REPUBLIC OF INDONESIA
MINISTRY OF PUBLIC WORKS
DIRECTORATE GENERAL OF HIGHWAYS

THE FEASIBILITY STUDY OF THE LOCAL ROAD DEVELOPMENT IN THE REPUBLIC OF INDONESIA

KABUPATEN REPORT 9

KABUPATEN KOTAWARINGIN TIMUR

MARCH 1986

JAPAN INTERNATIONAL COOPERATION AGENCY

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PREFACE

This is the Kabupaten Report of the Feasibility Study of the Local Road Development in the Republic of Indonesia for Kabupaten Kotawaringin Timur in Kalimantan Tengah Province. The report has been prepared by the Study Team of the Japan International Cooperation Agency (hereinafter called JICA).

Based upon a request from the Government of Indonesia, the Government of Japan arranged for JICA to conduct the Study and JICA accordingly organized a Study Team. The study was carried out using data which were generally prepared by the Kabupaten, routed through the province, under the instructions of Bina Marga of the Ministry of Public Works and Bangda of the Ministry of Home Affairs.

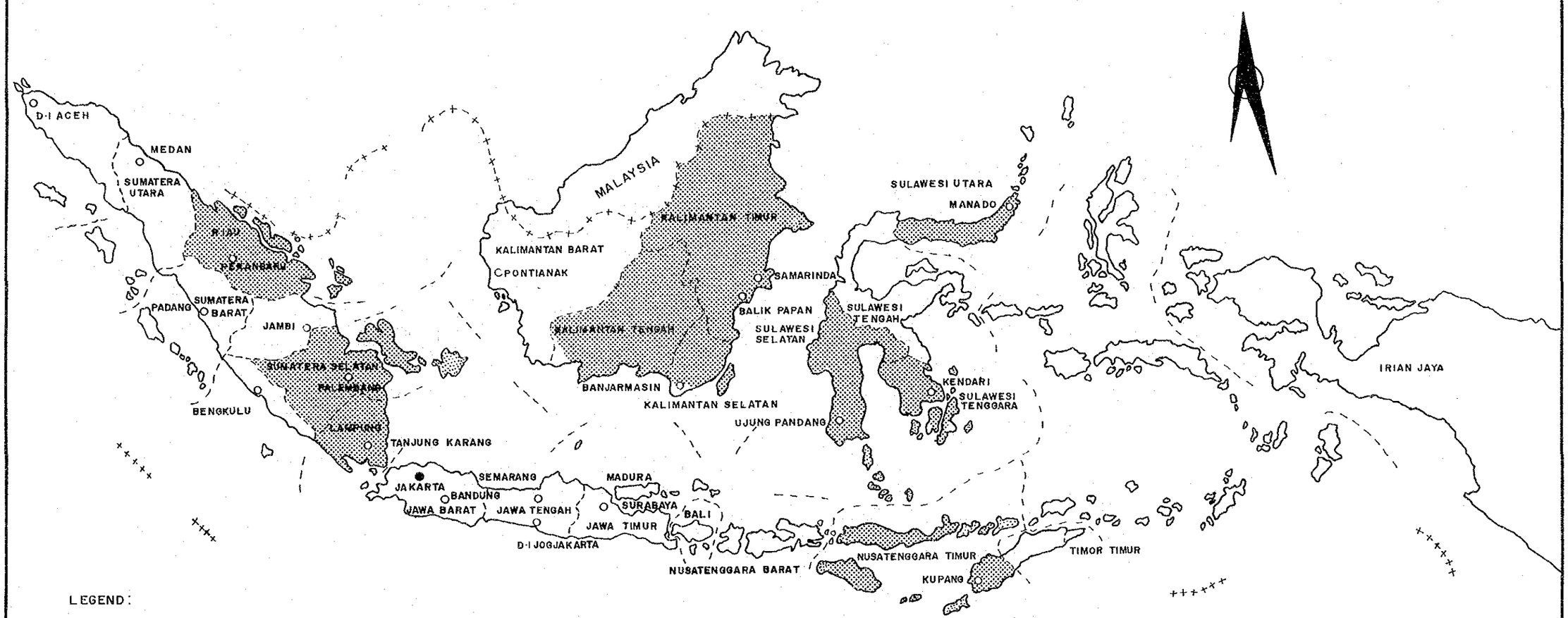
Since the study period was limited, without cooperation of Bina Marga, Bangda and local governments of both province and Kabupaten in collecting the data, the study would not have been completed within the period.

The report consists of the results of the feasibility study and proposed implementation programme of the local road development in the Kabupaten.

The simplified economic feasibility evaluation methodology utilized for the study was established by the Study Team in Phase I Study through a pilot study of seven (7) model Kabupatens, and is described in the Main Report.

The purpose of the study for the Kabupaten is mainly to estimate the total Project Cost for the local road development but only limited data is available for study base. Therefore a detailed survey and design for the improvement of the Kabupaten roads should be carried out before commencing the Project together with a review of this report.

LOCATION MAP OF THE PROJECT AREAS



IV · PROPINSI KALIMANTAN TENGAH
09 · KAB · KOTA WARINGIN TIMUR
10 · KAB · KAPUAS
11 · KAB · BARITO SELATAN
12 · KAB · BARITO UTARA

V · PROPINSI KALIMANTAN TIMUR
13 · KAB · PASIR
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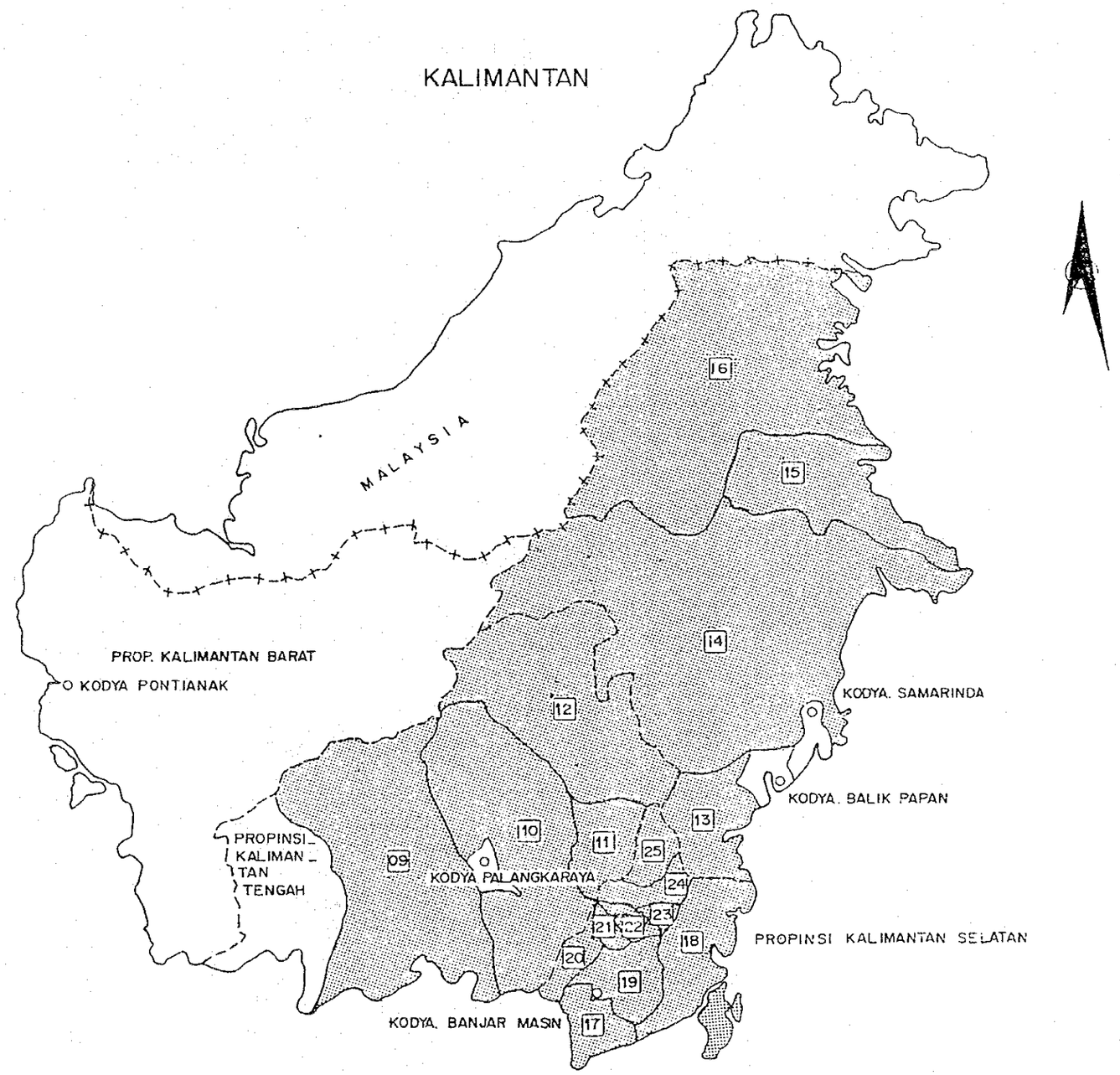
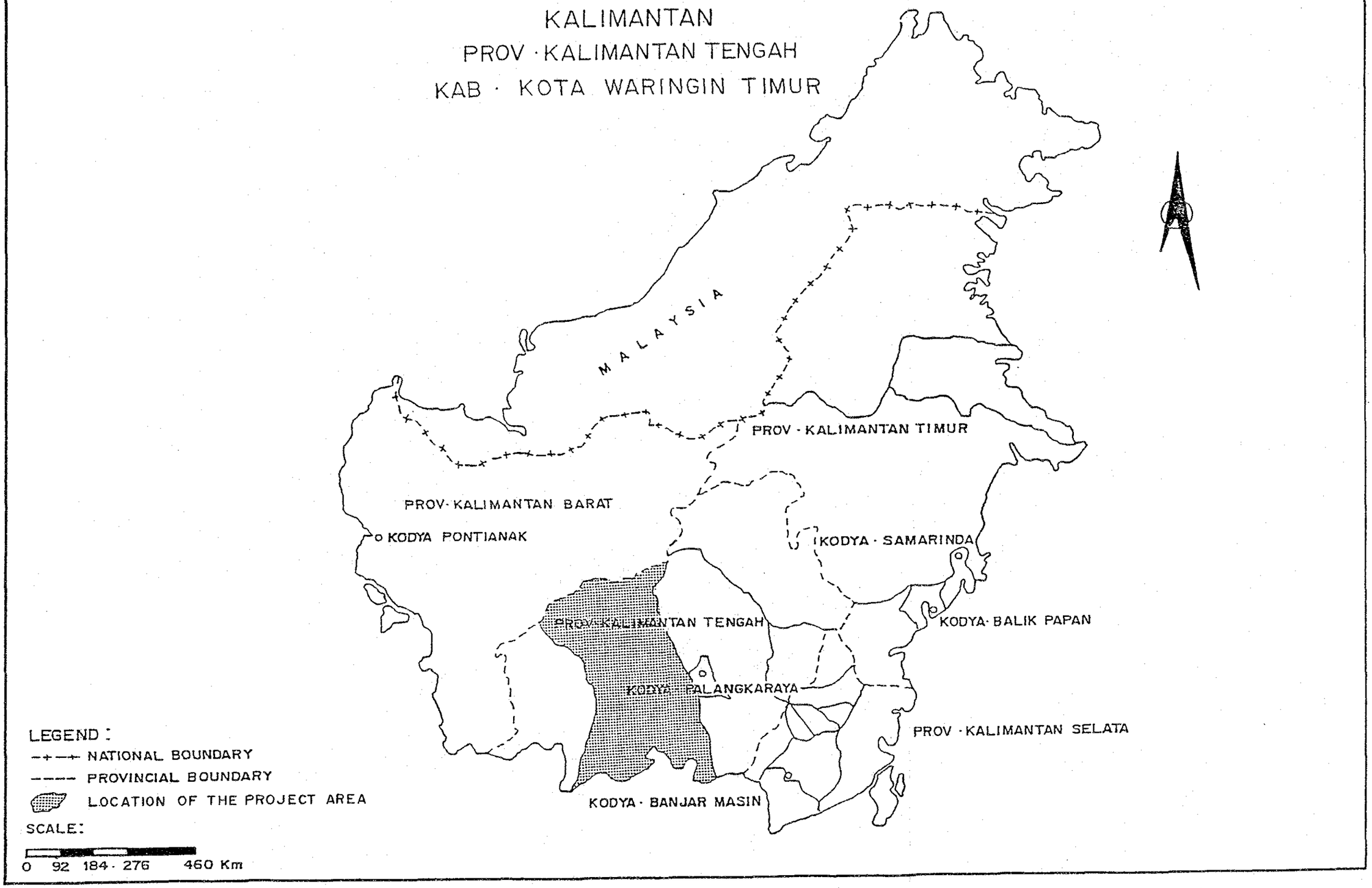
16 · KAB · BULUNGAN

VI · PROPINSI KALIMANTAN SELATAN
17 · KAB · TANAH LAUT
18 · KAB · KOTA BARU
19 · KAB · BANJAR
20 · KAB · BARITO KUALA
21 · KAB · TAPIN
22 · KAB · HULU SUNGAI SELATAN
23 · KAB · HULU SUNGAI TENGAH
24 · KAB · HULU SUNGAI UTARA
25 · KAB · TABALONG

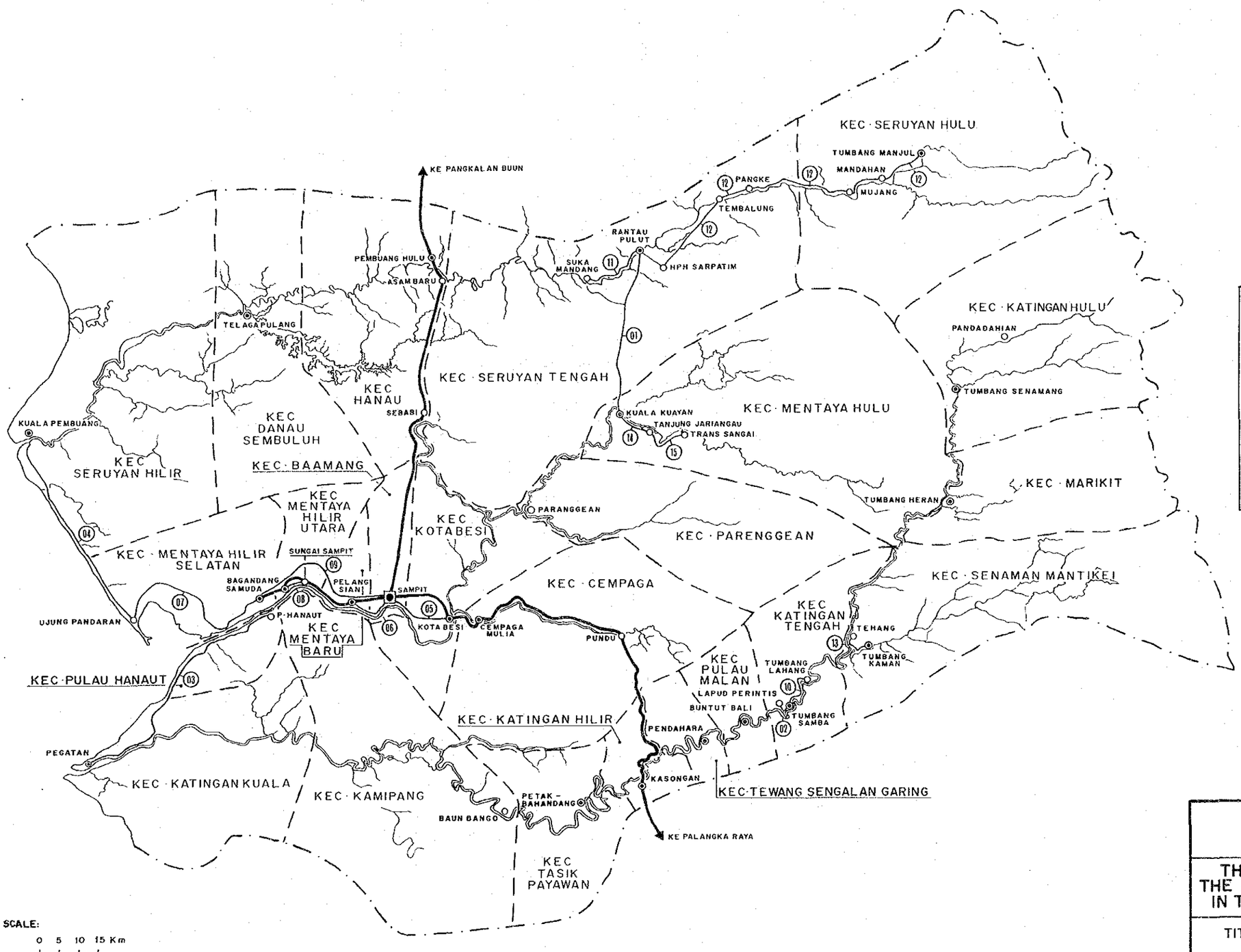


LEGEND :
−+−+ NATIONAL BOUNDARY
– – – – PROVINCIAL BOUNDARY
LOCATION OF THE PROPOSED AREA

SCALE :
0 92 184 276 460 Km.

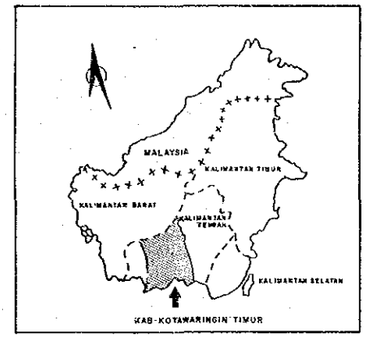

KALIMANTAN
PROV · KALIMANTAN TENGAH
KAB · KOTA WARINGIN TIMUR
MALAYSIA
PROV · KALIMANTAN TIMUR
PROV · KALIMANTAN BARAT
KODYA PONTIANAK
KODYA · SAMARINDA
PROV · KALIMANTAN TENGAH
KODYA · BALIK PAPAN
KODYA · PALANGKARAYA
PROV · KALIMANTAN SELATA
KODYA · BANJAR MASIN
LEGEND :
NATIONAL BOUNDARY
PROVINCIAL BOUNDARY
LOCATION OF THE PROJECT AREA
SCALE:
0 92 184 · 276 460 Km

KAB · KOTAWARINGIN TIMUR



SCALE:
0 5 10 15 Km

LOCATION MAP



LEGEND :

- KABUPATEN CAPITAL
- KECAMATAN CAPITAL
- OTHER CITY
- LINK NUMBER
- PROVINCIAL BOUNDARY
- KABUPATEN BOUNDARY
- KECAMATAN BOUNDARY
- NATIONAL ROAD
- PROVINCIAL ROAD
- KABUPATEN ROAD
- VILLAGE ROAD
- RIVER

THE FEASIBILITY STUDY OF THE LOCAL ROAD DEVELOPMENT IN THE REPUBLIC OF INDONESIA

TITLE :

SOURCE:	SCALE:	PROVINCE : KALIMANTAN TENGAH
DIREKTORAT JENDERAL CIPTA KARYA	AS SHOWN	KABUPATEN : KOTAWARINGIN TIMUR

C O N T E N T S

Chapter 1 BACKGROUND OF THE KABUPATEN

1.1 Topographic and Meteorological Conditions

1.1.1 Location and Topography

Kabupaten Kotawaringin Timur is bordered on the west by Kabupaten Kotawaringin Barat, the westernmost Kabupaten of Kalimantan Tengah Province, and on the east by Kabupaten Katingan.

Since Kabupaten Katingan is a mandatory Kabupaten administered by Kabupaten Kotawaringin Timur, the study for these two Kabupatens shall be carried out as one Kabupaten Kotawaringin Timur.

In the northern part of these Kabupatens 1,500 to 2,000 meter high mountains range along the provincial boundary with Kalimantan Barat, but descending towards the south the topographic features change through undulating hills to luxuriat tropical forests. Rising from the northern mountains three large rivers, the Katingan, the Sampit and Pembuang flow almost in parallel towards the south where their numerous tributaries widely form swamps. In the boundary location west from Sampit, the capital of the Kabupaten, the forked mountains extending in a north-south direction from the northern mountain range form topographical walls between the neighboring Kabupatens.

The total area of both the Kabupatens is about 50,700 square kilometers, approximately 33 percent of the total of Kalimantan Tengah Province. They consists administratively of 24 Kecamatans in all.

1.1.2 Meteorological Conditions

The average number of rainy days and the average amount of yearly rainfall in Kabupaten Kotawaringin Timur are 132 days and 2,272 mm respectively.

One year in the Kabupaten consists of a rainy season and a dry season. The dry season is from June through October in general. However this is variable as Table 1-1-1 shows.

The number of working days which is necessary for planning the construction schedule in chapter 6, is estimated at 230 days using the following formula based upon the data shown in the table referred to above.

$$\text{Working Days} = 365 - \text{Holidays} - \text{Rainy Days} + \left(\text{Rainy Days} \times \frac{\text{Holiday}}{365}\right) + (0.10 \times \text{Rainy Days})$$

Where :

- Holidays consist of 52 Sundays and 13 national holidays; and
- 10% of rainy days are assumed to be workable days.

Table 1-1-1

METEOROLOGICAL CONDITIONS

PROVINCE : Kalimantan Tengah
KABUPATEN : Kotawaringin Timur STATION : Sampit

MONTH	1980		1981		1982		1983		1984	
	RAINY DAYS	RAINFALL (mm)	RAINY DAYS	RAINFALL (mm)	RAINY DAYS	RAINFALL (mm)	RAINY DAYS	RAINFALL (mm)	RAINY DAYS	RAINFALL (mm)
January	9	112	3	45	14	168	15	281	22	274
February	10	98	14	415	12	334	9	123	21	204
March	8	87	14	250	15	343	13	200	23	258
April	6	77	13	340	15	312	6	143	23	245
May	4	50	12	268	8	199	14	482	24	403
June	1	3	3	84	6	85	8	91	14	239
July	5	71	10	184	2	26	7	92	22	261
August	-	-	2	30	1	12	4	111	6	197
September	2	21	15	230	2	18	9	126	19	374
October	6	115	9	192	4	74	9	245	11	235
November	16	218	21	432	4	96	11	249	18	269
December	12	172	20	307	17	234	17	321	19	176
Total	79	1,025	136	2,827	100	1,904	122	2,466	222	3,136

1.2 Socio-Economic Conditions

1.2.1 Population

The population of Kabupaten Kotawaringin Timur in 1984 was 293,800 which was approximately 2.7% of the 1,088,700 total population of Kalimantan Tengah Province as shown in Table 1-2-1.

The population density was 0.06 persons per ha which was lower than the provincial density of 0.07 and indicates that the Kabupaten is one of the lowest population density areas in the islands outside Jawa.

The recent annual average growth rate of population of the Kabupaten is 3.3% which is almost the same as the provincial rate of 3.4% and higher than and the national rate of 2.2%. This may be a result of the on-going transmigration programme.

The population of each Kecamatan and its proportion to the Kabupaten population is shown in Table 1-2-2.

Table 1-2-1 POPULATION BY KABUPATEN

DESCRIPTION	POPULATION	AAGR (%)	AREA (ha)	POPULATION DENSITY (persons/ha)	SURVEY YEAR
KABUPATEN:					
KOTAWARINGIN TIMUR	293,800	3.3	5,070,000	0.06	1984
KAPUAS	364,172	6·0	3,480,000	0·10	1982
BARITO SELATAN	125,014	1·0	1,290,000	0.10	1983
BARITO UTARA	126,398	1.6	3,200,000	0.04	1984
PROVINCE:					
KALIMANTAN TENGAH	1,021,400		15,260,000		1982
	1,054,600	3.4	15,260,000	0.07	1983
	1,088,700		15,260,000		1984
JAWA IS.(Excluding DKI JAKARTA)	91,126,900	1.7	13,159,700	6.92	-
INDONESIA	161,579,500	2·2	191,944,300	0·84	-

Notes :

1. Sources:
   Kabupaten; Kabupaten concerned with the study
   Province ; Jawa and Indonesia:
   Statistical yearbook of Indonesia 1984, published by the Central Statistics Bureau.
2. AAGR ; Average Annual Growth Rate.

Table 1-2-2 POPULATION BY KECAMATAN

Year : 1983

PROVINCE : KALIMANTAN TENGAH

KABUPATEN : KOTAWARINGIN TIMUR

KECAMATAN	POPULATION	PROPORTION (%)
KOTA BESI	11,911	4.2
CEMPAGA	17,761	6.3
MENTAYA HULU	24,291	8.6
PARENGGEAN	7,497	2.7
BAAMANG	24,485	8.7
MENTAYA BARU	41,429	14.7
MENTAYA HILIR UTARA	5,104	1.8
MENTAYA HILIR SELATAN	22,859	8.1
SERUYAN HILIR	14,573	5.2
PULAU HANAUT	11,449	4.1
DANAU SEMBULUH	5,005	1.8
HANAU	7,464	2.7
SERUYAN TENGAH	8,496	3.0
SERUYAN HULU	6,978	2.5
KATINGAN KUALA	13,066	4.6
TASIK PAYAWAN	5,416	1.9
KAMIPANG	5,201	1.8
KATINGAN HILIR	6,553	2.3
TEWANG SENGALANGARING	7,112	2.5
PULAU MALAU	5,621	2.0
KATINGAN TENGAH	11,260	4.0
SENAMAN MANTIKEI	7,171	2.5
MARIKIT	3,699	1.3
KATINGAN HULU	7,622	2.7
TOTAL	281,983	100

1.2.2 Land Use

In Kabupaten Kotawaringin Timur, 121,690 ha of the current available land use area, which is approximately 14.5% of the 844,710 ha total area of the Kabupaten, is used for living purposes and for industrial activity of the inhabitants of the Kabupaten. It is the total value of columns (1) through (6) in Table 1-2-3.

The current available land use area consists of 118,320 ha of agricultural harvest area and 3,370 ha of residential area which are 97.2% and 2.8% of the current available land use area respectively.

The agricultural harvest area consists of 5,760 ha of paddy field, 42,630 ha of plantation and 69,930 ha of other cultivated area which are 4.9%, 36.0% and 59.1% of the agricultural harvest area respectively.

It can be realized from the land use that the main industry in the Kabupaten is plantation.

Table 1-2-3 LAND USE

PROVINCE : KALIMANTAN TENGAH

(ha)

KABUPATEN	WET PADDY FIELD	UPLAND PADDY FIELD	OTHER GUL-TIVATED AREA	PLANTATION AREA	RESIDENTIAL AREA	USABLE OPEN SPACE	RIVER & LAKE	FORESTRY AREA	OTHERS	TOTAL AREA	SURVEY YEAR
KOTAWARINGIN TIMUR	5,760 (0 7)	-	69,930 (8 3)	42,630 (5 1)	3,370 (0 4)	-	23,820 (2 8)	699,500 (82 8)	-	844,710 (100)	1984
KAPUAS	179,054 (5.1)		652,700 (18.8)	-	-	-	10,380 (0.3)	2,101,600 (60.4)	536,266 (15.4)	3,480,000 (100)	1982
BARITO SELATAN	7,291 (0.6)	6,561 (0.5)	106,265 (8.2)	45,299 (3.5)	13,364 (1.0)	156,000 (12.1)	285,060 (22.1)	498,599 (38.6)	171,598 (13.3)	1,290,000 (100)	1983
BARITO UTARA	2,503 (0.1)	21,110 (0.7)	243,354 (7.6)	17,984 (0.6)	912 (0.03)	-	2,670 (0.1)	2,715,717 (84.9)	172,801 (5.4)	3,200,000 (100)	1984

Notes :

1. The value in ( ) denotes the proportion
2. Source ; kabupaten concerned with the study

1.2.3 Agriculture

The cultivated area and food crop production in Kabupaten Kotawaringin Timur in 1984 were 10,620 ha and 28,221 ton respectively as shown in Table 1-2-4. Of food crops, the area and production of paddy which consists of wet paddy and upland paddy was 9,630 ha and 23,112 ton respectively which are 90.7% and 81.9% of the total food crops. The yield rate of paddy production is 2.40 ton per ha. Thus, paddy is the most predominant agricultural crop of the Kabupaten.

As the table shows, average annual growth rates of area and production of paddy in 1980 through 1984 were 3.0% and 3.1% respectively which show a tendency to increase gradually.

The paddy production of the Kabupaten is characterized by the upland paddy forming 100% of the paddy production. Therefore, it is necessary to consolidate the irrigation system in the swampy area extending to the southern part of the Kabupaten in order to develop wet paddy fields with high productivity.

The population of the agricultural sector which is assumed from the employment in the Kabupaten is 61.8% of the total population as shown in Table 1-2-6. Thus the Kabupaten is an agricultural Kabupaten.

Future agricultural development will be needed to promote wet paddy production and plantation crops suitable for future demand.

Table 1-2-4 AREA AND PRODUCTION OF FOOD CROPS

KABUPATEN : KOTAWARINGIN TIMUR

CULTIVATED AREA

(ha)

ITEM	YEAR						AAGR
	1979	1980	1981	1982	1983	1984	(%)
PADDY	7,479	8,554	9,047	9,268	9,680	9,630	3.0
OTHERS	473	574	629	683	859	990	14.6
TOTAL	7,952	9,128	9,676	9,951	10,539	10,620	3.9

PRODUCTION

(ton)

ITEM	YEAR						AAGR
	1979	1980	1981	1982	1983	1984	(%)
PADDY	10,246	20,444	21,441	21,224	23,232	23,112	3.1
OTHERS	1,213	1,630	1,840	2,250	3,007	5,109	33.0
TOTAL	11,459	22,074	23,281	23,474	26,239	28,221	6.3

YIELD RATE

(ton/ha)

ITEM	YEAR						AAGR
	1979	1980	1981	1982	1983	1984	(%)
PADDY	1.37	2.39	2.37	2.29	2.40	2.40	1.5

Notes :

1. AAGR : Average annual growth rate
2. Source : Kabupaten concerned with the study

Table 1-2-5 AREA AND PRODUCTION OF PLANTATION CROPS
Year : 1983

PROVINCE : KALIMANTAN TENGAH

KABUPATEN	AREA (ha)	PRODUCTION (ton)	AAGR (%) AREA	AAGR (%) PRODUCTION
KOTAWARINGIN TIMUR	0	0	0	0
KAPUAS	0	0	0	0
BARITO SELATAN	48,245	22,948	13.3	11.0
BARITO UTARA	10,062	1,703	2.6	8.8

Table 1-2-6 POPULATION OF AGRICULTURAL SECTOR

PROVINCE : KALIMANTAN TENGAH

KABUPATEN	AGRICULTURAL SECTOR	TOTAL POPULATION	PROPORTION (%)	AAGR (%)	SURVEY YEAR
KOTAWARINGIN TIMUR	182,000	293,800	61.8	4.0	1984
KAPUAS	328,000	364,172	90.0	5.5	1982
BARITO SELATAN	102,000	125,014	81.7	3.6	1983
BARITO UTARA	66,000	126,398	52.3	2.3	1984

Notes :

1. AAGR : Average annual growth rate
2. Source : Kabupaten concerned with the Study

1.2.4 Other Economic Activities

Due to the lack of data, it was obliged to omit the analysis on the notable economis activities excluding agriculture in Kabupaten Kotawaringin Timur.

1.3 Present Status of Kabupaten Roads

1.3.1 Outline of Road Networks

In Kabupaten Kotawaringin Timur there is one provincial road which runs across the Kabupaten from east to west leading to Pembuang Hulu from Kasongan, the capital of the Administrative Kabupaten Katingan via Sampit, the Kabupaten capital. However this provincial road and the bridges over the main rivers are not yet complete. Therefore this provincial road can function only as service roads for the areas around the road and does not take the role of regional trunk road at present. Accordingly the main transportation system in the Kabupaten still relies upon the river which runs almost the whole length of the Kabupaten.

The Kabupaten roads are also only developed along the main rivers as individual service roads. The future development of the road networks depends upon how the existing and future roads are linked with the provincial roads which will be consolidated as regional trunk roads.

1.3.2 Road Inventory

From the road inventory data prepared by the Kabupaten, the number and total length of Kabupaten roads to be studied in Kabupaten Kotawaringin Timur are confirmed as 15 links and 344 Km respectively. These figures exclude Kabupaten roads with no data.

According to the data the present status of the Kabupaten roads is as follows:

(1) Density of Kabupaten Roads

The density of the Kabupaten roads is 0.41 m per ha. This is lower than the national density of 0.48 m per ha and distinctly lower than 2.11 m per ha which is the density in Jawa Island, excluding DKI Jakarta, as shown in the following table. Thus, the Kabupaten lags behind in density of Kabupaten roads.

	Total Length (km)	Area (ha)	Density (m/ha)
Kabupaten : Kotawaringin Timur	344	844,710	0.41
Province : Kalimantan Tengah	1,076	20,474,710	0.05
Jawa Is.(Excluding DKI Jakarta)	27,715	13,159,700	2.11
Indonesia	92,038	191,944,300	0.48

Notes : 1. The value for the province is the total value for the Kabupatens included in with the study.

2. The sources of data are as follows:
Kabupaten and Province : Bina Marga Inventory
Jawa and Indonesia : Statistical Yearbook of Indonesia 1984, published by the Central Statistics Bureau

(2) Kabupaten Road Surface Type

The type of surface on the Kabupaten roads in the Kabupaten is shown in Table 1-3-1.

Table 1-3-1 EXISTING ROAD LENGTH BY SURFACE TYPE

PROV : KALIMANTAN TENGAH KAB : KOTA WARINGIN TIMUR

(Ka)

I02 (7)	KRK	BTB	TNH	TOTAL
LINK 1	12			12
LINK 2		2	1	3
LINK 3			65	65
LINK 4			71	71
LINK 5			18	18
LINK 6			9	9
LINK 7			25	25
LINK 8			5	5
LINK 9		40		40
LINK 10			10	10
LINK 11	10			10
LINK 12	45			45
LINK 13	7			7
LINK 14	10			10
LINK 15	14			14
TOTAL	98	42	204	344
RATIO	28	12	59	(%)

The legend used in the table is as follows:

ASP : Asphalt

KRK : Gravel/Stone/Telford/Water Bound Macadam

TNH : Earth

LL : Others

Comparison of the proportion of surface type in the Kabupaten with other regions is as follows:

	ASP	KRK	TNH/LL
Kabupaten : Kotawaringin Timur	-	40.7	59.3
Province : Kalimantan Tengah	-	29.0	71.0
Jawa Is.(Excluding DKI Jakarta)	56 2	25.0	18.8
Indonesia	26 0	26.6	47.4

Thus, there are no asphalt paved roads. The proportion of low grade roads such as earth roads and others is distinctly high. This means that the road classification in the Kabupaten is low.

(3) Surface Condition of Kabupaten Roads

The surface condition of the Kabupaten classified as good, fair, poor and bad which are shown as BA, SD, RU and RB respectively, are summarized in Table 1-3-2.

Comparison of the proportions of the various surface conditions of the Kabupaten roads in the Kabupaten with other regions is as follows:

	Good	Fair	Poor	Bad
Kabupaten : Kotawaringin Timur	18.0	40.7	35.2	6.1
Province : Kalimantan Tengah	30.6	25.2	37.5	6.7
Jawa Is.(Excluding DKI Jakarta)	45.6	29.8	19.6	5.0
Indonesia	43.5	21.8	21.1	13.6

Table 1-3-2 EXISTING ROAD CONDITION BY SURFACE TYPE

PROVINCE : KALIMANTAN TENGAH

KABUPATEN : KOTAWARINGIN TIMUR (%)

[illegible]	[illegible]				[illegible]				[illegible]			
[illegible]	BA	SD	RU	RB	BA	SD	RU	RB	BA	SD	RU	RB
LINK 1	23	40	32	6								
LINK 2						50	30	20		50	30	20
LINK 3									18	44	32	5
LINK 4									16	50	34	
LINK 5									9	34	42	15
LINK 6									11	38	47	4
LINK 7									23	46	28	
LINK 8									16	32	46	6
LINK 9					11	49	35	5				
LINK 10									21	34	45	
LINK 11	22	31	38	9								
LINK 12	18	51	31									
LINK 13	41	26	27	6								
LINK 14	34	34	32									
LINK 15	37	30	33									
AVERAGE	29	37	31	4	6	50	34	12	15	44	38	6
LENGTH	90 Km				43 Km				204 Km			
(Km)	20	36	30	4	3	21	14	5	33	81	78	12

The surface condition level of the Kabupaten roads in the Kabupaten is lower than either that of Indonesia or of Jawa Island. The proportion in good condition is relatively low. Therefore improvement of Kabupaten roads in poor or bad condition is desirable.

(4) Terrain Conditions of Kabupaten Roads

The difficulty of road improvement is mainly dependent upon the terrain conditions.

The terrain conditions of the Kabupaten roads, classified as flat, hilly, mountainous and swampy which are shown as DT, BK, GN and RW, are summarized in Table 1-3-3.

The proportions of terrain conditions in the Kabupaten are 22.0% flat, 10.0% hilly, 16.0% mountainous and 52.0% swampy. Road construction is anticipated to be difficult because of the large proportion of swamp.

1.3.3 Bridge Inventory

A bridge inventory showing the existing condition of bridges on the Kabupaten roads in Kabupaten Kotawaringin was prepared by the Kabupaten.

The bridge types are classfied as timber, concrete, steel and others which are shown in the inventory as KY, BT, BJ and LL respectively.

The inventory shown in Table 1-3-4 and Table 1-3-5 indicates a total of 25 bridges with a total length of 365 m of which 96% are timber, 4% are others. There are no bridges listed in the inventory to be newly constructed.

Table 1-3-3 EXISTING ROAD LENGTH BY TERRAIN CONDITION

PROV : KALIMANTAN TENGAH KAB : KOTA WARINGIN TIMUR

(Km)

102 (3)	GN	BK	DT	RW	TOTAL
LINK 1	3	9			12
LINK 2			3		3
LINK 3				65	65
LINK 4				71	71
LINK 5				18	18
LINK 6			9		9
LINK 7				25	25
LINK 8			5		5
LINK 9			40		40
LINK 10			10		10
LINK 11		10			10
LINK 12	45				45
LINK 13	3	4			7
LINK 14			10		10
LINK 15	4	10			14
TOTAL	55	33	77	179	344
RATIO	16	10	22	52	(%)

Table 1-3-4 NUMBER AND LENGTH OF BRIDGES

PROV : KALIMANTAN TENGAH KAB : KOTA WARINGIN TIMUR

<<<< BRIDGE >>>> (UNIT: m)

	EXISTING		NOT EXIST		TOTAL	
LINK NO	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH
3	11	176.00			11	176.00
7	10	120.00			10	120.00
9	1	6.50			1	6.50
14	3	62.00			3	62.00
TOTAL	25	364.50			25	364.50

Table 1-3-5 NUMBER OF EXISTING BRIDGES BY BRIDGE TYPE

PROV : KALIMANTAN TENGAH KAB : KOTA WARINGIN TIMUR

	<<< BRIDGE >>> (No)		
I 103 (IB) I	KY I	LL I	TOTAL I
I LINK 3 I	11 I	I	11 I
I LINK 7 I	10 I	I	10 I
I LINK 9 I	1 I	I	1 I
I LINK 14 I	2 I	1 I	3 I
I TOTAL I	24 I	1 I	25 I
I RATIO I	96 I	4 I	(%) I

The number of existing bridges by span length is as follows:

Bridge Type	Span Length (m)										
	〈3	〈5	〈8	〈10	〈12	〈14	〈16	〈18	〈20	〈99	Total
Timber	-	-	22	1	1	-	-	-	-	-	24
Concrete	-	-	-	-	-	-	-	-	-	-	-
Steel	-	-	-	-	-	-	-	-	-	-	-
Others	-	-	-	1	-	-	-	-	-	-	1
Total	-	-	22	2	1	-	-	-	-	-	25

Thus, most of the existing bridges on the Kabupaten roads are timber and the majority of spanlengths is within the range of 5 m to 8 m.

1.3.4 Traffic

Inventories of the average daily traffic (ADT) on the Kabupaten roads in Kabupaten Kotawaringin Timur were prepared by the Kabupaten and are shown in Chapter 2.

From the inventories, total value of average daily trips by vehicle type and their proportions in the Kabupaten in 1985 are summarized as follows:

	SEDAN	BUS	TRUCK	MOTOR-CYCLE	TOTAL
Total Trips	6	0	11	160	177
Proportion (%)	3.39	0.00	6.21	90.40	100.00

Source : Bina Marga Inventory

The proportions of registered vehicles by vehicle type are as follows:

	SEDAN	BUS	TRUCK	MOTOR-CYCLE	TOTAL
Proportion (%)	2.57	0.00	1.98	95.45	100.00

Source : Kabupaten.

Thus, the proportion of motorcyles in the Kabupaten is by far the highest.

From the above tables the following can be observed:

- Number of total trips might be underestimated
- Proportions are probably reasonable.

Essentially, for estimation of future traffic volumes past and present traffic data together with the trend in the number of registered vehicles are important basic data. However the data obtained for the study was traffic count data for each road link in 1985 and of low reliability.

Therefore the future traffic volumes are estimated by the calculation process recommended in chapter 3 of the Main Report.

Chapter 2 ESTIMATIONS OF FUTURE TRAFFIC VOLUME AND BENEFIT

2.1 Future Traffic Volume

2.1.1 Traffic Growth Rate

The traffic growth rate used for estimation of the future traffic volume on the Kabupaten roads was estimated by the following calculation process.

Growth of Production Basis "A":

$$\sqrt{\text{Annual Population Growth of the Kabupaten} \times \text{Growth of the Total Cultivated Area}}$$

Growth of Productivity "B" :

$$\sqrt{\text{Growth of the Total Paddy Field Area} \times \text{Growth of the Paddy Production per ha}}$$

Traffic Growth Rate: Initial estimated figure:

$$\overline{GR'} = \sqrt{A \times B}$$

Traffic Growth Rate GR =Final adjusted figure:

$$\sqrt{GR' \times \text{Trend of GDP/Capita of the Province Concerned}}$$

Results of the estimation are shown in Table 2-1-1.

Table 2-1-1 TRAFFIC GROWTH RATE ESTIMATION

PROV : KALIMANTAN TENGAH KAB : KOTA WARINGIN TIMUR

A)	Growth Rate of Population	:	3.30 (%)
B)	Growth Rate of Cultivated Area	:	4.00 (%)
C)	Growth Rate of Rice field	:	3.00 (%)
D)	Growth Rate of Rice yield rate	:	1.50 (%)
E)	Growth Rate of GDP / capita	:	9.50 (%)
a)	Geometrical Mean (A x B)	:	3.65 (%)
b)	Geometrical Mean (C x D)	:	2.25 (%)
c)	Geometrical Mean (a x b)	:	2.95 (%)
d)	Geometrical Mean (c x E)	:	6.17 (%)
	TRAFFIC GROWTH RATE	:	6.17 (%)

2.1.2 Present and Future Traffic Volume

The future traffic volumes on the Kabupaten roads in 1998 for the Project life time of ten years were estimated by the following formula :

$$Tn = Te\ (1 + r)^n$$

Where :

Tn : Future traffic volume n years later
Te : Traffic volume in 1985
r : Traffic growth rate

The results are shown in Table 2-1-2 together with the traffic volume in 1985.

Table 2-1-2 EXISTING AND FUTURE TRAFFIC VOLUME

PROV : KALIMANTAN TENGAH KAB : KOTA WARINGIN TIMUR

(SPD : 1/2)

	INVENTORY (1985)					RATE	AFTER 13 YEARS (1998)					CLASS
LINK NO	MBL	BUS	TRUK	SPD	TOTAL		MBL	BUS	TRUK	SPD	TOTAL	
1	0	0	0	10	5	6.2%	0	0	0	22	11	IIIC
2	0	0	0	15	8	6.2%	0	0	0	33	17	IIIC
3	0	0	0	0	0	6.2%	0	0	0	0	0	IIIC
4	0	0	0	0	0	6.2%	0	0	0	0	0	IIIC
5	0	0	0	10	5	6.2%	0	0	0	22	11	IIIC
6	0	0	0	10	5	6.2%	0	0	0	22	11	IIIC
7	0	0	0	10	5	6.2%	0	0	0	22	11	IIIC
8	5	0	5	10	15	6.2%	11	0	11	22	33	IIIC
9	0	0	3	40	23	6.2%	0	0	7	87	50	IIIB-2
10	0	0	0	0	0	6.2%	0	0	0	0	0	IIIC
11	0	0	0	10	5	6.2%	0	0	0	22	11	IIIC
12	0	0	0	10	5	6.2%	0	0	0	22	11	IIIC
13	1	0	1	10	7	6.2%	2	0	2	22	15	IIIC
14	0	0	2	15	10	6.2%	0	0	4	33	22	IIIC
15	0	0	0	10	5	6.2%	0	0	0	22	11	IIIC
PERCENT	3.39	0.00	6.21	90.40			3.39	0.00	6.21	90.40		

2.2 Benefit

2.2.1 Benefit Estimation Method

Generally, estimation of the benefit on each Kabupaten road due to the Project was made by analyzing the direct benefit i.e. the VOC reduction benefit, which was estimated by comparing "with project" and "without project" based upon the future traffic volume on the road. However for the following road links it was decided to estimate the indirect benefit through the producer's surplus benefit.

a) Road links with present traffic volume (ADT) less than 60 equivalent 4-wheel vehicles.

b) Road links with no 4-wheel vehicle operation at present.

The indirect benefit was changed into the future traffic volume and the VOC reduction benefit was estimated.

The VOC adopted for the estimation is shown in Table 2-2-1.

Table 2-2-1 VEHICLE OPERATION COST ON KABUPATEN ROADS

(KM)

SURFACE	CONDITION	SEDAN	BUS	TRUCK	MOTORCYCLE
ASPHALT	GOOD	104.7	86.2	85.4	15.9
	Fair	125.5	101.0	98.0	18.2
	Poor	164.1	135.2	138.5	22.8
	Bad	222.1	202.0	205.0	29.1
GRAVEL	Good	125.7	101.4	102.5	18.5
	Fair	145.0	124.6	127.1	21.1
	Poor	198.6	172.6	178.4	27.1
	Bad	242.7	228.9	231.2	31.8
EARTH	Fair	201.8	180.0	185.1	28.0
	Poor	240.7	218.2	225.8	31.8
	Bad	264.9	278.0	281.7	35.5

Source : Bina Marga

Table 2-2-2 FUTURE TRAFFIC VOLUME ESTIMATED BY THE PRODUCER'S SURPLUS

PROV : KALIMANTAN TENGAH KAB : KOTA WARINGIN TIMUR

(1998)

LINK NO	CLASS	SURFACE	MOBIL	BUS	TRUCK	SEPEDA	TOTAL
1	IIIC	KRK	0	0	0	0	0
2	IIIC	KRK	0	0	0	0	0
3	IIIA	ASP	39	0	71	1034	627
4	IIIB-2	KRK	10	0	19	274	166
5	IIIC	KRK	1	0	2	31	19
6	IIIC	KRK	1	0	2	26	16
7	IIIB-2	KRK	5	0	9	134	81
8	IIIC	KRK	0	0	0	0	0
9	IIIC	KRK	1	0	2	31	19
10	IIIC	KRK	0	0	0	0	0
11	IIIC	KRK	0	0	0	0	0
12	IIIC	KRK	0	0	0	0	0
13	IIIC	KRK	0	0	0	0	0
14	IIIC	KRK	0	0	0	0	0
15	IIIC	KRK	0	0	0	0	0

2.2.2 Benefit

The benefit estimation was carried out for each Kabupaten road. Table 2-2-3 shows a sample of the result of benefit estimation. In the table "surplus" and "VOC" show the estimation method utilized and III A, III B-1, III B-2 and III C show the road classification.

Table 2-2-3

RESULTS OF BENEFIT ESTIMATION

KABUPATEN : KOTA WARINGIN TIMUR

(1000Rupiah)

	LINK 1	LINK 2	LINK 3	LINK 4	LINK 5	LINK 6	LINK 7	LINK 8	LINK 9	LINK 10
	12 Km	3 Km	65 Km	71 Km	18 Km	9 Km	25 Km	5 Km	40 Km	10 Km
	IIIC	IIIC	IIIA	IIIB-2	IIIC	IIIC	IIIB-2	IIIC	IIIC	IIIC
YEAR	Surplus	Surplus	Surplus	Surplus	Surplus	Surplus	Surplus	Surplus	Surplus	Surplus
1988	0	0	0	0	0	0	0	0	0	0
1989	0	0	411416	95560	3028	1353	15843	0	2675	0
1990	0	0	428611	100865	3028	1353	16326	0	2675	0
1991	0	0	445807	103385	3028	1353	18463	0	2675	0
1992	0	0	463320	111007	3028	1353	18945	0	2675	0
1993	0	0	490260	116312	4180	1853	19331	0	3683	0
1994	0	0	514906	119112	4180	1853	20673	0	3683	0
1995	0	0	532102	126454	4180	1853	21156	0	3683	0
1996	0	0	559359	136876	4180	1853	23776	0	3683	0
1997	0	0	586299	142181	4662	2006	24162	0	4114	0
1998	0	0	621008	147486	4662	2006	24645	0	4114	0
SUM	0	0	5053088	1199238	38156	16836	203320	0	33660	0
COST	-43209	-10802	2643700	453437	-42390	-22482	30058	-18004	-124244	-36007
/Km	-3601	-3601	40672	6386	-2355	-2498	1202	-3601	-3106	-3601

Chapter 3 ENGINEERING

3.1 Design Criteria and Specification

3.1.1 Geometric Design Criteria

Currently a technical standard for improvement of Kabupaten roads i.e. PETUNJUK TEKNIS INPRES PENUNJANGAN JALAN KABUPATEN, TAHUN 1984-1985 is established by Bina Marga.

The geometric design criteria in the above standard are recommended to be adopted in general for the Project. Following discussions with Bina Marga, exceptions to this are allowed for Pavement width and pavement type to minimize the construction cost of the Kabupaten road improvement, if necessary. The geometric design criteria adopted for the Project are shown in Table 3-1-1. The typical cross sections of Kabupaten roads are shown in Fig. 3-1-1.

3.1.2 Loading Specification

The LOADING SPECIFICATIONS FOR HIGHWAY BRIDGES BY DIRECTORATE GENERAL BINA MARGA is used in principle as the basic specification of loading and the TECHNICAL STANDARD FOR KABUPATEN ROADS compiled by Bina Marga shows that the design live load for bridges on Kabupaten roads is 70% of the Bina Marga live road. However, after discussions with Bina Marga the following loads were decided as the design live loads for the standard bridges of Kabupaten roads:

a. 50% of Bina Marga live load (hereinafter BM 50) is applied for concrete and timber bridges on roads of III A classification.

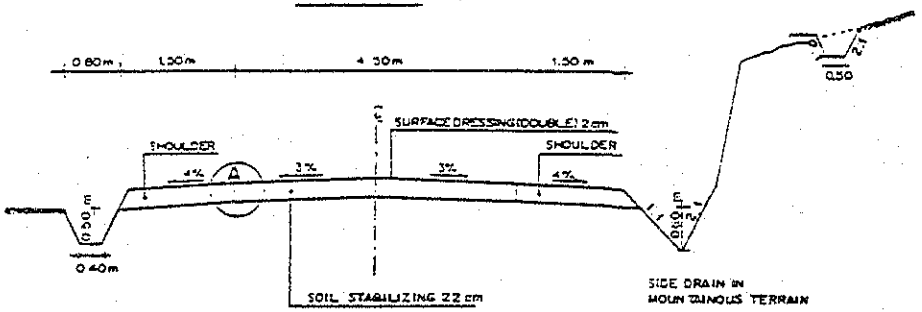
b. 10-ton truck load is applied for timber bridges on roads of III B-1, III B-2 and III C classification.

Table 3-1-1 DESIGN CRITERIA FOR KABUPATEN ROADS

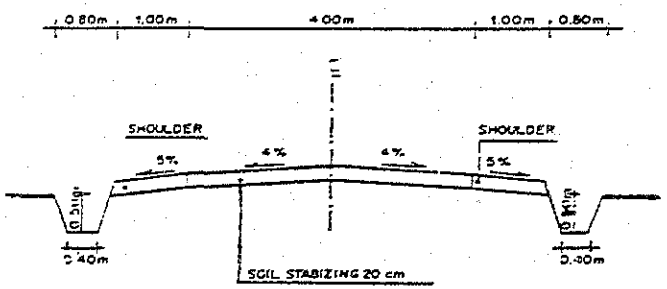
ROAD CLASSIFICATION		CLASS III A			CLASS III B-1			CLASS III B-2			CLASS III C		
SURFACE TYPE		ASPHALT SEAL (DOUBLE)			ASPHALT SEAL (SINGLE)			GRAVEL			GRAVEL		
TRAFFIC VOLUME : ADT (Forecast 10 th year average per day)		3000 - 500			500 - 200			200 - 50			50		
T E R R A I N		FLAT TO ROLLING	HILLY	MOUNT-AINOUS	FLAT TO ROLLING	HILLY	MOUNT-AINOUS	FLAT TO ROLLING	HILLY	MOUNT-AINOUS	FLAT TO ROLLING	HILLY	MOUNT-AINOUS
TRAFFIC LANES		1+	1+	1+	1+	1+	1+	1+	1+	1+	1	1	1
DESIGN SPEED (Km/hr)	DESIRABLE	70	60	40	70	40	30	60	40	30	50	30	AS PRACTI-CABLE
	MINIMUM	30	30	30	30	30	AS PRACTI-CABLE	30	30	AS PRACTI-CABLE	30	AS PRACTICABLE	
GRADIENT (LIMITING) (%)	DESIRABLE	4	5	8	4	6	8	4	7	8	5	8	12
	MAXIMUM	7	7	10	7	8	10	7	9	12	7	12	16
PAVEMENT WIDTH (M)	DESIRABLE	6.0	6.0	6.0	4.5	4.5	4.5	4.5	4.5	4.5	3.5	3.5	3.5
	MINIMUM	4.5	4.5	4.5	3.5	3.5	3.5	3.5	3.5	3.5	3.0	3.0	3.0
SHOULDER WIDTH (M)	DESIRABLE	2.0	1.5	1.5	1.5	1.5	1.0	1.5	1.0	1.0	1.0	1.0	0.75
	MINIMUM	1.5	1.0	0.75	1.0	1.0	0.75	1.0	0.75	0.5	0.75	0.5	0.5
ROAD BED WIDTH (M)	DESIRABLE	10.0	9.0	9.0	8.0	7.5	6.5	7.5	6.5	6.5	5.5	5.5	5.0
	MINIMUM	6.0	6.0	6.0	5.5	5.5	5.0	5.5	5.0	4.5	4.5	4.0	4.0
RIGHT OF WAY (M)	DESIRABLE	16			12			12			12		
	MINIMUM	12			10			10			8		
ROAD CAMBER (%)	PAVEMENT	3			3			4			4		
	SHOULDER	4			4			5			5		

Fig. 3-1-1 STANDARD ROAD CROSS SECTIONS

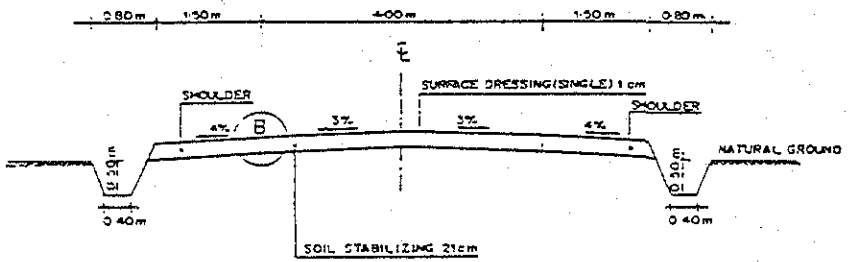
CLASS III A



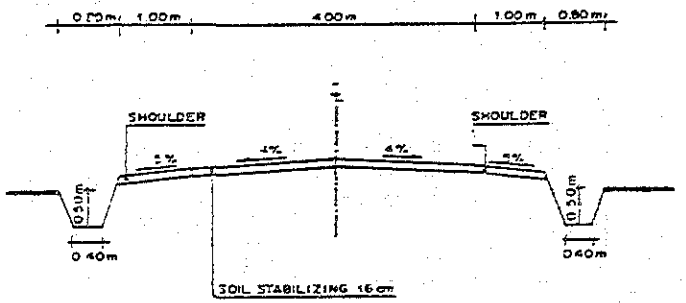
CLASS III B-2



CLASS III B-1



CLASS III C



3.2 Pavement Design

3.2.1 Design Conditions

From the engineering data prepared by the Kabupaten it is noted that the pavement structure of the Kabupaten roads seems to have been determined without adequate designs, therefore the Kabupaten roads generally have insufficient capacity. The standards generally used for highway pavement design such as Road Note 29, Road Note 31 and AASHTO are not suitable for Kabupaten roads with small traffic volumes and loads.

Therefore formulae suitable for the pavement design of Kabupaten roads are recommended as described in Chapter 5 of the Main Report.

The following are important factors for the design of pavement thickness.

1) Design Traffic Volume

As the pavement thickness is designed for each road classification the design traffic volume of which the target year is 1998, is adopted for each classification as follows:

Road Classification	Design Traffic Volume (vpd)
III A	1,000
III B-1	500
III B-2	200
III C	50

2) Strength of Roadbed

The CBR value of the existing roadbed is a very important factor for the pavement design but no results are available from CBR tests on the Kabupaten roads.

CBR of the laterite is generally in the range of CBR 4 to 10. However site CBR tests should be conducted before construction to finally decide the pavement thickness.

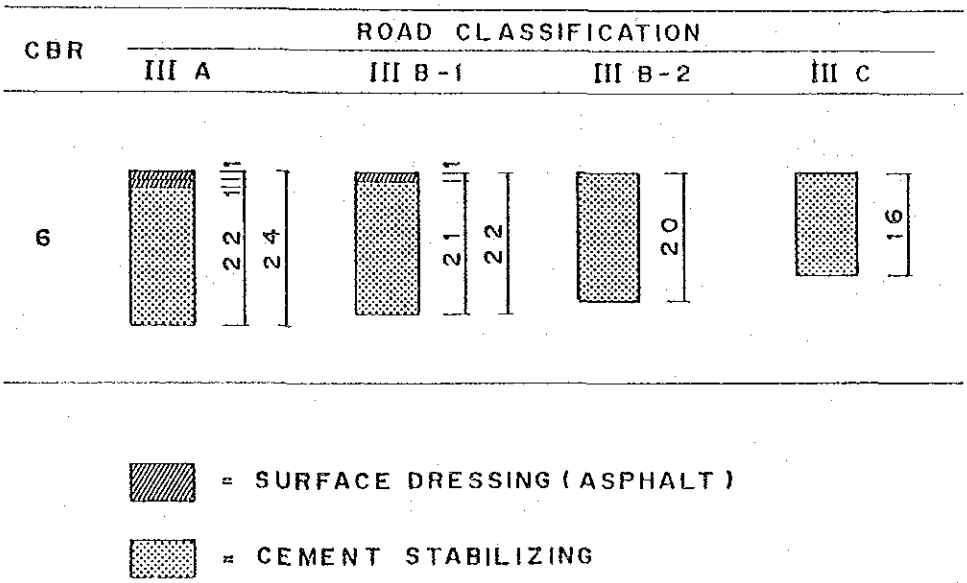
3.2.2 Pavement Structure

Fig. 3-2-1 shows the standard pavement structures adopted for the Kabupaten roads. In the Kabupaten aggregate material is difficult to obtain and so the price is extremely high, therefore the cement stabilization method is recommended for both the base and sub-base courses as a substitute for crusher run or river gravel.

Fig. 3-2-1

PAVEMENT STRUCTURE
(CEMENT STABILIZING)

(cm)



3.3 Design of Bridges and Other Structures

3.3.1 Standard Bridge

There are so many bridges to be improved or to be newly constructed on the Kabupaten roads in the Project Area that it is very difficult to prepare an individual design for each bridge. Therefore, standardization is recommended as being necessary for the bridge design with conclusions as deseribed below.

(1) Bridge Type

1) Superstructure

A timber beam bridge (hereinafter timber bridge has been finally selected regardless of road classification by the agreement of Bina Marga after studying the actual rurall condition of bridge construction. Fig. 3-3-1 shows the cross section of the standard type.

2) Substructure

Taking account of the actual combinations of super and substructure types noted from the field survey, timber pile barts are recommended as standard because of ease of construction and economy.

3) Foundation

There is no information of subsoil conditions in the inventory data. However, timber piles of 20 cm diamenter are generally recommended as piles of this type are in common use.

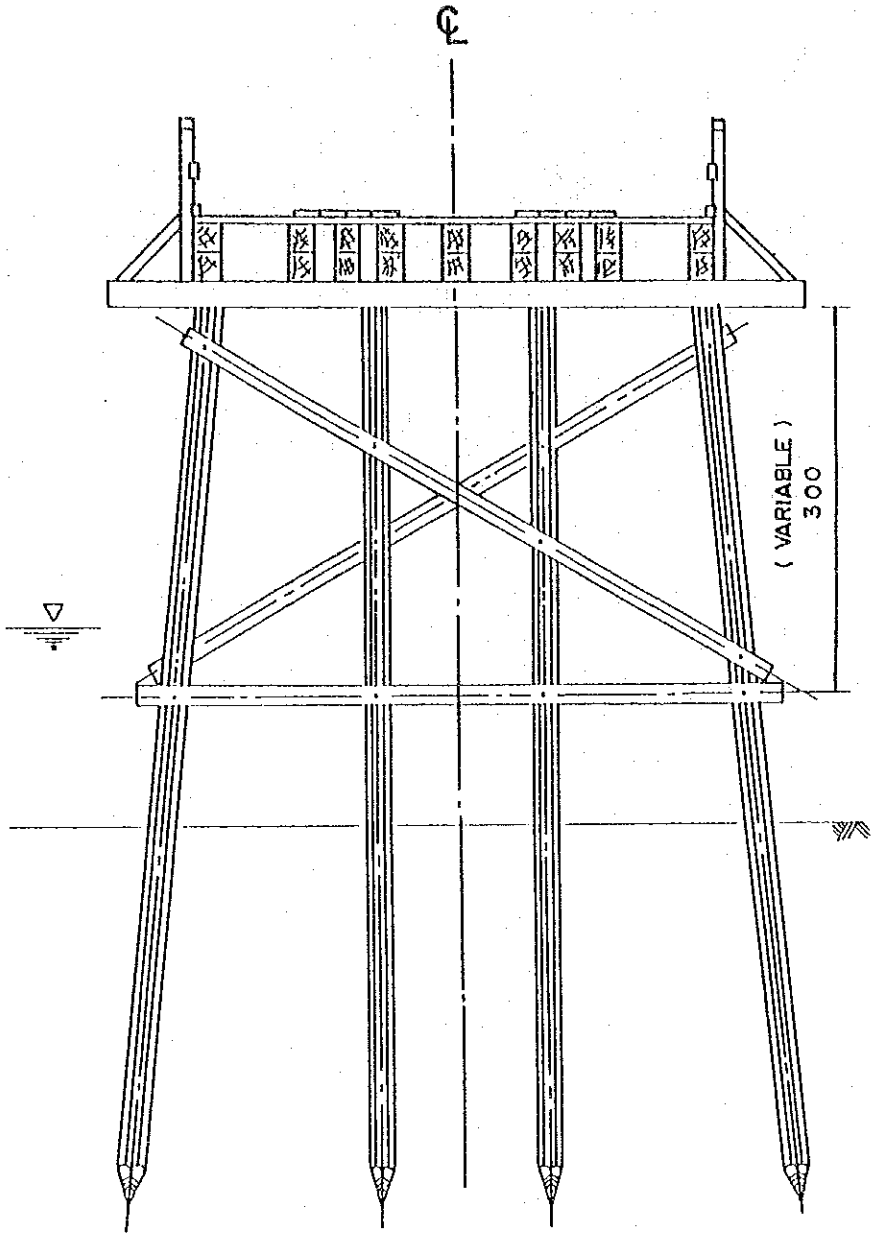
The pile length is suggested to be a minimum of 3 meters under the bottom of the foundation or river bed.
The length and number of piles should be decided in order to be adequate for the condition of the foundation materials.

(2) Bridge Width

The effective bridge width for the standard bridge has been generally decided as 4.0 m through discussions with Bina Marga and considering the actual width of Kabupaten roads.

Fig. 3-3-1 CROSS SECTION OF STANDARD BRIDGE

TIMBER BRIDGE



(3) Span Length

The range of span lengths are determined as:

Timber bridge: 3.0, 5.0 and 8.0 m

3.3.2 Other Structures

Culverts and retaining walls shown in Fig. 3-3-2 and Fig. 3-3-3 are recommended as standard structures.

(1) Culvert

The following two culvert types have been adopted for the tranverse drainage.

a) Reinforced concrete pipe culvert Ø 80 cm m
b) Rubble in mortar box culvert with RC slab 80 cm X 80 cm

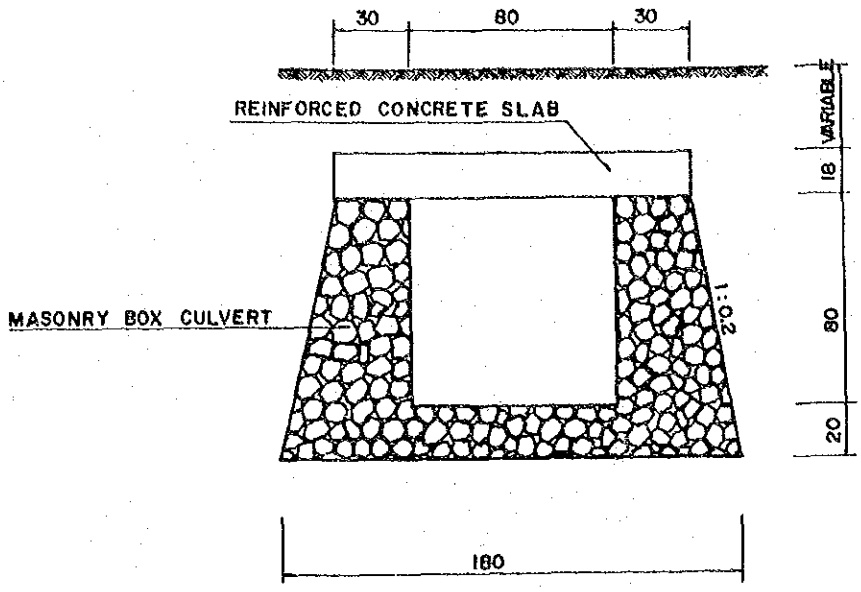
(2) Retaining Wall

The following two types of retaining walls have been adopted because of ease of construction, economy and familiarity in Indonesia.

a) Rubble in mortar retaining wall
b) Timber retaining wall

Fig. 3-3-2 STANDARD CULVERTS

80 x 80 RUBBLE IN MORTAR BOX CULVERTS



Ø 80 RENFORCED CONCRETE PIPE CULVERT

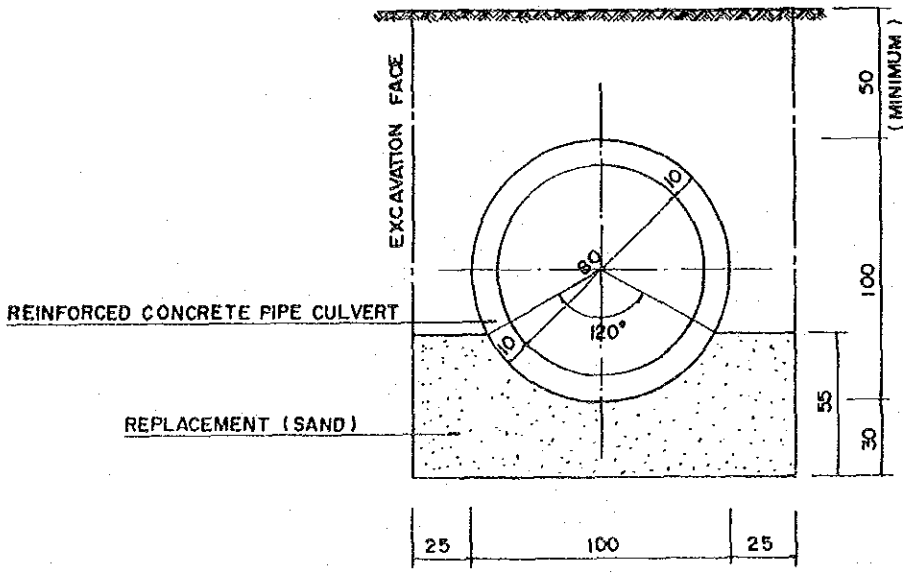
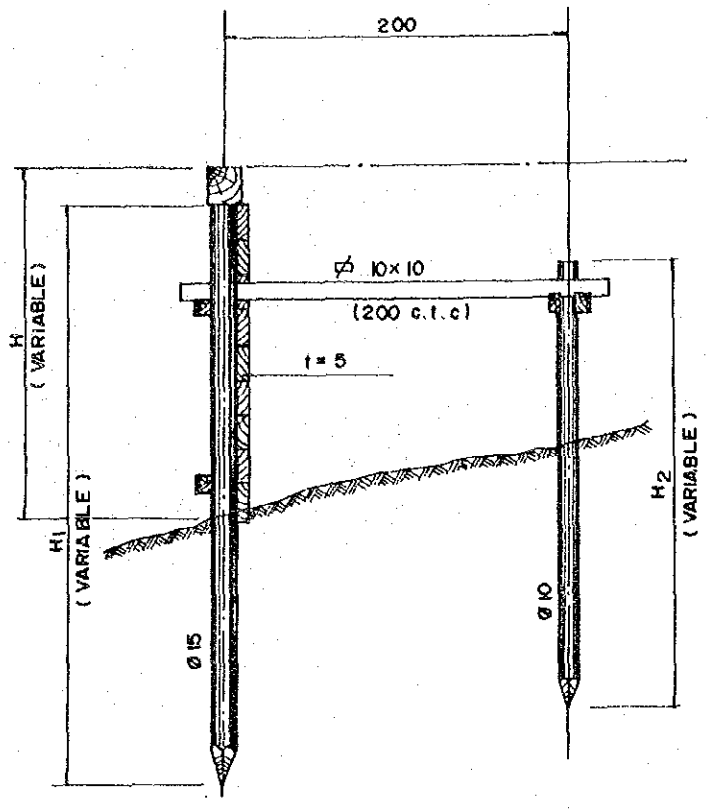
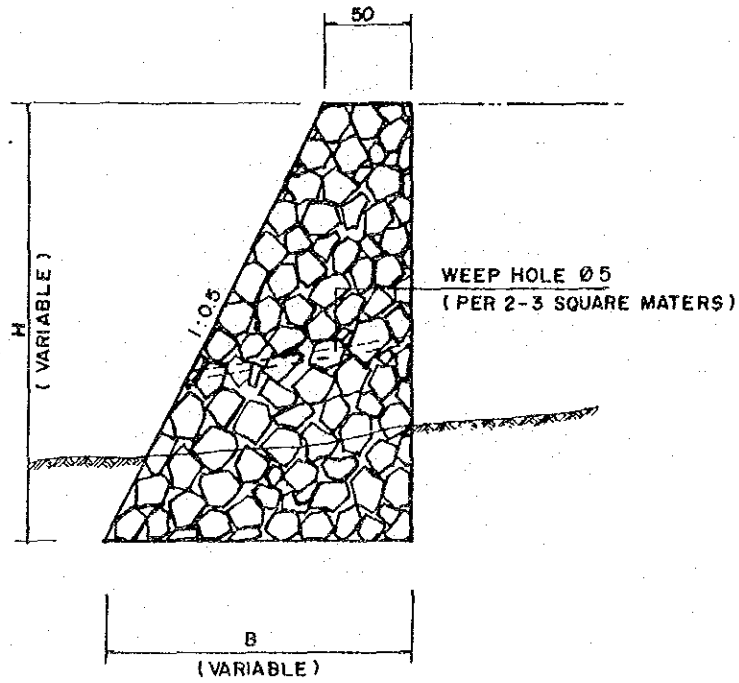


Fig. 3-3-3 STANDARD RETAINING WALLS

TIMBER RETAINING WALL



RUBBLE IN MORTAR WALL



3.4 Selection of Equipment Types

From the results of comparison of two types of Kabupaten road construction methods, i.e. equipment intensive method and labour intensive method construction methods for major works were basically decided as shown in Table 3-4-1.

Table 3-4-1 CONSTRUCTION METHODS FOR MAJOR WORKS

METHOD	WORK TYPE
Equipment Intensive	Earthwork, Base Course and Subbase Course
Labour Intensive	Surface Dressing, Drainage, Bridge and Other Structures.

3.4.1 Points to be Considered for the Selection

Full consideration was given to the following points in studying the selection of equipment type.

a. Most of the construction in the Project is pavement works for road improvement.

b. The pavement width adopted is equal to or less than 4.5 m and therefore large sized equipment is omitted from the selection process.

c. Equipment should be capable of with standing the heavy rainfall and poor soil quality. Equipment for construction in swampy areas is considered if necessary.

d. Uniformity of equipment types with existing equipment is considered to facilitate repair of the equipment in the provincial work shop.

e. Since the scale of the construction is small and transportation of equipment will frequently be necessary, wheel type equipment has been selected as much as possible as this can move by itself or by being towed.

f. The road like to be improved are scattered all over the Kabupatens and therefore a low bed truck or equivalent is necessary for transportation of crawler type equipment. It is desirable to protect the existing pavement from damage caused by the movement of crawler type equipment on the existing roads.

g. The capacity of the equipment has been decided taking into consideration the construction volume and the combination of equipment in the main work.

3.4.2 Combinations of Equipment for Major Works and Maintenance

The combinations of equipment for major works and maintenance are listed in Table 3-4-2 and 3-4-3 respectively.

Table 3-4-2 EQUIPMENT OF ONE WORK GANG FOR MAJOR TYPES OF WORK

TYPE OF WORK	EQUIPMENT REQUIRED	
1. Site Clearing in Light Bush	1- Bulldozer 90 HP 2- Dump Truck 3.0 Ton	1- Wheel Loader 1.2 m^3
2. Excavation & Embankment		
i) Normal Fill	1- Bulldozer 90 HP 1- Vibratory Roller 4.0 Ton (D&T)	1- Water Tank Truck 4,000 Ltr
ii) Fill by Borrow Material	1- Bulldozer 90 HP 3- Dump Truck 3.0 Ton	1- Wheel Loader 1.2 m^3
iii) Fill in Swamp	1- Swamp Bulldozer 90 HP 1- Water Tank Truck 4,000 Ltr	1- Vibratory Roller 4.0 Ton (D&T)
iv) Excavation to Spoil	1- Bulldozer 90 HP 1- Wheel Loader 1.2 m^3	4- Dump Truck 3.0 Ton
3. Subgrade Preparation	1- Motor Grader 75 HP 1- Vibratory Roller 4.0 Ton (D&T)	1- Water Tank Truck 4,000 Ltr
4. Subbase Course	1- Motor Grader 75 HP 1- Vibratory Roller 4.0 Ton (D&T)	1- Water Tank Truck 4,000 Ltr
5. Base Course	1- Motor Grader 75 HP 1- Vibratory Roller 4.0 Ton 1- Portable Crusher/Screens 30-40 Ton/H	1- Water Tank Truck 4,000 Ltr
6. Cement Stabilizing	1- Motor Grader 70 HP 1- Bulldozer 90 HP 1- Wheel Loader 1.2 m^3 1- Flat Bed Truck 3.0 Ton	1- Vibratory Roller 4.0 Ton (D&T) 1- Road Stabilizer 1- Water Tank Truck 4,000 Ltr
7. Surface Course	1- Asphalt Sprayer 850 Ltr 1- Tyre Roller 8-15 Ton 1- Portable Crusher/Screens 30-40 Ton/H	1- Flat Bed Truck 3.0 Ton
8. Concrete	1- Concrete Mixer 0.5 m^3 1- Water Pump 200 Ltr/Min 1- Concrete Vibrator 3.3 HP	1- Flat Bed Truck 3.0 Ton 1- Hand-Guided Vibratory Roller 1000 Kg

Table 3-4-3 EQUIPMENT OF ONE WORK GANG FOR MAINTENANCE

TYPE OF WORK	EQUIPMENT REQUIRED
Road	1- Motor Grader
	1- Tyre Roller 8-15 Ton
	1- Hand-Guided Vibratory Roller 1000 Kg
	1- Flat Bed Truck 3.0 Ton
	1- Dump Truck 3.0 Ton
Bridge and Other Structure	1- Flat Bed Truck With Crane 3.0 Ton

3.5 Workshop and Laboratory

3.5.1 Policy of the Kabupaten Workshop

A workshop will be provided for each Kabupaten. The function of the workshop is to cope with requests from the construction site. The main service will be routine maintenance while the secondary service will be light repairs which can be carried out by changing parts. Dismantling and assembling of units which need setting or adjustment using special equipment or facilities will not be carried out in the Kabupaten workshop. Such repairs are planned to be carried out by the provincial workshop or the regional Workshop of Bina Marga.

Accordingly the main tasks of the Kabupaten workshop are as follows:

1) Administration for and storage of equipment
2) Routine maintenance and light repair of equipment
3) Storage and supply of spare parts
4) Operation of equipment including crushing plant.

3.5.2 Workshop Equipment and Tools

Equipment and tools for the workshop are recommended as shown in Table 3-5-1.

Table 3-5-1 WORKSHOP EQUIPMENT AND TOOLS

DESCRIPTION	QUANTITY
Upright Drilling Machine	1 Set
Electric Hand Drill	1
Electric Portable Grinder	1
Disc Grinder	1
Bench Electric Grinder	1
Engineer's Vice	1
DC Electric Welder with Engine	1 Set
Portable Hydraulic Jack, Screw Head	1
Hydraulic Jack	1
Grease Gun	2
Suction Pump for Oil Recovery	2
High Pressure Grease Pump	1

continued

DESCRIPTION	QUANTITY
Drum Opening Spanner	1
Silicon Normal Charger	1
Tyre Changer Air Operated	1
Tyre Service Tool Set	1
Tyre Pressure Gauge	1
Automatic Tyre Inflator	1
Plug Cleaner and Tester	1
Mechanics Tool Set, Heavy Equipment	1
Mechanics Tool Set, Large Vehicle	1
Portable Air Compressor	1
Electric Cord Reel, 15 A, 50 m	1
Oil Measure, Polyethylene	1
Funnel 200 mm, Steel	3
Hand Truck (Cart), 4-Wheel	1
Nylon Sling, 10 ton	2
Chain Block, 1 ton	2
Wire Rope (for sling), 1.8 ton	2
Wire Rope (for sling) 3.2 ton	2
Generator	1

3.5.3 Laboratory

For quality control of construction in the Project it is recommended that a laboratory is provided for each Kabupaten. For each laboratory, provision of laboratory test equipment for the following tests is recommended:

- Physical characteristic, compaction and strength tests for the road bed and pavement materials.
- Slump and strength tests for the bridge concrete.

In the laboratory a fixed water tank should be provided for CBR tests and curing of concrete specimens.

The proposed laboratory equipment is listed in Table 3-5-2.

Table 3-5-2 LABORATORY TEST EQUIPMENT

DESCRIPTION	QUANTITY
Soil Moisture Test Set (JIS A1203)	1
Liquid Limit Set (JIS A1205)	1
Plastic Limit Set (JIS A1206)	1
Compaction Set (JIS A1210)	1
CBR Laboratory Set, Mechanical (JIS A1211)	1
Sand Density Apparatus (JIS A1214)	1
Aggregate Test Sieve Set	1
Portable Cone Penetrometer	1
Compression & Bending Test Machine	1
Cylinder Mould (JIS A1132, 1108)	9
Slump Test Apparatus (JIS A1101)	2

To conduct the surveys necessary for road and structure construction such as centering, profile leveling, cross section leveling etc., the surveying equipment listed in Table 3-5-3 recommended.

Table 3-5-3 SURVEYING EQUIPMENT

DESCRIPTION	QUANTITY
Transit	1
Level	1
Staff	3

Chapter 4 CONSTRUCTION AND MAINTENANCE COST ESTIMATIONS

4.1 Unit Price

With regard to the unit prices of materials and labor, the data were collected from each Kabupaten through Bina Marga. The collected data were compared with those of Jakarta using BAHAN BANGUNAN DKI-JAKARTA MAY & JUNE 1985 compiled by PUSAT INFORMASI TEHNIK PEMBANGUNAN, and then finalized.

4.1.1 Unit Labour Price

The unit labour prices of Kabupaten Kotawaringin Timur and other Kabupatens in Kalimantan Tengah Province are shown in Table 4-1-1.

Table 4-1-1 UNIT LABOUR PRICE

(Rp)

KABUPATEN	MAN	SKL LAB	CAP	MAS	LAB	DRIV	OPE
Kotawaringin Timur	2,500	2,000	2,500	2,500	1,500	3,000	7,500
Kapuas	2,200	2,000	2,500	2,500	1,650	2,200	2,750
Barito Selatan	4,000	3,250	2,500	3,000	2,750	3,000	3,500
Barito Utara	3,000	3,600	3,000	3,000	2,250	3,300	3,300
Average	2,925	2,713	2,625	2,750	2,038	2,875	4,263

Notes :

MAN : Mandur
SKL LAB : Skilled Labour
CAP : Carpenter
MAS : Mason
LAB : Labourer
DRIV : Driver
OPE : Operater

4.1.2 Unit Price of Materials

Table 4-1-2 shows the unit price of materials for Kabupaten Kotawaringin Timur together with for other Kabupatens in Kalimantan Tengah Province.

The unit price of river stone in the Kabupaten which has direct effects upon construction costs is significantly high.
Stone and sand are not produced in the Kabupaten. Therefore unit prices of these materials include the shipping cost from the producing Kabupaten.

Table 4-1-2 UNIT PRICE OF MATERIALS

(Rp)

MATERIAL	UNIT	KOTAWARI-NGIN TIMUR	KAPUAS	BARITO SELATAN	BARITO UTARA	AVERAGE
Bitumen	L	500	500	1,000	400	600
Asphalt oil	L	800	800	800	800	800
Gasoline	L	250	250	250	250	250
Sand	M^3	7,500	7,000	7,500	10,000	8,000
Cement	bag	5,000	5,000	5,000	5,000	5,000
River Stone	M^3	15,000	20,000	30,000	10,000	18,750
Steel moulds	Set	8,500	8,500	8,500	8,500	8,500
Timber	M^3	75,000	70,000	75,000	75,000	73,750
Paint	L	2,000	3,000	3,000	3,000	2,750
Reinforcing Steel	Kg	1,000	1,000	1,000	1,000	1,000
Tying Wire	Kg	1,500	1,500	1,500	1,500	1,500

4.1.3 Hourly Equipment Cost

The hourly equipment cost for Kabupaten is shown in Table 4-1-3.

Table 4-1-3

HOURLY EQUIPMENT COST

PROVINCE : KALIMANTAN TENGAH
KABUPATEN : KOTA WARINGIN TIMUR

(UNIT : Rp) (6'85)

CODE NO	EQUIPMENT NAME	CLASS	LOCAL COST OWNERSHIP	LOCAL COST OPERATION	LOCAL COST SUB-TOTAL	FOREIGN COST OWNERSHIP	FOREIGN COST OPERATION	FOREIGN COST SUB-TOTAL	TOTAL COST
	Bulldozer	120 HP	272	16,082	16,354	7,769	1,029	8,798	25,152
	Bulldozer/Ripper	120 HP	298	17,097	17,395	8,499	1,583	10,082	27,477
	Swamp Bulldozer	120 HP	311	17,341	17,652	8,879	1,654	10,533	28,185
	Bulldozer	90 HP	173	11,016	11,189	4,914	650	5,564	16,753
	Bulldozer/Ripper	90 HP	186	11,608	11,794	5,299	987	6,286	18,080
	Bulldozer	65 HP	123	8,018	8,141	3,499	463	3,962	12,103
	Bulldozer/Ripper	65 HP	134	8,470	8,604	3,819	711	4,530	13,134
	Swamp Bulldozer	90 HP	185	11,598	11,783	5,284	984	6,268	18,051
	Swamp Bulldozer	65 HP	142	8,232	8,374	4,049	754	4,803	13,177
	Motor Grader	110 HP	243	13,746	13,989	6,919	1,289	8,208	22,197
	Motor Grader	75 HP	168	9,411	9,579	4,779	890	5,669	15,248
	Motor Grader	65 HP	151	8,257	8,408	4,299	801	5,100	13,508
	Road Stabilizer	W=1850 mm	301	3,398	3,699	8,594	426	9,020	12,719
	Vibratory Roller	4 ton	102	4,161	4,263	2,899	384	3,283	7,546
	Hand-guide Vib. Roller	1000 Kg	77	732	809	849	29	878	1,687
	Tire Roller	8-15 ton	109	9,772	9,881	3,106	102	3,208	13,089
	Vibratory Roller (D&T)	4 ton	102	4,161	4,263	2,899	384	3,283	7,546
	Hand-guide Vib. Roller	600 Kg	54	498	552	600	20	620	1,172
	Rough Terrain Crane	10 ton	352	16,068	16,420	10,039	748	10,787	27,207
	Hydraulic Excavator; Wheel	0.3 m3	144	9,961	10,105	4,109	544	4,653	14,758
	Wheel Loader	1.2 m3	246	10,186	10,432	7,019	929	7,948	18,380
	Wheel Loader	0.3 m3	80	3,597	3,677	2,269	300	2,569	6,246
	Water Tank Truck	4000 ltr.	79	3,802	3,881	868	120	988	4,869
	Fuel Tank Truck	4000 ltr.	80	3,808	3,888	882	122	1,004	4,892
	Dump Truck	3.0 ton	133	4,606	4,739	1,469	204	1,673	6,412
	Flat Bed Truck with Crane	3.0 ton	61	4,049	4,110	1,716	127	1,843	5,953
	Dump Loader Truck	12 ton	135	25,959	26,094	3,837	127	3,964	30,058
	Dump Truck	5.0 ton	198	7,661	7,859	2,189	305	2,494	10,353
	Flat Bed Truck	3.0 ton	20	3,620	3,640	563	41	604	4,244
	Portable Crusher/Screening	30-40 t/h	658	26,953	27,611	18,800	2,490	21,290	48,901
	Concrete Mixer	0.5 m3	486	2,536	3,022	5,400	423	5,823	8,845
	Water Pump	200 l/min	18	342	360	188	6	194	554
	Concrete Vibrator	3.3 HP	7	306	313	73	2	75	388
	Asphalt Sprayer	850 ltr.	92	886	978	1,019	142	1,161	2,139

4.2 Unit Construction Cost by Work Type

4.2.1 All Works Except Bridges

The unit construction costs by work type, excluding bridge construction costs, have been estimated using the combination of equipment described in Clause 3.4 and the unit prices already listed. The results are summarized in Table 4-2-1.

Table 4-2-1 UNIT COST BY WORK TYPE EXCEPT BRIDGE WORK

PROV : KALIMANTAN TENGAH KAB : KOTA WARINGIN TIMUR

(Rp)

ITEM	UNIT	LOCAL	FOREIGN	TOTAL
Site Clearance in Light Bush	m2	200	91	291
Subgrade Preparation	m2	26	11	37
Normal Fill	m3	2,068	863	2,931
Fill in Swamp	m3	8,207	267	8,474
Normal Excavation to Spoil	m3	1,202	523	1,725
Cement Stabilizing	m3	13,387	12,368	25,755
Cement Stabilizing	m3	13,387	12,368	25,755
Shoulder	m2	363	146	509
Asphalt Patching	m2	8,918	1,308	10,226
Surface Dressing (Single)	m2	1,187	896	2,083
Surface Dressing (Double)	m2	1,690	1,410	3,100
Earth Drain	m	845	119	964
Earth Drain in Swamp (by machine)	m3	1,425	474	1,899
Pipe Culvert D80cm	m	61,479	49,971	111,450
Masonry Culvert (80x80cm)	m	92,728	39,061	131,789
Retaining Wall and Wing Wall (Timber)	m2	9,055	246	9,301
Retaining Wall and Wing Wall (Masonry)	m3	64,550	10,457	75,007
Gabion Protection	m3	20,848	120	20,968
Manual routine maintenance of road	Km	134,680	7,248	141,928
Routine maintenance of earth road	Km	116,066	37,924	153,990
Routine maintenance of gravel road	Km	918,075	42,664	960,739
Routine maintenance of asphalt road	Km	891,800	130,800	1,022,600

4.2.2 Bridges

The unit construction costs by bridge type including the cost of demolition of existing bridges are shown in Table 4-2-2.

Table 4-2-2 BRIDGE COST

PROV : KALIMANTAN TENGAH KAB : KOTA WARINGIN TIMUR

(Rp)

ITEM	UNIT	LOCAL	FOREIGN	TOTAL
Superstructure (Timber;Span 3m;10T)	m2	33,858	2,998	36,856
Superstructure (Timber;Span 5m;10T)	m2	37,503	3,311	40,814
Superstructure (Timber;Span 8m;10T)	m2	49,673	4,351	54,024
Superstructure (Timber;Span 3m;BM50)	m2	41,982	3,707	45,689
Superstructure (Timber;Span 5m;BM50)	m2	45,832	4,019	49,851
Superstructure (Timber;Span 8m;BM50)	m2	58,127	5,088	63,215
Superstructure (Concrete;Span 3m;BM50)	m2	57,023	106,749	163,772
Superstructure (Concrete;Span 5m;BM50)	m2	59,754	119,370	179,124
Superstructure (Concrete;Span 8m;BM50)	m2	62,462	130,068	192,530
Superstructure (Concrete;Span10m;BM50)	m2	68,766	147,794	216,560
Superstructure (Concrete;Span15m;BM50)	m2	75,968	174,184	250,152
Substructure (Pier;for Timber;10T)	NO	294,975	27,724	322,699
Substructure (Abut;for Timber;10T)	NO	1,048,856	112,169	1,161,025
Substructure (Pier;for Timber;BM50)	NO	433,827	41,015	474,842
Substructure (Abut;for Timber;BM50)	NO	1,153,708	126,412	1,280,120
Substructure (Pier;for Concrete;BM50)	NO	2,075,750	477,264	2,553,014
Substructure (Abut;for Concrete;BM50)	NO	4,811,586	920,351	5,731,937
Demolition of Bridge (Timber->Timber)	m2	10,707	1,061	11,768
Demolition of Bridge (Timber->Concrete)	m2	10,707	1,061	11,768
Demolition of Bridge (Concrete)	m2	105,087	79,667	184,754
Maintenance of Timber Bridge (New)	m2	6,631	1,009	7,640
Maintenance of Concrete Bridge (New)	m2	2,754	3,061	5,815
Maintenance of Timber Bridge (Exist)	m2	8,025	2,347	10,372
Maintenance of Concrete Bridge (Exist)	m2	5,260	2,455	7,715

Chapter 5 RESULTS OF ECONOMIC FEASIBILITY EVALUATION

5.1 Preliminary Screening

The road links to be improved should be effective for development of the Project Area. The road links where improvements were assumed to be inefficient for development of the Project Area were generally screened out using the following cut-off criteria.

(1) Very short roads, less than 2 Km long, which have no connection with the trunk road network.

(2) Roads not connected to the network at any point

(3) Unpreferred roads, due to poor suitability for transportation compared to other existing alternative roads serving the same purpose.

(4) Road in good condition according to the Bina Marga road inventory which lists improvement projects carried out in the last two or three years

(5) Roads with asphalt surface in good condition

(6) Urban roads, except those forming part of a longer route

(7) Roads serving single large organizations rather than the general public

(8) Roads with no inventory data

(9) Kabupaten roads also assigned as provincial roads

The road links to be screened out in Kabupaten Kotawaringin Timur are shown in Table 5-1-1.

Table 5-1-1 ROAD LINKS TO BE SCREENED OUT

KABUPATEN : KOTAWARINGIN TIMUR

CRITERIA NO	ROAD LINK NO
-	-

5.2 Evaluation

5.2.1 Primary Analysis

The Kabupaten roads were classified by using the future traffic volume on the road links in 1998. The primary analysis of the IRR was carried out using the construction and maintenance costs. Road links where IRRs were more than 10% were defined as feasible links.

Results of primary analysis are shown in Table 5-2-1.

5.2.2 Secondary Analysis

From the infeasible road links evaluated by the primary analysis, road links where the IRRs were between 1% and 10%, i.e. road links which could become feasible if down graded by one rank, in classification were down graded and the costs re-estimated. Using these costs, a secondary analysis of IRR was carried out. Road links where these IRRs were then more than 10% were also defined as feasible links. This reflected that even though the road classification was rather low the road link should be improved.

Results of secondary analysis are shown in Table 5-2-2.

5.2.3 Ranking of Feasible Road Links

From the results of the primary and secondary analysis, road links where the IRRs were more than 10% were selected and their NPVs and B/Cs were estimated. The ranking of feasible road links from the economic evaluation are decided in the order of the NPVs, i.e. the larger the NPV the higher the road link priority as shown in Table 5-2-3.

Table 5-2-1 RESULTS OF PRIMARY ANALYSIS

PROVINCE : KALIMANTAN TENGAH KABUPATEN : KOTA WARINGIN TIMUR

LINK NO	LENGTH	CLASS	IRR(%)	REMARK
3	65 Km	IIIA	1.223	Surplus
2	3 Km	IIIC	0.078	Surplus
1	12 Km	IIIC	0.078	Surplus
4	71 Km	IIIB-2	0.078	Surplus
5	18 Km	IIIC	0.078	Surplus
6	9 Km	IIIC	0.078	Surplus
7	25 Km	IIIB-2	0.078	Surplus
8	5 Km	IIIC	0.078	Surplus
9	40 Km	IIIC	0.078	Surplus
10	10 Km	IIIC	0.078	Surplus
11	10 Km	IIIC	0.078	Surplus
12	45 Km	IIIC	0.078	Surplus
13	7 Km	IIIC	0.078	Surplus
14	10 Km	IIIC	0.078	Surplus
15	14 Km	IIIC	0.078	Surplus

Table 5-2-2 RESULTS OF SECONDARY ANALYSIS

PROVINCE : KALIMANTAN TENGAH KABUPATEN : KOTA WARINGIN TIMUR

LINK NO	LENGTH	CLASS	IRR(%)	REMARK
3	65 Km	IIIB-1	2.157	Surplus

Table 5-2-3 RANKING OF FEASIBILITY ROAD LINKS

Nil

Chapter 6 IMPLEMENTATION PROGRAMME

6.1 Implementation Schedule

6.1.1 Project Cost

The total Project Cost for the Kabupaten is composed of the cost of construction and maintenance, supplementation as described later, and workshop, laboratory and survey equipment. The total Project Cost for the Kabupaten is summarized in Table 6-1-1.

Table 6-1-1 TOTAL PROJECT COST (1)

KABUPATEN: Kotawaringin Timur

(Rpx10^6)

COST	FOREIGN CURRENCY	LOCAL CURRENCY	TOTAL
CONSTRUCTION	1,032	1,529	2,561
MAINTENANCE	34	540	574
SUPPLEMENTATION	460	-	460
WORKSHOP EQUIPMENT & TOOLS	28	-	8
LABORATORY EQUIPMENT	12	-	12
SURVEY EQUIPMENT	5	-	5
TOTAL	1,571	2,069	3,640

The total Project Cost can be divided into costs as shown in Table 6-1-2.

Table 6-1-2 TOTAL PROJECT COST (2)

(Rpx10^6)

COST	FOREIGN CURRENCY	LOCAL CURRENCY	TOTAL
CIVIL WORK	767	2,060	2,827
CONSTRUCTION & MAINTENANCE EQUIPMENT	721	-	721
SPARE PARTS	38	9	47
WORKSHOP/LABORATORY/SURVEY EQUIPMENT	45	-	45
TOTAL	1,571	2,069	3,640

The cost for civil work is composed of the cost of labour and materials, operation cost excluding spare parts, indirect cost and transportation cost of equipment, and ownership cost for existing equipment.

6.1.2 Proposed Road Links

(1) Road Link to be Improved

The road links to be improved were generally selected taking into consideration the following criteria:

(1) Feasible road links
- Feasible road links from the primary evaluation
- Feasible road links from the secondary evaluation

(2) Road links selected from the engineering points of view

(3) Road links selected because of basic human needs.

The final proposal to be improved in the Kabupaten are the 7 links with the total length of 154 km which is 45% of the 344 km total length of Kabupaten roads studied. The proposed road links are shown in Table 6-1-3.

Table 6-1-3 ROAD LINKS TO BE IMPROVED

KABUPATEN : KOTAWARINGIN TIMUR

REASON FOR SELECTION	ROAD LINK NO
Feasible	
- Primary	-
- Secondary	-
Engineering Point of View	-
Basic Human Needs	1,5,6,7,8,9,12

As the table shows there are no feasible road links from the economic evaluation. Therefore the following minimum required road links are selected regardless of any result of economic evaluation from the view point of basic human needs:

- Road links which connect the Kabupaten capital with the Kecamatan capital provided the population density of the Kecamtan is greater than the mean for the Kabupaten; and
- Road links connecting isolated Kabupaten or Kecamatan capital to a trunk road.

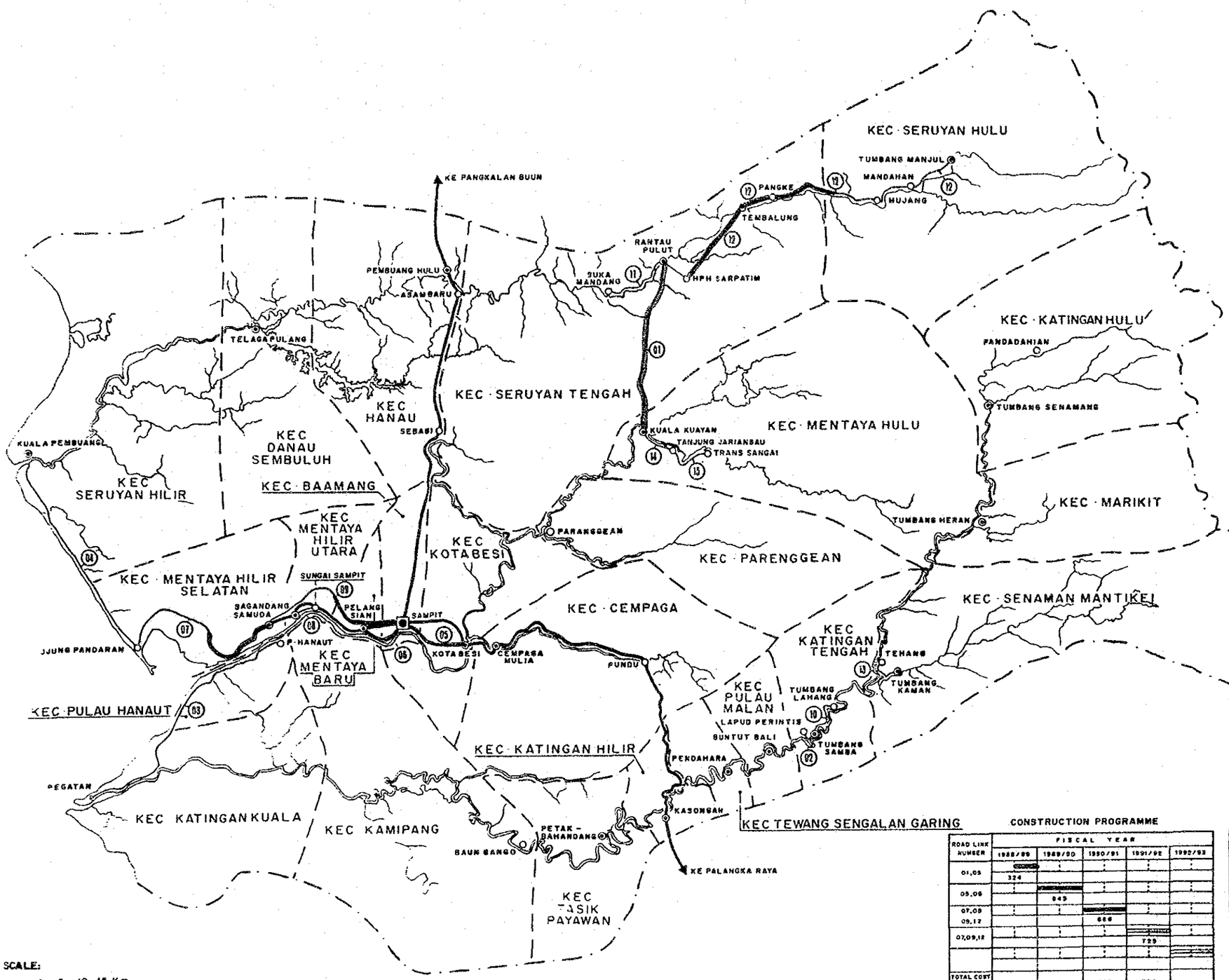
The order of proceeding with the improvement of the proposed road links are decided as shown in Table 6-1-4.

Table 6-1-4 ROAD LINKS TO BE IMPROVED BY YEAR

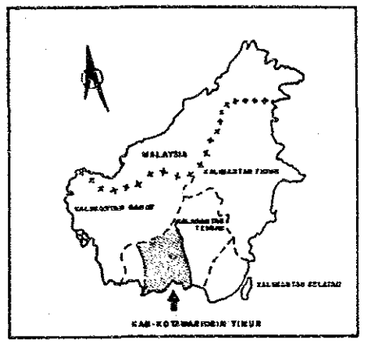
PROV : KALIMANTAN TENGAH KAB : KOTA WARINGIN TIMUR

YEAR	LINK NO ( ) : rate
1988 :	1, 5 (25%)
1989 :	5 (75%), 6
1990 :	7 (50%), 8, 9 (50%), 12 (50%)
1991 :	7 (50%), 9 (50%), 12 (50%)
1992 :	

KAB · KOTAWARINGIN TIMUR



LOCATION MAP



LEGEND :

- KABUPATEN CAPITAL
- KECAMATAN CAPITAL
- OTHER CITY
- LINK NUMBER
- PROVINCIAL BOUNDARY
- KABUPATEN BOUNDARY
- KECAMATAN BOUNDARY
- NATIONAL ROAD
- PROVINCIAL ROAD
- KABUPATEN ROAD
- VILLAGE ROAD
- RIVER

CONSTRUCTION PROGRAMME

ROAD LINK NUMBER	FISCAL YEAR 1988/89	1989/90	1990/91	1991/92	1992/93
01,05	324				
05,06		645			
07,08					
09,12			658		
02,09,12				729	
TOTAL COST (10^6 Rp)	324	645	658	729	

THE FEASIBILITY STUDY OF THE LOCAL ROAD DEVELOPMENT IN THE REPUBLIC OF INDONESIA

TITLE : CONSTRUCTION PROGRAMME

SOURCE:	SCALE:	PROVINCE: KALIMANTAN TENGAH
DIREKTORAT JENDERAL CIPTA KARYA	AS SHOWN	KABUPATEN: KOTAWARINGIN TIMUR

(2) Road Links to Be Maintained

It is desirable that all Kabupaten roads are maintained. However, because of the limited budget it is inevitable that some road links in the Kabupatens will be left without maintenance for the time being. The budget should be used for those which are effective in producing more useful development of the Kabupaten through the road development project. The road links to be maintained are finally proposed as shown in Table 6-1-5.

Table 6-1-5 ROAD LINKS TO BE MAINTAINED

PROV : KALIMANTAN TENGAH KAB : KOTA WARINGIN TIMUR

(1000Rp)

LINK NO	LENGTH (Km)	BA (%)	SD (%)	RU (%)	RB (%)	ASPHAL (Km)	GRAVEL (Km)	EARTH (Km)	TN NO	AREA (m2)	RC NO	AREA (m2)	BRIDGE COST	LOCAL COST	FOREIGN COST	TOTAL COST
5	18	8.9	33.9	42.2	15.0	0	0	18	0	0.00	0	0.00	0	4,513	813	5,326
6	9	14.4	34.4	46.7	4.4	0	0	9	0	0.00	0	0.00	0	2,257	407	2,664
7	25	25.4	46.2	28.4	0.0	0	0	25	10	480.00	0	0.00	4,979	10,121	2,256	12,377
8	5	16.0	32.0	46.0	6.0	0	0	5	0	0.00	0	0.00	0	1,254	226	1,480
9	40	10.5	48.8	37.8	3.0	0	40	0	1	39.00	0	0.00	405	42,423	2,088	44,511
11	10	22.0	31.0	38.0	9.0	0	10	0	0	0.00	0	0.00	0	10,528	499	11,027
12	45	17.8	58.7	23.1	0.4	0	45	0	0	0.00	0	0.00	0	47,374	2,246	49,620
14	10	34.0	34.0	32.0	0.0	0	10	0	3	186.00	0	0.00	1,929	12,020	936	12,956
15	14	37.1	30.0	32.9	0.0	0	14	0	0	0.00	0	0.00	0	14,739	699	15,438
SUM	176					0	119	57	14	705.00	0	0.00	7,312	145,229	10,170	155,399

6.1.3 Annual Construction and Maintenance Cost

The annual allocation of the total construction and maintenance cost in the four years programme for Kabupaten Kotawaringin Timur is finally recommended as shown in Tables 6-1-6 (1), (2) and (3) for the construction, maintenance and total respectively.

The proposed construction cost is Rp 2,561 x 10^6 and maintenance cost is Rp 574 x 10^6 which is approximately 18% of the total expenditure.

Table 6-1-6 (1) CONSTRUCTION AND MAINTENANCE COST

(CONSTRUCTION)

PROV : KALIMANTAN TENGAH KAB : KOTA WARINGIN TIMUR

(UNIT : 1000Rp)

ITEM	(1988)	(1989)	(1990)	(1991)	(1992)	(TOTAL)	
LOCAL CURRENCY :	203,061	411,531	491,873	401,585	0	1,508,050	(58.9%)
Ownership Cost	1,767	2,939	4,419	3,746	0	12,871	(0.9%)
Operation Cost	73,885	124,123	180,185	152,714	0	530,907	(35.2%)
Material Cost	79,053	191,018	196,058	156,727	0	622,856	(41.3%)
Labour Cost	21,870	39,773	47,054	36,017	0	144,714	(9.6%)
Contingency	26,486	53,678	64,157	52,381	0	196,702	(13.0%)
FOREIGN CURRENCY :	120,931	233,690	374,876	323,066	0	1,052,563	(41.1%)
Ownership Cost	34,195	57,790	86,698	73,989	0	252,672	(24.0%)
Operation Cost	4,716	7,674	11,654	9,992	0	34,036	(3.2%)
Material Cost	66,246	137,745	227,627	196,946	0	628,564	(59.7%)
Labour Cost	0	0	0	0	0	0	(0.0%)
Contingency	15,774	30,481	48,897	42,139	0	137,291	(13.0%)
TOTAL COST :	323,992	645,221	866,749	724,651	0	2,560,613	
Ownership Cost	35,962	60,729	91,117	77,735	0	265,543	(10.4%)
Operation Cost	78,601	131,797	191,839	162,706	0	564,943	(22.1%)
Material Cost	145,299	328,763	423,685	353,673	0	1,251,420	(48.9%)
Labour Cost	21,870	39,773	47,054	36,017	0	144,714	(5.7%)
Contingency	42,260	84,159	113,054	94,520	0	333,993	(13.0%)

(Contingency : 15%)

Table 6-1-6 (2) CONSTRUCTION AND MAINTENANCE COST

(MAINTENANCE)

PROV : KALIMANTAN TENGAH KAB : KOTA WARINGIN TIMUR

(UNIT : 1000Rp)

ITEM	(1988)	(1989)	(1990)	(1991)	(1992)	(TOTAL)	
LOCAL CURRENCY :	72,323	155,035	153,892	158,530	0	539,780	(94.1%)
Ownership Cost	157	322	286	291	0	1,056	(0.2%)
Operation Cost	14,021	28,584	25,517	25,910	0	94,032	(17.4%)
Material Cost	47,266	103,987	108,355	112,292	0	371,900	(68.9%)
Labour Cost	10,879	22,142	19,734	20,037	0	72,792	(13.5%)
FOREIGN CURRENCY :	5,032	10,259	9,135	9,271	0	33,697	(5.9%)
Ownership Cost	4,470	9,115	8,123	8,244	0	29,952	(88.9%)
Operation Cost	484	988	884	899	0	3,255	(9.7%)
Material Cost	78	156	128	128	0	490	(1.5%)
Labour Cost	0	0	0	0	0	0	(0.0%)
TOTAL COST :	77,355	165,294	163,027	167,801	0	573,477	
Ownership Cost	4,627	9,437	8,409	8,535	0	31,008	(5.4%)
Operation Cost	14,505	29,572	26,401	26,809	0	97,287	(17.0%)
Material Cost	47,344	104,143	108,483	112,420	0	372,390	(64.9%)
Labour Cost	10,879	22,142	19,734	20,037	0	72,792	(12.7%)

Table 6-1-6 (3) CONSTRUCTION AND MAINTENANCE COST

(TOTAL)

PROV : KALIMANTAN TENGAH KAB : KOTA WARINGIN TIMUR

(UNIT : 1000Rp)

ITEM	(1988)	(1989)	(1990)	(1991)	(1992)	(TOTAL)	
LOCAL CURRENCY :	275,384	566,566	645,765	560,115	0	2,047,830	(65.3%)
Ownership Cost	1,924	3,261	4,705	4,037	0	13,927	(0.7%)
Operation Cost	87,906	152,707	205,702	178,624	0	624,939	(30.5%)
Material Cost	126,319	295,005	304,413	269,019	0	994,756	(48.6%)
Labour Cost	32,749	61,915	66,788	56,054	0	217,506	(10.6%)
Contingency	26,486	53,678	64,157	52,391	0	196,702	(9.6%)
FOREIGN CURRENCY :	125,963	243,949	384,011	332,337	0	1,086,260	(34.7%)
Ownership Cost	38,665	66,905	94,821	82,233	0	282,624	(26.0%)
Operation Cost	5,200	8,662	12,538	10,891	0	37,291	(3.4%)
Material Cost	66,324	137,901	227,755	197,074	0	629,054	(57.9%)
Labour Cost	0	0	0	0	0	0	(0.0%)
Contingency	15,774	30,481	48,897	42,139	0	137,291	(12.6%)
TOTAL COST :	401,347	810,515	1,029,776	892,452	0	3,134,090	
Ownership Cost	40,589	70,166	99,526	86,270	0	296,551	(9.5%)
Operation Cost	93,106	161,369	218,240	189,515	0	662,230	(21.1%)
Material Cost	192,643	432,906	532,168	466,093	0	1,623,810	(51.8%)
Labour Cost	32,749	61,915	66,788	56,054	0	217,506	(6.9%)
Contingency	42,260	84,159	113,054	94,520	0	333,993	(10.7%)

(Contingency : 15%)

6.1.4 Construction and Maintenance Equipment Cost

(1) Required Number of Equipment

The required numbers of construction equipment for Kabupaten Kotawaringin Timur are estimated from the annual proposed construction quantities as shown in Table 6-1-7.

The proposed numbers of equipment to be purchased are finally decided considering the following number of existing equipment in the Kabupaten which are available for the Project.

- 2-Hand-guided Vibratory Roller
- 2-Steel Roller

The proposed numbers of maintenance equipment have been decided as shown below from the proposed annual maintenance volume taking into account the capacity of the proposed maintenance gangs.

a. Equipment for Road Maintenance

- 1-Motor Grader 75 HP
- 1-Tire Roller 8-15 Ton
- 1-Dump Truck 3 Ton
- 1-Hand Guided Vibratory Roller 1000 Kg
- 1-Flat Bed Truck 3 Ton

b. Equipment for Bridge Maintenance

- 1-Flat Bed Truck with Grane 3 Ton

(2) Equipment Cost

The proposed construction and maintenance equipment and their purchase costs are shown in Table 6-1-8. In the Project the supplementation cost or equipment cost supplemented is the difference between the purchase cost for newly supplied equipment and the depreciated value.

This comes about because full depreciated of the supplied equipment would not be completed within Project Period of 5 years.

Table 6-1-7 REQUIRED NUMBER OF EQUIPMENT

PROV : KALIMANTAN TENGAH KAB : KOTA WARINGIN TIMUR

EQUIPMENT NAME	WORKABLE	EXISTING	(1988)	(1989)	(1990)	(1991)	(1992)
Bulldozer	230	0	0.25	0.47	0.83	0.75	0.00
Bulldozer/Ripper	230	0	0.30	0.21	0.57	0.52	0.00
Swamp Bulldozer	230	0	0.09	0.27	0.06	0.02	0.00
Motor Grader	250	0	0.67	0.95	1.85	1.65	0.00
Road Stabilizer	230	0	0.25	0.47	0.83	0.75	0.00
Hand-guide Vib. Roller	250	2	0.05	0.27	0.16	0.00	0.00
Tire Roller	230	0	0.00	0.00	0.00	0.00	0.00
Vibratory Roller (D&T)	250	0	0.61	1.07	1.65	1.44	0.00
Hydraulic Excavator; Wheel	230	0	0.49	1.47	0.49	0.17	0.00
Wheel Loader	250	0	0.60	0.84	1.67	1.50	0.00
Water Tank Truck	250	0	0.40	0.86	1.24	1.08	0.00
Dump Truck	250	0	4.34	6.50	10.26	8.76	0.00
Flat Bed Truck with Crane	250	0	0.04	0.21	0.12	0.00	0.00
Flat Bed Truck	250	0	0.35	0.74	1.20	1.03	0.00
Concrete Mixer	230	0	0.02	0.09	0.05	0.00	0.00
Water Pump	230	0	0.02	0.07	0.04	0.00	0.00
Concrete Vibrator	230	0	0.01	0.04	0.03	0.00	0.00
Asphalt Sprayer	230	0	0.00	0.00	0.00	0.00	0.00

NOTE WORKABLE : workable days in a year
EXISTING : number of existing equipment

Table 6-1-8 EQUIPMENT PURCHASE COST

PROV : KALIMANTAN TENGAH KAB : KOTA WARINGIN TIMUR

(1000 Rp)

EQUIPMENT NAME	CLASS	CIF (JAKARTA)	PURCHASE NO.	PURCHASE COST
Bulldozer	90 HP	49,150	1	49,150
Bulldozer/Ripper	90 HP	53,000	-	-
Swamp Bulldozer	90 HP	52,850	1	52,850
Swamp Bulldozer	65 HP	40,500	-	-
Motor Grader	75 HP	47,800	2	95,600
Road Stabilizer	W=1850 mm	85,950	1	85,950
Hand-guide Vib. Roller	1000 Kg	8,500	-	-
Tire Roller	8-15 ton	31,070	1	31,070
Vibratory Roller (D&T)	4 ton	29,000	-	-
Vibratory Roller	4 ton	29,000	-	-
Rough Terrain Crane	10 ton	100,400	-	-
Hydraulic Excavator; Wheel	0.3 m3	41,100	1	41,100
Wheel Loader	1.2 m3	70,200	2	140,400
Water Tank Truck	4000 ltr.	12,750	1	12,750
Dump Truck	3.0 ton	14,700	9	132,300
Dump Loader Truck	12 ton	56,300	-	-
Flat Bed Truck with Crane	3.0 ton	25,190	1	25,190
Flat Bed Truck	3.0 ton	11,275	2	22,550
Portable Crusher/Screening	30-40 t/h	188,000	-	-
Concrete Mixer	0.5 m3	18,000	-	-
Water Pump	200 l/min	630	-	-
Concrete Vibrator	3.3 HP	740	-	-
Asphalt Sprayer	850 ltr.	10,200	-	-
Service Car	3 ton	11,600	1	11,600
4 Wheel Drive Vehicle	70 HP	17,500	1	17,500
Motorcycle	100 cc	1,100	3	3,300

PURCHASE COST TOTAL	721,310
OWNERSHIP COST (FOREIGN)	261,389
EQUIPMENT COST SUPPLEMENTED	459,921

NOTE : OWNERSHIP COST (FOREIGN) for Existing Equipment

Hand-guide Vib. Roller	595
Vibratory Roller (D&T)	20,640
TOTAL	21,235

6.1.5 Other Costs

Cost other items includes the costs of workshop equipment and tools, laboratory test equipment and survey equipment which are recommended in Sub-Clause 3.5. These total costs are summarized in Table 6-1-1.

6.1.6 Quantities by Work Type

The annual construction and maintenance quantities for all proposed road links are shown in Table 6-1-9.

Table 6-1-9

CONSTRUCTION QUANTITIES FOR ALL PROPOSED LINKS

PROV : KALIMANTAN TENGAH KAB : KOTA WARINGIN TIMUR

ITEM	UNIT	(1988)	(1989)	(1990)	(1991)	(1992)	(TOTAL)
Site Clearance in Light Bush	m2	0.00	0.00	0.00	0.00	0.00	0.00
Subgrade Preparation	m2	27000.00	135000.00	121550.00	91550.00	0.00	375100.00
Normal Fill	m3	0.00	0.00	0.00	0.00	0.00	0.00
Fill in Swamp	m3	3600.00	10800.00	2295.00	435.00	0.00	17130.00
Normal Excavation to Spoil	m3	561.00	2433.00	1447.00	1030.00	0.00	5471.00
Cement Stabilizing	m3	3750.00	12960.00	12662.00	10262.00	0.00	39634.00
Cement Stabilizing	m3	2880.00	0.00	10200.00	10200.00	0.00	23280.00
Shoulder	m2	93000.00	54000.00	180000.00	165000.00	0.00	492000.00
Asphalt Patching	m2	0.00	0.00	0.00	0.00	0.00	0.00
Surface Dressing (Single)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Surface Dressing (Double)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Earth Drain	m	6750.00	7050.00	6100.00	4500.00	0.00	24400.00
Earth Drain in Swamp (by machine)	m3	9000.00	27000.00	9000.00	3000.00	0.00	48000.00
Pipe Culvert D80cm	m	54.00	288.00	168.00	0.00	0.00	510.00
Masonry Culvert (80x80cm)	m	0.00	0.00	0.00	0.00	0.00	0.00
Retaining Wall and Wing Wall (Timber)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Retaining Wall and Wing Wall (Masonry)	m3	19.20	115.20	64.00	0.00	0.00	198.40
Gabion Protection	m3	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Timber;Span 3m;10T)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Timber;Span 5m;10T)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Timber;Span 8m;10T)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Timber;Span 3m;BM50)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Timber;Span 5m;BM50)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Timber;Span 8m;BM50)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Concrete;Span 3m;BM50)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Concrete;Span 5m;BM50)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Concrete;Span 8m;BM50)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Concrete;Span10m;BM50)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Concrete;Span15m;BM50)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Substructure (Pier;for Timber;10T)	NO	0.00	0.00	0.00	0.00	0.00	0.00
Substructure (Abut;for Timber;10T)	NO	0.00	0.00	0.00	0.00	0.00	0.00
Substructure (Pier;for Timber;BM50)	NO	0.00	0.00	0.00	0.00	0.00	0.00
Substructure (Abut;for Timber;BM50)	NO	0.00	0.00	0.00	0.00	0.00	0.00
Substructure (Pier;for Concrete;BM50)	NO	0.00	0.00	0.00	0.00	0.00	0.00
Substructure (Abut;for Concrete;BM50)	NO	0.00	0.00	0.00	0.00	0.00	0.00
Demolition of Bridge (Timber->Timber)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Demolition of Bridge (Timber->Concrete)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Demolition of Bridge (Concrete)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Manual routine maintenance of road	Km	86.88	176.75	158.00	160.50	0.00	582.13
Routine maintenance of earth road	Km	27.38	45.75	21.25	18.75	0.00	113.13
Routine maintenance of gravel road	Km	59.50	131.00	136.75	141.75	0.00	469.00
Routine maintenance of asphalt road	Km	0.00	0.00	0.00	0.00	0.00	0.00
Maintenance of Timber Bridge (New)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Maintenance of Concrete Bridge (New)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Maintenance of Timber Bridge (Exist)	m2	352.50	705.00	575.25	575.25	0.00	2208.00
Maintenance of Concrete Bridge (Exist)	m2	0.00	0.00	0.00	0.00	0.00	0.00

6.2 Organization and Construction System

6.2.1 Organization

The Bupati as head of the Kabupaten has been authorized by Law No. 13, 1980 as an official responsible for the Local Road Development Project implementation. This means that the DPUK is considered as a responsible agency for the actual execution of the Project.

According to instruction letter dated June 24, 1982 Ref. No. 620/975-/BANGDA, the Project Manager appointed by the Bupati will be responsible for the operation and maintenance of the equipment. Accordingly the Equipment Coordinator appointed from the staff of the Regional Public Works (Kantor Wilayah) by Bina Marga as a coordinator between the Governor and the Bupati will be responsible for delivery, effectual utilization and maintenance of the equipment.

The standard organization of DPUK consists of a minimum of four sections, i.e. Road Section, Housing and City Planning Section, Irrigation Section and Administration Section. For execution of the Project it is strongly recommended that the structural organization of DPUK is established. It will be necessary not only to organize new sections but also to reorganize the current structure through a review of the roles and responsibilities of each inter-related section.

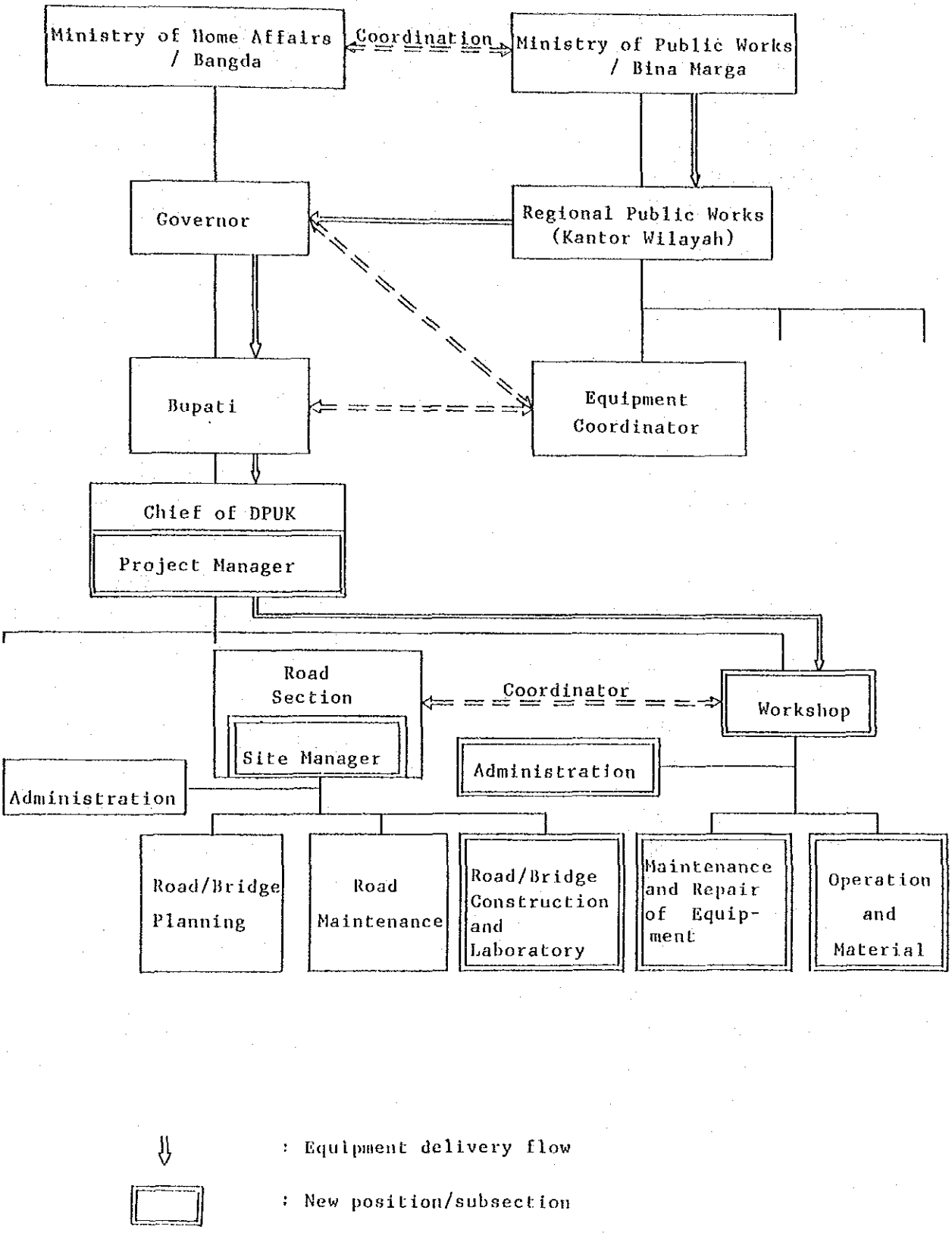
It is recommended that the workshop is newly organized to consist of three sub-sections, i.e. maintenance and repair of equipment, operation and materials, and administration to execute the main tasks described in Clause 3.5.

The sub-section of laboratory would be under the relevant Road Section. The proposed organization is shown in Fig. 6-2-1.

6.2.2 Construction System

For the construction of Kabupaten roads with a ten year effective design life, it has been recommended in Clause 3.4 that the equipment intensive method should be adopted for earth work and pavement work with the exception of surface dressing.

Fig. 6-2-1 PROPOSED ORGANIZATION



Current road construction in the Kabupatens is obliged to rely upon the traditional labour intensive method. It is therefore assumed that both the DPUK and the local contractors in the Kabupatens do not have sufficient experience and technique for the equipment intensive method of road construction.

For realization of the Local Road Development Project the GOI has ensured availability of the required human resources of DPUK and intends to conduct training programmes for those human resources as described in Clause 8.3 of the Main Report. This means that the GOI intends the Kabupatens to have the ability to execute the Project by force account (Swakelola).

It should be recognized from the experiences in the first local road project, which was assisted by OECF, ADB and IBRD, that because of their poor construction management and traditional labour intensive methods most of the road construction by local contractors could not be completed within the contract periods. Therefore execution of the road improvement by force account is desirable as recommended from their experience by the consultants for the first local road project.

It is strongly recommended that except for labourers the staff of the force account team should not be hired by the day as it would then not be able to consolidate the foundations for development of self reliability.

However, it will be very difficult to execute all the Projects by force account because of the need for many Kabupaten staff. The GOI has emphasized the need to promote the employment of local weak contractors in order to up-grade their capability in the road project schemes within the Fourth Five-Year Plan (REPELITA)

Taking into consideration the conditions mentioned above it is strongly recommended that the DPUK is obliged to lend some equipment with skilled operators to the local contractors in the Kabupatens for the execution of a part of the road improvement works.

The types of work executed only by force account are recommended as follows:

- Routine maintenance work for the Kabupaten roads
- Laboratory tests
- Production of crushed stone
- Technical service for the equipment

APPENDIX

Appendix 1

INPUT DATA

FOR ESTIMATION OF THE PRODUCER'S SURPLUS BENEFIT

PRV. : KALIMANTAN TENGAH KAB. : KOTA WARINGIN TIMUR SURVEY YEAR: 1984

Code No.	KECAMATAN NAME	CULTIVATED AREA : (PA)	YIELD RATE : (Y)	FARMER'S POPULATION : (AP)	CIRCULATED COMMODITY : (PG)
01	KOTA BESI	0	0	0	0
02	CEMPAGA	0	0	0	0
03	MENTAYA HULU	0	0	0	0
04	PERENGGEAN	0	0	0	0
05	BAAMANG	1,160	2.61	16,100	0
06	KETAPANG	1.751	2.36	34.070	0
07	KATINGAN KUALA	2,320	2.37	8,900	0
08	MENTAYA HILIR SELATAN	2.164	2.58	15,100	0
09	SERUYAN HILIR	0	0	0	0
10	PULAU HANAUT	2,235	2.42	7.530	0
11	DANAU SEMBULUH	0	0	0	0
12	HANAU	0	0	0	0
13	SERUYAN TENGAH	0	0	0	0
14	SERUYAN HULU	0	0	0	0
15	MENTAYA HILIR UTARA	0	0	0	0
16	TASIK PAYAMAN	0	0	0	0
17	KAMIPANG	0	0	0	0
18	KATINGAN HILIR	0	0	0	0
19	T. SENGALAN GARING	0	0	0	0
20	PULAU MALAU	0	0	0	0
21	KATINGAN TENGAH	0	0	0	0
22	SENAMAN MANTIKEI	0	0	0	0
23	MARIKIT	0	0	0	0
24	KATINGAN HULU	0	0	0	0

	r_1	r_2	r_3	r_4
ANNUAL AVERAGE GROWTH RATE %	2.8	1.7	4.0	6.2

FARMER'S CONSUMPTION : (Cp)	NON-AGRO REQUIRMENT : (NG)
0.17 Ton/head/year	0.12 Ton/ton

	SEDAN	BUS	TRUCK	MOTOR CYCLE
RATE OF EACH VEHICLE TYPE %	3.39	0.00	6.21	90.40

AVERAGE FREIGHT TONAGE	0.7 Ton/Truck

Appendix A-2 Engineering Data

ROAD LINK DATA

PROVINCE :Kalimantan Tengah

KABUPATEN:Kota Waringin Timur

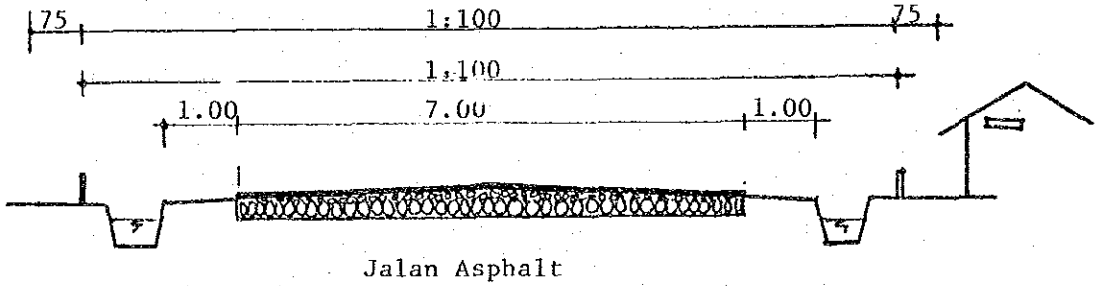
LINK NO.	BEGINNING POINT (DESA NAME)	END POINT (DESA NAME)	LENGTH (KM)	THROUGH THE KEC. NAME & LENGTH		REMARKS
				KEC. NAME	LENGTH (KM)	
01	Kuala Kuayan	Rantau Pulut	12	Mentaya Hulu	3	1
				Seruyan Tgh	9	
02	Tambang Samba	Lapud Perintis	3	Katingan Tengah	3	1
03	Pegatan	P.Hanaut	65	Ktn.Kuala	27.5	2
				P.Hanaut	37.5	
04	Ujung Pandaran	Kuala Pembuang	71	Mentaya.H.Sel	51	
				Seruyan Hilir	20	
05	Sampit	Kotabesi	18	Kota besi	13	
				Baamang	5	
06	Sampit	Pelangsian	9	Baamang	4.5	1
				Ktg.Mentaya B	4.5	
07	Samuda	Ujung Pandaran	25	Mentaya Hilir Selatan	25	
08	Sungai Sampit	Bagandang	5	Mentaya Hilir Utara	5	1
09	Sampit	Samuda	40	Baamang	5	
				Mentaya Baru	10	
				Mentaya Hilir Utara	25	
10	Tumbang Samba	Tumbang Lahang	10	Kantingan Tengah	10	
11	Suka Mandang	Tumbang Manjul	10	Seruyan Tengah	10	
12	HPH Sarpatim	Rantau Pulut	45	Seruyan Teng	25	
				Seruyan Hulu	20	
13	Tumbang Kaman	Tehang	7	Senaman Manti Kei	7	
14	Kuala Kuayan	Tj.Jariangau	10	Mentaya Hulu	10	2
15	Tj.Jariangau	Trans.Sangai	14	Mentaya Hulu	14	2

Please note the priority No. in the Remarks of this list for each links No. according to the each Kabupaten's development plan.

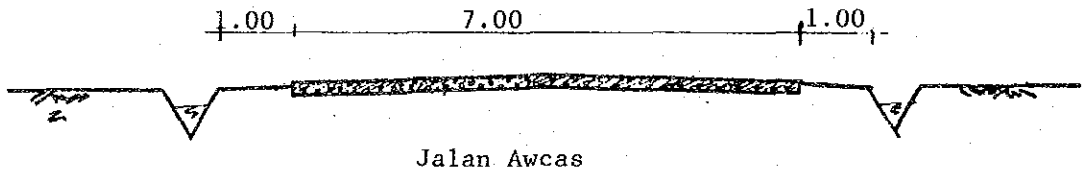
What Kind of Design Criteria has being applied for the new road construction and the improvement for the Kabupaten Road ?
Kriteria Perencanaan yang dipakai pada program penanganan jalan Kabupaten, baik untuk jalan lama maupun pembangunan baru.

Please draw the Typical Cross Section of the Kabupaten Road.
Buat gambar dan penjelasan dari: Typical cross section yang dipakai pada program penanganan jalan selama ini (baik untuk jalan lama, maupun pembangunan baru)

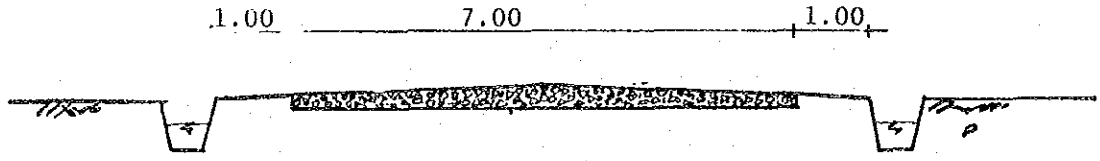
TYPICAL CROSS SECTION.



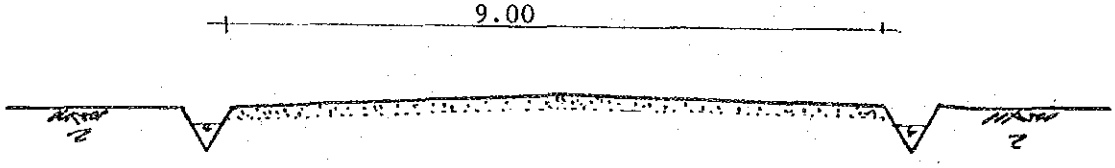
Jalan Asphalt



Jalan Awcas



Jalan Makadam



Jalan Tanah

PROPINSI: Kalimantan Tengah

E-03-(1)

KABUPATEN: Kotawaringin Timur

LOCATION AND COSTS OF THE KABUPATEN ROADS CONSTRUCTED OR INPROVED IN 1980/1981

Biaya konstruksi penanganan jalan dan jembatan Kabupaten thn. 1980/1981

LINK NO : Nomor Ruas	L O C A T I O N From - To (dari - ke)	Lebar perkerasan(m) / Lebar Jembatan	Type perkerasan / Type Jembatan	LENGTH Panjang (KM)	COSTS Harga (Rp 10^6)	REMARKS Keterangan

* PAVEMENT TYPE : Pls note the appropriate No. below.

1. : Asphalt surface / penetrasi macadam
2. : Asphalt seal / pelaburan aspal
3. : Gravel / kerikil
4. : Gravel /AWCAS / kerikil / japat

PROPINSI: Kalimantan Tengah

KABUPATEN: Kotawaringin Timur

LOCATION AND COSTS OF THE KABUPATEN ROADS CONSTRUCTED OR INPROVED IN 1981/1982

Biaya konstruksi penanganan jalan dan jembatan Kabupaten thn. 1981/1982

LINK NO : Nomor Ruas	LOCATION From - To (dari - ke)	Lebar perkerasan(m) / Lebar Jembatan	Type perkerasan / Type Jembatan	LENGTH Panjang (KM)	COSTS Harga (Rp 10^6)	REMARKS Keterangan
1	Kw.Pembuang-Uj.Pandaran		Earth	43.5	126,478	
2	Pegatan - P.Hanaut		Earth	28	129,060	
3	Pasar Sampit-P.Bagendang		Earth	5	27,533	
4	Sampit - Kota Besi		Earth	17.5	156,056	
5	Samuda-Uj.Pandaran		Earth	18	102,342	
6	Pasar Sampit-P.Pelangsian		Earth	8.604	102,312	

* PAVEMENT TYPE : Pls note the appropriate No. below.

1. : Asphalt surface / penetrasi macadam
2. : Asphalt seal / pelaburan aspal
3. : Gravel / kerikil
4. : Gravel /AWCAS / kerikil / japat

PROPINSI: Kalimantan Tengah

E-03-(3)

KABUPATEN: Kotawaringin Timur

LOCATION AND COSTS OF THE KABUPATEN ROADS CONSTRUCTED OR INPROVED IN 1982/1983

Biaya konstruksi penangánan jalan dan jembatan Kabupaten thn. 1982/1983

LINK NO : Nomor Ruas	LOCATION From - To (dari - ke)	Lebar perkerasan(m) / Lebar Jembatan	Type perkerasan / Type Jembatan	LENGTH Panjang (KM)	COSTS Harga (Rp 10^6)	REMARKS Keterangan
1	Sampit - Samuda		Gravel	21.6	190,000	
2	Suka Mandang-Rantau Pulut		Earth	10	76,000	
3	Tumbang Samba-T.Lahang		Earth	10	76,000	
4	Tbg.Kaman-Tehang		Earth	6,515	47,500	
5	HPH Sarpatim-T.Manjul		Earth	28	190,000	
6	Jembatan Sei Sampit	65	Timber		123,500	

* PAVEMENT TYPE : Pls note the appropriate No. below.

1. : Asphalt surface / penetrasi macadam
2. : Asphalt seal / pelaburan aspal
3. : Gravel / kerikil
4. : Gravel /AWCAS / kerikil / japat

PROPINSI: Kalimantan Tengah

E-03-(4)

KABUPATEN: Kotawaringin Timur

LOCATION AND COSTS OF THE KABUPATEN ROADS CONSTRUCTED OR INPROVED IN 1983/1984

Biaya konstruksi penanganan jalan dan jembatan Kabupaten thn. 1983/1984

LINK NO Nomor Ruas	L O C A T I O N From - To (dari - ke)	Lebar perkerasan(m) / Lebar Jembatan	Type perkerasan / Type Jembatan	LENGTH Panjang (KM)	COSTS Harga (Rp 10^6)	REMARKS Keterangan
1	Kuala Pembuang-Uj.Pandaran	80	Earth+Timber	14.535	190,000	
2	Sampit - Samuda	20	Gravel+Timber	14.4	130,000	
3	Samuda-Uj.Pandaran	40	Earth+Timber	7	60,000	
4	Kw.Kuayan-TJ.Jariangau	39	Earth+Timber	10	83,600	
5	HPH.Sarpatim-Tbg.Manjul	-	Gravel	12	95,000	
6	Tbg.Samba-Lapud Perintis-Tbg.Hiran	-	Gravel	14	95,000	

* PAVEMENT TYPE : Pls note the appropriate No. below.

1. : Asphalt surface / penetrasi macadam
2. : Asphalt seal / pelaburan aspal
3. : Gravel / kerikil
4. : Gravel /AWCAS / kerikil / japat

PROPINSI: Kalimantan Tengah

E-03-(5)

KABUPATEN: Kotawaringin Timur

LOCATION AND COSTS OF THE KABUPATEN ROADS CONSTRUCTED OR INPROVED IN 1984/1985

Biaya konstruksi penanganan jalan dan jembatan Kabupaten thn. 1984/1985

LINK NO Nomor Ruas	L O C A T I O N From - To (dari - ke)	Lebar perkerasan(m) / Lebar Jembatan	Type perkerasan / Type Jembatan	LENGTH Panjang (KM)	COSTS Harga (Rp 10^6)	REMARKS Keterangan

* PAVEMENT TYPE : Pls note the appropriate No. below.

1. : Asphalt surface / penetrasi macadam
2. : Asphalt seal / pelaburan aspal
3. : Gravel / kerikil
4. : Gravel /AWCAS / kerikil / japat

PROPINSI : Kalimantan Tengah

E-04

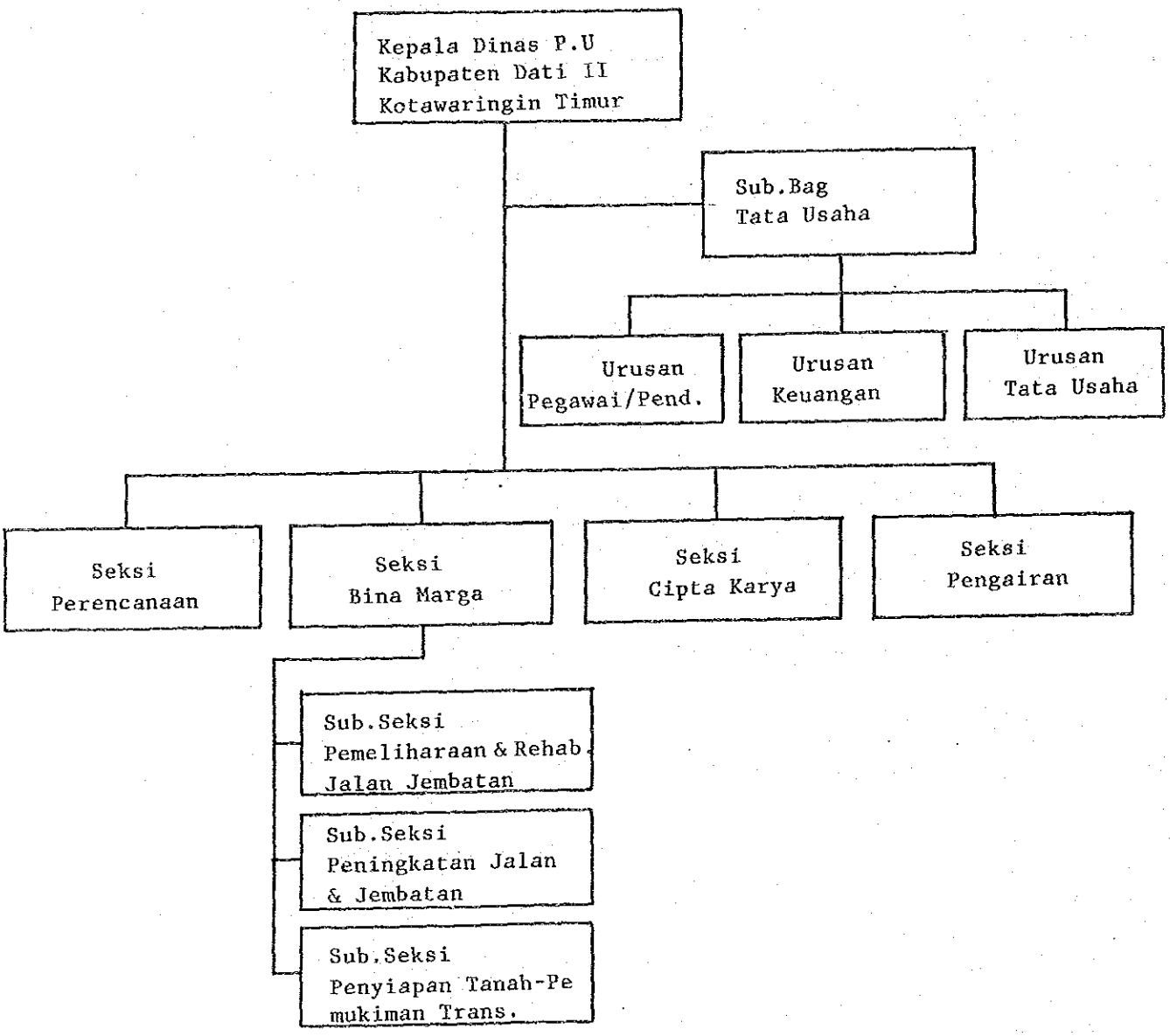
KABUPATEN: Kotawaringin Timur

EXISTING ORGANIZATION IN KABUPATEN

Structur Organisasi yang ada dari P.U Kabupaten

Please draw the Cart of the Existing Organization in the Kabupaten.

Harap digambar bagan organisasi dari DPUK.



EXISTING STAFF RESOURCES OF BINA MARGA OF PU KABUPATEN

Tenaga Dinas PUK yang ada

PROPINSI: Kalimantan Tengah

KABUPATEN: Kotawaringin Timur

DESCRIPTION /Uraian	NUMBER / Jumlah	REMARKS Keterangan
CONTROLING STAFF Staff teknis PUK	(2)	
DPUK ENGINEED Sarjana Teknik	-	
ASSISTANT ENGINEER Sarjana Muda Teknik	-	
TECHNICIAN STAFF Staff Teknik (STM)	2	
ADMINISTRATION Tenaga Administrasi	7	
SUPERVISOR Tenaga Pengawas	2	
WORKING FORCE Tenaga Pelaksana Lapangan	(7)	
OPERATORS Operators	1	
DRIVERS Supir	-	
MECHANICS Mechanic	1	
TRADESMAN Tukang	2	
L A B O U R Buruh / Pekerja	-	
OTHERS Lain-lain	3	
TOTAL / JUMLAH	18	

Catatan ; Untuk kolom keterangan harap diisi berapa orang yang telah mendapat Training.

LOCATION AND AREA OF DPUK WORKSHOP

E-06

Lokasi Workshop DPUK

PROPINSI : Kalimantan Tengah

KABUPATEN: Kotawaringin Timur

LOCATION Lokasi	AREA (m2) Luas	NUMBER Jumlah	REMARKS Keterangan

PROPINSI: Kalimantan Tengah

E-07

KABUPATEN: Kotawaringin Timur

LAND ACQUISITION COST

Daftar harga pembebasan tanah

DESCRIPTION Uraian	UNIT Satuan	RATE (RP) Harga	REMARKS Keterangan
CITY/kota	M2	60,000	
VILLAGE / desa	M2	5,000	
RICE FIELD/sawah	M2	1,000	
DRY FIELD/ladang	M2	-	
MIX CROPS/panen	M2	250	
FOREST/hutan	M2	500	
SWAMP / rawa	M2		
OTHERS / lain-lain	M2		

PROPINSI: Kalimantan Tengah

KABUPATEN: Kotawaringin Timur

Classification of local contractors at Kabupaten level.

Klasifikasi kontraktor di Kabupaten

COMPANY NAME Nama Kontraktor	CLASS Kelas	CAPITAL Modal (Rp)	NUMBER OF EMPLOYEE Jumlah pegawai	REMARKS Keterangan
4	B1	-	-	
10	B2	-	-	

NOTE: DATI II

PROPINSI: Kalimantan Tengah

E-09

KABUPATEN: Kotawaringin Timur

LIST OF EXISTING EQUIPMENT OF LOCAL CONTRACTOR

Name of contractor

NAME OF EQUIPMENT Jenis peralatan	EXISTING CONDITION/ Kondisi Peralatan						REQUIRE - MENT / Kebutuhan peralatan baru
	TYPE/ Tipe	P.Y	NUMBER / Jumlah			REASON OF BAD CONDITION/Sebab Kerusakan	
			GOOD Baik	BAD Rusak	TOTAL Jumlah		
Bulldozer							
Motor Grader							
Tyre Roller							
Steel Whell Roller			3	2	5		
Vibration Roller			2		2		
Wheel Loader							
Front End Loader and Backhoe							
Mobile Crane							
Concrete Mixer							
Stone Crusher				1	1		
Portable Compressor							
Hydraulic Excavator							
Asphalt Paving Machine							
Asphalt Sprayer							
Asphalt Mixing Machine							
Mobile Workshop							
Mechanic Rammer							
Plate Tamper							
Pile Driver							
Leg Drill							
Hand Hammer							
Farm Tractor							
Dump Truck							
Water Tank Truck							
Fuel Tank Truck							
Pick Up							
Jeep							
Motorcycle							
Generator							
Water Pump							
Others							

PROPINSI: Kalimantan Tengah

KABUPATEN: Kotawaringin Timur

LIST OF EXISTING EQUIPMENT OF P.U KABUPATEN

NAME OF EQUIPMENT Jenis peralatan	EXISTING CONDITION/ Kondisi Peralatan						REQUIRE - MENT / Kebutuhan peralatan baru
	TYPE/ Tipe	P.Y	NUMBER / Jumlah			REASON OF BAD CONDITION/Sebab Kerusakan	
			GOOD Baik	BAD Rusak	TOTAL Jumlah		
Bulldozer							
Motor Grader							
Tyre Roller							
Steel Whell Roller			3	2	5		
Vibration Roller			2	-	2		
Wheel Loader							
Front End Loader and Backhoe							
Mobile Crane							
Concrete Mixer							
Stone Crusher							
Portable Compressor			-	1	1		
Hydraulic Excavator							
Asphalt Paving Machine							
Asphalt Sprayer							
Asphalt Mixing Machine							
Mobile Workshop							
Mechanic Rammer							
Plate Tamper							
Pile Driver							
Leg Drill							
Hand Hammer							
Farm Tractor							
Dump Truck							
Water Tank Truck							
Fuel Tank Truck							
Pick Up							
Jeep							
Motorcycle							
Generator							
Water Pump							
Others							

Appendix A-3 CONSTRUCTION AND MAINTENANCE COST FOR PROPOSED ROAD LINKS

PROV : KALIMANTAN TENGAH KAB : KOTA WARINGIN TIMUR

LINK NO : 12 (IIIC) LENGTH : 45 Km

UPGRADE : 7.0m road bed, 4.0m road with surface Subbase Cource

(Rp)

ITEM	UNIT	QUANTITY	<<< UNIT COST >>> LOCAL	FOREIGN	<<<<<< COST LOCAL	FOREIGN	>>>>>> TOTAL
Site Clearance in Light Bush	m2	0.0	200	91	0	0	0
Subgrade Preparation	m2	0.0	26	11	0	0	0
Normal Fill	m3	0.0	2,068	863	0	0	0
Fill in Swamp	m3	0.0	8,207	267	0	0	0
Normal Excavation to Spoil	m3	0.0	1,202	523	0	0	0
Cement Stabilizing	m3	1912.0	13,387	12,368	25,595,944	23,647,616	49,243,560
Cement Stabilizing	m3	10800.0	13,387	12,368	144,579,600	133,574,400	278,154,000
Shoulder	m2	135000.0	363	146	49,005,000	19,710,000	68,715,000
Asphalt Patching	m2	0.0	8,918	1,308	0	0	0
Surface Dressing (Single)	m2	0.0	1,187	896	0	0	0
Surface Dressing (Double)	m2	0.0	1,690	1,410	0	0	0
Earth Drain	m	200.0	845	119	169,000	23,800	192,800
Earth Drain in Swamp (by machine)	m3	0.0	1,425	474	0	0	0
Pipe Culvert D80cm	m	0.0	61,479	49,971	0	0	0
Masonry Culvert (80x80cm)	m	0.0	92,728	39,061	0	0	0
Retaining Wall and Wing Wall (Timber)	m2	0.0	9,055	246	0	0	0
Retaining Wall and Wing Wall (Masonry)	m3	0.0	64,550	10,457	0	0	0
Gabion Protection	m3	0.0	20,848	120	0	0	0
New Bridge (Timber)	SET	1.0	--	--	0	0	0
New Bridge (Concrete)	SET	1.0	--	--	0	0	0
			Sub Total		219,349,544	176,955,816	396,305,360
Overhead (15%)					32,902,431	26,543,372	59,445,803
			TOTAL COST		252,251,975	203,499,188	455,751,163
Manual routine maintenance of road	Km	45.0	134,680	7,248	6,060,600	326,160	6,386,760
Routine maintenance of gravel road	Km	45.0	918,075	42,664	41,313,375	1,919,880	43,233,255
			Sub Total		47,373,975	2,246,040	49,620,015
Maintenance of Timber Bridge (New)	m2	0.0	6,631	1,009	0	0	0
Maintenance of Concrete Bridge (New)	m2	0.0	2,754	3,061	0	0	0
Maintenance of Timber Bridge (Exist)	m2	0.0	8,025	2,347	0	0	0
Maintenance of Concrete Bridge (Exist)	m2	0.0	5,260	2,455	0	0	0

Earthwork & Pavement	Unit Cost	(Rp/Km)	:	10,127,804
Timber Bridge	Unit Cost	(Rp/m2)	:	
Concrete Bridge	Unit Cost	(Rp/m2)	:	
Survived Value		(Rp)	:	19,697,424
Maintenance Rate without Bridge		(%)	:	10.89
New Bridge Cost Rate		(%)	:	

PROV : KALIMANTAN TENGAH KAB : KOTA WARINGIN TIMUR

LINK NO : 1 (IIIC) LENGTH : 12 Km

UPGRADE : 11.0m road bed, 4.0m road with surface Subbase Cource

(Rp)

ITEM	UNIT	QUANTITY	<<< UNIT COST >>> LOCAL	FOREIGN	<<<<<< COST LOCAL	FOREIGN	>>>>>> TOTAL
Site Clearance in Light Bush	m2	0.0	200	91	0	0	0
Subgrade Preparation	m2	0.0	26	11	0	0	0
Normal Fill	m3	0.0	2,068	863	0	0	0
Fill in Swamp	m3	0.0	8,207	267	0	0	0
Normal Excavation to Spoil	m3	0.0	1,202	523	0	0	0
Cement Stabilizing	m3	870.0	13,387	12,368	11,646,690	10,760,160	22,406,850
Cement Stabilizing	m3	2880.0	13,387	12,368	38,554,560	35,619,840	74,174,400
Shoulder	m2	84000.0	363	146	30,492,000	12,264,000	42,756,000
Asphalt Patching	m2	0.0	8,918	1,308	0	0	0
Surface Dressing (Single)	m2	0.0	1,187	896	0	0	0
Surface Dressing (Double)	m2	0.0	1,690	1,410	0	0	0
Earth Drain	m	6200.0	845	119	5,239,000	737,800	5,976,800
Earth Drain in Swamp (by machine)	m3	0.0	1,425	474	0	0	0
Pipe Culvert D80cm	m	6.0	61,479	49,971	368,874	299,826	668,700
Masonry Culvert (80x80cm)	m	0.0	92,728	39,061	0	0	0
Retaining Wall and Wing Wall (Timber)	m2	0.0	9,055	246	0	0	0
Retaining Wall and Wing Wall (Masonry)	m3	0.0	64,550	10,457	0	0	0
Gabion Protection	m3	0.0	20,848	120	0	0	0
New Bridge (Timber)	SET	1.0	--	--	0	0	0
New Bridge (Concrete)	SET	1.0	--	--	0	0	0
			Sub Total		86,301,124	59,681,626	145,982,750
Overhead (15%)					12,945,168	8,952,243	21,897,411
			TOTAL COST		99,246,292	68,633,869	167,880,161
Manual routine maintenance of road	Km	12.0	134,680	7,248	1,616,160	86,976	1,703,136
Routine maintenance of gravel road	Km	12.0	918,075	42,664	11,016,900	511,968	11,528,868
			Sub Total		12,633,060	598,944	13,232,004
Maintenance of Timber Bridge (New)	m2	0.0	6,631	1,009	0	0	0
Maintenance of Concrete Bridge (New)	m2	0.0	2,754	3,061	0	0	0
Maintenance of Timber Bridge (Exist)	m2	0.0	8,025	2,347	0	0	0
Maintenance of Concrete Bridge (Exist)	m2	0.0	5,260	2,455	0	0	0

Earthwork & Pavement	Unit Cost	(Rp/Km)	:	13,990,014
Timber Bridge	Unit Cost	(Rp/m2)	:	
Concrete Bridge	Unit Cost	(Rp/m2)	:	
Survived Value		(Rp)	:	8,962,740
Maintenance Rate without Bridge		(%)	:	7.88
New Bridge Cost Rate		(%)	:	

PROV : KALIMANTAN TENGAH KAB : KOTA WARINGIN TIMUR

LINK NO : 9 (IIIC) LENGTH : 40 Km

UPGRADE : 7.0m road bed, 4.0m road with surface Subbase Cource

(Rp)

ITEM	UNIT	QUANTITY	<<< UNIT COST >>> LOCAL	FOREIGN	<<<<<< COST LOCAL	FOREIGN	>>>>>> TOTAL
Site Clearance in Light Bush	m2	0.0	200	91	0	0	0
Subgrade Preparation	m2	8100.0	26	11	210,600	89,100	299,700
Normal Fill	m3	0.0	2,068	863	0	0	0
Fill in Swamp	m3	870.0	8,207	267	7,140,090	232,290	7,372,380
Normal Excavation to Spoil	m3	0.0	1,202	523	0	0	0
Cement Stabilizing	m3	2612.0	13,387	12,368	34,966,844	32,305,216	67,272,060
Cement Stabilizing	m3	9600.0	13,387	12,368	128,515,200	118,732,800	247,248,000
Shoulder	m2	120000.0	363	146	43,560,000	17,520,000	61,080,000
Asphalt Patching	m2	0.0	8,918	1,308	0	0	0
Surface Dressing (Single)	m2	0.0	1,187	896	0	0	0
Surface Dressing (Double)	m2	0.0	1,690	1,410	0	0	0
Earth Drain	m	8000.0	845	119	6,760,000	952,000	7,712,000
Earth Drain in Swamp (by machine)	m3	6000.0	1,425	474	8,550,000	2,844,000	11,394,000
Pipe Culvert D80cm	m	0.0	61,479	49,971	0	0	0
Masonry Culvert (80x80cm)	m	0.0	92,728	39,061	0	0	0
Retaining Wall and Wing Wall (Timber)	m2	0.0	9,055	246	0	0	0
Retaining Wall and Wing Wall (Masonry)	m3	0.0	64,550	10,457	0	0	0
Gabion Protection	m3	0.0	20,848	120	0	0	0
New Bridge (Timber)	SET	1.0	--	--	0	0	0
New Bridge (Concrete)	SET	1.0	--	--	0	0	0
			Sub Total		229,702,734	172,675,406	402,378,140
Overhead (15%)					34,455,410	25,901,310	60,356,720
			TOTAL COST		264,158,144	198,576,716	462,734,860
Manual routine maintenance of road	Km	40.0	134,680	7,248	5,387,200	289,920	5,677,120
Routine maintenance of gravel road	Km	40.0	918,075	42,664	36,723,000	1,706,560	38,429,560
			Sub Total		42,110,200	1,996,480	44,106,680
Maintenance of Timber Bridge (New)	m2	0.0	6,631	1,009	0	0	0
Maintenance of Concrete Bridge (New)	m2	0.0	2,754	3,061	0	0	0
Maintenance of Timber Bridge (Exist)	m2	39.0	8,025	2,347	312,975	91,533	404,508
Maintenance of Concrete Bridge (Exist)	m2	0.0	5,260	2,455	0	0	0

Earthwork & Pavement	Unit Cost	(Rp/Km)	:	11,568,372
Timber Bridge	Unit Cost	(Rp/m2)	:	
Concrete Bridge	Unit Cost	(Rp/m2)	:	
Survived Value		(Rp)	:	26,908,824
Maintenance Rate without Bridge		(%)	:	9.53
New Bridge Cost Rate		(%)	:	

PROV : KALIMANTAN TENGAH KAB : KOTA WARINGIN TIMUR

LINK NO : 8 (IIIC) LENGTH : 5 Km

UPGRADE : 6.0m road bed, 3.0m road with surface Subbase Cource

(Rp)

ITEM	UNIT	QUANTITY	UNIT COST LOCAL	UNIT COST FOREIGN	COST LOCAL	COST FOREIGN	COST TOTAL
Site Clearance in Light Bush	m2	0.0	200	91	0	0	0
Subgrade Preparation	m2	30000.0	26	11	780,000	330,000	1,110,000
Normal Fill	m3	0.0	2,068	863	0	0	0
Fill in Swamp	m3	1860.0	8,207	267	15,265,020	496,620	15,761,640
Normal Excavation to Spoil	m3	417.0	1,202	523	501,234	218,091	719,325
Cement Stabilizing	m3	2400.0	13,387	12,368	32,128,800	29,683,200	61,812,000
Cement Stabilizing	m3	0.0	13,387	12,368	0	0	0
Shoulder	m2	15000.0	363	146	5,445,000	2,190,000	7,635,000
Asphalt Patching	m2	0.0	8,918	1,308	0	0	0
Surface Dressing (Single)	m2	0.0	1,187	896	0	0	0
Surface Dressing (Double)	m2	0.0	1,690	1,410	0	0	0
Earth Drain	m	1600.0	845	119	1,352,000	190,400	1,542,400
Earth Drain in Swamp (by machine)	m3	6000.0	1,425	474	8,550,000	2,844,000	11,394,000
Pipe Culvert D80cm	m	168.0	61,479	49,971	10,328,472	8,395,128	18,723,600
Masonry Culvert (80x80cm)	m	0.0	92,728	39,061	0	0	0
Retaining Wall and Wing Wall (Timber)	m2	0.0	9,055	246	0	0	0
Retaining Wall and Wing Wall (Masonry)	m3	64.0	64,550	10,457	4,131,200	669,248	4,800,448
Gabion Protection	m3	0.0	20,848	120	0	0	0
New Bridge (Timber)	SET	1.0	--	--	0	0	0
New Bridge (Concrete)	SET	1.0	--	--	0	0	0
			Sub Total		78,481,726	45,016,687	123,498,413
Overhead (15%)					11,772,258	6,752,503	18,524,761
			TOTAL COST		90,253,984	51,769,190	142,023,174
Manual routine maintenance of road	Km	5.0	134,680	7,248	673,400	36,240	709,640
Routine maintenance of gravel road	Km	5.0	918,075	42,664	4,590,375	213,320	4,803,695
			Sub Total		5,263,775	249,560	5,513,335
Maintenance of Timber Bridge (New)	m2	0.0	6,631	1,009	0	0	0
Maintenance of Concrete Bridge (New)	m2	0.0	2,754	3,061	0	0	0
Maintenance of Timber Bridge (Exist)	m2	0.0	8,025	2,347	0	0	0
Maintenance of Concrete Bridge (Exist)	m2	0.0	5,260	2,455	0	0	0

Earthwork & Pavement	Unit Cost	(Rp/Km)	:	28,404,835
Timber Bridge	Unit Cost	(Rp/m2)	:	
Concrete Bridge	Unit Cost	(Rp/m2)	:	
Survived Value		(Rp)	:	24,724,800
Maintenance Rate without Bridge		(%)	:	3.88
New Bridge Cost Rate		(%)	:	

PROV : KALIMANTAN TENGAH KAB : KOTA WARINGIN TIMUR

LINK NO : 7 (IIIC) LENGTH : 25 Km

UPGRADE : 7.0m road bed, 4.0m road with surface Subbase Cource

(Rp)

ITEM	UNIT	QUANTITY	UNIT COST LOCAL	UNIT COST FOREIGN	COST LOCAL	COST FOREIGN	COST TOTAL
Site Clearance in Light Bush	m2	0.0	200	91	0	0	0
Subgrade Preparation	m2	175000.0	26	11	4,550,000	1,925,000	6,475,000
Normal Fill	m3	0.0	2,068	863	0	0	0
Fill in Swamp	m3	0.0	8,207	267	0	0	0
Normal Excavation to Spoil	m3	2060.0	1,202	523	2,476,120	1,077,380	3,553,500
Cement Stabilizing	m3	16000.0	13,387	12,368	214,192,000	197,888,000	412,080,000
Cement Stabilizing	m3	0.0	13,387	12,368	0	0	0
Shoulder	m2	75000.0	363	146	27,225,000	10,950,000	38,175,000
Asphalt Patching	m2	0.0	8,918	1,308	0	0	0
Surface Dressing (Single)	m2	0.0	1,187	896	0	0	0
Surface Dressing (Double)	m2	0.0	1,690	1,410	0	0	0
Earth Drain	m	800.0	845	119	676,000	95,200	771,200
Earth Drain in Swamp (by machine)	m3	0.0	1,425	474	0	0	0
Pipe Culvert D80cm	m	0.0	61,479	49,971	0	0	0
Masonry Culvert (80x80cm)	m	0.0	92,728	39,061	0	0	0
Retaining Wall and Wing Wall (Timber)	m2	0.0	9,055	246	0	0	0
Retaining Wall and Wing Wall (Masonry)	m3	0.0	64,550	10,457	0	0	0
Gabion Protection	m3	0.0	20,848	120	0	0	0
New Bridge (Timber)	SET	1.0	--	--	0	0	0
New Bridge (Concrete)	SET	1.0	--	--	0	0	0
			Sub Total		249,119,120	211,935,580	461,054,700
Overhead (15%)					37,367,868	31,790,337	69,158,205
			TOTAL COST		286,486,988	243,725,917	530,212,905
Manual routine maintenance of road	Km	25.0	134,680	7,248	3,367,000	181,200	3,548,200
Routine maintenance of gravel road	Km	25.0	918,075	42,664	22,951,875	1,066,600	24,018,475
			Sub Total		26,318,875	1,247,800	27,566,675
Maintenance of Timber Bridge (New)	m2	0.0	6,631	1,009	0	0	0
Maintenance of Concrete Bridge (New)	m2	0.0	2,754	3,061	0	0	0
Maintenance of Timber Bridge (Exist)	m2	480.0	8,025	2,347	3,852,000	1,126,560	4,978,560
Maintenance of Concrete Bridge (Exist)	m2	0.0	5,260	2,455	0	0	0

Earthwork & Pavement	Unit Cost	(Rp/Km)	:	21,208,516
Timber Bridge	Unit Cost	(Rp/m2)	:	
Concrete Bridge	Unit Cost	(Rp/m2)	:	
Survived Value		(Rp)	:	164,832,000
Maintenance Rate without Bridge		(%)	:	5.20
New Bridge Cost Rate		(%)	:	

PROV : KALIMANTAN TENGAH KAB : KOTA WARINGIN TIMUR

LINK NO : 6 (IIIC) LENGTH : 9 Km

UPGRADE : 6.0m road bed, 3.0m road with surface Subbase Cource

(Rp)

ITEM	UNIT	QUANTITY	UNIT COST LOCAL	UNIT COST FOREIGN	COST LOCAL	COST FOREIGN	TOTAL
Site Clearance in Light Bush	m2	0.0	200	91	0	0	0
Subgrade Preparation	m2	54000.0	26	11	1,404,000	594,000	1,998,000
Normal Fill	m3	0.0	2,068	863	0	0	0
Fill in Swamp	m3	0.0	8,207	267	0	0	0
Normal Excavation to Spoil	m3	750.0	1,202	523	901,500	392,250	1,293,750
Cement Stabilizing	m3	4320.0	13,387	12,368	57,831,840	53,429,760	111,261,600
Cement Stabilizing	m3	0.0	13,387	12,368	0	0	0
Shoulder	m2	27000.0	363	146	9,801,000	3,942,000	13,743,000
Asphalt Patching	m2	0.0	8,918	1,308	0	0	0
Surface Dressing (Single)	m2	0.0	1,187	896	0	0	0
Surface Dressing (Double)	m2	0.0	1,690	1,410	0	0	0
Earth Drain	m	5400.0	845	119	4,563,000	642,600	5,205,600
Earth Drain in Swamp (by machine)	m3	0.0	1,425	474	0	0	0
Pipe Culvert D80cm	m	144.0	61,479	49,971	8,852,976	7,195,824	16,048,800
Masonry Culvert (80x80cm)	m	0.0	92,728	39,061	0	0	0
Retaining Wall and Wing Wall (Timber)	m2	0.0	9,055	246	0	0	0
Retaining Wall and Wing Wall (Masonry)	m3	57.6	64,550	10,457	3,718,080	602,323	4,320,403
Gabion Protection	m3	0.0	20,848	120	0	0	0
New Bridge (Timber)	SET	1.0	--	--	0	0	0
New Bridge (Concrete)	SET	1.0	--	--	0	0	0
			Sub Total		87,072,396	66,798,757	153,871,153
Overhead (15%)					13,060,859	10,019,813	23,080,672
			TOTAL COST		100,133,255	76,818,570	176,951,825
Manual routine maintenance of road	Km	9.0	134,680	7,248	1,212,120	65,232	1,277,352
Routine maintenance of gravel road	Km	9.0	918,075	42,664	8,262,675	383,976	8,646,651
			Sub Total		9,474,795	449,208	9,924,003
Maintenance of Timber Bridge (New)	m2	0.0	6,631	1,009	0	0	0
Maintenance of Concrete Bridge (New)	m2	0.0	2,754	3,061	0	0	0
Maintenance of Timber Bridge (Exist)	m2	0.0	8,025	2,347	0	0	0
Maintenance of Concrete Bridge (Exist)	m2	0.0	5,260	2,455	0	0	0

Earthwork & Pavement	Unit Cost	(Rp/Km)	:	19,661,314
Timber Bridge	Unit Cost	(Rp/m2)	:	
Concrete Bridge	Unit Cost	(Rp/m2)	:	
Survived Value		(Rp)	:	44,504,640
Maintenance Rate without Bridge		(%)	:	5.61
New Bridge Cost Rate		(%)	:	

PROV : KALIMANTAN TENGAH KAB : KOTA WARINGIN TIMUR

LINK NO : 5 (IIIC) LENGTH : 18 Km

UPGRADE : 6.0m road bed, 4.0m road with surface Subbase Cource

(Rp)

ITEM	UNIT	QUANTITY	UNIT COST LOCAL	UNIT COST FOREIGN	COST LOCAL	COST FOREIGN	COST TOTAL
Site Clearance in Light Bush	m2	0.0	200	91	0	0	0
Subgrade Preparation	m2	108000.0	26	11	2,808,000	1,188,000	3,996,000
Normal Fill	m3	0.0	2,068	863	0	0	0
Fill in Swamp	m3	14400.0	8,207	267	118,180,800	3,844,800	122,025,600
Normal Excavation to Spoil	m3	2244.0	1,202	523	2,697,288	1,173,612	3,870,900
Cement Stabilizing	m3	11520.0	13,387	12,368	154,218,240	142,479,360	296,697,600
Cement Stabilizing	m3	0.0	13,387	12,368	0	0	0
Shoulder	m2	36000.0	363	146	13,068,000	5,256,000	18,324,000
Asphalt Patching	m2	0.0	8,918	1,308	0	0	0
Surface Dressing (Single)	m2	0.0	1,187	896	0	0	0
Surface Dressing (Double)	m2	0.0	1,690	1,410	0	0	0
Earth Drain	m	2200.0	845	119	1,859,000	261,800	2,120,800
Earth Drain in Swamp (by machine)	m3	36000.0	1,425	474	51,300,000	17,064,000	68,364,000
Pipe Culvert D80cm	m	192.0	61,479	49,971	11,803,968	9,594,432	21,398,400
Masonry Culvert (80x80cm)	m	0.0	92,728	39,061	0	0	0
Retaining Wall and Wing Wall (Timber)	m2	0.0	9,055	246	0	0	0
Retaining Wall and Wing Wall (Masonry)	m3	76.8	64,550	10,457	4,957,440	803,097	5,760,537
Gabion Protection	m3	0.0	20,848	120	0	0	0
New Bridge (Timber)	SET	1.0	--	--	0	0	0
New Bridge (Concrete)	SET	1.0	--	--	0	0	0
			Sub Total		360,892,736	181,665,101	542,557,837
Overhead (15%)					54,133,910	27,249,765	81,383,675
			TOTAL COST		415,026,646	208,914,866	623,941,512
Manual routine maintenance of road	Km	18.0	134,680	7,248	2,424,240	130,464	2,554,704
Routine maintenance of gravel road	Km	18.0	918,075	42,664	16,525,350	767,952	17,293,302
			Sub Total		18,949,590	898,416	19,848,006
Maintenance of Timber Bridge (New)	m2	0.0	6,631	1,009	0	0	0
Maintenance of Concrete Bridge (New)	m2	0.0	2,754	3,061	0	0	0
Maintenance of Timber Bridge (Exist)	m2	0.0	8,025	2,347	0	0	0
Maintenance of Concrete Bridge (Exist)	m2	0.0	5,260	2,455	0	0	0

Earthwork & Pavement	Unit Cost	(Rp/Km)	:	34,663,417
Timber Bridge	Unit Cost	(Rp/m2)	:	
Concrete Bridge	Unit Cost	(Rp/m2)	:	
Survived Value		(Rp)	:	118,679,040
Maintenance Rate without Bridge		(%)	:	3.18
New Bridge Cost Rate		(%)	:	

Appendix A-4 CONSTRUCTION AND MAINTENANCE QUANTITIES
FOR ALL PROPOSED ROAD LINKS
(CONSTRUCTION)

PROV : KALIMANTAN TENGAH KAB : KOTA WARINGIN TIMUR

I T E M	UNIT	(1988)	(1989)	(1990)	(1991)	(1992)	(TOTAL)
EQUIPMENT :							
Bulldozer	hr	331.5	648.0	1143.1	1023.1	0.0	3145.7
Bulldozer/Ripper	hr	401.5	285.8	786.1	713.2	0.0	2186.6
Swamp Bulldozer	hr	120.0	360.0	76.5	14.5	0.0	571.0
Motor Grader	hr	995.9	1410.7	2766.5	2474.0	0.0	7647.1
Road Stabilizer	hr	331.5	648.0	1143.1	1023.1	0.0	3145.7
Hand-guide Vib. Roller	hr	71.0	401.4	228.5	0.0	0.0	700.9
Tire Roller	hr	0.0	0.0	0.0	0.0	0.0	0.0
Vibratory Roller (D&T)	hr	905.9	1590.7	2467.7	2155.6	0.0	7119.9
Hydraulic Excavator; Wheel	hr	675.0	2025.0	675.0	225.0	0.0	3600.0
Wheel Loader	hr	898.7	1257.8	2500.7	2247.8	0.0	6905.0
Water Tank Truck	hr	589.4	1289.2	1851.6	1611.9	0.0	5342.1
Dump Truck	hr	6508.6	9738.4	15384.7	13135.1	0.0	44766.8
Flat Bed Truck with Crane	hr	55.0	301.5	174.0	0.0	0.0	530.5
Flat Bed Truck	hr	521.3	1106.8	1791.8	1534.6	0.0	4954.5
Concrete Mixer	hr	20.7	118.4	67.2	0.0	0.0	206.3
Water Pump	hr	16.8	95.3	54.4	0.0	0.0	166.5
Concrete Vibrator	hr	9.2	49.3	28.8	0.0	0.0	87.3
Asphalt Sprayer	hr	0.0	0.0	0.0	0.0	0.0	0.0
LABOUR :							
Mandor	man day	624.7	1296.4	1316.1	922.6	0.0	4159.8
Skilled Labourer	man day	37.3	199.3	116.2	0.0	0.0	352.8
Carpenter	man day	3.0	16.4	9.6	0.0	0.0	29.0
Mason	man day	19.2	115.2	64.0	0.0	0.0	198.4
Labourer	man day	6090.5	11452.8	11209.5	7822.9	0.0	36575.7
Driver	man day	1298.4	2081.8	3191.5	2714.1	0.0	9285.8
Operator	man day	953.4	1650.9	2261.4	1844.7	0.0	6710.4
MATERIAL :							
Bitumen	l	0.0	0.0	0.0	0.0	0.0	0.0
Asphalt Oil	l	0.0	0.0	0.0	0.0	0.0	0.0
Kerosene	l	0.0	0.0	0.0	0.0	0.0	0.0
Sand	m3	10365.9	24512.0	25589.0	20897.0	0.0	81363.9
Cement	bag	12904.9	25711.7	44453.6	39389.3	0.0	122459.5
River Stone	m3	19.2	115.2	64.0	0.0	0.0	198.4
Steel Moulds	set	54.0	288.0	168.0	0.0	0.0	510.0
Timber	m3	0.0	0.0	0.0	0.0	0.0	0.0
Paint	l	0.0	0.0	0.0	0.0	0.0	0.0
Reinforcing Steel	kg	1722.6	9187.2	5359.2	0.0	0.0	16269.0
Tying Wire	kg	15.6	83.5	48.7	0.0	0.0	147.8
BaseCourse Material	m3	0.0	0.0	0.0	0.0	0.0	0.0
Crushed Stone	m3	15.4	82.2	48.0	0.0	0.0	145.6

CONSTRUCTION AND MAINTENANCE QUANTITIES
FOR ALL PROPOSED ROAD LINKS
(MAINTENANCE)

PROV : KALIMANTAN TENGAH KAB : KOTA WARINGIN TIMUR

I T E M	UNIT	(1988)	(1989)	(1990)	(1991)	(1992)	(TOTAL)
EQUIPMENT :							
Bulldozer	hr	0.0	0.0	0.0	0.0	0.0	0.0
Bulldozer/Ripper	hr	0.0	0.0	0.0	0.0	0.0	0.0
Swamp Bulldozer	hr	0.0	0.0	0.0	0.0	0.0	0.0
Motor Grader	hr	377.2	772.5	700.3	712.8	0.0	2562.8
Road Stabilizer	hr	0.0	0.0	0.0	0.0	0.0	0.0
Hand-guide Vib. Roller	hr	0.0	0.0	0.0	0.0	0.0	0.0
Tire Roller	hr	377.2	772.5	700.3	712.8	0.0	2562.8
Vibratory Roller (D&T)	hr	0.0	0.0	0.0	0.0	0.0	0.0
Hydraulic Excavator; Wheel	hr	0.0	0.0	0.0	0.0	0.0	0.0
Wheel Loader	hr	0.0	0.0	0.0	0.0	0.0	0.0
Water Tank Truck	hr	0.0	0.0	0.0	0.0	0.0	0.0
Dump Truck	hr	0.0	0.0	0.0	0.0	0.0	0.0
Flat Bed Truck with Crane	hr	406.4	812.9	663.3	663.3	0.0	2545.9
Flat Bed Truck	hr	1419.7	2893.5	2596.3	2638.8	0.0	9548.3
Concrete Mixer	hr	0.0	0.0	0.0	0.0	0.0	0.0
Water Pump	hr	0.0	0.0	0.0	0.0	0.0	0.0
Concrete Vibrator	hr	0.0	0.0	0.0	0.0	0.0	0.0
Asphalt Sprayer	hr	0.0	0.0	0.0	0.0	0.0	0.0
LABOUR :							
Mandur	man day	425.7	866.5	773.7	785.9	0.0	2851.8
Skilled Labourer	man day	112.8	225.6	184.1	184.1	0.0	706.6
Carpenter	man day	60.5	121.1	98.8	98.8	0.0	379.2
Mason	man day	0.0	0.0	0.0	0.0	0.0	0.0
Labourer	man day	5018.4	10216.4	9141.8	9287.7	0.0	33664.3
Driver	man day	323.5	656.2	574.6	581.8	0.0	2136.1
Operator	man day	125.7	257.5	233.4	237.6	0.0	854.2
MATERIAL :							
Bitumen	l	0.0	0.0	0.0	0.0	0.0	0.0
Asphalt Oil	l	0.0	0.0	0.0	0.0	0.0	0.0
Kerosene	l	0.0	0.0	0.0	0.0	0.0	0.0
Sand	m3	0.0	0.0	0.0	0.0	0.0	0.0
Cement	bag	0.0	0.0	0.0	0.0	0.0	0.0
River Stone	m3	0.0	0.0	0.0	0.0	0.0	0.0
Steel Moulds	set	0.0	0.0	0.0	0.0	0.0	0.0
Timber	m3	5.5	11.0	8.9	8.9	0.0	34.3
Paint	l	39.2	78.4	64.0	64.0	0.0	245.6
Reinforcing Steel	kg	0.0	0.0	0.0	0.0	0.0	0.0
Tying Wire	kg	0.0	0.0	0.0	0.0	0.0	0.0
BaseCourse Material	m3	1338.7	2947.5	3076.8	3189.3	0.0	10552.3
Crushed Stone	m3	0.0	0.0	0.0	0.0	0.0	0.0

CONSTRUCTION AND MAINTENANCE QUANTITIES
FOR ALL PROPOSED ROAD LINKS
(TOTAL)

PROV : KALIMANTAN TENGAH KAB : KOTA WARINGIN TIMUR

I T E M	UNIT	(1988)	(1989)	(1990)	(1991)	(1992)	(TOTAL)
EQUIPMENT :							
Bulldozer	hr	331.5	648.0	1143.1	1023.1	0.0	3145.7
Bulldozer/Ripper	hr	401.5	285.8	786.1	713.2	0.0	2186.6
Swamp Bulldozer	hr	120.0	360.0	76.5	14.5	0.0	571.0
Motor Grader	hr	1373.1	2183.2	3466.8	3186.8	0.0	10209.9
Road Stabilizer	hr	331.5	648.0	1143.1	1023.1	0.0	3145.7
Hand-guide Vib. Roller	hr	71.0	401.4	228.5	0.0	0.0	700.9
Tire Roller	hr	377.2	772.5	700.3	712.8	0.0	2562.8
Vibratory Roller (D&T)	hr	905.9	1590.7	2467.7	2155.6	0.0	7119.9
Hydraulic Excavator; Wheel	hr	675.0	2025.0	675.0	225.0	0.0	3600.0
Wheel Loader	hr	898.7	1257.8	2500.7	2247.8	0.0	6905.0
Water Tank Truck	hr	589.4	1289.2	1851.6	1611.9	0.0	5342.1
Dump Truck	hr	6508.6	9738.4	15384.7	13135.1	0.0	44766.8
Flat Bed Truck with Crane	hr	461.4	1114.4	837.3	663.3	0.0	3076.4
Flat Bed Truck	hr	1941.0	4000.3	4388.1	4173.4	0.0	14502.8
Concrete Mixer	hr	20.7	118.4	67.2	0.0	0.0	206.3
Water Pump	hr	16.8	95.3	54.4	0.0	0.0	166.5
Concrete Vibrator	hr	9.2	49.3	28.8	0.0	0.0	87.3
Asphalt Sprayer	hr	0.0	0.0	0.0	0.0	0.0	0.0
LABOUR :							
Mandor	man day	1050.4	2162.9	2089.8	1708.5	0.0	7011.6
Skilled Labourer	man day	150.1	424.9	300.3	184.1	0.0	1059.4
Carpenter	man day	63.5	137.5	108.4	98.8	0.0	408.2
Mason	man day	19.2	115.2	64.0	0.0	0.0	198.4
Labourer	man day	11108.9	21669.2	20351.3	17110.6	0.0	70240.0
Driver	man day	1621.9	2738.0	3766.1	3295.9	0.0	11421.9
Operator	man day	1079.1	1908.4	2494.8	2082.3	0.0	7564.6
MATERIAL :							
Bitumen	l	0.0	0.0	0.0	0.0	0.0	0.0
Asphalt Oil	l	0.0	0.0	0.0	0.0	0.0	0.0
Kerosene	l	0.0	0.0	0.0	0.0	0.0	0.0
Sand	m3	10365.9	24512.0	25589.0	20897.0	0.0	81363.9
Cement	bag	12904.9	25711.7	44453.6	39389.3	0.0	122459.5
River Stone	m3	19.2	115.2	64.0	0.0	0.0	198.4
Steel Moulds	set	54.0	288.0	168.0	0.0	0.0	510.0
Timber	m3	5.5	11.0	8.9	8.9	0.0	34.3
Paint	l	39.2	78.4	64.0	64.0	0.0	245.6
Reinforcing Steel	kg	1722.6	9187.2	5359.2	0.0	0.0	16269.0
Tying Wire	kg	15.6	83.5	48.7	0.0	0.0	147.8
BaseCourse Material	m3	1338.7	2947.5	3076.8	3189.3	0.0	10552.3
Crushed Stone	m3	15.4	82.2	48.0	0.0	0.0	145.6

Appendix A-5

CONSTRUCTION AND MAINTENANCE COSTS FOR ALL PROPOSED ROAD LINKS (CONSTRUCTION)

PROV : KALIMANTAN TENGAH KAB : KOTA WARINGIN TIMUR

(1000 Rp)

I T E M	UNIT	(1988)	(1989)	(1990)	(1991)	(1992)	(TOTAL)
EQUIPMENT :		114,563	192,526	282,956	240,441	0	830,486
Bulldozer	16753	5,553	10,855	19,150	17,139	0	52,697
Bulldozer/Ripper	18080	7,259	5,167	14,212	12,894	0	39,532
Swamp Bulldozer	13177	1,581	4,743	1,008	191	0	7,523
Motor Grader	15248	15,185	21,510	42,183	37,723	0	116,601
Road Stabilizer	12719	4,216	8,241	14,539	13,012	0	40,008
Hand-guide Vib. Roller	1687	119	677	385	0	0	1,181
Tire Roller	13089	0	0	0	0	0	0
Vibratory Roller (D&T)	7546	6,835	12,003	18,621	16,266	0	53,725
Hydraulic Excavator; Wheel	14758	9,961	29,884	9,961	3,320	0	53,126
Wheel Loader	18380	16,518	23,118	45,962	41,314	0	126,912
Water Tank Truck	4869	2,869	6,277	9,015	7,848	0	26,009
Dump Truck	6412	41,733	62,442	98,646	84,222	0	287,043
Flat Bed Truck with Crane	5953	327	1,794	1,035	0	0	3,156
Flat Bed Truck	4244	2,212	4,697	7,604	6,512	0	21,025
Concrete Mixer	8845	183	1,047	594	0	0	1,824
Water Pump	554	9	52	30	0	0	91
Concrete Vibrator	388	3	19	11	0	0	33
Asphalt Sprayer	2139	0	0	0	0	0	0
LABOUR :		21,870	39,773	47,054	36,017	0	144,714
Mandur	2500	1,561	3,241	3,290	2,306	0	10,398
Skilled Labourer	2000	74	398	232	0	0	704
Carpenter	2500	7	41	24	0	0	72
Mason	2500	48	288	160	0	0	496
Labourer	1500	9,135	17,179	16,814	11,734	0	54,862
Driver	3000	3,895	6,245	9,574	8,142	0	27,856
Operator	7500	7,150	12,381	16,960	13,835	0	50,326
MATERIAL :		145,299	328,763	423,685	353,673	0	1,251,420
Bitumen	500	0	0	0	0	0	0
Asphalt Oil	800	0	0	0	0	0	0
Kerosene	250	0	0	0	0	0	0
Sand	7500	77,744	183,840	191,917	156,727	0	610,228
Cement	5000	64,524	128,558	222,268	196,946	0	612,296
River Stone	15000	288	1,728	960	0	0	2,976
Steel Moulds	8500	459	2,448	1,428	0	0	4,335
Timber	75000	0	0	0	0	0	0
Paint	2000	0	0	0	0	0	0
Reinforcing Steel	1000	1,722	9,187	5,359	0	0	16,268
Tying Wire	1500	23	125	73	0	0	221
BaseCourse Material	35000	0	0	0	0	0	0
Crushed Stone	35000	539	2,877	1,680	0	0	5,096

CONSTRUCTION AND MAINTENANCE COSTS
FOR ALL PROPOSED ROAD LINKS
(MAINTENANCE)

PROV : KALIMANTAN TENGAH KAB : KOTA WARINGIN TIMUR

(1000 Rp)

I T E M	UNIT	(1988)	(1989)	(1990)	(1991)	(1992)	(TOTAL)
EQUIPMENT :		19,132	39,009	34,810	35,344	0	128,295
Bulldozer	16753	0	0	0	0	0	0
Bulldozer/Ripper	18080	0	0	0	0	0	0
Swamp Bulldozer	13177	0	0	0	0	0	0
Motor Grader	15248	5,751	11,779	10,678	10,868	0	39,076
Road Stabilizer	12719	0	0	0	0	0	0
Hand-guide Vib. Roller	1687	0	0	0	0	0	0
Tire Roller	13089	4,937	10,111	9,166	9,329	0	33,543
Vibratory Roller (D&T)	7546	0	0	0	0	0	0
Hydraulic Excavator; Wheel	14758	0	0	0	0	0	0
Wheel Loader	18380	0	0	0	0	0	0
Water Tank Truck	4869	0	0	0	0	0	0
Dump Truck	6412	0	0	0	0	0	0
Flat Bed Truck with Crane	5953	2,419	4,839	3,948	3,948	0	15,154
Flat Bed Truck	4244	6,025	12,280	11,018	11,199	0	40,522
Concrete Mixer	8845	0	0	0	0	0	0
Water Pump	554	0	0	0	0	0	0
Concrete Vibrator	388	0	0	0	0	0	0
Asphalt Sprayer	2139	0	0	0	0	0	0
LABOUR :		10,879	22,142	19,734	20,037	0	72,792
Mandur	2500	1,064	2,166	1,934	1,964	0	7,128
Skilled Labourer	2000	225	451	368	368	0	1,412
Carpenter	2500	151	302	247	247	0	947
Mason	2500	0	0	0	0	0	0
Labourer	1500	7,527	15,324	13,712	13,931	0	50,494
Driver	3000	970	1,968	1,723	1,745	0	6,406
Operator	7500	942	1,931	1,750	1,782	0	6,405
MATERIAL :		47,348	104,143	108,483	112,420	0	372,390
Bitumen	500	0	0	0	0	0	0
Asphalt Oil	800	0	0	0	0	0	0
Kerosene	250	0	0	0	0	0	0
Sand	7500	0	0	0	0	0	0
Cement	5000	0	0	0	0	0	0
River Stone	15000	0	0	0	0	0	0
Steel Moulds	8500	0	0	0	0	0	0
Timber	75000	412	825	667	667	0	2,571
Paint	2000	78	156	128	128	0	490
Reinforcing Steel	1000	0	0	0	0	0	0
Tying Wire	1500	0	0	0	0	0	0
BaseCourse Material	35000	46,854	103,162	107,688	111,625	0	369,329
Crushed Stone	35000	0	0	0	0	0	0

CONSTRUCTION AND MAINTENANCE COSTS
FOR ALL PROPOSED ROAD LINKS
(TOTAL)

PROV : KALIMANTAN TENGAH KAB : KOTA WARINGIN TIMUR

(1000 Rp)

I T E M	UNIT	(1988)	(1989)	(1990)	(1991)	(1992)	(TOTAL)
EQUIPMENT :		133,695	231,535	317,766	275,785	0	958,781
Bulldozer	16753	5,553	10,855	19,150	17,139	0	52,697
Bulldozer/Ripper	18080	7,259	5,167	14,212	12,894	0	39,532
Swamp Bulldozer	13177	1,581	4,743	1,008	191	0	7,523
Motor Grader	15248	20,936	33,289	52,861	48,591	0	155,677
Road Stabilizer	12719	4,216	8,241	14,539	13,012	0	40,009
Hand-guide Vib. Roller	1687	119	677	385	0	0	1,181
Tire Roller	13089	4,937	10,111	9,166	9,329	0	33,543
Vibratory Roller (D&T)	7546	6,835	12,003	18,621	16,266	0	53,725
Hydraulic Excavator; Wheel	14758	9,961	29,884	9,961	3,320	0	53,126
Wheel Loader	18380	16,518	23,118	45,962	41,314	0	126,912
Water Tank Truck	4869	2,869	6,277	9,015	7,848	0	26,009
Dump Truck	6412	41,733	62,442	98,646	84,222	0	287,043
Flat Bed Truck with Crane	5953	2,746	6,633	4,983	3,948	0	18,310
Flat Bed Truck	4244	8,237	16,977	18,622	17,711	0	61,547
Concrete Mixer	8845	183	1,047	594	0	0	1,824
Water Pump	554	9	52	30	0	0	91
Concrete Vibrator	388	3	19	11	0	0	33
Asphalt Sprayer	2139	0	0	0	0	0	0
LABOUR :		32,749	61,915	66,788	56,054	0	217,506
Mandur	2500	2,625	5,407	5,224	4,270	0	17,526
Skilled Labourer	2000	299	849	600	368	0	2,116
Carpenter	2500	150	343	271	247	0	1,019
Mason	2500	48	288	160	0	0	496
Labourer	1500	16,662	32,503	30,526	25,665	0	105,356
Driver	3000	4,865	8,213	11,297	9,887	0	34,262
Operator	2500	8,092	14,312	18,710	15,617	0	56,731
MATERIAL :		192,643	432,906	532,168	466,093	0	1,623,810
Bitumen	500	0	0	0	0	0	0
Asphalt Oil	800	0	0	0	0	0	0
Kerosene	250	0	0	0	0	0	0
Sand	7500	77,744	183,840	191,917	156,727	0	610,228
Cement	5000	64,524	128,550	222,268	196,946	0	612,296
River Stone	15000	288	1,728	960	0	0	2,976
Steel Moulds	8500	459	2,448	1,428	0	0	4,335
Timber	75000	412	825	667	667	0	2,571
Paint	2000	78	156	128	128	0	490
Reinforcing Steel	1000	1,722	9,187	5,359	0	0	16,268
Tying Wire	1500	23	125	73	0	0	221
BaseCourse Material	35000	46,854	103,162	107,688	111,625	0	369,329
Crushed Stone	35000	539	2,877	1,680	0	0	5,096

Appendix A-6 QUANTITIES OF BRIDGE ON PROPOSED ROAD LINKS

PROV : KALIMANTAN TENGAH KAB : KOTA WARINGIN TIMUR

LINK NO	BRIDGE NAME	Km	From	<< TYPE >> (EXIST)	(NEW)	DESIGN LOAD	SPAN CLASS	LENGTH (m)	SPAN NO (no)	SPAN LENGTH (m)	WIDTH (m)	AREA (EXIST) (m2)	AREA (NEW) (m2)	PIER (no)	ABUT (no)	ROAD CLASS
7	N.1	3	SMUD	KK				12.00	2	6.00	4.00	48.00		1	2	IIIC
	N.1	5	SMUD	KK				12.00	2	6.00	4.00	48.00		1	2	
	N.1	7	SMUD	KK				12.00	2	6.00	4.00	48.00		1	2	
	N.1	9	SMUD	KK				12.00	2	6.00	4.00	48.00		1	2	
	N.1	11	SMUD	KK				12.00	2	6.00	4.00	48.00		1	2	
	N.1	13	SMUD	KK				12.00	2	6.00	4.00	48.00		1	2	
	N.1	15	SMUD	KK				12.00	2	6.00	4.00	48.00		1	2	
	N.1	17	SMUD	KK				12.00	2	6.00	4.00	48.00		1	2	
	N.1	19	SMUD	KK				12.00	2	6.00	4.00	48.00		1	2	
	N.1	21	SMUD	KK				12.00	2	6.00	4.00	48.00		1	2	
9	SAMPIT SUNGAI	21	SMPT	KK				6.50	1	6.50	6.00	39.00		0	2	IIIC

Appendix A-7 CONSTRUCTION AND MAINTENANCE COST OF BRIDGES ON PROPOSED ROAD LINKS

PROV : KALIMANTAN TENGAH KAB : KOTA WARINGIN TIMUR

LINK NO : 7 (IIIC) LENGTH : 25 Km

(Rp)

ITEM	UNIT	QUANTITY	<<< UNIT COST >>> LOCAL	FOREIGN	<<<<<< COST LOCAL	FOREIGN	>>>>>> TOTAL
Superstructure (Timber;Span 3m;10T)	m2	0.00	33,858	2,998	0	0	0
Superstructure (Timber;Span 5m;10T)	m2	0.00	37,503	3,311	0	0	0
Superstructure (Timber;Span 8m;10T)	m2	0.00	49,673	4,351	0	0	0
Superstructure (Timber;Span 3m;BM50)	m2	0.00	41,982	3,707	0	0	0
Superstructure (Timber;Span 5m;BM50)	m2	0.00	45,832	4,019	0	0	0
Superstructure (Timber;Span 8m;BM50)	m2	0.00	58,127	5,088	0	0	0
Superstructure (Concrete;Span 3m;BM50)	m2	0.00	57,023	106,749	0	0	0
Superstructure (Concrete;Span 5m;BM50)	m2	0.00	59,754	119,370	0	0	0
Superstructure (Concrete;Span 8m;BM50)	m2	0.00	62,462	130,068	0	0	0
Superstructure (Concrete;Span10m;BM50)	m2	0.00	68,766	147,794	0	0	0
Superstructure (Concrete;Span15m;BM50)	m2	0.00	75,968	174,184	0	0	0
Substructure (Pier;for Timber;10T)	NO	0.00	294,975	27,724	0	0	0
Substructure (Abut;for Timber;10T)	NO	0.00	1,048,856	112,169	0	0	0
Substructure (Pier;for Timber;BM50)	NO	0.00	433,827	41,015	0	0	0
Substructure (Abut;for Timber;BM50)	NO	0.00	1,153,708	126,412	0	0	0
Substructure (Pier;for Concrete;BM50)	NO	0.00	2,075,750	477,264	0	0	0
Substructure (Abut;for Concrete;BM50)	NO	0.00	4,811,586	920,351	0	0	0
Demolition of Bridge (Timber->Timber)	m2	0.00	10,707	1,061	0	0	0
Demolition of Bridge (Timber->Concrete)	m2	0.00	10,707	1,061	0	0	0
Demolition of Bridge (Concrete)	m2	0.00	105,087	79,667	0	0	0
Maintenance of Timber Bridge (New)	m2	0.00	6,631	1,009	0	0	0
Maintenance of Concrete Bridge (New)	m2	0.00	2,754	3,061	0	0	0
Maintenance of Timber Bridge (Exist)	m2	400.00	8,025	2,347	3,852,000	1,126,560	4,978,560
Maintenance of Concrete Bridge (Exist)	m2	0.00	5,260	2,455	0	0	0
(Without Overhead)	TOTAL COST (Timber Bridge)				0	0	0
	(Concrete Bridge)				0	0	0
	TOTAL COST (without Maintenance)				0	0	0
(Overhead : 15%)	TOTAL COST (Timber Bridge)				0	0	0
	(Concrete Bridge)				0	0	0
	TOTAL COST (without Maintenance)				0	0	0

PROV : KALIMANTAN TENGAH KAB : KOTA WARINGIN TIMUR

LINK NO : 9 (IIIC) LENGTH : 40 Km

(Rp)

ITEM	UNIT	QUANTITY	UNIT COST LOCAL	UNIT COST FOREIGN	COST LOCAL	COST FOREIGN	TOTAL
Superstructure (Timber;Span 3m;10T)	m2	0.00	33,858	2,998	0	0	0
Superstructure (Timber;Span 5m;10T)	m2	0.00	37,503	3,311	0	0	0
Superstructure (Timber;Span 8m;10T)	m2	0.00	49,673	4,351	0	0	0
Superstructure (Timber;Span 3m;BM50)	m2	0.00	41,982	3,707	0	0	0
Superstructure (Timber;Span 5m;BM50)	m2	0.00	45,832	4,019	0	0	0
Superstructure (Timber;Span 8m;BM50)	m2	0.00	58,127	5,088	0	0	0
Superstructure (Concrete;Span 3m;BM50)	m2	0.00	57,023	106,749	0	0	0
Superstructure (Concrete;Span 5m;BM50)	m2	0.00	59,754	119,370	0	0	0
Superstructure (Concrete;Span 8m;BM50)	m2	0.00	62,462	130,068	0	0	0
Superstructure (Concrete;Span10m;BM50)	m2	0.00	68,766	147,794	0	0	0
Superstructure (Concrete;Span15m;BM50)	m2	0.00	75,968	174,184	0	0	0
Substructure (Pier;for Timber;10T)	NO	0.00	294,975	27,724	0	0	0
Substructure (Abut;for Timber;10T)	NO	0.00	1,048,856	112,169	0	0	0
Substructure (Pier;for Timber;BM50)	NO	0.00	433,827	41,015	0	0	0
Substructure (Abut;for Timber;BM50)	NO	0.00	1,153,708	126,412	0	0	0
Substructure (Pier;for Concrete;BM50)	NO	0.00	2,075,750	477,264	0	0	0
Substructure (Abut;for Concrete;BM50)	NO	0.00	4,811,586	920,351	0	0	0
Demolition of Bridge (Timber->Timber)	m2	0.00	10,707	1,061	0	0	0
Demolition of Bridge (Timber->Concrete)	m2	0.00	10,707	1,061	0	0	0
Demolition of Bridge (Concrete)	m2	0.00	105,087	79,667	0	0	0
Maintenance of Timber Bridge (New)	m2	0.00	6,631	1,009	0	0	0
Maintenance of Concrete Bridge (New)	m2	0.00	2,754	3,061	0	0	0
Maintenance of Timber Bridge (Exist)	m2	39.00	8,025	2,347	312,975	91,533	404,508
Maintenance of Concrete Bridge (Exist)	m2	0.00	5,260	2,455	0	0	0
(Without Overhead)	TOTAL COST (Timber Bridge)				0	0	0
	(Concrete Bridge)				0	0	0
	TOTAL COST (without Maintenance)				0	0	0
(Overhead : 15%)	TOTAL COST (Timber Bridge)				0	0	0
	(Concrete Bridge)				0	0	0
	TOTAL COST (without Maintenance)				0	0	0