NO.

REPUBLIC OF INDONESIA

JAKARTA/TANGERANG FREEWAY FINANCIAL STUDY

FINAL REPORT

JUNE 1979

JAPAN INTERNATIONAL COOPERATION AGENCY

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P R E F A C E

In response to the request of the Government of the Republic of Indonesia, the Government of Japan decided to conduct a financial feasibility study for operating the Jakarta-Tangerang Section (approximately 27 km in length) of the Jakarta-Merak Highway as a tollway. The Japan International Cooperation Agency (JICA), the official technical cooperation agency, has carried out this study.

The feasibility study for the Jakarta-Merak Highway was carried out during 1973-1974 by JICA's predecessor, the Overseas Technical Cooperation Agency (OTCA).

The detailed engineering design of the Jakarta-Merak Highway was prepared by Pacific Consultants International in 1977, and a loan from the Overseas Economic Cooperation Fund (OECF) has now become available.

In March 1978, P.T. Jasa Marga, the tollway operation agency of the Republic was established for the operation of the Jagorawi Freeway, the first tollway in the Republic. The Jakarta-Tangerang section of the Jakarta-Merak Highway is intended to be a tollway forming a part of the Jakarta-West Java Tollway System.

In March 12, 1979, JICA dispatched a survey team headed by Mr. Takashi Sakai, the Ministry of Construction, to Indonesia. The survey was carried out smoothly with the full cooperation of the Indonesian authorities, particularly the Directorate General of Highways (Bina Marga) and Indonesian Highway Corporation (P.T. Jasa Marga). After returning to Japan, the team made further studies and has compiled this report.

I hope that this report will contribute to the socio-economic development of metropolitan Jakarta and the surrounding region, and at the same time to enhancing the friendly relations between the Republic of Indonesia and Japan.

I would like to take this opportunity to express my heartfelt appreciation to all the people concerned in the Republic of Indonesia who extended close cooperation to the study team.

June 1979

Shinsaku Hogen
President
Japan International Cooperation Agency

LETTER OF TRANSMITTAL

Mr. Shinsaku Hogen
President
Japan International Cooperation Agency

Dear Sir,

We have pleasure in submitting to you our Final Report of the Jakarta-Tangerang Freeway Financial Study.

This study investigates the financial viability of tollway operation for the Jakarta-Tangerang Section (approximately 27 km in length) of the Jakarta-Merak Highway, for which the detail engineering services have been already completed in 1974.

The toll collecting systems recommended for each stage of operation were selected from various alternatives after a careful study on the future tollway network proposed for the Jakarta Metropolitan Area, taking fully into considerations of requirements by the Indonesian authorities.

The results of the site investigation during the team's stay in Indonesia were analyzed, and then reflected especially in the traffic study and construction costs estimate. In estimating the costs for maintenance, repair and operation, relevant data on the Jagorawi Freeway, the first tollway in the Republic, were referred.

This study was carried out by engineers from Pacific Consultants International under the supervision of the team leader entrusted by the Japan International Cooperation Agency.

We wish to express our sincere thanks for the cooperation of the Indonesian authorities, particularly the Directorate General of Highways Bina Marga) and Indonesian Highway Corporation (P.T. Jasa Marga).

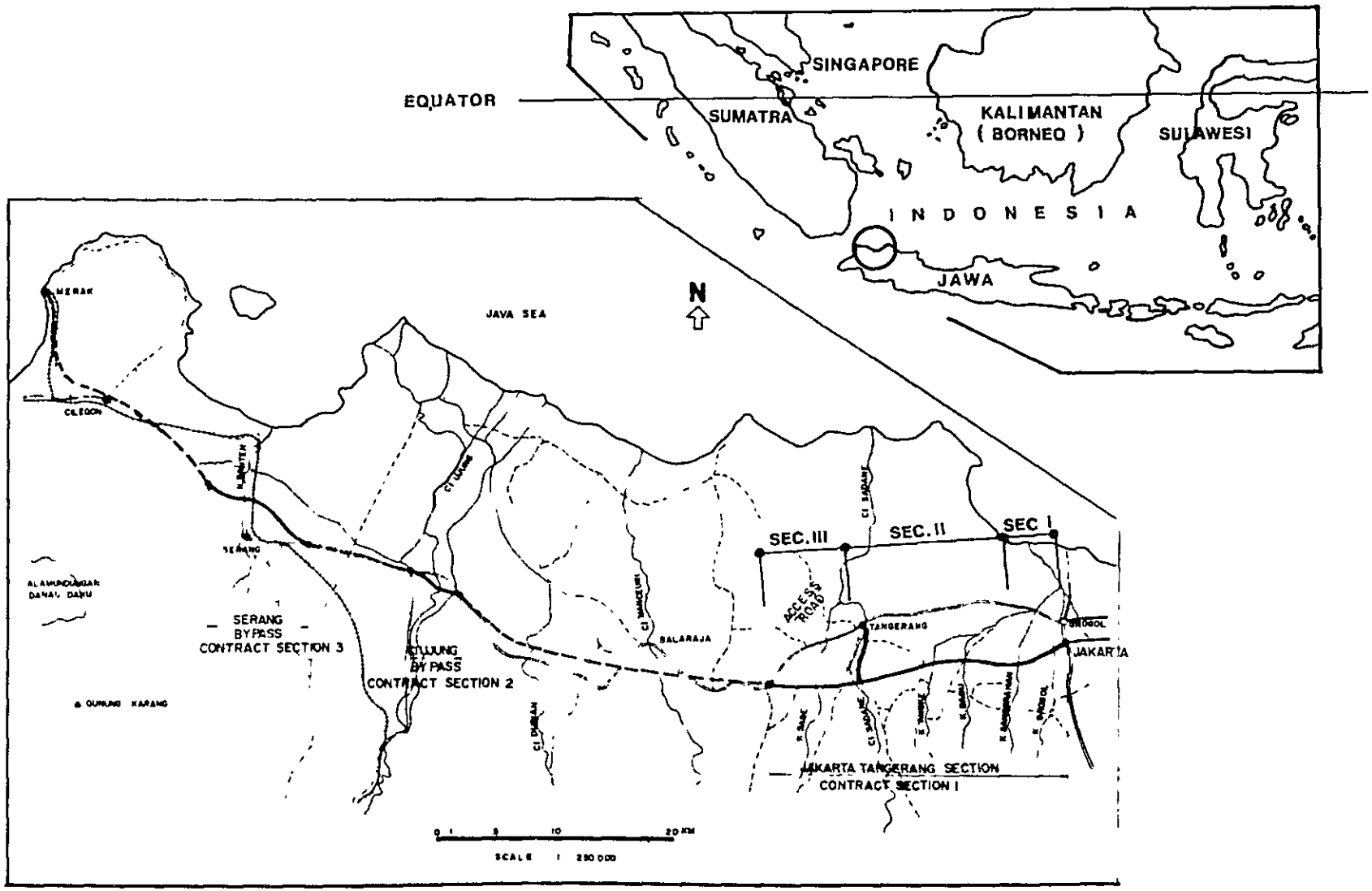
June 1979

Very truly yours,

Takashi Sakai

Takashi Sakai
Team Leader
Jakarta-Tangerang Freeway
Financial Study Team

MAP OF PROJECT AREA



SUMMARY AND CONCLUSIONS

SUMMARY AND CONCLUSIONS

1. This study investigates the financial viability of applying the tollway system to the Jakarta-Tangerang section, (Jakarta-Tangerang Freeway), of the Jakarta-Merak Highway. A feasibility study and detailed design study have already been completed. The results of the study is summarized as follows:

2. The Jakarta-Tangerang Freeway is divided into 3 sections in the engineering study*) as follows:

   - Section I : Jakarta - Sta. 4 km 600
   - Section II : Sta. 4 km 600 - Sta. 18 km 800
   - Section III : Sta. 18 km 800 - Sta. 26 km 560

   Note: *) Sectional sub-division for the engineering study differs from that for the traffic and toll collecting system studies.

3. The highway geometric standard is briefly summarized as follows:

	Section I	Section II	Section III
- Road Length:	4.6 km	14.2 km	7.76 km
- Design Speed:	100 km/hr.	120 km/hr.	100 km/hr.
- Minimum R.O.W. Width:	40 m	Urban 40 m Rural 60 m	40 m
- Number of Lane:	4 Lanes	4 Lanes	4 Lanes

4. The sectional sub-division for the traffic and toll collecting system studies is as follows:

   - Section A : Jakarta - Outer Ring Road Intersection (Approximately 7 km)

- Section B : Outer Ring Road Intersection - Tangerang Accessway Intersection (Approximately 12 km)
- Section C : Tangerang Accessway Intersection - West Tangerang Intersection (Approximately 8 km)

5. The future daily traffic volume by vehicle type is estimated for each case of flat and sectional tariff system*) as follows:

	Year	Sedan	Bus	Truck	Total	Growth Ratio
- Flat Tariff:	1985:	5,459	325	1,282	7,066	100
	1995:	7,934	403	1,715	10,052	142
	2005:	10,104	495	3,065	13,664	193
- Sectional Tariff:						
Section A:	1985:	2,188	68	674	2,930	100
	1995:	2,616	93	1,043	3,752	128
	2005:	3,331	122	2,238	5,691	194
Section B:	1985:	5,471	329	1,112	6,912	100
	1995:	6,540	456	1,741	8,737	126
	2005:	8,328	551	3,111	11,990	173
Section C:	1985:	5,471	329	1,117	6,917	100
	1995:	11,324	513	1,866	13,703	138
	2005:	17,867	670	4,098	22,635	327

Note: *) The above traffic volume is estimated based on the toll fare conditions which will be described later.

6. The toll collecting system is selected for each stage of the tollway operation after a careful study based on various alternatives taking the requirements of the Indonesian Government fully into considerations.

Staging for the toll collecting system development is as follows:

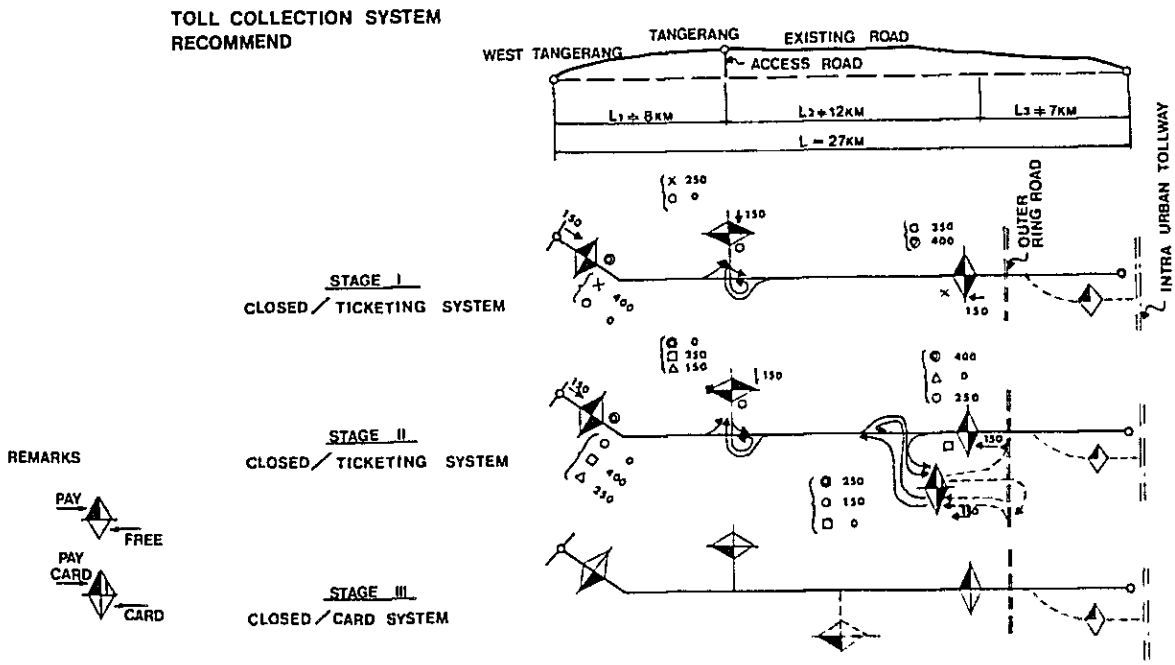
Stage I : After opening until the Outer Ring Road is connected.

Stage II : After connection with the Outer Ring Road until the integrated operation system for both the Jakarta - Tangerang Freeway and the Outer Ring Road is introduced.

Stage III : After introduction of the integrated operation system.

The toll collecting system recommended is illustrated below:

TOLL COLLECTION SYSTEM RECOMMENDED



7. The construction costs based on 1979 prices have been estimated by reviewing the quantity estimate for the Jakarta-Merak Highway project, up-dating the unit costs and also adding the costs for tollway facilities.

The results are as follows:

- Construction Cost:	34,030 Million Rupiah
- Land Acquisition and Compensation:	12,529 Million Rupiah
- Contingencies:	4,657 Million Rupiah
- Total:	51,216 Million Rupiah

8. The annual costs for maintenance based on 1979 prices are estimated by referring to those for the Jagorawi Freeway. The annual costs for operation based on 1979 prices are estimated based on the administration organization proposed. The annual maintenance and operation cost is as follows:

- Maintenance and Operation Cost:	236 Million Rupiah/Year

9. The toll fare for the first year after opening is assumed for both the cases of the flat and sectional tariff systems considering the value of the time saved, toll resistance*)-1 and the toll fare for the Jagorawi Freeway.

		Sectional Tariff		Flat Tariff
1983 - 1984:	-	Section A.B *)-2	: 400 Rp./PCU	400 Rp./PCU
		(Section A	: 150 Rp./PCU)	
		(Section B	: 250 Rp./PCU)	
	-	Section C	: 150 Rp./PCU	

Note: *)-1: Toll resistance means the effect the toll fare has on reduction of the traffic volume on a tollway.

*)-2: At this point the Outer Ring Road will not have been connected yet, and therefore users for section A or B only are not considered.

Then, the annual rate of increase of 7.0% is applied to the toll fares for each 5 year period in the future.

10. The annual revenue is calculated for the project life-span of 25 years based on the above future toll fare schedule and the estimated future traffic volume.

The annual revenue is estimated to be as follows:

	Sectional Tariff	Flat Tariff
- 1985:	5,518 Million Rupiah	5,205 Million Rupiah
- 1990:	10,204 Million Rupiah	8,216 Million Rupiah
- 1995:	17,881 Million Rupiah	13,998 Million Rupiah
- 2000:	30,599 Million Rupiah	23,815 Million Rupiah
- 2005:	50,831 Million Rupiah	39,617 Million Rupiah

11. The 1979 present value of the construction cost and revenue at discount rates of 10%, 12% and 15% for the project life-span of 25 years is computed, and then a revenue-cost analysis is made for both the cases of flat and sectional tariff systems.

		Revenue-Cost Ratio	Internal Rate of Return
Flat Tariff:	10%:	1.23	11.7%
	12%:	0.96	
	15%:	0.68	
Sectional Tariff:	10%:	1.54	13.6%
	12%:	1.19	
	15%:	0.83	

Then, according to the above analysis the sectional tariff system is recommended.

12. The repayment program has been studied assuming repayment items as follows:

- Loan Repayment Costs
- Tax and Other Annual Expenditures (7% of the annual revenue)
- Rental Fee*) (7% of the annual revenue)

Note: *) Two repayment programs have been studied with and without the rental fee paid to the Government by the corporation.

The loan conditions for various loans are as follows:

- OECF:	- Interest Rate:	3%/Year
	- Grace Period:	7 Years
	- Repayment Period including Grace Period:	30 Years
- Other Foreign Bank Loans:	- Interest Rate:	8%/Year
	- Grace Period:	5 Years
	- Repayment Period:	15 Years
- Domestic:	- Interest Rate:	13.5%/Year
	- Grace Period:	5 Years
	- Repayment Period:	15 Years

Repayments for the loans are calculated based on the above conditions and in equal annual allocation after the grace period.

13. The above repayment program indicates that the break-even point*)-1 is expected to occur within 2 years after opening even in the case of the rental fee. The year when the repayment is completed, or more specifically when the accumulated net profit exceeds the total amount of loans including interests, is predicted to be 13 years*)-2 after opening.

These results suggest that this project is quite feasible from the financial point of view, and it will depend largely on the very favorable repayment conditions for the OECF loan. The elasticity of the loan conditions at this point is rather high, and therefore the repayment program established in this report should be continuously reexamined and revised if necessary when conditions change or different combination of loans become available.

Notes: *)-1: The year when a surplus of net profit occurs for the first time and is expected to continue to occur for the rest of the project life-span.

*)-2: In Japan, a repayment period of 25 to 30 years is generally acceptable.

14. This study should be recognized as a follow-up study to the series of studies on the Jakarta-Merak Highway project started in 1973, and therefore reviewing or up-dating of data provided by the previous studies is one of the most important objectives. In this context, the escalation factors assumed for prediction of the future financial parameters must be further verified when the economic situation changes or additional information becomes available. For example, the rate of increase for future toll fares, (7% of annual average) as adopted in this study, is a very sensitive factor.

15. With regard to points to be considered for further study, several items are listed below:

- Compensation fund for unexpected loss;
- Pool fund for the whole tollway network with an integrated financial program;

- Discount system (i.e. season tickets);
- Mechanical improvement of toll facilities;
- etc.

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OUTLINE OF THE STUDY

Chapter 1 OUTLINE OF THE STUDY

1.1 Objectives

The Government of Indonesia has been making efforts to solve the traffic problems caused by the rapid urbanization of DKI Jakarta and its suroundings through a series of studies such as JABOTABEK Development Plan (1973), JMATS (1974-1976), Jakarta-Merak Highway Study (1974), Jakarta-West Jawa Tollway System Study (1976), Jakarta Outer Ring Road Feasibility Study (1977) and Jakarta Intra Urban Tollway Feasibility Study (1978).

The Jakarta-Merak Highway being planned was initially studied as one of the radial highways with a total length of approximately 110 Km from Grogol in DKI Jakarta westward to the city of Merak at the western tip of the Jawa Island, where it is connected with Sumatra Island by ferry.

The Jakarta-Tangerang section of the above highway (approximately 27 Km in length) is simply called the Jakarta-Tangerang Freeway in this report. The Directorate General of Highways, the Ministry of Public Works (Bina Marga) plans to operate it as a tollway.

The influence area of this study includes the entire DKI Jakarta and Kabupaten Tangerang.

The main objective of this study is to investigate the financial viability of applying the tollway system to the Jakarta-Tangerang Freeway for which a feasibility study and detail design study for a toll-free case have already been completed.

More specifically, the study items are:

- Review of the Jakarta-Merak Highway Study (1974);
- Selection of Toll Collecting System;
- Traffic Forecast for the Jakarta-Tangerang Freeway as a Tollway;
- Preliminary Design and Cost Estimates for Tollway Facilities;
- Study of the Operation and Administration Systems; and
- Financial Analysis and Repayment Program.

1.2 Work Items

The study has been carried out both in Indonesia and Japan.

Work items during the stay in Indonesia were:

- Site Reconnaissance;
- Alternative Setting for Toll Collecting System;
- Policy Setting for Financial Program;
- Data Collection for Construction Cost Estimates and Financial Analysis;
- Traffic Counting Survey
- etc.

Those, completed upon return to Japan were:

- Preliminary Design and Cost Estimates for Tollway Facilities;
- Review and Up-dating of Construction Costs Estimate in Jakarta-Merak Highway Project;
- Traffic Forecast;
- Study on Operation and Administration Systems;
- Financial Study and Repayment Program;

1.3 Team Organization

Members of the JICA study team and personnel participating from the Government of Indonesia are listed below:

JICA Study Team:

Mr. Takashi Sakai	:	Team Leader Deputy Chief of Tollway Division, Road Bureau, Ministry of Construction
Mr. Taichiro Kurayama	:	Tollway Specialist Pacific Consultants International
Mr. Tadashi Matsuda	:	Transport Economist Pacific Consultants International
Mr. Nobuwaka Yamakawa	:	Assist at Site (Transport Planner/Economist) Pacific Consultants International

Directorate General of Highways (Bina Marga):

Mr. Suryatin Sastromidjojo	:	Director General of Highways
Mr. Sunarno	:	Director of Planning
Mr. Djuned Djohari	:	Secretary of Director
Mr. Wiyoto Wiyono	:	Chief of Urban Highway
Mr. Trihardjo	:	Chief of Traffic Section
Mr. Eduward Pauner	:	(Counter Part) Staff of Traffic Section

Jasa Marga:

Mr. Joewono Kolopakin	:	President Director
Mr. Zainal Abidin Aziz	:	Director
Mr. Muharianto	:	Deputy of Technic
Mr. Basuki S.	:	Chief of Jagorawi Branch Office
Mr. Adnar	:	(Counter Part) Staff
Mr. Anton	:	(Counter Part) Staff

1.4 Study Team's Activities in Indonesia

March 12 (Mon), 1979	:	Arrived at Jakarta from Tokyo.
March 13 (Tue)	:	Courtesy call at P.T. Jasa Marga. Consultation on traffic survey schedule. Request for data and assistance. Also, visited the Japanese Embassy and JICA office explaining the schedule and purpose of the study. Reconnaissance of arterial roads in DKI Jakarta.
March 14 (Wed)	:	Briefing of the scope of work and submission of questionaire to Bina Marga. General discussion on the tollway system.
March 15 (Thu)	:	Visited traffic counting stations with survey personnel giving relevant instructions, while simultaneously conducting a travel speed survey.
March 16 (Fri)	:	Preparation of traffic counting survey sheets in the Bina Marga office. Reconnaissance of the Jagorawi Freeway.
March 17 (Sat)	:	Explanation of a rough scheme for the total tollway system in Jakarta metropolitan area to Bina Marga.
March 18 (Sun)	:	Discussion within the study team based on the data collected.
March 19 (Mon)	:	Exchange of opinions on the traffic count survey with the counter part staff. Analysis of the travel speed survey results. Discussion on the contents and organization of the interim report.

March 20 (Tue)	:	Supervision of the traffic count survey, simultaneously conducting a travel speed survey. Analysis of the traffic volume data for the Jagorawi Freeway.
March 21 (Wed)	:	Supervision of the traffic counting survey, simultaneously conducting a travel speed survey. Analysis of the travel speed survey results. Preparation of questionaire for P.T. Jasa Marga.
March 22 (Thu)	:	Compiling the traffic count survey results with the counter part staff. Conducting a travel speed survey for the Jagorawi Freeway. Explanation of a future tollway system scheme to Bina Marga utilizing illustrations.
March 23 (Fri)	:	Compilation and analysis of the traffic count survey results. Discussions with the Indonesian side of the general policy for the study. Minutes of the discussions authorized by the Chief of the Highway Division, Bina Marga, and the JICA team reader were made.
March 24 (Sat)	:	Visited the Japanese Embassy, JICA and OECF for a general explanation of the intermediate results of the team's stay in Jakarta.
March 25 (Sun)	:	The team leader returned to Tokyo
March 26 (Mon) ∿ April 13 (Fri)	:	Studied at the project office in Bina Marga, except Sundays. Discussions were held with members of Bina Marga and P.T. Jasa Marga on March 27 (Tue), April 3 (Tue) and April 7 (Sat).
April 12 (Thu)	:	Discussions with P.T. Jasa Marga and Bina Marga on the interim report, and also with the Japanese Embassy and JICA.

April 14 (Sat)	:	Submitted the interim report to Bina Marga, the Japanese Embassy and JICA.
April 15 (Sun)	:	The remaining members returned to Tokyo.

Chapter 2
SOCIO-ECONOMIC SITUATION OF PROJECT AREA

Chapter 2 SOCIO-ECONOMIC SITUATION OF PROJECT AREA

2.1 Administrative Regencies

Indonesia is composed of over 3,000 islands and has a total area of about two million square kilometers. At the national level, the whole country is divided into two special districts and 24 provinces. The island of Java is composed of two special districts and three provinces, namely the Special Districts of Jakarta and Yogyakarta, and the provinces of East Java, Central Java and West Java. The province of West Java, in which the Jakarta-Merak Highway lies, is on the western end of Java island, enclosing the Special District of Jakarta (DKI Jakarta) on the north. The province of West Java is further divided into 20 Kabupatens (counties) and Kotamadyas (cities).

DKI Jakarta is devided into 5 Walikotas and these are further divided into 30 Kecamatans. And Kabupaten Tangerang is divided into 17 Kecamatans.

For the purposes of this study Kabupaten Tangerang was divided into 5 zones, while DKI Jakarta was divided into 38 zones, which are finally integrated into 12 large zones as explained in the Sec. 5.2.1 Zone Division.

2.2 Population and Landuse

2.2.1 Population

The boundary of DKI Jakarta was partly changed in 1976 adding a considerable amount of sparsely inhabited fringe areas. The population statistics in "STATISTICAL YEAR BOOK, 1976" and 'RENCANA KOTA' which deal with the whole JaBoTaBek*) region are based on the old region. After revision of these data assuming the past conditions for the newly added fringe areas, the recent population development in the Jakarta metropolitan area is estimated as shown in Table 2-1.

Notes: JaBoTaBek: DKI Jakarta, and Kabupatens of Bogor, Tangerang and Bekashi.

Table 2-1 POPULATION DEVELOPMENT IN DKI JAKARTA AND BOTABEK

(Unit: 1,000 persons)

Year	*)-1 Old Jakarta Region	Population Added	New Jakarta Region	Growth Rates (%)	New BoTaBek Region	*)-5 JaBoTaBek Region
1970	4,437	107	4,544	3.1	3,545 *)-2	8,089
1971	4,576*)-3	109	4,685	3.7	3,648 *)-2	8,333
1972	4,755	111	4,866	3.9	-	-
1973	4,973	114	5,087	4.5	3,787 *)-2	8,874
1974	5,183	116	5,299	4.2	3,892 *)-4	8,191
1975	5,404	118	5,522	4.0	3,956 *)-2	9,478
1976	-	121	5,745	-	-	-

Notes:
*)-1 Source: "STATISTICAL YEAR BOOK DKI JAKARTA, 1976"
*)-2 [Data in "BAPPEMKA"] - [Population Added to DKI]
*)-3 Different from figures in 'SENSUS PENDUDUK, 1971'
*)-4 [Data in 'RENCANA KOTA'] - [Population Added to DKI]
*)-5 Figured out from Population in New Jakarta Region and in New BoTaBek Region.

The average growth rate of DKI Jakarta population during 1971 to 1975 was 4.0%, and according to 'JABOTABEK', 1973, 20% of this growth rate was a natural increase and the rest was due to

migration. During the same period BoTaBek*) and JaBoTaBek recorded respectively population growth rates of 2.2% and 3.2%.

Notes: BoTaBek: Kabupatens of Bogor, Tangerang and BeKashi

2.2.2 Landuse

So far, several landuse concepts for the Jakarta metropolitan area have been proposed in past studies, and some of them are somewhat outdated by the rapidity of actual development.

In the 'Jakarta Master Plan 1965-1985' the sphere of city expansion is bordered by the inner edge of a green belt at a distance of 15 km from the city center. This green belt, 3 km wide, is to be preserved as the outer most periphery of the city proper. However, the recently estimated future population in 2005 will require conversion of existing green areas to residential areas in almost every part within the DKI Jakarta city limits, except for some special low building coverage areas of green preservation, river banks, recreational areas, etc.

In the 'JABOTABEK' report the area along the DKI Jakarta border is considered to be a transitional zone from semi-urban to rural within which development would start along major directions towards growth poles of regional centers in the BoTaBek region such as Tangerang, Bogor, Cikarang, Bekasi, Serpong, Depok, etc. The proposed Outer Ring Road will not limit the urban growth, but contrarily, it will stimulate development along it. Especially, at the interchanges between the Outer Ring Road and radial regional highways some impact will be given to the development of areas around it.

In the landuse study in The Jakarta Intra Urban Tollway study in 1979, emphasis is placed on the merits of locating sub-growth poles with some urban character along the Outer Ring Road to accelerate the above mentioned radial carridor development.

The existing Jakarta-Tangerang Highway runs through the so called Jakarta-Tangerang carridor which is considered one of the major development carridors in the Jakarta metropolitan area. In a narrow zone between the existing Jakarta-Tangerang Highway and the Tangerang Railway Line a ribbon of industrial development is planned. When the Outer Ring Raod is extended to the Harbour Road, this area will have a strong connection to the Tanjung Priok Port. When the Cenkareng International Airport is constructed, more traffic will use the Outer Ring Road, and then a considerable amount of this traffic will flow into the future Jakarta-Tangerang Freeway through the interchange in this corridor. Consequently, for both passenger and cargo traffic the interchange in this corridor will become one of the most important nodes on the Outer Ring Road, and the Jakarta-Tangerang Freeway.

2.3 Economic Activities

2.3.1 Indonesia

The Repelita II (the Second National Five-Year Plan) which followed the successful achievement of the Repelita I is going to be terminated in 1979.

It might reasonably be argued that Indonesia's economy along with the world economy has undergone drastic changes during the period of Repelita II. In the fall of 1973, the price of petroleum in the world market rose about fourfold and eventually this euphoria for Indonesia seemed to keep on encouraging economic development.

Nevertheless, this was a turning point, and international economic activities have declined and become more stagnant. With the world economic stagnation and monetary crises Indonesia's economy incurred a great loss also, so that the per capita income and GNP (Gross National Product) in 1975 showed the lowest growth rates of recent years, rates of 3.0% and 5.4% respectively.

This was partly due to the drop in export volume of crude oil, timber, etc. and the rise in prices of imported goods. But also, the year 1975 was a crisis year for Indonesia for such reasons as the drought which cut rice production, and the low prices which hit rubber and other export crop share-holders. These crises cut the real incomes of cash crop producers and the consumption levels of subsistence farmers, who represent over 60% of the employed people in Indonesia.

Despite such discouragement, Indonesia seems capable of economic recovery and is likely to attain steady growth across intricate international and domestic issues. Favourable signs of this trend can be seem in the fact that recovery of the GDP went up nearly 7% in 1976 and foreign exchange reserves, which dropped drastically from US$2,030 million in October 1974 to US$580 million at the end of 1975, regained to US$1,400 million in 1976 and US$2,400 million at the end of July, 1977.

Meanwhile, the non oil export sector has put in a very healthy performance, with an increase of some 35% to over US$2.500 million in 1976-1977, with output up as well as prices. Also, the production of crude oil revived and rose from 477 million barrel in 1975 to 550 million barrel in 1976, which volume surpassed even the production of 502 million barrel in 1974.

In November, 1978 the Indonesian currency was devaluated against the US dollar. The former exchange rate was one US dollar equivalent to about 415 Rupiah and the present rate is about 625 Rupiah, Although the devaluation effect on the Indonesian economy is not cralified yet at national level, normally such devaluation depresses imports and encourages exports. A rise in the prices of import goods has an influence on the prices of various commodities.

Therefore, the unit construction costs of this project have to be reevaluated based on the latest data and information as will be seen in Sec. 7.1 Construction Costs.

The outline of the development of the Indonesian economy is shown in Table 2-2.

Table 2-2 DEVELOPMENT OF INDONESIAN ECONOMY

(Unit: See Notes)

	1971	1972	1973	1974	1975	1976
Population (in million)	118.8 (-)	121.6 (102.36)	124.6 (102.47)	127.6 (102.41)	130.6 (102.35)	133.7 (102.37)
GDP 1)	5,599.7 (-)	6,067.2 (109.42)	6,753.4 (111.31)	7,269.0 (107.63)	7,630.8 (104.98)	8,156.3 (106.89)
National Income 2)	4,832.8 (-)	5,207.5 (107.75)	5,740.7 (110.39)	6,075.8 (105.84)	6,403.9 (105.40)	6,859.9 (107.12)
Per Capita Income 3)	40,680 (-)	42,825 (105.27)	46,073 (107.58)	47,616 (103.35)	49,035 (102.98)	51,038 (104.64)
Per Capita Income 4)	26,411 (-)	31,841 (120.56)	46,073 (144.70)	70,987 (154.08)	82,280 (115.91)	102,630 (127.73)
Export (x 1,000 tons) (F.O.B. value in million US$)	49,701.7 (1,233.6)	61,186.1 (1,777.7)	77,762.9 (3,210.9)	80,891.5 (7,426.3)	73,215.1 (7,102.5)	83,722.3 (8,546.5)
Import (x 100 tons) (C.I.F. value in million US$)	4,335.6 (1,102.8)	6,030.2 (1,561.7)	9,953.9 (2,729.1)	10,458.4 (3,841.9)	10,396.8 (4,769.8)	83,722.3 (8,546.5)

Notes: Figures in parentheses show growth rates over previous year. (previous year = 100)

1) Unit: Billion Rp. at constant 1973 market prices.
2) Unit: Billion Rp. at constant 1973 factor costs.
3) Unit: Rp. at constant 1973 factor costs.
4) Unit: Rp. at current factor costs.

Source: 'STATISTICAL YEARBOOK OF INDONESIA, 1976', Biro Pusat Statistik, Jakarta

2.3.2 DKI Jakarta

DKI Jakarta has experienced remarkable conomic growth as shown in Table 2-3.

In spite of the 1975 economic depression at the national level, DKI Jakarta was hardly effected. On the contrary, DKI Jakarta's

economy grew much higher than in 1974 and its capability for further economic expansion was enhanced. The administration boundary of DKI Jakarta was also changed in 1975 to cover a broader area on its outskirts.

When looking into the development of economic sectors of industrial origin, the features of DKI Jakarta can be seen in the percentage distribution of the GRDP (Gross Regional Demestic Product). According to this, about a half of the GRDP has been dependent on the wholesale and retail trade sector, and the agricultural sector consecutively reduced its share from 8.41% in 1969 to 2.13% in 1975.

The second largest share of the GRDP in recent years has been held by the manufacturing sector which increased its share from 8.60% in 1969 to 12.07% in 1975 at current market prices.

In addition, DKI Jakarta's share in the manufacturing sector for the whole of Indonesia has generally been increasing.

In the Repelita II as well as the Jakarta Master Plan, plans were provided for the development of industrial estates around the periphery of DKI Jakarta, where it is intended to disperse and consolidate factories according to type and size. Thus, it can be anticipated that the manufacturing sector will continue to share an important part of the GRDP in the future.

The per capita income of DKI Jakarta has been about double of that of Indonesia as a whole throughout the period 1969 to 1975.

Despite the efforts of the Government to reduce the disparity in income levels between different regions, the advantages of economic integration in an urbanized area seem to continue to be effective in DKI Jakarta. Eventually, more in-flow migration will be attracted into DKI Jakarta than will be persuaded to leave for the other islands.

The counter-measure to avoid excessive population concentration in DKI Jakarta were proposed in the JABOTABEK study report, Jakarta Master Plan and also in the Repelita II. The emphasis in each case was placed on the need for economically balanced and well-harmonized development with such regions as Bogor, Tangerang and Bekasi so as to facilitate metropolitan regional development as a whole.

These efforts, however, will have to be continued for the time being before economic balance in the region is achieved.

Since data on DKI Jakarta's economic growth in 1976 is not available at present it has been estimated so as to integrate all the basic data into the statistical base year of 1976 for this economic study. For this estimation, however, the GRDP cannot be extrapolated from past data because DKI Jakarta's administration boundary changed in 1975, and this had to be taken into account. In the first place, therefore, the growth rate of per capita GRDP in 1976 was assumed by taking the annual average of the previous three years (1973-1975) which was about 7.2%. Multiplying this figure by the population in 1976, which was estimated in the landuse analysis, the GRDP in 1976 was estimated to grow at a rate of 13.7%.

Contemplating the existing conditions and future prospects of economic growth in DKI Jakarta, the future annual average growth rates were assumed to be as follows:

1977 - 1980	10%
1981 - 1985	9%
1986 - 1995	8%
1996 - 2005	7%

Table 2-3 ECONOMIC DEVELOPMENT OF DKI JAKARTA

(Unit: See Notes)

	1969	1970	1971	1972	1973	1974	1975
Population (in thousand)	4,274 (-)	4,437 (103.81)	4,576 (103.13)	4,755 (103.91)	4,973 (104.58)	5,183 (104.22)	5,404 (104.26)
GRDP 1)	214,947 (-)	234,893 (109.28)	260,483 (110.89)	283,761 (108.94)	319,744 (112.68)	355,553 (111.20)	399,696 (112.42)
Regional Income 2)	180,759 (-)	197,569 (109.30)	219,043 (110.87)	238,619 (108.94)	268,873 (112.68)	298,993 (111.20)	336,121 (112.42)
Per Capita Income 3)	42,293 (-)	44,528 (105.28)	47,868 (107.50)	50,183 (104.84)	54,067 (107.74)	57,687 (106.70)	62,199 (107.82)
Per Capita Income 4)	42,293 (-)	50,900 (120.35)	59,726 (117.34)	72,437 (121.28)	93,774 (129.46)	137,321 (146.44)	165,551 (120.56)

Notes: Figures in parentheses show growth rates over previous year (previous year = 100).

1) Unit: Million Rp. at constant 1969 market prices.
2) Unit: Million Rp. at constant 1969 factor costs.
3) Unit: Rp. at constant 1969 factor costs.
4) Unit: Rp. at current factor costs.

Source: 'REGIONAL INCOME OF JAKARTA', 1969-1975, Census and Statistical Office, Jakarta

2.4 Car-ownership

2.4.1 Indonesia

The growth rate of registered car-ownership in Indonesia is about 11.5% on annual average during 1972 to 1976, which surpasses any annual growth rates for the Gross Domestic Product.

The vehicle composition and growth rates by types of vehicle are given in Table 2-4.

Table 2-4 DEVELOPMENT OF ECONOMY AND CAR-OWNERSHIP IN INDONESIA

	1971	1972	1973	1974	1975	1976
Mid. year Population (million)	118.8 (-)	121.6 (102.36)	124.6 (102.47)	127.6 (102.41)	130.6 (102.35)	133.7 (102.37)
GDP (Bil. Rp. at 1973 const. Prices)	5,599.7 (-)	6,067.2 (109.42)	6,753.4 (111.31)	7,269.0 (107.63)	7,630.8 (104.98)	8,156.3 (106.89)
National Income (Bil. Rp. at 1973 const. factor Costs)	4,832.8 (-)	5,207.5 (107.75)	5,740.7 (110.39)	6,075.8 (105.84)	6,403.9 (105.40)	6,859.9 (107.12)
Per Capita Income (Rp. at 1973 const. factor costs)	40,680 (-)	42,825 (105.27)	46,073 (107.58)	47,616 (103.35)	49,035 (102.98)	51,308 (104.64)
Registered Motor Vehicle	397,161 (-)	434,873 (109.50)	480,001 (110.38)	535,683 (111.60)	614,580 (114.73)	684,008 (111.30)
Sedan	259,282 (-)	277,210 (106.91)	306,713 (110.64)	337,789 (110.13)	383,061 (113.40)	420,945 (109.29)
Bus	22,797 (-)	26,488 (116.19)	30,036 (113.39)	31,439 (104.67)	35,103 (111.65)	40,001 (113.95)
Truck	115,082 (-)	131,175 (113.98)	143,252 (109.21)	166,457 (116.21)	196,416 (118.00)	223,062 (113.57)
Car-ownership per 1,000 persons	3.34 (-)	3.58 (107.19)	3.85 (107.54)	4.20 (109.09)	4.71 (112.14)	5.12 (108.70)

Source: 1) STATISTIC YEARBOOK OF INDONESIA, 1976-Biro Pusat Statistical, Jakarta.

2) STATISTICAL POCKETBOOK OF INDONESIA 1966/1967, 1974/1975, 1976, 1977.

3) VEHICLE AND LENGTH OF ROAD STATISTICS, 1975-Biro Pusat Statistik Jakarta

Notes: Figures in parentheses show the growth rates over the previous year (previous year = 100).

From the investigation conducted by a reliable tire manufacturing company, car-ownership for all types of vehicles in 1977 is known to have grown 13.9%, sedan car-ownership, and bus and truck-ownership developed 11.0% and 18.6% respectively. Thus, the growth in car-ownership has always exceeded the growth rates of Indonesia's economy.

Rates of car-ownership per 1,000 persons are also increasing steadily at 7% to 8% annually, except for a drastic increase of over 12% in 1975.

Concerning the distribution of car-ownership in Indonesia, it is seen that more than 30% of the national total converges into DKI Jakarta. DKI Jakarta's percentage distribution has been increasing gradually from 30.9% in 1971 to 33.6% in 1976.

2.4.2 DKI Jakarta

As given in Table 2-4, the growth rate of car-ownership in DKI Jakarta has developed remarkably, increasing from a rate of 9.8% to 16.7% consecutively from 1971 to 1975. However, in 1976 the rate of increase dropped to 10.9%, which fell below the growth rate of 11.3% for car-ownership in Indonesia.

From Table 2-5 it can be seen that the proportion of trucks has

generally been expanding while the proportion of sedans has been reducing. Buses have held a fairly constant share with only slight fluctuations.

Table 2-5 VEHICLE COMPOSITION RATES IN DKI JAKARTA

(unit: %)

	1971	1972	1973	1974	1975	1976
Sedan	77.3	76.6	75.7	73.9	73.7	74.1
Bus	4.8	4.9	5.0	4.8	4.7	4.8
Truck	17.9	18.5	19.3	21.3	21.6	21.1
Total No. of Motor Vehicle	100.0	100.0	100.0	100.0	100.0	100.0

Such increase of the trucks' share may be brought about particularly by the development of the manufacturing industry in DKI Jakarta, because the demand for trucks is closely related to the consumption and production of goods.

Needless to say, DKI Jakarta is not only the major consumer city but also one of the major industrial producer cities in Indonesia.

The contribution of the manufacturing sector of DKI Jakarta to that of Indonesia has been rising in a steady curve from 6.5% for 1970 to 11.8% for 1975, though other sectors were reducing or fluctuating in a small range at the same time. This means that so far, DKI Jakarta has augmented the importance of this sector for Indonesia as a whole.

In addition, the economy of DKI Jakarta is supported by the development of Tanjung Priok Port which will continue to handle international and inter-island traffic. Therefore, the demand for cargo transport and truck-ownership in DKI Jakarta is expected to

continue its upward turn for a long time to come.

Generally, car-ownership has a good correlation with economic factors.

On account of this, regression analysis was applied to estimate the parameters of a linear regression equation. The per capita income growth in DKI Jakarta was found to provide a reasonable explanation of the growth in car-ownership.

Table 2-6 DEVELOPMENT OF ECONOMY AND CAR-OWNERSHIP IN DKI JAKARTA

	1971	1972	1973	1974	1975	1976
Population (in thousand)	4,576 (103.13)	4,755 (103.91)	4,973 (104.58)	5,183 (104.22)	5,404 (104.26)	5,734 (106.11)
GRDP (mil. Rp. at 1969 const. prices)	260,483 (110.89)	282,761 (108.94)	319,744 (112.68)	355,553 (111.20)	399,696 (112.42)	454,662 (113.75)
Regional Income (mil. at 1969 const. factor costs)	219,043 (110.87)	238,619 (108.94)	268,873 (112.68)	298,993 (111.20)	336,121 (112.42)	382,347 (113.75)
Per Capita Income (Rp. at 1969 const. factor costs)	47,868 (107.50)	50,183 (104.84)	54,067 (107.74)	57,687 (106.70)	62,199 (107.82)	66,680 (107.20)
Registered Motor Vehicle	122,846 (-)	134,926 (109.83)	152,713 (113.18)	177,380 (116.15)	207,054 (116.73)	229,649 (110.91)
Sedan	95,077 (-)	103,336 (108.69)	115,635 (111.90)	131,041 (113.32)	152,536 (116.40)	170,265 (111.62)
Bus	5,834 (-)	6,672 (114.36)	7,648 (114.36)	8,562 (111.95)	9,819 (114.68)	10,976 (111.78)
Truck	21,935 (-)	24,918 (113.60)	29,430 (118.11)	37,777 (128.36)	44,699 (118.32)	48,408 (108.30)
Car-ownership per 1,000 persons	26.85 (-)	28.38 (105.70)	30.71 (108.21)	34.22 (111.43)	38.31 (111.95)	40.05 (104.54)
Sedan-ownership per 1,000 persons	20.77 (-)	21.73 (104.62)	23.25 (106.99)	25.28 (108.73)	28.23 (111.67)	29.69 (105.17)

Notes:
1) Population and economic factors are estimated in the Jakarta Intra Urban Tollway study.
2) Figures in parentheses show growth rates over previous year (previous year = 100).

Chapter 3
TOLLWAY SYSTEM AND ITS FUTURE DEVELOPMENT

Chapter 3 TOLLWAY SYSTEM AND ITS FUTURE DEVELOPMENT

3.1 Background

In this chapter the evolution of the tollway system concept as well as the Government's legislation on construction and operation of tollways and the future prospects for the tollway system in Indonesia is discussed in order to provide a general understanding of the tollway situations.

Due to the recent increase in vehicular traffic demand accompanied by the regional development of the Jakarta metropolitan area and West Java, traffic flows have rapidly increased in recent years, and the necessity for strengthening the road network in the area has arisen.

In 1971, the Government of Indonesia regarded the traffic study as very important and asked the Government of the Federal Republic of Germany to carry out the Jakarta Metropolitan Area Transportation Study (JMATS) within the framework of the Technical Cooperation Agreement between both Governments.

From February 1972 to July 1974 a German Consultant (Arge Becker Intertraffic, Jakarta) conducted the above mentioned study in cooperation with the Directorate General of Land Communication and Waterways and prepared a comprehensive transportation master plan for the target years of 1985 and 2000.

After the completion of the JMATS report in October 1974, the Directorate General of Highways (Bina Marga) commissioned the same consultants to investigate the technical, economic and

financial feasibility of the Jakarta-West Java Tollway System. The work started in November 1974 and the final report was completed in October 1976.

The Jakarta-West Jawa Tollway System comprised of the Jakarta Intra Urban Tollway, Jakarta Outer Ring Road and three regional freeways in major transportation and development corridors leading into the capital city from the east, west and south. The above tollways form a tollway network system which contributes to the solution of the traffic problems in the Jakarta metropolitan area.

The concept of charging toll to road users was born of necessity in view of the Government's very limited financial resources. For the planning period of the Second 5-year Development Plan (Repelita II), from 1974 to 1979, the budget available to Bina Marga is estimated to be Rp. 353,000 million (Rp. 71,000 million annually), and 75% of the budget was to be spent for repair and improvement work of roads under the jurisdiction of Bina Marga totaling about 33,000 km. Thus, it was difficult to advance the new construction with the remaining 25%.

For the reasons outlined above, the Government decided that introduction of tolls to the expressway network would be a reasonable solution for closing the ever widening gap between the limited road funds and rapidly increasing road construction costs.

3.2 Tollway Legislation

Among those belonging to the proposed Jakarta-West Java Tollway Network, the Jakarta-Bogor-Ciawi line (The Jagorawi Freeway) has been open since April 1979. A feasibility study and detailed design

were carried out by U.S. consultants through U.S. aid. These were followed by an international tender in 1973. A Korean construction company was engaged to construct the road under the supervision of U.S. consultants.

Before opening the Jagorawi Freeway to traffic, the Indonesian Government completed legislation on tollway construction and promulgated Government Regulation No. 4 on February 25, 1978.

This regulation, consisting of 16 articles in six sections, provides basic regulations for legislation on tollways, and corresponds to the Raod Improvement Special Measures Law (1953) of Japan, the Act regarding Construction of Highways and General Raods Law (1955) of Italy, or the Act regarding Motorways (1955) of France.

Previously the Republic of Indonesia did not have specific regulations regarding roads such as the Road Law or the National Expressway Law of Japan, and the Law regarding Transportation (1965 Law No. 3) had only the following provisions.

Article 13. The State is to have the jurisdiction over construction and maintenance of roads.

Article 14. The Government is to prescribe the provisions regarding the construction, maintenance and use of roads.

2. The Minister of Transport and Communications is authorized to classify the roads and provide signs and raod marking.

It seems that Government Regulation No. 4 of 1978 was prescribed under the provision of Article 14 of the above law.

Outline of the Government Regulation No.4 of 1978 is as follows:

Chapter 1. (Article 1) Definitions.

Chapter 2. (Articles 2-5) State investment and the capital of the Corporation.

Chapter 3. Provisions regarding supervision of toll road operation.

(Article 6) Toll roads are to form part of the public road network.

2. Toll roads are to be alternative roads to existing roads.

(Article 7) Toll roads are provided only for car users.

2. Those who use toll roads are to observe laws and regulations regarding public roads and toll roads.

(Article 8) Authority regarding toll roads rests with the State.

2. The Government is to exercise supervision over toll roads.

(Article 9) Routes of toll roads are to be determined by Presidential Decree based on the authority of the State.

2. Based on the right of supervision, the Government is to delegate the authority to the Corporation regarding construction, operation, maintenance and control.

3. Though the governmental authority may be delegated to the Corporation as prescribed under the previous paragraph, the Government shall not be exempt from its responsibility for toll roads.

(Article 10) The purpose of the establishment of the Corporation and its goal in management are to play a role in providing a road network intended for realization of the national goal aiming at development for the State and its people, which should be fair to each region, and also for security and defense of the State.

2. In order to realize the purpose and the goal prescribed under the previous paragraph, the Corporation is to carry out activities regarding the following matters.

a. Operation, maintenance and control of toll roads.

b. Supply of toll roads.

c. Management of those facilities attached or related to toll roads.

d. Other matters relating to the purpose and the goal of the establishment of the Corporation.

(Article 11) The scope of activities of the Corporation shall be as follows.

a. Management, maintenance, control and supply of toll roads (including technical planning, supervision, maintenance, control and betterment work).

b. Collection of tolls and other activities relating to the purpose and the goal of the Corporation.

(Article 12) For the Corporation to operate toll roads, the following conditions are to be met.

a. It is ensured that the cost of running a vehicle on a toll road is smaller than the cost of using existing roads.

b. Toll roads are to be of special specifications and higher standards than existing general roads.

c. Toll roads are to provide more reliability to users than existing roads.

Chapter 4. Determination of toll rates

(Article 13) Toll rates and how they are to be spent

shall be determined by the President based on a proposal prepared by the Minister concerned (Minister of Public Works) upon consultation with Finance and Communication Ministers.

Chapter 5. Additional provisions

(Article 14) If the Corporation wishes to obtain cooperation from other organizations regarding operation, maintenance, control and supply of toll roads, written approval from the Government (the Minister in charge and Finance Minister) is to be obtained beforehand.

Chapter 6. Supplementary provision

(Article 15) Those matters not prescribed under this regulation will be regulated by the Minister in charge.

3.3 Future Development of Tollway Network

The implementation schedule for the Jakarta-West Java Tollway System is illustrated in Table 3-1.

For the reasons described already for the introduction of a tollway system, those roads which may be operated as tollways in the future are planned for the areas near large cities, and they are mostly concentrated in Java.

Those roads which are planned to be tollways at present are the following sections.

- Jakarta-West Java Tollway Network:

  a. Jakarta Intra Urban
  b. Jakarta Outer Ring Road
  c. Jakarta-Bogor-Ciawi (Jagorawi Freeway)
  d. Jakarta-Cikampek
  e. Jakarta-Tangerang

- Other networks:

  a. Java Island

     1) Surabaya-Parong
     2) Surabaya-Kertosono
     3) Semarang Bypass

  b. Sumatra Island

     1) Medan-Belawan
     2) Medan-Tebingtinggi

  c. Bali Island

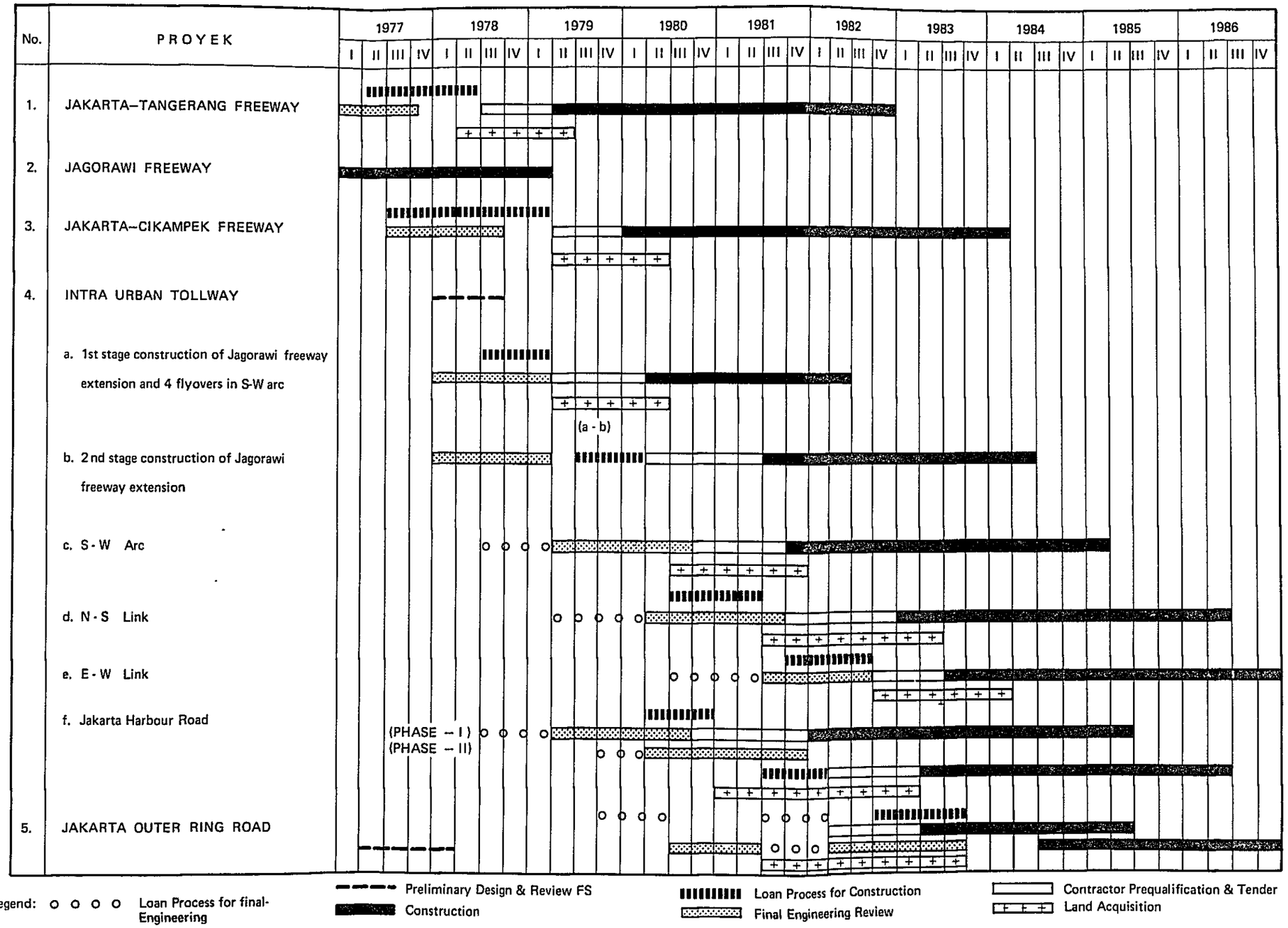
     1) Bualu-Kuta
     2) Denpasar Outer Ring Road

  d. Others
     Extension of these roads, bridge and tunnel

3.4 Utilization of Jagorawi Freeway

The Jagorawi Freeway of which the section to the Citeureup Interchange near Cibinong has been open since March 1978, and the remaining section up to Bogor has been open since April 1979, accommodated approximately 3,200 vehicles/day on average in the beginning and the volume had increased up to 6,100 vehicles/day by December 1978. In January 1979, it has decreased down to 5,200 vehicles/day because of new year holidays, and in February 1979, it increased again to around 5,600 vehicles/day.

Fig. 3-1 IMPLEMENTATION SCHEDULE FOR JAKARTA-WEST JAVA TOLLWAY SYSTEM



Notes: This table was provided by Bina Marga in 1978, and changes have occured since then. For example the construction period of Jakarta-Tangerang Freeway, which is scheduled to be 45 months in this table, is scheduled, in this study, to be 42 months starting in 1980.

Among vehicle types 30% are small size vehicles (less than 2.5 tons).

The variation of traffic volume during a week is very visible, and the number of vehicles less than 2.5 tons increases doubly on holidays. Large size vehicles decrease in number on holidays.

During one day the traffic starts growing after 6:00, and there are two peaks observed before and after noon, with a gradual decrease from 19:00. A very small volume exists after 12:00, midnight until 6:00 the next morning.

On Sundays, there is a clear trend of use by directions, and traffic flow from Jakarta to Cibinong is overwhelming in the monring, and vice versa in the evening.

The traffic count data on the Jagorawi Freeway are summarized in the following tables and figures.

Table 3-1 WEEKLY VARIATION OF TRAFFIC VOLUME ON JAGORAWI FREEWAY, DECEMBER 1978 - FEBRUARY 1979

(Unit: Vehicle/Day)

	SUN		MON		TUE		WED		THU		FRI		SAT	
DEC'78	3	9,067	4	5,081	5	4,681	6	5,020	7	5,186	1	7,306	2	6,102
	10	8,061	11	5,243	12	5,054	13	5,182	14	5,150	8	5,933	9	6,412
	17	7,960	18	5,100	19	4,807	20	5,003	21	5,267	15	5,176	16	6,537
	24	7,818	25	8,420	26	6,019	27	5,889	28	5,977	22	5,148	23	7,643
	31	8,605									29	6,051	30	7,855
JAN'79	7	7,582	1	9,134	2	5,455	3	5,259	4	5,258	5	5,443	6	6,302
	14	6,234	8	5,152	9	4,721	10	4,656	11	4,486	12	4,918	13	5,911
	21	6,441	15	4,847	16	4,471	17	4,656	18	4,649	19	4,448	20	5,365
	28	6,970	22	4,686	23	4,466	24	4,853	25	4,590	26	4,999	27	5,494
			29	5,355	30	4,819	31	4,945						
FEB'79	4	8,057	5	4,956	6	4,879	7	5,049	1	5,083	2	5,005	3	6,320
	11	8,719	12	5,176	13	4,617	14	7,955	8	6,494	9	6,418	10	6,131
	18	7,812	19	4,746	20	4,832	21	4,927	15	4,909	16	5,169	17	5,862
	25	7,774	26	4,979	27	4,898	28	5,132	22	4,828	23	5,034	24	5,981
TOTAL	13	101,100	13	72,875	13	63,719	13	65,526	12	61,877	13	71,321	13	81,915
AVERAGE		7,777		5,606		4,901		5,040		5,156		5,486		6,301

Fig. 3-2 WEEKLY VARIATION OF TRAFFIC VOLUME ON JAGORAWI FREEWAY, DECEMBER 1978 - FEBRUARY 1979

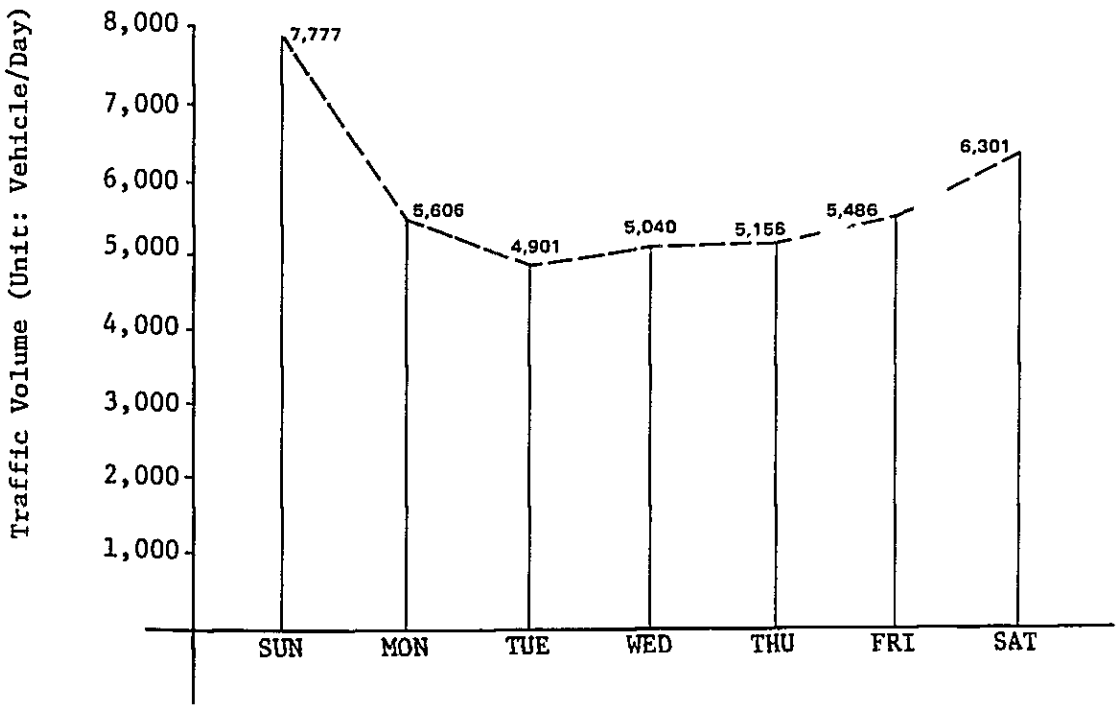


Table 3-2 WEEKLY VARIATION OF TRAFFIC VOLUME BY VEHICLE SIZE ON JAGORAWI FREEWAY, DECEMBER 1978 - FEBRUARY 1979

(Unit: Vehicle/Day)

	SUN		MON		TUE		WED		THU		FRI		SAT	
<2.5T		7,549		4,175		4,051		4,279		4,296		4,261		5,587
>2.5T	4	508	5	781	6	828	7	770	1	787	2	744	3	733
Sub total														
<2.5T		8,246		4,340		3,864		4,106		5,687		5,951		5,405
>2.5T	11	473	12	836	13	753	14	849	8	807	9	467	10	726
Sub total														
<2.5T		7,350		4,269		4,230		4,398		4,163		4,307		5,258
>2.5T	25	424	26	710	27	668	28	733	22	665	23	727	24	723
Sub total														
<2.5T		30,509		16,821		16,253		16,968		18,248		18,957		21,400
Total>2.5T		1,853		3,036		2,973		3,094		3,066		2,669		2,894
Total		32,362		19,857		19,226		20,062		21,314		21,626		24,294
<2.5T		7,627		4,205		4,063		4,242		4,562		4,739		5,350
Av.>2.5T		463		759		743		774		767		667		724
Total		8,090		4,964		4,806		5,016		5,329		5,406		6,074

Fig. 3-3 WEEKLY VARIATION OF TRAFFIC VOLUME BY VEHICLE SIZE ON JAGORAWI FREEWAY, DECEMBER 1978 - FEBRUARY 1979

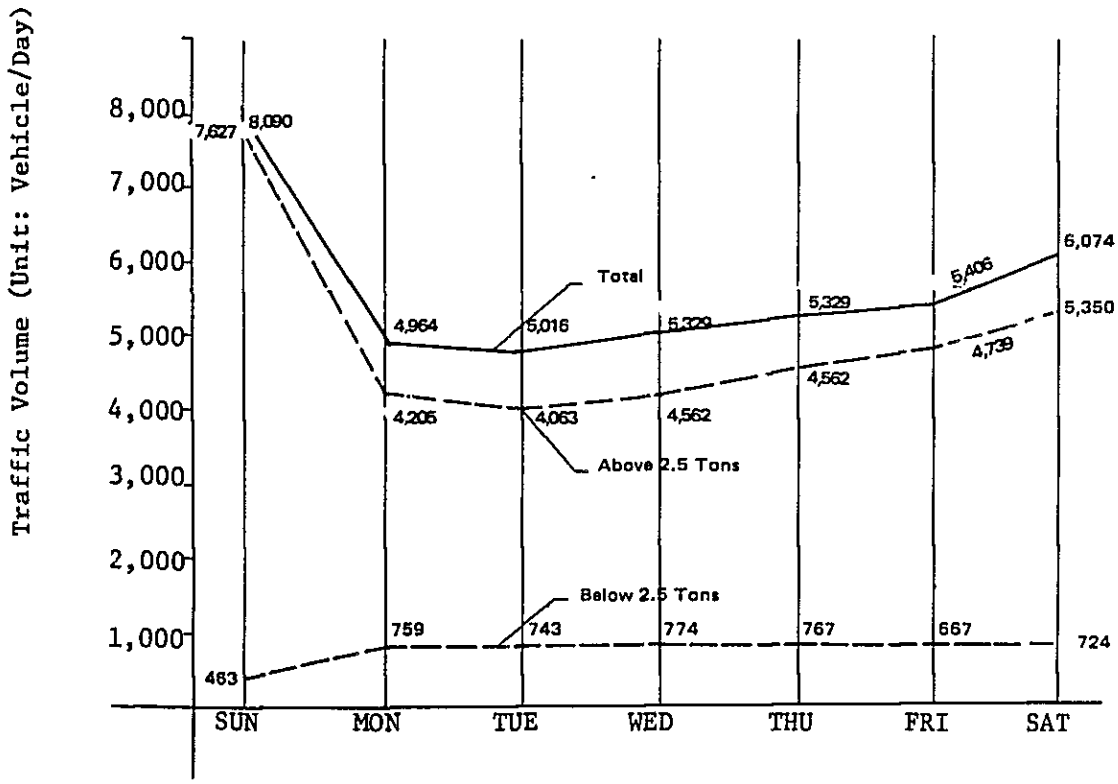


Table 3-3A HOURLY TRAFFIC VOLUME ON JAGORAWI FREEWAY, FEBRUARY 22 - 28, 1979 [BOTH DIRECTIONS]

(Unit: Vehicle/Hr.)

Time zone	Average			Saturday 24			Sunday 25		
	<2,5T	>2,5T	Total	<2,5T	>2,5T	Total	<2,5T	>2,5T	Total
24-01	35	6	41	40	6	46	60	2	62
01-02	27	5	32	36	6	47	34	3	37
02-03	23	3	26	19	3	22	28	2	30
03-04	23	3	26	33	4	42	18	2	20
05-06	45	8	53	51	12	63	59	8	67
06-07	132	20	152	59	11	70	119	6	125
07-08	287	39	326	198	35	233	281	13	294
08-09	287	42	329	239	39	278	428	28	456
09-10	297	56	353	296	65	301	616	40	656
10-11	260	60	320	248	55	303	576	27	603
11-12	230	47	277	259	84	343	366	23	389
12-13	214	46	260	257	68	325	429	29	458
13-14	243	50	293	471	68	539	368	25	393
14-15	321	52	373	383	58	441	502	28	530
15-16	317	54	371	426	67	493	470	33	503
16-17	254	52	306	479	61	540	604	22	626
17-18	321	43	364	429	40	469	614	23	637
18-19	251	41	292	393	25	418	505	19	524
19-20	239	32	271	301	21	322	472	13	485
20-21	205	18	223	190	17	207	227	11	238
21-22	108	11	119	154	15	169	104	16	120
22-23	70	11	81	109	9	118	74	6	80
23-24	49	9	58	93	13	106	67	6	73
Total	4,260	713	4,973	5,197	794	5,991	7,057	388	7,445

Note: The average volume was figured out from the results of the survey during Feb. 22 (Thu.) To 28 (Wed.), 1979.

Table 3-3B HOURLY TRAFFIC VOLUME ON JAGORAWI FREEWAY, FEBRUARY 22-28, 1979 [TO JAKARTA]

(Unit: Vehicle/Hr.)

Time zone	Average			Saturday 24			Sunday 25		
	<2,5T	>2,5	Total	<2,5T	>2,5T	Total	<2,5T	>2,5T	Total
24-01	22	5	27	17	6	23	17	2	19
01-02	15	3	10	12	3	15	13	3	16
02-03	14	3	17	12	3	15	11	2	13
03-04	14	3	17	18	5	23	14	2	16
04-05	14	5	19	18	7	25	14	3	17
05-06	25	7	32	22	9	31	26	6	32
06-07	87	16	103	9	9	18	29	4	33
07-08	129	19	148	118	23	141	60	7	67
08-09	159	29	186	131	29	160	78	12	90
09-10	170	42	212	138	43	181	121	26	147
10-11	128	37	165	90	29	119	126	19	145
11-12	106	28	134	97	46	143	88	17	105
12-13	110	28	138	95	28	123	180	23	203
13-14	104	31	135	140	37	177	199	15	214
14-15	139	31	170	104	34	138	248	19	267
15-16	148	32	180	149	31	180	337	27	364
16-17	184	32	216	193	35	228	462	20	482
17-18	158	22	180	240	29	269	520	21	541
18-19	122	25	147	183	13	196	421	12	433
19-20	129	20	149	142	19	161	424	9	433
20-21	82	11	93	93	4	97	167	11	178
21-22	45	8	53	42	10	52	66	12	78
22-23	31	10	41	44	9	53	49	6	55
23-24	26	7	33	31	6	37	49	4	53
Total	2,161	454	2,605	2,138	467	2,605	3,719	282	4,001

Note: The average volume was figured out from the results of survey during Feb. 22 (Thu.) To 28 (Wed.), 1979.

Table 3-3C HOURLY TRAFFIC VOLUME ON JAGORAWI FREEWAY, FEBRUARY 22 - 28, 1979 [TO CIBINOG]

(Unit: Vehicle/Hr.)

Time zone	Average			Saturday 24			Sunday 25		
	<2,5T	>2,5T	Total	<2,5T	>2,5T	Total	<2,5T	>2,5T	Total
24-01	13	1	14	23	-	23	43	-	43
01-02	12	2	14	24	3	27	21	-	21
02-03	9	0	9	7	-	7	17	-	17
03-04	9	0	9	15	4	49	4	-	4
04-05	8	0	8	16	-	16	22	-	22
05-06	20	1	21	24	3	32	33	2	35
06-07	45	4	49	50	2	52	90	2	92
07-08	158	20	178	80	12	92	221	6	227
08-09	130	13	143	108	10	118	350	16	366
09-10	127	14	141	158	22	180	495	14	509
10-11	132	23	155	158	26	184	450	8	458
11-12	124	19	143	162	38	200	278	6	284
12-13	104	18	122	162	40	202	249	6	255
13-14	139	19	158	331	31	362	169	10	179
14-15	182	21	203	279	24	303	254	9	263
15-16	169	22	191	277	36	313	133	6	139
16-17	170	20	190	286	26	312	142	2	144
17-18	163	21	184	189	11	200	94	2	96
18-19	129	16	145	210	12	222	84	7	91
19-20	110	12	122	159	2	161	48	4	52
20-21	123	7	130	97	13	110	60	-	60
21-22	63	3	66	112	5	117	38	4	42
22-23	39	1	40	65	-	65	25	-	25
23-24	23	2	25	62	7	69	18	2	20
Total	2,201	259	2,460	3,054	315	3,416	3,338	106	3,444

Note: The average volume was figured out from the results of the survey during Feb. 22 (Thu.) To 28 (Wed.), 1979.

Fig. 3-4A HOURLY TRAFFIC VOLUME ON JAGORAWI FREEWAY, FEBRUARY 22-28, 1979 (BOTH DIRECTIONS)

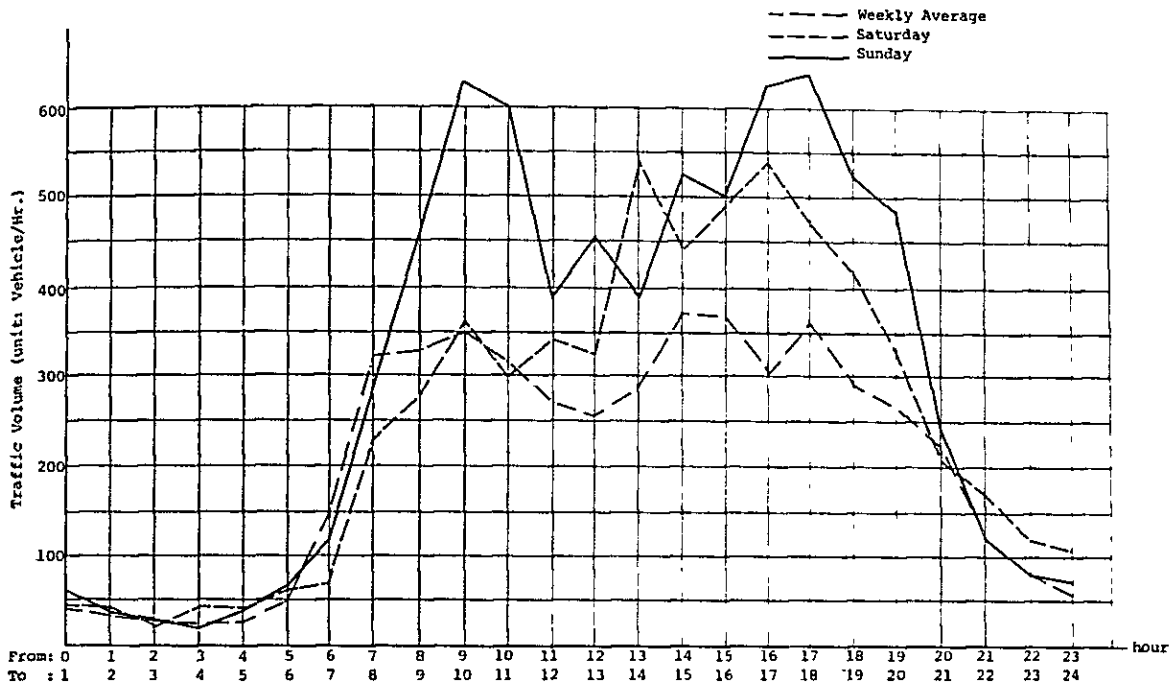


Fig. 3-4B HOURLY TRAFFIC VOLUME ON JAGORAWI FREEWAY, FEBRUARY 22-28, 1979 (TO JAKARTA)

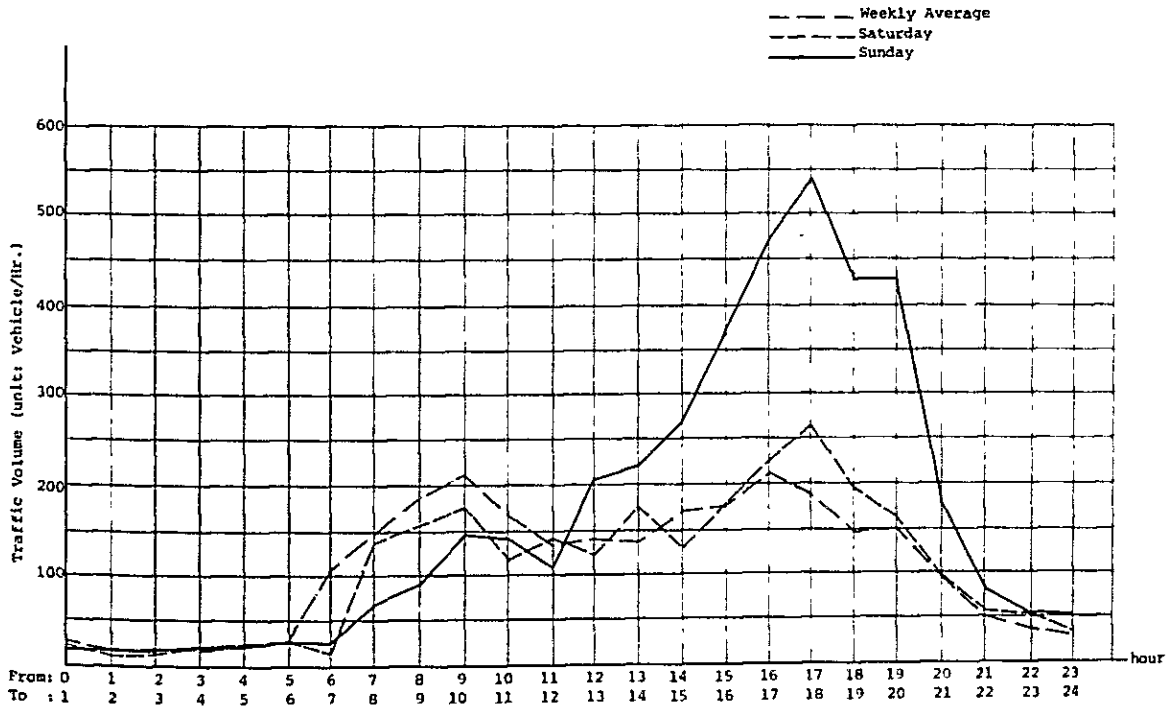


Fig. 3-4C HOURLY TRAFFIC VOLUME ON JAGORAWI FREEWAY, FEBRUARY 22-28, 1979 (TO CIBINONG)

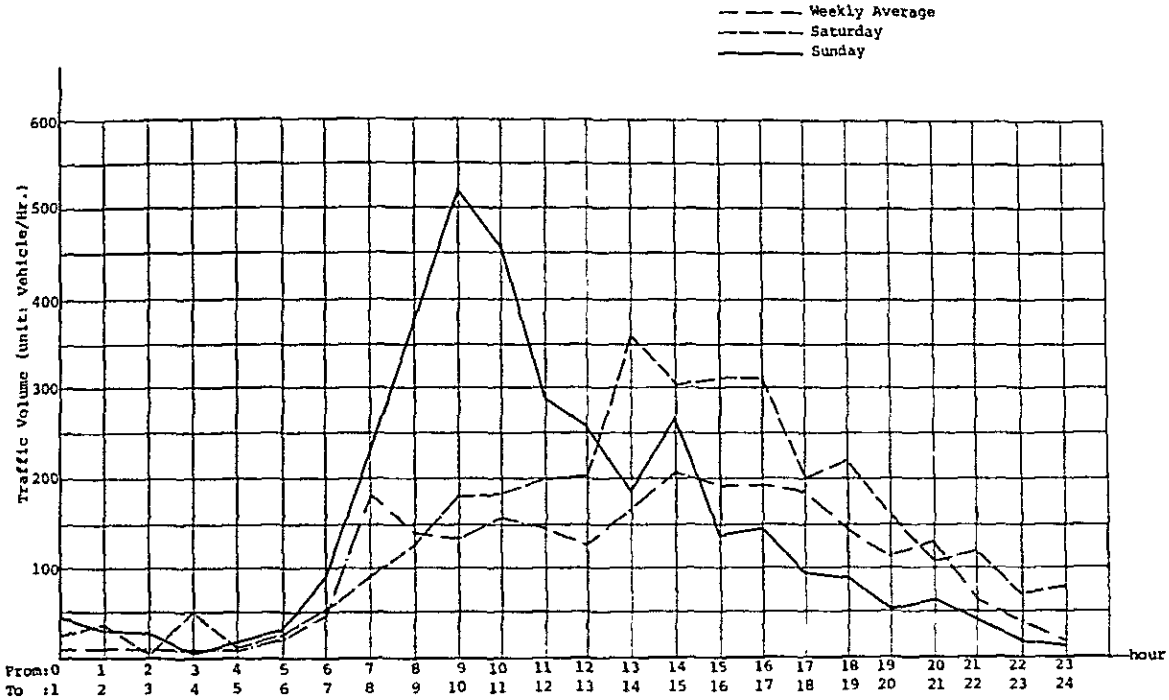


Fig. 3-4D AVERAGE HOURLY TRAFFIC VOLUME ON JAGORAWI FREEWAY, FEBRUARY 22-28, 1979

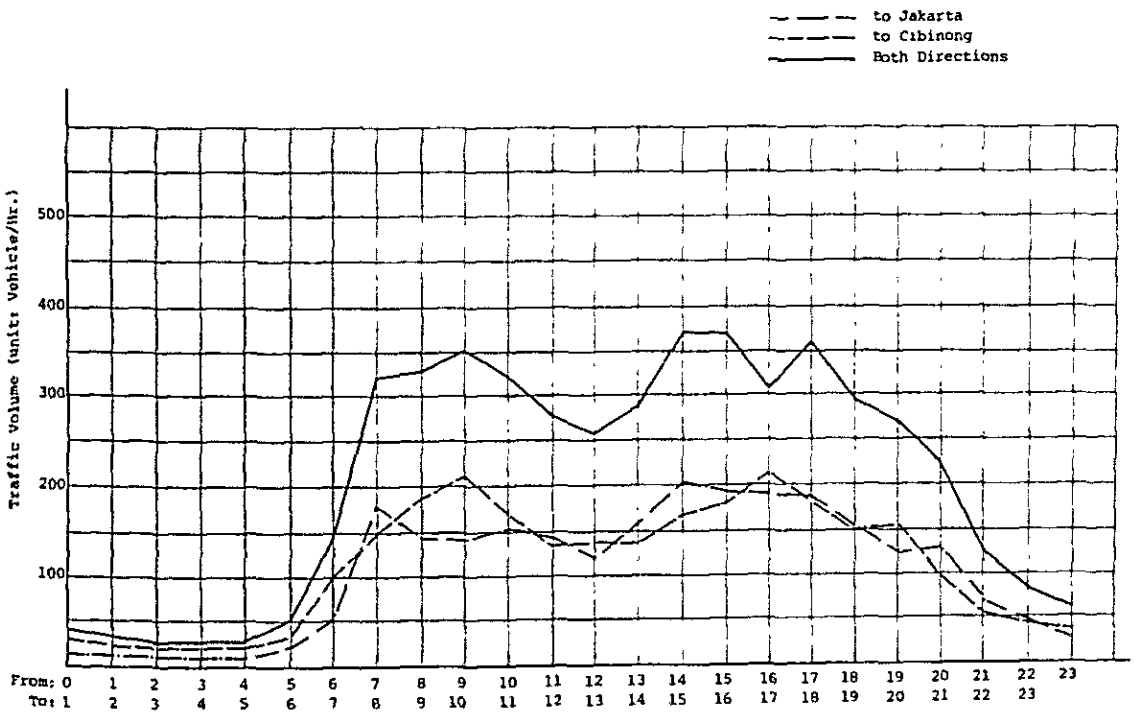


Fig. 3-4E HOURLY TRAFFIC VOLUME ON JAGORAWI FREEWAY, FEBRUARY 24, (SAT.) 1979

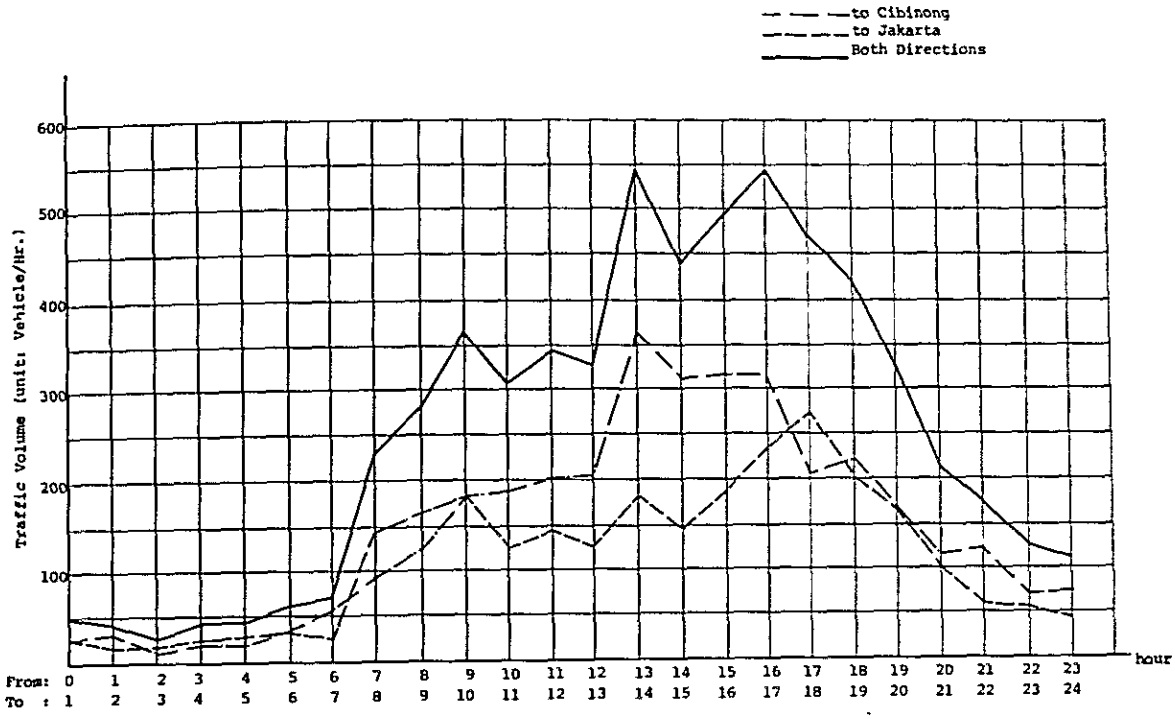


Fig. 3-4F HOURLY TRAFFIC VOLUME ON JAGORAWI FREEWAY, FEBRUARY 25 (SUN.), 1979

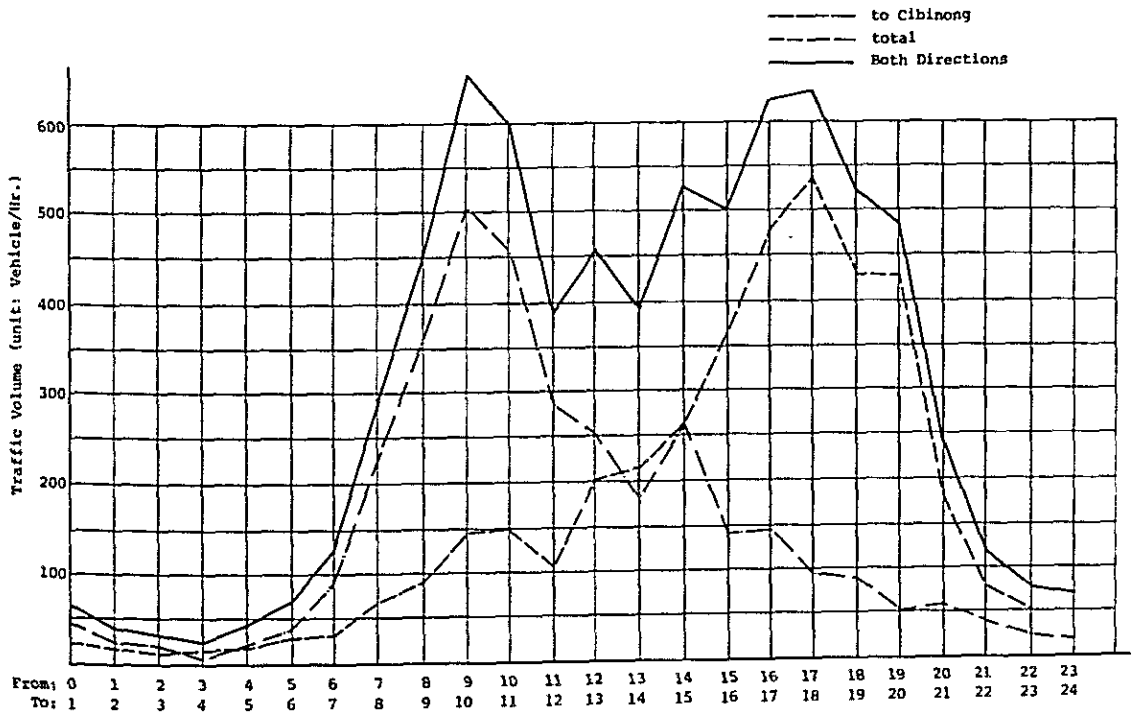


Table 3-4 TOLL RATE OF JAGORAWI FREEWAY AT PRESENT
(After April, 1979)

Cibinong-Bogar (Toll Gate at St. 11km+500)	Small Vehicle Large Vehicle	Rp.300 Rp.500
Cibinong-Jakarta (Toll Gate at St. 53km+400)	Small Vehicle Large Vehicle	Rp.300 Rp.500
Jakarta-Toman Mini (Toll Gate at St. 53km+400)	Small Vehicle Large Vehicle	Rp.100 Rp.200

Note: After the Jagorawi project is fully completed, the toll collection system will become Closed System, using Print Ticket System, and there will be 5 toll gates (Bogar, Ciawi, Cibinong, Toman Mini and Toman Mini Ramp).

Chapter 4
REVIEW OF JAKARTA-MERAK HIGHWAY PROJECT

Chapter 4 REVIEW OF JAKART-MERAK HIGHWAY PROJECT

4.1 Background

As mentioned in Chapter 1: INTRODUCTION this report investigates the financial viability of establishing the Jakarta-Tangerang section of the Jakarta-Merak Highway, or simply the Jakarta-Tangerang Freeway, as a tollway. The engineering study for the Jakarta-Merak Highway is reviewed adopting the alignment selection and design standard recommended by the above report, while up-dating the construction costs estimate in the same report.

The Jakarta-Merak Highway project is briefly outlined blow.

In 1973, the Government of Indonesia accorded the Jakarta-Merak Highway project a high priority and decided to commission the commencement of construction as soon as possible, when its feasibility becames evident.

In March 1973, a Japanese Government highway investigation team visited Indonesia to study the project. In its opinion, the traffic demand was observed to be extremely large and the effect of completion of the project on the socio-economic development of the Jakarta metropolitan area as well as the West Java province was expected to be enormous.

During the peiod from 1973 to 1974, the Government of Japan, in response to the request of the Government of Indonesia, carried out a survey on the project assigning OTCA (Overseas Technical Cooperation Agency) as an execution agency.

The agency despatched a survey team composed of experts on highway planning and highway economics to Jakarta for the survey in September, 1973. The survey was completed in July, 1974.

The feasibility study report prepared by the agency covered the route selection, traffic estimation, preliminary designs, construction cost estimates and economic evaluations.

Through these economic and technical studies, the OTCA emphasized the necessity of the earliest possible implementation of the initial stage construction of the highway, which includes:

- a 4-lane highway of the Jakarta-Tangerang section;
- bypasses of the existing highway for towns of Serang and Cilegon; and
- a bridge over Ci Ujung River and access roods to it.

Based on OTCA's recommendations in the above mentioned feasibility study, the Government decided to start the final engineering design and construction work.

In April 1974, a Japanese Government highway investigation team visited Indonesia and again evaluated the project based on the result of the OTCA's survey. Through discussions with the Government, the scope of the initial stage construction before mentioned was partly ammended to meet the optimum investment schedule, and then the framework of the first stage construction of the Jakarta-Merak Highway was finalized. It consisted of:

- The Jakarta-Tangerang alternate highway;
- The Ci Ujung Bypass including the bridge over the Ci Ujung River; and
- The Serang Bypass with an overpass bridge.

4.2 Design Standard

In the feasibility study report for the Jakarta-Merak Highway project, the OTCA team established basic design criteria for each section of the highway. However, in accordance with the general policy adopted at that moment, the Government intended to design the highway stretches including the Jakarta-Tangerang section and its further extensions based on tollway design criteria, and then the design criteria recommended by the OTCA team was modified.

The Jakarta-Tangerang Freeway is divided into 3 sections*)-1 in the engineering study *)-2 as follows:

- Section I : Jakarta-Sta. 4km 600
- Section II : Sta. 4km 600-Sta. 18km 800
- Section III: Sta. 18km 800-Sta. 26km 560

Notes: *)-1 Please refer the Map of Project Area

*)-2 Sectional division for the engineering study differs from that for traffic, toll collecting system and financial studies.

Table 4-1 presents the summary of the design standard applicable for each of the above sections.

However, due to the difficulty anticipated in the land acquisition and compensation as well as in the allocation of the funds for the construction, the design of the access road to Tangerang which is included in the cost estimates in Chapter 7: CONSTRUCTION COST ESTIMATES AND CONSTRUCTION SCHEDULE does not follow the current Government's standard.

Table 4-1 HIGHWAY GEOMETRIC DESIGN STANDARD FOR JAKARTA-TANGERANG FREEWAY

Item	Unit	Section I	Section II	Section III
– Terrain		Flat	Flat	Flat
– Design Speed	Km/Hr.	100	120	100
– Minimum R.O.W. Width	m	40	(Urban 40, Rural 60)	40
– Lane Width	m	2x(2x3.75)	2x(2x3.75)	2x(2x3.5)
– Shoulder Width	m	2.0	3.0	3.0
– Median Width	m	4.0	10.0	4.0
– Crossfall of Pavement	%	2.0	2.0	2.0
– Crossfall of Shoulder	%	4.0	4.0	4.0
– Type of Pavement		Asphalt Concrete	Asphalt Concrete	Asphalt Concrete
– Maximum Superelevation	%	10(6)	10(6)	10(6)
– Maximum Radic	m	380(640)	520(88)	380(640)
– Maximum Gradient	%	5	3	4
– Stopping Sight Distance	m	165	225	165
– Minimum Vertical Curve L.	m	In Accordance with BM's Std.	In Accordance with BM's Std.	In Accordance with BM's Std.
– Minimum Horizontal Curve L.	m	170 or 1,200/θ	200 or 1,400/θ	170 or 1,200/θ
– Minimum Transition Curve L	m	85	100	85
– Minimum Parameter of Clothoid Curve	A	210(250)	280(325)	210(250)
– Minimum Radius for Curves not Requiring Transition Curve	m	1,500(3,000)	2,000(4,000)	1,500(3,000)
– Minimum Radius for Curves not Requiring Superelevation	m	4,000	5,700	4,000
– Minimum Relative Slope between Profile of Edge of 2-lane Pavement & Center Line	–	1/240	1/280	1/240
– Value of Superelevation on Curvature	–	In Accordance with BM's Std.	In Accordance with BM's Std.	In Accordance with B"s Std.

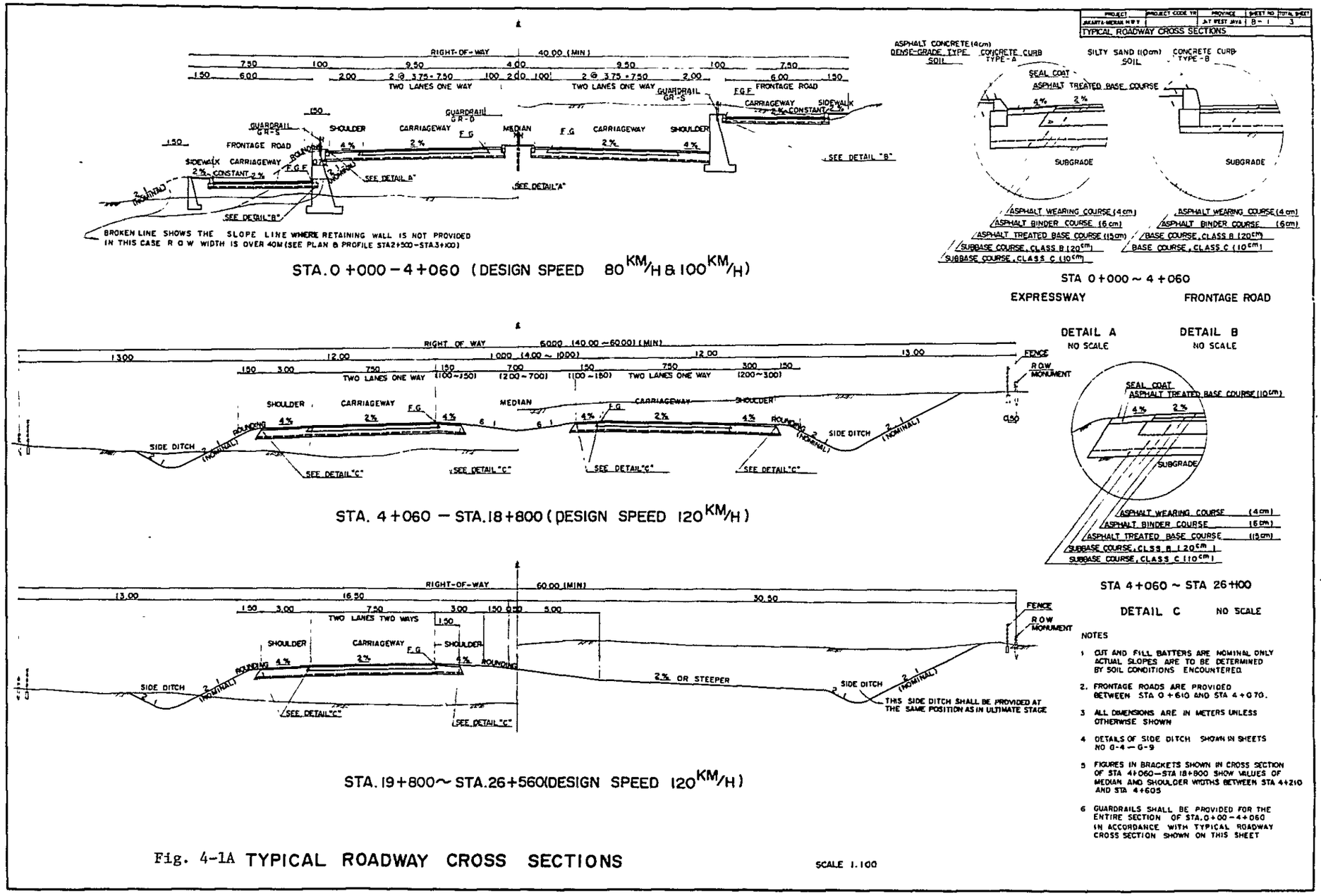
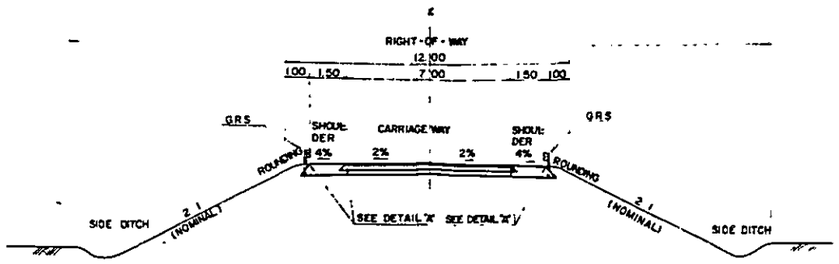


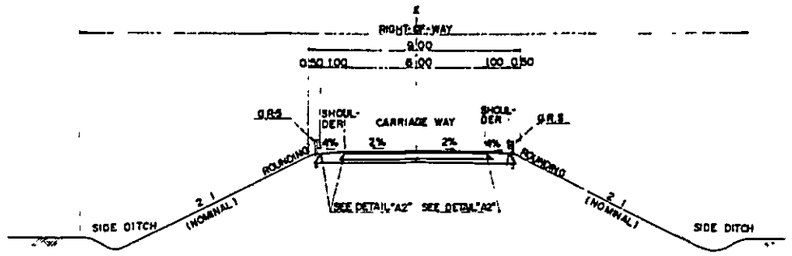
Fig. 4-1A TYPICAL ROADWAY CROSS SECTIONS

PROJECT	PROJECT CODE NO	PROVINCE	SHEET NO	TOTAL SHEET
JAKARTA-MEDAN HWY		JAVA WEST	B-2	3

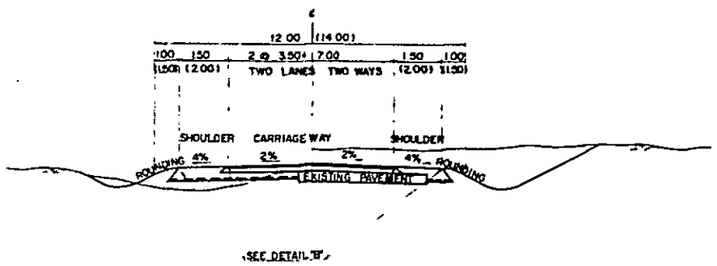
TYPICAL ROADWAY CROSS SECTION



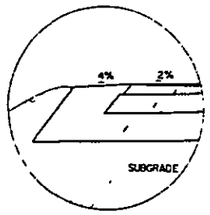
APPROACH SECTIONS OF OVERBRIDGE CLASS A



APPROACH SECTIONS OF OVERBRIDGE CLASS B

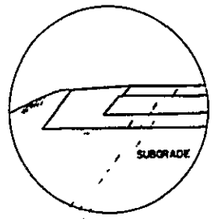


ACCESS ROAD (DESIGN SPEED 60-80 KM/H)



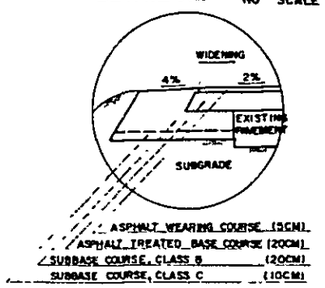
ASPHALT WEARING COURSE (5CM)
ASPHALT TREATED BASE COURSE (15CM) (7CM)
SUBBASE COURSE CLASS C (20CM) (8CM)

DETAIL A1 NO SCALE



ASPHALT WEARING COURSE (7CM)
BASE COURSE CLASS A (23CM)
SUBBASE COURSE CLASS C (10CM)

DETAIL A2 NO SCALE

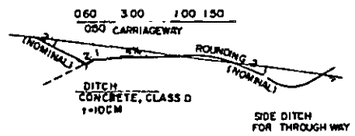


ACCESS ROAD

DETAIL B NO SCALE

NOTES

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN
2. CUT AND FILL BATTERS ARE NOMINAL ONLY. ACTUAL SLOPES ARE TO BE DETERMINED BY SOIL CONDITIONS ENCOUNTERED
3. FIGURES IN BRACKETS SHOWN IN CROSS SECTION OF ACCESS ROAD SHOW VALUES IN THE RECONSTRUCTION STRETCH
4. FIGURES ON UNDERLINES SHOWN IN DETAIL A1 SHOW VALUES FOR OVERBRIDGE NO1 ONLY



SEE SHEET NO D-11, D-16, D-17

STA6 ~ STA11 (JKT TANGERANG)

TYPICAL CROSS SECTION OF FRONTAGE ROAD

Fig. 4-1B TYPICAL ROADWAY CROSS SECTIONS SCALE 1:100

4.3 Highway Alignment

After a careful review, the Government found the alignment recommended in the Jakarta-Merak Highway feasibility study report by the OTCA team to be adequate from an engineering view point. However, due to the fact that the surrounding areas are changing due to the rapid urbanization of the metropolitan area, some alterations for the above alignment were unavoidable for urban areas. Field investigations were conducted repeatedly during January 1977. After several meetings with the regional governments the final alignment was fixed.

In this report the alignment for the Jakarta-Tangerang section of the Jakarta-Merak Highway project is accepted as decided by the Government. Since no major change has been made in the alignment recommended by the feasibility study report by the OTCA team please refer to the report.

Chapter 5
TRAFFIC ANALYSIS

Chapter 5 TRAFFIC ANALYSIS

5.1 Traffic Situation in the Project Area

5.1.1 Traffic Count Data and Survey Results

To review and re-estimate the future traffic volume on the Jakarta-Tangerang Freeway, traffic data on various roads concerned are essential and these were collected from many data sources as outlined below.

Besides the traffic volume data, the study team also completed the traffic count survey and travel speed survey at particular points and sections of the roads.

(a) Jagorawi Freeway

The Jagorawi Freeway has been open to traffic since March 1978 for the Jakarta-Cibinong section and from April 1979 for the Jakarta-Bogor section, and the daily traffic volume on the freeway reached around 6,000 vehicles in December 1978.

The traffic count data on the Jagorawi Freeway are summarized by two categories of vehicles as shown in Table 5-1 and Fig. 5-1.

(b) Regional Arterial Roads

Traffic count surveys have been conducted each year by such Government authorities as Bina Marga and Jakarta Municipality on arterial roads within DKI Jakarta and in the surrounding area including the project area.

Such traffic count results disclosed the following characteristics of the vehicular traffic in DKI Jakarta and its surroundings.

1) DKI Jakarta

According to the road traffic volume survey results at the 41 survey points in DKI Jakarta and the intersection traffic count survey results, the existing conditions are as follows:

a) More than 40 % of the survey points had the peak period between 7:00 and 9:00 a.m.

b) The average peak hour ratio in DKI Jakarta was 8.1 % of the 24 hour traffic volume and 11.0 % of the 12 hour (7:00 a.m. - 7:00 p.m.) traffic volume.

c) The average day time ratio (24 hour traffic volume divided by the 12 hour traffic volume) was 1.36.

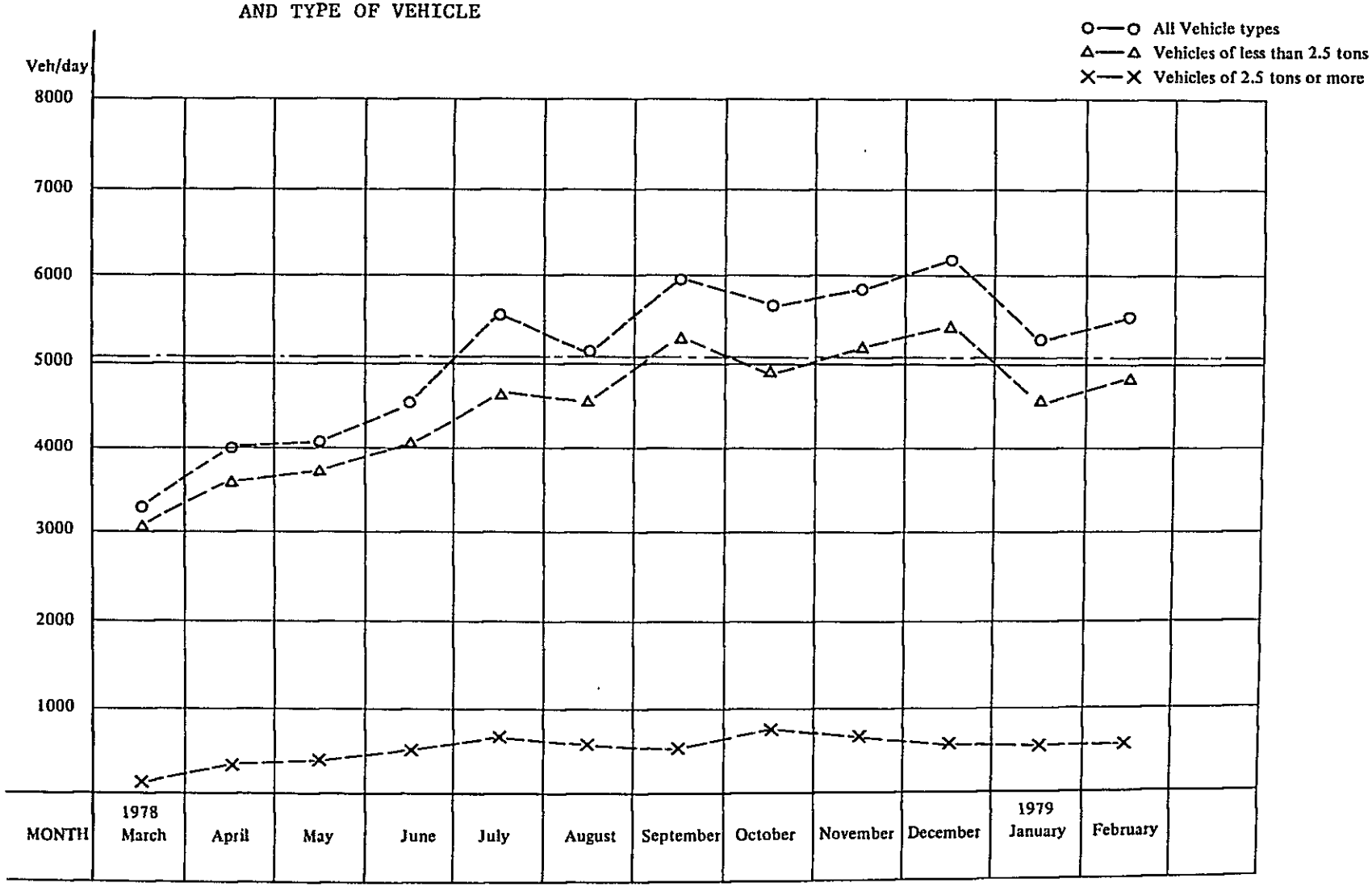
d) The traffic volume at some of the intersections is already close to their capacity, particulary in the morning peak.

Table 5-1 AVERAGE DAILY TRAFFIC VOLUME ON JAGORAWI FREEWAY BY MONTH AND TYPE OF VEHICLE

(Unit: Vehicle/day)

MONTH / VEHICLE TYPE	1978										1979		Average
	March	April	May	June	July	August	September	October	November	December	January	February	
Less than 2.5 tons (Small sized motor vehicle)	3009	3630	3649	4042	4753	4489	5298	4923	5167	5467	4671	4883	4498
2.5 tons or more (Large sized motor vehicle)	202	356	377	497	658	664	592	782	681	673	599	675	563
TOTAL	3211	3986	4026	4539	5411	5153	5890	5705	5848	6140	5270	5558	5061
Ratio of large sized motor vehicles (%)	6	9	9	11	12	13	10	14	12	11	11	12	11

Fig. 5-1 AVERAGE DAILY TRAFFIC VOLUME ON JAGORAWI FREEWAY BY MONTH AND TYPE OF VEHICLE



2) Area Surrounding DKI Jakarta

The yearly traffic volumes on the main roads near the DKI Jakarta boundary and within Botabek are shown in Table 5-2, 5-3 and Fig. 5-2, from which the following information can be extracted.

a) The existing traffic volume to and from DKI Jakarta on the main arterials (A005, A006 & A016) near the city boundary is about 50,000 vehicles per day and this has not increased significantly since 1974.

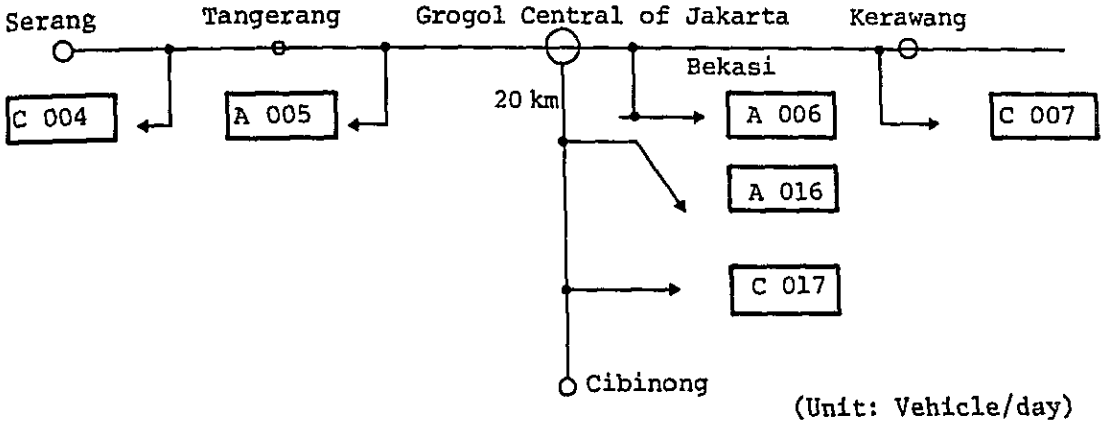
b) Furthermore, within BoTaBek (Kabupatens of Bogor, Tangerang and Bekasi), the traffic volume on the same main roads (C004, C007 & C017) is about 30,000 vehicles per day and since 1974 this has also not increased significantly.

c) The vehicle composition ratios for these traffic counting stations are as follows:

Main Roads near DKI Jakarta Boundary		Main Roads within BoTaBek	
Sedan	59.1%	Sedan	69.2%
Bus	7.3%	Bus	9.5%
Truck	33.6%	Truck	21.3%
Total:	100.0%	Total:	100.0%

d) The traffic flow southwards is the strongest. Each of the flows eastward and westward has about half the volume of the southward flow.

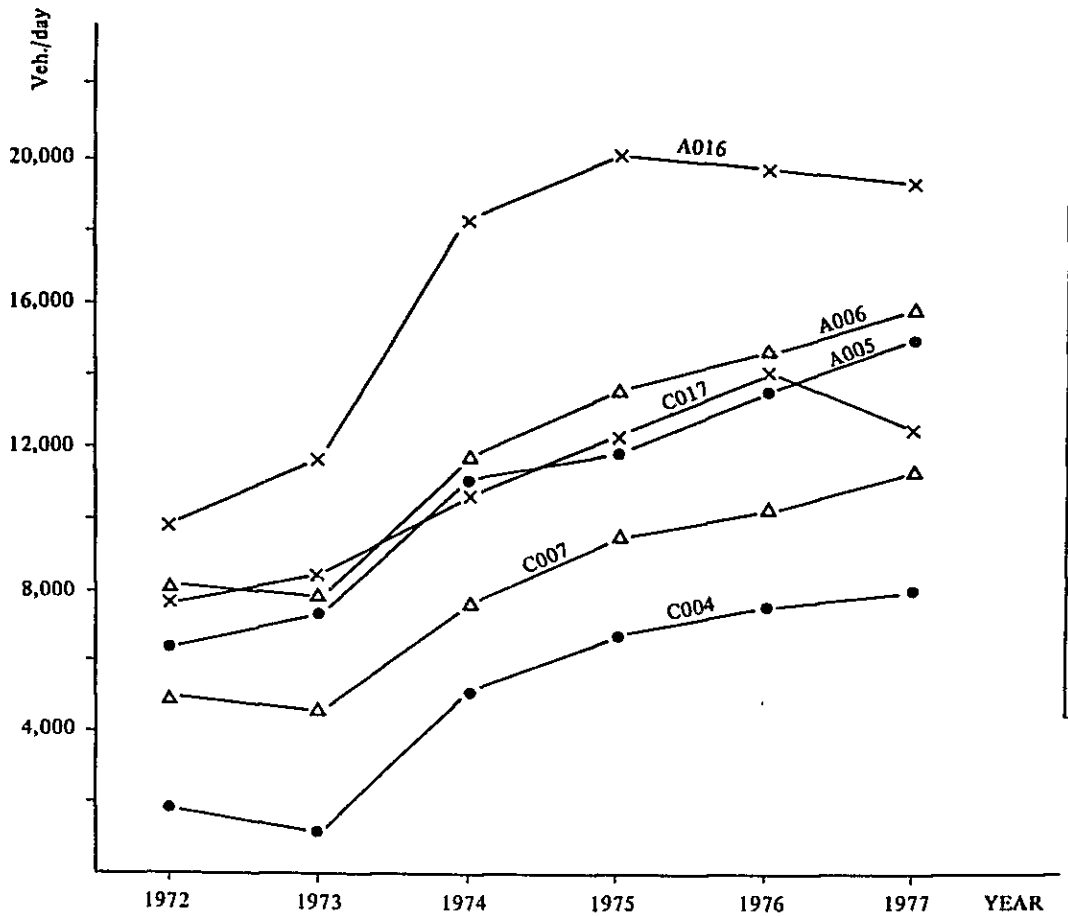
Table 5-2 DAILY TRAFFIC VOLUME ON REGIONAL ARTERIAL HIGHWAY



(Unit: Vehicle/day)

Year	Station	A 005	C 004	A 016	A 017	A 006	C 007
1972	Mobil	3114	1061	5508	3849	2817	1526
	Bus	653	228	1347	1224	1131	407
	Truck	2500	399	2828	2794	4002	2647
	Sub-total	6267	1688	9683	7864	7950	4580
1973	Mobil	4452	650	5711	3763	2720	1345
	Bus	878	295	1365	1812	1037	401
	Truck	2548	363	3779	2592	4089	2606
	Sub-total	7878	1308	10855	8167	7846	4352
1974	Mobil	6524	3410	9577	4908	4196	2825
	Bus	1215	509	2464	1546	998	858
	Truck	3203	1493	6090	3302	6518	3734
	Sub-total	10942	5412	18131	9756	11712	7477
1975	Mobil	7099	4540	11375	5998	6106	3925
	Bus	932	355	1777	1724	891	789
	Truck	3225	2052	6900	3992	6592	5251
	Sub-total	11256	6947	20052	11714	13589	9965
1976	Mobil	8288	5248	11271	8352	7253	6305
	Bus	864	381	1685	1479	1005	1250
	Truck	3195	1978	7018	3066	5472	727
	Sub-total	12347	7607	19974	12897	13730	8282
1977	Mobil	3743	5069	10862	8541	8263	7176
	Bus	1394	1101	1859	1482	1026	1098
	Truck	3889	1901	6249	2342	5799	3503
	Sub-total	14026	8071	18970	12365	15088	11777
Total	Mobil	38220	19978	54304	35411	31355	23162
	Bus	5936	2869	10497	9267	6088	4803
	Truck	18560	8186	32864	18085	32472	20642
	Total	62716	31033	97665	62763	69915	48607
Average	Mobil	6370	3330	9051	5902	5226	3860
	Bus	989	478	1750	1545	1015	801
	Truck	3093	1364	5477	3014	5412	3440
	Sub-total	10452	5172	16278	10461	11653	8101
REMARKS		Jakarta	Tangerang	Jakarta	Jakarta	Jakarta	Bekasi
		Tangerang	Serang	Cibinong	Cibinong	Bekasi	Kerawang

Fig. 5-2 DAILY TRAFFIC VOLUME ON REGIONAL ARTERIAL HIGHWAY BY YEAR



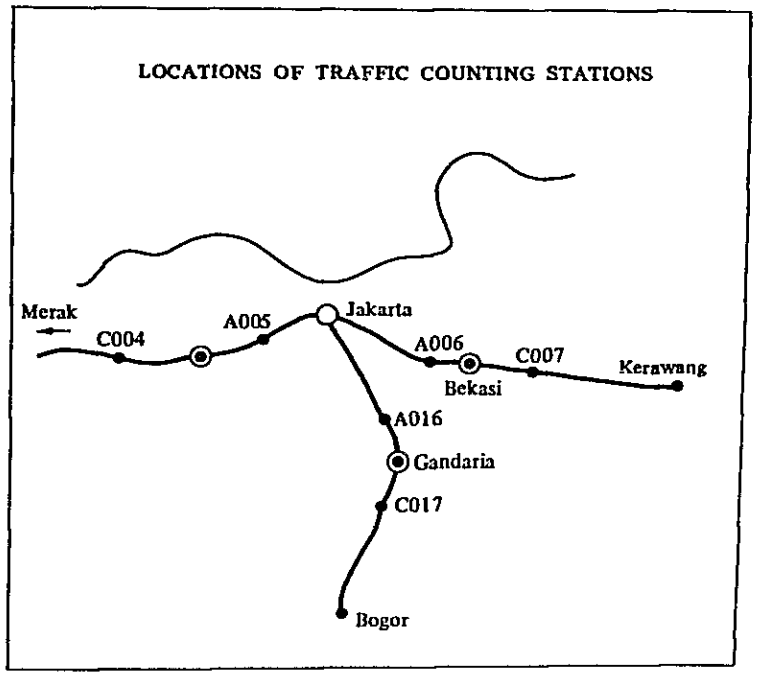


Table 5-3 ANNUAL AVERAGE GROWTH OF TRAFFIC BETWEEN DKI JAKARTA AND ITS SURROUNDING AREA

(Unit: %)

LOCATION		SEDAN	BUS	TRUCK	TOTAL
A005	A	23.0	16.3	9.3	17.5
	B	- 0.2	-29.8	47.0	12.8
A006	A	24.0	- 2.0	7.7	13.7
	B	-	-	-	-
A016	A	14.5	6.7	17.2	14.4
	B	-20.0	5.3	- 3.2	-11.6
C004	A	36.7	37.0	36.6	36.7
	B	- 4.6	-21.7	67.0	14.5
C007	A	36.3	22.0	5.7	20.8
	B	-	-	-	-
C017	A	17.3	3.9	- 3.4	9.4
	B	13.3	18.5	58.1	23.9
A005 + C004 (Jakarta-Tangerang)	A	27.0	23.1	14.9	22.7
	B	- 1.8	-26.0	53.9	13.3

Note: A shows the annual average rate from 1972 to 1977.
B shows the annual average rate from 1977 to 1979.

5.1.2 Traffic Count Survey

Bina Marga and the study team conducted the traffic count survey for two days on 20th and 21st of March 1979 at the selected nine points for the following purposes:

(a) To supplement the existing traffic count data (cross-section and intersection counts) and to collect the latest results.

(b) To check the diversion ratio for the Jagorawi Freeway.

As shown in Fig. 5-3, 9 survey locations were selected, taking into consideration of those for the previous surveys.

The survey was carried out for each survey location setting the categories and survey hours as shown in the following table.

Survey Location	Category	Survey hours
No. 1	Cross-Section	12 hours (6a.m.-6p.m)
2	Cross-Section	12 hours
3	Cross-Section	12 hours
4	Cross-Section	12 hours
5	Cross-Section	24 hours
6	Cross-Section	12 hours
7	Cross-Section	24 hours
8	Inter-Section	12 hours
9	Inter-Section	12 hours

Vehicles are classified into the following 6 types according to the classification by Bina Marga.

1. Motorcycle
2. Oplet, Pick up and Three-wheeled vehicle
3. Sedan, Jeep and Taxi
4. Bus
5. Pick-up Truck and Micro Truck, and
6. Truck

The main results of the survey are summarized in Table 5-4.

Fig. 5-3 .LOCATION OF TRAFFIC COUNTING STATIONS

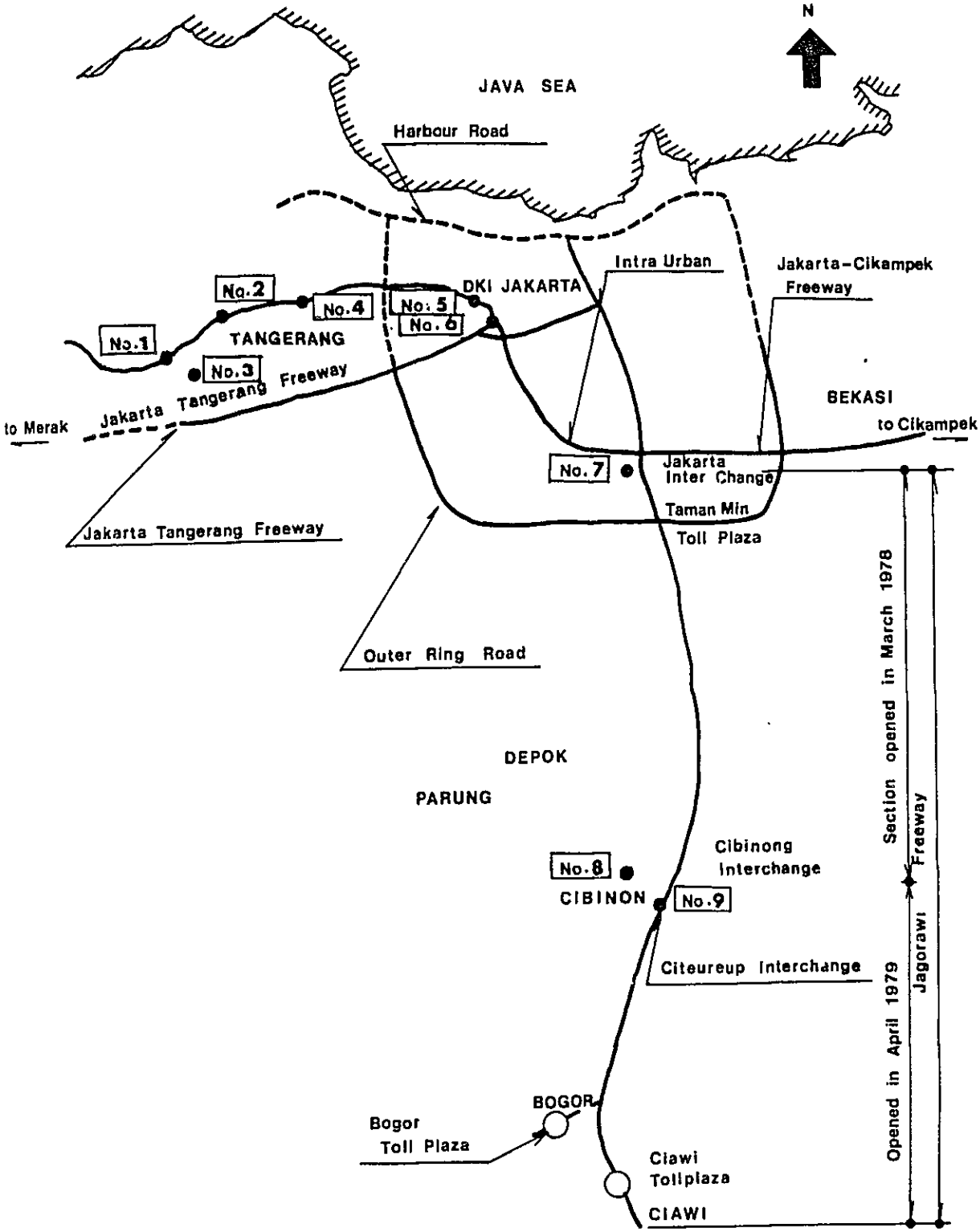


Table 5-4 TRAFFIC VOLUME ON NINE SURVEY LOCATIONS

(Unit: Vehicle)

SURVEY SITE	MOTOR CYCLE	PASSENGER VEHICLES				GOODS VEHICLES			TOTAL	
		OPLET PICK UP 3-WHEEL VEHICLE	SEDAN JEEP TAXI	BUS	SUB-TOTAL	PICK UP-TRUCK MICRO-TRUCK	TRUCK	SUB-TOTAL	INCLUD-ING MOTOR CYCLE	INCLUD-ING MOTOR CYCLE
1 (12hrs.)	2,471	2,342	1,104	427	3,873	1,295	2,875	4,170	10,514	8,043
2 (12hrs.)	2,919	4,329	2,190	367	6,886	1,500	3,567	5,067	14,872	11,953
3 (12hrs.)	1,252	1,535	424	78	2,046	157	807	963	4,225	3,009
4 (12hrs.)	3,479	3,919	2,581	435	6,935	2,170	4,471	6,741	17,055	13,576
5 (12hrs.)	8,683	8,772	9,332	905	19,009	4,037	4,336	8,383	36,075	27,392
5 (24hrs.)	12,033	12,033	12,525	1,556	26,118	4,790	5,662	10,462	48,925	36,572
6 (12hrs.)	11,953	4,333	19,199	2,515	26,047	6,318	2,829	9,147	47,147	35,194
7 (12hrs.)	8,335	4,208	11,859	3,671	19,738	2,263	4,100	6,363	34,436	26,101
7 (24hrs.)	9,837	6,084	15,235	5,679	26,998	2,990	5,321	8,311	45,146	35,309
8 (12hrs.)	1,375	2,804	2,341	1,304	6,449	1,510	3,107	4,617	12,441	11,172
9 (12hrs.)	938	4,215	2,029	182	6,426	919	2,800	3,719	11,083	10,145

5.1.3 Travel Speed Survey

Travel speed survey data is available from the previous road studies such as the Intra Urban Tollway study and the Outer Ring Road study.

In addition to this, the study team conducted a survey on the existing Jakarta-Tangerang and Jakarta-Bogor Highways and Jagorawi Freeway during four days from March 20 to 23, 1979, to supplement the above data.

The main results obtained from the survey as well as from data available are shown in the following tables.

Table 5-5 AVERAGE RUNNING SPEED

	May 1977	August 1978	March 1979
Existing Jakarta-Tangerang Highway	30 kph (35.9 kph)	-	34 kph
Existing Jakarta-Bogor Highway	40 - 45 kph	-	43 kph
Jagorawi Freeway	-	-	97 kph
Jakarta Area	36.9 kph	31.6 kph	-

Note: The figure in the parenthesis shows the result in January 1977.

Table 5-6 AVERAGE RUNNING SPEED ON ROADS IN DKI JAKARTA IN 1977 AND 1978

(1) In August 1978

Total Distance of the Route	939.0 km		
Total Travel Time	32 hrs	31 min	14 sec
Total Stopped-Time	2 hrs	45 min	33 sec
Total Running Time	29 hrs	45 min	41 sec
Overall Travel Speed *)-2	28.9 km/hr		
Average Running Speed *)-2	31.6 km/hr		

Source: Jakarta Intra Urban Tollway, Phase I Report, 1979.

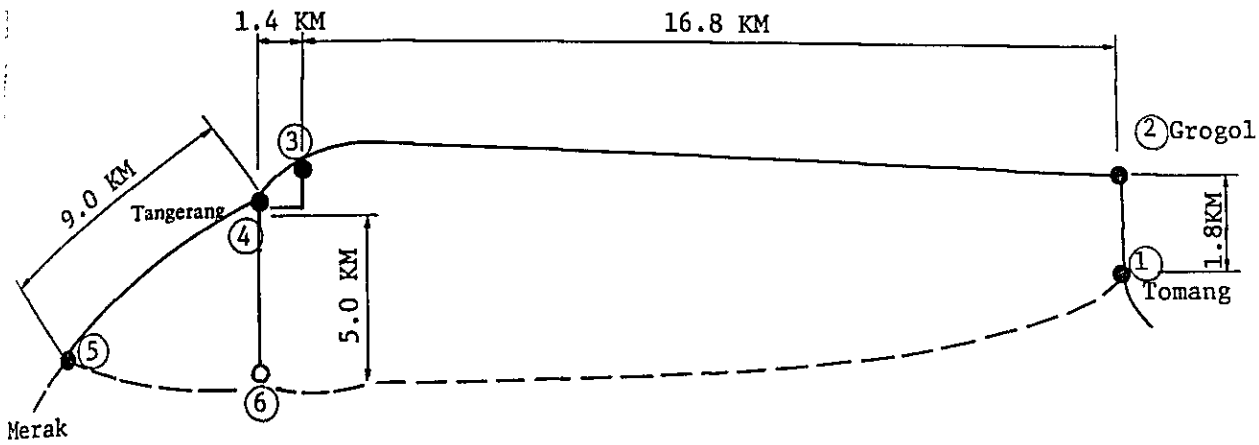
(2) In May 1977

Total Distance of the Route	336.1 km		
Total Travel Time	10 hrs	13 min	53 sec
Total Stopped-Time	1 hrs	7 min	15 sec
Total Running Time	9 hrs	6 min	38 sec
Overall Travel Speed *)-1	32.8 km/hr		
Average Running Speed *)-2	36.9 km/hr		

Source: Feasibility Study of Outer Ring Road Project, 1978.

Notes : *)-1 includes "Stopped - Time"
*)-2 excludes "Stopped - Time"

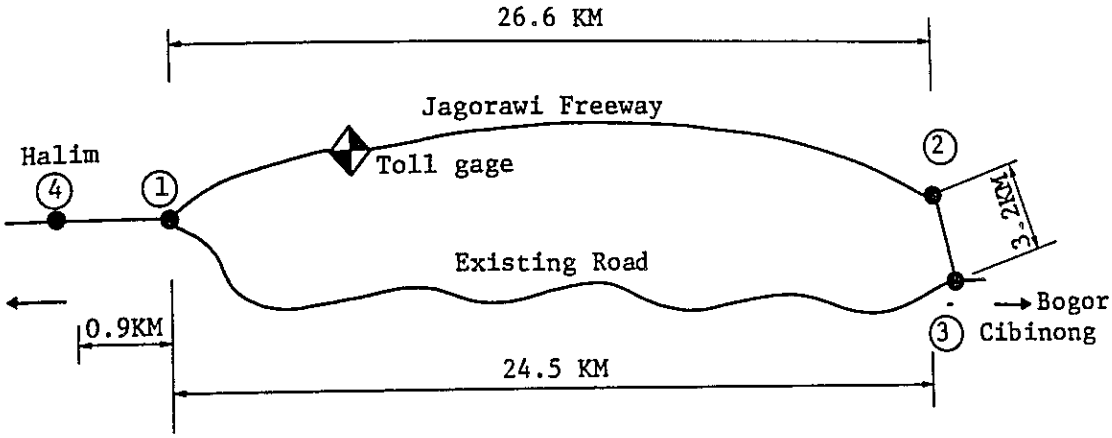
Table 5-7 AVERAGE RUNNING SPEED IN THE GROGOL-TANGERANG ROAD SECTION



(Unit: Minute) March, 1979

Section		① ~ ②	② ~ ⑤				④ ~ ⑥
			② ~ ③	③ ~ ④	④ ~ ⑤	Total	
DIRECTION (Km)		1.8	16.8	1.4	9.0	27.2	5.0
JAKARTA → MERAK	Case I	2	32	8	14	54	14
	Case II	3	28	12	15	55	12
	Case III	2	30	9	12	51	15
	Case IV	3	31	13	9	53	13
	Total	10	121	42	50	213	54
MERAK → JAKARTA	Case I	3	28	10	15	53	13
	Case II	3	34	6	13	53	15
	Case III	3	28	8	14	50	14
	Case IV	4	25	9	15	49	12
	Total	13	115	33	57	205	54
Total		23	236	75	107	418	108
AVERAGE TIME		2.88	29.50	9.38	13.38	52.25	13.50
AVERAGE SPEED (Km/Hr)		38	34	9	40	31	22

Table 5-8 AVERAGE RUNNING SPEED IN THE HALIM-CIBINONG ROAD SECTION



(Unit: minute) March, 1979

Section		Jagorawi Freeway ① - ③			Existing Road ① - ③	① ~ ④
		① ~ ②	② ~ ③	① ~ ③		
DIRECTION		26.6	3.2	29.8	24.5	0.9
AJAKARTA → CIBINONG	Case I	17	5.5	22.5	38	2
	Case II	16	4.5	20.5	32	1.5
	Case III	15	6	21	30	2.5
	Total	48	16	64	100	6
CIBINONG → JAKARTA	Case I	17	4	21	37	2
	Case II	18	7	25	35	1.5
	Case III	16	4	20	33	2.5
	Total	51	15	66	105	6
Total		99	31	130	205	12
AVERAGE TIME		16.5	5.2	21.7	34.2	6
AVERAGE SPEED (Km/Hr.)		97	37	82	43	9

5.2 Zone Division and Traffic Generation

Reference was made to the "Jakarta Intra Urban study" in analysing vehicular traffic for roads in the study area.

In the above study, the Jakarta-Tangerang Freeway has already been incorporated as a tollway into the future road network and is assumed to be open to traffic by the year 1985 with four traffic lanes.

A forecast of future traffic on the Jakarta-Tangerang Freeway was reviewed by taking several assignment alternatives such as toll rates and development of tollway networks in each year into consideration.

5.2.1 Zone Division

The zones established for the Intra Urban Tollway project were reffered as small zones and these were also integrated into larger zones to be best suited for this study. Transference of the zones is presented in Table 5-9 and newly coded for this study. The results of the zone division are as follows:

DKI Jakarta	12 zones
Tangerang Regency	5 zones
Bogor Regency	1 zone
Bekasi Regency	1 zone
Outside JABOTABEK	4 zones
Total	23 zones

Geographical locations of the zones are presented in Fig. 5-4 and 5-5.

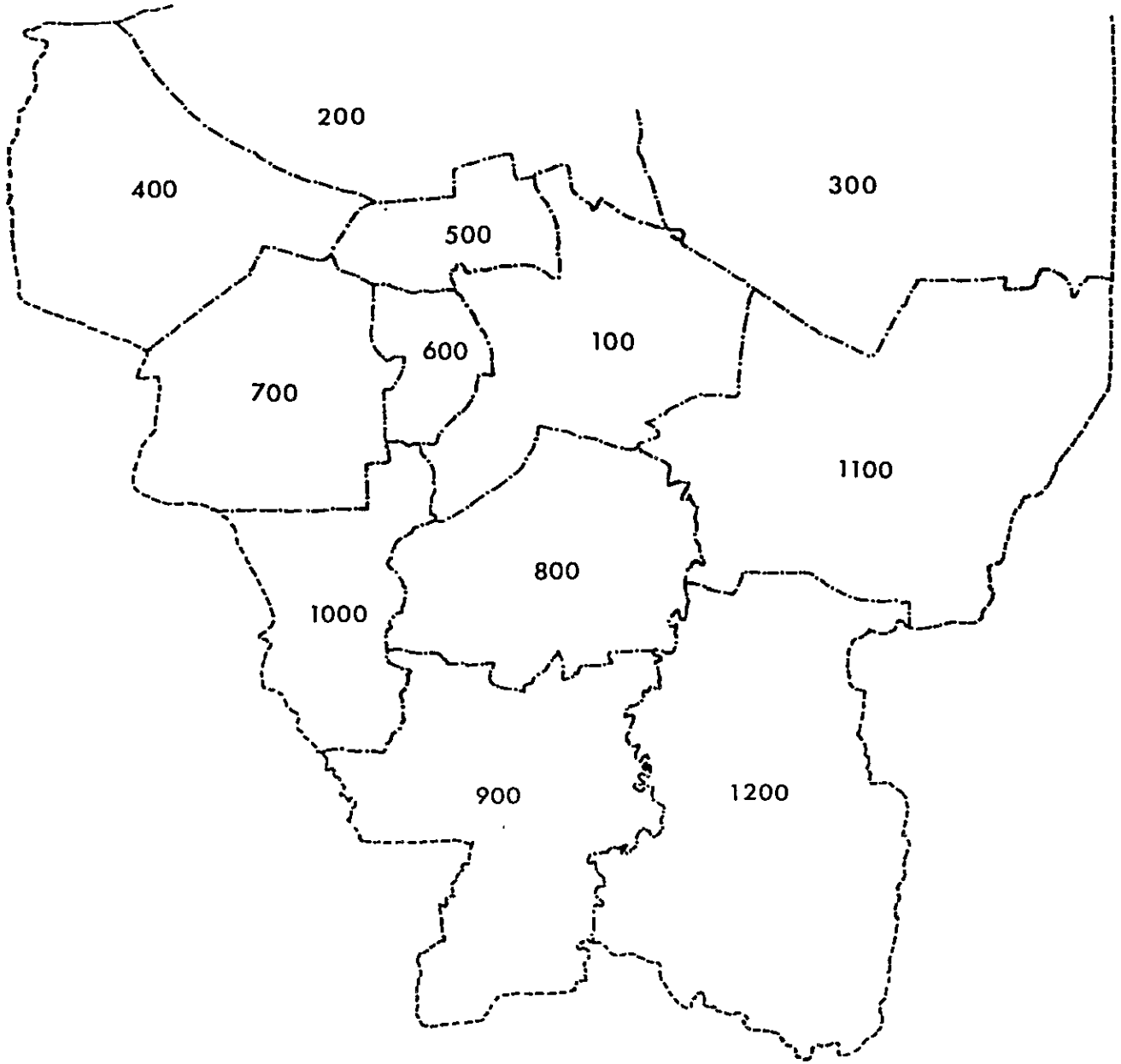


Fig. 5-4

ZONE DIVISION OF D.K.I. JAKARTA

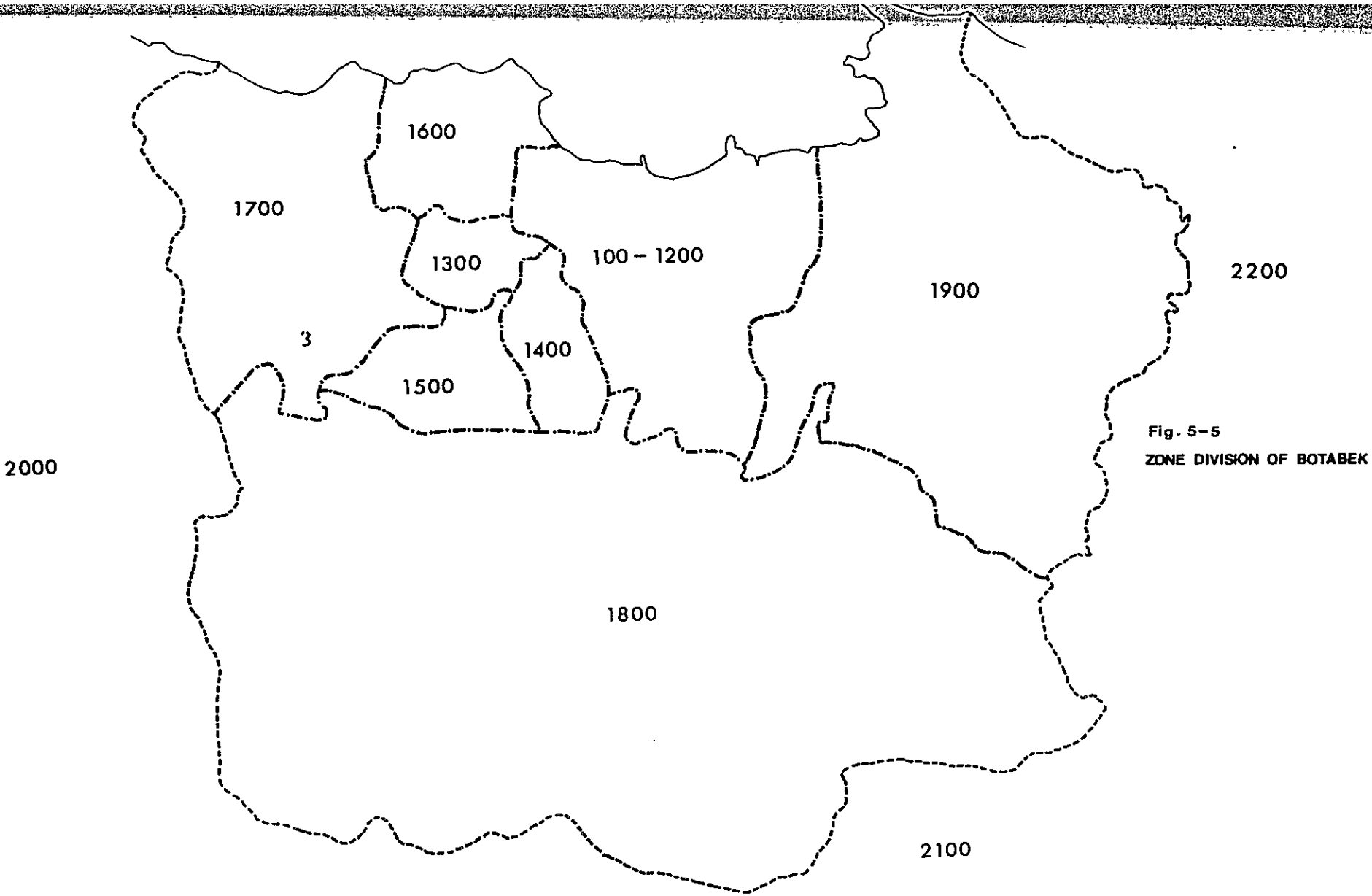


Fig. 5-5
ZONE DIVISION OF BOTABEK

Table 5-9 ZONE CODE TABLE

Zone No. (large zone)	Zone No. used for Intra Urban Tollway (small zone)	Names of Administrative Reg.	
		Kodya/Kabupaten	Kecamatan
100	1 - 8	Central Jakarta	Gambir Sawah Besar Kemayoran Senen Cempaka Putih Menteng Tanah Abang
200	9, 10	North Jakarta	Pajaringan
300	11, 12	North Jakarta	Tanjung Priok Koja
400	13	West Jakarta	Cengkareng
500	14, 17, 18		Grogol Petamburan Taman Sari Tambora
600	15, 16		Grogol Petamburan
700	19, 20		Kebon Jeruk
800	21 - 23, 26	South Jakarta	Tebet Setia Budi Mampang Prapatan Kebayoran Baru Baru
900	24, 25, 27		Pasar Minggu Cilandak
1000	27, 28		Kebayoran Lama
1100	30 - 33, 38	East Jakarta	Matraman Pulo Gadung Jatinegara Cakung
1200	34 - 37		Kramat Jati Pasar Rebo

(to be continued)

Zone No. (large zone)	Zone No. used for Intra Urban Tollway (small zone)	Names of Administrative Reg.	
		Kodya/Kabupaten	Kecamatan
1300	39	Tangerang	Tangerang Batuceper
1400	40		Ciledug Ciputat
1500	41		Serpong Legok
1600	42		Teluknaga Sepatan
1700	43		Mauk Kronjo Kresek Rajeg Pasar Kemis Balaraja Tigaraksa Cikupa Curug
1800	44 - 48	Bogor	
1900	49 - 51	Bekasi	
2000	52	West of JABOTABEK including Sumatra	
2100	53	South of JABOTABEK including Bandung	
2200	54	East of JABOTABEK	
2300	55	Outside Java and Sumatra	

5.2.2 Traffic Generation

(a) Person Trip Analysis*)-1

A person trip analysis was carried out based on the land use study in which the economically active population*)-2 and number of workers at work places*)-3 are estimated for each zone.

Based on these planning parameters produced in the landuse study, generated and attracted commuting person-trip ends per day are forecasted by each small zone as shown in Table 5-10.

Notes: *)-1 For detail information, please refer to Chapter 2: LANDUSE STUDY and Chapter 4: PRESON TRIP ANALYSIS in 'Jakarta Intra Urban Tollway, Phase I Report', Pacific Consultants International, 1979.

*)-2 Economically active population means the portion of residential population which has jobs.

*)-3 Workers at work places mean people who work within a certain region during the day including those who live outside and commute.

Table 5-10 ESTIMATED COMMUTING PERSON-TRIP ENDS BY SMALL ZONE
(Excluding intra zonal trips)

(Unit: 1,000 persons/day)

Zone No.	Name of Zone	1976		1985		1995		2005	
		Generated	Attracted	Generated	Attracted	Generated	Attracted	Generated	Attracted
1.	Gambir	21.2	110.3	26.6	133.4	31.0	159 6	35.2	185.8
2.	Sawah Besar	22.9	69.4	29.2	77.5	37.1	92.8	44.0	110.3
3.	Kemayoran	48.8	13.3	55.5	15.1	60.2	17.1	64.0	19.4
4.	Senen	23.1	60.8	27.0	75.3	29.8	91.5	32.4	107.8
5.	Cempaka Putih	49.4	13.9	58.8	17.6	68.2	21.4	76.4	26.0
6.	Menteng	20.2	61.6	25.7	75.5	30.8	91.6	36.2	107.7
7.	Kebon Melati	33.2	25.6	40.1	37.3	47.2	49.8	54.1	62.0
8.	Gelora	1.0	9.6	1.7	11.4	2.4	13.7	3.3	15.9
	CENTRAL JAKARTA	219.8	364.5	264.6	443.1	306.7	537.5	345.6	634.9
9.	Penjaringan	12.0	20.2	37.0	20.7	70.0	31.1	104.8	44.4
10	Pademangan Barat	17.3	25.6	17.8	23.6	18.7	29.9	20.7	43.1
11.	Tanjung Priok	30.7	34.6	47.2	45.3	67.3	66.7	89.1	97.1
12.	Koja	43.6	34.3	75.5	118.5	113.9	211.3	153.3	311.1
	NORTH JAKARTA	103.6	114.7	177.5	208.1	269.9	339.0	367.9	495.7
13.	Cengkareng	22.9	13.7	63.2	48.9	110.1	94.3	161.8	143.1
14.	Jelambar	21.5	6.2	24.8	11.4	28.3	16.9	32.4	23.2
15.	Tomang	14.5	5.4	18.2	8.9	23.6	12.6	29.8	16.1
16.	Pal Merah	31.2	10.8	38.5	15.3	48.5	20.3	59.1	25.5
17.	Taman Sari	21.8	45.9	28.7	56.4	34.0	68.9	38.8	82 1
18	Tambora	36.3	32.1	42.8	43.3	48.9	55.9	54.4	68.7
19.	Kembangan	5.1	3.6	30.6	8.5	60.2	18.3	91.9	28.6
20.	Kebon Jeruk	10.1	5.8	26.0	13.1	47.4	20.7	70.5	28.8
	WEST JAKARTA	163.4	123.5	272.8	205.8	401.0	307.9	538.7	416.1
21	Tebet	46.2	17.0	56.6	21.3	68.1	26.8	80.3	33.7
22.	Setia Budi	48.3	14.8	52.2	21.2	54.9	27.1	57.3	33.0
23.	Mampang Prapatan	20.5	23.6	32.1	29.7	46.1	39.0	60.9	50.0
24.	Pejaten	13.0	18.6	30.2	30.5	51.8	42.0	76.6	54.7
25.	Serengseng Sawah	4.7	7.4	19.9	13.7	42.0	21.9	66.0	30.5
26	Kebayoran Baru	34.8	17.9	40.3	30.0	51 0	45.5	62.2	60.6
27.	Grogol Utara	21.5	9.8	34.0	23.2	51.7	48.4	73.8	73.8
28.	Kebayoran Lama	15.0	6.5	30.8	15.7	51.5	24.9	74.2	34.5
29.	Cilandak	10.1	14.1	21.1	22.7	35.0	30.9	50.8	40 0
	SOUTH JAKARTA	214.1	129.7	317.2	208.0	452.1	306.5	602.1	410.8
30.	Matraman	28.0	20.3	34.5	29.5	42.4	40.0	50.8	50.1
31.	Pulo Gadung	30.4	22.8	41.6	29.1	55.1	39.3	69.4	52.3
32.	Cipinang Besar	48.1	14.4	58.3	19.3	70.4	24.5	83.0	30.3
33.	Kelender	8.8	2.4	32.2	10.1	60.8	23.4	92.2	37.1
34.	Cililitan	20.9	16.0	30.2	23.6	41.0	33.1	52.6	43.2
35.	Halim Perdana Kusumah	4.2	5.9	12.4	7.3	23.7	10.4	35.5	13.8
36.	Gedong	8.5	38.5	17.2	55.8	27.8	75.9	40.1	100.7
37.	Lubang Buaya	4.1	8.9	22.6	35.2	45.1	43.7	71.2	54.8
38.	Cakung	8.3	20.7	17.9	130.1	30.3	262.2	41.2	396.6
	EAST JAKARTA	161.3	149.4	266.9	340.0	396.6	552.5	536.0	778.9
	JAKARTA TOTAL	862.2	881.8	1,299.0	1,405.0	1,826.3	2,043.4	2,390.3	2,736.4
39.	Tangerang	6.8	5.0	18.4	6.6	32.9	8.4	48.0	19.7
40.	Ciputat	7.8	4.7	22.6	6.6	42.2	9.2	62.0	10.5
41.	Serpong	1.9	1.5	8.3	1.4	16.5	3.2	25.3	3 7
42.	Teluknaga	3.7	1.5	8.4	6.9	13.8	12.2	19.9	17.6
43.	Mauk	-	-	1.4	-	1.6	-	2.0	-
	KABUPATEN TANGERANG	20.2	12.7	59.1	21.5	107.0	33.0	157.2	51.5
44.	Bogor	8.9	6.2	11.7	7.1	15.2	8.0	19 7	9.1
45.	Depok	6.3	3.2	17.6	4.3	32.7	3.7	49.3	7.1
46.	Cibinong	14.4	10.0	32.8	12.3	54.8	14.3	86.4	16.2
47.	Parung	1.0	-	3.4	-	6.4	-	9.8	-
48.	Parung Panjang	-	-	-	-	0.8	-	0.9	-
	KABUPATEN BOGOR	30.6	19.4	65.5	23.7	109.9	26.0	166.1	32.4
49.	Bekasi	9.9	9.9	24.9	13.3	43.7	17.0	63.7	19.6
50.	Pondokgede	1.3	0.9	7.9	1.3	16.3	2.0	25.7	2.4
51.	Cikarang	5.4	4.9	14.4	6.0	25.5	7.3	37.7	8.4
	KABUPATEN BEKASI	16.6	15.7	47.2	20.6	85.5	26.3	127.1	30.4
	BOTABEK TOTAL	67.4	47.8	171.8	65.8	302.4	85.3	450.4	104.3
	JABOTABEK TOTAL	929.6	929.6	1,470.8	1,470.8	2,128.7	2,128.7	2,840 7	2,840.7
	TOTAL TRIP ENDS	1,859.2		2,941.6		4,257.4		5,681.4	

Source: 'Jakarta Intra Urban Tollway, Phase I Report', 1979

Subsequently, the above daily commuter traffic has been distributed to different modes of transport such as railways, buses and sedans.

Such inter modal distribution analysis was completed as follows:

1) Zonal person-trip generation and attraction by railway are estimated based on the locations of the railway stations and at the same time assuming their sphere of influence.

2) Zonal person-trip generation and attraction by vehicle are estimated by subtracting zonal person-trip generation and attraction by railway from the zonal person-trip generation and attraction by all modes.

3) Based on the road distances between a pair of zones, which are introduced into the Trip Interchange Model, person-trips by bus and sedan are estimated separately.

4) According to the rates of sedan-ownership by zone each zone is weighted by the determined coefficients and the person-trips by sedan are revised;

5) The revised person-trips by sedan are deduced from the person-trips by vehicle (estimated peviously in 2)) so as to obtain revised person-trips by bus.

In addition to the above, the estimated daily commuting traffic by sedan and bus is converted to the peak-2 hour (07:00-09:00 am) commuting traffic and then expanded to the person trips for all purposes during the peak-2 hours.

These conversion and expansion factors were determined based on the survey results of the JMATS report conducted in 1972.

Resulting person trips for all purposes and the estimated zonal person-trips by sedan and bus were obtained eventually as shown in Table 5-11 and 5-12.

Table 5-11 ESTIMATED PERSON TRIPS FOR ALL PURPOSES

(Unit: 1,000 Person Trips/peak 2 hours)

Zone No.	Name of Zone	1976		1985		1995		2005	
		Generated	Attracted	Generated	Attracted	Generated	Attracted	Generated	Attracted
1.	Gambir	8.7	45.0	11.6	58.3	14.1	73.1	17.3	90.8
2.	Sawah Besar	9.5	28.3	12.9	34.1	17.3	43.3	22.0	54.9
3.	Kemayoran	20.0	5.5	24.4	6.7	28.0	8.0	32.0	9.6
4.	Senen	9.5	24.8	11.9	32.5	13.5	41.3	15.7	52.0
5.	Cempaka Putih	20.2	5.7	25.9	7.7	32.2	10.1	38.5	13.1
6.	Menteng	8.1	24.9	11.1	32.1	13.3	39.9	17.1	50.1
7.	Kebon Melati	13.6	10.4	17.5	16.1	21.5	22.7	26.4	30.1
8.	Gelora	0.4	3.9	0.8	4.9	1.1	6.3	1.6	7.7
	JAKARTA PUSAT	90.0	148.5	116.1	192.4	141.0	244.7	170.6	308.3
9.	Penjaringan	4.9	8.3	16.4	9.2	33.2	14.7	52.8	22.3
10.	Pademangan Barat	7.1	10.4	7.7	10.3	8.4	13.6	10.1	20.8
11.	Tanjung Priok	12.6	14.3	20.8	20.0	31.4	31.2	44.5	48.3
12.	Koja	17.9	14.1	33.5	52.4	54.1	100.4	77.6	157.6
	JAKARTA UTARA	42.5	47.1	78.4	91.9	127.1	159.9	185.0	249.0
13.	Cengkareng	9.5	5.6	27.8	21.6	51.9	44.3	81.2	71.6
14.	Jelambar	8.8	2.5	11.1	5.1	13.5	8.0	16.4	11.7
15.	Tomang	6.0	2.3	8.1	4.0	11.2	6.0	15.1	8.1
16.	Pal Merah	12.7	4.4	17.1	6.7	22.9	9.6	29.9	12.8
17.	Taman Sari	8.9	18.8	12.4	24.4	15.3	31.2	18.9	39.6
18.	Tambora	14.8	12.9	18.3	18.4	21.3	24.3	25.6	31.9
19.	Kembangan	2.1	1.5	12.9	3.6	27.1	8.1	43.7	13.5
20.	Kebon Jeruk	4.1	2.4	11.5	5.7	22.5	9.9	35.7	14.7
	JAKARTA BARAT	66.9	50.4	119.2	89.5	185.7	141.4	266.5	203.9
21.	Tebet	18.9	6.9	25.0	9.3	32.1	12.7	40.4	16.9
22.	Setia Budi	20.0	6.1	22.9	9.3	25.7	12.7	28.8	16.5
23.	Mampang Prapatan	8.4	9.8	14.1	13.2	21.7	18.4	30.7	25.1
24.	Pejaten	5.3	7.6	13.3	13.4	24.4	19.7	38.4	27.3
25.	Serengseng Sawah	2.0	3.1	8.8	6.0	19.9	10.3	33.2	15.3
26.	Kebayoran Baru	14.4	7.3	17.9	13.4	24.3	21.6	31.5	30.7
27.	Grogol Utara	8.8	4.0	15.1	10.3	24.4	22.8	37.2	37.2
28.	Kebayoran Lama	6.1	2.7	13.7	6.9	24.4	11.9	37.6	17.5
29.	Cilandak	4.1	5.9	9.3	10.1	16.7	14.7	25.7	20.3
	JAKARTA SELATAN	88.0	53.4	140.1	91.9	213.6	144.8	333.5	206.8
30.	Matraman	11.5	8.3	14.9	12.8	19.2	18.0	24.7	24.1
31.	Pulo Gadung	12.5	9.3	18.4	12.9	25.9	18.5	34.9	26.3
32.	Cipinang Besar	19.6	5.9	25.7	8.4	32.8	11.5	41.2	15.1
33.	Kelender	3.6	0.9	14.0	4.4	28.4	10.9	45.7	18.4
34.	Cililitan	8.7	6.5	13.3	10.4	19.5	15.7	26.7	21.9
35.	Halim Perdana Kusumah	1.7	2.4	5.5	3.2	11.2	4.9	18.0	6.9
36.	Gedong	3.5	15.8	7.6	24.8	13.2	36.0	20.3	51.1
37.	Lubang Buaya	1.7	3.7	10.0	15.6	21.5	20.8	36.0	27.7
38.	Cakung	3.5	8.5	8.0	57.6	14.4	123.9	20.8	200.1
	JAKARTA TIMUR	66.3	61.3	117.4	150.1	186.1	260.2	268.3	391.6
	JAKARTA TOTAL	353.7	360.7	571.2	615.8	853.5	951.0	1,193.9	1,359.6
39.	Tangerang	2.5	2.0	7.6	2.7	14.4	3.6	22.4	4.5
40.	Ciputat	2.9	1.9	9.3	2.7	18.5	4.0	28.9	4.8
41.	Serpong	0.7	0.5	3.3	0.5	7.2	1.5	11.7	1.7
42.	Teluknaga	1.5	0.7	3.7	3.1	6.5	5.9	10.1	8.9
43.	Mauk	0.0	0.0	0.7	0.0	0.8	0.0	1.1	0.0
	TANGERANG	7.6	5.1	24.5	9.0	47.4	15.0	74.2	19.9
44.	Bogor	3.3	2.4	4.8	2.9	6.7	3.5	9.2	4.3
45.	Depok	2.4	1.2	7.2	1.7	14.3	1.6	23.1	3.3
46.	Cibinong	5.8	4.1	14.5	5.5	26.0	6.8	43.7	8.3
47.	Parung	0.4	0.0	1.5	0.0	3.1	0.0	4.9	0.0
48.	Parung Panjang	0.0	0.0	0.0	0.0	0.4	0.0	0.4	0.0
	BOGOR	11.9	7.7	28.0	10.1	50.5	11.9	81.3	15.9
49.	Bekasi	3.8	3.7	10.2	5.5	19.2	7.5	29.7	9.2
50.	Pondokgede	0.5	0.4	3.5	0.5	7.7	0.9	13.0	1.2
51.	Cikarang	2.0	1.9	5.9	2.4	11.2	3.2	17.6	3.9
	BEKASI	6.3	6.0	19.6	8.4	38.1	11.6	60.3	14.3
	BOTABEK TOTAL	25.8	18.8	72.1	27.5	136.0	38.5	215.8	50.1
	JABOTABEK TOTAL	379.5	379.5	643.3	643.3	989.5	989.5	1,409.7	1,409.7

Table 5-12 ESTIMATED ZONAL PERSON TRIP ENDS BY SEDAN AND BUS

(unit: Person Trip Ends/peak 2 hours)

Zone No.	Name of Zone	1976		1985		1995		2005	
		Sedan	Bus	Sedan	Bus	Sedan	Bus	Sedan	Bus
1.	Gambir	26,847	26,899	35,702	34,637	45,299	42,642	56,071	53,079
2.	Sawah Besar	19,124	18,697	24,396	22,811	31,961	28,996	40,557	36,853
3.	Kemayoran	13,865	11,729	17,335	13,916	18,689	17,560	21,670	20,262
4.	Senen	17,336	16,955	22,946	21,549	27,860	27,129	34,343	33,639
5.	Cempaka Putih	13,087	12,843	18,724	14,934	21,888	20,523	26,722	25,071
6.	Menteng	16,712	16,321	22,304	21,108	27,886	25,680	35,170	32,559
7.	Kebon Melati	11,787	12,292	16,893	16,906	22,592	21,952	28,907	28,086
8.	Gelora	2,132	2,165	2,871	2,845	3,806	3,626	4,756	4,593
	JAKARTA PUSAT	120,890	117,901	161,171	148,706	199,981	188,108	248.196	234,142
9.	Penjaringan	6,807	6,412	14,015	11,671	28,749	19,318	45,422	29,949
10.	Pademangan Barat	8,741	8,778	9,201	8,883	11,486	10,675	16,139	15,029
11.	Tanjung Priok	14,640	12,199	22,311	18,563	34,674	28,136	50,460	42,686
12.	Koja	18,077	13,794	47,800	37,198	88,796	63,873	129,311	103,056
	JAKARTA UTARA	48,265	41,183	93,327	76,315	163,705	122,002	241,332	190,722
13.	Cengkareng	9,510	5,592	31,186	18,173	62,385	33,730	95,978	56,699
14.	Jelambar	6,594	4,749	8,907	7,347	11,934	9,656	15,544	12,699
15.	Tomang	4,071	4,268	6,075	6,097	8,774	8,555	11,844	11,549
16.	Pal Merah	8,494	8,653	12,037	11,847	16,645	16,000	21,852	21,066
17.	Taman Sari	14,257	13,501	19,376	17,669	24,980	21,930	31,448	27,632
18.	Tambora	13,933	13,842	18,856	18,071	23,994	22,036	31,634	26,513
19.	Kembangan	2,199	1,401	10,641	5,816	22,768	12,315	35,574	21,436
20.	Kebon Jeruk	3,641	2,859	9,808	7,372	19,863	12,469	28,834	21,483
	JAKARTA BARAT	62,699	54,865	116,886	92,392	191,363	136,691	272,708	199,077
21.	Tebet	12,794	12,992	17,260	16,941	22,834	22,012	29,234	28,161
22.	Setia Budi	13,821	12,336	17,330	14,969	20,903	17,666	24,654	20,886
23.	Mampang Prapatan	9,806	8,376	14,970	12,325	22,285	17,832	30,901	24,946
24.	Pejaten	7,620	5,247	16,247	10,388	27,339	16,680	39,693	25,900
25.	Serengseng Sawah	3,210	1,875	9,668	5,072	20,096	9,993	31,332	16,991
26.	Kebayoran Baru	12,337	9,371	17,053	14,262	25,393	20,564	34,237	28,078
27.	Grogol Utara	7,103	5,700	14,363	11,018	28,390	18,800	42,433	31,988
28.	Kebayoran Lama	4,965	3,826	12,600	7,940	22,452	13,739	33,960	20,964
29.	Cilandak	6,081	3,891	11,804	7,545	19,349	11,979	28,180	17,717
	JAKARTA SELATAN	77,737	63,614	131,295	100,460	209,041	149,265	294,624	215,631
30.	Matraman	9,733	10,073	14,027	13,722	19,153	18,145	25,182	23,774
31.	Pulo Gadung	11,722	10,060	17,016	14,278	24,312	20,124	33,449	27,841
32.	Cipinang Besar	12,453	13,034	16,970	17,117	22,289	22,040	28,364	28,011
33.	Kelender	2,419	2,083	10,806	7,562	23,251	16,019	37,853	26,252
34.	Cililitan	8,925	6,230	13,866	9,746	20,855	14,233	28,708	19,748
35.	Halim Perdana Kusumah	2,371	1,720	5,267	3,416	9,910	6,164	15,348	9,531
36.	Gedong	12,420	6,788	20,898	11,336	31,977	17,009	45,494	25,635
37.	Lubang Buaya	3,648	1,729	17,265	8,161	28,351	13,661	42,183	21,078
38.	Cakung	7,130	4,830	40,183	25,065	86,886	50,547	137,683	81,740
	JAKARTA TIMUR	70,821	56,547	156,298	110,403	266,984	177,942	394,264	263,610
	JAKARTA TOTAL	380,412	334,110	658,977	528,276	1,031,074	774,028	1,451,122	1,103,182
39.	Tangerang	2,894	1,599	6,010	4,270	10,185	7,770	14,866	11,959
40.	Ciputat	2,749	2,045	6,498	5,385	12,147	10,299	17,857	15,751
41.	Serpong	726	471	2,034	1,760	4,837	3,851	7,233	6,143
42.	Teluknaga	1,286	911	4,326	2,468	8,092	4,315	12,236	6,782
43.	Mauk	0	0	0	0	0	0	0	0
	TANGERANG	7,655	5,026	18,868	13,883	35,261	26,235	52,192	40,635
44.	Bogor	3,951	1,734	5,211	2,456	6,742	3,430	8,766	4,689
45.	Depok	2,085	1,497	4,858	3,982	8,302	7,479	13,938	12,265
46.	Cibinong	6,381	3,477	11,931	7,938	18,758	13,826	28,792	22,853
47.	Parung	187	211	738	755	1,531	1,549	2,422	2,447
48.	Parung Panjang	0	0	0	0	0	0	0	0
	BOGOR	12,604	6,919	22,738	15,131	35,333	26,284	53,918	42,254
49.	Bekasi	4,583	2,902	9,249	6,427	15,453	11,248	22,048	16,899
50.	Pondokgede	486	411	2,050	1,926	4,420	4,129	7,255	6,872
51.	Cikarang	1,838	254	5,186	3,093	8,621	5,774	12,491	9,008
	BEKASI	6,907	3,567	16,485	11,446	28,494	21,151	41,794	32,779
	BOTABEK TOTAL	27,166	15,512	58,041	40,460	99,088	73,670	147,904	115,668
	JABOTABEK TOTAL	407,578	349,622	717,068	568,736	1,130,162	847,698	1,599,026	1,218,850

(b) Analysis of Passenger Vehicle Traffic

Among a wide variety of vehicles for carrying passengers, sedans including taxis and buses are the most representative transportation means.

Therefore, the analysis of future passenger vehicle traffic was concerned with these two types of vehicles.

Passenger occupancy surveys conducted for the Intra Urban Tollway project indicate that the existing average passenger occupancy rates per a bus and sedan are 45 persons vehicle and 1.85 person vehicle respectively in the morning peak-2 hours.

A future passenger occupancy will not change significantly, since the existing modes of transport are expected to continue. However, such factors as rising per capita income and increasing sedan ownership will tend to lower the passenger occupancy rates. On the other hand, insufficient parking spaces and the current increase in parking charges will encourage higher occupancy rates. Accordingly, the overall trend in future passengers occupancy rates for sedans was assumed to be slowly declining to a level lower than the existing one.

Regarding buses, the existing situation is such that the demand for buses exceeds the passenger capacity of buses in the morning peak hours, so that passenger occupancy is very high at present. In the future it is assumed that supply and demand for buses will become more balanced.

Taking all these factors into consideration, the future passenger occupancy rates for sedans and buses were determined as shown in Table 5-13.

Table 5-13 FUTURE PASSENGER OCCUPANCY RATES FOR SEDAN AND BUS

(Unit: Persons/vehicle)

Year	Peak-hours	
	Sedan *	Bus
1976	1.85	45.0
1985	1.80	40.0
1995	1.74	40.0
2005	1.68	40.0

* including taxi passengers

The generated and attracted person-trips by zone which were estimated previously as shown in Table 5-12 were divided by the passenger occupancy rates determined above so that the future passenger vehicle traffic can be summarized as shown in Table 5-14.

Table 5-14 ESTIMATED PASSENGER VEHICLE TRIP ENDS IN PEAK HOURS

(unit Trip ends/Peak hours)

Zone No.	Name of Zone	1976		1985		1995		2005	
		Sedan	Bus	Sedan	Bus	Sedan	Bus	Sedan	Bus
1.	Gambir	14,507	594	19,838	865	26,033	1,070	33,378	1,331
2.	Sawah Besar	10,333	417	13,554	570	18,368	729	24,140	923
3.	Kemayoran	7,493	259	9,634	343	10,743	440	12,903	505
4.	Senen	9,373	376	12,748	538	16,014	678	20,439	843
5.	Cempaka Putih	7,078	283	10,403	373	12,576	512	15,902	623
6.	Menteng	9,032	363	12,390	526	16,027	643	20,935	814
7.	Kebon Melati	6,368	268	9,382	421	12,987	550	17,208	704
8.	Gelora	1,159	46	1,600	65	2,188	86	2,833	110
	JAKARTA PUSAT	65,343	2,606	89,549	3,701	114,938	4,708	147,738	5,853
9.	Penjaringan	3,683	134	7,786	291	16,522	486	27,034	747
10.	Pademangan Barat	4,726	198	5,110	224	6,601	270	9,602	377
11.	Tanjung Priok	7,911	264	12,392	462	19,929	707	30,032	1,063
12.	Koja	9,772	304	26,559	931	51,036	1,597	76,969	2,574
	JAKARTA UTARA	26,092	900	51,847	1,908	94,088	3,060	143,637	4,761
13.	Cengkareng	5,138	120	17,330	453	35,857	846	57,128	1,417
14.	Jelambar	3,565	103	4,949	182	6,854	243	9,255	317
15.	Tomang	2,199	91	3,377	149	5,044	213	7,050	288
16.	Pal Merah	4,591	191	6,694	297	9,565	402	13,006	527
17.	Taman Sari	7,708	297	10,761	436	14,358	549	18,718	687
18.	Tambora	7,530	307	10,464	449	13,791	552	18,827	668
19.	Kembangan	1,187	22	5,910	144	13,086	310	21,175	536
20.	Kebon Jeruk	1,970	57	5,447	184	11,434	314	17,163	541
	JAKARTA BARAT	33,888	1,188	64,932	2,294	109,989	3,429	162,322	4,981
21.	Tebet	6,915	287	9,588	422	13,122	552	17,397	702
22.	Setia Budi	7,470	274	9,632	374	12,013	440	14,674	521
23.	Mampang Prapatan	5,294	183	8,322	307	12,808	447	18,392	623
24.	Pejaten	4,118	112	9,025	261	15,707	421	23,623	646
25.	Serengseng Sawah	1,738	32	5,371	124	11,554	252	18,650	428
26.	Kebayoran Baru	6,670	206	9,480	354	14,594	521	20,380	696
27.	Grogol Utara	3,841	118	7,979	275	16,310	472	25,257	799
28.	Kebayoran Lama	2,685	77	7,000	197	12,900	340	20,215	524
29.	Cilandak	3,284	84	6,557	190	11,123	300	16,772	438
	JAKARTA SELATAN	42,015	1,373	72,954	2,504	120,131	3,745	175,360	5,377
30.	Matraman	5,262	224	7,795	345	11,011	453	14,989	596
31.	Pulo Gadung	6,334	226	9,454	356	13,970	502	19,905	695
32.	Cipinang Besar	6,732	287	9,429	425	12,811	547	16,880	702
33.	Kelender	1,306	39	6,006	190	13,358	403	22,536	660
34.	Cililitan	4,823	134	7,705	244	11,991	357	17,088	491
35.	Halim Perdana Kusumah	1,288	30	2,925	83	5,697	151	9,140	240
36.	Gedong	6,711	148	11,606	282	18,380	424	27,079	639
37.	Lubang Buaya	1,969	28	9,591	205	16,293	342	25,116	525
38.	Cakung	3,853	107	22,323	628	49,935	1,270	81,952	2,044
	JAKARTA TIMUR	38,278	1,223	86,834	2,758	153,446	4,449	234,685	6,592
	JAKARTA TOTAL	205,616	7,290	366,116	13,165	592,592	19,391	863,742	27,564
39.	Tangerang	1,566	26	3,342	104	5,855	190	8,852	295
40.	Ciputat	1,489	40	3,612	133	6,981	257	10,627	392
41.	Serpong	391	1	1,128	42	2,784	90	4,303	150
42.	Teluknaga	689	13	2,406	63	4,646	112	7,288	171
43.	Mauk	0	0	0	0	0	0	0	0
	TANGERANG	4,135	80	10,488	342	20,266	649	31,070	1,008
44.	Bogor	2,137	36	2,893	57	3,871	86	5,222	116
45.	Depok	1,130	25	2,703	95	4,773	184	8,293	303
46.	Cibinong	3,450	75	6,630	199	10,779	344	17,136	571
47.	Parung	105	0	410	15	877	35	1,441	63
48.	Parung Panjang	0	0	0	0	0	0	0	0
	BOGOR	6,822	136	12,636	366	20,300	649	32,092	1,053
49.	Bekasi	2,474	63	5,135	162	8,885	279	13,124	422
50.	Pondokgede	266	1	1,138	43	2,535	100	4,325	171
51.	Cikarang	1,001	2	2,885	76	4,960	144	7,435	220
	BEKASI	3,741	66	9,158	281	16,380	523	24,884	813
	BOTABEK TOTAL	14,698	282	32,282	989	56,946	1,821	88,046	2,874
	JABOTABEK TOTAL	220,314	7,572	398,398	14,154	649,538	21,212	951,788	30,438

(c) Cargo Flow Analysis

The most representative modes of goods transport are vessels, railways and trucks. Generally, economic development generates a larger volume of cargo flows, or vice versa. Therefore, future as well as present cargo flows are influenced significantly by economic growth factors. In particular, such factors as the development of a secondary industry from a production stand point and the increase in per capita income from a consumption stand point.

In this manner regional production and consumption activities crete a certain pattern within the whole region micro-scopic patterns due to zonal characteristics.

Hence, future production and consumption of major commodities were estimated for each zone in DKI Jakarta and BoTaBek in relation to the future social and economic parameters attributable to them. The production and consumption analysis, or more specifically a balance between production and consumption composes inter-regional cargo flows (Outflow from DKI Jakarta and Inflow to DKI Jakarta) while the remaining portion comprises intra-regional (Intra-Jakarta) cargo flows.

The inter-regional cargo flows estimated above were adjusted to the future framework which were derived from the analysis of future inter-regional cargo transport by each mode including vessels, railways and trucks.

The future framework was established based on the Tanjung Priok Master Plan, the truck O-D survey carried out by Bina

Marga in 1972 and the future economic parameters in the Intra Urban Tollway project. The estimated future framework of inter-regional cargo flow is given in Table 5-15.

Table 5-15 ESTIMATED FUTURE FRAMEWORK OF INTER-REGIONAL CARGO FLOWS BY MODE

(Unit: 1,000 Tons/year)

Year	Vessels	Trucks	Railways	Total
1976	9,864	13,495	888	24,247
1985	18,478	43,308	2,311	63,097
1995	31,322	105,146	5,188	141,656
2005	41,568	233,327	8,298	283,193

Thus, intra-regional as well as inter-regional cargo flows were estimated and distributed to the modes of truck and railway transport based on the past trend of railway cargo traffic. As a result, cargo transport by truck was estimated as shown in Table 5-16.

Table 5-16 ESTIMATED FUTURE CARGO TRANSPORT BY TRUCK

(Unit: 1,000 Tons/year)

Direction of Cargo Transport	1976	1985	1995	2005
Intra-Jakarta	7,743	19,237	43,309	91,764
Inside-JKT → Outside JKT	2,089	6,712	15,212	34,481
Outside-JKT → Inside-JKT	10,557	31,892	80,535	184,240
Ports → Outside-JKT	440	2,037	5,111	7,047
Ports → Inside-JKT	8,090	12,679	17,010	19,559
Outside-JKT → Ports	410	1,473	4,254	7,537
Inside-JKT → Ports	438	1,052	2,458	3,443

The truck cargo traffic generated and attracted outside-Jakarta was divided into those in BoTaBek and outside-BoTaBek based on the O-D table prepared by Bina Marga in 1972.

Furthermore, intermediate destinations between the starting and ending points of a cargo-trip are also taken into consideration for such cargo traffic dropping in truck terminals and warehouses.

Finally, these intra-regional and inter-regional cargo flows were allocated to each zone in proportion to zonal production and consumption volumes derived from zonal landuse parameters such as residential population, workers at work places of primary, secondary and tertiary industries.

Making reference to the average load of trucks in the past the future average truck load was determined as shown in Table 5-17 and the cargo traffic (in tonnage) generated and attracted by zone was converted to the truck traffic as shown in Table 5-18.

Table 5-17 FORECAST OF FUTURE AVERAGE TRUCK LOAD

(Unit: Ton/vehicle)

	1976	1985	1995	2005
Intra-Jakarta	2.0	2.0	2.0	2.5
Inter-Regional	2.5	4.5	7.0	7.2

Table 5-18 ESTIMATED FUTURE TRUCK TRIP ENDS BY ZONE

(Unit: 1,000 Tons/year)

Zone No.	Name of Zone	Production	Consumption
1.	Gambir	145.8	436.7
2.	Sawah Besar	300.7	528.7
3.	Kemayoran	107.5	367.3
4.	Senen	114.9	366.9
5.	Cempaka Putih	36.7	396.8
6.	Menteng	94.8	322.8
7.	Kebon Melati	109.3	395.8
8.	Gelora	9.2	27.2
9.	Penjaringan	255.8	338.9
10.	Pademangan Barat	402.8	471.4
11.	Tanjung Priok	564.5	689.2
12.	Koja	389.8	698.0
13.	Cengkareng	226.7	343.0
14.	Jelambar	60.8	175.3
15.	Tomang	25.7	114.6
16.	Pal Merah	67.7	249.0
17.	Taman Sari	151.1	378.5
18.	Tambora	113.0	434.4
19.	Kembangan	42.4	80.3
20.	Kebon Jeruk	43.6	116.5
21.	Tebet	177.1	437.3
22.	Setia Budi	89.5	362.9
23.	Mampang Prapatan	200.3	382.9
24.	Pejaten	57.9	186.7
25.	Serengseng Sawah	28.8	77.6
26.	Kebayoran Baru	95.3	337.6
27.	Grogol Utara	102.7	233.4
28.	Kebayoran Lama	52.1	147.1
29.	Cilandak	42.8	140.3
30.	Matraman	81.1	315.7
31.	Pulo Gadung	265.5	464.8
32.	Cipinang Besar	110.2	376.3
33.	Kelender	21.2	70.7
34.	Cililitan	115.4	286.6
35.	Halim Perdana Kusumah	20.0	62.5
36.	Gedong	360.0	401.5
37.	Lubang Buaya	35.1	83.1
38.	Cakung	363.7	370.8
	Jakarta Total	5,582.3	11,669.0

5.3 Origin and Destination Analysis

5.3.1 Methodology

In this section the future traffic volumes on the Jakarta Tangerang Freeway are estimated based on the generated and attracted traffic volumes forecast for each zone in the previous Sec. 5.2.2. Traffic Generation.

The basic concept for the forecast of future traffic volumes is summarized in the flow chart shown in Fig. 5-6 and is explained as follows:

(a) Examination of the generated and attracted traffic volume by zone and year.

(b) Estimation of the distributed traffic volume and establishment of O-D matrices.

1) Examination of the method of estimation of the distributed traffic and the convergence calculation.

2) Establishment of the road network by year for the estimation of the distributed traffic.

(c) Estimation of the assigned traffic volume

1) Establishment of the road network by year.

2) Appraisal and determination of the method of traffic assignment.

3) Appraisal of the toll fares, toll resistance and toll system and determination of the toll fares within the limit

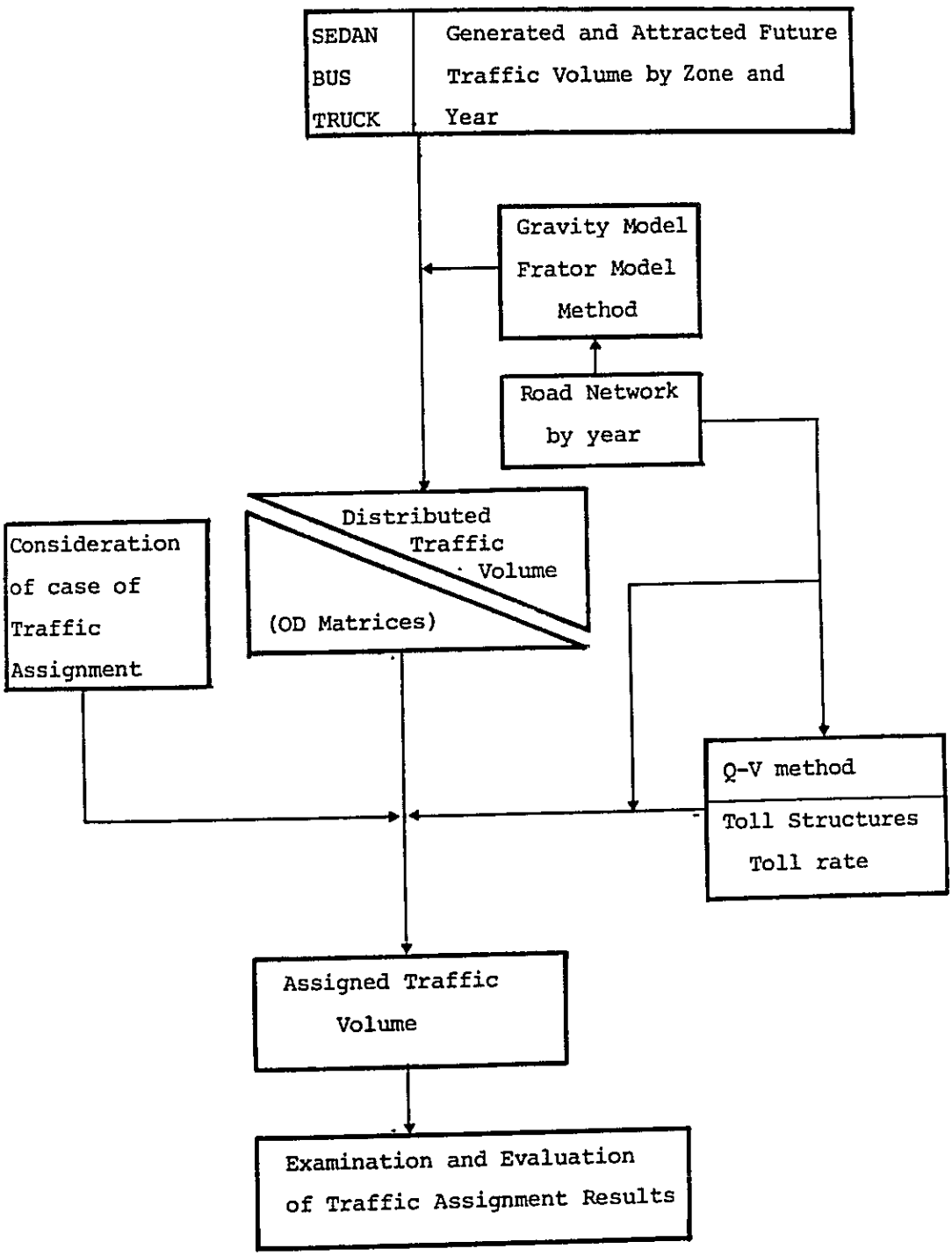
of the financial benefits.

4) Establishment of alternatives for the traffic assignment examining alternatives by year, toll fare and toll system.

(d) Evaluation of assignment results.

The overall evaluation of the results will be made subsequently in connection with the later financial analysis but before that an evaluation of the assignment is made by a traffic diversion rate obtained from the Jagorawi Freeway and similar experiences in other countries.

Fig. 5-6 CONCEPTUAL FLOW FOR THE TRAFFIC FORECAST



The future traffic volumes were estimated for sedan, truck and bus as summarized in Table 5-19 throng Table 5-22.

Table 5-19 ESTIMATED PEAK VEHICLE TRIPENDS OF JAKARTA

Unit: Vehicle/peak 2 hours

	1976	1985	1995	2005
Sedan	205,616	366,126	592,592	863,742
Bus	7,290	13,165	19,391	27,564
Truck	5,968	11,754	20,260	41,238
Total	218,874	391,045	632,243	932,544

Table 5-20 ESTIMATED DAILY VEHICLE TRIPENDS OF JAKARTA

Unit: Vehicle/day

	1976	1985	1995	2005
Sedan	1,398,189	2,310,255	3,330,367	4,776,493
Bus	94,041	136,916	190,032	250,832
Truck	111,093	207,928	347,173	689,465
Total	1,603,323	2,655,099	3,867,572	5,716,790

Table 5-21 ESTIMATED PEAK VEHICLE TRIPENDS OF OUTSIDE JAKARTA

Unit: Vehicle/peak 2 hours

	1976	1985	1995	2005
Sedan	14,698	32,282	56,946	88,046
Bus	282	989	1,821	2,874
Truck	1,880	3,882	6,156	14,238
Total	16,860	37,153	64,923	105,158

Table 5-22 ESTIMATED DAILY VEHICLE TRIPENDS OF OUTSIDE JAKARTA

Unit: Vehicle/day

	1976	1985	1995	2005
Sedan	99,946	203,699	320,037	486,894
Bus	3,638	10,286	17,846	26,153
Truck	34,433	68,358	105,585	237,881
Total	138,017	282,343	443,468	750,928

Note: Figures in the tables above show the interzonal traffic within DKI Jakarta and Botabek.

5.3.2 O-D Matrices

(a) Examination of Trip Distribution Model

It is considered that in a metropolitan area like DKI Jakarta, where much progress with development is anticipated in the foreseeable future, the traffic flow pattern will change rapidly. Improvement of the infrastructure, especially those parts of the road network that will become the main framework, such as the regional freeways, the Outer Ring Road and the Intra Urban Tollway, will exert a strong influence on the traffic flow pattern. Similarly the location of warehouses, cargo distribution terminals and port facilities will significantly alter the flow of goods traffic. The traffic model needs to be able to take into account these various factors affecting the pattern of traffic flow to simulate actual conditions, particularly the time distance between zones. In this study, based on these considerations, the "gravity model" was adopted. The parameters of the model are determined as follows from the analysis of the present O-D matrices.

"Gravity Model"

$$Tij = Ti \times Tj \times \frac{k}{Dijn}$$

where: Tij = distributed trip volume between zone i and j.

Ti = generated (attracted) trip volume of zone i.

Tj = generated (attracted) trip volume of zone j.

n and k = coefficients

Dij = required travel time between zone i and zone j.

The parameters are as follows:

Type of vehicle	n	k	Correlation Coefficient : R
Passenger Vehicle	1.00	1.047×10^{-6}	0.80
Truck	1.09	8.128×10^{-5}	0.80

(b) Establishment of O-D Matrices

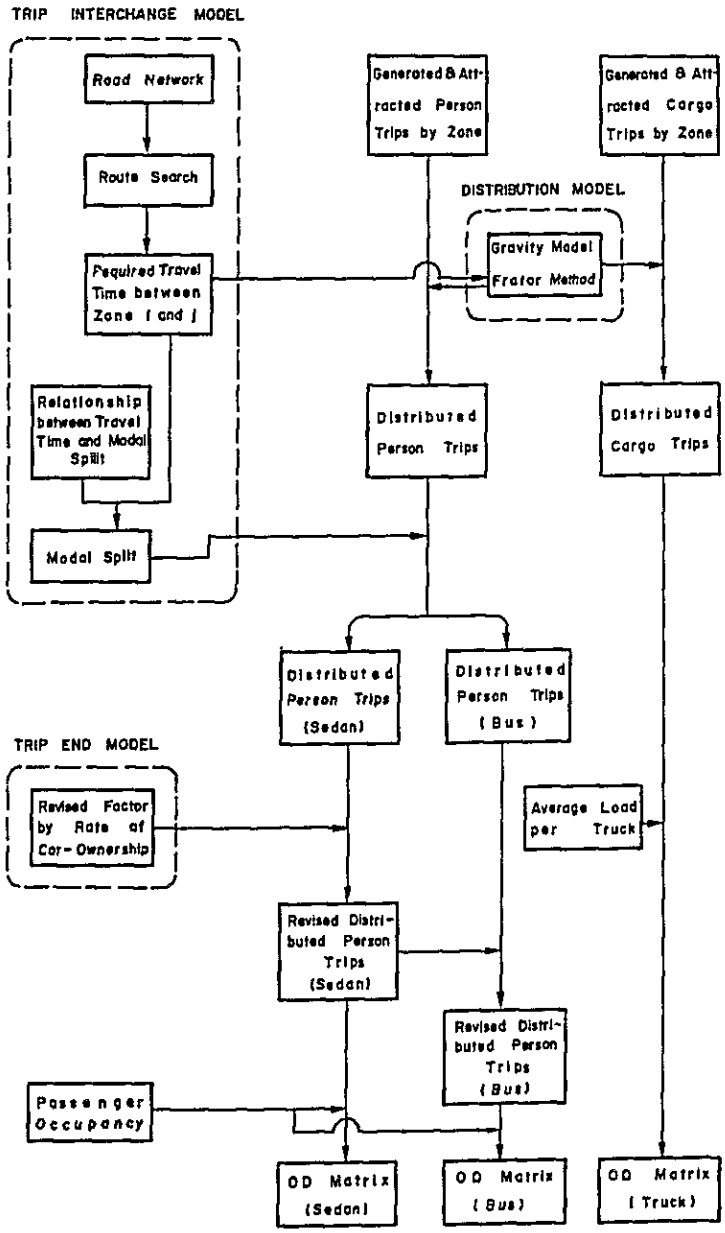
Based on the gravity trip distribution model and the flow chart shown in Fig. 5-7, the O-D matrices shown in Table 5-23 were established.

The peak hour O-D matrices are given in Table 5-24 through 5-32.

Table 5-23 ESTABLISHED O-D MATRICES

Year	Type of O-D Matrices	Unit
1. 1976	1. Sedan Person Trip	Per peak 2 hours
2. 1985	2. Bus Person Trip	Per peak 2 hours
3. 1995	3. Sedan Car Trip	Per peak 2 hours
4. 2005	4. Bus Trip	Per peak 2 hours
	5. Cargo Tonnage	Per year
	6. Cargo Tonnage	Per day
	7. Cargo Tonnage	Per peak 2 hours
	8. Truck Trip	Per day
	9. Truck Trip	Per peak 2 hours

Fig. 5-7 CONCEPTUAL FLOW CHART FOR THE ESTABLISHMENT OF O-D MATRIX



1985 *** JAKARTA OD ***

Table 5-24 SEDAN O-D MATRIX IN 1985 (unit Veh/peak-2hrs.)

SHASHU= 1 (SEDAN)

	100	200	300	400	500	600	700	800	900	1000	1100	1200	DKI TOTAL	1300	1400	1500	1600	1700	1800	1900	BOTABEK TOTAL	2000	2100	2200	OUT	TOTAL	T.E.
100	11962	1088	5723	1120	3088	636	412	2225	1301	788	5328	2441	34128	177	157	51	204	0	714	583	1866	0	0	0	0	35994	69369
200	2038	412	870	298	1341	104	86	331	235	148	745	434	7042	42	31	6	58	0	139	107	383	0	0	0	0	7425	12896
300	3183	472	4018	854	1160	205	207	855	665	372	3533	1413	16739	114	83	20	135	0	431	443	1226	0	0	0	0	17965	38931
400	2381	337	982	0	1036	227	374	761	545	429	1544	1010	9480	185	90	18	178	0	298	229	996	0	0	0	0	10476	17330
500	4388	819	1022	581	1254	249	169	610	432	271	1245	754	15635	75	54	12	84	0	233	177	637	0	0	0	0	16272	26184
600	2612	163	443	238	593	160	117	487	287	217	769	484	6554	42	40	8	46	0	148	108	392	0	0	0	0	6946	10071
700	1901	198	631	780	319	135	142	658	472	409	1151	773	7804	89	76	15	101	0	233	170	684	0	0	0	0	8490	11357
800	7090	445	1665	593	1226	382	315	1846	1383	807	3735	2338	21823	139	141	29	150	0	630	458	1547	0	0	0	0	23370	37022
900	2396	202	849	320	522	147	148	1029	730	519	1813	1518	10191	85	82	19	91	0	347	267	1089	0	0	0	0	11280	20933
1000	2265	190	684	388	509	174	231	856	746	241	1365	921	8570	83	118	19	90	0	311	206	827	0	0	0	0	9397	14979
1100	6245	441	2601	490	1029	257	212	1727	863	413	4797	2595	21670	131	118	27	131	0	642	632	1701	0	0	0	0	23371	53007
1200	2443	212	1084	293	497	135	126	909	684	259	2329	2115	11086	81	78	17	92	0	607	362	1237	0	0	0	0	12323	31827
DKI TOTAL	48904	4979	18572	5661	12762	2832	2528	12304	8375	4871	28354	16780	166922	1239	1068	221	1382	0	4933	3742	12585	0	0	0	0	179507	366126
1300	534	70	257	275	167	37	52	127	97	73	254	160	2103	0	0	0	0	0	0	0	0	0	0	0	0	2103	3362
1400	695	55	247	136	167	53	67	224	132	200	326	212	2344	0	0	0	0	0	0	0	0	0	0	0	0	2344	3612
1500	245	24	100	50	61	18	21	73	56	51	124	82	907	0	0	0	0	0	0	0	0	0	0	0	0	907	1128
1600	264	44	130	111	85	18	23	81	46	33	125	73	1024	0	0	0	0	0	0	0	0	0	0	0	0	1024	2406
1700	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1800	1787	173	834	266	401	102	108	539	704	232	1111	1528	7703	0	0	0	0	0	0	0	0	0	0	0	0	7703	12636
1900	1206	116	840	155	268	65	68	324	245	124	1138	667	5416	0	0	0	0	0	0	0	0	0	0	0	0	5416	9158
BOTABEK TOTAL	4651	492	2414	993	1152	293	339	1348	1298	711	3292	2724	19697	0	0	0	0	0	0	0	0	0	0	0	0	19697	32282
2000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	53555	5471	20986	6654	13914	3125	2867	13652	9673	5582	31634	19504	186619	1239	1068	221	1382	0	4933	3742	12585	0	0	0	0	199204	398408

1995 *** JAKARTA OD ***

Table 5-25 SEDAN O-D MATRIX IN 1995 (unit Veh/peak-2hrs.)

SHASHU= 1 (SEDAN)

	100	200	300	400	500	600	700	800	900	1000	1100	1200	DKI TOTAL	1300	1400	1500	1600	1700	1800	1900	BOTABEK TOTAL	2000	2100	2200	OUT	TOTAL	T.E.
100	12444	1284	5353	1764	3323	782	609	2552	1504	1213	7817	2643	41288	185	181	80	304	0	646	826	2020	0	0	0	0	43308	114938
200	3440	751	2053	793	2452	204	219	630	454	382	1874	782	14034	73	61	29	141	0	195	168	687	0	0	0	0	14721	23123
300	4341	751	7144	1406	1675	330	422	1342	1062	782	7744	2108	29307	152	133	61	273	0	503	683	1785	0	0	0	0	31092	70965
400	4125	666	2357	0	1830	441	958	1456	1139	1099	3950	1761	19782	311	173	72	436	0	431	395	1818	0	0	0	0	21600	35857
500	4816	1030	1545	791	1364	310	252	737	505	440	1987	840	14617	80	67	29	132	0	223	201	732	0	0	0	0	15349	35003
600	3233	234	755	443	749	196	204	661	395	399	1383	626	9278	51	55	22	79	0	160	138	505	0	0	0	0	9783	14609
700	3500	410	1603	2145	969	322	561	1302	954	1124	3092	1481	17325	160	134	63	261	0	361	323	1322	0	0	0	0	18645	24920
800	8204	593	2704	1056	1455	501	521	2352	1830	1422	6181	2902	29721	160	184	78	252	0	646	563	1883	0	0	0	0	31604	52537
900	4141	400	2054	833	919	284	356	1947	1451	1267	4424	2768	21044	140	158	75	221	0	836	493	1923	0	0	0	0	22967	38384
1000	3583	341	1500	922	819	306	505	1522	1283	557	3161	1516	16015	127	209	76	199	0	418	335	1358	0	0	0	0	17373	29210
1100	8124	654	4988	984	1385	375	397	2400	1260	803	9294	3580	34224	172	177	82	284	0	751	910	2376	0	0	0	0	36600	101085
1200	3894	383	2634	708	806	244	221	1553	1201	699	5515	3562	21190	127	141	63	208	0	867	625	2031	0	0	0	0	23221	52361
DKI TOTAL	64045	7497	34470	11845	17746	4295	5085	18514	13038	10097	56627	24569	267823	1736	1693	724	2790	0	6037	5460	18440	0	0	0	0	286263	592592
1300	859	129	571	663	274	67	121	225	172	167	604	267	4119	0	0	0	0	0	0	0	0	0	0	0	0	4119	5855
1400	1205	129	594	352	296	102	143	431	289	526	814	383	5288	0	0	0	0	0	0	0	0	0	0	0	0	5288	6981
1500	463	53	261	141	117	37	57	155	116	147	350	163	2060	0	0	0	0	0	0	0	0	0	0	0	0	2060	2784
1600	396	73	282	249	135	29	54	98	74	72	277	117	1836	0	0	0	0	0	0	0	0	0	0	0	0	1836	4640
1700	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1800	2691	305	1803	629	641	179	242	931	1279	531	2544	2488	14263	0	0	0	0	0	0	0	0	0	0	0	0	14263	20300
1900	1971	216	1892	378	445	117	153	579	449	297	3270	1153	10920	0	0	0	0	0	0	0	0	0	0	0	0	10920	16380
BOTABEK TOTAL	7585	905	5403	2412	1908	531	790	2419	2379	1740	7861	4571	38506	0	0	0	0	0	0	0	0	0	0	0	0	38506	56946
2000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	71630	8402	39873	14257	19654	4826	5875	20933	15417	11837	64488	29140	306329	1736	1693	724	2790	0	6037	5460	18440	0	0	0	0	324769	649538

2005 *** JAKARTA OD ***

Table 5-26 SEDAN O-D MATRIX IN 2005 (unit Veh/peak-2hrs.)

SHASHU= 1 (SEDAN)

	100	200	300	400	500	600	700	800	900	1000	1100	1200	DKI TOTAL	1300	1400	1500	1600	1700	1800	1900	BOTABEK TOTAL	2000	2100	2200	OUT	TOTAL	T.E.
100	14284	1777	7464	2511	3918	956	837	3121	1838	1689	10739	3195	52369	201	191	80	405	0	747	691	2315	0	0	0	0	54684	167738
200	4933	1286	3596	1425	3657	310	381	966	706	670	3286	1191	22407	101	82	36	239	0	288	259	1005	0	0	0	0	23412	36636
300	5524	1094	10722	2101	2078	421	610	1718	1376	1132	11496	2669	40941	185	150	68	382	0	654	774	2213	0	0	0	0	43154	107001
400	5787	1125	4028	0	2667	650	1635	2168	1720	1860	6756	2693	31049	418	225	89	708	0	638	557	2635	0	0	0	0	33704	57128
500	5771	1519	2273	1175	1679	386	363	937	649	638	2911	1065	19366	91	74	31	187	0	270	231	884	0	0	0	0	20250	46800
600	4065	353	1159	692	979	262	303	881	531	608	2111	832	12776	80	63	25	116	0	202	169	635	0	0	0	0	13411	20056
700	4851	686	2708	3776	1393	466	596	2006	1473	1880	9270	2170	27091	214	198	76	420	0	534	464	1888	0	0	0	0	28979	38338
800	9743	850	3945	1576	1779	627	744	2969	2379	2075	8885	3697	39269	187	206	82	352	0	787	652	2266	0	0	0	0	41535	70843
900	5996	699	3627	1494	1386	433	616	2988	2266	2178	8144	4230	34037	205	232	94	382	0	1274	702	2867	0	0	0	0	36904	59045
1000	4925	565	2518	1563	1156	439	813	2231	1907	934	5300	2205	24356	168	264	83	319	0	597	652	1883	0	0	0	0	26439	45472
1100	10479	1021	7948	1587	1843	511	615	3235	1760	1254	14751	4888	49872	214	214	94	431	0	982	1158	3093	0	0	0	0	52965	156262
1200	5576	661	4268	1258	1189	364	484	2326	1829	1050	9474	5416	34095	177	189	79	352	0	1260	876	2933	0	0	0	0	37028	78423
DKI TOTAL	81934	11036	54256	19098	23684	5825	7995	25544	16374	15968	89285	34251	387848	2219	2068	837	4293	0	8233	6967	24617	0	0	0	0	412465	863742
1300	1221	220	989	1164	401	100	206	341	241	286	1049	399	6633	0	0	0	0	0	0	0	0	0	0	0	0	6633	8852
1400	1741	224	1044	627	441	156	279	661	444	927	1433	582	8558	0	0	0	0	0	0	0	0	0	0	0	0	8558	10627
1500	695	95	477	262	179	59	101	247	185	268	640	258	3466	0	0	0	0	0	0	0	0	0	0	0	0	3466	4303
1600	565	126	489	438	198	44	97	149	112	124	482	177	2995	0	0	0	0	0	0	0	0	0	0	0	0	2995	7288
1700	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1800	4051	550	3295	1163	986	283	425	1481	2073	950	4667	5935	23859	0	0	0	0	0	0	0	0	0	0	0	0	23859	32092
1900	2847	373	3297	672	661	178	262	885	692	510	5767	1773	17917	0	0	0	0	0	0	0	0	0	0	0	0	17917	24884
BOTABEK TOTAL	11120	1588	9591	4326	2866	820	1364	3764	3767	3065	14014	7144	63429	0	0	0	0	0	0	0	0	0	0	0	0	63429	88046
2000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	93054	13224	63847	23424	26550	6645	9359	29308	22141	19033	103297	41395	451277	2219	2068	837	4293	0	8233	6967	24617	0	0	0	0	475894	951788

1985 *** JAKARTA OD ***

Table 5-27 BUS O-D MATRIX IN 1985 (unit Veh/peak-2hrs.)

SHASHU= 2 (BUS)

	100	200	300	400	500	600	700	800	900	1000	1100	1200	DKI TOTAL	1300	1400	1500	1600	1700	1800	1900	BOTABEK TOTAL	2000	2100	2200	OUT	TOTAL	T.E.
100	552	45	103	24	131	26	12	84	32	21	192	48	1270	0	2	0	0	0	1	7	10	0	0	0	0	1280	3701
200	99	19	28	9	63	5	2	11	4	3	18	6	267	0	0	0	1	0	0	0	1	0	0	0	0	268	515
300	142	21	181	8	30	5	3	16	6	5	109	15	541	0	0	0	1	0	0	3	6	0	0	0	0	547	1393
400	88	12	36	0	24	5	11	10	3	7	8	1	205	4	1	0	4	0	0	0	9	0	0	0	0	214	453
500	212	42	50	23	61	11	5	23	9	8	31	10	485	1	1	0	2	0	0	0	3	0	0	0	0	490	1067
600	144	10	24	13	30	7	5	23	10	10	25	12	313	1	1	0	1	0	1	1	3	0	0	0	0	318	446
700	73	8	24	29	19	6	5	17	7	12	15	5	220	1	2	0	2	0	0	0	5	0	0	0	0	225	329
800	336	22	81	28	59	18	15	86	33	30	133	67	928	0	4	0	0	0	5	7	16	0	0	0	0	944	1457
900	84	7	29	11	19	5	5	32	22	14	20	21	269	0	1	0	0	0	5	0	6	0	0	0	0	275	575
1000	94	8	28	16	22	8	7	10	35	27	9	18	282	0	4	0	1	0	0	1	6	0	0	0	0	288	472
1100	298	21	116	23	50	13	10	86	41	20	201	80	957	0	1	0	0	0	4	12	17	0	0	0	0	974	1944
1200	88	9	36	11	18	5	4	31	25	9	50	43	347	0	0	0	0	0	5	1	6	0	0	0	0	353	814
DKI TOTAL	2210	224	736	195	524	113	87	452	239	148	820	340	6098	7	17	0	12	0	21	35	92	0	0	0	0	6180	13165
1300	26	4	12	12	7	2	2	6	5	3	12	6	97	0	0	0	0	0	0	0	0	0	0	0	0	97	104
1400	31	3	11	6	8	3	3	10	7	9	15	10	116	0	0	0	0	0	0	0	0	0	0	0	0	116	133
1500	10	2	4	2	2	1	1	4	3	3	6	4	42	0	0	0	0	0	0	0	0	0	0	0	0	42	42
1600	12	2	6	5	5	1	2	4	2	2	6	4	51	0	0	0	0	0	0	0	0	0	0	0	0	51	63
1700	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1800	77	8	38	12	18	5	5	22	33	9	50	68	345	0	0	0	0	0	0	0	0	0	0	0	0	345	366
1900	55	4	39	7	13	3	3	15	11	6	61	29	246	0	0	0	0	0	0	0	0	0	0	0	0	246	281
BOTABEK TOTAL	211	23	110	46	53	15	16	61	61	32	150	121	897	0	0	0	0	0	0	0	0	0	0	0	0	897	989
2000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	2421	247	846	239	577	128	103	513	300	180	970	461	6985	7	17	0	12	0	21	35	92	0	0	0	0	7077	14154

1995 *** JAKARTA OD ***

Table 5-28 BUS O-D MATRIX IN 1995 (unit Veh/peak-2hrs.)

SHASHU= 2 (BUS)

	100	200	300	400	500	600	700	800	900	1000	1100	1200	DKI TOTAL	1300	1400	1500	1600	1700	1800	1900	BOTABEK TOTAL	2000	2100	2200	OUT	TOTAL	T.E.
100	617	56	165	46	149	38	19	109	42	38	106	64	1647	0	4	0	4	0	2	11	21	0	0	0	0	1668	4708
200	135	30	51	18	92	7	5	16	7	6	33	5	405	0	0	0	3	0	0	0	3	0	0	0	0	408	756
300	171	28	288	11	35	5	4	18	6	6	194	15	781	0	0	0	1	0	0	5	6	0	0	0	0	787	2304
400	135	21	76	0	36	8	24	16	4	14	11	1	344	6	1	0	8	0	0	0	15	0	0	0	0	359	846
500	227	51	74	37	65	15	10	27	11	12	50	14	593	1	2	0	3	0	0	1	7	0	0	0	0	600	1344
600	176	12	41	24	56	10	8	31	14	17	44	15	421	1	1	0	2	0	1	1	6	0	0	0	0	427	615
700	119	14	54	31	33	11	12	30	11	29	27	7	418	1	3	0	3	0	0	0	7	0	0	0	0	425	624
800	379	28	126	48	67	23	24	107	66	52	202	82	1204	0	5	0	2	0	5	7	19	0	0	0	0	1223	1960
900	139	13	68	28	30	10	13	59	43	30	43	38	514	0	2	0	0	0	7	1	10	0	0	0	0	524	973
1000	127	13	54	33	30	11	18	55	44	18	33	17	453	0	5	1	1	0	0	0	7	0	0	0	0	460	812
1100	362	30	205	42	60	16	17	112	58	34	362	106	1404	0	2	0	1	0	5	17	25	0	0	0	0	1429	3175
1200	128	12	80	24	27	10	10	53	39	20	97	101	601	0	0	0	0	0	6	4	10	0	0	0	0	611	1274
DKI TOTAL	2709	308	1282	382	660	162	164	631	345	276	1401	465	8785	9	25	1	28	0	26	47	136	0	0	0	0	8921	19391
1300	37	6	25	29	12	3	5	11	8	7	27	11	181	0	0	0	0	0	0	0	0	0	0	0	0	181	190
1400	53	6	26	15	13	5	7	19	15	23	35	17	232	0	0	0	0	0	0	0	0	0	0	0	0	232	257
1500	20	2	11	6	5	2	2	7	5	7	16	6	89	0	0	0	0	0	0	0	0	0	0	0	0	89	98
1600	18	3	13	11	6	2	2	5	3	5	13	5	84	0	0	0	0	0	0	0	0	0	0	0	0	84	112
1700	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1800	118	14	78	27	29	6	11	40	56	22	117	108	623	0	0	0	0	0	0	0	0	0	0	0	0	623	649
1900	85	9	82	17	19	6	8	24	19	14	162	51	476	0	0	0	0	0	0	0	0	0	0	0	0	476	525
BOTABEK TOTAL	331	40	235	105	84	26	35	106	104	76	345	198	1685	0	0	0	0	0	0	0	0	0	0	0	0	1685	1821
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	3040	348	1517	487	744	188	199	737	449	352	1746	663	10470	9	25	1	28	0	26	47	136	0	0	0	0	10606	21212

2005 *** JAKARTA OD ***

Table 5-29 BUS O-D MATRIX IN 2005 (unit Veh/peak-2hrs.)

SHASHU= 2 (BUS)

	100	200	300	400	500	600	700	800	900	1000	1100	1200	DKI TOTAL	1300	1400	1500	1600	1700	1800	1900	BOTABEK TOTAL	2000	2100	2200	OUT	TOTAL	T.E.
100	681	73	220	61	171	43	24	124	48	50	400	72	1987	0	6	0	6	0	4	11	25	0	0	0	0	1992	5853
200	184	47	81	30	130	9	7	22	8	10	52	8	588	1	1	0	4	0	0	1	7	0	0	0	0	595	1124
300	233	46	450	24	50	7	6	30	12	11	335	24	1228	0	0	0	2	0	0	9	11	0	0	0	0	1239	3637
400	199	38	139	0	58	13	45	26	10	28	30	3	589	9	2	1	15	0	0	0	27	0	0	0	0	616	1417
500	243	64	96	49	71	16	10	27	13	16	62	13	680	1	1	0	3	0	0	1	6	0	0	0	0	686	1672
600	210	19	59	36	47	14	14	40	17	25	62	17	560	1	2	0	2	0	1	2	8	0	0	0	0	568	813
700	184	25	102	135	52	18	22	51	21	57	67	17	746	3	1	1	6	0	0	1	16	0	0	0	0	762	1077
800	432	39	177	69	79	26	33	127	84	73	274	101	1516	0	5	0	4	0	8	8	25	0	0	0	0	1541	2542
900	208	24	125	51	48	15	21	95	68	53	82	64	854	0	3	0	0	0	15	1	19	0	0	0	0	873	1512
1000	188	21	95	60	49	16	32	88	66	33	64	28	734	1	8	2	2	0	1	1	15	0	0	0	0	751	1323
1100	447	44	313	65	76	23	27	141	75	51	562	139	1943	0	0	0	2	0	6	20	31	0	0	0	0	1974	4097
1200	184	21	138	41	40	12	16	75	59	34	163	155	938	0	0	0	0	0	12	4	16	0	0	0	0	954	1895
DKI TOTAL	3393	461	1995	621	867	212	257	844	481	441	2132	641	12345	16	34	4	46	0	47	59	206	0	0	0	0	12551	27564
1300	51	9	41	49	17	5	9	14	11	12	44	17	279	0	0	0	0	0	0	0	0	0	0	0	0	279	295
1400	73	9	44	26	18	6	12	28	18	39	60	25	358	0	0	0	0	0	0	0	0	0	0	0	0	358	392
1500	29	4	20	11	8	3	4	11	8	11	26	11	146	0	0	0	0	0	0	0	0	0	0	0	0	146	150
1600	24	5	20	18	8	3	4	6	5	6	21	6	125	0	0	0	0	0	0	0	0	0	0	0	0	125	171
1700	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1800	171	24	139	48	40	12	18	61	87	41	198	167	1006	0	0	0	0	0	0	0	0	0	0	0	0	1006	1053
1900	120	17	139	28	28	7	11	37	29	22	242	74	754	0	0	0	0	0	0	0	0	0	0	0	0	754	813
BOTABEK TOTAL	468	68	403	180	119	35	58	157	158	131	591	300	2668	0	0	0	0	0	0	0	0	0	0	0	0	2668	2876
2000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SUM OUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	3861	529	2398	801	986	247	315	1001	639	572	2723	941	15013	16	34	4	46	0	47	59	206	0	0	0	0	15219	30438

1985 *** JAKARTA OD ***

Table 5-30 TRUCK O-D MATRIX IN 1985 (unit Veh/peak-2hrs.)

SHASHU= 3 (TRUCK)

	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	OUT	TOTAL	TIEC
												DKI TOTAL								BOTABEK TOTAL					
100	36	9	11	8	7	3	0	14	0	2	18	1	106	0	0	0	0	2	10	2	14	0	6	8	16	134	532
200	36	23	18	14	32	6	6	14	6	7	23	7	194	2	1	1	1	3	15	7	30	2	6	9	17	241	412
300	125	65	264	57	42	18	21	64	36	27	213	55	987	14	11	8	11	28	122	58	257	14	51	82	147	1391	2038
400	18	10	10	0	9	5	13	11	6	8	16	8	114	5	4	3	4	10	43	21	92	5	18	29	52	258	505
500	10	10	4	5	4	2	0	0	0	1	3	0	39	0	0	0	0	0	3	3	6	0	3	3	6	51	190
600	1	0	0	1	0	0	0	0	0	0	1	0	3	0	0	0	0	0	0	0	0	0	0	1	1	4	64
700	0	1	0	1	0	0	1	1	0	2	7	0	12	0	0	0	0	0	1	0	1	0	1	2	3	18	87
800	11	2	3	4	0	1	0	11	6	4	12	4	58	0	0	0	0	2	7	2	11	0	4	5	9	78	301
900	0	0	0	3	0	0	0	2	2	1	4	2	14	0	0	0	0	0	1	0	1	0	1	3	4	19	126
1000	3	1	1	3	0	1	2	5	3	2	7	1	24	0	0	0	0	0	2	1	3	0	1	2	3	30	121
1100	69	17	65	22	11	7	9	45	18	14	81	37	395	6	5	4	5	14	63	28	125	6	26	41	73	593	1149
1200	7	2	6	5	3	1	2	8	5	2	15	14	70	3	2	2	2	6	28	12	55	3	12	19	34	159	376
DKI TOTAL	310	140	382	130	108	46	54	175	82	70	390	129	2014	30	23	18	23	65	302	134	595	30	129	204	363	2974	5877
1300	0	1	6	3	0	0	0	0	0	0	3	2	15	0	0	0	0	0	0	0	0	0	0	0	0	15	45
1400	0	0	3	3	0	0	0	0	0	0	2	1	11	0	0	0	0	0	0	0	0	0	0	0	0	11	34
1500	0	0	4	2	0	0	0	0	0	0	2	1	9	0	0	0	0	0	0	0	0	0	0	0	0	9	27
1600	0	0	3	2	0	0	0	0	0	0	2	1	10	0	0	0	0	0	0	0	0	0	0	0	0	10	33
1700	7	2	13	6	2	1	1	4	1	2	10	6	55	0	0	0	0	0	0	0	0	0	0	0	0	55	120
1800	23	8	62	29	7	4	5	12	7	6	62	22	227	0	0	0	0	0	0	0	0	0	0	0	0	99	532
1900	10	3	29	14	4	1	2	5	3	2	17	9	99	0	0	0	0	0	0	0	0	0	0	0	0	99	233
BOTABEK TOTAL	40	14	124	59	13	6	8	21	11	10	78	42	426	0	0	0	0	0	0	0	0	1	0	0	1	427	1024
2000	7	2	13	6	2	1	1	4	1	2	10	5	54	0	0	0	0	0	1	0	1	0	0	0	0	55	87
2100	9	3	25	12	4	2	2	5	3	2	17	9	93	0	0	0	0	0	0	0	0	0	0	16	16	109	266
2200	32	12	83	40	12	5	6	18	10	7	57	32	314	0	0	0	0	0	1	0	1	1	28	0	29	344	564
OUT	48	17	121	58	18	8	9	27	14	11	84	46	461	0	0	0	0	0	2	0	2	1	28	16	45	508	917
TOTAL	398	171	627	247	139	60	71	223	107	91	552	217	2903	30	23	18	23	65	304	134	597	32	157	220	409	3909	7818

1995 *** JAKARTA OD ***

Table 5-31 TRUCK O-D MATRIX IN 1995 (unit Veh/peak-2hrs.)

SHASHU= 3 (TRUCK)

	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	OUT	TOTAL	TIEC
												DKI TOTAL								BOTABEK TOTAL					
100	43	13	16	13	13	5	1	22	4	7	37	5	179	0	0	0	0	2	9	4	13	0	6	9	15	209	813
200	43	30	25	24	40	7	6	16	9	8	33	10	251	3	2	1	1	3	16	9	35	2	7	12	21	307	563
300	167	88	452	93	62	22	24	89	49	39	402	73	1360	24	22	17	17	39	201	101	423	23	80	129	232	2215	3370
400	36	21	23	0	22	9	24	24	13	17	39	14	242	10	8	7	7	15	78	39	164	9	31	50	90	494	941
500	19	16	7	10	8	3	2	6	2	2	8	2	85	0	0	0	0	1	3	2	8	0	3	4	7	100	331
600	4	1	0	2	1	0	0	2	0	1	7	0	13	0	0	0	0	0	0	0	0	0	0	1	1	14	99
700	0	1	2	10	1	0	2	2	0	3	3	0	24	0	0	0	0	0	1	0	1	0	1	2	3	28	138
800	18	4	8	6	0	3	2	16	8	7	23	7	102	0	0	0	0	0	5	3	8	0	4	4	8	118	492
900	1	1	4	3	0	0	0	8	4	5	7	4	39	0	0	0	0	0	1	0	1	0	1	3	4	44	227
1000	5	2	3	6	3	1	3	8	4	3	7	3	50	0	0	0	0	1	2	1	4	0	1	3	4	58	217
1100	147	40	179	58	35	18	21	94	48	34	178	80	930	13	10	8	8	20	101	50	210	6	27	47	74	1274	2259
1200	11	3	11	8	3	2	2	15	9	4	30	22	120	4	5	4	4	9	44	22	94	0	35	54	98	312	682
DKI TOTAL	494	220	730	233	188	70	87	302	152	130	769	220	3595	58	47	37	37	90	463	231	963	49	196	312	557	5115	10130
1300	3	1	13	7	1	0	0	4	0	1	9	4	43	0	0	0	0	0	0	0	0	0	0	0	0	43	102
1400	1	1	11	5	0	0	0	0	0	0	6	3	27	0	0	0	0	0	0	0	0	0	0	0	0	27	74
1500	0	0	8	4	0	0	0	0	0	0	4	2	18	0	0	0	0	0	0	0	0	0	0	0	0	18	55
1600	0	0	9	4	0	0	0	0	0	0	4	3	20	0	0	0	0	0	0	0	0	0	0	0	0	20	57
1700	7	2	20	10	3	1	2	4	2	2	14	8	73	0	0	0	0	0	0	0	0	0	0	0	0	73	165
1800	25	8	102	51	11	4	5	20	7	8	68	35	344	1	0	0	0	0	0	0	1	1	0	0	1	345	812
1900	14	5	52	25	5	1	2	8	4	3	33	18	170	0	0	0	0	0	0	0	0	0	0	0	0	170	401
BOTABEK TOTAL	50	17	215	106	20	6	9	36	13	14	138	73	697	1	0	0	0	0	0	0	1	1	0	0	1	699	1666
2000	7	2	22	11	3	1	2	4	2	2	15	8	79	0	0	0	0	0	1	0	1	0	0	0	0	80	133
2100	14	4	45	23	5	2	2	8	4	3	29	17	150	0	0	0	0	0	0	0	0	1	0	23	24	180	474
2200	39	13	143	72	15	6	8	24	12	10	94	52	488	0	0	0	0	0	2	0	2	2	38	0	40	530	865
OUT	60	19	210	106	23	9	12	36	18	15	138	77	723	0	0	0	0	0	3	0	3	3	38	23	64	790	1412
TOTAL	604	256	1155	445	231	85	108	374	185	159	1045	370	5015	59	47	37	37	90	466	231	967	53	234	335	622	6604	13208

2005 *** JAKARTA OD ***

Table 5-32 TRUCK O-D MATRIX IN 2005 (unit Veh/peak-2hrs.)

SHASHU= 3 (TRUCK)

	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	OUT	TOTAL	TIEC
												DKI TOTAL								BOTABEK TOTAL					
100	65	26	29	27	23	12	10	31	18	13	66	13	335	2	2	0	0	5	21	10	40	7	11	19	32	407	1389
200	61	55	46	47	53	9	12	22	16	15	58	18	412	6	3	3	3	5	30	15	63	5	15	23	43	518	1010
300	223	140	763	185	84	34	53	117	88	69	761	125	2642	51	44	34	34	74	384	202	823	54	188	300	542	4007	6348
400	65	44	56	0	39	19	71	43	33	41	92	34	537	24	20	16	16	34	170	94	383	25	88	140	253	1173	2246
500	29	25	12	24	10	8	8	13	5	8	20	6	168	1	1	1	1	3	11	7	25	1	6	8	15	208	577
600	5	2	3	5	2	2	2	3	1	2	6	1	32	0	0	0	0	0	1	1	2	0	1	2	3	37	201
700	7	4	5	26	3	2	3	7	3	6	18	4	82	1	0	0	0	1	6	3	11	1	3	5	9	102	411
800	25	8	12	15	6	4	8	21	17	14	44	16	190	1	0	0	0	3	12	7	23	1	7	10	18	231	835
900	10	3	8	10	0	1	6	13	11	9	19	12	103	0	0	0	0	1	7	4	12	0	4	6	10	127	557
1000	13	4	8	15	3	4	9	15	11	6	18	8	114	1	1	0	0	1	7	4	14	1	4	6	11	136	489
1100	259	84	442	151	62	35	55	168	110	83	377	180	2006	30	26	21	21	44	231	122	493	19	69	109	197	2698	4982
1200	20	9	24	21	6	3	8	27	26	13	71	51	379	14	12	10	10	22	112	59	239	29	100	162	291	809	1676
DKI TOTAL	782	404	1408	526	293	133	245	480	342	279	1540	470	4982	129	109	85	85	193	1001	528	2130	138	496	790	1424	10456	20639
1300	7	3	28	17	3	1	2	4	3	2	20	13	102	0	0	0	0	0	0	0	0	0	1	0	1	103	235
1400	7	2	23	14	3	1	2	6	3	2	16	11	92	0	0	0	0	0	0	0	0	0	0	0	0	92	201
1500	6	2	20	12	2	0	2	4	3	2	15	9	77	0	0	0	0	0	0	0	0	0	0	0	0	77	162
1600	6	2	20	11	2	0	2	4	3	2	15	9	74	0	0	0	0	0	0	0	0	0	0	0	0	74	161
1700	8	3	41	25	3	2	3	4	4	3	29	19	144	0	0	0	0	0	0	0	0	0	0	0	0	144	337
1800	47	21	218	127	17	7	15	20	19	16	154	91	761	1	0	0	0	0	0	0	1	2	0	1	3	765	1771
1900	22	11	114	67	8	3	7	15	10	9	85	48	397	0	0	0	0	0	0	0	0	0	1	0	1	398	927
BOTABEK TOTAL	103	44	466	273	38	14	33	64	45	36	334	199	1649	1	0	0	0	0	0	0	1	2	2	1	5	1655	3794
2000	9	5	49	29	4	2	3	7	4	4	34	21	171	0	0	0	0	0	1	0	1	0	1	0	1	173	317
2100	21	9	99	58	8	3	7	12	10	7	71	43	368	1	0	0	0	0	0	1	2	1	0	46	47	397	973
2200	67	30	317	187	26	12	21	41	29	24	225	134	1113	1	0	0	0	0	4	0	5	3	77	0	80	1198	2035
OUT	97	44	465	274	38	17	31	60	43	35	330	198	1632	2	0	0	0	0	5	1	8	4	78	46	128	1768	3325
TOTAL	982	492	2339	1073	369	164	309	604	430	350	2204	887	10183	132	109	85	85	193	1006	529	2139	144	574	837	1557	13879	27758