

PROJECT PAPER

THAILAND

PROVINCIAL WATERWORKS AUTHORITY  
INSTITUTIONAL DEVELOPMENT PROJECT

PROJECT NUMBER 493-0331

A.I.D. LOAN NUMBER 493-U-033

UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT  
(USAID/THAILAND)

MARCH 1984

*BEST AVAILABLE COPY*

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ACRONYMS, ABBREVIATIONS AND EQUIVALENTS

Acronyms & Abbreviations

AID	Agency for International Development
AID/W	AID/Washington
AIT	Asian Institute of Technology
AV	Audio Visual
B	Baht
C&L	Coopers & Lybrand
CDSS	Country Development Strategy Statement
CIF	Cost, Insurance, and Freight up to Port of Entry
CN	Congressional Notification
CP	Conditions Precedent (to disbursement of funds)
FAA	Foreign Assistance Act
FX	Foreign Exchange Cost
FY	Fiscal Year
GTZ	German Agency for Technical Cooperation
HRD	Human Resource Development
IBRD	International Bank for Reconstruction and Development
ID	Institutional Development
IDP	Institutional Development Project
IDWSSD	International Drinking Water Supply and Sanitation Decade
IIP	Immediate Improvement Program
ILSD	Institute of Labor Skill Development
IRC	International Reference Center
JICA	Japanese International Cooperation Agency
KK	Kampsax-Kruger
LC	Local Cost
LCD	Low Cost Design
MF	Management and Finance Contract - C&L Contractor
MOF	Ministry of Finance
MOPH	Ministry of Public Health
MWA	Metropolitan Water Works Authority

NESDB National Economic and Social Development Board  
NIDA National Institute of Development Administration

O&M Operations and Maintenance  
OJT On-the-Job Training  
OMDT Office of Manpower Development and Training  
OMT Operations, Maintenance and Training Contract

PACD Project Assistance Completion Date  
PIL Project Implementation Letter  
PIO/T Project Implementation Order/Technical Service  
PM Project Month  
PWA Provincial Waterworks Authority  
PY Project Year

QC Quality Circle

RFP Request for Proposal  
RFTP Request for Technical Proposal  
RTG Royal Thai Government

S&T/HEA/WS Science and Technology Bureau, Office of Health,  
Water and Sanitation Division (in AID/Washington)

SED Sanitary Engineering Division

TIS Training Information System  
TOT Training of Trainers

UNDP United Nations Development Program  
US United States  
USAID United States Agency for International Development  
UFW Unaccounted for Water

WASH Water and Sanitation Project for Health  
WHO World Health Organization  
WTP Water Treatment Plant

Currency Equivalents

US \$1 = Baht 23.0  
Baht 1 = U.S. \$0.0434

BASIC DATA (1983)

Population (millions)	48.5
Provincial Water Regions	15
Number Urban Water Systems	174
Urban Population (million) in PWA Services Areas	3.8
Percent Urban Population Served	50%
Number Local Authority Operated Facilities	675
Number of PWA Staff	5,190
Percent Revenues Covering	
Operating Cost	70%
PWA Employees/1,000 Persons Served	2.7
PWA Employees/1,000 Connections	15

AGENCY FOR INTERNATIONAL DEVELOPMENT <b>PROJECT DATA SHEET</b>	1. TRANSACTION CODE <input type="checkbox"/> A = Add <input type="checkbox"/> C = Change <input type="checkbox"/> D = Delete	Amendment Number _____ DOCUMENT CODE 3
2. COUNTRY/ENTITY Thailand	3. PROJECT NUMBER 493-0331	
4. BUREAU/OFFICE Asia <span style="margin-left: 100px;">04</span>	5. PROJECT TITLE (maximum 60 characters) PWA Institutional Development Project	

6. PROJECT ASSISTANCE COMPLETION DATE (PACD) MM DD YY 05 31 89	7. ESTIMATED DATE OF OBLIGATION (Under "B," below, enter 1, 2, 3, or 4) A. Initial FY <u>84</u> B. Quarter <u>3</u> C. Final FY <u>84</u>
--	---

8. COSTS (\$000 OR EQUIVALENT \$1 = )						
A. FUNDING SOURCE	FIRST FY <u>84</u>			LIFE OF PROJECT		
	B. FX	C. L/C	D. Total	E. FX	F. L/C	G. Total
AID Appropriated Total						
(Grant)	( )	( )	( )	( )	( )	( )
(Loan)	( 3,300 )	( 2,400 )	( 5,700 )	( 3,300 )	( 2,400 )	( 5,700 )
Other U.S.						
1. Host Country					3,800	3,800
Other Donor(s)						
<b>TOTALS</b>	3,300	2,400	5,700	3,300	6,200	9,500

9. SCHEDULE OF AID FUNDING (\$000)									
A. APPRO. PRIATION	B. PRIMARY PURPOSE CODE	C. PRIMARY TECH. CODE		D. OBLIGATIONS TO DATE		E. AMOUNT APPROVED THIS ACTION		F. LIFE OF PROJECT	
		1. Grant	2. Loan	1. Grant	2. Loan	1. Grant	2. Loan	1. Grant	2. Loan
(1)	104 729 B		790				5,700		5,700
(2)									
(3)									
(4)									
<b>TOTALS</b>							5,700		5,700

10. SECONDARY TECHNICAL CODES (maximum 6 codes of 3 positions each)	11. SECONDARY PURPOSE CODES
12. SPECIAL CONCERNS CODES (maximum 7 codes of 4 positions each)	
A. Code B. Amount	

15. PROJECT PURPOSE (maximum 480 characters).

To increase the institutional capacity of Provincial Waterworks Authority to plan, design, manage, operate and maintain water supply systems under its jurisdiction in a cost effective manner.

14. SCHEDULED EVALUATIONS Interim MM YY MM YY Final MM YY 1 1 8 6    0 9 8 8	15. SOURCE/ORIGIN OF GOODS AND SERVICES <input checked="" type="checkbox"/> 000 <input checked="" type="checkbox"/> 941 <input checked="" type="checkbox"/> Local <input type="checkbox"/> Other (Specify) _____
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16. AMENDMENTS/NATURE OF CHANGE PROPOSED (This is page 1 of a \_\_\_\_\_ page PP Amendment.)

17. APPROVED BY	Signature: <i>Robert Halligan</i> Title: Robert Halligan, Director, USAID	Date Signed MM DD YY 04 20 84
		18. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION MM DD YY

PROJECT COMMITTEE

USAID

1. Mr. Narintr Tima, Office of Health, Population and Nutrition
2. Mr. David A. Oot, Office of Health, Population and Nutrition
3. Dr. Basharat Ali, Office of Project and Engineering Support
4. Mr. Thomas Johnson, Office of Project and Engineering Support
5. Mr. John Neave, Office of Project and Engineering Support
5. Dr. John Austin, Office of Health, AID/Washington
7. Mr. Daniel Edwards, USAID Consultant
8. Mr. Richard Fox, USAID Consultant
9. Mr. Robert Muscat, USAID Consultant

RTG/PWA

1. Mr. Mechai Viravaidya, Governor
2. Mr. Lert Chainarong, Deputy Governor (O&M)
3. Mr. Ananda Tuntidhamma, Deputy Governor (Tech. Affairs)
4. Mr. Chatchawan Panmanee, Director, Office of the Governor
5. Mr. Suthichai Anambutr, Research Director
6. Dr. Prasert Chuapanich, Director, Engineering Department
7. Mr. Sitthichai Pitsathanporn, Director, Region 2
8. Mr. Chalermvong Nitipavachon, Director, Region 8
9. Mr. Jongshana Sitalaphruk, Director, Training Center
10. Mr. Thira Kunaviphakorn, Director, Special Project Bureau
11. Mr. Boonsong Seuyouyong, Director, Analysis & Evaluation Department
12. Mr. Somporn Sesthapivutkul, Manager, M&F
13. Dr. Wanchai Ghooprasert, Director, Corporate Planning Department
14. Mr. Chatpong Chucharoen, Director, Region 1
15. Mr. Sukhon Sitthilertpisan, Director, Community Waterworks Division

PROJECT AUTHORIZATION

Country : Thailand  
Project Title : Provincial Waterworks Authority  
Institutional Development Project  
Project Number : 493-0331  
A.I.D. Loan Number: 493-U-033

Pursuant to Section 104 of the Foreign Assistance Act of 1961 as amended (FAA), I hereby authorize the Provincial Waterworks Authority Institutional Development Project for the Kingdom of Thailand involving planned obligations of not to exceed Five Million Seven Hundred Thousand United States Dollars (U.S. \$5,700,000) in loan funds in FY 1984, subject to availability of funds, to help in financing foreign exchange and local currency costs for the Project. The Loan to Provincial Waterworks Authority is to be made subject to the furnishing of an acceptable repayment guaranty from the Royal Thai Government. The planned life of the Project is five years from the date of initial obligation.

The Project is designed to increase the institutional capacity of the Provincial Waterworks Authority to plan, design, manage, operate and maintain water supply systems under its jurisdiction. The loan funds will be used to finance long and short term U.S. and local consultants, training, Project commodities, in-country seminars/conferences, evaluations and certain Project operating costs.

The Project Agreement which may be negotiated and executed by the officer(s) to whom such authority is delegated in accordance with A.I.D. Regulations and Delegations of Authority, shall be subject to the following essential terms, covenants and major conditions, together with such other terms and conditions as A.I.D. may deem appropriate:

a. Interest Rate and Terms of Repayment

The Provincial Waterworks Authority shall repay the Loan to A.I.D. in U.S. Dollars within forty (40) years from the date of first disbursement of the Loan, including a grace period of not to exceed ten (10) years. The Provincial Waterworks Authority shall pay to A.I.D. in U.S. Dollars interest from the date of first disbursement of the Loan at the rate of (a) two percent (2%) per annum during the first ten (10) years, and (b) three percent (3%) per annum thereafter, on the outstanding disbursed balance of the Loan and on any due and unpaid interest accrued thereon.

b. Source and Origin of Goods and Services

Commodities financed by A.I.D. under the Project shall have their source and origin in the U.S., Thailand, or countries included in A.I.D. Geographic Code 941, except as A.I.D. may otherwise agree in writing. The suppliers of commodities or services financed by A.I.D. under the Project shall have the United States, Thailand or countries included in A.I.D. Geographic Code 941 as their place of nationality. Ocean shipping financed by A.I.D. under the Loan shall, except as A.I.D. may otherwise agree in writing, be financed only on flag vessels of the United States, Thailand, or Code 941 countries.

c. Source/Origin Waiver

Pursuant to the authority granted to me by Redelegation of Authority 40.10 (revised), I hereby waive:

(1) the requirement in Section 636(i) of the FAA, so as to permit the use of loan funds for the procurement of five minibus/cars assembled in Thailand from components manufactured in Japan and Thailand, at a price not to exceed \$50,000; and

(2) A.I.D.'s source/origin requirements to permit the use of loan funds for the procurement of one water truck assembled in Thailand from components manufactured in Japan and Thailand, at an estimated cost of \$22,000.

I hereby certify that exclusion of procurement of these items from free world countries other than the cooperating country and countries included in Code 941 would seriously impede attainment of U.S. foreign policy objectives and objectives of the foreign assistance program, which this Project is intended to serve.

\_\_\_\_\_  
Robert Halligan, Mission Director  
Authorizing Officer

\_\_\_\_\_  
Date

## I. RECOMMENDATIONS, SUMMARY DESCRIPTION, ISSUES AND FINDINGS

### A. Recommendations

It is recommended that a loan of \$5,700,000 of FAA Section 104 funds be authorized for the Provincial Waterworks Authority Institutional Development Project. Loan terms are to be 40 years, including 10 years of grace, 2 percent during grace, and 3 percent thereafter. Under the Redelelegation of Authority 40.10 (Revised), a waiver of Section 536(i) of the FAA is requested to permit the purchase of five minibus/cars of Japan/Thailand origin and a source/origin waiver is also requested to permit the procurement of a water truck of Japan/Thailand origin.

### B. Summary Description

This Project is designed to enhance the institutional capability of the Provincial Waterworks Authority (PWA) to plan, design, manage, operate and maintain water supply systems under its jurisdiction. In so doing, the Project will be directly supportive of Royal Thai Government (RTG) goals as stated in the Fifth Five-Year Plan, particularly with respect to the PWA objective of financial self-sufficiency. The Project is intended to enhance both the quality of service, and the number of people served, by PWA managed and/or supported waterworks.

Major Project objectives include:

(a) establishment of an in-house capability to plan, design, conduct and evaluate required PWA training activities;

(b) development of a corporate planning capability and production of short, medium, and long-term plans;

(c) upgrading of technical skills in the key areas of engineering design, planning, construction supervision, and operations and maintenance;

(d) development and implementation of improved management and administrative systems, particularly in the areas of supervision, personnel, financial and commodity management;

(e) development of an in-house research facility capable of pilot-testing and evaluating a wide-range of water supply technology; and

(f) identification and implementation of innovative activities designed to expand PWA population coverage and increase revenue generation.

In summary, the total cost of this Project is \$9,503,000, with \$5,700,000 to be provided under the AID loan. The AID assistance will finance long and short-term U.S. (184 person-months) and local (445 person-months) consultants, training, commodities, in-country conferences/seminars, evaluation, and certain operating costs. Of the total of \$1,924,000 provided for AID-financed commodities, the major portion is allocated for audio-visual equipment, data processing hardware and software, ground and surface water investigation equipment, and leak detection tools and equipment.

### C. Issues

In the cable (83 STATE 004315, Annex A) authorizing USAID to proceed with the preparation of a Project Paper, several issues were raised. Each of these issues is quoted and discussed briefly below and/or in more detail in the body of the Paper.

#### Issue 1

Institutional Development: The project is intended to strengthen performance capacities and technical skills at all levels of PWA's rural water system. Focus at the bottom operational end of system appears especially appropriate. In this connection, efforts to improve information flows through system should be carefully directed toward producing actionable data at reasonable cost in both monetary and paperwork terms.

#### Comment:

Plant-level operations and maintenance will be a major focus of the Project. In connection with this, a training information system will be developed which will monitor plant level performance and identify training needs on an on-going basis. This system will collect data on a small number of performance indicators and therefore should not be a burden to staff at the plant level. The recurrent costs of this system are expected to be minimal.

#### Issue 2

Technology Transfer: Among TA objectives, designing and testing of new low cost water systems adaptable to relative community sizes and spatial dispersions are particularly attractive. So is emphasis on improving water quality control.

Comment:

Designing and testing of potential cost-saving system modifications for plants of varying size is a major Project component. Plant level improvements in water quality will be brought about both by improved filtration and chlorination practices. Upgrading of regional and central level water quality surveillance functions (e.g., laboratories) will be assisted by other donors.

Issue 3

Private Sector: To maximum extent feasible, private sector participation should be structured into Project design, e.g., contracting for new, lower cost systems to be designed and built.

Comment:

Private contractors are used for all PWA financed construction. Any new low cost systems designed under the Project would also be constructed using private contractors. Other capital improvements, such as the drilling of production wells, are also contracted to the private sector.

Issue 4

Focus on Health: Project design should emphasize the potential of reducing infant and young child mortality rates as well as burden of illness in work force.

Comment:

This is essentially an institution building Project. The Project may not, therefore, have a direct and measurable impact on infant and child mortality and adult morbidity. Even in the case of more direct interventions, the host of potential intervening variables have often made such impact measurements difficult. It is our contention, however, that through improved organizational efficiency and effectiveness, this Project will ultimately enable PWA to provide safe water to a much larger number of people than they now serve. Without these improvements, water quality standards might never be met, and financial constraints would cause efforts to expand coverage to be severely restricted.

Issue 5

Prior Efforts: Project design should fully reflect lessons learned from prior AID and other donor assistance.

Comment:

This issue is discussed more fully in Section III-F. In sum, however, AID has been until recently the only other major donor to have been involved in piped water systems in Thailand. The findings of an evaluation of the AID Thailand Rural Potable Water Project found that many of the plants were in poor condition and operating very inefficiently. Lack of effective supervision and attention to maintenance were cited as major reasons for this situation. This Project is intended to address these issues by training supervisors and plant level staff, and through the establishment of a monitoring system which will provide managers with the information needed to correct poor performance and manage the individual waterworks more effectively.

Issue 6

Other Donors: Project should be designed to facilitate follow-on financing from other donors in the rural water sector.

Comment:

The Project is designed to complement the current and planned efforts of other donors. In particular, it will address critical institutional weaknesses within PWA. As a result of this institutional strengthening, and the accompanying improvement in PWA's financial performance, we believe that the Project will substantially increase the likelihood that international lending institutions will continue to invest in PWA.

D. Findings

This Project is considered socially sound and administratively and technically feasible. Cost estimates are reasonable and firm. The Project meets all applicable statutory criteria per Annex C.

II. PROJECT RATIONALE AND DESCRIPTION

A. Project Rationale

1. Background

Despite the investment of considerable Royal Thai Government (RTG) resources, a WHO-assisted study carried out in 1978 found that only about ten percent of the rural Thai population had access to safe (i.e., water from a protected source) supplies of water. If one includes larger villages and towns, Government sources estimate that less than 20 percent of the rural population is served by piped water systems,

though much of this water would not meet generally accepted quality standards. It is not surprising, therefore, that statistics from the Thai Ministry of Public Health (MOPH) show that water-related diseases rank high on the list of common diseases. Diarrheal disease is the third most common cause of death for all ages, and the second most cause for children under age six. It is also likely that diarrheal disease, and other water-related diseases, are the probable underlying cause of other morbidity, such as malnutrition.

Recognizing the importance of adequate supplies of safe water, both for health reasons and as a basic human need, the RTG has assigned high priority to addressing this problem both in the Fifth Five-Year Plan, and as part of the International Drinking Water Supply and Sanitation Decade. By the end of the Fifth Plan Period (1985), it is expected that a substantial portion of the Thai population will have access to a basic minimum supply of safe water for domestic use.

Water supply development activities outside Bangkok are being implemented by several Government organizations. The most important of these are the Ground Water Division of the Department of Mineral Resources, the Division of Rural Water Supply (RWS) of the MOPH, the Office of Accelerated Rural Development, and the Department of Public Works. Together, they account for most of the deep wells, shallow wells, and piped systems installed up until 1979.

In an effort to better coordinate the installation and maintenance of rural and urban piped water systems, however, the RTG decided in February 1979 to create a new state enterprise called the Provincial Waterworks Authority (PWA). Established through the merger of the Rural Water Supply Division and the Public Works Department Division of Provincial Water Works, this new entity is charged with the institutional responsibility for planning, developing, operating, and maintaining water supplies for cities and towns outside Bangkok (as well as larger villages with populations up to 5,000 population).

PWA also has a mandate to plan and develop piped water systems for rural communities at the request of local authorities. These systems are then handed over to local authorities for operation, maintenance and revenue collection.

At present PWA owns and operates 174 urban waterworks serving a total population of 1.9 million people, although the total population in PWA plant service areas is roughly twice that number. About 675 local authority-operated rural water supply systems also fall under PWA's responsibility for technical support (See Table II-1).

Table II-1  
Distribution of Piped Water Systems in Thailand

Operational Authority	Number and Classification of Waterworks	Population Served
PWA	174 Urban	1,895,000
Local Authorities	675 Rural	1,200,000
Local Municipal Concessions	<u>47 Urban</u>	<u>500,000</u>
Total	896	3,395,000

The decision to replace the civil service framework with a new state enterprise was motivated, in large part, by the RTG's desire to improve both the quality and cost-effectiveness of existing provincial waterworks. By making PWA a viable organization, the RTG believes that it will be possible to substantially increase the number of persons served by piped water systems. In this regard, very specific goals related to population coverage and organizational efficiency have been established under the Fifth Five-Year Plan. These goals include: (a) increasing the productive capacity and improving the distribution networks of existing urban and rural systems; (b) installation of new urban and rural systems; (c) reductions in capital and operating costs; (d) an increase in connections in existing service areas; and (e) improved bill collection performance.

From its inception, PWA has been subsidized by the RTG. The budget allocation for FY 1982 was over 600 million Baht. The total monthly expenditures were about 57 million Baht, while total monthly income was about 45 million Baht. Thus, PWA currently ran a 12 million Baht per month deficit with revenues covering no more than 70% of operating costs before depreciation and debt service (Management and Financial Review, Phase I, October 1982, Coopers and Lybrand Report).

To a large extent, these losses could be attributed to organizational inefficiency, inappropriate rate structures, and substantial uncollected user revenue. It is also important to note that many of the waterworks transferred to PWA were inherited in very poor condition. PWA is faced, therefore, with the need to make costly, yet urgently needed, physical improvements in most of their urban plants.

PWA's five year goals to increase connections in existing service areas and expand and rehabilitate existing plants, as well as construct new plants, is an effort to improve the long term financial picture and cost effectiveness of PWA.

## 2. Problems in Meeting Goals

In order to achieve the goals cited above, it is clear that a major effort will be needed to strengthen the organizational capability of PWA. While PWA recognizes that increased population coverage through the construction and/or acquisition of new plants is an important PWA goal, it is clear that the most immediate objective is to improve the cost-effectiveness and quality of service in the plants PWA now operates. Some of the institutional constraints to improved PWA performance are briefly summarized below.

The first set of problems relates to policy and planning and can be described as follows:

(a) PWA tariff structures, though revised upward by 65 percent in May 1981, are still too low. In recognition of this, PWA submitted a proposal for further rate increases in November 1982. This proposal has not yet been approved by the Ministry of the Interior. This issue, which is a condition to the IBRD-supported Project and a covenant to this Project, is a high priority within PWA and further efforts to bring these rates to more appropriate levels will continue to be made.

(b) PWA's mandate includes support to the rural water development program. To date, however, no plan exists which clearly delineates the role of PWA in expanding service in small communities. This makes it difficult for PWA to plan appropriate intervention in this sector. Partly in response to this problem, the National Economic and Social Development Board (NESDB) recently commissioned the Asian Institute of Technology (AIT) to produce a rural water supply master plan. The terms of reference for this plan are very comprehensive and will suggest the most appropriate role of PWA and other RTG agencies in implementing this plan. The plan is expected to be completed by October 1984.

(c) If PWA is to achieve its priority goal of fiscal self-sufficiency, short, medium, and long-term action plans to balance expenditures with anticipated revenues must be developed. Such a corporate planning capability, while vital to PWA's future success, is not yet well developed.

Management and administration is another area of institutional weakness as described below:

(a) Two recent studies (Coopers and Lybrand - Management and Finance Review, Phase I and WASH Field Report No. 68, Team Building for Management) indicate a range of organizational needs within PWA. Coopers and Lybrand found PWA to be overly centralized, with much of the engineering talent concentrated in Bangkok, while the real needs for engineering exist at the regional and waterworks level in improving operations and maintenance. Financial reporting and recording systems were found to be outmoded and not useful for management decision-making. The WASH\* team found similar indicators of organizational weakness, such as poorly defined lines of authority, inadequate decision-making mechanisms, poor intra-organizational communication, poor cooperation with the field and other government agencies, and a lack of consensus regarding organizational priorities and future directions.

(b) A management survey conducted by a USAID-supported consultant team and interviews conducted by the project design team suggest an urgent need for an improved management capability. Indicators of these needs include mixed morale among employees, inadequate accountability for work performance, and a lack of quality control. Managers generally do not delegate tasks nor share information. Work unit meetings are held infrequently and when they are, an agenda is seldom used and employee participation in discussion is low. The managerial process of setting unit work plans, conducting periodic performance reviews, holding employees accountable for tasks, and communicating with and motivating employees is not an operational norm. Contracting procedures are cumbersome, and workscopes sometimes adequate to ensure that the services provided are responsive to PWA needs.

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\* Water and Sanitation For Health Project, a USAID-sponsored project located in Arlington, Virginia.

(c) The creation of PWA by the consolidation of two divisions from two separate Ministries left PWA without many of the institutional capabilities that characterize a more mature water management agency. Existing financing, budgeting, auditing, and accounting systems do not provide managers with prompt and accurate information concerning monies available, expenditures to date, and hence monies available for expenditures. A personnel system which details employee responsibilities, employee performance appraisal procedures, employee benefits, requirements for promotion, and relevant disciplinary measures does not exist within PWA. Standardized filing procedures, forms, and equipment necessary to improve PWA's administrative services are not yet in place. Existing procurement and stores procedures are also inadequate to ensure that supplies are available at the plant on a timely basis. Finally, billing and revenue collection is hampered by a lack of standardized procedures and regulations.

Lastly, the following represent problems at the operational or service delivery level of PWA:

(a) Capital and operating costs are unnecessarily high and are directly related to inadequate or outdated skill levels in the key areas of system design, construction management and inspection, as well as operations and maintenance at the plant level. In general, PWA continues to use off-the-shelf system designs for both rural and urban areas and does not, therefore, take advantage of potential cost-saving design modifications. Plant level operations and maintenance is resulting in high repair costs, excessive down-time, and inefficient use of equipment. This is particularly true in the case of power costs, where poor maintenance and operating practices have resulted in drastically reduced operating efficiency and therefore very high energy costs.

(b) Currently, about 85 percent of the plants owned and operated by PWA provide treated surface water. PWA is finding it increasingly difficult, and more costly, to obtain adequate supplies of water of acceptable quality from these sources. In order to meet the longer-term water requirements and reduce costs, PWA will need to develop alternative water sources. The most promising is groundwater. Because of the past emphasis on surface water, however, PWA has a very limited capability in this area. A recent consultant survey of PWA waterworks has recommended that immediate steps be taken to develop groundwater sources and that test wells be drilled at 35 of the 125 plants scheduled for rehabilitation under the IIP.

(c) Unaccounted-for-water (UFW) through system leaks, illegal taps, and unbilled usage represents a major loss of revenue to the PWA. As of May 1983, nearly Baht 90 million in outstanding charges remained to be collected.

(d) Although virtually all PWA managed waterworks are equipped to filter and chlorinate water, filters and chlorination equipment are often poorly maintained, and systematic monitoring of chlorine levels is carried out in only a small percentage of plants.

(e) Currently PWA services less than half the population living in their potential service area. In some cases, this is due to the ready availability of acceptable alternative sources of water. In others, it is due to the high connection costs and the poor public image of the quality and dependability of PWA service.

(f) PWA currently possesses a very limited in-house research capability. As a result, PWA is unable to adequately evaluate new technology prior to applying it in the field. In some cases, this has meant that PWA has failed to take advantage of potential cost-saving innovations, while in others has resulted in investments in costly and/or ineffective plant modifications.

### 3. Unmet Needs - Summarized

As indicated in the foregoing discussion, efforts are underway to alter PWA's tariff structure and to more clearly determine PWA's role with respect to rural water supply. Other problem areas, such as the technical and material resources needed to improve water quality surveillance, are expected to be largely covered other donors. In other areas, however, additional external resources will be needed to initiate new activities and to continue, expand, and/or complement efforts which are currently planned or underway. A more detailed description of other donor activities is contained in Section II-D of the Project Paper. On the basis of our analysis of these other activities, the following represent the most pressing remaining institutional development needs of PWA, and those which this Project proposes to address.

#### a. Policy and Planning

- Though preliminary efforts have been made, corporate plans and planning skills are not adequate. Additional assistance is needed both to broaden the scope, improve analysis, extend the timeframe of existing plans, and to establish these planning skills within PWA.

- The PWA urgently requires assistance to develop skills needed to carry out ground and surface water investigations. Sufficient knowledge of this field is also needed to enable PWA to effectively procure and manage the private contractors who will be employed to drill production wells.
- In order to ensure that proposed new and/or modified plant designs, equipment, and other new technology are appropriate and cost-effective, PWA needs an in-house capability to evaluate these potential innovations prior to their application.

b. Management and Administration

- Assistance will be needed to implement changes resulting from the PWA reorganization. Workplans need to be established for each of the new Departments and intra-organizational communication strengthened.
- It will be necessary to build upon the initial management training efforts to ensure that entry-level and in-service training is provided for all supervisors. In particular, there is a need to train supervisors, and their subordinates, in problem-solving techniques.
- OMT efforts will need to be continued and expanded. Additional technical assistance will be needed to actually implement and evaluate the new waterworks staffing structures. Improvements in management information, which thus far have been confined primarily to financial matters, need to be expanded to cover issues such as personnel, auditing, procurement, and the non-financial aspects of plant operations.

c. Operations (Service Delivery)

- Upgrading and updating skills at each level of PWA is an urgent need. The focus should be on systems design, construction supervision, and operations and maintenance at the plant level. Assistance is needed both to establish an in-house training capability and to implement the training activities required to improve these skill levels.

- To reduce losses due to unaccounted-for-water, further efforts are needed to upgrade the leak detection capability within PWA. Assistance is needed both to train and equip PWA staff to expand and improve upon preliminary efforts made in this area to date. Written procedures and systems for carrying out and monitoring bill collection performance need to be established.
- An organized effort is needed to increase the number of household connections in areas where excess plant capacity exists and population coverage is low. This effort should attempt to enhance the public image of PWA and seek ways to increase access for low income families.
- There is also a need to be able to experiment with new approaches to generating revenue, especially those designed to increase the number of hook-ups in PWA service areas. Currently, PWA does not have the risk-capital needed to undertake such experimental initiatives.

## B. Detailed Description

### 1. Goal

The Project goal is to increase access to adequate supplies of safe water delivered in areas served by the PWA. Current data show that only about 50 percent of the population living in PWA service areas receive water from PWA sources. In addition, observations of plant-level operations indicate that water treatment practices are often inadequate to ensure that water produced by these systems is of acceptable quality. This project, in conjunction with other donor/lender efforts, is expected to enable PWA to substantially increase both population coverage and the quality of water produced by PWA owned and operated plants.

The Project will also contribute to PWA's longer term goal of expanding coverage through the acquisition and/or construction of new plants. Without the institutional strengthening which will result from this Project, PWA would be unable to obtain and manage the financial resources, both domestic and foreign, needed to substantially increase the supply of safe water to the rural Thai population.

## 2. Purpose

In order to achieve this goal, the Project will enhance the institutional capacity of PWA to plan, design, manage, operate and maintain water supply systems under their jurisdiction in a cost-effective manner.

## 3. Project Activities

This objective will be accomplished through a comprehensive training effort to be carried out at the central, regional and plant level. This training effort will involve both structured and on-the-job training approaches. Major training topics will include operations and maintenance, leak detection, water supply engineering, plant design, construction supervision, plant management, personnel management, administrative procedures, inventory control and warehousing, public relations, accounting and billing procedures, and sales. Within these areas, highest priority will be given to training plant level managers and staff. The structured training activities will be coordinated by the newly established Office of Manpower Development and Training (OMDT) officially known as Training Center. This Office will have 13 full-time staff and will include both training and subject matter specialists. Project consultants will help OMDT establish a Training Information System (TIS), develop training plans and curricula, train OMDT staff, and assist with the implementation of training activities. The project will also provide printed materials, audio-visual equipment, and other training aids needed for these activities.

The Project will support on-the-job training in the critical areas of corporate Department's engineering planning and engineering design. External and local consultants will work side-by-side with PWA staff, transferring these skills in the course of actually carrying out normal work assignments. Short and long-term engineering consultants will work with PWA staff to set goals, and prepare medium and long-term corporate plans, focusing particularly on the need to balance revenues with expenditures. A detailed analysis of future PWA manpower requirements will be part of these plans. In collaboration with PWA corporate planning staff, Project consultants will also work with senior staff at the waterworks, regional, and central level organizational units to prepare annual operational plans. Each concerned work unit head will set objectives, prepare an activity schedule, and identify the resources needed to carry it out.

Under engineering planning, Department's consultant engineers will work with staff of the Corporate Planning Department (CPD) to prepare and implement four project feasibility studies. Through these studies PWA engineering staff will be trained to identify and evaluate least-cost alternatives related to water source development, treatment, and distribution. Plants selected will be of varying size, with attention given to the development and application of both technical and financial criteria. A key element of this will be the evaluation of both surface and groundwater sources. CPD staff will be trained and equipped to carry out complete ground and surface water investigations and analyses. On the basis of these studies, Project consultants and CPD staff will develop written feasibility study procedures, criteria, and manuals. Project consultants will continue to provide on-the-job training throughout the Project life.

Upgrading of engineering design skills is another major Project component. A multi-disciplinary team of engineering consultants will work with PWA design engineering staff to develop and apply low cost water supply design criteria for small, medium, and large size plants. In the process, design manuals will be prepared, field tested, and revised, if necessary. These manuals will serve as the basis for continued on-the-job training to be provided to all PWA design engineers. Related to this, the Project will provide technical assistance, materials, and equipment needed to establish a pilot-testing capability within PWA. Key staff will be trained in research techniques, and will pilot test and/or adapt new technology related to plant design, equipment, construction materials, instrumentation, and plant automation, both under laboratory conditions and in the field. A fully-equipped research laboratory will be financed under the Project.

With assistance from project funded external and local consultants, improved policies and procedures covering administration, personnel, auditing, and contracting will be developed, tested, and put in place throughout PWA. This Project will finance the preparation of comprehensive manuals covering each of these areas. The Project will train procurement and stores personnel and finance the establishment of a computerized inventory control system in selected regions. Financing will also be provided for a computerized billing system in the four areas with the largest number of clients.

Financing is provided for small-scale innovative activities designed to enhance coverage in areas served by existing waterworks. Anticipated activities include testing of installment financing for household connections and new approaches to sales promotion.

In summary, the total cost of this Project is \$9,803,000, with \$5,700,000 to be provided under the AID loan. The AID assistance will finance long and short-term U.S. (184 person-months) and local (445 person-months) consultants, training, commodities, in-country conferences/seminars, evaluation, and certain operating costs. Of the total of \$1,924,000 provided for AID-financed commodities, the major portion is allocated for audio-visual equipment, data processing hardware and software, ground and surface water investigation equipment, and leak detection tools and equipment.

The Project activities described above are expected to lead to a substantial reduction in the unit cost of providing water through:

a. Increased population coverage

To be achieved by improving the quality of PWA service, more aggressive sales promotion, and introduction of installment financing for household connections;

b. Improved revenue collection

By training and motivating plant level personnel, and improved accounting and billing procedures;

c. Decreased water losses

Through improved leak detection, repair, and better maintenance of waterworks distribution systems;

d. Decreased ratio of PWA personnel to consumers

By enhancing and expanding functional skills and introducing improved management and administrative procedures, thereby enabling reduced staffing levels;

e. Reduced capital costs

Through the introduction of lower cost plant designs, development of groundwater sources, and application of improved selection criteria; and

f. Reduced operating and maintenance (O&M) costs

By improving plant level O&M, thereby decreasing plant down-time, equipment repairs, and fuel costs.

#### 4. Outputs/Inputs

The following discussion represents a brief summary of the major outputs and inputs to the Project. The Project is further described in Section IV-D and Annex B, Project Design Summary - Logical Framework. The Framework indicates the relationship between Project activities and outcomes, and identifies the key assumptions which are likely to influence Project success.

##### a. Training Systems Development

- (1) Staff of the OMDT will be trained to plan, implement, and evaluate a broad program of training activities. Each of the 13 persons assigned to OMDT will complete basic, intermediate, and advanced courses in training skills.
- (2) In addition to acquiring training methodology skills, OMDT training staff will receive short-term training in the seven subject areas considered to be most responsive to PWA's needs. These include supervision, plant operations and maintenance, leak detection administration, organizational development and team building, quality circles, public relations, and construction.
- (3) Training manuals will be developed and used for each of the subject area training courses identified above.
- (4) During the Project, comprehensive skill training in one or more of these subject areas will be provided to virtually all regional and plant level personnel. These skills will be updated and upgraded both through workshops and on-the-job training.
- (5) A training information system (TIS) will be developed and managed by OMDT. Using established performance criteria, employee performance will be monitored and performance discrepancies identified on a continuing basis. This information will then be used to determine training needs and to plan future training programs.

- (6) Both national and regional in-country conferences/seminars will be held on a regular basis to review progress related to project implementation, disseminate both administrative and technical information, and to resolve issues which may be inhibiting implementation. These gatherings will serve as a means of obtaining feedback from the field and will provide a vehicle for making any modifications which may be necessary.

Inputs to the Training Systems Development component include both short and long-term local and expatriate consultants, training aids, audio-visual equipment, resource materials, and office supplies and equipment.

b. Corporate and Engineering Planning

- (1) Five and ten-year master plans incorporating financial, management and manpower aspects of PWA will be produced. Initial plans, which are to be updated periodically, will be completed by the end of Project Years (PY's) 01 and 02 respectively.
- (2) Detailed annual operational plans, the first of which will be completed by the end of PY 02, will be prepared and updated by PWA on an annual basis.
- (3) Training in corporate planning techniques, covering organizational mission and goal setting, establishing priorities, developing financial plans, and allocating resources to design construction, operation and maintenance functions, will be given to the 5 permanent staff of the Planning Division. Skills will be transferred through a combination of on-the-job (OJT) training and workshops.

- (4) Engineering planning, most of which will be OJT, will involve the preparation of four feasibility projects in PY's 01 and 02, as well as the development of a manual to be used to guide the preparation of such studies. Follow-up training will be given to each of the staff in PY's 03 through 04. The focus of this training will be on the evaluation of alternative water sources, especially as it relates to groundwater.

Inputs to the corporate planning activities include the assistance of both local and expatriate economist/planners and financial analyst/planners. Inputs for engineering planning include the services of experts in hydrology and hydrogeology. Equipment needed for ground and surface water field training includes a drilling rig, service van (water truck), borehole logger, resistivity meter, and other related items.

c. Management and Administration

- (1) Office policies and procedures concerning intra-organizational communication, memoranda, and documentation/records will be developed and formalized in a manual to be printed and made available to key administrative staff at each level of the organization. This manual will form the basis of a training program to be carried out for administrative staff at the central and regional level.
- (2) A computerized billing system will also be established in the four areas where the concentration of PWA customers is the greatest. In some cases, this may be a single Region, or a consolidation of more than one Region as the situation warrants. Equipment will be installed, software prepared, and staff trained in each of Regions included in the system.
- (3) Procurement and stores training, initiated in four regions under the OMT contract, will be extended to the other eleven PWA regions. In all, 30 regional administration officers and 5 central-level procurement analysts will be trained. A modest computerized stores recording capability will also be installed.

- (4) Existing performance criteria will be field tested, and revised where necessary, for all regional and plant-level personnel. New criteria will also be prepared and fieldtested for central-level personnel.
- (5) New personnel policies and procedures, covering all key areas of personnel planning, auditing, contracting, and administration will be developed and prepared in a written manual. Central and regional staff concerned with personnel administration will be trained in the use of the manual.

Inputs include technical assistance in the areas of administration, commodity management, personnel planning, and job classification. Five micro-computers and related software will be procured for the automated stores record-keeping system. Equipment, software, and technical assistance will also be provided for the computerized billing system.

d. Water Supply Engineering and Design

- (1) Under the Project, improved plant design criteria will be developed and 12 PWA engineers will learn how to design and apply more cost-effective plant designs and appropriate automation technology. The new and/or modified design criteria will be applied in three water treatment plants each in PY's 01 and 02. Plants selected for this training will be of varying size so that the engineers will experience a range of conditions. Follow-up training will continue to be provided in PY's 03 through 04. On the basis of design criteria developed and the related field applications, a comprehensive design manual will be developed. This will be completed by the end of PY 02 and will be fieldtested in PY's 03 through 04 and modified as necessary.
- (2) Basic, intermediate, and advanced training in water supply engineering will be provided for 40 engineers. These courses will be designed to both update and upgrade skills in this area. Each course will be conducted in two parts, with field applications to be carried out between sessions.

Inputs include a multi-disciplinary team of consultant engineers who will be assembled to assist with this training, most of which will be carried out on-the-job. A small borehole drilling rig and soil testing equipment will be needed for the practical training.

e. Construction Supervision

- (1) On the basis of a comprehensive list of problems and recommended solutions, a set of guidelines and checklists will be developed covering each aspect of construction supervision.
- (2) Ten central level engineers will receive training in construction supervision. Training will cover surveying, excavation, placing of concrete, building erection, placement of equipment and start-up, as well as supervision skills related to construction of new and/or modified plant designs and well drilling. The newly-developed guidelines and checklists will be fieldtested through participation of these engineers in three plant projects to be carried out in PY's 01 and 02. The fieldtested guidelines and checklists will then be used to train an additional 25 regional level construction supervisors. Training will be carried out in two parts with practical applications in between.

Local consultants in the fields of mechanical, construction, and electrical engineering will be engaged to assist with this activity.

f. Research and Development

Research activities will be implemented throughout the Project life. Four PWA engineers will be trained in research techniques, and will pilot test and/or adapt new technology related to plant design, equipment, construction materials, instrumentation, and plant automation. Training will be carried out on-the-job, with research applications implemented both in laboratory and field settings.

Technical assistance will be provided by a research design engineer specialized in the field of water supply. Commodity support will include the equipment and materials needed for a lab-scale pilot plant, water analysis, data-processing equipment, and automation/instrumentation studies.

g. Innovative Activities

PWA is in a period of transition as the organization seeks to establish itself as a full-fledged, financially viable state enterprise. Efforts to achieve such financial viability will require more creative approaches to reducing costs and generating revenue than have been used in the past. The purpose of this category of Project activities is to provide PWA with the modest financial resources needed to be able to experiment with some of these approaches.

Examples of innovative activities planned under the Project are:

- (1) Fieldtesting of small loans for household connections, repayable on an installment basis, administered by PWA and/or through a commercial bank; and
- (2) Use of commercial marketing and advertising skills to help enhance PWA's image and promote utilization of their services.

Specific activities will be identified and incorporated into each annual project implementation and financial plan.

C. Relationship to the CDSS

The primary objective of the Project is to strengthen a major institution engaged in delivering water to urban and rural areas. In this sense, the Project is consistent with Mission priorities which emphasize longer-term efforts to address institutional, versus physical, constraints to development. The Project is also consistent with Mission efforts to complement, where appropriate, large investments being made by other donors/lenders in physical infrastructure. Prime objectives of the Project, therefore, are to improve management, transfer and upgrade selected technical skills, and establish an in-house capability to carry out the training functions necessary to maintain organizational efficiency and effectiveness in the longer run.

The successful implementation of this Project is expected to substantially reduce, and eventually eliminate, the need for government subsidies for those waterworks owned and operated by PWA. It is anticipated that the achievement of financial self-sufficiency will enable PWA to attract the additional financial resources needed to significantly expand population coverage. This emphasis on organizational efficiency and self-sustaining growth is directly responsive to the "Emerging Mission Strategy" outlined in the CDSS.

#### D. Other Donors

The major donors to the PWA currently are IBRD, UNDP, the German Agency for Technical Cooperation (GTZ), and the Japanese International Cooperation Agency (JICA). Each of these donors is involved in one or more aspects of institutional development within PWA. The contribution of these donors, and the specific relationships to the proposed AID in this Project, are described below and in Table II-2.

##### IBRD

The IBRD is by far the largest donor to the PWA. Under the on-going \$40 million Immediate Improvements Program (IIP), 125 existing PWA waterworks will be rehabilitated and/or expanded. The Program will finance the renovation and expansion of facilities, provide equipment such as pumps, motors, production and customer meters and chemical feeders, expand distribution piped networks and service connections, provide mobile equipment for construction, maintenance and operations, and improve operations and maintenance.

As is evident from the above description, the bulk of this assistance will be used to finance physical improvements. As part of this effort, PWA has entered into a contract with an engineering consulting firm (Kampsax-Kruger) to survey the 125 waterworks and prepare preliminary design and cost estimates for the repair work and/or plant expansion required. Thus far, design and costs estimates have been prepared and submitted for 10 plants, although implementation of this work has not yet begun.

IBRD financing has also been provided to support efforts to upgrade operations and maintenance. Under the Operations, Maintenance and Training Contract, PWA will receive 26 person-months of consultant assistance to strengthen regional and waterworks level O&M through improved management, administration and reporting systems, and by developing training programs for operating personnel. The Contractor (Parsons, with a sub-contract to its wholly own subsidiary Engineering Science) will review the O&M operational structure and procedures, recommend changes (including number and type of personnel needed), develop O&M manuals, and train trainers. This 16-month Contract is scheduled to be completed by June 1984.

### UNDP

The UNDP is providing technical assistance in the areas of overall technical advisory services, corporate planning, and training systems development. Under a seven-month consultancy, technical assistance is being provided to help the newly established Planning Division establish an office workplan and identify data requirements. Three months of technical assistance is also being provided to the Office of Manpower Development and Training to help plan and organize the 1983 training activities. One full time senior technical advisor acts as a liaison for IBRD and UNDP inputs and advises the Governor on all technical matters. This input is scheduled to end in August/1984.

### JICA

Under a proposed new project, the Government of Japan has been requested to provide \$5,000,000 to help establish a national training center and equipment repair workshops. Some technical assistance will also be provided to help train personnel who will staff these facilities, but the bulk of this assistance is for construction and equipment. This project is currently under review by DTEC and, if approved, will start in late 1983.

### GTZ

Under a contract with a financial management and accounting firm (Coopers and Lybrand), GTZ has provided \$180,000 to support several institutional development efforts within PWA. The contract provides 12 person-months of consultant time to help produce a new organizational plan and reclassify positions for the central office, design and fieldtest improved financial accounting systems in four regions, and assisted with preliminary efforts to develop a manpower plan. GTZ has received approval from DTEC for a proposal for follow-on assistance to PWA to build and equip water quality laboratories. Consultants will also be provided to help set up the laboratories and train PWA staff. This project will be carried out from 1984-86.

### Relationship to Other Donor Activities

In general, the activities described above represent only the initial steps required to bring about the necessary institutional changes in PWA. To a large extent, therefore, the proposed AID Project will provide the financing needed to continue, expand, and/or supplement efforts which are already planned or underway.

Efforts being made under the GTZ/C&L and IBRD/Parsons contracts to establish position descriptions will be very useful both for manpower planning and training system development purposes. These descriptions will provide the basis for determining what the skill training needs are for managers, supervisors, technicians, and plant level operating personnel. Preliminary efforts by C&L to assemble data related to manpower planning will also facilitate the implementation of AID-financed activities relevant to the development of comprehensive medium and long-term manpower plans.

AID financing will also enable the new financial management procedures, which have been developed under the GTZ/C&L contract and are currently being field tested in four regions, to be expanded to the remaining 11 regions. Efforts will also be made to expand the management information system financed under this contract to include non-financial aspects of plant operations.

The proposed Project will also build upon GTZ and UNDP assistance to the newly established Office of Manpower Development and Training. Thus far, staffing needs have been identified, a first-year training plan developed, and some training materials planned. A small-scale effort is also currently underway to train regional trainers, technicians, and plant operators. Under the skill training component of the proposed AID assisted Project, this effort will be expanded to all PWA regions. The AID assistance will continue efforts to train OMDT staff and build within OMDT an on-going capacity to plan, implement, and evaluate a comprehensive set of training activities.

JICA support for the construction and equipping of a training center and maintenance repair workshops will also complement training efforts proposed under the Project. Although much of the AID-financed training will be carried out on-site (e.g., at the central or regional headquarters or at selected waterworks), the availability of a fully-equipped training center will be useful for certain types of training activities. Fully equipped maintenance workshops will also provide an excellent setting for on-the-job training. It is not anticipated, however, that the lack of these completed facilities will seriously inhibit the successful implementation of this Project.

As discussed earlier, the proposed GTZ assistance will focus on the installation and upgrading of regional water quality laboratory facilities. Technical assistance is proposed to help train the staff of these facilities, with some portion of the time devoted to improving water quality monitoring procedures at the plant level. For that reason, the proposed AID Project will not finance equipment and consultants in

the field of water quality surveillance. The Project will, however, support efforts to improve water treatment practices at the plant level as part of the overall effort to upgrade operations and maintenance. To the extent that GTZ consultants are involved in plant level activities related to water quality, it will be important to ensure that there is no duplication of effort.

In sum, if managed properly, AID assistance and the resources described above should be mutually supportive. It is anticipated that the Project Executive Committee will play this coordinating role. Because certain AID-financed activities will build upon current efforts, it will be important to ensure that Project consultants are knowledgeable about activities to date and, to the extent that timeframes overlap, that they work closely with other donor-financed consultants. Finally, because of the potential role of JICA in the training field, an effort must be made by PWA to ensure that these inputs complement those to be financed by AID.

**Table II-2**  
**Current Development Inputs by Category by Other Donors**

Current Activity	Donor/Contractor	Year						Comment
		82	83	84	85	86	87	
<b>A. Institutional Development</b>								
1. Reorganization & position classification (central office)	GTZ/C&L	-----						Reorganization in place by 10/83
2. Financial accounting systems - MIS (accounting only)	GTZ/C&L		---					MIS limited to central accounting systems
3. Training systems development	UNDP/consultant GTZ/C&L		---					Effort of 5 person-months total. Limited to start-up plan for department. PWA will have 3-5 staff in place in 1983
4. Corporate planning dept. development	UNDP/consultant		---					Limited to start-up activity 7 person-months.
5. Manpower planning	GTZ/C&L		---					Limited to staffing and start-up. 2 person-months.
<b>D. O&amp;M Systems Development</b>								
1. Plant systems survey	IBRD/Parsons		-----					14 months. Limited to pilot regions.
2. Water quality control training	GTZ/consultant			-----				
<b>C. Plant Improvement &amp; Facilities Construction</b>								
1. Rehabilitate 125 WTP	IBRD/KK	-----						
2. Build training center	JICA			-----				
3. Build maintenance workshop	JICA			-----				
4. Equip and build water quality laboratories	GTZ			-----				

### III. Summaries of Analyses

#### A. Economic and Financial Analysis

Since several donors are providing technical assistance to the PWA, some of the benefits expected from the AID project may be "joint products," i.e., improvements that will result from the interactions between inputs from more than one assistance activity. In the analysis of benefits below (see Annex F-1 for details), cost savings and other benefits attributable all, or in part, to the AID inputs have been identified as well as possible.

The engineering planning, contracting and procurement improvements are conservatively estimated to enable the PWA to achieve its capacity expansion over the next 10 years at 10% lower cost than it would face otherwise. Similarly, O&M expenditure savings are expected to run around 10%. Assuming the annual savings in both categories rise gradually, they are projected to total around \$39 million over the ten-year period, and would be reflected in a 15% reduction in the cost per unit of water delivered. Comparison of the discounted present value of these savings with the present value of project costs yields a benefit-cost ratio of 1.87, and an internal rate of return of 40%.

The above analysis is conservative in several respects: (a) it excludes cash flow benefits to PWA expected from improved charge collection; (b) it excludes financial (and economic) benefits expected from the reduction or elimination of plant down-time; (c) it makes no estimate of the financial (and implicit economic) benefits from extension of delivery from existing plants now operating (on the average) at 45% of design capacity; and (d) no effort is made to quantify the value of the health benefits from the increases in population served or by improvements in water quality. Finally, basic institutional strengthening of the type to be provided should continue to affect cost-saving and other benefit flows much longer than the 10-year period used in the analysis.

While these excluded benefits are real, estimates of values (and the relative contribution of the Project to the generation of these benefits) would be very difficult to make and are more in the nature of illustrative magnitudes, and would serve only to move the benefit-cost relationship further in a positive direction.

Notwithstanding past losses and requirements for subsidation by the RTG, an independent January, 1983 review by the Office of Finance of USAID/Thailand reveals that the financial trend at PWA is positive. In order to ensure that the financial situation further improves, PWA has requested AID assistance for an institutional building project to include technical assistance and training activities as well as limited commodity procurement. Considering Thailand's relatively strong economic

performance and limited grant funds available to the Mission, USAID offered development loan assistance to PWA on standard AID terms, which is acceptable to PWA. Adequate assurance of loan repayment is strengthened by the RTG's willingness to sign a full repayment guarantee agreement. PWA views the AID offer as attractive given that the needed funds are not available to it on grant or comparable concessionary terms from other funding sources. The PWA does not normally borrow for such an institutional activities at commercial lending rates.

## B. Social Soundness

### 1. Beneficiaries

The primary beneficiaries of the Project will be the present consumer population of PWA. The improved operation, maintenance and management of PWA facilities will ensure these consumers of higher quality water a greater percentage of the time. The secondary beneficiaries will be that portion of the population who are not now, but who could be, served by PWA systems due to the improved management and financial procedures anticipated under the Project. A tertiary group of beneficiaries will be persons connected to PWA systems to be developed in the future.

### 2. Social Feasibility

For some years, the RTG has accepted the philosophy of delivering water to the individual home rather than through public standposts. Given that this fundamental philosophy has been adopted, the task then falls to the PWA to provide this service. With, on the average, only about 50% of the potential consumers connected in PWA service areas, it appears that measures taken to increase the connected population will be in keeping with this accepted philosophy of service delivery. Analysis shows that the initial connection fee charged by PWA is a major deterrent to increased coverage. This project will examine this issue and identify appropriate strategies for overcoming this constraint (e.g., by pro-rating the connection fee over a long period of time and making it a part of the monthly bill). Similar solutions will be explored in an effort to increase the number of homes being served by PWA direct hook-ups.

### 3. Impact on Women and Children

Women and children are the primary carriers of water in Thailand. In certain areas, this task can consume several hours a day. It is anticipated that this Project will improve the reliability of piped water services in areas serviced by existing plants, and increase the number of households connected to PWA systems, thereby reducing the amount of time spent drawing water. To the extent that this time is reduced, these women and children will have additional time for other more productive pursuits.

Women and children also bear the brunt of the water-related morbidity and mortality in Thailand. Although the impact of this Project on such health indicators may be indirect, we do believe that the improvements in plant level operations and maintenance will lead to increased access to piped water and improvements in water quality. This increase in the quantity and quality of water used for personal hygiene and consumption is expected to lead to improvements in health status.

Currently, about 20 percent of the PWA workforce is female. To date, little opportunity has existed for career advancement and few women perform managerial functions within the organization. Under this Project, it is expected that a substantial portion of these persons will receive training, and therefore the opportunities for increased responsibility and promotions will be enhanced.

### C. Technical Feasibility

Developing the inhouse capability within PWA to carry out its own institutional development (ID) programs is feasible. Recent efforts in existing projects have evaluated institutional development needs and have suggested possible ways of meeting these needs. In addition, in a recent team building workshop\*, PWA staff developed an action plan to move ahead with these efforts. Thus, the interest and basic commitment needed to plan and implement such activities already exists.

The training and institutional development technology selected for use in this project has been in place in organizations similar to PWA for some time. Basically this approach involves a two-step process whereby OMDT and other PWA counterpart staff obtain both training and technical skills, and then subsequently become trainers capable of transferring these skills to others within the organization. A detailed description of the steps in this process is given in Annex F-2.

Two important aspects of this approach are: (1) the ability of the consultant to "work with" the client, and (2) the ability of the client to absorb the new skills and incorporate them into the day-to-day work of the organization. This approach requires constant monitoring at each step of the process to ensure that these skills are actually being transferred. Just such a process will be used in this project.

The fact that the OMDT has already started to use the training and ID technology outlined for this project is indicative of the level of interest and commitment to this approach.

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\* "A Workshop for the PWA of Thailand - Team Building for Management", Nov. 1982. WASH Field Report No. 68, January 1983. WASH/AID, Washington, D.C.

#### D. Administrative Feasibility

PWA, which was formed in 1979 by consolidating parts of two different agencies, is still experiencing some internal conflict and confusion from this consolidation. In response to this problem, PWA has recently adopted a new organizational structure and is currently upgrading its operations.

A senior PWA official with the rank of not lower than an Assistant Governor as the Project Director and another one as the Project Manager will be responsible for the management of the Project. The Project Manager will be supported by an administrative officer and other PWA Project support staff. In addition, the consultant team leader will assist/advise the PWA Project Manager in directing project activities. A PWA Executive Committee (composed of all Deputy/Assistant Governors and selected office directors, with PWA Governor as its chairman, and PWA Project Manager as its secretary) is proposed in the Project to help resolve any conflicts and coordination problems which may arise from time to time.

The procurement of professional services and project commodities will be handled by PWA contract and procurement units under the Assistant Governor - Administration in consultation with the PWA Project Manager and Project-funded consultants. PWA has recently gained considerable contracting experience through the procurement and administration of three large professional service contracts over the last two years. The Project proposes technical assistance to upgrade PWA contracting and procurement operations. Other donor-assisted activities planned or currently underway will also enhance PWA's ability to administer and direct institutional development activities in the future.

Briefly, it has been determined that (with the existing and planned inputs) PWA has the administrative capability to execute the Project and that the proposed implementation plan (Section IV) is workable.

#### E. Environmental Analysis

Because the proposed Project falls under the CFR 215.2(c) Categorical Exclusion relating to Education, Technical Assistance, or Training Programs, no Initial Environmental Examination or Environmental Assessment is needed.

F. Relationship of Evaluations and Policy Papers to Proposed Project

1. Potable Water Project Evaluation

The major AID Project Evaluation relating to this Project is Report No. 3, entitled "The Potable Water Project in Rural Thailand", released in May 1980. Although this evaluation found the vast majority of waterworks to be functioning, in most cases operations and maintenance was poor. To a large extent, this was found to be due to poor supervision, infrequent preventive maintenance, and generally poor management at the plant level. Plant designs and construction techniques, though technically sound, were found to be essentially transplants from the U.S., with little apparent effort made to modify designs to reduce costs.

Despite these problems, piped water was found to be highly valued by those served by these systems. Indicative of this was the fact that rural families were found to be paying more for piped water than their urban counterparts. Many communities, largely on their own initiative, had installed household connections and meters, and hired a local plant manager/operator. Users of the piped water also perceived substantial economic benefits, primarily as it enabled them to grow vegetables and raise small animals more easily.

The positive and negative findings of the Evaluation had a direct impact both on the initial decision to undertake this Project, and on the subsequent project design. In response to the deficiencies noted above, a major effort will be made to improve supervision, operations and maintenance, and cost-effectiveness.

2. Relevant AID Policy Papers

The following AID Policy Papers contain guidance which is particularly relevant to the proposed Project:

- (1) Domestic Water and Sanitation Policy Paper
- (2) Health Assistance Policy Paper
- (3) Development Training Policy Paper
- (4) Institutional Development Policy Paper

The major objective of the Project is to enhance the ability of PWA to "plan, design, manage, operate and maintain water supply systems under its jurisdiction". This will be accomplished through the transfer of skills in each of these areas, using the services of both local and expatriate consultants. These skills will be considered to have been successfully transferred if the PWA is able to adequately perform these functions after the assistance is withdrawn.

Corporate planning activities to be undertaken will help to establish technically and financially feasible operations and expansion targets for PWA, and will lay out medium and long-term investment plans which are consistent with PWA's mandated goal of financial self-sufficiency. The Project does not provide financing for physical infrastructure or recurring operational costs. About 50 percent of Project financing is for technical assistance, with the remainder for commodities related to training and research activities.

Although PWA designs and manages the waterworks under its jurisdiction, private contractors are used for all construction and development of water sources (e.g., drilling of production wells). For sound financial reasons, PWA does not intend to develop an in-house capability to undertake such work. Instead, they are seeking ways to improve both the cost-effectiveness and quality of work for which it contracts. This Project will help PWA manage these private sector resources more effectively.

Finally, PWA has been encouraged to become less centralized, both with respect to management responsibility and the placement of key technical persons. It is anticipated that this Project will be supportive of efforts already underway by enhancing the ability of regional and plant level personnel to manage the waterworks under its jurisdiction more effectively.

In sum, the proposed Project is considered to be consistent with the policy guidance contained in the Papers listed above.

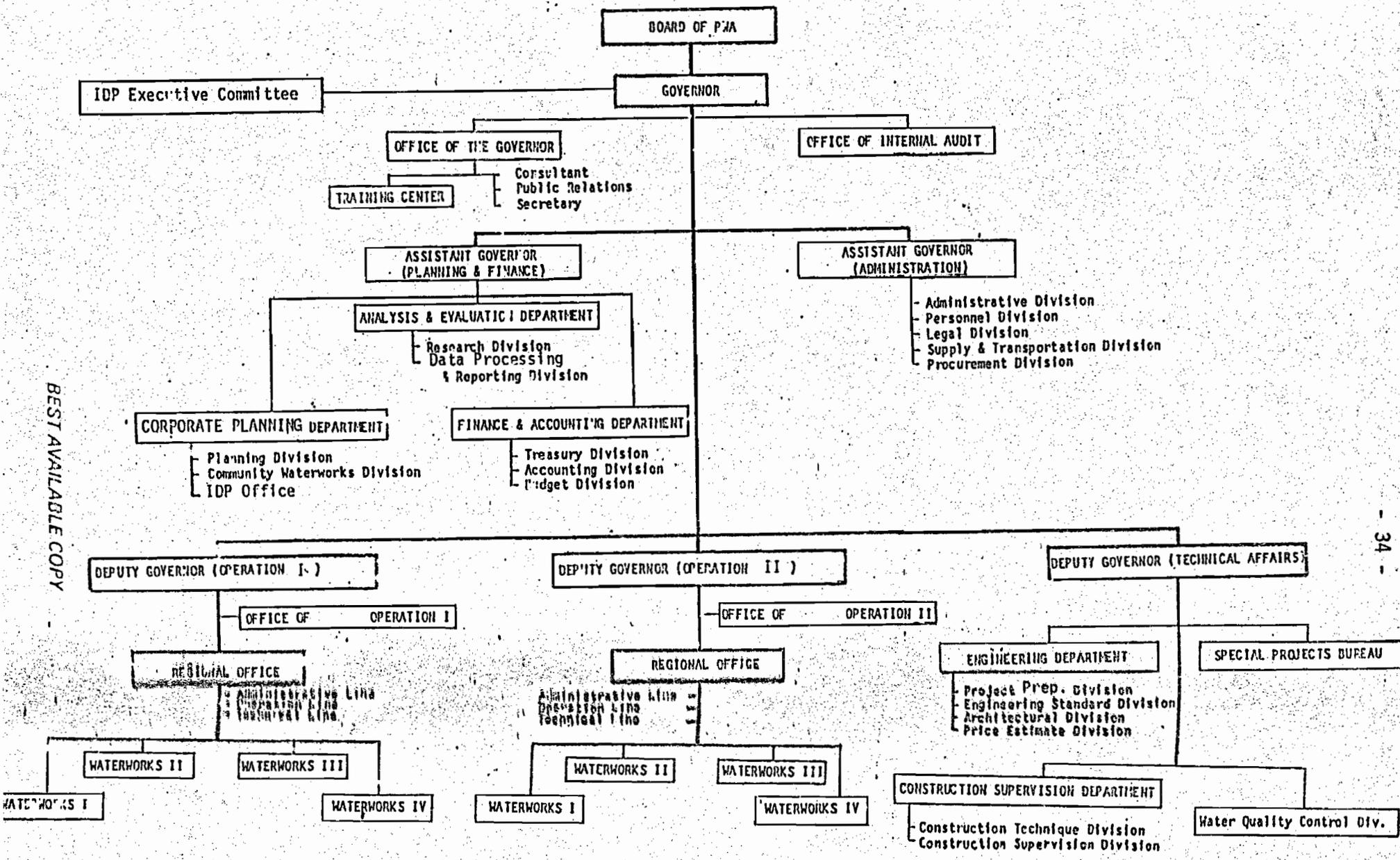
#### IV. IMPLEMENTATION PLAN

##### A. Project Organization

A new organizational structure for PWA has been approved by its Board and the Ministry of Finance (MOF), see Chart IV-1, since June 1983. The Project organization is shown in Chart IV-2.

All Project activities will be directed by the Project Director, a senior PWA official with the rank of not lower than an Assistant Governor and the Project Manager. The Project Manager will be assigned a full time administrative officer and adequate support staff and will be assisted by Project funded contract personnel, including a full-time Team Leader with a strong corporate planning/management background and experience in the water supply field. All Project inputs and activities will be coordinated by the Project Manager's Office in consultation and with assistance of the appropriate PWA office, department, units.

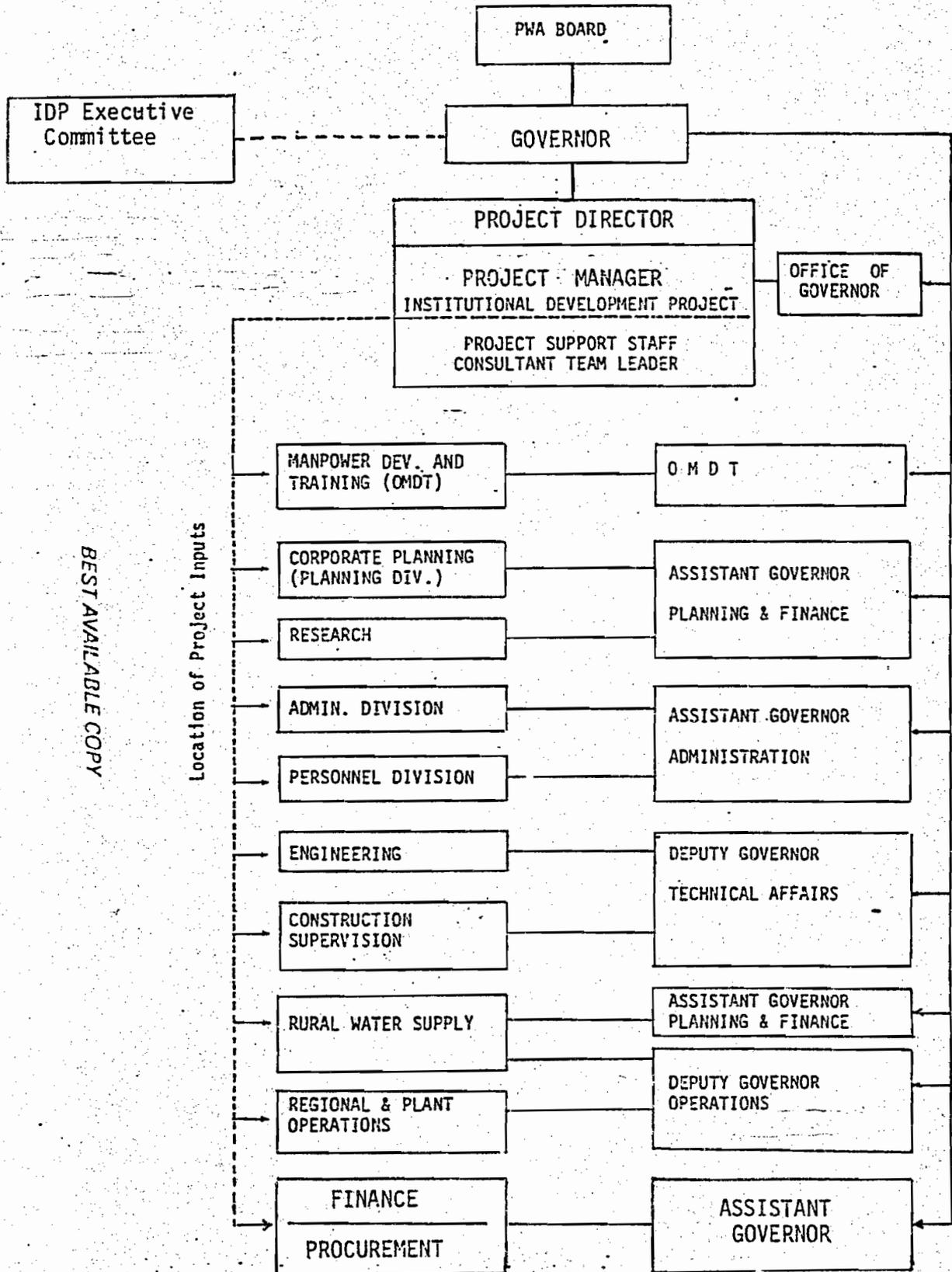
A Project Executive Committee (a condition precedent) will be appointed by the PWA Board and is expected to be made up of all the Deputy/Assistant Governors and the selected office/division heads. The PWA Governor will serve as the Committee's chairman, the Project Director as vice-chairman, and the Project Manager as its secretary. The Executive Committee will meet regularly to assess Project progress and help resolve any conflicts and coordination problems which may arise within PWA during implementation. The USAID Project Officer and Consultant Team Leader may be invited to attend the meeting of the Project Executive Committee in order to ensure smooth Project implementation.



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CHART IV-1 ORGANIZATION CHART OF PROVINCIAL WATERWORKS AUTHORITY

CHART IV-2 IDP PROJECT ORGANIZATION



## B. Projects Consultants and PWA Counterparts

The key consultant staff to the Project include a Team Leader, a human resource development (HRD) training specialist and a series of intermittent consultants, both U.S. and local, for periods ranging from a few weeks to more than a year. A total of 184 person-months of U.S. and 445 person-months of local consultant effort is anticipated under a host country U.S./Thai contracting arrangement.

The Team Leader will be responsible for managing all contractor activities. He will be responsible for arranging contract funded inputs on a timely basis. He is expected to be someone with a great deal of corporate planning/management background and experience. The Team Leader will serve as a counterpart to the PWA Project Manager. He will assist PWA leadership in policy formulation/corporate planning leading to the development of PWA as a viable organization.

The HRD training specialist (assistant team leader) will be responsible for guiding the human resource development and training inputs to the Project. As such, he will be responsible for orienting and advising all consultants in skill transfer technology and consultation skills. In addition to this role, the assistant team leader will serve as the primary consultant to the Director of the Training Center or OMDT working in a counterpart relationship for the development of the department and provide substantive skill inputs in the areas of training technology, training information systems development and task analysis. The skills required for the position include broad based experience in training systems development, training of trainers, consultation skills, organizational development, management training and skill training approaches. Substantive overseas training experience and demonstrated management and supervision skills are essential.

The intermittent consultants will be responsible for transferring technical skills to the staff in the various departments in which Project activities occur. The specific skill areas and the related activities are outlined in the Summary of Consultant Labor Estimates (Annex E, Table E-3). The primary task of each consultant will be to train his or her counterpart(s) in the course of carrying out their respective work assignments. This will be accomplished in a variety of ways, depending upon the nature of the Project activity. In some instances, the consultant will provide a structured learning experience such as a workshop; in others, the consultant will join with PWA staff in solving a particular work problem (such as the development of alternative plant designs, or preparation of a corporate plan). In these cases, the consultant will function virtually as a PWA staff member, transferring skills by on-the-job training.

The Project Manager and the Consultant Team Leader will be directly responsible for ensuring that the desired services are performed in an effective manner. It will be the responsibility of the heads of the recipient office/department/divisions to define the scope of work and the level of effort required from the consultants. The Team Leader and the Project Manager will review, with the Project Director's concurrence, the scope of work prior to bringing a consultant on board. The responsibilities of each consultant(s) will be clearly understood prior to assigning these personnel to the requesting organizational units.

It is the responsibility of each PWA Project counterpart and the consultant to keep the Project Manager and the Team Leader informed of work progress until the task(s) assigned has been successfully completed. The Team Leader and the Project Manager under the direction/supervision guidance of the Project Director will try to resolve any problems that may arise between the consultant and PWA counterpart official(s). Unresolved personnel problems will be brought to the Executive Committee for guidance and resolution.

### C. Procurement Plan

#### 1. Technical and Professional Services

The technical analysis prepared (Annex F) recommends that most external professional services will be provided by a single, long term (four-year) professional contract. This professional contract will not necessarily include any local professional services required. However, the Team Leader will coordinate the work of local consultants hired independently under separate host country contract. Because of the length of the Project, the contractor will be permitted, with the approval of PWA, to sub-contract in order to ensure that the appropriate breadth of skills is available. Where possible, PWA intends to tap the expertise of other state enterprises and/or public universities to meet short-term consulting requirements.

Professional services to be procured include human resource development skills, training skills, engineering and engineering planning skills, construction management skills, personnel administration skills, corporate planning skills, technical research skills, and waterworks operations, maintenance and management skills. Approximately 473 months of professional services and 156 months of support services will be required.

The successful contractor will maximize the use of Thai expertise in staffing the Project. Table E-3 (Annex E) indicates the type of consultants needed for each program area and the specific task required. In addition, the table indicates the mix of local and external talent required.

The major professional services contract will be procured from U.S. and local professional service firms under a joint venture or prime/sub-contractor contracting arrangement. Professional services will be procured using a negotiated procurement process (Request for Technical Proposal - RFTP) following A.I.D. host country contracting procedures. PWA will develop the Project's terms of reference and an RFTP advertisement and forward these to USAID for review and approval. Upon USAID approval, PWA will publish the RFTP, and establish a RFTP deadline. Following the receipt of proposals, PWA will evaluate the proposals, in consultation with USAID, and will select the proposal which best meets the terms of reference, Project needs and other considerations. Utilization of minority and/or Section 8(a) small/disadvantaged firms will be encouraged. PWA will then negotiate the final contract terms and, with USAID approval, award the contract.

## 2. Commodities

Table E-5, Annex E, contains a preliminary list of equipment and supplies that are needed in support of the Project. A detailed and final list of commodities will be developed by the Project staff in consultation with the respective PWA officials.

The source and origin of all loan funded commodities is expected to be the U.S. or Thailand, or countries included in A.I.D. Geographic Code 941, with the exception of Project vehicles and a water truck for which the source/origin is Japan/Thailand. Most of the equipment and supplies is expected to be procured in Thailand. The source and origin of all equipment and supplies is also identified in Table E-5.

PWA's Procurement Division, supervised by the Assistant Governor for Administration, will be responsible for the procurement of all commodities. PWA's standard procurement procedures will be used provided these procedures are found, upon review by USAID, to be in accordance with AID procedural requirements. Procurements are subject to approval by USAID.

## D. Implementation Schedule

An illustrative implementation schedule is proposed in Charts IV-3 and IV-4. The first chart summarizes the Project approval and the Project start-up processes by activity and the latest possible anticipated completion dates. The second chart details tasks/activities under each Project component, the targetted PWA unit, assignment of

responsibilities and a tentative schedule. Project Year 1 begins when the Consultant Team arrives. Considering the diverse nature of Project activities, it is assumed that the actual implementation approach (tasks/activities or sequence of events) may vary from what is proposed in the schedule. The financial plan for the Project is based on this implementation schedule.

Chart IV-3  
Implementation Schedule: Pre-Project Activities for  
PP Approval and Project Start-Up

Activity	Responsible Agent	Completed by Month/Date/Year
PP Authorized	USAID	3-23-84
CN Processed	USAID/AID/W	3-21-84
PP Approved	PWA/NESDB/RTG	2-15-84
Loan Agreement Signed	USAID/PWA/MOF	4-15-84
First P.I.L. Issued	USAID	4-20-84
RFTP Prepared	PWA	4-30-84
RFTP Approved	PWA/USAID	5-15-84
RFTP Advertised	PWA/AID/W	5-20-84
Initial CP's Satisfied	PWA	5-30-84
Additional CP's Met	PWA	5-15-84
RFTP Deadline	Bidders	7-20-84
Proposals Evaluated	PWA/USAID	8-7-84
Contract Negotiated	PWA	8-30-84
Contract Approved/Signed	USAID/PWA	9-15-84
Contractor Team Arrives	Contractor	10-1-84
PACD	USAID/PWA	3-31-89

## CHART IV-4 IMPLEMENTATION SCHEDULE

ACTIVITY	RECIPIENT OFFICE	TARGET	RESPONSIBLE AGENT	YEAR 1 QUARTER				YEAR 2 QUARTER				YEAR 3 QUARTER				YEAR 4 QUARTER			
				1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
<b>I. Training Systems Development</b>																			
<b>A. OMDT Administration</b>																			
1. Develop admin. procedures for program management to include: forms & records for training programs, program planning charts, departmental records	OMDT staff	13	Assistant Team Leader for IRD	X	X	X	X												
2. Develop and update staffing plan	OMDT staff	13	"	X				X			X				X				
3. Conduct and develop departmental, off site, team building workshop twice per year for each project year - 4 days each.	OMDT staff	13	"	X				X			X				X				
4. Train staff in meeting procedures, group process, and communication skills	OMDT staff	13	"	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
B. Conduct 8-week training in basic training methods. (to be conducted in 2 parts - four weeks each)	OMDT staff	13	Two intermittent Training Specialist, One external, one Thai with Asst. Team Leader for IRD	X	X														
C. Conduct 8-week training in intermediate training methods. Training follows the pattern of B above	OMDT staff	13	"			X	X												
D. Conduct 4 weeks of training in advanced training methods based upon a needs assessment of staff skills	OMDT staff	13	"					X											
E. Conduct two subject matter and materials development workshops of five days each in the following areas:			Consultants:																
1. Supervision	OMDT mgt./supervision trainers	4	2 IRD Management Trainers (Thai/Ext.)			X					X								

IV-4 (cont'd)

ACTIVITY	RECIPIENT OFFICE	TARGET	RESPONSIBLE AGENCY	YEAR 1 QUARTER				YEAR 2 QUARTER				YEAR 3 QUARTER				YEAR 4 QUARTER			
				1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
2. Plant O&M	OHDT O&M trainers	4	Technical Training Specialist			X						X							
3. Administrative skills	OHDT admin. trainers	4	Admin Consultant				X					X							
4. Organizational development (team building)	OHDT mgt./supervision trainers	4	HRD Management Trainer					X					X						
5. Sales and public relations	OHDT admin. trainers	2	PR Specialist (Thai)					X					X						
6. Quality circle technique	OHDT mgt./supervision trainers	4	2 HRD Training Specialist (Thai/Ext.)					X					X						
F. Develop training materials and manuals for use in skill training program.	OHDT staff	15	OHDT Staff/Consultants (listed above)		X	X	X												
<b>II. Training Information &amp; Training Planning</b>																			
A. Review plant O&M performance data & task analysis - update as needed	Training staff, OHDT	13	Assistant Team Leaders for HRD & Local HRD Training Specialist (Thai)	X															
B. Review performance data and task analysis conducted by admin. consultant (See VI-A below)	Training staff, OHDT	13	"	X															
C. Develop performance standards summary from all data in A&B above. List by job category	"	"	"	X															
D. Set up data sheets for recording training information	"	"	"	X															
E. Survey plant, regional and central training needs	"	"	"		X	X	X												
F. Develop skill training program for A-E above. Update as needed each year	"	"	"				X			X			X						X

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IV-4 (cont'd)

ACTIVITY	RECIPIENT OFFICE	TARGET	RESPONSIBLE AGENT	YEAR 1 QUARTER				YEAR 2 QUARTER				YEAR 3 QUARTER				YEAR 4 QUARTER			
				1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
<b>III. Skill Training Program</b>																			
<b>A. Team building-top management</b>																			
1. Develop team building workshop for top management: survey needs, design & arrange workshop			Consultant HRD Assistant Team Leader/CHDT Management Training Specialist (Thai)			X													
2. Carry out 5-day team building workshops for top management	Central office heads, deputy and assistant governors	25	"				X	X	X	X	X	X	X	X	X	X	X		
<b>B. Team building for regional staff</b>																			
1. Develop five-day team building workshop and pilot-test for one region	Key regional staff, plant managers	20	Consultant HRD Assistant Team Leader/CHDT/HRD Training Specialist (Thai)			X													
2. Conduct one team building workshop per year for each regional office	"	200	"				X	X	X	X	X	X	X	X	X	X	X		
<b>C. Quality circle program</b>																			
1. Develop quality circle approach, determine needs, design format and process, train CHDT staff in how to conduct	CHDT management training staff	4	Consultant HRD Training Specialist & CHDT Management Training Staff			X													
2. Pilot quality circle approach in one region	Waterworks level staff & regional office staff	50	"			X													
3. Carry out quality circle program in five regions	"	250	CHDT Management Training Staff				X	X	X	X									
4. Expand quality circle program to all remaining regions	"	750	"							X	X	X	X	X	X	X	X		

IV-4 (cont'd)

ACTIVITY	RECIPIENT OFFICE	TARGET	RESPONSIBLE AGENT	YEAR 1 QUARTER				YEAR 2 QUARTER				YEAR 3 QUARTER				YEAR 4 QUARTER			
				1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
<b>D. Management skills</b>																			
1. Develop & pilot supervisory skills seminar (1 region)	Regional supervisory staff.	15	Consultant: Management Training Specialist & OMDT Staff				X												
2. Implement 20 supervisory skills workshops in 14 regions	Regional & central supervisory staff	250	OMDT Supervisory Trainers					X	X	X	X	X	X	X	X	X	X	X	X
<b>E. O&amp;M skills</b>																			
1. Technical (including leak detection): Develop & pilot O&M workshop (1 region) of 5 days	Regional O&M staff	20	Consultant: Technical Training Specialist/OMDT Staff				X												
2. Conduct 10 TOT workshops in O&M of 5 days each	Regional O&M staff	225	OMDT O&M Staff					X	X										
3. Conduct on-the-job training in O&M	Plant O&M staff	875	Regional Training Coordinator with TOT Graduates							X	X	X	X	X	X	X	X	X	X
<b>F. Administrative skills</b>																			
1. Develop & pilot admin. workshop in one region	Regional admin. staff	5	Consultant: Admin. Trainer & OMDT Admin. Trainers				X												
2. Conduct 10 TOT workshops in admin. procedures	PWA regional	50	OMDT Admin. Trainers					X	X	X	X								
3. Conduct on-the-job training in administrative procedures	PWA regional/plant admin. staff	400	Regional Training Coordinator with TOT Graduates							X	X	X	X	X	X	X	X	X	X
<b>G. Public Relations/Sales</b>																			
1. Develop & pilot public relations/sales workshop (1 region)	Plant bill collectors, PR staff	15	Consultant: Public Relations Specialist & OMDT Staff							X									
2. Conduct TOT workshops for regional staff	Publ. relations regional staff	15	OMDT admin. trainers, PR Specialist									X	X	X	X				
3. Conduct OJT in public relations and sales	Regional/plant staff	300	Regional Training Coordinator with TOT Graduates											X	X	X	X	X	X

IV-4 (cont'd)

ACTIVITY	RECIPIENT OFFICE	TARGET	RESPONSIBLE AGENT	YEAR 1 QUARTER				YEAR 2 QUARTER				YEAR 3 QUARTER				YEAR 4 QUARTER			
				1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
<b>IV. Corporate Planning</b>																			
A. Develop corporate plans for 5 & to 10 years to include the following elements: <ul style="list-style-type: none"> <li>. Corporate goals</li> <li>. Financial plans</li> <li>. Administrative and organizational plan</li> </ul>	Corporate planning staff	0	Consultants: Team Leader Economist Planner Fin. Analyst/Planner	X	X	X	X	X	X	X	X								
B. Develop manpower plan	OMDT counterpart and staff	5	Manpower Consultant with OMDT-Manpower staff			X	X	X	X										
C. Develop yearly operational plans			Corporate Planning staff and PWA Unit Heads																
1. Develop unit, departmental and regional work plans which specify goals, objectives, tasks, responsibilities, and resources needed	Regional directors 15 Office and unit heads 10 Division chiefs 6 (Deputy and Asst. Governors)		Departmental Heads	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
D. Update master corporate plans (A.1-4 above)	Corporate planning staff	0	Corporate Planning Staff Consultants							X	X	X	X	X	X	X	X	X	
<b>V. Engineering Planning</b>																			
A. Feasibility studies: conduct four project feasibility studies (2/year)	Engineers in waterworks development & planning division	12	Consultants: Hydrologist & Hydrogeologist/ Engineering Planning Staff	X	X	X	X	X	X	X	X								
B. Develop feasibility study procedures, check lists and manuals	"	12	"					X	X	X	X								
C. Conduct OJT follow-up training.	"	12	"							X	X	X	X	X	X	X	X	X	
<b>VI. Administration</b>																			
<b>A. Office and Communication Procedures</b>																			
1. Survey current procedures for inter-office communications, filing, documentation of activity through memos and office procedures at the regional and central level	Administrative div. chief & staff OMDT admin. trainers	3 2	Consultant (Admin/systems) with PWA Team	X	X														

IV-4 (cont'd)

ACTIVITY	RECIPIENT OFFICE	TARGET	RESPONSIBLE AGENT	YEAR 1 QUARTER				YEAR 2 QUARTER				YEAR 3 QUARTER				YEAR 4 QUARTER			
				1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
2. Develop procedures, check lists, procedures, and recommendations for all of 1 above and compile into admin. handbook	"	3 2	Consultant with PWA Team			X	X												
3. Conduct skill training for admin. officers and office heads	(See skill training administration)		OMDT Staff					X	X	X	X	X	X	X	X	X	X	X	X
B. Procurement and Stores																			
1. Review procurement and stores procedures and update where necessary	Procurement analyst OMDT admin. trainer	1 2	Consultant with PWA Team	X	X	X	X												
2. Design workshop in updated procurement and stores procedures	"		Consultant (Procurement and Stores Specialist) with PWA Team				X	X											
3. Conduct workshop of 10 days with OJT assignments	Regional admin. officers & asst. procurement analysts	45	"				X		X										
4. Conduct follow-up workshop of 10 days for same group (3)	"		"				X		X										
C. Contracting																			
1. Review PWA contracting procedures	Legal Division	-	Consultant				X												
2. Draft appropriate contracting procedures/formats	"	-	Consultant, Contracting Staff				X												
D. Auditing																			
1. Review PWA auditing procedures	Internal Audit	-	Consultant				X												
2. Devise appropriate auditing procedures	"	-	Consultant, Internal Audit Staff				X												
3. Conduct OJT/follow-up workshops	"	-	Consultant, OMDT Staff				X	X	X	X	X	X	X	X	X	X	X	X	X
E. Billings																			
1. Review PWA billing procedures	Accounting Div. (Central and Regional)	-	Consultant			X	X												
2. Devise computerized billing system	"	-	Consultant			X	X												
3. Conduct OJT on use and application of new billing system	"	-	Consultant OMDT staff				X	X											

IV-4 (cont'd)

ACTIVITY	RECIPIENT OFFICE	TARGET	RESPONSIBLE AGENT	YEAR 1 QUARTER				YEAR 2 QUARTER				YEAR 3 QUARTER				YEAR 4 QUARTER			
				1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
<b>VII. Personnel System</b>																			
A. Review existing performance criteria developed at plant and regional level and update where necessary	Regional directors	15	Consultant: (Personnel Planning and Job Classification Specialist) with PWA Team Counterparts	X	X														
B. Develop performance evaluation and performance review procedures	Personnel officers	5	"	X	X														
C. Develop criteria for job promotion	"	5	"			X	X												
D. Recommend employee benefits package	"	5	"				X												
E. Train personnel officers in B, C and D above by conducting a 10-day workshop	Personnel officers & OMDT admin. trainer	5 1	"				X												
F. Conduct 5 three-day workshops to train supervisors in employee performance review procedures	Personnel officers, OMDT admin. trainers supervisory personnel	100	OMDT Trainer with consultant (Personnel Planning and Job Classification Specialist)					X	X			X	X			X	X		
<b>VIII. Engineering - Design</b>																			
A. Develop design criteria for low cost water supply technology for large, medium and small sizes & train engineers in process	OMDT, Engineering	1 11	Consultants: Soils Engr. Structural Engr. Mechanical Engr. Electrical Engr. San. Engr. Automation Engr.	X	X	X	X	X	X	X	X								
B. Utilizing above criteria, design plants (large, medium, and small)	OMDT, Engineering	1 11	"			X	X	X	X	X	X								
C. Develop design manuals	OMDT, Engineering	1 11	"				X	X	X	X	X								
D. Field test design manuals and conduct follow-up training	OMDT, Engineering	1 11	"						X	X	X	X	X	X	X	X	X	X	
E. Revise design manuals	OMDT, Engineering	1 11	"							X	X	X	X	X	X	X	X	X	
F. Develop and conduct basic water supply engineering course, two 1-week courses with intervening field work	OMDT, Engineering	1 2 40	"	X	X	X	X												
G. Develop and conduct intermediate water supply engineering course, two 1-week courses with intervening field work	OMDT, Engineering	1 3	"			X	X	X	X	X	X								

IV-4 (cont'd)

ACTIVITY	RECIPIENT OFFICE	TARGET	RESPONSIBLE AGENT	YEAR 1				YEAR 2				YEAR 3				YEAR 4			
				QUARTER				QUARTER				QUARTER				QUARTER			
				1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
II. Develop and conduct advanced water supply engineering course, two 1-week courses with intervening field work	OMDT, Engineering	1 3	"						X	X	X	X	X						
<b>IX. Construction Supervision</b>																			
A. Develop a comprehensive list of problems faced in general construction supervision	OMDT, Construction Supervision	3 10	Consultant: Construction Engr. Mechanical Engr. Electrical Engr.	X	X														
B. Develop guidelines and check lists for construction supervision	OMDT, Construction Supervision	3 10	"		X	X													
C. Field test guidelines and check lists	OMDT, Construction Supervision	3 10	"			X	X												
D. Revise guidelines and check lists	OMDT, Construction Supervision	3 10	"				X	X											
E. Develop workshop on construction supervision	OMDT, Construction Supervision	3 10	"				X	X											
F. Implement workshop on construction supervision in two parts of 5 days each, with intervening field work	OMDT, Construction Supervision trainees	3 3 25	"					X		X									
G. Conduct task analysis of well drilling and plant construction supervision for 3 new types of plants (see V.A. above)	OMDT, Construction Supervision	3 3	"	X	X	X	X	X	X	X									
H. Develop guidelines and check lists for supervision	OMDT, Construction Supervision	3 3	"			X	X	X	X	X	X	X	X						
I. Field test guidelines and check lists for supervision	OMDT, Construction Supervision	3 15	"				X	X	X	X	X	X	X	X					
J. Revise guidelines and check lists	OMDT, Construction Supervision	3 3	"						X	X	X	X	X	X					
K. Develop workshop on construction supervision for well drilling and 3 new types of plants	OMDT, Construction Supervision	3 3	"		X	X	X	X											

IV-4 (cont'd)

ACTIVITY	RECIPIENT OFFICE	TARGET	RESPONSIBLE AGENT	YEAR 0	YEAR 1 QUARTER				YEAR 2 QUARTER				YEAR 3 QUARTER				YEAR 4 QUARTER			
					1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
I. Implement workshop on construction supervision in two parts of 5 days each with intervening field work	OHDT, Construction Supervision trainees	3 3 10	"						X	X										
<u>X. Research</u>																				
A. Set up research design program and train research staff how to conduct research in: 1. Plant design 2. Equipment 3. Construction materials 4. Instrumentation 5. Automation 6. Pumping systems	Research	5	Consultant (Research Applications Engineer)		X				X			X					X			
B. Conduct pilot testing of technology developed in research design	Research	5	Research Engr. with consultant assistance (Research Applications Engr.)			X	X	X	X	X	X	X	X	X	X	X	X	X	X	
C. Review pilot tests and conduct follow-up OJT	Research	5	"				X		X				X						X	
<u>XI. Evaluation</u>																				
A. Collect and update baseline data	PWA Planning Div.	10	PWA		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
B. Select and contract for evaluation team	USAID, PWA	1	Project Manager and USAID				X						X							
C. Conduct evaluation	PWA	2	Evaluation Team					X								X				
<u>XII. Commodity Procurement</u>																				
A. Request submitted and approved	PWA		Procurement Division	X	X			X			X				X					
B. Procurement	PWA		Procurement Division	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
<u>XIII. In-Country Seminars &amp; Conferences</u>																				
	PWA	20	OHDT		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	

## E. Monitoring and Evaluation Arrangements

### 1. Monitoring

The primary responsibility for managing Project activities rests with the PWA Project Manager under the supervision of the Project Director. Overall Project monitoring functions will be performed by the PWA Project Executive Committee. This Committee will meet on periodic basis to assess Project progress. The Project-related reports, baseline and subsequent data will be used by PWA to monitor Project progress towards its stated purpose and goal.

Normal USAID O/HPW staff is expected to be responsible for monitoring Project activities. The Project plans, Project reports, consultations with PWA and other RTG officials, site visits, Project baseline data and evaluations will be the USAID Project Officer's tools for monitoring Project activities. A monitoring checklist detailing responsibilities within USAID will be developed by the USAID Project Officer before the Loan Agreement is signed. Fifty percent of the Project Officer's time is expected to be devoted to this task during the first two years of Project implementation. USAID will request technical assistance from S&T/HEA/WS as and when necessary.

### 2. Evaluation Plan

The PWA Executive Committee is expected to establish a Project evaluation working group soon after the signing of the Loan Agreement. It is the responsibility of the working group to establish an evaluation plan for the Project. PWA is to submit its evaluation plan for USAID review and approval.

The Project evaluation working group's task will be to establish indicators of success of the Project as related to the purpose and goal of the Project. Annex G provides examples of the types of indicators that will be useful in evaluating Project progress in accomplishing the goals and purposes of the Project. The working group will work towards developing an understanding of what is expected of the Project. The working group will be responsible for establishing a system of gathering data both before and after Project interventions are introduced pertaining to the selected indicators. The group will also decide on who is responsible for collecting the data.

Up to two Project funded evaluations are required during the life of the Project. The working group has the ultimate responsibility for deciding how and when these evaluations should take place. The evaluation working group should develop the scope of work for evaluations. The group will be responsible for devising reporting formats, selection of the evaluation team, and the distribution of results and follow-up meetings/workshops to incorporate evaluation findings into future program planning. The working group can, if necessary, bring in consultants to assist with any phase of the Project evaluation process.

F. Reports

1. Progress

Progress reports will be submitted by PWA on a quarterly basis. These reports will summarize all on-going Project activities, indicating their status, degree of completion, their achievement of Project objectives, problems, and proposed method for resolving problem areas. Annually, progress reports will contain a summary of the historical and planned performance indicators outlined in Annex G. The progress reports are to be prepared in English and submitted to USAID when due, and will be used by these agencies for monitoring Project activities. A draft of the report outline should be approved by USAID before the initial report is drafted.

2. Contractor

PWA is to require its contractor to submit quarterly reports to PWA with copies to USAID. These reports are expected to summarize the contractor's progress towards accomplishing the stated scope of work, including delivery of inputs, tasks accomplished, anticipated actions in the next quarter, problems encountered and their proposed resolution.

3. Financial

PWA is to submit financial reports on a quarterly basis summarizing the Project financial status by Project input. These reports will be compiled by PWA in accordance with the reporting formats to be provided by USAID.

4. OMDT Work Plan

Each 1, 3 and 5 year training workplan developed and approved for OMDT must be submitted to USAID for information purposes.

5. Other Donor Institutional Development (ID) Activity

PWA is to keep USAID informed of all existing and proposed ID activity that will affect PWA and this Project. On a semi-annual basis, PWA will submit to USAID an updated summary report of ID activities by other donors.

6. Special Reports

PWA will prepare and forward to USAID in a timely fashion and as requested, special reports summarizing extraordinary events which potentially may affect achievement of Project objectives.

G. Conditions Precedent and Covenants

1. Initial Disbursement

Prior to the initial disbursement under the Loan, or to the issuance by A.I.D. of documentation pursuant to which disbursement will be made, the Borrower will, except as the Parties may otherwise agree in writing, furnish to A.I.D. in form and substance satisfactory to A.I.D.:

a. An opinion of the Office of Juridical Council of the Kingdom of Thailand, to the effect that

(1) the Borrower is a state enterprise established by the PWA Act of B.E. 2522 of the Kingdom of Thailand;

(2) the Agreement has been duly authorized and/or ratified by, and executed on behalf of the Borrower by a duly authorized person, has been approved as required by law (no publication, registration or further approval thereof is required), and that it constitutes a valid and legally binding obligation of the Borrower in accordance with all of its terms;

(3) the execution and delivery of a Thailand Guaranty Agreement, acceptable to A.I.D., (i) is within the legal authority of the Kingdom of Thailand, (ii) has been duly authorized by the Kingdom of Thailand by all required legal action, (iii) will not violate any provision of any applicable law, decree, regulation or any order of any court within Thailand and (iv) will not conflict with, or result in a breach of, any of the terms, conditions, or provisions of any agreement or instrument to which the Kingdom of Thailand is a party; and

(4) the Thailand Guaranty Agreement has been duly executed by and in the name of the Kingdom of Thailand by a duly authorized person, constitutes a legal, valid, and binding obligation of the Kingdom of Thailand enforceable in accordance with its terms, has been approved as required by law (no publication, registration, or further approval being required), and is backed by the full faith and credit of the Kingdom of Thailand;

b. A statement of the name of the person holding or acting in the office of the Borrower specified in Section 9.3 of the Loan Agreement, and of any additional representatives, together with a specimen signature of each person specified in such statement;

c. Designation of a Borrower's representative (having a rank not lower than an Assistant/Deputy Governor) as the Project Director and another senior representative as the Project Manager and their names;

d. Evidence that adequate staff including a full time administrative officer have been assigned to the Office of the Project Manager for managing Project activities;

e. Evidence that the Project Executive Committee has been established; and

f. An implementation and financial plan for the first year of Project activities.

## 2. Additional Disbursements

Prior to additional disbursement under the Loan, or to the issuance by A.I.D. of documentation pursuant to which disbursement will be made, in any Project year after the first Project year, the Borrower will furnish to A.I.D. in form and substance satisfactory to A.I.D. an annual implementation and financial plan for that Project year.

## 3. Special Covenants

a. Project Evaluation. The Parties agree to establish an evaluation program as part of the Project. Except as the Parties otherwise agree in writing, the program will include during the implementation of the Project and at one or more points thereafter: (1) evaluation of progress toward attainment of the objectives of the Project; (2) identification and evaluation of problem areas or constraints which may inhibit such attainment; (3) assessment of how such information may be used to help overcome such problems; and (4) evaluation, to the degree feasible, of the overall development impact of the Project. This program will be developed within the first six months of the Project.

b. Additional Covenants. The PWA agrees to each of the following covenants:

(1) To provide adequate budgetary resources in support of the Project prior to the commencement of each Project year activities;

(2) To ensure that throughout the Project life, the PWA's Training Center is fully staffed;

(3) For each institutional development activity (other than training), to ensure that the PWA's concerned organizational unit is staffed with the needed counterpart and support staff;

(4) To ensure that the PWA will continue to pursue its goal of financial self-sufficiency which it has established for itself; and

(5) To provide A.I.D. with audit reports of its operations on an annual basis.

#### 4. Taxation

a. This Agreement and the Assistance hereunder will be free from, and the principal and interest will be paid free from, any taxation fees imposed under laws in effect in Thailand.

b. To the extent that (1) any contractor, including any consulting firm, any personnel of such contractor financed under the Assistance, and any property or transaction relating to such contracts and (2) any commodity procurement transaction financed under the Assistance, are not exempt from identifiable taxes, tariffs duties or other levies imposed under laws in effect in Thailand, the PWA will pay or reimburse the same with funds other than those provided under the Loan

#### V. Financial Plan

The Tables V-1 and V-2 provides a summarized financial plan for the Project. A total of \$9,503,000 will be used to finance long and short-term U.S. and local consultants, commodities, in-country seminars/conferences, evaluations and certain Project operating costs. Contingency and inflation have already been included in the cost estimates for each of the Project components listed below. The PWA's contribution will support in-kind costs such as staff salaries, travel/per diem, commodities and other unanticipated Project operating costs. Detailed financial tables for each Project component may be found in Annex E.

Table V-1: Summary Cost Estimates and Financial Plan (US\$000)

Inputs	A.I.D.		PWA	Total
	FX	LC	LC	
1. U.S. Consultants	1,995	-	-	1,995
2. Local Consultants	-	819	-	819
3. Consultant Support Costs	-	126	-	126
4. Other Cons. Support Costs	-	100	-	100
5. Project Commodities	924	1,000	100	2,024
6. In-country Seminars/ Conferences	-	100	-	100
7. Project Related Travel	25	50	-	75
8. Evaluation	30	20	-	50
9. Innovative Activities	91	200	-	291
10. Contingencies	220	-	-	220
11. PWA Staff	-	-	3,703	3,703
<b>Total</b>	<b>\$3,285</b>	<b>2,415</b> <b>(5,700)</b>	<b>3,803</b>	<b>9,503</b>

Table V-2  
Summary of Total Project Costs  
( '000)

Inputs	Year 1	Year 2	Year 3	Year 4	Total
<b>A. <u>AID Loan</u></b>					
1. External Consultants	\$590	\$530	\$422	\$353	\$1,295
2. Local Consultants	248	202	227	142	819
3. Consultant Local Support Costs	27	30	33	36	126
4. Other Consultant Support Costs	30	30	25	15	100
5. Project Commodities	505	829	520	70	1,924
6. In-country Seminars/Conferences	25	25	25	25	100
7. Project Related Travel	20	20	20	15	75
8. Evaluations	-	20	-	30	50
9. Innovative Activities	100	100	60	31	2919
10. Contingencies	50	55	55	60	220
	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
Total AID Loan	\$1,595	\$1,941	\$1,387	\$777	\$5,700
<b>B. <u>PWA Resources</u></b>					
1. PWA Staff					
Salaries/wages	B 13,368	B 20,122	B 21,943	B 22,868	B 78,301
Travel/per diem	B 658	B 1,759	B 1,916	B 2,520	B 6,853
2. Commodities	400	500	620	780	2,300
	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
Total PWA	B 14,426 (\$527)	B 22,381 (\$973)	B 24,479 (\$1,064)	B 26,168 (\$1,139)	B 87,454 (\$3,803)
<hr/>					
Total Project Cost	\$2,222	\$2,914	\$2,451	\$1,915	\$9,503

Exchange Rate \$1 = B 23.00

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P 070040Z JAN 83  
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BT  
UNCLAS STATE 004315

PROJ: 493-331

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TOR: 033004  
CN: 01703

CHARGE: AID 4  
INFO AMB DCM2 ECGN CHRON

9/FJV

C&R RECEIVED

7 JAN 1983

AIDAC

E.O. 12356:H/A

TAGS:

SUBJECT: PROPOSED RURAL WATER SUPPLY PROJECT (493-0331)

REFS: (A) BANGKOK 60228 (B) BANGKOK 65001

1. SUMMARY. BASED ON REFCABLES AND LATE NOVEMBER DISCUSSIONS WITH DAVID OOT IN AID/W, WE ENDORSE USAID'S PROPOSAL TO PROCEED WITH DETAILED DEVELOPMENT OF PP FOR SUBJECT PROPOSAL. GENERAL UNDERSTANDINGS ARE THAT PROJECT WOULD MAXIMIZE INSTITUTIONAL DEVELOPMENT AND TECHNOLOGY TRANSFER OUTCOMES AS WELL AS COST EFFECTIVENESS OF RURAL WATER SUPPLY INVESTMENTS AND OPERATIONS, INCLUDING COST RECOVERY AND USER CHARGES. FOLLOWING ARE BRIEF SUGGESTIONS FOR DESIGN EFFORT AND TDY ASSISTANCE. END SUMMARY.

2. INSTITUTIONAL DEVELOPMENT. AS NOTED REF A, PROJECT WOULD STRENGTHEN PERFORMANCE CAPACITIES AND TECHNICAL SKILLS AT ALL LEVELS OF PWA'S RURAL WATER SYSTEM. FOCUS AT THE BOTTOM OPERATIONAL END OF SYSTEM APPEARS ESPECIALLY APPROPRIATE. IN THIS CONTEXT, EFFORTS TO IMPROVE INFORMATION FLOWS THROUGH SYSTEM SHOULD BE CAREFULLY DIRECTED TOWARD PRODUCING ACTIONABLE DATA AT REASONABLE COST IN BOTH MONETARY AND PAPERWORK TERMS.

3. TECHNOLOGY TRANSFER. AMONG TA OBJECTIVES LISTED REF A, DESIGN AND TESTING OF NEW LOW COST WATER SYSTEMS ADAPTABLE TO RELATIVE COMMUNITY SIZES AND SPATIAL DISPERSIONS ARE PARTICULARLY ATTRACTIVE. SO IS EMPHASIS ON IMPROVING WATER QUALITY CONTROL.

4. OTHER CONCERNS.

A. PRIVATE SECTOR. TO MAXIMUM EXTENT FEASIBLE, PRIVATE SECTOR PARTICIPATION SHOULD BE STRUCTURED INTO PROJECT DESIGN, E.G. CONTRACTING FOR NEW, LOWER COST SYSTEMS TO BE DESIGNED AND BUILT.

B. FOCUS ON HEALTH. PROJECT DESIGN SHOULD EMPHASIZE POTENTIAL OF REDUCING INFANT AND YOUNG CHILD MORTALITY RATES AS WELL AS BURDEN OF ILLNESS IN THE WORKFORCE.

C. PRIOR EFFORTS. PROJECT DESIGN SHOULD FULLY REFLECT LESSONS LEARNED FROM PRIOR AID AND OTHER DONOR ASSISTANCE.

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D. OTHER DONORS. AS PER REF A, PROJECT SHOULD BE DESIGNED TO FACILITATE FOLLOW-ON FINANCE FROM OTHER DONORS IN THE RURAL WATER SECTOR.

E. RESPONSIBILITY FOR AUTHORIZATION. MISSION TO AUTHORIZE PP WHICH SHOULD FULLY TREAT ISSUES OF COST EFFECTIVENESS, USER CHARGES, REPLICATION, ETC.

5. TDY ASSISTANCE. PER DISCUSSION WITH DAVID OOT IN AID/W, JOHN AUSTIN OF S AND T BUREAU AND STEVE HORTON OF ASIA/PD AVAILABLE TO ASSIST PROJECT DESIGN EFFORT BEGINNING IN FEBRUARY. PER REF B, AID/W AWAITS DRAFT SCOPE OF WORK FOR DESIGN TEAM. SHULTZ  
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Annex A

PROJECT DESIGN SUMMARY  
LOGICAL FRAMEWORK

Project Title & Number: PWA Institutional Development  
(493-0331)

Life of Project: From FY '84 to FY '88  
Total U.S. Funding: US\$ 5.7 million  
Date Prepared: June 1983

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
<p><b>A.1 Goal:</b> To increase access to adequate supplies of safe water delivered in areas served by the PWA.</p>	<p><b>A.2 Measures of Goal Achievement:</b> (1) 40 percent increase in population served by PWA within PWA's existing service area. (2) At least 60 percent of PWA systems meet acceptable water quality standards.</p>	<p><b>A.3</b> (1) PWA records.  (2) Independent evaluation survey of water quality (MOPH and/or outside).</p>	<p><b>A.4 Assumptions for Achieving Goal:</b> (1) Current and planned efforts at system development, water quality improvement, and funding sources continue in a timely manner.  (2) Savings from reduced capital and operating costs are used to expand population served by PWA.</p>
<p><b>B.1 Purpose:</b> To increase the institutional capacity of PWA to plan, design, manage, operate and maintain water supply systems under their jurisdiction in a cost-effective manner.</p>	<p><b>B.2 End of Project Status:</b> Unit cost of producing water reduced by 10% through:</p> <p><b>B.2.1 Corporate Planning</b> (1) Corporate planning skills established and short, medium, and long-term plans prepared. (2) Comprehensive manpower plan, prepared and in use. (3) In-house capability to evaluate alternative water sources established. (4) Research unit, capable of evaluating broad range of water system technology, in place and functioning. (5) Improved low cost plant designs and selection criteria established. (6) Improved construction supervision capacity established.</p>	<p><b>B.3</b> PWA records, consultant reports, and external evaluation. Review of baseline and subsequent records of compliance with performance standards.</p>	<p><b>B.4 Assumptions for Achieving Purpose:</b> (1) PWA has, and makes available, financial and human resources needed to carry out IIRD and systems development activities on a timely basis. (2) Trained personnel at all levels apply their newly acquired skills. (3) RTG/PWA commits financial and human resources needed to sustain IIRD function after AID assistance terminates. (4) PWA able to attract and hold capable persons with necessary skills.</p>

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
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- B.2.2 Management and Administration**
- (1) Improved administrative policies and procedures in place.
  - (2) Improved procurement and stores procedures developed and in operation throughout PWA.
  - (3) New personnel, contracting, and auditing procedures and skills in use in all concerned divisions.
  - (4) Improved revenue collection procedures in place.
  - (5) Sales promotion, instalment financing of household connections and other innovations aimed at increasing population coverage tested and established.

- B.2.3 Technical Services and Service Delivery**
- (1) Key OMDT training staff able to demonstrate an acceptable level of skill in implementing on-going training activities.
  - (2) Training syllabi developed and in use.
  - (3) At least 90% of key staff at central, regional, and plant level, trained and in place.
  - (4) Operation and maintenance skills and performance improved resulting in substantial savings.
  - (5) Ratio of PWA personnel to consumers reduced.
  - (6) Leak detection and other measures to reduce water losses established.

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS																																								
C.1 <u>Outputs:</u>	C.2 <u>Magnitude of Outputs :</u>	C.3	C.4																																								
C.1.1 <u>Training Systems Development</u> (1) OMDT staffed trained in basic training methods, subject matter skills, materials development, and training program management. (2) Training materials and manuals developed.	C.2.1 (1) No. of persons trained: <table border="1"> <thead> <tr> <th>Type</th> <th colspan="4">Project Year</th> </tr> <tr> <th></th> <th>01</th> <th>02</th> <th>03</th> <th>04</th> </tr> </thead> <tbody> <tr> <td>Basic</td> <td>13</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Intermediate</td> <td>13</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Advanced</td> <td></td> <td>13</td> <td></td> <td></td> </tr> <tr> <td>Spec.Skl.</td> <td>14</td> <td>4</td> <td>12</td> <td></td> </tr> </tbody> </table> (2) Produce 2 manuals/yr, years 2-4.	Type	Project Year					01	02	03	04	Basic	13				Intermediate	13				Advanced		13			Spec.Skl.	14	4	12		C.3.1 PWA records and consultant reports.	Assumptions for Achieving Outputs: Established OMDT positions are filled on a timely basis.										
Type	Project Year																																										
	01	02	03	04																																							
Basic	13																																										
Intermediate	13																																										
Advanced		13																																									
Spec.Skl.	14	4	12																																								
C.1.2 <u>Training Information System</u> (1) Review performance standards, conduct task analysis, identify training needs. (2) Prepare training calendar. (3) Update training needs assessment and training calendar.	C.2.2 (1) Task analysis and identification of training needs completed by end of PY 01. (2) Training calendar developed by end of PY 01. (3) On-going system for identifying skill training needs and updating annual training calendar in place by end of PY 02.	C.3.2 PWA records and consultant reports.																																									
C.1.3 <u>Skill Training</u> (1) Design and conduct skill training in six key areas involving central, regional, and/or plant level staff.	C.2.3 <u>No. of Persons Trained :</u> <table border="1"> <thead> <tr> <th>Type of Training</th> <th colspan="4">Project Year</th> </tr> <tr> <th></th> <th>01</th> <th>02</th> <th>03</th> <th>04</th> </tr> </thead> <tbody> <tr> <td>(1) Team building (central and regional staff)</td> <td>45</td> <td>100</td> <td>100</td> <td>100</td> </tr> <tr> <td>(2) Quality circles</td> <td>54</td> <td>300</td> <td>350</td> <td>350</td> </tr> <tr> <td>(3) Management and Supervision</td> <td>15</td> <td>75</td> <td>100</td> <td>75</td> </tr> <tr> <td>(4) Operations and Maintenance</td> <td>20</td> <td>300</td> <td>400</td> <td>400</td> </tr> <tr> <td>(5) Administration</td> <td>5</td> <td>50</td> <td>200</td> <td>200</td> </tr> <tr> <td>(6) Public Relations/Sales</td> <td>15</td> <td>115</td> <td>100</td> <td>100</td> </tr> </tbody> </table>	Type of Training	Project Year					01	02	03	04	(1) Team building (central and regional staff)	45	100	100	100	(2) Quality circles	54	300	350	350	(3) Management and Supervision	15	75	100	75	(4) Operations and Maintenance	20	300	400	400	(5) Administration	5	50	200	200	(6) Public Relations/Sales	15	115	100	100	C.3.3 PWA records and consultant report.	
Type of Training	Project Year																																										
	01	02	03	04																																							
(1) Team building (central and regional staff)	45	100	100	100																																							
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(4) Operations and Maintenance	20	300	400	400																																							
(5) Administration	5	50	200	200																																							
(6) Public Relations/Sales	15	115	100	100																																							

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
<b>C.1.4 Corporate Planning</b> (1) Develop 5 and 10 year master corporate plans. (2) Develop PWA manpower plan. (3) Develop annual operational plans.	<b>C.2.4</b> (1) Complete by end of PY 02. (2) Complete by middle of PY 02. (3) Existence of initial, and updated plans, for each PY.	<b>C.3.4</b> PWA records and consultant reports.	
<b>C.1.5 Administration</b> <b>a. Administration Procedures</b> (1) Update and/or modify existing administrative procedures/develop administration handbook. (2) Train administrative officers and office heads.  <b>b. Procurement and Stores</b> (1) Review and update procedures. (2) Design and conduct workshop and OJT, including use of micro-computer, for regional procurement/stores staff.  <b>c. Contracting Procedures</b> (1) Review and revise contracting procedures/formats  <b>d. Auditing</b> (1) Review and revise audit procedures (2) Design/carryout training workshops and OJT.	<b>C.2.5</b> a. (1) Complete by end of PY 01. (2) Carry out training in PY's 02 - 04.  b. (1) Complete by end of PY 01. (2) Complete training for 45 staff by end of PY 02.  c. (1) Complete by end of PY 01.  d. (1) Complete by end of PY 01. (2) On-going in PY's 02-04.	<b>C.3.5</b> PWA records, consultant reports, and periodic evaluation	
<b>C.1.6 Personnel</b> (1) Review and update plant/regional level performance standards. (2) Develop personnel procedures and train personnel officers/supervisors in their use.	<b>C.2.6</b> (1) Complete by PY 01. (2) Train 5 personnel officers in PY 01, and 250 supervisors in PY's 02 - 04.	Ditto	

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
<b>C.1.7 Engineering - Design</b> (1) Develop and fieldtest low-cost plant design criteria for small, medium, and large plants. (2) Develop and fieldtest design manuals (3) Conduct basic, intermediate, advanced water supply engineering courses.	<b>C.2.7</b> (1) Complete by end of PY 02. (2) Complete manual by end of PY 02, fieldtest PY's 03-04. (3) Train 40 engineers in PY's 01-03.	Ditto	
<b>C.1.8 Construction Supervision</b> (1) Identify problem, develop guidelines and checklists. (2) Train construction supervisors and fieldtest/modify checklists.	<b>C.2.8</b> (1) Complete by PM 09. (2) Complete by end of PY 02.	Ditto	
<b>C.1.9 Research</b> (1) Equip research facility and provide OJT to staff. (2) Conduct pilot tests of new designs, equipment, materials.	<b>C.2.9</b> (1) Research facility operational by end of PM 18. (2) Tests being carried out on on-going basis in PY's 02-04.	Ditto	
<b>C.1.10 In-Country Conferences</b> (1) Conduct in-country conferences/seminars	<b>C.2.10</b> (1) At least two per year in PY's 01-04.	Ditto	
<b>C.1.11 Innovative Activities</b> (1) Identify activities/prepare plans. (2) Implementation/preparation of findings.	<b>C.2.11</b> (1) At least two activities identified/plans prepared by end of PY 01. (2) On-going, beginning in PY 02.	Ditto	
<b>C.1.12 Evaluation</b> (1) Collect/update baseline data (2) Conduct interim and final evaluation.	<b>C.2.12</b> (1) On-going (2) Complete by end of PY 02 and PY 04 respectively.	Ditto	
<b>D.1 Inputs:</b> <b>D.1.1 AID Funding for:</b> (1) Training support (2) Technical assistance (3) Commodities <b>D.1.2 RTG</b> <b>D.1.3 Other Donors</b>	<b>D.2 Implementation target:</b> (type and quantity) See financial and implementation plans.	<b>D.3</b> Project records and vouchers.	<b>D.4 Assumptions for providing inputs:</b> PWA budget needs approved by RTG. Consultants available.

PY = Project Year

PM = Project Month

Provincial Waterworks, Authority  
Institutional Development Project

CHECKLIST OF STATUTORY CRITERIA

PROJECT CHECKLIST

A. GENERAL CRITERIA FOR PROJECT

1. FY 1982 Appropriation Act  
Sec. 523; FAA Sec. 534A;  
Sec. 553(b).

(a) Describe how authorizing and appropriations committees of Senate and House have been or will be notified concerning the project;

Congressional Notification will be forwarded to Committees.

(b) Is assistance within (Operational Year Budget) country or international organization allocation reported to Congress (or not more than \$1 million over that amount)?

Yes.

2. FAA Sec. 511 (a)(1). Prior to obligation in excess of \$100,000, will there be

Financial and technical analysis have been prepared. See Project Paper.

(a) engineering, financial or other plans necessary to carry out the assistance and

(b) a reasonably firm estimate of the cost to the U.S. of the assistance?

3. FAA Sec. 511(a)(2). If further legislative action is required within recipient country, what is basis for reasonable expectation that such action will be completed in time to permit orderly accomplishment of purpose of the assistance.

No further legislative action required.

4. FAA Sec. 611(b); FY 1982 N/A.  
Appropriation Act Sec. 501. If for water or water-related land resource construction, has project met the standards and criteria as set forth in the Principles and Standards for Planning Water and Related Land Resources, dated October 25, 1973?
  
5. FAA Sec. 611 (e). If project is capital assistance (e.g., construction), and all U.S. assistance for it will exceed \$1 million, has Mission Director certified and Regional Assistance Administrator taken into consideration the country's capability effectively to maintain and utilize the project? N/A.
  
6. FAA Sec. 209. Is project susceptible to execution as part of regional or multilateral project? If so, why is project not so executed? Information and conclusion whether assistance will encourage regional development programs. No.
  
7. FAA Sec. 601 (a). Information and conclusions whether project will encourage efforts of the country to: (a) increase the flow of international trade; (b) foster private initiative and competition; and (c) encourage development and use of cooperatives, and credit unions, and savings and loan associations; (d) discourage monopolistic practices; (e) improve technical efficiency of industry, agriculture and commerce; and (f) strengthen free labor unions. Yes.

8. FAA Sec. 501(b). Information and ~~conditions~~ on how project will encourage U.S. private trade and investment abroad and encourage private U.S. participation in foreign assistance programs (including use of private trade channels and the services of U.S. private enterprise).
9. FAA Sec. 512(b); Sec. 535(h) FY 1982 Appropriation Act. Sec. 507. Describe steps taken to assure that, to the maximum extent possible, the country is contributing local currencies to meet the cost of contractual and other services, and foreign currencies owned by the United States are utilized to meet the cost of contractual and other services.
10. FAA Sec. 512(d). Does the United States own excess foreign currency and, if so, what arrangements have been made for its release?
11. FAA Sec. 501(e). Will the project utilize competitive selection procedures for the awarding of contracts, except where applicable procurement rules allow otherwise?
12. FY 1982 Appropriation Act Sec. 521. If assistance is for the production of any commodity for export, is the commodity likely to be in surplus on world markets at the time the resulting productive capacity becomes operative, and is such assistance likely to cause substantial injury to U.S. producers of the same, similar or competing commodity?
13. FAA 113(c) and (d). Does the project comply with the environmental procedures set forth on AID Regulation 152? Does the project or program take into account destruction of tropical forests?
- The project provides for substantial. U.S. technical assistance under a consultant contract with a U.S. private firm.
- The Royal Thai Government contribution to the project will exceed 38% of total requirements.
- There are no U.S. owned local currencies available for this Project.
- Yes.
- N/A.
- The project will have no significant effect on the environment, natural resources or tropical forests.

B. FUNDING CRITERIA FOR PROJECT

FUNDING CRITERIA FOR PROJECT

1. Development Assistance Project Criteria.

a. FAA Sec. 102(b); 111;  
113; 281(a). Extent to  
which activity will:

(i) effectively involve the poor in development, by extending access to economy at local level, increasing labor-intensive production and the use of appropriate technology, spreading investment out from cities to small towns and rural areas, and insuring wide participation of the poor in the benefits of development on a sustained basis, using the appropriate U.S. institutions;

(ii) Help develop cooperatives, especially b technical assistance, to assist rural and urban poor to help themselves toward a better life, and otherwise encourage democratic private and local governmental institutions;

(iii) support the self-help efforts of developing countries;

(iv) promote the participation of women in the national economies of developing countries and the improvement of women's status; and

(v) utilize and encourage regional cooperation by developing countries.

(i) Project will provide urban and rural poor with greater access to safe water supplies.

(ii) No direct effect planned.

(iii) No direct effect planned.

(iv) No differential effect on women is foreseen.

(v) N/A.

b. FAA Sec. 103, 103A, 104, 105, 106. Does the project fit the criteria for the type of funds (functional account) being used?

Indirectly.

c. FAA Sec. 110(a). Will the recipient country provide at least 25% of the costs of the program, project, or activity with respect to which the assistance is to be furnished (or is the latter cost-sharing requirement being waived for a "relatively least developed" country)?

Yes.

d. FAA sec. 110(b). Will grant capital assistance be disbursed for project over more than 3 years? If so, has justification satisfactory to Congress been made, and efforts for other financing, or is the recipient country "relatively least developed"?

N/A.

e. FAA Sec. 281(b). Describe extent to which program recognizes the particular needs, desires, and capacities of the people of the country; utilizes the country's intellectual resources to encourage institutional development; and supports civil education and training in skills required for effective participation in governmental processes essential to self-government.

The Project is consistent with the RTG's own development plans, is jointly developed, and strives to strengthen institutional capacity of RTG to meet urban and poor needs for increased access to safe water supplies.

f. FAS Sec. 122(b). Does the activity give reasonable promise of contributing to the development of economic resources, or to the increase of productive capacities and self-sustaining economic growth?

Yes, institutional capacity of Provincial Waterworks Authority (PWA) should be improved significantly enabling PWA to substantially increase the population served by them.

2. Development Assistance  
Project Criteria (Loans Only)

Repayment prospects are excellent.

a. FAA Sec. 122(b). Information and conclusion on capacity of the country to repay the loan, including reasonableness prospects.

b. FAA Sec. 620(d). If assistance is for any productive enterprise which will compete in the U.S. with U.S. enterprise, is there an agreement by the recipient country to prevent export to the U.S. of more than 20% of the enterprise's annual production during the life of the loan?

N/A.

ANNEX D

No. MI. 5705/718



PROJ: 493-0381

Provincial Waterworks Authority  
Viphavadee Rungsit Road  
Tung Song Hong, Bangkhen,  
Bangkok-10210.

March 16, 1984

Mr. Robert Halligan  
Director  
USAID/Thailand  
37 Soi Somprasong 3  
Petchburi Road  
Bangkok.

Subject: PWA Institutional Development Project

Dear Mr. Halligan,

Please be advised that we have reviewed the final draft of the mutually developed subject Project Paper and are in complete agreement with the proposed project description, financial plan and the implementation arrangements.

We, therefore, formally request that a loan of \$5,700,000 be provided by USAID for this project. The Provincial Waterworks Authority (PWA) agrees to contribute up to 87,454,000 Baht (\$3,803,000) towards the estimated project cost.

Your kind cooperation is always much appreciated.

Yours sincerely,

Mechai Viravaidya  
Governor

Corporate Planning Department  
Tel: 588-3284

4. Other Consultant Support Costs

The estimated yearly cost of other incidentals including travel expenses of consultants in support of the Project is estimated as follows:

<u>Project Year</u>	<u>Estimated Cost</u>
01	\$ 30,000
02	30,000
03	25,000
04	15,000

5. Project Commodities

The cost of the equipment/supplies is briefly summarized by category in Table E-4. An itemized list of commodities required in support of the Project is shown in Table E-5.

6. In-Country Seminars/Conferences

A total of five in-country seminars/conferences per year is anticipated during the project life. The average cost for each seminar/conference is approximately \$5,000, totalling \$100,000.

7. Project Related Travel

This includes expenses for in-country travel of Project personnel.

8. Evaluations

1. Mid-term Evaluation	\$20,000
2. Final Evaluation	\$30,000

9. Innovative Activities

Specific activities will be identified and incorporated into each annual Project implementation and financial plan.

10. PWA Staff Costs

Table E-2 summarizes the PWA staff input that is expected to be committed to the Institutional Development Project. These labor estimates include the staff in PWA's OMDT, trainers within each of PWA's regional offices and waterworks, and PWA central, regional, and local staff who will actually undergo training. Personnel costs were prepared using a weighted average of PWA's current salary scale escalated by 7 percent per annum (Table E-5).

The per person-year cost for different types of PWA staff is as follows:

<u>Project Year</u>	<u>Estimated Cost (Baht)</u>		
	<u>Group I</u>	<u>Group II</u>	<u>Group III</u>
01	80,000	64,400	171,000
02	85,000	69,000	183,000
03	92,000	74,000	196,000
04	98,000	79,000	210,000

Allowance for in-country travel and per diem needed for PWA staff attending training courses is summarized as follows:

<u>Project Year</u>	<u>Estimated Cost (Baht)</u>
01	658,000
02	1,759,000
03	1,916,000
04	2,520,000

11. PWA Commodities

Commodities to be provided by PWA to support the institutional and training development activities were estimated using current PWA budgets (Table E-7). These budgets increase sharply to reflect PWA's planned increase in staff in the OMDT. The PWA commodity budget for Project-related commodities is estimated to increase by 25 percent per annum.

Table E-1  
Summary of Total Project Costs  
('000)

Inputs	Year 1	Year 2	Year 3	Year 4	Total
<b>A. AID Loan</b>					
1. External Consultants	\$590	\$630	\$422	\$353	\$1,995
2. Local Consultants	248	202	227	142	819
3. Consultant Local Support Costs	27	30	33	35	126
4. Other Consultant Support Costs	30	30	25	15	100
5. Project Commodities	505	829	520	70	1,924
6. In-country Seminars/Conferences	25	25	25	25	100
7. Project Related Travel	20	20	20	15	75
8. Evaluations	-	20	-	30	50
9. Innovative Activities	100	100	60	31	291
10. Contingencies	50	55	55	60	220
	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
Total AID Loan	\$1,595	\$1,941	\$1,387	\$777	\$5,700
<b>B. PWA Resources</b>					
1. PWA Staff					
Salaries/wages	B 13,358	B 20,122	B 21,943	B 22,868	B 78,301
Travel/per diem	B 558	B 1,759	B 1,916	B 2,520	B 6,853
2. Commodities	400	500	620	780	2,300
	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
Total PWA	B 14,426 (\$527)	B 22,381 (\$973)	B 24,479 (\$1,054)	B 25,168 (\$1,139)	B 87,454 (\$3,803)
<hr/>					
Total Project Cost	\$2,222	\$2,914	\$2,451	\$1,915	\$9,503

Exchange Rate \$1 = B 23.00

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Table E-2: Inputs Requirement Schedule

INPUTS	Year 1		Year 2		Year 3		Year 4		TOTAL	
	US	Local	US	Local	US	Local	US	Local	US	Local
<b>I. Consultants (Person-months)</b>										
A. OMDT Development	12	18	12	18	12	18	12	18	48	72
B. Training Information System	-	12	-	12	-	12	-	6	-	42
C. Skill Training	6	7	6	7	6	7	-	-	18	21
D. Corporate and Engineering Planning	24	16	24	16	12	6	12	6	72	44
E. Engineering-Design	9	12	9	6	-	6	-	-	18	24
F. Engineering-Construction Supervision	-	4	-	8	-	2	-	-	-	14
G. Engineering-Research and Development	2	-	2	-	2	-	2	-	8	-
H. Administration	-	12	-	12	-	12	-	12	-	48
I. Personnel	3	12	3	12	2	12	-	-	8	36
J. Project Management	3	36	3	36	3	36	3	36	12	144
<b>Total Consultants</b>	<b>59</b>	<b>129</b>	<b>59</b>	<b>127</b>	<b>37</b>	<b>111</b>	<b>29</b>	<b>78</b>	<b>184</b>	<b>445</b>
<b>II. PWA Staff (Person-months)</b>										
A. OMDT Development	210		210		210		210		840	(Group I)
B. Training Information System	50		50		50		50		200	(Group I)
C. Skill Training - PWA Staff	2,000		3,000		3,085		3,000		11,085	(Group II)
D. Corporate and Engineering Planning	30		30		30		30		120	(Group I)
E. Engineering - Design	12		12		12		12		48	(Group I)
F. Engineering - Construction Supervision	12		12		12		12		48	(Group I)
G. Engineering - Research and Development	9		9		9		9		36	(Group I)
H. Administration	15		15		10		10		50	(Group I)
I. Personnel	15		15		10		10		50	(Group I)
J. Project Management	18		18		18		18		72	(Group III)
<b>Total PWA Staff</b>	<b>2,371</b>		<b>3,371</b>		<b>3,445</b>		<b>3,351</b>		<b>12,519</b>	
III. In-country seminars/conferences (Number)	5		5		5		5		20	
IV. Evaluations (Number)	-		1		-		1		2	

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Table E-3  
Summary of Consultant Labor Estimates  
(Person Months - p/m)

Activity/Types of Consultants	Year 1	Year 2	Year 3	Year 4	Total
<b>A. <u>External Consultants</u> (182 p/m)</b>					
1. <u>OMDT Development</u> (48 p/m)					
HRD Training Specialist	12	12	12	12	48
2. <u>Training Information System</u>	-	-	-	-	-
3. <u>Skill Training</u> (18 p/m)					
Subject Matter Training Specialists	6	6	6	-	18
4. <u>Corporate and Engineering Planning</u> (72 p/m)					
a. Economist Planner/Team Leader	12	12	12	12	48
b. Financial/Analyst/Planner	4	4	-	-	8
c. Hydrologist	4	4	-	-	8
d. Hydrogeologist	4	4	-	-	8
5. <u>Engineering Design</u> (18 p/m)					
a. Sanitary Engineer	3	3	-	-	6
b. Automation Specialist	6	6	-	-	12
6. <u>Engineering Construction Supervision</u>	-	-	-	-	-
7. <u>Engineering Research and Development</u> (8 p/m)					
Research Design Engineer	2	2	2	2	8
8. <u>Administration</u>	-	-	-	-	-

Table E-3 (cont'd)

Activity/Types of Consultants	Year 1	Year 2	Year 3	Year 4	Total
9. <u>Personnel</u> (8 p/m)					
HRD Manpower Planning Specialist	3	3	2	-	8
10. <u>Project Management</u> (12 p/m)					
Home Office Support	3	3	3	3	12
<hr/>					
B. <u>Local Consultants</u> (445 p/m)					
1. <u>OMDT Development</u> (72 p/m)					
a. Training Specialist	12	12	12	12	48
b. Subject Matter Training Specialist	6	6	6	6	24
2. <u>Training Information System</u> (42 p/m)					
Task Analysis/Planning	12	12	12	6	42
3. <u>Skill Training</u> (21 p/m)					
Subject Matter Training Specialists	7	7	7	-	21
4. <u>Corporate and Engineering Planning</u> (44 p/m)					
a. Economist/Planner	8	8	3	3	22
b. Financial Analyst/Planner	8	8	3	3	22
5. <u>Engineering-Design</u> (24 p/m)					
a. Soil Engineer	2	1	1	-	4
b. Structural Engineer	2	1	1	-	4
c. Mechanical Engineer	2	1	1	-	4
d. Electrical Engineer	2	1	1	-	4
e. Sanitary Engineer	2	1	1	-	4
f. Automation Specialist	2	1	1	-	4

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Table E-3 (cont'd)

Activity/Types of Consultants	Year 1	Year 2	Year 3	Year 4	Total
6. <u>Engineering-Construction Supervision</u> (14 p/m)					
a. Construction Engineer	2	4	2	-	8
b. Mechanical Engineer	1	2	-	-	3
c. Electrical Engineer	1	2	-	-	3
7. <u>Engineering-Research and Development</u>	-	-	-	-	-
8. <u>Administration</u> (48 p/m)					
a. Admin./Office Systems Specialist	3	3	3	3	12
b. Procurement and Stores Specialist	3	3	3	3	12
c. Contracting Specialist	3	3	3	3	12
d. Auditing/Accounts Specialist	3	3	3	3	12
9. <u>Personnel</u> (36 p/m)					
a. Personnel Planning & Job Classification Specialist	6	6	6	-	18
b. Manpower Planning Specialist	6	6	6	-	18
10. <u>Project Management</u> (144 p/m)					
a. Administrative Officer	12	12	12	12	48
b. Financial Officer	12	12	12	12	48
c. Secretary	12	12	12	12	48

Table E-4  
Estimated Costs of Project Commodities (US \$)

Equipment/Commodities	Year 1	Year 2	Year 3	Year 4	Total
A. Training Supplies/Equipment	30,000	25,000	17,000	16,000	88,000
B. Audio-Visual Equipment	50,000	37,000	25,000	13,000	125,000
C. Training Resource Materials	5,000	5,000	5,000	4,000	19,000
D. Office Equipment/Supplies	20,000	40,000	15,000	-	75,000
E. Other Project Support Equipment	40,000	37,000	-	-	77,000
F. Data Processing Equipment	50,000	200,000	110,000	-	360,000
G. Ground Water Equipment	200,000	200,000	278,000	-	678,000
H. Surface Water Equipment	15,000	15,000	5,000	-	35,000
I. Leak Detection Equipment	50,000	200,000	30,000	-	280,000
J. Research & Development Supplies/Equipment	25,000	50,000	13,000	12,000	100,000
II. Miscellaneous/Contingency	20,000	20,000	20,000	25,000	85,000
<b>Total</b>	<b>505,000</b>	<b>829,000</b>	<b>520,000</b>	<b>70,000</b>	<b>1,924,000</b>

1. The source/origin of project commodities is U.S. or Thailand, except for the vehicles and truck.
2. For details on types of equipment/supplies under each major category, see Table E-5.

Table E-5  
Itemized List of Commodities Required from USAID Funds

Item	Qty	Costs US\$	Origin	
			US	Local
<b>A. <u>Training Supplies/Equipment</u></b>				
- Easel board	25	3,000		+
- Offset printing press	1	25,000	+	
- Chart, paper, pens, etc.		25,000		+
- Manual printing costs		35,000		+
	<b>Total</b>	<b>88,000</b>		
<b>B. <u>Audio-Visual Equipment</u></b>				
- Movie projector, 16 mm	3	4,500	+	
- Daylight screen	3	1,500	+	
- Slide projector	17	17,000	+	
- Overhead projector	20	14,000	+	
- Screen, 70x70 in.	20	6,000	+	
- Tape recorder, player	40	6,000		+
- Tape duplicating machine	1	7,300	+	
- Master tape recorder	1	600	+	
- Video-tape set	1	30,000	+	
- Public speaking system	17	34,000	+	
- Other		4,000		
	<b>Total</b>	<b>125,000</b>		
<b>C. <u>Training Resource Material</u></b>				
- Textbooks		12,000	+	
- Books, manuals		7,000		+
	<b>Total</b>	<b>19,000</b>		

Table E-5 (cont'd)

Item	Qty	Costs US\$	Origin	
			US	Local
<b>D. <u>Office Supplies/Equipment</u></b>				
- Photocopy machine, plain paper, highspeed	1	20,000	+	
- Stencil duplicating machine	3	10,000	+	
- Typewriter, bilingual	4	6,000	+	
- Word processing system	1	40,000	+	
	<b>Total</b>	<b>76,000</b>		
<b>E. <u>Other Project Support Equipment</u></b>				
- Vehicles	5	50,000		Local/Japan
- Air-conditioners	12	27,000	+	
	<b>Total</b>	<b>77,000</b>		
<b>F. <u>Data Processing Equipment</u></b>				
- Microcomputer for planning, adm., research purposes	6	100,000	+	
- Computerized billing system	4	260,000	+	
	<b>Total</b>	<b>360,000</b>		
<b>G. <u>Groundwater &amp; Soil Investigation Equipment &amp; Supplies</u></b>				
- Water truck	1	22,000	+	Local/Japan
- Drilling rig	1	250,000		+
- Small borehole drilling rig	1	22,000	+	
- Resistivity meter	2	40,000	+	
- Borehole logger	1	130,000	+	
- Soil test equipment set	2	69,000	+	
- Ancillary equipment/supplies		145,000		+
	<b>Total</b>	<b>673,000</b>		

Table E-5 (cont'd)

Item	Qty	Costs US\$	Origin	
			US	Local
<b>H. <u>Surface Water Invest. Equipment</u></b>				
- Staff gauge	4	2,000	+	
- Current meter	2	10,000	+	
- Water sampler	2	10,000	+	
- W.Q. field test kit	2	5,000	+	
- Water level recorder	2	9,000	+	
	Total	35,000		
<b>I. <u>Leak Detection Equipment Set</u></b>				
	4	280,000	+	+
<b>J. <u>Research/Development Supplies &amp; Equipment</u></b>				
- Lab. scale sed. tank	1			+
- Lab scale filter	1			+
- Clear well	1			+
- Raw water tank	1	43,000		+
- Pumping facilities	1		+	
- Chemical dosing pump	1		+	
- In-line analog graph plotter	1		+	
- In-line turbidity meter	1		+	
- Automatic pH control dosing pump	1	15,000	+	
- Flow recorder with tatalizer	1		+	
- Pumping test facilities	1			+
- Water analysis equip. - pH meter	1		+	+
- Jar test apparatus	1	9,000	+	+
- Conductivity meter	1		+	+
- Water analysis chemicals			+	+
- Working tools		7,000		+

Table E-5 (cont'd)

Item	Qty	Costs US\$	Origin	
			US	Local
Automation/instrumentation				
- Microprocessor, educational set	1		+	
- Electronic parts, set	1		+	+
- Tools for electronic work, set	1			+
- Oscilloscope	1	20,000	+	
- Logic probe	1		+	
- Logic monitor	1		+	
- Digital voltmeter	1		+	
- Frequency counter	1		+	
- Voltage stabilizer/regulator	1		+	+
- VOM meter	1		+	
A/I Demonstration units for training purposes	1 set	5,000		+
Total		<u>100,000</u>		
K. <u>Miscellaneous &amp; Contingency</u>		<u>85,000</u>		
Grand total		US\$ <u>1,924,000</u>		

Table E-6  
PWA Staff Costs

Year/Item	Salaries and Wages (Baht)	Travel/Per Diem (Baht)	Total (Baht)
<u>Year 1</u> 30.9 person-years x 80,000 Baht (Group I)	2,472,000		
155.2 person-years x 64,400 Baht (Group II)	10,639,000		
1.5 person-years x 171,000 Baht (Group III)	257,000		
	<u>13,358,000</u>	658,000	14,026,000
<u>Year 2</u> 30.2 person-years x 86,000 Baht	2,597,000		
250 person-years x 69,000 Baht	17,250,000		
1.5 person-years x 183,000 Baht	257,000		
	<u>20,122,000</u>	1,759,000	21,881,000
<u>Year 3</u> 28.6 person-years x 92,000 Baht	2,631,000		
257 person-years x 74,000 Baht	19,018,000		
1.5 person-years x 196,000 Baht	294,000		
	<u>21,943,000</u>	1,916,000	23,859,000
<u>Year 4</u> 28.5 person-years x 98,000 Baht	2,803,000		
250 person-years x 79,000 Baht	19,750,000		
1.5 person-years x 210,000 Baht	315,000		
	<u>22,858,000</u>	2,520,000	25,388,000
<b>Grand Total</b>	<b>78,301,000</b>	<b>6,853,000</b>	<b>85,154,000</b> <b>(\$3,703,000)</b>

Note: Costs are adjusted of 7% per annum for minor contingencies and salary adjustments.

Table E-7  
PWA Commodity Costs (Baht)

Project Year	Item	Costs
01	Commodities	400,000
02	Commodities	500,000
03	Commodities	620,000
04	Commodities	780,000
Total		2,300,000

Notes:

1. Significant increase over current (1982) budget (200,000 Baht) has been assumed.
2. 25% equipment increase assumed per annum for inflation, and minor contingencies.

## PROJECT ANALYSES

### 1. Economic and Financial Analysis

Currently, projects supported by the World Bank, UNDP and the Dutch, German and Japanese aid programs are financing about \$3.5 million of technical assistance to the PWA in engineering and management areas related to the activities to be provided under this AID project. The creation of the PWA in 1979 and the appointment of senior management in whom donors have confidence, has drawn several of the development agencies active in Thailand to offer support. With the RTG having adopted the goals of the UN Drinking Water Supply and Sanitation Decade, the creation of the PWA offered a feasible opportunity for donors interested in helping to expand the availability of potable water in rural areas.

As a result there are several related projects inputs of consultant services and training similar to those to be provided to PWA during the same period as the life of the AID project. Some of the benefits expected from the AID project may therefore be "joint products", i.e., management or operating improvements that will result from the interactions between changes introduced by more than one assistance activity. In the analysis of benefits below, a careful attempt has been made to identify, as well as possible, cost-savings and other effects available largely or entirely to the AID inputs.

The benefits of this project to PWA will be as follows:

#### A. Future Capital Costs

The PWA will be adding new localities to its system over the next 10 years and making capital improvements to many of its existing systems. It is conservatively estimated that the project's assistance to PWA engineering planning, contracting, and procurement practices will enable the organization to achieve the same capacity expansion at 10% lower cost than it would face otherwise. The savings are estimated to rise gradually to the 10% level over the life of the project.

## B. Operating Costs

Substantial operating and maintenance savings are anticipated from the project. Improvements in construction standards and the quality of materials used in construction will reduce the frequency of repair outlays. Savings in energy costs and general repair are expected to amount to around 10%. Reductions in personnel redundancy, improvements in inventory management (including both reductions in excess stocks that unnecessarily tie up working capital, and raising stocks of items that are recurrently in short supply and cause shut-downs and other inefficiencies), and improvements in financial planning (which should result in savings in cash management and other areas), are the major areas where savings in operating costs are anticipated. The overall effect of these operational savings should be a reduction of 15% in the cost per unit of water delivered by the system.

The savings outlined above are real, not merely financial. That is, they all comprise reductions in the real resources the PWA will absorb in order to accomplish its expansion and deliver its product. In Tables F-1.1-1.4, these savings are estimated for a 10-year period including the 5-year period of the life of the project. The project outlays over the period, including the relevant expenditures of the PWA, are also shown year by year. The costs and associated benefits are then compared after applying discount rates to sum the amounts to common present values. As can be seen in the summation tables, the project has a very favorable internal rate of return and meets AID's benefit standards.

In some important respects, the analysis is conservative. First, even if viewed as a financial, not an economic analysis, it understates the benefits to PWA because it does not include an estimate of the gradual increase in cash flow that will result from the expected reduction in uncollected bills (mainly of RTG agencies) and in the number of customers not being billed at all, or being billed insufficiently, due to defective meters. The means for recovering these amounts due are being addressed under the IBRD loan: agreements to be reached with the RTG agencies eliminating their presumption of special non-paying status, and the replacing of all defective meters. More effective management of the billing and metering functions will also be needed, however, functions that will be addressed under the AID project. The capturing of these accounts due is expected to contribute substantially toward a reduction of the deficits of the small town and rural systems that have had to covered in the part of subventions from the government budget.

The analysis is also conservative from an economic perspective. It does not include certain benefits both internal and external to the PWA that are significant but cannot be quantified. One problem known to be widespread but not measurable is the interruptions in water delivery due to plant break-downs. To the extent that delivery is matched by cost-recovery level collections (which is one project objective), interruptions in service entail losses of earnings contributing to the meeting of fixed costs and debt service. From an economic point of view, down-time means idle capital from which Thailand gains no output and from which customers gain no service. The economic benefits to be derived from reducing or, hopefully, eliminating plant down-time could be measured by the payments customers would be willing to make to receive the water flow during the periods (or, more practically, by the payments they would make at actual rates being charged), but data on system down-time is not available, nor would it be realistic to attempt to estimate the proportion of these benefits that would be attributable to this project.

As an analysis of the rate of return "internal" to the project, or to the PWA, the analysis makes no attempt to quantify other benefits of an economic and social nature. Although such benefits are real enough, and although economic theory has described how they should be measured, practical quantification is difficult and not normally attempted in World Bank appraisals of substantial capital projects designed to provide benefits of an essentially health character, even if meeting a basic human need of such fundamental character as potable water.

By including only reductions in the cost of water delivery as the measure of project benefits, the analysis ignores the value of the product itself (i.e., the value of the incremental deliveries that will be facilitated by this project). The PWA has estimated that its systems were operating at 45% of design capacity and serving only 50% of their potential customers. To the extent this project contributes to PWA's ability to bring its existing system up to capacity operation, it will be helping to generate benefits measurable (or with down-time elimination) by the amounts the potential customers will be paying (or more correctly would be willing to pay) for the water. The net incremental benefit would be derived after deduction of the marginal cost of delivering the incremental water, which presumably would be low if plant inefficiency (and not water availability to the plants) is the main hindrance. (The pay-off leverage to this project may indeed be high because of its management focus, resting (so to speak) on top of the capital improvements to the existing plant being financed under the IBRD project.)

No attempt is made either to quantify the health benefits accruing to families that will be enabled to connect to the potable water systems. Water-borne diarrheal disease is the third most common cause of death in Thailand, second most common of deaths under age six. The relative contributions of water, hygienic practices and other factors determining exposure to diarrheal disease are very difficult to sort out. Clean water is a necessary but not sufficient condition for reduction in diarrheal incidence. The spread of potable water in Thailand should contribute to mortality reductions and to lower hospital admissions, and to the economic benefits these improvements entail.

The project will also help the PWA improve water quality which now varies from system to system and is not uniformly maintained by individual systems. Water quality obviously is a critical aspect of potability. While quality maintenance is known to be a problem, the average deviation from standards throughout the system is not known. It would be unrealistic to attempt to estimate the numbers of current customers who are actually at risk to exposure to disease-causing organisms, who should benefit from elimination of this risk and of the diseases actually being contacted from use of the system's water for drinking.

Finally, the analysis is conservative because it extends only ten years. If a project successfully assists an operating organization to upgrade its technical and managerial capacities, and to install more efficient management systems as permanent features in the functioning of the organization, the resulting economies can extend for many years beyond the life of the capital equipment, the period that usually determines the number of years used in a project's benefit-cost calculus. As can be seen in Annex E, Table F-3, the inputs for developing the manpower training are bunched in the early years of the project, while the numbers of trainees rises sharply to concentrate heavily in years three and four. By limiting the time-frame to ten years from project inception, the analysis in effect short changes the benefits, even if discounted, by taking into account only four-to-five years of impact. (It should also be noted that project break-even needs only reductions of 7.3% and 5.3% in annual operating costs and costs of new construction respectively, compared to the expected 15% and 10%).

In sum, as a conservative estimate of the reasonably calculated benefits internal to PWA, the project appears justifiable. If other excluded cash-flow benefits to PWA could be estimated, the financial rate of return would be more favorable still. If the analysis could be extended to include quantifiable economic and social benefits to customers, in effect benefits "external" to PWA, the results would strengthen the conclusion further. The measurement problems such an extension effort would entail would be very difficult, are no longer attempted by IBRD on much larger loan projects, and have not been attempted here since there is no doubt, if feasible, that they would move the benefit cost relationship in a positive direction.

Table F-1.1

## Summary of PWA Project, Operating and Capital Costs ( US\$)

Year	Estimated IDP Project Costs	Estimated O&M <u>1/</u>	PWA Budgets Capital <u>1/</u>	Other Donor Capital Investments <u>2/</u>	Total Capital
1	2,222,000	25,000,000	2,670,000	10,000,000	12,570,000
2	2,914,000	26,000,000	2,700,000	8,000,000	10,700,000
3	2,451,000	27,000,000	2,800,000	8,000,000	10,800,000
4	1,916,000	28,000,000	2,900,000	8,000,000	10,900,000
5	1,220,000	29,000,000	3,000,000	8,000,000	11,000,000
6	1,300,000	30,000,000	3,100,000	8,000,000	11,100,000
7	1,400,000	31,000,000	3,200,000	-	3,200,000
8	1,500,000	32,000,000	3,300,000	-	3,200,000
9	1,600,000	33,000,000	3,400,000	-	3,400,000
10	1,700,000	34,000,000	3,500,000	-	3,500,000
<b>Total</b>	<b>18,223,000 <u>1/</u></b>				

1/ 7% + escalation assumed per year.

2/ Based on information available as of February 1983.

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Table F-1.2  
Estimated Direct Project Benefits (US\$)  
(Anticipated Benefits)\*

Year	O&M Benefits**	Capital Benefits**		Total Benefits
		PWA	Other Donors	
1**	-	-	-	-
2**	780,000	54,000	160,000	994,000
3**	1,620,000	112,000	320,000	2,052,000
4**	2,940,000	203,000	560,000	3,703,000
5	4,350,000	300,000	800,000	5,450,000
6	4,500,000	310,000	800,000	5,610,000
7	4,650,000	320,000	-	4,970,000
8	4,800,000	330,000	-	5,130,000
9	4,950,000	340,000	-	5,290,000
10	5,100,000	350,000	-	5,450,000

\* Anticipated project benefits are a 15% reduction in annual operation costs and a 10% reduction in the costs of new construction.

\*\* Full effects of training and institutional improvements are not expected until the fifth year. Interim gains expected include:

	<u>Year 1</u>	<u>Year 2</u>	<u>Year 3</u>	<u>Year 4</u>	<u>Year 5-10</u>
O&M (%)	0	3.0	5.0	10.5	15
Capital (%)	0	2.0	4.0	7.0	10

Table F-1.2 (Con'd)  
Estimated Direct Project Benefits (US\$)  
(Break - Even)\*

Year	O&M Benefits**	PWA	Capital Benefits** Other Donors	Total Benefits
1**	-	-	-	-
2**	380,000	29,000	85,000	494,000
3**	789,000	59,000	170,000	1,512,000
4**	1,432,000	108,000	297,000	3,349,000
5	2,118,000	216,000	424,000	2,758,000
6	2,192,000	164,000	424,000	2,780,000
7	2,264,000	170,000	-	2,434,000
8	2,338,000	175,000	-	2,513,000
9	2,411,000	180,000	-	2,591,000
10	2,484,000	185,000	-	2,669,000

\* Break - even project benefits are 7.3% reduction in annual operating costs and a 5.3% reduction in costs of new construction.

\*\* Full effects of training and institutional improvements are not expected until the 5th year. Interim gains include:

	<u>Year 1</u>	<u>Year 2</u>	<u>Year 3</u>	<u>Year 4</u>
O&M (%)	0	1.5	2.9	5.1
Capital (%)	0	1.1	2.1	3.7

Table F-1.3

Project Benefit-Cost Ratio (US \$)  
(Anticipated Benefits)

Year	Costs	Present Worth of Costs* Factor	Present Worth of Costs* \$	O&M Benefits	PWA Capital Benefits	Discount Factor @ 5%	Other Donor Benefits	Discount Factor @ 3.25%	Present Worth of Total Benefits (\$)
1	2,222,000	.890	1,978,000	-	-	-	-	-	-
2	2,914,000	.840	2,448,000	780,000	54,000	.840	160,000	.789	827,000
3	2,451,000	.792	1,941,000	1,620,000	112,000	.792	320,000	.728	1,605,000
4	1,916,000	.747	1,431,000	2,940,000	203,000	.747	560,000	.673	2,725,000
5	1,220,000	.705	860,000	4,350,000	300,000	.705	800,000	.622	3,776,000
6	1,300,000	.665	865,000	4,500,000	310,000	.665	800,000	.574	3,658,000
7	1,400,000	.672	941,000	4,550,000	320,000	.672	-	.531	3,116,000
8	1,500,000	.592	888,000	4,800,000	330,000	.592	-	.490	3,037,000
9	1,600,000	.558	893,000	4,950,000	340,000	.558	-	.453	2,952,000
10	<u>1,700,000</u>	.527	<u>896,000</u>	5,100,000	350,000	.527	-	.418	<u>2,872,000</u>
	18,223,000		13,141,000						\$24,558,000

$$\text{Benefit - Cost Ratio} = \frac{24,558,000}{13,141,000} = 1.87$$

\* Present Worth Discount: 5% for O&M costs and PWA capital and 3.25% for other donor capital

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Table F-1.3 (Cont'd)  
 Project Benefit-Cost Ratio (US \$)  
 (Break - Even)

Year	Present Worth of Costs*	O&M Benefits	PWA Capital Benefits	Discount Factor @ 5%	Other Donor Benefits	Discount Factor @ 8.25%	Present Worth of Total Benefits*
							(\$)
1	1,978,000	-	-	-	-	-	-
2	2,448,000	380,000	29,000	.840	85,000	.789	411,000
3	1,941,000	789,000	59,000	.792	170,000	.728	796,000
4	1,431,000	1,432,000	108,000	.747	297,000	.673	1,350,000
5	860,000	2,118,000	216,000	.705	424,000	.622	1,909,000
6	860,000	2,192,000	164,000	.665	424,000	.574	1,810,000
7	865,000	2,264,000	170,000	.627		.531	1,526,000
8	888,000	2,338,000	175,000	.592		.490	1,483,000
9	893,000	2,411,000	180,000	.558		.453	1,446,000
10	<u>895,000</u>	2,484,000	185,000	.527		.418	<u>1,407,000</u>
	\$13,141,000						12,143,000

$$\text{Benefit-Cost Ratio} = \frac{12,143,000}{13,141,000} = 0.92$$

Break - Even = 7.3% reduction in annual O&M costs  
 = 5.3% reduction in capital costs

\* Present Worth Discount: 5% for O&M costs and PWA capital  
 8.25% for other donor capital

Table F-1.4  
Project Internal Rate of Return (US \$)

Year	Estimated Costs	Estimated Benefit	Net Project Benefit
1	2,222,000	-	-2,222,000
2	2,914,000	994,000	-1,920,000
3	2,451,000	2,052,000	-392,000
4	1,916,000	3,703,000	1,787,000
5	1,220,000	5,450,000	4,230,000
6	1,300,000	5,610,000	4,310,000
7	1,400,000	4,970,000	3,570,000
8	1,500,000	5,130,000	3,630,000
9	1,600,000	5,290,000	3,690,000
10	1,700,000	5,450,000	3,750,000

IRR = 40.05%

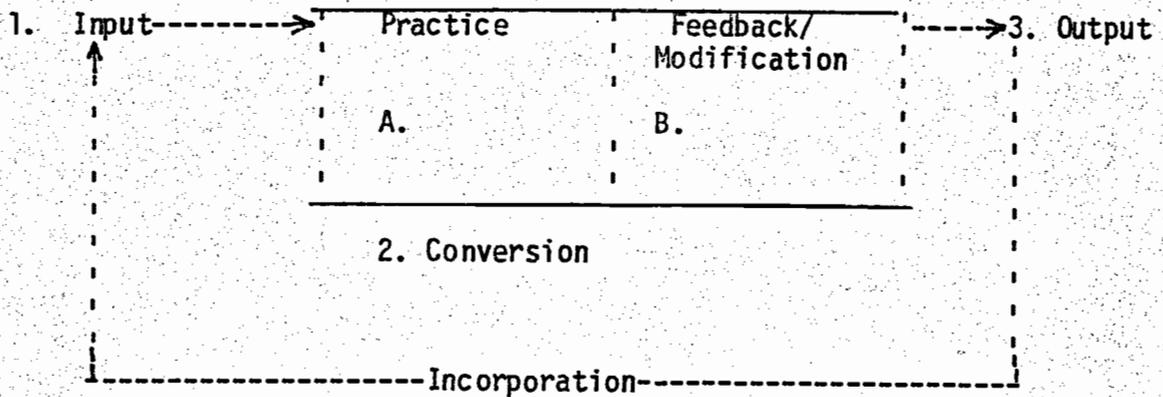
## 2. Technical Analysis

### A. Selection and Use of Training and Institutional Development Technology

In order to create and sustain institutional building (the primary focus of this project), the selected technology must focus on a skill transfer process within the overall framework of training. Basically, this approach involves a two-step process whereby OMDT and other PWA counterpart staff obtain both training and technical skills, and then subsequently function as trainers, transferring these technical skills to others within the organization.

The primary level of skill transfer can be described as a client-consultant relationship wherein skills are transferred through a conscious process using day to day work as a learning ground, and by the introduction of specific skills and knowledge through structured learning events (such as workshops, written materials, and seminars). Once the skill is introduced, it is practiced and modified by the client through active experimentation on the job (secondary level). An analysis-feedback phase follows so that the client may modify the skill for appropriate use before formalizing its incorporation into the institution. This process can be visualized using the following systems model.

Chart F-1 Skill Transfer Model for Institutional Building



<u>1. Input</u>	<u>2. Conversion A.</u>	<u>2. Conversion B.</u>	<u>3. Output</u>
Skill demonstration workshops	On-the-job practice	Reflection	Behavior change
Seminars	Active experimentation	Discussion	Organization change
Reading materials		Workshop	
Counterpart contact		Action planning	
Fellowships			

If the above described process is to be effective, two key issues must be considered: the selection and skills of the consultant, and the ability of the institution to absorb the skill transfer process. The approach of the consultant will require a development orientation which translates into the ability to "work with," rather than "do for." Within the cultural context this will require a high degree of personal contact and strong communication skills on the part of the consultant. The consultant must provide the room for the client to feel a part of the process and to claim local ownership for the outcomes. In fact, the client must feel that the consultant is working for him rather than the client feeling as the junior partner in the process.

The ability of the institution to absorb the technology will depend on both the length of time for the project and the many demands placed upon its staff which may interfere (e.g., work pressures to produce, availability of staff, budget, educational background, motivation). The length of time and the pace of the inputs are largely controllable. The institutional demands are largely uncontrollable and must be constantly assessed and project plans adjusted over the life of the project.

#### B. Requirements of the Technology

A great deal of experience has been accumulated on the effectiveness and requirements of training approaches in development work over the past twenty years. Effective models do exist and are in practice in industry, both in developed countries (such as the US and Japan) and in developing countries (such as the Philippines and Indonesia). For the levels of training work designed into this project, it is important that the contractor be skilled in the use of adult learning (applied behavioral science) and experiential, criterion-referenced training approaches. Both are briefly described to aid in the selection of the contractor.

##### a. Adult Learning Requirements

Adult learning follows a four step cycle model for conducting training events. This is often referred to as the "experiential learning cycle".

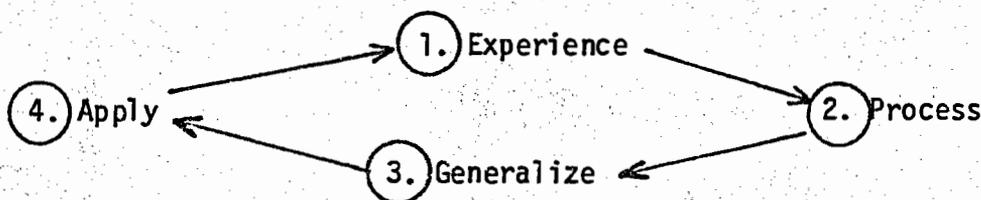


Chart F-2 The Experiential Learning Cycle

1) Experience: This step in the model is a training event which is largely practical or experiential in nature. Examples are demonstration, case study, problem cases, role play, field experience, short lecture, written exercises, etc. In this step the participant experiences an initial learning task. The learning task is structured using measurable indicators and a carefully designed training format which is written in advance. This step can be considered the skill or knowledge input.

2) Process: Immediately after the experiential step, a processing step is introduced to the participants. This usually consists of an instruction to carry out one or more of the following: discuss in small groups; reflect alone; write notes; discuss in the full group; answer questions (prepared in advance). This step is designed to guide the learner in a sorting, gleaning or analysis process of the important or significant of the prior experience. This serves to reinforce the learning process and correct errors in skill or concept.

3) Generalize: Following the process, the learner is then helped to generalize the important and significant uses or application to other like situations. This is accomplished by asking questions and recording responses. The assumption is that if a skill or knowledge is truly learned, then the learner should be able to articulate or demonstrate what he has learned. This step serves to further reinforce the learning.

4) Application: The final step in the learning cycle is the actual use of the skill on-the-job. In this step the skill is tried out and refined. The training process used for this is planning for use of the skill in the individual's normal work setting.

#### b. Criterion-Referenced Training Requirements

The criterion-referenced approach is essentially training by measurable objectives. In order to develop training using this method, the designer must follow a systematic process: (1) needs assessment; (2) selection of training intervention; (3) specification of training outcomes (objectives); (4) training design; (5) conduct training; and (6) measure and evaluate outcomes.

1) Needs Assessment: Two primary tools are used in needs assessment, task analysis and performance problem solving. In task analysis, a model is developed which specifies all the skills, knowledge, steps, and performance indicators to carry out a job. This model is then used to compare actual performance on the job against the model. Once performance discrepancies are specified, this information is used to decide what training should be used and what performance indicators are required for training objectives. Performance problem solving is used to analyse job performance to pin-point what needs to be improved. It is used to sort out which problems can be attacked through training and which require other problem solving solutions. Both task analysis and performance problem solving can be used together or separately. The end result is specification of training need.

2) Selection of Training Intervention: Once training needs are identified, an analysis must be made to decide how to treat the problem. Can it be dealt with through skills training, long-term training, short-term, on-the-job coaching or is it better not to conduct training? Is it a training problem or a management problem? The cost effectiveness of alternatives needs to be considered.

3) Specification of Training Outcomes: In this step the task analysis is used to define a set of training objectives which specify what will be learned and how it will be measured or evaluated. This step is the key to designing training which will result in change.

4) Training Design: This step is the process of specifying exactly what will occur in the training event. It lays out the activities, time lines, and selects the appropriate training device to achieve the outcomes.

5) Conduct Training: Training is carried out using the training design. The experiential learning cycle (explained in Chart F-2) is carried out.

6) Measure and Evaluate Outcome: This final step measures if the training objectives have been achieved, i.e., the results of the training are reflected in on-the-job performance. A great variety of devices may be used including observation, testing, certification check lists, and follow-up interview or output measuring on-the-job.

### C. Feasibility in the Use of the Technology

Two primary issues will determine the feasibility of using skill transfer technology in this project. The availability of consultant skills and PWA's capacity and willingness to absorb the technology.

It is doubtful that start-of-the-art training skills exist locally. Other institutions in Thailand conduct training (such as the Metropolitan Water Works Authority - MWWA), but most of these approaches use traditional lecture methods. However, there is a great deal of local interest in learning how to use advanced training models as evidenced by requests for training assistance now in MWWA from the Japanese government and the existence of the Professional Trainers Association and the Organizational Development Group, local associations for training officers and training professional in industry.

It should not be difficult to obtain the required technology outside of Thailand. A great many training resources exist both in the U.S. and other countries which can be used to assist in this project. Successful training models in water authorities have been developed in Trinidad and Tobago, the Philippines, Sri Lanka, using foreign contractors.

The willingness within PWA to absorb the technology is in clear evidence. Two important indicators are the positive reception the 30 top executives of PWA gave to a recent team building workshop (November, 1982, Pattaya) and PWA's commitment to create a training department through its reorganization. The training department is currently using two short term consultants to assist them in developing the training department this year. Both the Pattaya workshop and current efforts have used all of the elements of training technology described above successfully.

## 3. Administrative Analysis

### A. Organization

PWA was established by the Provincial Waterworks Authority Act of 1979 as a state enterprise to serve areas outside of Bangkok. The Act states that PWA should:

"Engage in and promote the business of waterworks by conducting surveys, providing sources of water and procuring raw water for production, delivery and distribution of water including undertaking other business related to or in continuation from the waterworks; for the purpose of providing utilities' services to the public giving primary consideration to the interest of the country and public health of the population".

PWA was formed by consolidating two divisions of two separate agencies. Thus the day-to-day functions of PWA reflect a partial consolidation of the policies and procedures of the two predecessor agencies. PWA has taken significant initial steps to improve the effectiveness of its organization. The latest approved organizational structure for PWA is shown in Chart II-1. The reorganization focused particular attention on eliminating the duplication and confusion created by the consolidation. A detailed description of PWA with the latest strategies on the organization is contained in Annex H.

B. Present Capability of Departments Engaged in Project

Overall management of the Project will be the responsibility of a PWA official with the rank of Assistant Governor. This person will be assigned an administrative assistant and adequate support staff. The Project Director will also be assisted by the project-funded consultants, and especially by the team leader/corporate planner.

Much of the proposed activity will center in the OMDT, Planning, Administrative, Personnel Divisions, and the Departments of Waterworks Development, Engineering, and Construction Supervision. OMDT has only recently been established and, as yet anyway, has only a Director. A workplan has been developed for the first year, however, and additional staff are expected to be added soon. A budget of 2.4 million baht has been provided for the first year of OMDT operations. The OMDT will be gaining considerable experience prior to the start-up of the proposed Project. Other key Divisions involved in implementation will also be strengthened prior to Project start-up, both through the addition of new staff and the return of several who are currently abroad on fellowships.

In short, we believe that with the assignment of a full complement of staff to the PWA units cited above, Project implementation should proceed as planned.

C. Planned Efforts to Improve the Capability of Departments Engaged in this Project

The PWA Procurement Division experiences some confusion and inconsistency as a result of the lingering remnants of the prior agencies. However, the Procurement Division has demonstrated their ability to procure large professional source contracts on several prior occasions subsequent to PWA's formation. Thus the present ability to procure the necessary services exists within PWA. Similarly, PWA has demonstrated an ability to administer the day-to-day activities of large professional service contracts.

All of the PWA divisions or departments that are expected to direct institutional development activities are currently in place with the exception of the corporate planning activity and the Research Division. The staffing of both the engineering and planning is at present very limited and this project could significantly tax the capabilities of these two departments. Several engineers are presently on fellowship and should return to the departments prior to project commencement.

During the institutional development phases of the project, many groups of PWA will be reviewed carefully to assess means of improving their institutional capability including:

- Office of Manpower Development and Training
- Office of Waterworks Development
- Office of Analysis and Evaluation
- Finance and Accounting Department
- Administrative Division
- Personnel Division
- Procurement Division
- Engineering Department
- Construction Supervision Department
- Regional Offices

Staff members of each of these PWA groups will be members of teams in these institutional development efforts, contributing their knowledge and expertise in their own subject matter areas while learning how to develop systematic approaches to their day-to-day work. These project activities are expected to eliminate much of the confusion that arose from the consolidation of the predecessor agencies. The revised organizational structure plans an increase in the staffing of the engineering and planning departments permitting these departments to more easily absorb the direction of selected activities in this project. The reorganization will also create and staff the Research Division and formalize the corporate planning activities. Corporate planning activities will also be further strengthened by the use of short term consultants to be funded by other donors. The planning function is critical to ensure that the later stages of training provided by this project and the institutional development planned by this project are compatible with PWA's long term goals. The Operations, Maintenance and Training contract will provide additional advice to PWA prior to the start of this project on selected areas of organizational efficiency, including procurement.

PWA's ability to administer large service contracts has been demonstrated to be adequate, but is expected to be improved substantially as a result of the activities proposed by this project. This project will place particular emphasis on improving PWA's ability as an organization to make the prompt and sound decisions required to make full use of external consultants. Emphasis will also be placed on standardizing policies and procedures to further improve PWA's administrative, financial and procurement capability.

## EVALUATION PARAMETERS

The following list of evaluation parameters has been prepared to indicate the types of data that are expected to be used to monitor and evaluate the progress of the Project. This list should be reviewed during the Project mobilization phase to reflect PWA's progress and other data sources which become available during the time period from Project development to contract commencement.

### I. Achievement of Agency Goals

- A. Number of waterworks with improved efficiency.
- B. Number of waterworks with increased capacity.
- C. Number of new installations.
- D. Funds made available from:
  - 1. Revenues
  - 2. Government
  - 3. External grants and loans
- E. Increased number of customers.
- F. The number of personnel per 1,000 consumers.
- G. The value of outstanding uncollected water bills.
- H. Number of waterworks under concession.

### II. PWA Production Performance Indicators

- A. Total water production-central, by region and by facility.
- B. Water consumption-central, by region, and by facility.
- C. Unaccounted-for-water
  - 1. System leakage
  - 2. Unbilled water

### III. PWA Maintenance Performance Indicators

- A. Facilities in operation continuously - central, by region, by facility.
- B. Funds expended on replacement parts.

IV. PWA Financial Performance Indicators

- A. Total annual budget - central, regional, facility.
- B. Actual expenditures - central, regional, facility.
- C. Total revenues collected - central, regional, facility.
- D. Total billings uncollected - central, regional, facility.
- E. Unit cost of production - central, regional, facility.
- F. Unit cost per connection - central, regional, facility.

V. PWA Quality of Service Performance Indicators

- A. Day service provided - central, regional, facility.
- B. Days acceptable quality met - central, regional, facility.

VI. PWA Manpower and Training Performance Indicators

- A. Total staff assigned - central, regional, facility.
- B. OMDT annual targets met.
  - 1. Training courses conducted
  - 2. Training materials/manuals produced
- C. Training information system development targets met.
  - 1. Analysis completed
  - 2. Performance standard developed
  - 3. Decision-making models designed
  - 4. Training needs identified on an on-going basis
- D. Training plan development targets met.
  - 1. Immediate training plan completed
  - 2. Medium-term training plan completed
  - 3. Long-term training plan completed
  - 4. Each annual plan updated
- E. Skill training targets met. Workshops conducted:
  - 1. Organizational Development
  - 2. Management
  - 3. Technical
  - 4. Administration

DESCRIPTION OF

THE PROVINCIAL WATERWORKS AUTHORITY\*\*

1. INSTITUTION AND ORGANIZATION

1.01 The Provincial Waterworks Authority Act of 1979 established PWA as a State Enterprise and empowered it to distribute piped water in all provinces outside of metropolitan Bangkok. The Act authorizes PWA to : "Engage in and promote the business of waterworks by conducting surveys, providing sources of water and procuring raw water for production, delivery and distribution of water including undertaking other business related to or in continuation from the waterworks; for the purpose of providing utilities' services to the public giving primary consideration to the interest of the country and public health of the population".\*

1.02 The PWA is controlled by its Board of Directors which consists of twelve members who are appointed by Cabinet and hold office for three year terms.

1.03 The Governor who is appointed by the Board, with Cabinet approval, is the chief executive of PWA. He is a member of, and official Secretary to the Board.

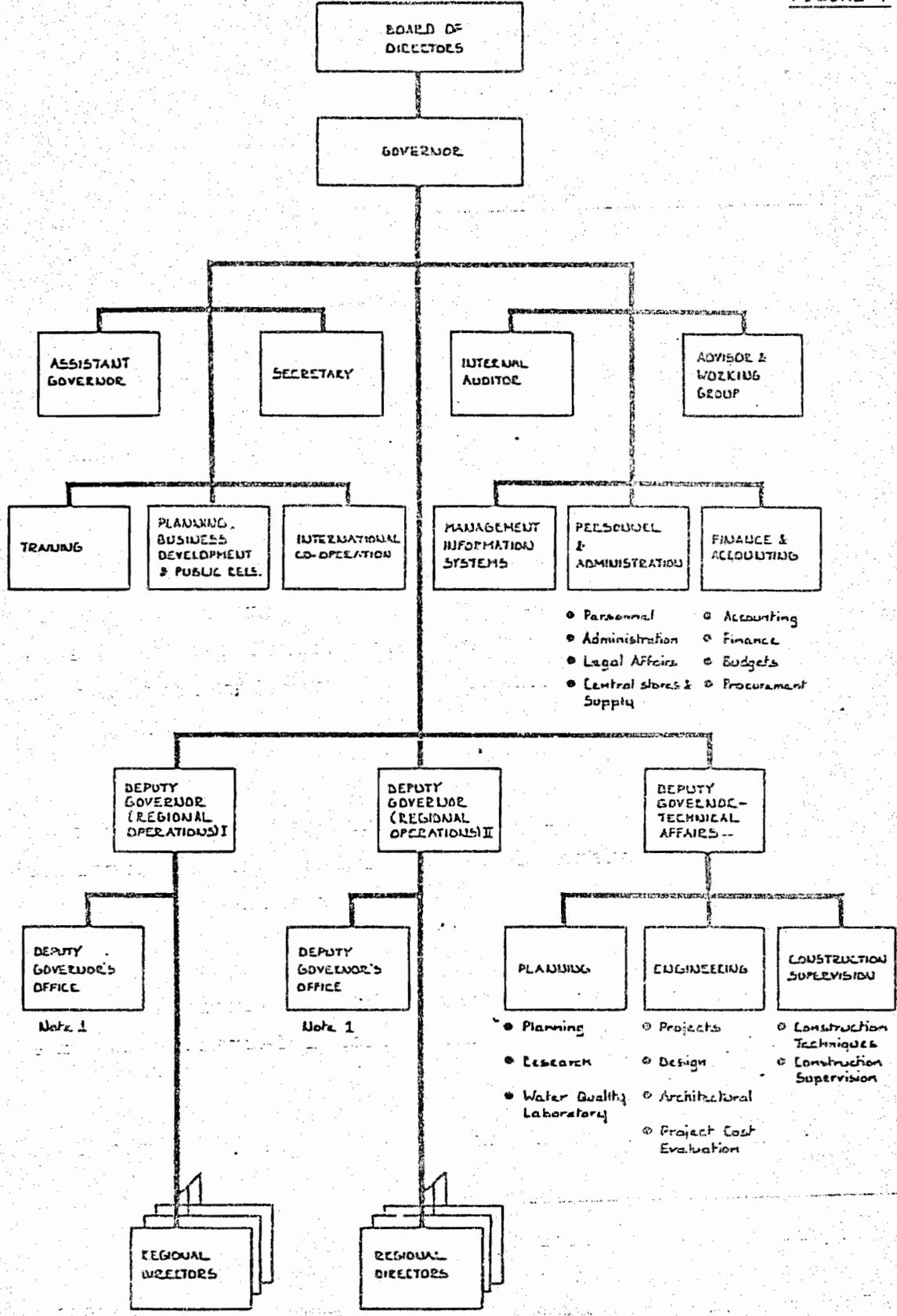
1.04 The organization structure, Figure 1, is based on

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\* Translation, by Office of the Judicial Council in the Prime Minister's Department.

\*\* This annex taken from the UNDP Tripartite Report of November 1982.

FIGURE 1



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\* See revised organization - Sep. 1983, page 34.

15 regional offices which provide the link between PWA Headquarters in Bangkok and the water supply systems. These systems which are owned and operated by PWA, serve provincial towns and municipalities throughout the country (Figure 2).

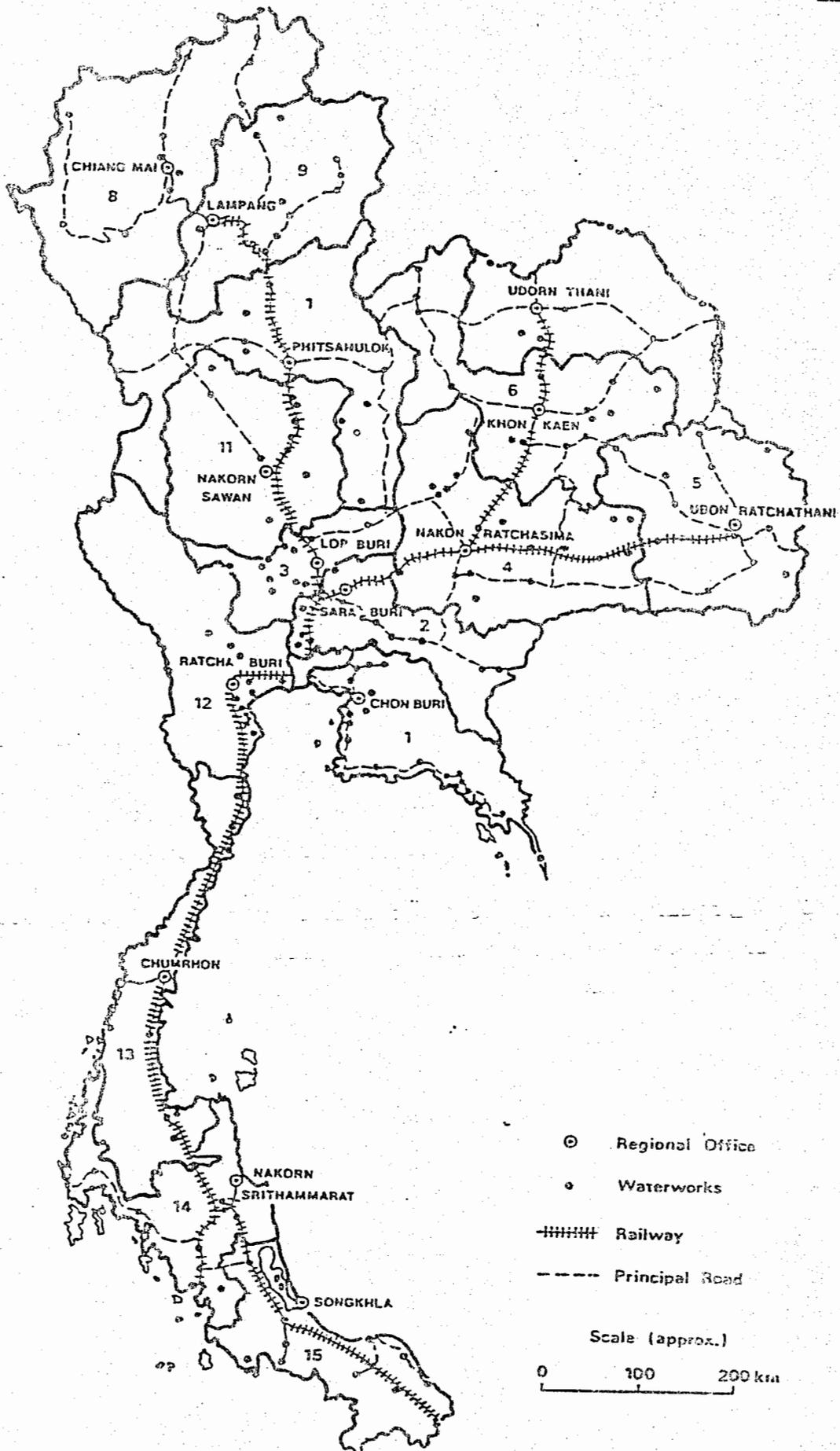
## 2. FUNCTIONS AND OPERATIONS

2.01 The four main functions of PWA are:

- (a) to plan and construct urban water supply projects throughout the country outside Bangkok;
- (b) to operate those projects, supplying water to 1.9 million consumers (1981);
- (c) as agent to local authorities, plan, construct and hand over (but not operate or maintain) rural water supply projects; and
- (d) to provide technical support to local authorities operating the rural projects, this support being normally provided on an adhoc basis at the request of the local authority concerned.

2.02 Operating and development statistics for Fiscal Year 1981 are shown in Table 1. Current assets are shown in Table 2.

P.W.A. REGIONS



(Financial Year October 1980 - September 1981, or at end September 1981)

1 Operation and Maintenance:

Waterworks operated by PWA	169	
Total output capacity	754,300	m <sup>3</sup> /day
Gross water production	498,600	m <sup>3</sup> /day (average)
Net metered consumption	367,100	
Estimated water used in treatment works	20,600	- - -
Estimated standpipe consumption	2,900	- - -
Number of consumer connections	315,785	
Estimated population served	1.90	million (approx) (1)
Total population in areas served	3.85	

2. Development:

	No	Capital Allocation	
		(Mn Baht)	(Mn US\$)
Water schemes under development			
- urban: in hand start of year	12	209.1	8.7
started in year: new	4	45.9	2.0
improvements	6	50.0	2.2
- rural: new	13	36.0	1.6
improvements	5	9.0	0.4
Counterpart funds		103.2	4.5
Other projects		48.0	2.1
<b>Total</b>	<b>40</b>	<b>492.2</b>	<b>21.5</b>

3. Manpower:

Headquarters staff	730	(14%)
Regional offices	640	(12%)
Waterworks	3,820	(74%)
	<u>5,190</u>	<u>(100%)</u>

4. Financial Results:

	(Mn Baht)	(Mn US \$)
Revenue: water sales	318.2	13.8
installation charges	41.2	1.8
other	2.2	0.1
	<u>361.6</u>	<u>15.7</u>
Costs: personnel	248.3	10.8
electricity	126.1	5.5
chemicals	44.8	1.9
pipes	26.6	1.2
fuel and lubricants	26.3	1.1
repairs and maintenance	37.1	1.6
other	10.0	0.5
	<u>519.2</u>	<u>22.6</u>
	<u>157.5</u>	<u>6.8</u>

5. Tariff Structure:

		Present	Proposed
		(Baht per Cubic Metre)	
<u>Consumption (m<sup>3</sup>/month)</u>			
First ten	( 1-10)	2.00	2.75
Next ten	( 11-20)	2.50	3.75
Next thirty	( 21-50)	3.00	5.00
Next thirty	( 51-80 )	4.00	5.25
Next twenty	( 81-100)	4.50	7.50
Next two hundred	(101-300)	5.00	9.00
All subsequent consumption	( 301 +)	5.50	10.50

Notes 1. Estimated population served is based on an assumed figure on six persons per connection.

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PWA

TABLE 2

CURRENT ASSETS1982

Assets	Current quarter	Previous quarter
<u>Fixed Assets</u>		
Land	39.58	39.58
Buildings, plant and equipment	575.00	477.54
Less: Accumulated depreciation	<u>52.56</u>	<u>39.57</u>
Net fixed assets service	<u>522.44</u>	<u>1439.27</u>
Total Fixed Assets	<u>561.82</u>	<u>478.55</u>
<u>Other Assets</u>		
Advance	4.98	11.74
Construction in progress	<u>394.87</u>	<u>375.90</u>
Total Other Assets	<u>399.85</u>	<u>387.64</u>
<u>Current Assets</u>		
Cash	147.16	137.28
Customer Accounts Receivable	88.34	76.73
Less: Provision for bad debts	<u>1.97</u>	<u>1.27</u>
Net Customer Accounts Receivable	86.37	75.46
Other Accounts Receivable	<u>6.36</u>	<u>5.94</u>
Total Current Assets	239.89	218.58
Total Assets <sup>1/</sup>	<u>1,201.56</u>	<u>1,084.87</u>

Note: <sup>1/</sup> Assets transferred from the Department of Public Works in 1979 are in process of evaluation and are not included.

3. MANPOWER AND TRAININGMANPOWER

3.01 The PWA has 5213 employees located as follows:

Table 3 LOCATION OF STAFF

<u>Branch</u>	<u>Bangkok</u>	<u>Regional Offices</u>	<u>Waterworks</u>	<u>Total</u>
Admin. & Finance	386	-	-	386
Technical Affairs	222	-	-	222
Operations	<u>122</u>	<u>637</u>	<u>3,846</u>	<u>4,613</u>
TOTAL	<u>730</u>	<u>637</u>	<u>3,846</u>	<u>5,213</u>

3.02 The 169 PWA owned water supply systems are operated by 3,846 waterworks personnel organized under the Operations Branch. Waterworks are essentially small units with an average of less than 25 operations personnel per waterworks (Table 4). The deployment of staff at waterworks is shown in Table 5 which indicates an average of 12 waterworks staff per 1,000 connections.

3.03 Regional Office staff number 637 deployed as shown in Table 6, and Headquarters staff number 730, (Table 7).

TRAINING

3.04 The revised Organization Structure includes a Manpower Development and Training Department, and a full time Training Director was appointed in June 1982. The Department is in the formative stages, and the Director is concentrating on the design and development of the training institution and on the establishment of training, strategies, guidelines, concepts and methods.

Table 4 Distribution of Waterworks by Number of Employees

Number of employees at each works	Number of waterworks	Total number of employees
under 10	23	177
10-19	71	972
20-29	39	943
30-39	19	626
40-49	8	360
50-59	1	52
60-69	3	186
70-79	3	223
over 80	<u>3</u>	<u>307</u>
	170	3,846

Table 5 Deployment of Staff at Waterworks Level

Function	Number of staff	%	Staff per 1,000 connections	Staff per 1,000 population served
Supervisory/ Administrative	1,736	45	5.4	0.9
Technical/ Operating	1,643	43	5.1	0.9
Meter Reading/ Bill Collecting	467	12	1.5	0.2
Total	<u>3,846</u>	<u>100</u>	<u>12.0</u>	<u>2.0</u>

Table 6 Deployment of Staff at Regional Offices

Function	Region Number															Total	%
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
Directorate	3	4	4	4	4	3	4	4	3	4	3	3	4	3	4	54	8
Department Heads	9	9	6	6	7	9	7	8	8	8	8	7	7	9	9	117	18
Laboratory	2	2	2	-	-	-	1	-	1	1	-	2	-	-	1	12	2
Technicians	5	3	3	3	2	4	2	2	7	7	7	7	2	7	3	64	10
Draughtmen.	1	1	6	1	1	-	1	6	-	-	2	1	-	-	-	20	3
Mechanics	9	6	6	12	5	10	7	5	9	6	4	6	3	4	10	102	16
Plumbers	1	-	2	-	-	-	1	2	1	3	3	1	-	-	1	15	2
Workers	4	-	-	2	-	5	-	2	2	4	1	2	1	1	3	27	4
Procurement	3	1	-	-	1	2	2	1	-	-	2	1	-	3	-	16	3
Finance	3	3	3	-	4	1	1	2	3	1	1	3	2	6	4	37	6
Administration	6	4	5	4	4	5	5	3	2	1	3	3	2	5	6	58	9
Drivers	4	4	2	5	2	7	2	3	3	4	2	5	2	5	4	54	8
Janitors	1	1	-	1	1	1	-	2	-	-	1	1	-	2	1	12	2
Security	3	2	-	2	2	4	-	2	2	2	-	3	1	3	3	29	5
Other	2	-	-	3	4	7	2	-	-	1	1	-	-	-	-	20	3
<b>TOTAL</b>	<b>56</b>	<b>40</b>	<b>39</b>	<b>43</b>	<b>37</b>	<b>58</b>	<b>35</b>	<b>42</b>	<b>41</b>	<b>42</b>	<b>38</b>	<b>45</b>	<b>24</b>	<b>48</b>	<b>49</b>	<b>637</b>	

Table 7 Distribution of Staff at Headquarters

Function	Other Central Functions	Admin Branch and Finance	Technical Affairs	Operations	Total	%
Top Management	5	-	-	-	5	1
Planners etc.	-	-	13	-	13	2
Engineers	-	-	43	2	45	6
Architects	-	-	2	-	2	*
Cost Estimators	-	-	11	-	11	2
Technicians	-	7	94	48	149	20
Draught men	-	-	11	-	11	2
Maintenance Technicians	-	1	-	29	30	4
Inspectors	9	-	-	-	9	1
Laboratory	-	-	-	11	11	2
Finance	39	99	5	4	147	20
Procurement	-	27	-	-	27	4
Administrative/ clerical	18	66	43	28	155	21
Personnel	-	27	-	-	27	4
Lawyers	-	7	-	-	7	1
Public Relations	3	-	-	-	3	*
Drivers	-	37	-	-	37	5
Security	-	24	-	-	24	3
Labourers	-	18	-	-	18	2
	74	313	222	122	731	

\* Less than 0.5%

- 3.05 Manpower plans and skills inventories will be developed during 1983 along with position descriptions, task analysis and the identification of training needs at all levels.
- 3.06 Overall training program design should be prepared by mid 1983, and full scale Training of Trainers and program delivery should proceed during the second half of 1983.
- 3.07 As the importance of training to the PWA program has not been fully appreciated during the earlier years of PWA, up to date training expertise and experience is limited to only several staff members. Consequently external assistance is needed to help design and establish the training institution, strategies and programs.
- 3.08 Only 3% of all PWA staff have University degrees, 35% have only secondary and 31% only a primary school education. Table 8 summarizes education qualifications.
- 3.09 The educational background of PWA-personnel will be taken into account when designing training programs, and basic skills courses in reading, writing, arithmetic and basic science courses will be included as needed.

4. WATER SUPPLY SYSTEMS - OPERATIONS AND MAINTENANCE PROGRAM

- 4.01 PWA is involved in both rural and urban water supply, but the scope of PWA activities in each sector differs.

Table 8 Educational Qualifications of Staff

Qualification Level	<u>Subect Specialism:</u>		Law	Accountancy or Social Science/ Humanities	No Specialism	Total	%
	Engineering	Other Science or Technology					
Doctorate	2	-	-	-	-	2	*
Master's Degree	12	-	-	3	-	15	*
Degree, Bachelor's	67	19	19	70	-	175	3
Vocational Course	428	-	-	48	-	476	9
Certificate Course	728	-	-	350	-	1,078	21
Secondary School	-	-	-	-	1,816	1,816	35
Primary School	-	-	-	-	1,637	1,637	31
	<u>1,237</u>	<u>19</u>	<u>19</u>	<u>471</u>	<u>3,453</u>	<u>5,199</u>	

\* = less than 0.5%

- 4.02 PWA serves 169 urban communities having populations ranging from under 5,000 to 175,000 people with an estimated total population of 3.9 million. The classifications of PWA urban waterworks is given in Table 9, and 10.
- 4.03 The waterworks which are planned, designed, constructed owned and operated by PWA have a total capacity of 754,300 m<sup>3</sup>/day and sales average about 390,000 m<sup>3</sup>/day (see Table 1 ).
- 4.04 For rural communities with populations averaging about 3,200, PWA provides planning design and construction services for piped water supply system development. The 650 rural systems constructed thus far by PWA are operated by the local communities with PWA providing technical assistance for operations and maintenance.
- 4.05 Capital allocations for rural and urban schemes are listed in Table 1 .

---

## 5. WATER DECADE

- 5.01 PWA is collaborating with AIT in the development of Water Decade Master Plans which are expected to be completed in about 18 months. The plan will include all rural areas, both piped and other sources, and all urban communities except metropolitan Bangkok.
- 5.02 Estimated existing levels of service and projected needs, country wide and including all sources are as follows:

TABLE 9

Classification of PWA Waterworks Plants by Plant Capacity (1981)

<u>Region</u>	Number of plants with capacity not exceeding:-													Capacities and Numbers of Larger Plants
	<u>0.5</u>	<u>1.0</u>	<u>1.5</u>	<u>2.0</u>	<u>2.5</u>	<u>3.0</u>	<u>4.0</u>	<u>5.0</u>	<u>6.0</u>	<u>7.0</u>	<u>8.0</u>	<u>9.0</u>	<u>10.0</u>	
	x 1,000 m <sup>3</sup> /d													x 1,000 m <sup>3</sup> /d
1	1	1	3	1	2	-	-	2	-	-	1	-	-	11 26 48 (3 plants)
2	-	2	-	1	3	2	-	1	-	1	-	-	-	
3	-	3	1	3	2	-	2	-	-	1	-	-	1	42 (1 plant)
4	-	7	2	3	1	-	-	-	-	1	1	2	-	
5	1	6	-	2	1	1	1	-	-	1	-	-	-	28 (1 plant)
6	1	3	1	1	2	3	1	1	-	-	-	-	-	22 (1 plant)
7	-	3	1	2	-	2	1	1	1	-	-	-	-	22 (1 plant)
8	1	5	-	3	-	1	-	1	-	-	-	-	-	58 (1 plant)
9	-	2	2	2	2	1	1	-	-	-	1	-	1	
10	-	2	1	-	2	4	1	1	-	-	-	-	-	
11	1	1	-	2	3	1	2	-	-	-	-	-	-	
12	-	2	-	-	1	-	2	-	1	1	-	-	-	13 (1 plant)
13	-	-	-	1	1	1	1	1	-	2	-	-	-	11 (1 plant)
14	-	3	1	2	1	-	3	-	-	-	-	-	-	
15	1	1	-	1	4	-	2	-	1	-	-	-	-	28 (1 plant)
<u>Total</u>														
Column	6	41	12	24	25	16	17	8	3	7	3	2	2	(11 plants)
Cumulative	6	47	59	83	108	124	141	149	152	159	162	164	166	177 Total

TABLE 10

Classification of PWA Waterworks by Number of Connections (1981)

<u>Region</u>	Number of waterworks having the following connections						
	250 to 750	751 to 1,500	1,501 to 2,500	2,501 to 3,500	3,501 to 4,500	4,501 to 5,500	Over 5,000
1	3	6	-	2	2	-	1(15,500)
2	4	4	1	1	-	-	
3	5	4	1	1	2	-	
4	9	3	-	2	1	1	
5	7	3	2	1	-	-	1(9,000)
6	4	2	3	-	2	-	1(9,300)
7	2	3	2	2	1	-	1(9,000)
8	7	2	1	1	-	-	1(11,600)
9	4	3	-	1	2	-	1(6,900)
10	4	1	4	2	-	-	
11	4	1	3	1	-	-	
12	2	1	2	1	1	-	1(6,250)
13	1	2	2	1	1	-	1(6,800)
14	3	3	1	2	-	-	
15	4	3	2	1	-	-	1(12,150)
<b>Total</b>	<u>63</u>	<u>41</u>	<u>24</u>	<u>19</u>	<u>12</u>	<u>1</u>	<u>9</u>

Total number of waterworks:169

Summary:

104 Under 1,500 connections  
56 1,500 - 5,500  
9 Connections in the range 6,000 - 15,000

169

EXISTING LEVELS OF SERVICE AND PROJECTED NEEDS

Source	Population (Provincial) Served (millions)		Projected Needs	
	1980	% of Total	1990	% of Total
<u>Piped Water</u>				
Urban	2.5	5.9	19.0	35.5
Village	2.0	4.7	4.3	8.0
(includes non connected users)				
<u>Wells</u>				
Dug	26.2	62.2	20.5	38.2
Tube	3.0	7.1	5.0	9.3
<u>Rainwater Storage</u>				
	0.6	1.4	4.8	9.0
<u>Other</u>				
	7.9	18.7	-	-
<hr/>				
Totals	42.2	100.0	53.6	100.0
<hr/>				

5.03 The estimated cost to meet the Decade target of providing a safe water supply for all Thai citizens by 1991 is Bht 18,900 million. The PWA portion will be about:

urban - 9,000 million  
rural - 4,500 million.