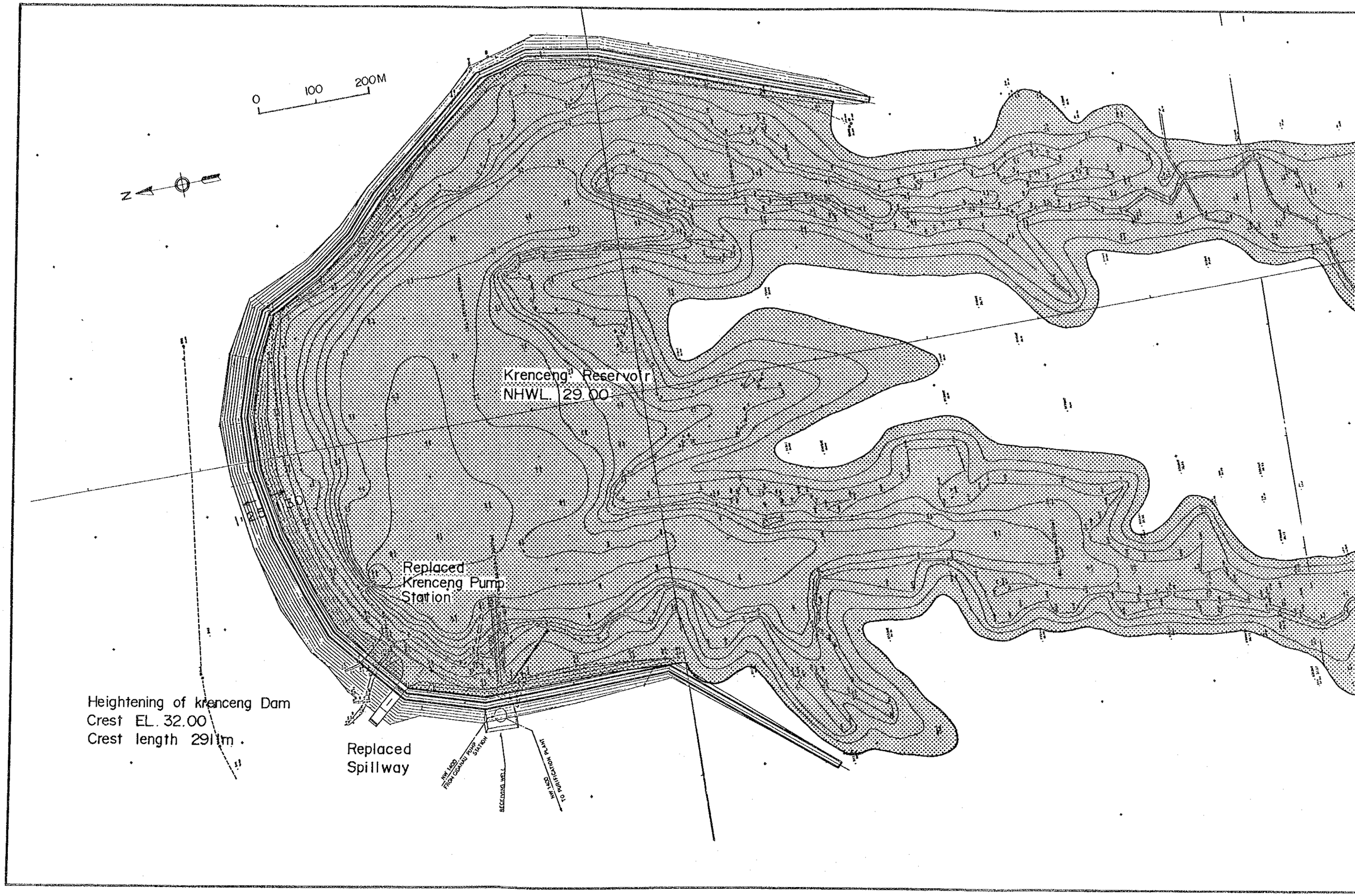
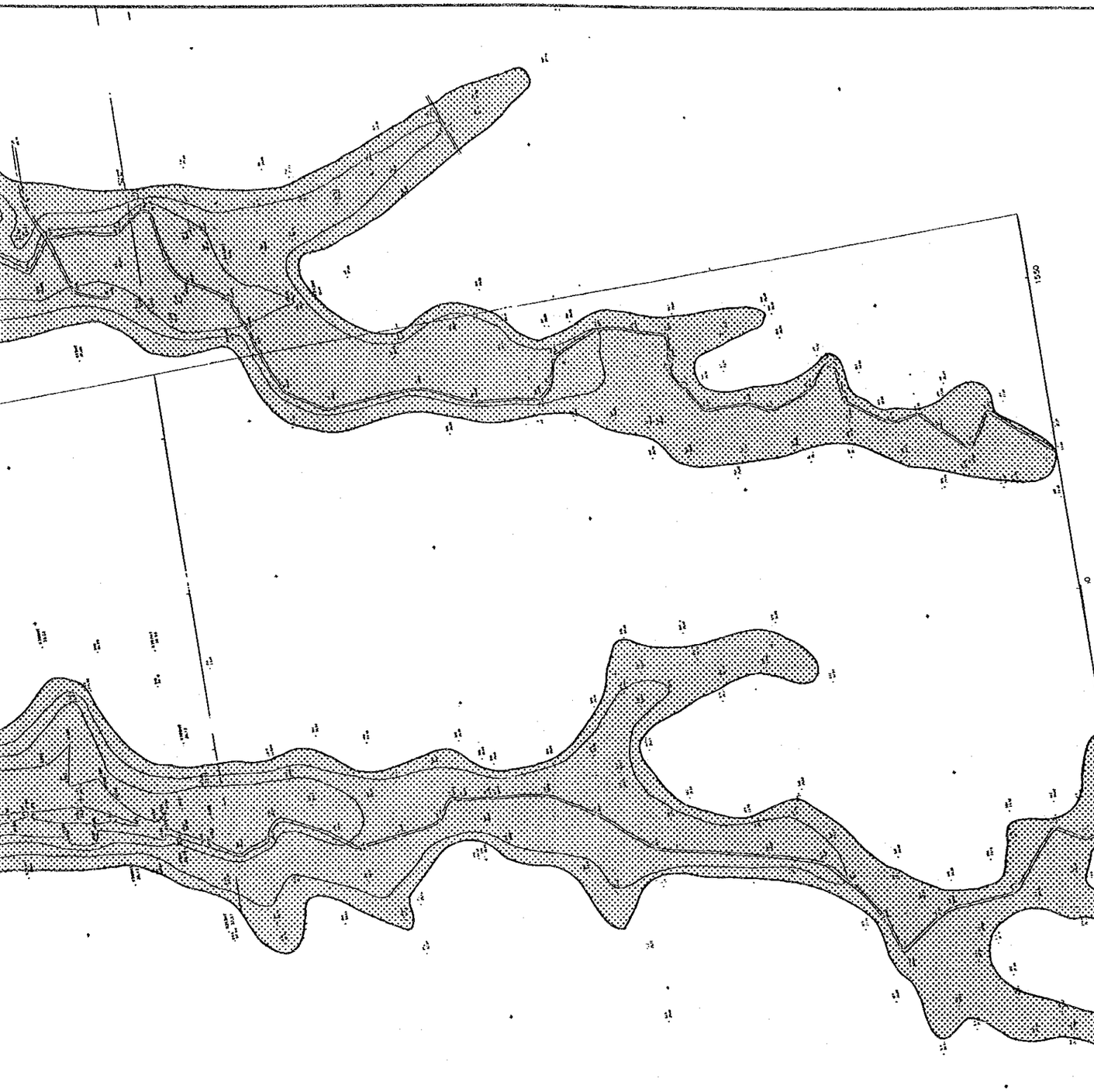
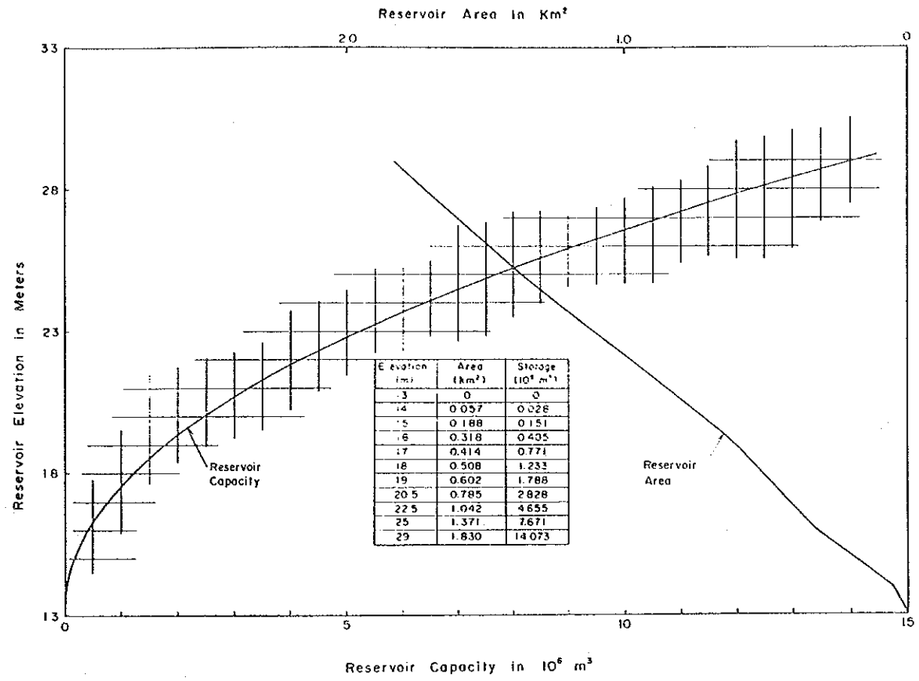

0 100 200M
N
Krenceng Reservoir
NHWL. 29.00
Replaced
Krenceng Pump
Station
Heightening of krenceng Dam
Crest EL. 32.00
Crest length 291m.
Replaced
Spillway
NW LOOP FROM CIGADUG PUMP STATION
TUNNEL
NW LOOP TO PURIFICATION PLANT

Fig. G-15





Elevation (m)	Area (km²)	Storage (10⁶ m³)
13	0	0
14	0.057	0.028
15	0.188	0.151
16	0.318	0.405
17	0.414	0.771
18	0.508	1.233
19	0.602	1.788
20.5	0.785	2.828
22.5	1.042	4.655
25	1.371	7.671
29	1.830	14.073

Modified Area - Storage Curves for Krenceng Dam Site

General Plan of Proposed Heightening of Krenceng Dam and Its Reservoir

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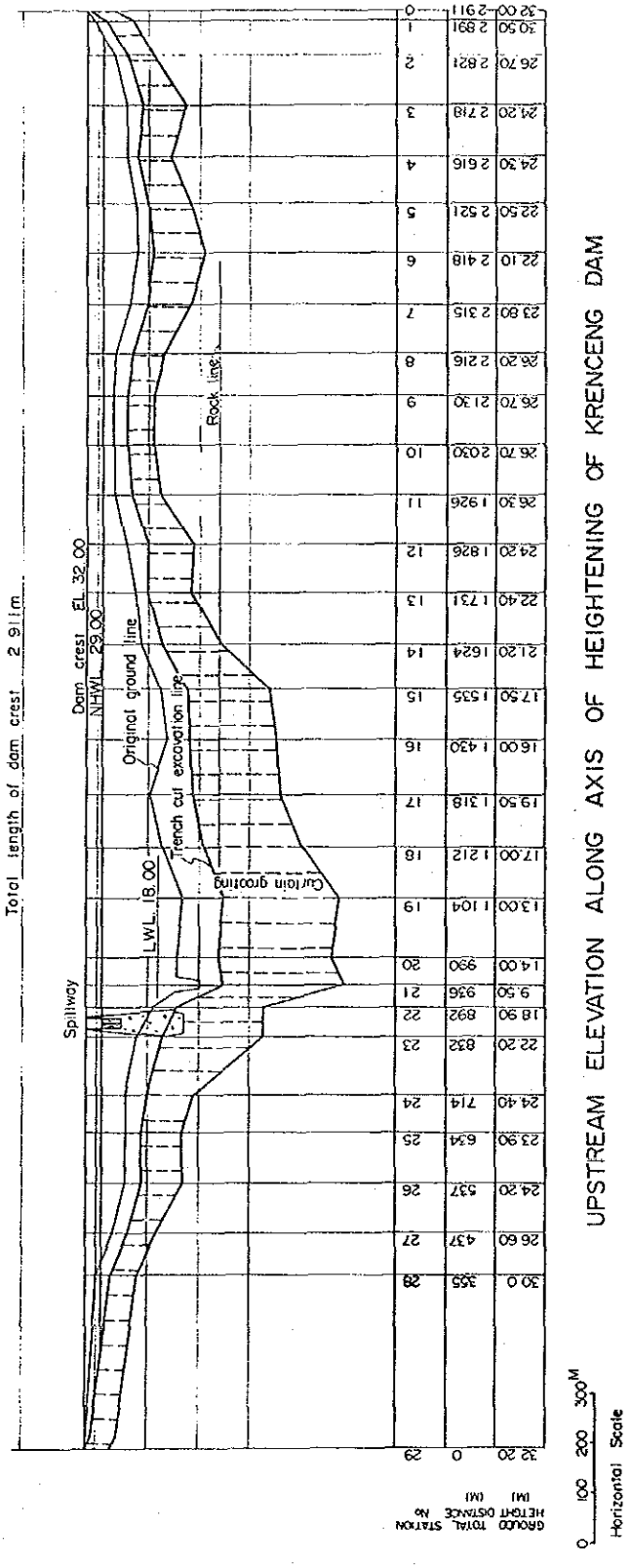
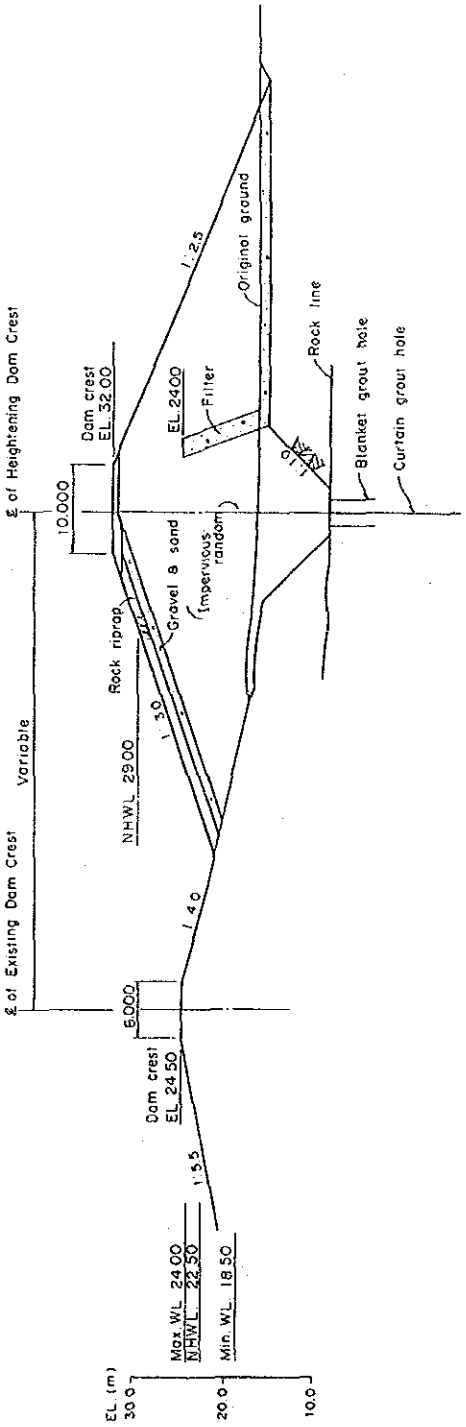
DIRECTORATE GENERAL OF WATER RESOURCES DEVELOPMENT
FEASIBILITY STUDY ON CIDANAU - CIBANTEN
WATER RESOURCES DEVELOPMENT PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. G-16



UPSTREAM ELEVATION ALONG AXIS OF HEIGHTENING OF KRENCENG DAM



PROFILE OF HEIGHTENING DAM

Horizontal Scale
0 100 200 300M

Profile and Section of Proposed Heightening of Krenceng Dam

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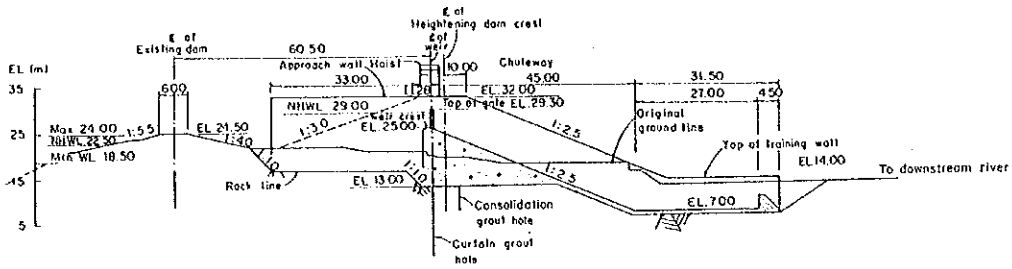
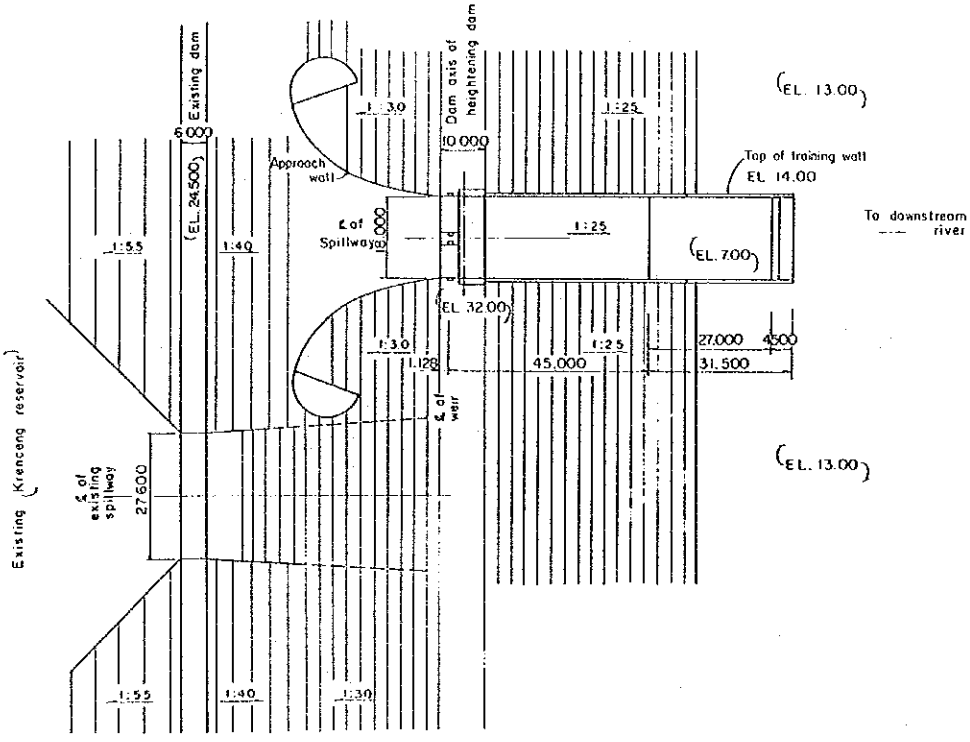
DIRECTORATE GENERAL OF WATER RESOURCES DEVELOPMENT
FEASIBILITY STUDY ON CIDANAU-CIBANTEN WATER RESOURCES DEVELOPMENT PROJECT

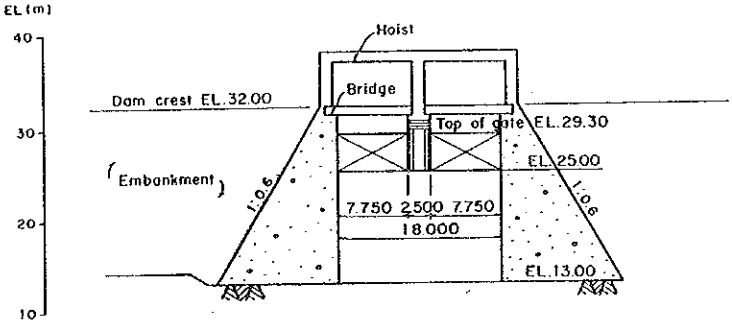
JAPAN INTERNATIONAL COOPERATION AGENCY



PROFILE OF SPILLWAY



PLAN OF SPILLWAY



UPSTREAM VIEW OF SPILLWAY

Plan, Profile and Section of Spillway for Proposed Heightening of Krenceng Dam

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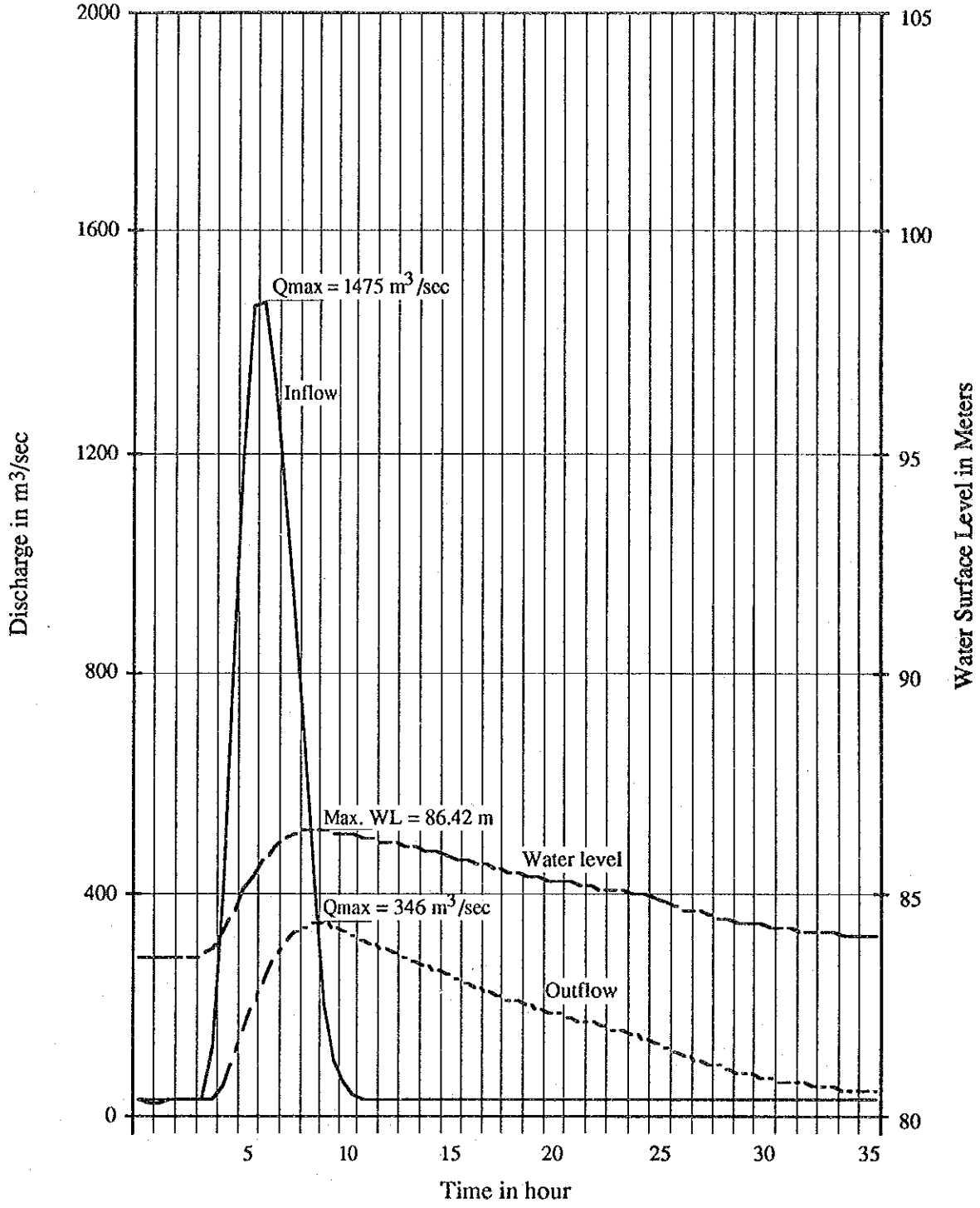
FEASIBILITY STUDY ON CIDANAU-CIBANTEN WATER RESOURCES DEVELOPMENT PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. G-18



Outflow Hydrograph for 25-years Probable Flood at Kubang Baros

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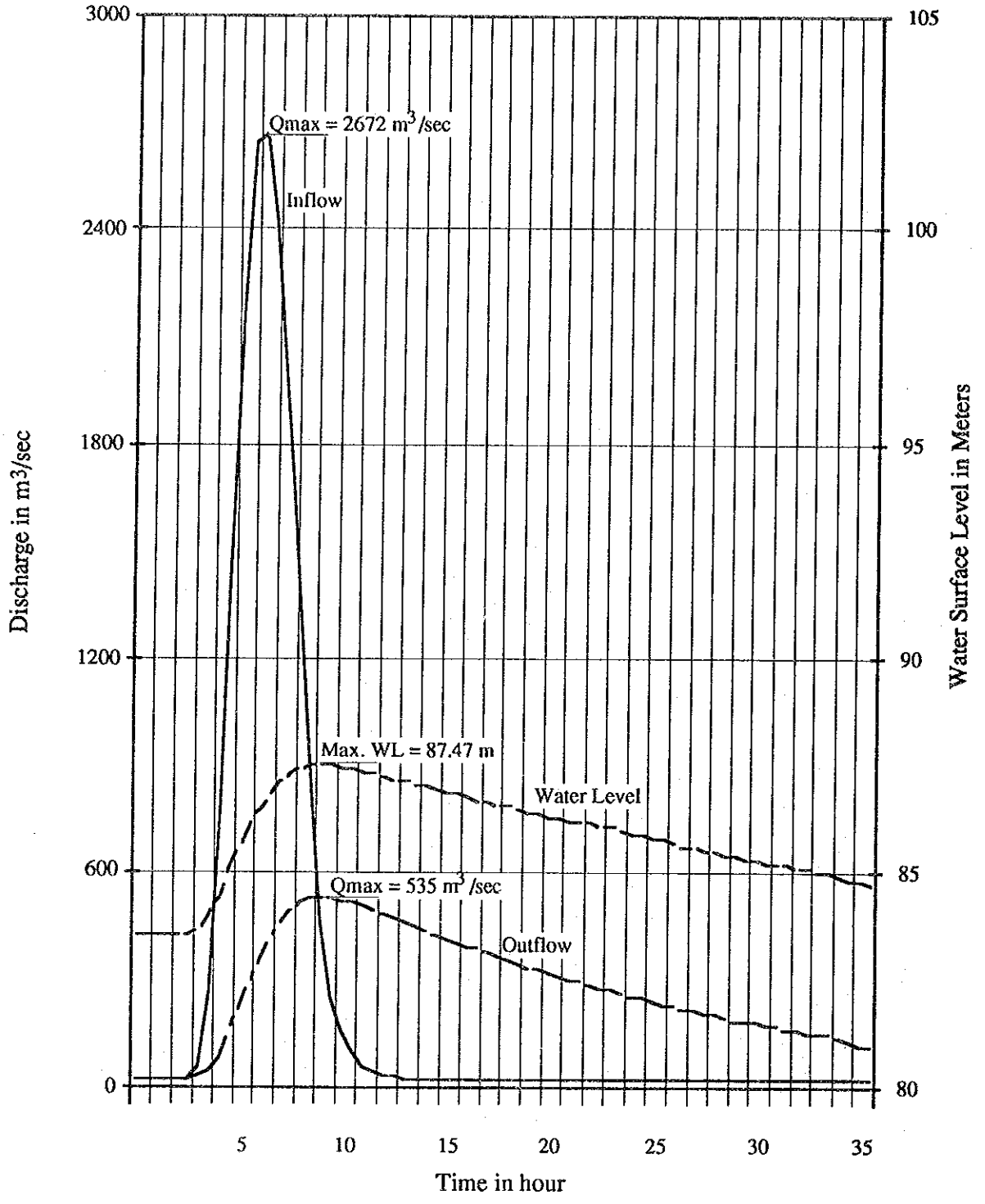
DIRECTORATE GENERAL OF WATER RESOURCES DEVELOPMENT
FEASIBILITY STUDY ON CIDANAU-CIBANTEN
WATER RESOURCES DEVELOPMENT PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. G-19

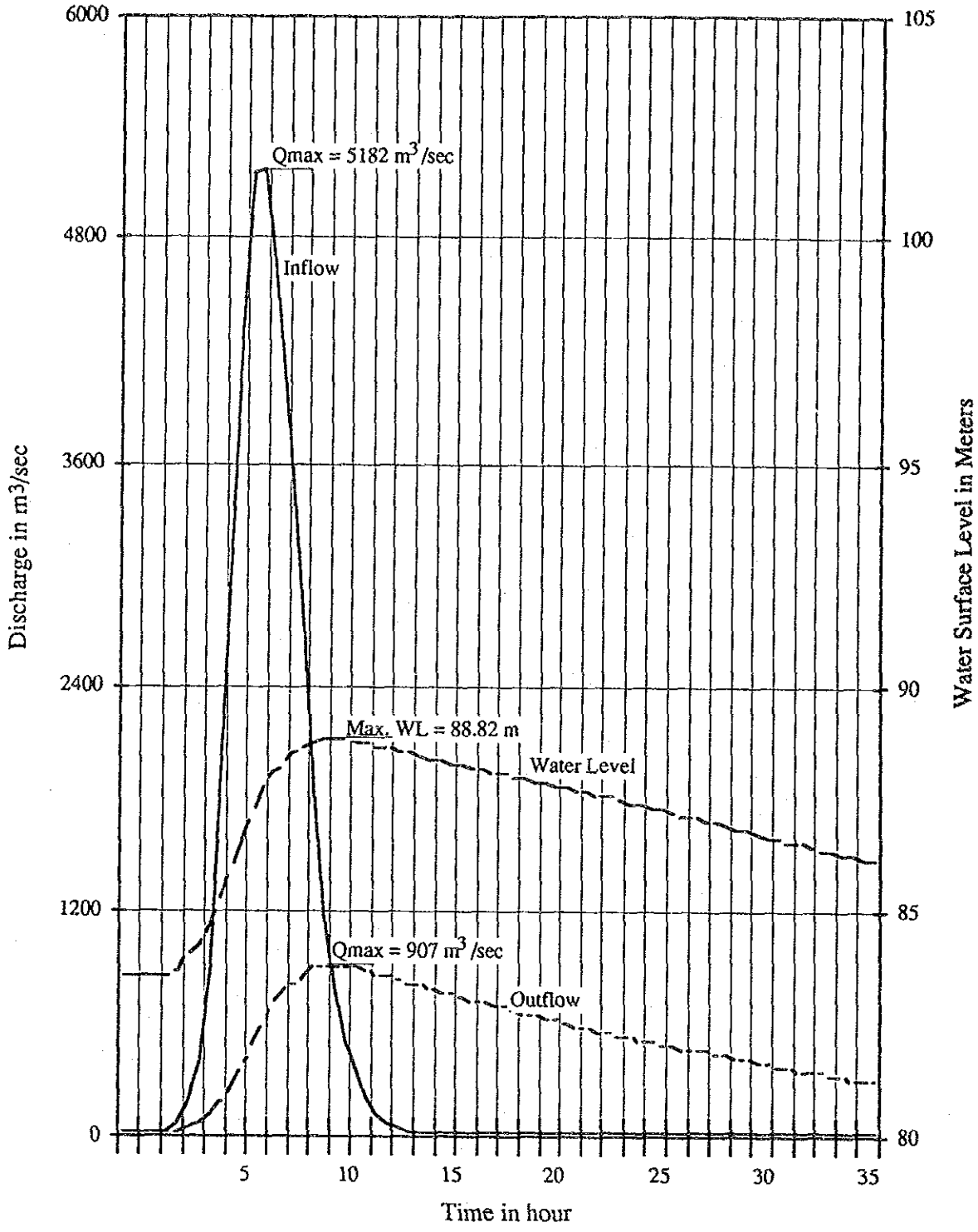


Outflow Hydrograph for 1.2 x 200-years Probable Flood at Kubang Baros

MINISTRY OF PUBLIC WORKS
DIRECTORATE GENERAL OF WATER RESOURCES DEVELOPMENT
FEASIBILITY STUDY ON CIDANAU-CIBANTEN
WATER RESOURCES DEVELOPMENT PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. G-20

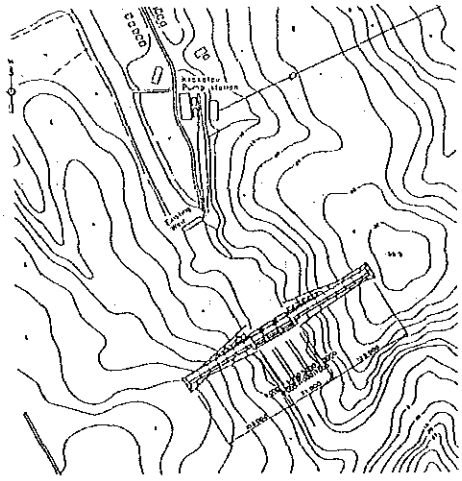


Outflow Hydrograph for PMF at Kubang Baros

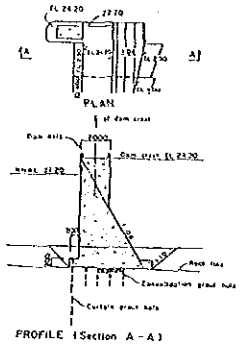
MINISTRY OF PUBLIC WORKS
DIRECTORATE GENERAL OF WATER RESOURCES DEVELOPMENT
FEASIBILITY STUDY ON CIDANAU-CIBANTEN
WATER RESOURCES DEVELOPMENT PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. G-21

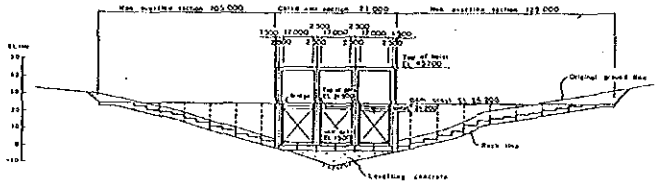


PLAN

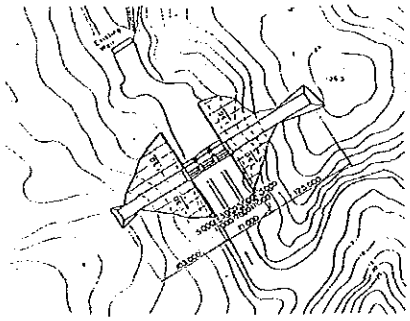


PROFILE (Section A - A)

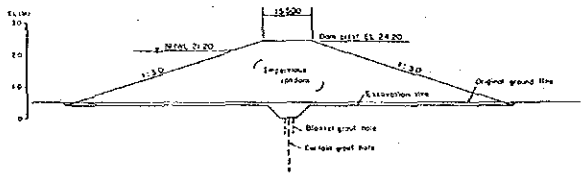
PROFILE & PLAN OF
NON OVERFLOW SECTION



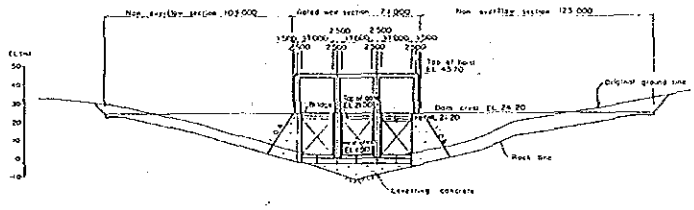
UPSTREAM ELEVATION



PLAN



NON-OVERFLOW SECTION



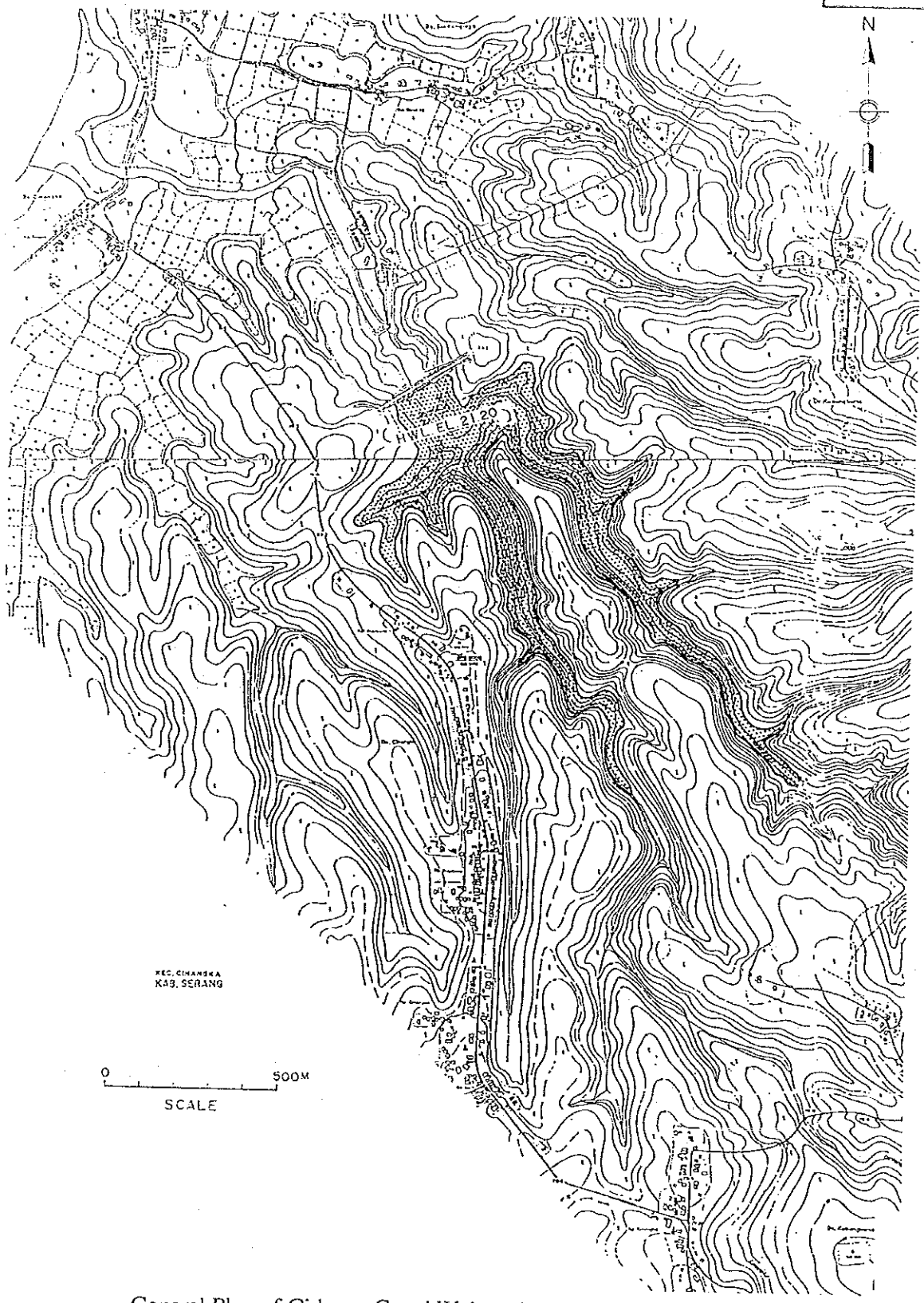
UPSTREAM ELEVATION

Alternative Development Scales of
Cidanau Gated Weir

MINISTRY OF PUBLIC WORKS
DIRECTORATE GENERAL OF WATER RESOURCES DEVELOPMENT
FEASIBILITY STUDY ON CIDANAU-CIBANTEN
WATER RESOURCES DEVELOPMENT PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. G-22



General Plan of Cidanau Gated Weir and Its Reservoir

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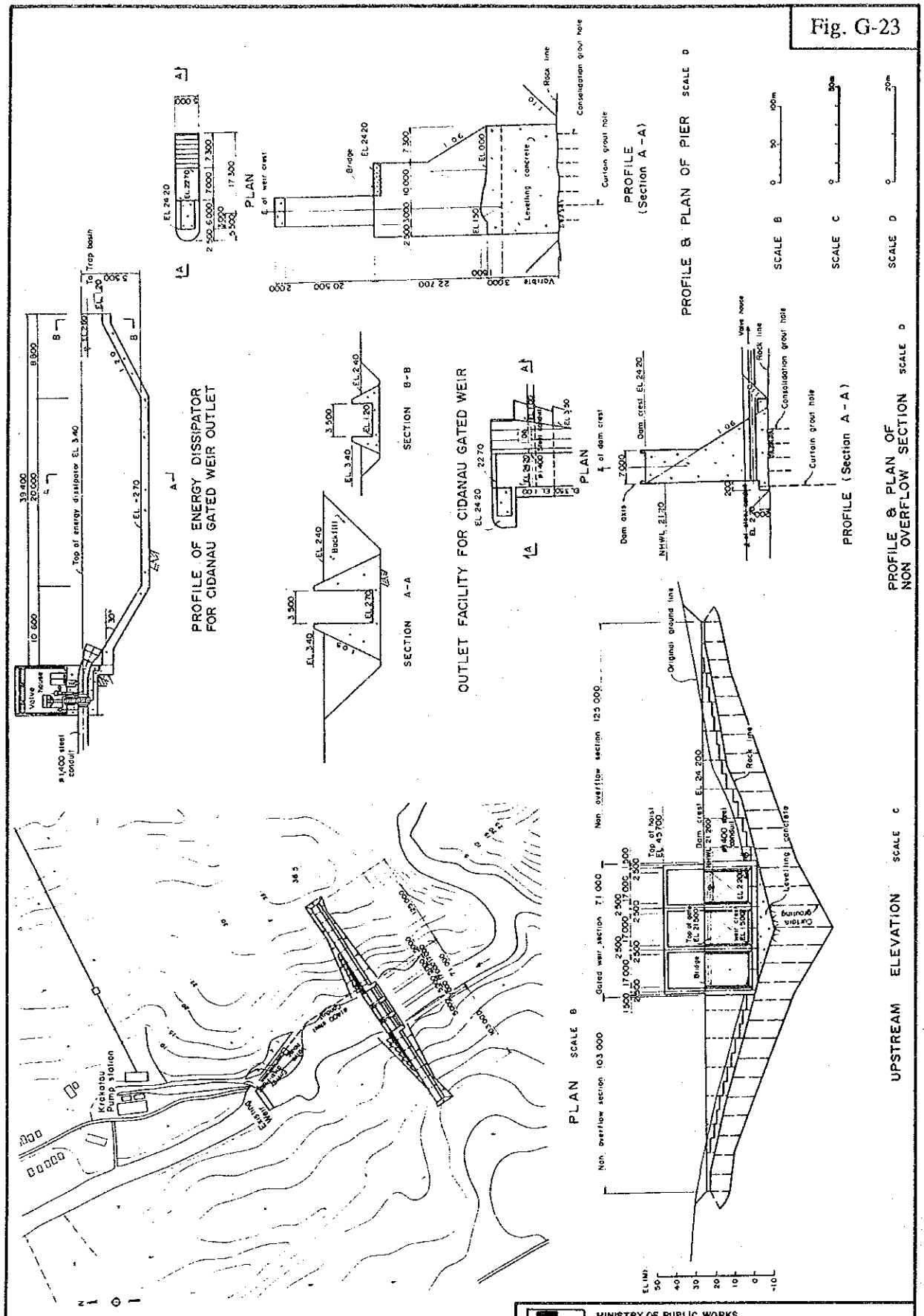
DIRECTORATE GENERAL OF WATER RESOURCES DEVELOPMENT
FEASIBILITY STUDY ON CIDANAU-CIBANTEN
WATER RESOURCES DEVELOPMENT PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

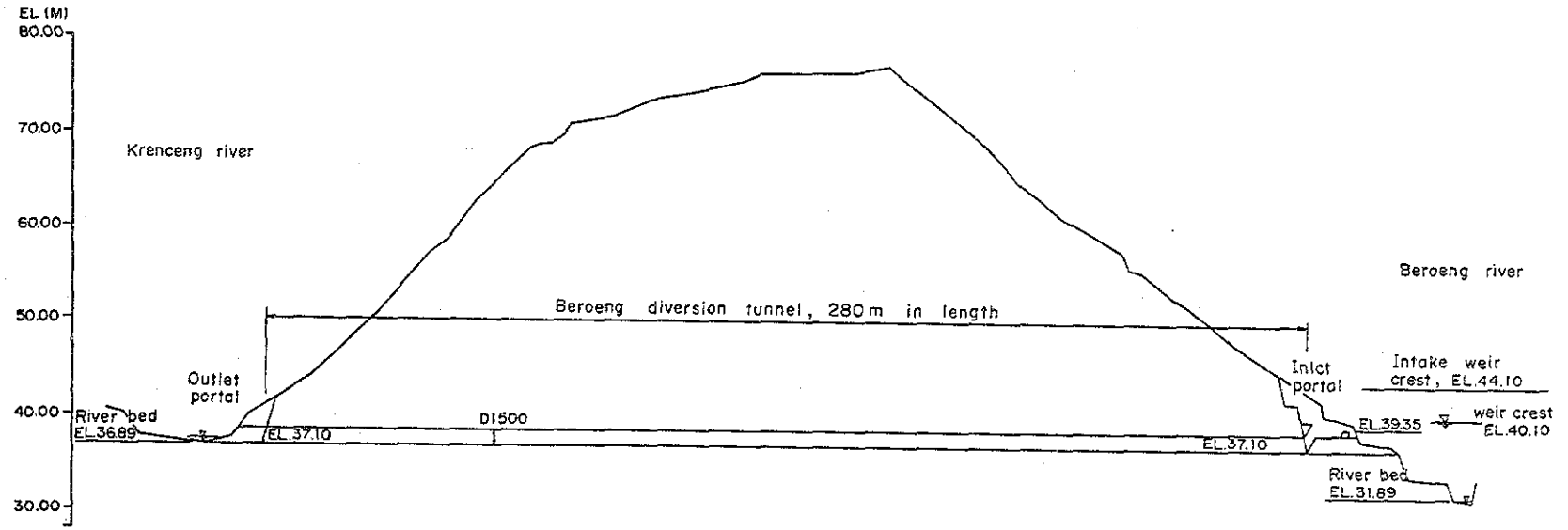
Fig. G-23



Plan, Profile and Section of Proposed Cidanau Gated Weir

MINISTRY OF PUBLIC WORKS
DIRECTORATE GENERAL OF WATER RESOURCES DEVELOPMENT
FEASIBILITY STUDY ON CIDANAU-CIBANTEN WATER RESOURCES DEVELOPMENT PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

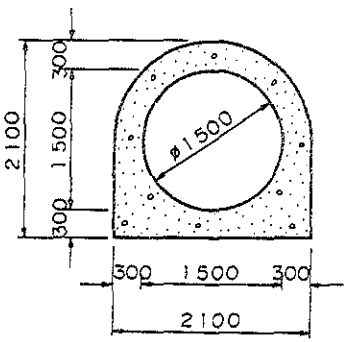


SCALE

Horizontal 0 25M

Vertical 0 10M

PROFILE OF BEROENG DIVERSION TUNNEL



SECTION OF DIVERSION TUNNEL

Profile and Section of Proposed Beroeng Diversion Tunnel

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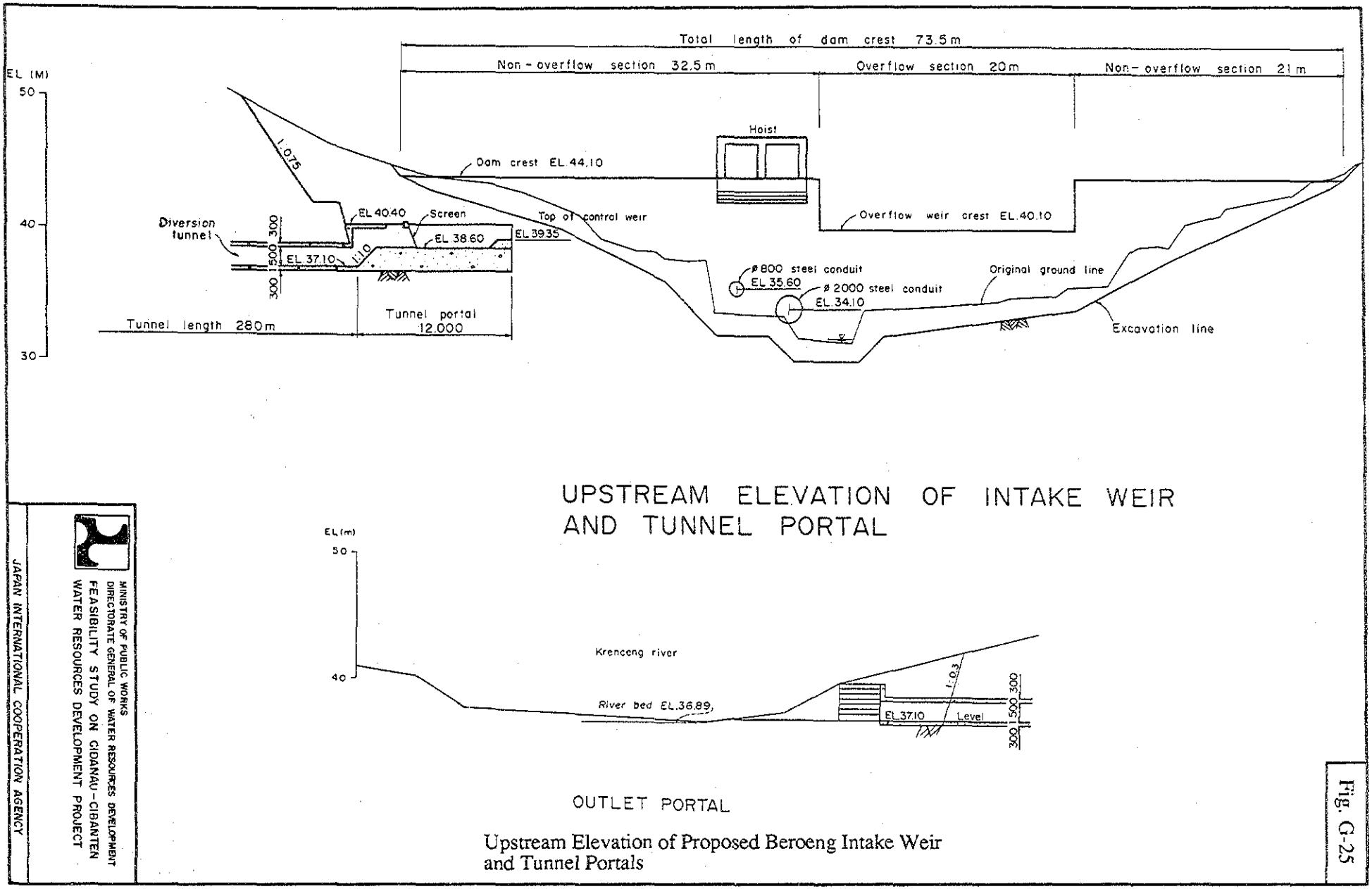
DIRECTORATE GENERAL OF WATER RESOURCES DEVELOPMENT
FEASIBILITY STUDY ON CIDANAU-CIBANTEN
WATER RESOURCES DEVELOPMENT PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

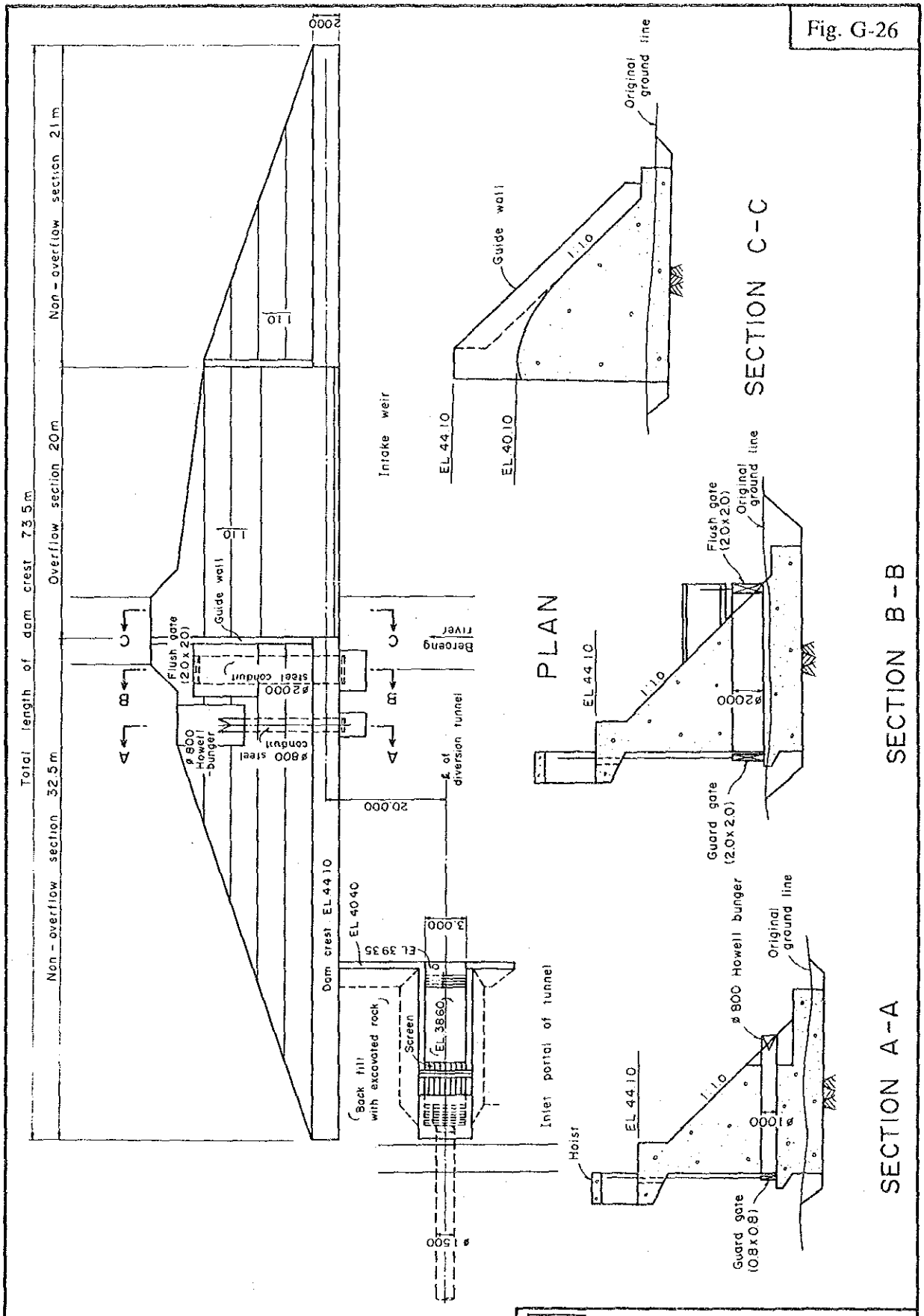
Fig. G-24



Upstream Elevation of Proposed Beroeng Intake Weir and Tunnel Portals

Fig. G-25

Fig. G-26

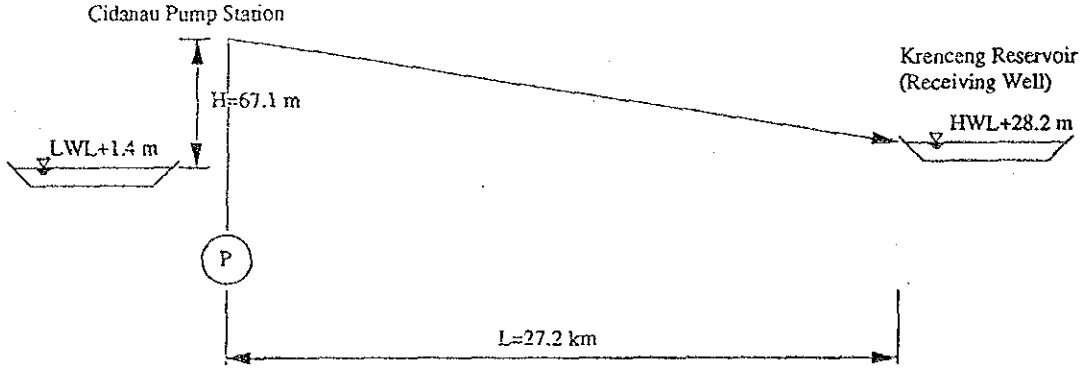


MINISTRY OF PUBLIC WORKS
DIRECTORATE GENERAL OF WATER RESOURCES DEVELOPMENT
FEASIBILITY STUDY ON CIDANAU-CIBANTEN
WATER RESOURCES DEVELOPMENT PROJECT

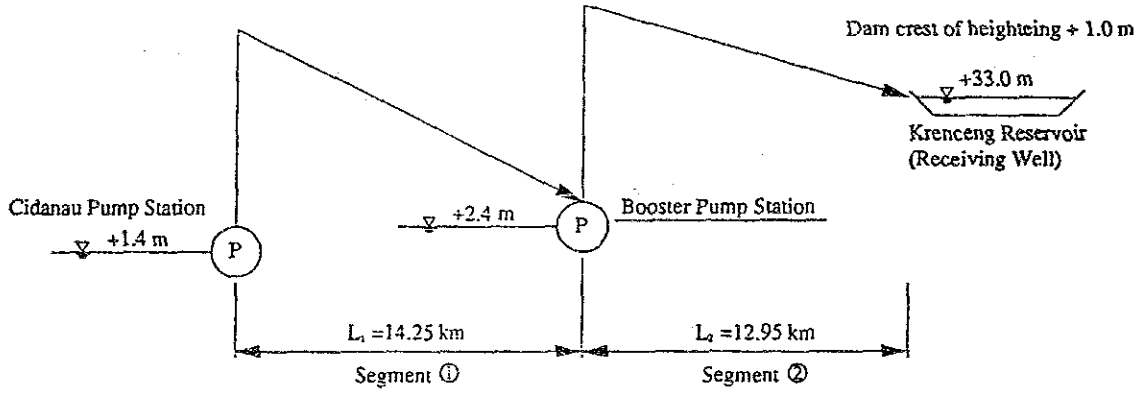
JAPAN INTERNATIONAL COOPERATION AGENCY

Plan and Section and Proposed Beroeng Intake Weir

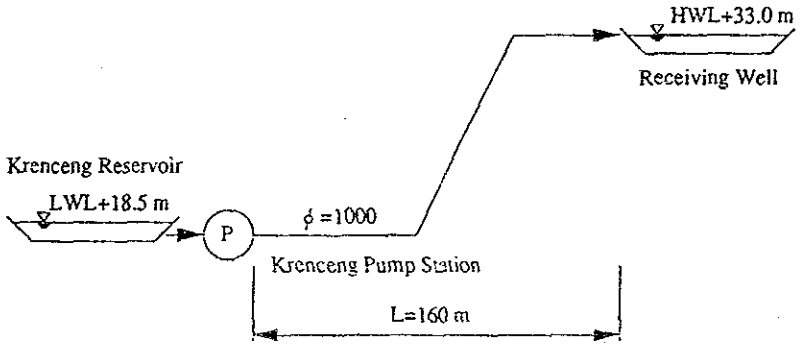
Fig. G-27



Existing Water Conveyance between Cidanau Pump Station and Krenceng Reservoir



Water Conveyance between Cidanau Pump Station and Krenceng Reservoir for the Project



Water Conveyance between Krenceng Reservoir and Receiving Well for the Project

Schematic Diagram of Water Conveyance Facilities

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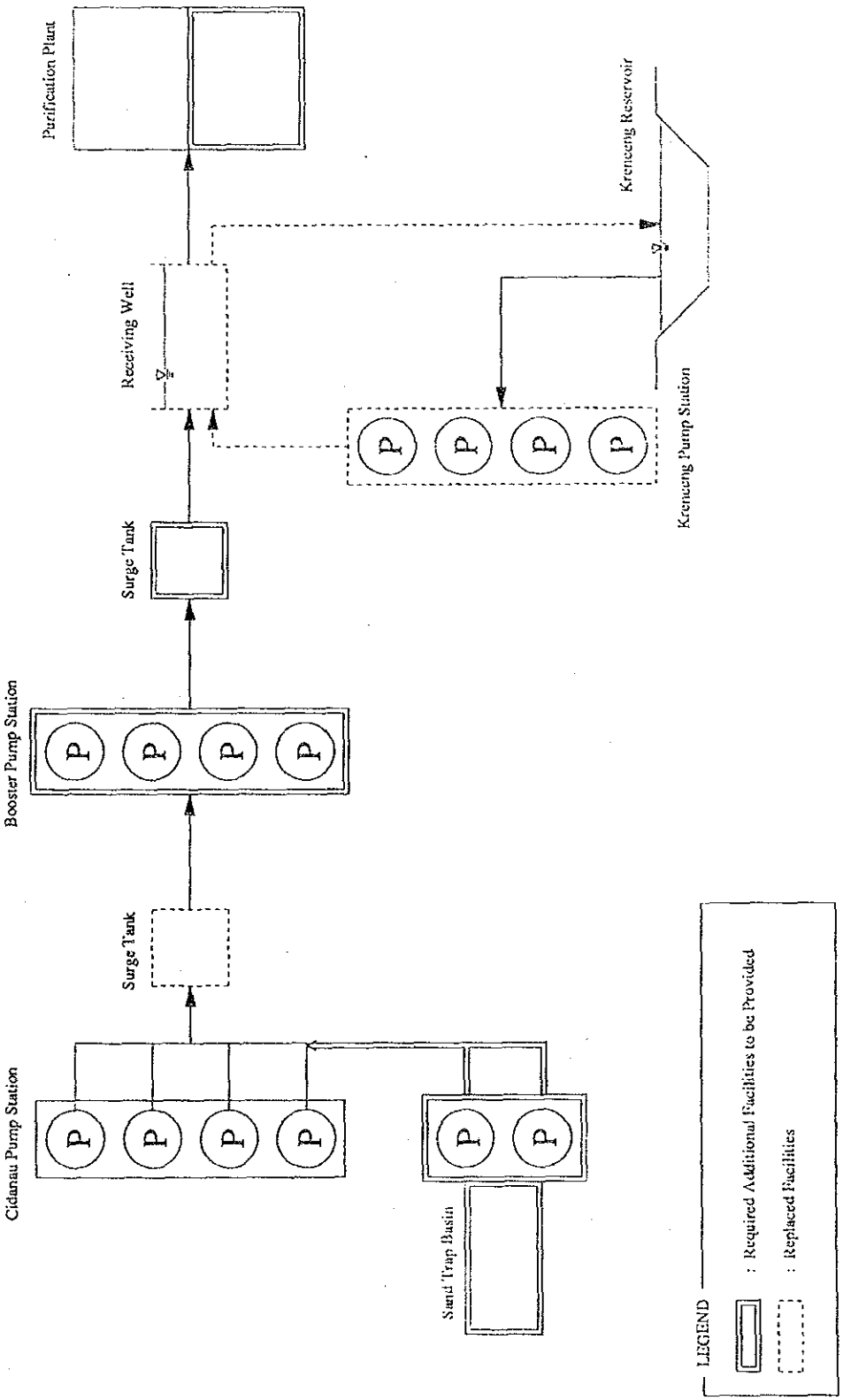
DIRECTORATE GENERAL OF WATER RESOURCES DEVELOPMENT
FEASIBILITY STUDY ON CIDANAU-CIBANTEN
WATER RESOURCES DEVELOPMENT PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. G-28

Schematic Diagram of Water Conveyance and Treatment Facilities for the Project



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FEASIBILITY STUDY ON CIDANAU-CIBANTEN
WATER RESOURCES DEVELOPMENT PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. G-29

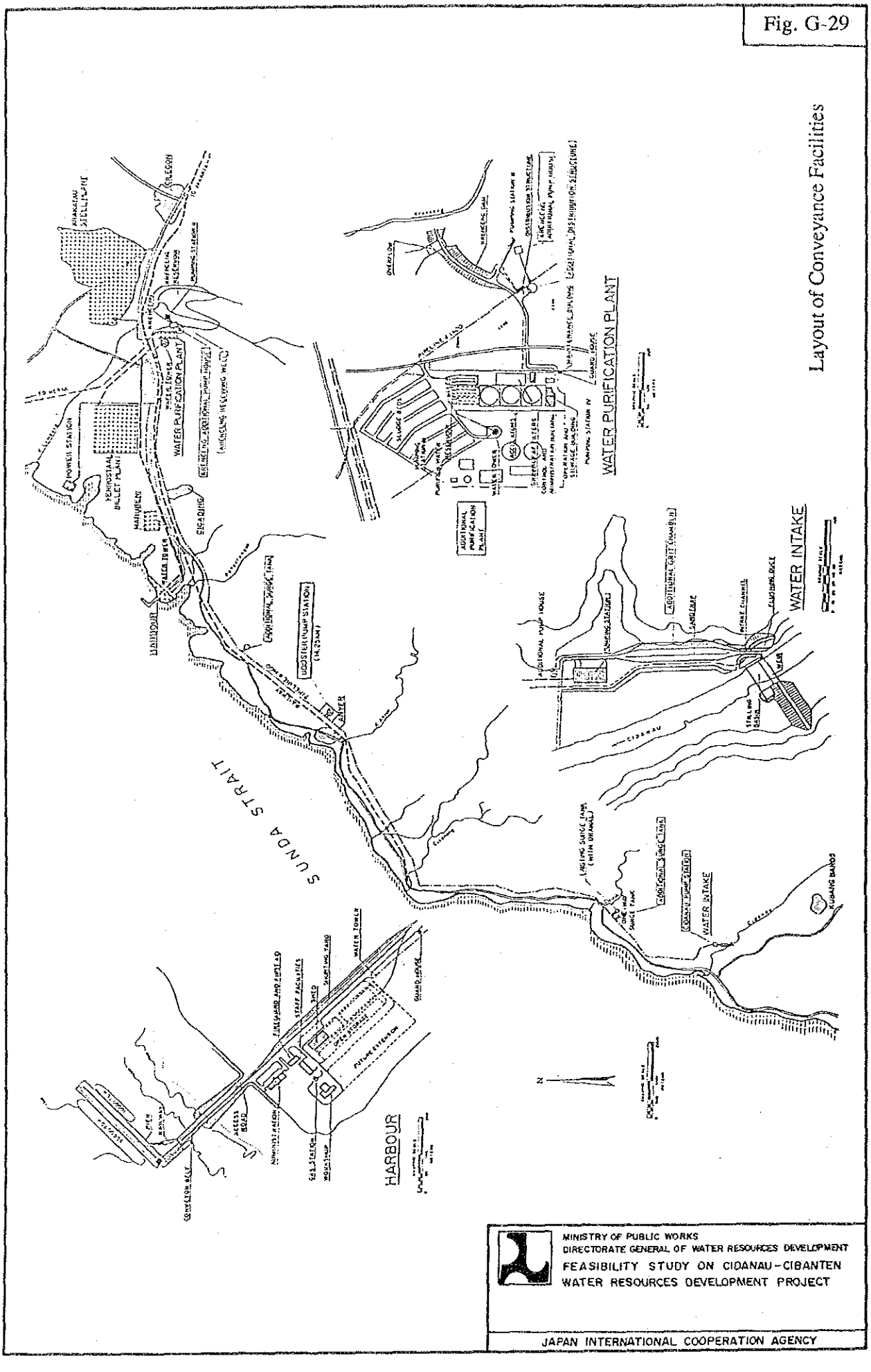

Layout of Conveyance Facilities
WATER PURIFICATION PLANT
WATER INTAKE
SUNDA STRAIT
HARBOUR
MINISTRY OF PUBLIC WORKS
DIRECTORATE GENERAL OF WATER RESOURCES DEVELOPMENT
FEASIBILITY STUDY ON CIDANAU-CIBANTEN
WATER RESOURCES DEVELOPMENT PROJECT
JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. G-30

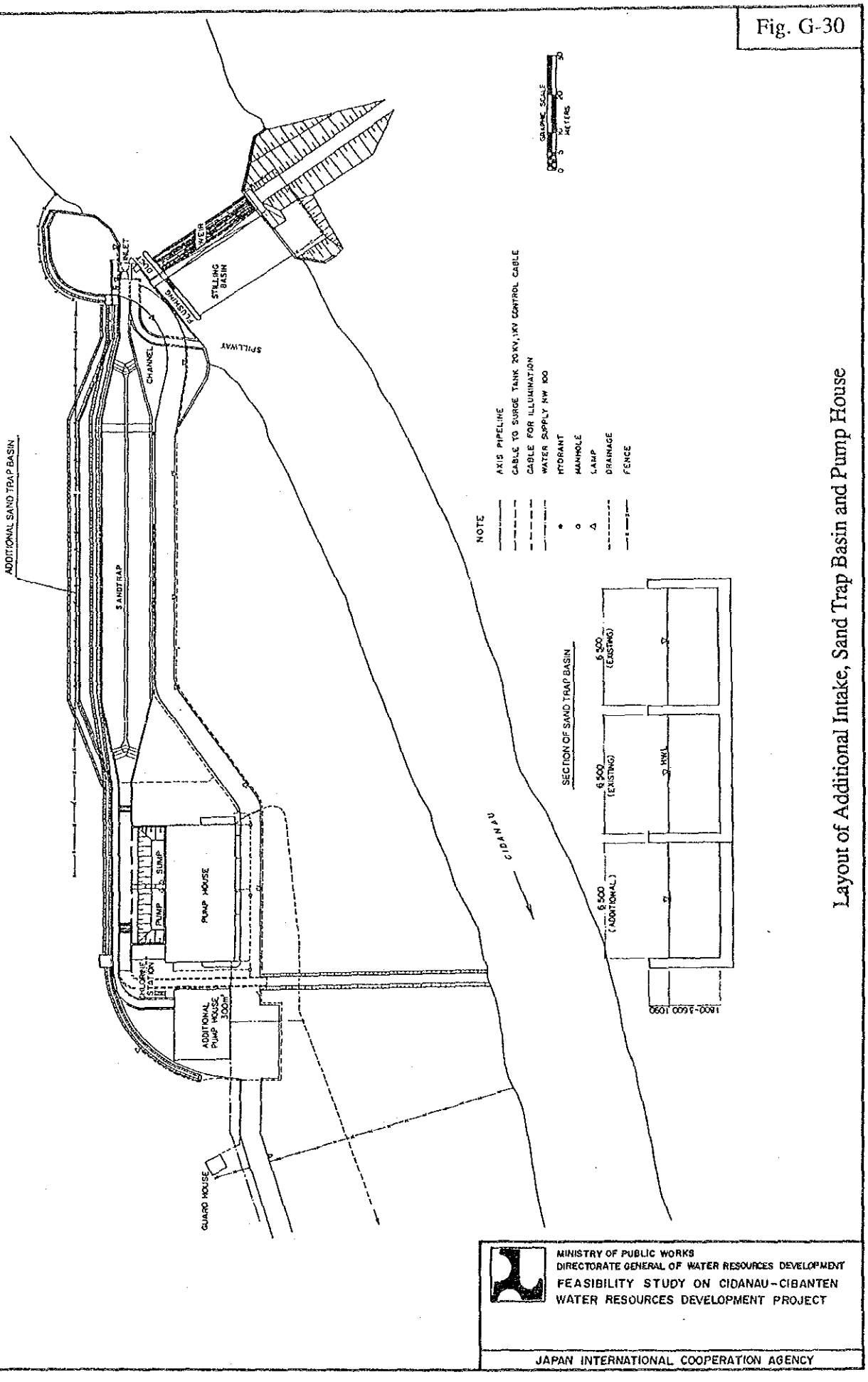
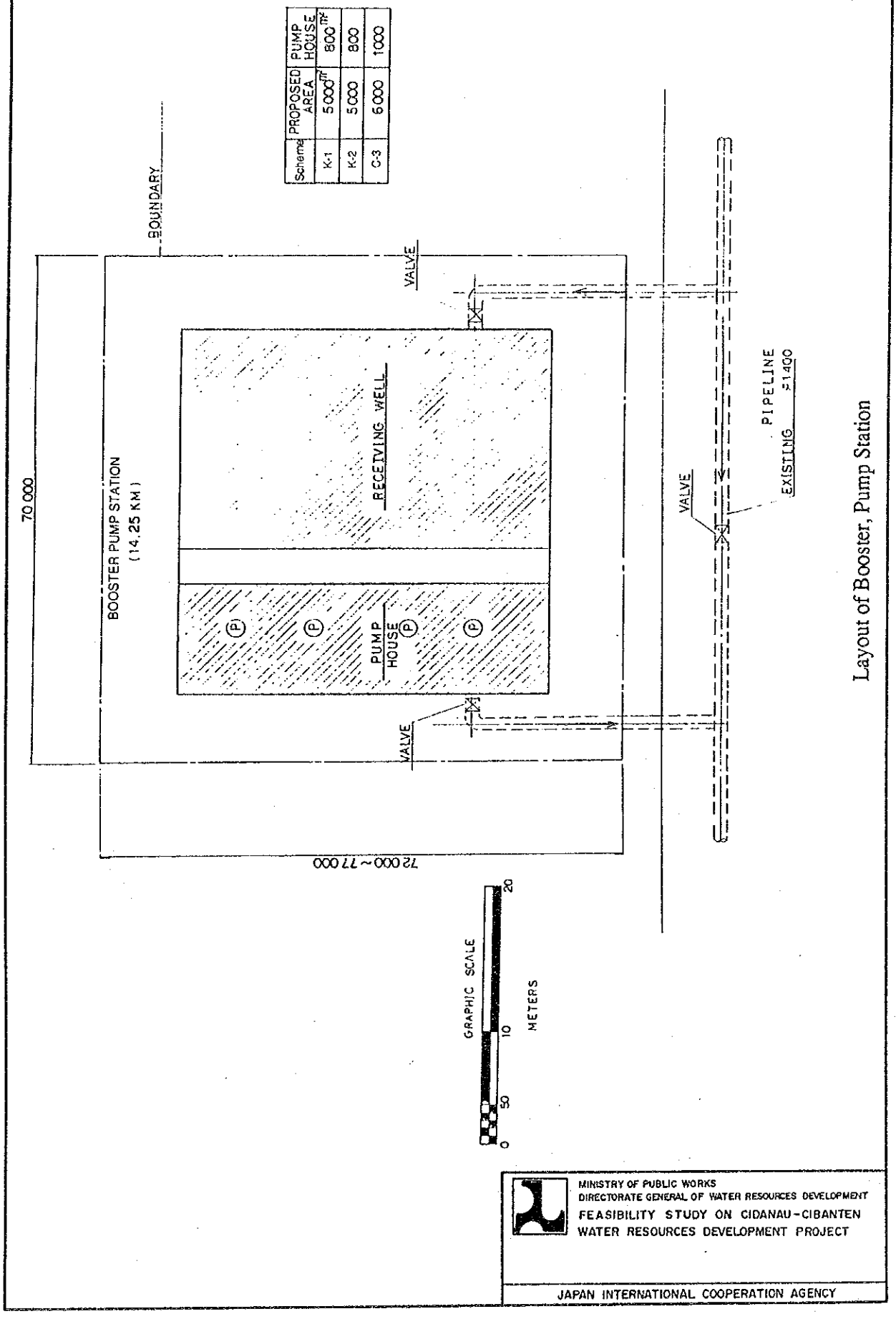
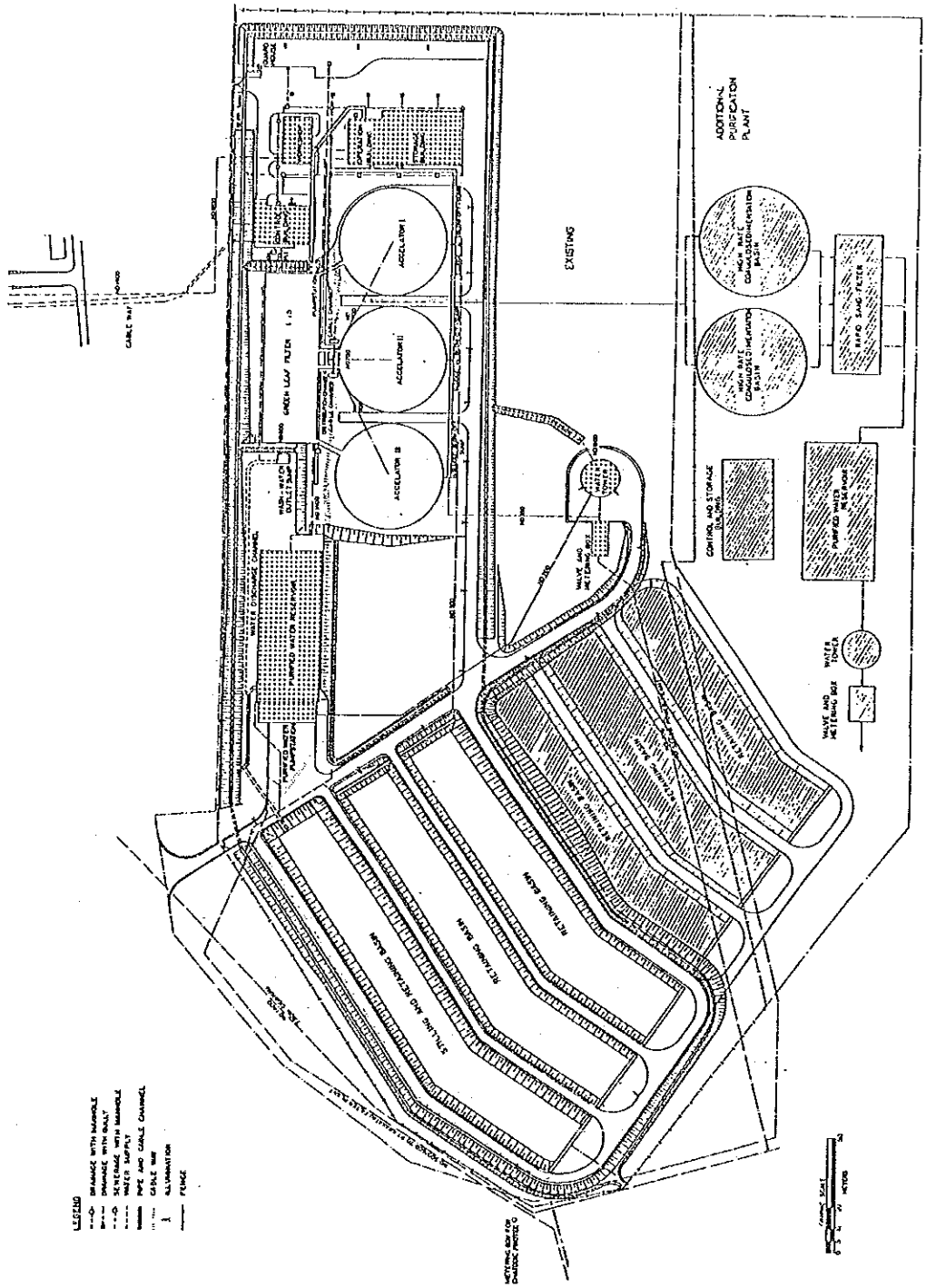

Layout of Additional Intake, Sand Trap Basin and Pump House
ADDITIONAL SAND TRAP BASIN
SAND TRAP
CHANNEL
SPILLWAY
STILLING BASIN
FLUSHING
INLET
PUMP HOUSE
SUMP
PUMP
CHLORINE STATION
ADDITIONAL PUMP HOUSE
GUARD HOUSE
CIDANAU
NOTE
AXIS PIPELINE
CABLE TO SURGE TANK 20 KV, 1 KV CONTROL CABLE
CABLE FOR ILLUMINATION
WATER SUPPLY NW 100
HYDRANT
MANHOLE
LAMP
DRAINAGE
FENCE
SECTION OF SAND TRAP BASIN
6,500 (EXISTING)
6,500 (EXISTING)
6,500 (ADDITIONAL)
HWL
1800-3600 1050
GRAPHIC SCALE
METERS
MINISTRY OF PUBLIC WORKS
DIRECTORATE GENERAL OF WATER RESOURCES DEVELOPMENT
FEASIBILITY STUDY ON CIDANAU-CIBANTEN
WATER RESOURCES DEVELOPMENT PROJECT
JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. G-31



Layout of Booster, Pump Station

Fig. G-32



Layout of Additional Purification Plant

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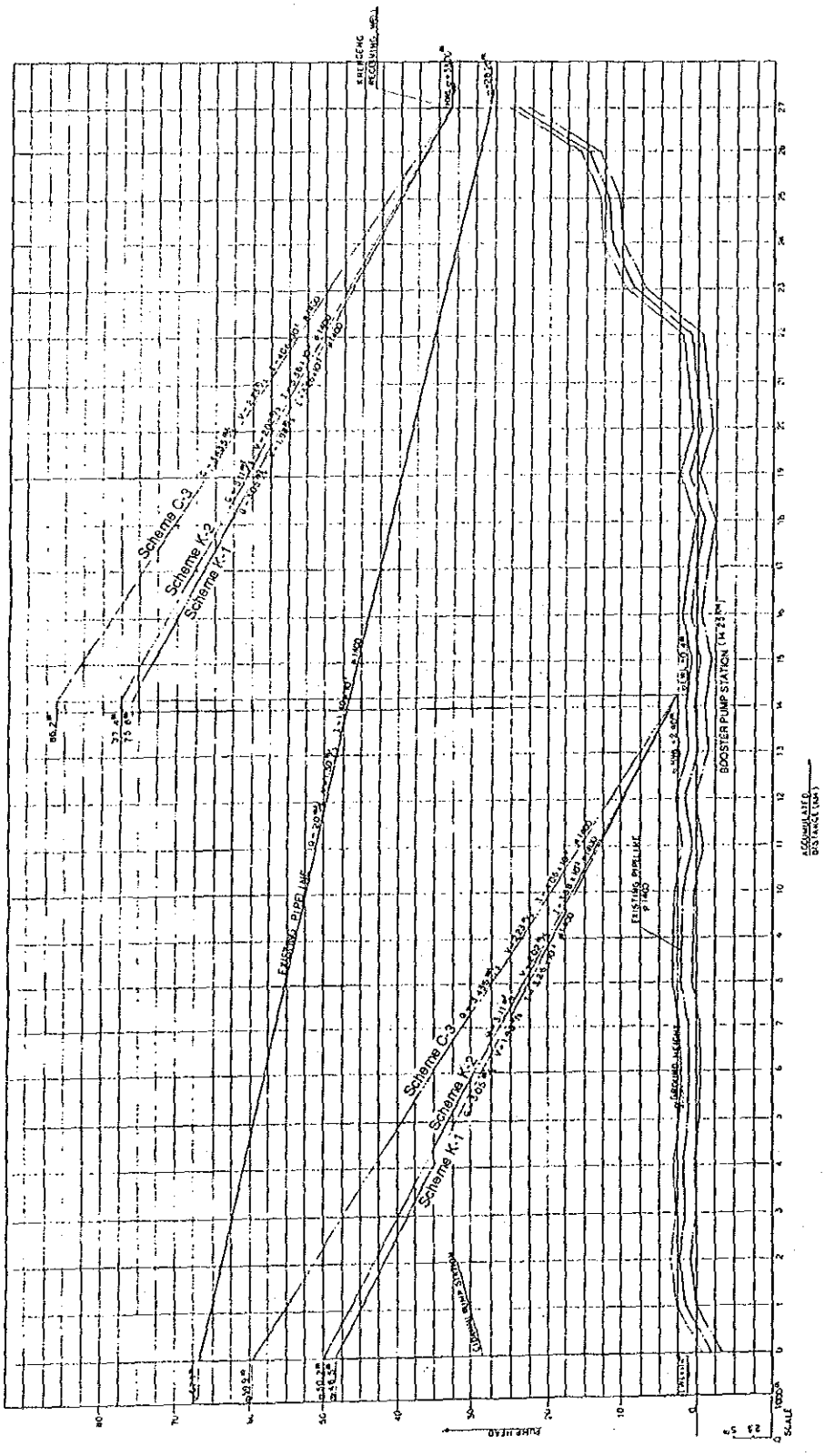
DIRECTORATE GENERAL OF WATER RESOURCES DEVELOPMENT
FEASIBILITY STUDY ON CIDANAU-CIBANTEN WATER RESOURCES DEVELOPMENT PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. G-33



Profile and Hydraulic Gradient of Conveyance Pipeline

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DIRECTORATE GENERAL OF WATER RESOURCES DEVELOPMENT
FEASIBILITY STUDY ON CIDANAU-CIBANTEN
WATER RESOURCES DEVELOPMENT PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

APPENDIX - H
ENVIRONMENTAL ASSESSMENT

APPENDIX - H
ENVIRONMENTAL ASSESSMENT

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1. General

The Cidanau river and the Cibanten river are the principal rivers in the Study Area. On the upstream reaches of the Cidanau river, there is a nature reserve area embracing freshwater swamp, which is called the Rawa Danau.

As the Government of Indonesia had already performed Environmental Information Presentation (PIL) concerning the Cidanau development plan in 1989, the environmental assessment (PIL) in this Study was carried out first on the Cibanten development in 1991. With the progress of the Study, due to the unfavourable geology of the Cidanau dam site and the irrigation water requirement downstream from the Cibanten dam, another investigation was additionally introduced for heightening of the Krenceng reservoir and provision of a gated weir on the lowest downstream reaches of the Cidanau river.

Accordingly, the environmental assessment (PIL) for Krenceng Heightening Scheme and Cidanau Gated Weir was carried out in January 1992.

The water quality survey was also carried out for the Cidanau river, the Cibanten river and the Krenceng reservoir. Since the water quality survey for dry season had been already performed in 1989 by the Government of Indonesia, the water quality survey in this Study was made during the rainy season in 1991, for the purpose of comparing with dry season data and to have general understanding on the water quality of both rivers.

Both the environmental assessment (PIL) and the water quality survey were carried out based upon the laws and regulations of Indonesia. Their results are described in following pages.

2. Present Laws and Regulations on Environmental Assessment in Indonesia

In Indonesia, the Environmental Impact Assessment (AMDAL[1]) will be carried out not only in the planning stage, but also in the implementation stage of a project when the environment is clearly anticipated or actually found to be affected by the project.

AMDAL consists of three steps, namely, PIL[2]/ PEL[3]), ANDAL[4])/ SEL[5]), and

---

1) AMDAL : Analisis Mengenai Dampak Lingkungan (Environmental Impact Assessment)
2) PIL : Penyajian Informasi Lingkungan (Environmental Information Presentation)
3) PEL : Penyajian Evaluasi Lingkungan (EnvironmentalEvaluation Presentation)

RKL[6]/ RPL[7] as shown in Fig. H-2. Reports will be accordingly prepared on each step, referring to as follows:

1) the identification of items which will affect the environment,
2) the forecast of their effect on the environment,
3) the environmental monitoring plan and the environmental management plan.

Each report will provide the prior conditions to the next step. Their preparation periods are shown in Fig. H-2. The roles and work items of related institutions are tabulated in Table H-1.

Outline of environmental assessment in the planning stage, which is closely related to the study of this time, will be described as follows:

2.1 Purpose and Objective of the Environmental Information Presentation (PIL)

2.1.1 Purpose of PIL

The purpose of PIL is to identify the environmental elements which will be affected by implementation of the project, and to provide background data for the decision whether further investigation in the next step is needed or not. The details are as follows:

1) To provide general environmental data in broad outline, which may cover wide range but not to be deep-rooted, in order to use them as the background to identify the presence of significant environmental impacts.

2) To give general study regarding to the plan of activities to be implemented, the condition of place of activities, and the emerging possibility of environmental impacts by the activities.

3) To support in providing information, especially of environment at proposed development site, which will be used to indicate whether above mentioned activities are necessary to be supplemented with the analysis of environmental impact.

4) To comply with the regulation of the Government of Indonesia No. 29,1986

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4) ANDAL : Analisis Dampak Lingkungan (EnvironmentalImpact Analysis)
5) SEL : Studi EvaluasiLingkungan(EnvironmentalEvaluation Study)
6) RKL : Rencana Pengelolaan Lingkungan (EnvironmentalManagement Plan)
7) RPL : Rencana Pemantauan Lingkungan (EnvironmentalMonitoring Plan)

on the Environmental Impact Assessment (AMDAL), especially in the framework of implementation of development.

2.1.2 Objective of PIL

The study of PIL is to identify the present environmental situation of the project area, mainly by existing data and materials, and also through hearing information. The regulation[8] refers to the study to be performed in wide range but not deep-rooted. The details are as follows:

1) To identify the situation of the environment and its problems; and also to recognize the sensitivity of element or process of the environment which may be affected by impacts.

2) To identify the effects on the environment of the area to be impounded for a short, medium and a long period of time.

3) To anticipate the environmental impact as caused by construction of a dam, and also to recognize other significant impacts which may need through investigation.

The aim of this study is to decide further steps to be taken in the study process of PIL, which should be discussed with the Work Team from the Ministry of Public Works.

2.1.3 From PIL to ANDAL

The subsequent processes after the submission of PIL report to the Directorate General of Water Resources Development (DGWRD) are as follows:

1) The submitted PIL report will be studied by the working team, which is set up in DGWRD, whether ANDAL should be carried out or not.

2) If the working team comes to a conclusion that some significant effect or damage should occur, then execution of ANDAL will be decided to start as the next step.

3) Then the TOR will be prepared accordingly.

---

8) The Regulation of the Government of Indonesia, No.29, 1986, Guidelines.

4) It is stipulated that the significant effect or damage, mentioned above, should correspond with the cases as follows:

a) When the affected people will be of a large number.
b) When the affected range of the region will be of a wide area.
c) When the effect will continue over a long period.
d) When the damage intensity will be concentrated.
e) When the damaged elements of environment will be diversified.
f) When the damage will be of accumulative nature.
g) When the damaged condition will be of irreversible nature.

2.2 ANDAL (Environmental Impact Analysis)

As mentioned before, PIL is to identify the environmental elements to be affected by the project, whereas ANDAL is to study the degree. extent. and period of the effect. In other words, it corresponds to a forecast of the effect by the project.

Accordingly, study items of ANDAL will be in further detail than PIL. Especially, for the items designated by PIL to be significantly affected, through investigation on the existing condition will be required for the preparation of monitoring plan.

Study results of ANDAL will be finally submitted by the DGWRD working team to the Central Commission in the Ministry of Public Works (DPU) to obtain its evaluation.

2.3 RKL (Environmental Management Plan)

RKL is to present the management plan of the environmental effect, predicted by ANDAL, in and around the project site. It might be necessary, if circumstances require, to refer to some alteration of the implementation plan.

The scheduled environmental management system is to be studied not only from the technical and economic aspects, but also from the institutional aspects as follows:

1) Technical approaches such as:
   - prevention of noxious substance discharge,
   - prevention of destruction of natural resources,
   - prevention of indiscriminate development, etc.

2) Economic approaches such as:
   - economical assistance necessary for prevention of environmental effect,
   - solution of socio-economic and socio-cultural problems, etc.

3) Institutional approaches such as:
   - development of the cooperative regime among the related agencies.
   - promotion of the legal arrangement, etc.

2.4 RPL (Environmental Monitoring Plan)

RPL is to present the monitoring plan of the environmental effect predicted by ANDAL. The extent of monitoring will be as follows:

1) Necessary description according to the kind of environmental effect, namely the significant effect and others.

2) Environmental elements subject to monitoring, such as:
   - source causing the significant effect,
   - results caused by the significant effect.

3) Criteria of the environmental effect, inclusive of:
   - biological and geophysical aspects,
   - socio-economic and socio-cultural aspects, etc.

3. Environmental Assessment of the Cibanten River Basin

As the study of Environmental Information Presentation (PIL) for the Cidanau development plan was already completed by the Government of Indonesia in 1989, the environmental assessment study of this time was carried out for PIL of the Cibanten development plan. This assessment study was entrusted to P.T. Gamma Epsilon.

The report submitted from P.T. Gamma Epsilon will be briefly described as follows:

The result of survey is as shown in the matrix of Table H-2. In this table, work classifications and environmental items, whose score is 10 or more, may be anticipated to be affected by possible impact due to the dam construction plan.

They will be as follows:

<<Work classifications>>

* Acquisition of land --- A very delicate problem related to existence of inhabitants of the area concerned
* Construction of access road, office, and associated facilities (workers living quarters, etc.)
* Excavation and quarrying of rocks, including blasting, transport, and storage
* Dam construction, including temporary cofferdam, diversion tunnel, main dam, and spillway
* impounding of dam -- Change from land to aqueous environment

<<Environment items>>

* Landscape -- Artificial structures included into natural landscape
* Culture pattern of inhabitants -- Transition from agricultural to fishery culture
* Relocation of inhabitants -- Relocate to nearby district or another island
* Health -- Probable infection of respiratory troubles or diseases like malaria via pathogenic insects during a period from land preparation to full impounding
* Society and economy -- Change in the living pattern of surrounding inhabitants, resulting possibly in social change associated with crimes, prostitution, and others

It is noted that no any special species of animals and plants have been confirmed in the area under survey.

4. Heightening of Krenceng dam with Beroeng Diversion Tunnel and Cidanau Gated Weir

Environmental assessment in this Study was carried out for PIL of the heightening of Krenceng dam with Beroeng diversion tunnel and Cidanau gated weir.

The results of the survey are as shown in the matrix in Table H-3. In this table, group of activities and group of environment, whose score is 8 or more, may be assumed to be affected by possible impact due to the construction of the Schemes.

a) Important impact of group of activities

1. Activity in the pre construction stage, which may cause important impact is land acquisition activities and resettlement. Land acquisition will cause important impact, because it relates to the future life of people influenced by the project, which may derive difficult problems. Resettlement will also cause important impact, because it may increase the population density, addition of new settlement land,and it may cause impacts on water storage, flora, fauna, land form, economy, health and social relationship.

2. Activity in the construction stage,which may cause important impact are;

   Construction of the supporting facilities such as storehouse, workshop, base camp, etc.

   The heightening of the dam embankment.

3. Activity in the operation stage, which is assumed to cause important impacts are; the raising of the reservoir water level and the reservoir operation.

   The two activities may influence the soil stability,increase the atmospheric moisture,disturb the flora and fauna, change the land use, change the life pattern of the people, influence the settlement and the health. Important positive impact which may cause in this stage are;

   Increase of water supply, which will promote industrialization and provide opportunities for the new fields of work.

b) Important impact of group of environment

Group of life environment, which may be influenced by important impact are;

1) Possibility of instability of borrow pits and quarry sites where embankment material are extracted.

2) Resettlement of people due to construction of the dam.

c) As the resettlement of people comes to rather big amount (1403 persons, 311 families), the project has to carry out study on resettlement plan to support the

resettlement activities.

From results of above investigation,the resettlement and compensation which may be caused by implementation of the scheme will be as follows;

1) The extent of resettlement and/or compensation due to the heightening of Krenceng reservoir is as shown in Fig. H-3.

   This area includes the area for construction road.

2) The objects to be resettled and/or compensated due to the heightening of Krenceng dam are listed below.

People's houses	278
Office building	1
Elementary school	1
Mosque	4
Agricultural land	11.05 ha

People's houses (278 houses) includes 201 own houses and 77 leased or vacant houses. The own houses also include 6 non permanent houses.

5. Water Quality Survey in the Project Area

Water quality survey was already carried out in the dry season of 1989 for the Cidanau and the Cibanten rivers. The water quality survey of this time was carried out in the rainy season for the purpose of comparison with the former survey and general understanding of the water quality of both rivers. Water was sampled at eight points as shown in Fig. H-4.

According to the survey result shown in Table H-4(1), both the Cidanau and the Cibanten rivers are appropriate to irrigation and fisheries, but showed the number of colitis germs exceeding the standard level in certain points (that is, the water is unsatisfactory for drinking as it is). These points at which the standard level was exceeded were located on the Cidanau river downstream from the Rawa Danau and on the Cibanten river downstream from Serang. The survey result for the dry season shows that the standard level for drinking was exceeded at all points where analysis of number of colitis germs was made. Concerning nitrogen and phosphorus, T-N of 0.2 mg/l and T-P of 0.02 mg/l, which are

some signs to anticipate eutrophication, were exceeded at all points. There arises a concern therefore that eutrophication may occur in the reservoir once the dam is completed. Consequently, it may be necessary to take some appropriate measures, such as installation of a circulation system within the reservoir, to prevent such eutrophication.

The flow observation was made along with water sampling for analysis. The observation result shows that the difference in flow between rainy and dry seasons is 3.5 times in the case of the Cidanau river and 1.4 to 2.2 times for the Cibanten river, as shown in Table H-5. Moreover, the comparison of both rivers shows that flow of the Cidanau river is higher than the Cibanten river and the difference runs up to 7.9 times for dry season and 15.6 times for rainy season.

On the other hand,the water quality survey for the Beroeng river was carried out in January 1992 so as to confirm the quality of water to be diverted to the Krenceng reservoir through the proposed Beroeng diversion tunnel.
As shown in Table H-4(2),the quality of water in the upstream Beroeng river was generally good.

6. Catchment conservation

The present land use in the catchment basin of heightening of Krenceng dam, Cidanau gated weir and Beroeng diversion tunnel is summarized in Table H-6. Table H-6 shows that each catchment basin is almost fully developed for the agricultural purposes such as wet paddy field, upland crop field and plantation. Especially in the Beroeng river basin, 98% of the catchment area is occupied by agricultural fields and only 2% is left as forest. As the forest is quite important to retain water resources, the present land use in some basins can be said to be in critical condition. Therefore,it is proposed to improve or at least preserve the present basin conditions to maintain the development water resources.

From the viewpoint of maintaining water volume and quality,the catchment conservation will be achieved in the manners as follows;

- Forest conservation :
  The forest will retain the slope failure and erosion. Thus the volume of suspended solids which flow into the reservoir will be decreased.

- Prohibiting over-development :
  The over-development will bring rapid runoff in rainy season.

- Water quality control :
  Control of artificial pollutant outflow will protect the reservoir from eutrophication.

There is virtually no comprehensive guide-lines and/or criteria with regards to protection, conservation, and operation of facilities in the catchment area. In the future, they should be established by DPU or DGWRD to keep a steady level of operation and maintenance and for the sake of conservation of the environment.

TABLES

Table H-1 Job Assignment of Agencies Concerning the Environmental Assessment Report

Institution / Document	Initiator	Working Team	Technical Team	Central Commission	Minister	KANWIL
PIL and PEL	- to prepare	- to assess - to prepare summary - to submit recommendation - to draft letter of decree	- to assist in preparing note of explanation	- receive the report - to submit rdaft letter of decree to the Minister	- to decree (delegated to echelon I) 1)	-to receive the document
PkI and RPL from PIL and PEL 2)	- to prepare	- to assess - to prepare summary - to give recommendation - to draft letter of decree	- to assist in preparing note of explanation	- receive the report - to submit rdaft letter of decree to the Minister	- to decree (delegated to echelon I) 1)	-to receive the document
TOR of ANDAL and SEL	- to prepare	- to assess - to prepare summary	- to assess - to prepare the memorandum	- to assess - to decree	- to receive the report	-to receive the document
ANDAL and SEL	- to prepare	- to assess - to prepare summary	- to assess - to prepare draft note of explanation	- to assess - to submit draft note explanation - to submit recommendation	- to decree	-to receive the document
PKL and RPL from ANDAL and SEL 2)	- to prepare	- to assess - to prepare summary	- to assess - to prepare note of explanation	- to assess - to submit note of explanation - to submit recommendation	- to decree	-to receive the document
Deviation of RKL and RPL Implementation	- to monitor and reporting	- Corrective action if necessary	- Corrective action if necessary	- Corrective action if necessary		- to monitor and to solve - to report to the Commission

1) By issuing the Minister's decree regarding this document, the power of decree is delegated.

2) The drafts, of RKL and RPL are submitted together with the draft PIL or PEL or ANDAL or SEL.

Table H-2 Evaluation Matrix between Activity Group and Environment Group in the Cibanten Basin

Environment Group \ Activity Group		Pre Construction		Construction							Operation		Score	Remark
				Preparation			Implementation							
		Survey	Land Acquisition	Mobilization of Equipment	Mobilization of Labour	Construct of Support Facilities	Dewatering	Material Mining	Material Excavation	Dam Construction	Impounding of Reservoir	Operation of Dam		
Bio Geo Physics	Soil/Rock	0	1	0	0	1	0	1	1	1	1	0	6	Score > 10
	Water	0	1	0	0	1	1	1	1	1	1	1	8	Critical Impacts
	Climate	0	1	1	1	1	1	1	1	1	1	0	9	Score >10
	Flora	1	1	1	0	1	0	1	1	1	1	0	8	Non Critical impacts
	Fauna	1	1	0	0	1	1	1	1	1	1	1	9	
Socio-culture	Land Use	1	1	0	0	1	0	1	1	1	1	0	7	
	Recreation	0	1	1	1	1	1	0	1	0	1	1	8	
	Aesthetics	0	1	1	1	1	1	1	1	1	1	1	10	
	Culture Pattern	1	1	1	1	1	1	1	1	1	1	1	11	
Socio-economics	Resettlement	1	1	1	1	1	1	1	1	1	1	1	11	
	Health	0	1	1	1	1	1	1	1	1	1	1	10	
	Economic Aspect	1	1	1	1	1	1	1	1	1	1	1	11	
Score		6	12	8	7	12	9	11	12	11	12	8		

Table H-3 Evaluation Matrix between Activity Group and Environment Group in Krenceng, Beroeng and Downstream Cidanau Basins

Environment Group \ Activity Group		Pre Construction			Construction					Operation		Score	Remark
					Preparation			Implementation					
		Survey	Land Acquisition	Resettlement	Mobilization of Equipment & Materials	Mobilization of Labour	Construct of Support Facilities	Heighening of Dam	Construct of Gated Weir	Heightening of Reservoir Surface	Operation of Dam		
Bio Geo Physics	Soil/Rock	0	1	1	1	0	1	1	1	1	1	8	Score > 8
	Water	0	1	1	1	0	1	1	1	0	1	7	Critical Impacts
	Climate	0	0	0	0	0	1	0	0	1	1	3	Score >8
	Flora	0	1	1	1	0	1	1	0	1	0	6	Non Critical impacts
	Fauna	0	1	1	1	0	1	1	0	1	0	6	
Socio-culture	Land Use	0	1	1	0	0	1	1	0	1	1	6	
	Recreation	0	1	0	0	0	0	0	0	1	1	3	
	Aesthetics	0	1	1	0	0	1	1	0	1	1	6	
	Culture Pattern	1	1	1	0	1	0	0	0	0	1	5	
Socio-economics	Resettlement	1	1	1	0	1	1	1	0	1	1	8	
	Health	0	1	1	1	0	1	1	0	1	1	7	
	Economic Aspect	0	1	1	0	1	0	1	0	1	1	6	
Score		2	11	10	5	3	9	9	2	10	10		

Table H-4 (1) Results of Water Quality Measurement for Cidanau and Cibanten Rivers and Krenceng Reservoir

Dry Season

unit : mg/ℓ

		pH	DO	BOD	COD	SS	col. germs[1]	NH_4-N	NO_2-N	NO_3-N	Org-N	T-N	T-P
Cidanau	Peusar	6.9	3.6	1.7	23	34	1.7×10^5	0.24	0.005	0.13	0.19	0.57	0.10
	Kadu Peureup	7.3	6.9	1.9	23	38	–	0.21	ud	0.20	0.15	0.56	0.09
	Sindang Laya	7.3	7.3	1.4	20	38	1.7×10^5	0.21	ud	0.23	0.27	0.71	0.14
Cibanten	Serut	7.9	7.3	1.2	10	53	2.2×10^4	0.20	0.004	0.23	0.15	0.58	0.13
	Karundang	7.8	7.2	1.3	9.0	57	7.5×10^3	0.07	0.019	0.21	0.22	0.52	0.08
	Telanggaran	7.4	3.0	5.2	17	63	3.4×10^6	0.52	0.10	0.26	0.27	1.15	0.23
Rawa Danau	Perumukaan	7.0	1.7	3.6	23	23	5.8×10^5	0.31	0.010	0.11	0.21	0.64	0.11
Krenceng Reservoir													
Water quality standard[2]		5-9	6	5.0	10		2000	0.5	1.0	10			

1) Number of colitis germs 2)drinking water

Source : DPU Survey Result for 1989/Survey made by Puslitbang Air

Rainy Season

unit : mg/ℓ

		pH	DO	BOD	COD	SS	col. germs	NH_4-N	NO_2-N	NO_3-N	Org-N	T-N	T-P
Cidanau	Peusar	7.1	5.8	1.3	19	143	3.8×10^3	0.06	0.002	0.27	0.10	0.43	0.04
	Kadu Peureup	7.2	5.8	1.2	17	166	2.3×10^3	0.05	0.002	0.21	0.09	0.35	0.04
	Sindang Laya	7.1	7.2	1.4	21	90	2.9×10^3	0.07	0.011	0.12	0.10	0.30	0.06
Cibanten	Serut	7.1	7.0	1.7	18	174	1.8×10^3	0.04	0.001	0.17	0.10	0.31	0.03
	Karundang	7.2	6.9	1.4	17	199	1.8×10^3	0.05	0.002	0.25	0.09	0.39	0.04
	Telanggaran	7.1	6.4	4.1	17	279	2.7×10^3	0.06	0.006	0.44	0.12	0.63	0.06
Rawa Danau	Perumukaan	6.9	5.8	1.2	18	111	1.6×10^3	0.05	0.001	0.15	0.10	0.30	0.05
Krenceng Reservoir		7.2	6.7	1.3	18	319	1.6×10^3	0.04	0.004	0.22	0.07	0.33	0.03

Source : JICA Survey Result for 1990/Survey made by Puslitbang Air

Table H-4 (2) Results of Water Quality Measurement for the Beroeng River

No.	Item		Unit	Location	
				S-1 [1]	S-2 [2]
	<Physics>				
1.	Electric conductivity		umho/cm	110	1130
2.	Total Dissolved Solid		mg/l	78	84
3.	Water Temperature		'C	-	-
4.	Air Temperature		'C	-	-
	<Chemistry>				
1.	Hg	(Mercury)	ppm	0.000013	ud [3]
2.	NH_4	(Ammonium)	"	0.09	0.04
3.	As	(Arsen)	"	0.0187	0.05
4.	Ba	(Barium)	"	ud	ud
5.	Fe	(Iron)	"	0.64	0.75
6.	F	(Fluoride)	"	0.10	0.15
7.	Cd	(Cadmium)	"	ud	ud
8.	Cl	(Chloride)	"	4.8	5.5
9.	Cr^{6+}	(Chromium)	"	ud	ud
10.	Mn	(Manganese)	"	0.02	0.03
11.	No_3	(Nitrate)	"	0.21	0.17
12.	No_2	(Nitrate)	"	0.012	0.001
13.	Se	(Selenium)	"	0.05	0.01
14.	Zn	(Zinc)	"	0.01	0.01
15.	CN	(Cyanide)	"	ud	ud
16.	SO_4	(Sulphate)	"	1.2	1.3
17.	Cu	(Copper)	"	ud	ud
18.	Pb	(Lead)	"	ud	ud
19.	B	(Boron)	"	0.03	0.02
20.	Co	(Cobalt)	"	ud	ud
21.	Na	(Sodium)	"	ud	ud
22.	Ni	(Nickel)	"	ud	ud
23.	SAR	(Sodium Absorption Rstio)	"	0.86	0.91
24.	RSC	(Residual Sodium Carbonatc)	"	0.32	0.39
25.	CO_3	(Carbonatc)	"	0	0
26.	Hardness		"	26	32
27.	Ca	(Calcium)	"	6.5	9.0
28.	Mg	(Magnesium)	"	2.4	2.3
29.	K	(Potassium)	"	2.7	2.9
30.	MBAS	(Dctergent)	"	0.034	0.052
31.	% Na		"	43	42
32.	Grcase & Oil		"	ud	ud
33.	Aldrin & Dieldrin		ppb	0.001	ud
34.	Chlordane		"	ud	0.037
35.	DDT		"	ud	ud
36.	Endrin		"	ud	ud
37.	Heptachlor & Heptachlor epoxide		"	0.02	0.027
38.	Hexachlorobenzen Lindanc		"	ud	ud
39.	Metoxychlor		"	ud	ud
40.	BHC		"	ud	ud

Note: 1) S-1 : the Beroeng River (5km upstream of the Krenceng Reservoir)
2) S-2 : the Krenceng River (5km upstream of the Krenceng Reservoir)
3) ud : under detection

Table H-5 Observation Result of Discharge

unit : m^3/s

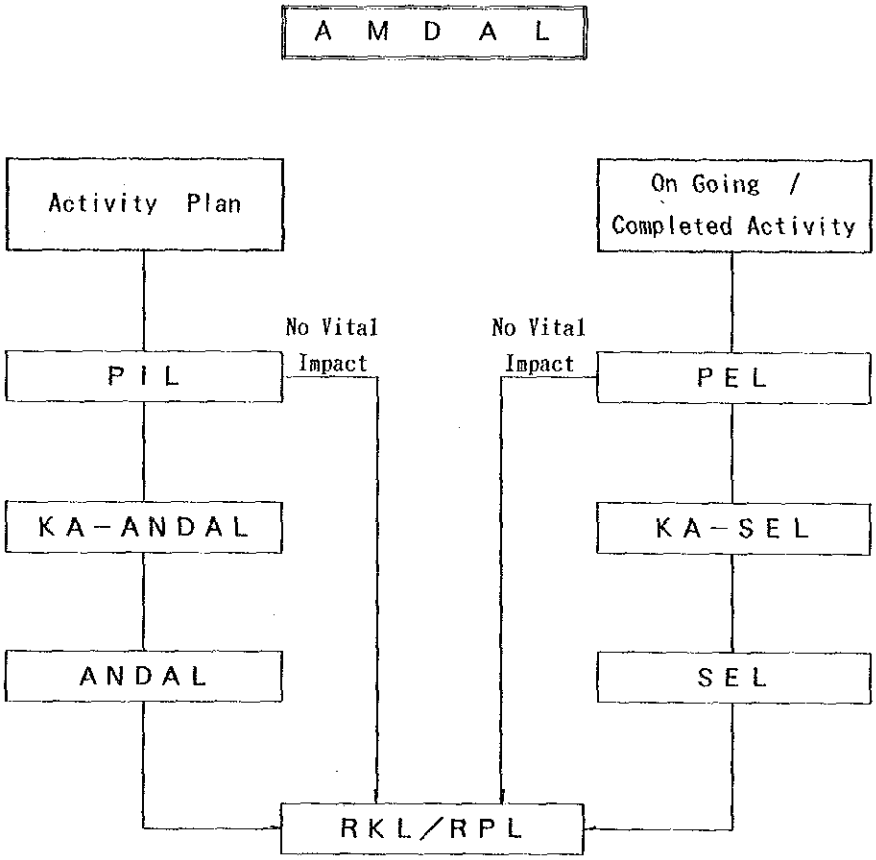
Location		Dry Season 1)	Rainy Season 2)	2)/1) Ratio
Cidanau River	Peusar	9.33	32.66	3.5
	Kadu Peureup		40.25	
	Sindang Laya	12.40	43.93	3.5
	Average 3)	10.87	38.90	3.6
Cibanten River	Serut	1.62	2.25	1.4
	Karundang	1.10	2.41	2.2
	Telanggaran	1.38	2.79	2.0
	Average 4)	1.37	2.50	1.8
3)／4) Ratio		7.9	15.6	

Table H-6 Present Land Use in the Catchment Area at Proposed Sites

Category \ Catchment Area	Downstream Cidanau Dam		Cidanau Gated Weir		Beroeng Diversion Tunnel		Krenceng Reservoir	
	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)
Wet Paddy Field	7,600	37	7,600	36	140	12	120	10
Upland Crop Field	8,700	43	9,130	44	940	78	550	45
Plantation	100	0	100	0	110	9	430	35
Forest	3,800	19	3,800	18	20	2	-	0
Swamp/Reservoir	200	1	200	1	-	0	15	1
Industrial Area	-	0	-	0	-	0	105	9
Total	20,400	100	20,830	100	1,210	100	1,220	100

FIGURES

Fig. H-1

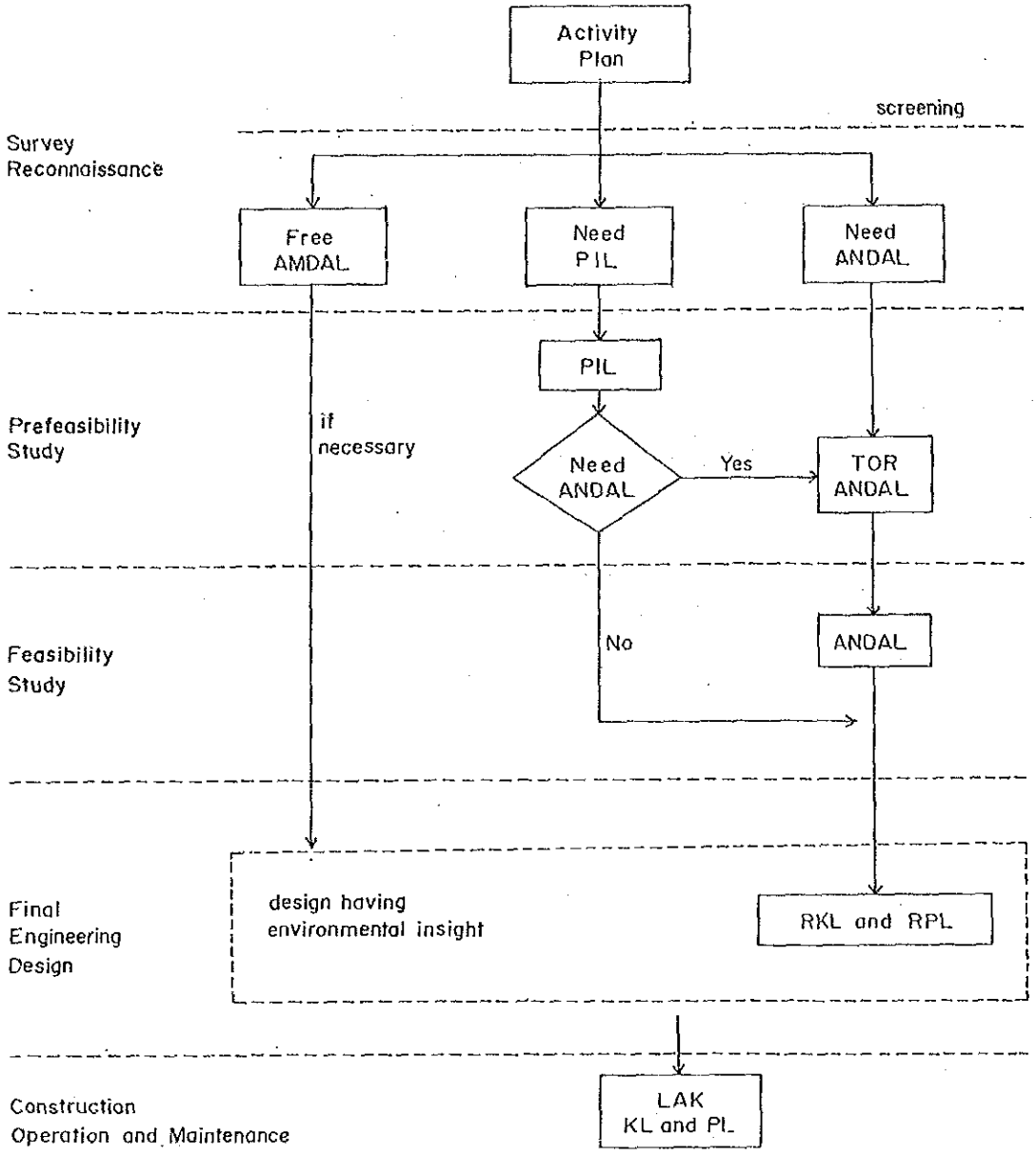


Environmental Assessment Flow

MINISTRY OF PUBLIC WORKS
DIRECTORATE GENERAL OF WATER RESOURCES DEVELOPMENT
FEASIBILITY STUDY ON CIDANAU-CIBANTEN
WATER RESOURCES DEVELOPMENT PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. H-2

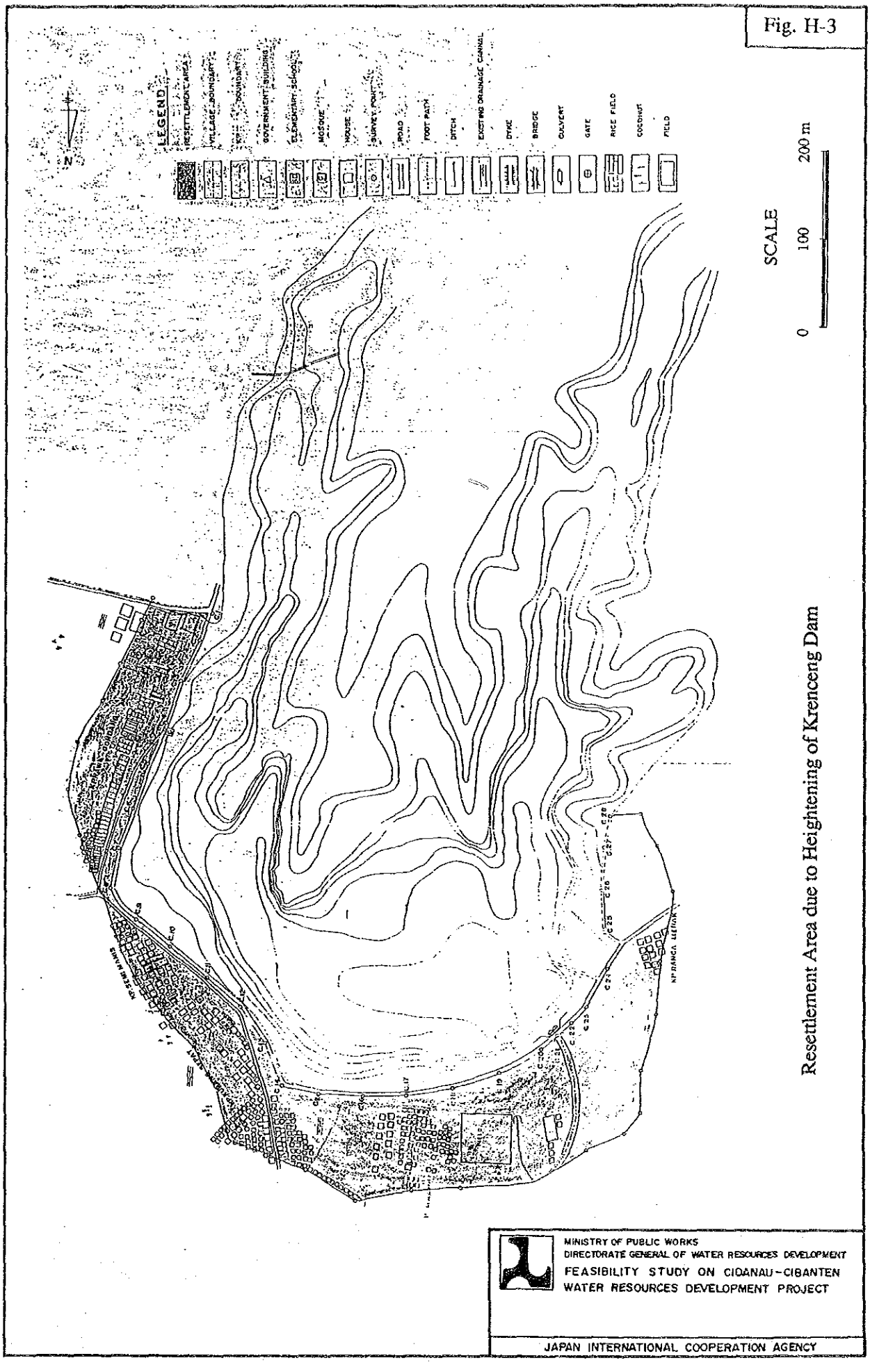


Executing Stage of Environmental Assessment

MINISTRY OF PUBLIC WORKS
DIRECTORATE GENERAL OF WATER RESOURCES DEVELOPMENT
FEASIBILITY STUDY ON CIDANAU-CIBANTEN
WATER RESOURCES DEVELOPMENT PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. H-3



Resettlement Area due to Heightening of Krenceng Dam

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FEASIBILITY STUDY ON CIDANAU-CIBANTEN
WATER RESOURCES DEVELOPMENT PROJECT

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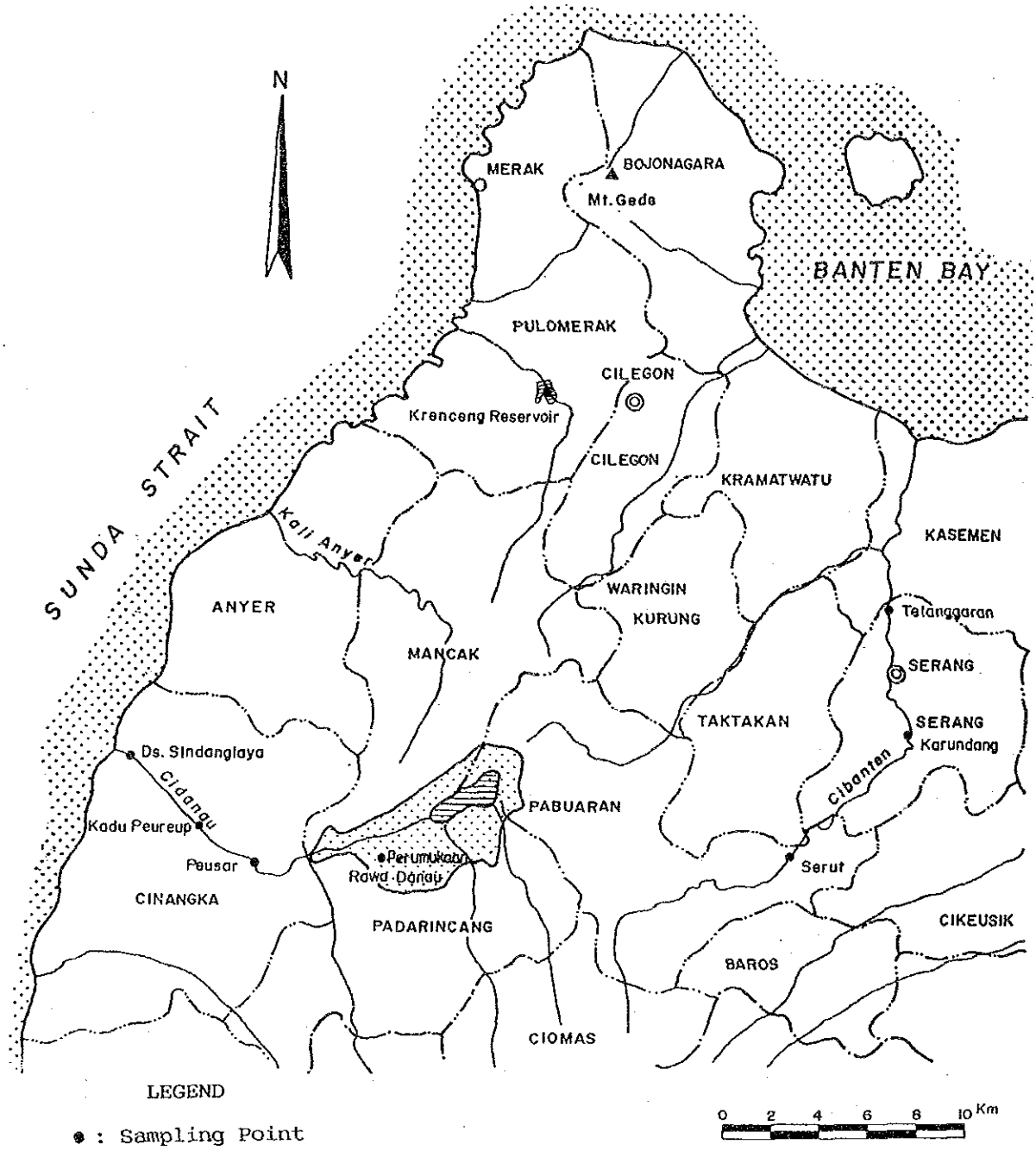
Fig. H-4



Location Map of Sampling for Water Quality Survey

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FEASIBILITY STUDY ON CIDANAU-CIBANTEN
WATER RESOURCES DEVELOPMENT PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY