Design Scale

Design scale for the feasibility study stage is set at 5-year return period considering that the area consists mainly of agricultural lands. Consideration should be given, however, to upgrading the structures in the future in accordance with the Overall Development Plan of 50-year return period scale. Accordingly, structures difficult for upgrading in the future, e.g., bridges and sluice gates, are to be designed for 50-year return period scale.

Standard Flood Discharge

Standard flood discharges by design scale have been determined through hydrological analysis, as follows:

5-year Return Period	2,800 m^3/s
50-year Return Period	4,000 m^3/s

5.3.2 Optimization of River Improvement

(1) Optimization of Alignment and Longitudinal Profile

The alignment and profile have been determined following the Overall Development Plan.

(2) Optimization of Cross Section

The basic policy of the Overall Development Plan is maintained; namely, flow capacity is assured mainly by embankment. On the basis of the cross sections determined in the Overall Development Plan stage, more detailed optimization was conducted. Construction costs were compared against the width of the five cases of 200, 250, 300, 350 and 400 m. The width was finally determined at 300 m, same as the Overall Development Plan.

5.3.3 Preliminary Design of Proposed Facilities

(1) Dike

Dike is designed in accordance with the design criteria of DPU for the design discharge of 2,800 m^3/s of 5-year return period, as follows:

Freeboard	1.2 m
Crown Width	5.0 m
Side Slope	1 : 2 (V:H) or 1 : 3.0
Maintenance Road	3.0 m wide

(2) Groin

Concrete pile permeable type groins are provided at concave sides of extreme meandering portions.

(3) Sluice

Sluices are provided at junction points with tributaries. The design discharges of sluices are of 50-year return period.

(4) Bridge

Two bridges presently spanning over the Kampar Kanan River are proposed to be reconstructed due to the river improvement works.

5.3.4 Cost Estimate

Project cost has been estimated as summarized in the following table:

Unit: Rp. 10^6

Item	Value
Construction Base Cost	176,070
Compensation Cost	2,591
Administration and Engineering Cost	26,540
Price Contingency	116,133
Physical Contingency	30,586
Sub-Total	351,920
Value Added Tax	35,192
Total	387,112

5.3.5 Project Evaluation

(1) Economic Benefit

Flood control benefit is defined as the reduction of inundation damage attributed to the proposed works. The reduction is obtained as the difference between the estimated inundation damage under the with- and the without-the-project situations.

The annual average benefit of river improvement of Bangkinang area is accordingly estimated at Rp. $22,712 \times 10^6$.

(2) Economic Cost

The economic project cost is estimated at Rp. $204,867 \times 10^6$.

(3) Economic Evaluation

The project has been evaluated from the economic viewpoint in terms of Economic Internal Rate of Return (EIRR), Benefit-Cost Ratio (B/C) and Net Present Value (NPV) as below. The opportunity cost of capital is assumed at 10% and applied to a discount rate for the calculation of B/C and NPV.

EIRR	10.19%
B/C	1.02
NPV	Rp. $2,216 \times 10^6$

Sensitivity analysis is carried out for the project on several cases of changes in the benefit or cost as summarized below.

CASE	EIRR (%)	B/C	NPV (Rp. 10^6)
Benefit, 5% down	9.73	0.97	- 3,120
Benefit, 10% down	9.25	0.92	- 8,456
Cost, 5% up	9.75	0.99	- 3,009
Cost, 10% up	9.34	0.93	- 8,234

5.4 Kuantan River Multipurpose Development Project

5.4.1 Planning Criteria

Purpose and Major Component of the Project

The purposes of the project are as follows:

(1) Flood Control

To protect areas for irrigation development from flooding.

(2) Irrigation Development

To supply irrigation water to priority areas of Lubukjambi Irrigation Development Project and conduct irrigation development.

(3) Hydropower Generation

To execute hydropower generation at the proposed Kuantan Dam.

The proposed structures consist of the Kuantan Dam, the Lubukjambi Intake Weir, a main irrigation canal and on-farm development structures of Lubukjambi Irrigation Development Project.

Objective Area

The objective area for flood control is the area to be developed in the Irrigation Development Plan as summarized below.

Unit: ha

Lubukjambi Irrigation Development Area	Left Bank Area	Right Bank Area
Existing Irrigation Area	4,142	-
Presently irrigated	1,670	-
Presently rainfed	376	-
Presently undeveloped	2,096	-
Net Additional Area	5,234	-
Total	9,376	-

Design Scale

The design scale for flood control for the feasibility study stage is set at 5-year return period considering that the area consists mainly of agricultural lands. The design scale for the determination of irrigation water requirement is set at 5-year return period.

Standard Flood discharge

Standard flood discharge of the Kuantan River at Kuantan Dam is determined through hydrological analysis, as follows:

- 5-year Return Period : 3,900 m^3/s

5.4.2 Water Demand

(1) Irrigation Water Requirement

The irrigation water requirement of the priority project area in the Lubukjambi Irrigation Area has been estimated based on the optimum cropping pattern with double cropping. The estimated peak water requirement is summarized below.

Unit: m^3/s

Area	Peak Water Requirement
Left Bank	7.85

(2) River Maintenance Flow (Constant Release)

The specific discharge of river maintenance flow is taken at 0.9 $m^3/s/100\ km^2$. The river maintenance flow at the proposed Kuantan Dam is calculate at 57.39 m^3/s from the catchment are of 6,377 km^2 (except Singkarak Lake basin of 1,076 km^2).

(3) River Maintenance Flow (Supplementation of Deficit in Downstream Area)

The other river maintenance flow is to supplement deficit which might occur in the residual catchment of the Kuantan-Indragiri River. With this release, a specific discharge of 0.9 m3/s/100 km2 is realized at the river mouth. A peak release of 24.64 m^3/s for this purpose has been calculated.

(4) Total Water Demand

Based on the above, the peak water demand in the Feasibility Study was determined as follows:

Unit: m^3/s

Purpose	Peak Water Demand
Left Bank Irrigation	7.85
River Maintenance Flow (Constant Release)	57.39
River Maintenance Flow (Supplementation of Deficit in Downstream Area)	24.64
Total	89.88

5.4.3 Optimization of Kuantan Reservoir Allocation for Initial Phase

Kuantan Dam is to be constructed in the initial phase of the Indragiri River Development Project at the scale determined in the Overall Development Plan. The optimum capacity allocation of the Kuantan Reservoir for the initial phase has been decided through a study on alternatives, as follows:

Unit: $10^6 m^3$

Purpose	Allocation	
	Dry Season (April-September)	Rainy Season (October-March)
Flood Control	400	793
Hydropower Generation	528	135
Irrigation	4	4
River Maintenance	213	213
Dead Storage	425	425
Gross Storage	1,570	1,570

5.4.4 Preliminary Design of Proposed Facilities

Preliminary designing has been conducted for the Kuantan Dam, Lubukjambi Intake Weir and Main Irrigation Canal for the Initial Phase of the Lubukjambi Irrigation Development Plan.

(1) Kuantan Dam

The main structural features of the Kuantan Dam are given in Fig. S.5.2 and summarized in the table below.

Dam Type	Concrete Gravity Type
Crest Elevation	EL 123.0 m
Surcharge Water Level (SWL)	EL 120.0 m
Normal Water Level (NWL)	EL 115.2 m
Low Water Level (LWL)	EL 102.0 m
Crest Width	5.0 m
Upstream Slope	
Below EL 100 m	1 : 0.25
Above EL 100 m	Vertical
Downstream Slope	1 : 0.85
Installed Capacity	114 MW
Maximum Turbine Discharge	270 m^3/sec

(2) Lubukjambi Intake Weir

The Lubukjambi Intake Weir is proposed to regulate the water released from the Kuantan Dam and to intake water to main irrigation canals. The movable type weir with roller gates is employed considering technical and economical aspects. The main structural features are as shown in Fig. S.5.4 and summarized below.

Afterbay Reservoir	
Normal Water Level	EL 60.0 m
Low Water Level	EL 58.0 m
Required Storage Capacity	2.2×10^6 m^3
Intake Discharge (for Overall Plan)	
Left Bank	19.31 m^3/s
Right Bank	17.62 m^3/s

Design Flood	
Design Scale (Return Period)	50-year
Design Flood Discharge	3,200 m^3/s
High Water Level	EL 62.10 m
Dike Crest Elevation	EL 63.30 m
Riverbed Elevation	EL 54.30 m
Structural Dimensions of Weir	
Gate Type	Roller Gate
Sill Elevation	EL 55.30 m
Crest Elevation	EL 60.00 m
Length × Height × Unit	29.4 m × 4.7 m × 4 units

(3) Main Irrigation Canal

The main features of the irrigation canal are as follows:

Particulars	Left Bank Irrigation Canal
Canal Length	76.0 km
Design Discharge	7.85 m^3/s
Gradient	1/3,000
Max. Velocity	0.95 m/s
Lining	10-cm thick concrete lining side slopes with stone wet masonry footing and compacted earth on bottom

5.4.5 Cost Estimate

Project cost has been estimated as summarized below.

Unit: Rp. 10^6

Item	Value
Construction Base Cost	507,371
Compensation Cost	29,335
Administration and Engineering Cost	77,573
Price Contingency	282,717
Physical Contingency	85,351
Sub-Total	982,347
Value Added Tax	98,235
Total	1,080,582

5.4.6 Project Evaluation

(1) Economic Benefit

The average annual benefit of each category is estimated as below.

Category	Average Annual Benefit (Rp. 10^6)
Flood Control	54,621
Irrigation	8,220
Hydropower Generation	87,906

(2) Economic Cost

The economic project cost is estimated at Rp. 613,636×10^6.

(3) Economic Evaluation

The project has been evaluated from the economic viewpoint in terms of Economic Internal Rate of Return (EIRR), Benefit-Cost Ratio (B/C) and Net Present Value (NPV) as summarized below. The opportunity cost of capital is assumed at 10% and applied to a discount rate for the calculation of B/C and NPV.

EIRR	15.27%
B/C	1.74
NPV	Rp. 256,670×10^6

Sensitivity analysis has been carried out for the project on several cases of changes in the benefit or cost, as summarized below.

CASE	EIRR (%)	B/C	NPV (Rp. 10^6)
Benefit, 5% down	14.79	1.66	228,947
Benefit, 10% down	14.23	1.58	198,742
Cost, 5% up	14.82	1.67	241,904
Cost, 10% up	14.33	1.59	224,657

(4) Financial Evaluation of Hydropower Generation

(a) Annual Revenue

By taking the produced energy of 583.4 GWh in 2005 and the unit price of revenue of Rp. 170/kWh into account, the annual revenue of the project has been estimated at Rp. $99{,}178\times10^6$.

(b) Financial Cost

Financial cost of the project is estimated as real expenses of the project owner. In other works, financial cost is estimated by market price including contractor's profit, price contingencies and value added tax.

(c) Financial Evaluation

To calculate the indicators of Financial Internal Rate of Return (FIRR), B/C and NPV of the project, the annual cost-benefit flow has been estimated as below based on the disbursement schedule.

FIRR	15.54%
B/C	2.22
NPV	Rp. $314{,}097\times10^6$

Sensitivity analysis has been carried out for the project on several cases of changes in the benefit or cost as summarized below.

CASE	FIRR (%)	B/C	NPV (Rp. 10^6)
Benefit, 5% down	14.32	1.98	268,425
Benefit, 10% down	13.76	1.87	239,815
Cost, 5% up	14.35	1.98	283,276
Cost, 10% up	13.87	1.89	269,518

5.5 Rengat Area Flood Protection Works

5.5.1 Planning Criteria

Purpose and Major Component of Project

The purpose of the project is to protect Rengat Area from flooding. Major components of the project are the ring dike and related structures.

Objective Area

The objective area for flood control has been determined based on the Detailed City Layout Plan of Rengat as well as considering the discussion with PU officials.

Design Scale

Design scale of 10-year return period is applied for flood control in the area since this area is considered as urban area. The design scale for the interior drainage is determined at 5-year return period.

Design High Water Level and Design Discharge

Design high water level for the design scale of 10-year return period has been determined. The highest flood water level at the pier of Rengat City when the 10-year return period flood flows is EL 7.0 m. The design discharge of the Indragiri River is obtained from H-Q curve at Q = 2,850 m^3/s.

5.5.2 Alignment of Ring Dike

The alignment of ring dike is as shown in Fig. S.5.5. The alignment has been determined to follow the Indragiri River Improvement Plan in the Overall Development Plan in the riverside, considering the existing road alignment and the possible new road to Tembilahan in the land side.

5.5.3 Optimization Study for Interior Drainage

The proposed alignment of the ring dike will cross the existing drainage channels and create an interior drainage problem. A pumping station is thus required to discharge the interior water over the dike during floods.

(1) Design Scale

The design scale has been determined at 5-year return period.

(2) Retarding Basin

A retarding basin has been taken into consideration at the downstream part of the interior drainage area to minimize the capacity of the pump. The area of the retarding basin is 20 ha.

(3) Optimum Capacity of Drainage Pump

The optimum capacity of the interior drainage pump has been decided at 3.0 m^3/s through the comparative study.

5.5.4 Preliminary Design of Proposed Facilities

(1) Ring Dike

Ring dike is designed in accordance with the design criteria of DPU, as follows:

Freeboard	1.2 m
Crown Width	3.0 m
Side Slope	1 : 2.0 (V : H)

(2) Other Structures

Control gates, bridges and sluices are designed as structures related to the ring dike.

(3) Drainage Pumping Station

The drainage pump is designed as follows:

Location	Eastern end of Ring Dike
Pump Capacity	1.0 m^3/s x 3 units
Total Head	3.5 m
Pump Type	Submersible pump
Diameter	700 mm

5.5.5 Cost Estimate

Project cost has been estimated as summarized below.

Unit: Rp. 10^6

Item	Value
Construction Base Cost	28,817
Compensation Cost	280
Administration and Engineering Cost	4,336
Price Contingency	8,568
Physical Contingency	4,006
Sub-Total	46,007
Value Added Tax	4,601
Total	50,608

5.5.6 Project Evaluation

(1) Economic Benefit

The annual average benefit is estimated at Rp. $5,044 \times 10^6$.

(2) Economic Cost

The economic project cost is estimated at Rp. $32,851 \times 10^6$.

(3) Economic Evaluation

The project has been evaluated from the economic viewpoint in terms of Economic Internal Rate of Return (EIRR), Benefit-Cost Ratio (B/C) and Net

Present Value (NPV) as below. The opportunity cost of capital is assumed at 10% and applied to a discount rate for the calculation of B/C and NPV.

EIRR	11.00%
B/C	1.11
NPV	Rp. 2,815×10^6

Sensitivity analysis has been carried out for the project on several cases of changes in the benefit or cost, as summarized below.

CASE	EIRR (%)	B/C	NPV (Rp. 10^6)
Benefit, 5% down	10.52	1.06	1,444
Benefit, 10% down	10.03	1.00	72
Cost, 5% up	10.54	1.06	1,584
Cost, 10% up	10.12	1.01	354

5.6 Evaluation of All Priority Projects

An integrated economic evaluation is conducted for all priority projects in the Feasibility Study. By this evaluation, the final judgment of feasibility is made possible for all projects.

The EIRR as well as B/C and NPV for project is calculated on the annual cost-benefit flow. The opportunity cost of capital is considered to be 10% in the project. Then, the discount rate 10% is applied for the calculation of B/C and NPV. The economic viability is as follows:

EIRR	13.59%
B/C	1.46
NPV	Rp. 263,182×10^6

Sensitivity analysis is carried out for the project on several cases of changes in the benefit or cost as summarized below.

CASE	EIRR (%)	B/C	NPV (Rp. 10^6)
Benefit, 5% down	13.15	1.40	226,349
Benefit, 10% down	12.60	1.33	184,796
Cost, 5% up	13.17	1.41	239,744
Cost, 10% up	12.70	1.34	211,586

6 ENVIRONMENTAL STUDY

6.1 Components of Environmental Study

The implementation of projects may cause certain environmental impacts. In accordance with Government Regulation PP No. 51, 1993, therefore, the Environmental Impact Assessment (AMDAL) shall be conducted before project implementation. AMDAL shall include the Environmental Impact Analysis (ANDAL), the Environmental Management Plan (RKL) and the Environmental Monitoring Plan (RPL).

6.2 Objectives of AMDAL Study

The objectives of the AMDAL study are as follows:

ANDAL Study

The general objectives of the ANDAL study are as follows:

- To identify the major activities of the project which may potentially cause serious impacts against the environment;
- To identify the components of life environment which may be subjected to the impacts;
- To estimate the extent, intensity, quality of impacts, and its significance based on agreed criteria; and
- To use the results for deciding project implementation;
- To integrate the balance between each plan of project activity and environments; and

- To formulate the Environmental Management Plan (RKL) and the Environmental Monitoring Plan (RPL) with due consideration on the results of the ANDAL study.

RKL

The objectives of RKL are as follows:

- To conserve the environment of the project area by effective and efficient ways;
- To find out ways to solve negative impacts as well as to optimize positive impacts; and
- To decide on relevant agencies to be responsible for the management of environment impacts as identified in ANDAL.

RPL

The objectives of RPL are as follows:

- To evaluate and control the efforts of environmental management;
- To make the development effective and efficient;
- To complete the development plan; and
- To determine the relevant agencies responsible for the monitoring of environment, the location and time of monitoring.

6.3 Environmental Impact Analysis (ANDAL)

ANDAL study has been carried out for the proposed priority projects and concluded as follows:

(1) Kampar River Basin

In the Kampar river basin, the Kuok Intake Weir, the Rantauberangin Irrigation Canal and the Bangkinang Area River Improvement Works have been proposed as priority projects. The ANDAL study for priority projects concluded that the construction of facilities proposed in these priority projects will not present any serious damage to the natural and social environments.

(a) Land Acquisition and House Evacuation

The area of land acquisition for priority projects in the Kampar river basin is 417 ha and the number of house evacuation is 730 units. According to the interview survey, there is no strong objection among the inhabitants in the project site. Therefore, land acquisition and house evacuation can proceed with reasonable compensation for inhabitants' losses and assurance of firm countermeasures for the resettlement of people.

(b) Natural Environment

Impacts on the natural environment by the construction of proposed facilities are judged to be little.

(c) Social Environment

No important historical assets and cultural properties were found in the project area.

(2) Indragiri River Basin

In the Indragiri river basin, the Kuantan Dam, the Lubukjambi Intake Weir and Irrigation Canal, and the Rengat Area Flood Protection Works are proposed as priority projects. It was concluded through the ANDAL study that among them, the Lubukjambi Intake Weir and Irrigation Canal and the Rengat Area Flood Protection Works will not bring any serious impact on the social and natural environments. However, construction of the Kuantan Dam will bring negative impacts to people living in the reservoir area who have to be evacuated, as well as the terrestrial and aquatic fauna and flora.

(a) Land Acquisition and House Evacuation

The area of land acquisition for priority projects in the Indragiri river basin is 2,740 ha and the number of house evacuation is 1,720 units. Therefore, land acquisition and evacuation of inhabitants can be conducted with reasonable compensation and provision of

countermeasures for the resettlement of people to assure livelihood measures and income after evacuation.

(b) Terrestrial Fauna

Terrestrial large mammals are distributed in the reservoir area, including 19 protected species such as tigers, tapir and bear. However, large mammals are considered to be able to escape from the reservoir area following the water level rising, and extermination of these species is considered not to take place.

(c) Aquatic Fauna

A protected species of Patin Kunyit is found in the Indragiri River except in the upper reaches from the damsite. Therefore, construction of the dam will not affect this protected species.

(d) Other Flora and Fauna

Serious negative impacts on the other flora and fauna was not identified with the construction of the dam.

(e) Other Environmental Impacts

Although negative impacts to air and water quality, public health, and historical assets and cultural properties are expected, such impacts are considered to be small, and construction of the dam will not bring any serious damage to these factors.

6.4 Preparation of Environmental Management Plan (RKL)

(1) Serious Impacts to be Managed

The ANDAL study has concluded that the implementation of priority projects will not cause any serious impacts on the natural environment. However, implementation will cause serious social impacts by the evacuation of inhabitants from the projects sites. The number of inhabitants to be evacuated

from the Kuantan Reservoir is, particularly, the largest. Therefore, the preparation of a resettlement area is the most important matter in the RKL.

(2) Possible Site for Resettlement

The following three sites have been identified as alternative resettlement areas for inhabitants to be evacuated:

- The first alternative is located at about 5 km southeast of the UPT Timpeh V transmigration resettlement area in Tanjung Gadang District. This is flat with an area of 45 km^2 and suitable for agricultural use. It is possible for all people (8,187 persons) in the reservoir area to move into this area. The West Sumatra Office of the Ministry of Transmigration also has a plan to expand the Timpeh V resettlement area to that place.
- The second alternative is located in the vicinity of Kunangan Village, near the reservoir area, around 7 km southwest of Batangkaring Village, also in Tanjung Gadang District. The place is somewhat undulated and near the concession of coal mining. Access to the Trans-Sumatra road is convenient.
- The third alternative is located 22 km eastward from the UPT Timpeh V transmigration resettlement area, between Tanjung-kambing Hill and Jao Village, very near the provincial boundary in Kota Baru District. The place is flat and suitable for agricultural use.

(3) Management after Resettlement

Living conditions and income level of evacuated inhabitants shall be maintained by providing necessary facilities and infrastructures in resettlement areas.

(4) Implementation of RKL

The following items are taken into consideration to implement the RKL:

- Managing Institution
- Structure, Scope and Work System of the Organization

- Funds
- Supervision of Environmental Management Implementation

6.5 Preparation of Environmental Monitoring Plan (RPL)

The purpose of the RPL is to supervise and monitor the implementation of RKL in each activity at each project stage. Results of monitoring by institutions shall be submitted to related agencies or institutions for getting feedback. The environmental monitoring shall be made by reporting, supervision, monitoring and unexpected inspections as follows:

(1) Reporting

The reporting shall cover the notification on the schedule of project activities and implementation, compensation, monitoring and other relevant information, as well as minutes of meetings on the approval of designated activities. Periodical reports (daily, weekly or monthly) on supervision activities shall be prepared and submitted.

(2) Supervision

The supervision shall cover supervision on:

- Implementation of land acquisition;
- Implementation of irrigation system and dike as well as non-physical works which are assumed to have a potential to cause impacts;
- Implementation measure for air quality and noise;
- Operation of irrigation channel, application of cropping pattern and water allocation; and,
- Reforestation of critical land areas.

(3) Monitoring

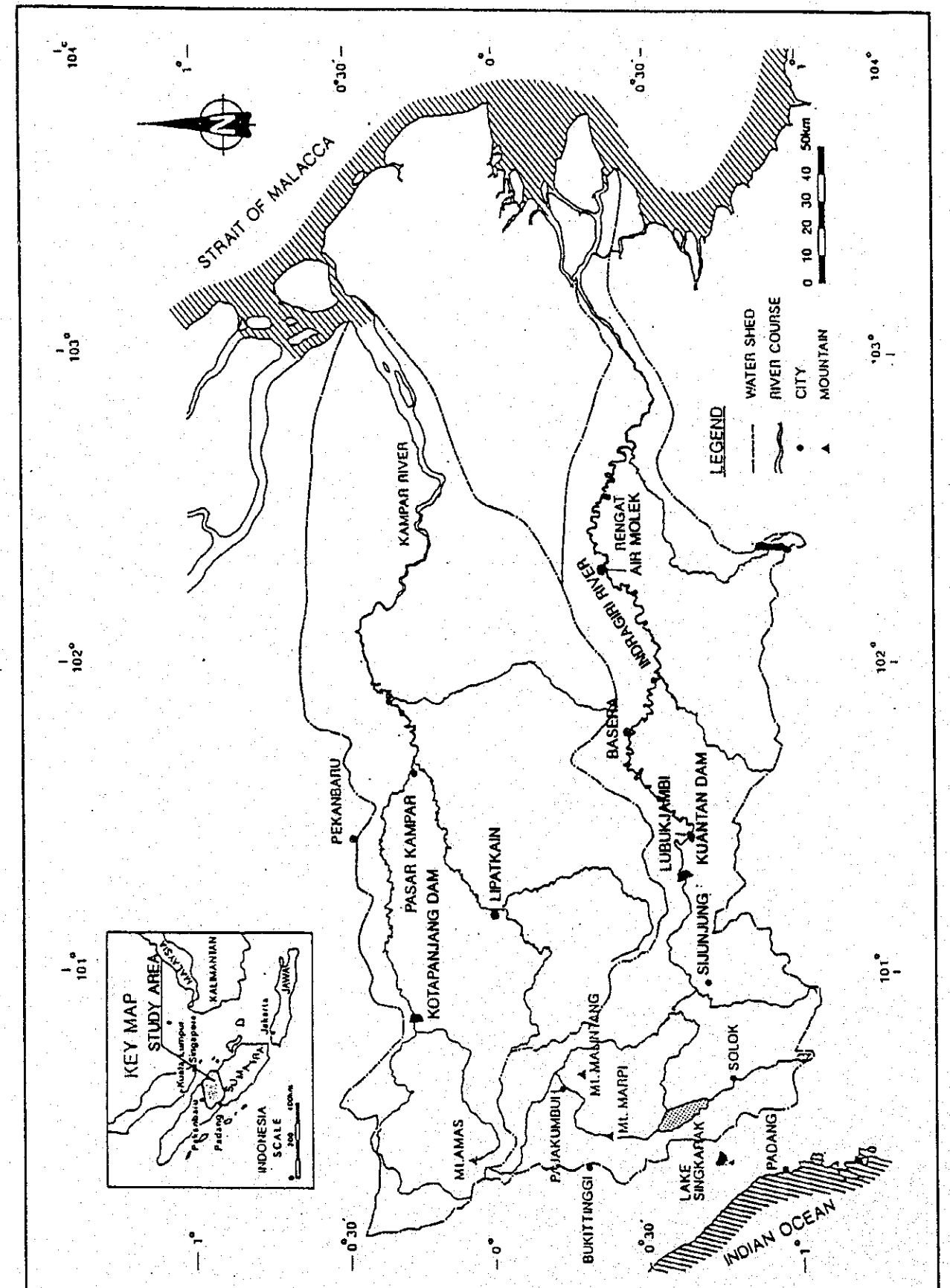
Monitoring shall cover the evaluation of environmental management being implemented to examine whether it is appropriate or recommendable to implement field monitoring of environment factors affected by impacts, and periodical sampling for laboratory study.

(4) Unexpected Inspection

Unexpected inspection is to inspect the actual work implementation unexpectedly, particularly when a deviation in the environmental management implementation is indicated.

FIGURES

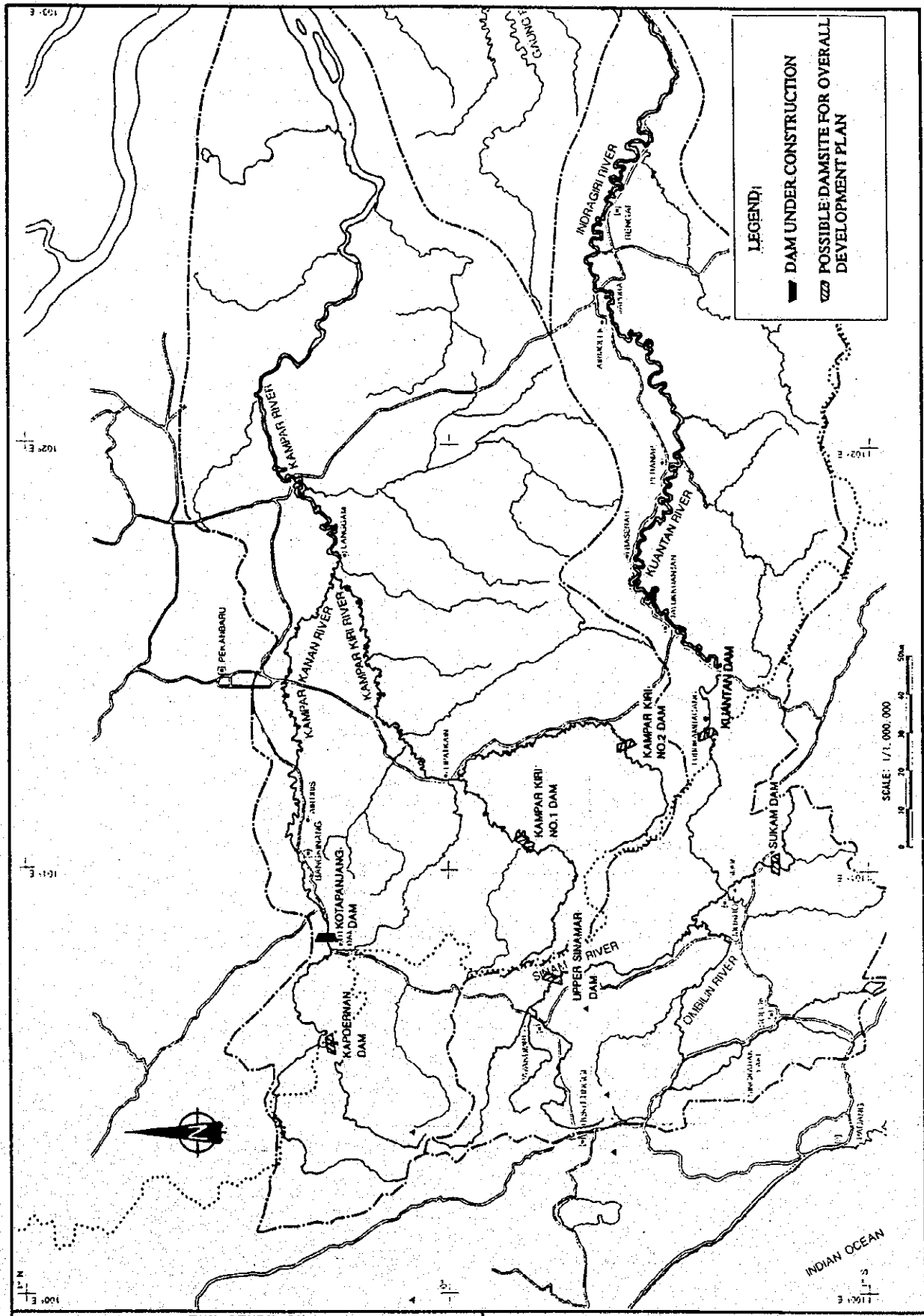
VOLUME 1 SUMMARY



THE STUDY ON
KAMPAR-INDRAGIRI RIVER BASIN DEVELOPMENT PROJECT
IN THE REPUBLIC OF INDONESIA

JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. S.1.1 STUDY AREA



THE STUDY ON
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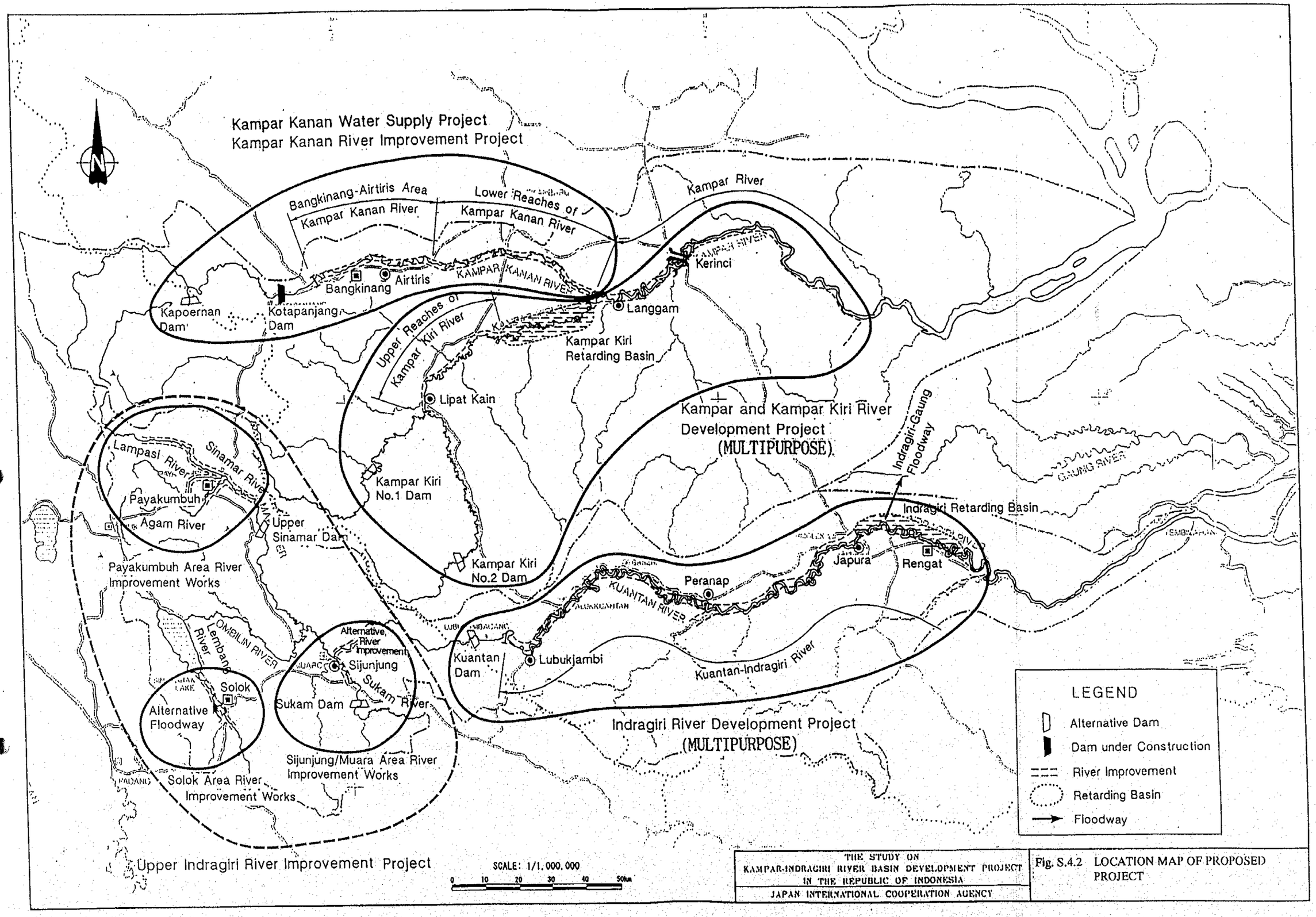
IN THE REPUBLIC OF INDONESIA

JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. S.4.1 LOCATION OF POSSIBLE DAMSITES



THE STUDY ON KAMPAR-INDRAGIRI RIVER BASIN DEVELOPMENT PROJECT IN THE REPUBLIC OF INDONESIA JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. S.4.2 LOCATION MAP OF PROPOSED PROJECT

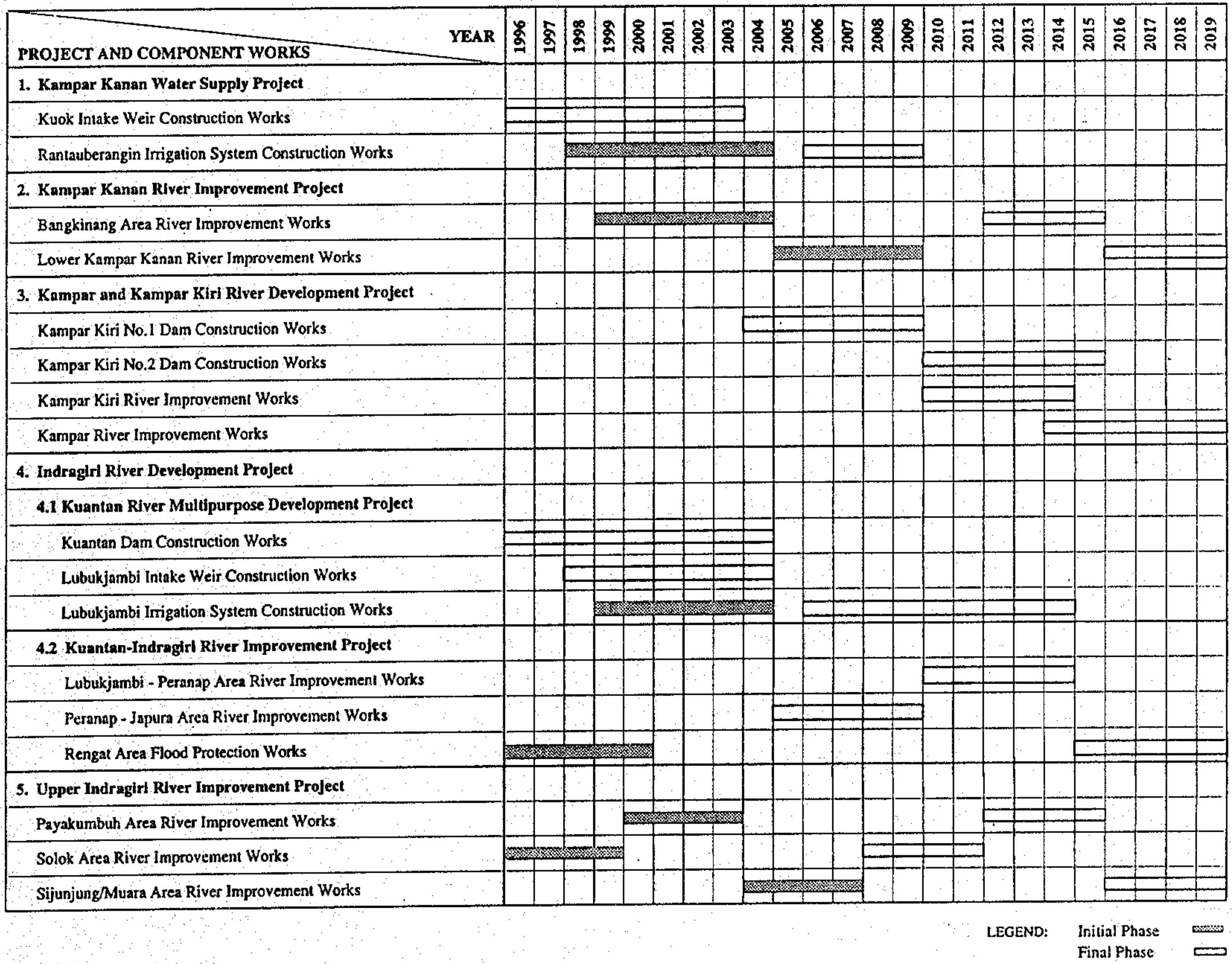


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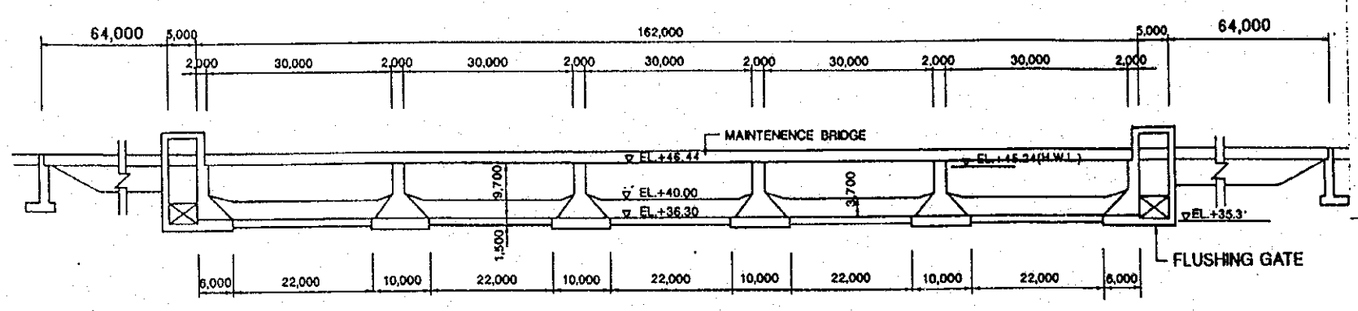
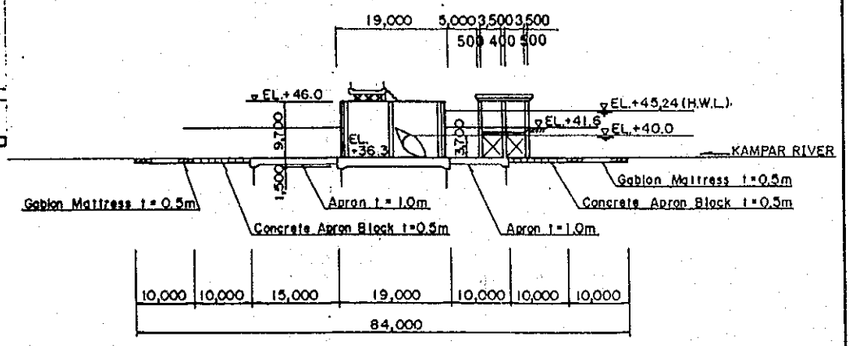
Fig. S.4.3 IMPLEMENTATION SCHEDULE FOR OVERALL DEVELOPMENT PLAN

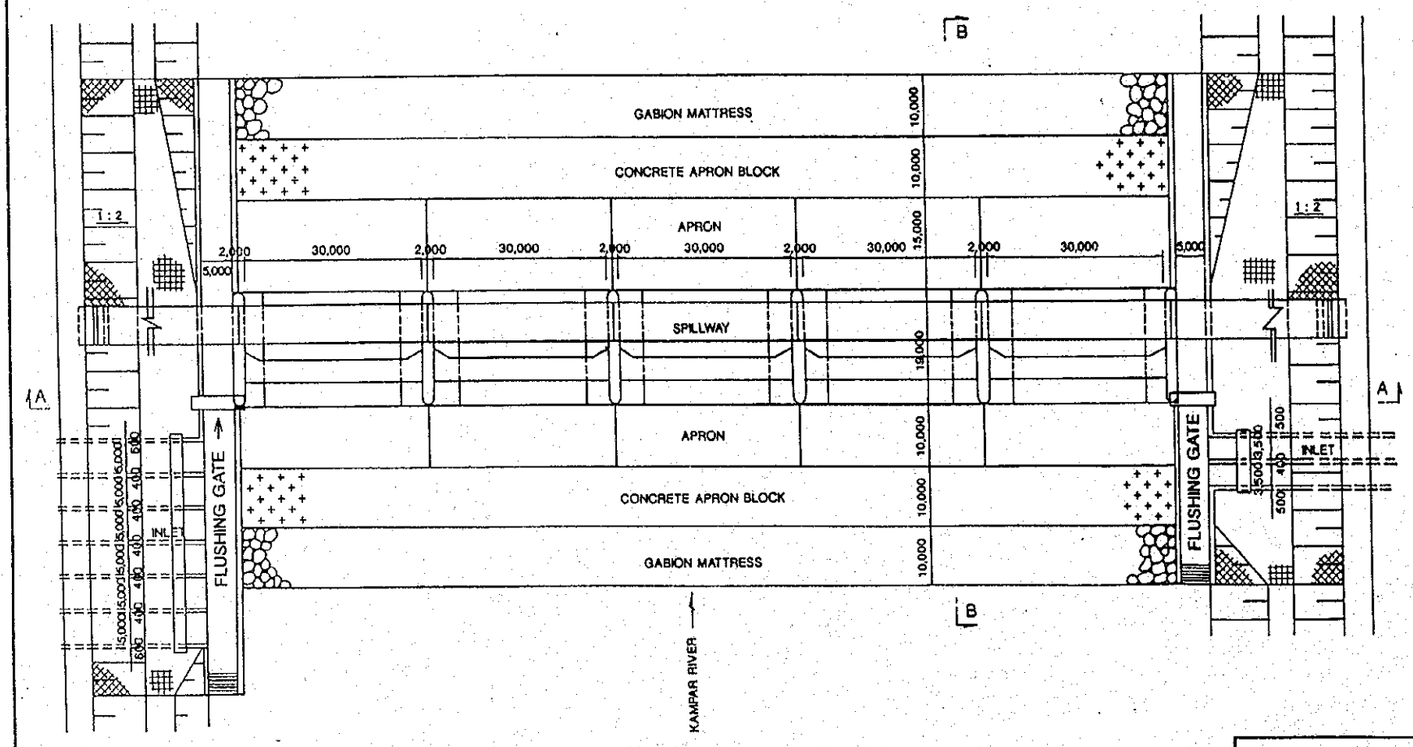
SECTION A - A



SECTION B - B



PLAN

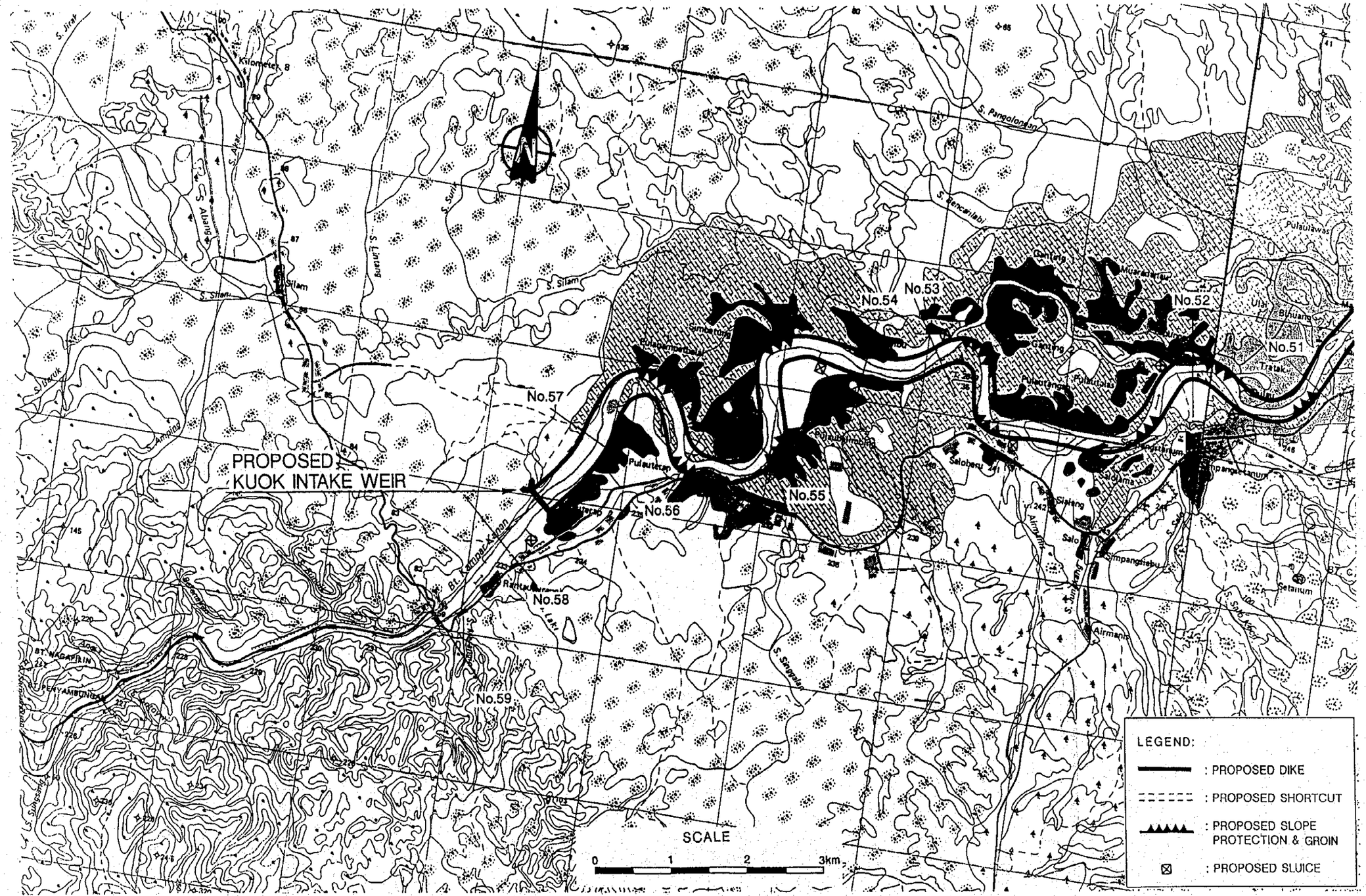


SCALE: 1/1,000

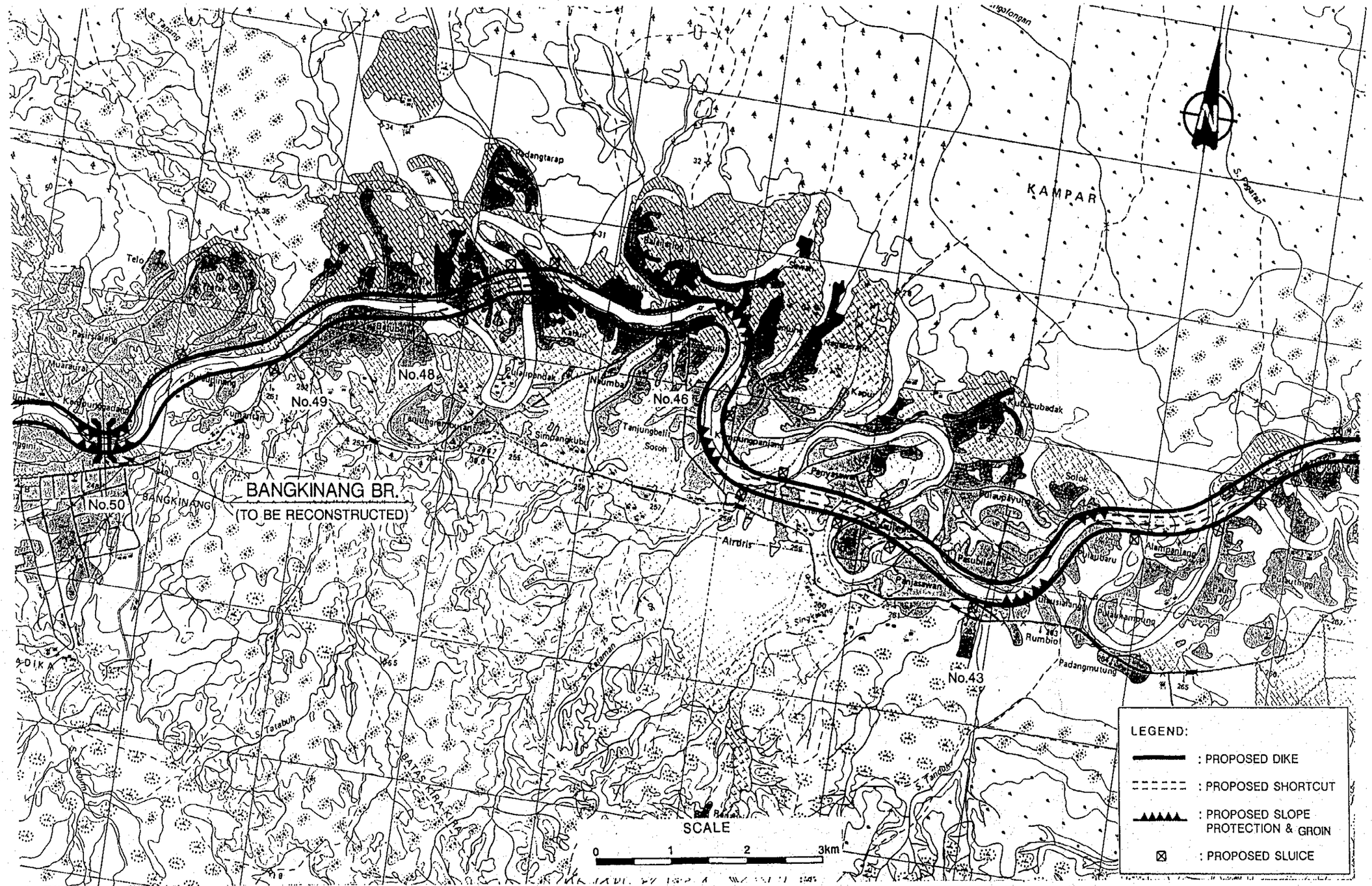
0 10 20 30 40 50m

(UNIT : m)

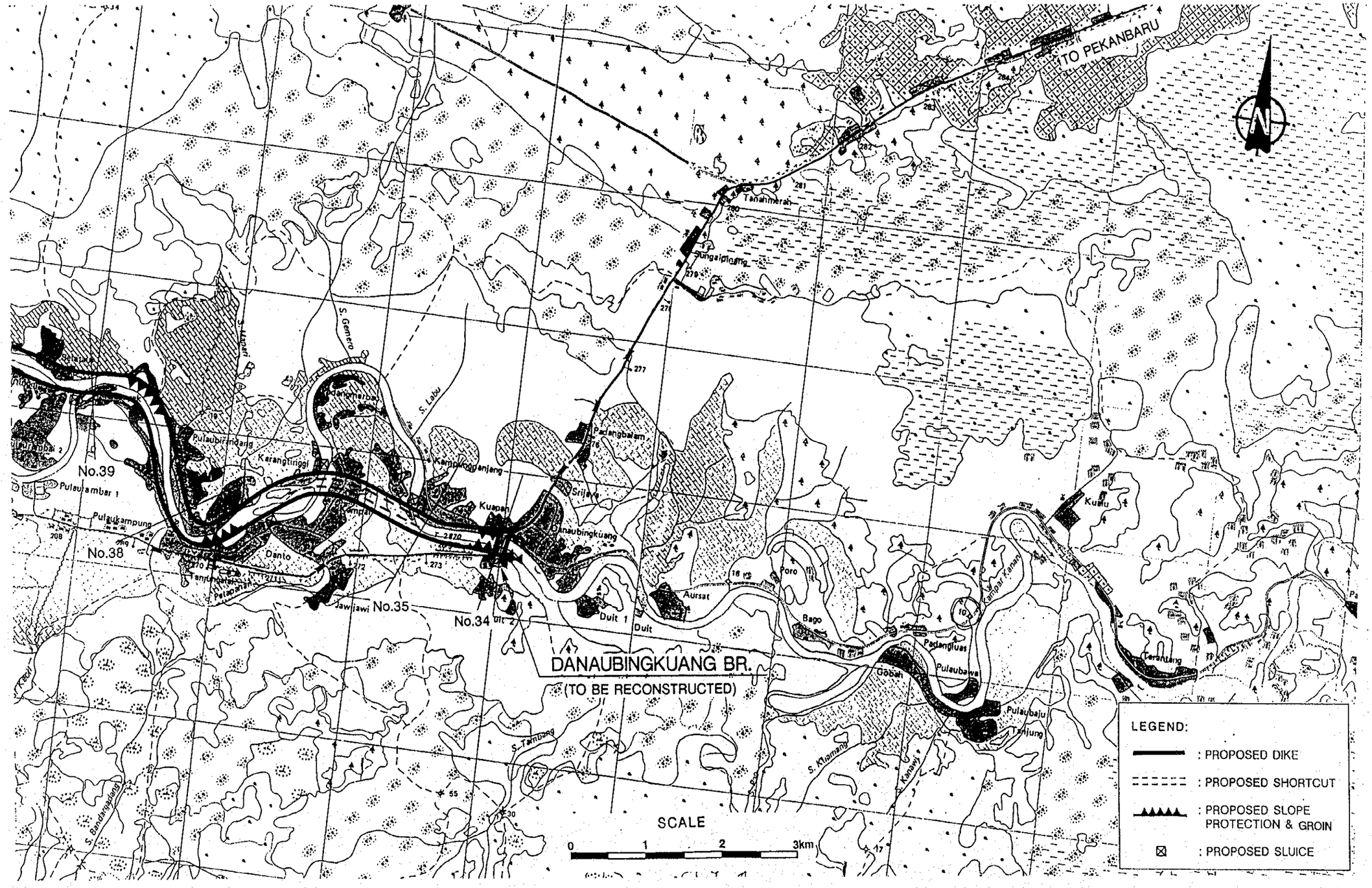
THE STUDY ON KAMPAR-INDRAGIRI RIVER BASIN DEVELOPMENT PROJECT IN THE REPUBLIC OF INDONESIA JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. S.5.1 PROPOSED KUOK INTAKE WEIR STRUCTURES



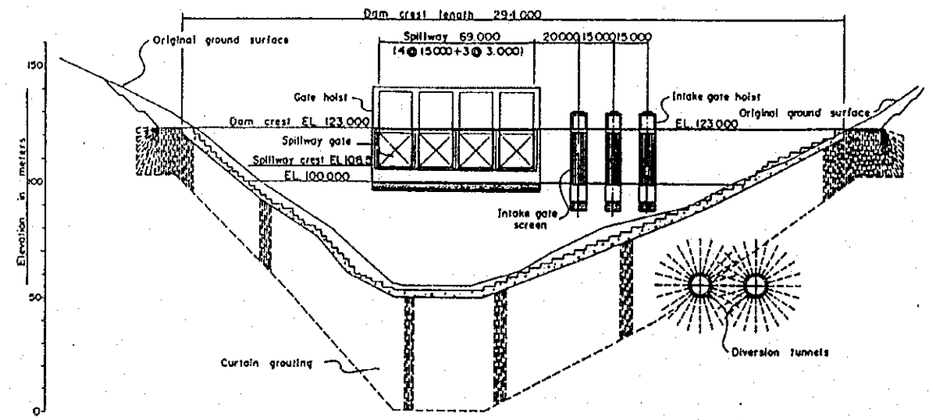
THE STUDY ON KAMPAR-INDRAGIRI RIVER BASIN DEVELOPMENT PROJECT IN THE REPUBLIC OF INDONESIA JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. S.5.2 (1/3) PROPOSED PLAN (INTAKE PHASE) OF RIVER IMPROVEMENT FOR KAMPAR KANAN RIVER (BANGKINANG AREA)



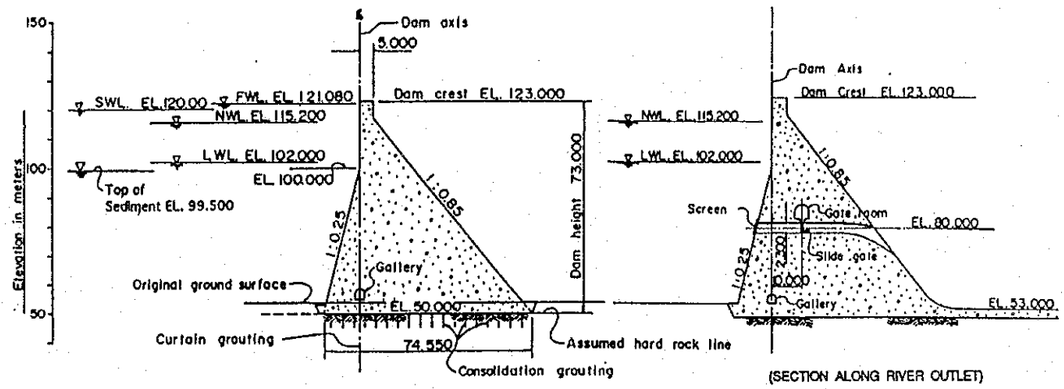
THE STUDY ON KAMPAR-INDRAGIRI RIVER BASIN DEVELOPMENT PROJECT IN THE REPUBLIC OF INDONESIA JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. S.5.2 (2/3) PROPOSED PLAN (INTAKE PHASE) OF RIVER IMPROVEMENT FOR KAMPAR KANAN RIVER (BANGKINANG AREA)



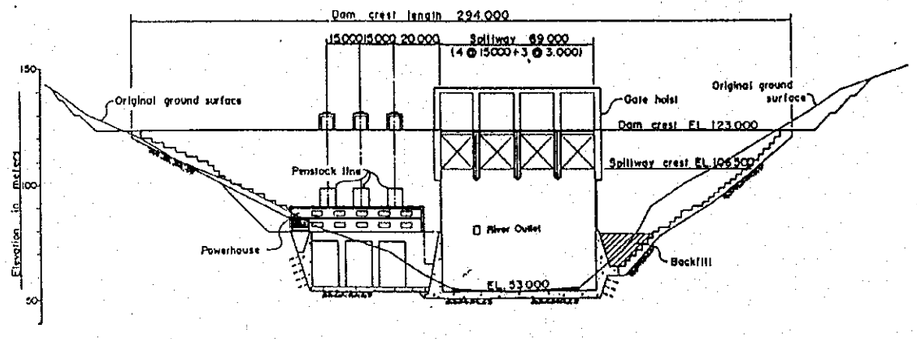
THE STUDY ON KAMPAR-INDRAGIRI RIVER BASIN DEVELOPMENT PROJECT IN THE REPUBLIC OF INDONESIA JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. S.5.2 (3/3) PROPOSED PLAN (INTAKE PHASE) OF RIVER IMPROVEMENT FOR KAMPAR KANAN RIVER (BANGKINANG AREA)



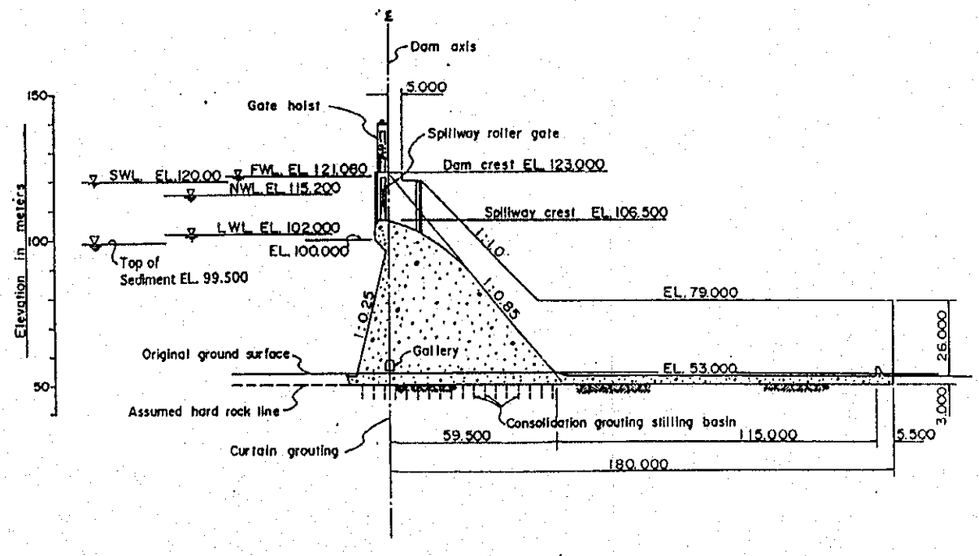
UPSTREAM ELEVATION



TYPICAL NON-OVERFLOW SECTION



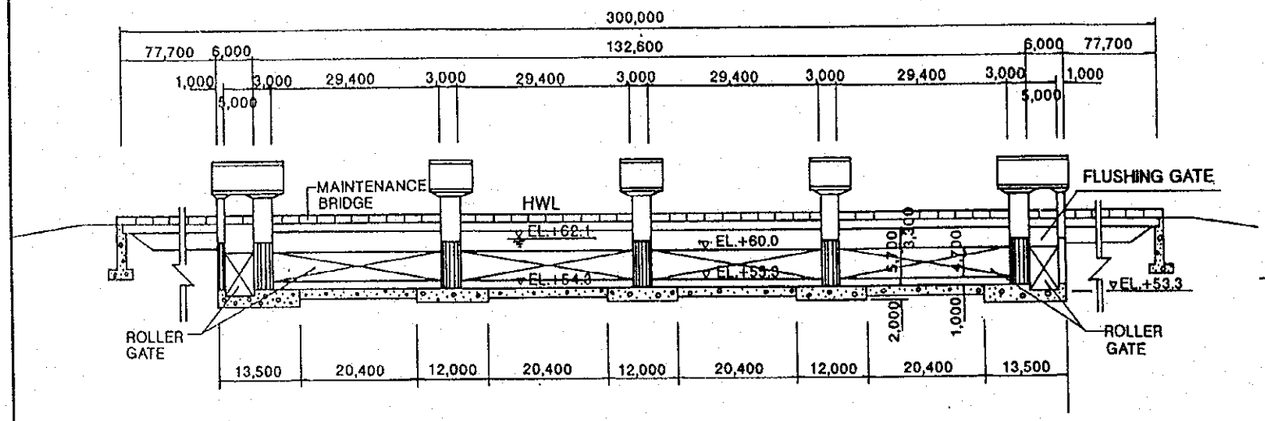
DOWNSTREAM ELEVATION



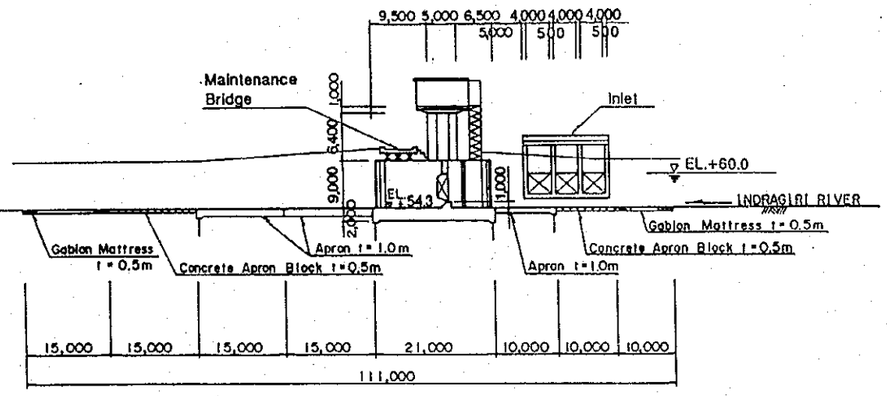
TYPICAL OVERFLOW SECTION

THE STUDY ON KAMPAR-INDRAGIRI RIVER BASIN DEVELOPMENT PROJECT IN THE REPUBLIC OF INDONESIA JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. S.5.3 PRELIMINARY DESIGN OF KUANTAN DAM (DAM PROFILE AND CROSS SECTION)

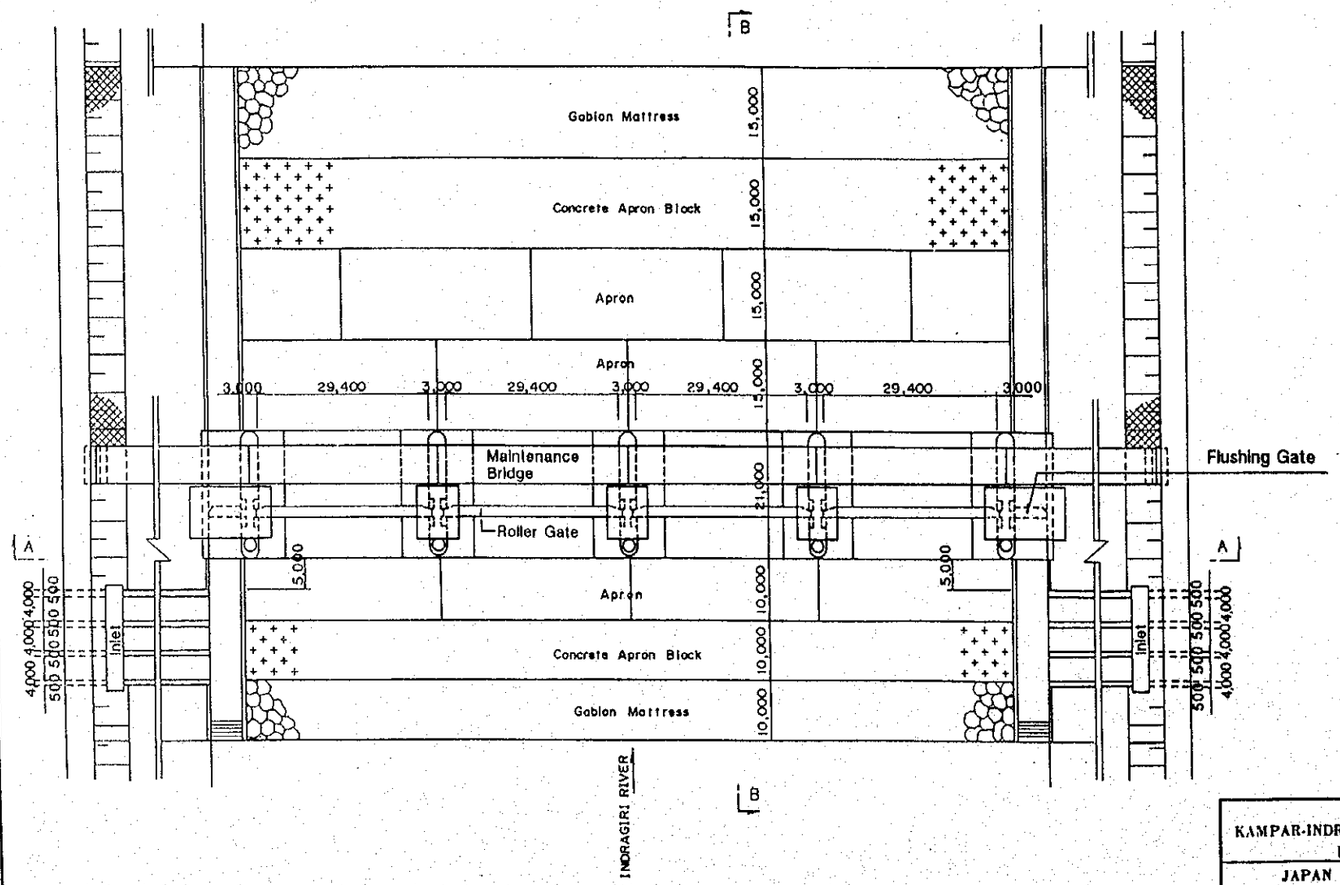
SECTION A - A



SECTION B-B



PLAN

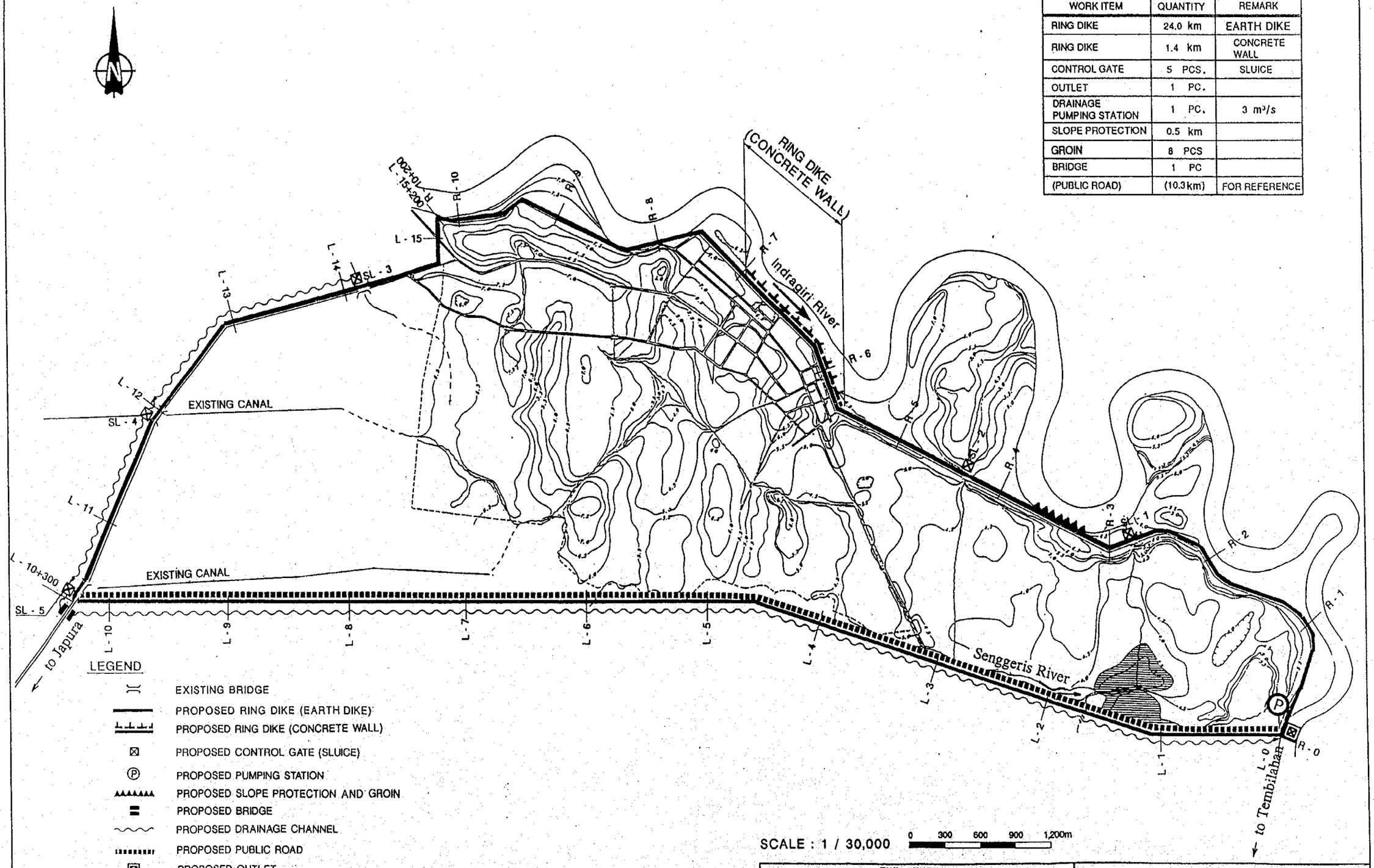


(UNIT : m)

THE STUDY ON KAMPAR-INDRAGIRI RIVER BASIN DEVELOPMENT PROJECT IN THE REPUBLIC OF INDONESIA JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. S.5.4 PROPOSED LUBUKJAMBI INTAKE WEIR STRUCTURES

PROPOSED STURUCTURES

WORK ITEM	QUANTITY	REMARK
RING DIKE	24.0 km	EARTH DIKE
RING DIKE	1.4 km	CONCRETE WALL
CONTROL GATE	5 PCS.	SLUICE
OUTLET	1 PC.	
DRAINAGE PUMPING STATION	1 PC.	3 m³/s
SLOPE PROTECTION	0.5 km	
GROIN	8 PCS	
BRIDGE	1 PC	
(PUBLIC ROAD)	(10.3km)	FOR REFERENCE



THE STUDY ON KAMPAR-INDRAGIRI RIVER BASIN DEVELOPMENT PROJECT IN THE REPUBLIC OF INDONESIA	Fig. S.5.5 PROPOSED PLAN (INITIAL PLAN) OF FLOOD CONTROL FACILITIES FOR RENGAT AREA
JAPAN INTERNATIONAL COOPERATION AGENCY