Figures

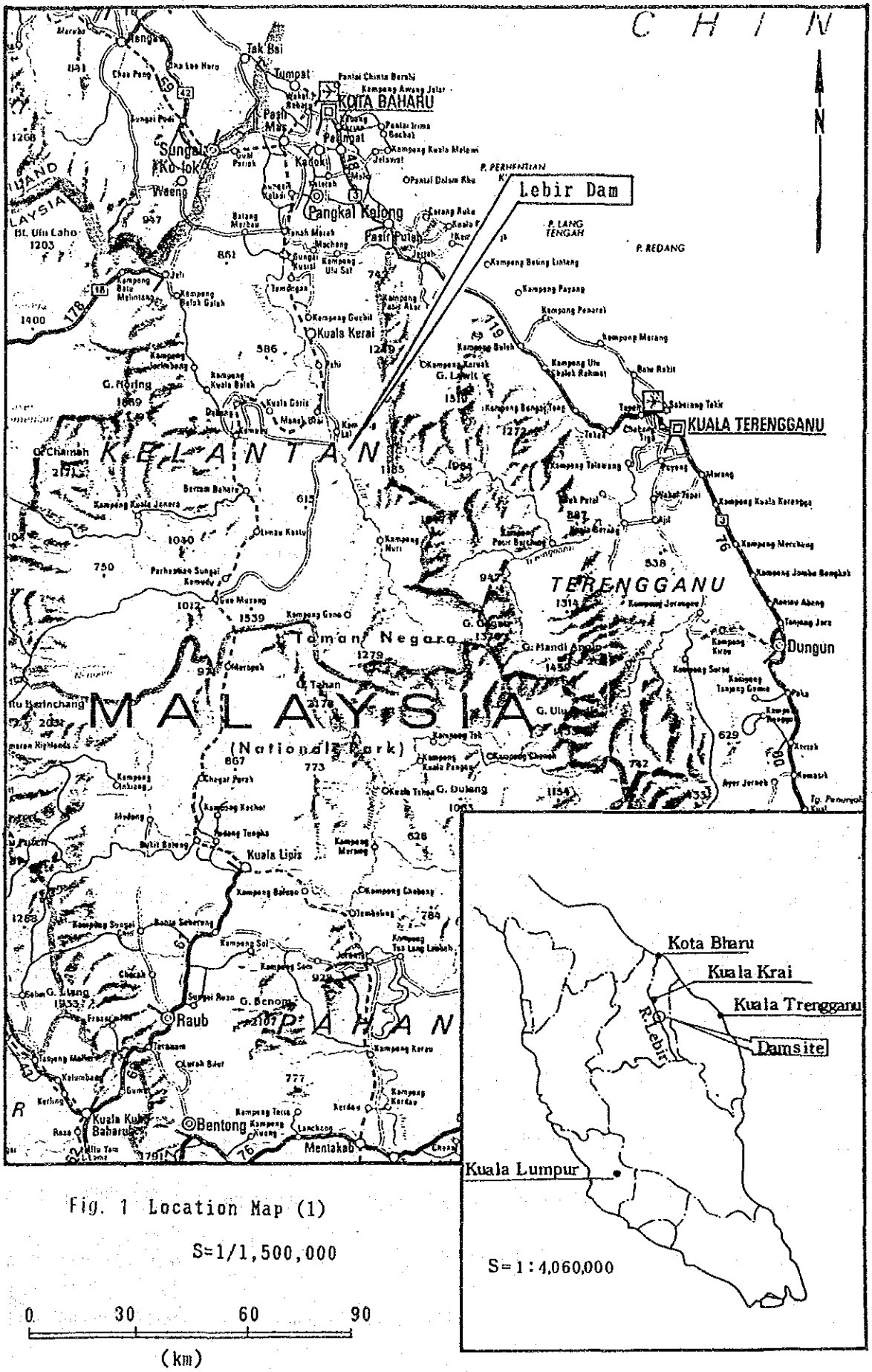
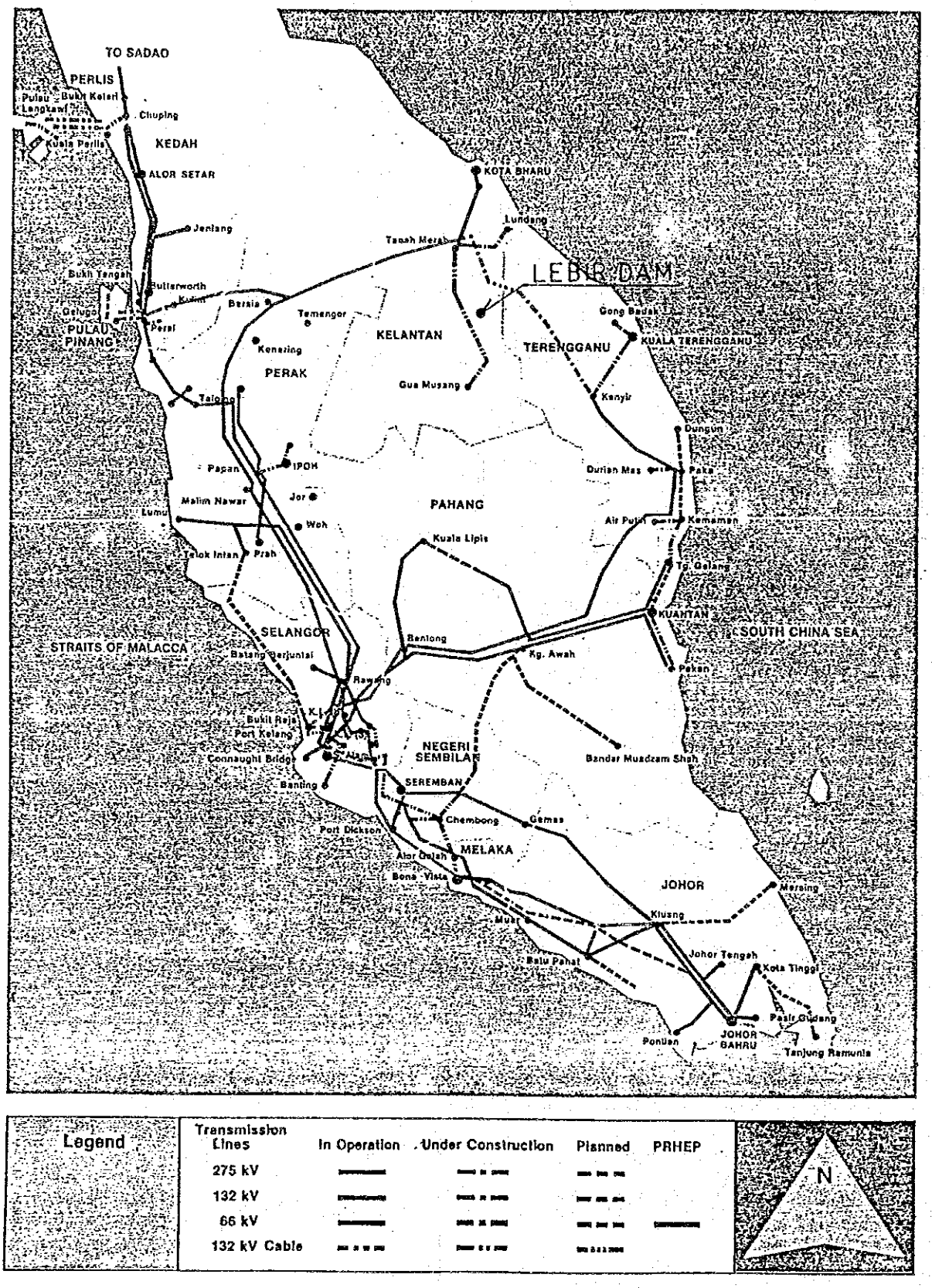


Fig. 1 Location Map (1)

S=1/1,500,000

Fig. 2 **THE NATIONAL GRID (Year ending 31 August 1985)**



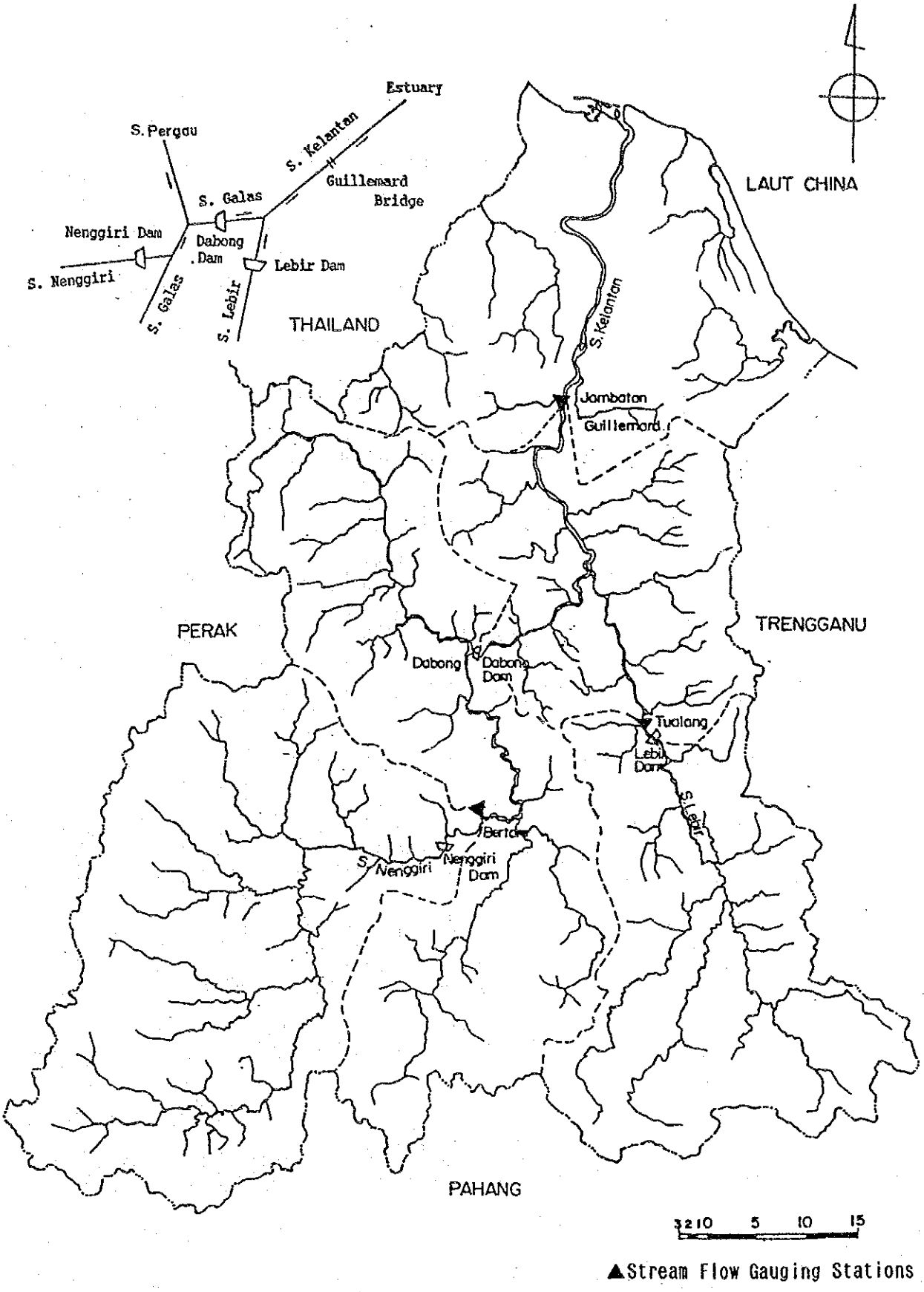


Fig. 3 Map of Kelantan Rever Basin

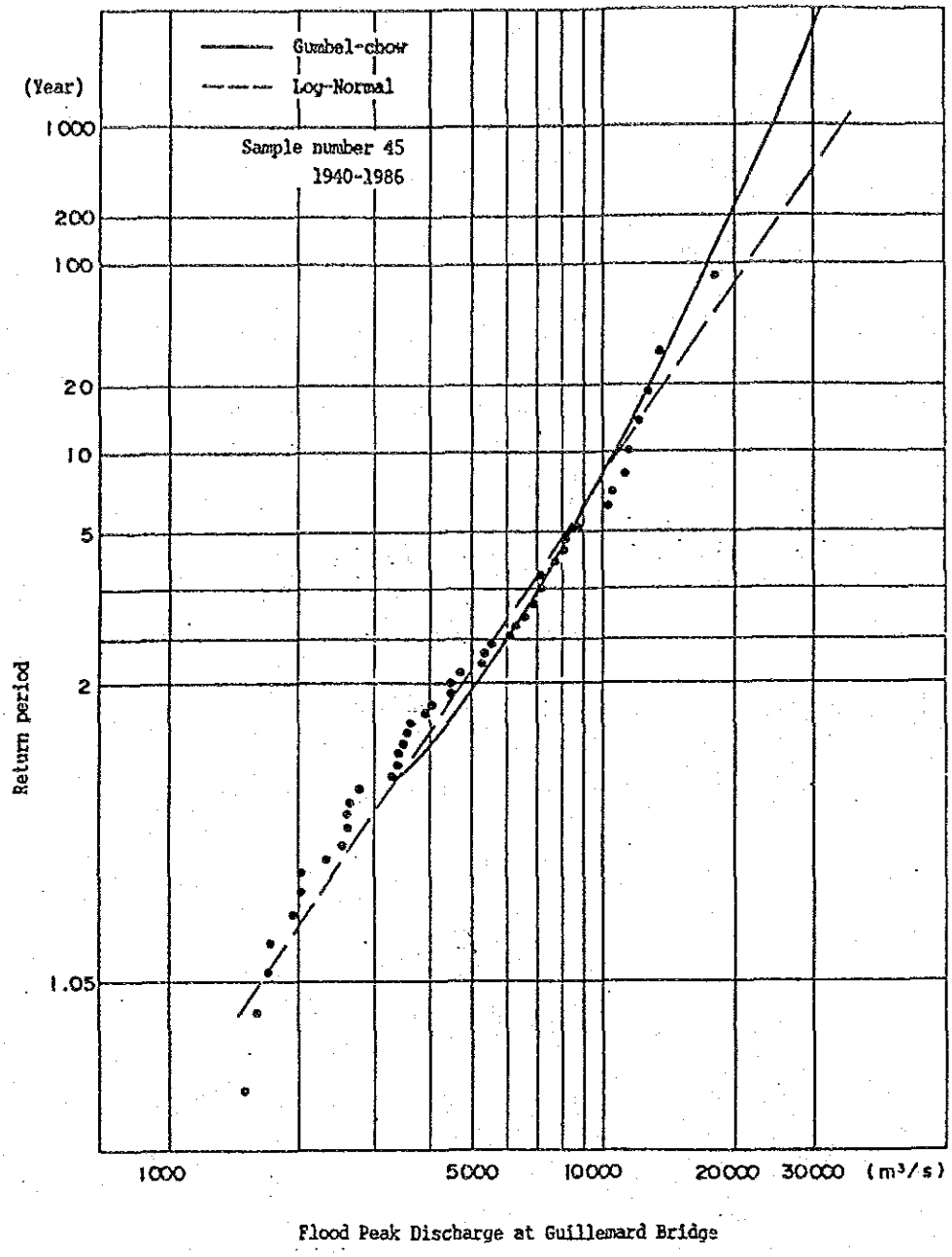
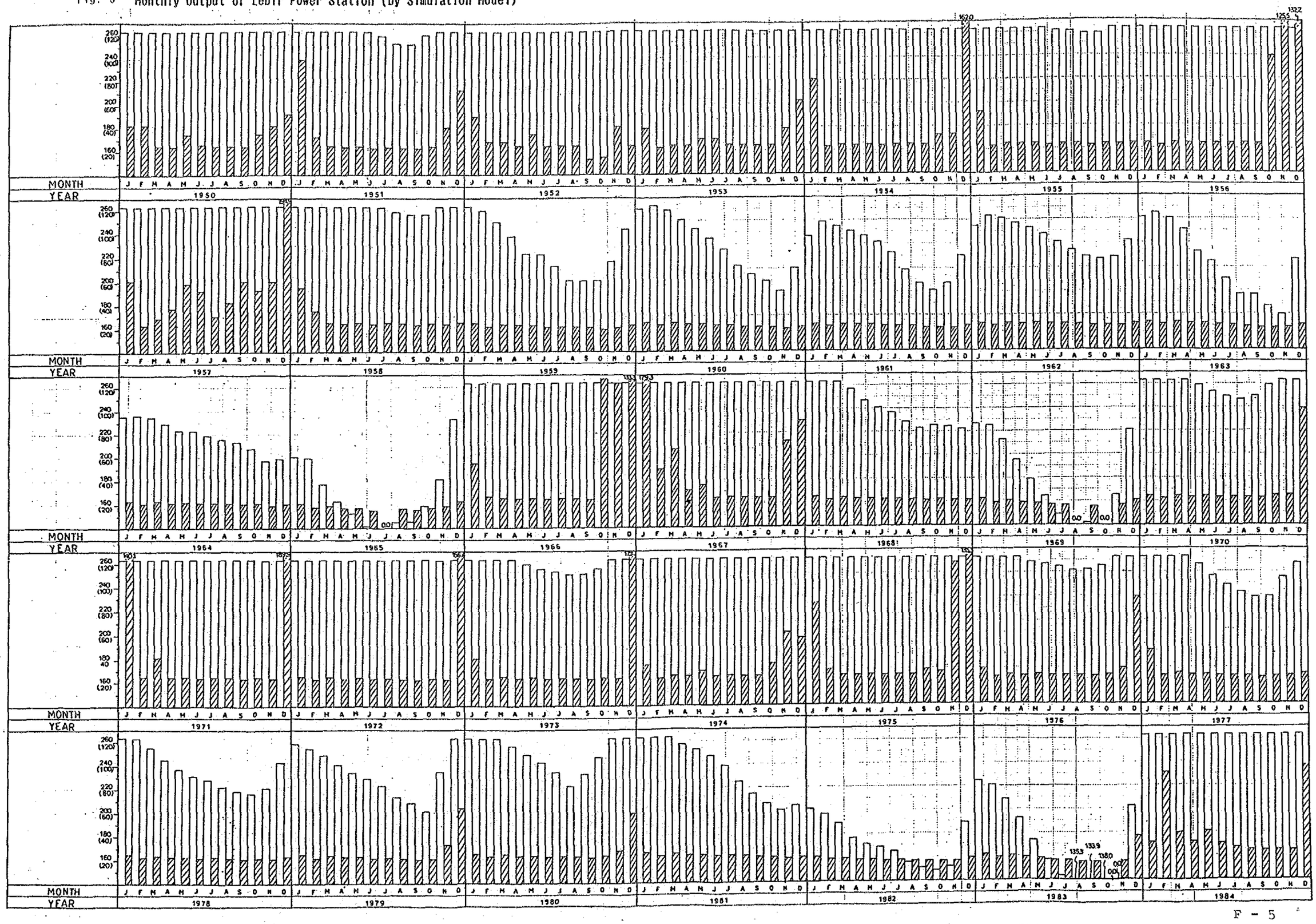


Fig. 4 Relationship between Flood Peak Dischage at Guillemard Bridge and Its Return Period

Fig. 5 Monthly Output of Lebir Power Station (by Simulation Model)



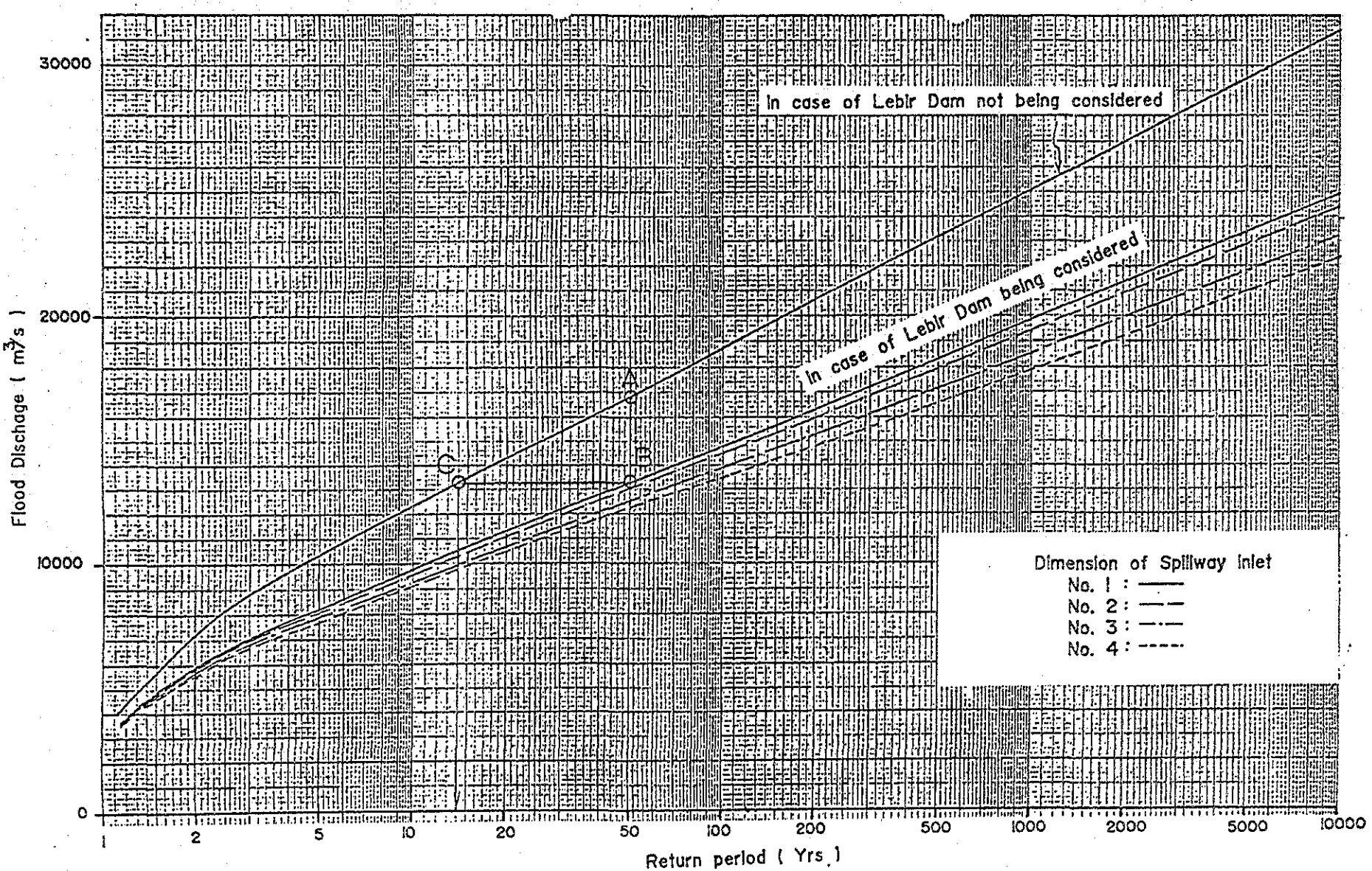


Fig. 6 Probable peak flood dischage at Guillemard Bridge
with / without Lebir Dam (Lebir Dam , ungated spillway)

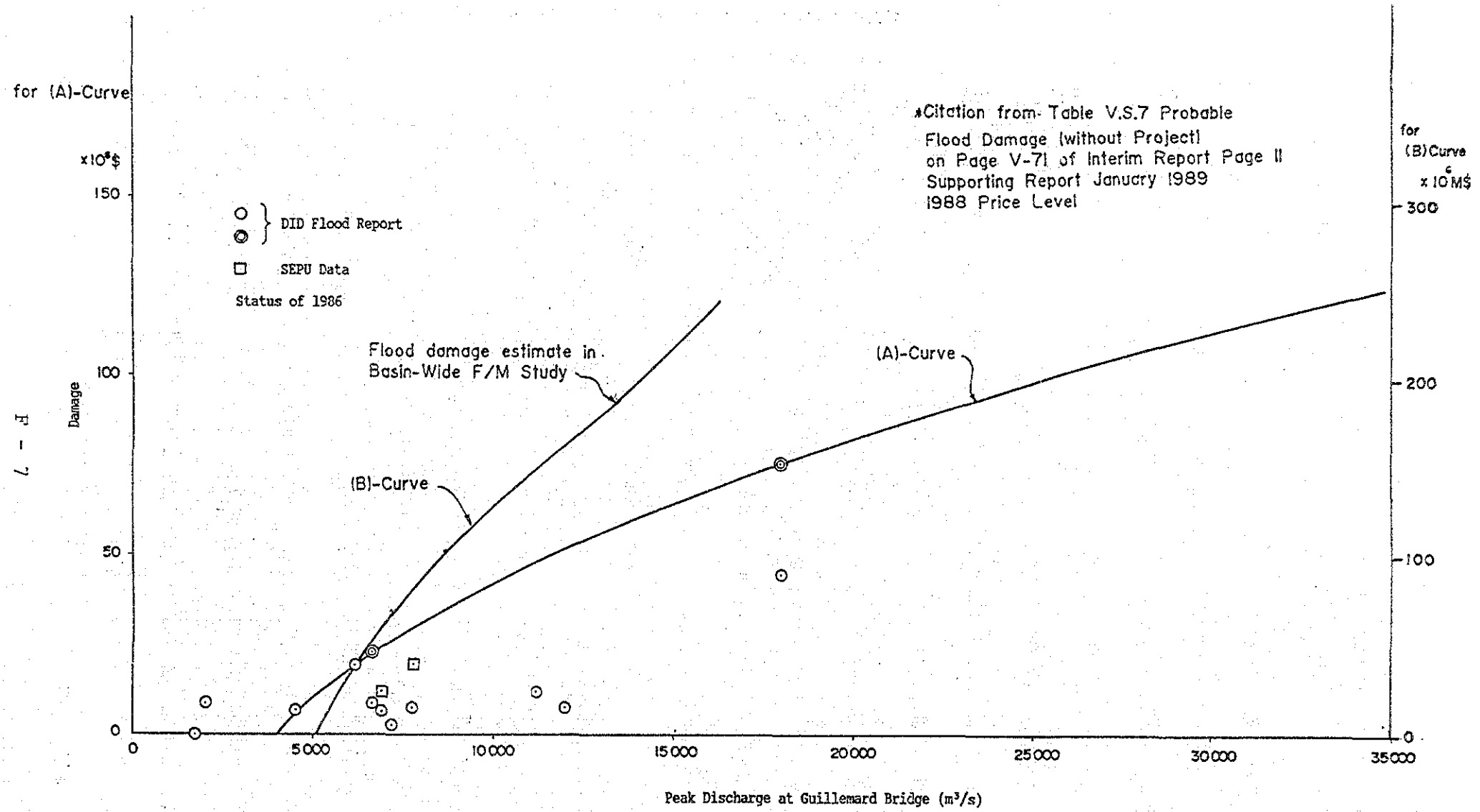


Fig. 7 RELATIONSHIP BETWEEN DAMAGES AND FLOOD DISCHARGES AT GUILLEMARD BRIDGE

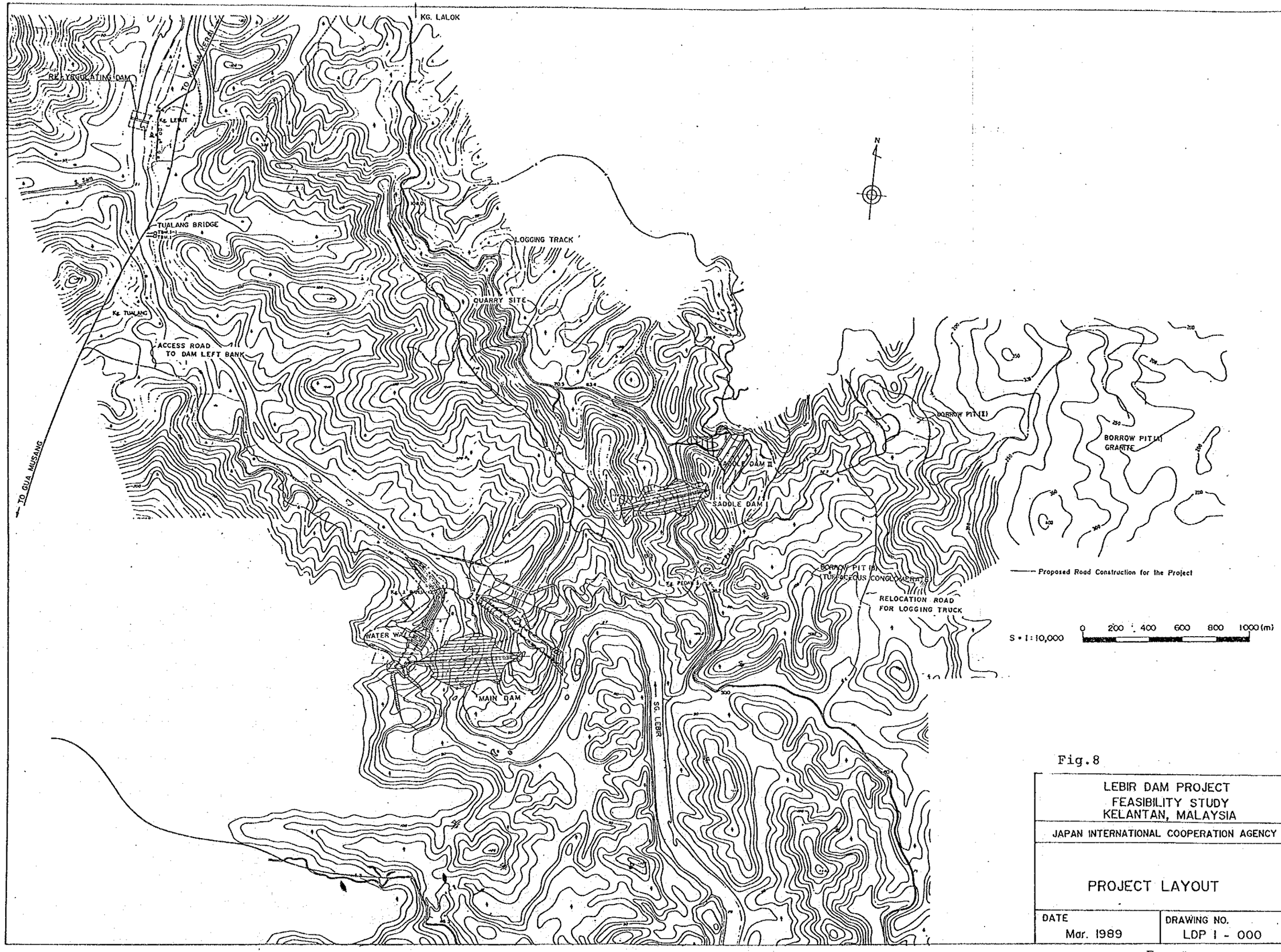


Fig.8

LEBIR DAM PROJECT FEASIBILITY STUDY KELANTAN, MALAYSIA	
JAPAN INTERNATIONAL COOPERATION AGENCY	
PROJECT LAYOUT	
DATE Mar. 1989	DRAWING NO. LDP I - 000

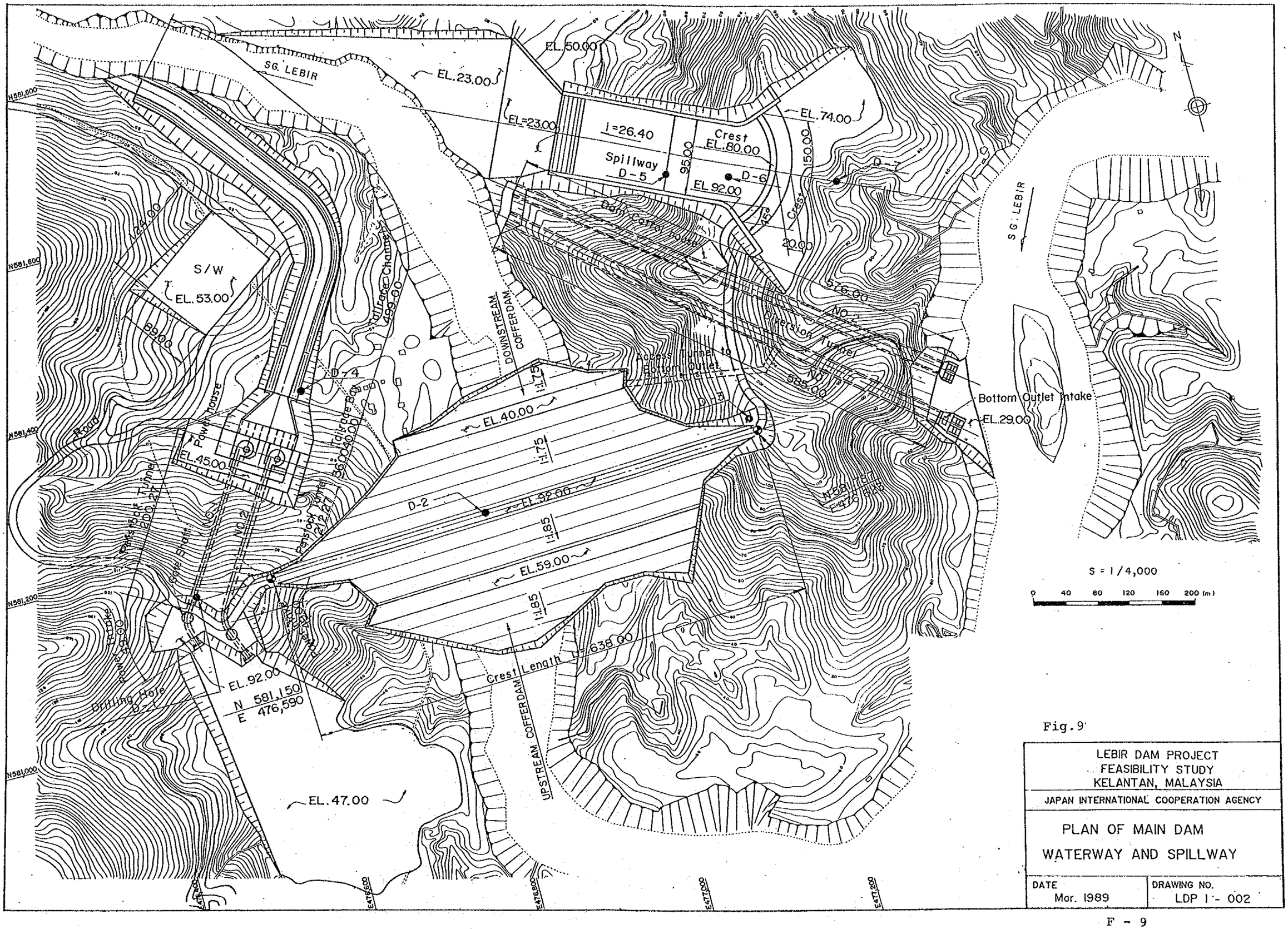
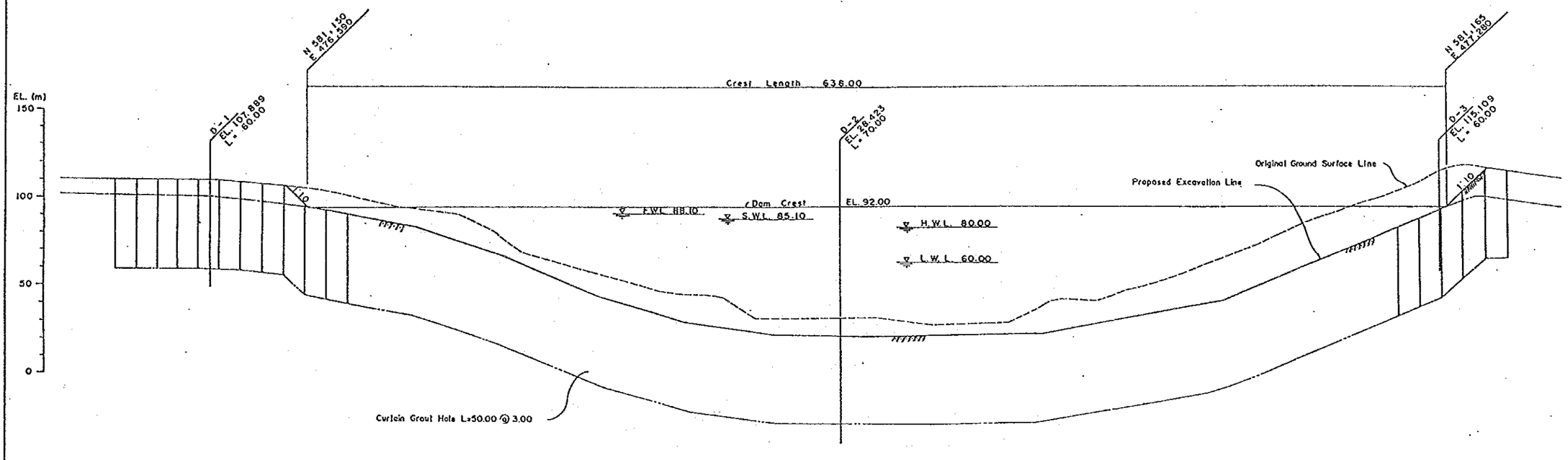


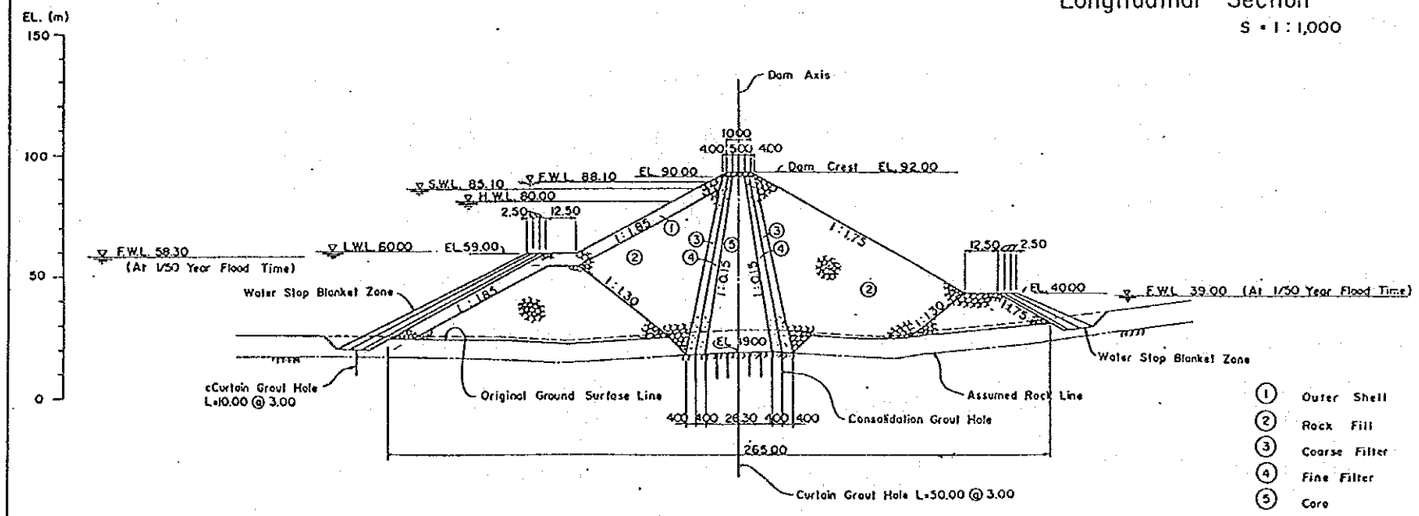
Fig. 9

LEBIR DAM PROJECT FEASIBILITY STUDY KELANTAN, MALAYSIA	
JAPAN INTERNATIONAL COOPERATION AGENCY	
PLAN OF MAIN DAM WATERWAY AND SPILLWAY	
DATE Mar. 1989	DRAWING NO. LDP 1 - 002



Longitudinal Section

S = 1 : 1,000



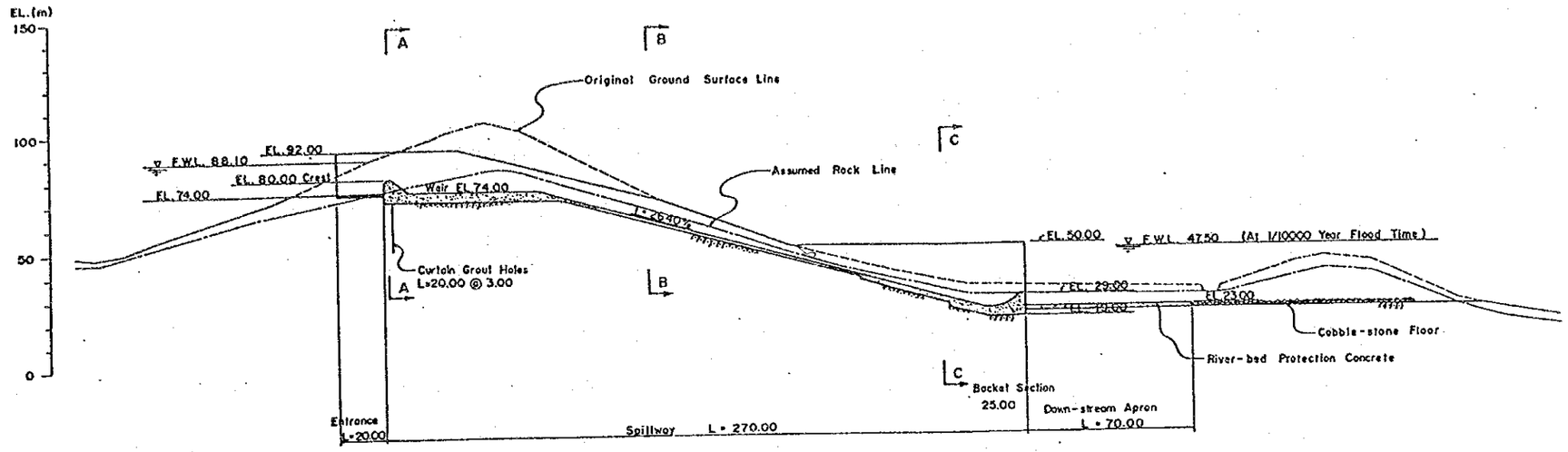
Typical Section

S = 1 : 1,000

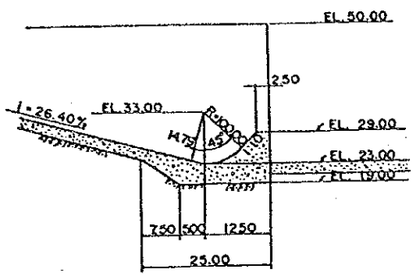
S = 1 : 1,000 0 20 40 60 80 100 (m)

Fig.10

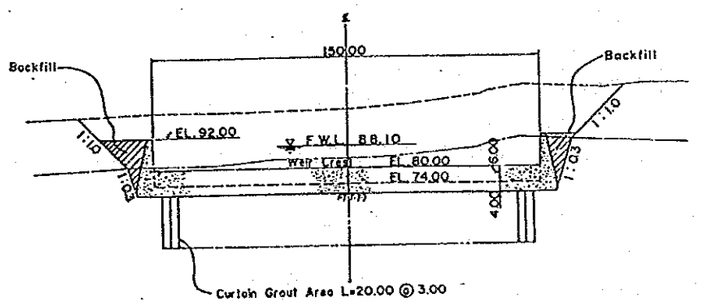
LEBIR DAM PROJECT FEASIBILITY STUDY KELANTAN, MALAYSIA	
JAPAN INTERNATIONAL COOPERATION AGENCY	
MAIN DAM SECTIONS	
DATE Mar. 1989	DRAWING NO. LDP I - 002.



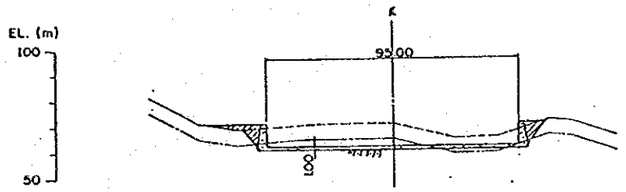
Profile
S = 1 : 1,000



Detail of Bucket
S=1 : 500



Section A-A
(Development Profile)
S = 1 : 1,000



Section B-B
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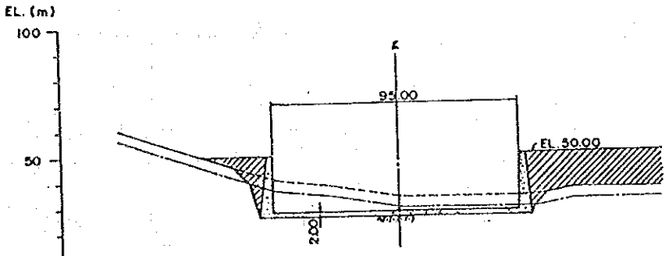

Section C-C
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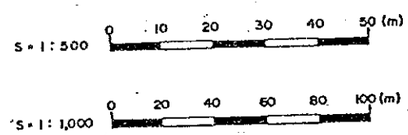
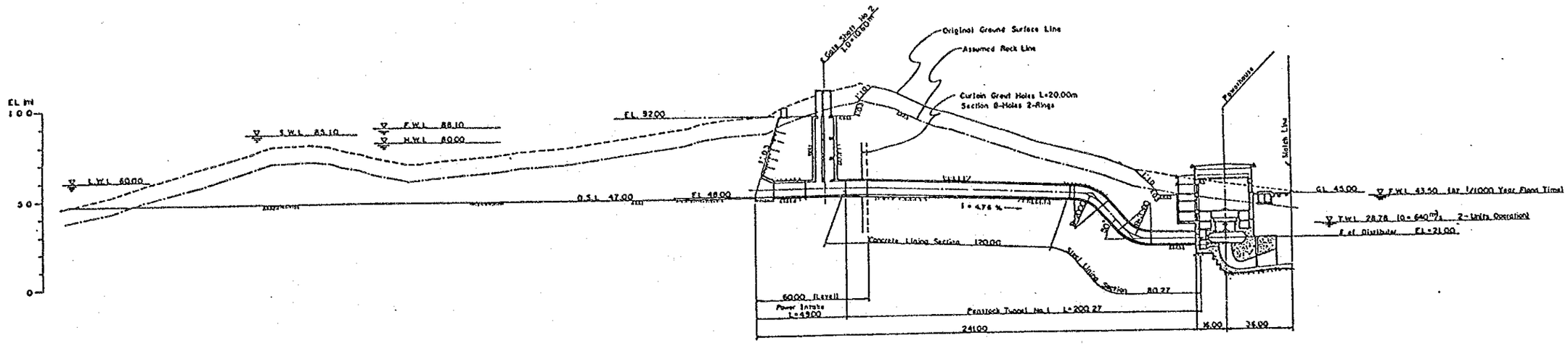


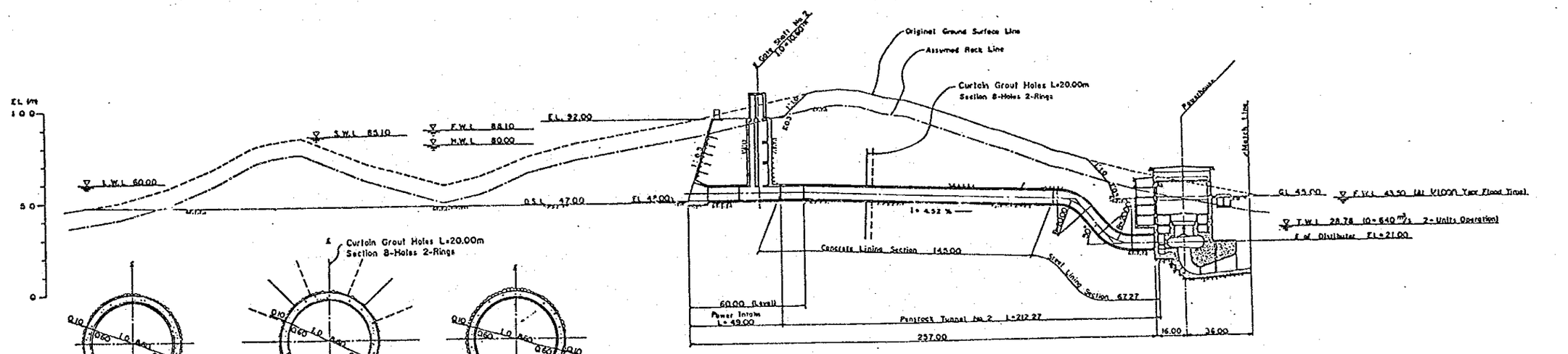
Fig.11

LEBIR DAM PROJECT FEASIBILITY STUDY KELANTAN, MALAYSIA	
JAPAN INTERNATIONAL COOPERATION AGENCY	
SPILLWAY PROFILE AND CROSS SECTIONS	
DATE Mar. 1989	DRAWING NO. LDP I - 007



Profile No.1

S=1:1000



Profile No.2

S=1:1000

Typical Sections

S=1:200

S=1:200 0 5 10 15 20m

S=1:1000 0 20 40 60 80 100m

Fig.12

LEBIR DAM PROJECT FEASIBILITY STUDY KELANTAN, MALAYSIA	
JAPAN INTERNATIONAL COOPERATION AGENCY	
POWER WATERWAY (I) PROFILES AND TYPICAL SECTIONS	
DATE Mar. 1989	DRAWING NO. LDP I - 009

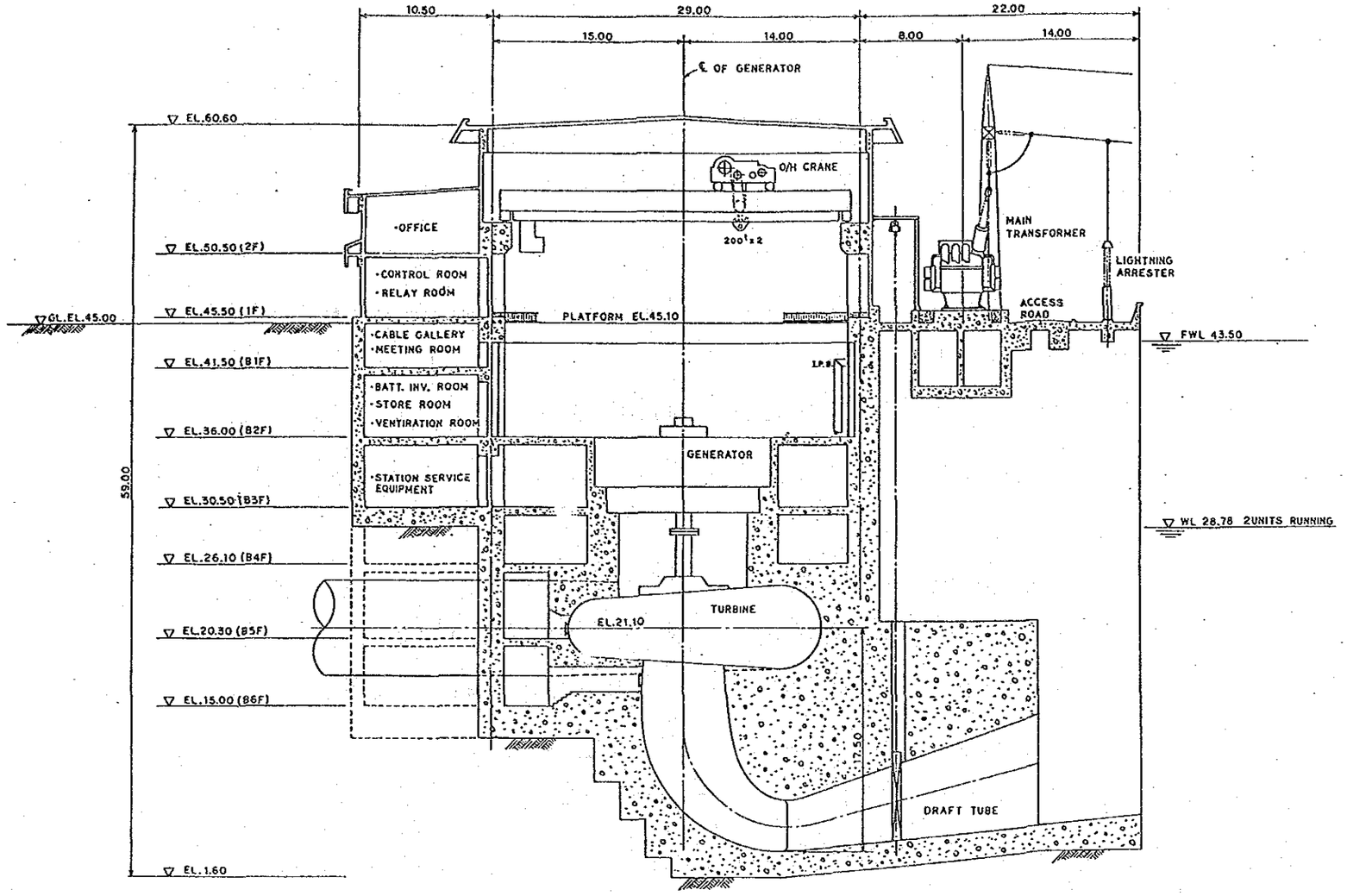
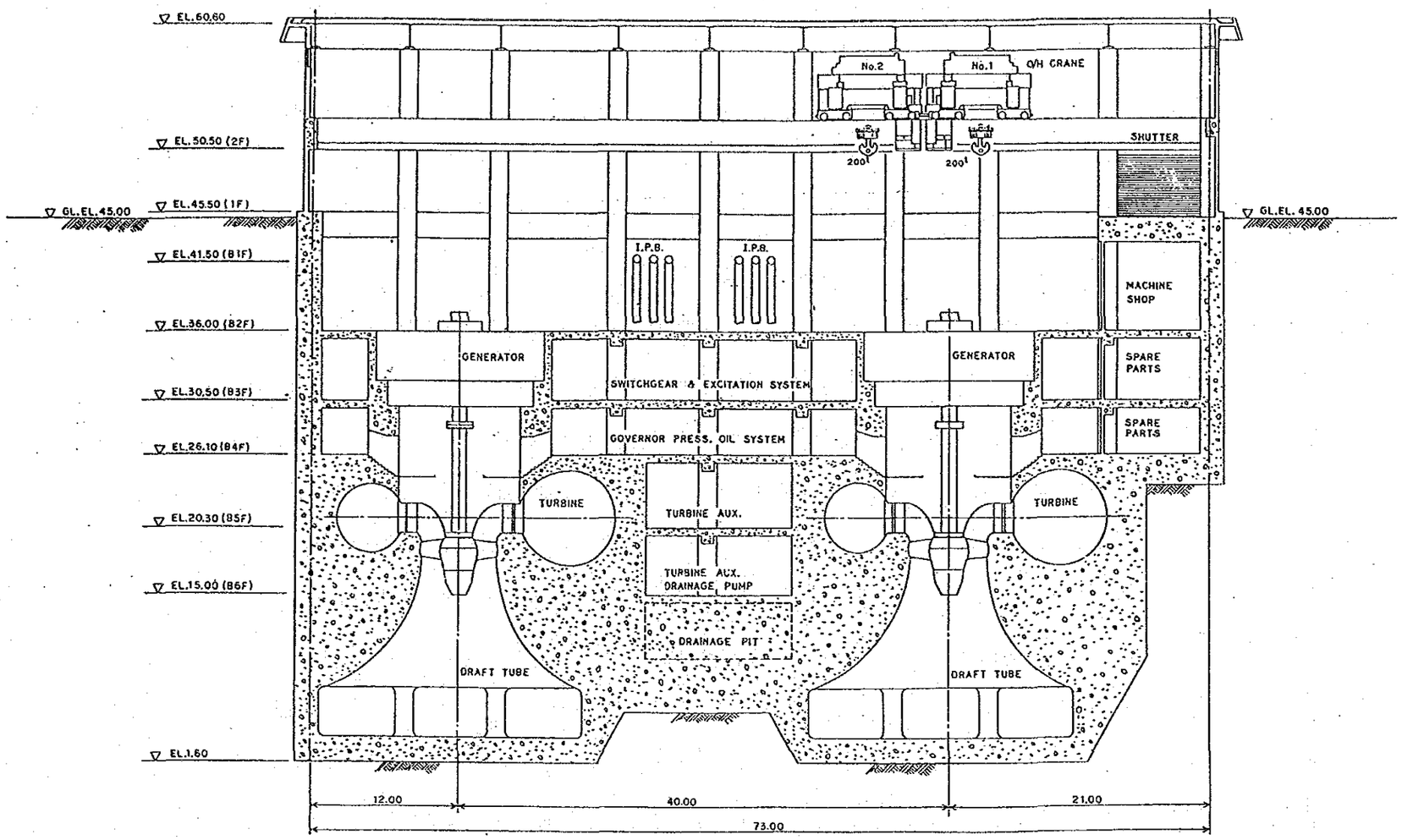


Fig.13

CROSS SECTION

LEBIR DAM PROJECT FEASIBILITY STUDY KELANTAN, MALAYSIA	
JAPAN INTERNATIONAL COOPERATION AGENCY	
POWERHOUSE CROSS SECTION	
DATE Mar. 1989	DRAWING NO. LDP I - 011



LONGITUDINAL SECTION

Fig.14

LEBIR DAM PROJECT FEASIBILITY STUDY KELANTAN, MALAYSIA	
JAPAN INTERNATIONAL COOPERATION AGENCY	
POWERHOUSE LONGITUDINAL SECTION	
DATE Mar. 1989	DRAWING NO. LDP I - 012

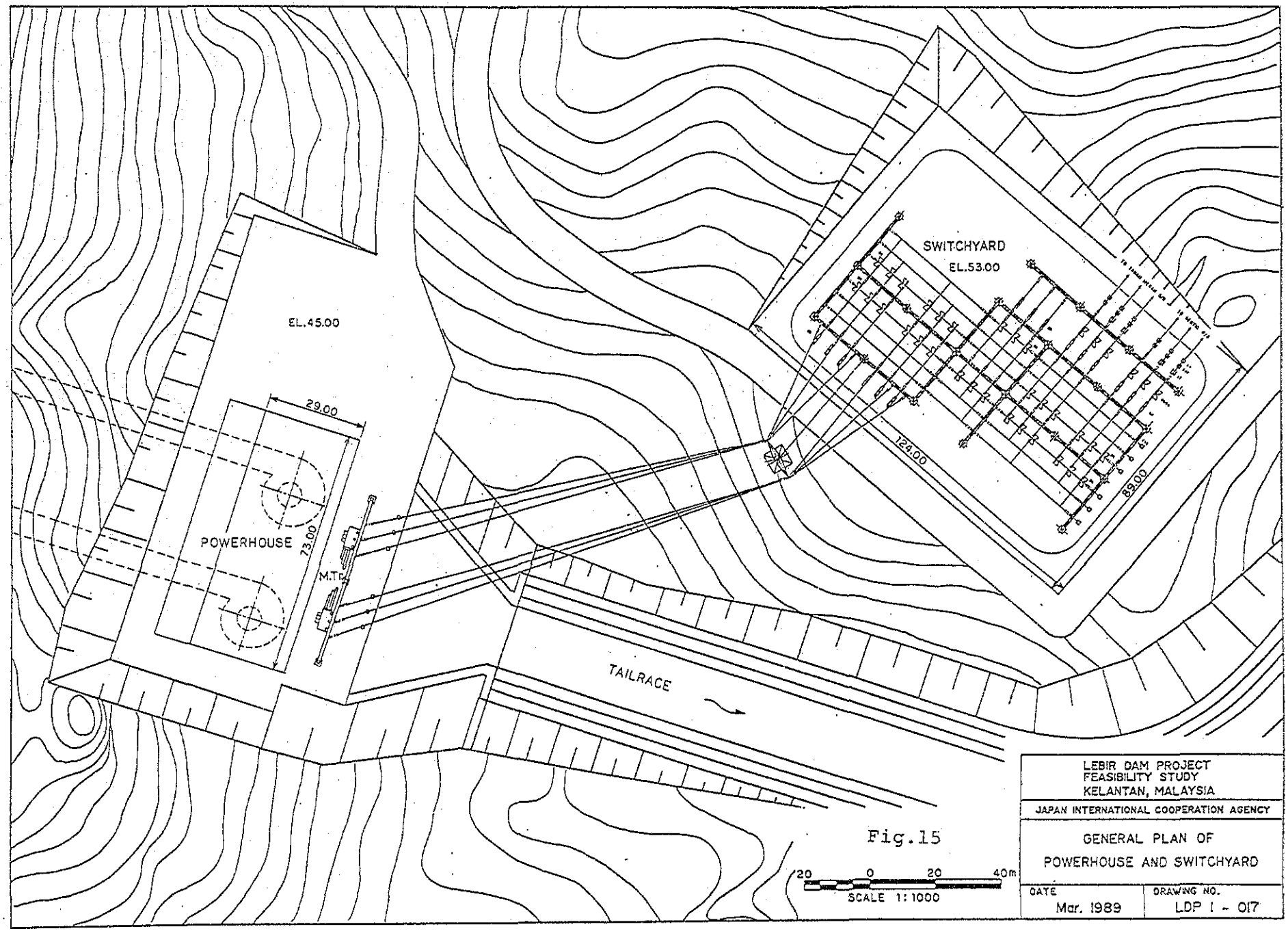
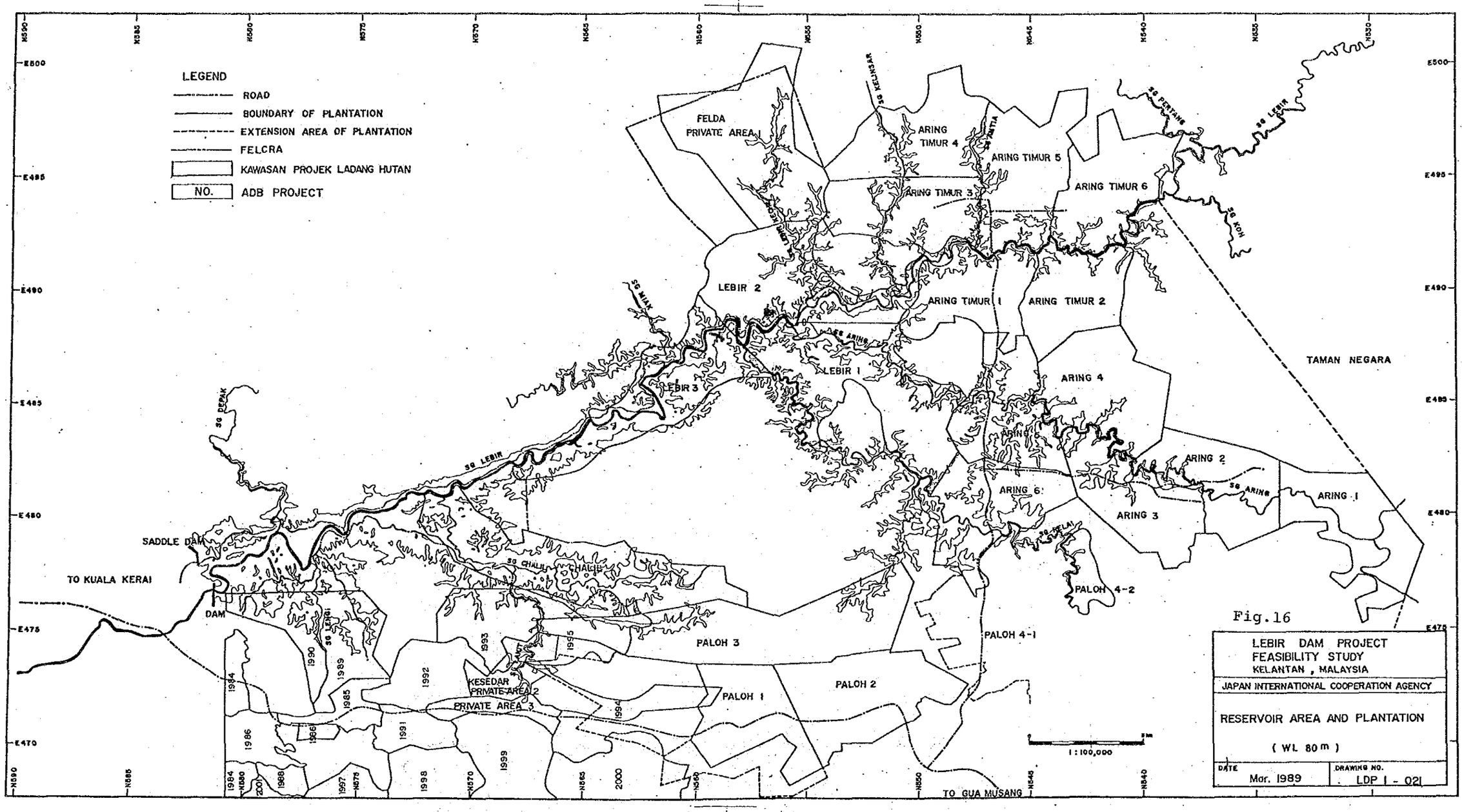


Fig.15

LEBIR DAM PROJECT FEASIBILITY STUDY KELANTAN, MALAYSIA	
JAPAN INTERNATIONAL COOPERATION AGENCY	
GENERAL PLAN OF POWERHOUSE AND SWITCHYARD	
DATE Mar. 1989	DRAWING NO. LDP I - 017


LEGEND
ROAD
BOUNDARY OF PLANTATION
EXTENSION AREA OF PLANTATION
FELCRA
KAWASAN PROJEK LADANG HUTAN
NO. ADB PROJECT
FELDA PRIVATE AREA 1
ARING TIMUR 4
ARING TIMUR 5
ARING TIMUR 3
ARING TIMUR 6
LEBIR 2
ARING TIMUR 1
ARING TIMUR 2
LEBIR 1
LEBIR 3
ARING 4
ARING 5
ARING 6
ARING 2
ARING 3
ARING 1
TAMAN NEGARA
SADDLE DAM
TO KUALA KERAI
DAM
PALOH 3
PALOH 1
PALOH 2
PALOH 4-1
PALOH 4-2
KESEDAR PRIVATE AREA 2
PRIVATE AREA 3
TO GUA MUSANG
SG LEBIR
SG ARING
SG CHALIB
1 : 100,000
Fig.16
LEBIR DAM PROJECT
FEASIBILITY STUDY
KELANTAN , MALAYSIA
JAPAN INTERNATIONAL COOPERATION AGENCY
RESERVOIR AREA AND PLANTATION
(WL 80 m)
DATE Mar. 1989
DRAWING NO. LDP I - 021

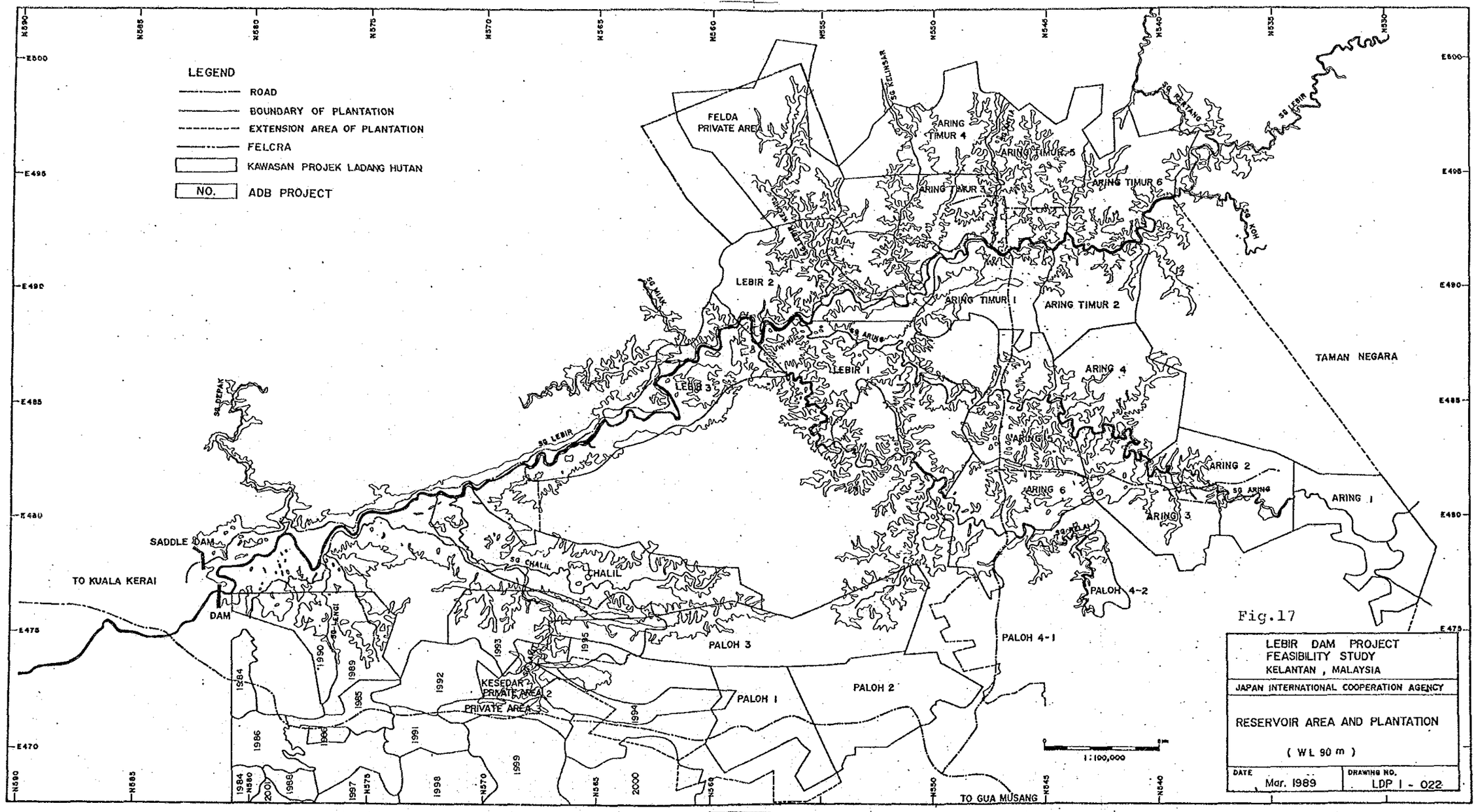
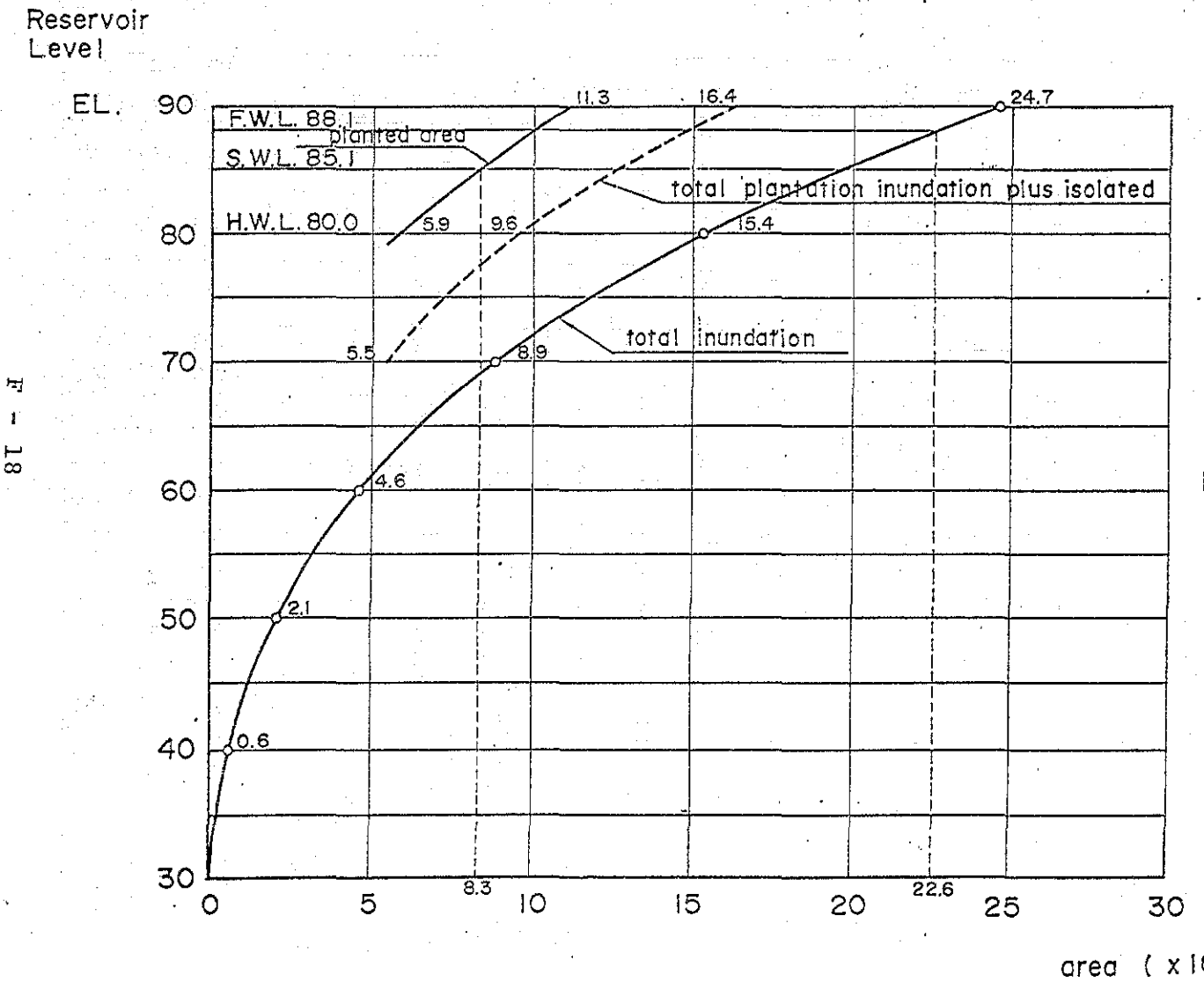

LEGEND
ROAD
BOUNDARY OF PLANTATION
EXTENSION AREA OF PLANTATION
FELCRA
KAWASAN PROJEK LADANG HUTAN
NO. ADB PROJECT
FELDA PRIVATE AREA
ARING TIMUR 4
ARING TIMUR 5
ARING TIMUR 3
ARING TIMUR 6
LEBIR 2
ARING TIMUR 1
ARING TIMUR 2
LEBIR 1
LEBIR 3
ARING 4
ARING 5
ARING 6
ARING 2
ARING 3
ARING 1
TAMAN NEGARA
SG LEBIR
SG KELINSAR
SG PERTANG
SG KOH
SG ARING
SG CHALIL
SG DEPAK
SADDLE DAM
DAM
TO KUALA KERAI
CHALIL
PALOH 4-2
PALOH 4-1
PALOH 3
PALOH 2
PALOH 1
KESEDAR PRIVATE AREA 2
KESEDAR PRIVATE AREA 3
1:100,000
TO GUA MUSANG
LEBIR DAM PROJECT
FEASIBILITY STUDY
KELANTAN , MALAYSIA
JAPAN INTERNATIONAL COOPERATION AGENCY
RESERVOIR AREA AND PLANTATION
(WL 90 m)
DATE Mar. 1989
DRAWING NO. LDP I - 022

Fig.17

Fig.18 Plantation Area to be Compensated due to Inundation of Lebir Dam

(based on the current development)



Area at F.W.L 88.1 = 10,000 ha
Rubber (31%) 3,100 ha
Oil Palm (69%) 6,900 ha

Location	WL80	WL90
Kesedar	3,312 ha	5,565 ha
Felda	1,758	4,402
Felcra	77	129
ADB project	750	1,180
total	5,897 ha	11,276 ha

Note :

Kesedar includes Paloh 3, Lebir I and Chalil.

Felda includes Aring 1, 2, 3, 4 and 5, Aring Timur 1, 2, 3 and 4. (refer to Table II - 5)

Fig. 19 Lebir Dam Project Implimentation Programme

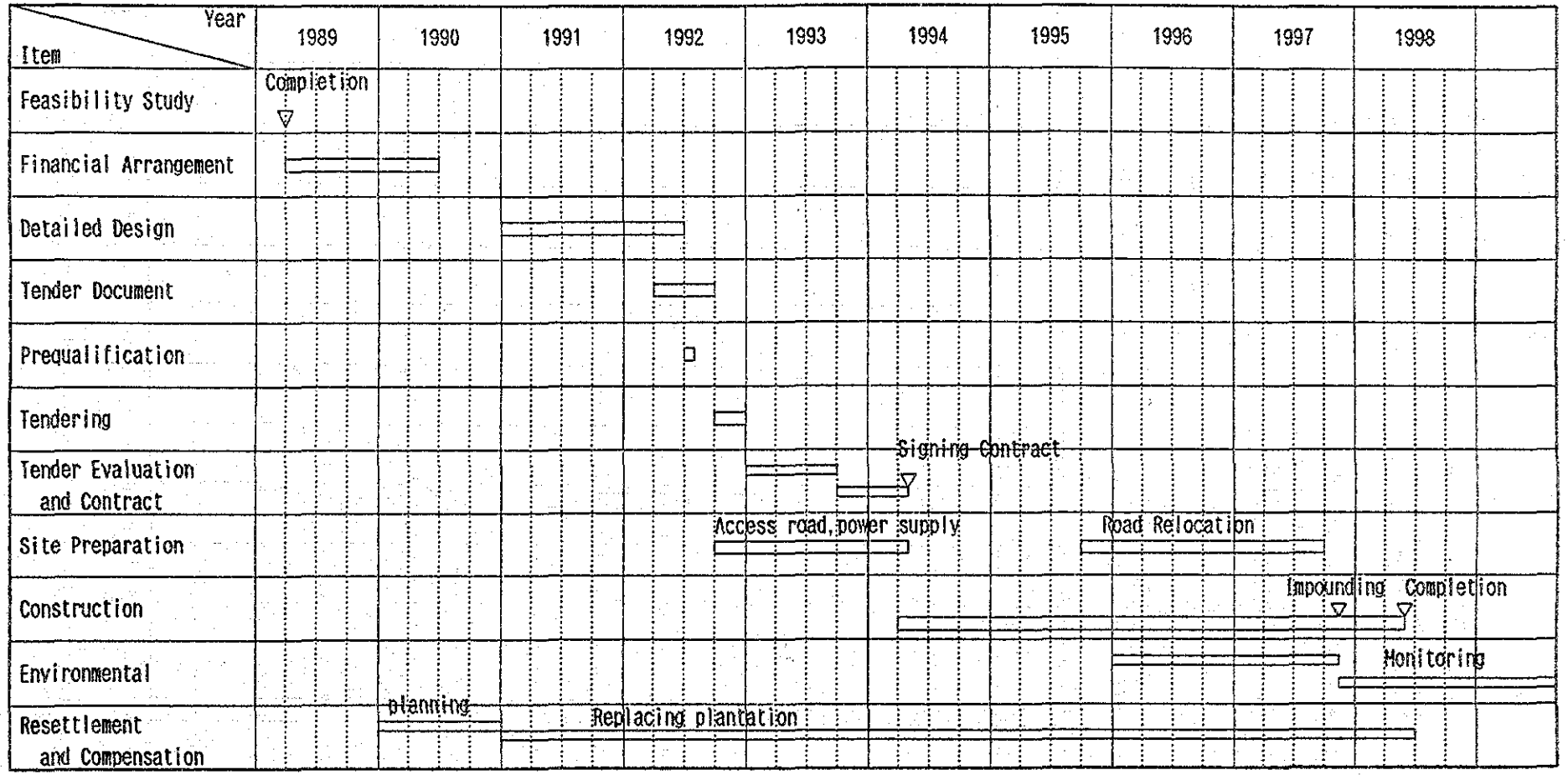


Fig.20 Time Schedule for Detail Design and Preparation of Tender Document for Lebir Dam Project

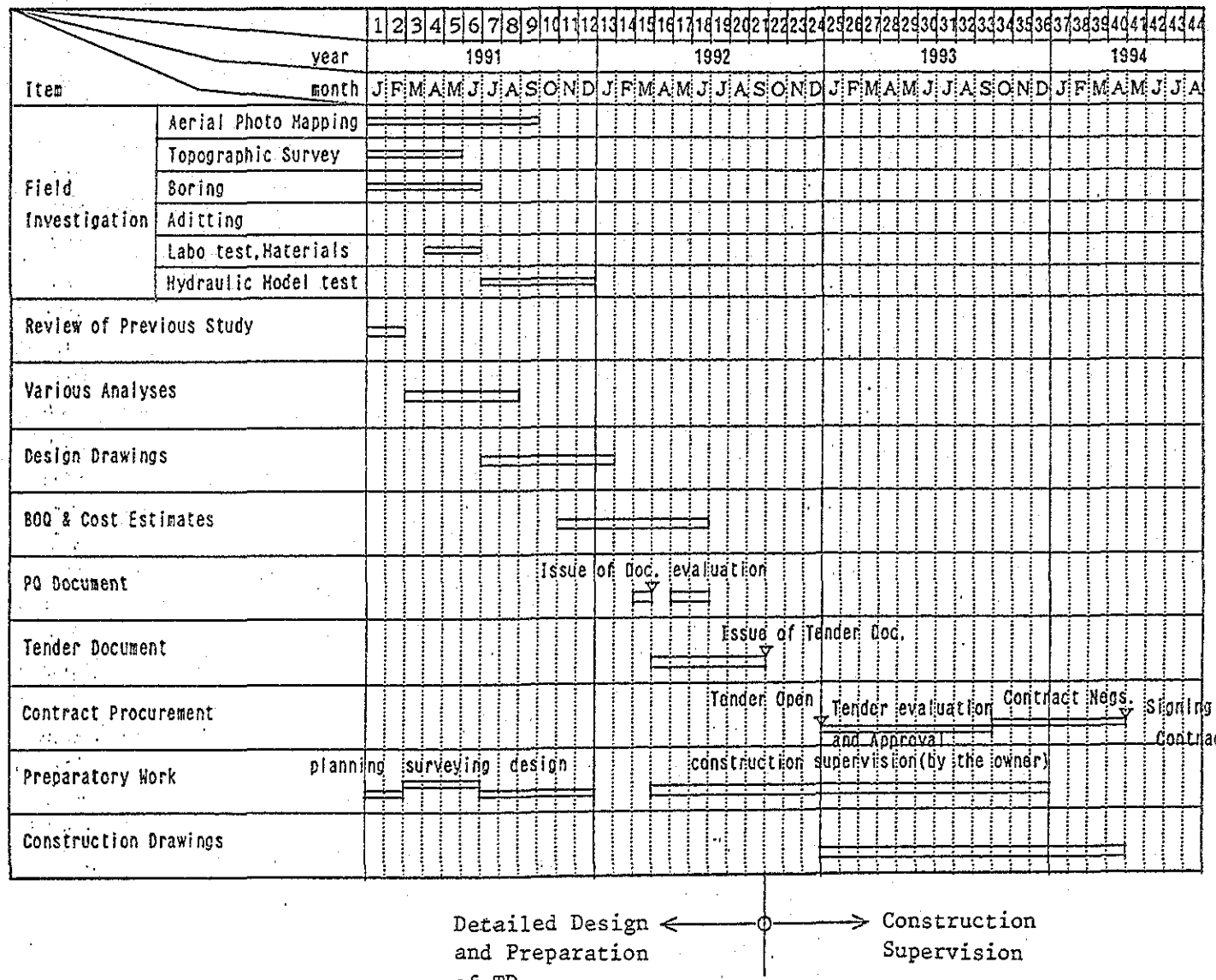
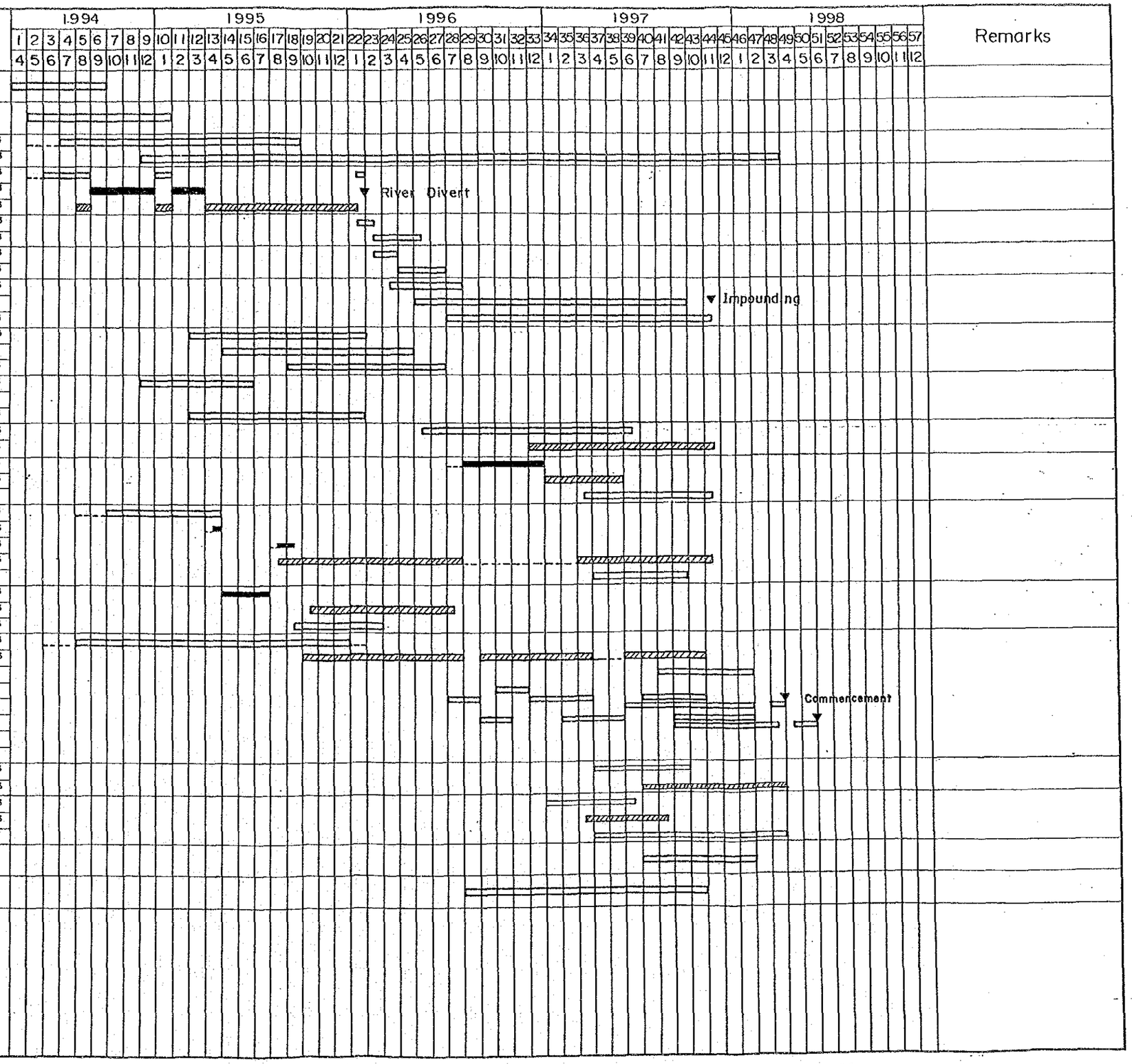


Fig.21 Construction Schedule of Main Works

Item		Quantity
Mobilization		
Site Installation		
Quarry	Common	1 250,500 m³
	Rock Product	5 000,000 m³
Diversion Tunnel	Open Ex.	141,200 m³
	Tunnel Ex.	189,100 m³
	Con.	79,500 m³
Upstream Cofferdam	Ex	127,300 m³
	Em.	503,500 m³
Downstream Cofferdam	Ex.	45,700 m³
	Em.	154,000 m³
Main Dam	Ex.	356,200 m³
	Grouting	13,050 m
	Em.	2 362,000 m³
Saddle Dam I	Ex.	868,100 m³
	Grouting	8,820 m
	Em.	1 395,500 m³
Saddle Dam II	Ex.	195,100 m³
	—	—
	Em.	741,700 m³
Spillway	Ex.	1 318,800 m³
	Con.	121,600 m³
Bottom Outlet	Tunnel Ex.	3,600 m³
	Con.	1,500 m³
	Facility Inst.	
Power Intake	Open Ex.	1 042,100 m³
	Tunnel Ex.	2,600 m³
	Shaft Ex.	14,700 m³
	Con.	12,270 m³
	Gate & Screen	
Penstock Tunnel	Tunnel Ex.	31,100 m³
	Con.	8,100 m³
	Steel Liner	920 m³
Power house	Ex.	238,000 m³
	Con.	74,000 m³
	Draft Gate	
	Over Head Crane	—
	Unit # 1	—
	# 2	—
	M.T. # 1	—
	# 2	—
Tailrace	Ex.	437,300 m³
	Con.	12,300 m³
Switchyard	Ex.	74,900 m³
	Con.	4,000 m³
	E/M	—
Transmission Line		
Hydrological Telemetering & Downstream Warning System		



Remarks

Attachments

JICA STUDY TEAM
c/o The New Japan Engineering Consultants, Inc.,
20 - 19, Shimanouchi Ichome, Minami-ku,
Osaka, Japan.

Mr. Th'ng Yong Huat,
Chief Engineer for Hydro Projects,
National Electricity Board,
129, Jalan Bangsar,
Kuala Lumpur,
MALAYSIA.

March 12, 1988

Dear Sir,

Re: Submission of Minutes of Meeting
for the feasibility study for the Lebir Dam Project

We are pleased to submit herewith a copy of the Minutes of Meeting which was held on March 7, 1988 regarding the Interim Report of Feasibility Study for the captioned project prepared by us as a record of the meeting.

Thank you for your kind attention.

Yours faithfully,

Yoichi Takemura
Team Leader
JICA STUDY TEAM
for the Lebir Dam Project

MINUTES OF MEETING

ON

INTERIM REPORT

THE FEASIBILITY STUDY FOR THE LEBIR DAM PROJECT

MARCH 7, 1988

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

1. A Technical Committee Meeting has been held at NEB Head Office on March 7, 1988 regarding the Interim Report of Feasibility Study for the Lebir Dam Project which was submitted to the authorities concerned through NEB in February 1988 by Japan International Cooperation Agency (JICA).

2. Parcitipants of the Meeting are as per attached attendance list.

3. The following points have been raised and discussed in the meeting.

1) Results of Seismic Prospecting

No weak zone nor major faults have been found through the seismic prospecting.

Deep weathering at the Saddle Dam No. 1 is a major concern among the results.

In the survey site, the rock is, in general, lightly weathered and fresh.

2) Rocks in Tuff Group

- This type of rock usually contains sulphides which are harmfull to concrete. Therefore, tests should be made when this type of rock was planned to be used for concrete aggregate.

3) Matrix System in Environmental Assessment

- A utilization of the matrix system in the screening process on the environmental items which are not applied to the Interim Report was recommended to e adopted by D.O.E.

4) Environmental Impact Statement by JICA

- The Environmental Impact Statement which was submitted to NEB does not cover medico-ecological aspects being handled by IMR (Institute for Medical Research),except which the statement is the final.

5) Regulation of Generation Discharge

- The reregulating pondage site studied by JICA Team has a limited storage capacity of approx. 1,000,000 m^3 at WL 27 m which corresponds to the tailrace water level at the proposed Lebir Hydro Power Station.

- It is difficult to regulate the generation discharge with this limited storage which is one sixth of the required storage for a complete regulation.

- JICA Team is studying on the flow of the generation discharge towards the downstream area where the pump stations are operated for their use of water by a analytical method. The preliminary result indicates rather levelized flow in these area.

- JICA Team is also studying on the necessity of the establishment of a downstream discharge warning system to make downstream inhabitants up to Kuala Krai take precaution against the generation discharge.

- DID recommended to study a bank erosion problem due to the peak generation discharge.

6) Flood Analysis

- DID pointed out that the contribution of the Dabong Dam to the flood mitigation at the Guillemard Bridge is almost the same extent as the Lebir Dam in the Interim Report. This is somewhat inconsistent with their catchment areas, the former having three times as much as the latter.

- JICA Team commented that the possible reason for that seems due to lesser rainfalls in the Dabong Dam catchment area.

7) Dam Break Analysis

- JKR questioned whether a dam break analysis is necessary or not.

- JICA Team stated that the modern dam construction techniques and the foundations in the Lebir Dam Project would permit to construct very safe dams in this Project. Therefore, such analysis appears unnecessary.

ATTENDANCE LIST

NAME	ASSIGNMENT & FUNCTION	ORGANIZATION
Y. Takemura	Team Leader	JICA Study Team
Y. Tsurumaki	Flood Control	JICA Study Team
R. Kobayashi	Hydrology	JICA Study Team
S. Yamada	Agricultural Eng.	JICA Study Team
M. Kawahara	Geologist	JICA Study Team
A. Muramatsu	Environmental Analyist	JICA Study Team
S. Ogawa	Power Economist	JICA Study Team
T. Kimura	Coordinator	JICA Study Team
S. Shibata		JICA HQ
T. Sugawara		MITI
Th'ng Yong Hua t	Chief Engineer, Hydro Projects.	NEB
Soh Chak Yuen	Senior Planning Eng.	NEB
Lam Sit Chi		NEB
Sanusi Paijan		Water Supply Branch, PWD HQ
V. R. Vijayan		GSD
Chow Weng Sum	Acting Principal Geologist	GSD
Rahmah Tahir		Environmental Control Office, DOE
Lim Teik Keat	Senior Engineer	DID HQ
T. Matsuishi	Colombo Plan Expert	DID

MINUTES OF MEETING
ON
INTERIM REPORT
FOR THE
FEASIBILITY STUDY OF THE LEBIR DAM PROJECT

A Steering Committee Meeting was held on 8 March, 1988 at EPU in Kuala Lumpur, attended by participants listed attached herewith, to discuss the Interim Report for the above project. This Minutes of Meeting is to endorse the proceedings of the meeting.

11 March 1988
Kuala Lumpur.

On behalf of the Econ. Planning Unit Prime Minister's Dept the Government of Malaysia.	On behalf of Japan International Cooperation Agency	On behalf of National Electricity Board.
Leong So Seh Principal Assistant Director, Economic Planning Unit.	Yoichi Takemura Team Leader JICA STUDY TEAM	Th'ng Yong Huat Chief Engineer Hydro Projects.

1. Coordination between Lebir Dam Project Study and Kelantan River Basin Flood Control Master Plan Study.

- Since the Kelantan River Basin Flood Control Master Plan Study is expected to be commenced around April 1988, it is necessary to coordinate the Lebir Dam Project Study with the Master Plan Study.

- Interim results of the Master Plan Study in relation with the Lebir Dam Project are expected to be available around August, 1988. Therefore, the submittal of the draft final report on the Lebir Dam Project Study originally scheduled in August, 1988 should be extended for some three months towards November or December 1988.

2. Briefing to the State Government of Kelantan

- EPU requested JICA Team to brief relevant Kelantan State agencies on the Interim Report and JICA Team agreed to do so.

3. Optimization of Project

- EPU queried on the low cost-benefit ratio of the Project, and asked whether a FIRR analysis would also be undertaken to assess the financial viability of the project. JICA Team explained that the results at this stage are preliminary and steps would be taken to optimize the project through possible reduction of costs. JICA Team also confirmed that FIRR analysis will be carried out.

4. Environmental Impact Statement by JICA

- JICA Team was asked whether the Environmental Impact Statement Report submitted by JICA Team at this stage is the finalised report. JICA Team responded affirmatively except for medico-ecological aspects which would be incorporated later.

5. Potential Relocation Area

- SEPU questioned whether potential relocation areas have been identified or not and whether consideration have been made to relocate affected FELDA and KESEDAR settlers to the future planned land schemes so as to minimise cost.

- JICA Team replied that according to the USM Sub-Study Report, potential areas scattered in and outside of the Lebir River catchment for future development of agriculture were surveyed and their total areas were about 55,000 ha. Among these areas, several small plots south of Gua Musang appear to be suitable for the Lebir riverine settlers while a large area extended in the north of Ciku land scheme area is attractive for the land scheme settlers. The USM report also looked into the possibility of accomodating the FELDA and KESEDAR settlers to the planned land schemes.

6. Potential of Granite used as Construction Material

- GSD questioned JICA Team whether consideration has been made on the use of granite as a potential construction material. JICA Team responded that the Team does not consider granite for the concrete aggregate since the weathered granite layer in the region is estimated to be 25-40 metres deep. JICA Team recommended that volcanic tuff (greenrock) could be used as concrete aggregate. The rock has to be tested for sulphide content.

7. Rainfall distribution Analysis

- JICA stated that the 1983 rainfall distribution pattern was used for the flood mitigation study; from this distribution, the flood volume of Lebir is about the same as that of Sg. Galas even though the latter's drainage basin is 3 times that of Lebir. DID pointed out that for the 1967 floods, the runoff of Sg. Galas was about double that of Sg. Lebir.

8. Field Investigation

- JICA Team explained that at present 22 drilling holes have been made covering 700 metres. It was found that the rock foundation condition is competent to support the project. So far, there is no major fault or weak zone identified. JICA Team reiterated that there is a low probability of defects in the area and the volume of investigation work done by them is sufficient.

9. Comments on the Interim Report

- JICA Team expects to have comments on the Interim Report within two months.

ATTENDANCE LIST

FEASIBILITY STUDY OF THE LEBIR DAM PROJECT

	Government Officials	Agency
1.	Leong So Seh (Chairman)	EPU
2.	Noraini bte Ismail	EPU
3.	Wan Norma Wan Daud	EPU
4.	Abd. Aziz Abd. Rahman	SEPU
5.	Tadatoshi Matsuishi	DID
6.	Lim Teck Keat	DID
7.	Ho Yuen Chuen	DOE
8.	V.R. Vijayan	GSD
9.	Chow Weng Sum	GSD
10.	Soh Chak Yuen	LLN
11.	Th'ng Yong Huat	LLN
12.	Lam Sit Chi	LLN
	JICA Study Team	
13.	T. Sugawara	MITI
14.	S. Shibata	JICA Tokyo
15.	Y. Takemura	JICA Team (Leader)
16.	Y. Tsurumaki	JICA Team
17.	R. Kobayashi	JICA Team
18.	S. Yamada	JICA Team
19.	M. Kawahara	JICA Team
20.	A. Muramatsu	JICA Team
21.	S. Ogawa	JICA Team
22.	T. Kimura	JICA Team

Attachment 1-3

Notes of Discussions

for

Technical Committee Meeting

on

Lebir Dam Project

The meeting was held to explain to and discuss with on the results presented in the Draft Final Report for Lebir Dam Project, the agencies concerned, mostly on the technical aspects, prior to the Steering Committee Meeting to be held at EPU on February 28, 1989.

The meeting commenced at 9.00 am at NEB on February 25, 1989 by the participants listed in the attached attendance list, and adjourned at 11.45 am.

As a memorandum of what have been discussed in the meeting, NEB and JICA Study Team concluded this Note of Discussions.

We the undersigned hereby certify that the contents of the note attached herewith are correct and authentic.

Kuala Lumpur, February 25, 1989.

On behalf of National Electricity Board	On behalf of JICA Study Team
Lim Hui Koon Hydro Projects National Electricity Board	Yoichi Takemura Team Leader JICA Study Team

1. Following the welcoming speech of the chairman, Mr Lim Hui Koon, NEB, Mr Y. Takemura, Team Leader for Lebir Dam Project gave a briefing of the Lebir Dam Project on the development size, flood control effects, inundation area and designs of the major project components such as dams, spillway, waterways and powerhouse.

2. JICA Team further explained on the findings during the course of feasibility grade design, and the benefits derived from the Lebir Dam Project are referred in the monetary terms as follows.

   1) Power Generation

      The benefit of M$64 million/year can be expected from the power generation.

   2) Flood Control

      M$16 million/year (based on the estimate made by Lebir Team from the past records) are kept as a flood control benefit. If calculated based on the figures referred in the Interim Report for Kelantan River Basin - Wide Flood Mitigation Study, M$27 million/year can be expected as a benefit derived from the flood mitigation effect. In the draft final report, JICA Team referred this M$27 million/year for economic evaluation. Because this seems to be more accurate since the figure has been obtained based on the detailed field survey.

   3) Agricultural Irrigation Benefit

      By having the Lebir Dam, the seasonal river flow fluctuations shall be levelized to a certain extent at the downstream area where irrigation pumping stations exist.

      As a nett benefit derived from the stabilized water supply, M$15 million/year can be enumerated.

   4) Potentiality on aquacultural development

      As a secondary benefit arising from the implementation of the project, JICA Team suggested that there are much potentialities on aquacultural development, because the proposed reservoir area is very flat and suitable for such development.

      Furthermore, it was suggested that the industrial development in the downstream area of the Kelantan River, if the flood control was achieved, could produce another secondary benefit.

3. JICA Team explained about the results of economic evaluation referring the figures of EIRR as stated in the report, and the difference of the project cost between the one estimated in the interim stage (M$800 million) and the draft final stage (M$640 million).

4. As the results of the base-line study conducted by USM and the field survey and study made by JICA Team, the JICA Team finally concluded that there are no serious impacts found except for the inundation area of agricultural plantations. For minimizing the impacts, JICA Team proposed and designed the following structures and facilities to be adopted as measures other than relocation measures.

   1) Fish ladder for migrating fish species.

   2) Reregulating pondage for regulating the peak generation discharge and supplying the minimum discharge to the downstream course of the Lebir River.

   3) Discharge warning systems to let the inhabitants know the water release from the powerhouse and the spillway.

5. Detail discussions on the technical aspects:-

   1) DOE raised the questions and replied by JICA Team:

   i. Whether the agricultural, logging and mining losses were considered for compensation or not?

   - JICA Team explained about the basic concept on the compensation considered for the agricultural plantation, i.e. only to compensate the development cost for the relocated plantation area to ensure continuous productions. However, no compensation on the logging loss is considered because valuable timbers will be logged prior to the impoundment. JICA Team agreed, however, to consider certain compensation for loss on the future opportunity for logging.

   - For mining loss, no compensation is considered. However, should the valuable mineral deposit be found to exist during the future stages the extraction of such deposit should be considered taking priority of the implementation of the Project.

   ii. What kind of arrangement or measures have been considered for management of catchment area?

- JICA Team suggested that the preservation of the forest around the reservoir area is a significant measure to protect shoreline erosion of the reservoir and to minimize the production of sediment materials in the basin. And the necessity of water quality monitoring was emphasized following determination of the responsible agency to handle these matters.

iii. Is the relocation plan included in the report?

- JICA Team replied that these plans should be prepared in the next stage, however, the decision on the implementation of the project should precede.

iv. Are there any plans of abandonment of the project?

- JICA Team and NEB jointly explained that no such abandonment can be expected because the plant will be operated forever at the maximum extent by rehabilitating when required.

  DOE asked, however, to comment these in the final report.

2) DID expressed their comments on the draft final report;

- DID has no major points on the method and figures adopted for the Lebir Project since most of the figures referred in the report is consistent with the figures reported in the Kelantan River Basin - Wide Flood Mitigation Study even though the agricultural benefit seems rather optimistic and also DID expressed his intention to share a part of the project cost for the multi-purpose scheme.

3) JKR raised a question on the impact caused by the power generation discharge on bank erosion in the downstream course of the river.

- JICA Team explained that no major impact on the river bank erosion is expected according to the river flow analysis although the minor erosion may occur in the limited area, just downstream of the dam site.

4) GSD raised the following questions and suggestions.

i. GSD suggested to mention about the mineral potentiality in the Summary of the Report.

ii. GSD raised the question whether the occurrence of reservoir-induced-earthquake was considered in the dam design or not.

- JICA Team replied that it has been considered.

iii. GSD further asked about the location of the Lebir Fault.

- JICA Team replied that the Lebir Fault is located outside the reservoir area. Even thought the topography shows the potential existence of fault zone near the project area, as the result of field reconnaissance by JICA's Geologist, no outcrops of such fault zone were found in the reservoir area.

iv. GSD raised the question on the alkaline-silical reaction of the aggregate.

- JICA Team replied th
at no alkaline silical
reaction is expected to occur according to the judgement of JICA's Geologist, however, it is recommended to carry out the laboratory test during the detailed design stage.

5. JICA Team stressed the necessity of renewal of aerophoto map covering the reservoir area in order to measure the accurate inundation area and for other planning purposes, and it should be prepared in the detailed design stage.

NEB understood that it would be essential to the determination of compensation area and the planning of the relocation road.

The meeting was closed at 11.45 am.

February 25, 1989

Technical Committee Meeting

ATTENDANCE LIST

No.	Name	Position	Department	
1.	Y. Takemura	Team Leader	JICA	
2.	R. Kebayashi	Hydrologist	JICA	
3.	M. Doi	Civil	"	
4.	S. Ogawa	Economic Analysis	JICA	
5.	Y. Kawakami	Ele. Mech. Eng.	JICA	
6.	T. Kimura	Coordinator	"	
7.	Chow Weng Sum	Geologist	Geological Survey Dgpt.	
8.	Nordin Abu Bakar	Civil Engineer	Ibu Pejabat JKR (Bekalan Air)	
9.	Lim Teik Keat	Engineer	JPT	
10.	Lim Hui Koon	"	LIN	
11.	Lam Sit Chi	"	LIN	
12.	Omar Md. Zain	ENV. Control Officer.	DOE	

MINUTES OF MEETING
ON
DRAFT FINAL REPORT
FOR THE
FEASIBILITY STUDY OF THE LEBIR DAM PROJECT

A Steering Committee Meeting was held on 28 February 1989 at EPU in Kuala Lumpur, attended by participants listed on Appendix A, to discuss the Draft Final Report of the above-stated project. These minutes of meeting record the proceedings of the meeting.

1 March 1989
Kuala Lumpur

Economic Planning Unit
Prime Minister's Dept.

.....
(Sit Hadaar Ismail)
Director, Energy Division

Japan International
Cooperation Agency

.....
(Yoichi Takemura)
JICA Study Team Leader

National Electricity Board
(Project Executing Agency)

.....
(Th'ng Yong Huat)
Chief Engineer (Hydro Projects)

Lebir Dam Project Feasibility Report

Minutes of Joint Meeting Between the
Steering Committee and JICA Study Team

1. Briefing to Steering Committee

The JICA Study Team briefed the meeting on the findings of the study as contained in the Draft Final Report. The aspects touched on included the optimisation of Lebir dam, changes in design and cost estimates, and the economic evaluation of the proposed project.

The project with an investment cost of M$640 million will provide significant power generation, irrigation and flood mitigation benefits. The major significant impacts are the flooding of 10,000 ha. of agricultural plantation and the displacement of 4,700 inhabitants from 775 families.

Viewed solely as a power project, Lebir is assessed to be sub-economic (EIRR = 6%). However taking into agricultural and flood mitigation benefits, the rate of return is considered to be satisfactory (EIRR = 11%). If the decision to proceed is made in 1989, then the project can be completed by 1998.

2. Other Briefings and Discussions

The meeting noted that the JICA Study Team briefed the Kelantan SEPU on 20 February 1989. It was also reported that the Technical Committee deliberated on the technical and environmental aspects of the report on 25 February 1989.

3. Request by Kelantan SEPU

Kelantan SEPU suggested that the project study report should include a plan for resettlement of displaced inhabitants. It was noted that this matter is outside the scope of works. However it was pointed out that the USM socio-economic study did identify possible resettlement areas.

The JICA Study Team also clarified that the Lebir reservoir could provide some potential for aquaculture development. If developed, this industry could be expected to support the livelihood of an appreciable number of displaced inhabitants.

4. Other Technical Aspects

The following technical aspects were also briefly discussed by the Steering Committee:-

a) The need for a detailed Environmental Impact Statement (EIS) was requested by DOE if the project were to proceed. The meeting agreed that this matter would be reviewed at the appropriate time.

(b) The State Government of Kelantan was requested to initiate action on further mineralogical exploration in order to determine the extent of mineral resources.

(c) The method of economic evaluation could be made more equitable by comparison with both combined cycle and gas turbine plants instead of only combined cycle plant.

(d) The meeting noted that Lebir as a multipurpose project should be reviewed together with the Masterplan Study for Flood Mitigation currently under study and scheduled for completion later this year.

5. Steering Committee's Conclusions

In the review of the Draft Final Report of the Lebir Dam Project, the Steering Committee reached the following conclusions:-

(a) The JICA Study Team was requested to consider the comments and incorporate agencies' suggestions into the final Feasibility Report,

(b) It was noted that the JICA Study Team has complied with study requirements as detailed in the Scope of Works document,

(c) The study findings were noted, and it was clarified that more detailed reviews would be made after the completion of the Kelantan River Basin-Wide Flood Mitigation Study, and

(d) It was noted that the final Feasibility Report is scheduled to be submitted in March 1989.

6. Acknowledgements

The Steering Committee gratefully acknowledges the technical assistance given by JICA and the Study Team in the fulfillment of the Lebir project study.

Appendix A. Attendance List
Lebir Steering Committee Meeting
on 28 February 1989

Malaysian Government Representatives		Agency
1.	Siti Hadzar Ismail (Chairperson)	EPU
2.	Leong So-Seh	EPU
3.	Mohd. Yazi Mohd. Zin	EPU
4.	Wan Norma Wan Daud	EPU
5.	Abdul Aziz Abdul Rahim	SEPU
6.	Ishak Manaf	KTTP
7.	Th'ng Yong Huat	LLN
8.	Lim Hui Koon	LLN
9.	Lam Sit Chi	LLN
10.	Lim Teik Kiat	DID
11.	Chow Weng Sum	GSD
12.	Omar Md. Zain	DOE

JICA Representatives/Study Team		
13.	Yoichi Takemura	Team Leader
14.	Hirofumi Ohnishi	Japanese Embassy
15.	Yoshiyuki Kita	JICA Tokyo
16.	Keizo Kagawa	JICA KL
17.	Moboyuki Doi	Study Team
18.	Rokuro Kobayashi	Study Team
19.	Yukio Kawakami	Study Team
20.	Shuhei Ogawa	Study Team
21.	Tomokazu Kimura	Coordinator