

## Appendices

## 1. Member List of the Survey Team

### (1) Basic Design Study Team

No.	Designation	Name and Affiliation
1	Team Leader	Masayuki WATANABE Development Specialist, Institute for International Cooperation, JICA
2	Technical Adviser	Tatsuru MATSUOKA Cultivate Division, Agriculture, Forestry and Fisheries Department, Toyama Prefectures Government
3	Coordinator	Katsumi YAMANOME Forth Project Study Division, Grant Aid Project Study Department, JICA
4	Chief consultant / Management, Operation and Maintenance Planner	Toshiki KAWAKAMI CTI Engineering International Co., Ltd.
5	River and Sabo Structures Planning and Design Engineer I	Masashi FURUTAGUCHI CTI Engineering International Co., Ltd.
6	River and Sabo Structures Planning and Design Engineer II / Natural Condition Surveyor	Kenji TOYOTA CTI Engineering International Co., Ltd.
7	Geological Surveyor	Yoshihira NISHIYANAGI CTI Engineering International Co., Ltd.
8	Cost Estimator / Procurement Planner	Tatsuhide HAMASAKI CTI Engineering International Co., Ltd.

### (2) Draft Report Explanation Team

No.	Designation	Name and Affiliation
1	Team Leader	Masayuki WATANABE Development Specialist, Institute for International Cooperation, JICA
2	Coordinator	Yoshinobu KINOSHITA Second Management Division, Tsukuba International Center, JICA
3	Chief consultant / Management, Operation and Maintenance Planner	Toshiki KAWAKAMI CTI Engineering International Co., Ltd.
4	River and Sabo Structures Planning and Design Engineer I	Masashi FURUTAGUCHI CTI Engineering International Co., Ltd.

## 2. Study Schedule

### (1) Basic Design Study

No.	Date	Day	Activities
1	March 9, 2000	Thu.	All members except River and Sabo Structures Planning and Design Engineer II and Cost Estimator/Procurement Planner arrive in Manila, Courtesy Call on JICA Philippines Office, Team Meeting
2	March 10	Fri.	Courtesy Call on National Irrigation Administration (NIA), Explanation of the Inception Report to NIA, Meeting with NIA Staff, Team Meeting
3	March 11	Sat.	Team Meeting, Site Survey
4	March 12	Sun.	Data Analysis, Selection of Local Contractors for Geotechnical and Topographic Survey
5	March 13	Mon.	Courtesy Call on NIA Regional Office, Meeting with NIA Regional Office Staff, Site Survey, Courtesy Call on Department of Environment and Natural Resources (DENR), Data Collection at DENR, Team Meeting
6	March 14	Tue.	Meeting for Minutes of Discussions with NIA Staff, Negotiations for work for Geotechnical and Topographic Surveys with Local Contractors
7	March 15	Wed.	Signing of Minutes of Discussions, Courtesy Call on National Economic Development Authority (NEDA), Meeting with NEDA Staff, Report to JICA Philippines Office
8	March 16	Thu.	Courtesy Call on Embassy of Japan, Report to Embassy of Japan, Team Leader, Technical Advisor and Coordinator leave for Japan
9	March 17	Fri.	Arranging Survey Office at NIA, Meeting for Geotechnical Survey with Local Contractor, River and Sabo Structures Planning and Design Engineer II / Natural Condition Surveyor arrives in Manila
10	March 18	Sat.	Site Survey, Meeting for Topographic Survey with Local Contractor
11	March 19	Sun.	Data Analysis
12	March 20	Mon.	Site Survey, Planning Geotechnical Survey
13	March 21	Tue.	Site Survey, Planning Topographic Survey, Cost Estimator / Procurement Planner arrives in Manila
14	March 22	Wed.	Site Survey, Planning to Remove Water on the Apron
15	March 23	Thu.	Site Survey, Planning Boring and Rader Surveys
16	March 24	Fri.	Site Survey, Supervising Boring Survey
17	March 25	Sat.	River Channel Survey of Angat River
18	March 26	Sun.	Data Analysis
19	March 27	Mon.	Site Survey, Data Collection at National Power Corporation (NPC)
20	March 28	Tue.	Site Survey, Survey of River Bed Materials

No.	Date	Day	Activities
21	March 29	Wed.	Site Survey, Survey of Damages for Existing Structures
22	March 30	Thu.	Site Survey, River Channel Survey
23	March 31	Fri.	Site Survey, Supervising Rader Survey
24	April 1	Sat.	Site Survey, Supervising Rader Survey
25	April 2	Sun.	Data Analysis
26	April 3	Mon.	Site Survey, Supervising Density Test
27	April 4	Tue.	Site Survey, Supervising Density Test
28	April 5	Wed.	Site Survey, Supervising Rader Survey
29	April 6	Thu.	Site Survey, Supervising Rader Survey
30	April 7	Fri.	Site Survey, Supervising Density Test
31	April 8	Sat.	Data Analysis, Making Survey Report
32	April 9	Sun.	Data Analysis
33	April 10	Mon.	Meeting with NIA Regional Office Staff, Data Collection at NIA Regional Office
34	April 11	Tue.	Data Collection at Angat Dam and Ipo Dam
35	April 12	Wed.	Data Analysis, Making Survey Report
36	April 13	Thu.	Data Analysis, Making Survey Report
37	April 14	Fri.	Data Analysis, Making Survey Report
38	April 15	Sat.	Data Analysis, Making Survey Report
39	April 16	Sun.	Data Analysis, Making Survey Report
40	April 17	Mon.	Meeting with NIA Head Office Staff, Making Survey Report
41	April 18	Tue.	Report to JICA Philippines Office
42	April 19	Wed.	Leave Manila for Tokyo

(2) Draft Report Explanation

No.	Date	Day	Activities
-	August 18, 2000	Fri.	Team Leader arrives in Manila
1	August 21	Mon.	All members except Team Leader arrive in Manila, Courtesy Call on JICA Philippines Office, Team Meeting
2	August 22	Tue.	Courtesy Call on NEDA and NIA, Team Meeting
3	August 23	Wed.	Meeting with NIA Staff, Team Meeting
4	August 24	Thu.	Explanation of Draft Report, Meeting with NIA Staff
5	August 25	Fri.	Signing of Minutes of Discussions, Report to JICA Philippines Office, Site Survey with NIA Staff
6	August 26	Sat.	Team Leader and Coordinator leave Manila for Tokyo, Team Meeting
7	August 27	Sun.	Team Meeting, Data Collection
8	August 28	Mon.	Meeting with NIA, Courtesy Call on Embassy of Japan, Report to Embassy of Japan
9	August 29	Tue.	Leave Manila for Tokyo

### 3. List of Party Concerned in the Recipient Country

No.	Office	Name	Designation
1	Head Office, National Irrigation Administration (NIA)	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 Principal Engineer, DSD Division Manager, IDD
2	Regional Office (Region-III), National Irrigation Administration (NIA)	Mabuel Collado Oscar Mercado Leonardo S. Gonzales	Regional Irrigation Manager Division Manager Division Manager
3	Head Office, Department of Agriculture	Cecilia Q. Astilla	Officer in Charge Director Project Development Services
4	Head Office, Department of Environment and Natural Resources (DENR)	Romeo de Ocampo  Roberto Aguda	Chief Watershed, Forest Management Bureau (WFMB) Engineer III of WFMB
5	Regional Office (Region-III), Department of Environment and Natural Resources (DENR)	Vicente Cabrera Wilfredo Saraos Lormelyn Claudio Dominice Balerite	Asst. Exec. Regional Director Asst. Exec. Regional Director Regional Director, EMB Chief, EQD, EMB
6	Head Office, National Economic Development Authority (NEDA)	Cristina Tantriyo Cristina Santiago Lawrence Nelson Guevana Rufino Guinto R. Noriel B. Sicad	PIS, NEDA PIS, NEDA PIS, NEDA Infrastructure Staff Project Monitoring Staff

4. Minutes of Discussion  
(1) Basic Design Study

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

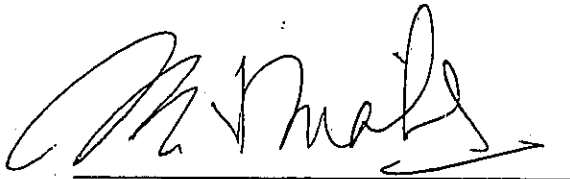
In response to the request from the Government of the Philippines, the Government of Japan decided to conduct a Basic Design Study on the Project for Rehabilitation of Apron at Angat Afterbay Regulator Dam (hereinafter referred to as "the Project"), and entrusted the study to the Japan International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

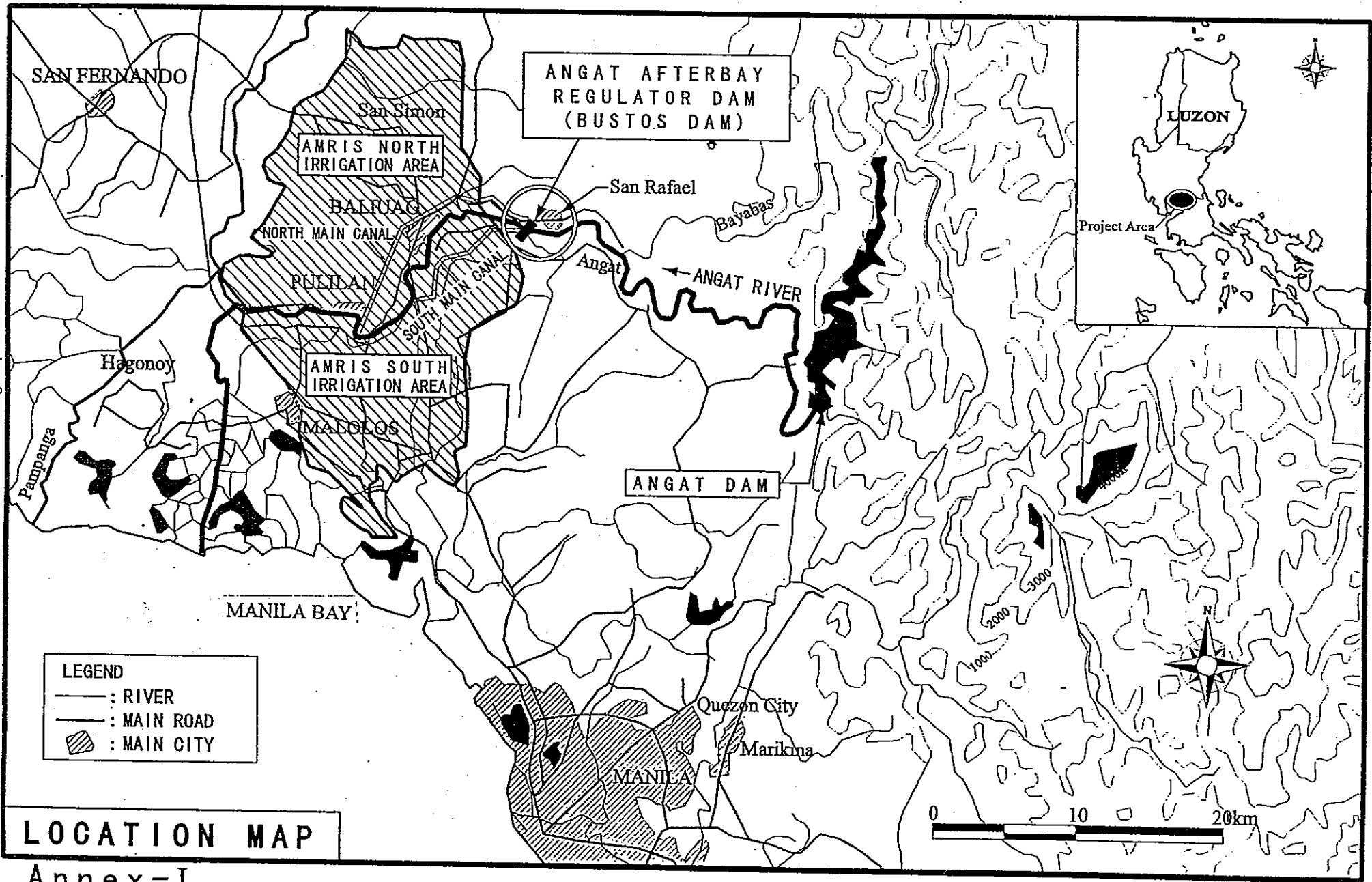


disaster in the future. The Philippine Side promised to take effective measures regarding this matter.

- (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.

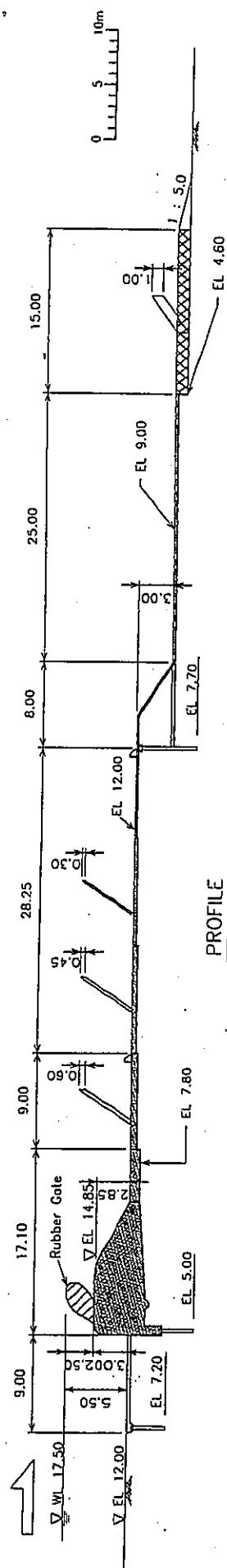
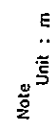
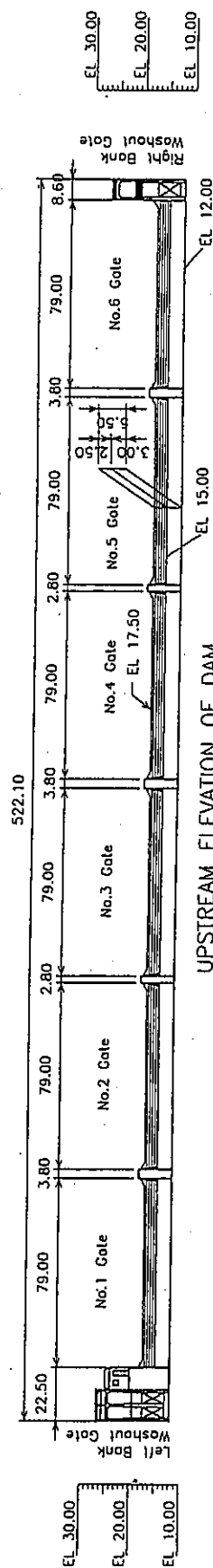
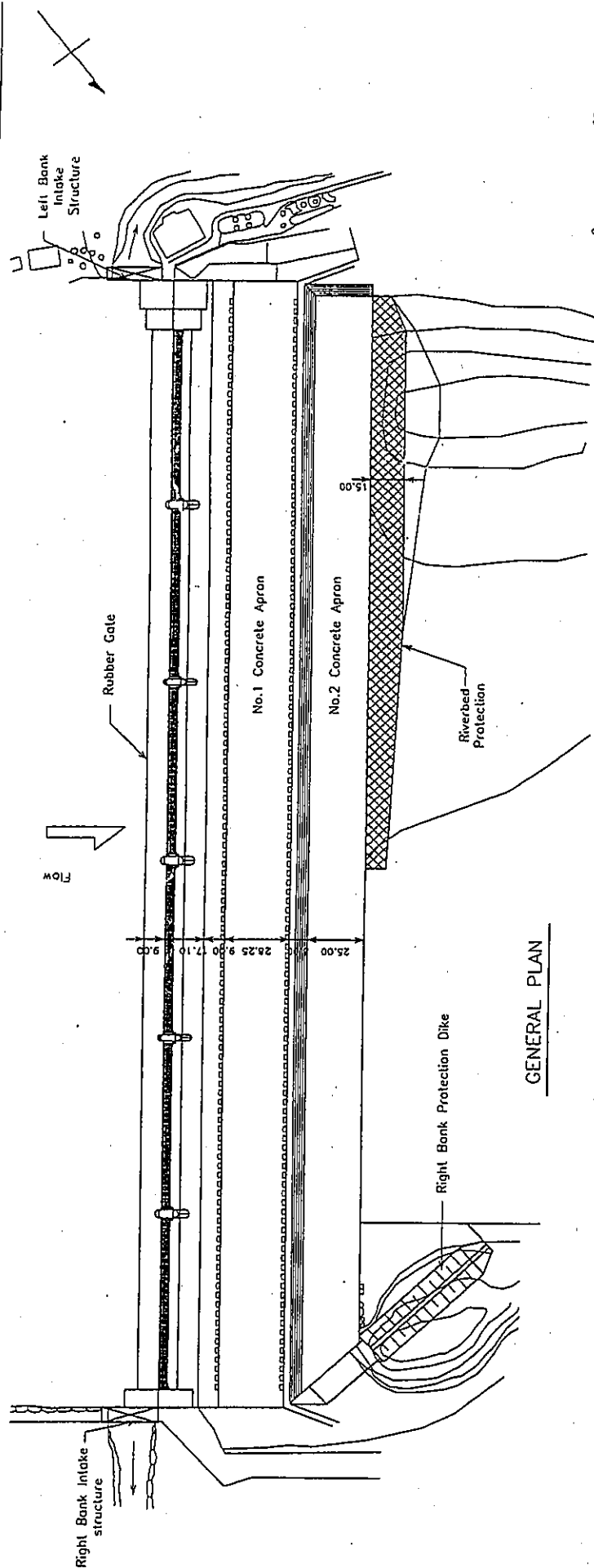
- (i) To formulate a proper operation and maintenance (O&M) plan for the dam and the reservoir;
  - (ii) To carry out the plan;
  - (iii) To put an O&M activity on record through the regular inspection;
  - (iv) To hold regular meetings among or between agencies concerned to confirm the effectiveness 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.



**Contents of Request for Japan's Grant Aid**

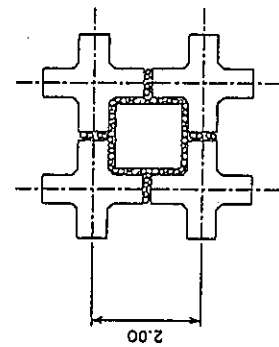
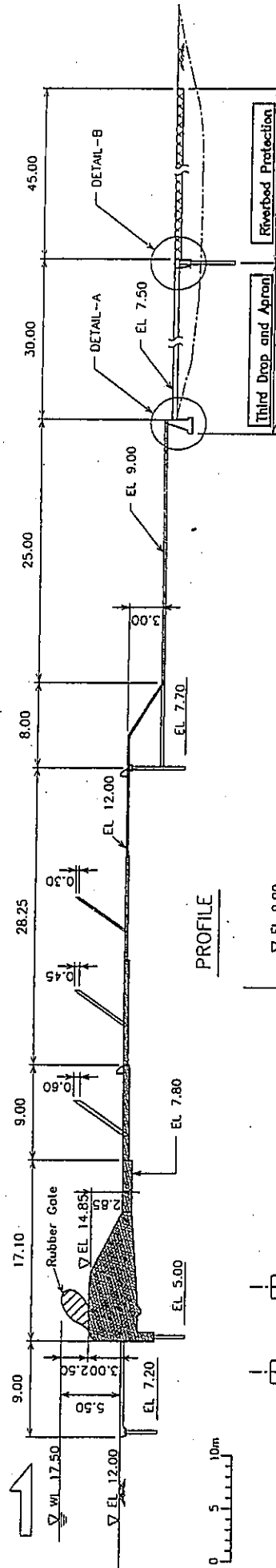
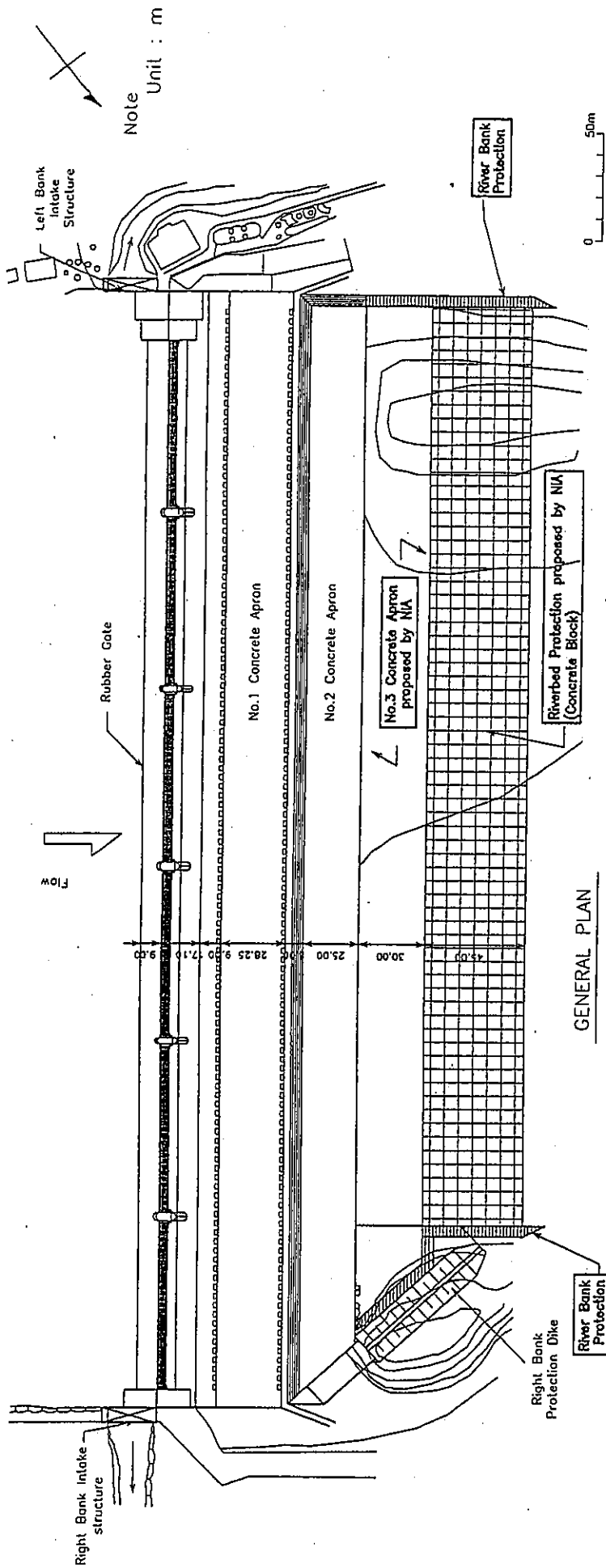
Item	Contents
1. Engineering Services	<ul style="list-style-type: none"> <li>• Detailed design of proposed facilities.</li> <li>• Construction supervision.</li> </ul>
2. Construction of Facilities	
(a) Existing First and Second Aprons	<ul style="list-style-type: none"> <li>• Demolition of damaged portions.</li> <li>• Filling and compaction of foundation ground underneath the damaged aprons.</li> <li>• Reconstruction of aprons including steel sheet piles.</li> </ul>
(b) Third Drop and Apron	<ul style="list-style-type: none"> <li>• Construction of third drop and apron downstream of the existing second apron.</li> </ul>
(c) Riverbed Protection	<ul style="list-style-type: none"> <li>• Construction of riverbed protection using concrete blocks and gabion.</li> </ul>
(d) Riverbank Protection	<ul style="list-style-type: none"> <li>• Construction of revetment with wet stone pitching for the downstream riverbanks.</li> <li>• Rehabilitation and/or reconstruction of revetment on the right side upstream riverbank.</li> </ul>
(e) Temporary Works	<ul style="list-style-type: none"> <li>• Cofferdam, dewatering and other temporary works.</li> </ul>
(f) Expenditure at Site Office	
3. Maintenance Equipment	<ul style="list-style-type: none"> <li>• Boat and warning device.</li> </ul>
4. Training Program	<ul style="list-style-type: none"> <li>• On-the-job-training on operation and maintenance technique for a large-scale river structure.</li> </ul>

*Mya + m*

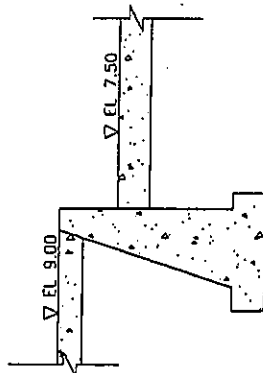


Annex--II(2/3) EXISTING ANGAT AFTERBAY  
REGULATOR DAM

Byss & M



DETAIL OF RIVERBED PROTECTION  
(NO SCALE)



DETAIL - A  
(NO SCALE)



DETAIL - B  
(NO SCALE)

## 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.

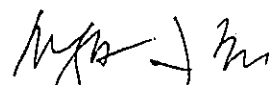
Fourthly, the Project approved by the Cabinet becomes official when pledged by the Exchange of Notes signed by both Governments.

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.

*Mpa Jh*

### 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.

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.

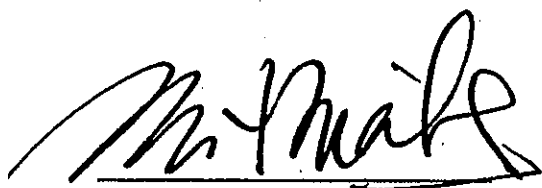
Minutes of Discussions  
on  
the Basic Design Study on the Project  
for  
Rehabilitation of Apron at Angat Afterbay Regulator Dam  
in  
the Republic of the Philippines  
(Explanation on the Draft Basic Design)

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

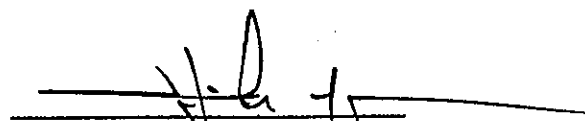


Mr. Masayuki WATANABE  
Leader,  
Basic Design Study Team  
JICA



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.

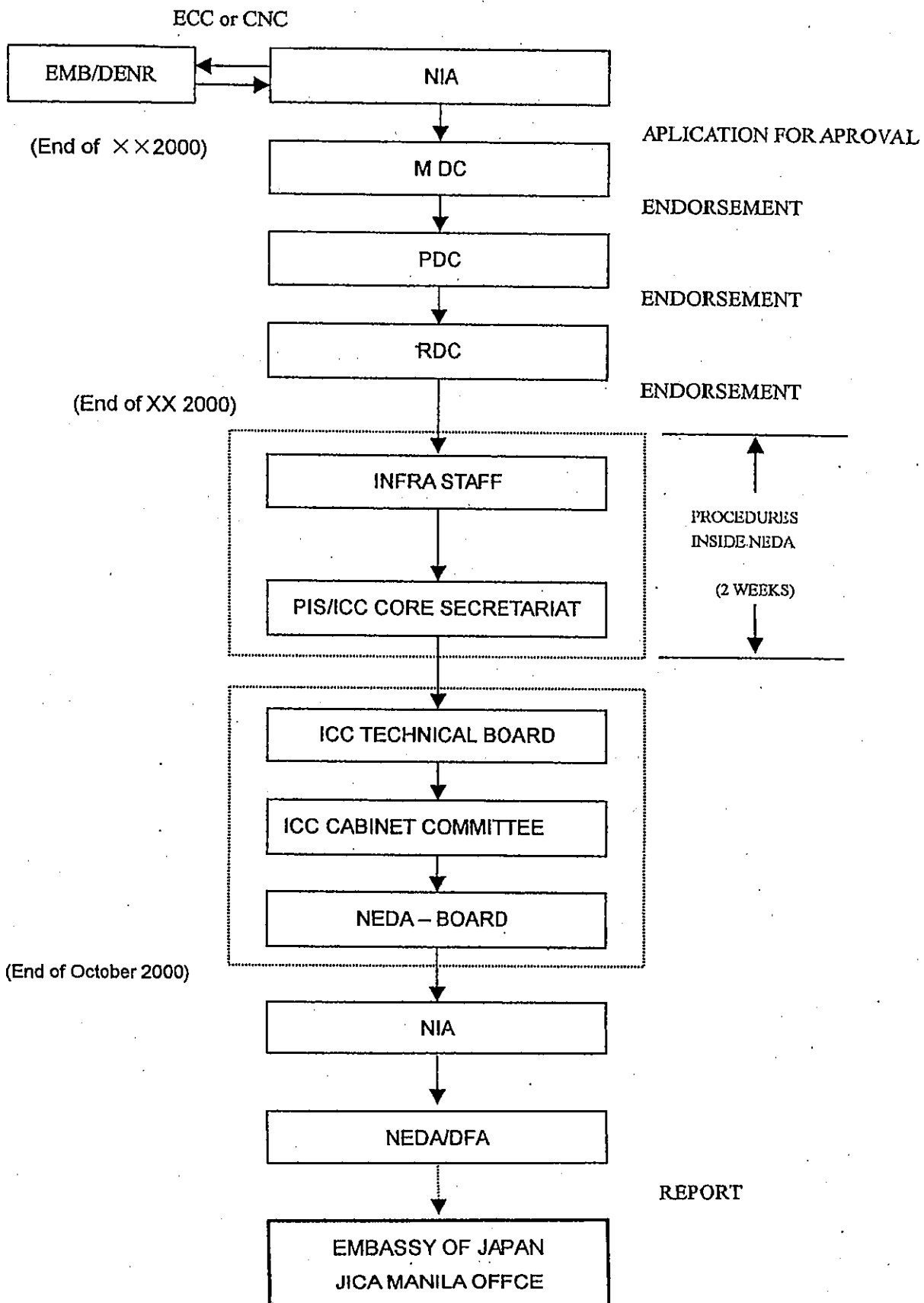
(9) Banking Arrangement (B/A)

- 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 Philippines 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

### 5. Cost Estimation Borne by the Recipient Country

No.	Items	Amount of Cost (Philippine Pesos)			Remarks
		Year 2001	Year 2002	Year 2003	
1	Private Land Cost	190,200	---	---	Area: 634 sq.m., Cost per Unit Area: 300 Pesos/sq.m.
2	Steel Sheet Pipes				Total Weight: 488.16 tons, Japan Made
	International Transportation	180,300	96,300	---	
	Unloading, Port Charge, Handling Charge, etc.	309,700	165,300	---	
	Customs Charges	1,058,800	565,100	---	The cost of steel sheet piles is 16,239,000 Pesos and the customs rate for steel is 10%. However, in case of imports under the Japan Grant Aid, the Philippine Government will take necessary measures to exempt them from customs
3	Commissions to the Japanese Foreign Exchange Bank				The amount of this cost depends upon the Banking Arrangement.
	Advising Commission on the Authorization to Draw	---	---	---	
	Payment Commission	23,900	423,900	496,400	If 1 Peso is equivalent to 2.76 Yen and the payment commission rate is 0.2% of the total grant cost.
4	Value Added Tax	11,097,000	32,204,900	3,919,400	Total cost for the Project is 472,213,000 Pesos and the rate of value added tax is 10%.
Total Cost		12,859,900	33,455,500	4,415,800	Including customs charges for steel sheet piles

Total Cost of Year 2001 to 2003

50,731,200 Philippine Pesos

## **6. Other Relevant Data**

### **(1) Proposed Operation & Maintenance Manual (Draft)**

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# **PROPOSED OPERATION & MAINTENANCE MANUAL FOR ANGAT AFTERBAY REGULATOR DAM (DRAFT)**

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## **I GENERAL**

### **1. Purpose**

This O/M Manual stipulates for Regional Irrigation Office of Region III under National Irrigation Administration through Provincial Irrigation Office to maintain Angat Afterbay Regulator Dam and Reservoir in good condition keeping facilities life longer and to operate the hydraulic structure effectively preventing man-made flood/inundation and securing human lives in the surround areas.

### **2. Organization**

The Regional Irrigation Manager shall be responsible to operation and maintenance of the Facilities. Provincial Irrigation Manager shall implement the operation and maintenance under the supervision of the Regional Irrigation Manager and in cooperation with the staff of the Regional Office and the Main Office.

### **3. Duties**

#### **1) Regional Irrigation Manager**

The manager shall supervise the staff activities to collect data, information on weather and flood, communicate with the other agencies concerned and to operate and maintain the Facilities.

#### **2) Operation Division**

The operation division shall supervise staff activities on the operation and maintenance according to the O/M Manual and collect data, information on weather and flood, and communicate with the other agencies concerned and provide necessary means for the operation and maintenance.

#### **3) Provincial Irrigation Manager**

The Provincial Irrigation Manager, directing the operation and maintenance and coordinating with the operation division, shall supervise staff to operate and maintain

the Facilities according to the O/M Manual.

#### 4) Operation & Management Section

The operation & management section shall operate and maintain the facilities according to the O/M Manual.

## **II Operation and Maintenance Manual on Reservoir Management**

### 1. Purpose

The purposes on O/M Manual on Reservoir Management are shown in the followings;

- (1) To secure the visitor and resident lives in and/or surrounding the reservoir against operation of the hydraulic facilities.
- (2) To prevent the adverse effect to the Facilities from the human activities and physical stuff in the reservoir.
- (3) To maintain reservoir function

### 2. Duty

The duty of personnel in this system is described in the following;

- (1) To monitor the surface of the reservoir regularly. Frequency of the monitoring is stipulated in Table at the section 4, in this chapter.
- (2) To remove the harmful stuff or adverse effect to the Facilities from the reservoir as soon as possible right after discovering.
- (3) To extract sediment from the reservoir regularly limiting the extent not to cause bank erosion along the surrounding of the reservoir and hydraulic piping through the dam foundation. The sediment extraction should be carried out within the limitation shown in the following;

Limitation: Not nearer than 20 meters to the Dam upstream face and 10 meters to the Banks

### 3. Activities

The activities of the O/M Manual are described in the following;

#### (1) Monitoring

Monitoring shall be done by cruising on the surface and by walking along the perimeter on the reservoir to find harmful stuff not only on the reservoir surface but also lands along the perimeter of the reservoir. Any illegal human activities shall be

reported to the regional irrigation manager.

(2) Removal of Illegal Activities and Harmful Stuff

Operators shall warn the owner to remove the illegal human activities, the harmful stuff or any other adverse effect to the Facilities as soon as possible and report to the provincial irrigation manager. If there is any difficulty to remove them, the provincial irrigation manager shall report to the regional irrigation manager, who shall take action in accordance to the Memorandum in order to remove such activities, stuff or effect in cooperation with other agencies concerned including Philippine National Police.

(3) Extraction of Sediment

The reservoir shall be maintained with capacity as much as possible in the room between the elevation 13.00m and 18.00m to secure the regulating capacity for supply irrigation water, to retard flood to the surrounding area of the reservoir and to gain time to operate the hydraulic facilities with a safety margin.

4. Frequency and Area of Monitoring

Duty	Area	Frequency	Kind of Harmful Stuff
Monitoring	from the dam site to the end of the reservoir (5.2km)	Daily	Floating material, Floatable material in flood area, Trees, A mass of water lily,
Report		Weekly/on any occasion	

### III Structural Maintenance Manual

1 Purpose

The purposes of the structural maintenance manual are described in the following;

- (1) To keep the facilities in good condition
- (2) To restore faults and damages in the structures as soon as possible to prevent the further development.

2 Duty

The duty of personnel in the system is described in the following;

- (1) To monitor appearance of rubber gates, concrete structure like piers and aprons and steel structure like wash-out gates, hoisting machinery, rubber gate air blower, operation facilities and warning devices.



(2) To make first aid to restore the minor faults or damages.

### 3 Activities

The activities of the structural maintenance manual are stipulated in the following;

#### (1) Monitoring

Personnel in the operation & maintenance section (Operator) shall monitor the appearance of the structures.

#### (2) Removal of Obstruction

Operator shall remove obstruction on/in the structure and report to PIM. If there is any difficulty to remove, PIM shall report to RIM who shall take action to remove that in corporation with the other agencies concerned if required.

#### (3) Restoration

Personnel in the operation & maintenance section shall make first aid restoration work in cooperation with the related divisions and departments.

### 4 Frequency

Duty	Area	Frequency	Monitoring Points
Monitoring	Rubber gates Concrete structures Steel structures Machinery Rubber gate air blower Other facilities	Once a week Time to time before/after gates operation	Damage Obstruction
Report		Weekly/on any occasion if required	

## IV River Management

### 1 Purposes

The purposes of the river management are stipulated in the following;

(1) To secure the residents and visitors lives against the water released from the hydraulic control facilities. They utilize the aprons and rubber gates for a path between both banks as well as the downstream areas for resort with stall and shade rentals. In this regard, the Operator shall pay attention to them and keep them out of the area before the water release from the hydraulic control facilities.

(2) To maintain the river are in good natural condition

## 2 Duty

The duties of personnel concerned with the river management are stipulated in the following;

- (1) To monitor the downstream areas and facilities paying attention to the pedestrians and visitors, and other activities in the project area.
- (2) To warn the people to move away from the project area before water release from the reservoir
- (3) To keep the illegal quarrying out of the NIA responsible area

## 3 Activities

The activities the personnel designated to their assignment are stipulated in the following;

### (1) Monitoring

Operator shall closely monitor human activities in the downstream area even at night if it is required.

### (2) Warning

Operator shall surely warn people in the downstream area to keep out of the area before releasing water from any gate in the facilities. Operator shall not release water from the reservoir before clearing the downstream area.

### (3) Anti-Illegal Quarrying

- (i) Operator shall watch illegal quarrying in the river area and report PIM on his finding as soon as possible.
- (ii) PIM shall report RIM and warn the owner to give up operation in coordination with RIM.
- (iii) RIM shall make necessary arrangement and coordination to the agencies concerned in accordance with the Memorandum.

(2) Spillway Gate Operation Rule (Draft)

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**SPILLWAY GATE OPERATION RULE**  
**(DRAFT)**

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## Chapter 1 GENERAL

(The Rule)

**Article 1** The Spillway Gate Operation Rule (hereafter referred to as the Rule) is hereby stipulated for the Spillway Gate Operation ( hereafter referred to as the Operation) in the Angat Afterbay Regulator Dam (hereafter referred to as the Dam).

( Purposes)

**Article 2** The Rule is stipulated in order to operate the gates to release the reservoir water smoothly to prevent man-made flood/inundation in the surrounding areas of the reservoir and along the downstream of the river.

( Responsibility )

**Article 3** The designated personnel shall have responsibilities to their assignment stipulated in the following;

- (1) Provincial Irrigation Manager (hereafter referred to as the Manager) shall be assigned to undertake and supervise all the activities regarding the Operation.
- (2) The Manager shall be tasked with making necessary decisions on the Operation conforming to the stipulation of the Rule.
- (3) The Manager shall execute the Operation through the hand of operators conforming to the stipulation of the Rule.
- (4) Regional Irrigation Manager (hereafter referred to as the Regional Manager) shall, with his full supports, back up the Manager executing the Operation.

( Organization )

**Article 4** The organization for the Operation is stipulated in [Fig. 1](#) including back-up.

## Chapter 2 DEFINITION

(Flood Season)

**Article 5** The Flood Season is defined as of period from May to October. The Manager shall execute an exercise of the Operation conforming to the stipulation of Articles in the Rule.

(Classification of Operational Stage)

**Article 6** Classification of the operational stages is defined and the duties are stipulated in [Table 1](#). The Regional Manager shall announce the operation stages to the

Manager, who shall execute the duties in cooperation with the Regional Manager.

( Flood )

**Article 7** The situation that the reading of reservoir water level ( hereafter referred to as RWL) exceeded twenty (20) centimeters within one (1) hour, RWL reached at 17.65 El.m, or Operation I or higher stage among the Operational Stage was announced by the Regional Manager is defined as “flood”.

( Project Area )

**Article 8** The project area is defined by the areas of 5.2 km upstream and of 2.0 km downstream away from the dam site.

### **Chapter 3 PREPARATION**

( Monitoring )

**Article 9** The operator, before releasing the reservoir water, shall monitor the surroundings of the project site and assure the human safety and no disturbance against the facilities conforming to the reservoir management manual and river management manual.

( Warning )

**Article 10** The operator shall warn person or people to move away from the project area before releasing water from the facilities. The warning shall be made with all means provided in the operation facilities.

( Reading of RWL)

**Article 11** The operator shall read the digital indication of RWL. Frequency of the reading is given in the table below.

RWL Reading	Frequency	Remarks
Normal Stage	Once(1) an hour (1 hr)	
Flood Stage	Once(1) thirty (30 min.) to five (5) minutes	

### **Chapter 4 RUBBER GATE**

( Normal Operation )

**Article 12** The rubber gates shall be normally inflated with air pressure of 2,600 mm Aq and be deflated with no air pressure.

( Controlled Operation )

**Article 13** The rubber gates may be deflated controlling air pressure less than 2,600

mm Aq. under close observation on air pressure gauge indication and the gate performance. In case the gauge indication shows pressure fluctuating rapidly or the gate performance does V-notch, the deflation shall be canceled and the air pressure be resumed in normal condition. The minimum of controlled air pressure shall be 2,200 mm Aq.

## **Chapter 5 WASH-OUT GATE**

( Operation )

**Article 14** The wash-out gates shall be operated for washing sediment out away from the front of the intake gates by flushing water and for releasing the reservoir water to prevent man-made flood/inundation.

## **Chapter 6 GATE OPERATION**

(Gate Operation for Reservoir Water Level Ascending)

**Article 15** The gate operation for RWL ascending shall be made conforming to the stipulation presented in [Fig. 2 and 3](#), and [Table 2](#).

(Gate Operation for Reservoir Water Level Descending)

**Article 16** The gate operation for RWL descending shall be made conforming to the stipulation presented in [Fig. 4](#).

## **Chapter 7 COMMUNICATION**

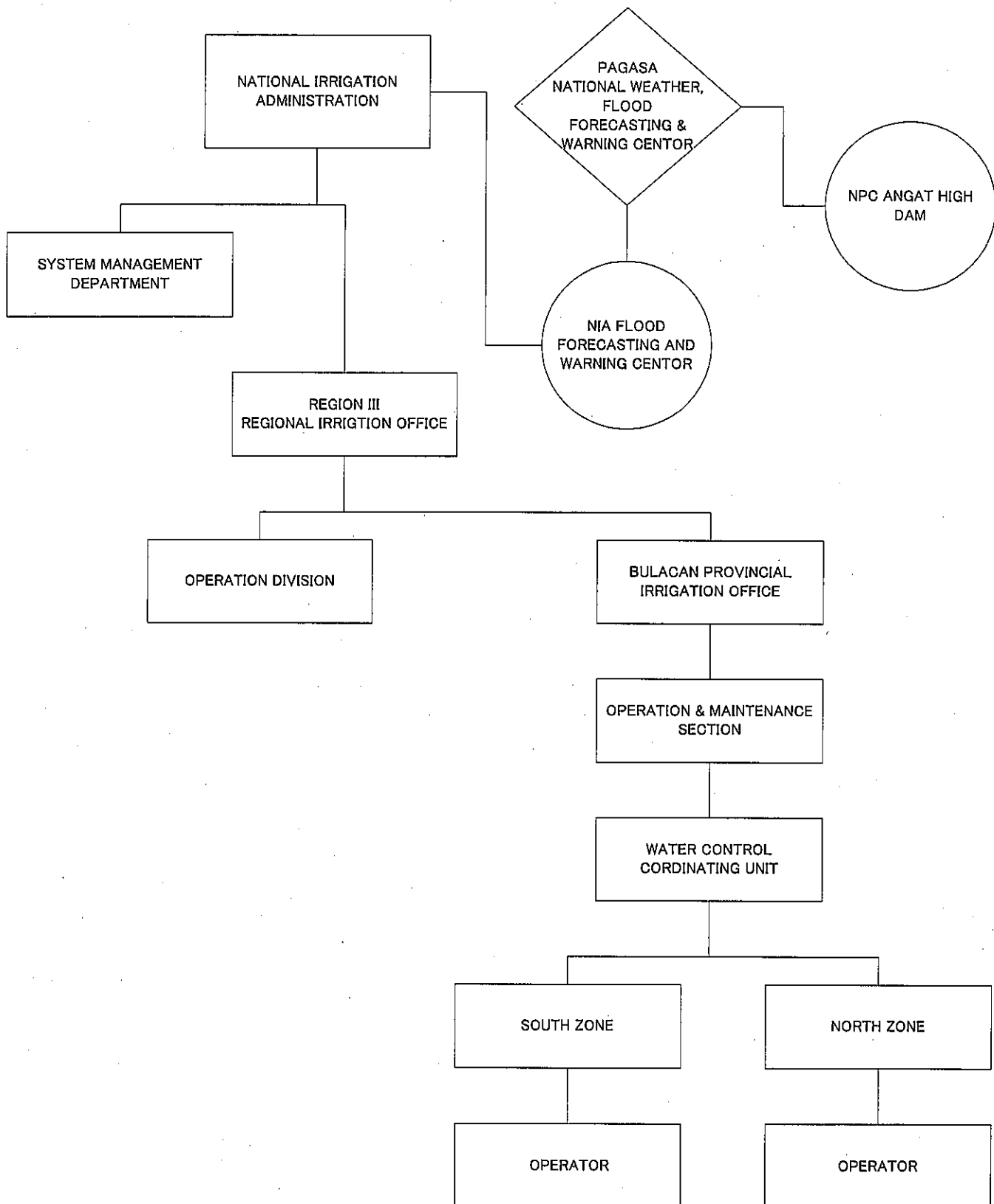
(Communication)

**Article 17** The internal or external communication shall be kept among the offices, divisions, sections and personnel concerned. The required communication network is shown in [Fig. 5](#).

## **Chapter 8 EXERCISE**

(Exercise)

**Article 18** Operational exercise shall be carried out, before entering the flood season, assuring the procedure of operation stipulated in the Rule and the handling of equipment and facilities of the Operation.



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

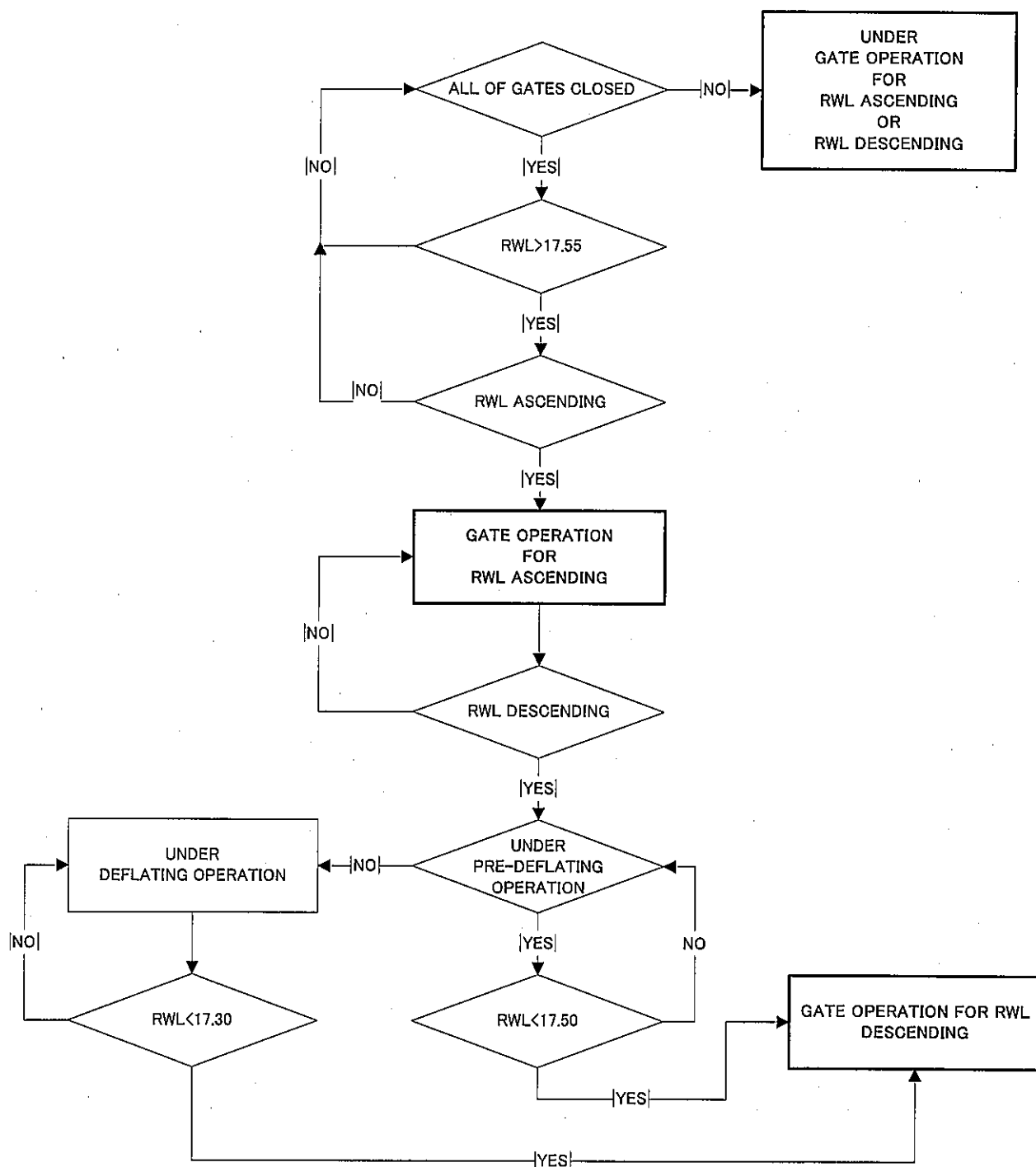
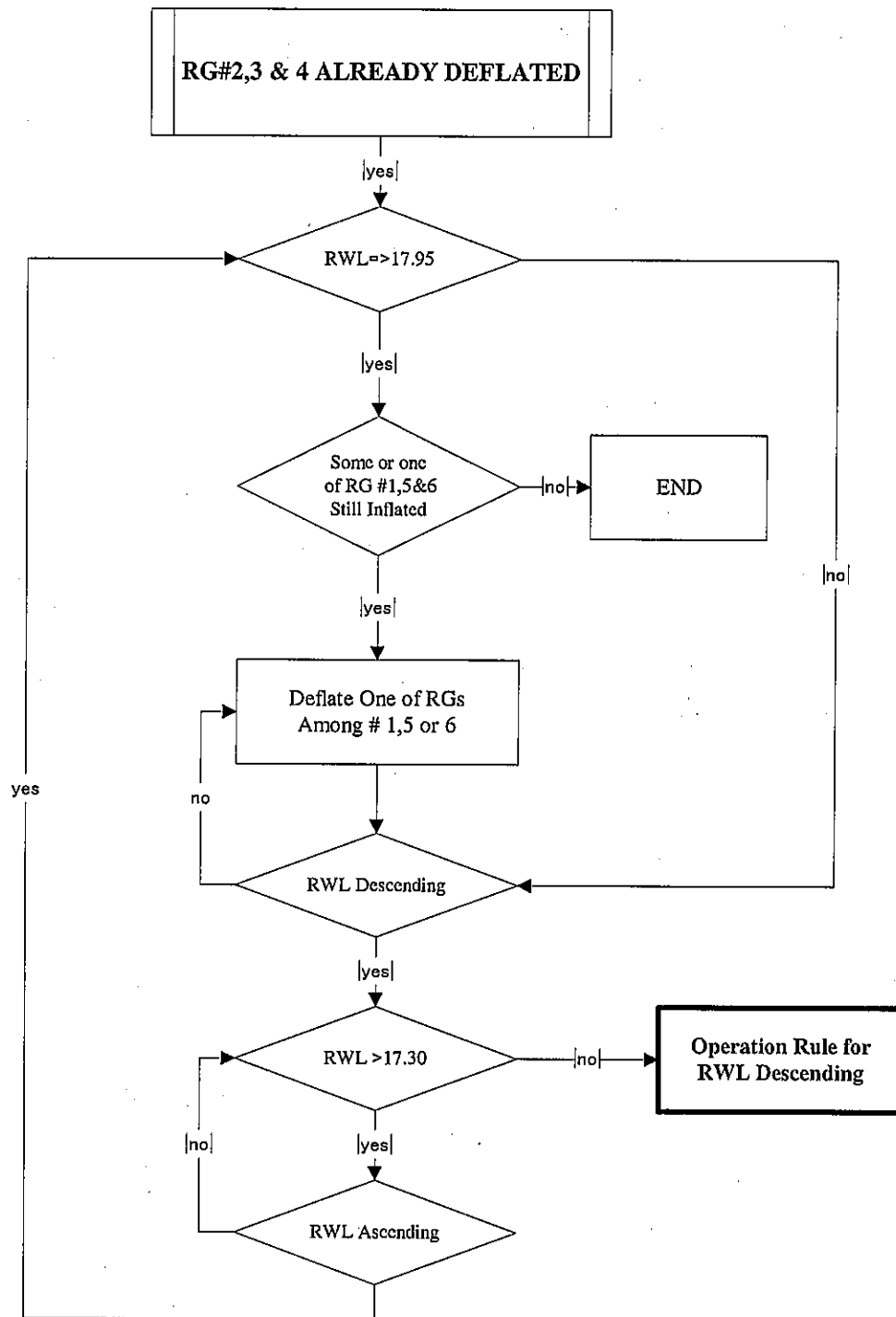


Fig. 2 GENERAL OPERATION RULE FOR GATE OPERATION RULE  
for  
ANGAT AFTERBAY REGULATOR DAM





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

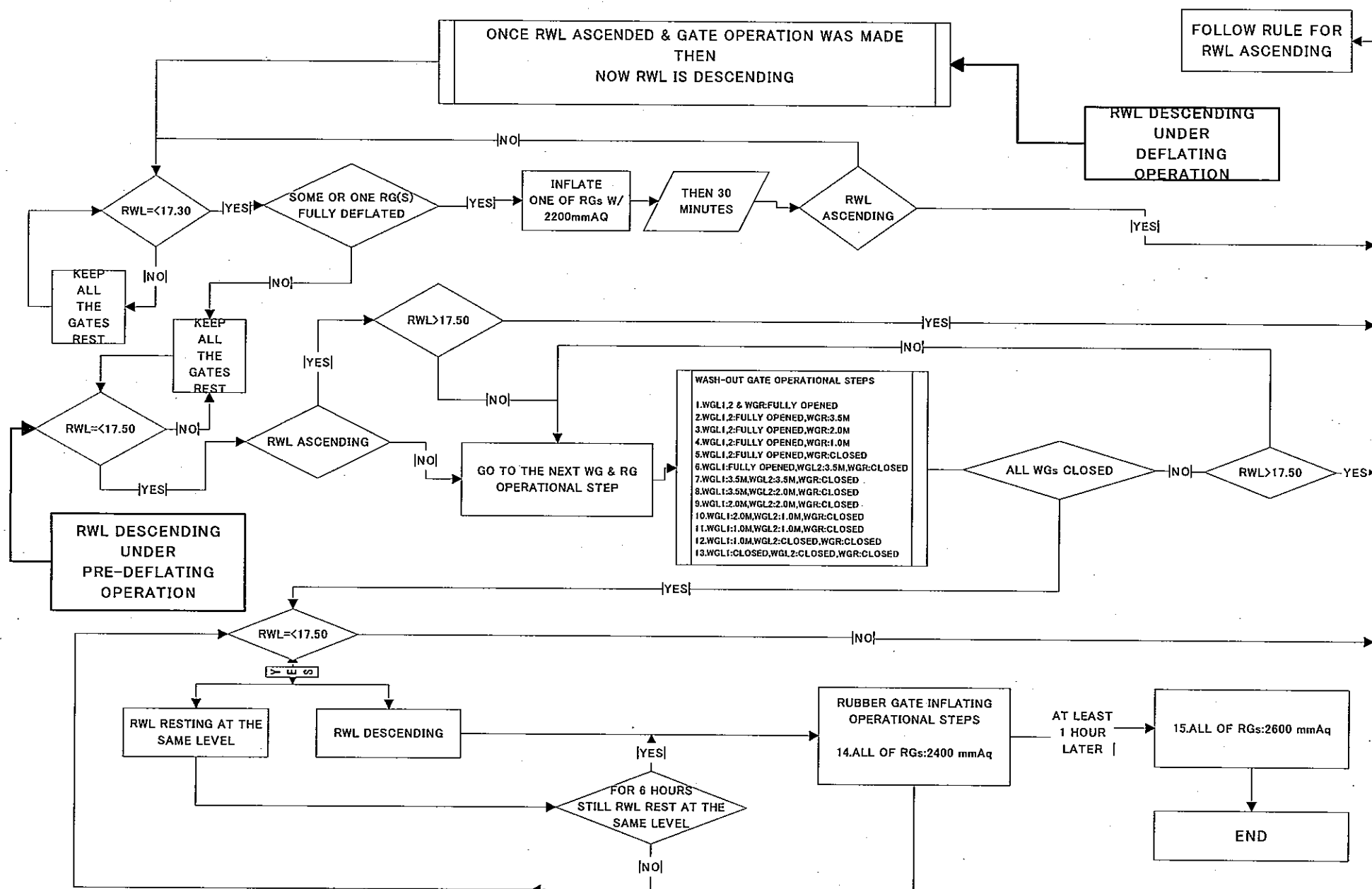


Fig. 4 GATE OPERATION RULE FOR RWL DESCENDING AT ANGAT AFTERBAY REGULATOR DAM & RESERVOIR MANAGEMENT (SPILLWAY GATES & WASH-OUT GATES)

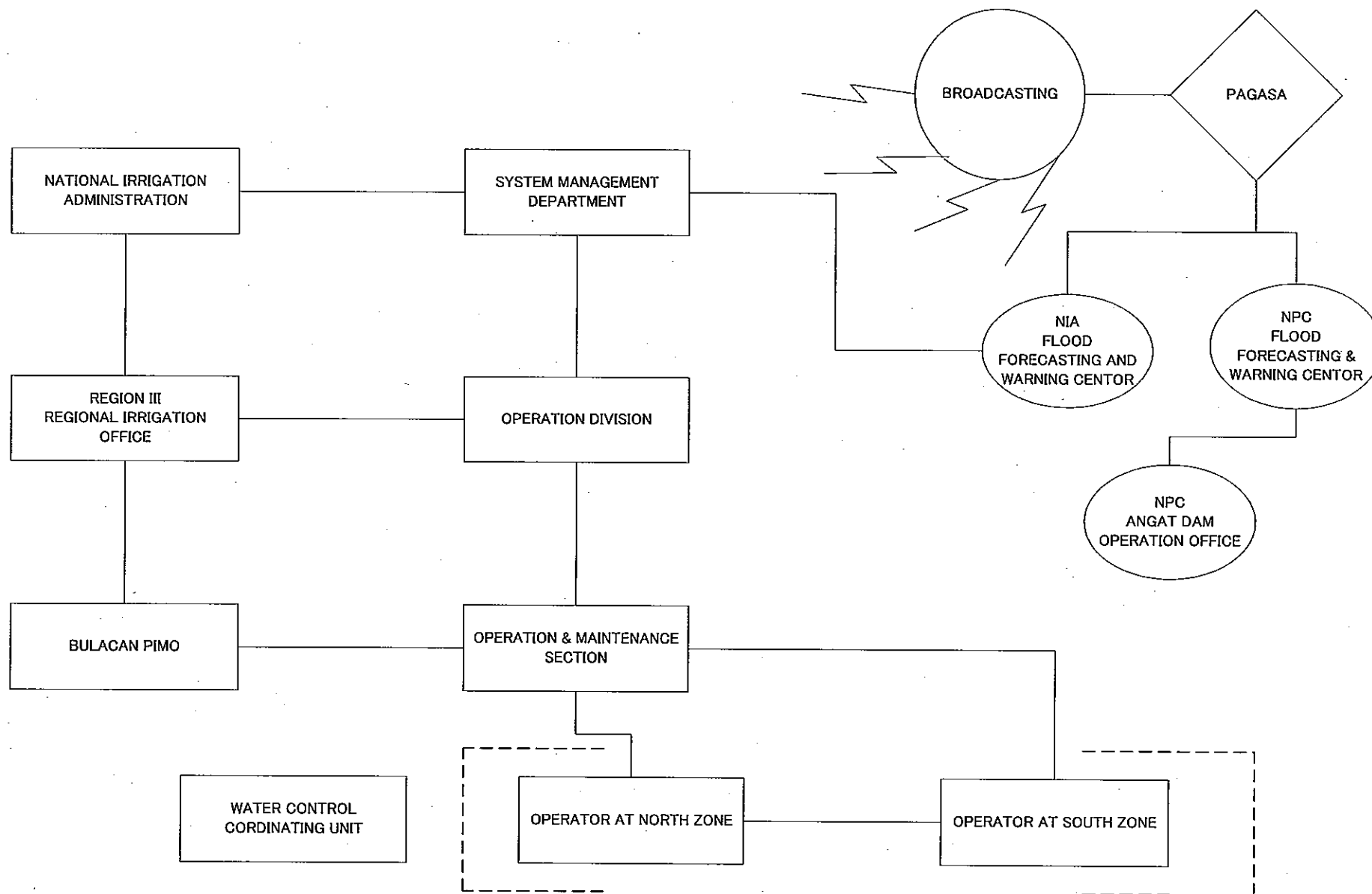


Fig. 5 ANGAT AFTERBAY REGULATOR DAM OPERATIONAL COMMUNICATION NETWORKS

**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 Manager, Section	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 Manager, Section	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

**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	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.

## 7. References (1/2)

Drawings
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