

資 料

資料 1. 調査団氏名

本調査団の構成メンバーは以下の通りである。

調査団の氏名、所属、担当（基本設計調査）

1.	総括：渡辺 正幸 Masayuki WATANABE, Team Leader JICA 国際協力総合研修所国際協力専門員 Development Specialist, Institute for International Cooperation, JICA
2.	技術参与：松岡 樹 Tatsuru MATSUOKA, Technical Adviser 富山県農林水産部耕地課 Cultivate Division, Agriculture, Forestry and Fisheries Department, TOYAMA Prefectures Government
3.	計画管理：山目 克己 Katsumi YAMANOME, Coordinator, JICA 無償資金協力調査部業務第4課 Forth Project Study Division, Grant Aid Project Study Department, JICA
4.	業務主任 / 運営維持管理管理計画：川上 俊器 Toshiki KAWAKAMI, Chief consultant / Management, Operation and Maintenance Planner 株式会社建設技研インターナショナル CTI Engineering International Co., Ltd.
5.	河川・砂防施設設計計画 I：古田口 正志 Masashi FURUTAGUCHI, River and Sabo Structures Planning and Design Engineer I 株式会社建設技研インターナショナル CTI Engineering International Co., Ltd.
6.	河川・砂防施設設計計画 II / 自然条件調査：豊田 憲二 Kenji TOYOTA, River and Sabo Structures Planning and Design Engineer II / Natural Condition Surveyor 株式会社建設技研インターナショナル CTI Engineering International Co., Ltd.
7.	地質調査：西柳 良平 Yoshihira NISHIYANAGI, Geological Surveyor 株式会社建設技研インターナショナル CTI Engineering International Co., Ltd.
8.	積算 / 調達計画：浜崎 竜英 Tatsuhide HAMASAKI, Cost Estimator / Procurement Planner 株式会社建設技研インターナショナル CTI Engineering International Co., Ltd.

調査団の氏名、所属、担当（基本設計調査概要説明）

1.	総括：渡辺 正幸 Masayuki WATANABE, Team Leader JICA 国際協力総合研修所国際協力専門員 Development Specialist, Institute for International Cooperation, JICA
2.	計画管理：木下 佳信 Yoshinobu KINOSHITA, Coordinator JICA 筑波国際センター業務第二課 Second Management Division, Tukuba International Center, JICA
3.	業務主任 / 運営維持管理管理計画：川上 俊器 Toshiki KAWAKAMI, Chief consultant / Management, Operation and Maintenance Planner 株式会社建設技研インターナショナル CTI Engineering International Co., Ltd.
4.	河川・砂防施設設計計画 I：古田口 正志 Masashi FURUTAGUCHI, River and Sabo Structures Planning and Design Engineer I 株式会社建設技研インターナショナル CTI Engineering International Co., Ltd.

資料2. 調査日程

現地調査は以下の日程で行われた。

調査日程（基本設計調査）

日数	年月日	行程	宿泊地	主要行動実績及び検討事項
1	平成12年 3月9日(木)	東京～マニラ	マニラ	移動、JICA フィリピン事務所表敬、団内打合せ
2	3月10日(金)		"	国家灌漑庁（NIA）表敬訪問、NIA にてインセプションレポートの説明・協議、団内打合せ
3	3月11日(土)		"	団内打合せ（サイト調査）
4	3月12日(日)		"	収集資料の整理（再委託業務実施業者の選定）
5	3月13日(月)		"	NIA 第三地方局表敬・会議、サイト調査、環境天然資源省（DENR）表敬・情報収集、団内打合せ
6	3月14日(火)		"	NIA にてミニッツ協議（現地再委託業務の交渉）
7	3月15日(水)		"	ミニッツ署名、国家経済開発局（NEDA）表敬・意見交換、JICA フィリピン事務所へ報告
8	3月16日(木)	(マニラ～東京)	"	大使館表敬・調査の報告、官団員帰国、コンサルタント団員調査継続
9	3月17日(金)		"	NIA 内に事務所設営・準備、再委託業務の打合せ（地質調査）、豊田団員チームに合流
10	3月18日(土)		"	サイト調査、再委託業務の打合せ（測量）
11	3月19日(日)		"	資料整理
12	3月20日(月)		"	サイト調査、地質・地盤調査計画の策定
13	3月21日(火)		"	サイト調査、測量業計画策定、浜崎団員チームに合流
14	3月22日(水)		"	サイト調査、水叩き部の水の除去計画
15	3月23日(木)		"	サイト調査、ボーリング及びレーダー調査の準備計画
16	3月24日(金)		"	サイト調査、ボーリング調査の指導監督
17	3月25日(土)		"	アンガット川河道調査
18	3月26日(日)		"	収集資料の整理
19	3月27日(月)		"	サイト調査、国家電力公社（NPC）にて資料収集
20	3月28日(火)		"	サイト調査、河床材料調査
21	3月29日(水)		"	サイト調査、構造物破損状態の調査
22	3月30日(木)		"	サイト調査、上下流河道の現地踏査
23	3月31日(金)		"	サイト調査、地下レーダー調査の指導監督
24	4月1日(土)		"	サイト調査、地下レーダー調査の指導監督
25	4月2日(日)		"	収集資料の整理
26	4月3日(月)		"	サイト調査、現場密度試験の指導監督
27	4月4日(火)		"	サイト調査、現場密度試験の指導監督

日数	年月日	行程	宿泊地	主要行動実績及び検討事項
28	4月5日(水)		マニラ	サイト調査、地下レーダー調査の指導監督
29	4月6日(木)		"	サイト調査、地下レーダー調査の指導監督
30	4月7日(金)		"	サイト調査、現場密度試験の指導監督
31	4月8日(土)		"	資料整理、概要書作成
32	4月9日(日)		"	資料の取りまとめ
33	4月10日(月)		"	第三地方局にて打合せ、情報収集
34	4月11日(火)		"	アンガットダムとイボダムにて資料収集
35	4月12日(水)		"	資料整理、概要書作成
36	4月13日(木)		"	資料整理、概要書作成
37	4月14日(金)		"	資料整理、概要書作成
38	4月15日(土)		"	資料整理、概要書作成
39	4月16日(日)		"	資料整理、概要書作成
40	4月17日(月)		"	NIA 本部との協議、概要書作成
41	4月18日(火)		"	帰国準備、JICA フィリピン事務所報告
42	4月19日(水)	マニラ～東京	"	帰国

調査日程（基本設計調査概要説明）

日数	年月日	行程	宿泊地	主要行動実績及び検討事項
	平成 12 年 8月18日(金)			団長：香港よりマニラ入り
1	8月21日(月)	東京～マニラ	マニラ	移動、JICA フィリピン事務所表敬、団内打合せ
2	8月22日(火)		"	NEDA および NIA への表敬訪問、団内打合せ
3	8月23日(水)		"	NIA との打合せ、団内打合せ
4	8月24日(木)		"	基本設計概要書の内容説明・協議
5	8月25日(金)		"	ミニッツ署名、JICA 事務所へ報告、NIA 担当者と現地視察（コンサルタント）
6	8月26日(土)	(マニラ～東京)	"	官側団員帰国、コンサルタント団員団内打合せ
7	8月27日(日)		"	コンサルタント団員団内打合せ、追加資料収集
8	8月28日(月)		"	コンサルタント団員 NIA との打合せ、午後大使館表敬・報告
9	8月29日(火)	マニラ～東京	"	帰国

資料 3. 面会者リスト

面会者リスト（基本設計調査）

No.	Office	Name	Designation
(1)	NIA（本庁）	Manuel Antonio S. Arevalo Orlando C.Hondrade Antonio A.Galves Edilberto B.Punzal Edilberto B.Payawal Isidro R.Digal Romeo E.Carbonell Abelardo Anmentia Rodolfo D.Gales Lolita Luz Zenaida Sirios Enrique Sabio	Administrator Deputy Administrator Assistant Administrator,PDI Department Manager, PDD Department Manager, SMD AA for SOME Department Manager,PDI Division Manager,PDD Division Manager,DSD Supervising Engineer,SMD C.O. Principal Engineer, DSD Division Manager, IDD
(2)	NIA 第三地方局	Mabuel Collado Oscar Mercado Leonardo S.Gonzales	Regional Irrigation Manager Division Manager Division Manager
(3)	Department of Agriculture	Cecilia Q.Astilla	Officer in Charge Director Project Development Services
(4)	DENR(本庁)	Romeo de Ocampo Roberto Aguda	Chief Watershed, Forest Management Bureau (WFMB) Engineer III of WFMB
(5)	DENR 第三地方局	Vicente Cabrera Wilfredo Saraos Lormelyn Claudio Dominice Balerite	Asst. Exec. Regional Director Asst. Exec. Regional Director Regional Director, EMB Chief, EQD, EMB
(6)	NEDA（本庁）	Cristina Tantriyo Cristina Santiago Lawrence Nelson Guevana Rufino Guinto	PIS, NEDA PIS NEDA PIS NEDA
(7)	日本大使館	Toru OKUDA	一等書記官
(8)	JICA フィリピン事務所	小野 英男 飯田 鉄二	所長 業務班
(9)	JICA 日本人専門家	竹内 兼蔵 細山田 真	NIA 所属 NIA 所属

面会者リスト（基本設計調査概要説明）

No.	Office	Name	Designation
(1)	NIA（本庁）	Manuel Antonio S. Arevalo Orlando C.Hondrade Antonio A.Galves Edilberto B.Punzal Edilberto B.Payawal Isidro R.Digal Romeo E.Carbonell Abelardo Anmentia Lolita Luz Enrique Sabio	Administrator Deputy Administrator Assistant Administrator,PDI Department Manager, PDD Department Manager, SMD AA for SOME Department Manager,PDI Division Manager,PDD Supervising Engineer,SMD C.O. Division Manager, IDD
(2)	NIA 第三地方局	Mabuel Collado Oscar Mercado Leonardo S.Gonzales	Regional Irrigation Manager Division Manager Division Manager
(3)	Department of Agriculture	Cecilia Q.Astilla	Officer in Charge Director Project Development Services
(4)	DENR(本庁)	Romeo de Ocampo Roberto Aguda	Chief Watershed, Forest Management Bureau (WFMB) Engineer III of WFMB
(5)	NEDA（本庁）	Cristina Tantriyo Lawrence Nelson Guevana Rufino Guinto R.Noriel B.Sicad	PIS, NEDA PIS NEDA Infrastructure Staff Project Monitoring Staff
(6)	日本大使館	植野 栄治	一等書記官
(7)	JICA フィリピン 事務所	小野 英男 飯田 鉄二	所長 業務班
(8)	JICA 日本人専門 家	竹内 兼蔵 吉岡 敏幸	NIA 所属 NIA 所属

資料 4. 当該国の社会・経済事情

国名	フィリピン共和国
	Republic of the Philippines

一般指標					
政体	立憲共和制	* 1	首都	マニラ (Manila)	* 2
元首	大統領 / ジョセフ・エストラダ	* 1,3	主要都市名	ダバオ、セブ、サンボアンガ	* 3
			雇用総数	30,881 千人 (1997 年)	* 6
独立年月日	1946 年 7 月 14 日 (独立記念日は 6 月 12 日)	* 3,4	義務教育年数	6 年間 (1997 年)	* 13
主要民族 / 部族	マレイ系、中国人、スペイン系	* 1,3	初等教育就学率	116.0 % (1996 年)	* 6
主要言語	タガログ語を基本とするフィリピン語、英語	* 1,3	中等教育就学率	77.0 % (1996 年)	* 6
宗教	カトリック 83 %、その他のキリスト教 10 %	* 1,3	成人非識字率	5.4 % (1995 年)	* 13
国連加盟年	1945 年 10 月 24 日	* 12	人口密度	241.13 km ² (1997 年)	* 6
世銀加盟年	1945 年 12 月	* 7	人口増加率	2.5 % (1980 年)	* 6
IMF 加盟年	1945 年 9 月	* 7	平均寿命	平均 68.30 男 66.50 女 70.20	* 6
国土面積	299.40 千 km ²	* 6	5 歳児未満死亡率	41/1000 (1997 年)	* 6
総人口	73,527 千人 (1997 年)	* 6	カロリー供給量	2,356.0 cal/日/人 (1996 年)	* 10

経済指標				
通貨単位	ペソ (Peso)	* 3	貿易量	(1997 年)
為替レート	1 US\$ = 40.85 (2000 年 3 月)	* 8	商品輸出	25,228.0 百万ドル
会計年度	Dec. 31	* 6	商品輸入	-36,355.0 百万ドル
国家予算	(1997 年)		輸入カバー率	2.0 (月) (1997 年)
歳入総額	470,105 百万ペソ	* 9	主要輸出品目	電子・電気機器、輸送用機器等
歳出総額	467,319 百万ペソ	* 9	主要輸入品目	通信・電気機器、電子部品、発電用重電機
総合収支	-3,094.00 百万ドル (1997 年)	* 15	日本への輸出	4,411.0 百万ドル (1997 年)
ODA 受取額	688.60 百万ドル (1997 年)	* 18	日本からの輸入	7,232.0 百万ドル (1997 年)
国内総生産(GDP)	82,157.29 百万ドル (1997 年)	* 6		
一人当たり GNP	1,200.0 ドル (1997 年)	* 6	粗外貨準備額	7,266.3 百万ドル (1997 年)
GDP 産業別構成	農業 18.7 % (1997 年)	* 6	対外債務残高	0.0 百万ドル (1997 年)
	鉱工業 32.2 % (1997 年)	* 6	対 外 債 務 返 済 率	9.2 % (1997 年)
	サービス業 49.2 % (1997 年)	* 6	インフレ率	8.9 % (1990-97 年)
産業別雇用	農業 男 44.0 % 女 26.0 % (1990 年)	* 6	消費者価格物価上昇率	
	鉱工業 17.7 % 11.7 % (1990 年)	* 6		
	サービス業30.8 % 53.9 % (1990 年)	* 6	国家開発計画	中期経済開発計画 (1999 ~ 2004 年)
実質 GDP 成長率	3.3 % (1990 年)	* 6		

気象 (1961 年 ~ 1990 年平均) 観測地 : マニラ (北緯 14 度 31 分、東経 121 度 00 分、標高 15 m)														* 4,5
月	1	2	3	4	5	6	7	8	9	10	11	12	平均/計	
降水量	14.6	3.8	5.2	10.2	113.3	257.1	306.3	377.1	300.9	223.3	109.4	48.1	1,769 mm	
平均気温	25.5	26.0	27.5	29.0	29.4	28.4	27.7	27.3	27.7	27.2	26.9	25.9	27.4	

* 1 各国概況 (外務省)

* 2 世界の国々一覧表 (外務省)

* 3 世界年間 1998 (共同通信社)

* 4 最新世界各国要覧 9 訂版 (東京書籍)

* 5 理科年表 1998 (国立天文台編)

* 6 World Development Indicators 1998

* 7 The World Bank Public Information Center, International Financial Statistics Yearbook 1998

* 8 Universal Currency Converter

* 9 Government Finances Statistics Yearbook 1997 (IMF)

* 10 Human Development Report 1998 (UNDP)

* 11 JCIE, JICA 報告書、開発途上国国別経済協力シリーズ

* 12 United Nations Member States

* 13 UNESCO 文化統計年鑑 1997

* 14 Global Development Finance 1998 (WB)

* 15 International Finances Statistics 1998 (IMF)

* 16 世界各国経済情報ファイル 1998 (日本貿易振興会)

注 : 商品輸入については複式簿記の計上方式を採用しているため支払い額はマイナス標記になる

国名	フィリピン共和国
	Republic of the Philippines

我が国における ODA の実績 (資金協力は約束額ベース、単位：億円) *17				
項目 \ 暦年	1994	1995	1996	1997
技術協力	79.59	74.63	78.51	75.82
無償資金協力	115.44	103.23	107.31	105.43
有償資金協力	1,242.38	1,485.44	1,242.80	0.00
総額	1,437.41	1,663.30	1,428.62	181.25

当該国に対する我が国 ODA の実績 (支出純額、単位：百万ドル) *17				
項目 \ 暦年	1994	1995	1996	1997
技術協力	110.41	114.43	94.34	89.25
無償資金協力	138.41	121.08	91.14	68.21
有償資金協力	342.78	180.62	228.96	161.51
総額	591.60	416.13	414.45	318.98

OECD 諸国の経済協力実績 (支出純額、単位：百万ドル) *18					
	贈与 (1) (無償資金協力・ 技術協力)	有償資金協力 (2)	政府開発援助 (ODA) (1) + (2) = (3)	その他政府資金 及び民間資金 (4)	経済協力総額 (3) + (4)
二国間援助 (主要供与国)	380.70	186.60	567.30	4,806.30	5,373.60
1. Japan	157.50	161.50	319.00	1,157.20	1,476.20
2. Germany	33.90	22.70	56.60	231.20	287.80
3. Australia	42.90	0.00	42.90	22.20	65.10
4. Spain	6.30	16.40	22.70	81.10	103.80
多国間援助 (主要援助機関)	62.00	60.20	122.20	39.20	161.40
1. AsDB			49.00	151.70	200.70
2. CEC			34.50	-0.30	34.20
その他		-0.90	-0.90	0.00	-0.90
合計	442.70	245.90	688.60	4,845.50	5,534.10

援助受入窓口機関 *19	
技術協力：	国家経済開発庁 (NEDA)
無償：	国家経済開発庁 (NEDA)
協力隊：	Philippine National Volunteer Service Coordination Agency (PNVSCA)

*17 我が国の政府開発援助 1998 (国際渠力推進協会)

*18 Geographical Distribution of Financial Flows to Aid Recipients 1998 (OECD)

*19 JICA 企画部地域課

資料 5 添付資料

- 5.1 ミニッツ（基本設計調査）
- 5.2 ミニッツ（基本設計概要説明調査）
- 5.3 資料収集リスト
- 5.4 ボーリング柱状図
- 5.5 地下レーダー調査解析結果
- 5.6 水叩き底面地盤密度試験結果
- 5.7 ゲート操作規則（案）
- 5.8 情報伝達システムの提案
- 5.9 ゲート操作ルールの提案

Minutes of Discussions
on
the Basic Design Study on the Project
for
Rehabilitation of Apron at Angat Afterbay Regulator Dam
in
the Republic of the Philippines

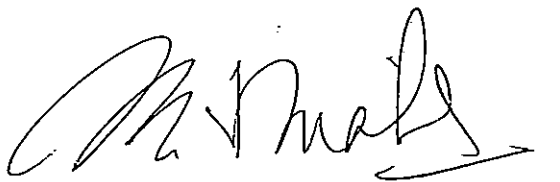
In response to the request from the Government of the Philippines, the Government of Japan decided to conduct a Basic Design Study on the Project for Rehabilitation of Apron at Angat Afterbay Regulator Dam (hereinafter referred to as "the Project"), and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to the Republic of the Philippines a Basic Design Study Team (hereinafter referred to as "the Team"), which is headed by Mr. Masayuki WATANABE, Development Specialist, Institute for International Cooperation, JICA, and is scheduled to stay in the country from March 9 to April 19, 2000.

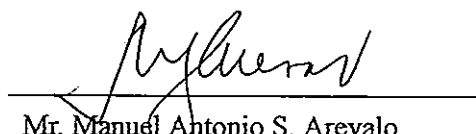
The Team held discussions with the officials concerned of the Government of the Philippines and conducted field surveys at the study area.

In the course of the discussions and field surveys, both parties have confirmed the main items described on the attached sheets. In accordance with the matters confirmed, the Team will proceed to further work and prepare the Basic Design Study Report.

Manila, March 15, 2000

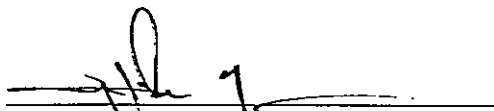


Mr. Masayuki WATANABE
Leader,
Basic Design Study Team
JICA

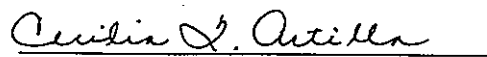


Mr. Manuel Antonio S. Arevalo
Administrator,
National Irrigation Administration
The Republic of the Philippines

Witnessed by



Mr. Romeo F. De Ocampo
Chief, Watershed Management Section
Department of Environmental and
National Resources
The Republic of the Philippines



Ms. Cecilia Q. Astilla
Officer-In-Charge Director,
Project Development Services,
Department of Agriculture
The Republic of the Philippines

Attachment

1. Objective

The objective of the Project is to rehabilitate the damaged facilities such as apron, riverbed protection and revetment of Angat Afterbay Regulator Dam, so as to protect the dam body from further damage due to the natural forces such as floods and earthquake, aiming at securing the stable water supply for irrigation to Angat-Maasim River Irrigation System (AMRIS) and for the other water users in the area.

2. Project Site

The Project site is located at Bustos, San Rafael in Bulacan Province (See Annex-I).

3. Responsible and Implementing Agency

The responsible and implementing agency is National Irrigation Administration.

4. Items requested by the Government of the Philippines

Through the discussions between the Philippine Side and the Team, the items requested by the Philippine Side were confirmed as described in Annex-II. JICA will assess the appropriateness of the contents of the request, and will recommend it to the Government of Japan for approval.

5. Japan's Grant Aid Scheme

- (1) The Philippine Side has understood the Japan's Grant Aid Scheme explained by the Team as described in Annex-III.
- (2) The Philippine Side will take the necessary measures described in Annex-IV for the smooth implementation of the Project as a condition for the Japanese Grant Aid to be implemented.

6. Schedule of the Study

JICA will prepare the draft report of basic design study and dispatch a mission in order to explain its contents late in August, 2000.

7. Other Relevant Issues

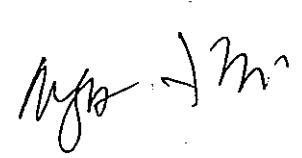
- (1) The Team expressed a deep regret at the disaster that happened to one of the rubber gates and the downstream apron. The Team strongly requested that the Philippine Side should fully enforce laws, regulations, ordinances and related acts for preventing similar

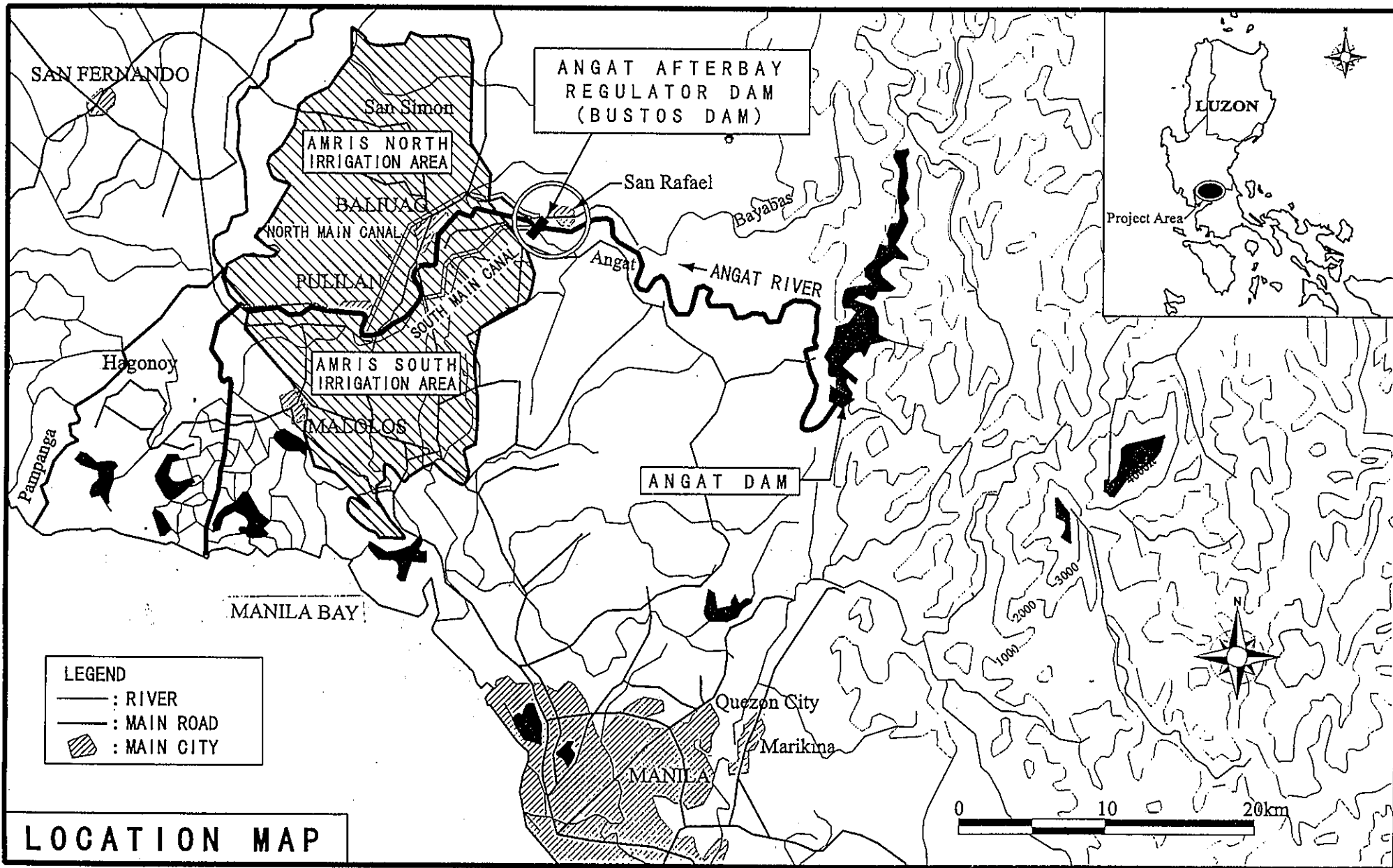
disaster in the future. The Philippine Side promised to take effective measures regarding this matter.

- (2) The Team requested the Philippine Side to take urgently legal and administrative measures for controlling sand/ gravel quarrying in the river channel and against activities affecting the stability of Angat Afterbay Regulator Dam. The Philippine Side expressed the intention to take effective measures urgently.

In addition to the above, the Team stressed that the following procedures should be followed in view of the successful management of the dam and reservoir. The Philippine Side assented to them.

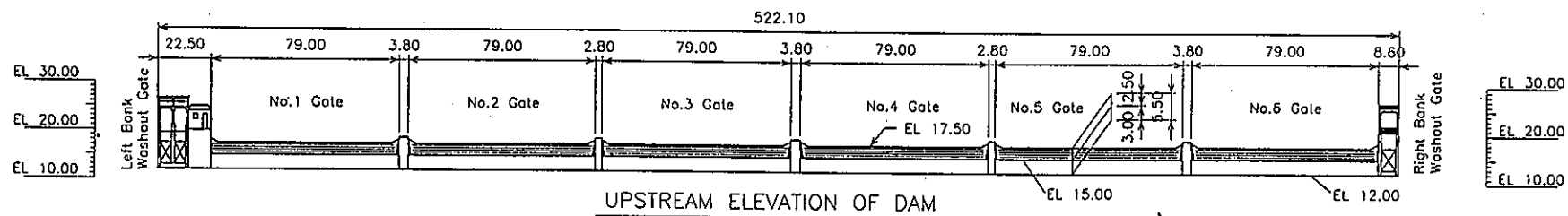
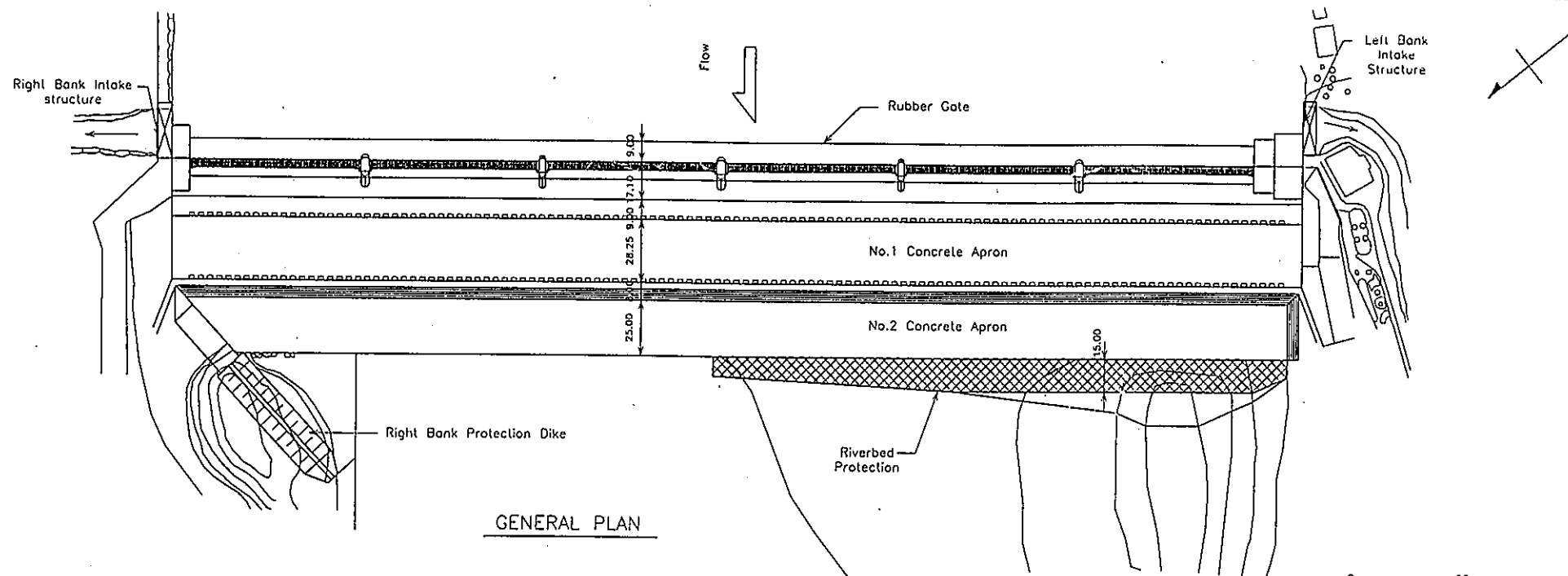
- (i) To formulate a proper operation and maintenance (O&M) plan for the dam and the reservoir;
 - (ii) To carry out the plan;
 - (iii) To put an O&M activity on record through the regular inspection;
 - (iv) To hold regular meetings among or between agencies concerned to confirm the effectiveness of O&M activities; and
 - (v) To control illegal activities in the river area by law enforcement.
- (3) The Team also stressed that the current system for operation and maintenance of Angat Afterbay Regulator Dam should be improved and strengthened for keeping the dam facilities in good condition after the completion of this Project. Both sides agreed.
 - (4) The Philippine Side agreed that the compensation for fishery, irrigation, land acquisition and so on caused by the Project should be made, if necessary, under the responsibility of the Government of the Philippines.
 - (5) For the smooth implementation of the Project, the Philippine Side promised to bear the necessary cost other than those to be born by the Grant Aid Project.
 - (6) Both sides agreed that in case the components other than the Project are damaged due to the possible floods or other factors during the implementation of the Project, the Philippine Side should take proper countermeasures in order to reduce the expansion of damage or impact on the components provided by Japan's Grant Aid Project.
 - (7) Regarding the maintenance of dam and reservoir, the Philippine Side requested the provision of O&M equipment as listed in Annex-II (1/3) in the discussions. The Team replied that the maintenance equipment be considered in the Basic Design Study.
 - (8) Both sides confirmed that the items requested by the Government of the Philippines are subject to change in accordance with the result of the Basic Design Study.

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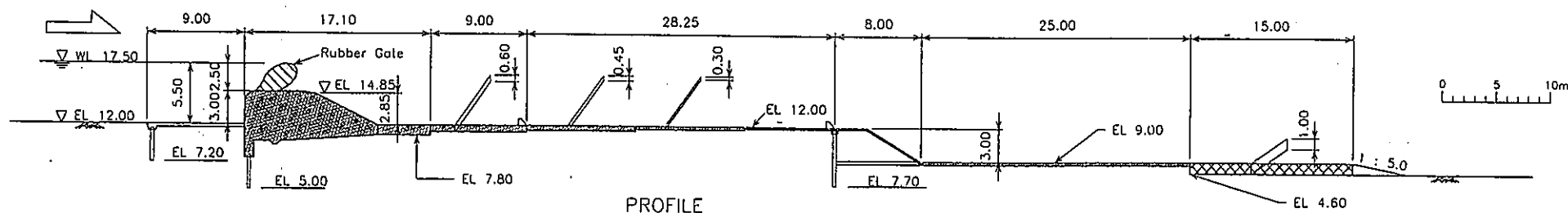


Contents of Request for Japan's Grant Aid

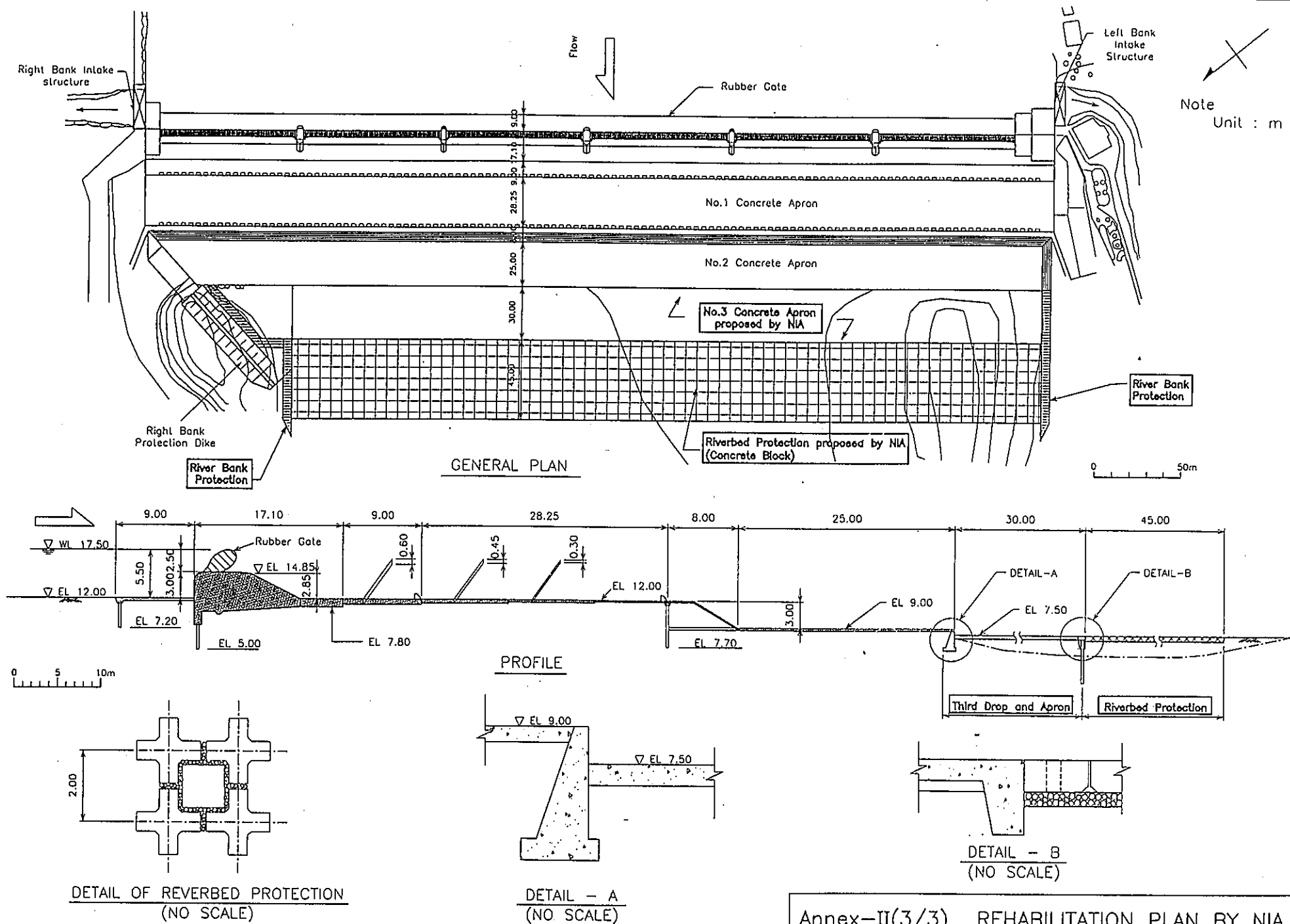
Item	Contents
1. Engineering Services	- Detailed design of proposed facilities. - Construction supervision.
2. Construction of Facilities	
(a) Existing First and Second Aprons	- Demolition of damaged portions. - Filling and compaction of foundation ground underneath the damaged aprons. - Reconstruction of aprons including steel sheet piles.
(b) Third Drop and Apron	Construction of third drop and apron downstream of the existing second apron.
(c) Riverbed Protection	Construction of riverbed protection using concrete blocks and gabion.
(d) Riverbank Protection	- Construction of revetment with wet stone pitching for the downstream riverbanks. - Rehabilitation and/or reconstruction of revetment on the right side upstream riverbank.
(e) Temporary Works	Cofferdam, dewatering and other temporary works.
(f) Expenditure at Site Office	
3. Maintenance Equipment	Boat and warning device.
4. Training Program	On-the-job-training on operation and maintenance technique for a large-scale river structure.



Note
Unit : m



Annex--II(2/3) EXISTING ANGAT AFTERBAY
REGULATOR DAM



ON JAPAN'S GRANT AID PROGRAM

1. Japan's Grant Aid Procedures

- (1) The Japan's Grant Aid Program is executed by the following procedures.
- Application (request made by a recipient country)
 - Study (Preliminary Study / Basic Design Study conducted by JICA)
 - Appraisal & Approval (Appraisal by the Government of Japan and Approval by the Cabinet of Japan)
 - Determination of Implementation (Exchange of Notes between both Governments)
 - Implementation (Implementation of the Project)
- (2) Firstly, an application or a request for a project made by the recipient country is examined by the Government of Japan (the Ministry of Foreign Affairs) to see whether or not it is suitable for Japan's grant Aid. If the request is deemed suitable, the Government of Japan entrusts a study on the request to JICA (Japan International Cooperation Agency).

Secondly, JICA conducts the Study (Basic Design Study), using a Japanese consulting firm. If the background and objective of the requested project are not clear, a Preliminary Study is conducted prior to a Basic design Study.

Thirdly, the Government of Japan appraises to see whether or not the Project is suitable for Japan's Grant Aid Program, based on the Basic Design Study report prepared by JICA and the results are then submitted for approval by the Cabinet.

Fourthly, the Project approved by the Cabinet becomes official when pledged by the Exchange of Notes signed by both Governments.

Finally, for the implementation of the Project, JICA assists the recipient country in preparing contracts and so on.

2. Contents of the Study

(1) Contents of the Study

The purpose of the Study (preliminary Study / Basic Design Study) conducted on a project requested by JICA is to provide a basic document necessary for

appraisal of the project by the Japanese Government. The contents of the Study are as follows:

- a) to confirm background, objectives, benefits of the project and also institutional capacity of agencies concerned of the recipient country necessary for project implementation.
- b) to evaluate appropriateness of the Project for the Grant Aid Scheme from a technical, social and economical point of view,
- c) to confirm items agreed on by both parties concerning a basic concept of the project,
- d) to prepare a basic design of the project,
- e) to estimate cost involved in the project.

Final project components are subject to approval by the Government of Japan and therefore may differ from an original request.

Implementing the project, the Government of Japan requests the recipient country to take necessary measures involved which are itemized on Exchange of Notes.

(2) Selecting (a) Consulting Firm(s)

For smooth implementation of the study, JICA uses (a) consulting firm(s) registered. JICA selects (a) firm(s) through proposals submitted by firms which are interested. The firm(s) selected carry(ies) out a Basic Design Study and write(s) a report, based upon terms of reference made by JICA.

The consulting firm(s) used for the study is(are) recommended by JICA to a recipient country after Exchange of Notes, in order to maintain technical consistency and also to avoid possible undue delay in implementation caused if a new selection process is repeated.

(3) Status of a Preliminary Study in the Grant Aid Program

A Preliminary Study is conducted during the second step of a project formulation & preparation as mentioned above.

A result of the study will be utilized in Japan to decide if the Project is to be suitable for a Basic Design Study.

Based on the result of the Basic Design Study, the Government would proceed to the stage of decision making process (appraisal and approval).

It is important to notice that at the stage of Preliminary Study, no commitment is made by the Japanese side concerning the realization of the Project in the scheme of Grant Aid Program.

3. Japan's Grant Aid Scheme

(1) What is Grant Aid?

The Grant Aid Program provides a recipient country with non reimbursable funds needed to procure facilities, equipment and services for economic and social development of the country under the following principles in accordance with relevant laws and regulations of Japan. The Grant Aid is not in a form of donation or such.

(2) Exchange of Notes (E/N)

The Japan's Grant Aid is extended in accordance with the Exchange of Notes by both Governments, in which the objectives of the Project, period of execution, conditions and amount of the Grant, etc. are confirmed.

(3) "The period of the Grant Aid" means one Japanese fiscal year which the Cabinet approves the Project for. Within the fiscal year, all procedure such as Exchange of Notes, concluding a contract with (a) consulting firm(s) and (a) contractor(s) and a final payment to them must be completed.

(4) Under the Grant, in principle, products and services of origins of Japan or the recipient country are to be purchased.

When the two Governments deem it necessary, the Grant may be used for the purchase of products or services of a third country origin.

However the prime contractors, namely, consulting, contractor and procurement firms, are limited to "Japanese nationals". (The term "Japanese nationals" means Japanese physical persons or Japanese juridical persons controlled by Japanese physical persons.)

(5) Necessity of the "Verification"

The Government of the recipient country or its designated authority will conclude into contracts in Japanese yen with Japanese nationals. Those contracts shall be verified by the Government of Japan. The "Verification" is deemed necessary to secure accountability to Japanese tax payers.

(6) Undertakings required to the Government of the recipient country

In the implementation of the Grant Aid, the recipient country is required to undertake necessary measures such as the following:

- a) to secure land necessary for the sites of the project and to clear and level the land prior to commencement of the construction work,
- b) to provide facilities for distribution of electricity, water supply and drainage and other incidental facilities in and around the sites,

- c) to secure buildings prior to the installation work in case the Project is providing equipment,
- d) to ensure all expenses and prompt execution for unloading, customs clearance at the port disembarkation and internal transportation of the products purchased under the Grant Aid,
- e) to exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which will be imposed in the recipient country with respect to the supply of the products and services under the Verified Contracts,
- f) to accord Japanese nationals whose services may be required in connection with the supply of the products and services under the Verified Contracts, such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work.

(7) Proper Use

The recipient country is required to maintain and use facilities constructed and equipment purchased under the Grant Aid properly and effectively and to assign staff necessary for their operation and maintenance as well as to bear all expenses other than those to be borne by the Grant Aid.

(8) Re-export

The products purchased under the Grant Aid shall not be re-exported from the recipient country.

(9) Banking Arrangement (B/A)

- a) The Government of the recipient country or its designated authority shall open an account in the name of the Government of the recipient country in an authorized foreign exchange bank in Japan (hereinafter referred to as "the Bank"). The Government of Japan will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by Government of the recipient country or its designated authority under the contracts verified.
- b) The payments will be made when payment requests are presented by the Bank to the Government of Japan under an Authorization to Pay issued by the Government of the recipient country or its designated authority.

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NECESSARY MEASURES TO BE TAKEN BY THE GOVERNMENT OF PHILIPPINES IN CASE JAPAN'S GRANT AID IS EXTENDED.

1. To provide data and information necessary for the Project.
2. To secure the site for the Project.
3. To bear two kinds of commissions to the Japanese foreign exchange bank for its banking services based upon the Banking Arrangement (B/A) namely,
 - the advising commission of the "Authorization to Pay (A/P)" and
 - the payment commission.
4. To ensure prompt unloading, tax exemption, and customs clearance at the port of disembarkation in Philippines and prompt internal transportation therein of the materials and equipment for the project purchased under the Grant Aid.
5. To exempt Japanese nationals or a staff from a third country engaged in the project from customs duties, internal taxes and other fiscal levies which may be imposed in Philippines with respect to the supply of the products and services under the verified contracts.
6. To accord Japanese nationals or a staff from a third country whose services may be required in connection with supply of the products and services under the verified contracts, such facilities as may be necessary for their entry into Philippines and stay therein for the performance of their work.
7. To provide necessary permissions, licenses, and other authorization for implementing the Project, if necessary.
8. To assign appropriate budget and staff members for proper and effective operation and maintenance of the facilities constructed under the Project.
9. To maintain and use properly and effectively the facilities constructed and equipment provided under the Project;
10. To bear all the expenses other than those to be borne by the Grant Aid within the scope of the Project.

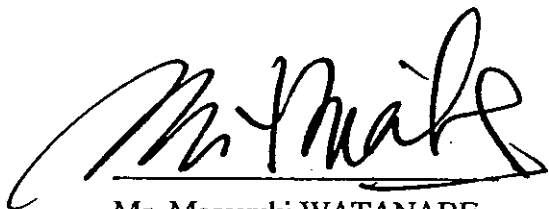
Minutes of Discussions
on
the Basic Design Study on the Project
for
Rehabilitation of Apron at Angat Afterbay Regulator Dam
in
the Republic of the Philippines
(Explanation on the Draft Basic Design)

In March 2000, the Japan International Cooperation Agency (JICA) dispatched the Basic Design Study Team on the Project for Rehabilitation of Apron at Angat Afterbay Regulator Dam (hereinafter referred to as "the Project") to the Republic of Philippines. After the assessment of the data and information obtained through the study, JICA has prepared the Draft Basic Design on the Project.

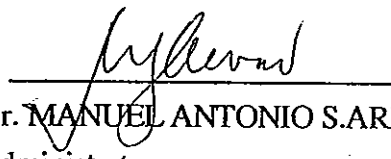
In order to explain and consult with the officials concerned of the Government of Philippines on the components of the Draft Basic Design, JICA sent to the Republic of Philippines a Study Team (hereinafter referred to as "the Team") headed by Mr. Masayuki WATANABE, Development Specialist, Institute for International Cooperation, JICA, which is scheduled to stay in the country from August 21 to 26, 2000.

As a result of the discussions held between the Team and the officials concerned of the Government of Philippines, both parties have confirmed the main items described on the attached sheets.

Manila, August 25, 2000

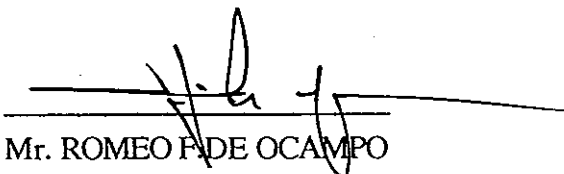


Mr. Masayuki WATANABE
Leader,
Basic Design Study Team
JICA

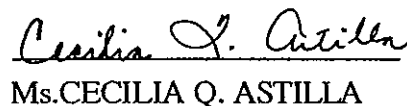


Mr. MANUEL ANTONIO S. AREVALO
Administrator,
National Irrigation Administration
The Republic of the Philippines

Witnessed by



Mr. ROMEO F. DE OCAMPO
Chief, Watershed Management Section
Department of Environmental and
National Resources
The Republic of the Philippines



Ms. CECILIA Q. ASTILLA
Officer-In-Charge Director
Project Development Services,
Department of Agriculture
The Republic of the Philippines

ATTACHMENT

1. Components of the Draft Basic Design

The Government of Philippines has agreed and accepted in principle on the components of the Draft Basic Design proposed by the Team.

2. Japan's Grant Aid System

(1) The Philippines side has understood the system of Japan's Grant Aid on Annex-II as explained by the Team.

(2) The Philippines side will take the necessary measures described in the Annex-III for the smooth implementation of the Project, on condition that the Grant Aid Assistance by the Government of Japan is extended to the Project.

3. Schedule of the Study

JICA will complete the final report and send it to the Philippines side by the end of December 2000.

4. Other Relevant Issues

(1) Both sides confirmed that the approval of Investment Coordination Committee (ICC) for the Project should be completed by the end of October 2000. The Philippines side understands that NIA is responsible for preparation of the Project proposal for ICC based on the Draft Final Report.

NIA and other relevant agencies will take all necessary measures to ensure the said schedule as per Annex-IV

(2) The Team confirmed to Philippine side the contents of the Minutes of Discussions signed on March 15, 2000, especially "Article 7. Other Relevant Issues; (1) ~ (6)".

The Philippines side assented to them.

(3) The Team stressed that the Philippines side should take proper maintenance for project equipment, such as putting on record through the regular inspection.

(4) The Team stressed that the Philippines side should take necessary procedures promptly for the Project to execute smoothly from now.

Japan's Grant Aid Scheme

1. Grant Aid Procedures

- 1) Japan's Grant Aid Program is executed through the following procedures.

Application	(Request made by a recipient country)
Study	(Basic Design Study conducted by JICA)
Appraisal & Approval	(Appraisal by the Government of Japan and Approval by Cabinet)
Determination of Implementation	(The Notes exchanged between the Governments of Japan and the recipient country)

- 2) Firstly, the application or request for a Grant Aid project submitted by a recipient country is examined by the Government of Japan (the Ministry of Foreign Affairs) to determine whether or not it is eligible for Grant Aid. If the request is deemed appropriate, the Government of Japan assigns JICA (Japan International Cooperation Agency) to conduct a study on the request.

Secondly, JICA conducts the study (Basic Design Study), using (a) Japanese consulting firm(s).

Thirdly, the Government of Japan appraises the Project to see whether or not it is suitable for Japan's Grant Aid Program, based on the Basic Design Study report prepared by JICA, and the results are then submitted to the Cabinet for approval.

Fourthly, the project, once approved by the Cabinet, becomes official with the Exchange of Notes signed by the Governments of Japan and the recipient country.

Finally, for the implementation of the Project, JICA assists the recipient country in such matters as preparing tenders, contracts and so on.

2. Basic Design Study

1) Contents of the Study

The aim of the Basic Design Study (hereafter referred to as "the Study"), conducted by JICA on a requested project (hereinafter referred to as "the Project") is to provide a basic document necessary for the appraisal of the Project by the Japanese Government. The contents of the Study are as follows:

- a) Confirmation of the background, objectives, and benefits of the requested Project and also institutional capacity of agencies concerned of the recipient country necessary for Project's implementation.
- b) Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a technical, social and economic point of view.
- c) Confirmation of items agreed on by both parties concerning the basic concept of the Project.
- d) Preparation of a basic design of the Project.
- e) Estimation of costs of the Project.

The contents of the original request are not necessarily approved in their initial form as the contents of the Grant Aid project. The Basic Design of the Project is confirmed considering the guidelines of Japan's Grant Aid Scheme.

The Government of Japan requests the Government of the recipient country to take whatever measures are necessary to ensure its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization in the recipient country actually implementing the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country through the Minutes of Discussions.

2) Selection of Consultants

For smooth implementation of the Study, JICA uses (a) registered consultant firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms. The firm(s)

selected carry(ies) out a Basic Design Study and write(s) a report, based upon terms of reference set by JICA.

The consultant firm(s) used for the Study is(are) recommended by JICA to the recipient country to also work on the Project's implementation after the Exchanges of Notes, in order to maintain technical consistency and also to avoid any undue delay in implementation should the selection process be repeated.

3. Japan's Grant Aid Scheme

1) What is Grant Aid?

The Grant Aid Program provides a recipient country with non-reimbursable funds to procure facilities, equipment and services (engineering services and transportation of the products, etc.) for economic and social development of the country under principles in accordance with the relevant laws and regulations of Japan. Grant Aid is not supplied through the donation of materials as such.

2) Exchange of Notes (E/N)

Japan's Grant Aid is extended in accordance with the Notes exchanged by the Governments concerned, in which the objectives of the Project, period of execution, conditions and amount of the Grant Aid, etc. are confirmed.

3) "The period of the Grant Aid" means the one fiscal year which the Cabinet approves the Project for. Within the fiscal year, all procedures such as exchanging of the Notes, concluding contracts with (a) consultant firm(s) and (a) contractor(s) and a final payment to them must be completed.

However in case of delays in delivery, installation or construction due to unforeseen factors such as weather, the period of the Grant Aid can be further extended for a maximum of one fiscal year at most by mutual agreement between the two Governments.

4) Under the Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased.

When the two Governments deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country.

However the prime contractors, namely, consulting, contracting and procurement firms, are limited to "Japanese nationals". (The term "Japanese nationals" means persons of Japanese nationality or Japanese corporations controlled by persons of Japanese nationality.)

5) Necessity of the "Verification"

The Government of recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by the Government of Japan. This "Verification" is deemed necessary to secure accountability to Japanese taxpayers.

6) Undertakings required of the Government of the Recipient Country

In the implementation of the Grant Aid project, the recipient country is required to undertake such necessary measures as the following:

- (1) To secure land necessary for the sites of the Project and to clear, level and reclaim the land prior to commencement of the construction.
- (2) To provide facilities for distribution of electricity, water supply and drainage and other incidental facilities in and around the sites.
- (3) To secure buildings prior to the procurement in case the installation of the equipment.
- (4) To ensure all the expenses and prompt execution for unloading, customs clearance at the port of disembarkation and internal transportation of the products purchased under the Grant Aid.
- (5) To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which will be imposed in the recipient country with respect to the supply of the products and services under the Verified Contracts.

(6) To accord Japanese nationals whose services may be required in connection with the supply of the products and services under the Verified Contracts, such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work.

(7) Proper Use

The recipient country is required to maintain and use facilities constructed and equipment purchased under the Grant Aid properly and effectively and to assign staff necessary for this operation and maintenance as well as to bear all the expenses other than those covered by the Grant Aid.

(8) Re-export

The products purchased under the Grant Aid should not be re-exported from the recipient country.

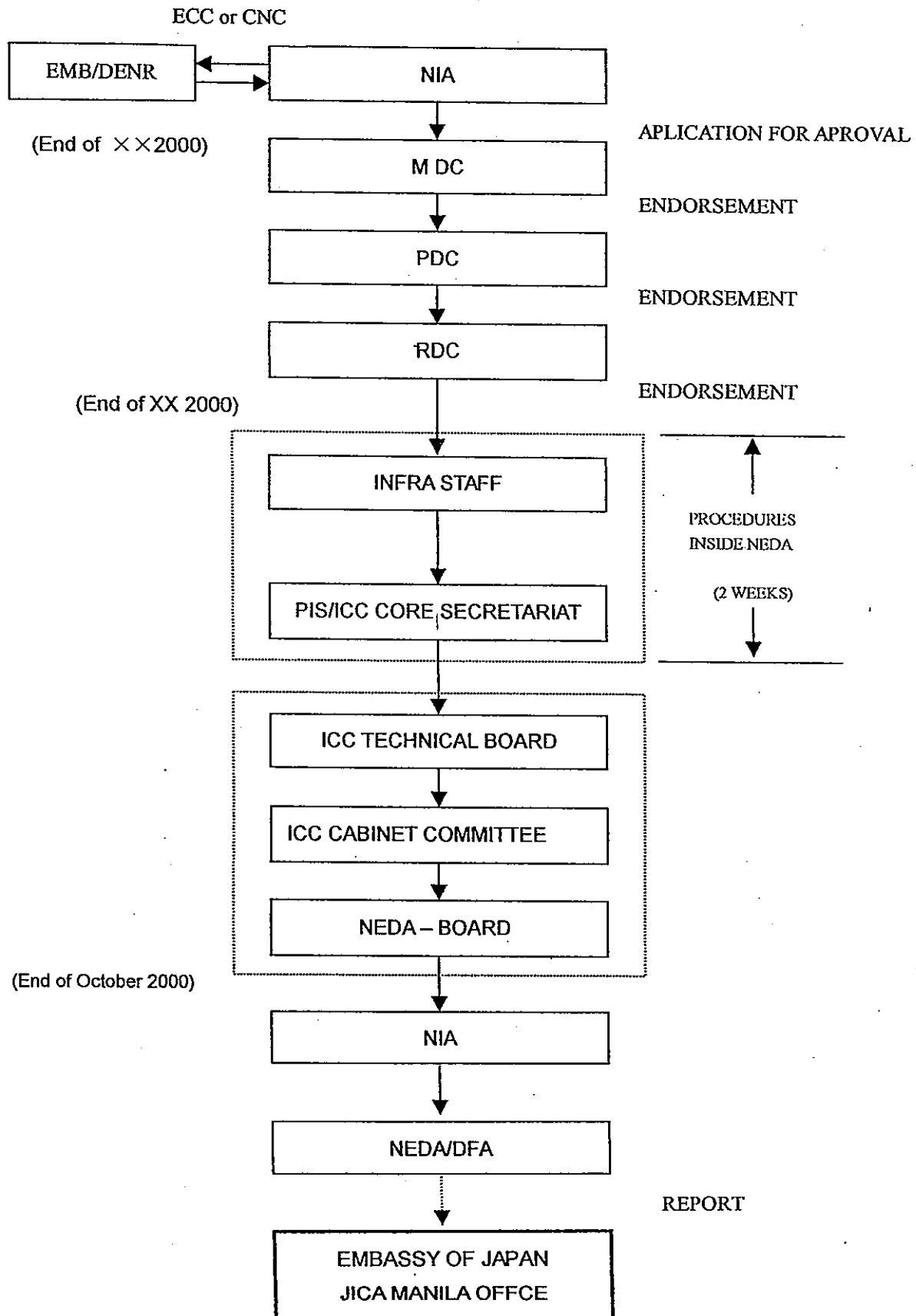
(9) Banking Arrangement (B/A)

- a) The Government of the recipient country or its designated authority should open an account in the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"). The Government of Japan will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the verified contracts.
- b) The payments will be made when payment requests are presented by the Bank to the Government of Japan under an authorization to pay issued by the Government of the recipient country or its designated authority.

**Necessary measures to be taken by the Government of the Republic of Philippines
in case Japan's Grant Aid is extended**

1. To provide data and information necessary for the Project.
2. To secure the land necessary for the execution of the Project.
3. To clear the sites prior to the commencement of the construction, if required.
4. To make passable all roads and bridges leading to the Projects sites before the commencement of inland transportation of materials and equipment, if required.
5. To bear commissions to the Japanese foreign exchange bank for its banking services based upon the Banking Arrangement, namely the advising commission of the "Authorization to Pay" and payment commission.
6. To ensure prompt unloading, tax exemption, customs clearance at the port of disembarkation in the Republic of Philippines and prompt internal transportation of the materials and equipment for the Project purchased under the Grant Aid.
7. To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which will be imposed in the recipient country with respect to the supply of the products and services under the verified contracts.
8. To accord Japanese nationals whose services may be required in connection with the supply of products and the services under the verified contract such facilities as may be necessary for their entry into the Republic of Phiulippines and stay therein for the performance of their work.
9. To provide necessary permissions, licenses and other authorizations for implementing the Project, if necessary.
10. To maintain and use properly and effectively the facilities constructed under the Project.
11. To coordinate and solve any issues related to the Project which may be raised from third parties or inhabitants in the Project area during implementation of the Project.

WORK PROCESS FLOW FOR APPROVAL OF ICC



NIA : National Irrigation Administration
NEDA : National Economic and Development Authority
PIS : Project Investment Staff
ICC : Investment Coordination Committee
RDC :Regional Development Committee
PDC : Provincial Development Committee
MDC : Municipal Development Committee
ECC : Environmental Compliance Certificate

図面関係資料

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積算関係資料

No.	Name	和文名	入手先	入手日
1	1998 Revised Equipment Rental Rates	1998年改訂 設備レンタル価格	NIA(Region 3) from Mr.Mercado	2000/3/22
2	Derivation of Unit Cost	単価根拠	ditto	2000/3/22
3		積算資料2000年3月号	丸善	2000/3/13
4		建設物価2000年3月号	ditto	2000/3/13
5	ASEL Equipment Guidebook		Association of Carriers and Equipment Lessors (ACEL), Inc.	2000/3/23

組織関係資料

No.	Name	和文名	入手先	入手日
1		AMRIS作付面積、収穫量およびBustos DamのOperation Rule	NIA(Region 3) from Mr.Mercado	2000/3/22
2	Operation and Maintenance Plan for system Management CY 2000	2000年度計画灌漑用水量	Region 3 & Head office (NIA)	2000/3/22
3	Organizational Chart (Region 3)	組織図 (Region 3)	NIA(Region 3) from Mr.Mercado	2000/3/22
4		組織図および配置要員 (NIA Head Office)	SMB	2000/3/22
5		NIA(全体) 予算に関する資料	SMB	2000/3/22
7	Monthly Accomplishment Reoprt (1997 to 1999) for Region 3	月別完成頻度(1997~1999) Region 3	SMB	2000/3/22

報告書関係資料

No.	Name	入手先	入手日
1	The Project for Rehabilitation Angat After bay Regulator Dam Completion Report (by Sanyu Consultants March 1998)	NIA(Region 3) from Mr.Mercado	2000/3/20
2	The Project for Rehabilitation Angat After bay Regulator Dam Operation and Maintenance Manual (by Sanyu Consultants March 1998)	ditto	2000/3/20
3	Proposal for Rehabilitation of Angat After bay Regulator Dam (by NIA December 1992)	NIA Head office	2000/3/28
4	The Project for Rehabilitation of Angat After bay Regulator Dam Recommendation and Additional Data (by Sanyu Consultants April 1998)	NIA Head office	2000/3/28
5	Basic Design Study Report on The Project for Rehabilitation of The Angat After bay Regulator Dam in The Republic of The Philippines (by JICA & Sanyu Consultants May 1996)	NIA Head office	2000/3/28
6	Feasibility Study Report on The Improvement Project of The Operation and Maintenance of National Irrigation Systems (AMRIS) Main Report Volume I (by JICA Feb 1984)	NIA Head office	
7	Feasibility Study Report on The Improvement Project of The Operation and Maintenance of National Irrigation Systems (AMRIS) Appensix A Volume II (by JICA Feb 1984)	ditto	
8	Feasibility Study Report on The Improvement Project of The Operation and Maintenance of National Irrigation Systems (AMRIS) Appendix B&C Volume III (by JICA Feb 1984)	ditto	

水文関係資料

No.	Name	和文名	入手先	入手日
1	Tabulation of Daily Water Level Data at South Intake Gate in Bustos Dam (1997 to Mar 2000)	ブストスダム左岸側取水ゲート操作記録	NIA(Region 3) from Mr.Mercado	2000/3/22
2	Tabulation of Daily Rainfall at Bustos Dam (1987 to 1999)	ブストスダム日雨量データ	ditto	2000/3/22
3	Tabulation of Hourly Water Level Data at Bustos Dam (1995 to 1999)	ブストスダム本川水位データ	ditto	2000/3/22
4	Rule Curve for Angat Reservoir (1988 to 1997)	アングアットダム放流量(旧)	ditto	2000/3/22
5	Rule Curve for Angat Reservoir (1999 to Present) & Proposed New Operation Rule Curves for the Angat	アングアットダム月別放流量(新) ルールカーブ更新について	SMB	2000/3/22
6	Actual Inflow at Angat Reservoir, Actual Water Consumption at Angat Auxiliary Units & Actual Water Consumption at Angat Main Units		NPC (Diliman)	
7		アングアットダム放流記録(日流量)1979~1999	NPC (Angat Inspection)	
8		ブストスダムゲート操作記録	NIA(Region 3)	
9		アングアットダム放流記録(時間流量)過去最大30 番目までのデータ	NPC (Angat Inspection)	
10		アングアットダム放流量内訳(メモ)	NWSS (Head office)	
11		アングアットダム放流記録(時間流量)とアングアットダム一般図(ダム標準断面、配置図)	NPC (Angat Inspection)	

一般情報関係資料

No.	Name	和文名	入手先	入手日
1	Republic of The Philippines National Irrigation Administration (NIA) Design Manual for Diversion Dams	NIA作成設計マニュアル(取水ダム編)	NIA Head Office	2000/3/28
2	Republic of The Philippines National Irrigation Administration (NIA) Design Manual for Canals & Canal Structures	NIA作成設計マニュアル(水路&水路施設編)	ditto	2000/3/28
3		フィリピン国別援助研究会報告書(現状分析編) 1999年3月 国際協力事業団	JICAフィリピン事務所	2000/3/15
4		月報(Monthly Review 新年号) 2000年1月号 No.158 フィリピン日本人商工会議所	ditto	2000/3/15
5		各国・地域事情と日本との関係:フィリピン共和国	外務省ホームページ(www.mofa.go.jp)	2000/3/14
6		JICA国別環境情報整備調査:フィリピン国	JICA国際協力総合研修所図書館	2000/3/14
7		JICA関係者限定資料 フィリピン任国情報 1998年 国際協力事業団	JICAホームページ(www.jica.go.jp)	2000/3/14
8	ECC (Environmental Compliance Certificate)			
9	Selected Statistics on Agriculture (May 1999 by Bureau of Agricultural Statistics Department of Agriculture)		Bureau of Agricultural Statistics, Department of Agriculture	2000/3/27
10	NIA Irrigation Development Program from 2000 to 2009 (with Medium)	NIA(全体)10ヵ年灌漑供給計画 (FD 付き)	SMB	2000/3/22
11	1997 Family Income and Expenditures Survey Vol. 1 National Summary Final Report		National Statistics Office	2000/3/28
12	1997 Family Income and Expenditures Survey Vol. 2 Provincial/Key City Final Report		ditto	2000/3/28
13	1994 Census of Establishments - Agriculture and Forestry		ditto	2000/3/28
14	1994 Census of Establishments - Fishery		ditto	2000/3/28
15	1995 Census of Population - Central Luzon		ditto	2000/3/28
16	Philippine Environmental Law, Vol. II, Comments and Materials, 1983		Environmental Management Bureau Library, Department of Environment and Natural Resources	2000/4/3
17	Final Report, Volume II, Manila Metropolitan Region Environmental Improvement Study, 1990		ditto	2000/4/3
18	Procedural Manual for DAO 96-37, 1997		ditto	2000/4/3
19	Philippine EIS System Guide: Policies and Procedures, 1994		ditto	2000/4/3
20	DENR Administrative Order No. 34, 1990		ditto	2000/4/3
21	DENR Administrative Order No. 35, 1990		ditto	2000/4/3
22	A Compilation of Environment and Natural Resources Policy Issuances, 1996		ditto	2000/4/3
23	Philippine Environmental Quality Report 1990-1995		ditto	2000/4/3
24	The Central Luzon Region Development Plan		National Economic Development Authority	2000/4/4
25	1999 Annual Accomplishment Report		Regional Office, Department of Agriculture	2000/4/6
26	Regional Profile 1999		ditto	2000/4/6
27	Provincial Physical Framework Plan, Province of Bulacan		Bulacan Provincial Office	2000/4/7
28	1998 Annual Accomplishment Report, Province of Bulacan		ditto	2000/4/7
29	1999 Annual Accomplishment Report, Province of Bulacan		ditto	2000/4/7
30	Bulacan Conceptual Development Plan		ditto	2000/4/7
31	Demography and Economy, Province of Bulacan		ditto	2000/4/7

BORE HOLE No. : BH1
 ELEVATION : 13.37m
 DATA STARTED : 2000-04-06
 DATA COMPLETED : 2000-04-15
 PROJECT : Basic Design Study on the project for Rehabilitation of Apron
 at Angat Afterbay Dam in the Republic of the Philippines
 LOCATION : Bustos, Bulacan

DEPTH (m)	GRAPH USCS	LITHOLOGY	CONS- ISTENCY	NMC %	LL %	PL %	PI %	N-Value				
								0	20	40	60	80
1	SLAB	Concrete Slab										
2												
3	GP	Gray, Gravel	V. Dense	3	Nil	Nil	NP	59	13	36	35	41
4		Dark Gray, Sandy Gravel	M. Dense									
5			Dense	4	Nil	Nil	NP	35				
6				6	Nil	Nil	NP	35				
7		Gray, Sandy Gravel	M. Dense ~ Dense	6	Nil	Nil	NP	30				
8				11	40	25	15	27				
9								42				
10								46				
11	SC	Brown, Clayey Sand with little Gravel	V. Dense	12	43	24	19	57	56	63	65	68
12				7	48	20	28	63				
13	GC	Brown, Clayey Gravel with little Sand						65				
14	SC	Grayish brown, Clayey Sand with some Gravel		17	45	25	20	65				
15	SM	Sand with some Gravel		16	Nil	Nil	NP	72				
16								73	72	67		
17								72				
18								72				
19								72				
20								67				
		END OF BORING AT 15.00m										
16												
17												
18												
19												
20												

ボーリング柱状図 BH2

BORE HOLE No. : BH2
 ELEVATION : 13.44m
 DATA STARTED : 2000-04-01
 DATA COMPLETED : 2000-04-09
 PROJECT : Basic Design Study on the project for Rehabilitation of Apron
 at Angat Afterbay Dam in the Republic of the Philippines
 LOCATION : Bustos, Bulacan

DEPTH (m)	GRAPH USCS	LITHOLOGY	CONS- ISTENCY	NMC %	LL %	PL %	PI %	N-Value				
								0	20	40	60	80
1	SLAB	Concrete Slab										
2												
3		Gray, subrounded Gravel		12	Nil	Nil	NP	37				
4	SP	Gray, medium grained Sand with some Gravel	Dense	16	Nil	Nil	NP	45				
5				13	Nil	Nil	NP	46				
6								49				
7								62				
8	GP	Light Brownish gray, Sand with some Gravel	V. Dense	9	Nil	Nil	NP	64				
9								61				
10				5	Nil	Nil	NP	53				
11				5	Nil	Nil	NP	64				
12	GP	Light Brownish gray, Sandy Gravel	Dense					66				
13								50				
14				6	Nil	Nil	NP	46				
15				8	Nil	Nil	NP	55				
16	GP	Brownish gray, sandy Gravel	V. Dense	11	Nil	Nil	NP	58				
17								53				
18				9	Nil	Nil	NP	63				
19				11	Nil	Nil	NP	58				
20	SP	Brownish gray, Sand with some Gravel		11	Nil	Nil	NP	57				
21		END OF BORING AT 15.00m						64				
22								66				
23								58				
24								64				
25								58				
26												
27												
28												
29												
30												

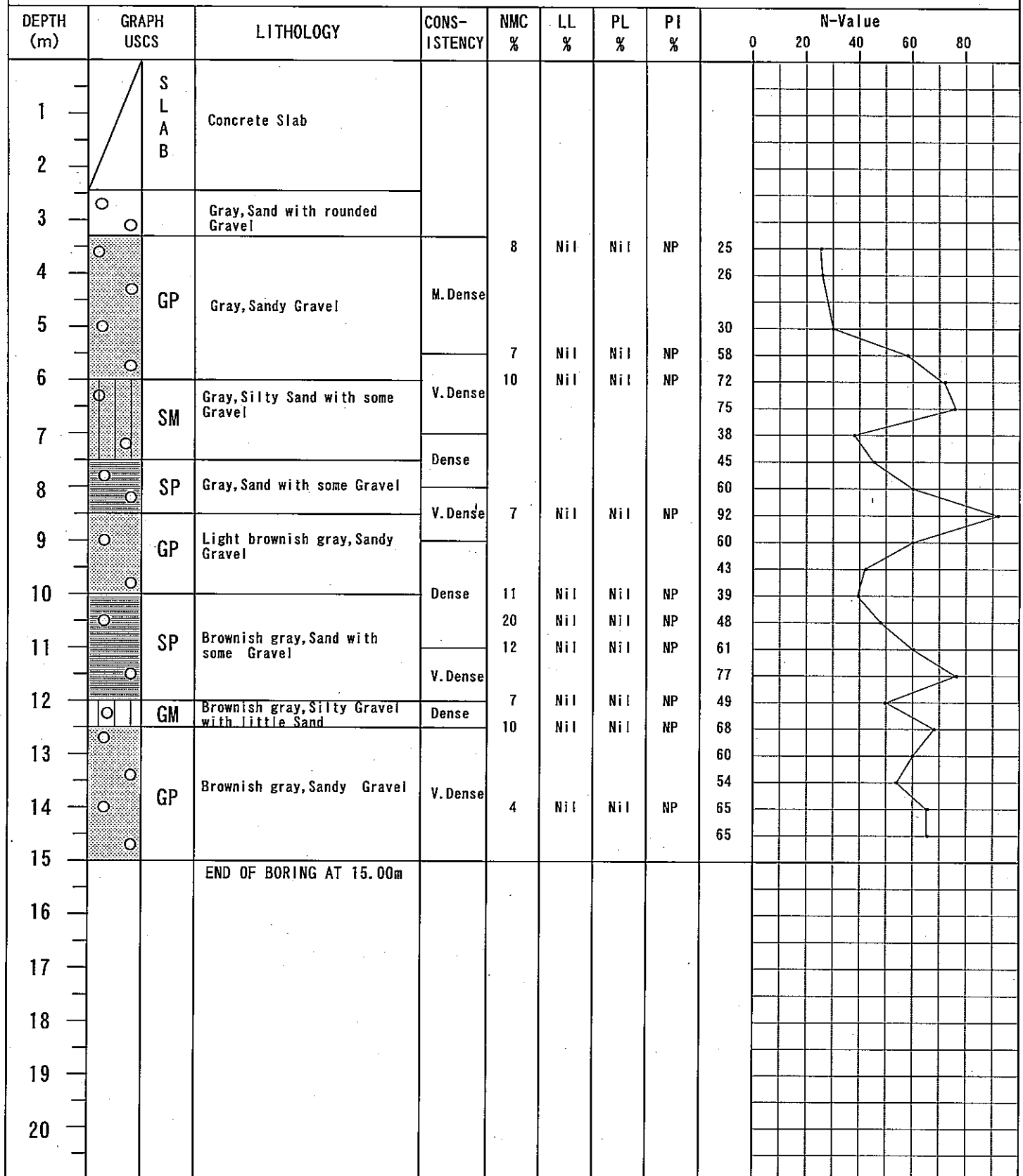
ボーリング柱状図 BH3

BORE HOLE No. : BH3
 ELEVATION : 13.49m
 DATA STARTED : 2000-04-15
 DATA COMPLETED : 2000-04-19
 PROJECT : Basic Design Study on the project for Rehabilitation of Apron
 at Angat Afterbay Dam in the Republic of the Philippines
 LOCATION : Bustos, Bulacan

DEPTH (m)	GRAPH USCS	LITHOLOGY	CONS- ISTENCY	NMC %	LL %	PL %	PI %	N-Value				
								0	20	40	60	80
1	SLAB	Concrete Slab										
2												
3		Gray, Gravel										
4	GP	Brownish gray, sandy Gravel	Dense	6	Nil	Nil	NP	31				
5								46				
6	SM	Brownish gray, Silty Sand with some Gravel	M. Dense					32				
7		Greenish gray, Silty Sand with some Gravel	Loose	16	Nil	Nil	NP	29				
8	GP	Brown, sandy Gravel with traces of clay	V. Dense	9	38	23	15	6				
9		Brown, sand with some Gravel & traces of Silt		12	Nil	Nil	NP	6				
10	GP	Gray, Sandy Gravel	Dense	9	Nil	Nil	NP	63				
11								53				
12	SP	Brownish gray, coarse grained Sand with some Gravel	V. Dense	7	Nil	Nil	NP	33				
13				3	Nil	Nil	NP	37				
14	GP	Gray, Sandy Gravel		12	Nil	Nil	NP	31				
15				8	Nil	Nil	NP	45				
16		END OF BORING AT 15.00m						56				
17								56				
18								53				
19								55				
20								52				

ボーリング柱状図 BH4

BORE HOLE No. : BH4
 ELEVATION : 13.34m
 DATA STARTED : 2000-03-27
 DATA COMPLETED : 2000-04-02
 PROJECT : Basic Design Study on the project for Rehabilitation of Apron
 at Angat Afterbay Dam in the Republic of the Philippines
 LOCATION : Bustos, Bulacan



ボーリング柱状図 BH5

BORE HOLE No : BH5									
ELEVATION :13.36m									
DATA STARTED :2000-03-28									
DATA COMPLETED :2000-04-13									
PROJECT :Basic Design Study on the project for Rehabilitation of Apron									
at Angat Afterbay Dam in the Republic of the Philippines									
LOCATION :Bustos,Bulacan									

DEPTH (m)	GRAPH USCS	LITHOLOGY	CONS- ISTENCY	NMC %	LL %	PL %	PI %	N-Value								
								0	20	40	60	80				
1		Concrete Slab														
2																
3		Gray, Subrounded Gravel														
4	SP	Dark gray, Sand with some Gravel	Dense	5	Nil	Nil	NP	35								
5		Dark gray~Gray, Sandy Gravel	Dense	2	Nil	Nil	NP	41								
6				2	Nil	Nil	NP	30								
7			V.Dense	2	Nil	Nil	NP	79								
8				M.Dense	2	Nil	Nil	NP	49							
9					7	Nil	Nil	NP	50							
10			SP	Dark gray, Sand with little Gravel	Dense	7	Nil	Nil	NP	45						
11						15	Nil	Nil	NP	29						
12		Brownish gray, Sandy Gravel	I	5	Nil	Nil	NP	25								
13				3	Nil	Nil	NP	21								
14				16	Nil	Nil	NP	32								
15				16	Nil	Nil	NP	46								
16	SP	Dark gray, Sand, with few Gravel	V.Dense	10	Nil	Nil	NP	34								
17		Brownish gray, Sandy Gravel with few Silt	V.Dense	5	Nil	Nil	NP	40								
18																
19																
20																
21	SILT	Greenish gray, soft Siltstone	Hard	25	30	21	9	55								
22		Greenish gray, soft Tuff fragments		21	31	21	10	53								
23																
24																
25																
26																
27	SILT	Dark gray, soft Siltstone		16	35	23	12	56								
28		Dark gray, Tuff						63								
29								66								
30								69								
								72								
		END OF BORING AT 15.00m														

ボーリング柱状図 BH 6

BORE HOLE No. : BH6
 ELEVATION : 9.15m
 DATA STARTED : 2000-04-15
 DATA COMPLETED : 2000-04-17
 PROJECT : Basic Design Study on the project for Rehabilitation of Apron
 at Angat Afterbay Dam in the Republic of the Philippines
 LOCATION : Bustos, Bulacan

DEPTH (m)	GRAPH USCS	LITHOLOGY	CONS- ISTENCY	NMC %	LL %	PL %	PI %	N-Value				
								0	20	40	60	80
1		Dark gray, Cobbles & Boulders		5	Nil	Nil	NP	16				
2	GP	Brown, sandy Gravel	M. Dense	6	Nil	Nil	NP	14				
3			Loose					6				
4								4				
5	SP	Dark gray~Light greenish gray, medium grained Sand with some Gravel	M. Dense	10	Nil	Nil	NP	44				
6	SM	Light greenish gray, silty fine Sand with traces of Gravel	V. Loose	12	Nil	Nil	NP	15				
7	SC	Clayey Sand with some Gravel	M. Dense	34	22	12	10	16				
8	SP	Brownish gray~Greenish gray, Sand with some Gravel	V. Dense	10	Nil	Nil	NP	20				
9								21				
10								2				
11	SC	Brown, Clayey Sand with some Gravel		16	33	23	10	22				
12	SP	Brownish gray, Sand with some Gravel						55				
13								76				
14								77				
15		END OF BORING AT 15.00m						81				
16								79				
17								78				
18								73				
19								75				
20								65				

ボーリング柱状図 BH7

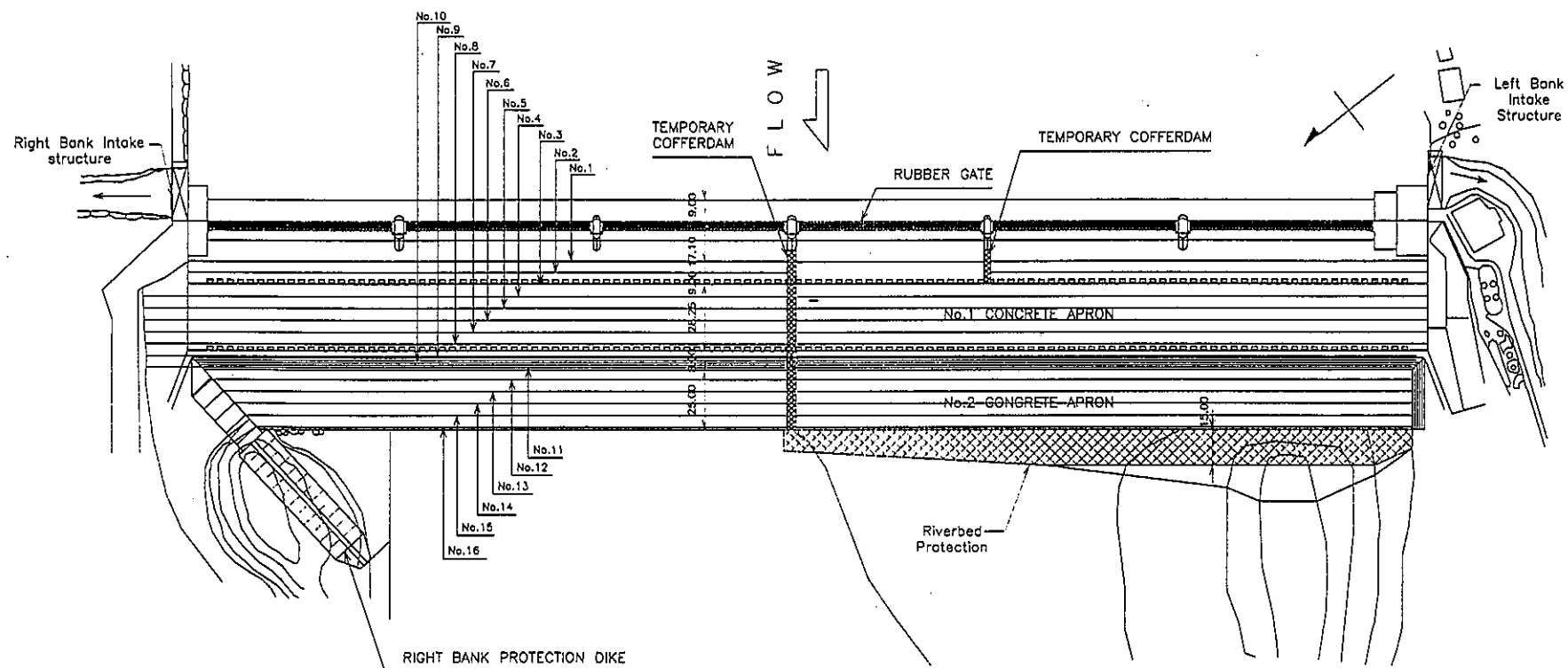
BORE HOLE No. : BH7
 ELEVATION : 9.00m
 DATA STARTED : 2000-04-20
 DATA COMPLETED : 2000-04-23
 PROJECT : Basic Design Study on the project for Rehabilitation of Apron
 at Angat Afterbay Dam in the Republic of the Philippines
 LOCATION : Bustos, Bulacan

DEPTH (m)	GRAPH USCS	LITHOLOGY	CONS- ISTENCY	NMC %	LL %	PL %	PI %	N-Value 0 20 40 60 80				
1	SP	Dark gray, Cobbles & Boulders		22	Nil	Nil	NP	24				
2		Brown, fine Sand with traces of Gravel	M. Dense	6	Nil	Nil	NP	25				
			V. Dense	4	Nil	Nil	NP	50				
3	GP	Brownish gray, Dark gray, Light gray, Sandy Gravel	Dense					46				
4								46				
5								47				
6								39				
7								36				
8	SP	Gray~dark gray, Sand with some Gravel	V. Dense	5	Nil	Nil	NP	46				
9								21				
10								59				
11								80				
12				4	Nil	Nil	NP	73				
13								66				
14								71				
15								61				
16				10	Nil	Nil	NP	54				
17								57				
18								57				
19								63				
20				4	Nil	Nil	NP	65				
21								65				
22								65				
23								68				
24								69				
25								67				
26								71				
27								76				
28		END OF BORING AT 15.00m										
29												
30												
31												
32												
33												
34												
35												
36												
37												
38												
39												
40												

ボーリング柱状図 BH8

BORE HOLE No. : BH8
 ELEVATION : 9.20m
 DATA STARTED : 2000-04-18
 DATA COMPLETED : 2000-04-20
 PROJECT : Basic Design Study on the project for Rehabilitation of Apron
 at Angat Afterbay Dam in the Republic of the Philippines
 LOCATION : Bustos, Bulacan

DEPTH (m)	GRAPH USCS	LITHOLOGY	CONS- ISTENCY	NMC %	LL %	PL %	PI %	N-Value 0 20 40 60 80				
1		Dark gray, Cobbles & Boulders										
		Brown, Sand with some Gravel & traces of Clay	Dense	10	Nil	Nil	NP	37				
		Brownish gray, Sandy Gravel		4	Nil	Nil	NP	15				
2		Grayish brown, Sand with some Gravel traces of Clay	M. Dense	14	Nil	Nil	NP	20				
		Gray & Brown, Sandy Gravel						28				
3		Gray & Brown, Sandy Gravel						46				
		Gray & Brown, Sandy Gravel	Dense					53				
4		Gray & Brown, Sandy Gravel	V. Dense					31				
		Gray & Brown, Sandy Gravel						32				
5		Gray & Brown, Sandy Gravel	Dense	5	Nil	Nil	NP	38				
		Gray & Brown, Sandy Gravel						57				
6		Brown, Sand with some Gravel & traces of Clay		10	Nil	Nil	NP	68				
		Brown, Sand with some Gravel & traces of Clay	V. Dense					68				
7		Gray & Brown, Sandy Gravel		2	Nil	Nil	NP	79				
		Gray & Brown, Sandy Gravel		5	Nil	Nil	NP	83				
8		Gray & Brown, Sandy Gravel						40				
		Gray & Brown, Sandy Gravel	Dense					54				
9		Gray & Brown, Sandy Gravel	V. Dense	5	Nil	Nil	NP	46				
		Gray & Brown, Sandy Gravel						56				
10		Gray & Brown, Sandy Gravel						62				
		Gray & Brown, Sandy Gravel		3	Nil	Nil	NP	61				
11		Gray, Sandy Gravel						64				
		Gray, Sandy Gravel						59				
12		Gray, Sandy Gravel						56				
		Gray, Sandy Gravel	V. Dense	5	Nil	Nil	NP	55				
13		Gray, Sandy Gravel						65				
		Gray, Sandy Gravel		5				69				
14		Gray, Sandy Gravel						70				
		Gray, Sandy Gravel						67				
15		END OF BORING AT 15.00m										
16												
17												
18												
19												
20												



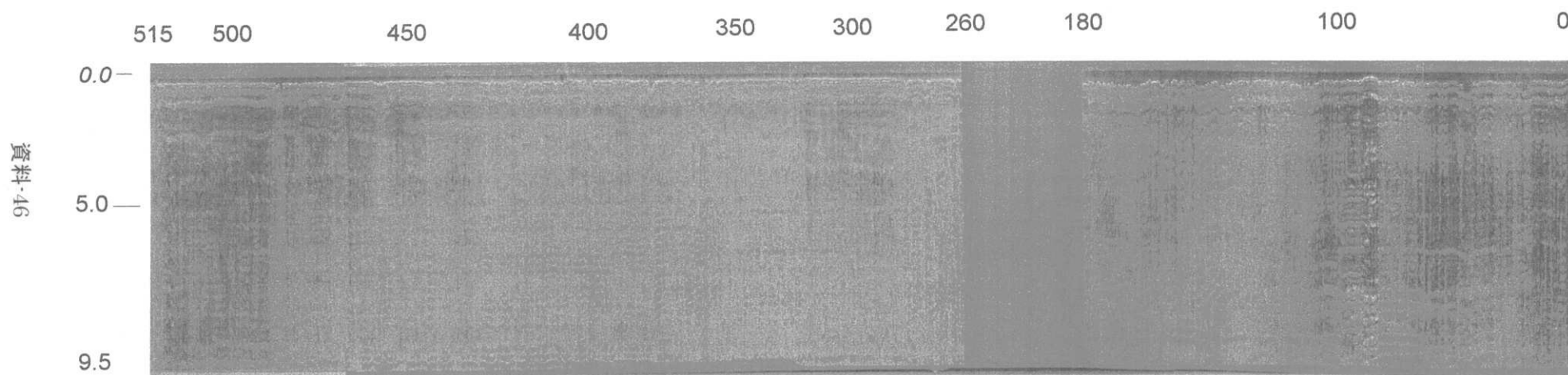
SIDING PLAN FOR RADAR SURVEY

NOTE:
STANDARD INTERVAL OF SIDING LINE FOR RADAR SURVEY IS 5.0M.

0 50m

レーダー調査位置図

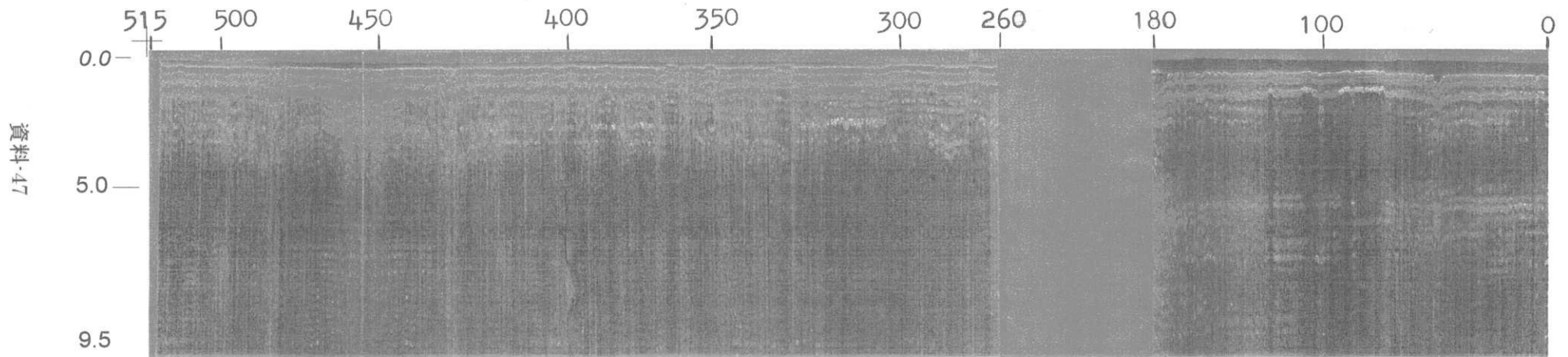
Ground Radar Survey for Bustos Dam
Line 1 looking upstream



Legend

- ☐ Concrete
- ☐ Embankment Materials
- ☐ Suspected porous and saturated zone

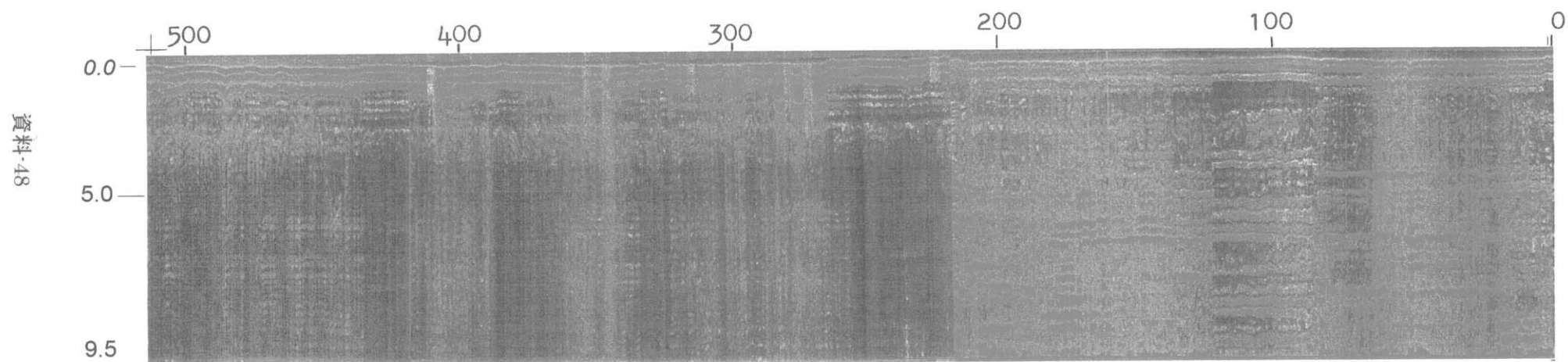
Ground Radar Survey for Bustos Dam
Line 2 looking upstream



Legend

- ☐ Concrete
- ☐ Embankment Materials
- ☐ Suspected porous and saturated zone

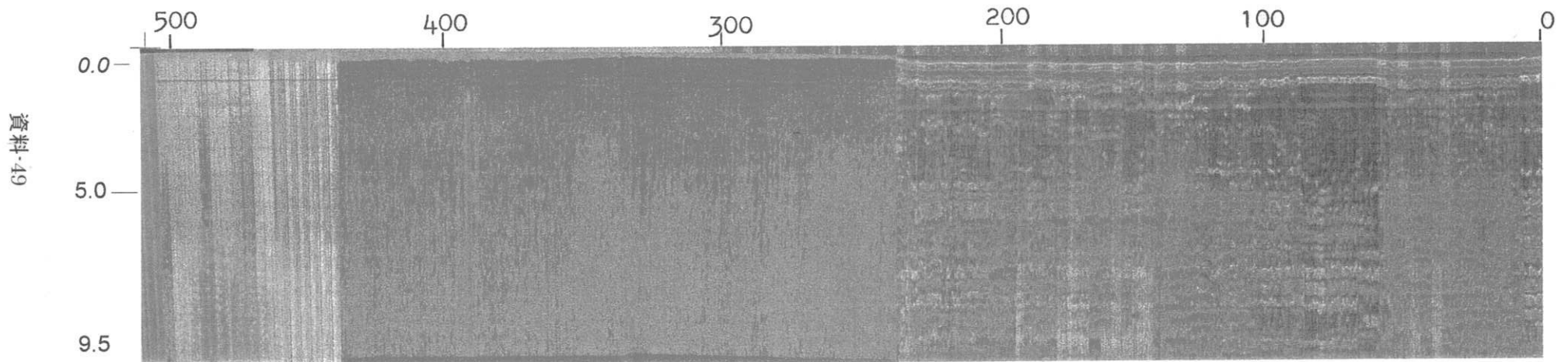
Ground Radar Survey for Bustos Dam
Line 3 looking upstream



Legend

- ☐ Concrete
- ☐ Embankment Materials
- ☐ Suspected porous and saturated zone

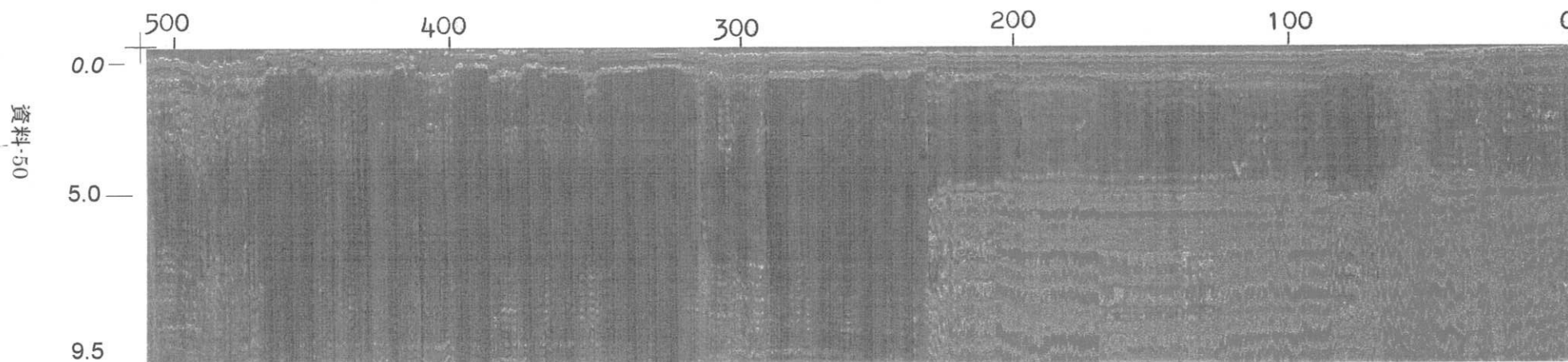
Ground Radar Survey for Bustos Dam
Line 4 looking upstream



Legend

- ☐ Concrete
- ☐ Embankment Materials
- ☐ Suspected porous and saturated zone

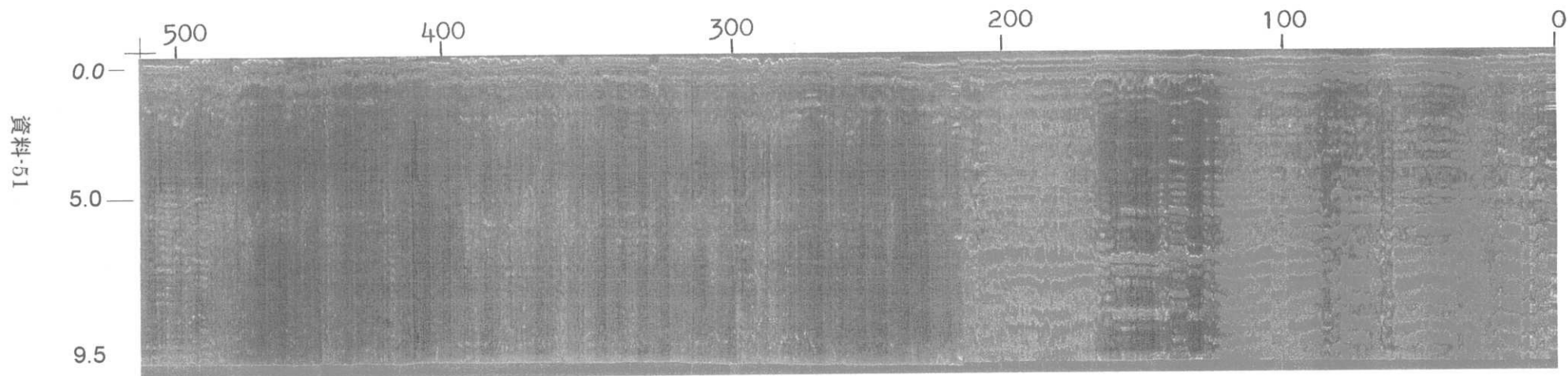
Ground Radar Survey for Bustos Dam
Line 5 looking upstream



Legend

- ☐ Concrete
- ☐ Embankment Materials
- ☐ Suspected porous and saturated zone

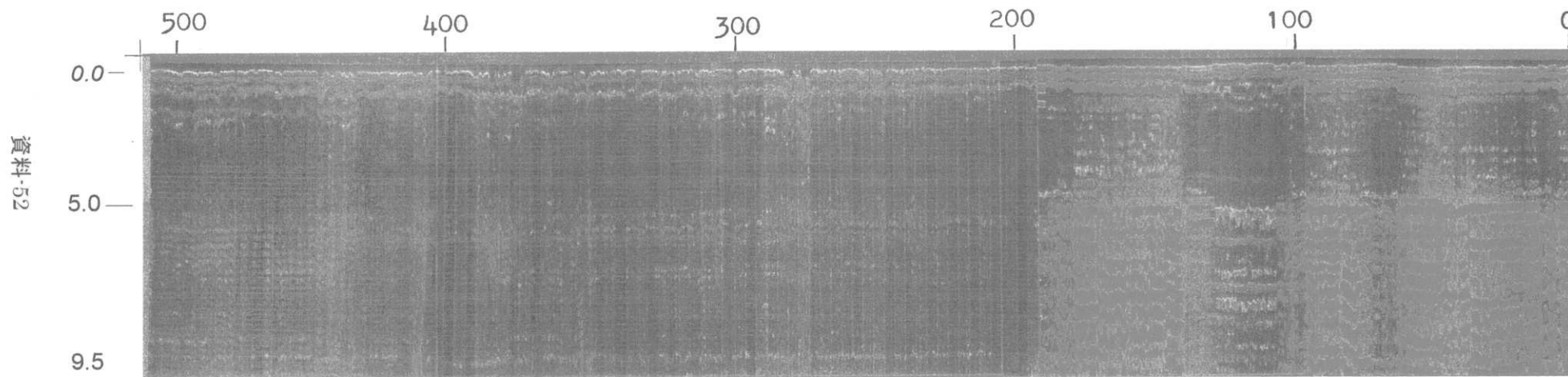
Ground Radar Survey for Bustos Dam
Line 6 looking upstream



Legend

- ☐ Concrete
- ☐ Embankment Materials
- ☐ Suspected porous and saturated zone

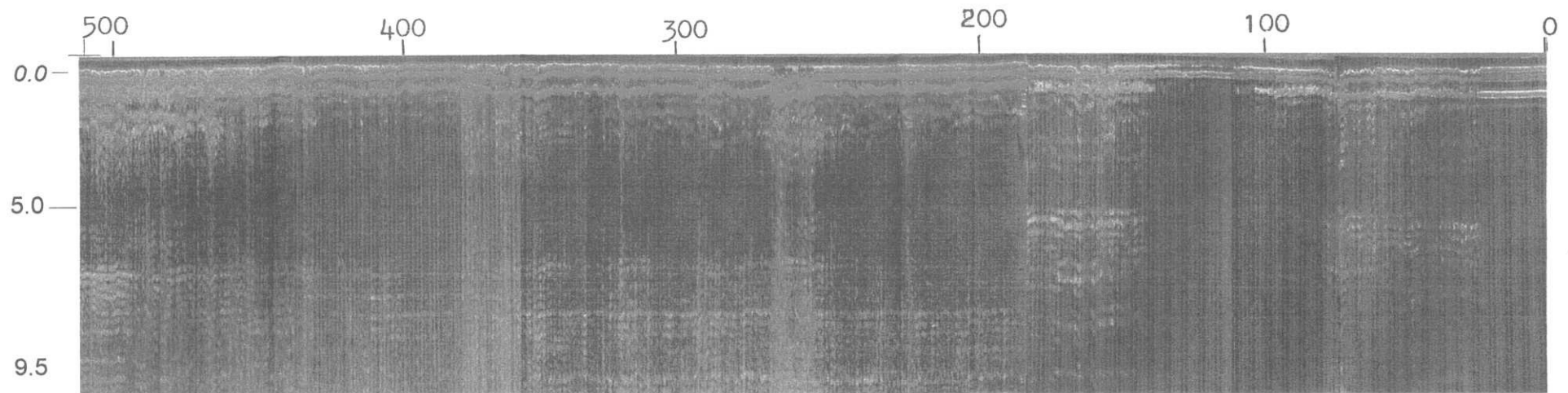
Ground Radar Survey for Bustos Dam
Line 7 looking upstream



Legend

- ☐ Concrete
- ☐ Embankment Materials
- ☐ Suspected porous and saturated zone

Ground Radar Survey for Bustos Dam
Line 8 looking upstream

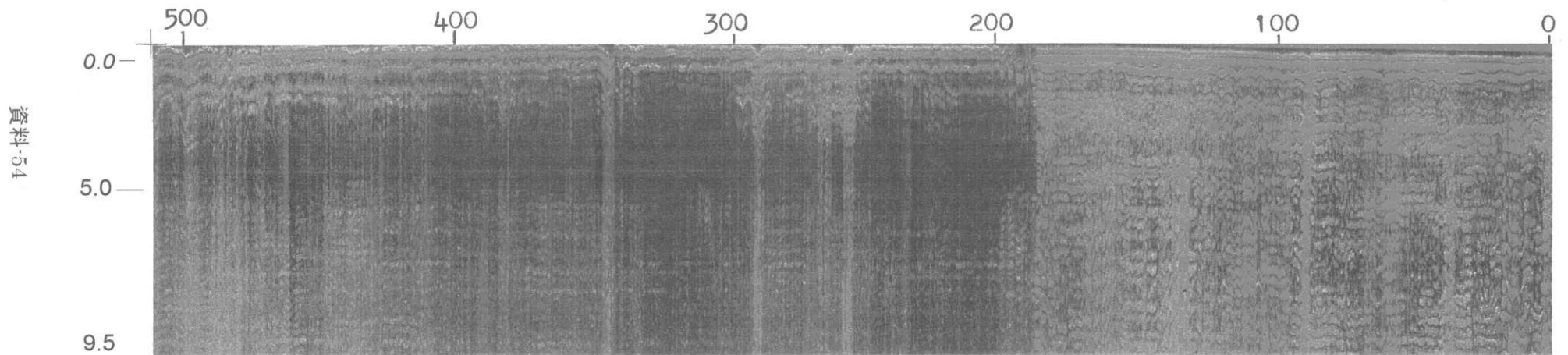


資料-53

Legend

- Concrete
- Embankment Materials
- Suspected porous and saturated zone

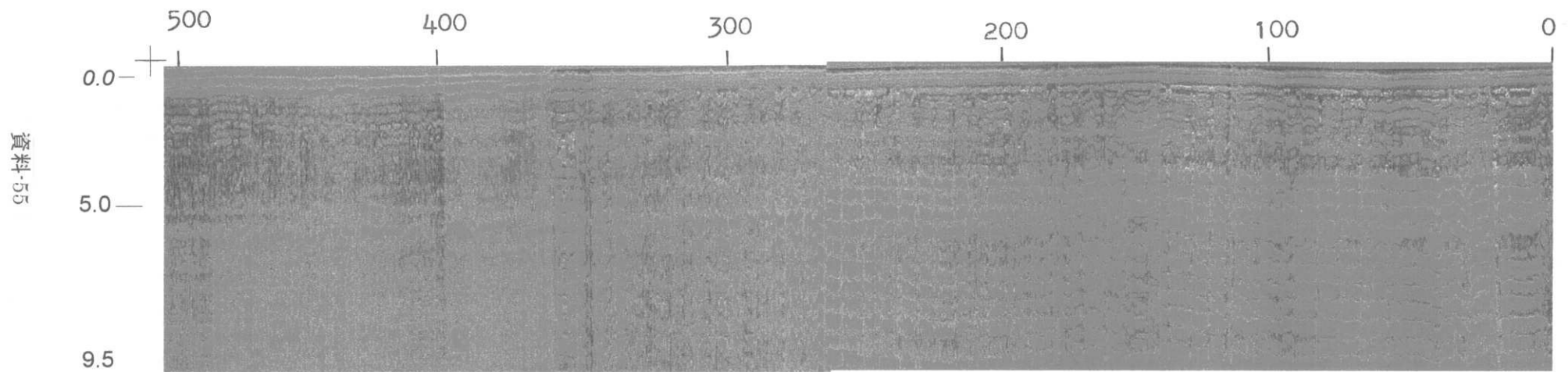
Ground Radar Survey for Bustos Dam
Line 9 looking upstream



Legend

- ☐ Concrete
- ☐ Embankment Materials
- ☐ Suspected porous and saturated zone

Ground Radar Survey for Bustos Dam
Line 10 looking upstream

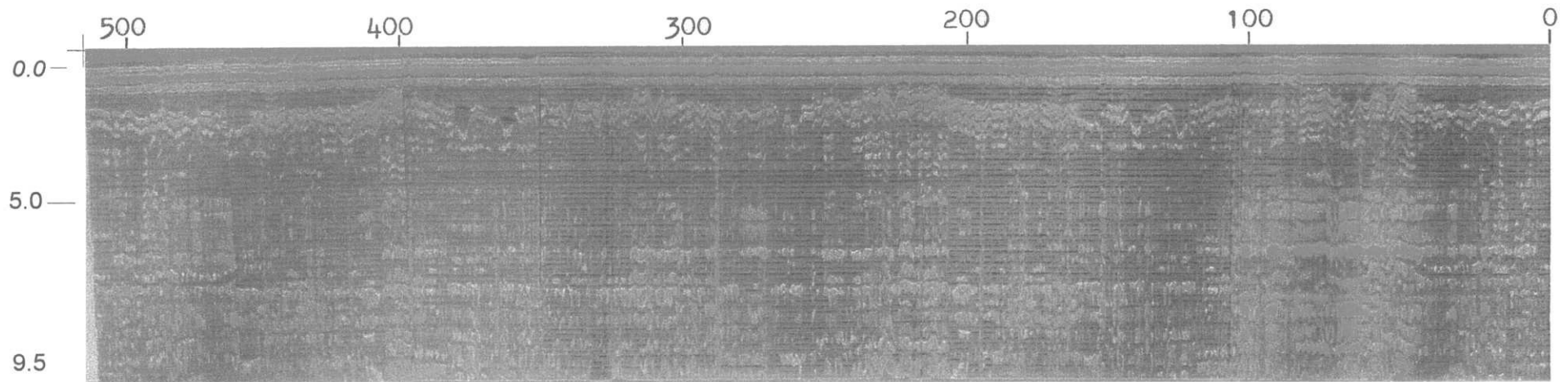


Legend

- ☐ Concrete
- ☐ Embankment Materials
- ☐ Suspected porous and saturated zone

Ground Radar Survey for Bustos Dam
Line 11 looking upstream

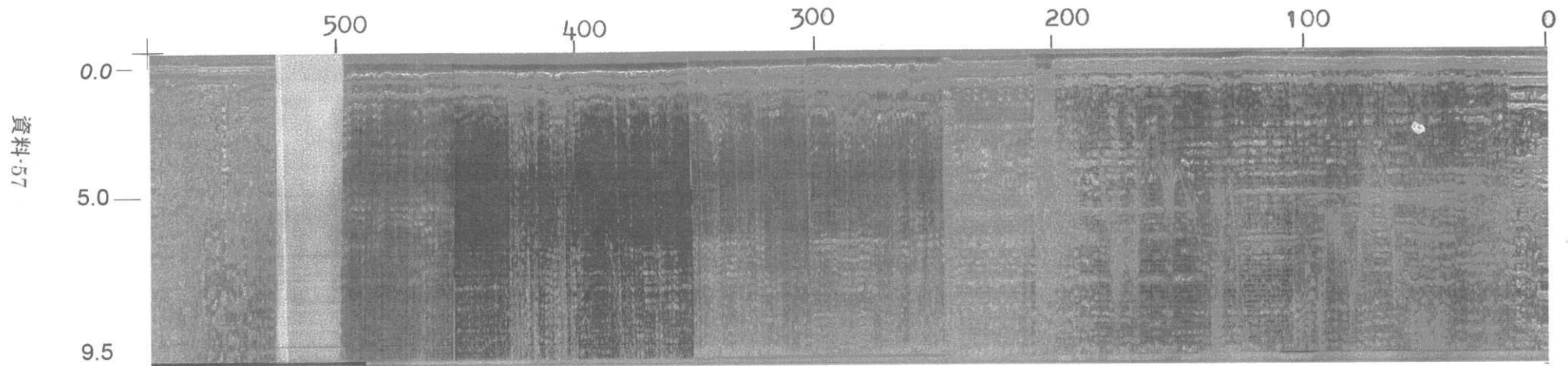
資料-56



Legend

- ☐ Concrete
- ☐ Embankment Materials
- ☐ Suspected porous and saturated zone

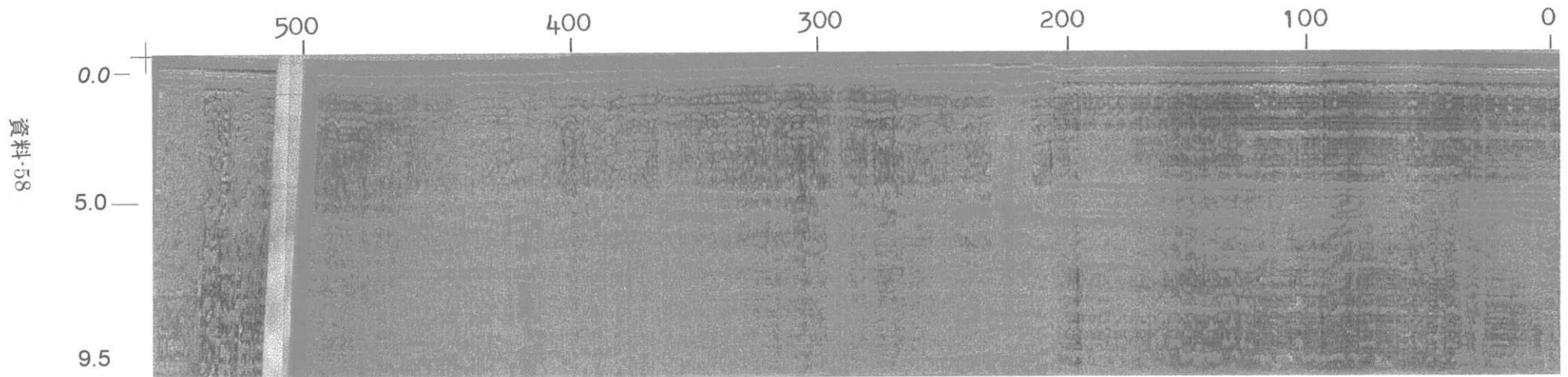
Ground Radar Survey for Bustos Dam
Line 12 looking upstream



Legend

- ☐ Concrete
- ☐ Embankment Materials
- ☐ Suspected porous and saturated zone

Ground Radar Survey for Bustos Dam
Line 13 looking upstream

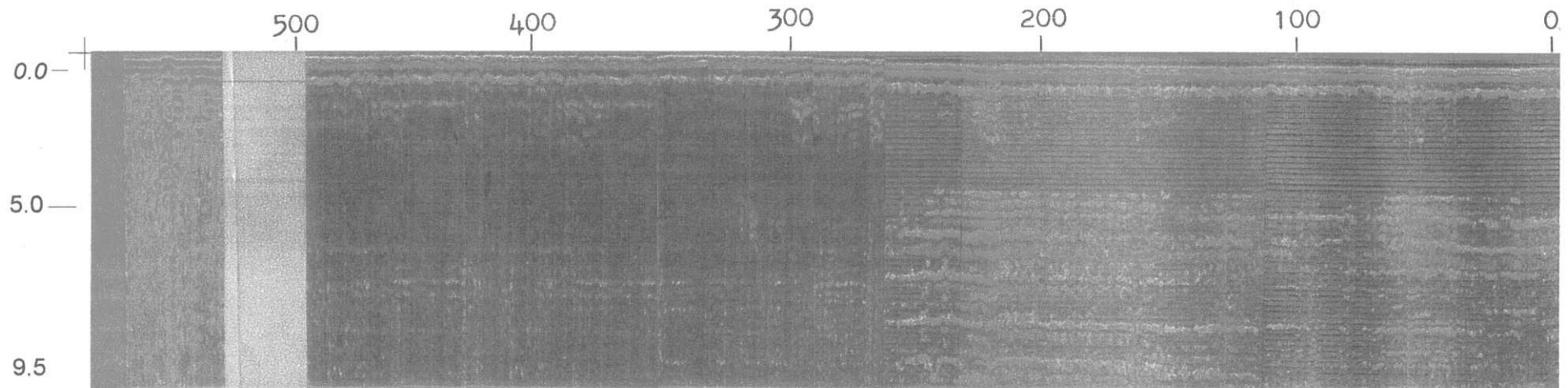


Legend

- ☐ Concrete
- ☐ Embankment Materials
- ☐ Suspected porous and saturated zone

Ground Radar Survey for Bustos Dam
Line 14 looking upstream

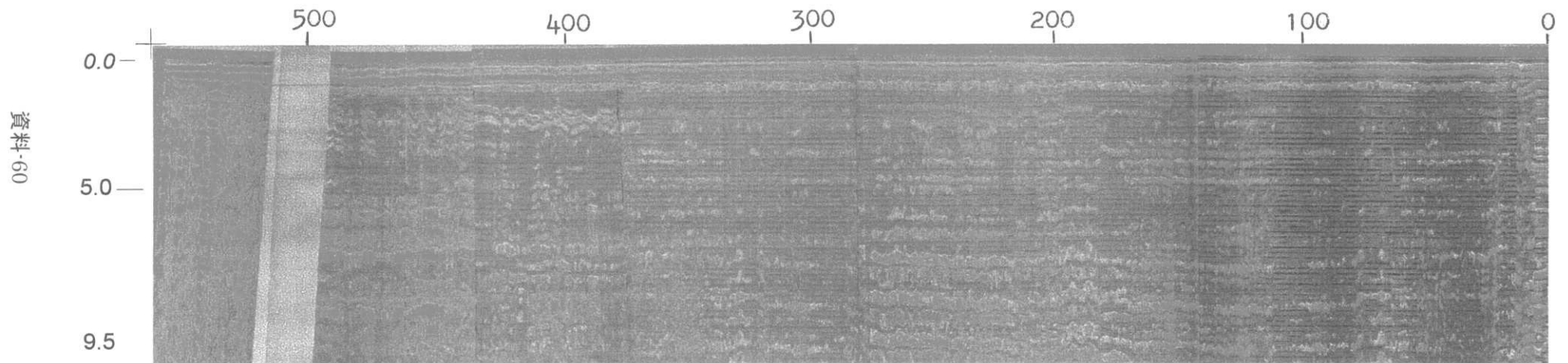
資料-59



Legend

-  Concrete
-  Embankment Materials
-  Suspected porous and saturated zone

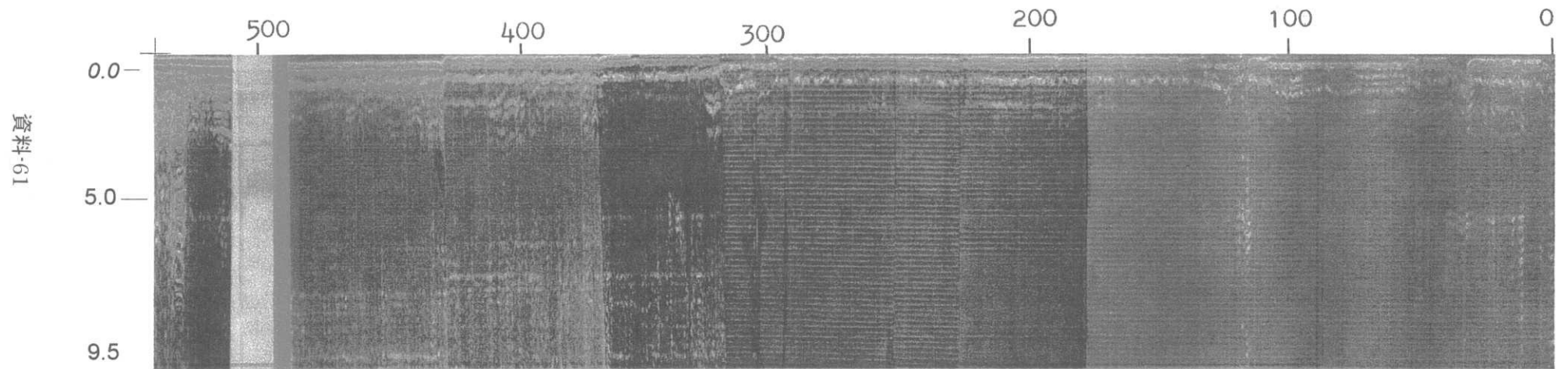
Ground Radar Survey for Bustos Dam
Line 15 looking upstream



Legend

- ☐ Concrete
- ☐ Embankment Materials
- ☐ Suspected porous and saturated zone

Ground Radar Survey for Bustos Dam
Line 16 looking upstream



Legend

- ☐ Concrete
- ☐ Embankment Materials
- ☐ Suspected porous and saturated zone

水置換による現場密度試験データシート

ピットNo.	1		
ピットの大きさ	幅 (cm)	長さ (cm)	深さ (cm)
	40	40	40

試験日時 2000/4/5

	採取土砂の重量(自然状態)			注入水の測定		
	容器+土砂 重量 (g)	容 器 重量 (g)	土 砂 重量 (g)	容器+水 重量 (g)	注水後の 重量 (g)	水 重量 (g)
1	8,530	678	7,852	11,218	678	10,540
2	20,709	678	20,031	13,487	678	12,809
3	15,160	678	14,482	12,760	678	12,082
4	14,466	678	13,788	12,540	678	11,862
5	14,358	678	13,680	11,015	678	10,337
6	17,445	678	16,767	8,600	889	7,711
7	17,348	678	16,670			
8	16,316	678	15,638			
9	15,117	678	14,439			
10	7,889	678	7,211			
11						
12						
13						
14						
15						
合 計	採取土砂重量 : Gn (g)		140,558	注入水の重量 : M (g)		65,341
				水温 T° : 30 ° C		
				上記水温の水比重 : ρ _w 0.99565		

	採取土砂の乾燥重量(乾燥状態)		
	容器+土砂 重量 (g)	容 器 重量 (g)	土 砂 重量 (g)
1	16,591	680	15,911
2	15,923	680	15,243
3	15,929	680	15,249
4	16,722	680	16,042
5	15,957	680	15,277
6	17,560	680	16,880
7	17,803	680	17,123
8	16,268	680	15,588
9	12,695	680	12,015
10			
11			
12			
13			
14			
15			
合 計	土砂の乾燥重量 : Gd (g)		139,328

$$\text{自然状態の密度} = G_n / (M / \rho_w)$$

$$\cong \frac{2.14}{21.01} \text{ g/cm}^3$$

$$\cong \frac{2.14}{21.01} \text{ kN/m}^3$$

含水比

0.88 %

$$\text{乾燥状態の密度} = G_d / (M / \rho_w)$$

$$\cong \frac{2.12}{20.83} \text{ g/cm}^3$$

$$\cong \frac{2.12}{20.83} \text{ kN/m}^3$$

水置換による現場密度試験データシート

ピットNo.	2		
ピットの大きさ	幅 (cm)	長さ (cm)	深さ (cm)
	40	40	35

試験日時 2000/4/5

	採取土砂の重量(自然状態)			注入水の測定		
	容器+土砂 重量 (g)	容 器 重量 (g)	土 砂 重量 (g)	容器+水 重量 (g)	注水後の 重量 (g)	水 重量 (g)
1	14,537	678	13,859	12,853	678	12,175
2	15,390	678	14,712	11,783	678	11,105
3	13,813	678	13,135	11,860	678	11,182
4	11,920	678	11,242	12,605	678	11,927
5	10,645	678	9,967	13,005	2,448	10,557
6	19,336	678	18,658			
7						
8						
9						
10						
11						
12						
13						
14						
15						
合 計	採取土砂重量 : Gn(g)		81,573	注入水の重量 : M(g)		56,946
	水温 T° : 31 ° C					
	上記水温の水比重 : ρ_w 0.99534					

	採取土砂の乾燥重量(乾燥状態)		
	容器+土砂 重量 (g)	容 器 重量 (g)	土 砂 重量 (g)
1	13,765	680	13,085
2	17,210	680	16,530
3	16,313	680	15,633
4	14,390	680	13,710
5	17,735	680	17,055
6	3,630	680	2,950
7			
8			
9			
10			
11			
12			
13			
14			
15			
合 計	土砂の乾燥重量 : Gd(g)		78,963

$$\text{自然状態の密度} = G_n / (M / \rho_w)$$

$$\begin{aligned} &\doteq 1.43 \text{ g/cm}^3 \\ &\doteq 13.99 \text{ kN/m}^3 \end{aligned}$$

$$\text{含水比} = 3.20 \%$$

$$\text{乾燥状態の密度} = G_d / (M / \rho_w)$$

$$\begin{aligned} &\doteq 1.38 \text{ g/cm}^3 \\ &\doteq 13.54 \text{ kN/m}^3 \end{aligned}$$

水置換による現場密度試験データシート

ピットNo.	3		
ピットの大きさ	幅 (cm)	長さ (cm)	深さ (cm)
	50	50	30

試験日時 2000/4/12

	採取土砂の重量(自然状態)			注入水の測定		
	容器+土砂 重量 (g)	容 器 重量 (g)	土 砂 重量 (g)	容器+水 重量 (g)	注水後の 重量 (g)	水 重量 (g)
1	17,398	680	16,718	12,885	680	12,205
2	17,952	680	17,272	12,115	680	11,435
3	18,530	680	17,850	12,745	680	12,065
4	19,295	680	18,615	12,755	680	12,075
5	17,682	680	17,002	12,602	680	11,922
6	19,288	680	18,608	11,427	3,397	8,030
7	18,280	680	17,600			
8	17,880	680	17,200			
9	11,014	680	10,334			
10						
11						
12						
13						
14						
15						
合 計	採取土砂重量 : Gn(g)		151,199	注入水の重量 : M(g)		67,732
	水温 T° : 29 ° C					
	上記水温の水比重 : ρ_w 0.99594					

	採取土砂の乾燥重量(乾燥状態)		
	容器+土砂 重量 (g)	容 器 重量 (g)	土 砂 重量 (g)
1	16,005	680	15,325
2	16,409	680	15,729
3	16,400	680	15,720
4	15,415	680	14,735
5	16,445	680	15,765
6	16,545	680	15,865
7	16,730	680	16,050
8	15,430	680	14,750
9	16,385	680	15,705
10	6,910	680	6,230
11			
12			
13			
14			
15			
合 計	土砂の乾燥重量 : Gd(g)		145,874

$$\text{自然状態の密度} = Gn / (M / \rho_w)$$

$$\approx \frac{2.22}{21.81} \text{ g/cm}^3$$

$$\approx \frac{2.22}{21.81} \text{ kN/m}^3$$

含水比

3.52 %

$$\text{乾燥状態の密度} = Gd / (M / \rho_w)$$

$$\approx \frac{2.14}{21.04} \text{ g/cm}^3$$

$$\approx \frac{2.14}{21.04} \text{ kN/m}^3$$

水置換による現場密度試験データシート

ピットNo.	4		
ピットの大きさ	幅 (cm)	長さ (cm)	深さ (cm)
	50	50	30

試験日時 2000/4/13

	採取土砂の重量(自然状態)			注入水の測定		
	容器+土砂 重量 (g)	容 器 重量 (g)	土 砂 重量 (g)	容器+水 重量 (g)	注水後の 重量 (g)	水 重量 (g)
1	15,181	680	14,501	12,215	680	11,535
2	16,378	680	15,698	12,439	680	11,759
3	15,743	680	15,063	12,115	680	11,435
4	16,721	680	16,041	12,131	680	11,451
5	14,821	680	14,141	14,405	680	13,725
6	16,668	680	15,988	10,785	680	10,105
7	17,265	680	16,585			
8	14,632	680	13,952			
9	18,507	680	17,827			
10	17,387	680	16,707			
11						
12						
13						
14						
15						
合 計	採取土砂重量 : Gn (g)		156,503	注入水の重量 : M (g)		70,010
				水温 T° : 29 ° C		
				上記水温の水比重 : ρ_w 0.99594		

	採取土砂の乾燥重量(乾燥状態)		
	容器+土砂 重量 (g)	容 器 重量 (g)	土 砂 重量 (g)
1	16,490	680	15,810
2	15,738	680	15,058
3	17,460	680	16,780
4	17,455	680	16,775
5	17,370	680	16,690
6	17,210	680	16,530
7	17,288	680	16,608
8	17,710	680	17,030
9	17,520	680	16,840
10	6,535	680	5,855
11			
12			
13			
14			
15			
合 計	土砂の乾燥重量 : Gd (g)		153,976

$$\begin{aligned} \text{自然状態の密度} &= G_n / (M / \rho_w) \\ &\doteq \frac{2.23 \text{ g/cm}^3}{21.84 \text{ kN/m}^3} \end{aligned}$$

$$\text{含水比} = 1.61 \%$$

$$\begin{aligned} \text{乾燥状態の密度} &= G_d / (M / \rho_w) \\ &\doteq \frac{2.19 \text{ g/cm}^3}{21.49 \text{ kN/m}^3} \end{aligned}$$

水置換による現場密度試験データシート

ピットNo.	5
ピットの大きさ	幅 (cm) 長さ (cm) 平均深さ (cm)
	50 50 20
ピットの概形	筒状、平面形状：円形 (半径25cm)

試験日時 2000/4/14

	採取土砂の重量(飽和状態)			注入水の測定		
	容器+土砂 重量 (g)	容 器 重量 (g)	土 砂 重量 (g)	容器+水 重量 (g)	注水後の 重量 (g)	水 重量 (g)
1	19,620	680	18,940	掘削中深度 8 cm で地下水位が存在し水置換による体積測定が困難であるため、ピットの概形より体積を試算した。		
2	18,402	680	17,722			
3	17,330	680	16,650			
4	18,130	680	17,450			
5				$V = \text{表面積} \times \text{深さ}$ $= \pi 25^2 \times 20$ $39,270 \text{ cm}^3$		
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
合 計	採取土砂重量 : $G_w(g)$		70,762	注入水の重量 : $M(g)$		
				水温 T° : $^\circ C$		
				上記水温の水比重 : ρ_w		

	採取土砂の乾燥重量(乾燥状態)		
	容器+土砂 重量 (g)	容 器 重量 (g)	土 砂 重量 (g)
1	16,202	680	15,522
2	15,030	680	14,350
3	16,505	680	15,825
4	18,512	680	17,832
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
合 計	土砂の乾燥重量 : $G_d(g)$		63,529

飽和状態の密度 = G_w/V

$$\begin{aligned} &= \frac{1.80 \text{ g/cm}^3}{17.68 \text{ kN/m}^3} \end{aligned}$$

含水比 10.22 %

乾燥状態の密度 = G_d/V

$$\begin{aligned} &= \frac{1.62 \text{ g/cm}^3}{15.87 \text{ kN/m}^3} \end{aligned}$$

水置換による現場密度試験データシート

ピットNo.	6		
ピットの大きさ	幅 (cm)	長さ (cm)	平均深さ (cm)
	50	50	20
ピットの概形	筒状、平面形状：円形 (半径25cm)		

試験日時 2000/4/14

	採取土砂の重量(飽和状態)			注入水の測定		
	容器+土砂 重量 (g)	容 器 重量 (g)	土 砂 重量 (g)	容器+水 重量 (g)	注水後の 重量 (g)	水 重量 (g)
1	17,060	680	16,380	掘削中深度9cmで地下水位が存在し水置換による体積測定が困難であるため、ピットの概形より体積を試算した。		
2	17,825	680	17,145			
3	19,695	680	19,015			
4	18,825	680	18,145			
5				$V = \text{表面積} \times \text{深さ}$ $= \pi 25^2 \times 20$ $39,270 \text{ cm}^3$		
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
合 計	採取土砂重量：Gw(g)		70,685	注入水の重量：M(g)		
				水温 T° : 29 °C		
				上記水温の水比重： ρ_w 0.99594		

	採取土砂の乾燥重量(乾燥状態)		
	容器+土砂 重量 (g)	容 器 重量 (g)	土 砂 重量 (g)
1	15,368	680	14,688
2	15,525	680	14,845
3	15,220	680	14,540
4	15,769	680	15,089
5	5,230	680	4,550
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
合 計	土砂の乾燥重量：Gd(g)		63,712

飽和状態の密度 = G_w/V

$$\begin{aligned} &= \frac{1.80 \text{ g/cm}^3}{17.66 \text{ kN/m}^3} \end{aligned}$$

含水比

9.86 %

乾燥状態の密度 = G_d/V

$$\begin{aligned} &= \frac{1.62 \text{ g/cm}^3}{15.92 \text{ kN/m}^3} \end{aligned}$$

資料 5.7 ゲート操作規則（案）

洪水吐ゲート操作規則(案)

目 次

第 1 章	一般
第 1 節	適用
第 2 節	目的
第 3 節	義務
第 4 節	組織
第 2 章	定義
第 5 節	洪水期
第 6 節	出勤区分
第 7 節	洪水
第 8 節	範囲
第 3 章	準備
第 9 節	巡視および監視
第 10 節	警報
第 11 節	貯水位
第 4 章	ラバーゲート
第 12 節	通常操作
第 13 節	調整操作
第 5 章	土砂吐ゲート
第 14 節	土砂吐ゲート操作
第 6 章	ゲート操作
第 15 節	水位上昇時の操作
第 16 節	水位下降時の操作
第 7 章	連絡体制
第 17 節	連絡体制
第 8 章	演習
第 18 節	演習

第 1 章 一般

(適用)

第 1 節 洪水吐ゲート操作規則（以下規則と言う）は、アンガット川灌漑用調整ダムの洪水吐ゲートの操作（以下操作と言う）に適用する。

(目的)

第 2 節 規則は、貯水池からの放流を円滑に行い、貯水池周辺や下流部への人工洪水の発生を防止するために、定めるものである。

(義務)

第 3 節 操作に従事する者は、以下に定める義務を果たさなければならない。

- (1) 州灌漑事務所長（以下所長と言う）は、操作を実施し、また、操作に係わるすべての行為を監督しなければならない。
- (2) 所長は、規則の定めるところに従って、操作に関する必要な決定を行わなければならない。
- (3) 所長は、規則の定めるところに従って、操作を実施しなければならない。
- (4) 地区灌漑局長（以下局長と言う）は、所長の実施する操作に関して、これを監督すると共に、同局の組織全体で、これを支援するものとする。

(組織)

第 4 節 操作のための組織を、支援体制も含めて Fig. 1 に定める。

第 2 章 定義

(洪水期)

第 5 節 洪水期は 5 月から 10 月とし、所長は洪水期の前に、第 18 節の定めるところに従って、演習を実施しなければならない。

(出勤区分)

第 6 節 出勤区分は Table 1 に規定する。局長は所長に対して、出勤区分を通知する。

(洪水)

第 7 節 貯水池水位が次の状態のいずれかに達した時を洪水と言う。
水位上昇が 1 時間に 20 cm を超えたとき
水位が El.17.65 m を超えたとき
出勤区分が Operation I になったとき

(範囲)

第 8 節 規則の適用範囲はダムの下流は 5.2 km、上流は 2.0 km とする。

第 3 章 準備

(巡視および監視)

第 9 節 操作員は、操作に先立って、維持管理マニュアルの定めるところに従っ

て、ダム上下流を巡視および監視して、操作の安全性を確認しなければならない。

(警報)

第 1 0 節 操作員は、ゲート放流に先立って、操作の障害となる者に対して、警報施設のすべての手段を講じて、警報を発しなければならない。

(貯水位)

第 1 1 節 操作員は貯水位を下記の頻度で読み取り、記録しなければならない。

貯水位の読み	頻 度	備 考
平常時	毎正時	
洪水時	5 分毎	

第 4 章 ラバーゲート

(通常操作)

第 1 2 節 ラバーゲートは、通常操作においては、2,600mmAq の空気圧をもって起立させるか、あるいは、空気圧を完全に抜いて倒伏させるものとする。

(調整操作)

第 1 3 節 ラバーゲートは、必要に応じ、空気圧計とゲートの挙動を注視しながら、通常操作時より低い圧力で調整操作することができる。この場合、空気圧計が振動を示すか、あるいは、ゲートに V ノッチが発生した時は、直ちに、通常操作に戻らなければならない。ただし、調整操作における空気圧は 2,200mmAq を下回ってはならない。

第 5 章 土砂吐ゲート

(土砂吐ゲート操作)

第 1 4 節 土砂吐ゲートは、貯水池の堆砂排除と貯水位調整、および洪水放流のために操作する。

第 6 章 ゲート操作

(水位上昇時の操作)

第 1 5 節 水位上昇時の操作は、Fig. 2 、 3 および Table 2 に定める方法にて、実施するものとする。

(水位下降時の操作)

第 1 6 節 水位下降時の操作は、Fig. 4 に定める方法にて、実施するものとする。

第 7 章 連絡体制

(連絡体制)

第 1 7 節 地区局、州事務所、操作室、および操作員間の相互の連絡を、継続して実施するものとする。連絡体制は Fig. 5 に示すものとする。

第 8 章 演習

(演習)

第 18 節

洪水期に先立って、所長は、操作の演習を実施しなければならない。演習は、規則に定められた操作の手順と操作に関する施設の動作について実施するものとする。

**Fig.1 ORGANAZATION CHART FOCUSING TO SPILLWAY GATE OPERATION
AT ANGAT AFTERBAY REGULATOR DAM**

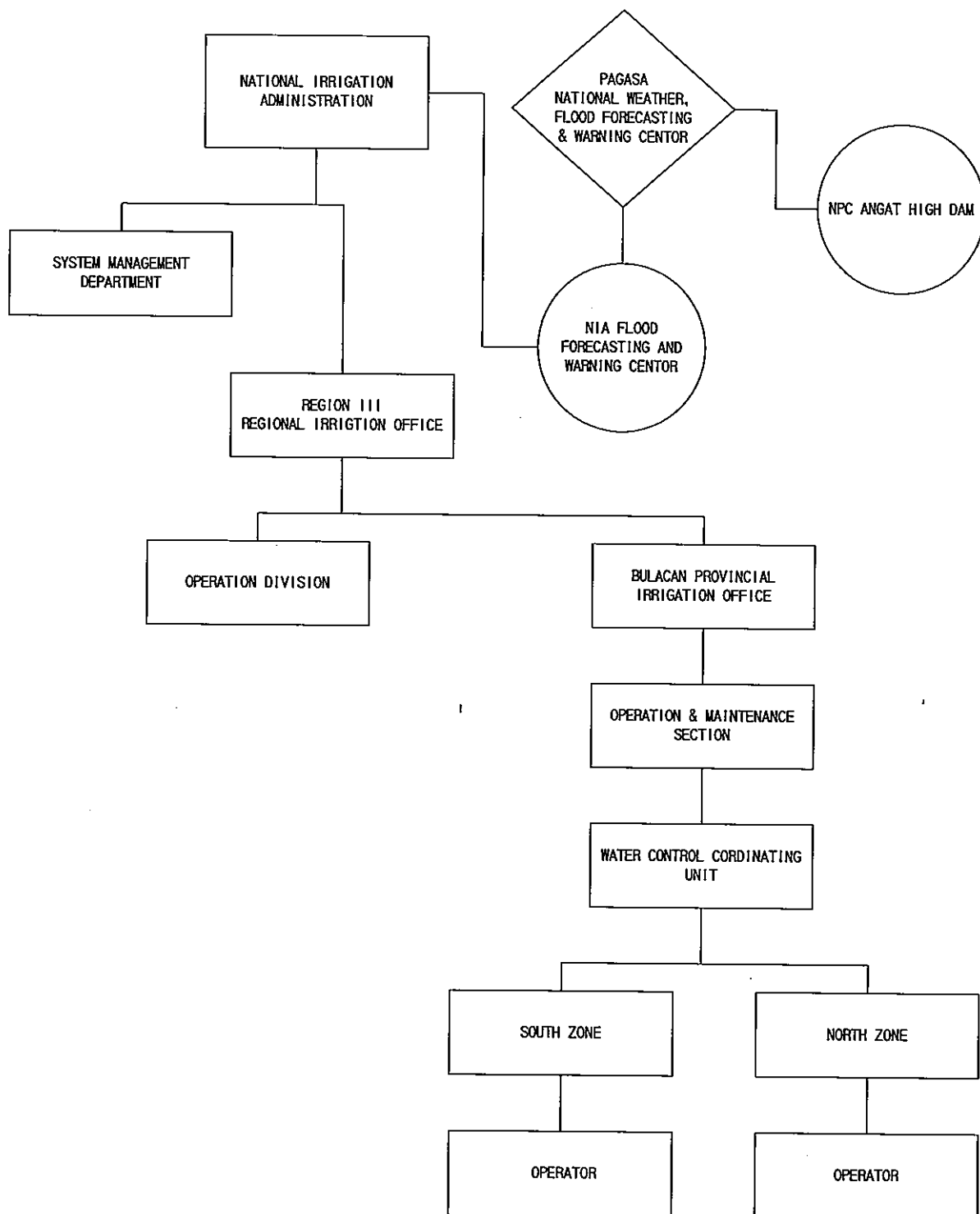
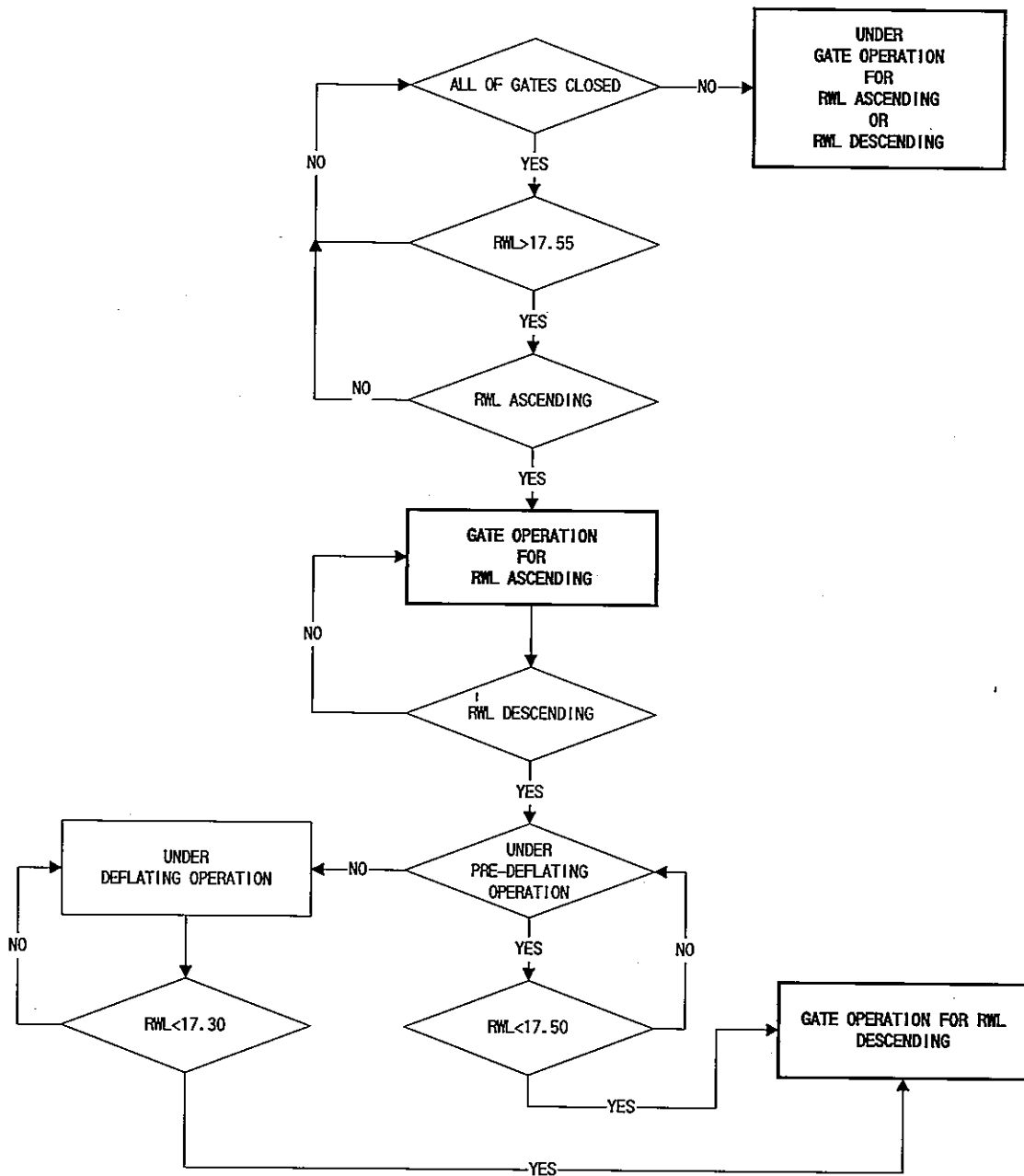


Table 1 CLASSIFICATION ON OPERATIONAL STAGE

Stage	Condition	Responsible	Duty
Alert	The time when typhoon entered the Philippines territory	Division Chief, Provincial Irrigation Manager, Section Chief, Operator	Collecting information on weather from public broadcasting or NIA Flood Forecasting Center
Operation I	The time when typhoon signal was announced by PAGASA, the warning was given by NPC Angat Dam Operation Office to release water from the spillway or NIA Flood Forecasting Center announced warning stage for Pantabangan Dam	Division Chief, Provincial Irrigation Manager, Section Chief, Operator	Collecting information on weather from public broadcasting or NIA Flood Forecasting Center Responsible person should keep mutual communication
Operation II	The time when the warning was given by NPC Angat Dam Operation Office to release water more than 500 cu.m/s from the spillway	Regional Irrigation Manager, Division Chief, Provincial Irrigation	Collecting information on weather from public broadcasting or NIA Flood Forecasting Center Responsible person should keep mutual communication. Section Chief should stay at the operation house to supervise the operation.
Emergency	The time when the warning was given by NPC Angat Dam Operation Office to release water more than 2000 cu.m/s from the spillway	Regional Irrigation Manager, Division Chief, Provincial Irrigation	Collecting information on weather from public broadcasting or NIA Flood Forecasting Center Responsible person should keep mutual communication. Section Chief should stay at the operation house to supervise the operation. PIM should inform situation to the community

Fig.2 GENERAL OPERATION RULE FOR GATE OPERATION RULE
for
ANGAT AFTERBAY REGULATOR DAM



**Fig.3 RUBBER GATE DEFLATING OPERATION RULE
AFTER RG#2,3 & 4 ALREADY DEFLATED
FOR
RWL ASCENDING**

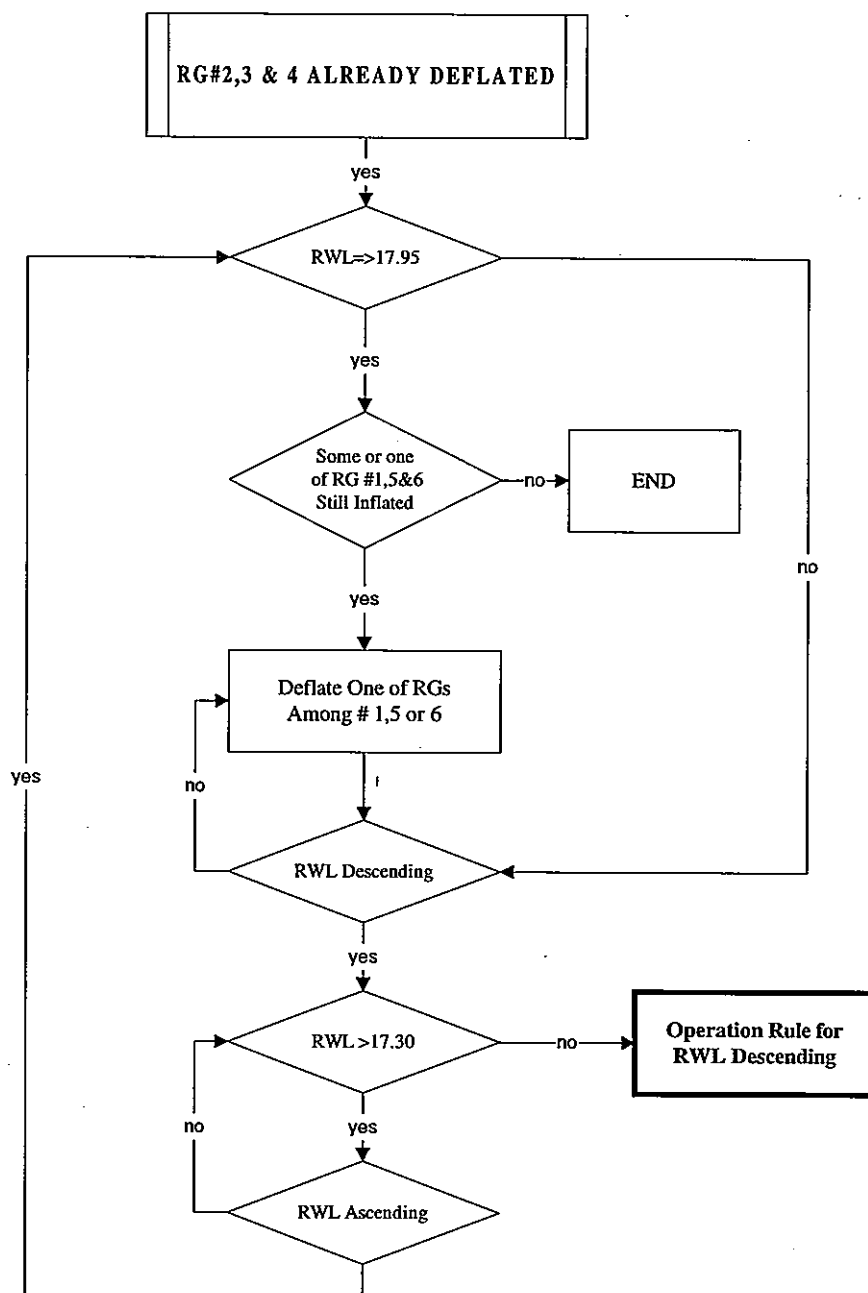


Table 2 GATE OPERATION RULE FOR RWL ASCENDING

Operational Stage	RWL El.m	Description	WG Opening			Rubber Gate Pressure(mmAq)						Total Out flow cu.m/s	Remarks
			L1	L2	R	Bay Number							
			m	m	m	#1	#2	#3	#4	#5	#6		
Pre-deflating Operation	17.50	Initially no gate operation is required at the water level less than 17.50 El.m, or keep the all the gates itinal position	0.0	0.0	0.0	2600	2600	2600	2600	2600	2600	0	
	17.55	The water level reached at 17.55 El.m then reduce air pressure of all of the RG to 2400 mmAq.	0.0	0.0	0.0	2400	2400	2400	2400	2400	2400	4	
	17.60	The water level reached at 17.60 El.m then reduce air pressure of all of the RG to 2200 mmAq.	0.0	0.0	0.0	2200	2200	2200	2200	2200	2200	15	
	17.65	The water level reached at 17.65 El.m then open WG L-1 1.0m	1.0	0.0	0.0	2200	2200	2200	2200	2200	2200	47	
	17.66	The water level reached at 17.66 El.m then open WG L-2 1.0m	1.0	1.0	0.0	2200	2200	2200	2200	2200	2200	74	
	17.67	The water level reached at 17.67 El.m then open WG L-1 2.0m	2.0	1.0	0.0	2200	2200	2200	2200	2200	2200	97	
	17.68	The water level reached at 17.68 El.m then open WG L-2 2.0m	2.0	2.0	0.0	2200	2200	2200	2200	2200	2200	120	
	17.69	The water level reached at 17.69 El.m then open WG L-1 3.5m	3.5	2.0	0.0	2200	2200	2200	2200	2200	2200	145	
	17.70	The water level reached at 17.70 El.m then open WG L-2 3.5m	3.5	3.5	0.0	2200	2200	2200	2200	2200	2200	170	
	17.71	The water level reached at 17.71 El.m then open WG L-1 fully	10.0	3.5	0.0	2200	2200	2200	2200	2200	2200	181	
	17.72	The water level reached at 17.72 El.m then open WG L-2 fully	10.0	10.0	0.0	2200	2200	2200	2200	2200	2200	192	
	17.73	The water level reached at 17.73 El.m then open WG R 2.0m	10.0	10.0	2.0	2200	2200	2200	2200	2200	2200	257	
	17.74	The water level reached at 17.74 El.m then open WG R 3.5m	10.0	10.0	3.5	2200	2200	2200	2200	2200	2200	291	
	17.75	The water level reached at 17.75 El.m then open WG R fully	10.0	10.0	10.0	2200	2200	2200	2200	2200	2200	306	
Deflating Operation	17.85	The water level reached at 17.85 El.m then deflate RG#3completely	10.0	10.0	10.0	2200	2200	0	2200	2200	2200	972	
	17.90	The water level reached at 17.90 El.m then deflate RG#4 completely	10.0	10.0	10.0	2200	2200	0	0	2200	2200	1657	
	17.95	The water level reached at 17.95 El.m then deflate RG#2 completely	10.0	10.0	10.0	2200	0	0	0	2200	2200	2374	
	17.95	The water level reached at 17.95 El.m then deflate RG#5 completely	10.0	10.0	10.0	2200	0	0	0	0	2200	3044	refer to flow chart of Operation Rule after RG #2,3&4 deflated
	17.95	The water level reached at 17.95 El.m then deflate RG#1 completely	10.0	10.0	10.0	0	0	0	0	0	2200	3715	
	17.95	The water level reached at 17.95 El.m then deflate RG#6 completely	10.0	10.0	10.0	0	0	0	0	0	0	4385	

* 10 meter opening of WGs means that the gate is fully opened.

** 0 air pressure of RG means that the gate is completely deflated.

*** This operation rule should be adapted to spillway gates, RG and WGs, not to intake gates.

Fig.4 GATE OPERATION RULE FOR RWL DESCENDING AT ANGAT AFTERBAY REGULATOR DAM & RESERVOIR MANAGEMENT (SPILLWAY GATES & WASH-OUT GATES)

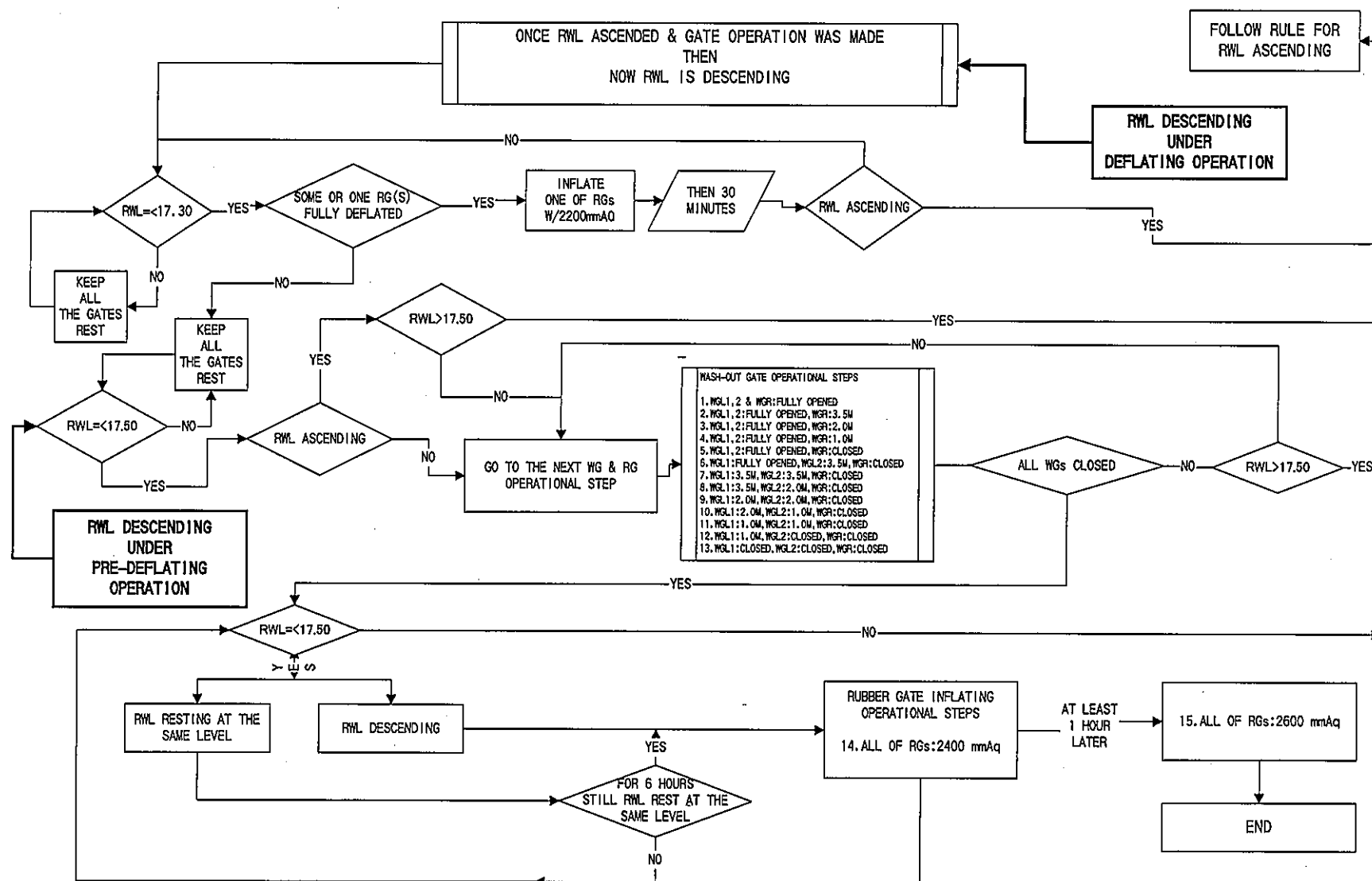
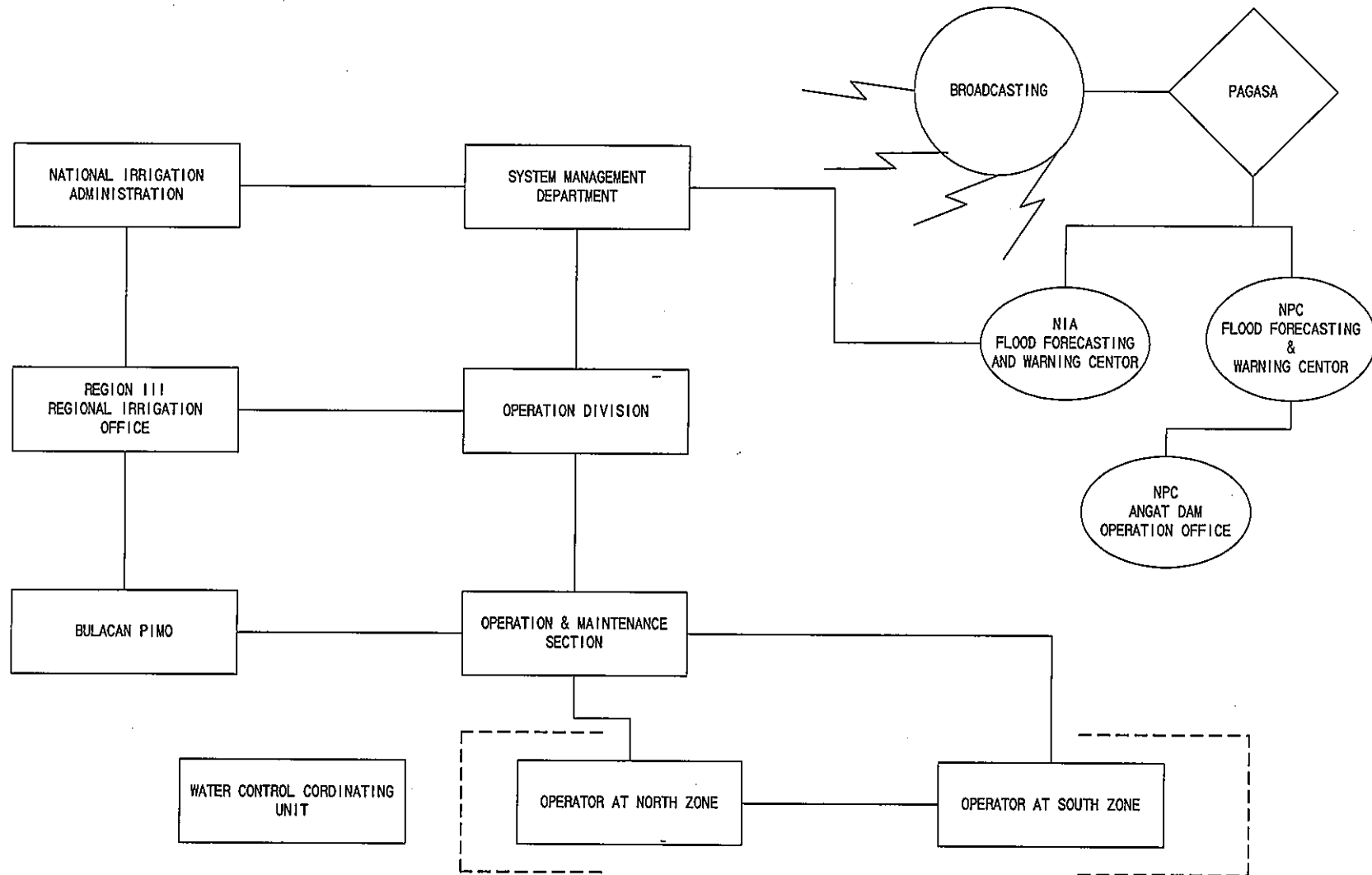


Fig.5 ANGAT AFTERBAY REGULATOR DAM OPERATIONAL COMMUNICATION NETWORKS



資料 5.8 情報伝達システムの提案

アンガット川灌漑用調整ダム（以下、調整ダムとする）のゲート操作にあたっては、次の情報が不可欠である。

- １）アンガット NPC ダムの放流量
- ２）ノルサガライ水位計読み情報
- ３）調整ダム貯水位

これらの情報のうち、調整ダム貯水位は毎正時の情報が、NPC によって設置・管理されている水位計読みを垣間見る形で入手しているのが現状である。そのほかの情報は入手されていない。

このため、次の事項を提案する。

- １）調整ダム管理を全国洪水予警報システムに編入する。
- ２）水位計をアンガット橋付近に設置して、ノルサガライ水位、アンガット NPC ダム放流量と共にテレメタリー化し、調整ダム管理所にデータを送信する。
- ３）調整ダム貯水水位計をリアルタイムで表示するよう改造あるいは新設する。
- ４）地方事務所 - 左岸管理所 - 右岸管理所、左岸管理所 - アンガット NPC ダム管理所間の情報伝達システムの確立を図る。

これらの提案のうち、今回無償案件には、４）の情報伝達システムの確立を取り込むこととする。ただし、１）の予警報システムへの編入は早急に実現して、NPC より洪水時におけるアンガット NPC ダムの放流量及びノルサガライ河川水位の情報伝達システムを通じて、情報提供を受ける態勢を確立する必要がある。

管理体制に関する提言

施設管理のため、管理点検マニュアル、組織、情報・命令伝達網の確立が望まれる。施設管理は次に示す観点から実施するものとする。

- １）貯水池管理：侵入者、浮遊物、土砂堆積、障害物
- ２）施設管理：障害物、破損、機器異常
- ３）河川管理：侵入者

資料 5.9 ゲート操作に関する提言

ゲート操作上の課題は次のとおりである。

- 1) 平常時における水位維持
- 2) 出水時におけるスムーズな洪水放流
- 3) 出水時における上流側の人口洪水の防止
- 4) 河床洗掘を最小限に抑える。

以上の課題に対応するための提言を以下に示す。

1) 平常時におけるゲート操作

ゲート操作は行わず、ラバーゲートからの自然越流に任せる。この場合、水位が EL.18.0 mの全幅自然越流状態で $240\text{m}^3/\text{s}$ 程度の流下能力となる。おれは平常時においては十分な能力である。

2) 出水時におけるゲート操作の流れ

ラバーゲートの脱気減圧し ($2,600 \rightarrow 2,500 \rightarrow 2,400\text{mmAq}$ 、適切な減圧値が確立するまでは最低空気圧は、V ノッチあるいは圧力振動が起きない範囲で $2,400\text{mmAq}$ とする) 但し、ゲートを振動し始めた場合 (ゲート空気圧計の指示針の振動) その時点で脱気操作を中止し、振動が止まるまで 1 段階ずつ加圧して空気圧を戻す。ゲートの脱気はゲート (# 3) $\rightarrow$ # 4 $\rightarrow$ # 2 $\rightarrow$ # 5 $\rightarrow$ # 1 $\rightarrow$ # 6 の順で行う。

10%の減圧で 3%程度ゲート高さが降下するため、水位 18.0mかつラバーゲート全門 10%減圧状態で自然越流すると、その流下能力は $300\text{m}^3/\text{s}$ 程度である。

なお水位が上昇する場合は、左岸土砂吐ゲート 2 門を交互に開度 0.5m 毎、3.0m まで開け、さらに水位増加する場合は全開する。水位 18.0m での流下能力は $170\text{m}^3/\text{s}$ 程度のため、 と合わせると $470\text{m}^3/\text{s}$ 程度の流下能力となる。

さらに水位が上昇する場合は、右岸土砂吐ゲートを開度 0.5m 毎に全開まで開ける。この場合、水位 18.0m での流下能力が $120\text{m}^3/\text{s}$ 程度となり、左右岸土砂吐ゲートの流下能力は合計 $290\text{m}^3/\text{s}$ 程度となり、 と合わせると $590\text{m}^3/\text{s}$ 程度の流下能力となる。

さらに水位が上昇する場合は、ラバーゲートを 1 門ずつ全開 (全倒) する。全門全倒状態では、 $4,100\text{m}^3/\text{s}$ 程度となり、全土砂吐ゲート流下能力と合わせて、合計 $4,400\text{m}^3/\text{s}$ 程度の流下能力となる。これは、ラバーゲートの設計流量 $3,300\text{m}^3/\text{s}$ 以内である。

水位が低下し始めたら、ラバーゲートを 1 門ずつ、ゲート (# 3) $\rightarrow$ # 4 $\rightarrow$ # 2 $\rightarrow$ # 5 $\rightarrow$ # 1 $\rightarrow$ # 6 の順で全閉 (全立) する。

さらに水位が低下し続けるようであれば、土砂吐ゲートを左岸ゲート 2 門交互に、さらに右岸ゲートを全閉する。

但し、ラバーゲートの脱気減圧については、専門家の指導の下で、V ノッチの起こらない空気圧 - 水位関係の実機実験を行い、適切な操作方法を確立するものとする。そのような操作方法が確立するまでは、脱気減圧は 10%程度 ($2,400\text{mmAq}$) に止めておくことが望ましい。