

**PROPOSED LOAN AND TECHNICAL ASSISTANCE
WATER SUPPLY AND SANITATION PROJECT
(FEDERATED STATES OF MICRONESIA)**

ATTACHMENTS

TABLE 1:	COST SUMMARY
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Table 1: Cost Summary
(\$ million)

Item	Foreign Exchange Cost	Local Currency Cost	Total Cost
A. Base Cost			
1. Chuuk Components			
a. Civil Works	1.5	0.6	2.1
b. Materials and Equipment	0.6	0.0	0.6
c. Project Implementation Support	0.0	0.1	0.1
2. Pohnpei Components			
a. Civil Works	0.8	0.4	1.2
b. Materials and Equipment	0.3	0.0	0.3
c. Project Implementation Support	0.0	0.1	0.1
3. Yap Components			
a. Civil Works	1.2	0.4	1.6
b. Materials and Equipment	0.5	0.0	0.6
c. Project Implementation Support	0.0	0.1	0.1
4. Kosrae Components			
a. Civil Works	1.1	0.3	1.4
b. Materials and Equipment	0.3	0.0	0.3
c. Project Implementation Support	0.0	0.1	0.1
5. Project Management			
a. Consulting Services	1.3	0.2	1.5
b. Equipment and Office Accomodations	0.1	0.1	0.2
c. Incremental Salaries	<u>0.0</u>	<u>0.2</u>	<u>0.2</u>
Subtotal (A)	7.7	2.7	10.4
B. Contingencies			
1. Physical	0.9	0.3	1.2
2. Price	<u>0.4</u>	<u>0.2</u>	<u>0.6</u>
Subtotal (B)	1.3	0.5	1.8
C. Interest During Construction			
1. Interest During Construction	0.0	0.9	0.9
2. Service Charge on Bank Loan	<u>0.1</u>	<u>0.0</u>	<u>0.1</u>
Subtotal (C)	0.1	0.9	1.0
Total	9.2	4.1	13.3
Percent	69	31	100

Source: Staff Estimates

Table 2: Project Cost Estimates
(thousand \$)

Project Component	Total Project			Chhuok			Korae			Pohnpel			Yap		
	Foreign ^a	Local	Total	Foreign ^a	Local	Total	Foreign ^a	Local	Total	Foreign ^a	Local	Total	Foreign ^a	Local	Total
Water Supply Facilities Development															
1. Intake	9	11	20	-	-	-	9	11	20	-	-	-	-	-	-
2. Wells	1,493	816	2,309	848	578	1,426	-	-	-	-	-	-	645	238	883
3. Treatment	814	210	1,024	92	13	105	538	170	708	-	-	-	184	27	211
4. Reservoirs	1,105	222	1,327	602	88	690	394	102	496	-	-	-	109	32	141
5. Transmission/Distribution	2,370	695	3,065	340	72	412	267	55	322	1,076	419	1,495	687	149	836
6. Meters/Connections	407	92	499	164	24	188	117	24	141	83	35	118	43	9	52
Total	6,198	2,046	8,244	2,046	775	2,821	1,325	363	1,688	1,159	454	1,613	1,668	454	2,122
Consulting Services															
1. PMU Support	195	66	261	67	23	90	40	13	53	38	13	51	50	17	67
2. Design Services	821	110	931	358	25	383	182	22	204	46	26	72	235	37	272
3. Construction Supervision	260	33	293	78	10	88	78	10	88	46	5	51	58	8	66
Total	1,276	209	1,485	503	58	561	300	45	345	130	44	174	343	62	405
Project Implementation Support															
1. PMU Salaries	-	170	170	-	65	65	-	28	28	-	31	31	-	46	46
2. PIO Salaries & Local Inspection Services	-	229	229	-	53	53	-	53	53	-	70	70	-	53	53
3. PMU Equipment	80	60	140	28	21	49	15	12	27	17	12	29	20	15	35
4. PIO Equipment	121	39	160	30	9	39	30	9	39	28	12	40	33	9	42
Total	201	498	699	58	148	206	45	102	147	45	125	170	53	123	176
Base Cost ^b	7,675	2,753	10,428	2,607	981	3,588	1,670	510	2,180	1,334	623	1,957	2,064	639	2,703
Contingencies															
Physical ^c	856	299	1,156	300	111	411	182	53	235	140	64	204	234	71	305
Price ^d	467	161	628	156	54	210	105	33	138	83	39	122	122	36	158
Interest/Service Charge															
Interest During Construction ^e	-	887	887	-	332	332	-	162	162	-	144	144	-	249	249
Service Charge on Bank Loan ^f	151	-	151	56	-	56	28	-	28	24	-	24	42	-	42
Total Project Cost ^g	9,149	4,101	13,250	3,120	1,478	4,597	1,985	758	2,743	1,581	871	2,452	2,462	995	3,457
	59.0%	31.0%	100.0%	67.9%	32.1%	100.0%	72.4%	27.6%	100.0%	64.5%	35.5%	100.0%	71.2%	28.8%	100.0%

PMU - Project Management Unit; PIO - Project Implementation Office

- ^a Foreign cost includes both direct and indirect foreign exchange costs.
- ^b Base cost calculated at June 1996 prices.
- ^c At 10 percent, except 15 percent for consulting services.
- ^d Price contingencies calculated at 2.5 percent a year for foreign and local costs.
- ^e Calculated on the basis of current ordinary capital resources (OCR) rate of 6.89 percent.
- ^f Calculated on the basis of 1.0 percent service charge.
- ^g Includes duties and taxes estimated at \$0.23 million.

Table 3: Detailed Financing Plan
(\$ thousand)

item	FY1996			FY1997			FY1998			FY1999			Total		
	Foreign Exchange	Local Currency	Total	Foreign Exchange	Local Currency	Total	Foreign Exchange	Local Currency	Total	Foreign Exchange	Local Currency	Total	Foreign Exchange	Local Currency	Total
A. Bank Financing															
1. Wells	0	0	0	965	0	965	528	0	528	0	0	0	1,493	0	1,493
2. Treatment	0	0	0	94	30	124	564	0	564	156	52	208	814	82	896
3. Reservoirs	0	0	0	0	15	15	681	83	764	424	64	488	1,105	162	1,267
4. Transmission/Distribution	0	0	0	0	0	0	1,174	331	1,505	1,196	278	1,474	2,370	609	2,979
5. Meters/Connections	0	0	0	0	0	0	217	38	255	190	39	229	407	77	484
6. PMU Support	0	0	0	0	0	0	116	40	156	79	26	105	195	66	261
7. Design Services	0	0	0	821	110	931	0	0	0	0	0	0	821	110	931
8. Construction Supervision	0	0	0	0	0	0	130	17	147	130	16	146	260	33	293
9. PMU Salaries	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10. PIO & Local Inspection Services	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11. PMU Equipment & Operating Expenses	5	4	9	67	44	111	4	4	8	4	4	8	80	56	136
12. PIO Equipment & Operating Expenses	3	0	3	91	8	99	14	12	26	13	12	25	121	32	153
13. Contingencies	1	0	1	348	33	381	558	87	645	416	92	509	1,323	213	1,536
14. Service Charge on Bank Loan	0	0	0	14	0	14	50	0	50	87	0	87	151	0	151
Subtotal (A)	18	4	22	2,400	251	2,651	4,036	612	4,648	2,695	584	3,279	9,149	1,451	10,600
B. Government Financing *															
1. Wells	0	0	0	0	540	540	0	276	276	0	0	0	0	816	816
2. Treatment	0	0	0	0	3	3	0	104	104	0	20	20	0	128	128
3. Reservoirs	0	0	0	0	0	0	0	45	45	0	15	15	0	60	60
4. Transmission/Distribution	0	0	0	0	0	0	0	42	42	0	43	43	0	86	86
5. Meters/Connections	0	0	0	0	0	0	0	8	8	0	7	7	0	15	15
6. PMU Support	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7. Design Services	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8. Construction Supervision	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9. PMU Salaries	0	7	7	0	108	108	0	28	28	0	27	27	0	170	170
10. PIO & Local Inspection Services	0	4	4	0	40	40	0	93	93	0	92	92	0	229	229
11. PMU Equipment & Operating Expenses	0	0	0	0	4	4	0	0	0	0	0	0	0	4	4
12. PIO Equipment & Operating Expenses	0	0	0	0	5	5	0	1	1	0	1	1	0	7	7
13. Contingencies	0	1	1	0	111	111	0	97	97	0	39	39	0	248	248
14. Interest During Construction	0	1	1	0	82	82	0	292	292	0	512	512	0	887	887
Subtotal (B)	0	13	13	0	893	893	0	987	987	0	757	757	0	2,650	2,650
Total (A+B)	18	17	35	2,400	1,144	3,544	4,036	1,599	5,635	2,695	1,340	4,036	9,149	4,101	13,250

Notes:

* Government financing share includes duties and taxes estimated at \$0.23 million and land compensation of \$0.54 million.

Table 4: Indicative Procurement Packages

Package Number	Location	Method	Description	Estimated Value Dollars (000)
PP1	PMU	DP	Computers, office equipment, etc.	35
PP2	PMU & PIO	DP	Vehicles (4 packages)	80
			Subtotal PMU & PIOs	115
K1	Kosrae	IS	Ductile Iron Pipe & Fittings	70
K2	Kosrae	IS	PVC Pipe & Fittings	82
K3	Kosrae	IS	Conductor Wires & Transformers (with Chuuk & Yap)	20
K4	Kosrae	DP	Forming Materials (Lumber, Plywood, nails, ties)	60
K5	Kosrae	DP	Miscellaneous (chlorinators, wiers, sluice gates etc.)	16
K6	Kosrae	UCFA	Power Line and Transformer Installations	45
K7	Kosrae	IS	Civil & Mechanical Works (access roads, excavation, concrete forming, reinforced concrete construction, pipeline installation etc.)	1,312
			Subtotal Kosrae	1,605
C1	Chuuk	IS	Drilling Rig Acquisition	105
C2	Chuuk	IS	Well Casing, Pumps & Chlorinators	255
C3	Chuuk	UCFA	Drill, Develop and Test 30 wells	135
C4	Chuuk	IS	Renovation & Repairs to 3 Existing Steel Tanks	665
C5	Chuuk	IS	Pipe, Fittings and Meter Supply	135
C6	Chuuk	UCFA	Power Line and Transformer Installations	80
C7	Chuuk	IS	Wire, Switchgear & Transformers (with Kosrae & Yap)	90
C8	Chuuk	UCFA	Install Meters on Existing Lines	155
C9	Chuuk	DP	Lumber, Miscellaneous Hardware (fence, doors)	39
C10	Chuuk	IS	Civil & Mechanical Works (access roads, pump installations, Pump Houses, Pipelines, etc.)	775
			Subtotal Chuuk	2,434
P1	Pohnpei	IS	Preordered Materials (piping, valves & fittings)	294
P2	Pohnpei	UCFA	Construct Civil Works (pipelines)	
P2A	Pohnpei	UCFA	Awak Segment	630
P2B	Pohnpei	UCFA	Meitk Segment	340
P2C	Pohnpei	UCFA	Sekere Segment	240
P2D	Pohnpei	UCFA	Likkie Segment	145
			Subtotal Pohnpei	1,649
Y1	Yap	IS	Drilling Rig Acquisition	140
Y2	Yap	UCFA	Drill, Develop and Test 7 wells	266
Y3	Yap	IS	Preordered Well Materials (pumps, piping, valves, fittings, meters, chlorinator etc.)	194
Y4	Yap	IS	Reservoir Materials (forming & steel or prefab tank)	70
Y5	Yap	IS	Plant Repair Materials (various)	25
Y6	Yap	IS	Wire, Switchgear & Transformers (with Chuuk & Kosrae)	70
Y7	Yap	UCFA	Power Line and Transformer Installations	80
Y8	Yap	DP	Miscellaneous Hardware (doors, fences etc.)	30
Y9	Yap	IS	Construct Civil Works (pipelines, connections, reservoir, Pump House, plant upgrade etc.)	1,249
Y10	Yap	LCB	Connection of existing well to water supply system	50
			Subtotal Yap	2,174
			TOTAL PROJECT	7,977

DP = Direct Purchase, IS = International Shopping, UCFA = Utilities Corporations' Force Account.

PMU = Project Management Unit, PIO = Project Implementation Office, LCB = Local Competitive Bidding.

RRP:FSM 27465

ASIAN DEVELOPMENT BANK

REPORT AND RECOMMENDATION
OF THE
PRESIDENT
TO THE
BOARD OF DIRECTORS
ON A
PROPOSED LOAN
AND TECHNICAL ASSISTANCE
TO THE
FEDERATED STATES OF MICRONESIA
FOR THE
WATER SUPPLY AND SANITATION PROJECT

August 1996

CURRENCY EQUIVALENTS

The unit of currency in the Federated States of Micronesia is the US dollar.

ABBREVIATIONS

AIEC	-	Average Incremental Economic Cost
BME	-	Benefit Monitoring and Evaluation
CSPUC	-	Chuuk State Public Utilities Corporation
EDA	-	Economic Development Administration
EIRR	-	Economic Internal Rate of Return
EOCC	-	Estimated Economic Opportunity Cost of Capital
EPA	-	Environmental Protection Authority
FIRR	-	Financial Internal Rate of Return
FSM	-	Federated States of Micronesia
GEF	-	Global Environment Facility
IEE	-	Initial Environmental Examination
IS	-	International Shopping
KUA	-	Kosrae Utilities Authority
LCB	-	Local Competitive Bidding
LRMC	-	Long Run Marginal Cost
MIS	-	Management Information Systems
MTR	-	Midterm Review
NRW	-	Nonrevenue Water
O&M	-	Operation and Maintenance
OMIP	-	Operation and Maintenance Improvement Program
OPS	-	Office of Planning and Statistics
PIO	-	Project Implementation Officer
PMU	-	Project Management Unit
PPTA	-	Project Preparatory Technical Assistance
PUC	-	Pohnpei Utilities Corporation
TA	-	Technical Assistance
UC	-	Public Utility Corporation
UNDP	-	United Nations Development Programme
US	-	United States of America
USEPA	-	United States Environment Protection Agency
WACC	-	Weighted Average Cost of Capital
YSPSC	-	Yap State Public Service Corporation

WEIGHTS AND MEASURES

km	-	kilometer
km ²	-	square kilometer
lpcd	-	liters per capita per day
m ³	-	cubic meter
m ³ /day	-	cubic meter per day
mm	-	millimeter

NOTE

- (I) The fiscal year (FY) of the Government ends on 30 September, e.g., FY2000 ends on 30 September 2000.

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LOAN AND PROJECT SUMMARY

Borrower	:	Federated States of Micronesia
Project Description	:	The Project will refurbish and expand water supply facilities, and optimize the operation of sewage treatment facilities in the capital areas of the states of Chuuk, Kosrae, Pohnpei, and Yap, where lack of safe water supply and sanitation inhibits economic and social development and poses serious health risks.
Classification	:	Human Development
Environmental Assessment	:	Category B An initial environmental examination (IEE) was undertaken.
Rationale	:	The Project supports sectoral policy reforms through the commercialization of water supply and sanitation services in the most populated areas of Chuuk, Kosrae, Pohnpei, and Yap states. The overall aims of the reforms are to (i) conserve resources through the introduction of demand management measures, (ii) provide an affordable supply of water to all consumers in the Project areas, (iii) ensure that water supply utilities are efficient and self-financing through institutional reforms and adequate water charges, and (iv) ensure adequate levels of operation and maintenance of water supply and sanitation facilities. In the principal settlements in Chuuk, Kosrae, and Yap, water supplies are intermittent and unsafe because of physical system deficiencies as well as institutional shortcomings. In and around the capital of Pohnpei, several localities do not have a safe, piped water supply. The Project's physical components will improve the standard of facilities and allow the provision of adequate services. Together, policy reforms and physical works will provide equitable distribution of services throughout the Project area.
Objectives and Scope	:	The objectives of the Project are to (i) improve the management and efficiency of water supply and sewerage services by supporting the development of autonomous utilities corporations (UCs), (ii) implement cost recovery programs to manage

demand and improve the financial resources of UCs, (iii) support economic growth and improve the health of people living in the Project areas through reliable and safe water supplies and improved sewerage operation, and (iv) improve the economic and technical efficiencies of UCs.

The Project includes the improvement of financial management and cost recovery policies through the development of user charging systems and improved financial and management systems, which will lead to the full financial autonomy of UCs. The physical components of the Project are as follows

Part A - Civil Works, to augment water production, rehabilitate and construct water storage tanks, construct and rehabilitate water treatment plants, expand water transmission and distribution networks, and install consumer water meters.

Part B - Project Implementation Support, for the Project Management Unit (PMU) and UC implementation staff, including the provision of office facilities, computer hardware and software, and service vehicles. International consultants will assist in project management, carry out specialist design services, review design work carried out by UCs, and monitor construction work.

Cost Estimates

The Project is estimated to cost \$13.3 million equivalent, of which \$9.2 million is the foreign exchange cost and \$4.1 million is the local currency cost equivalent.

Financing Plan

(\$ million)

Source	Foreign Exchange	Local Currency	Total	Percent
Bank	9.2	1.4	10.6	80
National and State Governments	-	2.7	2.7	20
Total	9.2	4.1	13.3	100

Loan Amount and Terms

The equivalent in various currencies of Special Drawing Rights (SDR) 7,233,000 million (currently \$10.6 million) from the Bank's Special Funds resources for 40 years, including a grace period of 10 years, with a service charge of 1 percent per annum to be paid semiannually.

Relending Terms	:	The National Government shall relend proceeds of the loan to the state governments at terms which include a service charge of 1 percent per annum and a repayment period of 25 years, including a grace period of 5 years. The state governments shall on-lend to their respective UCs at the Bank's interest rate for US dollar loans from its ordinary capital resources (currently 6.82 percent per annum), and an amortization period of 25 years including a grace period of 5 years. A portion of the loan proceeds will be held by the National Government to finance consulting services.
Period of Utilization	:	Until 30 October 2000.
Implementation Arrangements	:	The UCs will implement the Project, which will be coordinated by the National Government's Office of Planning and Statistics (OPS). A Project Management Unit has been established within OPS and Project implementation officers will be designated within each UC with the responsibility to coordinate and manage Project activities.
Executing Agency	:	Office of Planning and Statistics of the National Government
Procurement	:	Procurement of goods and services financed by the Bank under the Project will be undertaken in accordance with the Bank's <i>Guidelines for Procurement</i> . Principal civil works will be carried out using international shopping procedures, although some works will be carried out by UCs using force account procedures (not to exceed, in total, the equivalent of \$2,500,000) and some minor items of equipment will be purchased by direct purchase procedures. Civil works contracts estimated to cost the equivalent of \$50,000 or less will be awarded under local competitive bidding procedures acceptable to the Bank.
Consultant Services	:	Selection and engagement of consultants will be in accordance with the Bank's <i>Guidelines on the Use of Consultants</i> . A total of 99 person-months of consulting services will be utilized to assist in the project management, detailed design, procurement, environmental assessment, and construction supervision.

**Estimated Project Completion
Date**

: 30 April 2000.

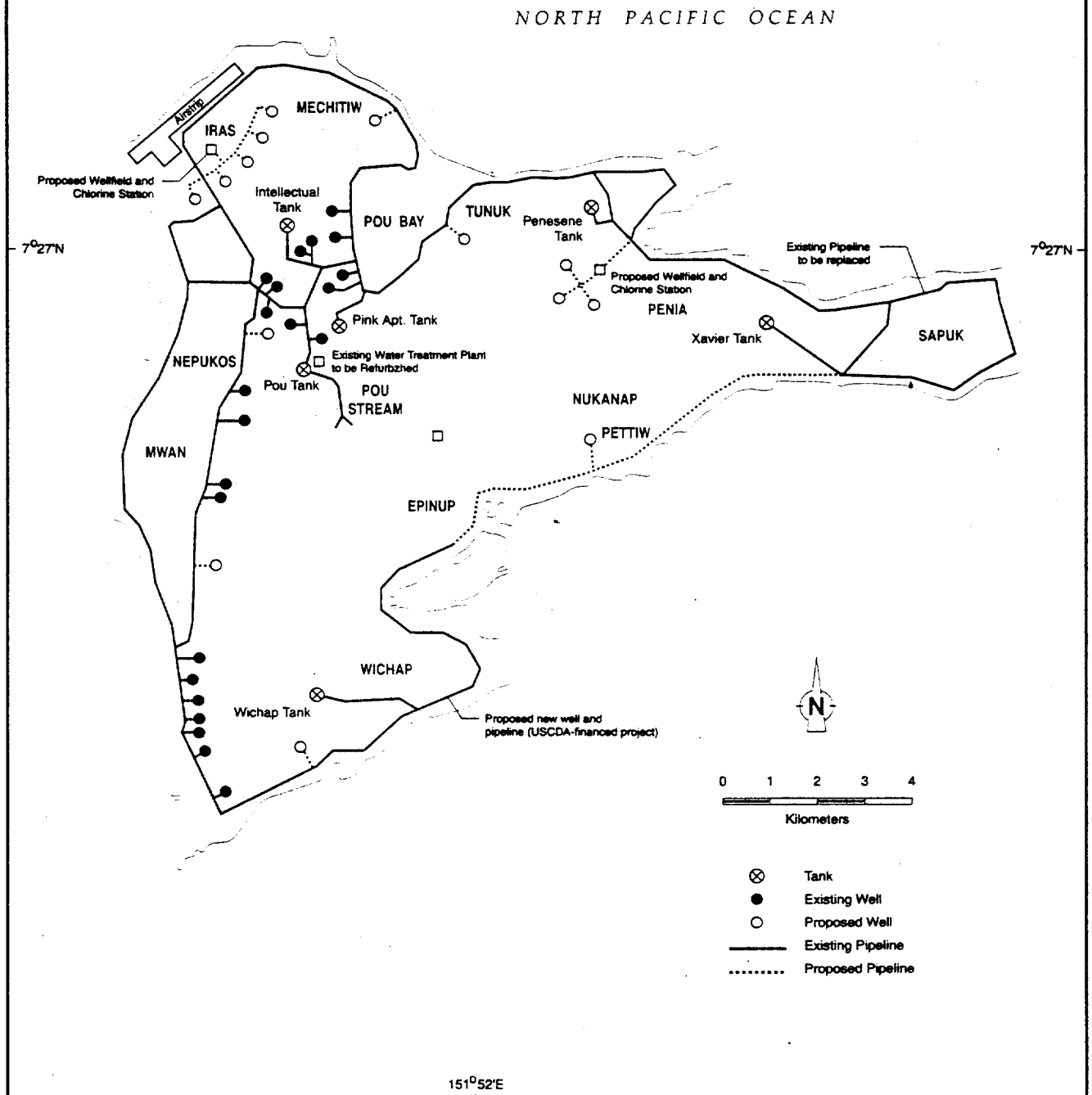
**Project Benefits and
Beneficiaries**

: The Project will benefit about 28,000 people (about 25 percent of the country's population) who will enjoy improvements in health and welfare arising from the increased quantity and quality of the water supplied. Businesses, industries, and institutions will benefit from the provision of basic infrastructure to facilitate economic development. Improvements in sewerage operations will provide environmental benefits, and demand management through the implementation of consumption-based water charges will foster resource conservation. Improved water supply and a basic quantity of water at an affordable tariff will reduce the burden on lower socioeconomic groups. Continued development of financial and institutional reforms in UCs will contribute to efficiency and sustainability of the sector.

Technical Assistance

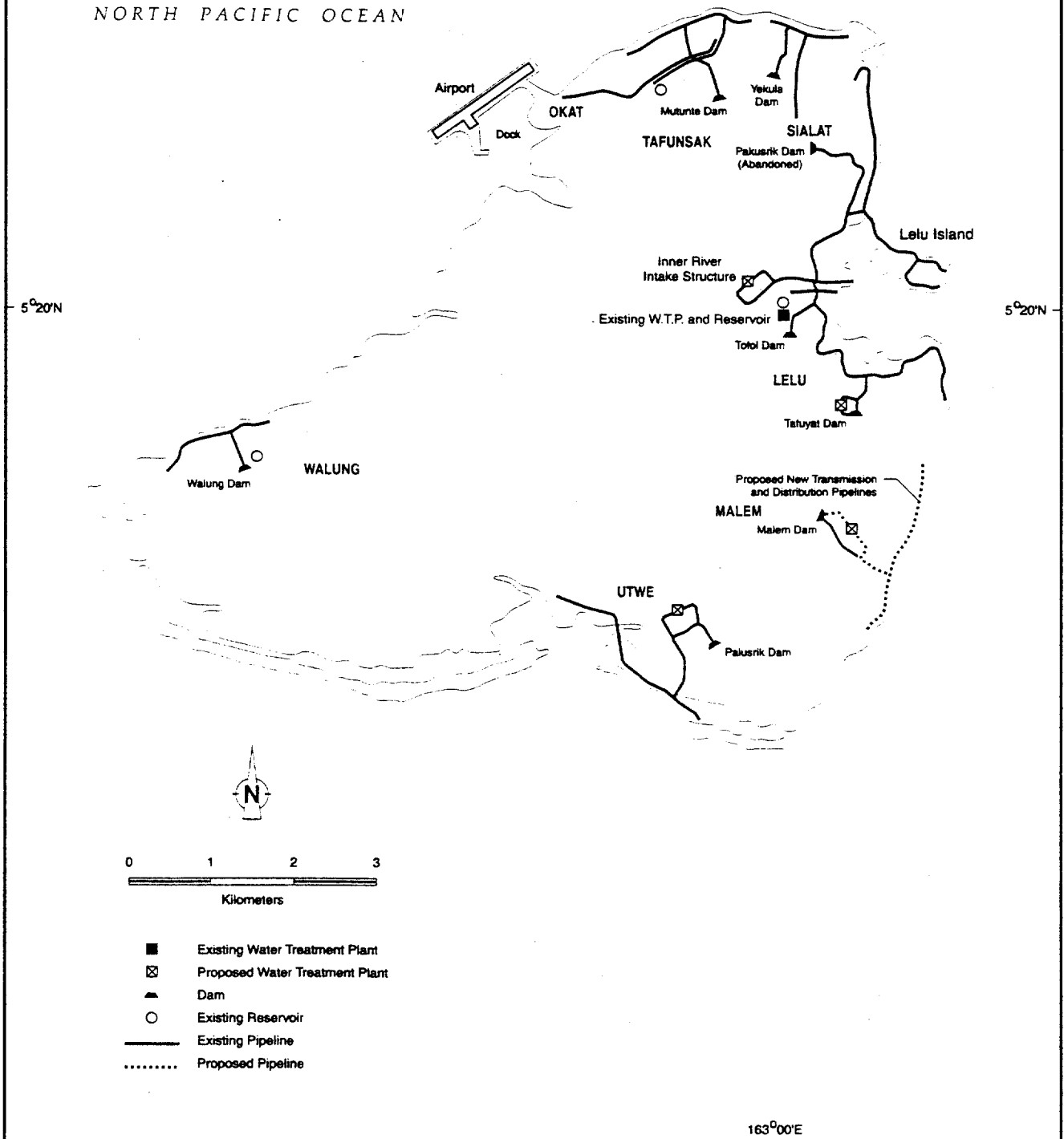
: One technical assistance (TA) grant totaling \$587,000 is proposed to be approved with this Project. The TA is for capacity building in UCs, to assist them to develop expertise in operation and maintenance of water supply and sewerage systems; improved management information, billing, and accounting systems; and public education and participation programs. OPS will be the Executing Agency.

FEDERATED STATES OF MICRONESIA
WATER SUPPLY AND SANITATION PROJECT
CHUUK-WENO WATER SUPPLY SYSTEM



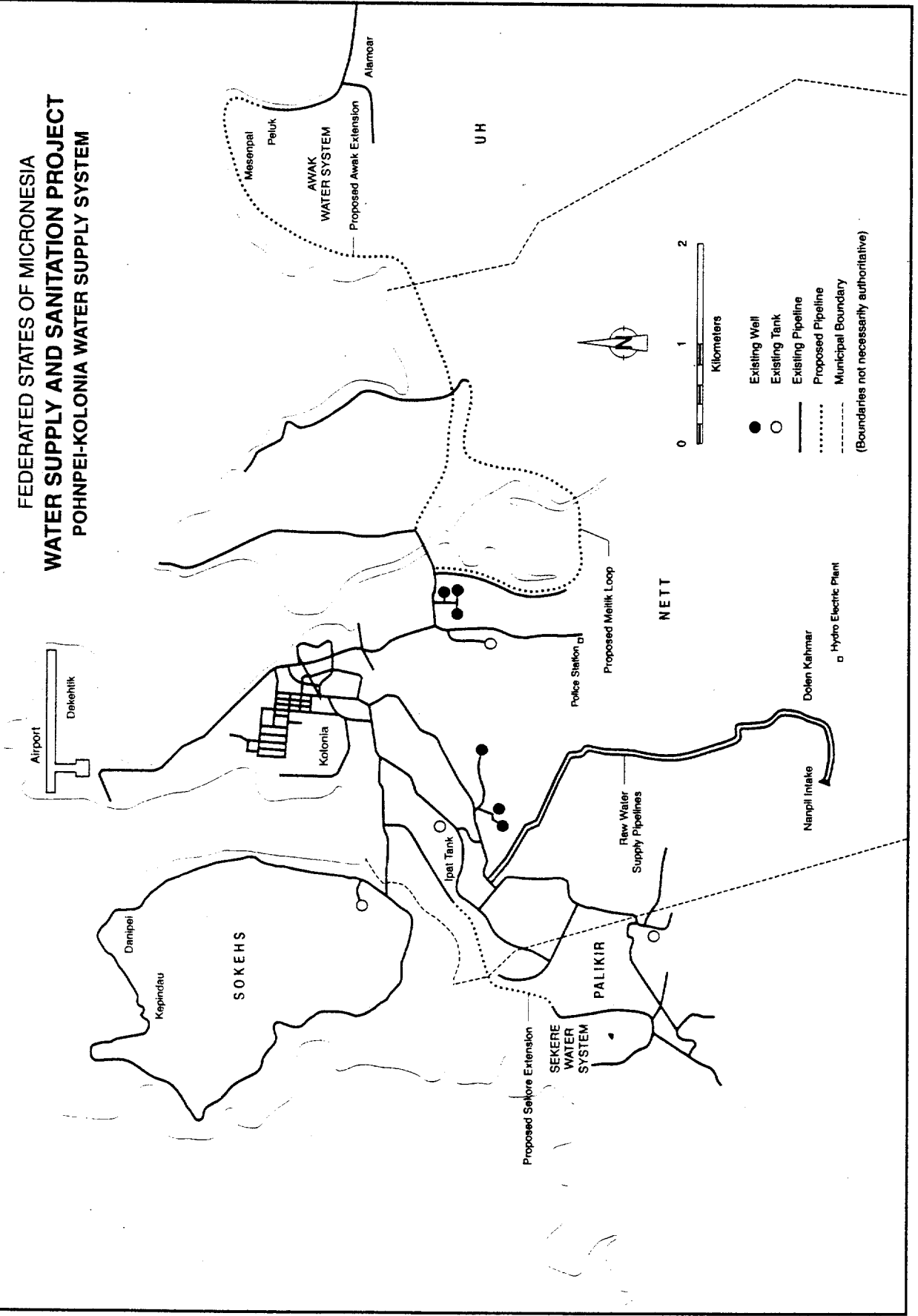
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WATER SUPPLY AND SANITATION PROJECT
KOSRAE WATER SUPPLY SYSTEM

NORTH PACIFIC OCEAN



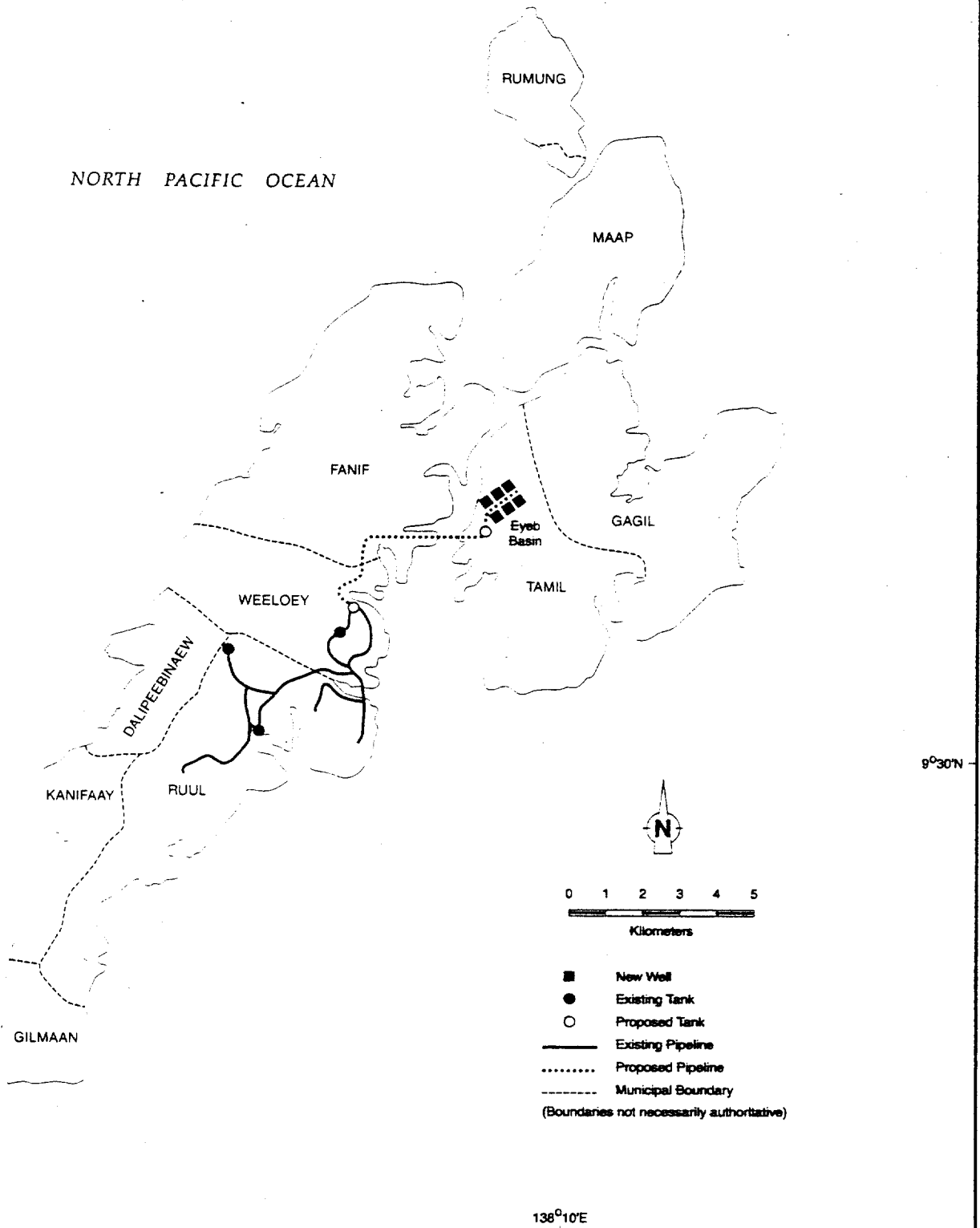
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FEDERATED STATES OF MICRONESIA **WATER SUPPLY AND SANITATION PROJECT** POHNPEI-KOLONIA WATER SUPPLY SYSTEM



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FEDERATED STATES OF MICRONESIA
WATER SUPPLY AND SANITATION PROJECT
YAP - COLONIA WATER SUPPLY SYSTEM



I. THE PROPOSAL

1. I submit for your approval the following Report and Recommendation on a proposed loan to the Federated States of Micronesia for the Water Supply and Sanitation Project. The Report also describes the proposed technical assistance for the Project, and if the proposed loan is approved by the Board, I, acting under the authority delegated to me by the Board, shall approve the technical assistance.

II. INTRODUCTION

2. In 1993, the Government of the Federated States of Micronesia (FSM) requested Bank assistance for the improvement of the water supply systems serving the capital areas of each of Micronesia's four states, from master plans prepared by the Government with assistance from the United Nations Development Programme (UNDP). The master plans highlighted a need for policy and institutional reforms, as well as for physical improvement of the water supply systems. In 1994 the Bank approved a Project preparatory technical assistance (TA) to carry out a feasibility study for the Water Supply and Sanitation Project.¹ The study was completed in 1995.

3. Fact-finding in February 1996 was followed by a Consultation Mission in April 1996, which reviewed the status of an action plan agreed upon by the Government and the Fact-finding Mission. The Appraisal Mission in May-June 1996² discussed policy issues and firmed up details of the scope, implementation arrangements, timing, costs, and social, environmental, financial and economic aspects of the Project. In particular, the Mission reviewed policy and Project-related issues with the National Government and the state governments of Chuuk, Pohnpei, and Yap, and with Chuuk State Public Utilities Corporation (CSPUC), Pohnpei Utilities Corporation (PUC), and Yap State Public Service Corporation (YSPSC). The Mission reaffirmed issues discussed during the Consultation Mission with the state government of Kosrae and Kosrae Utilities Authority (KUA).

4. Bank Missions liaised closely with officials of the Embassies of Australia, People's Republic of China, Japan, and United States of America (US). During Project appraisal, the Government convened a funding agencies' meeting at which the Appraisal Mission outlined the scope and objectives of the Project and the policy and institutional reforms that the Project will support.

III. BACKGROUND

A. Sector Description

1. Physical Features

5. The four states—Yap, Chuuk, Pohnpei, and Kosrae—that make up the FSM cover more than 600 islands scattered over an area of about 2.6 million square kilometers (km²) of the western Pacific Ocean. The island chain, which extends through two time zones, is about 3,200 kilometers (km) from east to west. Its nearest neighbors are the Marshall

¹ TA No. 2137-FSM: *Water Supply and Sewerage*, for \$250,000, approved on 18 August 1994.

² Comprising E. G. Fox, Project Engineer/Mission Leader; D. O'Hearn (Consultant Economist/Financial Analyst), and K. Hamman (Consultant Water Supply Engineer). The Mission was supported from Headquarters by J. Hovland, Assistant General Counsel.

Islands to the east and the Republic of Palau to the west. Air transport routes from Yap, the westernmost State, to the other states pass through Guam, a US territory lying north of the Micronesian island chain. The easternmost state, Kosrae, is unique in the Federation in that it comprises only one island; the other States are composed of many small islands varying from low-lying atolls to high mountainous islands of volcanic origin. The total land area of the FSM Micronesia is about 700 km² and the country's total population is about 105,000.

6. All the states are endowed with ample annual rainfall. Kosrae and Pohnpei experience heavy rainfalls, with coastal region rainfall of about 5,100 millimeters (mm) per year. Rainfall in Chuuk ranges from 2,500 to 4,700 mm per year, and the average in Yap is 3,000 mm annually. However, rainfall is unevenly distributed over the year, causing droughts that particularly affect the lower-lying islands. Yap is subject to relatively severe droughts, which have tended to occur every three to five years, and persist for several months.

7. The state capitals are located on hilly islands surrounded by coral reefs and coastal lagoons. Habitation is scattered on the coastlines, with little development in the interiors. The native forest has not been significantly disturbed, although some are being progressively damaged by *sakau*¹ plantations which are starting to adversely affect Pohnpei's water catchments. Despite abundant rainfall, the small size of each island, combined with steep topography, intense rainstorms, and rocky ground cause rapid runoff, and limit the percolation of rain to groundwater. Nonetheless both groundwater and surface water are used for water supplies. The water resources of each state are sufficient to meet the projected water demands and, with careful husbandry, can be extended for many years into the future.

8. Micronesia's first piped water supply systems were constructed during the period of Japanese administration between 1914 and 1945, and parts of these systems remain in service. The systems were subsequently expanded and sewerage systems were developed during the period of administration by the US. Further development has taken place during the period of the Compact of Free Association with the US, which commenced in 1986. Sewerage and sanitation systems have recently been improved with assistance from the US Environmental Protection Agency (USEPA). However, the water supply systems now in use are old, disparate, and of varying quality. Standards of repair, maintenance, and supervision vary across the states and further training in the operation and maintenance (O&M) of water supply and sewerage systems is required.

2. Sector Institutions

9. Through its Office of Planning and Statistics (OPS), the Government plays an important role in mobilizing funds for water supply development. The Government allocates national and foreign financial resources, appropriates national funds for designated projects in the states, and reviews and approves national policies for the sector.² OPS prepares long-term economic development plans, establishes sectoral development strategies, and provides technical assistance to the states for water and sewerage sector planning, project formulation, and project implementation. The Department of Human Resources administers externally

¹ *Sakau* (also known as *kava* in some Pacific island countries) is a root crop that is ground and mixed with water to produce a mildly narcotic drink. Its use has traditionally been associated with ceremonial occasions, but its adoption as a popular beverage is increasing, resulting in increased clearing of native vegetation for *sakau* plantations.

² However, the states also directly seek foreign assistance.

funded programs in the training of water personnel and the provision of short-term advisory services to the states.

10. The Department of Health (DOH) coordinates the bacteriological examination of water. The Department's main function is to advise the states, which have the primary responsibility for monitoring water quality. This involves water sampling and bacteriological testing. Sewer systems, water resources, and coastal water quality are also monitored by the states.

11. Each state has its own institutional framework. State Legislatures review and allocate state financial resources, enact and review legislation, and appropriate funds for specific projects and programs. The Office of the Governor in each state establishes sector priorities, and reviews and approves sector policies, sector development plans, and project proposals. The framework of other state institutions is summarized as follows:

- (i) In Yap, the Office of Planning and Budget prepares economic and sector development plans, mobilizes and controls funds for financing development projects, and coordinates and monitors development project finance. The Department of Public Works and Transportation designs and constructs infrastructure projects, the state's Environmental Protection Agency (EPA) monitors the quality of distributed water, and the Land Resource Management Office provides survey and land use data. Water supplies outside the state capital, Colonia, are operated by the Gagil-Tomil Water Authority and the Southern Yap Water Authority. The Yap Community Action Program designs and constructs rural water supply projects. YSPSC was established to develop and operate the electric power, water supply, and sewerage services for Colonia, and has operated as an autonomous agency since 1 April 1996.
- (ii) In Chuuk, the Department of Planning and Statistics carries out functions similar to those of the Yap State Office of Planning and Budget. In addition, the department coordinates the design and construction of projects. The Chuuk state EPA functions are similar to those of the Yap state EPA. CSPUC became responsible for the development and operation of the electric power, water, and sewerage systems in the main islands of Weno and Tonoas as of October 1995, but is underfunded and lacks experienced manpower and other resources.
- (iii) In Pohnpei, the Office of Budget, Planning and Statistics prepares sector development plans, project proposals, and funding applications for specific projects. PUC, which became operational in October 1991, has the responsibility for developing, operating, and maintaining electric power, and water supply and sewerage systems, initially focusing on the state capital, Kolonia, and its vicinity. The Utility Division of the Office of Construction, Management and Property Maintenance is responsible for the construction and maintenance of some water supply and sewerage systems, and the municipalities operate and maintain rural community water supplies. The Department of Conservation, Resources and Surveillance, and the state's EPA monitor the quality of public and private water supplies and water sources.

- (iv) In Kosrae, the functions of the Office of Budget and Planning are similar to those of the Pohnpei State Office of Budget, Planning and Statistics in the water supply and sewerage sector. The Department of Transportation and Utility operates and maintains two water supply and sewerage systems. Municipalities operate and maintain seven smaller water supply systems. A Civic Action Team, staffed by US military personnel, provides the municipalities with assistance in the maintenance of water supply systems (mainly the repair of leaks). The Public Health Unit monitors the quality of water supplies and water sources. The Kosrae Utilities Authority (KUA) was established to operate the state's electric power supply system, and legislation has been introduced in the state legislature to give KUA responsibility for water supply and sewerage services.

12. Except in the capitals of Pohnpei and Yap, there is fragmentation of responsibilities between state departments and a consequent lack of focus, coordination, and accountability within the sector. The situation has adversely affected the levels of service provided by water and sewerage systems, which is particularly noticeable in Kosrae and Chuuk. The public utilities corporations in each state (CSPUC, KUA, PUC, and YSPSC) are relatively new, and have been established at the prompting of the Operation and Management Improvement Program (OMIP) of the US Department of the Interior, and the Bank.

3. Sector Issues

13. The National Government's water supply master plans, which were completed in 1993, included projections of water demand and water resources, and identified institutional and financial requirements, development needs, and capital works programs. Importantly, the plans also highlighted the lack of a firm policy framework, limited funding for O&M, and the absence of effective organizations for developing and operating water supply systems. The plans drew attention to water shortages, water quality deficiencies, deferred maintenance, high rates of water loss through leakages, high rates of water consumption, and lack of technical capability in all States. It was recommended that consumer metering and effective billing systems be introduced to assist demand management and raise operational revenues. Recommended institutional improvements included the establishment of autonomous water supply authorities in some states, and the strengthening of the water supply divisions of Public Works Departments in others. Technical training programs were recommended for each state.

14. Most water supply and sewerage systems in the FSM have been developed with grant funding from bilateral sources. Their cost structures are high because of their small scale, small population base, dispersed patterns of settlement, and relatively high price and wage levels. The ready availability of grant funds has led to the development of some elaborate systems, as well as high expectations of service levels, without a parallel awareness of the real costs. The transition from the expectation of grants and "free money" to a "pay-for-service" awareness will take some time for the public to fully understand and accept. Public education needs to be improved, particularly with regard to real system costs, water conservation measures, and the need to pay for water supply and sanitation services.

15. Until recently, cost recovery has been poor and remains so in Chuuk and Kosrae. With the exception of a small system serving industrial and commercial users in Kosrae, no water supply charges are levied in these two states, and O&M is supported by annual budgetary allocations from the state governments. However, consumption-based tariffs were introduced in Kolonia, Pohnpei, in 1993, and cost recovery in PUC's service area

has improved. Income from water charges in Yap was, in the past, directed to the state's consolidated funds, rather than directly financing water supply and sewerage services. This has changed with the establishment of YSPSC.

16. Lack of consumption-based user charges has led to poor demand management and underfunding of O&M. The only restrictions on water demand in Chuuk and Kosrae and, until recently, in Pohnpei and Yap have been the physical capacity of the water supply systems and deliberate rationing that has been imposed by restricting the number of hours of water supply each day. Extravagant water use practices, resulting from the general historical availability of surface water from rainfall, are only tempered during periods of drought. Many houses in all states supplement the piped water supply with rainwater collected from roofs. However, most of these roof systems are only used to collect small quantities of drinking water and would require substantial reconstruction before they could become a principal source of water supply.¹

17. The impact of consumer metering and billing is illustrated by experience in Pohnpei. In 1993, prior to the introduction of water metering, water demand in Kolonia was essentially infinite. PUC introduced metering and computer-based billing in October 1993, and increased water and sewerage tariffs in January 1994 to give an average combined tariff of \$0.26 per cubic meter (m^3).² In response, consumption per connection in late 1994 declined by 24 percent relative to that in the previous year. During Project appraisal, domestic water consumption was assessed as 350 liters per capita per day (lpcd). The reduction in consumption, together with an increase of supply from the river intake to the water treatment plant, has enabled PUC to provide a 24-hour water supply. The efficiency of collection of billings is about 92 percent. In Colonia in Yap, recent improvements to bulk and consumer water metering have allowed domestic water consumption to be assessed as 315 lpcd, at an average tariff of \$0.34 per m^3 and with a collection efficiency of about 88 percent. These figures indicate that consumers have been willing to pay water charges.

18. Chuuk and Yap suffer from chronic shortages of water that, in the case of Yap, have become particularly severe during extended droughts, which have tended to occur every three to five years. In one of Chuuk's groundwater sources, overpumping has led to high chloride content due to saltwater intrusion, and the water supply is currently untreated. Kosrae suffers from shortages, frequent turbidity, and bacteriological contamination of water supplies.

19. Improvements to O&M funding, which has been a persistent problem, are being made, but some water and sewage treatment plants are either out of service or are operating inefficiently. Some facilities have been mothballed or disposed of, partly because of lack of funds to support their operation. In the past, even when system repairs were undertaken, they were often inappropriate and inadequate, and led to further breakdowns and higher levels of water loss. PUC's level of nonrevenue water (NRW) in 1993 was about 50 percent of production. It has since been reduced to about 42 percent, and PUC is working to reduce it further. Leakage detection and repair programs have commenced in Yap (where NRW is about 36 percent of production) and in Chuuk (where about 40 percent of water production cannot be accounted for). A leak detection program in Kosrae in 1994 indicated that as much as 70

¹ Many simply consist of old oil drums placed under house eaves.

² Tariffs in Kolonia were increased on 1 April 1996 to give an average tariff of \$0.48 per m^3 . However the first billings at the new tariff level have not been carried out, so the impact of the increase on water consumption cannot yet be ascertained.

percent of water supplied to one distribution area could not be accounted for, but an ongoing leakage repair program has significantly reduced losses through leakage.

20. In most states, inadequate water treatment has compounded the problems caused by demand exceeding supply, resulting in exposure to health risks. This is markedly noticeable in epidemiological profiles, which are characterized by high incidences of waterborne diseases. The most striking examples of the effect of poor water and sanitation conditions were outbreaks of cholera in Chuuk between 1980 and 1982, and again in 1990. During the 1980-1982 outbreak, 2,254 reported cases of the disease led to at least 17 deaths. Outbreaks of leptospirosis in all states have been associated with contamination by rats of rainwater collected from roofs and stored in household rainwater tanks. The impact of unhealthy conditions is particularly heavy on women, who have to tend sick children and adults.

21. The above sector issues can be grouped into two broad categories: those related to the country's economic development, and those related to the immediate welfare of its citizens, particularly the poor and women. Presently, the uncertain water supply of unreliable quality inhibits potential investment in development activities. Reliable and regular availability of safe water is a precondition of any development thrust. Therefore, it is important that the necessary sectoral reforms are instituted at the outset, so that investments in other key economic sectors can be made in a sound environment.

B. Government Policies and Plans

22. The National Government and state governments have identified the development of fisheries and tourism as priority industries for evolving financial independence of the nation. Both industries require reliable and safe sources of water supply. As the end of Compact funding draws near, the country is seeking to increase its economic activity and to reduce the costs of poor health through the provision of safe drinking water supplies.

23. The recent improvements in O&M of the water supply and sewerage systems in the capitals of Pohnpei and Yap states, which have been implemented with assistance from the OMIP administered by the US Department of the Interior, foreshadow the reforms the National Government wishes to introduce throughout the states. The consolidation of responsibility for the water supply, sewerage, and power supply systems has allowed PUC to reduce the fixed overhead component of the unit costs. PUC and YSPSC are credible indigenous models for adaptation and replication in Chuuk and Kosrae.

24. The Government proposes to develop the sector in keeping with the long-term objective of sustainability of economic and environmental resources on the one hand, and the provision of a supply of clean water to the population at affordable prices on the other. The Government is committed to reform sector institutions and to let them function autonomously on a self-supporting basis. Fiscal relations between the National Government and the state governments are evolving into a development partnership. In particular, the National Government is willing to help the states adapt and replicate the experience of Pohnpei and Yap in improving water supply management.

C. External Assistance to the Sector

25. The sector has received significant levels of external assistance, especially from the US (see Appendix 1 for details). Currently, water supply developments are planned in Chuuk and Kosrae, outside the Project areas, assisted by the US Department of Commerce Economic Development Administration (EDA). The single most important source of US support, which has played an important role for several years, is OMIP with its advisory, technical and financial support. In particular, OMIP is providing financial support for international managerial and technical personnel who are establishing operational programs and developing the management skills of local staff. UNDP has played a major role in assisting water sector planning, providing engineering and project management assistance, and mobilizing resources for the development of the sector. Assistance for building small community water systems has been provided by the Australian Agency for International Development (AusAID), and the People's Republic of China has recently provided a small drilling rig for use on the outer islands of Yap.

D. Lessons Learned

26. Experience in O&M of water supply and sewerage systems in FSM clearly indicates that the technology adopted in future projects must be as simple as is practicable and must be operationally robust. Some water treatment plants installed during earlier projects are presently unserviceable because sophisticated spare parts have not been ordered and fitted, and because the operators of the plants have lacked the necessary skills and experience to operate them effectively. Sewage treatment systems installed in earlier projects are power-intensive, and are now being operated inefficiently because power consumption is being reduced to save costs. Systems that lie within local operational capability must be selected, and advice and training must be provided to extend this capability. The facilities to be provided under the Project utilize simple technology, consume as little power as practicable, and will be designed to lessen dependence on sophisticated spare parts.

27. The need for adequate financial support for O&M has only recently been recognized. Management of the Project facilities by commercially viable public utility corporations (UCs) will ensure that adequate funding is available. Through on-the-job training provided by the Project consultants, and with the accompanying TA, the Project will assist in improving O&M. Implementation of the Project will dovetail with assistance being provided under OMIP.

28. No earlier water supply and sanitation project in FSM has been as comprehensive in scope as this Project. Earlier expansion and improvement were carried out on a piecemeal basis, with each project focusing on a few specific components. The Project addresses system-wide needs together with institutional reforms at state and UC levels. The Bank's experience with similar-size comprehensive projects in other Pacific countries has indicated that for successful project implementation, the small inexperienced implementing agencies need considerable support in project management. The project preparatory TA consultants have assessed project management capabilities at national and state levels, and found that neither level has in-house resources to fully staff a Project Management Unit (PMU). Project consulting services will include an experienced team leader who will advise PMU on project management. Project implementation relationships between the National Government and the state governments have been carefully framed, recognizing the capabilities that exist in some UCs.

E. The Bank's Sectoral Strategy

29. The Bank's sectoral strategy for the FSM focuses on three principal areas. First, it recognizes the crucial role of safe and regular water supply in the development of tourism, fisheries and infrastructure—sectors that are critical for the economic growth of the country. Second, the Bank supports the Government's proactive steps toward improving the health of the country's population and reducing health costs by providing treated water and improved sanitation facilities. Human resource development through improved health is critical for increasing labor's productivity and promoting welfare. Third, the Bank recognizes a need to develop a framework under which water and sewerage services can be commercialized so that sector institutions can function autonomously and efficiently without outside interventions.

30. In the above context, the Project is consistent with the Bank's Pacific and sectoral objectives. In its emphasis on commercializing and increasing the efficiency of operation and management of water supply and sewerage systems, the Project fits well with the priority development needs of the FSM.

F. Policy Dialogue

31. Policy dialogue with the National Government and the state governments started in 1993 and is continuing, focusing on the need for sectoral policy reforms, particularly as they relate to demand management and cost recovery. The National Government has encouraged the states to undertake the necessary legislative and institution-building reforms to establish autonomous, self-governing UCs. Each State has made some progress toward instituting policy reforms, and some states have made significant progress.

32. The variation in the pace of reform between the states reflects the small size of the systems and intersystem differences, and the socioeconomic differences between the states. This is the first time that the states have dealt with the Bank in the water supply and sanitation sector, which has high visibility and touches the majority of the households. The Bank's procedures differ from the states' earlier experience with grant-funded projects that had few conditions for ensuring effective O&M, let alone the repayment of capital.

33. Under the circumstances, the states' high priority for improvements in the water sector and their demonstrated willingness to institute difficult reforms provide the basis for the continuation of policy dialogue during Project implementation. This dialogue forms part of a broader dialogue on general economic reforms within the country, and in particular on structural and economic reforms that the Bank is assisting the Government to formulate through the ongoing TA.¹ The objectives of the reform program are to reduce the country's reliance on external assistance, diversify sources of external investment, increase the competitiveness of productive sectors, and ensure economic growth that leads to sustainable development. The following issues, in particular, are being addressed.

1. Autonomy of Public Utility Corporations

34. The Project will assist UCs to develop as viable and sustainable institutions. Participating states are ensuring the autonomy of their UCs to provide the basis for this

¹ TA No. 2294-FSM: *Policy Advisory Team for Economic Management* for \$2.5 million (and cofinanced by the USA and Japan), approved on 31 January 1995. The Bank is also participating in a Consultative Group of funding agencies, which first met in 1995 and which has endorsed an overall reform program.

development. Chuuk and Kosrae have lagged behind Pohnpei and Yap in this regard. In particular, CSPUC is not yet fully operational because of lack of sufficiently qualified staff and resources. In Chuuk, legislation has been introduced to enable CSPUC's Board of Directors to set tariffs, after due public discussion. CSPUC is proceeding with the appointment of a qualified general manager, supported through OMIP assistance. In Kosrae, KUA is operating as an autonomous UC with respect to electric power supplies. The state legislature is considering legislation that will give KUA the responsibility for water supply and sewerage services.

2. Cost Recovery

35. Appropriate cost-recovery policies and mechanisms need to be put in place, so as to eliminate subsidies to UCs within five years of Project completion and full cost recovery within ten years of Project completion. Cost-recovery policies and mechanisms are to be developed for each UC through the preparation of corporate plans. The plans will establish annual financial performance and cost recovery objectives for each UC and provide a strategy for achieving these objectives. UCs will determine appropriate tariff structures and levels, develop programs for the implementation of these tariffs, and determine the degree of cross-subsidization between user groups to ensure that a basic quantity of water is available at an affordable price to lower income consumers.

3. Public Education and Public Participation

36. All state governments recognize the need to intensify their efforts to explain the need for water supply and sewerage charges to the public. States will develop their capacity to implement public education programs. The contents of the programs will vary from state to state, reflecting each state's socioeconomic environment. However, the programs are likely to highlight the immediate benefits to water delivery through the introduction of metering, and the problems caused by indiscriminate water usage. They will address the implications of sliding scale billing, water conservation, health aspects of water use, rights of access to water resources, water tariffs, affordability, and other Project-related issues. The programs will be aimed at all levels of society, from members of the states' legislatures to schoolchildren, and will incorporate participatory meetings and public workshops. The Bank will support these efforts through the TA accompanying the loan.

4. Nonrevenue Water

37. Excessive water usage is a result of wrong pricing signals that lead to wasteful practices, with open taps depleting the supply for all but those nearest the sources. There is also an element of physical loss resulting from undetected leaks. Ongoing programs are continuing to minimize water leakages and illegal connections. In the long term, UCs intend to reduce NRW to 30 percent of production.¹

¹ The Project will bring about improvements that will increase water pressures which will in turn tend to increase losses through leakage. In the circumstances, reduction of NRW to 30 percent of production is a practicable target.

V. THE PROJECT

A. Rationale

1. The Bank's Approach

38. Currently, with the exception of Pohnpei, water supply systems in the country's principal population centers are under stress, producing an erratic supply of sometimes turbid and largely untreated water. Supply deficiencies are due to a combination of irregular supply, unchecked demand, and institutional shortcomings caused by deficient managerial and financial practices. The situation is being addressed by policy and institutional reforms that are being supported by the Project. Reforms will support the sustainability of the system improvements implemented under the Project. The favorable experience with demand management measures in Pohnpei is to be replicated in other states.

39. The Project supports the Bank's and the Government's sectoral strategy through the extension of commercialization initiatives, which have already commenced in Pohnpei and Yap. Institutional and financial development of the water supply and sanitation sector in the state capitals of Chuuk, Pohnpei and Yap, and throughout Kosrae will be supported under the Project.

40. The Project will allow immediate coverage of areas of relatively high population density, thus contributing to the reduction of unit costs. The timing of the proposed Project is opportune because PUC has had a lead of about three years in instituting reforms, and reforms in Yap are under implementation. These initiatives are providing valuable experience, and public opinion is being built in favor of autonomous and efficient functioning utilities that implement user charges. The autonomous UC model can further developed and replicated.

2. The Project Area

41. The Project area covers the capital areas of the states of Yap (Colonia), Chuuk (the island of Weno), and Pohnpei (Kolonia), and principal centers of population in Kosrae within which Project facilities are to be located or which are to be served by Project facilities. These areas provide a service function and are the focal point for most of the commercial activity of the respective states. They are bases for domestic and foreign fishing fleets and are centers of a small but important tourist industry, both of which require safer and more reliable water supplies for their future development.

B. Objectives and Scope

1. Objectives

42. The principal objective of the Project is to improve the management and efficiency of water supply and sewerage services in the Project areas by improved commercialization. The implementation of cost-recovery programs that lead to water conservation, provide resources for O&M, and repay capital in the long run is a crucial step toward the greater independence and financial viability of UCs. Autonomous UCs will continue to develop tariff structures that are affordable and will provide the basis for the sustainability of service provision. These policy measures, together with the Project's physical works, will provide reliable water supplies and better sanitation that will improve the urban environment,

facilitate economic growth, enhance resource conservation, and improve the health and quality of life of people who live in the Project areas. The Project is designed to improve the economic and technical efficiencies of UCs to enable them to attract the necessary investments in the sector on a consistent basis.

2. Scope

43. Institutional improvements, including development of UCs, and the establishment of operations and financial and monitoring procedures, will proceed in parallel with the Project's physical works. Appropriate tariff structures will be adopted. The accompanying TA will provide staff development and training systems for UCs. The institutional improvements will also assist in developing operational capacity for sewerage systems, and will enable these systems to be optimally utilized.

44. The physical components of the Project are tailored to the priority needs of each UC. In Chuuk, 30 water wells will be constructed, an existing water treatment plant and three existing water tanks will be refurbished, additional chlorination facilities will be installed, and a transmission pipeline will be constructed. In Pohnpei, four new water distribution pipelines will be constructed to extend the UC's service area. In Kosrae, an existing intake will be refurbished, four water treatment plants, and water transmission and distribution pipelines will be constructed. In Yap, seven water wells will be constructed and an existing well will be deepened; an existing water treatment plant will be refurbished and new chlorination facilities will be installed; and a water tank, transmission and distribution pipelines, and a pumping station will be constructed. In all states, new household water connections and consumer water meters will be installed.

45. Project implementation will be supported through financing of the incremental salaries of temporary PMU and Project implementation staff by the National Government and UCs. Office accommodation, computers, service vehicles, and other equipment will be provided. Consulting services included in the Project will assist in Project management and will further develop the concept of the proposed works, undertake surveys, prepare environmental impact assessments, and draw up detailed engineering designs and plans. The consultants will review the design work carried out by UCs, coordinate construction supervision, prepare materials schedules and procurement documents, and make recommendations for contract awards. While undertaking these activities, the consultants will develop local managerial skills by utilizing existing UC personnel, to the extent possible, providing valuable engineering and project management experience for local staff.

46. The Project places a high degree of importance on the management efficiency of UCs. During Project implementation, UCs will continue to implement financial and institutional improvements, including the following

- (i) preparation of fixed assets registers;
- (ii) development of appropriate billing, accounting, and management information systems (MIS);
- (iii) development of appropriate staffing structures;
- (iv) identification of short-term capital works and maintenance requirements;
- (v) preparation of annual budgets for water supply and sewerage operations;
- (vi) adoption of appropriate connection and disconnection policies and practices;
- (vii) implementation of water and sewerage tariffs;

- (viii) assessment of the need for development of improved regulations for water resources management;
- (ix) implementation of O&M impact statements;
- (x) improvements to legislation; and
- (xi) development of long-term corporate plans.

47. Financial performance objectives, tailored to the needs of each UC, are to include improvements in net incomes, cash balances, current ratios,¹ and debt service ratios. Assistance in the implementation of management and financial efficiency measures will be provided through the accompanying TA.

48. The Project will build the local capacity to plan, operate, and maintain water supply and sanitation services in two ways. First, the Project consultants will provide local staff with hands-on experience in the investigation and design of water supply systems, and experience in Project management. On-the-job training in the operation of Project facilities and the O&M of existing water supply and sewerage facilities is an important part of the consulting services. Second, the accompanying TA will build local capacity in the operation of financial management systems, and will provide further operational training, particularly in O&M activities, in each of the participating UCs.

49. The Bank has financed a study in community-based watershed management in Pohnpei.² Follow-on activities form an adjunct to the Project through the conservation of water resources. The Bank has held preliminary discussions with World Bank Global Environment Facility (GEF) staff, who have expressed preliminary interest in developing community-based watershed management in the FSM through a proposed Pacific-wide GEF project, to be implemented in association with the Bank. The Government is to approach GEF for assistance.

C. Technical Justification

50. The Project has been specifically tailored to the small size of the water systems, the need for economy, and concern for conservation and the environment. Technical solutions reflecting physical and climatological conditions have varied from state to state. Elements of the existing water systems have been optimally incorporated into the Project, which responds to demands that stem from the unique cultural background of each state.

51. The essence of the technical approach is the use of least-cost solutions such as (i) reuse of elements that continue to have useful life, (ii) renovation of those that simply need refurbishment, and (iii) use of groundwater requiring little treatment, where it is available and offers the least-cost solution. Technology has been selected to make best use of simple, low capital cost and low operating cost approaches. These include the use of slow sand filters (rather than more complex systems requiring the injection of chemicals) for water treatment, economically justified transmission and distribution pipeline sizing, easily handled hypochlorite addition for disinfection, and materials selected to maximize asset life. However, the Project also includes reconditioning of some high-investment elements already in place, such as large capacity steel tanks and water treatment plants that have mechanical components.

¹ Defined as the ratio of current assets to current liabilities

² TA No. 1925-FSM: *Watershed Management and Environment*, for \$585,000, approved on 6 August 1996.

52. Roof water catchments and storage tanks designed to provide a basic quantity of water to houses on the fringes of the Project areas, where housing density is relatively low, would cost more than the piped water supplies to be installed under the Project. The sanitation needs of many of these houses are met by dry pit latrines. Consequently, minimal-size rainwater storage systems to supply water only for drinking, washing, and cooking have been considered. Even so, the cost of rainwater collection and storage systems would vary from \$5,600 to \$9,500 per house depending on location (and rainfall), the number of people in the household (and tank size), and the area of house roof available for collecting rainwater (about 75 percent of the houses in the Project area in Chuuk and about 50 percent of houses in other Project areas would need extensive re-roofing).¹ The cost of providing piped water supply varies with locality, from \$2,300 to \$4,200 per house. Piped water supplies give a higher level of service, provide a higher degree of protection from contamination, and are not dependent on individual householders for O&M services. They are therefore inherently more reliable and will be installed under the Project.

D. Cost Estimates

53. The total cost of the Project is estimated at \$13.3 million, including taxes and duties of \$0.2 million, of which the foreign cost is estimated at \$9.2 million (69 percent) equivalent including \$0.1 million for service charge during construction on the Bank loan. The local cost is estimated at \$4.1 million (31 percent), including \$0.9 million for interest during construction. Interest during construction has been calculated on the assumption that proceeds of the Bank loan will be on-lent by the state governments to their respective UCs at an interest rate of 6.82 percent (based on the Bank's US dollar ordinary capital resources rate) and an amortization period of 25 years, including a grace period of 5 years.

E. Financing Plan

54. The Government has requested a loan of \$10.6 million equivalent in various currencies from the Bank's Special Funds resources, which would cover 80 percent of the total Project cost. The loan will finance the entire foreign exchange cost (which includes the foreign exchange components of materials and equipment, construction, consulting services, and the service charge during construction), and \$1.4 million in local costs (which includes part of the local components of construction costs). Local cost financing from the loan is justified because of the difficult financial position of the National Government and the states and the support required for sectoral improvements that are under implementation. The National Government and the state governments will jointly meet the remaining \$2.7 million, or 20 percent of the Project cost (which will cover land costs, taxes and duties, interest during construction once the loan proceeds have been on-lent, incremental salaries of PMU and other Project implementation staff, and part of the cost of civil works). Details of the financing plan are summarized in Table 1.

¹ Analysis has been based on *Designing Your Rainwater Catchment and Storage System*, published by the Water and Energy Research Institute of the Western Pacific, University of Guam. The design allows for a water supply of 75 lpcd (15 lpcd of water for drinking, cooking, and washing dishes, and 60 lpcd for bathing and washing clothes). The design approach has been specifically prepared for islands in Yap and Chuuk, and was modified for localities with higher rainfall in Pohnpei.

Table 1: Financing Plan (\$ million)

Source	Foreign Exchange	Local Currency	Total Cost	Percent
Bank	9.2	1.4	10.6	80
National and State Governments	-	2.7	2.7	20
Total	9.2	4.1	13.3	100

55. The Federated States of Micronesia will be the Borrower of the Bank loan. Loan proceeds will be relent by the National Government to the state governments at terms which include a service charge of 1 percent per annum and a repayment period of 25 years, including a grace period of 5 years. The state governments shall bear the foreign exchange risks on their respective portions of the Loan. The state governments will on-lend to their respective UCs at the Bank's interest rate for US dollar loans from its ordinary capital resources (currently 6.82 percent per annum), and an amortization period of 25 years including a grace period of 5 years. A portion of the Loan proceeds will be retained by the National Government to finance consulting services. The National Government, the state governments, and UCs will enter into tripartite Financing Agreements covering the terms and conditions of relending and on-lending and the provision of counterpart support.

F. Implementation Arrangements

1. Organization and Management

56. A Project Management Unit (PMU) has been established in OPS, the Project Executing Agency. The National Planner (Director, OPS) is the Project Director and is supported by a Project Manager. Necessary qualified staff and resources have been assigned to the PMU, which is responsible for the day-to-day management and coordination of all Project activities. UCs will implement the Project, and each UC will appoint a Project Implementation Officer (PIO) to implement the Project at the state level and to coordinate with PMU.

57. A Project Implementation Committee (PIC), comprising the General Managers of each UC, together with one senior staff representative nominated by each state government, under the chairmanship of the Project Director, has been established to coordinate Project activities across the states. PMU is the secretariat for PIC. It is expected that PIC will meet every six months (or more frequently, if needed), and will co-opt other members as necessary to ensure the resolution of implementation issues as they arise.

2. Implementation Schedule

58. The Project will be implemented over a period of four years from 20 May 1996 to 30 April 2000. The Project implementation schedule is presented in Appendix 2.

3. Procurement

59. All goods and services financed by the Bank under the Project will be procured in accordance with the Bank's *Guidelines for Procurement*. However, no local contractors in any of the participating states are capable of undertaking the principal civil works. PUC has the necessary equipment and expertise to design and construct the water supply pipelines and associated works that form the physical Project components in Pohnpei, and has recently successfully implemented projects of similar magnitude. PUC will accordingly carry out the civil works components in Pohnpei under force account procedures. Electric power connections and installation of consumer water meters in Yap, Chuuk, and Kosrae will also be carried out by the respective UCs under force account procedures, as will well drilling in Yap and Chuuk. The value of all civil works completed on a force account basis shall not exceed, in total, the equivalent of \$2,500,000. Civil works contracts estimated to cost the equivalent of \$50,000 or less, including one small contract for connecting an existing well to the main water supply system in Yap, will be awarded under local competitive bidding procedures acceptable to the Bank.

60. The relatively low value of contract works, together with the remoteness of the Project areas, will deter foreign suppliers and contractors from going through the Bank's international competitive bidding procedures. The Bank's international shopping (IS) procedures will accordingly be used for principal civil works contracts in Chuuk and Yap, and for contracts for the supply of equipment and materials.

61. To provide flexibility in Project implementation, separate IS contracts will be awarded for the supply of materials and equipment in each state, and separate IS contracts will be awarded for civil works in Chuuk, Kosrae, and Yap. However the total number of contract packages has been minimized, to provide economies of scale and expedite Project implementation. The largest civil works contracts to be carried out under IS procedures are for civil works in Kosrae and Yap (estimated at slightly less than \$1.3 million equivalent each). Contracts for the supply of materials and equipment will be less than \$500,000 equivalent. Drilling rigs for Chuuk and Yap are being procured under IS procedures. Minor items of equipment and materials costing less than \$50,000 equivalent will be procured using direct purchase procedures.

4. Consulting Services

62. Consulting services will be utilized to assist in Project implementation through the provision of specialist design services, preparation and evaluation of bid documentation and environmental impact statements, coordination of construction supervision, and assistance in Project management. Consulting services will be engaged in accordance with the Bank's *Guidelines on the Use of Consultants*. A summary of the consulting services, together with the terms of reference is given in Appendix 3.

63. The Project consultants will work closely with staff of OPS and each UC. Through this collaboration, the consultants will provide on-the-job training in project management, engineering design, and construction supervision. The Project consultants will provide UC staff with hands-on training in O&M of all facilities to be provided under the Project.

5. Land Acquisition

64. Land acquisition for each component will be undertaken by the individual states and, in the case of Pohnpei, by PUC. Although pipeline routes will be close to existing roadways, some easements in Pohnpei and Yap and some land compensation in Chuuk and Kosrae may be required. While there are no land resettlement issues, discussions regarding encroachment on private property have commenced between UCs and landowners.

6. Midterm Review

65. Within 18 months of loan effectiveness, a comprehensive midterm review (MTR) of the Project will be undertaken to evaluate Project progress, implementation procedures, procurement, benefit monitoring and evaluation, performance of Project consultants and the effectiveness of the National Government's public education and community participation initiatives. The findings of MTR will be discussed jointly by the Government and the Bank and necessary modifications in design, if required, will be carried out to ensure achievement of the Project objectives.

7. Operation and Maintenance

66. O&M will be the responsibility of UCs. Structured O&M systems will be developed to ensure that UCs can meet the desired service levels in a cost-effective manner. The Project and its accompanying TA will build the O&M capacity of UCs through on-the-job training, development of O&M manuals, and the provision of equipment. O&M training will complement capacity building, which is being supported by OMIP. The National Government shall ensure that CSPUC, by 31 March 1997, has prepared and submitted an application for comprehensive assistance to the OMIP of the US Department of the Interior and, in such connection, also ensure that CSPUC shall have submitted a formal request to the Chuuk legislature for appropriation of state counterpart funds necessary for OMIP assistance.

8. Disbursement Procedures

67. The Bank's direct payment procedures will be used to reimburse consulting services and procurement carried out under IS. To assist UCs to meet obligations on time, the Government has requested that portions of the loan proceeds be deposited in an imprest fund account, which will be established at a bank designated by the Government and acceptable to the Bank. Except as the Bank may otherwise agree, the imprest account will consist of advances from the Bank for eligible expenditures for the Project. The amount to be deposited will be based on the anticipated expenditures for materials and equipment required by PMU and PIOs, estimated at \$120,000. The account will be established, operated, and maintained in accordance with the *Bank's Guidelines on Imprest Fund and Statement of Expenditures Procedures* (November 1986), as amended from time to time, and such terms and conditions as may be agreed upon between the Borrower and the Bank.

68. The Bank's statement of expenditures procedures will be used for (i) reimbursing expenditures equivalent to \$5,000 or less, and (ii) liquidating advances for individual payments for the imprest account equivalent to \$5,000 or less.

9. Reports, Accounts, and Audit

69. UCs will prepare and submit quarterly progress reports to PMU. PMU will consolidate the quarterly reports and submit an integrated report to the Bank. Within three months of the physical completion of the Project, PMU, with assistance from the UCs, will prepare and submit to the Bank a Project Completion Report on the execution and operation of the Project facilities.

70. All UCs will maintain adequate accounting systems consistent with the Uniform System of Accounts prescribed by the United States Federal Energy Regulatory Commission and will prepare a set of financial statements including an income and expenditure account and a balance sheet. All the accounts and financial statements will be audited by auditors acceptable to the Bank within 12 months of the end of the fiscal year. The imprest account and expenditures reimbursed under the statement of expenditure procedures will also be audited and included in the auditor's report submitted to the Bank.

10. Advance Action and Retroactive Financing

71. The Bank has approved advance action and retroactive financing for Chuuk and Yap to acquire drilling rigs and retain drillers to pre-drill, develop, and cap water wells. This will ensure the development of the wells and determination of land to be acquired. It will also provide the designers with firm information on the location, pumping rates, and quality of the available groundwater. In Yap, an existing well will be connected to the main water distribution system. In addition, the PMU will be established and the project management, design, and supervision consultants will be engaged. These advance actions will ensure that the Project preparation activities will be in accordance with the Project implementation schedule. The amount of retroactive financing is estimated to be \$0.7 million. The National Government has appropriated funds for advance action.

11. Benefit Monitoring and Evaluation

72. To ensure that piped water supply is efficiently operating at the envisaged service levels and that the target groups are realizing the anticipated benefits from the development, a Benefit Monitoring and Evaluation (BME) program will be developed and implemented. BME objectives and indicators have been defined by the project preparatory TA consultants and will be refined during Project implementation to provide UCs with essential information for updating their corporate plans. The results of the program will be incorporated into an evaluation, which will be undertaken after an extended period of operation of the upgraded Project facilities. The BME program will be based on the Bank's *Benefit Monitoring and Evaluation Handbook* and will compare the Project benefits with the baseline condition.

G. The Executing Agency

73. The Office of Planning and Statistics, which was the Executing Agency for the project preparatory TA, has four divisions (Construction Management, Planning, Maintenance, and Statistics) under the responsibility of the National Planner. Currently the National Planner is an economic adviser to the Cabinet, and the Planning Division is responsible for the preparation of the national plan and sector development plans. The Statistics Division collects and collates national statistics from information provided by the states. The Maintenance

Division is responsible for maintaining the National Government complex at Palikir in Pohnpei and other Government facilities and assets.

74. Management of construction projects is an increasingly important OPS function. The Construction Division is the Government agency responsible for project formulation and management and provides technical input to the planning process. It is, or has been, the executing agency for several relatively major projects, including the new College of Micronesia project and the recent USEPA-assisted sewerage and rural sanitation project (costing about \$10 million). It is also the executing agency for projects funded by the National Government Congress, including construction of roads and bridges and the development of rural electrification. With assistance from a resident UNDP technical adviser, OPS prepared the master plans on which the Project is based. While OPS is the agency to coordinate the Project, it has not yet managed a project financed through a Bank loan. Support in Project management, which is to be provided by the Project consultants, will be essential. Experience gained by OPS staff during Project implementation will contribute to local institutional capacity building.

75. PUC has completed several pipe-laying works similar in nature to the Project works, and has good resources of personnel and facilities. YSPSC assumed full control of the Colonia Water Supply system in 1996, and is minimizing its overhead by engaging optimal staff numbers for O&M. CSPUC and KUA are developing their expertise in management and in water supply and sewerage operations. With OMIP assistance, all UCs engage international staff in key managerial positions. Staff structures are shown in Appendix 4.

H. Environmental and Social Measures

1. Environment

76. An initial environmental examination (IEE) was carried out as part of the feasibility study.¹ Environmental impacts were assessed in two stages. First, the degree and significance of the possible environmental implications of each Project component were identified. Second, the Bank's checklist format, expanded to cover details specific to the FSM, was used to rate the relative significance of the environmental impacts and identify mitigation measures. Most of the aspects identified have no significant impact, but some potential impacts were noted in each component. Impacts will be appropriately considered in the detailed design of the Project. The Project consultants will coordinate with the environmental protection agency of each participating state to formulate environmental impact assessments in accordance with each state's requirements.

77. The most significant potential for adverse impacts is seen in the development and operation of wells in the Eyeb Basin in Yap to meet water supply needs, since this could affect downstream riparian rights to water from surface streams. This will be fully assessed in design, and optimal pumping rates and monitoring arrangements will be defined.

2. Social Analysis

78. Social impact assessments, which included socioeconomic profiles, were prepared for each Project community during the project preparatory TA. Subsequently,

¹ A summary IEE is held in the Project files.

household interviews addressed Project design, affordability, willingness to pay, and operations. The social profiles of the Project areas are outlined below; a full description is presented in the final report of the project preparatory TA consultants.

79. Traditional social structures have been considerably modified. Yap has retained its traditional culture more strongly than have the other states. Yap's main island is governed by three social orders, between which marriage is not allowed. Women have not traditionally participated in public affairs but they are not without say, as indicated by the success of the Yap Women's Organization. Female participation in the labor force is high, particularly in subsistence agriculture. In Chuuk, the traditional social organization was originally matrilineal, but sons now tend to be given precedence over daughters. Women make up only 25 percent of the employed labor force. In Pohnpei and Kosrae, land tenure is no longer matrilineal. Pohnpei comprises several different cultures, all of which are represented in significant community populations. Pohnpei has a large in-country migrant population.

80. Fewer than half of the households surveyed in Chuuk, received piped water. About 70 percent of the households have roof catchments, but only a small minority have adequate-size storage tanks. Most households without water supply catchments or adequate roof water storage use uncovered and unprotected shallow wells, many with visibly foul water. The number of tourists visiting Weno has been declining in recent years, although Chuuk Lagoon is a special destination for scuba divers. One tourist hotel has had great difficulty in obtaining a reliable water supply and has recently installed its own seawater desalination plant.

81. Two thirds of the households surveyed in Kosrae complained about intermittent supply of water, with some households receiving very little water, if at all, from the public water supply system. Of these households, 63 percent have roof catchments but, as in other states, few have adequate-sized storage tanks. Nearly all surveyed consumers felt that the quality of the piped water supply is not satisfactory. Despite these perceived water supply deficiencies, over 70 percent of the households surveyed possess washing machines (high proportions of washing machine ownership were noted in other states).

82. In Yap, about 70 percent of the households surveyed were served by piped water supplies. A similar proportion had some form of roof catchment, and a further 11 percent used their neighbors' catchments. Nearly 90 percent of households surveyed relied on piped water supplies for washing in the dry season, compared with 95 percent in the wet season.¹ Several households reported traveling several kilometers from Colonia to obtain water from well sources. Nearly 90 percent of the households surveyed felt the need for improved water supplies.

83. In view of Pohnpei's high rainfall and the impact of user charges, a high usage of roof rainwater catchments might be expected; however, this is not the case. Only about one third of the houses surveyed had some form of roof catchment because of the high cost of such systems. Two thirds of the households surveyed felt that the piped water supply was unfit for drinking,² therefore, they either boil their water, use rainwater, or occasionally purchase bottled water (which costs about \$0.40 per liter). However, all surveyed households felt that the water supply service has improved in recent years.

¹ There are recent indications that reliance on piped water supplies has grown with improvements in the reliability of supply implemented by YSPSC.

² This illustrates a public misconception and the need for a public education program. The quality of water supplied in Colonia now meets the standards in the World Health Organization's guidelines.

I. Technical Assistance

84. An advisory TA accompanies the loan for capacity building in UCs. The TA will address the need for UCs to improve their O&M procedures; improve their billing, accounting, and management information systems; and develop their abilities in public education and participation. The TA will be carried out by an international consulting firm, which will provide a total of 17 person-months of expertise in O&M of water and sewerage systems, including water and sewage treatment plant operation and leakage prevention and detection; billing, accounting, and management information systems; and public education and participation. The consulting firm will be engaged in accordance with the *Bank's Guidelines on the Use of Consultants*. The estimated cost of the TA is \$612,000 equivalent, comprising \$559,000 in foreign exchange costs and \$53,000 equivalent in local currency costs. The TA will be financed by the Bank on a grant basis in the amount of \$587,000, to cover remuneration, per diems, and travel costs of the international consultants, computers and software, participatory workshops, preparation of reports and manuals, and other out-of-pocket expenses. The Office of Planning and Statistics will be the Executing Agency. Each UC will finance (in kind) the costs of office space and facilities and counterparts. The TA will be implemented over an eight-month period. The terms of reference are given in Appendix 5.

V. PROJECT JUSTIFICATION

A. Economic and Financial Analyses

1. Economic

85. Through the development of new water sources, rehabilitation of existing facilities, provision of water treatment, provision of new water storage facilities, and extension of transmission and distribution systems, the Project will benefit about 16,000 people in Chuuk, 3,250 people in Pohnpei, 5,000 people in Kosrae, and 4,000 people in Yap. The Project will bring a significant improvement in quality and consistency of the supply of treated water. This will eliminate existing severe seasonal shortages in some states, and allow reliable service to be extended to many new users in each target community in all the Project states. The Project will play a significant role in reducing the high levels of waterborne and water-related diseases observed country-wide.

86. The Project will also reinforce the development of UCs and ensure the formulation of appropriate tariff structures. The supply improvements are seen to be an important adjunct to implementing and increasing tariffs by demonstrating a new value as the tariffs are imposed. The tariffs are, in turn, expected to contribute to suppressing excess demand and wastage of water. Ongoing institutional strengthening is introducing improved billing and financial management systems, in turn enhancing the financial sustainability of each UC and the Project. The combined result will be a significant economic benefit for the states and the country.

87. Other economic benefits will arise from (i) savings in costs and time spent by consumers in collecting, storing, and treating water from nonpiped sources and from remote piped sources; (ii) savings in costs and time as consumers switch from developing and maintaining nonpiped sources; and (iii) increased quantities of water used by nonpiped water users switching to a more convenient piped water system. The costs saved under the Project, such as time savings for women in collection and treatment of water and income saved from

not having to pay high prices for water from water vendors, can be directed to other economic activities.

88. Economic analysis was carried out using an analytical framework covering the following: (i) identification of the need or demand for the Project, using information on willingness to pay and affordability obtained from a socioeconomic survey undertaken in each Project town; (ii) verification of the Project as the least cost means of meeting that demand; and (iii) a comparison of the costs and benefits of the most cost effective means to determine the most efficient resource allocation. The analysis is in accordance with the Bank's *Interim Guidelines for the Economic Analysis of Water Supply Projects*. This analysis gave the overall Project-wide economic internal rate of return (EIRR) as 16.2 percent, which is considered satisfactory because it exceeds the estimated economic opportunity cost of capital (EOCC) of 10 percent. The EIRRs for the individual Projects all exceed the EOCC and range from a high of 19.7 percent in Chuuk to a low of 13.1 percent for Kosrae. The economic analysis is presented in Appendix 6.

2. Financial

89. Detailed financial projections for 10 years have been prepared for each of the four UCs to assess the ability of each component to become a financially sustainable entity and to estimate the financial impact of the Project. The overall Project-wide financial internal rate of return (FIRR) is 7.0 per cent, which is considered satisfactory because it exceeds 3.3 percent, the estimated weighted average cost of capital (WACC), which is the standard comparator for determining the cost of capital to UCs. The FIRRs for the individual Projects all exceed the WACC and range from a high of 8.5 percent in Kosrae to a low of 4.4 percent for Pohnpei. The details are given in Appendix 7, and the financial projections of UCs are given in Appendix 8.

3. Willingness to Pay, Affordability, and Subsidies

90. Cost structures differ for each UC, and water tariff levels differ accordingly. By indicative tariff levels, the cost of water supply and sanitation to low-income households in Kosrae, Pohnpei, and Yap is estimated to be within the range 3 to 6 percent of household income. In Chuuk, the proportion may exceed 6 percent. The precise requirement for tariffs and their impact on customers' ability to pay for piped water to low-income households will be assessed in UCs' corporate plans. In social surveys carried out by the project preparatory TA consultants, 31 percent of low-income households surveyed in Colonia, 52 percent in Weno, 22 percent in Kosrae, and 18 percent in Colonia¹ indicated that they would be willing to pay up to \$20 per month for water.

91. Tariff levels incorporated in the Project financial analyses have been based on the elimination of operating subsidies by FY2000, and the achievement of full cost recovery by FY2005.² Water pricing may become a sensitive political issue and the National and state governments will require some time to introduce pricing reforms. The precise requirements for tariffs and their impact on customers' ability to pay will be determined in the corporate plans that will be prepared by UCs. Progressive block tariffs will allow some cross-subsidization from

¹ However, the high level of billing efficiency in Pohnpei now indicates that this figure may be misleading.
² FY2000 ends on 30 September 2000.

large to small consumers, to ensure that a basic quantity of water is available at an affordable price to lower income consumers.

92. The level of subsidization of water and sanitation services is difficult to quantify because state accounting systems do not specifically identify expenditure on these services. Despite their being accustomed to low water tariffs, consumers have expressed willingness to pay higher tariffs. The results of the affordability analyses indicate that the targets are realistic. However, complaints about tariff increases in Pohnpei indicate that some public resistance to paying for services is likely and that elimination of operating subsidies before FY2000 would not be practicable. Further details of the affordability analysis, and details of subsidy levels required are given in Appendixes 6 and 8.

4. Demand Management

93. All of the Project areas are located on hilly islands, and present water consumption patterns reflect the high rainfall and consumers' perceptions of plentiful water. On hilly Pacific islands, where consumption is often limited only by the physical capacity of water supply systems, water demands can be among the highest in the world. Consumers have little appreciation of how much water they use, and how much they really need. In such circumstances, willingness to pay surveys, which attempt to assess the actual quantities of water that consumers are willing to pay for, may be misleading.

94. However, the reduction of water consumption in Pohnpei, where a tariff increase in 1994 reduced consumption by about 24 percent to 350 lpcd, has enabled the price elasticity of demand for water to be estimated (see Appendix 6). Domestic water demand in Pohnpei is projected to decline by a further 30 percent, to 245 lpcd by 1998. The domestic water demand in Yap, which is presently the lowest in the four states, is projected to decrease by 35 percent from its present level of 315 lpcd to 205 lpcd by 1998. In Kosrae domestic water demand is projected to fall from 265 lpcd to 225 lpcd. No accurate consumption figures are available for Chuuk, but with the implementation of tariffs, demand is projected to be 225 lpcd by 1998.

5. Project Risks

95. Three significant risks have been identified during Project preparation: (i) the National Government and the state governments may lack the political will to implement the necessary policy reforms, (ii) the demand for water may fall to levels below those required for Project viability, and (iii) a perceived fall in national and household incomes following the cessation of Compact payments may adversely affect cost recovery. The Government and the states have demonstrated a commitment to policy reforms through the establishment of autonomous UCs. Nevertheless, the political will to continue the reforms may be weakened by public reaction to increased water charges. The proposed staging of the reduction of external support to UCs will enable consumers to gradually become accustomed to higher tariffs and to the improved levels of service that can be achieved through more effective cost recovery. This has been recently demonstrated in Yap, where improved management through YSPSC has improved the reliability of water supply services, and in Kosrae where the public support for the handing over of the management of water and sewerage services to KUA.

96. A conservative approach has been taken in projecting water demand. The elasticity of demand observed in Pohnpei has been doubled, on the assumption that some consumers may initially react to increased water charges by turning to other water sources.

Demand is not likely to fall below 150 lpcd, as this is a reasonable minimum for houses with water carriage sanitation systems. The critical levels of consumption at which the FIRR of the Project components will fall below WACC are less than 150 lpcd in Yap, Kosrae, and Chuuk. In Pohnpei, household incomes are relatively high, and in view of the conservative approach taken in projecting demand it is unlikely that consumption will fall below 212 lpcd. This analysis indicates that the Project will be viable.

97. Trends in the national economy and household incomes are difficult to project. The economy may grow steadily until the year 2003, led by growth in core activities such as fisheries and tourism. Payments under the Compact are likely to cease after 2003 (following a two-year negotiation period), after which US assistance may fall to about 25 percent of its present level. Other external support is likely to remain at the present level. The declining rate in Compact funding up to 2003 is likely to generate growth of the internal economy and if used wisely, the country's offshore reserves¹ will buffer the decline in external support. While it seems likely that the economy will grow, decline, and then grow again, the analysis of cost recovery projects that household incomes will remain constant at 1996 levels in real terms. On this basis, water tariffs will remain affordable.

B. Environmental Benefits

98. The Project's environmental benefits stem from the improved use of resources associated with the introduction of water demand management (through consumer metering and consumption-based tariffs), community control of development in water catchment areas, and improved operation of existing sewerage facilities. NRW reduction will complement consumer demand management to ease the overall demand on water resources.

99. While the Project areas are adequately served by sanitation and sewerage systems—some constructed with assistance from the USEPA, are relatively new—additional expertise is required to provide on-the-job training of sewage treatment plant operators in Chuuk and Yap. This training is assisted through the capacity-building TA accompanying the proposed Bank loan. Such training will enable sewage treatment plants to be operated at optimal levels, and the present pollution of coastal waters caused by the discharge of untreated or partially treated sewage will be reduced.

100. The proposed follow-up actions to the Bank-financed TA for Watershed Management and the Environment will help conserve water resources, as well as conserve native forests and prevent soil erosion. Control of soil erosion will reduce sedimentation in coastal waters and on coral reefs. These community-based actions will contribute significantly to the conservation of land and marine biodiversity.

¹

The Government currently holds about \$70 million equivalent of offshore reserves.

C. Social Dimensions

1. General

101. The main social benefit of an improved water supply is the improved health profile of the community. Health benefits are not quantifiable, yet they are significant. Improvement in water supply and sanitation facilities complemented by hygiene education will help reduce the incidence of waterborne and water-related diseases.

102. Although conditions and cultures vary between the states, the quality of life is much affected by the influence of external funding of the economy. The Project will be beneficial in changing this attitude by supporting commercial activity that will economically strengthen the community, reinforcing the water sector as a self-supporting and regulating entity, reducing wastage of produced water, and benefiting the community's health.

103. The findings of the social analysis indicate that a relatively high proportion of consumers need and are willing to pay for improved piped water supplies and improved environmental sanitation. Commercial and industrial users also expressed a clear preference for piped water supply for use in their businesses.

2. Poverty Reduction

104. The primary constraints to the lower income households in accessing Project services will be affordability and location. A progressive block rate tariff structure will lead to cross-subsidization between the large-volume users and poorer sections of the communities and encourage the large users to conserve water, thus ensuring that water at an affordable price is available to poor households. The need to boil water will be reduced through improvements to water quality. The Project includes the installation of standpipe water supplies in community groups where there is severe poverty and where even the lowest tariff levels may present affordability problems. The Project will therefore contribute to poverty reduction by ensuring that a reliable supply of water is available to even the poorest consumers, and by reducing the costs which water-related diseases cause to lower income consumers.

3. Women in Development

105. The Project's health benefits will have an immediate impact on women. Women's traditional roles in Micronesian society have focused on the family home, even when they are assisting in economic activities such as subsistence agriculture. Women's burden of tending the sick will be reduced by the Project.

106. Women also have the role of ensuring a sufficient quantity of water for family needs, a task which is extremely difficult in localities where public water supply is inadequate. Improvement in water supply reliability in Kolonia, Pohnpei, has been reflected in the positive responses received in social surveys. The improved reliability of water supply has benefits that will accrue to many women as improvement spreads in other Project areas.

VI. ASSURANCES

107. It is expected that the Bank will enter into a Loan Agreement with the National Government, and separate Project Implementation Agreements with the respective UCs. The National Government and the UCs have given the following assurances, in addition to the standard assurances, which have been incorporated in the legal documents.

A. Specific Assurances

1. National Government

a. Public Education and Participation

108. The National Government will ensure, or cause the states to ensure, that each UC will commence and continue public education programs during Project implementation, during which public meetings will be held to discuss water conservation, health aspects of water use, rights of access to water resources, water tariffs, affordability, and other Project-related issues.

109. The National Government will inform the Bank annually of steps taken to improve community acceptance of meterized billings and willingness to pay.

b. Access to Land

110. The National Government will ensure, or cause each state to ensure, that all land, and rights on land and water, required for the construction of water supply facilities under the Project are made available in a timely manner for the commencement of construction activities.

c. Environmental Matters

111. The National Government will ensure, or cause the states to ensure, that UCs comply with the Bank's environmental requirements and with those of the National Government and state governments, and that UCs obtain all necessary approvals with respect to environmental impact assessments.

d. Midterm Review

112. Within 18 months of loan effectiveness, the National Government will conduct a comprehensive midterm review, in consultation with the Bank and the Project consultants, to review and to critically evaluate the progress of the Project, implementation procedures, procurement, benefit monitoring and evaluation, performance of the consultants, public education and community participation, and implementation of policy and institutional improvements. Measures will be formulated to remedy any weaknesses.

2. Utility Corporations

a. Financial Performance of Utilities Corporations

113. Each UC will make best efforts to generate revenues in order to fund operating expenses (and thus eliminate the need for subsidies) within five years of Project completion and all O&M expenses, including depreciation and interest expense, within ten years of Project completion.

114. Each UC will make best efforts to maintain a debt service ratio, within five years of Project completion, of at least 1.0 and, within ten years of Project completion, of at least 1.2.

115. Expressed in terms of the average number of days of annual billings for water supply and sanitation services, PUC and YSPSC will achieve the following accounts receivable targets: 110 days by the end of FY1997, 90 days by the end of FY1998, and 70 days by the end of FY 1999 and thereafter. CSPUC and KUA will achieve the following targets: 110 days within 12 months of the date of Project completion; 90 days within 24 months of Project completion; and 70 days within 36 months of Project completion and thereafter.

b. Nonrevenue Water

116. Each UC will adopt the objective of reducing NRW to 30 percent by the end of FY2005, by means of appropriate measures including the use of improved meter reading, computerized billing, operational procedures, construction standards, and leakage detection programs.

c. Annual Review of Corporate Plans

117. Prior to the commencement of each Fiscal Year during Project implementation, each UC will submit to the Bank, through the PMU, a draft corporate plan for review and comment which details the projected development and operation of the UC on a three-year rolling basis, including (a) establishing annual performance objectives, (b) providing a strategy for delivering such objectives, (c) providing projections of O&M expenses, capital expenditures, tariff requirements, and (d) identifying the need for, and availability of, grants and subsidies.

d. Institutional Improvements

118. Each UC will implement procedures, to the satisfaction of the Bank, to promote the continuing institutional improvements of the UC including:

- (i) the preparation of a fixed assets register;
- (ii) development of an appropriate billing, accounting and management information system;
- (iii) development of an appropriate staffing structure;
- (iv) identification of short-term capital works and maintenance requirements;

- (v) preparation of annual budgets for water supply and sewerage options;
- (vi) adoption of appropriate connection and disconnection policies and practices;
- (vii) implementation of water and sewerage tariffs;
- (viii) promotion of the development of appropriate regulations for water resources management;
- (ix) implementation of O&M impact statements; and
- (x) development of long-term corporate plans

B. Conditions of Effectiveness

119. The loan agreement will become effective when:

- (i) at least two UCs and their respective states have entered into tripartite Financing Agreements with the National Government, acceptable to the Bank. Under each such Financing Agreement, the National Government will relend the proceeds of the loan to each state on terms which shall include a service charge of one percent per annum and a repayment period of 25 years including a grace period of five years. Each state will bear the foreign exchange risk on its proportionate amount of the loan. Each state shall onlend the loan proceeds to its UC on terms which shall include interest at the rate applicable to US dollar loans from the Bank's ordinary capital resources at the date of effectiveness, and with an amortization period of 25 years including a grace period of 5 years. A portion of the loan proceeds will be held by the National Government to finance consulting services. Each Financing Agreement will determine the proportionate shares of counterpart support to be agreed upon by the National Government and the respective state governments, which in any case will not be less than 20 percent of the total Project cost; and
- (ii) each of the two UCs referred to in (i) above have: (a) executed a Project Implementation Agreement with the Bank; and (b) confirmed, to the satisfaction of the Bank, that it has secured access for surveys and well drilling on all land on which Project works have been tentatively located in the state concerned.

C. Conditions of Disbursement

1. Development of Public Utilities Corporation Corporate Plans

120. Prior to the disbursement of loan proceeds for Project components in any state, the concerned UC in that state will prepare a corporate plan satisfactory to the Bank, which will guide the development and operation of the UC on a three-year rolling basis. The plan will

establish annual financial performance objectives for the UC and provide a strategy for achieving these financial objectives. The plan will project annual O&M expenses, capital expenditures, tariff requirements, and the need for and availability of grants and subsidies.

2. Project Implementation Officers

121. Prior to the disbursement for loan proceeds on Project components in any state, the concerned UC in that State will confirm to the Bank that an appropriately qualified and experienced Project Implementation Officer (PIO), satisfactory to the Bank, has been appointed. UCs will submit the names and biodata of the PIO to the Bank for comment.

3. Project Components in Chuuk State

122. In addition to other requirements set out herein, prior to the disbursement of loan proceeds for Project components in Chuuk state:

- (i) the Bank shall have received a legal opinion satisfactory to the Bank, of counsel acceptable to the Bank, confirming that CSPUC's Board of Directors has the ability to set tariffs for water supply and sewerage, without the prior approval of the state government, and that CSPUC has the right to retain all revenues generated through its business activities;
- (ii) Chuuk state shall have confirmed to the Bank that the ownership of all state-owned water supply and sewerage system assets in Weno have been transferred to CSPUC;
- (iii) CSPUC shall have confirmed that it has appointed a full-time general manager with experience and qualifications acceptable to the Bank; and
- (iv) the National Government shall ensure that CSPUC, by 31 March 1997, has prepared and submitted an application for comprehensive assistance to the OMIP of the US Department of Interior and, in such connection, also ensure that CSPUC shall have submitted a formal request to the Chuuk legislature for appropriation of state counterpart funds necessary for OMIP assistance.

4. Project Components in Kosrae State

123. In addition to other requirements set out herein, prior to the disbursement of loan proceeds for Project components in Kosrae state:

- (i) the Bank shall have received a legal opinion satisfactory to the Bank, of counsel acceptable to the Bank, confirming that KUA's Board of Directors has the ability to set tariffs for water supply and sewerage, without the approval of the state government; and that KUA has the right to retain all revenues generated through its business activities; and
- (ii) Kosrae state shall have confirmed to the Bank that the ownership of all water supply and sewerage assets within the Project area in Kosrae has been transferred to KUA.

VII. RECOMMENDATION

124. I am satisfied that the proposed loan would comply with the Articles of Agreement of the Bank and recommend that the Board approve the loan in various currencies equivalent to Special Drawing Rights 7.233 million to the Federated States of Micronesia for the Water Supply and Sanitation Project, with a service charge at the rate of 1 percent per annum and with an amortization period of 40 years, including a grace period of 10 years, and such other terms and conditions as are substantially in accordance with those set forth in the draft Loan and Project Implementation Agreements presented to the Board.

MITSUO SATO
President

22 August 1996

APPENDIXES

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EXTERNAL ASSISTANCE TO THE WATER SUPPLY AND SANITATION SECTOR

1. The water supply and sewerage sector in the Federated States of Micronesia (FSM) has received support from a number of external agencies:

A. The Bank

2. On 18 August 1994, the Bank approved a \$250,000 Technical Assistance (TA No. 2137-FSM) for the preparation of the proposed Water Supply and Sanitation Project. The Project has been completed.

B. United States Government Agencies

3. Over the past five years, Federal agencies of the United States of America (US) have provided about \$16.8 million in grant funding for the water and sanitation sector. About 65% of this amount (\$9.9 million) has been utilized for the construction of wastewater facilities under a project funded and executed by the United States Environmental Protection Agency (USEPA). A major source of financial support in the establishment of public utility corporations (UCs) in Pohnpei and Kosrae has been the Department of Interior's Operation and Maintenance Improvement Program (OMIP). In addition, two other agencies of the US Government are presently considering funding requests amounting to about \$3.4 million for water supply projects in Pohnpei and Kosrae. Details of the projects funded by the US Federal agencies are as follows:

(i) Trust Territories of the Pacific Islands Administration

The former Trust Territories of the Pacific Islands (TTPI) Administration has provided approximately \$3.8 million in funding for water supply and sewerage projects in Kosrae, Chuuk, and Pohnpei. About 75% of this amount has already been disbursed.

(ii) US Environmental Protection Agency

The USEPA has funded a \$9.9 million FSM-wide wastewater project. This project is expected to be completed in 1996.

(iii) Department of the Interior

The US Department of the Interior's OMIP has been operating in the FSM since 1991. Under this program, Pohnpei state has received about \$1.5 million to improve the operations of the Pohnpei Utilities Corporation (PUC). The Project is scheduled for completion in 1996. Kosrae state has also received funds to establish the Kosrae Utility Authority, which presently operates the state's power supply systems.

(iv) **Economic Development Administration**

The Economic Development Administration (EDA) of the US Department of Commerce has approved funding of \$1.6 million for a water supply project in Chuuk. Construction of the project is expected to commence in 1996. The EDA is also reviewing a grant application for \$1.2 million for a water project in Kosrae.

(v) **Rural Economic Community Development Service (RECDS) of the US Department of Agriculture**

RECDS is considering a funding application from Pohnpei for four rural water supply projects with a total cost of \$2.15 million. It is expected that a decision on these applications will be made during 1996.

C. United Nations Development Programme (UNDP)

4. Since 1992, UNDP has provided about \$0.5 million in technical assistance to the FSM, aimed at building a long-term capacity to assess and develop the country's water resources. The primary components of the UNDP-financed project consist of (i) preparation of water sector development plans, (ii) operational and training assistance to water sector institutions, (iii) engineering and project management assistance for the design and construction of a water supply system, and (iv) assistance in mobilizing resources for the development of the sector. The UNDP project ends in June 1996.

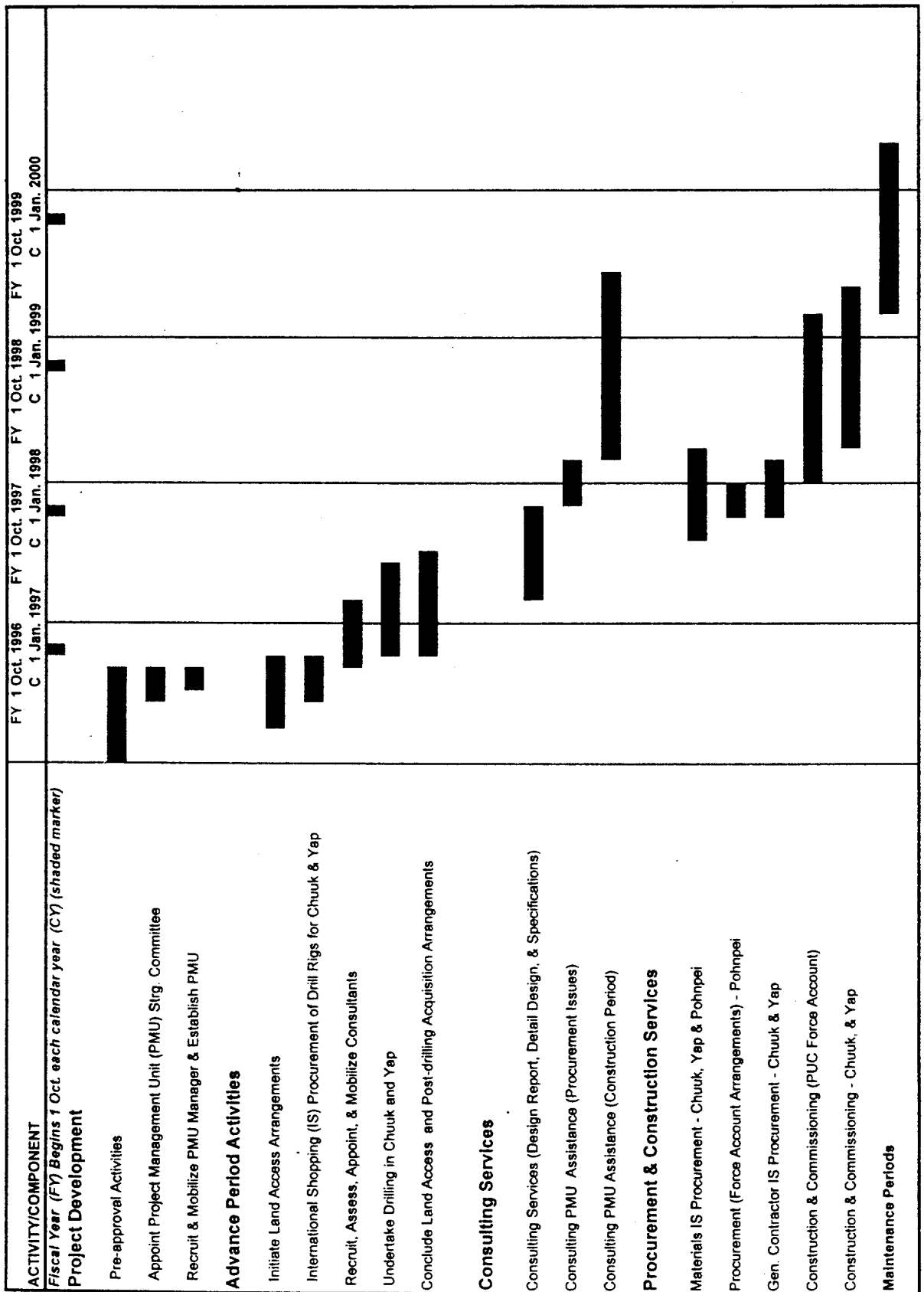
D. Government of Australia

5. The water supply sector has benefited from five grants over the past four years under the Australian Government Small Grants Program. These grants have financed the construction of small community systems in the states of Chuuk, Pohnpei, and Kosrae. The amount of funding provided through the grants is about \$120,000. Two systems have been completed. A third is being designed.

E. Government of the People's Republic of China (PRC)

6. The Government of the PRC has provided assistance for the development of the water supply sector by donating \$35,000, the cost of a small drilling rig to be used for the development of groundwater resources on the outer islands. The drilling rig was delivered in March 1996.

PROJECT IMPLEMENTATION SCHEDULE



TERMS OF REFERENCE FOR CONSULTING SERVICES

A. Introduction

1. Engineering consulting services are required to assist the Government in project management, carrying out investigations, preparing designs, preparing contract documents and specifications, evaluating bids, and supervising construction of the Water Supply and Sanitation Project to be implemented in the capital regions of Weno on Chuuk, Kolonia on Pohnpei, and Colonia on Yap.

2. The consultants will support the Project Management Unit (PMU) within the National Government's Office of Planning and Statistics and will report to the Project manager. A team of experts from an international firm of consulting engineers, who will engage local surveyors as necessary, is required. The required expertise is summarized in Table 1.

Table 1. Consulting Services Required
(person-months)

Component	Foreign Input	Local Input
Project Engineer/Team Leader	27	
Hydrogeologist	2	
Materials Specialist (Steel)	1	
Structural Steel Specialist	2	
Structural Engineer	7	
Mechanical Engineer	1	
Project Technician	10	
Draftspersons	23	
Water Treatment Specialist	2	
Hydraulic Engineering Specialist	1	
Electrical Engineer	3	
Structural and Electrical Technical Support	3	
Environmental Specialist	2	
Geotechnical Specialist	1	
Secretarial Support	6	
Surveying Team		8
Total	91	8

C. Specific Tasks

3. The tasks of the consultants will include, but will not necessarily be limited to the following:

- (i) Prepare a design report for each state's Project components to guide the detailed design. The design will include process review, control philosophy for well installations, related facilities and system operations; structural elements, such as reservoirs, treatment tanks, and pump houses; pump

installations; and pipelines. The design report will also include an environmental impact assessment meeting the requirements of each state.

- (ii) Carry out appropriate hydraulic analyses and transient pressure analyses of the existing and proposed water supply system elements to confirm or establish the sizing requirements of the proposed new transmission and distribution system elements and to establish a control philosophy for the systems.
- (iii) Review treatment and storage concepts and repairs contemplated in the engineering proposals of the Project Preparatory Technical Assistance (PPTA) and consider alternative construction materials to optimize the system economics. The consultant will need to assess the condition of steel reservoirs in Chuuk by nondestructive means, review their structural integrity by analyzing the sound steel remaining, and plan their rehabilitation. The consultant will need to establish a schedule for examining the reservoirs and for making cost-effective repairs to each, while maintaining lifeline water service to users of the system that rely on the tank.
- (iv) Undertake pipeline route and facility site surveys and geotechnical assessments in Chuuk, Kosrae, and Yap as bases for detailed design; undertake detailed design and prepare construction drawings, specifications, and tender documents for the Chuuk, Kosrae and Yap Project elements.
- (v) Provide design overview and final review of the detailed design undertaken by staff of the Pohnpei Utilities Corporation (PUC) in Pohnpei; periodically inspect the Pohnpei works as they progress and confirm the work completed by PUC force account construction.
- (vi) Prepare bills of material for procurement of the equipment, controls, and materials required by the consultant's design.
- (vii) Prepare bid documents satisfactory to the Bank and the Public Utility Corporations (UCs).
- (viii) Establish international shopping (IS) tendering and bid evaluation procedures acceptable to the Bank and UCs for the acquisition of materials and construction contractors for the various Project elements.
- (ix) Establish quality control criteria and procedures to monitor standards; implement a construction management system for civil works and equipment,
- (x) liaise with the Bank on Project implementation issues.
- (xi) Design and implement a Project benefit, monitoring, and evaluation (BME) system suitable for monitoring Project benefits; provide necessary training for the use of the system following project completion; obtain baseline data and prepare annual BME reports for the Bank during Project implementation;

- (xii) In consultation with the State Environmental Protection and/or Health officers, develop methods to avoid or mitigate any negative environmental impacts of the Project components, and prepare an "environmental audit" of the design together with environmental impact assessments to demonstrate the consideration given to environmental concerns raised in the PPTA Feasibility Report.
- (xiii) Provide liaison with the local Women's Associations and other local organizations as well as any other Bank consultants regarding the health education aspects of the Project.
- (xiv) Prepare structured operation and maintenance (O&M) procedures manuals (including budgets) for the proper O&M of the system components specific to projects in Chuuk, Kosrae, and Yap.
- (xv) Provide interpretation of the design intent, guidance of inspection, and testing services provided by UCs as appropriate for the construction of all Project works to ensure compliance with specifications, and for acceptance of the works.
- (xvi) Guide the preparation of as-constructed drawings for all Project works.
- (xvii) Assist in commissioning and performance evaluation of completed facilities and in initiating O&M programs.
- (xviii) Collaborate as required with other Bank consultants in their provision of technical, managerial, and financial management training to the respective UCs.

4. The consultant will also be required to direct the preparation of progress payments and final payment certificates for each contract by the State Project Implementation Officer(s) (PIOs), for presentation to the Project Management Unit (PMU) and to maintain Project cost records.

C. Schedule and Reporting

5. The services to be provided under these terms of reference will commence in 1997 and will run continuously for 27 months.

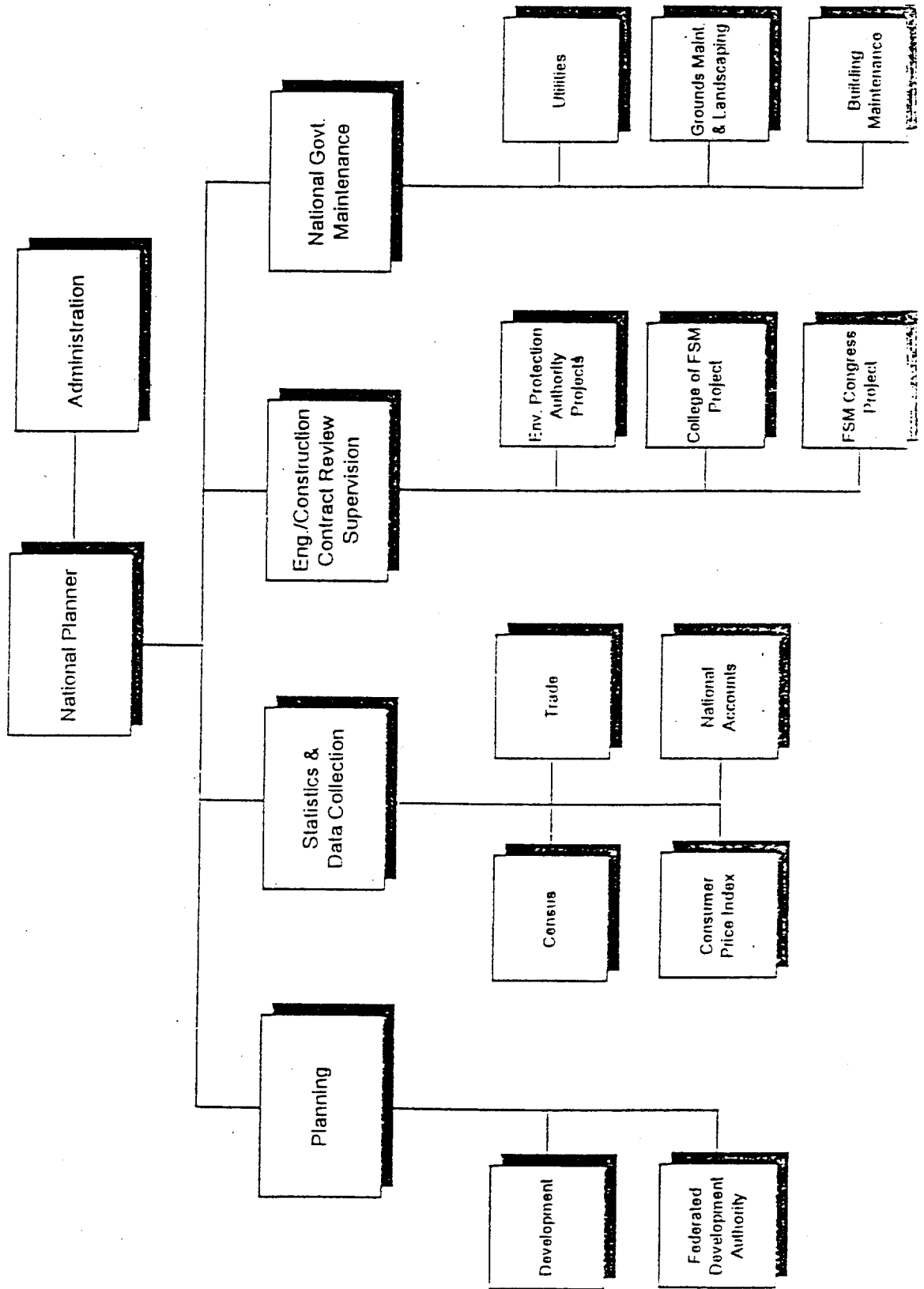
6. The consultant will submit short monthly reports in English summarizing progress achieved, person-months expended, expenditures incurred versus budgets; difficulties encountered and issues to be resolved. Monthly reports will be issued within 15 days following the end of each calendar month. Copies of each monthly report will be sent to PIOs in each state and to the PMU manager. In addition to these brief reports for each state, the consultant will also provide data and assist PMU with the preparation of quarterly progress reports on the overall Project and each state component for the Bank.

D. Local Support

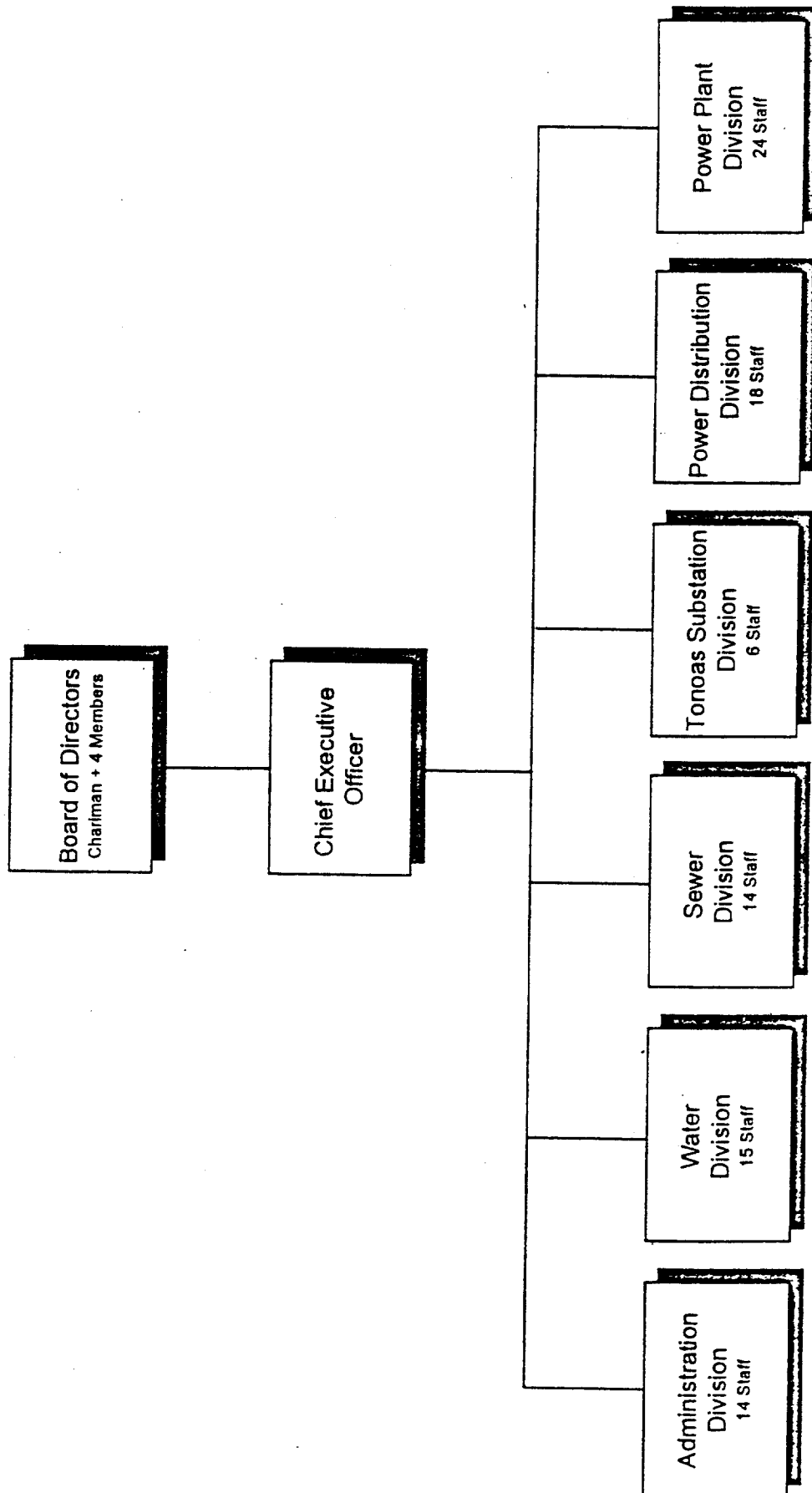
7. The Government of the Federated States of Micronesia and each UC will provide support for the visiting consultant team during preparation of the design report at no cost to the consultant. Each UC will provide suitable office accommodations for the consultant team leader when the leader visits each state from time to time during the course of the Project, at no cost to the consultant. Each UC (or state) will also provide all available data, mapping, legal plans and/or access for surveys required for the design of the state's Project components; printing and access to microcomputing and other equipment purchased through the Project, including communication facilities, at no cost to the consultant.

8. The Government and the various UCs will provide some counterpart support staff to work with the consultant. This will include secretarial services for the team leader throughout the implementation of the Project; staff who will prepare design and drawings for transmission and distribution pipelines in Pohnpei; and full-time inspection personnel to check contractor layout, inspect materials and workmanship of works in each state, and prepare payment certificates.

FIGURE 1: Government of Federated States of Micronesia
Office of Planning and Statistics
Organization Structure

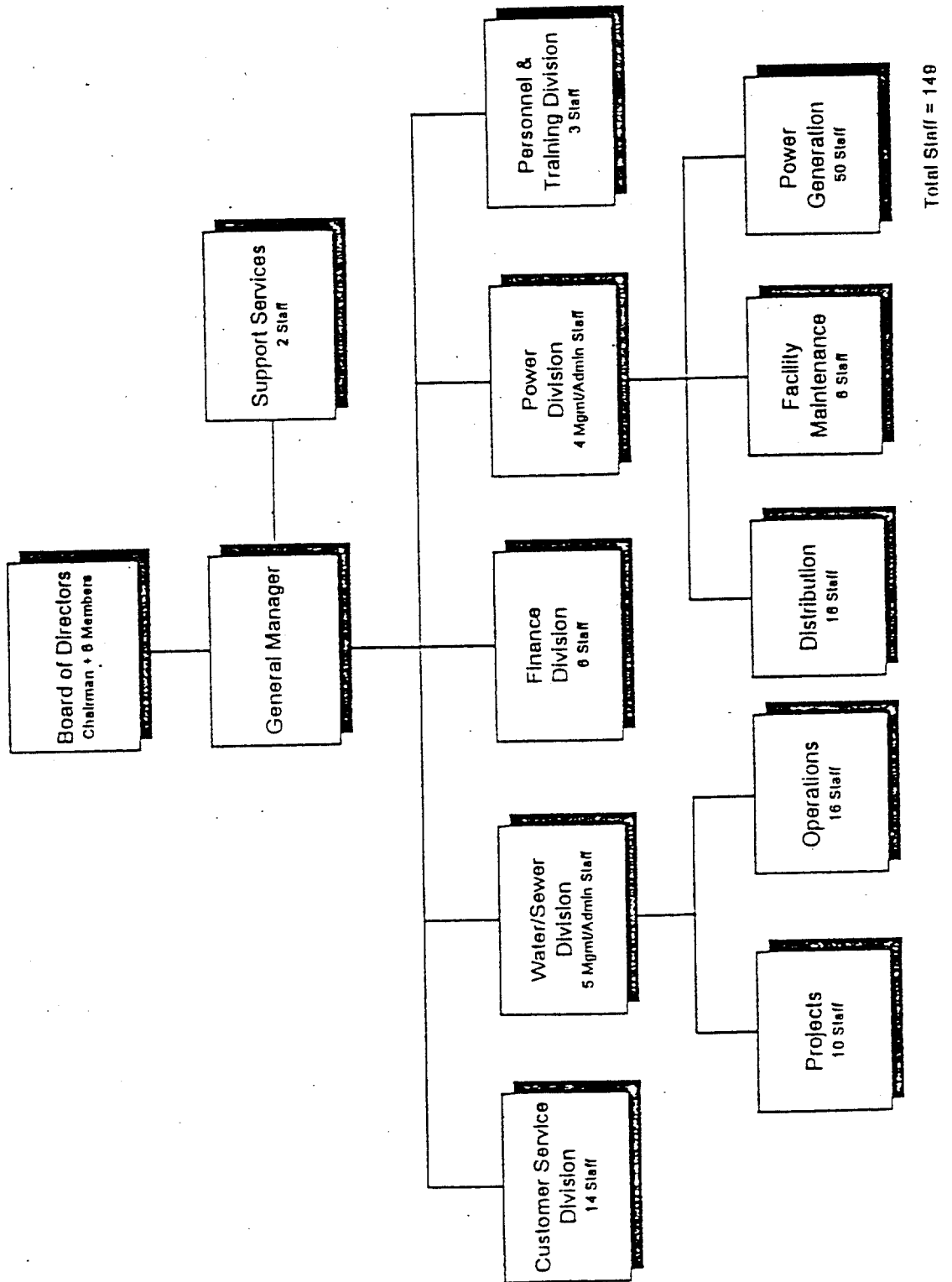


**FIGURE 2: Chuuk State Public Utilities Corporation
Organization Structure**



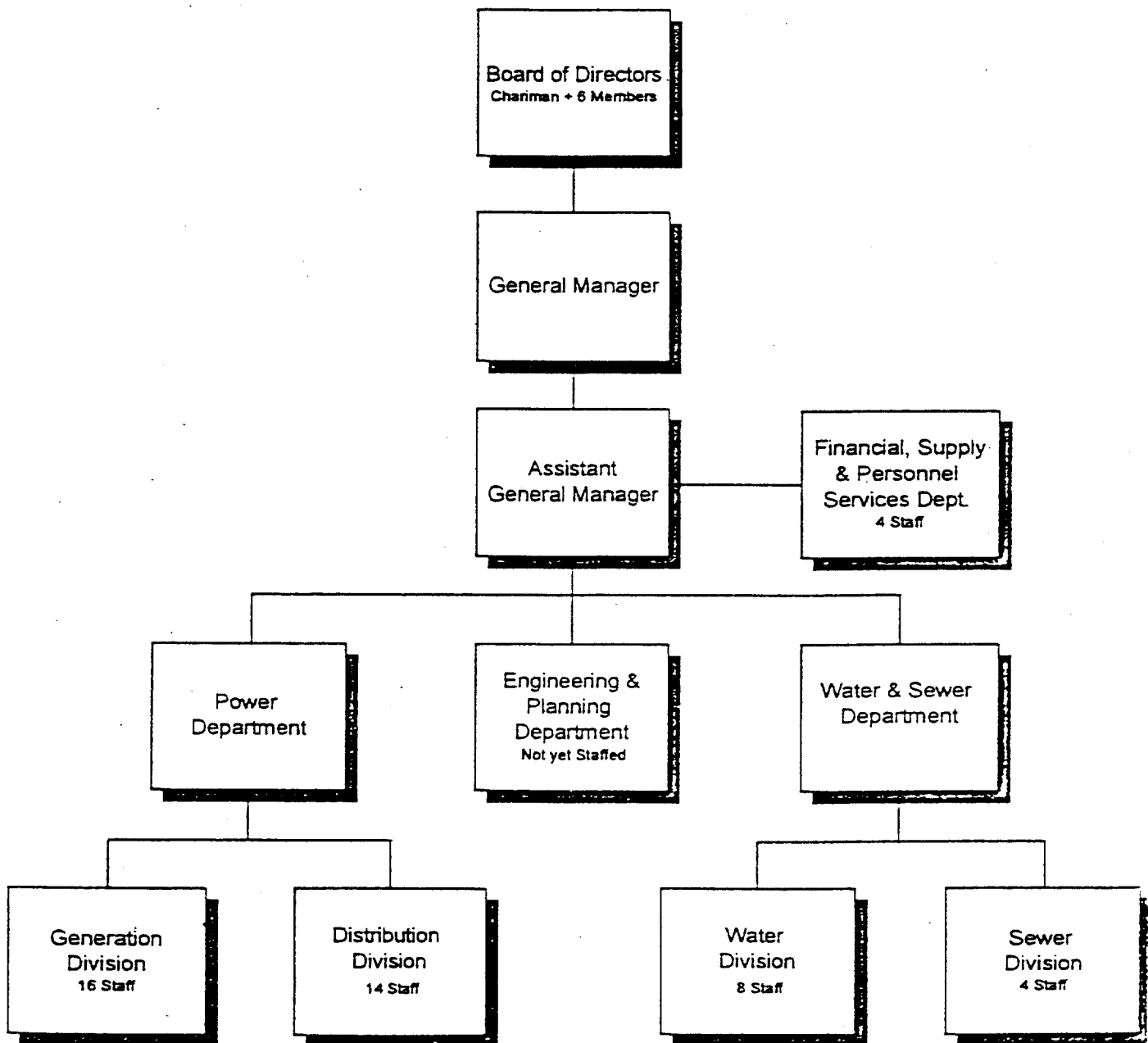
Total Staff = 92

FIGURE 3: Pohnpel Utilities Corporation
Organization Structure



**FIGURE 4: Yap State Services Corporation
Organization Structure**

Appendix 4, page 4



Total Staff = 48

TECHNICAL ASSISTANCE FOR CAPACITY BUILDING FOR MANAGEMENT AND OPERATION OF WATER SUPPLY AND SANITATION SYSTEMS

A. Objectives

1. The objectives of the technical assistance (TA) are to develop financial and management systems, operation and maintenance (O&M) capability, and public education and participation capability in Chuuk State Public Utilities Corporation (CSPUC), Pohnpei Utilities Corporation (PUC), Kosrae Utilities Authority (KUA) and Yap State Public Services Corporation (YSPSC). The TA is built around the specific needs of each of these public utilities corporations (UCs).

B. Scope

2. The overall services include (i) determination of requirements for leakage detection and prevention measures; (ii) determination of water supply and sewerage system O&M requirements; (iii) determination of Management Information Services (MIS), billing, and accounting requirements; (iv) identification of public education and public participation measures relevant to the socioeconomic background of each state; (v) establishment of the necessary systems to address these issues; (vi) provision of staff training; and (vii) preparation of operational manuals.

3. The TA addresses the specific level of development and capabilities presently each of the four UCs. However the TA should promote the standardization of systems between UCs to enhance operational efficiencies and facilitate inter-UC cooperation. A brief description of the overall requirements of each UC is given below:

- (i) Chuuk State Public Services Corporation - CSPUC is only just becoming operational and requires considerable improvement to its billing and accounting systems and MIS. While its water supply and sewerage operational staff have received some basic training, a full range of O&M training is required.
- (ii) Pohnpei Utilities Corporation - PUC has established billing and accounting systems and MIS. Operational training in water supply and sewerage O&M has been provided with assistance from bilateral and international agencies. However, CSPUC is giving priority to the reduction of nonrevenue water through the detection and repair of leakages, and PUC requires assistance to build capacity in detecting leaks.
- (iii) Yap State Public Services Corporation - YSPSC has recently assumed responsibility for the provision of water supply and sewerage services to the Colonia area of Yap. Billing and accounting systems are in place, but a full range of water supply and sewerage O&M training is required.
- (iv) Kosrae Utilities Authority - KUA has recently assumed responsibility for the provision of water supply and sewerage services in Kosrae, and requires assistance to modify its billing and accounting systems to

accommodate the requirements of these services. A full range of O&M training is required.

C. Specific Tasks

1. Leakage Detection

4. The consultant will undertake, but will not necessarily be limited to, the following services for CSPUC, PUC, KUA, and YSPSC:

- (i) Formulate leakage detection programs appropriate to the needs of each UC, including handling of public complaints, visual inspections, examination of metering records, and other detection and recording methods.
- (ii) Recommend appropriate modifications to water distribution system arrangements and operations to facilitate leakage detection and minimization, and provide outline specifications for any special equipment required.
- (iii) Establish appropriate recording systems and prepare operational manuals for leakage detection and prevention.
- (iv) Provide on-the-job training in leakage detection techniques.

2. Capacity Building in Operations and Maintenance

5. The consultant will undertake, but will not necessarily be limited to, the following services for CSPUC, KUA, and YSPSC:

- (i) Assess the O&M needs for water supply and sewerage systems in each UC, including the operation of water wells, water and sewage treatment plants, pumping stations, and water distribution and sewerage systems.
- (ii) Prepare outline specifications for O&M equipment, including basic laboratory equipment.
- (iii) Prepare and implement on-the-job training programs for O&M operatives in each UC.
- (iv) Prepare O&M manuals for each UC, scheduling routine O&M activities, and including operation and laboratory services for treatment plants, and servicing and repair operations on pumping systems, water supply pipelines, sewers, water reservoirs, and other water supply and sewerage facilities as appropriate.

3. Management Information Services (MIS), Billing and Accounting

6. The consultant will undertake, but will not necessarily be limited to, the following services for CSPUC, KUA, and YSPSC:

- (i) Review the requirements for MIS and billing and accounting systems for the five years' operations and assess the ability of CSPUC's systems to meet these requirements.
- (ii) Design MIS and billing and accounting systems to meet the requirements identified in (i) and recommend software and hardware as appropriate to support these systems.
- (iii) Assist in the procurement of software and hardware to support MIS, billing and accounting systems in CSPUC and YSPSC, including the preparation of specifications and evaluation of offers.
- (iv) Assist in the implementation of the recommended systems and provide staff training in the use of the systems.
- (v) Prepare an accounting manual to supplement the information provided in the software manuals.

4. Public Education and Participation

7. The consultant will undertake, but will not necessarily be limited to, the following services for CSPUC, KUA, PUC, and YSPSC:

- (i) Review the public education and public participation programs being implemented or planned by each UC.
- (ii) Assess the requirements for public education to introduce the concepts of water conservation, health aspects of water use, rights of access to water resources, water tariffs, and affordability, and assess methods by which the public can participate in the implementation of the Water Supply and Sanitation Project.
- (iii) For each UC, determine an appropriate program of public education and participation to introduce understanding of the issues outlined in (ii). The programs will take into account the socioeconomic background of each state, and will be aimed at all levels, from members of the States' legislatures to schoolchildren. The programs will utilize appropriate methodology, which may incorporate participatory workshops, news media, public meetings, and school programs.
- (iv) Familiarize local staff with participatory techniques and with the public education and participation programs, to ensure continuity of the programs.

D. Implementation

8. The services of an international consulting firm will be required to provide a total input of 17 person-months over an eight-month period. Expertise in the following fields will be required: leakage detection and prevention (3 person-months); O&M of water and sewerage treatment plants (3 person-months); O&M of water distribution and sewerage systems (3 person-months); MIS, billing and accounting systems (5 person-months); public education and public participation (3 person-months). The consulting firm will be selected in accordance with the Bank's *Guidelines on the Use of Consultants*.

9. The Office of Planning and Statistics of the Government will be the Executing Agency for the TA. The consultants will, however, work directly with each UC, which will provide office accommodations, local communications, and secretarial and other support. The UCs will provide counterpart staff to participate in the public education programs.

10. The consultants will select computer hardware and software for MIS and billing and accounting systems to integrate with systems already in place, where appropriate, through direct purchase procedures in accordance with the Bank's *Guidelines on Procurement*.

E. Reporting and Reviews

11. The team leader will prepare and submit progress and other reports to the Government, the Bank, and the UCs as follows: (i) an inception report outlining the team leader's work program one month after their mobilization consultants, (ii) brief monthly progress reports summarizing inputs and results, (iii) systems requirements reports for each UC, and (iv) accounting and O&M manuals. The TA will be reviewed jointly by the Bank, the National Government, and the consultants on presentation of the inception report and on conclusion of the TA.

F. Cost Estimates

12. The total estimated cost of the TA is \$612,000. It is proposed that the Bank finance the foreign exchange cost of \$559,000 and \$28,000 equivalent of the local currency cost. The remaining local currency cost of equivalent \$25,000 will be financed by the Government through services in kind, including office accommodations and secretarial and other support. The estimated costs associated with the TA are presented in the table.

COST ESTIMATES AND FINANCING PLAN
(\$ 1,000)

Item	Foreign Exchange	Local Currency	Total
A. Bank Financing			
1. Consultants			
a. Remuneration	289.00	—	289.00
b. Per diem	69.00	—	69.00
c. Travel			
Consultants international and interstate travel	35.00	—	35.00
Government observer at contract negotiations	6.00	—	6.00
Car hire	15.00	—	15.00
2. Materials and Equipment			
a. Computer hardware, Yap	20.00	—	20.00
b. Computers, other hardware, and software, Chuuk	50.00	—	50.00
c. Materials for public education program	—	10.00	10.00
3. Workshops, Training and Seminars			
a. O&M training workshops	—	6.00	6.00
b. Public participatory workshops	—	3.00	3.00
4. Studies, Surveys, and Reports			
a. Printing and circulation of progress reports	—	1.00	1.00
b. Printing of O&M manuals	—	3.00	3.00
c. Printing of accounting manuals	—	1.00	1.00
5. Miscellaneous Administration Services			
International communications	2.00	—	2.00
6. Contingencies	73.00	4.00	77.00
Subtotal (A)	559.00	28.00	587.00
B. Government Financing			
1. Support Staff Remuneration	—	15.00	15.00
2. Office Accommodation and Miscellaneous Services	—	10.00	10.00
Subtotal (B)		25.00	25.00
Total A+B	559.00	53.00	612.00

ECONOMIC ANALYSIS

A. Demand Analysis

1 Water sales are projected on the basis of the estimated number of water connections and the demand per connection, given that sufficient productive capacity is available to fully meet the demand. In addition to the increase in the number of connections directly attributable to extensions of the water supply service area provided under the Project, the number of domestic and nondomestic connections in both new and existing service areas is projected to increase at an annual rate of 1 percent and 3 percent per annum, respectively, over the economic life of the Project. In fact, the provision of piped water supply into these areas may promote higher rates of growth. The impact of access to piped water supply on the rate of residential and mixed residential/commercial development is particularly pronounced in the Federated States of Micronesia (FSM) because of the availability of mortgages on attractive terms from the United States Rural Economic Community Development Service (RECDS) for property served by such systems.

2 The demand for water per connection is assumed to decline as tariffs are implemented in Chuuk and Kosrae and as further increases in tariffs are implemented in Pohnpei and Yap. The sensitivity of demand to increases in tariffs is assumed from the recent experience of PUC in Pohnpei. PUC reintroduced tariffs in October 1993 with the transfer of the water supply and sewerage system to PUC from the State Department of Public Works. It then increased these tariffs in January 1994. The impact of the increase on customer bills did not occur until March-April 1994. The unit tariff for domestic and small nondomestic customers with consumption within the first 75 cubic meter (m^3) tariff block increased by 180 percent, while customers consuming in excess of 75 m^3 experienced larger increases. The average tariff increased by 260 percent, from about \$0.07 per m^3 to \$0.25 per m^3 . In response to this increase, demand per connection declined by 24 percent indicating a price elasticity of demand of 0.36.¹

3 For purposes of economic and financial analyses, the demand projections conservatively incorporate a higher price elasticity of demand than has been observed in Pohnpei over the 1993-1994 period. Over FY1996 - FY2005, it has been assumed that the price elasticity of demand in Pohnpei and Yap is 0.80 and 0.75, respectively. These higher price elasticities have been assumed because, with the existence of private non-piped systems, the new customers added to these systems over the forecast period may initially be more sensitive to changes in the price of piped supplies than existing customers are. From these estimated price elasticities of demand, the demand by domestic consumers in Pohnpei is projected to decline by 30 percent, from its present level of 350 liters per capita per day (lpcd) to 245 lpcd. The domestic demand in Yap is projected to decline by 30 percent, from its present level of 315 lpcd to 205 lpcd. No reliable information exists regarding existing consumption levels in Chuuk. However, for purposes of the projections, it is assumed that domestic demand Chuuk and Kosrae exhibit trends similar to those in Pohnpei and Yap. The demand in Chuuk is assumed to be 225 lpcd by FY1999 and to

¹ Price elasticity of demand is estimated as: $(Q_2 - Q_1)/(P_2 - P_1) \times (P_2/Q_2)$, where Q_1 is consumption before the price change, Q_2 is consumption after the price change, P_1 is the average tariff before the price change, and P_2 is price after the price change.

remain constant thereafter. The demand in Kosrae is assumed to decline from 265 lpd in FY1997 to 225 lpcd by FY2000, and to remain constant thereafter.

4. Nondomestic demand has been projected on the basis of the specific mix of consumers in each state. The price elasticity of demand for nondomestic consumers in Pohnpei is estimated to be 0.50, which will result in a projected decline of 22 percent in the average demand per connection. In Yap, the average demand per connection is projected to increase by just under 5 percent as a result of expected changes in the composition of the nondomestic customer group. The changes in demand by nondomestic customers in Chuuk and Kosrae are assumed to be similar to those in Pohnpei.

B. Least-Cost Analysis

5. The Project design was selected on the basis of a least-cost analysis in which a range of possible water supply delivery systems were evaluated in terms of both cost and their ability to provide a satisfactory standard of service. One alternative evaluated was the provision of rainwater collection systems in those Project areas presently not served by the piped water supply system. Collection of rainwater is common throughout the country, both outside the existing piped water supply service areas, as well as in places within the service areas but which receive an inadequate level of supply. However, virtually all of the rainwater catchment systems currently in use in the Project areas cannot meet minimum standards for quality and quantity of supply. Therefore, for purposes of least-cost analysis, collection systems considered were those that could provide a basic and safe supply of water on a regular basis.

6. In the four FSM states, rainwater collection systems are most viable in Pohnpei since the amount and distribution of rainfall throughout the year allow for the installation of smaller, and, therefore, less costly storage systems. The estimated capital cost of a simple gravity system capable of providing an average of 75 lpcd is \$6,300 per household versus approximately \$9,400 in Chuuk. The average incremental economic cost (AIEC) for a rainwater collection system serving the Pohnpei Project area is estimated to be \$4.10 per m³ compared with only \$0.84 per m³ for the selected piped water supply option.

7. In addition to assessment of non-piped water supply systems, a range of piped systems were evaluated in identifying the least-cost Project option. For example, the total cost of a minimum configuration consisting of a basic piped system capable of supplying the Pohnpei Project area with up to 150 lpcd, but with no capacity to meet anticipated population growth, very limited ability to meet peak hour demands, and no fire flow capacity is estimated to be \$2.17 million versus \$2.50 million for the selected option. The AIEC for this minimum configuration is estimated to be \$1.30 per m³ or about 55 percent higher than that for the selected option.

C. Assumptions in EIRR Analysis

8. Economic analysis was undertaken to determine the economic viability of the least-cost Project option as well as that for each individual state component. Economic viability

is determined on the basis of the economic internal rate of return (EIRR). The EIRR is based on the following assumptions.

1. General Assumptions

- (i) All revenues and costs are expressed at constant 1996 prices on an incremental basis.
- (ii) The economic life of the proposed Project is 30 years (FY2000 - FY2029), exclusive of the four-year Project construction period, after which all assets are assigned a zero salvage value.
- (iii) The real economic opportunity cost of capital (EOCC) is 10 percent.

2. Costs

- (i) All costs are net of duties and taxes.
- (ii) Capital costs are total capital costs less price contingencies and service charge during construction.
- (iii) Capital costs after the construction period represent replacement costs of major equipment based on their estimated useful life. It is assumed that replacements are made every five years after each state component enters service. The cost of each replacement is estimated to be equivalent to 2.0 percent of the original component cost for the Chuuk, Kosrae, and Yap components. Because of the lower mechanical and electrical content of the Pohnpei component, the estimated cost of asset replacement is equivalent to 1.0 percent of the original component cost over the first 15 years of operation and 2.0 percent thereafter.
- (iv) Tradable inputs are expressed at domestic price levels. Since the country uses the United States dollar as its domestic currency and no significant price distortions exist in the market for tradable inputs, the standard conversion factor is assumed to be 1.0.
- (v) A shadow wage rate for unskilled labor of 90 percent of the market wage rate has been used for the estimated unskilled labor component of capital and operation and maintenance (O&M) costs for Chuuk, Kosrae, and Pohnpei. A shadow wage rate for unskilled labor of 80 percent of the market wage rate has been used for Yap. It is assumed that no significant distortions exist in the wage rates for skilled labor.
- (vi) Incremental (O&M) costs are based on the specific operating characteristics of each Project component. A conversion factor of 1.25 has been used in Chuuk, Kosrae, and Yap to reflect the estimated full

economic cost of electricity. A conversion factor of 1.85 has been used in Pohnpei to eliminate the impact of subsidies on the cost of power sold to the PUC Water and Sewer Division by the PUC Power Division.

- (vii) The incremental supply of water to be provided by the Chuuk and Yap Project components is to be derived from groundwater. The incremental supply of water to be provided by the Pohnpei Project component is to be derived from surface water sources. In the case of all three Project components, there is no alternative economic use for these supplies. Furthermore, the groundwater extraction rates are designed to be consistent with the longer term sustainable yield of the aquifers in Chuuk and Yap. The Kosrae Project component will not increase the supply of water but rather provide treatment systems for the existing supply. Therefore, the opportunity cost of raw water is assumed to be zero for all four Project components.

3. Benefits

- (i) Project benefits have been estimated separately for households, institutions, and businesses not connected to the piped water systems (new connections) as well as for customers currently connected to the system (existing connections). New connections will benefit from the Project in Chuuk, Kosrae, and Yap because improved quality, quantity, and reliability of piped water will eliminate the costs associated with rainwater collection systems, storage tanks, and supplementary water treatment. Customers currently connected to the piped water supply systems will also benefit through the elimination of costs associated with supplementary water supply and treatment systems.
- (ii) Gross benefits to new connections are calculated as the sum of three components: (a) economic cost savings in switching from private supplies to the public water system, (b) expenditure on piped water consumed, and, (c) the consumers surplus on incremental water consumption induced by the lower price of piped water relative to non-piped water. The cost savings in switching from private supplies to the public system in FY2005 are estimated as follows:

State	Cost (\$/m ³) Expressed in Constant 1996 Prices		
	Non-piped Supply	Piped Supply	Savings
Chuuk	1.20	0.95	0.25
Kosrae	1.51	0.98	0.53
Pohnpei	1.30	0.56	0.74
Yap	1.56	1.23	0.33

- (iii) Gross benefits to existing connections are calculated on the basis of the economic cost savings due to the elimination of non-piped water supply systems currently needed to supplement piped water supplies.

D. Economic Internal Rate of Return

9. From the presented methodology, the Project EIRR is calculated to be 16.2 percent. It is considered acceptable because it exceeds the EOCC.

10. The EIRRs for the individual Project components range from a high of 19.9 percent for Chuuk to a low of 13.1 percent for Kosrae (see Table 1). The EIRRs for the Pohnpei and Yap Project components are estimated to be 14.0 percent and 14.9 percent, respectively. The Chuuk EIRR is high relative to the other Project components because, as a result of the serious shortfalls in the capacities of the piped water systems in the state, the total cost to consumers in supplementing these supplies through private non-piped systems is estimated to be significant. The Kosrae EIRR is lower relative to the other Project component EIRRs because the benefits of the Kosrae Project component accrue almost entirely to existing connections rather than to new customers. The benefits derived by customers presently connected to the piped water system are less than the benefits derived by residents who presently receive no service but will be connected to the piped water system as a result of the Project component.

E. EIRR Sensitivity Analysis

11. The sensitivity of the EIRR to adverse changes in selected key variables was tested. The variables tested were increases in capital costs, increases in O&M costs, reductions in Project benefits, and a one year delay in Project completion. As shown in Table 1, the EIRR is most sensitive to a delay in Project completion and least sensitive to changes in O&M costs. However, even under a worst case scenario, in which all four adverse assumptions are combined, the EIRR remains above the EOCC.

F. Average Incremental Economic Cost and Pricing Policy

12. The estimation of the AIEC of water supply over the life of the Project represents a measure of the economic cost of water supplies to be provided under the Project (see Table 2). To meet the overall objective of economic efficiency, tariffs should reflect the long-run marginal costs (LRMC) of supplying and distributing water to consumers. In practice, estimation of the LRMC associated with the supply of a single unit of water is very difficult because of the indivisibility associated with the large and long-term additions to capacity typical in the sector. As an approximation of LRMC, therefore, the AIEC of water supply is usually estimated for purposes of tariff formulation and project evaluation. The AIEC is the ratio of the total discounted capital and O&M costs incurred by a measurable addition to capacity divided by the total discounted water sales, in cubic meters, made available by this additional capacity over its expected life. The discount rate employed in the calculation of the AIEC is the EOCC, which is estimated to be 10 percent.

13. The AIEC for the Chuuk Project is equivalent to the FY2005 average tariff of \$0.95 per m³, which indicates that the Project operates without any economic subsidy. The AIEC for the Yap Project is estimated to be \$1.32 per m³, which implies a relatively minor economic subsidy of \$0.09 per m³. The AIEC for the Pohnpei Project is estimated to be \$0.82 per m³, or about \$0.26 per m³ higher than the financial tariff in FY2005.

Table 1: EIRR Sensitivity Analysis

Key Variable	Change	Chuuk		Kosrae		Pohnpei		Yap		Total Project	
		EIRR	SI ^a	EIRR	SI ^a	EIRR	SI ^a	EIRR	SI ^a	EIRR	SI ^a
Base Case		19.9		13.1		14.0		14.9		16.2	
1. Capital Cost	10	18.3	0.79	11.9	0.89	12.8	0.89	13.7	0.80	14.8	0.83
2. O&M Costs	10	19.8	0.04	12.4	0.47	13.9	0.07	14.8	0.04	16.0	0.10
3. Benefits	-10	18.1	0.92	11.1	1.46	12.5	1.06	13.6	0.84	14.5	1.01
4. One-year Delay		17.7		11.8		12.6		13.5		14.7	
5. Combination of (1+2+3+4)		14.8		8.7		10.2		11.4		12.0	

^a Sensitivity Indicator - ratio of percentage change in EIRR to change in parameter.

Table 2: Average Incremental Cost of Water (\$/m³ - Constant 1996 Prices)

Item	Chuuk	Kosrae	Pohnpei	Yap
Average Financial Tariff (FY2005)	0.95	0.79	0.56	1.23
Average Incremental Economist Cost (AIEC)	0.95	^a	0.82	1.32

^a The Kosrae Project will provide water treatment and a more regular supply of water through the provision of storage facilities. Since it will not increase the supply of water, AIEC is not applicable.

FINANCIAL ANALYSIS

A. Assumptions

1. Financial analysis was undertaken to determine the financial viability of the Project as well as that of each individual state component. Financial viability is determined on the basis of the financial internal rate of return (FIRR). The FIRR is based on the following assumptions.

1. Basic Assumptions

- (i) All revenues and costs are expressed at constant 1996 prices on an incremental basis.
- (ii) That the economic life of the proposed Project is 30 years (FY2000 - FY2029), exclusive of the four-year Project construction period, after which all assets are assigned a zero salvage value.
- (iii) The financial viability of the Project is assessed by comparing the FIRR to the weighted average cost of capital (WACC), which is the average of the required return on equity and debt weighted by the proportional capitalization of each source of funds. Expressed on a real basis, the WACC for the Project is estimated to be 3.3 percent.

2. Incremental Costs

- (i) Capital costs are total capital costs less price contingencies and service charge during construction.
- (ii) Capital costs after the construction period represent replacement costs of major equipment based on their estimated useful life. It is assumed that replacements are made every five years after each state component enters service. The cost of each replacement is estimated to be equivalent to 2.0 percent of the original component cost for the Chuuk, Kosrae, and Yap components. Because of the lower mechanical and electrical content of the Pohnpei component, the estimated cost of asset replacement is equivalent to 1.0 percent of the original component cost over the first 15 years of operation and 2.0 percent thereafter.
- (iii) Incremental operation and maintenance (O&M) costs are based on the specific operating characteristics of each state component.

3. Incremental Revenues

2 The methodology used to calculate incremental revenues is specific to each state component and is as follows.

a. Chuuk

- (i) Incremental revenues are calculated on the basis of the incremental volume of water sold and the average tariff plus a portion of the value of water sold to existing customers, which can be attributed to Project-related improvements in the quality of water and reliability of service. The existing water supply system is operating at maximum capacity, but is unable to meet the demand. Over 500 households, businesses, and institutions located in low-pressure areas of the existing service area receive no water. The additional capacity provided under the Project will allow Chuuk State Public Utilities Corporation (CSPUC) to serve these customers as well as to provide for future growth. Incremental sales are projected to be 655 cubic meters (m^3) per day in FY2000, the year in which the Project commences service. Incremental sales are then projected to increase to 1,310 m^3 per day in FY2015 and 2,140 m^3 per day by FY2029.
- (ii) The Project will rehabilitate the existing Pou River water treatment plant, which presently accounts for about 40 percent of total production for approximately 9 to 10 months of each year. Currently, water is processed through the plant without treatment and, because of its poor physical condition, the plant is subject to frequent service disruptions. Under the Project, the plant's treatment systems will be put back into operation and operating reliability will improve significantly. Furthermore, the repair of the Pou, Peniecene, and Pink Apartment Reservoirs will improve the ability of the system to meet peak daytime demands. The proposed tariffs could probably not be implemented in the absence of the Project because the quality and reliability of the existing supply will remain low. Therefore, with the improvements in water quality, reliability, and peak hour quantity of supply to be provided for under the Project, the ability of CSPUC to implement the proposed tariff increases, and the willingness of existing customers to pay these higher tariffs, will increase. For purposes of the FIRR calculation, it is conservatively assumed that 10 percent of the tariff revenues generated from existing customers over the forecast period can be attributed to the Project.
- (iii) The average tariffs employed in calculating incremental revenues are those required to meet CSPUC's overall financial performance objectives. Expressed in 1996 constant prices, the average tariff is projected to be \$0.89 per m^3 in FY2000 and \$0.95 per m^3 by

FY2002. It is then assumed to remain constant over the FY2002 - FY2029 period.

b. Kosrae

- (i) With the exception of a small water supply system serving industrial customers, no tariffs have been applied for piped water in Kosrae. Given that the water produced by the existing systems is untreated and is provided only irregularly, there is little basis for the application of tariffs. From the results of the socioeconomic survey, the maximum charge consumers appear to be willing to pay given the existing level of service is about \$5 per month, which is equivalent to about \$0.11 per m³. The Project will provide for a regular supply of treated water and, therefore, allow for the implementation of tariffs. The Project will also provide the financial and billing systems necessary for the implementation of tariffs. Therefore, incremental revenues are calculated as the total volume of water sold to customers within the Project service area and the difference between the actual average tariff in each year and \$0.11 per m³. The volume of water sold is projected to be 1,380 m³ per day in FY2000, the year in which the Project commences service. Incremental sales are then projected to increase to 1,475 m³ per day by FY2005 and are conservatively assumed to remain constant thereafter.
- (ii) The average tariffs employed in calculating incremental revenues are those required to meet Kosrae Utilities Authority's (KUA's) overall financial performance objectives. Expressed in 1996 constant prices, the average tariff is projected to be \$0.42 per m³ in FY1998 and \$0.98 per m³ by FY2002. The average tariff is then assumed to remain constant over the FY2005 - FY2029 period.

c. Pohnpei

- (i) Incremental revenues are calculated on the basis of the total volume of water sold to customers who will be connected to the supply system under the Project. The Project will extend the piped water supply system into three areas (Awak, Meitik, Sekere) with a current combined population of about 3,250. It is assumed that all customers in these areas will connect to the system gradually over a four year period after the completion of the Project and that the total number of connections increases at an annual rate of 1 percent over the economic life of the system. On this basis, the incremental volume of water sold is projected to increase from about 685 m³ per day in FY2000, the year in which the Project enters service, to about 1,015 m³ per day by FY2029.
- (ii) The average tariffs employed in calculating incremental revenues are those required to meet the Pohnpei Utilities Corporation's

(PUC's) overall financial performance objectives. Expressed in 1996 constant prices, the average tariff is projected to be \$0.55 per m³ in FY1999 and \$0.56 per m³ in FY2001 and thereafter.

d. Yap

- (i) Incremental revenues are calculated on the basis of the incremental volume of water sold plus a portion of the value of water sold to existing customers, which can be attributed to Project-related improvements in the quality of water. The existing water supply system is operating at maximum capacity but is unable to meet the demand, particularly during extended droughts that occur about every four to five years. During these drought periods, the productive capacity of the existing system declines from about 1,600 m³ per day to about 750 m³ per day. The Project will also provide piped water supply service to about 400 persons residing along the transmission pipeline route. On this basis, the incremental volume of water sold is projected to be about 90 m³ per day in FY2000, the year in which the Project enters full service. By FY2008, which is expected to be a drought year, incremental sales are projected to be 400 m³ per day. In FY2028, which is expected to be the last drought year during the economic life of the Project, incremental sales are projected to be 1,280 m³ per day.
- (ii) The wells to be developed under the Project will replace much of the production currently provided by the water treatment plant, which produces relatively low quality water and is nearing the end of its economic life. The proposed tariffs could probably not be implemented in the absence of the Project because the quality and reliability of the existing supply will remain low. In addition, the system can presently provide service for only 16 hours per day because of the need to produce for storage during the 10 p.m. - 6 a.m. period to enhance the supply capability of the system during the peak daytime hours. Therefore, as a result of improvements in water quality, reliability, and peak hour quantity of supply under the Project, the ability of YSPSC to implement the proposed tariff increases and the willingness of existing customers to pay these higher tariffs will increase. For purposes of the FIRR calculation, it is conservatively assumed that 25 percent of the increases in tariffs over the forecast period can be attributed to the Project.
- (iii) The average tariffs employed in calculating incremental revenues are those required to meet YSPSC's overall financial performance objectives. Expressed in 1996 constant prices, the average tariff is projected to be \$0.80 per m³ in FY1999 and \$1.23 per m³ by FY2001. It is then assumed to remain constant over the FY2001 - FY2029 period.

B. Financial Internal Rate of Return

3. By the methodology presented above, the Project FIRR is calculated to be 7.0 percent. It is considered to be acceptable because it exceeds the WACC of 3.3 percent.

4. The FIRRs for the individual Projects all exceed the WACC and range from a high of 8.5 percent for Kosrae to a low of 4.6 percent for Pohnpei (see Table 1). The Kosrae FIRR is relatively high because in the absence of the Project, the quality of service provided is low and there is little basis for the implementation of tariffs. The Chuuk FIRR is also relatively high primarily because of the significant impact of the Project in addressing the major supply and water quality deficiencies, which presently exist in Weno. The Pohnpei FIRR is lower because the system extensions to be provided under the Project will serve areas that presently have population densities somewhat lower than those in the core PUC service area in the Kolonia town center.

C. FIRR Sensitivity Analysis

5. The sensitivity of FIRR to adverse changes in selected key variables was tested. The variables were increases in capital costs, increases in O&M costs, reductions in revenues, a one-year delay in Project completion, and, in the case of Chuuk and Yap, the exclusion of incremental revenues derived from existing customers. Sensitivity analysis indicates that the Project FIRR is most sensitive to a reduction in incremental revenues and least sensitive to an increase in incremental O&M costs. However, even under a worst case scenario, in which all four adverse assumptions are combined, the Project FIRR remains above the WACC.

D. Average Incremental Financial Cost and Pricing Policy

6. The average incremental financial cost (AIFC) is the average incremental cost expressed in financial prices. The AIFC can be used for purposes of tariff formulation and to provide an indication of the extent of any financial subsidies associated with the Project. The discount rate employed in calculating the AIFC is the WACC, which is estimated to be 3.3 percent.

Table 1: FIRR Sensitivity Analysis

Key Variable	Change	Chuuk		Kosrae		Pohnpei		Yap		Total Project	
		FIRR	SI ^a	FIRR	SI ^a	FIRR	SI ^a	FIRR	SI ^a	FIRR	SI ^a
Base Case		7.4		8.5		4.6		6.7		7.0	
1. Capital Cost	10	6.6	1.00	7.6	1.10	3.8	1.61	6.0	0.99	6.2	1.08
2. Operations & Maintenance Costs	10	7.2	0.19	7.8	0.85	4.4	0.30	6.6	0.09	6.8	0.28
3. Revenues	-10	6.4	1.31	6.7	2.11	3.6	2.11	6.0	1.01	5.9	1.49
4. Project Delay 1 Year		7.0		8.0		4.2		6.4		6.6	
5. Exclusion of Revenues from Existing Conn.		5.3		NA		NA		4.2		NA	
6. Combination of (1+2+3+4)		5.3		4.8		2.5		5.1		4.8	

NA Not applicable

^a Sensitivity Indicator - Ratio of percentage change in FIRR to change in parameter.

7. As shown in Table 2, the average tariff set for FY2005 actually exceeds the AIFC in three states. In Chuuk and Yap, the average tariff needs to be set levels higher than the AIFC to properly operate and maintain each UC's existing systems, which are in part based on technologies requiring high inputs of power and maintenance relative to those systems incorporated into the Bank Project.

Table 2: Average Incremental Cost of Water
(\$/m³ - Constant 1996 Prices)

Item	Chuuk	Kosrae	Pohnpei	Yap
Average Financial Tariff (FY2005)	0.95	0.98	0.56	1.23
Average Incremental Financial Cost	0.75	^a	0.48	1.02

^a The Kosrae Project will provide water treatment and a more regular supply of water through the provision of storage facilities. Since it will not increase the supply of water, AIFC is not applicable.

FINANCIAL PROJECTIONS OF PUBLIC UTILITIES CORPORATIONS

A. Past Financial Performance

1 The operating record of all the Public Utility Corporations (UCs) is very limited, with only Pohnpei Utility Corporation (PUC) having provided water supply and sewerage services for more than a full year. PUC established its Water and Sewer Division in October 1993 with the transfer of assets and operating responsibility from the Pohnpei State Department of Public Works. Prior to the transfer, only 10 percent of customers were receiving water on a 24-hour daily basis and no tariffs were being collected. Because of the implementation of tariffs—which significantly reduced demand—and minor modifications to the physical works to provide an increase in supply, all residents began receiving water on a 24-hour daily basis in February 1994. The PUC Water and Sewer Division generated revenues sufficient to cover approximately 31 percent and 47 percent of its total operation and maintenance (O&M) expenses, including depreciation, in FY1994 and FY1995, respectively. In both years, however, PUC received substantial assistance from the state government and US agencies to undertake major maintenance programs needed to bring the facilities back into proper working order. As these programs are implemented, maintenance expenditures will decline and, in combination with PUC's April 1996 tariff increase, cost-recovery levels will improve substantially.

2 The water supply and sanitation systems in Chuuk and Kosrae have relied entirely on government grants and subsidies to provide for capital works and operations. While customers in the Colonia area of Yap have been billed for water supply and sewerage services provided by the State Department of Public Utilities and Contracts (PU&C) since 1981, all revenues collected have been transferred to the state's general fund; therefore, there has been little incentive to maximize collection efficiency. Because of the constrained financial resources of the states, the sector has suffered from underfunding and, service levels have deteriorated significantly, particularly in Chuuk. In addition, the cost of service in both Chuuk and Yap cannot be clearly determined since many expenditures have been consolidated with those for other functions undertaken by their respective public works departments. With the establishment of Chuuk State Public Utilities Corporation (CSPUC) in 1995, Pohnpei State Utilities Corporation (PSUC), and Yap State Public Services Corporation (YSPSC) in 1996, and the upcoming transfer of the water and sewerage systems in Kosrae to the Kosrae Utilities Authority (KUA), the institutional framework now exists to replicate the success of PUC in significantly improving service levels through the application of cost-recovery principles.

3 Because of the small population base, dispersed pattern of settlement, relatively high cost of production inputs, and the poor physical conditions of many of the systems, the cost structure of each of the UCs is high. This situation is further exacerbated by system designs and configurations, generally provided on a grant basis, which are inappropriate to local conditions and costly to operate and maintain. The average O & M expense (including depreciation) per cubic meter (m^3) of water sold by PUC, which is the only UC possessing reliable cost data, was \$0.58 per m^3 in FY1995. The unit cost of water sold by CSPUC and YSPSC is expected to be over 165 percent and 110 percent higher, respectively, than that for PUC upon the commencement of full operations by each UC in FY1997. Although KUA's unit cost of water is actually expected to be lower than that for PUC in FY1997, KUA will be providing only untreated water until the Bank Project enters full operation in FY2000. Once KUA begins providing treated water, its unit cost is projected to be about 55 percent higher than that for PUC.

B. Financial Projections

4 Detailed financial projections for ten years (FY1996 to FY2005) have been prepared for each UC's Water and Sewer Division to assess the impact of the Project on the UCs' ability to perform satisfactorily, and to service the debt on the proposed on-lending from the Government. The projections are based on the following assumptions.

1. Projected Inflation

5 The projected financial statements are presented in current prices (i.e.: including projected inflation in each year). The domestic inflation rate is assumed to be 5.0 percent per annum over the entire forecast period. The foreign inflation rate is assumed to be 2.5 percent per annum over the same period.

2. Financial Objectives

6 The financial objectives assumed for each UC are summarized as follows:

- (i) Generate revenues sufficient to cover all cash O&M expenses and eliminate the requirement for operating subsidies, no later than FY2000.
- (ii) Achieve full cost recovery by FY2005.
- (iii) Meet debt service on the UC Project loan. Specifically, each UC should maintain a debt-service ratio (DSR) of at least 1.0 upon commencement of the debt-service obligations associated with the Project (FY2001) assets and 1.2 by FY2005.
- (iv) Meet a portion of ongoing capital expenditure required for water supply and sewerage systems improvements and expansions from internal sources after FY2001. The self-financing ratio (SFR) will be not less than 20 percent by FY2002 and 30 percent by FY2005.

3. Water Sales

7. Water sales are projected on the basis of the methodology presented in the economic analysis (Appendix 6).

4. Operation and Maintenance Expenses

8. Labor expenses PUC and YSPSC are assumed to increase only by the local inflation rate as the number of employees remains constant at present levels. CSPUC is assumed to reduce the number of staff by 20 percent over the FY1997-FY1998 period to achieve a staffing structure more appropriate to its scale of operations. KUA is assumed to increase its staff by about 15 percent upon the commissioning of the Bank Project in FY2000. Expenses for power and chemicals have been estimated on the basis of the specific operating

requirements of each water supply and sewerage system. Maintenance expenses, expressed as a percentage of gross fixed assets, are expected to gradually decline as UCs complete the major maintenance programs needed to put their systems back into proper working order. By FY2000, maintenance expenditures by CSPUC, KUA, PUC, and YSPSC are assumed to represent 1.00 percent, 1.00 percent, 0.75 percent, and 1.00 percent of revalued gross fixed assets, respectively. While maintenance expenditures by PUC, expressed as a proportion of fixed assets, are assumed to remain constant at 0.75 percent over the FY2000-FY2005 period, CSPUC, KUA, and YSPSC are assumed to be able to reduce maintenance expenditures to the equivalent of 0.60 percent, 0.60 percent, and 0.80 percent of fixed assets, respectively, by FY2004.

5. Project Financing Structure

9. From agreements between the state governments and UCs, the terms of on-lending are (i) an interest rate equal to the Bank's ordinary capital resources (OCR) rate at the time of loan negotiations (currently 6.82 percent per annum) and (ii) a repayment period of 25 years including a 5 year grace period.

C. Projected Financial Performance and External Support Requirements

10. The levels of subsidization of water and sewerage services by state governments have been difficult to quantify because state government accounting systems have not clearly defined the funding allocated to these services. However, it is evident that these services have been underfinanced. The financial performance of UCs will progressively improve over the forecast period as water sales and service levels increase with the commissioning of the Bank Project and as tariff increases are implemented. As a result, all UCs are expected to be able to progressively reduce and then eliminate their requirement for operating subsidies by FY2000. The total projected subsidy requirement by each UC are presented in Table 1. These estimates are based on the implementation of tariff increases for each UC as shown in Tables 2 - 5. It should be noted that each UC has already received commitments for portions of its support requirements through agreements with its state government as well as with US Government agencies such as the Operation and Maintenance Improvement Program (OMIP).

Table 1: Estimated Requirements for External Support (FY1997 - FY1999)

State - Utilities Corporation	Total Requirement for External Support (\$ million)			
	Bank Project ^a	Other Capital Works	Operation & Maintenance	Total
Chuuk - CSPUC	0.9	1.6	1.6	4.1
Kosrae - KUA	0.5	0.4	0.3	1.2
Pohnpei - PUC	0.5	1.4	0.7	2.6
Yap - YSPSC	0.7	0.3	0.4	1.4

^a External support requirement for Bank Project covers FY1996 - FY1999 period.

11 As shown in Tables 2 - 5, each UC is expected to achieve full cost recovery by FY2005. However, the need to generate revenues sufficient to fully cover depreciation calculated on a revalued basis will be addressed by corporate plans to be prepared by UCs as agreed upon between the Bank, the Government, and UCs. To varying degrees, all UCs operate physical systems of relatively high cost technologies inappropriate to local conditions. As a result, they are likely to be replaced with lower cost systems that are more consistent with local institutional and financial capabilities. Therefore, the coverage of full depreciation on revalued fixed assets may result in the generation of funds in excess of that required for asset replacement.

12 The ability of UCs to meet their debt-service requirements and generate funds for system improvements and expansions is within the targets established for them. The DSR in FY2001 ranges from a low of 1.0 for YSPSC to a high of 2.6 for PUC. By FY2005, the DSR is projected to improve to 1.5 for the YSPSC and to 4.4 for PUC. The lowest projected SFR over the FY2001-FY2005 period is that for YSPSC in FY2002 which, at 37 percent, exceeds the minimum target of 20 percent for this year. By the estimated requirement for capital expenditures over this period, the high SFRs indicate that the coverage of full depreciation may not be necessary.

D. Tariffs and Affordability

13 Differences in the cost structures between the UCs result in corresponding differences in the level of tariffs required. As shown in Table 6, the tariffs required by YSPSC and CSPUC are significantly higher than that required by PUC. By FY2005, PUC average tariff needs to be set at \$0.56 per m³ (constant 1996 prices) or about 18 percent higher than its current average tariff. Because of the smaller scale of YSPSC relative to PUC and CSPUC, as well as to differences in the consumption of electricity per unit of water production, tariffs are expected to be highest in Yap. By FY2005, the average tariff will need to be set at \$1.23 per m³ or about 120 percent higher than that of PUC. Consistent with this requirement, YSPSC has proposed to increase its average tariff from its current level of \$0.34 per m³ to between \$0.90 and \$1.00 per m³ as of October 1996. Although KUA operates a number of small water supply and sewerage systems, its water supply systems are entirely gravity fed and, as a result, the energy input per unit of water is low relative to that in other UCs. Expressed in 1996 constant prices, the average CSPUC tariff needs to be set at \$0.95 per m³ in FY2005, or almost 70 percent higher than that for PUC. The cost structure of CSPUC is high because of the configuration of its existing water supply and sewerage systems, which are both energy and maintenance intensive. The average tariff requirement for KUA is projected to be \$0.98 per m³.

14 Indicative tariff structures for domestic customers for each UC have been prepared to assess affordability. Household incomes have been assumed to remain constant in real terms over the FY1996-FY2005 period. From the tariffs presented in Table 6, the cost of water supply and sanitation to households in Pohnpei and Yap with median household income is estimated to be within the generally accepted guideline that such charges should not exceed 3 percent to 6 percent of this income. It is also estimated that most low-income households will be able to afford a basic supply of water. A low-income household in Pohnpei will pay approximately 3.0 percent of its income for a monthly supply of 150 lpcd by FY2005. A low-income household in Yap is expected to pay about 5.5 percent of its income for a monthly supply of 115 lpcd by FY2005, while a low-income household in Kosrae consuming 130 lcd in FY2005 will need to allocate approximately 5.8 percent of its income for this supply. The proportion of income required to pay for water supply and sanitation by a household earning the average income in Chuuk may exceed

6 percent. With larger average households and lower household incomes in Chuuk, the cost of water and sanitation is projected to represent 8.0 percent and 8.5 percent of the projected median household average income in FY2005.

15 The Bank Project will contribute toward improved affordability in Chuuk because the incremental supply of water to be provided under the Project will allow CSPUC to spread its fixed costs over a larger volume of water and, therefore, reduce the unit cost of water sold. It is estimated that the unit of cost of water sold in FY2005 would be 15 percent to 20 percent higher without the Project than with the Project. A 20 percent increase in tariffs will require a household earning the median income allocate approximately 10.2 percent of this income to water and sanitation in FY2005.

16 Households with very low incomes will have access to water supply through a network of public standpipes. PUC presently operates such a network and distributes water to low-income households at no cost. It is envisaged that the other UCs will replicate this model.

17 The precise requirement for tariffs and their impact on customers' ability to pay for piped water will be determined by UCs through the preparation of corporate plans. Should it be determined that UCs' existing fixed assets can be replaced with lower cost and more technologically appropriate systems, which appears likely, the recovery of full depreciation expense will not be necessary and tariffs can be reduced accordingly. Recovery of full depreciation expense, calculated on the basis of revalued fixed assets, is particularly questionable in Chuuk. CSPUC's existing sewerage system is very costly to operate and maintain and could be replaced by a lower cost and more technologically appropriate system that meets similar environmental standards. For example, CSPUC could reduce its FY2005 average tariff by almost 25 percent over that required for full cost recovery and still meet all DSR and SFR objectives set for it and generate sufficient cash for an adequate level of capital investment. At these lower tariff levels, it is estimated that the proportion of median household income required for water and sanitation in FY2005 would be reduced from 8.5 percent to 6.5 percent.

Table 2: Chuuk State Public Utilities Corporation - Water and Sewer Division
Summary Financial Projections (\$ Thousand)

Item	Estimated		P r o j e c t e d											
	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05		
Water Production, Sales & Tariffs														
Water Production (m ³ per day)	3,610	3,610	3,890	3,640	4,010	3,680	4,960	4,940	4,940	4,940	4,940	5,010		
Non-Revenue Water (%)	100%	100%	100%	46%	41%	36%	34%	33%	32%	31%	30%	30%		
Water Sales (m ³ per day)	-	-	-	1,970	2,380	2,360	3,260	3,310	3,360	3,410	3,460	3,510		
Average Water Tariff (\$/1000 gallons)	-	-	-	2.00	2.00	2.00	4.10	4.55	4.80	5.05	5.30	5.55		
Average Water Tariff (\$/m ³)	-	-	-	0.53	0.53	0.53	1.08	1.20	1.27	1.33	1.40	1.47		
Annual Increase in Tariff	0%	0%	0%	0%	0%	0%	105%	11%	5%	5%	5%	5%		
Cost of Water Sold (\$/m ³)	0.67	0.70	1.14	1.53	1.39	1.41	1.32	1.42	1.40	1.39	1.38	1.41		
Income Statements														
Operating Revenues	-	-	-	356	443	437	1,268	1,401	1,514	1,616	1,722	1,832		
Operating Expenses	567	588	639	1,101	1,217	1,238	1,336	1,486	1,491	1,522	1,557	1,631		
Net Interest Expense	-	(0)	(0)	(2)	(12)	(21)	231	227	220	200	189	173		
Net Income	(567)	(588)	(639)	(744)	(762)	(780)	(300)	(312)	(197)	(106)	(24)	27		
Sources & Applications of Funds Statements														
Sources														
Gross Internal Cash Generation	(225)	(242)	(280)	(373)	(337)	(299)	523	591	717	823	924	996		
Other Sources	-	-	-	-	-	-	-	-	-	-	-	-		
Government Equity Injections	763	689	1,707	2,123	1,222	763	-	-	-	-	-	-		
Long term Debt	-	-	6	1,390	1,188	1,094	-	-	-	-	-	-		
Total Sources	538	447	1,434	3,139	2,073	1,558	523	591	717	823	924	996		
Applications														
Capital Expenditures	538	447	1,408	2,737	1,886	1,567	264	268	198	464	470	482		
Total Debt Service	-	-	-	-	-	-	253	425	412	399	387	374		
Net Working Capital Needs	(5)	(0)	3	213	22	(28)	164	2	(26)	(22)	13	21		
Total Applications	533	447	1,411	2,951	1,908	1,539	681	694	584	842	869	877		
Cash Increase/(Decrease) for Year	5	1	23	189	166	19	(159)	(103)	133	(19)	55	119		
Closing Balance	5	5	28	217	382	402	243	140	272	253	309	428		
Balance Sheets														
Assets														
Current Assets	6	7	33	469	662	648	650	553	655	615	681	823		
Fixed Assets	5,779	5,880	7,071	9,575	11,171	12,455	12,346	12,260	12,079	12,131	12,159	12,166		
Total Assets	5,785	5,886	7,104	10,044	11,834	13,103	12,996	12,814	12,734	12,747	12,840	12,989		
Liabilities and Equity														
Current Liabilities	6	7	7	42	47	41	222	226	221	222	219	221		
Long-Term Debt	-	-	6	1,396	2,584	3,678	3,494	3,310	3,126	2,942	2,758	2,575		
Equity	5,779	5,880	7,091	8,606	9,202	9,384	9,280	9,277	9,386	9,582	9,862	10,193		
Total Liabilities and Equity	5,785	5,886	7,104	10,044	11,834	13,103	12,996	12,814	12,734	12,747	12,840	12,989		
Key Performance Indicators														
Operating Ratio	NA	NA	NA	310%	275%	283%	105%	106%	98%	94%	90%	89%		
Rate of Return on Net Fixed Assets	-19.6%	-10.3%	-11.5%	-13.7%	-11.6%	-10.1%	-0.7%	-0.7%	0.2%	0.8%	1.4%	1.6%		
Debt-Service Ratio (Times)	NA	NA	NA	NA	NA	NA	1.41	1.39	1.80	2.11	2.36	2.61		
Self-Financing Ratio (%) - 3-year Average	-45%	-30%	-18%	-29%	-17%	-22%	15%	68%	107%	118%	111%	126%		
Debt/Debt+Equity Ratio (%)	0%	0%	0%	14%	22%	28%	28%	27%	26%	25%	23%	21%		
Current Ratio	1.0	1.0	4.5	11.3	14.1	15.7	2.9	2.4	3.0	2.8	3.1	3.7		
Receivables (no. of Days Worth of Sales)	0	0	200	180	150	120	90	80	70	60	60	60		

Table 3: Kosrae Utilities Authority - Water and Sewer Division
Summary Financial Projections (\$ Thousand)

Item	Estimated		Projected											
	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05		
Water Production, Sales & Tariffs														
Water Production (m ³ per day)	2,280	2,510	2,610	2,860	2,460	2,460	2,300	2,310	2,310	2,340	2,380	2,410		
Non-Revenue Water (%)	100%	100%	95%	43%	42%	41%	40%	30%	29%	29%	29%	29%		
Water Sales (m ³ per day)	1,330	1,510	1,590	1,520	1,430	1,450	1,370	1,620	1,650	1,670	1,700	1,720		
Average Water Tariff (\$/1000 gallons)	-	2.04	2.13	1.76	1.76	2.25	4.45	4.69	4.85	5.20	5.45	5.75		
Average Water Tariff (\$/m ³)	-	0.54	0.56	0.47	0.47	0.59	1.17	1.24	1.31	1.37	1.44	1.52		
Annual Increase in Tariff	-	0%	5%	-17%	0%	28%	98%	6%	5%	5%	5%	6%		
Cost of Water Sold (\$/m ³)	0.10	0.12	0.16	1.01	1.11	1.09	1.82	1.43	1.41	1.42	1.44	1.46		
Income Statements														
Operating Revenues	-	12	23	244	231	301	566	712	769	820	873	935		
Operating Expenses	50	68	95	561	581	579	663	709	715	747	779	816		
Net Interest Expense	-	(0)	(1)	(1)	(3)	(2)	149	139	131	120	112	103		
Net Income	(50)	(56)	(72)	(316)	(347)	(276)	(246)	(136)	(77)	(47)	(18)	16		
Sources & Applications of Funds Statements														
Sources														
Gross Internal Cash Generation	(50)	(56)	(72)	(55)	(77)	5	234	387	452	490	529	574		
Other Sources														
Government Equity Injections	71	80	116	379	438	298	109	-	-	-	-	-		
Long-term Debt	-	-	5	299	1,131	760	-	-	-	-	-	-		
Total Sources	20	24	49	622	1,492	1,063	343	387	462	490	529	574		
Applications														
Capital Expenditures	16	-	21	477	1,518	1,058	109	112	170	232	284	301		
Total Debt Service	-	-	-	-	-	-	151	253	246	238	231	223		
Government Remittances	-	12	23	-	-	-	-	-	-	-	-	-		
Net Working Capital Needs	(1)	7	4	109	(19)	4	49	10	(13)	10	10	11		
Total Applications	15	18	48	587	1,499	1,062	310	375	402	480	505	536		
Cash Increase/(Decrease) for Year	6	5	2	35	(8)	1	34	12	50	10	23	38		
Closing Balance	6	11	12	48	40	41	76	87	138	147	170	208		
Balance Sheets														
Assets														
Current Assets	8	19	27	188	162	185	248	268	303	323	357	408		
Fixed Assets	6,363	6,363	6,543	6,922	8,334	9,275	9,218	9,181	9,187	9,240	9,309	9,399		
Total Assets	6,370	6,381	6,570	7,111	8,496	9,440	9,466	9,449	9,490	9,563	9,667	9,806		
Liabilities and Equity														
Current Liabilities	3	2	5	22	22	20	130	128	128	127	127	128		
Long Term Debt	-	-	5	304	1,434	2,194	2,085	1,975	1,865	1,756	1,646	1,536		
Equity	6,367	6,379	6,560	6,786	7,040	7,225	7,252	7,346	7,498	7,861	7,894	8,142		
Total Liabilities and Equity	6,370	6,381	6,570	7,111	8,496	9,440	9,466	9,449	9,490	9,563	9,667	9,806		
Key Performance Indicators														
Operating Ratio	NA	582%	414%	230%	251%	192%	117%	100%	93%	91%	89%	87%		
Rate of Return on Net Fixed Assets	-1.6%	-0.9%	-1.1%	-4.8%	-5.4%	-4.3%	-1.2%	0.0%	0.6%	0.8%	1.0%	1.3%		
Debt-Service Ratio (Times)	NA	NA	NA	NA	NA	NA	1.22	1.49	1.89	2.02	2.25	2.52		
Self-Financing Ratio (%) - 3 Year Average	-625%	NA	-45%	-24%	-6%	0%	8%	95%	128%	109%	108%	120%		
Debt/Debt-Equity Ratio (%)	0%	0%	0%	4%	17%	23%	23%	22%	21%	20%	18%	17%		
Current Ratio	2.5	8.6	5.4	8.7	7.3	8.2	1.9	2.1	2.4	2.6	2.8	3.2		
Receivables (no. of Days Worth of Sales)	NA	200	180	150	120	90	80	70	60	60	60	60		

Table 4: Pohnpei Utilities Corporation - Water and Sewer Division
Summary Financial Projections (\$ Thousand)

Item	P r o j e c t e d												
	Actual	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05
Water Production, Sales & Tariffs													
Water Production (m ³ per day)	12,660	11,450	10,890	8,860	8,300	7,570	8,540	8,480	8,370	8,560	8,690	8,830	
Non-Revenue Water (%)	47%	49%	42%	40%	38%	36%	34%	32%	30%	30%	30%	30%	
Water Sales (m ³)	6,700	5,820	6,320	5,320	5,150	4,840	5,640	5,770	5,860	5,990	6,090	6,180	
Average Water Tariff (\$/1000 gallons)	0.76	0.99	1.33	1.80	1.80	2.40	2.55	2.70	2.85	3.00	3.15	3.30	
Average Water Tariff (\$/m ³)	0.20	0.26	0.35	0.48	0.48	0.63	0.67	0.71	0.75	0.79	0.83	0.87	
Annual Increase in Tariff	-	31%	34%	36%	0%	33%	6%	6%	6%	5%	5%	5%	
Cost of Water Sold (\$/m ³)	0.65	0.58	0.48	0.79	0.75	0.74	0.75	0.76	0.77	0.79	0.82	0.85	
Income Statements													
Operating Revenues	490	588	787	899	881	1,099	1,392	1,472	1,578	1,703	1,814	1,929	
Operating Expenses	1,599	1,241	1,113	1,542	1,409	1,315	1,405	1,501	1,570	1,652	1,744	1,839	
Net Interest Expense	-	-	-	-	-	-	130	105	86	85	83	78	
Net Income	(1,109)	(653)	(326)	(643)	(528)	(216)	(143)	(133)	(78)	(34)	(13)	12	
Sources & Applications of Funds Statements													
Sources													
Gross Internal Cash Generation	(718)	(270)	106	(164)	(14)	328	569	627	707	785	842	905	
Other Sources	-	-	-	-	-	-	-	-	-	-	-	-	
Government Equity Injections	1,749	1,153	818	1,349	1,057	197	-	-	-	-	-	-	
Long term Debt	-	-	5	154	1,217	586	-	-	-	-	-	-	
Total Sources	1,031	883	929	1,339	2,259	1,110	569	627	707	785	842	905	
Applications													
Capital Expenditures	1,465	969	529	1,204	2,050	948	109	168	566	638	646	662	
Total Debt Service	-	-	-	-	-	-	135	226	220	213	206	199	
Net Working Capital Needs	(160)	288	224	48	(100)	(11)	(8)	17	19	24	21	22	
Total Applications	1,305	1,257	753	1,252	1,951	937	237	411	805	875	873	884	
Cash Increase/(Decrease) for Year	(274)	(374)	176	87	308	173	332	216	(98)	(90)	(31)	22	
Closing Balance	(274)	(647)	(471)	(385)	(76)	97	429	645	547	457	426	448	
Balance Sheets													
Assets													
Current Assets	504	334	(55)	149	293	421	749	984	906	841	833	879	
Fixed Assets	7,781	8,379	8,664	9,606	11,377	12,023	11,795	11,626	11,819	12,049	12,249	12,425	
Total Assets	8,284	8,714	8,609	9,755	11,671	12,444	12,544	12,609	12,725	12,890	13,083	13,304	
Liabilities and Equity													
Current Liabilities	469	341	64	134	70	35	136	138	139	141	143	145	
Long-Term Debt	-	-	5	159	1,376	1,962	1,864	1,766	1,667	1,569	1,471	1,373	
Equity	7,815	8,372	8,540	9,462	10,226	10,448	10,544	10,706	10,919	11,180	11,469	11,787	
Total Liabilities and Equity	8,284	8,714	8,609	9,755	11,671	12,444	12,544	12,609	12,725	12,890	13,083	13,304	
Key Performance Indicators													
Operating Ratio	326%	211%	141%	172%	160%	120%	101%	102%	99%	97%	96%	95%	
Rate of Return on Net Fixed Assets	-17.2%	-9.4%	-4.0%	-7.1%	-5.5%	-2.2%	-0.1%	-0.2%	0.1%	0.4%	0.6%	0.7%	
Debt-Service Ratio (Times)	NA	NA	NA	NA	NA	NA	4.26	2.69	3.13	3.57	3.98	4.43	
Self-Financing Ratio (%) - 3 Year Average	-46%	-57%	-13%	-17%	6%	33%	108%	137%	102%	89%	95%	105%	
Debt/Debt+Equity Ratio (%)	0%	0%	0%	2%	12%	16%	16%	15%	14%	13%	12%	11%	
Current Ratio	1.1	1.0	-0.9	1.1	4.2	12.1	5.5	7.1	6.5	6.0	5.8	6.1	
Receivables (no. of Days Worth of Sales)	165	170	140	120	100	80	60	60	60	60	60	60	

**Table 6: Water and Wastewater Tariff Requirements and Affordability
(Constant 1996 Prices)**

State - Utilities Corporation	FY1996	FY2000	FY2005
Chuuk - CSPUC			
Average Tariff (\$/m ³)	^b	0.89	0.95
Domestic Tariffs^a			
0 - 19 m ³ /month ^b (\$/m ³)	^b	0.63	0.67
> 19 m ³ /month ^b (\$/m ³)	^b	0.89	0.94
Affordability			
Average Household^d			
Per Capita Consumption (lpcd)	N/A	230	230
Median Household Income (\$)	515	515	515
Average Monthly Bill (\$)	-	41.08	43.56
% of Household Income	0.0	8.0	8.5
Low-Income Household^e			
Per Capita Consumption (lpcd)	N/A	110	110
Household Income (\$)	225	225	225
Average Monthly Bill (\$)	-	18.16	19.28
% of Household Income	0.0	8.1	8.6
Kosrae - KUA			
Average Tariff (\$/m ³)	See Note ^f	0.97	0.98
Domestic Tariffs			
0 - 19 m ³ /month ^b (\$/m ³)	See Note ^f	0.79	0.79
> 19 m ³ /month ^b (\$/m ³)	See Note ^f	1.02	1.03
Affordability			
Average Household^d			
Per Capita Consumption (lpcd)	N/A	230	230
Median Household Income (\$)	740	740	740
Average Monthly Bill (\$)	-	42.87	43.24
% of Household Income	0.0	5.8	5.8
Low Income Household^e			
Per Capita Consumption (lpcd)	N/A	130	130
Household Income (\$)	390	390	390
Average Monthly Bill (\$)	-	22.45	22.55
% of Household Income	0.0	5.8	5.8

Table 6 (continued):

Pohnpei - PUC			
Average Tariff (\$/m ³)	0.48	0.55	0.56
Domestic Tariffs			
0 - 19 m ³ /month ^b (\$/m ³)	0.48	0.45	0.45
> 19 m ³ /month ^b (\$/m ³)	0.48	0.58	0.59
Affordability			
Average Household ^d			
Per Capita Consumption (lpcd)	350	250	250
Median Household Income (\$)	1,035	1,035	1,035
Average Monthly Bill (\$)	30.80	24.10	24.45
% of Household Income	3.0	2.3	2.4
Low Income Household ^e			
Per Capita Consumption (lpcd)	150	150	150
Household Income (\$)	470	470	470
Average Monthly Bill (\$)	13.39	13.87	13.99
% of Household Income	2.8	3.0	3.0
Yap - YSPSC			
Average Tariff (\$/m ³)	0.34	1.22	1.23
Domestic Tariffs			
0 - 19 m ³ /month ^b (\$/m ³)	See Note ^h	0.82	0.83
> 19 m ³ /month ^b (\$/m ³)	See Note ^h	1.29	1.31
Affordability			
Average Household ^d			
Per Capita Consumption (lpcd)	310	210	210
Median Household Income (\$)	710	710	710
Average Monthly Bill (\$)	14.62	32.23	32.65
% of Household Income	2.1	4.5	4.6
Low Income Household ^e			
Per Capita Consumption (lpcd)	110	110	110
Household Income (\$)	265	265	265
Average Monthly Bill (\$)	5.00	14.23	14.46
% of Household Income	1.9	5.4	5.5

N/A Not applicable

- a Domestic tariffs in Chuuk, assuming nondomestic customers pay the domestic tariff plus a 25 percent surcharge.
 - b CSPUC is currently not applying water and wastewater tariffs.
 - c 5,000 US gallons = 18.9 m³.
 - d Average household defined as household earning the median household income as derived from the 1994 FSM Census and updated to 1996 prices.
 - e Low-income household defined as household earning top of fourth quartile income as derived from the 1994 FSM Census and updated to 1996 prices.
 - f Current tariff in effect for Okat water system which serves 12 nondomestic customers. Tariff is \$0.50/1000 gallons (\$0.13/ m³) for first 1,000 gallons/month (3.8 m³), \$1.00/1000 gallons (\$0.26/ m³) for next 4,000 gallons/month (15 m³), \$2.00/1,000 gallons (\$0.52/ m³) for next 5,000 gallons/month (19 m³), and \$2.50/1,000 gallons (\$0.66/ m³) for all consumption above 10,000 gallons/month (38 m³).
 - g Revised PUC tariff implemented in April 1996.
 - h Current YSPSC tariff is \$5.00 minimum charge for 5,000 gallons/month (18.9 m³) or less, \$1.25/1,000 gallons (\$0.33/ m³) for next 45,000 gallons/month (170 m³), and \$2.00/1,000 gallons for all consumption over 50,000 gallons/month (189 m³).
-