Japan International
Cooperation Agency
(JICA)

Department of Irrigation
and Drainage (DID)
Malaysia

THE STUDY ON MODERNIZATION OF IRRIGATION WATER MANAGEMENT SYSTEM IN THE GRANARY AREAS OF PENINSULAR MALAYSIA

Volume-II

ANNEXES

July 1998

Nippon Koei Co., Ltd.

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CURRENCY EQUIVALENT

US$ 1.0 = RM 4.4 = Yen 129.5

(as of January, 1998)

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WATER BALANCE STUDY

ANNEX - I

WATER BALANCE STUDY

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I. WATER BALANCE STUDY

1 GENERAL

Water balance study was made in order to confirm whether five(5) granary areas have enough irrigation water for achieving cropping intensity as high as 180%. By conducting the water balance study, present condition and effect of irrigation water management system modernization can be clearly recognized, which contributes the formulation of water management system planning.

As the first step of the study, available water for irrigation in probable drought years were estimated based on river discharge and relevant data. Secondly, irrigation water requirement in probable drought years were calculated on the basis of various climatic data etc. Then, the available water for irrigation and irrigation water requirement were compared to judge if the available water meets the requirement. In the study, several conditions shown below are assumed.

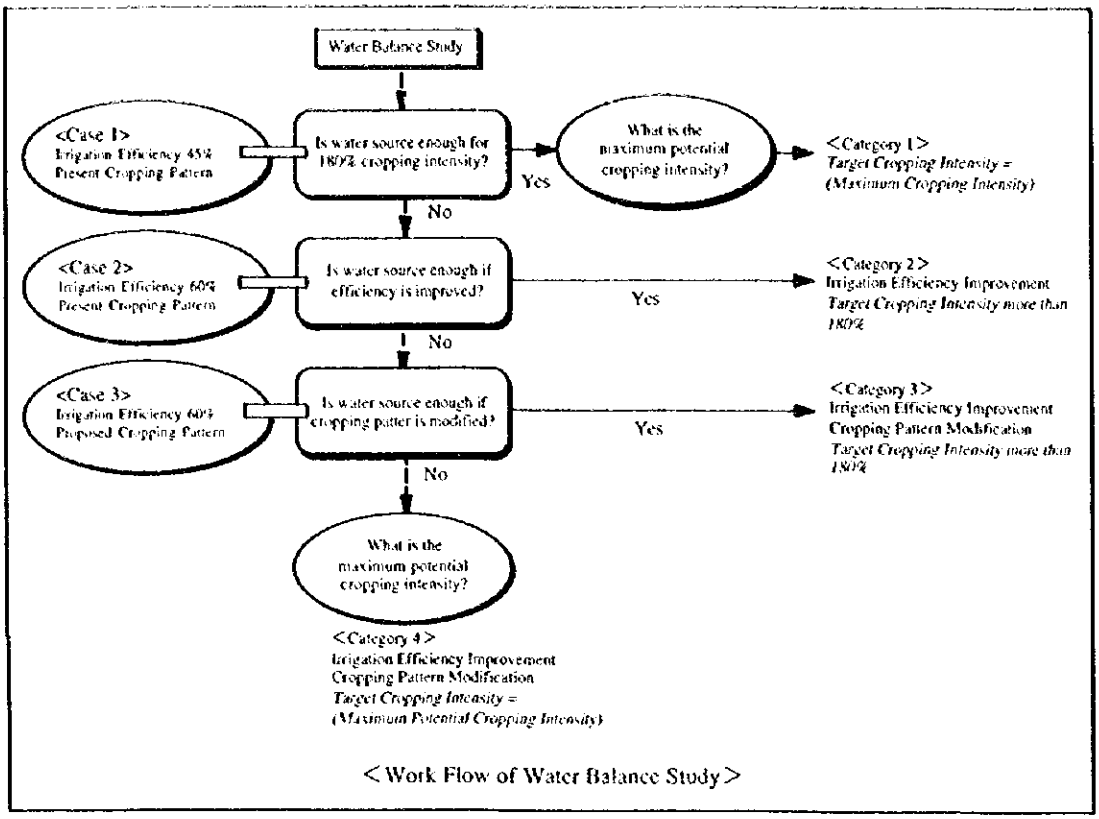
(1) Available water for irrigation

- Present Condition
- Future Condition (year 2010)

(2) Irrigation water requirement

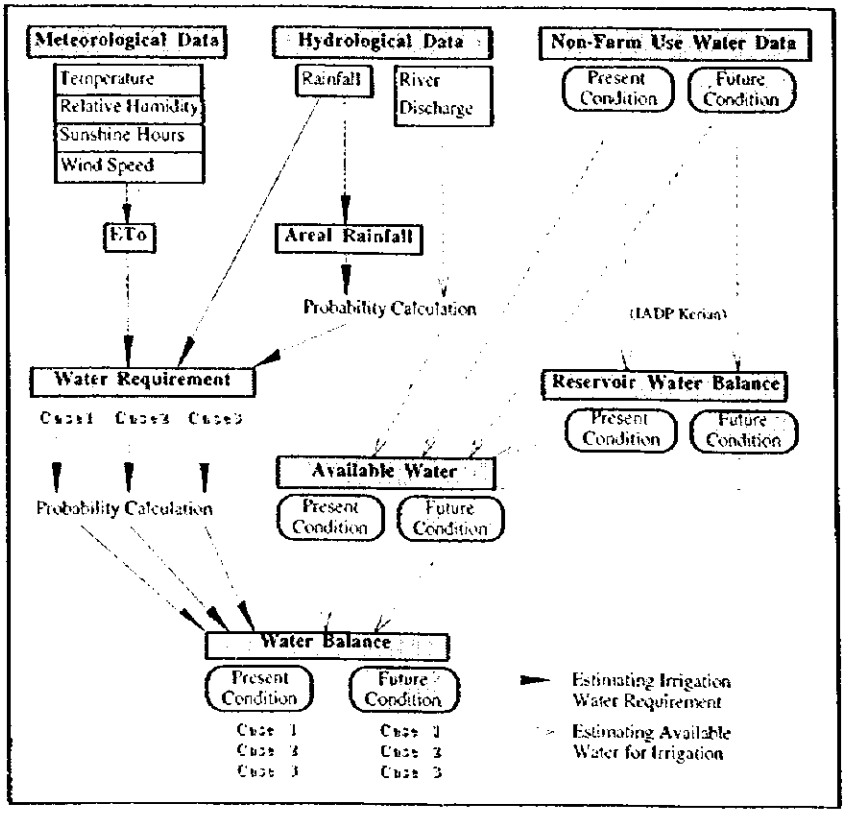
- Case 1 (overall irrigation efficiency : 45%, present cropping pattern)
- Case 2 (overall irrigation efficiency : 60%, present cropping pattern)
- Case 3 (overall irrigation efficiency : 60%, proposed cropping pattern)

The water balance study was conducted along the work flow shown below. Firstly, using the assumed present overall irrigation efficiency of 45% and present cropping pattern, water balance was conducted <Case 1>. Secondly, if water sources do not meet the requirement, with the assumption that overall irrigation efficiency is improved as much as 60% thanks to the irrigation system modernization, the calculation is repeated <Case 2>. Finally, when water sources still remained insufficient, proposed cropping pattern was applied <Case 3>. In the study, target drought probability is set to be less than 1/5, in other words, drought will be occur less than once a five years.



<Work Flow of Water Balance Study>

The flow of water balance calculation is shown below. Tables No. and figures No. used for the calculation are shown in Fig. I-1.

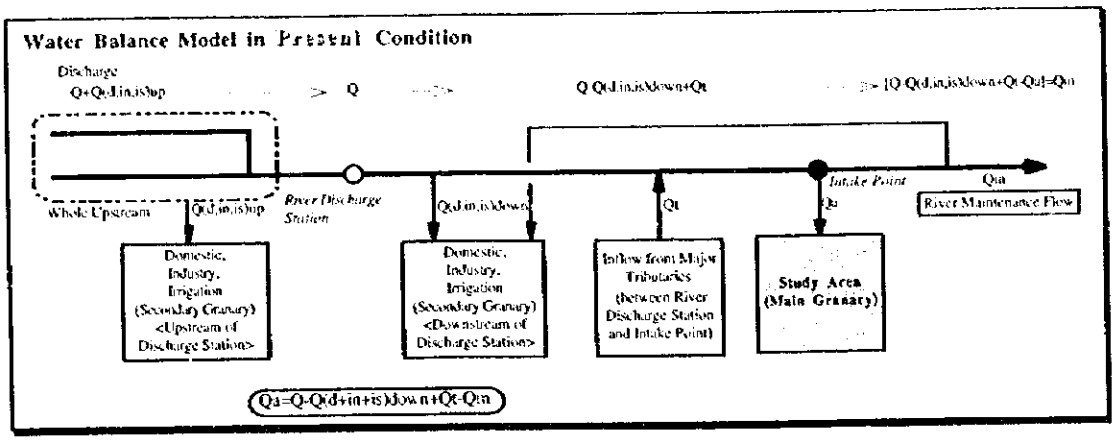


2 METHODOLOGY

2.1 Available Water for Irrigation

In the study areas, except Jarak river in Pulau Pinang and Angga river in Ketara (Besut), river discharge data is gauged by DID. In the study, available water for irrigation was estimated based on the data in the latest 10 years river discharge data. However, as for Besut river, reliable data period falls on between 1961 and 1964. Hence, 4 x 4 tank model shown in Fig. I-9 and I-10 was used for estimation of discharge in the past ten years. For Angga river, river discharge record is not available, so that it is assumed that the drought probability of Angga sub-scheme in Ketara(Besut) is same as that of Besut sub-scheme. Available water of study areas were determined considering present and future water demand of domestic water, industrial water and river maintenance flow etc. Present and provision data of domestic and industrial water demand are corrected at relevant agencies. For the river which does not have detail water distribution plan of domestic and industrial water, the estimation based on the capacity of intake facilities are made. Concerning river maintenance flow, only data of Muda river is available Accordingly, the river maintenance flow of the other rivers are estimated based on specific river maintenance flow of Muda river. The general models used for determining available water for irrigation are shown below. The models for respective rivers are shown in Fig. I-30 to I-39.

<Available Water for Irrigation in Present Condition (Qa)>



$$Qa = Q - Q(d+in+is)down + Qt - Qm$$

where, Qa : Available irrigation water for the study area in present water demand

Q : River discharge at the river discharge station

Q(d) : Domestic water in present condition

Q(in) : Industrial water in present condition

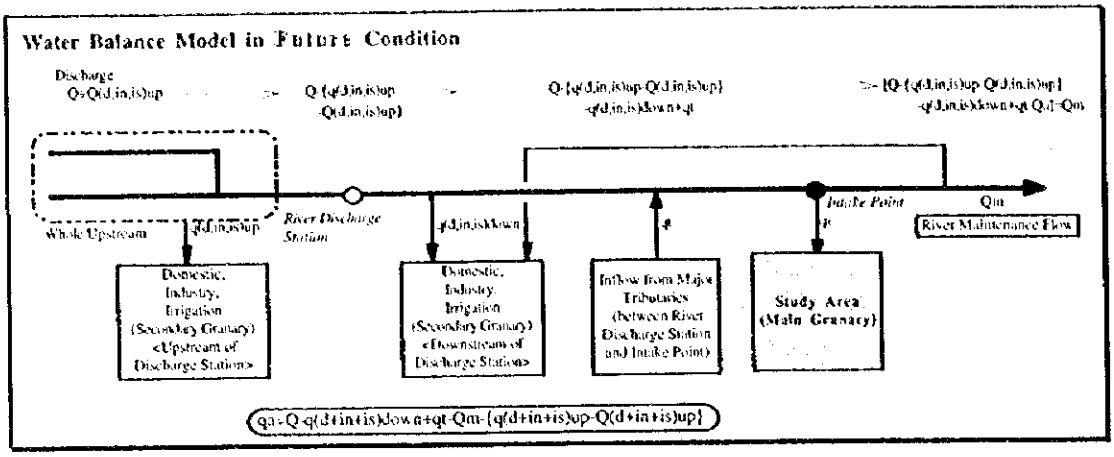
Q(is) : Irrigation water for secondary granary areas in present condition

Q( )down : Water demand for downstream of river discharge station in present condition

Qt : Inflow from major tributary or excess water from another schemes

Qm : River maintenance flow

<Available Water for Irrigation in Future Condition (Year 2010) (qa)>



$$qa = Q - q(d+in+is)down + qt - Qm - \{q(d+in+is)up - Q(d+in+is)up\}$$

where, qa : Available irrigation water for the study area in future water demand
Q : River discharge at the river discharge station
q(d) : Domestic water in future condition
q(in) : Industrial water in future condition
q(is) : Irrigation water for secondary granary areas in future condition
Q( )up : Water demand for upstream of river discharge station in present condition
q( )up : Water demand for upstream of river discharge station in future condition
q( )down : Water demand for downstream of river discharge station in future condition
Qt : Inflow from major tributary or excess water from another schemes
Qm : River maintenance flow

Q(d), Q(in) and Q(is) consist of two parts, one is the water taken from upstream of river discharge station, and the other is the water taken from downstream. In present condition, river discharge at the station does not include upstream water demand already taken from the river. Consequently, only downstream water demand is considered in present condition. On the other hand, in future condition model, river discharge at the station might be decrease because of water demand increment in upstream. Hence, upstream water demand increment is considered in the future condition model.

(1) Domestic and Industrial Water

The data of domestic and industrial water are obtained from relevant departments or agencies as shown below. The amount of water to be released at the intake point for domestic and industrial water use in the downstream is estimated considering inflows from tributaries located between the both intake points for irrigation and domestic/industrial water. Estimated

domestic and industrial water demands at intake points of the study areas are shown below and their breakdowns are shown in Table I-14 and I-15.

Scheme	River	D/I Water Demand (m^3/s)				Data Source
		Present		Future (2010)		
		U/S	D/S	U/S	D/S	
Pulau Pinang	Muda	-	7.96	-	16.11	Penang Water Authority Comprehensive Management Plan of Muda River Basin (JICA)
	Kulim	-	0.54	-	0.88	Penang Water Authority
Kerian	Kurau (Bukit Merah)	-	0.88	-	1.40	Perak Water Board
	Kerian	-	0.32	-	0.73	
Sungai Manik	Btg. Padang	-	-	-	-	-
Seberang Perak	Perak	6.41	3.76	8.83	6.72	Perak Water Board
Kemasin/Semerak	Kemasin	-	-	-	-	-
Ketara (Besut)	Besut	-	0.25	-	0.77	JBA[1] Terengganu
	Angga	-	-	-	-	

Note : D/I : Domestic and Industrial
1) : Jabatan Bekalan Air (Waterworks Department)
U/S : Upstream of River Discharge Station
D/S : Downstream of River Discharge Station

(2) Irrigation Water for Secondary Granary Areas

There are 74 secondary granary areas in Malaysia and its demarcation is decided based on Feasibility Study on Rationalization and Crop Diversification in Non-Granary Irrigated Areas in Malaysia (JICA, 1990). Secondary granary areas are also considered in the water balance model because it is projected that cropping intensity of secondary granary areas will increase 120 % to 170% based on NAP. In the water balance model, cropping patterns of secondary granary areas are assumed as same as those of granary areas. Inventory of secondary granary areas in relevant river basin is shown in Table I-16.

(3) Inflow from Major Tributaries

Some of the river discharge stations are located far from intake point of the study area. There might be some significant inflow from tributaries between river discharge station and intake point. In the water balance model, inflows from tributaries are estimated from specific discharges of the main rivers by using tributaries catchment area factors. In the water balance model, tributaries catchment area factor is defined as shown below.

TCF = (Catchment Area of Tributaries / Catchment Area of Main Flow at discharge station)
where, TCF : Tributaries Catchment Area Factor

Table I-17 shows tributaries catchment area factors of relevant rivers to be used for the study. The discharges of tributaries can be estimated by use of the following equation :

$$Qt = TCF \times Q$$

where, Qt : Discharge of Tributaries
Q : Discharge of Main Flow

(4) River Maintenance Flow

The river maintenance flow is the indicator of the allowable limit of water withdrawal from the river. Water withdrawal should not be increased, if it is expected to impair the river maintenance flow frequently. In Muda river, it is agreed between Pinang State, Kedah State and Penang Water Authority that 5 m^3/s of water should be released from Muda Barrage as river maintenance flow. On the other hand, JICA study team could not get any information about river maintenance flow for the rest of relevant river.

For the water balance study, river maintenance flows shown below are considered based on specific river maintenance flow of Muda river (0.00119$m^3/s/km^2$). In the water balance model, downstream water demand is already considered so that river maintenance flow is used only for maintaining river environment and so on, not for downstream water demand. Procedure to estimate river maintenance flow to be used in water balance study is shown in Table I-18, and summarized below.

Scheme	River	River Maintenance Flow for Water Balance Study at Intake Point (m^3/s)
Pulau Pinang	Muda	5.00
	Kulim	0.15
Kerian	Kerian	1.60
Sungai Manik	Batang Padang	0.54
Seberang Perak	Perak	17.55
Kemasin/Semerak	Kemasin	0.16
Ketara (Besut)	Besut	0.69
	Angga	0.09

2.2 Irrigation Water Requirement

Diversion irrigation water requirement was calculated from every 10 days on the basis of the formula shown below. Concerning cropping method, wet direct seeding, dry direct seeding and transplanting which are being practiced in the study areas were used for the water balance study. For planting period, 120 days for the schemes located on the west coast and 130 days for the schemes located on the east coast ware applied.

(1) Presaturation, 2nd standing water supply period

$$DWR = (S + H + ETo + PL - ER) / E$$

DWR : Diversion Water Requirement
S : Soil Saturation Depth
H : Standing Water Depth
ETo : Potential Evapotranspiration
PL : Percolation

ER : Effective Rainfall

E : Overall Irrigation Efficiency

For soil saturation depth , DID standard value 150mm was applied. For standing water depth, 100mm derived from DID standard was used for presaturation period and 0mm was used for 2nd standing water supply period. Potential Evapotranspiration (ETo) was estimated by using modified Penman method. Required climatic data were collected from principal meteorological stations closest to the study areas as shown below. Percolation (PL) data were obtained from operation and maintenance manuals collected from DID local offices and "Assessment of Selected Performance Indicators for Paddy Irrigation in Kerian Scheme" published by DID in 1995. The maximum and minimum limit of effective rainfall were set as 165mm and 5mm respectively. Maximum limit 165mm consists of 100mm to make standing water and 65mm to keep standing water depth. 65mm derives from paddy plot water balance shown below. The minimum limit 5mm was decided considering the rainfall to be kept in stems of rice plants. In presaturation and 2nd standing water supply period, 10-days areal rainfall in 1/5 probability drought year were used for estimating effective rainfall. Overall irrigation efficiency were assumed as 45% for present irrigation system and 60% for modernized irrigation system.

Meteorological Stations for Estimation of Potential Evapotranspiration

Scheme	P.Pinang Kerian	Sg.Manik Sb.Perak	Kemasin/ Semerak	Besut
Meteorological Station	Bayan Lepas	Sitiawan	Kota Bahru	Kota Bahru
Calculation Period	1977-1996	1977-1996	1977-1996	1977-1996

(Paddy Plot Water Balance Study)

Effective rainfall is given by conducting water balance calculation at paddy field level. The water balance calculation is performed based on the following formula.

$$WL(i) = WL(i-1) + R - ETo \times Kc - PL$$

where, WL(i) : Water Level at time(i)

R : Rainfall more than 5 mm (rainfall less than 5 mm is assumed as ineffective rainfall because it'll be kept around stem of rice plant)

ETo : Potential Evapotranspiration

Kc : Crop Coefficient

PL : Percolation Loss

Based on Assessment of Selected Performance Indicators for Paddy Irrigation in Kerian Scheme, storage capacity of the model and irrigation & drainage interval are assumed to be 75 mm and 10 days respectively. The results of the calculation are shown in Table I-1 and Fig I-5. The other factors used for estimating irrigation water requirement are shown in Table I-2.

(2) Normal supply period

$$DWR = (ETo \times Kc + PL - ER) / E$$

DWR	:	Diversion Water Requirement
ETo	:	Potential Evapotranspiration
Kc	:	Crop Coefficient
PL	:	Percolation
ER	:	Effective Rainfall
E	:	Overall Irrigation Efficiency

The maximum and minimum effective rainfall for normal supply period were set as 65mm and 5mm, respectively. The nearest rainfall station data (more than 20years) was used for estimating diversion water requirement. Probability calculation was done in order to estimate water requirement in each probability drought year.

3. RESULT OF THE WATER BALANCE STUDY IN THE FIVE(5) GRANARY AREAS

3.1 Pulau Pinang Scheme

Pulau Pinang Scheme has three(3) main water sources, namely, Muda river (for Sungai Muda Sub-Scheme, Pinang Tunggal Sub-Scheme and Pokok Tampang Block in Sungai Jarak Sub-Scheme), Kulim river (for Sungai Kulim Sub-Scheme) and Jarak river (for Padang Menora Block in Sungai Jarak Sub-Scheme). Kulim and Jarak Sub-Scheme receive supplementary irrigation water from Muda river system as shown in Fig. I-29, so that water balance study of Muda river is quite important for Pulau Pinang Scheme. The water balance study of Muda river basin including the biggest granary MADA has been done in "Comprehensive Management Plan of Muda River Basin (JICA,1995)". According to the result, granary areas in Muda river basin can achieve 200% of cropping intensity if proposed water resources structures such as Beris Dam, Jeniang Transfer, Naok Dam and Reman Dam are constructed.

3.2 Kerian Scheme

For Kerian Scheme, water balance model considering Bukit Merah reservoir storage function was developed. In the model it is assumed that Kerian Darat Sub-Scheme which completely depends on the reservoir water source is given priority for the water distribution. Kerian Laut Sub-Scheme is given excess water from Bukit Merah reservoir and supplemented by Bogak Pump Station. The water balance model used for the study is described in Fig. I-30 and equation/operation rule used for the reservoir water balance study are summarized below.

Storage - Area - Elevation Curve of Bukit Merah Reservoir used for the study is shown in Fig I-39.

The water balance study of Bukit Merah Reservoir

$Se = Sb + In - RD - RL - Ev - Sp$

where, Se : Reservoir storage volume at the end of the period
Sb : Reservoir storage volume at the beginning of the period
In : Inflow to the reservoir from Sungai Kurau during the period
RD : Release from reservoir to Kerian Darat including domestic, industrial and irrigation water requirement
RL : Release from reservoir to Kerian Laut including domestic, industrial and irrigation water requirement
Ev : Evaporation loss from reservoir
Sp : Spillout discharge if any

The rule of operating reservoir used in the study

(1) The water level should be the maximum level on December 1st.

(2) The release will first meet the domestic, industrial and irrigation water requirement in Kerian Darat.

(3) The balance will be supplied to Kerian Laut.

(4) If this balance is inadequate to meet the demands in Kerian Laut, pumping augmentation shall be initiated to meet the deficit to the extent possible.

(5) In the Reservoir Operation Study, it is mentioned that the reservoir level should be kept low level in October, November, December because of anticipation of flood. But there are no certain regulation to operate the reservoir level, so that the this release is not consider in this study.

In Kerian Scheme, present cropping pattern is quite different from the original one. According to the water balance study, the scheme can achieve 200% of cropping intensity in <Case 1> (present cropping pattern). However, from agriculture and water management point of view, it is recommended to use proposed cropping pattern <Case 3> which is similar to the original pattern to achieve 5.5t/ha yield. <Case 3> has high water demand peak compare with <Case 2>, but <Case 3> can also achieve 200% of cropping intensity. In Kerian Scheme, it is quite important to operate Bukit Merah reservoir with proper management method. For proper reservoir operation, it is important to decide command area of Bukit Merah reservoir and Bogak Pump Station. Command areas of Bukit Merah reservoir and Bogak Pump Station are shown in Fig. I-45 to I-51. 10-days basis reservoir water level transition in 1/5 probability drought year is shown in Fig. I-52. 10-days basis water balance of Kerian river is shown in Fig. I-53.

It is quite important to keep desirable reservoir water level to achieve optimum reservoir operation. "Drought - Required Reservoir Storage Curve Method" is recommended for agriculture purpose reservoir because of its effectiveness and simplicity. Reservoir operator have to adjust two kind of requirement shown below :

(a) To release water as much as possible for the farmers,

(b) To restore water as much as possible for present or future drought.

Drought - Required Reservoir Storage Curve Method is developed to adjust the opposite object shown above. If reservoir storage is larger than "Drought - Required Reservoir Storage", reservoir storage will not become zero even in design drought year (1/5 probability drought year). Drought - Required Reservoir Storage should be converted to Drought - Required Reservoir Storage Curve by using H-Q curve of the reservoir considering simplicity of the reservoir operation. Drought - Required Reservoir Storage Curve consists of two curves, namely "Standard Storage Curve" and "Release Limitation Curve".

At first, it is necessary to determine "Standard Storage Curve" by using formula as follows :

$$K(i) = P(i) - Y(i)$$
$$V(i) = V(i+1) - K(i)$$
in case $V(i)<0$, $V(i) = 0$

where, K(i) : Water balance
P(i) : Available inflow in design drought year
Y(i) : Irrigation water requirement in design drought year
V(i) : Required reservoir storage
i : Calculation time (i = 1, 2, 3, ..., n)

Reservoir water level should be kept to "Standard Storage Water Level". Nevertheless, the water level often falls down below "Standard Storage Water Level" because of fluctuation of weather condition. In case the water level is below "Standard Storage Water Level", the reservoir should be operate according to the "Release Limitation Curve". "Release Limitation Curve" is determine by using formula shown below.

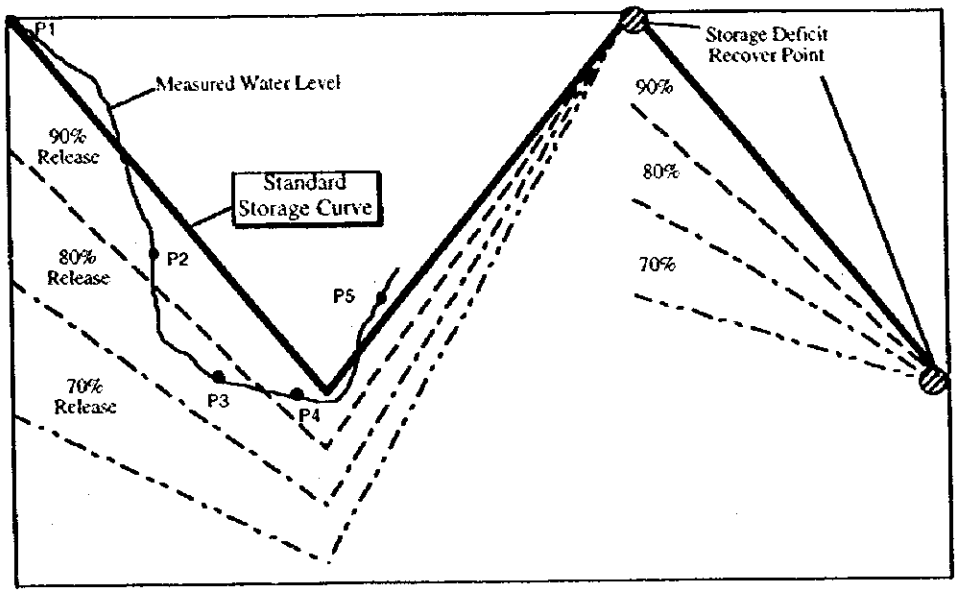
$$K(i) = P(i) - Y(i) \times Z$$
$$V(i) = V(i+1) - K(i)$$
in case $V(i)<0$, $V(i) = 0$

where, Z : Release Rate

"Storage Deficit Recover Point" is the critical point of this method. The water level must be higher than "Standard Storage Curve" at this point to supply 100% of water demand after "Storage Deficit Recover Point".

The example of "Drought - Required Reservoir Storage Curve" is shown below. At first, water level was maximum level (P1) so that release was set as 100% of water demand. Nevertheless, because of unexepectable drought (more than 1/5 probability), water level of reservoir went down from P1 to P2. P2 is located at 90% release zone, hence release from reservoir was set as 90% of water demand. Unfortunately, drought is very severe in the sample year, water level went down from P2 to P3 even with 90% release. P3 is located at 80% release zone, hence release from reservoir was set as 80% of water demand. Thanks to the 20% water release decrease, water level went up from P3 to P4, so that water release was set as 90%. At last, water level went up to P5 which is located higher than "Standard Storage Curve" so that reservoir can supply 100% of water demand. By using this method, reservoir operator will be able to keep "Standard Storage Curve".

Fig. I-57 shows sample "Drought - Required Reservoir Storage Curve" of Bukit Merah Reservoir in Case 3 (Future Non-Farm Water Demand). In Fig. I-57, "Storage Deficit Recover Point" was determined based on the growth stage of rice plant. For rice plant, it is very important to be given water in heading period so that water supply in this period must be 100% of water demand to attain high yield. Consequently, in Fig. I-57, "Storage Deficit Recover Point" were set considering beginning of heading period of main season (September) and off season (March).



3.3 Sungai Manik Scheme

Sungai Manik Scheme has sufficient water to achieve 180% cropping intensity even in present condition <Case 1>, and the scheme can conduct 200% cropping intensity from water resource point of view. 10-days water balance result is shown in Fig. I-54.

3.4 Seberang Perak Scheme

For Seberang Perak scheme, detail water balance study could not be achieved because of non-availability of proper Perak river discharge data. However, it can be said that the scheme has abundant water resource according to the rough estimated river discharge data given by DID Ipoh. The scheme can accomplish not only 180% but also 200% cropping intensity even in low irrigation efficiency condition <Case 1>.

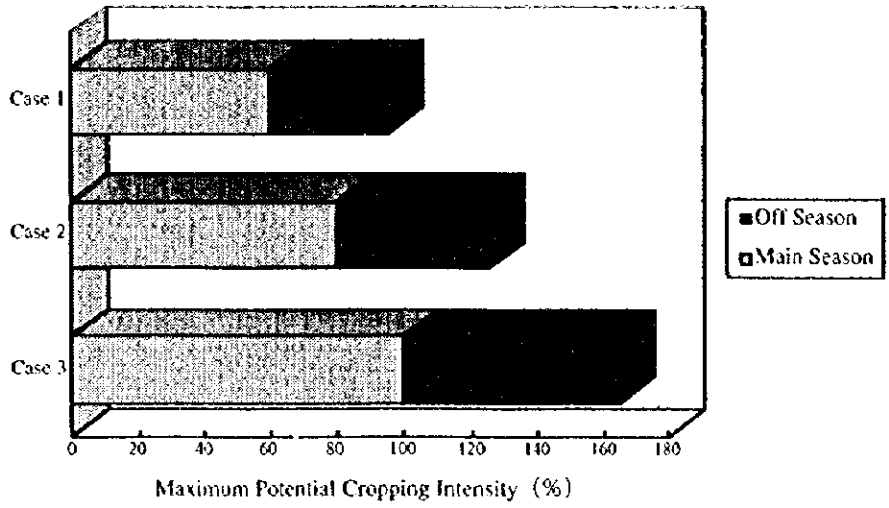
3.5 Kemasin / Semerak Scheme

In Kemasin / Semerak Scheme, only Kemasin Hilir sub-scheme and Jelawat Rusa sub-scheme has operated so that the water balance study was conducted only for the two(2) sub-schemes. In the study, two(2) sub-schemes were regarded as one(1) system since they receive water from the same river (Kemasin river). Kemasin scheme has planed to be provided 5 m^3/sec water from Kemubu Pump Station located at Kelantan river which has constructed for KADA. The water balance study was conducted with supply water of 5 m^3/sec. The scheme can attain 200% cropping intensity, if Kemubu Pump Station supply water to Kemasin scheme properly. 10-days water balance result is shown in Fig. I-55.

3.6 Ketara(Besut) Scheme

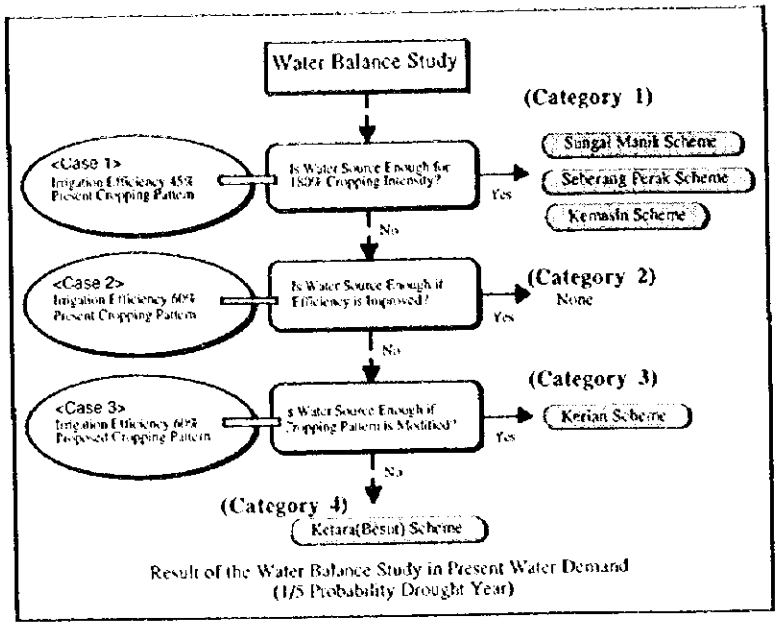
Ketara(Besut) scheme has 2 water sources, namely Besut river and Angga river. In this area, north east wind peculiar in the east coast area has great influence and as a result, annual and monthly variation of water sources is significant and effective use of river discharge is very difficult. In Besut scheme, the original cropping pattern is considered as recommended cropping pattern <Case 3> and adjustment of present cropping pattern <Case 1> to the original cropping pattern <Case 3> makes great benefit. In addition, introducing dry direct seeding in off season in 20% of total area can decrease peak water demand as shown in Fig. I-58. In the water balance study, the original cropping schedule with 20% dry direct seeding is recommended as <Case 3>.

However, even in <Case 3>, the scheme cannot attain 180% cropping intensity in 1/5 probability drought year, hence the scheme is recognized as (Category 4) in work flow of water balance study. The maximum potential cropping intensity of the scheme in 1/5 probability drought year is about 165% as shown below. 10-days water balance result is shown in Fig. I-56.



4. RESULT OF WATER BALANCE STUDY AND PROPOSED PLAN

Based on the water balance study, the study areas can be classified as shown below. Sungai Manik, Seberang Perak and Kemasin Schemes have enough water to achieve not only 180% cropping intensity but also 200%. Consequently, these schemes were classified as (Category 1) and the target cropping intensity should be set as 200%. Kerian scheme was classified as (Category 3), hence irrigation efficiency improvement and cropping pattern modification are required to get more than 180% cropping intensity and high yield. Ketara(Besut) scheme was classified as (Category 4), so that irrigation efficiency improvement plan, cropping pattern modification plan and drainage water recycling plan should be taken. In Ketara(Besut) scheme, capacity of recycling pump is about 10% of peak diversion irrigation water requirement. If the scheme can recycle about 10% of irrigation water, maximum potential cropping intensity in 1/5 probability drought year is about 175%. Pulau Pinang scheme will be able to achieve 180-200% cropping intensity with the proposed dam projects. In the water balance study, it is assumed that there is no water distribution problem. In case of water distribution problem, there will be water deficit in local areas.



Result of the Water Balance Study in Present Water Demand
(1/5 Probability Drought Year)

5. ADDITIONAL STUDY FOR THE FUTURE WATER SHORTAGE

In order to help policy formulation contingency plans in the event of water shortages in the future, additional study to grasp maximum cropping intensity for the future water shortage is made. In the additional study, more stringent drought year condition than one in five years (1/5) such as one in ten years (1/10) and one in twenty years (1/20) are assumed. The result of the additional study is summarized below.

Maximum Cropping Intensity (%) of Case 3 in Future Water Demand Condition

Drought Probability / Scheme	1/5	1/10	1/20
Pulau Pinang [1]	200	200	-
Kerian	200	140	75
Sg. Manik	200	190	170
Perak [2]	200	200	200
Kemasin [3]	200	200	200
Ketara(Besut)	165	145	130
Ketara(Besut) [4]	175	155	140

[1] : Comprehensive Management Plan of Muda River Basin (JICA,1995)

[2] : Estimated from minimum discharge (113m^3/s) guaranteed by Tenaga Nasional Berhad at Iskandar Bridge (upstream of Telok Sena Intake)

[3] : with supplementary water from Kemubu pump station (KADA)

[4] : with 10% recycling water

TABLES

Table I-1 Inventry of Principal Meteorological Station Used for the Study

	Latitude(N) Deg.	Min.	Longitude(E) Deg.	Min.	Height above M.S.L. (m)	Data Collected Period	Height of Anemometer Head above Ground (m)
Pinang International Airport (Bayan Lepas)	5	18	100	16	2.8	1977-1996	12.5
Sitiawan	4	13	100	42	7.0	1977-1996	16.8
Kota Bharu Airport	6	10	102	17	4.6	1977-1996	14.0
Kuala Terengganu Airport	5	23	103	06	5.2	1986-1996	14.0

Table I-2 Areal Rainfall of Pulau Pinang Scheme

Rainfall Station
5303053, 5304046, 5303042, 5404041, 5503031, 5503034, 5504035, 5505033

(mm)

Month/10days / Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
1980	9.6	90.3	137.9	157.8	196.6	124.8	149.5	379.6	656.6	391.3	282.9	150.8	2727.6
1981	38.4	121.7	123.1	236.8	236.8	144.4	89.4	155.1	398.7	192.8	182.7	19.6	1939.4
1982	2.7	18.1	142.8	215.8	238.7	50.2	139.2	113.8	323.2	319.1	289.8	97.1	1950.7
1983	20.1	46.1	39.1	123.0	378.7	162.0	124.9	90.4	427.4	226.7	96.5	98.9	1833.8
1984	196.0	135.0	107.9	453.4	146.4	119.0	231.9	117.8	178.9	171.2	154.4	139.8	2151.8
1985	54.2	133.0	178.6	187.5	220.4	46.5	95.6	150.2	342.1	383.6	231.2	86.9	2109.8
1986	30.5	6.6	80.3	94.1	239.7	107.4	149.2	203.1	400.5	466.6	173.8	76.8	2028.4
1987	5.2	0.0	65.6	132.1	219.0	93.4	124.8	251.2	336.7	214.5	353.7	138.7	1934.9
1988	45.8	94.0	140.4	206.9	131.2	146.3	115.7	388.5	329.4	183.3	177.5	27.1	1983.1
1989	80.8	45.5	206.1	220.8	138.7	212.5	179.3	231.4	392.3	385.5	115.8	73.4	2332.0
1990	63.8	108.3	87.8	181.8	266.6	119.2	155.3	111.2	348.7	274.6	324.5	78.9	2120.6
1991	64.8	48.2	135.0	205.9	380.3	268.6	281.6	241.7	272.0	200.8	131.8	86.4	2317.1
1992	29.6	110.1	81.7	152.4	266.3	62.6	201.1	386.3	185.1	408.3	154.0	94.4	2131.9
Average	49.3	73.4	117.4	201.4	235.3	127.4	156.7	216.9	353.2	293.7	205.3	89.9	2120.1

Probable Areal Rainfall

Estimated by Pearson Method

(mm)

Month/10days / Return Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
20	5.8	2.8	58.6	98.4	130.5	51.1	86.5	84.0	199.0	154.8	97.8	40.4	1009.3
10	7.5	2.9	64.0	112.8	146.2	59.5	97.3	100.6	220.0	175.7	113.0	43.0	1142.3
5	11.0	3.1	73.5	134.1	168.6	72.7	112.6	125.7	250.9	205.4	135.1	48.3	1341.0
4	13.5	3.8	79.5	145.3	180.4	80.4	120.5	139.5	268.0	221.0	145.9	52.6	1451.4
3	17.7	4.9	88.0	161.3	196.9	91.6	131.5	159.6	291.8	242.8	163.5	58.6	1608.2
2	26.0	6.9	101.6	186.7	222.6	110.0	148.8	192.9	329.0	277.2	190.3	68.4	1860.4

Table I-3 Areal Rainfall of Kerian Scheme

Rainfall Station
4905032, 5003028, 5004027, 5005002, 5006021, 5104011, 5104012, 5104052

(mm)

Month/10days / Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
1979	101.0	147.4	74.6	351.9	189.1	150.6	197.3	122.9	230.4	366.5	255.6	32.1	2219.2
1980	57.0	171.9	142.8	232.9	255.1	131.7	102.5	317.0	317.0	347.6	334.3	239.2	2649.0
1981	93.7	117.5	86.8	375.4	242.2	57.8	143.4	86.7	260.6	147.6	152.3	82.9	1846.9
1982	54.2	48.2	174.6	235.0	250.7	42.9	106.4	110.0	238.2	421.5	379.8	158.7	2220.1
1985	87.5	154.0	246.9	163.9	95.9	20.9	92.6	104.3	182.8	311.7	368.4	124.5	1953.5
1986	45.9	48.8	237.6	226.2	283.7	61.6	105.9	197.3	314.6	285.8	163.8	160.2	2131.5
1987	55.7	5.2	158.4	162.6	192.8	163.9	121.7	242.4	321.9	297.0	289.2	289.6	2300.5
1988	172.1	175.1	358.8	296.7	154.5	229.2	108.9	259.9	246.6	104.6	282.7	77.5	2466.6
1990	128.1	100.9	145.2	213.6	206.6	98.3	97.7	101.9	277.1	287.1	338.5	178.9	2174.0
1993	139.3	93.3	323.8	148.5	141.5	121.3	224.6	116.9	164.8	277.7	357.1	204.0	2312.7
Average	93.4	106.3	191.9	240.7	201.2	107.8	130.1	165.9	255.4	284.7	292.2	154.8	2227.4

Probable Areal Rainfall

Estimated by Pearson Method

(mm)

Month/10days / Return Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
20	40.4	30.4	77.8	136.2	125.9	32.4	75.5	70.0	181.5	164.3	187.9	59.1	1181.3
10	47.5	31.7	91.2	152.6	132.5	37.7	84.1	82.6	190.9	171.8	196.4	64.8	1283.8
5	58.0	35.2	112.1	175.6	145.1	47.4	96.2	101.3	205.6	186.5	212.6	76.3	1452.0
4	63.7	39.4	124.0	187.5	153.4	53.9	102.4	111.5	214.2	198.3	223.8	84.7	1556.8
3	71.9	45.6	141.4	204.0	164.7	63.7	111.0	126.1	225.8	214.5	239.1	97.0	1704.6
2	85.2	55.9	170.0	229.8	182.1	80.5	124.3	149.9	243.3	239.6	262.5	117.2	1940.2

Table I-4 Areal Rainfall of Sungai Manik Scheme

Rainfall Station
4010098, 4010138, 411137

(mm)

Month/10days / Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
1979	131.5	208.4	94.9	169.6	132.2	81.3	163.0	94.0	379.0	353.4	316.7	214.9	2338.9
1980	175.6	257.2	349.3	219.1	196.7	143.1	125.3	189.6	222.3	221.8	331.5	198.5	2629.9
1982	43.6	110.6	182.8	446.4	253.4	64.3	164.0	137.9	103.5	462.3	581.0	326.1	2875.7
1987	116.0	115.4	180.7	304.2	104.0	97.7	183.3	267.2	204.0	299.0	128.2	273.2	2273.0
1988	105.4	143.2	300.1	355.0	146.6	175.9	178.6	367.1	313.0	39.7	377.4	169.3	2671.3
1989	372.8	126.3	183.1	260.4	289.7	112.6	41.8	39.8	460.8	155.8	379.6	109.1	2531.9
1990	83.8	120.7	119.9	82.4	267.5	92.2	111.5	40.7	203.6	261.9	161.3	199.5	1745.1
1991	123.4	160.6	200.9	306.8	276.0	134.7	56.1	94.8	81.1	167.8	280.3	221.2	2103.5
1992	69.5	41.9	99.3	95.1	166.7	38.9	146.7	108.9	94.5	147.2	438.7	214.3	1661.7
1993	117.6	64.6	210.3	241.2	345.5	134.4	193.2	50.0	234.7	212.7	359.4	333.5	2497.1
Average	133.9	134.9	192.1	248.0	217.8	107.5	136.4	139.0	229.6	232.2	335.4	226.0	2332.8

Probable Areal Rainfall

Estimated by Pearson Method

(mm)

Month/10days / Return Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
20	45.3	58.2	88.2	105.6	112.2	56.1	67.6	30.7	79.3	92.9	172.1	136.6	1044.6
10	55.4	65.0	102.3	117.0	125.4	60.2	71.7	40.2	94.9	99.8	185.3	147.0	1164.2
5	71.1	76.9	123.2	137.9	145.5	68.1	79.8	56.3	119.9	113.6	210.4	163.6	1366.1
4	79.8	84.4	134.5	151.7	156.9	73.4	86.1	65.9	134.6	125.0	227.0	173.5	1492.8
3	92.7	95.2	150.5	171.5	173.0	80.8	95.1	80.7	156.3	141.5	250.5	187.1	1674.8
2	114.5	112.9	176.5	203.9	198.5	92.5	109.3	107.3	192.8	168.4	287.7	208.2	1972.4

Table I-5 Areal Rainfall of Seberang Perak Scheme

Rainfall Station
4008102, 4009096, 4010098

(mm)

Month/10days / Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
1979	109.5	217.0	128.2	233.8	136.9	156.7	227.8	110.8	35.7	349.2	203.7	141.3	2050.6
1980	136.5	159.5	193.4	172.8	237.0	138.3	226.8	161.9	258.3	219.8	273.1	215.7	2393.0
1982	102.9	86.9	191.4	268.1	160.2	95.5	143.6	133.4	200.9	275.7	312.0	315.0	2285.6
1984	359.3	530.2	239.7	192.5	168.4	131.1	139.9	116.9	113.9	272.5	179.1	162.8	2606.4
1988	129.7	153.4	325.8	229.4	163.9	128.4	124.4	229.1	255.7	62.3	317.2	111.4	2230.5
1989	272.2	52.4	164.1	220.3	154.8	35.6	27.1	101.0	330.9	158.5	352.1	181.2	2050.2
1990	184.8	86.8	124.4	178.1	152.2	35.4	120.0	63.2	210.5	262.0	125.8	239.6	1782.9
1991	95.9	91.2	258.0	229.6	123.4	152.8	44.7	48.1	232.0	172.1	351.3	256.4	2055.6
Average	173.9	172.2	203.1	215.6	162.1	109.2	131.8	120.5	204.7	221.5	264.3	202.9	2181.8

Probable Areal Rainfall

Estimated by Pearson Method

(mm)

Month/10days / Return Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
20	70.8	41.5	111.5	168.0	116.8	44.4	42.1	50.9	88.1	112.5	154.6	113.6	1114.7
10	84.0	53.4	125.6	176.5	125.0	48.3	47.0	58.9	91.6	117.9	164.2	126.2	1218.6
5	103.8	73.2	145.7	187.8	135.8	56.2	57.2	71.3	100.2	129.3	182.1	144.7	1387.2
4	114.6	84.7	156.1	193.6	141.2	62.0	64.6	78.5	108.9	139.0	193.9	154.7	1491.8
3	130.2	102.4	170.6	201.2	148.5	70.3	75.6	88.8	121.3	152.6	210.2	168.6	1640.4
2	155.7	133.6	193.3	212.6	159.4	84.1	94.5	105.8	141.2	174.0	235.6	190.5	1880.2

Table I-6 Areal Rainfall of Kemasin / Semerak Scheme

Rainfall Station
5823076, 5824080, 5923001, 5923081, 6022001, 6023001, 6023072, 6024074

(mm)

Month/10days / Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
1982	24.8	23.2	56.3	31.0	105.0	113.7	276.3	186.1	161.6	150.3	240.6	602.1	1971.0
1983	67.8	13.9	94.9	11.7	63.4	143.5	292.8	203.4	240.0	182.2	323.8	1199.2	2836.6
1984	139.7	110.1	194.9	78.3	149.7	181.3	101.6	181.1	197.4	191.6	338.8	706.9	2571.3
1985	101.9	132.7	458.2	98.4	207.4	37.3	170.0	228.0	292.5	340.3	283.4	646.4	2996.5
1988	70.5	112.7	60.7	104.2	180.4	115.1	208.5	225.8	321.1	239.0	1256.6	543.3	3437.8
1989	86.7	35.6	34.3	87.4	118.0	103.1	163.3	245.8	373.3	355.2	339.8	187.2	2129.6
1990	100.1	21.9	30.9	261.9	133.1	104.1	180.6	196.5	286.7	236.6	169.3	246.9	1968.5
1991	298.9	25.8	29.1	62.8	132.5	104.0	72.9	301.5	292.0	219.2	866.4	421.3	2826.5
1992	71.9	76.0	26.3	25.8	82.4	201.6	216.7	69.6	110.8	118.7	672.8	426.9	2102.3
1993	189.4	38.0	236.2	149.9	62.4	127.5	248.5	187.6	302.7	515.7	538.7	457.7	3054.3
Average	115.2	59.0	122.2	91.1	123.4	123.4	193.1	202.5	257.8	254.9	503.0	543.8	2589.4

Probable Areal Rainfall

Estimated by Pearson Method

(mm)

Month/10days / Return Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
20	33.6	12.0	14.5	17.6	61.1	68.6	103.0	135.9	156.1	114.6	152.2	213.3	1082.3
10	41.3	15.9	20.7	22.1	69.1	71.8	109.9	137.8	164.0	133.7	189.6	250.3	1226.0
5	53.7	22.6	32.2	30.3	81.1	78.2	123.3	143.1	179.0	161.9	249.1	308.0	1462.6
4	61.3	26.7	39.5	35.9	87.8	83.4	132.5	149.0	189.6	177.0	282.8	341.5	1607.0
3	72.5	33.0	51.5	44.7	97.3	90.6	145.4	156.9	204.3	198.5	333.2	390.0	1817.9
2	92.0	44.6	74.9	60.7	112.5	101.8	165.6	168.9	226.8	233.5	419.8	470.3	2171.3

Table I-7 Areal Rainfall of Besut Scheme

Rainfall Station
5625004, 5625011, 5725005, 5725006

(mm)

Month/10days / Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
1978	123.5	71.0	45.0	35.5	160.8	111.8	192.5	202.6	344.5	309.0	369.1	359.1	2324.3
1980	71.9	97.9	47.0	97.3	129.1	127.3	148.4	276.7	220.7	346.3	404.4	770.8	2737.8
1981	40.4	85.0	54.1	72.8	196.0	60.2	147.2	90.8	240.9	238.5	428.5	620.8	2275.2
1982	24.6	11.6	87.0	107.0	121.4	171.6	253.1	250.3	163.4	242.7	223.9	651.1	2307.7
1983	198.2	18.8	96.4	0.0	107.2	164.0	348.5	249.3	222.0	195.6	293.8	1412.0	3305.9
1984	371.4	385.5	230.2	111.2	126.7	133.9	198.9	205.6	294.4	158.7	278.8	1040.7	3536.2
1985	127.1	227.8	697.5	171.2	295.3	46.7	114.6	307.2	350.9	410.6	218.9	832.8	3800.5
1986	141.1	4.5	85.8	7.6	167.8	230.0	64.5	55.1	412.3	252.6	1189.7	335.1	2946.4
Average	137.3	112.8	167.9	75.3	163.0	130.7	183.5	204.7	281.2	269.3	425.9	752.8	2904.2

Probable Areal Rainfall

Estimated by Pearson Method

(mm)

Month/10days / Return Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
20	26.9	5.1	22.5	0.7	90.8	56.0	77.4	89.6	167.1	157.4	149.9	315.0	1158.4
10	34.8	7.9	31.3	0.7	101.9	62.4	88.5	96.0	184.0	174.9	181.6	367.7	1331.7
5	48.6	14.1	47.2	0.9	117.7	73.8	106.3	108.8	208.2	199.6	230.5	448.4	1603.9
4	57.5	18.9	57.2	1.3	125.8	81.1	117.0	118.9	221.2	212.4	257.5	494.1	1762.9
3	71.4	27.6	73.2	2.0	137.2	91.6	132.5	133.4	239.1	230.1	297.2	559.9	1995.1
2	97.0	46.9	103.6	3.7	155.0	108.9	157.7	156.8	266.9	257.7	363.6	667.9	2385.5

Table I-8 River Discharge of Kurau River

River	: Kurau River	Location	: Pondok Tanjung
Scheme	: Kerian	Station No.	: 5007421
Sub-Scheme	: Kerian Darat, Kerian Laut	Catchment Area	: 337 km²

10-Days Basis Measured River Discharge Data

(m³/s)

Month/10days / Year	Jan 1	2	3	Feb 1	2	3	Mar 1	2	3	Apr 1	2	3	May 1	2	3	Jun 1	2	3	Jul 1	2	3	Aug 1	2	3	Sep 1	2	3	Oct 1	2	3	Nov 1	2	3	Dec 1	2	3	Average
1981	-	9.5	7.0	9.2	9.0	12.7	10.4	5.8	11.5	17.8	26.5	25.7	31.4	40.4	40.7	34.7	12.1	9.7	6.2	8.0	7.9	5.0	3.4	5.1	17.4	21.3	8.7	-	-	31.6	-	-	-	-	-	-	-	16.7
1982	-	3.0	7.1	5.1	-	-	2.7	2.2	8.0	14.4	24.2	27.2	19.5	19.2	22.2	16.6	7.9	5.9	16.7	9.8	8.9	8.1	12.2	12.3	11.5	15.3	25.8	27.3	-	-	-	-	-	-	-	-	-	13.3
1983	-	8.6	6.6	5.2	8.9	8.5	6.5	14.7	17.0	6.5	5.7	5.3	20.9	23.7	-	-	33.2	9.0	8.6	13.8	10.1	7.8	3.7	10.1	27.0	57.3	25.7	11.6	18.4	27.3	10.8	28.3	10.2	7.4	7.4	7.3	14.1
1984	5.1	4.4	-	-	11.1	5.4	6.2	7.8	20.4	33.8	26.8	18.6	33.5	31.2	16.0	9.1	10.8	5.2	3.8	22.7	10.6	7.8	6.8	5.1	5.3	7.6	7.5	16.4	9.0	8.1	31.8	41.7	19.5	25.9	30.6	-	15.2
1985	-	-	-	-	-	6.1	-	-	18.0	9.7	11.8	8.1	7.3	14.7	13.5	8.8	5.6	3.0	3.0	6.9	7.9	4.2	6.6	-	4.6	8.5	16.5	25.1	19.8	27.2	42.6	40.4	41.4	30.1	22.2	9.9	15.1
1986	7.9	3.9	6.1	4.2	3.4	4.5	4.0	7.6	7.3	10.0	27.3	21.6	31.7	14.2	18.5	12.6	12.1	6.1	5.7	4.8	4.8	3.3	3.5	9.2	10.3	6.7	22.3	54.1	27.1	25.3	32.4	16.2	-	-	-	13.4	15.5
1987	7.0	4.8	5.5	-	-	-	-	4.3	3.6	5.3	-	-	-	29.9	22.9	29.2	7.1	12.6	5.9	4.1	15.2	25.8	30.5	-	-	18.6	36.6	41.0	41.9	56.1	45.1	35.4	31.8	34.7	32.3	19.9	22.3
1988	9.9	5.9	10.6	18.3	11.7	13.6	17.3	14.0	25.3	35.3	20.8	17.7	12.1	22.7	11.1	7.2	7.2	22.0	18.6	11.3	8.7	-	-	-	44.5	29.0	23.5	20.7	18.0	9.8	16.1	12.4	21.6	21.5	9.7	14.2	17.0
1989	7.3	6.9	9.3	3.6	5.4	5.9	18.6	8.3	14.7	20.9	39.0	22.9	20.5	24.8	11.3	15.6	9.6	5.9	10.9	10.9	6.9	6.1	6.7	4.2	13.7	9.1	38.7	22.6	13.0	33.7	27.0	28.5	22.3	11.6	10.6	10.2	14.9
1990	8.8	11.9	7.2	6.3	8.1	9.9	5.9	8.5	14.2	19.0	14.4	16.7	40.1	39.4	19.3	20.0	10.5	12.0	13.6	28.4	16.3	15.1	9.6	8.3	9.9	15.4	22.9	28.7	45.0	52.9	53.9	30.6	41.7	27.1	20.9	16.0	20.4
Average	7.7	6.5	7.4	7.4	8.2	8.3	9.0	8.1	14.0	19.3	21.8	18.2	24.0	25.7	19.5	17.0	11.6	9.2	9.3	11.9	9.8	9.2	9.0	7.9	16.0	18.9	22.6	27.5	24.0	30.7	33.2	29.2	26.9	20.6	19.1	13.0	16.2

10-Days Basis Probable River Discharge Data

(m³/s)

Estimated by Pearson Method

Month/10days / Return Period	Jan 1	2	3	Feb 1	2	3	Mar 1	2	3	Apr 1	2	3	May 1	2	3	Jun 1	2	3	Jul 1	2	3	Aug 1	2	3	Sep 1	2	3	Oct 1	2	3	Nov 1	2	3	Dec 1	2	3	Annual Average
20	5.9	3.0	5.1	2.6	4.5	3.9	2.4	3.2	5.9	5.1	9.5	8.6	10.4	13.6	9.5	6.2	4.6	3.2	2.9	3.4	3.1	2.7	2.1	3.8	3.8	5.0	10.0	11.8	8.6	10.2	14.2	15.7	12.3	10.0	6.6	7.3	6.7
10	5.8	3.4	5.5	3.1	4.8	4.5	3.1	3.6	6.4	6.4	10.3	9.2	11.4	15.4	10.7	7.5	5.4	3.9	3.6	4.3	3.8	3.3	2.7	4.3	5.0	6.3	11.6	13.9	10.4	11.7	15.6	16.8	13.7	10.8	7.9	8.1	7.7
5	5.7	3.8	6.1	4.0	5.2	5.1	4.1	4.1	7.5	8.6	11.6	10.3	13.6	17.9	12.9	9.5	6.7	4.9	4.7	5.7	4.8	4.6	3.8	5.1	6.8	8.5	12.4	17.0	13.3	14.3	18.2	18.8	16.1	12.5	10.3	9.3	9.2
4	6.3	4.6	6.3	4.5	5.7	5.9	4.8	4.8	8.3	9.9	12.9	11.2	14.7	19.3	13.9	10.6	7.4	5.6	5.3	6.5	5.3	5.0	4.4	5.5	7.9	9.8	14.1	18.7	14.8	16.4	20.0	20.2	17.5	13.7	11.3	10.0	10.1
3	6.8	5.1	6.7	5.2	6.2	6.6	5.7	5.5	9.4	11.9	14.6	12.4	16.5	21.2	15.5	12.2	8.5	6.4	6.2	7.7	6.0	6.0	5.3	6.2	9.6	11.7	15.8	21.1	17.2	19.1	22.5	22.1	19.7	15.3	13.1	10.8	11.8
2	7.3	6.0	7.3	6.4	7.0	7.7	7.3	6.6	11.2	15.1	17.2	14.3	19.6	24.1	18.0	14.9	10.2	7.9	7.8	9.8	9.2	7.6	6.9	7.2	12.6	15.1	17.7	25.0	21.1	23.7	26.6	25.2	23.1	19.1	16.2	12.3	13.7

Table I-9 River Discharge of Kerian River

River	: Kerian River	Location	: Selama
Scheme	: Kerian	Station No.	: 5206432
Sub-Scheme	: Kerian Darat, Kerian Laut	Catchment Area	: 629 km²

10-Days Basis Measured River Discharge Data

(m³/s)

Month/10days / Year	Jan 1	2	3	Feb 1	2	3	Mar 1	2	3	Apr 1	2	3	May 1	2	3	Jun 1	2	3	Jul 1	2	3	Aug 1	2	3	Sep 1	2	3	Oct 1	2	3	Nov 1	2	3	Dec 1	2	3	Average
1981	38.2	27.0	19.4	27.2	22.5	18.5	16.5	12.7	16.2	39.2	33.0	27.8	45.3	58.4	60.3	-	-	23.7	14.3	13.1	24.1	14.5	8.3	14.2	25.0	44.1	41.1	19.9	-	38.4	35.8	18.5	15.2	11.2	7.0	5.5	25.4
1982	4.8	6.1	6.6	5.4	3.2	2.2	2.7	-	-	-	-	-	-	20.9	42.5	18.3	11.5	7.8	8.2	12.1	7.9	5.9	6.1	13.2	22.3	20.5	24.1	34.0	40.7	54.7	40.0	48.0	55.3	-	-	17.5	19.4
1983	19.5	6.1	3.8	2.3	6.5	5.6	4.2	7.7	7.8	2.2	2.3	5.2	27.6	19.3	12.3	14.0	26.7	7.9	5.7	8.6	6.1	17.0	9.5	18.3	50.6	79.4	39.6	16.5	40.5	41.4	19.4	35.2	12.9	11.6	9.7	10.1	17.9
1984	10.4	10.1	17.4	12.9	12.8	8.2	7.4	10.7	23.7	19.0	16.0	25.6	-	-	-	-	-	9.8	8.5	26.7	17.3	11.7	8.0	12.1	8.2	8.2	12.5	-	16.7	19.8	21.7	29.3	16.8	15.0	13.8	16.1	14.9
1985	20.4	17.0	17.6	21.8	41.3	22.7	42.2	29.2	40.2	23.8	23.6	19.8	21.0	36.9	36.5	24.8	15.1	10.7	10.1	11.6	-	13.5	12.9	18.4	16.6	16.9	30.7	40.2	40.1	51.5	55.9	56.8	52.8	39.9	38.3	26.4	28.5
1986	17.2	12.8	12.1	9.4	8.1	6.6	7.2	22.3	24.3	19.7	35.5	28.8	38.5	24.5	18.9	28.5	28.9	12.8	11.0	13.1	9.8	10.6	7.9	18.8	16.8	22.0	64.9	79.5	77.4	76.7	79.8	67.7	49.5	49.4	27.5	20.9	29.4
1987	14.9	10.9	9.6	7.0	6.3	3.4	10.1	18.3	11.6	6.9	12.6	13.5	20.7	29.1	30.1	35.3	14.2	-	-	-	-	38.1	39.2	26.2	22.2	43.7	55.0	-	-	-	-	35.4	36.8	61.1	44.0	32.3	24.5
1988	29.9	21.6	22.9	29.2	21.3	15.4	21.7	18.9	24.0	37.4	32.0	36.6	24.0	53.7	34.4	17.1	17.9	33.1	36.4	31.7	20.3	24.0	21.6	69.9	82.6	50.1	42.4	35.4	58.4	36.1	35.1	29.5	41.3	29.3	-	-	33.3
1989	15.4	15.3	-	-	-	12.5	-	-	18.3	47.8	57.1	-	-	-	-	21.1	17.3	-	-	28.2	23.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17.1	24.9
1990	15.6	15.1	11.9	8.6	13.3	11.4	8.6	7.9	15.8	19.2	15.7	19.1	30.1	39.7	29.9	20.9	14.7	16.4	17.9	28.5	24.5	25.6	16.2	12.6	15.2	-	32.1	56.1	44.1	93.1	93.5	51.9	42.2	30.5	24.7	20.0	27.7
Average	18.5	13.2	13.5	13.4	15.0	10.7	13.4	16.0	20.2	23.7	25.5	21.9	30.7	36.4	33.0	22.5	18.1	15.1	13.4	19.3	16.7	17.9	14.2	22.6	26.8	35.6	38.0	40.2	46.1	51.7	47.7	43.4	35.6	30.9	25.9	16.4	25.2

10-Days Basis Probable River Discharge Data

(m³/s)

Estimated by Pearson Method

Month/10days / Return Period	Jan 1	2	3	Feb 1	2	3	Mar 1	2	3	Apr 1	2	3	May 1	2	3	Jun 1	2	3	Jul 1	2	3	Aug 1	2	3	Sep 1	2	3	Oct 1	2	3	Nov 1	2	3	Dec 1	2	3	Annual Average
20	7.7	6.0	5.7	3.1	3.2	2.9	2.5	6.5	8.8	5.7	7.0	9.8	17.5	16.3	15.0	13.4	10.4	5.7	6.7	7.7	6.7	6.5	4.5	7.8	7.6	9.6	10.8	14.6	24.0	22.3	16.5	21.0	13.6	9.3	7.1	8.7	9.9
10	8.6	7.0	6.2	3.9	4.2	3.5	3.3	7.7	10.2	6.4	7.6	10.4	19.6	19.1	16.8	14.9	11.6	6.9	7.7	9.2	7.6	7.8	5.6	9.5	9.6	11.8	20.2	17.6	25.6	25.5	20.1	23.5	15.6	11.4	8.6	9.6	11.4
5	10.1	8.3	7.3	5.2	5.9	4.5	4.5	9.6	12.7	7.8	9.6	11.7	23.5	23.0	20.7	16.9	13.6	8.7	9.2	11.6	9.2	9.8	7.2	12.0	12.0	15.0	30.5	19.5	27.9	27.4	24.9	26.5	17.6	13.7	11.0	10.7	13.9
4	11.2	9.3	8.0	6.1	6.9	5.2	5.7	10.6	13.5	9.0	10.3	12.7	24.0	25.4	21.3	18.0	14.3	9.6	8.1	12.6	10.2	11.0	8.2	13.5	14.9	17.8	24.8	25.0	31.2	33.5	29.0	29.6	20.9	17.0	12.5	11.6	15.3
3	12.7	10.5	9.1	7.4	8.5	6.2	7.1	12.0	15.2	10.9	12.2	14.2	26.1	28.5	24.2	19.4	15.5	11.1	9.3	14.4	11.6	12.7	9.5	15.6	17.9	21.3	27.5	26.9	36.6	37.7	33.7	32.7	23.9	20.1	14.8	12.9	17.5
2	15.1	12.5	10.8	9.7	11.5	8.0	9.7	14.4	19.0	14.1	15.4	19.6	29.4	33.5	28.4	21.7	17.4	13.4	11.4	17.3	13.9	15.5	11.9	19.1	22.0	27.5	31.9	35.4	39.8	44.7	41.5	37.9	28.9	25.4	18.6	15.1	21.1

Table I-10 River Discharge of Batang Padang River

River	: Batang Padang River	Location	: Tanjung Kerantai
Scheme	: Sungai Manik	Station No.	: 4111455
Sub-Scheme	: Sungai Manik, Labo Kubong	Catchment Area	: 455 km²

(m³/s)

10-Days Basis Measured River Discharge Data

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Average
Year	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
1981	30.2	26.0	27.5	24.0	25.5	25.6	21.5	19.2	17.5	31.4	28.8	26.2	56.4	42.7	37.6	34.8	30.1	29.2	17.0	17.6	16.7	14.7	14.2	13.9	27.9	38.7	19.7	18.1	27.3	22.4	37.1	26.7	23.4	19.7			38.4
1982	14.3	13.5	16.3	28.5	26.1	15.7	14.0	14.8	26.4	29.3	38.7	44.2	46.2	29.1	31.0	52.4	27.4	29.2	26.9	22.3	30.9	25.8			22.4	27.5	27.3	35.0	53.6	33.2	45.3	38.9	33.8	27.7	23.9	23.0	47.9
1983	25.2	17.3	14.8	16.1	15.7	17.6	19.6	19.0	13.9	11.9	12.8	12.4	15.5	22.0	14.3	16.2	12.3	12.3	19.3	20.2	28.7	26.2	19.0	20.6	44.6	56.1	34.4	28.4	29.7	33.3	33.0	29.5	26.2	27.7	26.7	24.6	55.6
1984	19.8	21.9	36.2	65.7	52.0	34.8	34.9	33.4	47.0	37.7	42.6	39.7	40.8	32.7	36.1	36.5	33.8	25.7	26.7	49.3	31.0	24.9	19.0	20.5	18.7	22.3	28.1	40.3	29.2	29.2	41.3	62.4	44.3	63.3	69.2	58.7	64.5
1985	42.4	29.7	30.1	34.7	34.2	33.5	33.7	37.1	34.9	29.9	25.0	24.0	23.1	38.0	44.9	28.5	19.5	16.9	17.0	14.9	21.8	17.4	17.5	15.6	15.2	18.2	25.2	49.0	49.1	48.6	66.7	68.8	72.7	66.6	68.9	42.7	71.5
1986	35.4	29.8	30.9	32.3	32.8	19.8	24.0	29.4	29.9	30.9	42.1	42.2	36.6	25.0	27.3	24.2	26.2	18.9	20.2	16.2	19.1	15.5	14.4	14.2	13.4	21.2	21.2	30.2	32.0	46.5	58.0	37.7	32.2	37.1	31.7	27.6	29.3
1987	24.1	23.1	21.2	18.9	25.0	15.1	29.1	22.2	23.7	27.4	31.4	28.3	33.7	33.8	31.9	37.0	21.2	19.4	12.9	14.8	30.0	31.7	40.1	29.8	26.9	38.4	46.4	30.7	54.7	75.5	69.2	46.2	36.6	41.5	54.8		33.1
1988	-	26.2	30.9	27.6	32.5	25.6	26.0	27.9	31.5	31.1	33.6	26.4	20.9	37.5	30.5	26.3	25.2	30.7	36.0	24.1	21.1	29.5	37.9	53.1	61.5	67.4	56.5	42.7	35.7	30.4	-	-	51.3	51.2	42.6	51.5	36.3
1989	42.0	36.7	39.8	31.1	24.3	20.7	33.5	27.4	31.6	36.2	51.2	40.5	47.5	40.1	34.8	34.8	27.2	28.3	40.8	39.1	30.6	26.4	23.0	25.4	25.6	29.5	45.5	37.8	38.4	66.3	78.6	65.7	52.0	48.2	37.9	33.5	38.2
1990	26.9	31.2	26.5	26.1	23.8	20.0	19.1	16.1	20.7	20.3	23.7	19.8	-	30.0	27.1	21.0	21.8	21.0	23.7	25.5	-	-	21.0	22.6	20.8	-	-	33.3	40.4	60.6	52.3	30.4	-	-	-	-	27.1
Average	32.7	30.5	33.1	39.3	39.7	31.5	30.4	30.3	31.7	31.0	34.9	32.1	34.9	41.4	39.4	36.2	31.2	30.0	45.1	42.4	41.6	45.5	43.0	48.4	50.6	48.5	48.8	59.3	60.8	52.3	61.4	54.3	50.4	50.1	51.7		

10-Days Basis Probable River Discharge Data

(m³/s)

Estimated by Pearson Method

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	Average
20	16.5	16.8	16.5	15.3	16.7	13.6	14.5	14.3	15.1	19.9	19.1	15.8	19.4	25.0	22.1	16.6	16.1	13.9	13.0	11.6	16.1	14.8	11.6	11.0	11.7	14.8	16.6	23.9	25.0	20.9	40.3	23.5	21.6	21.3	21.1	19.7	17.7
10	16.1	17.7	17.8	17.5	18.7	15.1	16.1	15.9	17.1	20.2	20.1	17.2	20.5	26.0	22.7	18.8	16.8	15.0	14.7	13.4	19.2	16.0	13.3	12.8	13.8	17.5	19.2	25.1	27.2	24.2	43.5	26.7	24.6	24.0	24.4	22.4	19.5
5	20.5	19.2	19.9	20.7	21.5	17.2	18.4	18.1	19.9	21.1	22.2	19.6	22.6	27.7	23.8	21.4	18.1	16.6	17.2	16.9	20.9	17.7	15.6	15.4	16.9	21.7	22.7	27.3	30.3	29.0	48.2	31.3	28.8	29.0	29.3	26.2	22.2
4	21.9	20.2	21.1	22.3	22.9	18.3	19.6	19.3	21.4	21.9	23.7	21.3	23.9	28.8	24.8	23.3	18.9	17.4	18.5	17.4	21.8	18.0	16.9	16.6	18.6	23.9	24.5	29.8	33.8	31.5	50.2	33.6	31.0	30.2	31.8	28.2	24.8
3	23.9	21.6	22.8	24.7	24.8	19.7	21.2	20.9	23.5	23.1	25.7	23.2	25.8	30.2	26.1	25.5	20.0	19.6	20.3	19.4	23.1	19.9	18.6	18.8	21.0	27.1	27.1	30.8	33.9	35.2	54.3	37.2	34.1	33.5	35.5	31.0	26.9
2	27.0	23.7	25.3	28.4	27.9	23.0	23.8	23.5	28.9	24.8	28.8	26.5	28.7	32.3	29.0	29.0	21.7	20.4	23.1	22.5	25.9	21.9	21.4	22.0	24.9	32.5	31.3	33.8	37.1	41.0	59.8	42.0	39.0	36.6	41.3	35.5	29.2

Table I-11 River Discharge of Kemasin River

River	: Kemasin River	Location	: Peringat
Scheme	: Kemasin / Semerak	Station No.	: 6022421
Sub-Scheme	: Jelawat Rusa, Kemasin Hulu	Catchment Area	: 47.9 km²

(m³/s)

10-Days Basis Measured River Discharge Data

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Average
Year	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
1980	1.9	1.6	1.9	1.7	2.2	1.4	1.1	0.8	0.9	0.9	0.6	0.3	0.2	0.8	1.8	1.2	1.4	1.3	2.8	2.2	1.8	2.1	1.8	2.0	1.1	1.9	1.5	4.4	2.2	-	1.8	3.4	8.8	12.2	20.6	11.7	5.0
1981	2.5	2.6	-	2.4	1.5	1.4	1.9	1.5	1.2	2.0	0.9	0.6	0.7	0.6	2.5	1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.7	5.7	64.8	19.1	2.5	0.1	
1982	2.8	2.1	1.6	1.3	1.2	0.9	1.0	0.9	-	-	1.4	1.4	1.1	1.5	2.2	2.3	4.3	2.5	9.0	4.7	1.8	3.1	2.5	3.2	2.2	4.5	3.7	1.0	2.3	2.1	2.9	1.9	3.3	10.1	-	-	2.6
1983	-	2.8	2.8	1.7	1.6	1.1	1.9	1.3	2.7	1.4	0.6	0.5	0.4	0.4	0.8	2.7	1.8	1.9	3.1	4.1	3.7	3.3	2.9	2.2	1.9	2.8	2.7	2.1	1.8	1.5	1.9	3.9	4.4	58.8	90.3	4.6	5.8
1984	2.4	1.5	3.2	3.4	3.0	2.4	2.8	2.2	-	-	2.9	2.2	1.6	2.2	1.5	1.1	2.0	1.2	2.9	0.7	0.6	0.5	1.2	2.8	1.8	1.9	2.6	3.5	3.4	3.7	3.0	3.6	8.8	8.5	3.5	55.5	4.2
1985	2.1	1.3	1.9	1.3	-	0.6	15.7	3.0	-	-	1.5	3.1	2.2	3.1	3.1	1.4	1.0	0.9	1.6	2.5	0.9	1.8	4.6	2.3	2.5	2.0	2.9	4.0	3.4	5.0	4.4	2.5	19.4	12.5	4.2	4.9	
1986	3.6	2.6	2.6	1.9	1.4	0.8	2.2	0.8	0.8	0.7	0.7	0.8	1.3	1.7	4.1	3.1	2.2	2.8	2.3	3.0	3.1	3.4	3.4	3.9	8.3	5.5	5.7	2.3	3.3	4.1	4.9	3.9	54.5	48.7	3.8	3.9	5.8
1987	3.5	4.1	-	-	3.4	1.2	2.4	1.6	2.0	1.3	0.9	0.7	0.8	0.9	0.9	1.8	3.5	4.1	2.5	2.7	4.1	2.6	2.9	2.4	3.9	2.8	2.5	1.4	2.3	1.1	5.3	10.0	4.7	57.9	13.0	6.3	4.1
1988	4.2	4.2	4.6	4.2	4.0	4.1	4.0	4.0	4.4	3.5	2.7	1.2	1.5	1.3	2.3	2.6	2.9	3.9	4.1	4.3	4.7	4.1	4.3	5.8	4.8	6.7	4.5	5.0	4.2	4.4	15.4	10.1	47.0	43.1	4.2	4.4	6.8
1989	-	-	4.0	4.3	3.1	2.8	2.4	3.8	3.8	4.2	3.4	3.4	3.2	3.4	2.7	4.4	3.9	3.2	4.0	4.1	3.6	1.8	3.2	3.9	4.6	4.2	7.1	7.1	4.6	10.0	6.7	4.7	12.4	4.4	4.2	4.4	5.6
Average	2.9	2.7	2.9	2.5	2.3	1.8	2.8	3.5	2.4	1.9	2.5	1.4	1.6	1.5	2.3	2.3	2.5	2.5	3.5	3.5	3.0	2.7	3.1	3.7	3.5	4.0	3.8	3.7	3.3	5.0	5.9	12.1	30.7	15.9	11.0	4.5	

10-Days Basis Probable River Discharge Data

(m³/s)

Estimated by Pearson Method

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	Average
20	1.7	1.5	1.4	1.1	1.1	0.7	0.9	0.5	0.7	0.6	0.4	0.3	0.3	0.5	0.8	1.0	1.2	0.9	1.2	1.3	1.1	0.8	1.4	1.8	1.0	1.5	1.2	0.2	1.4	1.2	1.4	1.9	1.3	5.3	2.0	1.5	1.2
10	1.9	1.5	1.6	1.3	1.2	0.8	1.1	0.7	0.9	0.7	0.5	0.3	0.3	0.6	0.8	1.2	1.4	1.1	1.4	1.4	1.2	0.9	1.6	2.0	1.2	1.8	1.5	1.4	1.7	1.4	1.8	2.3	2.0	6.8	2.8	2.0	1.5
5	2.2	1.7	1.9	1.5	1.5	1.0	1.3	1.0	1.1	1.0	0.7	0.5	0.5	0.7	1.0	1.4	1.7	1.4	1.8	1.6	1.4	1.1	1.8	2.4	1.6	2.3	1.9	1.8	2.1	1.8	2.3	3.0	2.7	9.7	4.1	3.0	1.9
4	2.3	1.9	2.1	1.7	1.8	1.3	1.7	1.2	1.3	1.1	0.8	0.8	0.6	0.8	1.2	1.5	1.8	1.6	2.0	1.7	1.5	1.2	1.9	2.4	1.8	2.5	2.1	2.0	2.3	2.0	2.7	3.4	4.0	11.6	5.3	3.6	2.2
3	2.5	2.1	2.3	1.8	1.8	1.4	1.9	1.5	1.5	1.3	1.0	0.8	0.8	1.0	1.4	1.7	2.0	1.8	2.4	2.0	1.7	1.4	2.1	2.9	2.1	2.9	2.4	2.3	2.7	2.3	3.2	4.0	5.3	14.6	6.9	4.6	2.9
2	2.8	2.5	2.7	2.2	2.2	1.6	2.4	2.2	1.9	1.6	1.2	1.1	1.1	1.2	1.7	2.0	2.4	2.2	2.9	2.5	2.1	1.8	2.5	3.3	2.6	3.5	2.9	2.8	3.2	2.8	4.0	5.0	7.0	20.3	9.9	6.4	3.8

Table I-12 River Discharge of Besut River

River	: Besut River	Location	: Jerteh
Scheme	: Ketara(Besut)	Station No.	: 9411 (closed)
Sub-Scheme	: Besut Barrage	Catchment Area	: 787 km²

(m³/s)

10-Days Basis Estimated River Discharge by Tank Model

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Average
Year	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
1982	98.5	63.2	52.5	43.4	42.1	9.6	10.8	12.0	13.2	12.0	41.2	23.0	27.8	16.8	28.9	21.2	33.1	23.6	61.5	25.8	27.3	31.8	67.2	26.1	19.0	27.8	68.9	56.7	53.5	66.1	96.0	39.6	69.5	85.4	328.0	170.9	48.3
1983	95.7	78.1	39.9	24.3	16.7	10.0	12.0	29.1	21.4	12.2	12.0	12.0	12.0	12.0	13.2	12.0	12.0	12.2	26.0	87.9	91.0	64.0	28.7	30.8	23.8	60.2	39.1	35.0	23.6	22.2	27.0	51.4	104.2	615.6	927.6	202.1	70.7
1984	71.2	40.1	165.5	203.5	128.3	71.5	73.3	32.6	41.6	21.2	18.9	45.9	29.5	30.8	24.8	27.6	35.8	18.5	15.6	37.2	37.7	53.2	27.5	36.0	73.3	66.6	79.1	30.9	21.4	62.7	50.5	30.5	90.3	190.0	81.3	420.9	66.2
1984	71.2	40.1	165.5	203.5	128.3	71.5	73.3	32.6	41.6	21.2	18.9	45.9	29.5	30.8	24.8	27.6	35.8	18.5	15.6	37.2	37.7	53.2	27.5	36.0	73.3	66.6	79.1	30.9	21.4	62.7	50.5	30.5	90.3	190.0	81.3	420.9	66.2
1985	86.6	38.0	83.8	22.7	29.3	35.5	132.7	266.6	61.5	26.7	15.2	28.7	17.9	70.4	35.6	22.0	17.2	12.5	12.0	12.0	16.2	12.4	25.1	54.0	86.0	96.1	35.1	106.0	73.5	62.3	92.3	61.1	41.2	214.5	137.9	109.5	54.3
1986	173.0	67.6	35.8	18.7	12.8	12.8	40.0	16.0	13.6	12.0	12.0	12.0	12.0	12.0	24.5	46.8	55.9	31.1	23.8	26.5	15.3	14.8	12.0	13.2	36.2	72.0	49.5	76.6	47.3	58.6	76.4	55.9	219.9	134.5	134.4	275.4	48.2
1987	119.2	71.8	55.4	28.2	21.0	11.5	35.8	13.2	13.2	12.0	12.0	12.0	12.0	12.0	18.9	33.8	14.4	19.7	13.3	12.0	15.2	12.0	12.0	13.2	20.7	80.2	51.5	24.8	56.7	27.8	19.8	53.5	37.3	366.7	153.3	165.8	46.2
1988	46.7	35.0	24.3	15.3	12.1	10.8	12.0	12.0	13.2	12.0	12.0	12.0	12.0	12.0	13.2	12.0	12.0	12.1	26.9	59.2	23.0	41.1	52.0	116.5	44.8	92.8	60.2	52.3	29.3	120.5	128.7	203.1	209.6	187.7	77.5	78.7	57.4
1988	46.7	35.0	24.3	15.3	12.1	10.8	12.0	12.0	13.2	12.0	12.0	12.0	12.0	12.0	13.2	12.0	12.4	12.2	12.0	12.0	13.3	12.0	12.5	25.4	15.1	13.1	18.5	12.5	12.4	16.5	12.7	48.4	149.6	133.8	68.7	43.8	25.7
1989	57.1	28.0	23.0	16.8	12.0	9.6	12.0	12.0	13.2	12.0	12.0	12.0	12.0	12.0	13.2	12.0	12.0	12.3	12.0	12.0	13.2	12.0	12.0	13.2	12.0	12.0	12.0	12.0	12.0	13.2	12.0	12.0	49.2	13.6	12.0	13.2	19.7
1990	30.1	31.4	48.1	47.1	26.9	14.4	12.9	13.2	13.3	55.5	16.8	12.8	12.0	12.0	13.2	12.0	12.0	12.3	12.0	12.0	13.2	12.0	12.0	13.2	12.0	12.0	12.0	12.0	12.0	13.2	12.0	12.0	49.2	13.6	12.0	13.2	19.7
1991	17.3	64.1	122.2	37.5	22.6	13.6	13.2	12.0	13.2	24.0	12.8	12.0	13.2	12.2	13.2	33.4	13.5	12.0	12.0	12.1	21.9	14.3	18.8	14.3	12.3	55.6	59.1	33.4	93.1	29.3	100.4	237.6	194.1	142.0	314.7	134.1	55.4
Average	84.7	49.7	66.9	47.3	29.4	19.9	35.5	35.9	21.7	20.0	16.5	18.2	16.3	21.0	19.0	23.3	21.8	16.6	26.5	29.7	27.5	26.8	26.8	34.3	30.6	56.4	48.3	44.0	36.5	47.5	59.4	45.3	123.7	202.4	183.6	171.7	51.0

10-Days Basis Probable River Discharge Data

(m³/s)

Estimated by Pearson Method

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	Average
20	35.0	25.3	14.7	7.8	6.5	5.2	5.2	4.6	7.2	7.3	8.0	7.3	8.6	5.9	9.8	8.9	7.3	8.8	6.5	6.6	8.1	7.0	7.9	8.1	7.9	17.9	16.7	11.6	14.7	11.6	11.8	13.3	27.6	44.2	30.6	37.6	13.1
10	37.8	29.0	19.2	10.6	8.4	6.8	7.2	6.4	8.8	8.8	9.2	8.6	9.7	7.4	11.3	10.6	9.0	10.0	8.3	8.6	10.1	8.9	9.9	10.6	10.5	19.9	20.7	14.5	14.1	15.0	15.0	18.3	36.1	50.1	36.7	42.6	15.8
5	45.3	34.1	26.9	15.4	11.5	9.8	10.8	9.5	11.3	11.1	10.9	10.7	11.8	9.7	13.4	13.4	11.5	11.7	11.3	12.0	13.2	12.0	13.0	14.3	15.0	24.2	24.6	19.4	18.1	20.6	20.7	27.0	50.5	63.0	49.8	53.3	20.5
4	47.8	36.8	31.3	18.6	13.4	10.1	13.0	11.4	12.7	12.3	11.8	11.8	12.2	11.0	14.5	14.8	12.9	12.5	13.1	14.0	14.9	13.8	14.8	16.6	17.7	27.3	27.3	22.6	20.4	23.9	24.5	32.4	59.0	73.5	59.6	62.2	25.5
3	51.0	40.6	38.2	23.0	16.2	12.0	16.5	14.5	14.7	14.2	13.1	13.4	13.4	13.0	16.0	17.0	15.0	13.8	15.8	17.0	17.6	16.6	17.5	20.0	21.8	32.0	31.2	26.8	23.9	28.9	30.4	41.0	72.1	89.6	75.3	75.7	30.1
2	61.2	46.7	50.6	31.6	21.1	15.3	23.2	20.2	18.2	17.2	15.1	16.1	15.3	16.4	19.5	20.6	18.5	15.7	20.5	22.5	22.0	21.4	22.1	26.2	29.4	40.0	37.7	34.7	29.9	37.9	41.2	55.2	95.7	118.5	104.5	100.0	36.3

Table I-13 River Discharge of Angga River

River	: Angga River	Location	: Angga Barrage
Scheme	: Ketara(Besut)	Station No.	:
Sub-Scheme	: Angga Barrage	Catchment Area	: 78 km²

10-Days Basis River Discharge Based on Estimated River Discharge of Besut River ＝Besut River Discharge x 1147.5 / 4015.8 (Besut Barrage sub-scheme : 4015.8ha, Angga Barrage sub-scheme : 1147.5ha) (m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Average
Year	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
1982	27.4	11.6	5.7	3.1	2.7	2.0	2.4	2.7	3.1	2.7	11.1	5.9	7.2	4.0	7.5	5.4	8.7	6.1	16.9	6.7	7.1	8.4	19.5	6.8	4.7	7.2	13.3	15.5	14.6	18.2	23.5	10.9	13.4	23.7	93.0	49.8	13.1
1983	26.7	21.6	10.7	6.2	4.1	2.2	2.7	7.6	5.4	2.8	2.7	2.7	2.7	2.7	3.1	2.7	2.7	2.8	21.0	24.4	25.3	17.6	7.5	8.1	6.1	16.5	10.5	9.3	6.0	5.6	7.0	14.0	29.1	175.2	150.1	57.0	19.5
1984	19.6	10.7	46.6	57.4	36.0	19.7	20.2	8.8	11.2	5.4	4.3	12.6	7.7	8.1	6.4	7.2	9.5	4.6	3.8	9.9	10.1	14.5	7.2	9.5	20.2	17.8	21.9	8.1	5.4	17.2	13.7	8.0	24.0	45.0	22.5	121.6	18.8
1985	23.5	10.2	23.2	20.1	7.7	9.5	37.2	58.3	16.9	6.9	3.7	7.5	4.6	21.7	9.5	5.6	4.2	2.9	2.7	2.7	3.9	2.8	6.5	14.7	23.9	23.9	9.3	29.6	20.3	17.1	22.8	16.8	11.1	60.6	38.7	56.5	17.7
1986	48.7	18.6	9.5	4.6	2.9	2.9	10.7	3.9	3.2	2.7	2.7	2.7	2.7	2.7	6.5	12.7	15.5	8.2	6.1	6.9	3.7	3.5	2.7	3.1	5.2	22.2	16.0	6.4	15.5	6.1	5.0	14.8	10.0	109.8	43.1	46.7	14.8
1987	33.5	19.8	14.6	7.3	5.3	2.6	9.5	3.1	3.1	2.7	2.7	2.7	2.7	2.7	4.7	8.9	3.4	4.9	3.1	2.7	3.1	2.7	2.7	3.1	3.2	22.2	16.0	6.4	15.5	6.1	5.0	14.8	10.0	109.8	43.1	46.7	12.5
1988	33.5	19.8	14.6	7.3	5.3	2.6	9.5	3.1	3.1	2.7	2.7	2.7	2.7	2.7	4.7	8.9	3.4	4.9	3.1	2.7	3.1	2.7	2.7	3.1	3.2	22.2	16.0	6.4	15.5	6.1	5.0	14.8	10.0	109.8	43.1	46.7	15.7
1988	12.6	9.3	6.3	3.7	2.7	2.4	2.7	2.7	3.1	2.7	2.7	2.7	3.0	2.7	3.1	2.7	2.7	2.7	3.1	2.7	2.9	2.8	2.7	2.7	3.1	2.7	2.9	6.6	3.6	3.0	4.6	2.9	2.8	4.0	2.9	13.1	42.1	37.5	18.9	13.8	6.6
1989	15.6	7.3	5.9	3.5	2.7	2.0	2.7	2.7	3.1	2.7	2.7	2.7	2.7	2.7	3.1	2.7	2.9	2.8	2.7	2.7	3.1	2.7	2.7	2.7	3.1	2.7	2.7	2.7	2.7	2.7	3.1	2.7	2.7	13.4	3.2	2.7	3.1	4.9
1990	23.1	8.3	13.0	12.8	7.0	3.4	3.0	3.1	3.1	15.1	4.1	3.0	2.7	2.7	3.1	2.7	2.9	2.8	2.7	2.7	3.1	2.7	2.7	3.1	2.7	2.7	2.7	2.7	2.7	2.7	3.1	2.7	2.7	13.4	3.2	2.7	3.1	5.1
1991	4.2	17.6	48.5	10.0	5.7	3.2	3.1	2.7	3.1	6.1	3.0	2.7	3.6	2.8	3.1	8.8	3.2	2.7	2.7	2.8	5.6	3.4	4.7	3.4	2.8	15.2	14.2	8.0	8.8	7.2	28.0	78.6	56.8	30.9	89.2	37.6	13.9
Average	23.5	13.5	18.4	12.9	7.7	5.0	9.3	9.5	5.5	5.0	4.0	4.5	3.0	5.3	5.0	5.9	5.5	4.0	6.0	7.8	7.1	6.9	7.0	9.1	10.6	15.4	13.1	11.9	9.7	12.9	16.3	25.1	34.5	58.6	51.7	48.4	13.9

10-Days Basis Probable River Discharge Data

(m³/s)

Estimated by Pearson Method

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	Average
20	9.3	6.5	3.5	1.5	1.2	0.8	0.8	0.6	1.4	1.4	1.6	1.4	1.7	1.0	2.1	1.8	1.9	1.8	1.2	1.2	1.6	1.3	1.6	1.6	1.5	4.4	4.6	2.6	2.6	2.6	2.7	3.1	7.2	11.9	8.1	10.0	3.0
10	10.1	7.6	4.8	2.3	1.7	1.2	1.4	1.1	1.8	1.8	1.9	1.8	2.1	1.4	2.5	2.3	1.9	2.2	1.7	1.8	2.2	1.8	2.1	2.3	2.3	5.0	5.2	3.5	3.3	3.6	3.6	4.5	9.6	13.6	9.8	11.5	3.8
5	11.7	9.0	7.0	3.7	2.6	1.8	2.4	2.0	2.5	2.5	2.8	2.4	2.5	2.1	3.1	3.1	2.6	2.9	2.5	2.7	3.1	2.7	3.0	3.4	3.6	6.2	6.5	4.8	4.5	5.2	5.2	7.0	13.7	17.3	13.5	14.5	5.2
4	13.0	9.8	8.2	4.5	3.1	2.2	3.0	2.6	2.9	2.8	2.7	2.7	2.8	2.5	3.4	3.5	3.0	2.9	3.0	3.3	3.6	3.3	3.5	4.0	4.3	7.1	7.1	5.7	5.1	6.1	6.3	8.6	16.2	20.3	16.3	17.1	6.0
3	14.7	10.9	10.2	5.9	3.9	2.7	4.0	3.4	3.5	3.3	3.0	3.1	3.1	3.0	3.9	4.2	3.6	3.2	3.8	4.2	4.3	4.0	4.3	5.0	5.5	8.5	8.2	7.0	6.1	7.6	8.0	11.0	19.9	24.9	20.8	20.9	7.3
2	17.6	12.6	13.8	8.3	5.3	3.2	5.9	5.1	4.5	4.2	3.6	3.9	3.7	4.0	4.6	5.2	4.0	3.8	5.1	5.7	5.6	5.4	5.6	6.8	7.7	10.2	10.1	9.2	7.8	10.1	11.1	15.6	26.6	33.2	29.2	27.9	9.7

Table I-14 Projected Domestic and Industrial Water Demand for Relevant Rivers

Scheme		River	Projected Water Demand for Relevant River System (m³/s) 1997	2000	2005	2010	2020	Name of Major Intake	Intake Location from River Discharge Station	Note	Data Source
Pulau Pinang	Muda	[1]Managed by Penang Water Authority	6.34	7.29	9.04	11.10		Lahar Tiang	Downstream		Penang Water Authority
		[2]Managed by Others	1.62	3.02	4.02	5.01		Sungai Petani etc.	Downstream		Muda River Basin Study (JICA)
		[3]Total (1+2)	**7.96**	10.32	13.06	**16.11**					
	Kulim	[1]Bukit Tok Allang	0.54	0.54	0.54	0.54		Bukit Tok Allang	Downstream		Penang Water Authority
		[2]Mak Sulong	0.29	0.00	0.57	0.57		Mak Sulong	Downstream		
		[3]Perai	-	1.11	1.59	1.59		Perai (Proposed)	Downstream	Construction by 1997 Operation from 1999	
		[4]Total ([1]+[2]+[3])	0.82	1.65	2.70	2.70					
		[5]Perai with Catchment Area Factor ([3]x0.215)*	-	0.24	0.34	0.34					
		[6]Demand at Kulim Headworks ([1]+[5])	**0.54**	0.78	0.88	**0.88**					
Kerian	Kurau	Downstream of Bukit Merah	**0.88**	1.00	1.30	**1.40**	1.50	Gunung Semanggol	Reservoir Release	Projected Water Demand of Kerian Distrct in 2020 is 2.55m³/s (220,000 m³/day)	Lembaga Air Perak
	Kerian		**0.32**	0.41	0.57	**0.73**	1.05	Jalan Bharu (New Pump Station)	Downstream		
	Total		1.20	1.41	1.87	2.13	2.55				
Sungai Manik	Batang Padang		1.35	1.46	1.66	1.89	2.08				
Seberang Perak	Perak	[1]Upstream of Discharge Station	**6.41**	6.97	7.90	**8.83**	10.70	Sultan Idris Shah II Kota Lama Kiri	Upstream	Projected Water Demand of Perak River Basin in 2020 is 19.70 m³/s (1,702,010 m³/day)	Lembaga Air Perak
		[2]Downstream of Discharge Station	**3.76**	4.44	5.58	**6.72**	9.00	Teluk Kepung Kampung Paloh	Downstream		
		[3]Total ([1]+[2])	10.16	11.41	13.48	15.55	19.70				
Kemasin/Semerak	Kemasin										
Besut	Besut		**0.25**	0.50	0.63	**0.77**		Existing Bukit Bunga	Downstream		Jabatan Bekalan Air Terengganu
								Bukit Bunga Extension	Downstream	Implementation around 2000	
	Angga		-	-	-	-		Nil	-		

Note : In Kulim River System, Mak Sulong Intake is not considered in the model because the priority is given to Kulim Headworks.

Bold : Data will be Used for Water Balance Study

_____ : Given Data by Relevant Departments / Agencies

* : Catchment Area Factor for Perai Pump Station (0.215=129/600)

Assumed Catchment Area at Sungai Kulim Headworks (129 km² = at Ara Kuda River Discharge Station)

Assumed Effective Catchment Area at Perai Pump Station (600 km² = at 13km Upstream of Estuary)

Source : National Water Resource Study (1982)

Table I-15 Estimation of Domestic and Industrial Water Demand of Perak River

Unit (m^3/s)

Confirmed Major Intakes	Location from River Discharge Station	Capacity		Capacity of Confirmed Intakes [1]	Upstream / Downstream Ratio [2]	Capacity of Other Intakes (Estimated) [3]	Water Demand to be Used for the Study <Total Capacity> ([1]+[3])
1997							
Air Ganda	Upstream	0.01	Upstream Confirmed Intakes	2.2	63.0%	4.21 (=10.16x[2]-[1])	**6.41**
Kota Lama Kiri	Upstream	0.14					
Sultan Idris Shah II	Upstream	2.05					
	sub-Total	2.20					
Kampung Paloh	Downstream	0.41	Downstream Confirmed Intakes	1.29	37.0%	2.47 (=10.16x[2]-[1])	**3.76**
Teluk Kepung	Downstream	0.84					
Kampung Gajah	Downstream	0.04					
	sub-Total	1.29					
	Total	3.49	Total	3.49	100.0%	6.67	10.16
2020							
Air Ganda	Upstream	0.01	Upstream Confirmed Intakes	4.41	54.3%	6.29 (=19.70x[2]-[1])	**10.70**
Kota Lama kiri	Upstream	0.29					
Sultan Idris Shah II	Upstream	3.48					
Banding	*Upstream*	*0.03*					
Grik V	*Upstream*	*0.15*					
Bandar Baru Seri Iskandar	*Upstream*	*0.45*					
	sub-Total	4.41					
Kampung Paloh	Downstream	0.58	Downstream Confirmed Intakes	3.71	45.7%	5.29 (=19.70x[2]-[1])	**9.00**
Teluk Kepung	Downstream	1.74					
Kampung Gajah	Downstream	0.12					
Hilir Perak	*Downstream*	*1.27*					
	sub-Total	3.71					
	Total	8.12	Total	8.12	100.0%	11.58	19.70

Italic : Proposed Intake
Bold : Data will be Used for Water Balance Study
: Data Given by Lembaga Air Perak

Data Source (Total Water Demand) : Lembaga Air Perak

Data Source (Comfirmed Major Intakes) : The Study on the Establishment of the River Basin Information System in Malaysia (JICA, 1997) - Interim Report -

Table I-16 Inventry of Secondary Granary Areas in Relevant River Basins

(1) IADP Pulau Pinang

Muda River (Downstream of Ladang Victoria)

Code Number	Name	Type	Water Source	Irrigable Aera (ha) Main	Off	CI (1987-1989) Main	Off	Category	Intake Location from Discharge Station
PP 001	Pinang Tunggal	Pump	SD	710	710	>50%	>50%	3	Downstream
PP 003	Tesek Geluger	Pump	SD	221	221	>50%	>50%	3	Downstream
KH 008	Sidam Kanan	Pump	SD	500	500	>50%	>50%	7	Downstream
KH 015	Terat Batu	Pump	SD	28	28	>50%	>50%	7	Downstream
KH 035	Sidam Kiri	Pump	SD	219	219	>50%	>50%	7	Downstream
KH 036	Pekula	Pump	SD	1557	1088	>50%	>50%	6	Downstream
KH 039	Pinang Tunggal	Pump	SD	279	198	>50%	>50%	2	Downstream
KH 042	Pantai Prai / Serukam	Pump	SD	259	259	>50%	>50%	7	Downstream

Kulim, Jarak, Perai River

Code Number	Name	Type	Water Source	Irrigable Aera (ha) Main	Off	CI (1987-1989) Main	Off	Category	Intake Location from Discharge Station
PP 004	Jarak Tengah	Pump	SD	105	105	<50%	<50%	1	Upstream
PP 006	Sg. Kulim	Gravity	SD	561	561	>50%	>50%	3	Downstream
KH 009	Sg. Seluang	Gravity	-	134	0	Converted to other crops		2	Upstream
KH 013	Otak Kerbau	Gravity	SD	193	193	Idle	Idle	1	Upstream

(2) IADP Kerian / Sungai Manik

Kerian Scheme

Kurau River

Code Number	Name	Type	Water Source	Irrigable Aera (ha) Main	Off	CI (1987-1989) Main	Off	Category	Intake Location from Discharge Station
PK 001	Batu Kurau	Gravity	SD	562	562	>50%	>50%	6	Upstream
PK 002	Air Kuning	Gravity	SD	127	127	<50%	<50%	1	Upstream
PK 003	Jelai dan Tambahan	Gravity	SD	278	278	<50%	<50%	1	Upstream
PK 004	Pantai Besar	Gravity	SD	93	93	>50%	>50%	3	Upstream
PK 005	Jemerang Setar	Gravity	SD	191	191	>50%	>50%	6	Upstream
PK 008	Bukit Bertam	Pump	SD	287	287	<50%	<50%	3	Upstream

Kerian River

Code Number	Name	Type	Water Source	Irrigable Aera (ha) Main	Off	CI (1987-1989) Main	Off	Category	Intake Location from Discharge Station
PK 012	Sg. Segar	Gravity	SD	144	144	<50%	<50%	6	Upstream
PK 013	Sg. Chop	Gravity	SD	26	26	<50%	<50%	2	Upstream
PK 014	Sg. Simpol Kiri	Gravity	SD	37	37	>50%	>50%	2	Upstream
PK 015	Sg. Rambutan	Gravity	SD	76	76	>50%	>50%	2	Upstream
PK 016	Sg. Damak	Gravity	SD	22	22	>50%	>50%	2	Upstream
PK 017	Sg. Berdarah	Pump	SD	101	101	>50%	>50%	6	Upstream
PK 018	Sg. Nor	Gravity	SD	127	127	>50%	>50%	6	Upstream
PK 019	Sg. Garok	Gravity	SD	74	74	>50%	>50%	2	Upstream
PK 020	Batu 3, Kg. Medan	Pump	SD	57	57	<50%	<50%	2	Upstream
PK 021	Gua Petai	Pump	SD	33	33	>50%	>50%	2	Upstream
PK 022	Bukit Torak/Lubuk Sengga	Gravity	SD	95	95	>50%	>50%	2	Upstream
PK 023	Tapah Hulu	Gravity	SD	66	66	>50%	>50%	2	Upstream
PK 025	Belukar Hantu	Gravity	SD	65	65	>50%	>50%	2	Upstream
KH 001	Bandar Baharu	Pump	SD	800	800	>50%	>50%	6	Downstream
KH 002	Serdang Bt. 16	Gravity	SD	29	26	>50%	>50%	2	Upstream
KH 003	Kilang Bt. Kg. Ulu Relau	Gravity	SD	40	40	>50%	>50%	7	Upstream
KH 004	Serdang Batu 18	Gravity	SD	40	40	Idle	Idle	2	Upstream
KH 005	Kg. Sg. Tengas	Gravity	SD	40	40	>50%	>50%	2	Upstream
KH 006	Kg. Sg. Taka	Gravity	SD	97	97	>50%	>50%	7	Upstream
KH 007	Kg. Berjaya	Pump	SD	150	150	Idle	Idle	2	Upstream
KH 010	Ulu Mahang	Gravity	SD	61	61	>50%	>50%	7	Upstream
KH 011	Bendang Sena	Gravity	SD	23	23	>50%	>50%	7	Upstream
KH 019	Kg. Lobak	Pump	SD	28	20	>50%	>50%	3	Upstream

Sungai Manik Scheme

Batang Padang River

Code Number	Name	Type	Water Source	Irrigable Aera (ha) Main	Off	CI (1987-1989) Main	Off	Category	Intake Location from Discharge Station
Nil	-	-	-	-	-	-	-	-	-

Table I-16 Inventry of Secondary Granary Areas in Relevant River Basins

(3) IADP Seberang Perak

Perak River (Downstream of Iskandar Bridge)

Code Number	Name	Type	Water Source	Irrigable Aera (ha) Main	Off	CI (1987-1989) Main	Off	Category	Intake Location from Discharge Station
PK 026	Bdg.Jeliang	Gravity	SD	47	37	>50%	>50%	3	Upstream
PK 028	Padang Rengas	Gravity	LS	250	115	Idle	Idle	2	Upstream
PK 029	Bdg. Senggang	Gravity	LS	42	42	>50%	>50%	1	Upstream
PK 031	Bdg. Ketiou	Gravity	SD	49	20	<50%	<50%	1	Upstream
PK 032	**Beluru**	**Gravity**	**SD**	**180**	**180**	**>50%**	**>50%**	**6**	**Upstream**
PK 033	**Bendang Lempar**	**Gravity**	**SD**	**100**	**100**	**>50%**	**>50%**	**6**	**Upstream**
PK 037	Kroh Hulu	Gravity	SD	15	15	>50%	>50%	3	Upstream
PK 038	Bendang Telang	Gravity	SD	70	70	>50%	>50%	3	Upstream
PK 039	Bendan Ulu Kenas	Gravity	SD	27	27	>50%	>50%	2	Upstream
PK 040	**Kota Lama Kiri**	**Gravity**	**SD**	**112**	**112**	**>50%**	**>50%**	**6**	**Upstream**
PK 041	**Salong**	**Pump**	**SD**	**180**	**180**	**>50%**	**>50%**	**6**	**Upstream**
PK 042	Chepias	Gravity	SD	90	90	>50%	>50%	2	Upstream
PK 044	Bendan Kuala Dal	Gravity	SD	20	20	Idle	Idle	2	Upstream
PK 059	Parit Bukit Cupak & Merua	Pump	SD	220	220	<50%	<50%	2	Upstream
PK 024	Bukit Tunggal	Pump	SD	746	746	>50%	>50%	2	Upstream
PK 055	Sb.Perak Peringkat &Tam	Pump	SD	2309	2309	<50%	<50%	7	Upstream
PK 056	Bota/Lambor	Pump	SD	754	754	<50%	<50%	7	Upstream
PK 057	Senin	Pump	SD	137	137	<50%	<50%	2	Upstream
PK 058	Lambor Kiri	Pump	SD	168	168	<50%	<50%	7	Upstream
PK 059	Parit Bukit & Merua	Pump	SD	220	220	>50%	>50%	2	Upstream

(4) IADP Kemasin/Semerak

Kemasin River

Code Number	Name	Type	Water Source	Irrigable Aera (ha) Main	Off	CI (1987-1989) Main	Off	Category	Intake Location from Discharge Station
Nil	-	-	-	-	-	-	-	-	-

(5)IADP Ketara (Besut)

(i) Besut Barrage Sub-Scheme

Besut River

Code Number	Name	Type	Water Source	Irrigable Aera (ha) Main	Off	CI (1987-1989) Main	Off	Category	Intake Location from Discharge Station
TR 001	Telabak	Gravity	LS	120	60	<50%	<50%	2	Upstream
TR 004	*Pelagat*	*Pump*	*SD*	*650*	*650*	*<50%*	*<50%*	*6*	***Downstream (Water Source is not Besut River but Pelagat River - Tributary of Besut River)***

(ii) Angga Barrage Sub-Scheme

Angga River

Code Number	Name	Type	Water Source	Irrigable Aera (ha) Main	Off	CI (1987-1989) Main	Off	Category	Intake Location from Discharge Station
Nil	-	-	-	-	-	-	-	-	-

Category 1 : Schemes to be converted to high value crop cultivation under irrigated condition,
Category 2 : Schemes to be converted to tree crop cultivation,
Category 3 : Schemes to introduce two-cropping system planting paddy during main season and short-term annual crops during the off-season
Category 4 : Shemes to be converted to animal feeding crop cultivation or cattle raising fields,
Category 5 : Schemes to be converted to freshwater fish culture ponds,
Category 6 : Schemes to be positively maintained as secondary granary areas,
Category 7 : Schemes to be maintained as paddy cultivation areas within a definite period of time for social welfare purposes and thereafter to be further evaluated, and
Category 8 : Schemes to be converted to housing/industrial and other uses.

SD : Sufficient for Double Cropping
LS : Limited for Single Cropping
CI : Cropping Intensity
Bold : Secondary Granary Areas Used for the Water Balance Model
Bold : Secondary Granary Areas Out of the Water Balance Model

Souce : Feasibility Study on Rationalization and Crop Diversification in Non-Granary Irrigated Areas in Malaysia (JICA 1990)

Table I-17 Tributaries Catchment Area Factor of Relevant Rivers

Scheme	River System	Catchment Area at River Discharge Station (km²) [1]	Catchment Area at Intake Point (km²) [2]	Catchment Area of Tributaries [3] (=[2]-[1])	Tributaries Catchment Area Factor (=[3]/[1])	Data Source	Note
Kerian	Kurau	337	492	155	0.46	Kurau River Flood Mitigation (1987)	Bukit Merah Reservoir Inflow
	Kerian	629	1,346	717	1.14	Kurau River Flood Mitigation (1987)	
Kemasin/Semerak	Kemasin	68	134	67	0.7*	Kemasin-Semerak Integrated Rural Development Project (1980)	* Catchment Area Factor is based on Return Flow Factor of KADA
Besut	Besut	787	579	-208	-0.26	Besut Flood Mitigation Project (1988)	1.Angga River is excluded 2. River Discharge Station is located downstream of the Intake Point

Table I-18 River Maintenance Flow to be Used for Water Balance Study

Scheme	River System	Approximate Catchment Area at Intake Point (km²) [1]	Note	Specific River Maintenance Flow of Muda River (m³/s/km²) [2]	River Maintenance Flow at Intake Point (m³/s) (=[1]x[2])	Data Source of Catchment Area at Intake Point
Pulau Pinang	Muda	4,200	Effective Catchment Area at Muda Barrage at Ara Kuda	0.00119	5.00	National Water Resource Study (1982)
	Kulim	129		0.00119	0.15	Hydrological Data Book (DID) (1991)
Kerian	Kerian	1,346		0.00119	1.60	Kurau River Flood Mitigation (1987)
Sungai Manik	Batang Padang	455		0.00119	0.54	Hydrological Data Book (DID) (1991)
Seberang Perak	Perak	14,743	at Bagan Datoh	0.00119	17.55	The Establishment of the River Information System in Malaysia - Interim Report - (1997)
Kemasin/Semerak	Kemasin	134	Melor river is excluded	0.00119	0.16	Kemasin-Semerak Integrated Rural Development Project (1980)
Besut	Besut	579		0.00119	0.69	Besut Flood Mitigation Project (1988)
	Angga	78		0.00119	0.09	F/S of Paya Peda Dam (1995)

Table I-19 Inflow of Bukit Merah Reservoir (Kurau River) in Present Condition

Scheme	: Kerian	River	: Kurau River
Sub-Scheme	: Kerian Darat, Kerian Laut	Condition	: Present Water Demand

<1> Q (Present River Discharge at River Discharge Station)

<2> Q(d+in)down (Present Domestic and Industrial Use Water taken from Downstream of River Discharge Station)

0.0 (m³/s)

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	5.5	3.0	5.1	2.6	4.5	3.9	2.4	3.2	5.9	5.1	9.5	8.6	10.4	13.6	9.3	6.2	4.6	3.2	2.9	3.4	5.1	2.7	2.1	3.8	3.8	5.0	10.0	11.8	8.6	10.2	14.2	15.7	12.3	10.0	6.6	7.3	6.7
10	5.8	3.4	5.5	3.1	4.8	4.5	3.1	3.6	6.4	6.4	10.3	9.2	11.4	15.4	10.7	7.5	5.4	3.9	3.6	4.3	5.8	3.3	2.7	4.3	5.0	6.3	11.0	13.9	10.4	11.7	15.6	16.8	13.7	10.8	7.9	8.1	7.7
5	6.2	4.2	6.1	4.0	5.3	5.4	4.2	4.3	7.3	8.6	11.8	10.3	13.4	17.9	12.8	9.5	6.7	4.9	4.7	5.7	6.8	4.4	3.8	5.1	6.8	8.5	12.8	17.9	13.3	14.5	18.2	18.8	16.1	12.5	10.1	9.3	9.2
4	6.5	4.6	6.3	4.5	5.7	5.9	4.8	4.8	8.3	9.9	12.9	11.2	14.7	19.3	13.9	10.6	7.4	5.6	5.3	6.5	7.3	5.0	4.4	5.5	7.9	9.8	14.1	18.7	14.8	16.4	20.0	20.2	17.5	13.7	11.3	10.6	10.1
3	6.8	5.1	6.7	5.2	6.2	6.6	5.7	5.5	9.4	11.9	14.6	12.4	16.5	21.2	15.5	12.2	8.5	6.4	6.2	7.7	8.0	6.0	5.3	6.2	9.6	11.7	15.8	21.1	17.2	19.1	22.5	22.1	19.7	15.3	13.1	10.8	11.5
2	7.3	6.0	7.3	6.4	7.0	7.7	7.3	6.6	11.2	15.4	17.2	14.4	19.6	24.1	18.0	14.9	10.2	7.9	7.8	9.8	9.2	7.6	6.9	7.2	12.6	15.1	18.7	25.0	21.1	23.8	26.6	25.2	23.1	18.1	16.2	12.5	13.7

<3> Q(is)down (Present Irrigation Use Water for Secondary Granary Areas taken from Downstream of River Discharge Station)

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

<4> Qt (Present Inflow from Major Tributary between River Discharge Station and Intake Point of the Study Area)

Qt1+Qt2(=0.46xQ)

Qt1 : Diversion Flow from Kerian River(=1.5m³/s)

Qt2 : Tributaries Catchment Area Factor (=0.46)

<5> Qm (River Maintenance Flow)

0.0 (m³/s)

Source : Kurau River Flood Mitigation Study

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	4.1	2.9	3.9	2.7	3.6	3.3	2.6	3.0	4.2	3.8	5.9	5.5	6.3	7.8	5.8	4.3	3.6	3.0	2.8	3.1	3.8	2.7	2.5	3.2	3.3	3.8	6.1	6.9	5.4	6.2	8.0	8.7	7.1	6.1	4.5	4.9	4.6
10	4.2	3.1	4.0	2.9	3.7	3.6	2.9	3.2	4.5	4.4	6.2	5.7	6.8	8.6	6.4	4.9	4.0	3.3	3.2	3.5	4.2	3.0	2.8	3.5	3.8	4.4	6.6	7.9	6.3	6.9	8.7	9.2	7.8	6.5	5.2	5.2	5.0
5	4.4	3.4	4.3	3.3	3.9	4.0	3.4	3.5	5.0	5.5	6.9	6.2	7.6	9.7	7.4	5.9	4.6	3.8	3.7	4.1	4.6	3.5	3.2	3.9	4.6	5.6	7.4	9.3	7.6	8.2	9.9	10.2	8.9	7.2	6.1	5.8	5.7
4	4.5	3.6	4.4	3.6	4.1	4.2	3.7	3.7	5.3	6.1	7.5	6.6	8.2	10.4	7.9	6.4	4.9	4.1	3.9	4.5	4.9	3.8	3.5	4.1	5.1	6.0	8.0	10.1	8.3	9.0	10.7	10.8	9.6	7.8	6.7	6.1	6.2
3	4.6	3.8	4.6	3.9	4.4	4.5	4.1	4.0	5.8	7.0	8.2	7.2	9.1	11.2	8.6	7.1	5.4	4.5	4.4	5.0	5.2	4.2	3.9	4.3	5.9	6.9	8.8	11.2	9.4	10.3	11.8	11.7	10.5	8.6	7.5	6.5	6.8
2	4.9	4.3	4.8	4.4	4.7	5.0	4.9	4.5	6.6	8.6	9.4	8.1	10.5	12.6	9.8	8.4	6.2	5.1	5.1	6.0	5.7	5.0	4.7	4.8	7.3	8.4	10.1	13.0	11.2	12.4	13.7	13.1	12.1	9.8	9.0	7.1	7.8

<6> Qa (Available Water at Intake Point of the Study Area) **[Qa=Q-Q(d+in+is)down+Qt-Qm]**

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	9.6	5.8	9.0	5.3	8.1	7.2	5.0	6.2	10.1	8.9	15.4	14.1	16.7	21.4	15.0	10.5	8.2	6.1	5.7	6.5	8.9	5.4	4.6	7.0	7.1	8.8	16.1	18.7	14.0	16.3	22.3	24.5	19.4	16.1	11.1	12.2	11.3
10	10.0	6.5	9.6	6.1	8.5	8.1	6.0	6.8	10.9	10.9	16.5	14.9	18.2	24.0	17.1	12.4	9.4	7.1	6.7	7.7	9.9	6.4	5.5	7.8	8.8	10.7	17.5	21.8	16.7	18.6	24.3	26.0	21.5	17.3	13.1	13.4	12.7
5	10.6	7.6	10.4	7.3	9.2	9.5	7.6	7.8	12.5	14.0	18.7	16.5	21.0	27.7	20.2	15.3	11.3	8.7	8.3	9.8	11.4	8.0	7.0	9.0	11.5	13.9	20.2	26.3	20.9	22.7	28.1	29.0	24.9	19.7	16.2	15.1	14.9
4	10.9	8.1	10.8	8.0	9.8	10.2	8.5	8.5	13.6	16.0	20.4	17.8	22.9	29.6	21.8	16.9	12.4	9.6	9.2	11.0	12.2	8.9	7.9	9.6	13.1	15.8	22.0	28.8	23.2	25.4	30.7	31.0	27.1	21.4	18.0	16.0	16.3
3	11.4	9.0	11.3	9.1	10.6	11.2	9.8	9.5	15.2	18.8	22.8	19.6	25.7	32.4	24.1	19.3	13.9	10.9	10.6	12.7	13.2	10.2	9.2	10.5	15.5	18.6	24.6	32.3	26.6	29.4	34.3	33.8	30.2	23.9	20.7	17.3	18.3
2	12.2	10.3	12.1	10.8	11.8	12.8	12.2	11.1	17.8	23.9	26.6	22.5	30.1	36.8	27.8	23.3	16.3	13.1	12.9	15.8	14.9	12.5	11.5	11.9	19.9	23.5	28.8	38.1	32.3	36.2	40.3	38.2	35.3	27.9	25.2	19.3	21.6

Table I-20 Available Water of Kerian River in Present Condition

Scheme	: Kerian	River	: Kerian River
Sub-Scheme	: Kerian Laut	Condition	: Present Water Demand

<1> Q (Present River Discharge at River Discharge Station)

<2> Q(d+in)down (Present Domestic and Industrial Use Water taken from Downstream of River Discharge Station) → Jalan Bharu Pump Station

0.3 (m³/s)

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	7.7	6.0	5.7	3.1	3.2	2.9	2.5	6.5	8.8	5.7	7.0	9.8	17.5	16.3	15.0	13.4	10.4	5.7	4.7	7.7	6.7	6.5	4.5	7.8	7.6	9.6	18.8	14.6	24.0	22.3	16.5	21.0	13.8	9.3	7.1	8.7	9.9
10	8.6	7.0	6.2	3.9	4.2	3.5	3.3	7.7	10.2	6.4	7.6	10.4	19.6	19.1	16.8	14.9	11.6	6.9	5.7	9.2	7.6	7.8	5.6	9.5	9.6	11.8	20.2	17.6	25.6	25.5	20.1	23.5	15.6	11.4	8.6	9.4	11.4
5	10.1	8.5	7.3	5.2	5.9	4.5	4.8	9.6	12.3	7.8	9.0	11.7	22.5	23.2	19.7	16.9	13.4	8.7	7.2	11.4	9.2	9.8	7.2	12.0	13.0	15.5	22.9	22.4	28.9	30.5	25.8	27.4	18.8	14.9	11.0	10.7	13.9
4	11.2	9.3	8.0	6.1	6.9	5.2	5.7	10.6	13.5	9.0	10.3	12.7	24.0	25.4	21.5	18.0	14.3	9.6	8.1	12.6	10.2	11.0	8.2	13.5	14.9	17.8	24.8	25.0	31.2	33.5	29.0	29.6	20.9	17.0	12.5	11.6	15.3
3	12.7	10.5	9.1	7.4	8.5	6.2	7.1	12.0	15.2	10.9	12.2	14.2	26.1	28.5	24.2	19.4	15.5	11.1	9.3	14.4	11.6	12.7	9.5	15.6	17.9	21.3	27.5	28.9	34.6	37.7	33.7	32.7	23.9	20.1	14.8	12.9	17.5
2	15.1	12.5	10.8	9.7	11.5	8.0	9.7	14.4	18.0	14.1	15.4	16.6	29.4	33.5	28.4	21.7	17.9	13.4	11.4	17.3	13.9	15.5	11.9	19.1	23.0	27.5	31.8	35.4	39.8	44.7	41.5	37.6	28.9	25.4	18.8	15.1	21.1

<3> Q(is)down (Present Irrigation Use Water for Secondary Granary Areas taken from Downstream of River Discharge Station) → Bandar Baharu Secondary Granary Scheme (800 ha) (Cropping Intensity 120%)

= Water Requirement of Kerian Laut (13,726ha) / 13,726 x 800 x 120/180

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	0.7	0.5	0.3	0.1	0.0	0.1	0.3	0.6	0.7	0.8	0.9	1.0	0.9	0.7	0.8	0.9	0.9	0.7	0.5	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.3	0.4	0.4	0.6	0.7	0.8	1.0	1.0	0.7	0.5
10	0.6	0.4	0.3	0.1	0.0	0.1	0.3	0.6	0.6	0.8	0.8	0.9	0.7	0.5	0.6	0.7	0.7	0.5	0.4	0.3	0.2	0.1	0.0	0.1	0.1	0.1	0.2	0.3	0.3	0.3	0.5	0.6	0.7	0.8	0.8	0.6	0.4
5	0.5	0.4	0.2	0.1	0.0	0.1	0.3	0.5	0.6	0.7	0.7	0.7	0.6	0.4	0.5	0.5	0.5	0.4	0.3	0.2	0.1	0.1	0.0	0.1	0.1	0.1	0.2	0.3	0.3	0.3	0.3	0.4	0.5	0.6	0.7	0.5	0.4
4	0.4	0.3	0.2	0.1	0.0	0.1	0.3	0.5	0.5	0.6	0.7	0.7	0.5	0.3	0.4	0.5	0.5	0.4	0.3	0.2	0.1	0.1	0.0	0.1	0.1	0.1	0.2	0.3	0.3	0.2	0.3	0.4	0.5	0.6	0.6	0.5	0.3
3	0.4	0.3	0.2	0.1	0.0	0.1	0.3	0.5	0.5	0.6	0.6	0.6	0.4	0.3	0.4	0.4	0.4	0.3	0.2	0.1	0.1	0.0	0.0	0.1	0.1	0.1	0.2	0.3	0.2	0.2	0.3	0.3	0.4	0.5	0.5	0.4	0.3
2	0.3	0.3	0.2	0.1	0.0	0.1	0.3	0.5	0.5	0.5	0.5	0.5	0.3	0.2	0.3	0.3	0.3	0.2	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.4	0.4	0.3	0.2

<4> Qt (Present Inflow from Major Tributary between River Discharge Station and Intake Point of the Study Area)

<5> Qm (River Maintenance Flow)

Qt1=Qt2(=1.14xQ)

Qt1 : Diversion Flow to Bukit Merah Reservoir(=-1.5m³/s)

Qt2 : Tributaries Catchment Area Factor (=1.14)

1.6 (m³/s)

Source : Kurau River Flood Mitigation Study

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	7.3	5.4	5.0	2.1	2.1	1.8	1.3	5.9	8.5	5.0	6.4	9.7	18.4	17.1	15.6	13.8	10.3	5.0	3.8	7.2	6.2	5.9	3.7	7.4	7.1	9.4	19.9	15.1	25.8	23.9	17.3	22.4	14.3	9.1	6.6	8.4	9.8
10	8.3	6.5	5.6	2.9	3.3	2.5	2.3	7.3	10.1	5.8	7.2	10.4	20.8	20.3	17.6	15.4	11.7	6.3	5.0	8.9	7.2	7.4	4.9	9.3	9.5	11.9	21.5	18.6	27.7	27.5	21.5	25.3	16.3	11.5	8.3	9.2	11.5
5	10.1	8.1	6.8	4.4	5.2	3.6	4.0	9.4	12.5	7.4	8.8	11.8	24.2	24.9	21.0	17.8	13.7	8.4	6.7	11.5	9.0	9.7	6.8	12.2	13.2	16.2	24.6	24.0	31.4	33.3	27.9	29.7	19.9	15.5	11.0	10.2	14.3
4	11.2	9.1	7.6	5.4	6.4	4.4	5.0	10.5	13.8	8.8	10.2	13.0	25.9	27.4	23.1	19.0	14.8	9.5	7.7	12.9	10.1	11.0	7.8	13.9	15.5	18.8	26.8	27.0	34.1	36.7	31.5	32.2	22.3	17.8	12.8	11.7	16.0
3	12.9	10.5	8.8	6.9	8.2	5.6	6.6	12.2	15.8	10.9	12.4	14.7	28.3	31.0	26.0	20.6	16.2	11.1	9.1	14.9	11.7	13.0	9.4	16.2	18.9	22.8	29.8	31.4	37.9	41.5	36.9	35.7	25.8	21.4	15.4	13.2	18.4
2	15.7	12.8	10.8	9.6	11.6	7.6	9.6	14.9	19.0	14.6	16.0	17.4	32.1	36.7	30.8	23.2	18.4	13.8	11.5	18.3	14.3	16.2	12.0	20.2	24.7	29.8	34.7	38.8	43.9	49.5	45.8	41.3	31.5	27.4	19.9	15.7	22.5

<6> Qa (Available Water at Intake Point of the Study Area) [Qa=Q-Q(d+in+is)down+Qt-Qm]

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	12.4	9.0	8.4	3.2	3.3	2.6	1.6	9.9	14.7	7.9	10.5	16.5	33.2	30.9	27.9	24.4	17.9	8.2	6.0	12.7	10.8	10.3	6.3	13.2	12.6	16.9	36.5	27.4	47.5	43.9	31.3	40.8	25.3	15.5	10.8	14.4	17.4
10	14.3	11.1	9.6	4.8	5.5	3.9	3.4	12.6	17.7	9.4	12.1	18.0	37.8	36.9	31.8	27.7	20.8	10.8	8.3	15.9	12.8	13.2	8.5	16.8	17.1	21.6	39.5	34.0	51.1	50.8	39.2	46.3	29.3	20.2	14.1	16.0	20.6
5	17.8	14.3	11.9	7.6	9.2	6.1	6.6	16.5	22.2	12.6	15.2	20.8	44.2	45.8	38.3	33.2	24.6	14.7	11.7	20.8	16.1	17.6	12.1	22.3	24.2	29.6	45.4	44.1	58.2	61.6	51.5	54.7	36.3	27.8	19.5	18.9	25.9
4	20.0	16.1	13.5	9.4	11.4	7.6	8.5	18.7	24.8	15.2	17.9	23.1	47.5	50.5	42.2	34.6	26.6	16.8	13.6	23.4	18.2	20.1	14.0	25.3	28.4	34.5	49.5	49.8	63.2	68.0	58.3	59.5	40.8	32.3	22.8	20.9	29.1
3	23.3	18.8	15.8	12.3	14.8	9.7	11.6	21.8	28.5	19.2	22.0	26.3	52.1	57.2	47.9	37.7	29.4	19.9	16.3	27.2	21.2	23.7	17.0	29.8	34.7	42.0	55.2	58.1	70.3	77.1	68.3	66.2	47.4	39.0	27.8	23.8	33.7
2	28.6	23.1	19.5	17.3	21.0	13.5	17.2	26.9	34.6	26.2	29.0	31.5	59.3	68.2	57.0	42.7	33.6	25.1	20.9	33.6	26.2	29.8	22.0	37.3	45.7	55.2	64.4	72.1	81.6	92.1	85.2	76.8	58.2	50.5	36.4	28.5	41.4

Table I-21 Available Water of Batang Padang River in Present Condition

Scheme	: Kerian / Sg. Manik	River	: Batang Padang River
Sub-Scheme	: Sungai Manik	Condition	: **Present Water Demand**

<1> Q (Present River Discharge at River Discharge Station)

<2> Q(d+in)down (Present Domestic and Industrial Use Water taken from Downstream of River Discharge Station)

1.4 (m³/s)

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	16.5	16.8	16.5	15.3	16.7	13.6	14.5	14.3	15.1	19.9	19.1	15.8	19.4	25.0	22.1	16.6	16.1	13.9	13.0	11.6	16.1	14.8	11.6	11.0	11.7	14.8	16.8	23.9	25.0	20.9	30.3	23.5	21.6	21.3	21.1	19.7	17.7
10	18.1	17.7	17.8	17.5	18.7	15.1	16.1	15.9	17.1	20.2	20.1	17.2	20.5	26.0	22.7	18.8	16.8	15.0	14.7	13.4	19.2	16.0	13.3	12.8	13.8	17.5	19.2	25.1	27.2	24.2	33.5	26.7	24.6	24.0	24.4	22.3	19.5
5	20.5	19.2	19.9	20.7	21.5	17.2	18.4	18.1	19.9	21.1	22.2	19.6	22.6	27.7	23.8	21.8	18.1	16.6	17.2	16.0	20.9	17.7	15.6	15.4	16.9	21.7	22.7	27.3	30.3	29.0	38.2	31.3	28.8	28.0	29.3	26.2	22.2
4	21.9	20.2	21.1	22.3	22.9	18.3	19.6	19.3	21.4	21.9	23.7	21.1	23.9	28.8	24.8	23.3	18.9	17.4	18.5	17.4	21.8	18.6	16.9	16.8	18.6	23.9	24.5	28.8	31.8	31.5	40.7	33.8	31.0	30.2	31.8	28.2	23.8
3	23.9	21.6	22.8	24.7	24.8	19.7	21.2	20.9	23.5	23.1	25.7	23.2	25.8	30.2	26.1	25.5	20.0	18.6	20.3	19.4	23.1	19.9	18.6	18.8	21.0	27.1	27.1	30.8	33.9	35.2	44.3	37.2	34.1	33.5	35.5	31.0	25.9
2	27.0	23.7	25.5	28.4	27.9	22.0	23.8	23.5	26.9	24.8	28.8	26.5	28.7	32.3	28.0	29.0	21.7	20.4	23.1	22.5	24.9	21.9	21.4	22.0	24.9	32.5	31.3	33.8	37.1	41.0	49.8	42.6	39.0	38.6	41.3	35.5	29.2

<3> Q(is)down (Present Irrigation Use Water for Secondary Granary Areas taken from Downstream of River Discharge Station)

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

<4> Qt (Present Inflow from Major Tributary between River Discharge Station and Intake Point of the Study Area)

<5> Qm (River Maintenance Flow)

0.5 (m³/s)

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

<6> Qa (Available Water at Intake Point of the Study Area) [Qa=Q-Q(d+in+is)down+Qt-Qm]

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	14.7	14.9	14.6	13.4	14.9	11.8	12.6	12.4	13.2	18.0	17.2	13.9	17.5	23.1	20.2	14.7	14.3	12.0	11.1	9.7	16.2	13.0	9.7	9.1	9.8	12.9	14.9	22.0	23.1	19.0	28.4	21.6	19.7	19.6	19.3	17.8	15.8
10	16.2	15.8	15.9	15.6	16.8	13.2	14.3	14.0	15.2	18.4	18.3	15.3	18.6	24.1	20.8	16.9	14.9	13.1	12.8	11.5	17.4	14.1	11.4	10.9	11.9	15.7	17.3	23.2	25.3	22.3	31.6	24.8	22.7	22.1	22.6	20.4	17.6
5	18.6	17.3	18.0	18.8	19.6	15.3	16.5	16.2	18.0	19.2	20.3	17.7	20.7	25.6	21.9	19.9	16.2	14.7	15.3	14.1	19.0	15.8	13.7	13.5	15.0	19.8	20.8	25.4	28.4	27.1	36.3	29.4	26.9	26.1	27.4	24.3	20.4
4	20.0	18.3	19.2	20.4	21.0	16.4	17.7	17.4	19.5	20.0	21.8	19.2	22.0	26.9	22.9	21.5	17.0	15.5	16.6	15.5	19.9	16.7	15.0	14.9	16.7	22.0	22.7	26.9	29.9	29.7	38.8	31.9	29.1	28.4	30.0	26.3	21.9
3	22.0	19.7	20.9	22.8	23.0	17.8	19.3	19.0	21.6	21.2	23.8	21.3	23.9	28.3	24.2	23.6	18.1	16.7	18.4	17.5	21.2	18.0	16.7	16.9	19.1	25.3	25.2	28.9	32.0	33.3	42.4	35.3	32.2	31.6	33.6	29.1	24.0
2	25.1	21.8	23.6	26.5	26.0	20.1	21.9	21.6	25.0	22.9	26.9	24.6	26.8	30.4	26.1	27.1	19.8	18.5	21.2	20.6	23.0	20.0	19.5	20.1	23.0	30.6	29.4	31.9	35.2	39.1	47.9	40.7	37.1	36.7	39.5	33.6	27.3

Table I-22 Available Water of Kemasin River in Present Condition

Scheme	: Kemasin/Semerak	River	: Kemasin River
Sub-Scheme	: Jelawat Rusa, Kemasin Hilir	Condition	: Present Water Demand

<1> Q (Present River Discharge at River Discharge Station)

<2> Q(d+in)down (Present Domestic and Industrial Use Water taken from Downstream of River Discharge Station)

0.0 (m³/s)

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	1.7	1.3	1.4	1.1	1.1	0.7	0.9	0.5	0.7	0.6	0.4	0.3	0.3	0.5	0.8	1.0	1.2	0.9	1.2	1.3	1.1	0.8	1.4	1.8	1.0	1.5	1.2	1.2	1.4	1.2	1.4	1.9	1.4	5.3	2.0	1.5	1.2
10	1.9	1.5	1.6	1.3	1.2	0.8	1.1	0.7	0.9	0.7	0.5	0.4	0.4	0.6	0.8	1.2	1.4	1.1	1.4	1.4	1.2	0.9	1.6	2.0	1.2	1.8	1.5	1.4	1.7	1.4	1.8	2.3	2.0	6.8	2.8	2.0	1.5
5	2.2	1.7	1.9	1.5	1.5	1.0	1.5	1.0	1.1	1.0	0.7	0.5	0.5	0.7	1.0	1.4	1.7	1.4	1.8	1.6	1.4	1.2	1.8	2.4	1.6	2.3	1.9	1.8	2.1	1.7	2.3	3.0	3.2	9.7	4.4	3.0	1.9
4	2.3	1.9	2.1	1.7	1.6	1.1	1.7	1.2	1.3	1.1	0.8	0.6	0.6	0.8	1.2	1.5	1.8	1.6	2.0	1.7	1.5	1.2	1.9	2.6	1.8	2.5	2.1	2.0	2.3	2.0	2.7	3.4	4.0	11.6	5.3	3.6	2.2
3	2.5	2.1	2.3	1.8	1.8	1.3	1.9	1.5	1.5	1.3	1.0	0.8	0.8	1.0	1.4	1.7	2.0	1.8	2.4	2.0	1.7	1.4	2.1	2.9	2.1	2.9	2.4	2.3	2.7	2.3	3.2	4.0	5.3	14.6	6.9	4.6	2.6
2	2.8	2.5	2.7	2.2	2.2	1.6	2.4	2.2	1.9	1.6	1.2	1.1	1.1	1.2	1.7	2.0	2.4	2.2	2.9	2.3	2.1	1.8	2.5	3.3	2.6	3.5	2.9	2.8	3.2	2.8	4.0	5.0	7.8	20.3	9.9	6.4	3.4

<3> Q(is)down (Present Irrigation Use Water for Secondary Granary Areas taken from Downstream of River Discharge Station)

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

<4> Qt (Present Inflow from Major Tributary between River Discharge Station and Intake Point of the Study Area)

<5> Qm (River Maintenance Flow)

0.2 (m³/s)

Qt1+Qt2 Qt1 : Supplementary Water from Kemubu Pump Station (=5m³/s)
Qt2 : KADA Dram Water (=0.7xQ) Source : Kemasin-Semerak Integrated Rural Development Project

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	6.2	5.9	6.0	5.7	5.7	5.5	5.6	5.3	5.5	5.4	5.3	5.2	5.2	5.3	5.5	5.7	5.8	5.7	5.8	5.9	5.8	5.5	6.0	6.3	5.7	6.1	5.8	5.8	6.0	5.8	6.0	6.3	6.0	8.7	6.4	6.0	5.8
10	6.3	6.0	6.1	5.9	5.9	5.6	5.8	5.5	5.6	5.5	5.4	5.3	5.3	5.4	5.6	5.8	6.0	5.8	6.0	6.0	5.8	5.6	6.1	6.4	5.8	6.3	6.0	6.0	6.2	6.0	6.2	6.6	6.4	9.8	7.0	6.4	6.0
5	6.5	6.2	6.4	6.1	6.1	5.7	6.0	5.7	5.8	5.7	5.5	5.4	5.6	5.5	5.7	6.0	6.2	6.0	6.3	6.1	6.0	5.7	6.3	6.7	6.1	6.6	6.3	6.2	6.5	6.2	6.6	7.1	7.2	11.8	8.0	7.1	6.3
4	6.6	6.3	6.5	6.2	6.1	5.8	6.2	5.8	5.9	5.8	5.6	5.4	5.6	5.5	5.7	6.0	6.2	6.4	6.2	6.6	6.4	6.2	6.0	6.5	7.0	6.5	7.0	6.7	6.6	6.9	6.6	7.2	7.8	8.7	15.2	9.8	8.2	6.8
3	6.7	6.5	6.6	6.3	6.3	5.9	6.3	6.1	6.1	5.9	5.7	5.6	5.5	5.7	6.0	6.2	6.4	6.2	6.6	6.4	6.2	6.0	6.5	7.0	6.5	7.0	6.7	6.6	6.9	6.6	7.2	7.8	8.7	15.2	9.8	8.2	6.8
2	6.9	6.7	6.9	6.5	6.5	6.1	6.7	6.5	6.4	6.1	5.9	5.8	5.7	5.8	6.2	6.4	6.6	6.5	7.0	6.6	6.4	6.2	6.7	7.3	6.8	7.5	7.1	7.0	7.3	6.9	7.8	8.5	10.5	19.2	11.9	9.5	7.4

<6> Qa (Available Water at Intake Point of the Study Area) [Qa=Q-Q(d+in+is)down+Qt-Qm]

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	7.8	7.0	7.3	6.7	6.6	6.0	6.4	5.7	6.0	5.8	5.5	5.3	5.3	5.6	6.1	6.6	6.9	6.4	6.8	7.1	6.7	6.1	7.2	7.9	6.5	7.4	6.9	6.9	7.2	6.9	7.2	8.1	7.2	13.8	8.2	7.3	6.9
10	8.1	7.3	7.6	7.0	6.9	6.2	6.8	6.0	6.3	6.1	5.7	5.5	5.5	5.8	6.3	6.8	7.2	6.7	7.2	7.2	6.8	6.3	7.5	8.3	6.9	7.9	7.3	7.2	7.7	7.2	7.8	8.8	8.3	16.4	9.6	8.3	7.3
5	8.5	7.8	8.1	7.4	7.4	6.6	7.3	6.5	6.8	6.5	6.0	5.8	5.7	6.1	6.6	7.2	7.7	7.2	7.9	7.5	7.2	6.6	7.9	8.9	7.5	8.7	8.0	7.8	8.4	7.8	8.6	10.0	10.3	21.3	12.2	9.9	8.2
4	8.8	8.0	8.4	7.6	7.6	6.7	7.6	6.9	7.0	6.7	6.2	5.9	5.9	6.2	6.8	7.4	7.9	7.5	8.3	7.8	7.4	6.9	8.1	9.3	7.8	9.1	8.4	8.2	8.8	8.2	9.4	10.7	11.6	24.5	13.9	11.0	8.6
3	9.1	8.4	8.8	8.0	8.0	7.0	8.1	7.5	7.4	7.0	6.5	6.2	6.1	6.5	7.2	7.7	8.3	7.9	8.8	8.2	7.7	7.2	8.5	9.7	8.4	9.8	8.9	8.7	9.4	8.7	10.2	11.7	13.8	29.7	16.6	12.6	9.3
2	9.5	9.0	9.4	8.5	8.5	7.5	8.9	8.5	8.1	7.6	6.9	6.7	6.7	6.9	7.7	8.2	8.8	8.5	9.8	8.7	8.3	7.8	9.0	10.4	9.3	10.8	9.8	9.7	10.3	9.6	11.7	13.4	18.1	39.4	21.7	15.8	10.5

Table I-23 Available Water of Besut River in Present Condition

Scheme	: Besut	River	: Besut River
Sub-Scheme	: Besut Barrage	Condition	: Present Water Demand

<1> Q (Present River Discharge at River Discharge Station)

<2> Q(d+in)down (Present Domestic and Industrial Use Water taken from Downstream of River Discharge Station) → Bukit Bunga

0.3 (m³/s)

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	35.0	25.3	14.7	7.8	6.5	5.2	5.2	4.6	7.2	7.3	8.0	7.3	8.6	5.9	9.8	8.9	7.3	8.8	6.5	6.6	8.1	7.0	7.9	8.1	7.9	17.9	18.7	11.6	11.7	11.6	11.8	13.3	27.6	44.2	30.6	37.6	13.1
10	37.8	28.9	19.2	10.6	8.4	6.6	7.2	6.4	8.8	8.8	9.2	8.6	9.7	7.4	11.3	10.6	9.0	10.0	8.3	8.6	10.1	8.9	9.9	10.4	10.5	19.9	20.7	14.5	14.1	15.0	15.0	18.3	36.1	50.1	36.7	42.6	15.8
5	43.5	34.3	26.8	15.4	11.5	8.8	10.8	9.5	11.3	11.1	10.9	10.7	11.4	9.7	13.4	13.4	11.5	11.7	11.3	12.0	13.2	12.0	13.0	14.3	15.0	24.2	24.6	19.4	18.1	20.6	20.7	27.0	50.5	63.0	49.8	53.3	20.5
4	47.8	36.8	31.3	18.4	13.4	10.1	13.0	11.4	12.7	12.3	11.8	11.8	12.2	11.0	14.5	14.8	12.9	12.5	13.1	14.0	14.9	13.8	14.8	16.6	17.7	27.3	27.3	22.4	20.4	23.9	24.5	32.4	59.0	73.5	59.6	62.2	23.5
3	54.0	40.6	38.2	23.0	16.2	12.0	16.5	14.5	14.7	14.2	13.1	13.4	13.4	13.0	16.0	17.0	15.0	13.8	15.8	17.0	17.6	16.6	17.5	20.0	21.8	32.0	31.2	26.8	23.9	28.9	30.4	41.0	72.1	89.6	75.3	75.7	28.1
2	64.2	46.7	50.6	31.6	21.1	15.3	23.2	20.2	18.2	17.2	15.1	16.1	15.3	16.4	18.5	20.6	18.5	15.7	20.5	22.5	22.0	21.4	22.1	26.2	29.4	40.0	37.7	34.7	29.9	37.9	41.2	57.2	95.7	118.5	104.5	100.0	36.3

<3> Q(is)down (Present Irrigation Use Water for Secondary Granary Areas taken from Downstream of River Discharge Station)

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

<4-1> Qt/C1 (Present Inflow from Major Tributary between River Discharge Station and Intake Point of the Study Area)

<5> Qm (River Maintenance Flow)

0.7 (m³/s)

for Case 1

Qt1+Qt2(=-0.26xQ)

Qt1 : Excess Water from Angga River System in Case 1

Qt2 : Tributaries Catchment Area Factor (=-0.26) Source : Besut River Flood Mitigation Project

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	-1.8	-2.6	-3.3	-2.0	-1.7	-1.3	-1.4	-1.2	-1.9	-1.8	-0.4	-0.3	-2.2	-1.5	-1.9	-1.5	-1.9	-2.3	-1.7	-1.7	-2.1	-1.8	-2.1	-2.1	-1.8	-1.2	-0.6	-0.3	-0.1	-0.1	-0.1	-2.6	-4.1	-1.1	-0.4	-1.0	-1.6
10	-1.2	-2.0	-2.6	-2.8	-2.2	-1.7	-1.9	-1.7	-2.3	-1.5	-0.4	-0.2	-2.3	-1.9	-1.7	-1.4	-2.3	-2.1	-2.1	-2.0	-1.9	-1.9	-1.7	-1.9	-1.4	-0.9	-0.3	-0.1	0.0	0.0	0.0	-2.3	-3.6	-0.7	0.1	-0.4	-1.5
5	-0.5	-1.4	-2.0	-2.5	-2.6	-2.3	-2.7	-2.5	-2.5	-1.2	-0.2	-0.1	-2.3	-2.5	-1.5	-1.2	-2.4	-1.8	-1.6	-1.6	-1.5	-1.5	-1.2	-1.4	-0.9	-0.4	-0.1	0.2	0.1	0.2	0.2	-1.9	-2.7	0.0	0.9	0.5	-1.2
4	-0.1	-1.2	-1.6	-2.3	-2.3	-2.4	-2.5	-2.5	-2.3	-1.0	-0.2	-0.1	-2.3	-2.9	-1.5	-1.2	-2.2	-1.6	-1.4	-1.4	-1.3	-1.3	-1.1	-1.2	-0.8	-0.2	0.1	0.3	0.2	0.3	0.4	-1.7	-2.4	0.5	1.4	1.0	-1.1
3	0.2	-0.8	-1.2	-1.9	-2.0	-2.0	-2.1	-2.2	-2.0	-0.9	-0.1	0.0	-2.1	-3.4	-1.3	-1.0	-2.1	-1.4	-1.1	-1.1	-1.1	-1.0	-0.9	-1.0	-0.4	0.0	0.3	0.4	0.3	0.5	0.6	-1.2	-1.7	1.2	2.0	1.6	-0.8
2	0.8	-0.3	-0.6	-1.2	-1.4	-1.5	-1.5	-1.6	-1.5	-0.6	0.0	0.1	-2.0	-3.5	-1.2	-0.9	-1.8	-1.1	-0.7	-0.7	-0.7	-0.6	-0.4	-0.5	0.0	0.5	0.6	0.7	0.5	0.7	0.9	-0.5	-0.7	2.4	3.0	2.5	-0.4

<4-2> Qt/C2 (Present Inflow from Major Tributary between River Discharge Station and Intake Point of the Study Area)

for Case 2

Qt1+Qt2(=-0.26xQ)

Qt1 : Excess Water from Angga River System in Case 2

Qt2 : Tributaries Catchment Area Factor (=-0.26) Source : Besut River Flood Mitigation Project

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	-1.2	-1.9	-2.5	-2.0	-1.7	-1.3	-1.4	-1.2	-1.9	-1.4	-0.4	-0.3	-1.8	-1.5	-1.4	-1.2	-1.9	-1.8	-1.7	-1.7	-1.7	-1.8	-1.6	-1.8	-1.4	-0.9	-0.4	-0.2	-0.1	-0.1	-0.1	-2.0	-3.0	-0.7	-0.3	-0.6	-1.3
10	-0.7	-1.4	-2.0	-2.5	-2.2	-1.7	-1.9	-1.7	-2.3	-1.2	-0.3	-0.2	-1.8	-1.9	-1.3	-1.1	-2.0	-1.6	-1.7	-1.6	-1.5	-1.5	-1.3	-1.4	-1.1	-0.6	-0.2	-0.1	0.0	0.0	0.0	-1.7	-2.6	-0.3	0.2	-0.1	-1.2
5	-0.1	-0.9	-1.4	-1.9	-2.0	-2.0	-2.1	-2.2	-1.9	-0.9	-0.2	-0.1	-1.7	-2.5	-1.1	-0.9	-1.8	-1.3	-1.2	-1.2	-1.2	-1.1	-0.9	-1.1	-0.7	-0.2	0.0	0.2	0.1	0.2	0.2	-1.6	-1.8	0.4	0.9	0.7	-0.9
4	0.2	-0.8	-1.1	-1.7	-1.8	-1.8	-1.9	-1.9	-1.8	-0.8	-0.1	-0.1	-1.7	-2.9	-1.1	-0.9	-1.7	-1.2	-1.1	-1.0	-1.0	-1.0	-0.8	-0.9	-0.6	-0.1	0.2	0.3	0.2	0.3	0.4	-1.1	-1.5	0.8	1.5	1.2	-0.8
3	0.4	-0.4	-0.7	-1.4	-1.5	-1.5	-1.5	-1.6	-1.5	-0.7	-0.1	0.0	-1.6	-2.8	-1.0	-0.7	-1.5	-1.0	-0.8	-0.8	-0.8	-0.7	-0.6	-0.7	-0.3	0.2	0.3	0.4	0.3	0.5	0.6	-0.7	-0.9	1.5	2.0	1.7	-0.5
2	1.0	0.0	-0.2	-0.8	-1.0	-1.1	-1.1	-1.2	-1.1	-0.4	0.0	0.1	-1.5	-2.6	-0.8	-0.6	-1.3	-0.8	-0.4	-0.4	-0.5	-0.4	-0.2	-0.3	0.1	0.6	0.6	0.7	0.5	0.7	0.9	-0.1	0.0	2.6	3.0	2.6	-0.1

Table I-23 Available Water of Besut River in Present Condition

Scheme	: Besut	River	: Besut River
Sub-Scheme	: Besut Barrage	Condition	: Present Water Demand

<4-3> Qt/C3 (Present Inflow from Major Tributary between River Discharge Station and Intake Point of the Study Area)

for Case 3

Qt1=Qt2(a=0.26)xQ1

Qt1 : Excess Water from Angga River System in Case 3

Qt2 : Tributaries Catchment Area Factor (=0.26) Source : Besut River Flood Mitigation Project

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	-1.4	-1.9	-2.3	-1.5	-0.6	-0.4	-0.4	-1.2	-1.9	-1.9	-1.9	-1.9	-2.2	-1.5	-1.9	-2.0	-1.9	-1.7	-1.7	-1.6	-1.4	-0.8	-0.3	-0.3	-0.3	-1.8	-3.3	-1.7	-1.0	-1.7	-1.6	-1.2	-0.8	-0.4	-1.2	-1.2	-1.4
10	-1.0	-1.4	-1.8	-1.2	-0.4	-0.3	-0.3	-1.7	-2.3	-1.8	-1.8	-2.2	-2.0	-1.9	-1.6	-1.7	-1.7	-1.4	-1.7	-1.3	-1.1	-0.6	-0.2	-0.2	-0.2	-1.7	-3.1	-1.4	-0.8	-1.5	-1.2	-0.8	-0.3	0.1	-0.6	-0.7	-1.2
5	-0.4	-0.9	-1.2	-0.8	-0.2	-0.2	-0.1	-1.6	-2.5	-1.6	-1.7	-2.3	-1.8	-1.5	-1.3	-1.2	-1.2	-1.1	-1.1	-1.2	-1.0	-0.8	-0.4	0.0	0.0	0.0	-1.4	-2.8	-1.1	-0.7	-1.1	-0.8	-0.2	0.4	0.6	0.3	-0.9
4	-0.1	-0.7	-0.9	-0.6	-0.1	-0.1	0.0	-1.5	-2.4	-1.5	-1.7	-2.2	-1.7	-1.3	-1.2	-1.2	-1.1	-0.9	-1.1	-0.8	-0.6	-0.3	0.0	0.1	0.1	-1.3	-2.6	-0.9	-0.5	-1.0	-0.5	-0.1	0.7	1.3	0.7	0.5	-0.7
3	0.2	-0.4	-0.6	-0.3	0.0	0.0	0.1	-1.4	-2.3	-1.4	-1.6	-2.1	-1.5	-1.0	-1.0	-0.9	-1.0	-0.8	-0.9	-0.6	-0.5	-0.1	0.1	0.2	0.3	-1.1	-2.3	-0.8	-0.4	-0.7	-0.2	0.4	1.2	2.0	1.4	1.1	-0.5
2	0.8	0.0	0.0	0.1	0.3	0.1	0.4	-1.0	-2.0	-1.2	-1.4	-1.9	-1.2	-0.7	-0.8	-0.6	-0.6	-0.5	-0.6	-0.3	-0.1	0.1	0.3	0.4	0.5	-0.8	-1.9	-0.4	-0.1	-0.3	0.3	1.0	1.9	3.1	2.7	2.1	-0.1

<6-1> Qa/C1 (Available Water at Intake Point of the Study Area) [Qa/C1=Q-Q(d+in+is)down+Qt/C1-Qm]

for Case 1

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	32.2	21.7	10.4	4.8	3.9	2.9	2.9	2.5	4.4	4.6	6.6	6.1	5.4	3.4	7.0	6.4	4.5	5.6	3.9	4.0	5.1	4.2	4.9	5.0	5.2	15.8	17.1	10.4	10.6	10.5	10.7	9.8	22.6	42.1	29.3	35.6	10.6
10	35.7	25.9	15.6	6.9	5.3	3.9	4.4	3.8	5.6	6.3	7.9	7.5	6.4	4.5	8.6	8.3	5.7	6.9	5.3	5.7	7.3	6.1	7.3	7.6	8.2	18.1	19.4	13.5	13.2	14.0	14.0	15.0	31.6	48.4	35.9	41.2	13.4
5	42.1	31.7	23.8	12.0	8.0	5.6	7.1	6.1	7.8	8.9	9.8	9.6	8.1	6.2	10.9	11.2	8.2	9.0	8.8	9.5	10.8	9.6	10.9	11.9	13.2	22.8	23.0	18.7	17.3	19.9	20.0	24.2	46.8	62.1	49.7	53.0	18.3
4	46.8	34.6	28.7	15.1	10.1	6.7	9.5	7.9	9.4	10.3	10.7	10.8	9.0	7.2	12.0	12.8	9.7	10.0	10.7	11.6	12.7	11.6	12.8	14.4	15.9	26.2	26.5	21.7	19.7	23.3	23.9	29.8	55.6	73.0	60.1	62.3	21.5
3	53.3	38.9	36.0	20.1	13.2	9.0	13.5	11.3	11.8	12.3	12.0	12.5	10.4	8.7	13.7	15.1	12.0	11.4	13.7	15.0	15.5	14.7	15.7	18.1	20.5	31.1	30.5	26.3	23.3	28.5	30.0	38.9	69.4	89.8	76.3	76.4	26.4
2	64.1	45.4	49.1	29.5	18.8	12.9	20.7	17.6	15.7	15.7	14.2	15.2	12.3	12.0	16.4	18.8	15.7	13.6	18.9	20.9	20.4	19.8	20.8	24.8	28.5	39.5	37.4	34.4	29.4	37.7	41.2	55.2	94.0	119.9	106.6	101.6	35.0

<6-2> Qa/C2 (Available Water at Intake Point of the Study Area) [Qa/C2=Q-Q(d+in+is)down+Qt/C2-Qm]

for Case 2

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	32.8	22.4	11.2	4.8	3.9	2.9	2.9	2.5	4.4	5.0	6.7	6.1	5.8	3.4	7.4	6.7	4.5	6.1	3.9	4.0	5.5	4.2	5.3	5.4	5.6	16.1	17.3	10.4	10.6	10.5	10.7	10.4	23.7	42.6	29.4	36.0	10.9
10	36.1	26.5	16.3	7.2	5.3	3.9	4.4	3.8	5.6	6.7	7.9	7.5	7.0	4.5	9.0	8.6	6.0	7.4	5.7	6.1	7.7	6.5	7.6	8.0	8.5	18.4	19.5	13.5	13.2	14.0	14.0	15.6	32.6	48.9	36.0	41.5	13.6
5	42.4	32.2	24.4	12.6	8.6	5.9	7.8	6.4	8.4	9.2	9.8	9.6	8.7	6.2	11.3	12.5	8.6	9.4	9.2	9.8	11.1	10.0	11.2	12.3	13.4	23.0	23.7	18.7	17.3	19.9	20.0	24.7	47.7	62.4	49.8	52.1	18.6
4	47.0	35.1	29.2	15.7	10.7	7.3	10.2	8.5	10.0	10.6	10.7	10.8	9.6	7.2	12.4	13.1	10.3	10.4	11.1	12.0	13.0	11.9	13.1	14.7	16.2	26.3	26.5	21.7	19.7	23.3	23.9	30.4	56.5	73.4	60.1	62.4	21.8
3	53.5	39.2	36.5	20.7	13.7	9.5	14.0	11.9	12.3	12.6	12.1	12.5	10.9	9.3	14.1	15.4	12.5	11.8	14.0	15.3	15.8	14.9	15.9	18.4	20.6	31.3	30.6	26.3	23.3	28.5	30.0	39.4	70.2	90.1	76.3	76.5	26.7
2	64.2	45.7	49.5	29.9	19.2	13.3	21.1	18.1	16.1	15.9	14.2	15.2	12.9	12.9	16.7	19.1	16.2	13.9	19.1	21.3	20.6	20.1	20.9	25.0	28.6	39.6	37.4	34.4	29.4	37.7	41.2	56.1	94.8	120.2	106.6	101.6	35.2

<6-3> Qa/C3 (Available Water at Intake Point of the Study Area) [Qa/C3=Q-Q(d+in+is)down+Qt/C3-Qm]

for Case 3

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	32.6	22.4	11.4	5.3	5.0	3.9	3.9	2.5	4.4	4.5	5.1	4.4	5.4	3.4	7.0	5.9	4.5	6.2	3.9	4.0	5.8	5.3	6.7	6.9	6.7	15.2	14.4	9.0	9.7	8.9	9.2	11.2	25.9	42.8	28.5	35.4	10.8
10	35.9	26.5	16.4	8.4	7.1	5.3	6.0	3.8	5.6	6.0	6.5	5.4	6.7	4.6	8.7	8.0	6.3	7.6	5.7	6.4	8.1	7.4	8.8	9.3	9.4	17.3	16.6	12.2	12.4	12.5	12.8	16.5	34.9	49.2	35.2	40.9	13.6
5	42.2	32.2	24.6	13.7	10.4	7.7	9.7	6.9	7.8	8.5	8.3	7.4	8.6	7.3	11.1	11.1	9.3	9.7	9.1	10.1	11.5	10.7	12.1	13.2	14.1	21.8	20.9	17.4	16.5	18.6	19.0	25.9	49.9	62.9	49.1	52.5	18.7
4	46.8	35.1	29.4	16.8	12.3	9.0	12.0	8.9	9.3	9.8	9.2	8.7	9.6	8.8	12.3	12.8	10.8	10.7	11.0	12.2	13.4	12.6	13.9	15.7	16.8	25.1	23.8	20.5	19.0	22.0	23.0	31.4	58.7	73.8	59.4	61.8	21.9
3	53.3	39.3	36.6	21.7	15.2	11.0	15.7	12.1	11.5	11.8	10.5	10.4	11.0	11.1	14.0	15.2	13.1	12.0	13.9	15.5	16.1	15.6	16.7	19.3	21.2	30.0	27.9	25.1	22.6	27.3	29.2	40.5	72.3	90.6	75.7	75.9	26.7
2	64.1	45.7	49.7	30.8	20.5	14.5	22.6	18.2	15.2	15.1	12.8	13.2	13.1	14.8	16.8	19.1	15.9	14.2	19.0	21.3	21.0	20.5	21.5	25.7	29.0	38.2	34.9	33.3	28.8	36.7	40.6	57.2	99.6	120.6	106.3	101.2	35.3

Table I-24 Available Water of Angga River in Present Condition

Scheme	: Besut	River	: Angga River
Sub-Scheme	: Angga Barrage	**Condition : Present Water Demand**	

<1> Q (Present River Discharge at River Discharge Station)

<2> Q(d+in)down (Present Domestic and Industrial Use Water taken from Downstream of River Discharge Station)

0.0 (m³/s)

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	9.3	6.5	3.5	1.5	1.2	0.8	0.8	0.6	1.4	1.4	1.6	1.6	1.7	1.0	2.1	1.8	1.4	1.8	1.2	1.2	1.6	1.3	1.6	1.6	1.6	4.4	4.6	2.6	2.6	2.6	2.7	3.1	7.2	11.9	8.1	10.0	3.0
10	10.1	7.6	4.8	2.3	1.7	1.2	1.4	1.1	1.8	1.8	1.9	1.8	2.1	1.4	2.5	2.3	1.9	2.2	1.7	1.8	2.2	1.8	2.1	2.3	2.3	5.0	5.2	3.5	3.3	3.6	3.6	4.5	9.6	13.6	9.8	11.5	3.8
5	11.2	9.0	7.0	3.7	2.6	1.8	2.4	2.0	2.5	2.5	2.4	2.4	2.5	2.1	3.1	3.1	2.6	2.6	2.5	2.7	3.1	2.7	3.0	3.4	3.6	6.2	6.3	4.9	4.5	5.2	5.2	7.0	13.7	17.3	13.5	14.5	5.2
4	13.0	9.8	8.2	4.5	3.1	2.2	3.0	2.6	2.9	2.8	2.7	2.7	2.8	2.5	3.4	3.5	3.0	2.9	3.0	3.3	3.6	3.3	3.5	4.0	4.3	7.1	7.1	5.7	5.1	6.1	6.3	8.6	16.2	20.3	16.3	17.1	6.0
3	14.7	10.9	10.2	5.9	3.9	2.7	4.0	3.4	3.5	3.3	3.0	3.1	3.1	3.0	3.9	4.2	3.6	3.2	3.8	4.2	4.3	4.0	4.3	5.0	5.5	8.5	8.2	7.0	6.1	7.6	8.0	11.0	19.9	24.9	20.8	20.9	7.3
2	17.6	12.6	13.8	8.3	5.3	3.7	5.9	5.1	4.5	4.2	3.6	3.9	3.7	4.0	4.6	5.2	4.6	3.8	5.1	5.7	5.6	5.4	5.6	6.8	7.7	10.7	10.1	9.2	7.8	10.1	11.1	15.6	26.6	33.2	29.2	27.9	9.7

<3> Q(is)down (Present Irrigation Use Water for Secondary Granary Areas taken from Downstream of River Discharge Station)

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

<4> Qt (Present Inflow from Major Tributary between River Discharge Station and Intake Point of the Study Area)

<5> Qm (River Maintenance Flow)

0.1 (m³/s)

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

<6> Qa (Available Water at Intake Point of the Study Area) [Qa=Q-Q(d+in+is)down+Qt-Qm]

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	9.2	6.4	3.4	1.4	1.1	0.7	0.7	0.5	1.3	1.3	1.5	1.3	1.7	0.9	2.0	1.7	1.3	1.7	1.1	1.1	1.5	1.2	1.5	1.5	1.5	4.3	4.6	2.5	2.5	2.5	2.6	3.0	7.1	11.8	8.0	9.9	3.0
10	10.0	7.5	4.7	2.2	1.6	1.1	1.3	1.0	1.7	1.7	1.8	1.7	2.0	1.3	2.4	2.2	1.8	2.1	1.6	1.7	2.1	1.8	2.0	2.2	2.2	4.9	5.1	3.4	3.2	3.5	3.5	4.4	9.5	13.5	9.7	11.4	3.7
5	11.6	8.9	6.9	3.6	2.5	1.7	2.3	1.9	2.4	2.4	2.3	2.3	2.5	2.0	3.0	3.0	2.5	2.5	2.5	2.6	3.0	2.6	2.9	3.3	3.5	6.1	6.2	4.8	4.4	5.1	5.1	6.9	13.6	17.2	13.4	14.5	5.1
4	12.9	9.7	8.1	4.5	3.0	2.1	2.9	2.5	2.8	2.7	2.6	2.6	2.7	2.4	3.3	3.5	2.9	2.8	3.0	3.2	3.5	3.2	3.4	3.9	4.3	7.0	7.0	5.6	5.0	6.0	6.2	8.5	16.1	20.2	16.2	17.0	5.9
3	14.7	10.8	10.1	5.8	3.8	2.6	3.9	3.3	3.4	3.3	3.0	3.0	3.0	2.9	3.8	4.1	3.5	3.1	3.7	4.1	4.2	4.0	4.2	4.9	5.4	8.4	8.1	6.9	6.0	7.5	7.9	10.9	19.8	24.8	20.7	20.9	7.2
2	17.6	12.5	13.7	8.2	5.3	3.6	5.8	5.0	4.4	4.1	3.5	3.8	3.6	3.9	4.5	5.1	4.5	3.7	5.1	5.6	5.5	5.3	5.5	6.7	7.6	10.6	10.0	9.1	7.7	10.0	11.0	15.5	26.5	33.1	29.1	27.8	9.6

Table I-25 Inflow of Bukit Merah Reservoir (Kurau River) in Future Condition

Scheme	: Kerian	River	: Kurau River
Sub-Scheme	: Kerian Darat, Kerian Laut	Condition	: Future Water Demand

<1> Q (Present River Discharge at River Discharge Station)

<2> q(d+in)down (Future Domestic and Industrial Use Water taken fromDownstream of River Discharge Station)

0.0 (m³/s)

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	5.3	3.0	5.1	2.6	4.5	3.9	2.4	3.2	5.9	5.1	9.5	8.6	10.4	13.6	9.3	6.2	4.6	3.2	2.9	3.4	5.1	2.7	2.1	3.8	3.8	5.0	10.0	11.8	8.6	10.2	14.2	15.7	12.3	10.0	6.6	7.3	6.7
10	5.8	3.4	5.5	3.1	4.8	4.5	3.1	3.6	6.4	6.4	10.3	9.2	11.4	15.4	10.7	7.5	5.4	3.9	3.6	4.3	5.8	3.3	2.7	4.3	5.0	6.3	11.0	13.9	10.4	11.7	15.6	16.8	13.7	10.8	7.9	8.1	7.7
5	6.2	4.2	6.1	4.0	5.3	5.4	4.1	4.3	7.5	8.6	11.8	10.3	13.4	17.9	12.8	9.5	6.7	4.9	4.7	5.7	6.6	4.4	3.8	5.1	6.8	8.5	12.8	17.0	13.3	14.5	18.2	18.8	16.1	12.5	10.1	9.3	9.2
4	6.5	4.6	6.3	4.5	5.7	5.9	4.8	4.8	8.3	9.9	12.9	11.2	14.7	19.3	13.9	10.6	7.4	5.6	5.3	6.5	7.3	5.0	4.4	5.5	7.9	9.8	14.1	18.7	14.8	16.4	20.0	20.2	17.5	13.7	11.3	10.0	10.1
3	6.8	5.1	6.7	5.2	6.2	6.6	5.7	5.5	9.4	11.9	14.6	12.4	16.5	21.2	15.5	12.2	8.5	6.4	6.2	7.7	8.0	6.0	5.3	6.2	9.6	11.7	15.8	21.1	17.2	19.1	22.5	22.1	19.7	15.3	13.1	10.8	11.5
2	7.3	6.0	7.3	6.4	7.0	7.7	7.3	6.6	11.2	15.4	17.2	14.4	19.6	24.1	18.0	14.9	10.2	7.9	7.8	9.8	9.2	7.6	6.9	7.2	12.6	15.1	18.7	25.0	21.1	23.8	26.6	25.2	23.1	18.1	16.2	12.2	13.7

<3> q(is)down (Future Irrigation Use Water for Secondary Granary Areas taken from Downstream of River Discharge Station)

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

<4> qt (Future Inflow from Major Tributary between River Discharge Station and Intake Point of the Study Area)

Qt1=Qt2(=0.46xQ)

Qt1 : Diversion Flow from Kerian River(=1.5m³/s)

Qt2 : Tributaries Catchment Area Factor (=0.46)

<5> Qm (River Maintenance Flow)

0.0 (m³/s)

Source : Kurau River Flood Mitigation Study

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	4.1	2.9	3.9	2.7	3.6	3.3	2.6	3.0	4.2	3.8	5.9	5.5	6.3	7.8	5.8	4.3	3.6	3.0	2.8	3.1	3.8	2.7	2.5	3.2	3.3	3.8	6.1	6.9	5.4	6.2	8.0	8.7	7.1	6.1	4.5	4.9	4.6
10	4.2	3.1	4.0	2.9	3.7	3.6	2.9	3.2	4.5	4.4	6.2	5.7	6.8	8.6	6.4	4.9	4.0	3.3	3.2	3.5	4.2	3.0	2.8	3.5	3.8	4.4	6.6	7.9	6.3	6.9	8.7	9.2	7.8	6.5	5.2	5.2	5.0
5	4.4	3.4	4.3	3.3	3.9	4.0	3.4	3.5	5.0	5.5	6.9	6.2	7.6	9.7	7.4	5.9	4.6	3.8	3.7	4.1	4.6	3.5	3.2	3.9	4.6	5.4	7.4	9.3	7.6	8.2	9.9	10.2	8.9	7.2	6.1	5.8	5.7
4	4.5	3.6	4.4	3.6	4.1	4.2	3.7	3.7	5.3	6.1	7.5	6.6	8.2	10.4	7.9	6.4	4.9	4.1	3.9	4.5	4.9	3.8	3.5	4.1	5.1	6.0	8.0	10.1	8.3	9.0	10.7	10.8	9.6	7.8	6.7	6.1	6.2
3	4.6	3.8	4.6	3.9	4.4	4.5	4.1	4.0	5.8	7.0	8.2	7.2	9.1	11.2	8.6	7.1	5.4	4.5	4.4	5.0	5.2	4.2	3.9	4.3	5.9	6.9	8.8	11.2	9.4	10.3	11.8	11.7	10.5	8.6	7.5	6.5	6.8
2	4.9	4.3	4.8	4.4	4.7	5.0	4.9	4.5	6.6	8.0	9.4	8.1	10.5	12.6	9.8	8.4	6.2	5.1	5.1	6.0	5.7	5.0	4.7	4.8	7.3	8.4	10.1	13.0	11.2	12.4	13.7	13.1	12.1	9.8	9.0	7.1	7.8

Table I-25 Inflow of Bukit Merah Reservoir (Kurau River) in Future Condition

Scheme	: Kerian	River	: Kurau River
Sub-Scheme	: Kerian Darat, Kerian Laut	Condition	: Future Water Demand

<6> q(is)up (Future Irrigation Use Water for (753ha) Secondary Granary Areas taken (Cropping Intensity 170%) from Upstream of River Discharge Station)

Baku Kurau, Jemerang Setar

= Water Requirement of Kerian Darat (9,834ha) / 9,834 x 753 x 170/180

<7> q(d+in)up (Future Domestic and Industrial Use Water taken from Upstream of River Discharge Station)

0.0 (m³/s)

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	1.2	1.2	0.9	0.7	0.5	0.4	0.3	0.5	0.7	0.8	0.9	1.0	1.1	1.0	1.1	1.4	1.4	1.3	1.1	0.8	0.8	0.5	0.4	0.3	0.3	0.3	0.5	0.6	0.6	0.6	0.7	0.8	0.9	1.1	1.3	1.0	0.8
10	1.0	1.0	0.7	0.6	0.4	0.4	0.3	0.5	0.6	0.7	0.9	0.9	1.0	0.9	1.0	1.2	1.2	1.1	0.9	0.7	0.6	0.4	0.3	0.3	0.2	0.3	0.5	0.6	0.6	0.5	0.7	0.7	0.7	0.9	1.1	0.8	0.7
5	0.8	0.8	0.6	0.5	0.3	0.3	0.3	0.4	0.6	0.7	0.8	0.8	0.8	0.8	0.8	1.0	0.9	0.9	0.7	0.5	0.5	0.3	0.3	0.3	0.2	0.2	0.3	0.5	0.5	0.5	0.5	0.6	0.5	0.5	0.6	0.6	0.6
4	0.7	0.7	0.6	0.4	0.3	0.3	0.3	0.4	0.6	0.6	0.8	0.8	0.8	0.7	0.7	0.9	0.8	0.8	0.6	0.5	0.4	0.3	0.3	0.2	0.2	0.2	0.3	0.5	0.5	0.5	0.4	0.5	0.5	0.5	0.7	0.7	0.6
3	0.7	0.6	0.5	0.4	0.3	0.3	0.3	0.4	0.5	0.6	0.7	0.7	0.7	0.6	0.7	0.8	0.7	0.7	0.5	0.4	0.3	0.2	0.2	0.2	0.2	0.2	0.3	0.5	0.5	0.5	0.4	0.5	0.6	0.4	0.6	0.6	0.5
2	0.5	0.5	0.4	0.3	0.2	0.3	0.2	0.4	0.5	0.5	0.6	0.7	0.6	0.5	0.5	0.7	0.6	0.6	0.4	0.3	0.2	0.1	0.2	0.2	0.2	0.2	0.3	0.4	0.5	0.4	0.4	0.4	0.3	0.3	0.4	0.4	0.3

<8> Q(is)up (Present Irrigation Use Water for (753ha) Secondary Granary Areas taken (Cropping Intensity 120%) from Upstream of River Discharge Station)

Baku Kurau, Jemerang Setar

= Water Requirement of Kerian Darat (9,834ha) / 9,834 x 753 x 120/180

<9> Q(d+in)up (Present Domestic and Industrial Use Water taken from Upstream of River Discharge Station)

0.0 (m³/s)

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	0.8	0.8	0.6	0.5	0.3	0.3	0.2	0.3	0.5	0.5	0.7	0.7	0.8	0.7	0.8	1.0	1.0	0.9	0.8	0.6	0.5	0.4	0.3	0.2	0.2	0.2	0.2	0.4	0.4	0.4	0.4	0.5	0.5	0.6	0.8	0.9	0.7
10	0.7	0.7	0.5	0.4	0.3	0.3	0.2	0.3	0.4	0.5	0.6	0.6	0.7	0.6	0.7	0.8	0.8	0.8	0.6	0.5	0.4	0.3	0.2	0.2	0.2	0.2	0.2	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.7	0.8	0.6
5	0.6	0.6	0.4	0.3	0.2	0.2	0.2	0.3	0.4	0.5	0.5	0.6	0.6	0.5	0.6	0.7	0.6	0.6	0.5	0.4	0.3	0.2	0.2	0.2	0.1	0.2	0.3	0.4	0.4	0.3	0.4	0.4	0.4	0.5	0.6	0.6	0.4
4	0.5	0.5	0.4	0.3	0.2	0.2	0.2	0.3	0.4	0.4	0.5	0.6	0.6	0.5	0.5	0.6	0.6	0.6	0.4	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.3	0.4	0.3	0.3	0.3	0.4	0.3	0.3	0.5	0.5	0.4
3	0.5	0.4	0.3	0.3	0.2	0.2	0.2	0.3	0.4	0.4	0.5	0.5	0.5	0.4	0.5	0.6	0.5	0.5	0.4	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.2	0.3	0.4	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.3
2	0.4	0.3	0.3	0.2	0.2	0.2	0.2	0.3	0.4	0.4	0.4	0.5	0.5	0.4	0.4	0.5	0.4	0.4	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.3	0.3	0.2

<10> qa (Available Water at Intake Point of the Study Area) [qa=Q-Q(d+in+is)down+qt-Qm-(q(d+in+is)-Q(d+in+is))]

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	9.2	5.5	8.7	5.1	8.0	7.1	4.9	6.1	9.9	8.7	15.1	13.8	16.4	21.1	14.7	10.1	7.8	5.8	5.4	6.2	8.7	5.2	4.5	6.9	7.0	8.7	16.0	18.5	13.8	16.2	22.1	24.2	19.1	15.8	10.8	11.9	13.1
10	9.7	6.2	9.3	5.9	8.4	8.0	5.9	6.7	10.2	10.6	16.2	14.6	17.9	23.7	16.8	12.0	9.1	6.8	6.5	7.5	9.8	6.3	5.4	7.7	8.7	10.6	17.4	21.6	16.5	18.4	24.1	25.8	21.2	17.1	12.8	13.2	12.5
5	10.3	7.4	10.2	7.2	9.2	9.4	7.5	7.7	12.3	13.9	18.9	16.3	20.8	27.4	19.9	15.0	11.1	8.5	8.1	9.6	11.3	7.9	6.9	8.9	11.4	13.8	20.1	26.2	20.7	22.6	27.9	29.8	24.8	19.5	15.9	14.9	14.5
4	10.7	7.9	10.6	7.9	9.7	10.1	8.4	8.4	13.4	15.8	20.2	17.6	22.7	29.4	21.6	16.7	12.1	9.4	9.1	10.8	12.0	8.8	7.8	9.5	13.0	15.7	21.9	28.6	23.0	25.3	30.5	30.8	27.0	21.3	17.8	15.9	16.1
3	11.2	8.8	11.2	8.9	10.5	11.1	9.8	9.3	15.0	18.7	22.6	19.4	25.4	32.2	23.9	19.1	13.7	10.7	10.4	12.6	13.1	10.1	9.1	10.4	15.5	18.5	24.5	32.2	26.4	29.3	34.2	33.7	30.1	23.7	20.5	17.2	18.1
2	12.0	10.1	12.0	10.7	11.7	12.7	12.2	11.0	17.6	23.8	26.4	22.3	29.9	36.6	27.6	23.1	16.2	12.9	12.8	14.7	14.9	12.5	11.5	11.9	19.8	23.4	28.7	37.9	32.2	36.1	40.1	38.2	35.2	27.8	25.0	19.2	21.4

Table I-26 Available Water of Kerian River in Future Condition

Scheme	: Kerian	River	: Kerian River
Sub-Scheme	: Kerian Laut	Condition : Future Water Demand	

<1> Q (Present River Discharge at River Discharge Station)

<2> q(d+in)down (Future Domestic and Industrial Use Water taken fromDownstream of River Discharge Station)

0.7 (m³/s)

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	7.7	6.0	5.7	3.1	3.2	2.9	2.5	6.5	8.8	5.7	7.0	9.8	17.5	16.3	15.0	13.6	10.4	5.7	4.7	7.7	6.7	6.5	4.5	7.8	7.6	9.6	18.8	14.6	24.0	22.3	16.5	21.0	13.8	9.3	7.1	8.7	9.9
10	8.6	7.0	6.2	3.9	4.2	3.5	3.3	7.7	10.2	6.4	7.6	10.4	19.6	19.1	16.8	14.9	11.6	6.9	5.7	9.2	7.6	7.8	5.6	9.5	9.6	11.8	20.2	17.6	25.6	25.5	20.1	23.5	15.6	11.4	8.6	9.4	11.4
5	10.2	8.5	7.3	5.2	5.9	4.5	4.6	9.6	12.2	7.8	9.0	11.7	22.5	23.2	19.7	16.9	13.4	8.7	7.2	11.4	9.2	9.8	7.2	12.0	13.0	15.5	22.9	22.4	28.9	30.5	25.5	27.4	18.8	14.9	11.0	10.7	13.9
4	11.2	9.3	8.0	6.1	6.9	5.2	5.7	10.6	13.5	9.0	10.3	12.7	24.0	25.4	21.5	18.0	14.3	9.6	8.1	12.6	10.2	11.0	8.2	13.5	14.9	17.8	24.8	25.0	31.2	33.5	29.0	29.6	20.9	17.0	12.5	11.6	15.3
3	12.7	10.5	9.1	7.4	8.5	6.2	7.1	12.0	15.2	10.9	12.2	14.2	26.1	28.5	24.2	19.4	15.5	11.1	9.3	14.4	11.6	12.7	9.5	15.6	17.9	21.3	27.5	26.9	34.6	37.7	33.7	32.7	23.9	20.1	14.8	12.9	17.5
2	15.1	12.5	10.8	9.7	11.5	8.0	9.7	14.4	18.0	14.1	15.4	16.6	29.4	33.5	28.4	21.7	17.4	13.4	11.4	17.3	13.9	15.5	11.9	19.1	23.0	27.5	31.8	35.4	39.8	46.7	41.5	37.6	28.9	25.4	18.8	15.1	21.1

<3> q(is)down (Future Irrigation Use Water for Secondary Granary Areas taken from Downstream of River Discharge Station) → Bandar Baharu Secondary Granary Scheme (Cropping Intensity 170%)

= Water Requirement of Kerian Laut (13,726ha) / 13,726 x 800 x 170/180

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	0.9	0.7	0.4	0.2	0.1	0.2	0.4	0.8	0.9	1.2	1.3	1.4	1.2	0.9	1.1	1.2	1.2	0.9	0.7	0.5	0.3	0.2	0.1	0.1	0.1	0.1	0.2	0.3	0.5	0.5	0.5	0.8	1.0	1.2	1.4	1.4	1.0	0.7
10	0.8	0.6	0.4	0.2	0.1	0.2	0.4	0.8	0.9	1.1	1.2	1.2	1.0	0.7	0.9	1.0	1.0	0.8	0.6	0.4	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.3	0.4	0.4	0.4	0.6	0.8	0.9	1.2	1.2	0.9	0.6
5	0.7	0.5	0.3	0.2	0.1	0.2	0.4	0.8	0.8	1.0	1.0	1.1	0.9	0.6	0.7	0.8	0.7	0.6	0.4	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.3	0.4	0.4	0.4	0.5	0.6	0.7	0.9	0.9	0.7	0.5
4	0.6	0.5	0.3	0.2	0.1	0.2	0.4	0.7	0.8	0.9	1.0	1.0	0.7	0.5	0.6	0.7	0.7	0.5	0.4	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.3	0.4	0.4	0.3	0.4	0.6	0.6	0.8	0.8	0.7	0.5
3	0.6	0.5	0.3	0.2	0.1	0.2	0.4	0.7	0.7	0.8	0.9	0.9	0.6	0.4	0.5	0.6	0.6	0.4	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.3	0.4	0.3	0.3	0.4	0.5	0.5	0.7	0.7	0.6	0.4
2	0.5	0.4	0.3	0.1	0.1	0.1	0.4	0.7	0.7	0.7	0.8	0.7	0.5	0.3	0.4	0.4	0.4	0.3	0.2	0.1	0.1	0.0	0.1	0.1	0.1	0.2	0.3	0.3	0.3	0.3	0.2	0.3	0.3	0.4	0.5	0.6	0.5	0.3

<4> qt (Future Inflow from Major Tributary between River Discharge Station and Intake Point of the Study Area)

<5> Qm (River Maintenance Flow)

Qt1+Qt2(=1.14xQ)

Qt1 : Diversion Flow to Bukit Merah Reservoir(=1.5m³/s)

Qt2 : Tributaries Catchment Area Factor (=1.14) Source : Kurau River Flood Mitigation Study

1.6 (m³/s)

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	7.3	5.4	5.0	2.1	2.1	1.8	1.3	5.9	8.5	5.0	6.4	9.7	18.4	17.1	15.6	13.8	10.3	5.0	3.8	7.2	6.2	5.9	3.7	7.4	7.1	9.4	19.9	15.1	25.8	23.9	17.3	22.4	14.3	9.1	6.6	8.4	9.8
10	8.3	6.5	5.6	2.9	3.3	2.5	2.3	7.3	10.1	5.8	7.2	10.4	20.8	20.3	17.6	15.4	11.7	6.3	5.0	8.9	7.2	7.4	4.9	9.3	9.5	11.9	21.5	18.6	27.7	27.5	21.5	25.3	16.3	11.5	8.3	9.2	11.5
5	10.1	8.1	6.8	4.4	5.2	3.6	4.0	9.4	12.5	7.4	8.8	11.8	24.2	24.9	21.0	17.8	13.7	8.4	6.7	11.5	9.0	9.7	6.8	12.2	13.3	16.1	24.6	24.0	31.4	33.3	27.9	29.7	19.9	15.5	11.0	10.7	14.3
4	11.2	9.1	7.6	5.4	6.4	4.4	5.0	10.5	13.8	8.8	10.2	13.0	25.9	27.4	23.1	19.0	14.8	9.5	7.7	12.9	10.1	11.0	7.8	13.9	15.5	18.8	26.8	27.0	34.1	36.7	31.5	32.2	22.3	17.8	12.8	11.7	16.0
3	12.9	10.5	8.8	6.9	8.2	5.6	6.6	12.2	15.8	10.9	12.4	14.7	28.3	31.0	26.0	20.6	16.2	11.1	9.1	14.9	11.7	13.0	9.4	16.2	18.9	22.8	29.8	31.4	37.9	41.5	36.9	35.7	25.8	21.4	15.4	13.2	18.4
2	15.7	12.8	10.8	9.6	11.6	7.6	9.6	14.9	19.0	14.5	16.0	17.4	32.1	36.7	30.8	23.2	18.4	13.8	11.5	18.3	14.3	16.2	12.0	20.2	24.7	29.8	34.7	38.8	43.9	49.5	45.8	41.3	31.5	27.4	19.9	15.7	22.5

Table I-26 Available Water of Kerian River in Future Condition

Scheme	: Kerian	River	: Kerian River
Sub-Scheme	: Kerian Laut	**Condition : Future Water Demand**	

<6> q(is)up (Future Irrigation Use Water for (372ha) Secondary Granary Areas taken (Cropping Intensity 170%) from Upstream of River Discharge Station)

Sg. Berdarah, Sg. Segar, Sg. Nor

= Water Requirement of Kerian Darat (9,834ha) / 9,834 x 372 x 170/180

<7> q(d+in)up 0.0 (m³/s) (Future Domestic and Industrial Use Water taken from Upstream of River Discharge Station)

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	0.6	0.6	0.4	0.3	0.2	0.2	0.2	0.2	0.3	0.4	0.5	0.5	0.5	0.5	0.6	0.7	0.7	0.6	0.5	0.4	0.4	0.3	0.2	0.2	0.1	0.2	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.6	0.7	0.5	0.4
10	0.5	0.5	0.4	0.3	0.2	0.2	0.2	0.2	0.3	0.4	0.4	0.5	0.5	0.4	0.5	0.6	0.6	0.5	0.4	0.3	0.3	0.2	0.2	0.1	0.1	0.1	0.2	0.3	0.3	0.3	0.3	0.3	0.4	0.5	0.5	0.4	0.3
5	0.4	0.4	0.3	0.2	0.2	0.2	0.1	0.2	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.4	0.3	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.2	0.2	0.3	0.3	0.2	0.3	0.5	0.3	0.4	0.4	0.3
4	0.4	0.4	0.3	0.2	0.2	0.2	0.1	0.2	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.5	0.4	0.4	0.3	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.2	0.2
3	0.3	0.3	0.2	0.2	0.2	0.1	0.1	0.2	0.3	0.3	0.3	0.4	0.4	0.3	0.3	0.4	0.4	0.3	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
2	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.2

<8> Q(is)up (Present Irrigation Use Water for (372ha) Secondary Granary Areas taken (Cropping Intensity 170%) from Upstream of River Discharge Station)

Sg. Berdarah, Sg. Segar, Sg. Nor

= Water Requirement of Kerian Darat (9,834ha) / 9,834 x 372 x 120/180

<9> Q(d+in)up 0.0 (m³/s) (Present Domestic and Industrial Use Water taken from Upstream of River Discharge Station)

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	0.4	0.4	0.3	0.2	0.2	0.2	0.1	0.2	0.2	0.3	0.3	0.3	0.4	0.4	0.4	0.5	0.5	0.4	0.4	0.3	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.4	0.3	0.2
10	0.4	0.3	0.3	0.2	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.2	0.2
5	0.3	0.3	0.2	0.2	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.2	0.2
4	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.3	0.2	0.3	0.3	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.1	0.2	0.1	0.1	0.2	0.2	0.2
3	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.2	0.2	0.3	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1

<10> qa (Available Water at Intake Point of the Study Area) **[qa=Q-Q(d+in+is)down+q(-Qm-{q(d+in+is)-Q(d+in+is)})]**

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	11.5	8.2	7.7	2.6	2.8	2.1	1.0	9.2	13.9	7.0	9.6	15.6	32.2	30.1	27.0	23.4	17.0	7.3	5.3	12.0	10.2	9.8	5.8	12.7	12.2	16.4	35.9	26.7	46.9	43.3	30.6	40.0	24.4	14.5	9.8	13.6	16.6
10	13.5	10.4	9.0	4.2	5.0	3.4	2.8	11.8	16.9	8.6	11.2	17.1	36.9	36.2	31.0	26.8	19.9	10.0	7.6	15.3	12.2	12.9	8.0	16.3	16.6	21.1	38.9	33.3	50.5	50.2	36.5	45.6	28.5	19.4	13.2	15.2	19.9
5	17.1	13.6	11.3	7.1	8.7	5.6	6.0	15.8	21.5	11.8	14.4	20.0	42.5	45.1	37.5	31.5	23.9	14.0	11.1	20.2	15.6	17.1	11.6	21.5	23.8	29.0	44.8	43.5	57.5	61.0	50.9	54.0	35.6	27.1	18.7	18.2	25.3
4	19.3	15.5	12.9	8.9	10.9	7.1	8.0	18.0	24.1	14.5	17.1	22.3	46.8	49.8	41.5	33.8	25.9	16.2	13.0	22.9	17.7	19.6	13.6	24.9	27.9	34.0	48.9	49.2	62.6	67.4	57.7	58.8	40.2	31.6	22.0	20.3	28.5
3	22.6	18.1	15.2	11.8	14.3	9.2	11.0	21.1	27.8	18.5	21.2	25.5	51.4	56.6	47.2	37.0	28.7	19.3	15.7	26.7	20.7	23.2	16.5	29.3	34.2	41.5	54.6	57.5	69.7	76.6	67.7	65.5	46.7	38.3	27.1	23.2	33.1
2	28.0	22.5	19.0	16.8	20.6	13.1	16.6	26.2	33.9	25.5	28.2	30.8	58.6	67.6	56.4	42.1	33.0	24.5	20.4	33.1	25.8	29.3	21.5	36.9	45.3	54.7	63.8	71.5	81.1	91.6	84.7	76.2	57.7	49.8	35.8	27.9	40.8

Table I-27 Available Water of Batang Padang River in Future Condition

Scheme	: Kerian / Sg. Manik	River	: Batang Padang River
Sub-Scheme	: Sungai Manik	Condition : Future Water Demand	

<1> Q (Present River Discharge at River Discharge Station)

<2> q(d+in)down (Future Domestic and Industrial Use Water taken fromDownstream of River Discharge Station) → 1.9 (m³/s)

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	16.5	16.8	16.5	15.3	16.7	13.6	14.5	14.3	15.1	19.9	19.1	15.8	19.4	25.0	22.1	16.6	16.1	13.9	13.0	11.6	18.1	16.8	11.6	11.0	11.7	14.8	16.8	23.9	25.0	20.9	30.3	23.5	21.6	21.8	21.1	19.7	17.7
10	18.1	17.7	17.8	17.3	18.7	15.1	16.1	15.9	17.1	20.2	20.1	17.2	20.5	26.0	22.7	18.8	16.8	15.0	14.7	13.4	19.2	16.0	13.3	12.8	13.8	17.5	19.2	25.1	27.2	24.2	33.5	26.7	24.6	24.0	24.4	22.3	19.5
5	20.2	19.2	19.9	20.7	21.5	17.2	18.4	18.1	19.9	21.1	22.2	19.6	22.6	27.7	23.8	21.8	18.1	16.6	17.2	16.0	20.9	17.7	15.6	15.4	16.9	21.7	22.7	27.3	30.3	29.0	38.2	31.3	28.8	28.0	29.3	26.2	22.2
4	21.9	20.2	21.1	22.3	22.9	18.3	19.6	19.3	21.4	21.9	23.7	21.1	23.9	28.8	24.8	23.3	18.9	17.4	18.5	17.4	21.8	18.6	16.9	16.8	18.6	23.9	24.5	28.8	31.8	31.5	40.7	33.8	31.0	30.2	31.8	28.2	23.8
3	23.9	21.6	22.8	24.7	24.8	19.7	21.2	20.9	23.5	23.1	25.7	23.2	25.8	30.2	26.1	25.5	20.0	18.6	20.3	19.4	23.1	19.9	18.6	18.8	21.0	27.1	27.1	30.8	33.9	35.2	44.3	37.2	34.1	33.5	35.5	31.0	25.9
2	27.0	23.7	25.5	28.4	27.9	22.6	23.8	23.5	26.9	24.8	28.8	26.5	28.7	32.3	28.0	29.0	21.7	20.4	23.1	22.5	24.9	21.9	21.4	22.0	24.9	32.5	31.3	33.8	37.1	41.0	49.8	42.6	39.0	38.6	41.3	35.5	29.2

<3> q(is)down (Future Irrigation Use Water for Secondary Granary Areas taken from Downstream of River Discharge Station)

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

<4> qt (Future Inflow from Major Tributary between River Discharge Station and Intake Point of the Study Area)

<5> Qm (River Maintenance Flow) → 0.5 (m³/s)

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table I-27 Available Water of Batang Padang River in Future Condition

Scheme	: Kenan / Sg. Manik	River	: Batang Padang River
Sub-Scheme	: Sungai Manik	Condition	: Future Water Demand

<6> q(is)up (Future Irrigation Use Water for Secondary Granary Areas taken from Upstream of River Discharge Station)

<7> q(d+in)up 0.0 (m³/s) (Future Domestic and Industrial Use Water taken from Upstream of River Discharge Station)

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

<8> Q(is)up (Present Irrigation Use Water for Secondary Granary Areas taken from Upstream of River Discharge Station)

<9> Q(d+in)up 0.0 (m³/s) (Present Domestic and Industrial Use Water taken from Upstream of River Discharge Station)

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

<10> qa (Available Water at Intake Point of the Study Area) [qa=Q-Q(d+in+is)down+qt-Qm-{q(d+in+is)-Q(d+in+is)}]

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	14.1	14.4	14.0	12.9	14.3	11.2	12.1	11.9	12.7	17.5	16.6	13.4	17.0	22.6	19.7	14.2	13.7	11.5	10.5	9.2	15.6	12.4	9.2	8.6	9.3	12.4	14.4	21.5	22.6	18.5	27.8	21.0	19.2	18.9	18.7	17.2	15.3
10	15.7	15.3	15.3	15.1	16.3	12.7	13.7	13.5	14.6	17.8	17.7	14.8	18.1	23.6	20.2	16.3	14.4	12.5	12.3	11.0	16.8	13.5	10.8	10.4	11.3	15.1	16.8	22.7	24.8	21.8	31.1	24.3	22.1	21.5	22.0	19.9	17.1
5	16.1	16.8	17.4	18.2	19.0	14.8	16.0	15.7	17.4	18.7	19.8	17.2	20.1	25.3	21.4	19.3	15.6	14.1	14.7	13.6	18.5	15.2	13.2	13.0	14.5	19.2	20.3	24.9	27.8	26.6	35.8	28.9	26.4	25.5	26.9	23.7	19.8
4	19.5	17.8	18.7	19.9	20.4	15.8	17.2	16.9	19.0	19.5	21.2	18.7	21.5	26.3	22.3	20.9	16.5	15.0	16.0	15.0	19.4	16.2	14.4	14.4	16.1	21.5	22.1	26.3	29.4	29.1	38.3	31.3	28.6	27.8	29.4	25.8	21.3
3	21.5	19.2	20.4	22.2	22.4	17.3	18.8	18.5	21.1	20.6	23.2	20.8	23.4	27.8	23.6	23.1	17.6	16.2	17.8	17.0	20.6	17.5	16.2	16.3	18.6	24.7	24.7	28.3	31.5	32.7	41.8	34.7	31.7	31.0	33.1	28.6	23.5
2	24.6	21.3	23.1	26.0	25.5	19.5	21.3	21.0	24.4	22.3	26.3	24.1	26.3	29.9	25.6	26.6	19.3	18.0	20.7	20.1	22.5	19.5	19.0	19.5	22.5	30.0	28.8	31.4	34.7	38.5	47.3	40.1	36.6	36.2	38.9	33.0	28.8

Table I-28 Available Water of Kemasin River in Future Condition

Scheme	: Kemasin/Semerak	River	: Kemasin River
Sub-Scheme	: Jelawat Rusa, Kemasin Hilir	Condition	: Future Water Demand

<1> Q (Present River Discharge at River Discharge Station)

<2> q(d+in)down (Future Domestic and Industrial Use Water taken fromDownstream of River Discharge Station)

0.0 (m³/s)

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	1.7	1.3	1.4	1.1	1.1	0.7	0.9	0.5	0.7	0.6	0.4	0.3	0.3	0.5	0.8	1.0	1.2	0.9	1.2	1.3	1.1	0.8	1.4	1.8	1.0	1.5	1.2	1.2	1.4	1.2	1.4	1.9	1.4	5.3	2.0	1.5	1.2
10	1.9	1.5	1.6	1.3	1.2	0.8	1.1	0.7	0.9	0.7	0.5	0.4	0.4	0.6	0.8	1.2	1.4	1.1	1.4	1.4	1.2	0.9	1.6	2.0	1.2	1.8	1.5	1.4	1.7	1.4	1.8	2.3	2.0	6.8	2.8	2.0	1.5
5	2.2	1.7	1.9	1.5	1.5	1.0	1.5	1.0	1.1	1.0	0.7	0.5	0.5	0.7	1.0	1.4	1.7	1.4	1.8	1.6	1.4	1.1	1.8	2.4	1.6	2.3	1.9	1.8	2.1	1.7	2.3	3.0	3.2	9.7	4.4	3.0	1.9
4	2.3	1.9	2.1	1.7	1.6	1.1	1.7	1.2	1.3	1.1	0.8	0.6	0.6	0.8	1.2	1.5	1.8	1.6	2.0	1.7	1.5	1.2	1.9	2.6	1.8	2.5	2.1	2.0	2.3	2.0	2.7	3.4	4.0	11.6	5.3	3.6	2.2
3	2.5	2.1	2.3	1.8	1.8	1.3	1.9	1.5	1.5	1.3	1.0	0.8	0.8	1.0	1.4	1.7	2.0	1.8	2.4	2.0	1.7	1.4	2.1	2.9	2.1	2.9	2.4	2.3	2.7	2.3	3.2	4.0	5.3	14.6	6.9	4.6	2.6
2	2.8	2.5	2.7	2.0	2.2	1.6	2.4	2.2	1.9	1.6	1.2	1.1	1.1	1.2	1.7	2.0	2.4	2.2	2.9	2.3	2.1	1.8	2.5	3.3	2.6	3.5	2.9	2.8	3.2	2.8	4.0	5.0	7.8	20.3	9.9	6.4	3.4

<3> q(is)down (Future Irrigation Use Water for Secondary Granary Areas taken from Downstream of River Discharge Station)

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

<4> qt (Future Inflow from Major Tributary between River Discharge Station and Intake Point of the Study Area)

<5> Qm (River Maintenance Flow)

0.2 (m³/s) (=0.7×Q) Source : Kemasin-Semerak Integrated Rural Development Project

Qt2 : Supplementary Water from Kemubu Pump Station (=5m³/s)

Source : Kemasin-Semerak Integrated Rural Development Project (m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	6.2	5.9	6.0	5.7	5.7	5.5	5.6	5.3	5.5	5.4	5.3	5.2	5.2	5.3	5.5	5.7	5.8	5.7	5.8	5.9	5.8	5.5	6.0	6.3	5.7	6.1	5.8	5.8	6.0	5.8	6.0	6.3	6.0	8.7	6.4	6.0	5.8
10	6.3	6.0	6.1	5.9	5.9	5.6	5.8	5.5	5.6	5.5	5.4	5.3	5.3	5.4	5.6	5.8	6.0	5.8	6.0	6.0	5.8	5.6	6.1	6.4	5.8	6.3	6.0	6.0	6.2	6.0	6.2	6.6	6.4	9.8	7.0	6.4	6.0
5	6.5	6.2	6.4	6.1	6.1	5.7	6.0	5.7	5.8	5.7	5.5	5.4	5.4	5.5	5.7	6.0	6.2	6.0	6.3	6.1	6.0	5.7	6.3	6.7	6.1	6.6	6.3	6.2	6.5	6.2	6.5	6.6	7.1	11.8	8.0	7.1	6.3
4	6.6	6.3	6.5	6.2	6.1	5.8	6.2	5.8	5.9	5.8	5.6	5.4	5.4	5.6	5.8	6.1	6.3	6.1	6.4	6.2	6.1	5.8	6.4	6.8	6.2	6.8	6.5	6.4	6.6	6.4	6.9	7.4	7.8	13.1	8.7	7.5	6.5
3	6.7	6.5	6.6	6.3	6.3	5.9	6.3	6.1	6.1	5.9	5.7	5.6	5.5	5.7	6.0	6.2	6.4	6.2	6.6	6.4	6.2	6.0	6.5	7.0	6.5	7.0	6.7	6.6	6.9	6.6	7.2	7.8	8.7	15.2	9.8	8.2	6.8
2	6.9	6.7	6.9	6.5	6.5	6.1	6.7	6.5	6.4	6.1	5.9	5.8	5.7	5.8	6.2	6.4	6.6	6.5	7.0	6.6	6.4	6.2	6.7	7.3	6.8	7.5	7.1	7.0	7.3	6.9	7.8	8.5	10.5	19.2	11.9	9.5	7.4

Table I-28 Available Water of Kemasin River in Future Condition

Scheme	: Kemasin/Semerak	River	: Kemasin River
Sub-Scheme	: Jelawar Rusa, Kemasin Hili	Condition	: Future Water Demand

<6> q(is)up (Future Irrigation Use Water for Secondary Granary Areas taken from Upstream of River Discharge Station)

<7> q(d+in)up 0.0 (m³/s) (Future Domestic and Industrial Use Water taken from Upstream of River Discharge Station) →

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

<8> Q(is)up (Present Irrigation Use Water for Secondary Granary Areas taken from Upstream of River Discharge Station)

<9> Q(d+in)up 0.0 (m³/s) (Present Domestic and Industrial Use Water taken from Upstream of River Discharge Station) →

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

<10> qa (Available Water at Intake Point [qa=Q-Q(d+in+is)down+qt=Qm-{q(d+in+is)-Q(d+in+is)}]

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	7.6	7.0	7.3	6.7	6.6	6.0	6.4	5.7	6.0	5.8	5.5	5.3	5.3	5.6	6.1	6.6	6.9	6.4	6.8	7.1	6.7	6.1	7.2	7.9	6.5	7.4	6.9	6.9	7.2	6.9	7.2	8.1	7.2	13.6	8.2	7.3	6.9
10	8.1	7.3	7.6	7.0	6.9	6.2	6.8	6.0	6.3	6.1	5.7	5.5	5.5	5.8	6.3	6.8	7.2	6.7	7.2	7.2	6.8	6.3	7.5	8.3	6.9	7.9	7.3	7.2	7.7	7.2	7.8	8.8	8.3	16.4	9.6	8.3	7.3
5	8.5	7.8	8.1	7.4	7.4	6.6	7.3	6.5	6.8	6.5	6.0	5.8	5.7	6.1	6.6	7.2	7.7	7.2	7.9	7.5	7.2	6.6	7.9	8.9	7.5	8.7	8.0	7.8	8.6	7.8	8.8	10.6	10.3	21.3	12.2	9.9	8.1
4	8.8	8.0	8.4	7.6	7.6	6.7	7.6	6.9	7.0	6.7	6.2	5.9	5.9	6.2	6.8	7.4	7.9	7.5	8.3	7.8	7.4	6.9	8.1	9.2	7.8	9.1	8.4	8.2	8.8	8.2	9.4	10.7	11.6	24.5	13.9	11.0	8.6
3	9.1	8.4	8.8	8.0	8.0	7.0	8.1	7.5	7.4	7.0	6.5	6.2	6.1	6.5	7.2	7.7	8.3	7.9	8.8	8.2	7.7	7.2	8.5	9.7	8.4	9.8	8.9	8.7	9.4	8.7	10.2	11.7	13.8	29.7	16.6	12.6	9.3
2	9.5	9.0	9.4	8.5	8.5	7.5	8.9	8.5	8.1	7.6	6.9	6.7	6.7	6.9	7.7	8.2	8.8	8.5	9.6	8.7	8.3	7.8	9.0	10.4	9.3	10.8	9.8	9.7	10.3	9.6	11.7	13.8	18.1	39.4	21.7	15.8	10.5

Table I-29 Available Water of Besut River in Future Condition

Scheme	: Besut	River	: Besut River
Sub-Scheme	: Besut Barrage	Condition : Future Water Demand	

<1> Q (Present River Discharge at River Discharge Station)

<2> q(d+in)down (Future Domestic and Industrial Use Water taken fromDownstream of River Discharge Station)

0.8 (m³/s)

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	35.0	25.3	14.7	7.8	6.5	5.2	5.2	4.6	7.2	7.3	8.0	7.3	8.6	5.9	9.8	8.9	7.3	8.8	6.5	6.6	8.1	7.0	7.9	8.1	7.9	17.9	18.7	11.6	11.7	11.6	11.8	13.3	27.6	44.2	30.6	37.6	13.1
10	37.8	28.9	19.2	10.6	8.4	6.6	7.2	6.4	8.8	8.8	9.2	8.6	9.7	7.4	11.3	10.6	9.0	10.0	8.3	8.6	10.1	8.9	9.9	10.4	10.5	19.9	20.7	14.5	14.1	15.0	15.0	18.3	36.1	50.1	36.7	42.6	15.8
5	43.5	34.1	26.8	15.4	11.5	8.8	10.8	9.5	11.3	11.1	10.9	10.7	11.6	9.7	13.4	13.4	11.5	13.7	11.3	12.0	13.2	12.0	13.0	14.5	15.0	24.2	24.6	19.4	18.1	20.6	20.7	27.0	50.5	63.0	49.8	53.3	20.5
4	47.8	36.8	31.3	18.4	13.4	10.1	13.0	11.4	12.7	12.3	11.8	11.8	12.2	11.0	14.5	14.8	12.9	12.5	13.1	14.0	14.9	13.8	14.8	16.6	17.7	27.3	27.3	22.4	20.4	23.9	24.5	32.4	59.0	73.5	59.6	62.2	23.5
3	54.0	40.6	38.2	23.0	16.2	12.0	16.5	14.5	14.7	14.2	13.1	13.4	13.4	13.0	16.0	17.0	15.0	13.8	15.8	17.0	17.6	16.6	17.5	20.0	21.8	32.0	31.2	26.8	23.9	28.9	30.4	41.0	72.1	89.6	75.3	75.7	28.1
2	64.2	46.7	50.6	31.6	21.1	15.3	23.2	20.2	18.2	17.2	15.1	16.1	15.3	16.4	18.5	20.6	18.5	15.7	20.5	22.5	22.0	21.4	22.1	26.2	29.4	40.0	37.7	34.7	29.9	37.9	41.2	57.2	95.7	118.5	104.5	100.0	36.3

<3> q(is)down (Future Irrigation Use Water for Secondary Granary Areas taken from Downstream of River Discharge Station)

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

<4-1> qt/C1 (Future Inflow from Major Tributary between River Discharge Station and Intake Point of the Study Area)

<5> Qm (River Maintenance Flow)

0.7 (m³/s)

for Case 1

Qt1=Qt2(=-0.26xQ)

Qt1 : Excess Water from Angga River System in Case 1

Qt2 : Tributaries Catchment Area Factor (=-0.26) Source : Besut River Flood Mitigation Project

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	-1.7	-2.6	-3.2	-1.9	-1.6	-1.3	-1.3	-1.1	-1.8	-1.7	-0.3	-0.2	-2.1	-1.4	-1.8	-1.4	-1.8	-2.2	-1.6	-1.6	-2.0	-1.7	-2.0	-2.0	-1.7	-1.1	-0.5	-0.2	0.0	-0.1	0.0	-2.5	-4.0	-1.0	-0.3	-0.9	-1.5
10	-1.1	-1.9	-2.6	-2.7	-2.1	-1.6	-1.8	-1.6	-2.2	-1.4	-0.3	-0.1	-2.3	-1.8	-1.6	-1.3	-2.2	-2.0	-2.0	-1.9	-1.8	-1.8	-1.6	-1.8	-1.3	-0.8	-0.2	0.0	0.1	0.1	-2.2	-3.5	-0.7	0.2	-0.3	-1.4
5	-0.4	-1.2	-1.9	-2.4	-2.5	-2.2	-2.6	-2.4	-2.4	-1.1	-0.1	0.0	-2.2	-2.4	-1.4	-1.1	-2.3	-1.7	-1.5	-1.5	-1.4	-1.4	-1.2	-1.3	-0.8	-0.4	0.0	0.5	0.2	0.3	0.3	-1.8	-2.7	0.1	1.0	0.6	-1.2
4	0.0	-1.1	-1.5	-2.2	-2.2	-2.3	-2.4	-2.4	-2.3	-1.0	-0.1	0.0	-2.2	-2.8	-1.4	-1.1	-2.1	-1.5	-1.3	-1.3	-1.2	-1.2	-1.0	-1.1	-0.7	-0.1	0.2	0.4	0.3	0.4	0.5	-1.6	-2.3	0.6	1.5	1.1	-1.0
3	0.3	-0.7	-1.1	-1.8	-1.9	-1.9	-2.0	-2.1	-1.9	-0.8	0.0	0.1	-2.0	-3.3	-1.2	-0.9	-2.0	-1.3	-1.0	-1.0	-1.0	-0.9	-0.8	-0.9	-0.3	0.1	0.5	0.4	0.6	0.7	-1.1	-1.6	1.3	2.1	1.7	-0.7
2	0.9	-0.2	-0.5	-1.1	-1.4	-1.4	-1.4	-1.6	-1.5	-0.5	0.0	0.2	-2.0	-3.4	-1.1	-0.8	-1.7	-1.0	-0.6	-0.6	-0.6	-0.5	-0.3	-0.4	0.1	0.5	0.7	0.6	0.6	0.8	1.0	-0.4	-0.6	2.5	3.1	2.6	-0.3

<4-2> qt/C2 (Future Inflow from Major Tributary between River Discharge Station and Intake Point of the Study Area)

for Case 2

Qt1=Qt2(=-0.26xQ)

Qt1 : Excess Water from Angga River System in Case 2

Qt2 : Tributaries Catchment Area Factor (=-0.26) Source : Besut River Flood Mitigation Project

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	-1.1	-1.8	-2.4	-1.9	-1.6	-1.3	-1.3	-1.1	-1.8	-1.3	-0.3	-0.2	-1.8	-1.4	-1.3	-1.1	-1.8	-1.7	-1.6	-1.6	-1.6	-1.7	-1.5	-1.7	-1.3	-0.8	-0.4	-0.2	0.0	-0.1	0.0	-1.9	-2.9	-0.6	-0.2	-0.5	-1.2
10	-0.6	-1.3	-1.9	-2.4	-2.1	-1.6	-1.8	-1.6	-2.2	-1.1	-0.2	-0.1	-1.7	-1.8	-1.2	-1.0	-1.9	-1.5	-1.6	-1.5	-1.4	-1.4	-1.2	-1.4	-1.0	-0.5	-0.1	0.0	0.1	0.1	-1.6	-2.5	-0.2	0.3	0.0	-1.1
5	0.0	-0.8	-1.3	-1.8	-1.9	-1.9	-2.0	-2.1	-1.8	-0.8	-0.1	0.0	-1.6	-2.4	-1.1	-0.8	-1.7	-1.3	-1.1	-1.1	-1.0	-1.0	-0.8	-1.0	-0.6	-0.2	0.1	0.3	0.2	0.3	0.3	-1.3	-1.7	0.5	1.0	0.8	-0.8
4	0.2	-0.7	-1.0	-1.6	-1.7	-1.8	-1.8	-1.8	-1.7	-0.7	-0.1	0.0	-1.6	-2.8	-1.0	-0.8	-1.6	-1.1	-1.0	-0.9	-0.9	-0.9	-0.7	-0.8	-0.5	0.0	0.3	0.4	0.3	0.4	0.5	-1.0	-1.4	0.9	1.5	1.3	-0.7
3	0.5	-0.3	-0.7	-1.3	-1.4	-1.4	-1.4	-1.5	-1.4	-0.6	0.0	0.1	-1.5	-2.7	-0.9	-0.6	-1.4	-1.0	-0.7	-0.7	-0.7	-0.6	-0.5	-0.6	-0.2	0.3	0.4	0.5	0.4	0.6	0.7	-0.6	-0.8	1.6	2.1	1.8	-0.4
2	1.1	0.1	-0.1	-0.7	-0.9	-1.0	-1.0	-1.1	-1.0	-0.3	0.1	0.2	-1.4	-2.5	-0.7	-0.5	-1.2	-0.7	-0.3	-0.3	-0.4	-0.3	-0.2	-0.2	0.2	0.6	0.7	0.8	0.6	0.8	1.0	0.0	0.1	2.7	3.1	2.7	0.0

Table I-29 Available Water of Besut River in Future Condition

Scheme	: Besut	River	: Besut River
Sub-Scheme	: Besut Barrage	Condition	: Future Water Demand

<4-3> qt/C3 (Future Inflow from Major Tributary between River Discharge Station and Intake Point of the Study Area)

for Case 3

Qt1=Qt2(=0.26xQ)

Qt1 : Excess Water from Angga River System in Case 3

Qt2 : Tributaries Catchment Area Factor (=0.26) Source : Besut River Flood Mitigation Project

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	-1.3	-1.9	-2.2	-1.4	-0.5	-0.3	-0.3	-1.1	-1.8	-1.8	-1.8	-1.8	-2.1	-1.4	-1.8	-1.9	-1.8	-1.6	-1.6	-1.5	-1.3	-0.7	-0.2	-0.2	-0.2	-0.2	-1.7	-3.2	-1.6	-0.9	-1.7	-1.5	-1.1	-0.7	-0.3	-1.1	-1.3	-1.3
10	-0.9	-1.3	-1.8	-1.1	-0.3	-0.2	-0.2	-1.6	-2.2	-1.7	-1.7	-2.2	-2.0	-1.8	-1.5	-1.6	-1.6	-1.3	-1.6	-1.2	-1.0	-0.5	-0.1	-0.1	-0.1	-1.6	-3.0	-1.3	-0.7	-1.4	-1.1	-0.7	-0.2	0.1	-0.5	-0.6	-1.1
5	-0.3	-0.6	-1.1	-0.7	-0.1	-0.1	0.0	-1.5	-2.4	-1.5	-1.6	-2.2	-1.7	-1.4	-1.2	-1.2	-1.2	-1.0	-1.2	-0.9	-0.7	-0.3	0.1	0.1	0.1	-1.4	-2.7	-1.0	-0.6	-1.0	-0.7	-0.1	0.6	0.9	0.4	0.1	-0.8
4	0.0	-0.6	-0.8	-0.5	0.0	0.0	0.1	-1.4	-2.4	-1.5	-1.6	-2.1	-1.6	-1.2	-1.1	-1.1	-1.0	-0.8	-1.0	-0.7	-0.5	-0.2	0.1	0.2	0.2	-1.2	-2.5	-0.8	-0.4	-0.9	-0.4	0.0	0.8	1.4	0.8	0.6	-0.6
3	0.3	-0.3	-0.5	-0.2	0.1	0.1	0.2	-1.3	-2.2	-1.3	-1.5	-2.0	-1.4	-0.9	-0.9	-0.8	-0.9	-0.7	-0.8	-0.5	-0.4	0.0	0.2	0.3	0.4	-1.0	-2.3	-0.7	-0.3	-0.6	-0.1	0.5	1.3	2.1	1.5	1.2	-0.4
2	0.9	0.1	0.1	0.2	0.3	0.2	0.5	-1.0	-2.0	-1.1	-1.4	-1.8	-1.2	-0.6	-0.7	-0.5	-0.5	-0.6	-0.5	-0.2	0.0	0.2	0.4	0.5	0.6	-0.8	-1.8	-0.3	0.0	-0.2	0.4	1.1	2.0	3.2	2.8	2.2	0.0

<6> q(is)up (Future Irrigation Use Water for Secondary Granary Areas taken from Upstream of River Discharge Station)

<7> q(d+in)up (Future Domestic and Industrial Use Water taken from Upstream of River Discharge Station) →

0.0 (m³/s)

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

<8> Q(is)up (Present Irrigation Use Water for Secondary Granary Areas taken from Upstream of River Discharge Station)

<9> Q(d+in)up (Present Domestic and Industrial Use Water taken from Upstream of River Discharge Station) →

0.0 (m³/s)

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

<10-1> qa/C1 (Available Water at Intake Point of the Study Area) [qa=Q-Q(d+in+is)down+qt-Qm-{q(d+in+is)-Q(d+in+is)}]

for Case 1

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	31.8	21.3	10.0	4.4	3.4	2.5	2.5	2.1	4.0	4.1	6.2	5.6	5.0	3.0	6.6	6.0	4.1	5.2	3.4	3.5	6.6	3.8	4.5	4.6	4.8	15.3	16.7	10.0	10.2	10.1	10.2	9.3	22.2	41.7	28.8	35.2	10.2
10	35.3	25.5	15.2	6.5	4.8	3.5	4.0	3.4	5.1	5.9	7.5	7.1	6.0	4.1	8.2	7.8	5.3	6.5	4.8	5.2	6.8	5.6	6.8	7.2	7.8	17.7	19.0	13.1	12.7	13.6	13.6	14.6	31.2	48.0	35.5	40.8	12.9
5	41.7	31.3	23.4	11.5	7.5	5.1	6.7	5.6	7.4	8.5	9.3	9.2	7.7	5.8	10.5	10.8	7.7	8.5	8.4	9.0	10.4	9.2	10.4	11.5	12.7	22.4	23.1	18.2	16.8	19.4	19.6	23.7	46.3	61.6	49.3	52.5	17.9
4	46.3	34.2	28.3	14.7	9.6	6.3	9.1	7.5	9.0	9.9	10.3	10.4	8.6	6.8	11.6	12.3	9.3	9.5	10.3	11.2	12.3	11.2	12.4	14.0	15.5	25.7	26.0	21.3	19.3	22.8	23.5	29.4	55.2	72.6	59.7	61.8	21.1
3	52.8	38.4	35.6	19.7	12.8	8.6	13.1	10.9	11.4	11.9	11.6	12.0	9.9	8.3	13.3	14.7	11.6	11.0	13.3	14.6	15.1	14.2	15.3	17.7	20.0	30.7	30.1	25.9	22.9	28.0	29.6	38.5	69.0	89.4	75.9	76.0	25.9
2	63.6	45.0	48.7	29.0	18.3	12.5	20.2	17.2	15.3	15.3	13.7	14.8	11.9	11.6	16.0	18.4	15.3	13.2	18.4	20.5	19.9	19.4	20.3	24.3	28.1	39.1	36.9	34.0	29.0	37.3	40.8	55.3	93.6	119.5	106.2	101.1	34.5

Table I-29 Available Water of Besut River in Future Condition

Scheme	: Besut	River	: Besut River
Sub-Scheme	: Besut Barrage	Condition	: Future Water Demand

<10-2> qa/C2 (Available Water at Intake Point of the Study Area) [qa=Q-Q(d+in+is)down+qt-Qm-{q(d+in+is)-Q(d+in+is)}]

for Case 2

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	32.4	22.0	10.8	4.4	3.4	2.5	2.5	2.1	4.0	4.5	6.3	5.6	5.3	3.0	7.0	6.3	4.1	5.6	3.4	3.5	5.0	3.8	4.9	4.9	5.1	15.6	16.9	10.0	10.2	10.1	10.2	10.0	23.2	42.1	29.0	35.6	10.4
10	35.7	26.1	15.9	6.8	4.8	3.5	4.0	3.4	5.1	6.2	7.5	7.1	6.5	4.1	8.6	8.2	5.6	7.0	5.3	5.7	7.2	6.1	7.2	7.6	8.1	17.9	19.1	13.1	12.7	13.6	13.6	15.2	32.2	48.4	35.6	41.1	13.2
5	42.0	31.8	24.0	12.2	8.2	5.4	7.3	6.0	8.0	8.8	9.4	9.2	8.3	5.8	10.8	11.2	8.3	9.0	8.5	9.4	10.7	9.5	10.7	11.9	13.0	22.6	23.2	18.2	16.8	19.4	19.6	24.3	47.3	62.0	49.3	52.7	18.2
4	46.6	34.7	28.8	15.3	10.2	6.8	9.7	8.1	9.5	10.2	10.3	10.4	9.1	6.8	12.0	12.6	9.9	9.9	10.6	11.6	12.6	11.5	12.7	14.3	15.7	25.9	26.1	21.3	19.3	22.8	23.5	30.0	56.1	72.9	59.7	62.0	21.4
3	53.1	38.8	36.1	20.3	13.3	9.1	13.6	11.5	11.9	12.1	11.6	12.0	10.5	8.9	13.7	14.9	12.1	11.3	13.6	14.9	15.4	14.5	15.5	18.0	20.2	30.8	30.2	25.9	22.9	28.0	29.6	39.0	69.8	89.7	75.9	76.1	26.2
2	63.8	45.3	49.1	29.5	18.8	12.9	20.7	17.7	15.7	15.4	13.7	14.8	12.4	12.5	16.3	18.7	15.8	13.5	18.7	20.7	20.2	19.6	20.5	24.6	28.2	39.2	37.0	34.0	29.0	37.3	40.8	55.7	94.3	119.8	106.2	101.2	34.8

<10-3> qa/C3 (Available Water at Intake Point of the Study Area) [qa=Q-Q(d+in+is)down+qt-Qm-{q(d+in+is)-Q(d+in+is)}]

for Case 3

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	32.2	22.0	11.0	4.9	4.6	3.4	3.5	2.1	4.0	4.0	4.7	4.0	5.0	3.0	6.6	5.5	4.1	5.8	3.4	3.6	5.4	4.8	6.3	6.4	6.3	14.7	14.0	8.6	9.3	8.5	8.7	10.7	25.5	42.4	28.0	35.0	10.3
10	35.5	26.1	16.0	8.0	6.7	4.9	5.6	3.4	5.1	5.6	6.1	5.0	6.3	4.1	8.3	7.5	5.9	7.2	5.2	5.9	7.6	6.9	8.3	8.9	9.0	16.9	16.2	11.8	11.9	12.1	12.4	16.1	34.5	48.8	34.8	40.5	13.2
5	41.8	31.8	24.2	13.2	9.9	7.2	9.3	6.5	7.4	8.1	7.8	7.0	8.2	6.9	10.7	10.7	8.8	9.2	8.7	9.6	11.1	10.3	11.6	12.9	13.6	21.6	20.4	16.9	16.0	18.1	18.6	25.4	49.6	62.4	48.7	52.0	18.2
4	46.3	34.7	29.0	16.4	11.8	8.6	11.6	8.5	8.9	9.4	8.8	8.3	9.2	8.4	11.9	12.3	10.4	10.2	10.6	11.8	13.0	12.2	13.5	15.3	16.4	24.6	23.3	20.1	18.6	21.5	22.6	31.0	58.3	73.4	59.0	61.3	21.4
3	52.8	38.8	36.2	21.3	14.8	10.6	15.3	11.7	11.3	11.4	10.1	9.9	10.5	10.6	13.6	14.8	12.7	11.6	13.5	15.1	15.7	15.1	16.3	18.9	20.7	29.6	27.5	24.7	22.2	26.8	28.8	40.1	71.9	90.2	75.3	75.5	26.3
2	63.6	45.3	49.3	30.3	20.0	14.1	22.1	17.8	14.8	14.7	12.3	12.8	12.7	14.4	16.4	18.7	16.5	13.8	18.5	20.9	20.5	20.1	21.0	25.2	28.6	37.8	34.4	32.9	28.4	36.3	40.2	56.8	96.2	120.2	105.9	100.7	34.8

Table I-30 Available Water of Angga River in Future Condition

Scheme	: Besut	River	: Angga River
Sub-Scheme	: Angga Barrage	Condition : Future Water Demand	

<1> Q (Present River Discharge at River Discharge Station)

<2> q(d+in)down (Future Domestic and Industrial Use Water taken fromDownstream of River Discharge Station)

0.0 (m³/s)

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	9.3	6.5	3.5	1.5	1.2	0.8	0.8	0.6	1.4	1.4	1.6	1.4	1.7	1.0	2.1	1.8	1.4	1.8	1.2	1.2	1.6	1.3	1.6	1.6	1.6	4.4	4.6	2.6	2.6	2.6	2.7	3.1	7.2	11.9	8.1	10.0	3.0
10	10.1	7.6	4.8	2.3	1.7	1.2	1.4	1.1	1.8	1.8	1.9	1.8	2.1	1.4	2.5	2.3	1.9	2.2	1.7	1.8	2.2	1.8	2.1	2.3	2.3	5.0	5.2	3.5	3.3	3.6	3.6	4.5	9.6	13.6	9.8	11.5	3.8
5	11.7	9.0	7.0	3.7	2.6	1.8	2.4	2.0	2.5	2.5	2.6	2.4	2.5	2.1	3.1	3.1	2.6	2.6	2.5	2.7	3.1	2.7	3.0	3.4	3.6	6.2	6.3	4.9	4.5	5.2	5.2	7.0	13.7	17.3	13.5	14.5	5.2
4	13.0	9.8	8.2	4.5	3.1	2.2	3.0	2.6	2.9	2.8	2.7	2.7	2.8	2.5	3.4	3.5	3.0	2.9	3.0	3.3	3.6	3.3	3.5	4.0	4.3	7.1	7.1	5.7	5.1	6.1	6.3	8.6	16.2	20.3	16.3	17.1	6.0
3	14.7	10.9	10.2	5.9	3.9	2.7	4.0	3.4	3.5	3.3	3.0	3.1	3.1	3.0	3.9	4.2	3.6	3.2	3.8	4.2	4.3	4.0	4.3	5.0	5.5	8.5	8.2	7.0	6.1	7.6	8.0	11.0	19.9	24.9	20.8	20.9	7.3
2	17.6	12.6	13.8	8.3	5.3	3.7	5.9	5.1	4.5	4.2	3.6	3.9	3.7	4.0	4.6	5.2	4.6	3.8	5.1	5.7	5.6	5.4	5.6	6.8	7.7	10.7	10.1	9.2	7.8	10.1	11.1	15.6	26.6	33.2	29.2	27.9	9.7

<3> q(is)down (Future Irrigation Use Water for Secondary Granary Areas taken from Downstream of River Discharge Station)

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

<4> qt (Future Inflow from Major Tributary between River Discharge Station and Intake Point of the Study Area)

<5> Qm (River Maintenance Flow)

0.1 (m³/s)

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table I-30 Available Water of Angga River in Future Condition

Scheme	: Besur	River	: Angga River
Sub-Scheme	: Angga Barrage	Condition : Future Water Demand	

<6> q(is)up (Future Irrigation Use Water for Secondary Granary Areas taken from Upstream of River Discharge Station)

<7> q(d+in)up (Future Domestic and Industrial Use Water taken from Upstream of River Discharge Station) → 0.0 (m³/s)

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

<8> Q(is)up (Present Irrigation Use Water for Secondary Granary Areas taken from Upstream of River Discharge Station)

<9> Q(d+in)up (Present Domestic and Industrial Use Water taken from Upstream of River Discharge Station) → 0.0 (m³/s)

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

<10> qa (Available Water at Intake Point of the Study Area) {qu=Q-Q(d+in+is)down-qt-Qm-{q(d+in+is)-Q(d+in+is)}}

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	9.2	6.4	3.4	1.4	1.1	0.7	0.7	0.5	1.3	1.3	1.5	1.3	1.7	0.9	2.0	1.7	1.3	1.7	1.1	1.1	1.5	1.2	1.5	1.5	1.5	4.3	4.6	2.5	2.5	2.5	2.6	3.0	7.1	11.8	8.0	9.9	3.0
10	10.0	7.5	4.7	2.2	1.6	1.1	1.3	1.0	1.7	1.7	1.8	1.7	2.0	1.3	2.4	2.2	1.8	2.1	1.6	1.7	2.1	1.8	2.0	2.2	2.2	4.9	5.1	3.4	3.2	3.5	3.5	4.4	9.5	13.5	9.7	11.4	3.7
5	11.6	8.9	6.9	3.6	2.5	1.7	2.3	1.9	2.4	2.4	2.5	2.3	2.5	2.0	3.0	3.0	2.5	2.5	2.5	2.6	3.0	2.6	2.9	3.3	3.5	6.1	6.2	4.8	4.8	5.1	5.3	6.9	13.6	17.2	13.4	14.5	5.1
4	12.9	9.7	8.1	4.5	3.0	2.1	2.9	2.5	2.8	2.7	2.6	2.6	2.7	2.4	3.3	3.5	2.9	2.8	3.0	3.2	3.5	3.2	3.4	3.9	4.3	7.0	7.0	5.6	5.0	6.0	6.2	8.5	16.1	20.2	16.2	17.0	5.9
3	14.7	10.8	10.1	5.8	3.8	2.6	3.9	3.3	3.4	3.3	3.0	3.0	3.0	2.9	3.8	4.1	3.5	3.1	3.7	4.1	4.2	4.0	4.2	4.9	5.4	8.4	8.1	6.9	6.0	7.5	7.9	10.9	19.8	24.8	20.7	20.9	7.2
2	17.6	12.5	13.7	8.2	5.3	3.6	5.8	5.0	4.4	4.1	3.5	3.8	3.6	3.9	4.5	5.1	4.5	3.7	5.1	5.6	5.5	5.3	5.5	6.7	7.6	10.6	10.0	9.1	7.7	10.0	11.0	15.5	26.5	33.1	29.1	27.8	9.6

Table I-31 Sample of Paddy Field Water Balance Study to Estimate Effective Rainfall

Pulau Pinang Scheme, Sungai Muda Sub-Scheme, Block M1

Year	Month	Stage	No. of Day	Rainfall	Comsumptive Use	Water Level	Drain	Spillout	Eff. Rainfall
1993	1	1	10	7.0	67.3	150.0	0.0	0.0	7.0
1993	1	2	10	28.5	67.3	150.0	0.0	0.0	28.5
1993	1	3	11	23.0	74.0	150.0	0.0	0.0	23.0
1993	2	1	10	0.0	64.9	150.0	0.0	0.0	0.0
1993	2	2	10	0.0	64.9	150.0	0.0	0.0	0.0
1993	2	3	8	14.0	52.0	150.0	0.0	0.0	14.0
1993	3	1	10	0.0	61.6	150.0	0.0	0.0	0.0
1993	3	2	10	102.5	61.6	190.9	40.9	0.0	61.6
1993	3	3	11	0.0	67.7	150.0	0.0	0.0	0.0
1993	4	1	10	76.0	62.8	163.2	13.2	0.0	62.8
1993	4	2	10	32.0	62.8	150.0	0.0	0.0	32.0
1993	4	3	10	6.0	62.8	150.0	0.0	0.0	6.0
1993	5	1	10	39.5	65.2	150.0	0.0	0.0	39.5
1993	5	2	10	31.0	65.2	150.0	0.0	0.0	31.0
1993	5	3	11	188.0	71.7	225.0	75.0	41.3	71.7
1993	6	1	10	50.0	65.1	150.0	0.0	0.0	50.0
1993	6	2	10	53.0	65.1	150.0	0.0	0.0	53.0
1993	6	3	10	20.0	65.1	150.0	0.0	0.0	20.0
1993	7	1	10	111.0	65.3	195.7	45.7	0.0	65.3
1993	7	2	10	59.0	65.3	150.0	0.0	0.0	59.0
1993	7	3	11	194.0	71.8	225.0	75.0	47.2	71.8
1993	8	1	10	75.0	65.5	159.5	9.5	0.0	65.5
1993	8	2	10	37.0	65.5	150.0	0.0	0.0	37.0
1993	8	3	11	72.5	72.1	150.5	0.4	0.0	72.1
1993	9	1	10	0.0	65.7	150.0	0.0	0.0	0.0
1993	9	2	10	0.0	65.7	150.0	0.0	0.0	0.0
1993	9	3	10	0.0	65.7	150.0	0.0	0.0	0.0
1993	10	1	10	0.0	65.6	150.0	0.0	0.0	0.0
1993	10	2	10	0.0	65.6	150.0	0.0	0.0	0.0
1993	10	3	11	0.0	72.1	150.0	0.0	0.0	0.0
1993	11	1	10	138.0	66.7	221.3	71.3	0.0	66.7
1993	11	2	10	36.0	66.7	150.0	0.0	0.0	36.0
1993	11	3	10	76.0	66.7	159.3	9.3	0.0	66.7
1993	12	1	10	63.5	71.3	150.0	0.0	0.0	63.5
1993	12	2	10	25.0	71.3	150.0	0.0	0.0	25.0
1993	12	3	11	11.0	78.5	150.0	0.0	0.0	11.0

Table I-32 Relevant Data Used for Estimating Water Requirement (Case 1, Case 2)

Scheme	Pulau Pinang	Kenan			Sungai Manik	Seberang Perak	Kemasin/Semerak	Besut
		Compartment A-C	Compartment D-F	Compartment G-H				
Meteorological Station	Penang Airport	Penang Airport	Penang Airport	Penang Airport	Sitiawan	Sitiawan	Kota Bharu Airport	Kota Bharu Airport
Presaturation Period Effective Rainfall (mm)	5-165	5-165	5-165	5-165	5 - 65	5 - 65	5 - 65	5 - 65
Normal Supply Period Effective Rainfall (mm)	5 - 65	5 - 65	5-65	5-65	3.5	3.5	2.0	3.0
Percolation (mm)	2.0	0.5	1.8	1.8	-	O&M Manual	-	Northern Terengganu Integrated Development Project
(Data Source)	O&M Manual	Assessment of Selected Performance Indicators for Paddy Irrigation Schemes						

Presaturation Requirement (mm)

1st Supply (30days)

Season / Planting Method / Month	Main Wet Sep	Off Wet Apr	Wet Sep	Main Dry Oct	T/P Sep,Oct	Wet Mar	Off Dry Apr	T/P Mar,Apr	Wet Sep	Main Dry Oct	T/P Sep,Oct	Wet Mar	Off Dry Apr	T/P Mar,Apr	Wet Oct	Main Dry Nov	T/P Oct,Nov	Wet Apr	Off Dry May	T/P Apr,May	Wet Feb	Wet Aug	Main Wet Sep	Off Wet Mar	Main Wet Oct	Off Wet Apr	Main Wet Nov	Off Wet May
1. Soil Saturation (10days)	150.0	150.0	150.0	150.0	150.0	150.0	150.0	150.0	150.0	150.0	150.0	150.0	150.0	150.0	150.0	150.0	150.0	150.0	150.0	150.0	150.0	150.0	150.0	150.0	150.0	150.0	150.0	150.0
2. Standing Water (10days)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
3. ETo (10days)	41.0	48.0	41.0	40.0	40.5	51.0	48.0	49.5	41.0	40.0	40.5	51.0	48.0	49.5	40.0	42.0	41.0	48.0	44.0	46.0	44.0	42.0	42.0	46.0	42.0	54.0	37.0	49.0
4. Percolation (10days)	20.0	20.0	5.0	5.0	5.0	5.0	5.0	5.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	35.0	35.0	35.0	35.0	20.0	20.0	30.0	30.0
5. Areal Rainfall (Monthly)	250.9	134.1	205.6	186.5	196.1	112.1	175.6	143.9	205.6	186.5	196.1	112.1	175.6	143.9	186.5	212.6	199.6	175.6	145.1	160.4	76.9	56.3	100.2	145.7	161.9	80.3	239.5	117.7
<1/5 Probability Drought>	83.6	44.7	68.5	62.2	65.4	37.4	58.5	48.0	68.5	62.2	65.4	37.4	58.5	48.0	62.2	70.9	66.5	58.5	48.4	53.5	25.6	18.8	33.4	48.6	54.0	10.1	76.8	39.2
6. Areal Rainfall (10days)	83.6	44.7	68.5	62.2	65.4	37.4	58.5	48.0	68.5	62.2	65.4	37.4	58.5	48.0	62.2	70.9	66.5	58.5	48.4	53.5	25.6	18.8	33.4	48.6	54.0	10.1	76.8	39.2
7. Effective Rainfall (10days)	83.6	44.7	68.5	62.2	65.4	37.4	58.5	48.0	68.5	62.2	65.4	37.4	58.5	48.0	62.2	70.9	66.5	58.5	48.4	53.5	25.6	18.8	33.4	48.6	54.0	10.1	76.8	39.2
8. Requirement (10days)	**227.4**	**273.3**	**227.5**	**232.8**	**230.2**	**268.6**	**244.5**	**256.6**	**240.5**	**245.8**	**243.2**	**281.6**	**257.5**	**269.6**	**245.8**	**239.1**	**242.5**	**257.5**	**263.6**	**260.6**	**303.4**	**309.2**	**293.6**	**282.4**	**258.0**	**313.9**	**260.2**	**289.8**
(=1+2+3+4-7)																												

2nd Supply (10days)

Season / Planting Method / Month	Main Wet Oct	Off Wet May	Wet Oct	Main Dry	T/P	Wet Apr	Off Dry	T/P	Wet Oct	Main Dry	T/P	Wet Apr	Off Dry	T/P	Wet Nov	Main Dry	T/P	Wet May	Off Dry	T/P	Wet Mar	Wet Sep	Main Wet Oct	Off Wet Apr	Main Wet Nov	Off Wet May	Main Wet Dec	Off Wet Jun
1. Soil Saturation (10days)	0.0	0.0	0.0	-	-	0.0	-	-	0.0	-	-	0.0	-	-	0.0	-	-	0.0	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2. Standing Water (10days)	100.0	100.0	100.0	-	-	100.0	-	-	100.0	-	-	100.0	-	-	100.0	-	-	100.0	-	-	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
3. ETo (10days)	40.0	44.0	40.0	-	-	48.0	-	-	40.0	-	-	48.0	-	-	42.0	-	-	44.0	-	-	46.0	42.0	46.0	45.0	37.0	49.0	40.0	45.0
4. Percolation (10days)	20.0	20.0	5.0	-	-	5.0	-	-	18.0	-	-	18.0	-	-	18.0	-	-	18.0	-	-	35.0	35.0	35.0	35.0	20.0	20.0	30.0	30.0
5. Areal Rainfall (Monthly)	205.4	168.6	186.5	-	-	175.6	-	-	186.5	-	-	175.6	-	-	212.6	-	-	145.1	-	-	123.2	119.9	129.3	187.8	249.1	81.1	448.4	73.8
<1/5 Probability Drought>	68.5	56.2	62.2	-	-	58.5	-	-	62.2	-	-	58.5	-	-	70.9	-	-	48.4	-	-	41.1	40.0	43.1	62.6	83.0	27.0	149.5	24.6
6. Areal Rainfall (10days)	68.5	56.2	62.2	-	-	58.5	-	-	62.2	-	-	58.5	-	-	70.9	-	-	48.4	-	-	41.1	40.0	43.1	62.6	83.0	27.0	149.5	24.6
7. Effective Rainfall (10days)	68.5	56.2	62.2	-	-	58.5	-	-	62.2	-	-	58.5	-	-	70.9	-	-	48.4	-	-	41.1	40.0	43.1	62.6	83.0	27.0	149.5	24.6
8. Requirement (10days)	**91.5**	**107.8**	**82.8**	-	-	**94.5**	-	-	**95.8**	-	-	**107.5**	-	-	**89.1**	-	-	**113.6**	-	-	**139.9**	**137.0**	**131.9**	**117.4**	**74.0**	**142.0**	**20.5**	**150.4**
(=1+2+3+4-7)																												

Table I-33 Relevant Data Used for Estimating Water Requirement (Case 3)

Scheme	Kerian									Besut			
	Compartment A-C			Compartment D-F			Compartment G-H						
Meteorological Station	Pinang Airport			Pinang Airport			Pinang Airport			Kota Bharu Airport			
Presaturation Period Effective Rainfall (mm)	5-165			5-165			5-165			5-165			
Normal Supply Period Effective Rainfall (mm)	5 - 65			5-65			5-65			5 - 65			
Percolation (mm)	0.5			1.8			1.8			3.0			
(Data Source)	Assessment of Selected Performance Indicators for Paddy Irrigation Schemes									Northern Terrengganu Integrated Development Project			
Presaturation Requirement (mm)													
1st Supply (10days)													
Season	Main		Off	Main		Off	Main		Off	Main		Off	
Planting Method	Wet	Dry	Dry	Wet	Dry	Dry	Wet	Dry	Dry	Wet	Dry	Wet	Dry
Month	Aug	Sep	Mar	Sep	Oct	Apr	Oct	Nov	May	Sep	Oct	Mar	Apr
1. Soil Saturation (10days)	150.0	150.0	150.0	150.0	150.0	150.0	150.0	150.0	150.0	150.0	150.0	150.0	150.0
2. Standing Water (10days)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
3. ETo (10days)	42.0	41.0	51.0	41.0	40.0	48.0	40.0	42.0	44.0	45.0	42.0	52.0	54.0
4. Percolation (10days)	5.0	5.0	5.0	18.0	18.0	18.0	18.0	18.0	18.0	30.0	30.0	30.0	30.0
5. Areal Rainfall (Monthly) <1/5 Probability Drought>	101.3	205.6	112.1	205.6	186.5	175.6	186.5	212.6	145.1	208.2	199.6	47.2	0.9
6. Areal Rainfall (10days)	33.8	68.5	37.4	68.5	62.2	58.5	62.2	70.9	48.4	69.4	66.5	15.7	0.1
7. Effective Rainfall (10days)	33.8	68.5	37.4	68.5	62.2	58.5	62.2	70.9	48.4	69.4	66.5	15.7	0.1
8. Requirement (10days) (=1+2+3+4-7)	**263.2**	**227.5**	**268.6**	**240.5**	**245.8**	**257.5**	**245.8**	**239.1**	**263.6**	**255.6**	**255.5**	**316.3**	**333.9**
2nd Supply (10days)													
Season	Main		Off	Main		Off	Main		Off	Main		Off	
Planting Method	Wet	Dry	Dry	Wet	Dry	Dry	Wet	Dry	Dry	Wet	Dry	Wet	Dry
Month	Sep			Oct			Nov			Oct		Apr	
1. Soil Saturation (10days)	0.0	-	-	0.0	-	-	0.0	-	-	0.0	-	0.0	-
2. Standing Water (10days)	100.0	-	-	100.0	-	-	100.0	-	-	100.0	-	100.0	-
3. ETo (10days)	41.0	-	-	40.0	-	-	42.0	-	-	42.0	-	54.0	-
4. Percolation (10days)	5.0	-	-	18.0	-	-	18.0	-	-	30.0	-	30.0	-
5. Areal Rainfall (Monthly) <1/5 Probability Drought>	205.6			186.5			212.6			199.6		0.9	
6. Areal Rainfall (10days)	68.5	-	-	62.2	-	-	70.9	-	-	66.5	-	0.3	-
7. Effective Rainfall (10days)	68.5	-	-	62.2	-	-	70.9	-	-	66.5	-	0.3	-
8. Requirement (10days) (=1+2+3+4-7)	**77.5**	-	-	**95.8**	-	-	**89.1**	-	-	**105.5**	-	**183.7**	-

Table I-34 Planting Area (Case 1, Case 2)

Scheme	Sub-Scheme	Block	Area (ha)	Area (ha)				Planting Method (% of area)			
				1	2	3	4	Wet (130 Growth Days)	Wet (120 Growth Days)	Dry	Trans-planting
				Cropping Intensity							
Kerian	Kerian Laut	A	2,403	144	96	2163	-	0	6	4	90
		B	4,001	240	160	3601	-	0	6	4	90
		C	3,960	238	158	3564	-	0	6	4	90
		D	3,362	1412	941	1009	-	0	42	28	30
	Kerian Darat	E	2,344	984	656	703	-	0	42	28	30
		F	2,697	1133	755	809	-	0	42	28	30
		G	2,143	1286	857	0	-	0	60	40	0
		H	2,650	1590	1060	0	-	0	60	40	0
Sungai Manik	Sungai Manik		3,602	3,602	0	-	-	0	100	0	0
	Labu Kubong		2,716	0	2,716	-	-	0	100	0	0
Seberang Perak	LBC		4,365	4,365	-	-	-	0	100	0	0
	RBC		4,343	4,343	-	-	-	0	100	0	0
Kemasin / Semerak	Kemasin	Jelawat Rusa	1,384	1,384	-	-	-	100	0	0	0
		Kemasin Hilir	261	261	-	-	-	100	0	0	0
Besut	Besut Barrage	1	1,235	1,235	0	-	-	100	0	0	0
		3	1,306	0	1,306	-	-	100	0	0	0
		4	1,475	1,475	0	-	-	100	0	0	0
	Angga Barrage	2	1,148	730	417	-	-	100	0	0	0

Table I-35 Planting Area (Case 3)

Scheme	Sub-Scheme	Block	Area (ha)	Area (ha)				Planting Method (% of area)				Trans-planting
				1	2	3	4	Wet (130 Growth Days)	Wet (120 Growth Days)	Dry (130 Growth Days)	Dry (120 Growth Days)	
				Cropping Intensity								
Kerian (Main Season)	Kerian Laut	A	2,403	2403	0	0	-	0	100	0	0	0
		B	4,001	4001	0	0	-	0	90	0	10	0
		C	3,960	3960	0	0	-	0	100	0	0	0
		D	3,362	0	3362	0	-	0	40	0	60	0
	Kerian Darat	E	2,344	0	2344	0	-	0	90	0	10	0
		F	2,697	0	2697	0	-	0	80	0	20	0
		G	2,143	0	0	2143	-	0	70	0	30	0
		H	2,650	0	0	2650	-	0	100	0	0	0
Kerian (Off Season)	Kerian Laut	A	2,403	100	0	0	-	0	0	0	100	0
		B	4,001	100	0	0	-	0	0	0	100	0
		C	3,960	100	0	0	-	0	0	0	100	0
		D	3,362	0	100	0	-	0	0	0	100	0
	Kerian Darat	E	2,344	0	100	0	-	0	0	0	100	0
		F	2,697	0	100	0	-	0	0	0	100	0
		G	2,143	0	0	100	-	0	0	0	100	0
		H	2,650	0	0	100	-	0	0	0	100	0
Besut (Main Season)	Besut Barrage	1	1,235	1,235	0	-	-	100	0	0	0	0
		3	1,306	0	1,306	-	-	100	0	0	0	0
		4	1,475	1,475	0	-	-	100	0	0	0	0
	Angga Barrage	2	1,148	730	417	-	-	100	0	0	0	0
Besut (Main Season)	Besut Barrage	1	1,235	1,235	0	-	-	80	0	20	0	0
		3	1,306	0	1,306	-	-	80	0	20	0	0
		4	1,475	1,475	0	-	-	80	0	20	0	0
	Angga Barrage	2	1,148	730	417	-	-	80	0	20	0	0

Table I-36 Breakdown of Irrigation Water Requirement in Case 1 / Irrigation Duty (Kerian Scheme)

Scheme	: Kerian	Area	: 2366 ha
Sub-Scheme	: Kerian Darat, Kerian Laut		

Condition : Case 1
(Eff.45%, Present Cropping Pattern, Cropping Intensity 180%)

<1> Compartment A

Rainfall Station 5104052 Area : 2403 ha (m³/s)

Water Requirement

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	Average
20	2.9	2.1	1.2	0.6	0.1	0.3	1.3	2.7	2.9	3.7	4.0	4.9	3.5	2.0	3.8	3.6	3.4	2.7	2.3	1.4	0.8	0.5	0.1	0.1	0.2	0.4	0.8	1.1	1.4	1.6	2.5	3.3	3.7	4.3	4.6	3.2	2.2
10	2.5	1.9	1.1	0.6	0.1	0.2	1.2	2.5	2.7	3.3	3.6	4.3	2.9	1.5	3.1	3.0	2.7	2.2	1.9	1.1	0.6	0.4	0.1	0.1	0.2	0.4	0.7	1.0	1.2	1.3	2.1	2.7	3.0	3.6	3.8	2.8	1.8
5	2.3	1.6	1.0	0.5	0.1	0.2	1.2	2.4	2.5	2.9	3.1	3.7	2.2	1.1	2.4	2.2	2.1	1.6	1.4	0.8	0.4	0.3	0.1	0.1	0.1	0.4	0.7	1.0	1.1	1.1	1.6	2.1	2.3	2.8	3.0	2.3	1.5
4	2.0	1.5	0.9	0.5	0.1	0.2	1.2	2.3	2.4	2.8	2.9	3.4	2.0	0.9	2.1	2.0	1.8	1.4	1.3	0.7	0.4	0.2	0.1	0.1	0.1	0.4	0.7	0.9	1.0	1.0	1.4	1.9	2.1	2.6	2.7	2.2	1.4
3	1.8	1.4	0.9	0.5	0.1	0.2	1.1	2.2	2.2	2.6	2.7	3.1	1.7	0.7	1.8	1.7	1.5	1.2	1.1	0.6	0.3	0.2	0.1	0.1	0.1	0.4	0.7	0.9	0.9	0.9	1.2	1.6	1.7	2.2	2.3	2.0	1.2
2	1.5	1.2	0.8	0.5	0.1	0.2	1.1	2.1	2.0	2.2	2.3	2.6	1.2	0.4	1.3	1.2	1.1	0.8	0.7	0.4	0.2	0.1	0.1	0.1	0.1	0.3	0.6	0.8	0.8	0.7	0.8	1.2	1.2	1.7	1.7	1.6	1.0

(l/s/ha)

Irrigation Duty																																				
Diversion Point	0.4	0.3	0.2	0.1	0.0	0.1	0.4	0.5	0.6	0.7	0.8	0.9	0.7	0.5	0.5	0.5	0.5	0.4	0.3	0.2	0.1	0.1	0.0	0.0	0.0	0.1	0.2	0.3	0.3	0.4	0.5	0.6	0.6	0.6	0.6	0.5	0.4

<2> Compartment B

Rainfall Station 5104012 Area : 4001 ha (m³/s)

Water Requirement

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	Average
20	4.5	3.6	2.1	1.0	0.1	0.6	2.1	4.4	4.8	5.8	6.8	7.1	6.2	5.0	5.6	6.1	6.0	4.6	3.5	2.3	1.4	0.7	0.2	0.2	0.3	0.6	1.2	2.1	2.5	3.0	4.1	5.0	5.8	6.7	6.9	5.0	3.5
10	3.9	3.2	1.9	0.9	0.1	0.4	2.1	4.2	4.5	5.3	6.0	6.3	5.1	4.0	4.5	4.9	4.8	3.7	2.8	1.8	1.1	0.6	0.1	0.2	0.3	0.6	1.2	1.9	2.2	2.5	3.3	4.1	4.7	5.5	5.7	4.3	3.0
5	3.3	2.7	1.6	0.8	0.1	0.4	2.0	4.0	4.1	4.7	5.2	5.3	3.9	2.9	3.4	3.6	3.5	2.8	2.1	1.3	0.8	0.4	0.1	0.2	0.2	0.6	1.1	1.7	1.9	2.0	2.4	3.1	3.6	4.3	4.4	3.6	2.4
4	3.0	2.6	1.6	0.8	0.1	0.4	2.0	3.9	3.9	4.4	4.9	5.0	3.5	2.5	3.0	3.2	3.1	2.4	1.9	1.2	0.7	0.3	0.1	0.2	0.2	0.6	1.1	1.6	1.8	1.8	2.2	2.7	3.2	3.9	4.0	3.3	2.3
3	2.8	2.3	1.5	0.8	0.1	0.4	1.9	3.8	3.7	4.1	4.5	4.5	3.0	2.0	2.5	2.6	2.5	2.0	1.5	0.9	0.5	0.3	0.1	0.2	0.2	0.6	1.1	1.5	1.6	1.6	1.8	2.3	2.6	3.3	3.4	3.0	2.0
2	2.3	2.0	1.3	0.7	0.1	0.3	1.8	3.6	3.4	3.7	3.9	3.7	2.1	1.2	1.7	1.8	1.7	1.4	1.0	0.6	0.3	0.1	0.1	0.2	0.2	0.6	1.0	1.4	1.4	1.2	1.2	1.5	1.8	2.5	2.5	2.5	1.6

(l/s/ha)

Irrigation Duty																																				
Diversion Point	0.4	0.3	0.2	0.1	0.0	0.0	0.3	0.5	0.6	0.7	0.8	0.9	0.7	0.5	0.5	0.5	0.5	0.4	0.3	0.2	0.2	0.1	0.0	0.0	0.0	0.1	0.2	0.3	0.3	0.4	0.5	0.6	0.6	0.6	0.6	0.5	0.4

<3> Compartment C

Rainfall Station 5003028 Area : 3960 ha (m³/s)

Water Requirement

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	Average
20	4.7	3.6	2.1	1.0	0.1	0.4	2.1	4.4	5.0	6.2	6.9	7.4	6.7	4.1	5.2	6.3	6.4	4.5	3.1	2.5	1.5	0.8	0.1	0.2	0.3	0.7	1.2	2.1	2.3	2.2	4.0	5.9	6.0	7.7	7.6	5.7	3.6
10	4.1	3.2	2.0	0.9	0.1	0.4	2.1	4.2	4.6	5.5	6.1	6.5	5.5	3.2	4.1	5.0	5.3	3.6	2.5	2.0	1.2	0.7	0.1	0.2	0.3	0.6	1.2	1.9	2.0	1.8	3.2	4.7	4.9	6.4	6.3	4.9	3.1
5	3.5	2.8	1.8	0.8	0.1	0.4	2.0	4.0	4.2	4.9	5.3	5.6	4.2	2.3	3.0	3.8	4.0	2.6	1.8	1.5	0.9	0.5	0.1	0.2	0.2	0.6	1.1	1.7	1.8	1.5	2.4	3.5	3.8	5.1	5.0	4.1	2.5
4	3.3	2.6	1.7	0.8	0.1	0.4	1.9	3.9	4.0	4.6	5.0	5.2	3.8	2.0	2.6	3.3	3.6	2.3	1.6	1.3	0.7	0.4	0.1	0.2	0.2	0.6	1.1	1.6	1.7	1.4	2.2	3.0	3.4	4.7	4.6	3.8	2.3
3	3.1	2.4	1.6	0.8	0.1	0.4	1.9	3.7	3.8	4.3	4.6	4.8	3.2	1.6	2.1	2.8	3.1	1.9	1.4	1.0	0.6	0.3	0.1	0.2	0.2	0.6	1.1	1.5	1.5	1.3	1.8	2.5	2.9	4.1	4.0	3.4	2.1
2	2.6	2.1	1.5	0.7	0.1	0.3	1.8	3.5	3.4	3.7	3.9	4.0	2.2	0.9	1.4	1.8	2.0	1.2	0.9	0.6	0.3	0.2	0.1	0.2	0.2	0.6	1.0	1.4	1.3	1.0	1.2	1.6	2.1	3.2	3.0	2.8	1.6

(l/s/ha)

Irrigation Duty																																				
Diversion Point	0.4	0.3	0.2	0.1	0.0	0.0	0.3	0.5	0.6	0.7	0.8	0.9	0.7	0.5	0.5	0.5	0.5	0.4	0.3	0.2	0.1	0.1	0.0	0.0	0.0	0.1	0.2	0.3	0.3	0.4	0.5	0.6	0.6	0.6	0.6	0.5	0.4

<4> Compartment D

Rainfall Station 5004027 Area : 3362 ha (m³/s)

Water Requirement

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	Average
20	4.7	3.5	2.3	1.1	0.8	2.1	2.3	3.7	4.5	5.9	6.1	6.1	5.7	5.8	5.7	6.3	6.3	5.2	4.1	2.7	1.7	0.9	0.9	1.5	1.7	2.1	2.8	3.6	3.0	2.6	3.8	4.6	5.7	6.7	6.5	5.0	3.8
10	4.0	3.0	2.0	1.0	0.8	2.0	2.2	3.5	4.3	5.4	5.5	5.4	4.9	4.8	4.8	5.2	5.2	4.3	3.3	2.2	1.4	0.7	0.8	1.5	1.6	2.0	2.6	3.3	2.7	2.3	3.2	3.7	4.5	5.5	5.5	4.2	3.3
5	3.3	2.5	1.7	0.8	0.7	1.9	2.0	3.3	4.0	4.9	4.7	4.6	4.1	3.8	3.9	4.1	4.0	3.4	2.5	1.6	1.0	0.5	0.8	1.4	1.5	1.9	2.4	3.0	2.4	1.9	2.5	2.8	3.3	4.3	4.5	3.4	2.8
4	3.1	2.3	1.6	0.8	0.7	1.8	2.0	3.3	3.8	4.7	4.5	4.3	3.8	3.4	3.5	3.7	3.6	3.1	2.2	1.4	0.9	0.4	0.8	1.4	1.5	1.8	2.3	2.9	2.2	1.7	2.3	2.5	2.9	3.9	4.1	3.1	2.6
3	2.8	2.1	1.5	0.7	0.7	1.8	1.9	3.1	3.7	4.4	4.1	3.9	3.4	2.9	3.1	3.1	3.1	2.7	1.8	1.1	0.7	0.3	0.7	1.4	1.4	1.7	2.2	2.7	2.0	1.5	2.0	2.1	2.4	3.3	3.7	2.7	2.3
2	2.2	1.7	1.3	0.6	0.7	1.6	1.8	2.9	3.4	3.9	3.6	3.2	2.7	2.2	2.4	2.3	2.3	2.0	1.5	0.7	0.4	0.2	0.7	1.3	1.3	1.6	2.1	2.4	1.8	1.2	1.5	1.4	1.5	2.5	2.9	2.1	1.9

(l/s/ha)

Irrigation Duty																																				
Diversion Point	0.5	0.4	0.2	0.1	0.1	0.3	0.3	0.5	0.7	0.8	0.8	0.8	0.8	0.7	0.7	0.6	0.6	0.5	0.4	0.3	0.2	0.1	0.1	0.3	0.3	0.4	0.5	0.6	0.6	0.5	0.6	0.7	0.7	0.7	0.7	0.6	0.5

Table I-36 Breakdown of Irrigation Water Requirement in Case 1 / Irrigation Duty (Kerian Scheme)

Scheme	: Kerian	Area	: 23500 ha
Sub-Scheme	: Kerian Darat, Kerian Laut		

Condition : Case 1
(Eff.45%, Present Cropping Pattern, Cropping Intensity 180%)

<5> Total for Kerian Laut Sub-Scheme

Area : 13726 ha

(m³/s)

Water Requirement																																									Annual
Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec								Average
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	16.8	12.8	7.7	3.7	1.1	3.2	7.8	15.2	17.2	21.6	23.8	25.5	22.1	16.9	20.3	22.3	22.1	17.0	13.0	8.9	5.4	2.9	1.3	2.0	2.5	3.8	6.0	8.9	9.2	9.4	14.4	18.8	21.2	25.4	25.6	18.9							13.2
10	14.5	11.3	7.0	3.4	1.1	3.0	7.6	14.4	16.1	19.5	21.2	22.5	18.4	13.5	16.5	18.1	18.0	13.8	10.5	7.1	4.3	2.4	1.1	2.0	2.4	3.6	5.7	8.1	8.1	7.9	11.8	15.2	17.1	21.0	21.3	16.2							11.3
5	12.2	9.6	6.1	2.9	1.0	2.9	7.2	13.7	14.8	17.4	18.3	19.2	14.4	10.1	12.7	13.7	13.6	10.4	7.8	5.2	3.1	1.7	1.1	1.9	2.0	3.5	5.3	7.4	7.2	6.5	8.9	11.5	13.0	16.5	16.9	13.4							9.3
4	11.4	9.0	5.8	2.9	1.0	2.8	7.1	13.4	14.1	16.5	17.3	17.9	13.1	8.8	11.2	12.2	12.1	9.2	7.0	4.6	2.7	1.3	1.1	1.9	2.0	3.4	5.2	7.0	6.7	5.9	8.1	10.1	11.6	15.1	15.4	12.4							8.5
3	10.5	8.2	5.5	2.8	1.0	2.8	6.8	12.8	13.4	15.6	15.9	16.3	11.3	7.2	9.5	10.2	10.2	7.8	5.8	3.6	2.1	1.1	1.0	1.9	1.9	3.3	5.1	6.6	6.0	5.3	6.8	8.5	9.6	12.9	13.4	11.1							7.6
2	8.6	7.0	4.9	2.5	1.0	2.4	6.5	12.1	12.2	13.5	13.7	13.5	8.2	4.7	6.8	7.1	7.3	5.4	3.8	2.3	1.2	0.6	1.0	1.8	1.8	3.1	4.7	6.0	5.3	4.1	4.7	5.7	6.6	9.9	10.1	9.0							6.1

(l/s/ha)

Irrigation Duty																																									
Diversion Point	0.5	0.3	0.2	0.1	0.0	0.1	0.3	0.5	0.6	0.8	0.8	0.9	0.7	0.6	0.6	0.6	0.5	0.4	0.4	0.3	0.2	0.1	0.0	0.1	0.1	0.2	0.2	0.3	0.4	0.4	0.6	0.6	0.6	0.7	0.6	0.5							0.4

<6> Compartment E

Rainfall Station 5005010 Area : 2344 ha

(m³/s)

Water Requirement																																									Annual
Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec								Average
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	3.0	2.5	1.5	0.8	0.5	1.4	1.5	2.5	3.0	3.7	4.1	3.7	3.7	3.3	3.9	4.4	4.5	3.7	2.8	1.9	1.3	0.7	0.6	1.1	1.2	1.5	1.9	2.5	2.1	1.7	2.5	2.9	3.5	4.3	3.8	3.1							2.5
10	2.5	2.1	1.3	0.7	0.5	1.4	1.5	2.4	2.8	3.4	3.7	3.3	3.2	2.7	3.3	3.6	3.6	3.1	2.3	1.5	1.0	0.5	0.6	1.0	1.1	1.4	1.8	2.3	1.9	1.5	2.1	2.3	2.8	3.5	3.0	2.6							2.2
5	2.0	1.7	1.0	0.6	0.5	1.2	1.4	2.3	2.6	3.1	3.2	2.8	2.6	2.1	2.6	2.8	2.8	2.4	1.8	1.2	0.7	0.4	0.5	1.0	1.1	1.3	1.7	2.1	1.6	1.2	1.6	1.7	2.0	2.6	2.3	2.0							1.8
4	1.9	1.6	1.0	0.5	0.5	1.3	1.3	2.2	2.6	3.0	3.1	2.6	2.4	2.0	2.4	2.5	2.5	2.2	1.6	1.0	0.7	0.4	0.5	1.0	1.0	1.3	1.6	2.0	1.5	1.1	1.4	1.5	1.7	2.4	2.0	1.8							1.7
3	1.6	1.4	0.9	0.5	0.5	1.2	1.3	2.1	2.4	2.8	2.8	2.4	2.2	1.7	2.1	2.1	2.1	1.9	1.3	0.9	0.5	0.3	0.5	1.0	1.0	1.2	1.6	1.9	1.4	1.0	1.2	1.2	1.3	2.0	1.7	1.5							1.5
2	1.3	1.1	0.7	0.4	0.5	1.1	1.2	2.0	2.3	2.5	2.5	2.1	1.7	1.3	1.6	1.5	1.5	1.5	0.9	0.6	0.4	0.2	0.5	0.9	0.9	1.1	1.4	1.7	1.2	0.8	0.9	0.7	0.8	1.4	1.1	1.1							1.2

(l/s/ha)

Irrigation Duty																																								
Diversion Point	0.5	0.4	0.2	0.1	0.1	0.3	0.3	0.5	0.7	0.8	0.8	0.8	0.8	0.7	0.7	0.6	0.6	0.5	0.4	0.3	0.2	0.1	0.1	0.2	0.3	0.4	0.5	0.6	0.6	0.5	0.7	0.7	0.7	0.7	0.7	0.6							0.5

<7> Compartment F

Rainfall Station 4905023 Area : 2697 ha

(m³/s)

Water Requirement																																									Annual
Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec								Average
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	3.5	2.7	1.7	0.9	0.6	1.7	1.8	2.9	3.3	4.0	4.4	3.8	4.1	4.0	4.4	5.1	5.0	4.5	3.3	2.1	1.7	0.8	0.7	1.2	1.4	1.6	2.2	2.7	2.6	2.0	2.4	2.8	3.6	4.3	5.1	3.1							2.8
10	2.9	2.3	1.4	0.8	0.6	1.6	1.7	2.8	3.1	3.7	3.9	3.4	3.5	3.3	3.7	4.3	4.1	3.7	2.7	1.7	1.3	0.6	0.7	1.2	1.3	1.6	2.1	2.5	2.3	1.7	2.0	2.3	2.8	3.5	4.1	2.5							2.4
5	2.5	1.9	1.2	0.6	0.6	1.5	1.6	2.6	2.9	3.4	3.4	2.9	2.9	2.6	2.9	3.4	3.2	3.0	2.1	1.3	1.0	0.5	0.6	1.1	1.2	1.5	1.9	2.3	2.0	1.4	1.6	1.8	2.0	2.6	3.2	1.9							2.0
4	2.1	1.7	1.1	0.6	0.6	1.4	1.5	2.5	2.9	3.3	3.3	2.8	2.7	2.4	2.6	3.1	2.9	2.7	1.9	1.1	0.9	0.4	0.6	1.1	1.2	1.4	1.9	2.2	1.9	1.3	1.4	1.6	1.7	2.4	2.7	1.7							1.9
3	1.9	1.5	1.0	0.5	0.5	1.4	1.5	2.4	2.7	3.1	3.0	2.6	2.4	2.0	2.2	2.7	2.5	2.4	1.6	0.9	0.7	0.3	0.6	1.1	1.1	1.4	1.8	2.1	1.7	1.2	1.2	1.3	1.3	2.0	2.3	1.4							1.7
2	1.5	1.2	0.8	0.5	0.5	1.3	1.4	2.3	2.6	2.9	2.6	2.2	2.0	1.5	1.7	2.1	1.8	1.9	1.2	0.6	0.5	0.2	0.6	1.0	1.0	1.3	1.7	1.9	1.4	1.0	0.9	0.9	0.8	1.4	1.5	1.0							1.4

(l/s/ha)

Irrigation Duty																																								
Diversion Point	0.5	0.4	0.2	0.1	0.1	0.3	0.3	0.5	0.7	0.8	0.9	0.8	0.8	0.2	0.7	0.6	0.6	0.5	0.4	0.3	0.2	0.1	0.1	0.3	0.3	0.4	0.5	0.6	0.6	0.5	0.7	0.7	0.7	0.7	0.7	0.6							0.5

<8> Compartment G

Rainfall Station 4905023 Area : 2143 ha

(m³/s)

Water Requirement																																									Annual
Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec								Average
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	4.5	4.9	4.0	3.3	2.4	1.3	0.6	0.6	1.2	1.3	2.0	2.8	3.2	3.2	3.2	4.4	4.3	4.2	3.9	3.6	3.4	2.5	1.8	0.9	0.4	0.7	1.5	1.5	1.8	2.0	2.4	2.2	2.2	3.1	4.2	3.2							2.6
10	3.8	4.1	3.4	2.8	2.0	1.1	0.5	0.6	1.1	1.2	1.9	2.7	3.0	2.9	2.9	3.9	3.7	3.6	3.3	2.8	2.8	2.0	1.5	0.7	0.3	0.7	1.5	1.5	1.7	1.9	2.3	2.0	1.9	2.7	3.5	2.7							2.3
5	3.1	3.2	2.7	2.3	1.6	0.8	0.4	0.6	1.1	1.1	1.8	2.5	2.8	2.6	2.5	3.3	3.0	2.9	2.6	2.2	2.1	1.5	1.2	0.5	0.2	0.7	1.4	1.4	1.6	1.8	2.1	1.7	1.5	2.1	2.7	2.1							1.9
4	2.8	3.0	2.5	2.1	1.4	0.8	0.4	0.6	1.1	1.1	1.8	2.4	2.7	2.5	2.3	3.1	2.8	2.7	2.4	1.9	1.9	1.3	1.1	0.4	0.2	0.7	1.4	1.3	1.5	1.7	2.0	1.6	1.4	2.0	2.4	1.9							1.8
3	2.5	2.6	2.2	1.8	1.2	0.7	0.3	0.6	1.0	1.1	1.7	2.4	2.5	2.3	2.1	2.9	2.5	2.4	2.1	1.6	1.6	1.1	1.0	0.3	0.1	0.7	1.3	1.3	1.5	1.6	1.9	1.5	1.2	1.7	2.1	1.6							1.6
2	1.9	2.0	1.7	1.4	0.9	0.5	0.2	0.5	1.0	1.0	1.6	2.2	2.3	2.0	1.8	2.5	2.0	1.9	1.6	1.2	1.1	0.7	0.7	0.2	0.1	0.6	1.3	1.2	1.4	1.5	1.8	1.3	0.9	1.3	1.5	1.2							1.3

(l/s/ha)

Irrigation Duty																																									
Diversion Point	0.8	0.8	0.7	0.5	0.4	0.3	0.1	0.1	0.3	0.3	0.5	0.7	0.8	0.8	0.7	0.8	0.8	0.7	0.6	0.6	0.5	0.4	0.3	0.2	0.1	0.2	0.4	0.4	0.5	0.6	0.8	0.7	0.6	0.8	0.8	0.8							0.5

Table I-36 Breakdown of Irrigation Water Requirement in Case 1 / Irrigation Duty (Kerian Scheme)

Scheme	: Kerian	Area : 23560 ha	Condition : Case 1
Sub-Scheme	: Kerian Darat, Kerian Laut		(Eff.45%, Present Cropping Pattern, Cropping Intensity 180%)

<9> Compartment H

Rainfall Station 4905023 Area : 2650 ha (m³/s)

Water Requirement

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual Average
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	5.6	6.0	4.9	4.1	2.9	1.6	0.7	0.8	1.5	1.6	2.5	3.4	4.0	4.0	4.0	5.4	5.4	5.3	4.8	4.2	4.2	3.1	2.3	1.1	0.5	0.9	1.9	1.9	2.2	2.5	3.0	2.7	2.7	3.9	5.2	4.0	3.2
10	4.7	5.0	4.2	3.5	2.4	1.3	0.6	0.8	1.4	1.5	2.4	3.3	3.7	3.6	3.5	4.8	4.6	4.5	4.0	3.5	3.4	2.5	1.9	0.8	0.3	0.9	1.8	1.8	2.1	2.3	2.8	2.4	2.3	3.3	4.3	3.3	2.8
5	3.8	4.0	3.4	2.8	1.9	1.0	0.5	0.7	1.4	1.4	2.2	3.1	3.4	3.2	3.1	4.1	3.7	3.6	3.2	2.7	2.6	1.8	1.5	0.6	0.2	0.8	1.7	1.7	2.0	2.2	2.6	2.1	1.9	2.7	3.3	2.6	2.3
4	3.5	3.6	3.1	2.6	1.8	0.9	0.4	0.7	1.3	1.4	2.2	3.0	3.3	3.0	2.9	3.9	3.5	3.3	2.9	2.4	2.3	1.6	1.4	0.5	0.2	0.8	1.7	1.6	1.9	2.1	2.5	2.0	1.7	2.4	3.0	2.3	2.2
3	3.1	3.2	2.7	2.3	1.5	0.8	0.4	0.7	1.3	1.3	2.1	2.9	3.1	2.8	2.6	3.5	3.1	2.9	2.5	2.0	1.9	1.3	1.2	0.4	0.1	0.8	1.7	1.6	1.8	2.0	2.4	1.9	1.5	2.1	2.5	2.0	1.9
2	2.4	2.4	2.1	1.8	1.1	0.6	0.3	0.7	1.2	1.2	2.0	2.7	2.9	2.5	2.3	3.0	2.5	2.4	1.9	1.5	1.3	0.9	0.9	0.2	0.1	0.8	1.6	1.5	1.7	1.9	2.2	1.6	1.1	1.7	1.8	1.5	1.6

(l/s/ha)

Irrigation Duty																																					
Diversion Point	0.8	0.8	0.7	0.5	0.4	0.3	0.1	0.2	0.3	0.3	0.5	0.7	0.8	0.8	0.7	0.8	0.8	0.6	0.6	0.6	0.5	0.4	0.3	0.2	0.1	0.2	0.4	0.4	0.5	0.6	0.7	0.7	0.6	0.8	0.8	0.8	0.5

<10> Total for Kerian Darat Sub-Scheme

Area : 9834 ha (m³/s)

Water Requirement

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual Average
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	16.6	16.1	12.1	9.1	6.4	6.0	4.6	6.8	9.0	10.6	13.0	13.7	15.0	14.5	15.5	19.3	19.2	17.7	14.8	11.6	10.6	7.1	5.4	4.3	3.5	4.7	7.5	8.6	8.2	8.2	10.3	10.6	12.0	15.6	18.3	13.4	11.3
10	13.9	13.5	10.3	7.8	5.5	5.4	4.3	6.6	8.4	9.8	11.9	12.7	13.4	12.5	13.4	16.6	16.0	14.9	12.3	9.5	8.5	5.6	4.7	3.7	3.0	4.6	7.2	8.1	8.0	7.4	9.2	9.0	9.8	13.0	14.9	11.1	9.6
5	11.2	10.8	8.2	6.3	4.6	4.6	3.9	6.2	8.0	9.0	10.6	11.3	11.7	10.5	11.1	13.6	12.7	11.9	9.7	7.4	6.4	4.2	3.8	3.2	2.7	4.3	6.7	7.5	7.2	6.6	7.9	7.3	7.4	10.0	11.4	8.6	8.0
4	10.3	9.9	7.7	5.8	4.3	4.4	3.6	6.0	7.9	8.8	10.4	10.8	11.1	9.9	10.2	12.6	11.7	10.9	8.8	6.6	5.8	3.7	3.6	3.0	2.6	4.2	6.6	7.1	6.8	6.2	7.3	6.7	6.5	9.2	10.1	7.7	7.5
3	9.1	8.7	6.8	5.1	3.7	4.1	3.5	5.8	7.4	8.3	9.6	10.3	10.2	8.8	9.0	11.2	10.2	9.6	7.5	5.4	4.7	3.0	3.3	2.8	2.3	4.1	6.4	6.9	6.4	5.8	6.7	5.9	5.3	7.8	8.6	6.5	6.7
2	7.1	6.7	5.3	4.1	3.0	3.5	3.1	5.5	7.1	7.6	8.7	9.2	8.9	7.3	7.4	9.1	7.8	7.7	5.6	3.9	3.3	2.0	2.7	2.3	2.1	3.8	6.0	6.3	5.7	5.2	5.8	4.5	3.6	5.8	5.9	4.8	5.5

(l/s/ha)

Irrigation Duty																																					
Diversion Point	0.7	0.6	0.4	0.3	0.3	0.3	0.2	0.3	0.5	0.6	0.7	0.8	0.8	0.8	0.7	0.7	0.7	0.6	0.5	0.5	0.4	0.3	0.2	0.2	0.2	0.3	0.4	0.5	0.5	0.6	0.7	0.7	0.6	0.7	0.8	0.7	0.5

<11> Total for All Kerian Scheme

Area : 23560 ha (m³/s)

Water Requirement

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual Average
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
20	33.4	28.9	19.8	12.8	7.5	9.2	12.4	22.0	26.2	32.2	36.8	39.2	37.1	31.4	35.8	41.6	41.3	34.7	27.8	20.5	16.0	10.0	6.7	6.3	6.0	8.5	13.5	17.5	17.9	17.6	24.7	29.4	33.2	41.0	43.9	32.3	24.3
10	28.4	24.8	17.3	11.2	6.6	8.4	11.9	21.0	24.5	29.3	33.1	35.2	31.8	26.0	29.9	34.7	34.0	28.7	22.8	16.6	12.8	8.0	5.8	5.7	5.4	8.2	12.9	16.2	16.1	15.3	21.0	24.2	26.9	34.0	36.2	27.3	20.9
5	23.4	20.4	14.4	9.2	5.6	7.5	11.1	19.9	22.8	26.4	28.9	30.5	26.1	20.6	25.8	27.3	26.2	22.3	17.5	12.6	9.5	5.9	4.9	5.1	4.7	7.8	12.0	14.9	14.4	13.1	16.8	18.6	20.4	26.5	28.3	22.0	17.3
4	21.7	18.9	13.5	8.7	5.3	7.2	10.7	19.4	22.0	25.3	27.7	28.7	24.2	18.7	21.4	24.8	23.8	20.1	15.8	11.0	8.5	5.0	4.7	4.9	4.6	7.6	11.8	14.1	13.5	12.1	15.4	16.8	18.1	24.3	25.5	20.1	16.0
3	19.6	16.9	12.3	7.9	4.7	6.9	10.3	18.6	20.8	23.7	25.5	26.6	21.5	16.0	18.5	21.4	20.4	17.4	13.3	9.0	6.8	4.1	4.3	4.7	4.2	7.4	11.5	13.5	12.4	11.1	13.5	14.4	14.9	20.7	22.0	17.6	14.3
2	15.7	13.7	10.2	6.6	4.0	5.9	9.6	17.6	19.3	21.1	22.4	22.7	17.1	12.0	14.2	16.2	15.1	13.1	9.4	6.2	4.5	2.6	3.7	4.1	3.9	6.9	10.7	12.3	11.0	9.3	10.5	10.2	10.2	15.7	16.0	13.8	11.6

(l/s/ha)

Irrigation Duty																																					
Diversion Point	0.5	0.4	0.3	0.2	0.1	0.2	0.3	0.5	0.6	0.7	0.8	0.8	0.8	0.7	0.6	0.6	0.6	0.5	0.4	0.3	0.2	0.2	0.1	0.1	0.1	0.2	0.3	0.4	0.5	0.5	0.6	0.6	0.6	0.7	0.7	0.6	0.5

Table I-37 Breakdown of Irrigation Water Requirement in Case 1 / Irrigation Duty (Sungai Manik Scheme)

Scheme	: Sungai Manik	Area	: 6318 ha
Sub-Scheme	: Sungai Manik, Labu Kubong		

Condition : Case 1
(Eff.45%, Present Cropping Pattern, Cropping Intensity 180%)

<1> All Sungai Manik Scheme

Rainfall Station 4010138 Area : 6318 ha

(m³/s)

Water Requirement

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	Average
20	2.7	5.3	9.8	11.6	12.0	15.8	16.2	14.8	9.7	11.5	11.4	11.2	10.4	12.8	12.2	9.8	6.7	4.2	2.5	4.3	8.3	9.7	11.3	12.8	15.9	14.7	11.5	11.2	10.4	10.8	8.0	7.9	6.8	6.6	5.3	3.5	9.7
10	2.1	5.1	9.6	11.0	11.4	14.9	14.9	13.2	8.6	10.1	9.8	9.3	8.7	10.6	10.3	8.1	5.7	3.6	2.1	4.2	8.1	9.2	10.7	12.2	14.8	13.2	10.1	9.8	8.8	9.0	6.5	6.5	5.5	5.3	4.3	2.8	8.6
5	1.6	4.9	9.3	10.4	10.8	13.9	13.5	11.5	7.4	8.5	8.3	7.4	6.9	8.4	8.4	6.4	4.6	3.1	2.2	4.0	7.7	8.7	10.1	11.4	13.6	11.6	8.5	8.5	7.1	7.2	5.0	4.9	4.1	3.9	3.2	2.0	7.4
4	1.4	4.9	9.2	10.2	10.5	13.5	13.0	10.9	7.0	8.0	7.5	6.7	6.3	7.6	7.7	5.8	4.2	2.9	1.5	4.0	7.6	8.5	9.8	11.1	13.1	11.0	7.9	7.7	6.5	6.6	4.5	4.4	3.6	3.4	2.9	1.8	7.0
3	1.1	4.8	9.0	9.8	10.1	12.9	12.3	10.0	6.4	7.2	6.8	5.9	5.5	6.6	6.8	5.1	3.7	2.6	1.3	3.9	7.4	8.2	9.4	10.6	12.5	10.2	7.1	6.9	5.7	5.8	3.8	3.7	3.0	2.8	2.4	1.4	6.5
2	0.7	4.6	8.7	9.3	9.5	12.0	11.1	8.7	5.5	6.1	5.5	4.5	4.3	4.9	5.4	3.8	2.9	2.2	1.0	3.7	7.1	7.7	8.8	9.8	11.3	8.9	5.9	5.7	4.4	4.5	2.7	2.7	2.0	1.8	1.6	0.9	5.6

(l/s/ha)

Irrigation Duty																																				
Diversion Point	0.2	0.4	0.7	0.8	0.9	1.2	1.2	1.1	0.9	1.0	1.0	0.9	0.9	0.9	0.7	0.5	0.4	0.2	0.1	0.3	0.6	0.7	0.8	0.9	1.2	1.0	0.8	0.9	0.9	0.8	0.6	0.8	0.7	0.5	0.4	0.3	0.7

Table I-38 Breakdown of Irrigation Water Requirement in Case 1 / Irrigation Duty (Seberang Perak Scheme)

Scheme	: Seberang Perak	Area	: 8708 ha
Sub-Scheme	: LBC, RBC		

Condition : Case 1
(Eff.45%, Present Cropping Pattern, Cropping Intensity 180%)

<1> All Seberang Perak Scheme

Rainfall Station 4009096 Area : 8708 ha

(m³/s)

Water Requirement

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	Average
20	15.8	15.0	8.4	1.2	0.0	0.0	0.0	8.8	18.5	19.4	16.2	9.9	12.7	18.3	16.3	18.5	20.2	18.0	18.6	18.3	11.5	6.7	1.4	0.0	11.1	25.0	25.5	19.4	14.3	16.0	12.9	17.4	14.9	16.5	19.9	14.6	13.4
10	12.8	12.1	6.9	0.9	0.0	0.0	0.0	8.6	17.8	18.6	15.2	9.3	11.6	15.8	14.1	15.5	17.3	15.5	16.0	15.3	9.7	5.6	1.1	0.0	11.1	24.4	24.6	18.4	13.4	14.8	11.5	14.2	12.4	13.5	16.4	12.4	11.9
5	9.7	9.0	5.2	0.6	0.0	0.0	0.0	8.4	17.0	17.6	14.1	8.7	10.5	13.2	11.8	12.5	14.2	12.9	13.2	12.2	7.8	4.5	0.8	0.0	11.0	23.7	23.5	17.3	12.3	13.4	10.0	10.8	9.7	10.4	12.6	10.0	10.2
4	8.7	8.0	4.8	0.5	0.0	0.0	0.0	8.3	16.7	17.2	13.6	8.4	10.1	12.2	11.0	11.5	13.2	12.1	12.4	11.2	7.1	4.1	0.7	0.0	10.9	23.3	23.0	16.8	11.8	12.8	9.5	9.7	8.8	9.4	11.4	9.2	9.7
3	7.3	6.6	4.1	0.4	0.0	0.0	0.0	8.2	16.3	16.6	13.0	8.0	9.5	11.0	10.0	10.1	11.8	10.9	11.1	9.8	6.3	3.6	0.5	0.0	10.7	22.8	22.2	16.1	11.1	12.0	8.7	8.1	7.6	7.9	9.7	8.1	8.9
2	5.1	4.4	2.9	0.2	0.0	0.0	0.0	8.0	15.5	15.8	12.1	7.5	8.6	9.1	8.4	7.9	9.6	9.0	9.2	7.6	4.9	2.7	0.3	0.0	10.4	21.9	21.1	14.9	10.0	10.8	7.5	5.7	5.7	5.7	7.0	6.5	7.7

(l/s/ha)

Irrigation Duty																																				
Diversion Point	0.9	0.6	0.4	0.1	0.0	0.0	0.0	0.5	1.1	1.2	1.0	0.7	0.9	0.9	0.8	0.8	0.8	0.8	0.8	0.7	0.5	0.3	0.1	0.0	0.6	1.4	1.5	1.2	0.9	1.1	1.1	0.9	0.9	0.9	0.9	0.9	0.7

Table I-39 Breakdown of Irrigation Water Requirement in Case 1 / Irrigation Duty (Kemasin River System)

Scheme	: Kemasin/Semerak	Area : 1645 ha	Condition : Case 1
Sub-Scheme	: Kemasin (Jerawat Rusa, Kemasin Hilir)		(Eff.45%, Present Cropping Pattern, Cropping Intensity 180%)

<1> Jelawat Rusa

Rainfall Station 6023072 Area : 1384 ha

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	Average
20	3.6	3.4	3.8	4.1	3.9	2.7	1.5	0.2	0.0	0.0	1.5	3.5	3.8	2.9	1.7	2.6	2.7	2.9	2.4	2.3	2.2	2.7	2.2	2.0	1.2	0.7	0.1	1.6	3.6	3.4	2.6	1.5	1.8	1.7	2.1	2.4	2.3
10	3.0	2.9	3.2	3.5	3.3	2.3	1.2	0.2	0.0	0.0	1.5	3.4	3.6	2.7	1.6	2.3	2.3	2.4	2.0	1.9	1.8	2.2	1.7	1.7	0.9	0.5	0.0	1.6	3.5	3.2	2.3	1.3	1.5	1.3	1.6	1.9	2.0
5	2.4	2.3	2.5	2.9	2.7	1.8	1.0	0.1	0.0	0.0	1.5	3.3	3.4	2.5	1.5	2.1	2.0	1.8	1.5	1.5	1.4	1.7	1.3	1.3	0.6	0.4	0.0	1.5	3.3	2.9	2.0	1.0	1.1	0.9	1.1	1.3	1.6
4	2.2	2.1	2.3	2.7	2.5	1.6	0.9	0.1	0.0	0.0	1.5	3.3	3.3	2.4	1.5	2.0	1.8	1.7	1.4	1.4	1.3	1.5	1.1	1.1	0.5	0.3	0.0	1.5	3.2	2.8	1.8	0.8	0.9	0.7	0.9	1.2	1.5
3	1.9	1.9	2.0	2.4	2.3	1.4	0.8	0.1	0.0	0.0	1.5	3.2	3.2	2.3	1.4	1.8	1.7	1.4	1.2	1.2	1.1	1.3	0.9	1.0	0.4	0.2	0.0	1.5	3.1	2.7	1.6	0.6	0.6	0.5	0.6	0.9	1.4
2	1.4	1.5	1.6	2.0	1.8	1.0	0.6	0.1	0.0	0.0	1.4	3.1	3.0	2.2	1.3	1.6	1.4	1.0	0.9	0.9	0.8	0.9	0.6	0.7	0.2	0.1	0.0	1.4	2.9	2.4	1.3	0.2	0.2	0.1	0.3	0.6	1.1

(l/s/ha)

Irrigation Duty																																				
Diversion Point	0.8	0.8	0.8	0.9	0.8	0.6	0.3	0.0	0.0	0.0	0.5	1.1	1.1	0.9	0.6	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.6	0.4	0.2	0.0	0.6	1.3	1.3	1.0	0.7	1.0	0.9	0.7	0.8	0.7

<2> Kemasin Hilir

Rainfall Station 6024074 Area : 261 ha

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	Average
20	0.7	0.7	0.7	0.7	0.7	0.5	0.3	0.0	0.0	0.0	0.3	0.7	0.7	0.5	0.3	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.4	0.3	0.2	0.1	0.0	0.3	0.7	0.6	0.5	0.3	0.3	0.3	0.3	0.5	0.4
10	0.5	0.6	0.6	0.6	0.6	0.4	0.2	0.0	0.0	0.0	0.3	0.6	0.7	0.5	0.3	0.5	0.4	0.4	0.4	0.3	0.4	0.4	0.3	0.3	0.1	0.1	0.0	0.3	0.6	0.6	0.4	0.2	0.2	0.2	0.2	0.4	0.4
5	0.4	0.5	0.5	0.5	0.5	0.3	0.2	0.0	0.0	0.0	0.3	0.6	0.6	0.4	0.3	0.4	0.4	0.3	0.3	0.3	0.2	0.3	0.2	0.2	0.1	0.1	0.0	0.3	0.6	0.5	0.4	0.2	0.2	0.2	0.2	0.3	0.3
4	0.4	0.4	0.5	0.5	0.5	0.3	0.2	0.0	0.0	0.0	0.3	0.6	0.6	0.4	0.3	0.4	0.3	0.3	0.3	0.2	0.3	0.2	0.2	0.2	0.1	0.0	0.0	0.3	0.6	0.5	0.3	0.1	0.1	0.1	0.1	0.2	0.3
3	0.4	0.4	0.4	0.5	0.4	0.2	0.2	0.0	0.0	0.0	0.3	0.6	0.6	0.4	0.3	0.4	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.3	0.5	0.4	0.2	0.0	0.0	0.2
2	0.3	0.3	0.4	0.4	0.3	0.2	0.1	0.0	0.0	0.0	0.3	0.6	0.6	0.4	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.3	0.5	0.4	0.2	0.0	0.0	0.2

(l/s/ha)

Irrigation Duty																																				
Diversion Point	0.9	0.9	0.9	0.9	0.9	0.5	0.3	0.0	0.0	0.0	0.5	1.0	1.2	0.9	0.7	0.9	0.9	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.5	0.2	0.0	0.5	1.4	1.2	1.0	0.7	1.0	0.9	0.7	0.7	0.7

<3> Total for Kemasin Scheme

Area : 1645 ha

(m³/s)

Month/10days	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec			Annual
Return Period	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	Average
20	4.3	4.1	4.5	4.8	4.6	3.2	1.8	0.2	0.0	0.0	1.8	4.2	4.5	3.4	2.0	3.1	3.2	3.4	2.8	2.7	2.6	3.1	2.6	2.3	1.4	0.8	0.1	1.9	4.3	4.0	3.1	1.8	2.1	2.0	2.4	2.9	2.7
10	3.5	3.5	3.8	4.1	3.9	2.7	1.4	0.2	0.0	0.0	1.8	4.0	4.3	3.2	1.9	2.8	2.7	2.8	2.4	2.2	2.2	2.6	2.0	2.0	1.0	0.6	0.0	1.9	4.1	3.8	2.7	1.5	1.7	1.5	1.8	2.3	2.3
5	2.8	2.8	3.0	3.4	3.2	2.1	1.2	0.1	0.0	0.0	1.8	3.9	4.0	2.9	1.8	2.5	2.4	2.1	1.8	1.8	1.7	2.0	1.5	1.5	0.7	0.5	0.0	1.8	3.9	3.4	2.4	1.2	1.3	1.1	1.3	1.6	1.9
4	2.6	2.5	2.8	3.2	3.0	1.9	1.1	0.1	0.0	0.0	1.8	3.9	3.9	2.8	1.8	2.4	2.1	2.0	1.7	1.6	1.6	1.7	1.3	1.3	0.6	0.3	0.0	1.8	3.8	3.3	2.1	1.0	1.1	0.8	1.0	1.4	1.8
3	2.3	2.3	2.4	2.9	2.7	1.6	1.0	0.1	0.0	0.0	1.8	3.8	3.8	2.7	1.7	2.2	2.0	1.6	1.4	1.4	1.3	1.5	1.1	1.2	0.5	0.2	0.0	1.7	3.4	2.8	1.5	0.7	0.7	0.6	0.7	1.1	1.6
2	1.7	1.8	2.0	2.4	2.1	1.2	0.7	0.1	0.0	0.0	1.7	3.7	3.6	2.6	1.5	1.9	1.6	1.2	1.1	1.1	1.0	1.0	0.7	0.8	0.2	0.1	0.0	1.7	3.4	2.8	1.5	0.2	0.2	0.1	0.3	0.7	1.3

(l/s/ha)

Irrigation Duty																																				
Diversion Point	0.8	0.8	0.8	0.9	0.8	0.6	0.3	0.0	0.0	0.0	0.5	1.1	1.1	0.9	0.6	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.6	0.4	0.2	0.0	0.6	1.3	1.3	1.0	0.7	1.0	0.9	0.7	0.8	0.7