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AGENDA

PR-1884
3 November 1992
Original: English

TO: The Board of Executive Directors

FROM: The Secretary of the Bank

SUBJECT: Barbados. Proposal for loans for a south coast sewerage project

Attached for your consideration is a proposal for two loans to the Government of Barbados: one for up to the equivalent of US\$28 million, and the other for up to the equivalent of US\$23.2 million, both from the ordinary capital resources, for a south coast sewerage project.

Also proposed as part of this operation is the use of resources of the Intermediate Financing Facility (IFF) account to pay part of the interest on the prospective loan of US\$28 million.

Any questions concerning this operation may be addressed to Mr. Edward Agostini, Project Team Leader (extension 1511). This matter will be placed before the Committee of the Whole for consideration at a meeting held on or after November 25, 1992.

To expedite consideration of this matter in the Committee of the Whole, those Executive Directors who wish to do so may send the Secretariat, in writing, a list of the points they plan to raise at the meeting. The Secretariat will distribute the observations from Executive Directors that have so requested. If there is agreement on this operation in the Committee of the Whole, it will be placed before the Board of Executive Directors for approval at a forthcoming meeting.

Other distribution:

Managers and Advisors
Division Chiefs
Representative in Barbados

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BARBADOS

SOUTH COAST SEWERAGE PROJECT

(BA-0036)

LOAN PROPOSAL

This document was prepared by the Project Team consisting of: Edward Agostini (OP3/ODX), Project Team Leader, Juan Alfaro (SDV/SUD), Marta Mejía (SDV/SUD), Arthur Darling (PRA/PAO), Edward Farnworth (ENP/ENV), and Carlos Sampaio (LEG). Armando Diaz, formerly of the Country Office in Barbados, also assisted in the preparation.

BARBADOS
SOUTH COAST SEWERAGE PROJECT
(BA-0036)

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III-2	Detailed cost estimate, individual consultants
III-3	Terms of reference, individual consultants
III-4	Environmental conditions associated with the project
V-1	Financial projections

Information available in the technical files on request:

IDB procedures for procurement of goods and services
Selection and contracting of consulting services
Public water supply facilities
Solid waste collection and disposal
Map showing beaches in water quality study
List of equipment, O & M
Organization chart, PEU
PEU, estimate of cost and qualification requirements
Background data and design parameters
Land and easements
Organization structure, BWA
Historical statement of revenue and expenses
Historical operating data
Criteria and assumptions for financial projections
Basic assumptions and project costs
Cost-saving benefits
Contingency valuation survey

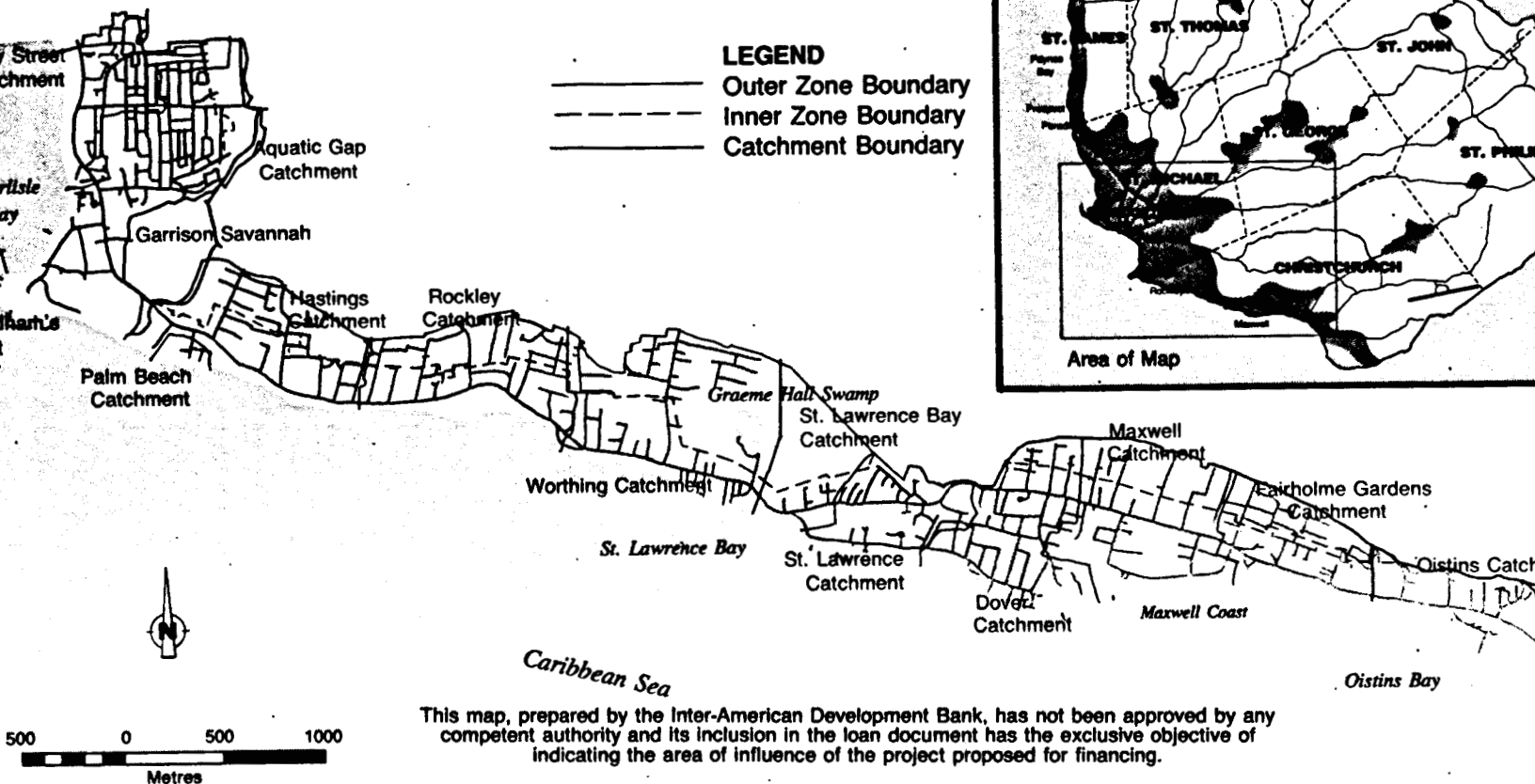
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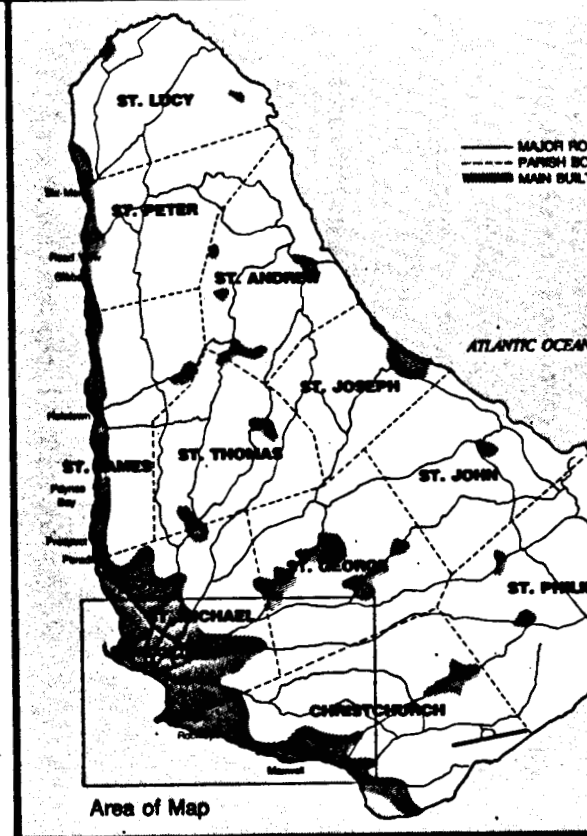
ABBREVIATIONS

BOD	Biochemical oxygen demand
BWA	Barbados Water Authority
Bss	Bridgetown sewerage system
CCPU	Coastal Conservation Project Unit
CMA	Environmental Management Committee
DES	Department of Economic and Social Development
EDF	European Development Fund
EIA	Environmental Impact Assessment
EIB	European Investment Bank
ft ²	Square feet
GDP	Gross Domestic Product
GOB	Government of Barbados
Ha	Hectares
IFF	Intermediate Financing Facility
IMF	International Monetary Fund
km	Kilometers
lppd	Liters per person per day
m	Meter
m.l.	Milliliter
m ³ /day	Cubic meter per day
mg/l	Milligrams per liter
MGD	Million gallons per day
mm	Millimeter
MOFEA	Ministry of Finance and Economic Affairs
MOH	Ministry of Health
MOW&C	Ministry of Public Works and Communication
MPN	Most probable number
OC	Ordinary capital
P	Phosphorus
PEU	Project executing unit
PVC	Polyvinyl Chloride
SPM	Suspended particulate matter
SSA	Sanitation Service Authority
TC	Technical cooperation
TKN	Total kjeldhal nitrogen
TOR	Terms of reference
TSS	Total suspended solids
UFW	Unaccounted-for water
USEPA	United States Environmental Protection Agency
WTP	Wastewater treatment plant

BARBADOS **South Coast Sewerage Project** **BA-0036**



LEGEND
 Outer Zone Boundary
 Inner Zone Boundary
 Catchment Boundary



This map, prepared by the Inter-American Development Bank, has not been approved by any competent authority and its inclusion in the loan document has the exclusive objective of indicating the area of influence of the project proposed for financing.

BARBADOS

Basic Socio-Economic Data
Statistics and Quantitative Analysis
Economic and Social Development Department

Executive Summary

Social Statistics

Land Area (Km2)	1991	430
Population (Thousands)	1991	255
Population (Average Annual Growth Rate)	1982-1991	0.2
Rural (Percent)	1991	54.8
Density (Population per Km2)	1991	593.0
Vital Statistics		
Crude Birth Rate (per 1,000 Population)	1990	15.9
Infant Mortality Rate (per 1,000 Live Births)	1990	10.4
Crude Death Rate (per 1,000 Population)	1990	8.7
Life Expectancy at Birth (Years)	1990	75.1
Illiteracy (Percent)	1980	0.5
Primary School Enrollment Ratio	1984	110.0

Economic Statistics

Market Exchange Rate (Barbados Dollars/US\$)	8-1992	2.0
GDP per Capita (Average Annual Growth Rate)	1982-1991	0.4
Labor Force (Thousands)	1990	137
Unemployment Rate (Percent)	1990	14.7
Consumer Prices (Twelve Month Variation)	6-1992	5.7
Central Government Deficit or Surplus (As % of GDP)	1991	-2.0
Domestic Credit (As % of GDP)	1991	53.0
Balance of Payments (Millions of US\$)		
Current Account Balance	1991	-30
Trade Balance	1991	-474
Capital Account Balance	1991	-1
Change in Reserves (- Increase)	1991	40
Total External Debt (Millions of US\$)	1991	535
Total Debt Service (Millions of US\$)	1991	150
Debt to GDP Ratio (Percent)	1991	31.7
Debt Service Ratio (Percent)	1991	18.0

19 October 1992

BARBADOS

Basic Socio-Economic Data

1. Exchange Rates

Barbados Dollars/US\$, End of Period Index 1980 = 100

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Market Rate	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Real Effective Index	85.5	81.3	76.3	75.2	80.7	86.2	88.5	85.5

2. Prices

Average Annual Growth Rates in Percent

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Consumer Price Index	10.4	5.1	4.7	4.0	1.3	3.4	4.9	6.2	3.1	6.2
Wholesale Price Index

3. International Liquidity

Millions of US\$

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Reserves	125	127	136	144	156	149	139	113	118	87
Reserves minus Gold	122	123	133	140	152	145	135	109	118	87
Special Drawing Rights (SDRs)	1	0	0	0	...	1	1	...	0	1
Reserve Position in the IMF	...	2	2	2	3	3	3	3	3	...
Foreign Exchange	121	121	130	137	149	141	132	107	114	87
Gold (National Valuation)	3	3	3	4	4	4	4	3

4. National Accounts

Millions of 1988 US\$ 1988 US\$

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Gross Domestic Product	1309	1316	1361	1379	1449	1489	1542	1592	1515	1470
GDP Per Capita	5228	5237	5389	5450	5716	5869	6072	6265	5941	5764

Annual Growth Rates in Percent - Constant Prices

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
GDP Per Capita	-5.3	0.2	3.0	0.9	4.9	2.5	3.4	3.4	-4.1	-3.8
GDP by Type of Expenditure (MP)	-4.9	0.5	3.6	1.1	5.1	2.6	3.5	3.5	-3.7	-3.8
Consumption	-6.8	-0.9	4.0	-1.3	6.4	1.7	3.8	9.7	-3.5	0.1
Gross Domestic Investment	-21.9	-11.5	-16.8	-4.7	7.4	2.5	2.1	12.9	-4.5	-1.8
Exports of Goods and Services	2.0	11.1	4.2	-6.0	-8.2	0.5	2.2	-8.8	-4.6	-11.2
Imports of Goods and Services	-8.1	4.9	-1.0	-10.7	-7.6	-1.0	2.0	2.2	-4.5	-3.9
GDP by Sector of Origin (FC)										
Agriculture, Forestry and Fishing	-2.5	3.7	9.4	-0.5	4.5	-11.2	-5.9	-9.0	8.5	-4.6
Mining and Quarrying	2.6	22.5	38.8	7.4	5.5	-6.5	-6.9	-7.5	4.8	-4.6
Manufacturing	-5.4	2.5	1.9	-9.5	5.1	-6.6	6.7	5.4	-2.7	-4.0
Electricity, Gas and Water	1.8	16.1	4.6	4.9	6.5	3.9	6.8	3.2	1.1	3.0
Construction	-11.9	-1.0	-1.0	-1.6	7.2	6.2	9.0	8.1	-10.2	-11.0
Wholesale and Retail Trade	-8.0	-3.0	4.0	5.0	6.0	5.5	2.5	2.5	-5.0	-6.0
Transport and Communications	3.1	1.5	5.0	3.0	4.6	5.0	0.5	6.3	-8.7	7.5
Financial Services
Government	-3.1	0.5	0.5	5.0	4.6	3.9	1.0	1.0	1.5	-2.1
Other Services	-4.8	-0.5	3.3	1.1	4.5	6.4	6.3	6.5	-4.3	-5.6

BARBADOS

Basic Socio-Economic Data

4. National Accounts (cont.)

Composition in Percent - Current Prices

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
GDP by Type of Expenditure (MP)										
Consumption	80.0	78.9	79.0	76.8	81.7	83.5	82.0	80.9	83.8	86.2
Gross Domestic Investment	22.6	19.9	16.2	15.5	16.0	16.0	17.5	19.2	18.8	16.8
Exports of Goods and Services	63.8	70.5	71.9	67.9	56.5	46.0	48.7	50.3	49.1	45.0
Imports of Goods and Services	66.5	69.4	67.2	60.2	54.2	45.5	48.2	50.3	51.7	48.0
GDP by Sector of Origin (FC)										
Agriculture, Forestry and Fishing	6.8	7.1	6.7	6.3	6.4	6.9	6.5	5.3	5.4	5.6
Mining and Quarrying	0.9	0.9	1.5	1.3	0.7	0.7	0.6	0.6	0.7	0.6
Manufacturing	11.5	12.6	12.7	10.6	10.0	8.9	9.0	8.1	8.0	8.0
Electricity, Gas and Water	2.5	2.8	3.3	3.3	3.1	3.2	3.2	3.2	3.1	3.5
Construction	6.8	7.0	6.3	5.4	5.7	5.8	6.4	6.8	6.5	5.6
Wholesale and Retail Trade	22.3	19.9	19.9	20.7	21.1	21.2	20.5	20.6	19.9	19.9
Transport and Communications	7.6	8.1	8.2	8.5	8.6	9.0	8.5	7.9	8.2	8.8
Financial Services	14.0	13.6	13.1	13.7	13.5	12.5	13.4	14.7	14.6	15.1
Government	13.1	13.9	14.2	15.8	16.5	17.0	16.3	17.4	18.5	18.3
Other Services	14.4	14.1	14.1	14.4	14.3	14.7	15.5	15.6	15.1	14.7

5. Central Government

As a Percent of GDP

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Current Revenues	24.4	25.8	24.3	25.9	24.9	24.0	26.4	29.3	27.1	30.0
Tax Revenue	21.6	22.7	21.3	23.7	21.9	22.0	24.8	26.9	25.4	28.3
Current Expenditures	23.2	23.0	23.1	25.3	24.2	24.1	24.4	24.7	27.3	27.2
Current Savings	1.2	2.8	1.2	0.5	0.6	0.0	2.0	4.5	-0.2	2.8
Capital Expenditure	6.3	7.0	5.4	5.5	6.8	6.5	6.7	5.3	6.9	4.8
Deficit or Surplus	-5.0	-4.1	-4.2	-5.0	-6.2	-6.5	-4.7	-0.7	-7.1	-2.0
Domestic Financing	3.4	1.6	2.6	0.3	1.5	2.3	0.8	0.4	7.8	2.2

6. Monetary Survey

As a Percent of GDP

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Domestic Credit	42.6	43.8	43.3	41.7	42.6	37.8	41.1	43.0	44.0	53.0
Public Sector	8.4	7.9	7.0	5.9	7.8	4.6	9.7	8.2	8.0	13.0
Private Sector	34.2	35.9	36.3	35.8	34.8	33.2	31.5	34.8	35.9	40.0
Money (M1)	12.1	12.6	13.1	13.0	15.2	14.0	15.3	14.8	13.9	15.0

7. External Trade

Direction in Percent Index 1980 = 100

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Exports of Goods (fob)										
Developed Countries	50.3	60.2	63.0	61.7	64.8	52.7	50.6	40.1	35.4	38.5
Developing Countries	49.7	39.8	37.0	38.3	35.2	47.3	49.4	59.9	64.6	61.5
Latin America	22.6	18.5	17.2	18.1	10.5	11.0	12.5	16.6	16.8	16.5
Imports of Goods (cif)										
Developed Countries	70.6	75.8	73.5	70.5	77.4	70.8	71.3	70.8	68.6	65.6
Developing Countries	29.4	24.2	26.5	29.5	22.6	29.2	28.7	29.2	31.4	34.4
Latin America	21.5	17.2	16.5	21.5	17.3	20.4	19.5	19.7	21.0	22.6
Terms of Trade Index

BARBADOS

Basic Socio-Economic Data

7. External Trade (cont.)

	Composition in Percent									
	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Exports of Goods (fob)										
All Food	19.4	10.2	12.8	11.4	15.7	29.4	...	23.6	27.9	...
Agricultural Raw Materials	0.1	0.0	0.0	0.1	0.1	0.9	...	0.7	0.1	...
Fuels	18.7	11.9	16.7	27.0	16.4	18.4	...	20.0	28.2	...
Ores and Metals	0.1	0.1	0.2	0.1	0.4	0.2	...	0.1	0.1	...
Manufactured Goods	61.8	77.8	70.3	61.4	67.4	51.0	...	55.6	43.7	...
Chemicals	7.1	5.5	3.9	2.4	5.5	10.5	...	12.5	12.0	...
Machinery and Transport Equipment	29.9	51.3	52.5	50.0	48.3	21.4	...	17.1	12.6	...
Other Manufactured Goods	24.8	20.9	13.9	9.0	13.6	19.1	...	26.0	19.0	...
Imports of Goods (cif)										
Capital Goods	20.3	16.9	16.6	17.1	17.3	18.4	18.3	20.3	21.6	...
Consumption Goods	33.9	32.0	31.3	35.1	35.4	42.1	40.1	38.1	37.6	...
Intermediate Goods	45.0	50.3	50.6	45.7	45.1	37.1	38.6	38.9	38.7	...
Fuels	8.8	5.3	6.1	5.3	2.4	5.7	5.0	5.7	6.9	...
Other	0.7	0.8	1.5	2.1	2.2	2.4	3.0	2.6	2.2	...

8. Balance of Payments

	Millions of US\$									
	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Current Account Balance	-36	-42	19	40	-16	-53	2	-3	-16	-30
Trade Balance	-299	-299	-267	-259	-278	-327	-373	-452	-472	-474
Exports of Goods (fob)	208	272	340	301	244	131	145	147	151	144
Imports of Goods (fob)	507	572	606	559	523	458	518	599	623	618
Service Balance	240	236	271	293	251	267	357	444	413	411
Freight and Insurance	-32	-36	-38	-42	-59	-54	-61	-70	-72	-71
Travel	227	232	263	288	297	345	423	484	452	417
Investment Income	-19	-25	-27	-28	-38	-44	-45	-36	-57	-57
Other Services	64	65	72	76	51	20	39	66	89	122
Unrequited Transfers	23	21	15	6	12	7	18	6	43	33
Private	17	17	17	15	19	19	30	32	35	32
Official	6	4	-2	-9	-7	-12	-12	-26
Capital Account Balance	24	40	-17	-6	19	101	42	0	45	-1
Non-Monetary Sector	19	26	-16	-22	27	88	36	-3	36	3
Private Sector	9	-3	-20	-51	-26	12	-7	-18	25	41
Direct Investment	4	2	-2	3	5	5	11	5	10	6
Portfolio Investment	-1	0	0	-3	-5	-1	0	-5	-6	-9
Other Long-Term	-6	-9	-22	-17	-40	-10	-22	-14	16	36
Other Short-Term	12	4	4	-34	15	18	4	-4	6	7
Government Sector	9	28	3	28	53	76	43	14	11	-38
Long-Term	11	28	4	29	53	76	43	15	12	-37
Short-Term	-2	0	-1	0	0	-1	0	0	-1	0
Monetary Sector	6	14	-1	17	-8	13	7	3	9	-4
Long-Term	0	0	0	0	0	0	0	0	0	0
Short-Term	6	14	-1	17	-8	13	7	3	9	-4
Change in Reserves (- Increase)	-2	11	14	-22	-20	-6	-38	42	37	40
Errors and Omissions	13	-9	-15	-12	17	-41	-6	-40	-66	-9

BARBADOS

Basic Socio-Economic Data

9. External Debt

	Millions of US\$ Ratios in Percent									
	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Debt	236	302	347	489	532	591	577	549	540	535
Long-Term Debt
Public and Publicly Guaranteed
Bilateral
Multilateral
Bond Holders
Banks
Suppliers
Other Creditors
Private Non-Guaranteed
Use of IMF Credit
Short-Term Debt
Interest Arrears on Debt
Total Debt Service	31	43	53	78	94	135	126	105	152	150
Public and Publicly Guaranteed
Bilateral
Multilateral
Private Non-Guaranteed
IMF Repurchases and Charges
Short-Term Debt (Interest only)
Debt to GDP Ratio	24	29	30	41	40	41	37	32	32	32
Debt Service Ratio	5	6	6	10	12	20	16	11	18	18

... Not Available

0.0 Indicates that the amount is nil or negligible

BARBADOS
Basic Socio-Economic Data

Sources and Notes

Executive Summary

Social Statistics:

Land Area: Organization of American States (OAS), América en Cifras 1974.

Population: IDB estimates based on data from Latin America Demographic Center (CELADE) and United Nations Population Division.

Vital Statistics:

World Bank, Social Indicators of Development - 1991-92 Edition and Economic Commission for Latin America and the Caribbean (ECLAC), Statistical Yearbook - 1991 Edition.

Economic Statistics:

Labor Force: World Bank, Social Indicators of Development - 1991-92 Edition.

Unemployment: Programa Regional del Empleo para América Latina y El Caribe (PREALC).

1. Exchange Rates:

International Monetary Fund (IMF), International Financial Statistics (IFS).

Real Effective Index: IDB estimates based on data from the IMF.

2. Prices:

IMF, IFS.

3. International Liquidity:

IMF, IFS.

4. National Accounts:

GDP in 1988 US Dollars: IDB estimates.

GDP by Type of Expenditure and Sector of Origin: Barbados Statistical Service and the Central Bank of Barbados.

Investment is fixed capital investment only. Financial Services is included in Other Services.

5. Central Government:

Central Bank of Barbados.

6. Monetary Survey:

IMF, IFS (mid-year observations).

7. External Trade:

Trade by Direction: IMF, Direction of Trade Statistics (magnetic tapes).

Export Composition: United Nations Statistical Division (UNSTAT) Commodity Trade (COMTRADE) Data Base; Exports include Re-Exports.

Import Composition: Central Bank of Barbados, Economic and Financial Statistics. Fuels include Crude Petroleum.

8. Balance of Payments:

Central Bank of Barbados and IMF, Balance of Payments Statistics (magnetic tapes).

9. External Debt:

Central Bank of Barbados, National Debt and Debt Service.

BARBADOS
OPERATIONS DEPARTMENT
OPS/IRO

IDB LOANS

APPROVED AS OF SEPTEMBER 30, 1992

	US\$Thousand	Percentage
TOTAL APPROVED *	158,990	100.0%
DISBURSED	147,639	92.9%
CANCELLATIONS	7,607	4.8%
UNDISBURSED BALANCE	11,351	7.1%
PRINCIPAL COLLECTED	42,540	26.8%
APPROVED BY FUND		
ORDINARY CAPITAL	96,415	60.6%
FUND FOR SPECIAL OPERATIONS	42,977	27.0%
SOCIAL PROGRESS TRUST FUND	0	0.0%
VENEZUELAN TRUST FUND	19,598	12.3%
OTHER FUNDS	0	0.0%
APPROVED BY SECTOR		
AGRICULTURE AND FISHERY	17,505	11.0%
INDUSTRY AND MINING	6,929	4.4%
TOURISM AND MICROENTERPRISE	8,214	5.2%
ENERGY	0	0.0%
TRANSPORTATION AND COMMUNICATIONS	38,531	24.2%
EDUCATION SCIENCE AND TECHNOLOGY	37,320	23.5%
PUBLIC AND ENVIRONMENTAL HEALTH	27,846	17.5%
URBAN DEVELOPMENT	0	0.0%
PLANNING AND REFORM	0	0.0%
EXPORT FINANCING	17,896	11.3%
PREINVESTMENT AND OTHER	4,749	3.0%

* Net of cancellations with monetary adjustments and export financing loan collections.

BARBADOS

PIPELINE

Project No.	Description	Sector	Amount US\$million
I. LOAN OPERATIONS			
1992			
BA-0017	Primary Education	ED-ADU	11.60
BA-0028	Multisectoral Preinvestment	PRE	8.40
BA-0036	South Coast Sewerage System	OS-ALC	51.20
	Subtotal 1992		71.20
1993			
BA-0012	Investment Sector Loan	PL-FIN	60.00
BA-0029	Multisectoral Credit	OT/MUL	15.00
BA-0047	Bridgetown Roads and Safety Improvement	TR-VIA	20.00
	Subtotal 1993		95.00
1994			
BA-0025	Solid Waste Management	PA-ADE	14.00
BA-0027	Rationalization of Health Services	SA-SER	20.00
BA-0031	Tourism Development	TUR	20.00
	Subtotal 1994		54.00
1995			
BA-0009	Transport Sector Improvement	TR-MAN	10.00
BA-0019	Coastal Conservation and Management	PA-AMB	21.00
BA-0032	Expansion of Bridgetown Port	TR-PUE	30.00
BA-0037	West Coast Sewerage System	OS-ALC	40.00
	Subtotal 1995		101.00
	Total Loans 1992-1995		321.20
II. TECHNICAL COOPERATIONS - 1993			
	Environmental Institutional Strengthening		1.00
	Strengthening of Bureau of Women's Affairs		0.20
	Total Technical Cooperations 1993		1.20
III. SMALL PROJECTS - 1993			
1.	Barbados Agricultural Society		0.50
2.	4-H Clubs		0.25
3.	Women in Development		0.25
	Total Small Projects 1993		1.00

SOUTH COAST SEWERAGE SYSTEM

(BA-0036)

EXECUTIVE SUMMARY

BORROWER AND GUARANTOR:	The Government of Barbados	
EXECUTING AGENCY:	Ministry of Health	
LOAN REQUEST DATE:	April 12, 1990	
FINANCING PLAN:	IDB:	US\$28.0 million (OC/IFF)
		US\$23.2 million (OC)
	Local counterpart funding:	US\$21.9 million
	Total:	US\$73.1 million
TERMS AND CONDITIONS FOR IDB LOAN:	Amortization period:	25 years
	Disbursement period:	4 years, except for the amounts required for the monitoring and opera- tional assistance pro- grams which shall be 6 years from the date of the signature of the loan contract.
	Interest rate:	variable during disburse- ment, fixed thereafter.
	Credit fee:	0.75% per annum on the undisbursed balance of the financing
	Inspection and supervision:	1% of the loan amount
OBJECTIVES:	The primary objective of the project is to bring the near-shore waters on the south coast to a bacteriological standard that corresponds to the accepted international standards and to reduce the chemical contamination affecting the reefs, marine life and beaches. Specifically, the project would: (a) stem the contamination of the near-shore seawater and the consequential deterioration of the coral reefs and other marine life; (b) prevent further contamination of groundwater reserves in the project area; and (c) improve general sanitary conditions. The project would also contribute to improving the	

operation and maintenance of the existing Bridgetown sewerage system and the efficiency of the Barbados Water Authority (BWA) in the commercial and financial management areas.

DESCRIPTION:

Project works would consist of: (a) a collection system (sewers); (b) five lift stations; (c) a transmission line; (d) a wastewater treatment plant and main pumping station; (e) an outfall line into the sea; and (f) in-house connections of properties in the project area. Complementary components include: (a) in-house connections of the central Bridgetown sewerage system (retroactive financing); (b) water meters to improve revenues of the BWA; and (c) operation and maintenance equipment. A technical assistance program would include: (a) institutional strengthening of the BWA which would assume responsibility for the operation and maintenance of the sewerage system; (b) an operational assistance program including on-the-job training; and (c) a water-quality monitoring program. These last two activities would be implemented with Bank financing for two years after the completion of the project.

**ENVIRONMENTAL
CLASSIFICATION:**

Classified as a category IV operation.

BENEFITS:

The project would contribute to sustain the Barbados tourism industry by restoring the quality of near-shore water in the area in Barbados with the highest density of tourism accommodations. The tourism and other sectors would benefit from the preservation of reefs and trap fisheries and, as a consequence, the reduction of beach erosion. The new sewerage system would also improve health conditions from the resident population and create private benefits by maintaining property values and replacing more costly private sewage disposal systems. Finally, the project would improve the financial viability of the public sewerage system and the public utility in charge of it, the BWA.

RISKS:

To achieve the planned improvements in water standards, the design of the system has to be without major flaws and the operation of the system well managed. The risk of sub-standard operation of the sewerage system will be minimized by a two-year operational assistance for the WTP and a 10-year monitoring program of the water quality. Both programs will permit to correct problems detected. Reaching full project benefits will also depend upon the timely completion of the in-house connections. This risk is minimized through the financing of the

in-house connections program in the project area, the costs of which would be recovered through the rates charged for water and sewerage services.

THE BANK'S

COUNTRY STRATEGY:

The Bank's lending strategy in Barbados focusses on: (a) assistance in the design and implementation of adjustment measures to restore growth and improve the competitiveness of the productive sectors; (b) programs to improve the protective infrastructure and natural resource management. This is a direct result of the deterioration of the country's fragile ecosystem both marine and land, threatening tourism and agriculture; (c) rationalization of social sector expenditures, and (d) strengthening the institutional capabilities of public agencies in order to enhance policy and program design and implementation.

SPECIAL ASPECTS:

It is recommended that the Bank retroactively finance up to US\$1.6 million equivalent for the completion of the in-house connections to the sewerage system in central Bridgetown. The reasons for this recommendation are contained in paragraph 3.14.

I. FRAME OF REFERENCE

A. Economic situation 1/

- 1.1 Barbados is the most densely populated island in the Caribbean area with an estimated population at the end of 1990 of 257,000 and a density of 590 persons per km² with most of the population concentrated along the west and south coasts. During the past decade annual growth was only about 0.3%. The urban population has grown from 35% in 1985 to 43% in 1991. The highest growth was on the west coast (St. James) with an estimated 20-25% increase in the 1980-90 period, followed by Christ Church on the south coast with an estimated 10% increase. In addition, 394,000 tourists came to the island in 1991 staying, on average, for seven nights. The rapid growth in urban population and the important presence of tourists poses increased demand for public services like sanitation.
- 1.2 Historically, sugar was the mainstay of the Barbadian economy and it still is the main agricultural crop. But after independence, in 1966, sugar gave way to tourism and light manufacturing which became the dynamic growth sectors. In the 1980s, however, and particularly since 1986, external competitiveness of Barbados in those sectors has been severely weakened as a result of macroeconomic policies which caused the real exchange rate to appreciate, and of trade policies characterized by a strong anti-export bias. Both public and private investment declined. Only tourism showed some buoyancy, but in that sector the high level of domestic costs (labor and highly protected intermediate inputs) and reduced quality of accommodation, led to lower profits and a smaller share in Caribbean tourism.
- 1.3 The slow decline in competitiveness registered in the 1980s was made worse by the emergence in 1989 and 1990 of serious external and internal imbalances. By the third quarter of 1991, some of the key macroeconomic performance indicators--the fiscal deficit, foreign exchange availability and Central Bank credit to the public sector--had reached alarming levels and the authorities sought the assistance of the IMF. A formal stand-by agreement signed in February 1992 will run until May 1993. The stand-by largely incorporated elements of a stabilization program mostly enacted in late 1991, which was designed to restore financial stability while keeping the nominal exchange rate parity. This was to be done primarily by bringing the fiscal deficit from 7.6% of GDP to zero in the period covered by the stand-by. Highly restrictive credit policies and wage guidelines were also enacted in support of that purpose.
- 1.4 The stabilization program has been largely successful in restoring financial stability. The balance of payments registered a surplus

1/ This section relies on macroeconomic studies prepared by DES.

in the first semester of 1992, and there was a substantial accumulation of net reserves. The targets agreed with the IMF with respect to the fiscal deficit and net domestic assets of the banking system were met. The price paid for financial stability, however, has been severe recession. Real GDP has fallen every year since 1989, with the total decline for the 1990-92 triennium expected to reach around 12%; and unemployment has risen concomitantly. The decline in aggregate output in the last two years has been exacerbated by uncontrollable external factors--chiefly the continued economic recession in the main tourist markets, namely the USA, United Kingdom, and Canada--which have adversely affected the key tourism sector. The Government of Barbados (GOB) is preparing policy measures to adjust its economy and set the stage for renewed growth and competitiveness. Reforms in the trade and tax regime are being negotiated as part of a structural adjustment loan with the World Bank, while agricultural and financial sector policies are the object of discussion with the IDB (Investment Sector Loan, BA-0012).

- 1.5 To counteract the present difficulties in the tourism sector, the GOB is developing a tourism strategy aiming at Barbados becoming a leading destination for quality in tourism, while cost reductions would be achieved through changes in the trade and tax regime (paragraph 1.4). Important elements of this strategy are quality management of all tourism services, urban rehabilitation as well as historical, cultural and nature-based attraction for visitors. The Bank is providing support to these objectives through the preparation of a tourism development program (BA-0031). A healthy and safe environment is a crucial ingredient of these policies involving more attention to water quality and sewerage treatment and disposal.

B. The sanitation sector

1. Water and wastewater

- 1.6 The island is served by a public water supply system divided into 16 inter-connected water service zones. All public water is supplied from groundwater resources through 18 wells. Eight additional wells are under construction. The coverage of piped water is high; 98% in the urban areas and 90% in the rural areas. There are some concerns about the availability of sources of water supply to serve the population after the year 2000. Under a proposed Bank-financed multisector preinvestment program (BA-0028), a water resources study has been included to address the availability of sources of supply beyond the year 2000.
- 1.7 Generally, properties in Barbados discharge sewage directly into the ground either through absorption wells (locally known as suck-wells), septic tanks supplemented by absorption wells, or pits. Grey water commonly discharges to roadside gutters which eventually run-off to the sea. Six private sewage treatment plants serve some of the major hotels. The GOB started to operate the first public

sewerage system in 1982 to serve central Bridgetown. 2/ The operation of the Bridgetown sewerage treatment plant has been hampered by a large volume of septic tank wastes trucked to the plant from non-sewered areas, particularly from the south coast. Consequently, the plant is producing large volumes of sludge and occasional odors. These problems would be relieved by the proposed project. In the interim, however, the BWA has initiated a program to recycle sludge, better manage the disposal of septage and test industrial wastes. This program is based upon the recommendations of experts financed by the Bank (IDB/PAHO agreement).

- 1.8 The lack of an adequate sewerage system in the densely populated and commercially developed coastal areas in the south and west and the rest of Bridgetown is cause of serious concern from a public health and environmental management viewpoint. The threats to health and the environment arise from drainage problems, contamination of ground and near-shore waters and the beaches, odor nuisances as well as deterioration of the marine ecosystem (see paragraphs 1.14-1.17). The existing system of sewage collection and disposal has been the major cause of pollution of the water resources and deterioration of the marine ecosystem, two of the country's major natural resources urgently in need of protective measures.

2. Solid waste collection and disposal

- 1.9 Refuse collection throughout the country is undertaken by the Sanitation Service Authority. It is likely that there is some filtration of organic materials from the disposal site into coastal waters. The Bank is financing a study 3/ to identify alternatives for improving environmental sanitation through the definition of a solid waste management program suited to the needs of Barbados. Based on this study, a solid waste project is expected to be financed in 1994.

3. Coastal areas

- 1.10 Barbados has a fragile 92 km long coastline. Natural processes of erosion and accretion are occurring at different points on the coasts. In addition, coastal civil works are causing changes to the natural system. The sandy beaches of the east coast are the main areas where accretion is occurring. Environmental protection along the east coast requires maintaining the beaches, including adjoining sand dunes, in their natural condition as attractive open spaces for controlled recreational use.

2/ Loans 440/SF-BA and 440A/SF-BA approved in October, 1975, and April, 1979, respectively. See paragraphs 1.18-1.22 for an assessment of the results of this project.

3/ Through ATN/JF-3862-BA approved on November 13, 1991.

- 1.11 The cliff areas of the north and southeastern coasts are being eroded in various degrees by natural forces. The main concern in these areas is residential development which may not be consonant with objectives such as maintaining public access to the coastline and the attractiveness of the landscape.
- 1.12 Coral sand beaches on the south and west coasts are generally experiencing erosion problems although accretion is also occurring in isolated locations. These problems result not only from deteriorating coral reefs, but also from poor physical planning practices which permit construction of buildings too near the coastline, as well as of sea defense structures erected at random to protect buildings and to form beaches. Such man-made structures interfere with natural processes and, in some cases, cause further erosion by preventing normal sand movement. In general, the concerns for the coast are not limited to erosion problems, but extend to the broader problems of a deteriorating marine life.
- 1.13 A coastal conservation preinvestment program partially financed by the Bank (see paragraphs 1.24 and 1.27) is currently under execution to determine the measures needed to prevent further destruction of the coastline on the south and west coasts, including the groundwater quality.

4. Quality of near-shore waters

- 1.14 As part of the preparation of the proposed project, diagnostic studies were carried out from June to September 1992, using IDB financing, to determine whether the near-shore waters on the south coast exceed the bacteriological standards (faecal coliforms and streptococci) established by the United States Environmental Protection Agency (USEPA) and whether the chemical standards are consistent with a healthy coastal marine environment. ^{4/} The USEPA standards ^{5/} refer to a mean or median standard and an extreme standard (no more than 10% of observations should exceed a specified level). Comprehensive sampling was carried out in two phases: a pilot phase for four beaches over a 30-day period and the final sampling of ten beaches over a 60-day period. The sampling was based on protocols previously approved by the Bank. The results were then analyzed to verify their statistical significance.
- 1.15 The study indicated that all beaches violated the extreme standards at one time or other and that eight of ten beaches violated the extreme standard in a statistically significant manner (that is, that the bacteriological counts are not likely to be unusual

^{4/} ATN/SF-3928-BA for US\$148,808 equivalent from the resources of the PPF.

^{5/} See Annex I-1.

occurrences) 6/. The study suggested that the violations are highly related to tidal conditions. When the tide is coming in, bacteria are pushed towards the shore and counts build up. When the tide is going out, the counts fall and, on the average, three beaches have no problem at all and six beaches have no problem with two of the three mean bacteriological standards. Three beaches (Oistins, Welches and Pebbles) exceed the mean standard indicating that they probably violate USEPA standards most of the time. In fact, while Oistins is always in violation of some standard, Pebbles is in violation of all standards all the time. This is the beach most often used by two of the largest hotels on the island. The study concludes: "On the basis that a beach should be closed to bathers whenever any of six USEPA bacteriological contamination standards are exceeded, all ten of the beaches investigated on the south coast of Barbados would have been closed in each of the five 30-day periods of the study; i.e. all beaches would have been permanently closed." Table I-1 summarizes the bacteriological results.

- 1.16 The study also sampled south coast waters for chemical contamination which affect the reefs and the food chain for fish. The report found that of the chemical contaminants measured, nitrate values were particularly above standards recommended. Phosphate values were acceptable most of the time and suspended particulate matter (SPM) rose above standards recommended in the rainy season.
- 1.17 On the whole, the data show the south coast beaches to be in statistically significant violations of bacteriological standards. Possible consequences are: (a) heightened health risks; (b) negative economic effects, if reductions occur in tourist arrivals, and (c) destruction of marine environment.

6/ The extreme standard for faecal streptococci is an absolute standard, that is, any observation above the specified level constitutes a violation of standard.

Table I-1						
Statistically significant 1/ violations of bacteriological standards at south coast beaches						
	Total coliforms		Faecal coliforms		Faecal streptococci	
	Median more/equal 1000 coliform per 100 ml	10% of samples more/equal 2400/100 ml in any 30-day period	Geometric mean more/equal 200/100 ml in any 30-day period	10% of samples more/equal 400/100 ml in any 30-day period	Geometric mean more/equal 35/100 ml	No sample 2/ more/equal 104/100 ml on high-use beaches
Miami				x		x
Oistins	x	x	x	x	x	x
Welches	x	x		x	x	x
Casuarina		x		x	x	x
Dover						x
St. Lawrence		x		x	x	x
Sandy Beach				x	x	x
Rockley						x
Drill Hill				x	x	x
Pebbles	x	x	x	x		
1/ Statistically significant at the 95% level.						
2/ This is an absolute standard not a statistical test.						

C. Past Bank involvement

1. Wastewater control

- 1.18 The IDB is the only external agency participating in the financing of the sanitation sector. The Bank approved in 1971 partial financing of the feasibility studies and final designs for a public sewerage system in central Bridgetown. 7/ Based upon these studies, loans 440/SF-BA (US\$9.7 million) and 440A/SF-BA (US\$2.56 million) in October 1975 and April 1979, respectively, provided financing towards the construction of a public sewerage collection, treatment and disposal system in the central Bridgetown area. The objectives of the operation were to: (a) improve the sanitary conditions in the central area of Bridgetown by constructing a sanitary sewerage system; and (b) prepare institutional and rate studies for the establishment of an authority to administer the water and sewerage services. The system was put into operation in 1982 under the control of the BWA, itself created with the Bank's support, approved jointly with loan 440/SF-BA 8/. The BWA became operational on April 1, 1981, with the transfer of assets

7/ Technical cooperation ATN/SF-1106-BA for US\$210,000.

8/ Technical cooperation ATN/SF-1398-BA.

and liabilities of the then water works department of the Ministry of Transport and Works, and the Bridgetown sewerage system.

- 1.19 The system was completed in June, 1982, 32 months behind the original schedule, at a cost of US\$21,4 million. The main reasons for this delay were deficient soil investigations during project preparation and litigation related to disagreements on payments to the contractor for the relocation of a pumping station because of the poor soil conditions. This resulted in a delay of 16 months in the award of the construction contract for the treatment plant and of 24 months for the sanitary sewers. Additional geotechnical studies and new designs were necessary to modify the foundation for the treatment plant. Construction completion was also delayed by 16 months for the treatment plant and 8 months for the sanitary sewers. Direct costs more than doubled because of the difficult soil conditions, relocation of underground utilities, more expensive foundation works for the treatment plant and escalation of construction prices in the three years between project approval and tenders.
- 1.20 The benefits derived from the system were delayed by the slow rate of in-house connections. Service connections were to be completed voluntarily by the property owners, with the exception of a fund of US\$300,000 established by the GOB to finance in-house installations in low-income households in the project area by loans or grants. However, mainly because of high connection costs for the project area, the high incidence of absentee landlords and a general indifference of residents in the area to the environmental benefits from connecting to the system, the rate of connections was slow. In fact, the rate increased only when the GOB provided the necessary funds to finance the connections for private and government-owned buildings, recovering the costs from the property owners through the water rates after the completion of the installations. 9/ All connections are scheduled for completion by the end of October 1992. Based on this experience, the proposed project includes in-house connections in the financing [paragraph 2.3(f)].
- 1.21 Furthermore, problems occurred regarding odor emissions, inefficient level of sewage treatment and mechanical malfunctioning at the treatment plant. These were directly related to septage discharges to the treatment plant as well as to the low level of connections to the system. Septage waste, 40% of which originates from the hotels on the south coast, is trucked to the plant and amounts to about five times the design capacity for this type of waste. The plant is therefore overloaded with organic materials while its hydraulic capacity was not fully used until recently, due to the limited number of house connections. This situation accounts for a large volume of sludge and occasional odors. The

9/ The authorities are authorized to recover these costs under the Barbados Water Authority Act 1980-42 dated October 8, 1980.

construction of the proposed project on the south coast would resolve these problems to a great extent. Meanwhile, the Bank is monitoring closely the execution of a series of interim measures taken by the BWA (see paragraph 1.7) which have allowed the BWA to comply with the annual maintenance report on the sewerage system under the IDB loan agreement.

- 1.22 The BWA, as the operating agency of the system, complied with the requirements for water tariffs established in the two Bank loans until FY1988/89 (April to March) as total operating revenues were sufficient to cover operation, maintenance and administrative expenses and partial depreciation for both water and sewerage systems. For FY1989/90 and 1990/91, the BWA experienced operating deficits (excluding depreciation) of 1% and 7% respectively and therefore did not comply with loan requirements. However, the BWA made effective a 25% across-the-board increase in water and sewerage rates on October 1, 1991, and has now sufficient resources to cover operating expenses, including depreciation, as evidenced by BWA's audited financial statements for FY1991/92.
- 1.23 In September 1981, a technical cooperation agreement was signed with the GOB to prepare the prefeasibility studies of public sewerage systems for the south and west coasts and Greater Bridgetown. 10/ The Bank also approved additional nonreimbursable financing in November 1986 to carry out complementary studies and final designs for the south coast sewerage project. 11/

2. Coastal conservation

- 1.24 In January 1983, the GOB and the Bank agreed on a technical cooperation to carry out prefeasibility studies for coastal conservation of the south and west coasts, and overseas graduate training in coastal engineering and coastal zone management for two Barbadian professionals. 12/ To provide supplementary information, the Bank approved a short-term technical cooperation in February 1986. 13/
- 1.25 In January 1990, the GOB and the Bank signed a loan contract 571/OC-BA for a coastal conservation preinvestment project to seek viable structural and non-structural solutions for the protection and enhancement of the south and west coastal zones of the country. This operation also includes three technical cooperations to contribute to the legal and institutional strengthening of the sector dealing with coastal conservation and coastal zone management, to provide technical support to the Coastal Conservation Project Unit (CCPU) in its supervisory functions of

10/ Technical cooperation ATC/CD(PP)-1990-BA for CAN \$1.4 million.
11/ Technical cooperation ATC/CD(PP)-2806-BA for Can\$1.97 million.
12/ Technical cooperation ATC/CD(PP)-1990-BA for CAN \$1.4 million.
13/ Technical cooperation ATN/SF-2704-BA.

the project, and for the construction and evaluation of the pilot structural projects. 14/

- 1.26 The loan and technical cooperations are being implemented by the CCPU set up with Bank assistance. In the initial phase of the program, consultants have surveyed eroding beaches along the south and west coasts of the island and seven beaches have been designated for engineering treatments to begin in December 1992. Water quality surveys of near-shore coastal waters and run-off from agricultural lands through gullies have begun and will continue in order to expand the existing information on land-based pollutant input into coastal waters. Consultants have completed an institutional assessment of coastal zone problems and risks, and the development of a preliminary coastal zone management plan will be undertaken. The project is about 35% complete and on schedule.
- 1.27 Regarding the three technical cooperations, the studies for institutional strengthening began in July 1991 and the first-stage report were approved by the Bank. Stage two is scheduled to begin in January 1993 and would include the implementation of the recommendations and an assessment of the results achieved. The technical assistance for the executing unit covers such areas as coastal erosion problems, water quality changes and related natural resources degradation, and is on schedule. Finally, the engineering assistance will be used exclusively for pilot structures in order to establish least-cost alternative solutions for coastal conservation on the west and south coasts. Construction of these structures is expected to begin in January 1993.

D. Study of investment alternatives

- 1.28 The 1984 Sewerage Master Plan for Barbados 15/ recommended that the sewerage system needs be met by constructing three conventional public collection, treatment and disposal systems for the south coast, west coast and Greater Bridgetown. Due to the critical environmental conditions along the south coast, the study recommended to construct the south coast scheme first.
- 1.29 Even though the master plan at feasibility level pre-dimensioned the main components of the selected alternative for the south coast project, the final design phase by a consulting firm began with a review of the study of alternatives for the south coast system. Thereafter, the consulting firm did an in-depth technical and economic comparison of the exact location for the project components of the selected alternative. This exercise also included comparison of varying degrees of treatment and several lengths, alignments and depths for the ocean outfall. The selected alternative (No. 3) appears to be 5% more expensive than the least-

14/ Technical cooperations ATN/SF-3316-BA, ATC/CD(PP)-3317-BA and ATN/JF-3318-BA, respectively.

15/ Feasibility study by Stanley, CEP, 1984.

cost alternative. The reasons for not selecting alternative No. 2 (least costs) included the projected high cost of land in an already densely urbanized area, national security evidenced by military installations, and the impact on the nearby Palm Beach area. The Bank and the borrower also participated in these reviews. 16/.

- 1.30 As part of the appraisal, the project team examined some additional alternatives in an effort to reduce the size of the project. An attractive option was to postpone the construction of part of the network-serving areas which might not produce serious environmental impact on the beaches. However, given the location of these small areas, the population density and the configuration of the system which concentrates all the wastewater in Graeme Hall and pumps it from there to the disposal point off Needhams, the benefits lost were greater than the savings. The proposed design of the project is, therefore, the least-cost alternative.

E. Rationale for Bank financing

1. Country's development strategy

- 1.31 Barbados' development strategy enunciated in the 1988-1993 Development Plan has been modified by domestic and external events (see paragraphs 1.2 to 1.5). Its long-term strategy to the year 2003 is to develop the island as an important service center through growth with structural change, human resource development and technological and scientific progress and satisfaction of basic needs. Structural adjustment measures to be undertaken with the support of the IMF, the World Bank and the IDB are designed to stem the recession and the loss of competitiveness of the main economic activities (paragraph 1.4). In the health sector environmental health is emphasized through corrective action, and projects have been identified for liquid and solid waste disposal, protection of coastal and drinking water and sewage and other waste disposal to restore the coral reefs and the coastal ecosystem, including fish life.

2. Bank strategy for the country

- 1.32 A primary focus of the Bank's activities is assistance in the design and implementation of adjustment measures to restore growth, enhance the cost-effectiveness of public expenditure and improve the competitiveness of the productive sectors. The deterioration of the country's fragile ecosystems, both marine and land, threaten the foundation of the tourism and agricultural sectors. Accordingly, programs to improve the protective infrastructure and natural resource management will remain a high priority for the Bank. There is also a strong need to strengthen the institutional capabilities of public agencies in order to enhance policy and

16/ See Annex I-2.

program design and implementation as well as overall government administration. Social sector programs should focus on rationalizing and improving the effectiveness of the significant share of resources currently devoted to these functions.

- 1.33 The approved 1992-95 lending program of 13 projects with loans estimated at US\$322 million consists of 38% for the benefit of the environment, 19% to support policy and institutional changes affecting private sector investment, 19% for economic infrastructure, 11% for private sector and export development, 10% for social sectors and the remainder for preinvestment studies. The proposed project is included in the 1992 lending program, and should be complemented by a sewerage project for the west coast (BA-0037, 1995), a solid waste management project (BA-0025, 1994) and a coastal conservation project (BA-0019, 1995).
- 1.34 The protection of the natural environment, and in particular the near-shore water and beaches, is critical to sustain the tourism industry in Barbados. The deterioration of water standards in one of the main tourism areas of Barbados presents a high risk to affect negatively the image of Barbados, as a tourism destination at a time of increased competition with other Caribbean islands. Improvements in water quality are a necessary condition for the tourism policies, oriented towards improving quality in all aspects of the tourism product, to succeed (paragraph 1.5).

II. THE PROJECT

A. The project area

- 2.1 The area of the south coast to be sewerred, (see map), covers 12 km of coastal strip from Oistins in the south to the edge of Bridgetown in the north; the width of the strip varies but is approximately 0.5 km inland from the coastline. This area of approximately 500 ha includes high levels of commercial and tourism activities and high residential density: 4,422 households, 182 retailers, 47 offices, 109 service businesses, 92 hotels, 51 public institutions (schools, etc.), 14 industrial establishments and 21 recreational facilities.

B. Objectives

- 2.2 The primary objective of the project is to achieve a bacteriological standard for the near-shore waters on the south coast that corresponds to accepted international standards and at the same time to reduce the chemical contamination that affects the reefs, marine life and beaches. Specifically, the project would: (a) prevent further contamination of the near-shore seawater and deterioration of coral reefs and other marine life; (b) prevent further contamination of groundwater reserves in the project area; and (c) improve sanitary conditions generally. The project would also contribute to improve the operation and maintenance of the existing Bridgetown sewerage system and the efficiency of the BWA in the commercial and financial management areas. All these elements, but particularly the restoration of water quality, would protect the tourism industry, a sector which is vital for the economic future of Barbados. The project would complement planned investment projects for solid waste management, sewerage on the west coast, and coastal conservation which are under study (see paragraphs 1.33).

C. Project description

1. Works

- 2.3 The components of the public sewerage system for the south coast would be as follows:
- a. a collection system composed of approximately 40-44 km of PVC gravity sewers, 1.4 km of PVC pressure pipe; 0.5 km polyethylene gravity pipe, and 20 km of pipes for service connections;
 - b. five lift stations at Aquatic Gap, Palm Beach, Deal Gardens, Welches and Hastings. These five stations would have submersible-type pumps;

- c. a force main line of approximately 4.1 km of ductile iron pipe, from the pumping station at Graeme Hall to Drill Hall;
- d. a wastewater treatment plant and main pumping station of approximately 27,930 m³/day of peak hydraulic capacity which would include: (i) influent and effluent pumping stations; (ii) coarse, medium and fine screening; (iii) a screening incinerator ^{17/} and a grit chamber; and (iv) odor control units;
- e. an ocean outfall of approximately 1.1 km seaward from Needhams's point. The outfall works would consist of: (i) a steel pipeline with a cement mortar lining and coal tar enamel fiberglass mat protection plus a concrete weight coat on the outside; and (ii) a diffuser section at the end of the outfall.
- f. installation of connections (in-house) to properties in the service area.

2. Complementary components

2.4 The project would include physical components which would support higher efficiency in BWA's general operations:

- a. Bridgetown in-house connections - The project makes provision to retroactively finance the works carried out by the BWA to complete the in-house connections program in central Bridgetown (see paragraph 3.14).
- b. Water meters. Forty thousand water meters and some macro meters would be required to improve water savings and the commercial activities of the BWA (see paragraph 3.19).
- c. equipment for operation and maintenance of the Bridgetown and proposed south coast sewerage systems.

3. Technical assistance

2.5 Consultant services would be required in the following areas:

- a. monitoring of the ground water quality and sea water quality would be carried out for two years after completion of the works by a consulting firm or institute to be contracted by the

^{17/} There is provision in the estimate for the purchase of this equipment. As recommended by the environmental impact assessment, it will be purchased if it is deemed necessary after the completion of the feasibility study for the solid waste management project. [See also Chapter III, paragraph 3.30(c)].

borrower. The MOH would continue the monitoring program for eight additional years (see paragraphs 3.32 and 3.33). 18/

- b. operational assistance. For two years after completion of the works, a consulting firm would be contracted to operate the system and to provide on-the-job training for the local operators of the treatment plant (see paragraph 3.35).
- c. Commercial and financial operation of BWA. The operations of the BWA would be strengthened with the support of individual consultants for a total of 16 expert/months. Improvements in the commercial and financial management and in the tariff rate system would be sought. Also a consultant would advise on the optimal introduction of additional water meters.

D. Cost and financing

1. Estimated costs

- 2.6 The total cost of the project is estimated at US\$73.1 million equivalent of which the Bank would finance up to US\$51.2 million equivalent, or 70% of the total project cost from the ordinary capital resources. Included in the Bank's financing is the amount of US\$28 million, or 38.3% of the total costs, which would be financed with IFF interest rate conditions in accordance with document GN-1662 dated January 10, 1990. In addition to the Bank's financing, the BWA would finance the local counterpart of US\$21.9 million equivalent, using partially resources from the European Investment Bank (EIB) (see paragraph 2.9). A breakdown of estimated costs by investment categories is given in Table II-1 below:

18/ See Annex II-1 for TOR and estimated costs.

2. Basis of cost estimates

- 2.7 The estimated project cost is based on the bill of quantities by the consulting firm contracted to prepare the final designs. The unit prices are supported by quotations for materials, equipment and labor and the corresponding analysis of the necessary time to complete the different activities of the project. Prices are current prices at March 31, 1992, using a rate of US\$1=2B\$. Provisions for contingencies have been introduced using 10% of all the categories except for the reimbursement of the technical cooperation (ATC/CD(PP)-2806-BA) and the financial cost. Escalation has been calculated using the factors estimated by DES (April 1992).

3. Financing

- 2.8 The terms and conditions of the proposed IDB financing are as follows:

- a. Amount of loan funds: Ordinary Capital - US\$23,200,000
Ordinary Capital/IFF US\$28,000,000
- b. Amortization period: 25 years
- c. Grace period: 4 years
- d. Disbursement period: 4 years from the date of loan contract except for the investments in the monitoring and operational assistance programs, the period for which would be 6 years from the effective date of the loan contract.
- e. Interest rate: variable during disbursement, fixed thereafter
- f. Credit commission: 0.75% on the undisbursed balance
- g. Inspection and supervision: 1% of the amount of the loan

4. Local contribution

- 2.9 The local contribution for project execution would be US\$21.9 million equivalent, representing 30% of the total project cost. These funds would be provided by the BWA. To ensure timely project execution, the BWA and the GOB, through the MOH, would sign an agreement, based on guidelines previously agreed upon with the IDB, for the timely provision of these funds to the executing agency. This agreement would be required as a condition prior to first disbursement. ^{19/} The GOB is currently negotiating with the EIB to partially finance the local counterpart requirement for the project. If successful, the contribution would amount to US\$11 million of the local counterpart. However, the financial projections of the BWA have shown that the BWA could afford to provide the full local counterpart requirement so that, if the

^{19/} Resolution 8(c)(1)(4).

EIB's contribution should not materialize, the execution of the project would not be affected. The EIB financing conditions, if available, would be as follows:

- a. Amount of loan funds: US\$11,000,000
- b. Amortization period: 20 years
- c. Grace period: 5 years
- d. Disbursement period: 4 years
- e. Interest rate: variable during disbursement with an EDF subsidy of 4%

5. Disbursement period

- 2.10 The disbursement period for project execution would be four years from the effective date of the loan contract. However, in order to finance the water quality monitoring program and the operational assistance program for the sewerage system, the disbursement of the financing relating to these two components would be six years from the effective date of the loan contract.

III. EXECUTION OF THE PROJECT

A. Executing agency

- 3.1 The Ministry of Health (MOH) would be the executing agency for the project. This ministry has ample experience with the implementation of Bank-financed projects. It executed the first sewerage project in Central Bridgetown (loans 440/SF-BA and 440A/SF-BA), the polyclinics project (loan 577/SF-BA), the expansion of the Queen Elizabeth Hospital and construction of the Glebe Polyclinic project (loans 155/IC-BA and 768/SF-BA) and is expected to be the executing agency for the proposed rationalization of health sector services project (BA-0027) and the solid waste management project (BA-0025). The operation of the project would be transferred to the BWA once its construction is completed. The BWA is under the policy control of the Ministry of Public Works and Communication (MPW+C).

1. Project executing unit

- 3.2 The project execution unit (PEU) for the proposed project would be part of the MOH and would be the same unit that executed the first sewerage project in central Bridgetown and was involved in the feasibility and final design study for the proposed project. The PEU would execute the project in close collaboration with the BWA. Some components of the project are under the responsibility of the BWA and, therefore, it would be necessary to formalize an agreement between the borrower, through the MOH, and the BWA, requiring the BWA to carry out some specific project activities, in particular the operational assistance for the new system and the institutional strengthening program for the BWA. The conclusion of the agreement, to the satisfaction of the Bank, would be a condition prior to first disbursement. These functions would be carried out by the BWA under the supervision of the PEU. To facilitate a smooth transfer of responsibility after completion of the project, the BWA would be required to assign an engineer to the PEU for the period of project execution. 20/
- 3.3 The organization of the PEU would be similar to that successfully adopted for execution of the central Bridgetown project. The project manager would head the unit and under him would be a project engineer who would liaise directly with the engineering consulting firm for engineering supervision. In addition, a suitably qualified finance officer would be hired for financial and accounting management of the project, including the preparation of periodic financial statements and disbursement requests to the Bank. An administrative officer would also be hired for the day-to-day office management including processing of all

20/ See Resolution 8(c)(ii).

correspondence. To ensure a smooth and efficient initiation of project execution, the GOB would be required to show satisfactory evidence as a condition prior to first disbursement that the project manager, project engineer and finance officer are appointed to the PEU. ^{21/} All other staff would be appointed based on the implementation of the schedule of activities (see Table III-1).

2. Engineering supervision of the construction

- 3.4 An international consulting firm would be contracted following the Bank's standard international procedures to supervise the construction of the project working closely with the PEU. The main activities of this firm would include: assistance to the PEU in the administration of the various construction contracts, technical input to the PEU and the contractor, and preparation of TOR for the consulting firm to be contracted for the operational assistance program (see paragraph 2.5). The firm would use technical office staff and field staff for surveys and inspection.
- 3.5 All staff would be under the direction of a resident project manager who would assume day-to-day responsibility for the performance of the supervision work including regular liaison with the PEU. TOR for the consultant's supervision functions and an estimate of costs are in Annex III-1. Given the importance of an engineering consulting firm to assist the PEU in the supervision phase of the project, the executing agency would be required to submit to the Bank, as a condition prior to first disbursement, evidence that it has contracted an engineering consulting firm for project supervision, ^{22/} following the Bank's standard procedures.

B. Status of project preparation

- 3.6 The complementary feasibility studies including final designs were completed by the consulting firm hired with the resources of ATC/CD(PP)-2806-BA and were approved by the Bank and the GOB. The specifications and the bidding documents were also completed and approved by the Bank and the GOB. For the design of the in-house connections, several local consultants would be hired to complete this activity within the first year of the project's execution. Civil works are therefore ready for procurement as soon as the consulting firm is hired.

C. Implementation schedules and procurement

- 3.7 Implementation includes the execution of four main contracts as follows: contract No. 1 for the treatment plant; contract No. 2 for the collection system including the lift stations and service connections (see paragraph 3.10); contract No. 3 for the ocean

^{21/} See Resolution 8(c)(ii).

^{22/} See Resolution 8(c)(iv).

outfall, and contract No. 4 for the designs and in-house property connections. Construction of the collection system and the installation of the in-house connections (contracts Nos. 2 and 4) are critical. Construction operations are planned to begin in the second semester of 1993 with the award of contracts Nos. 1 and 2. Completion of contract No. 1 is expected by late 1995 and contract No. 2 by mid-1996. Contract No. 3 for the construction of the outfall is expected to be awarded in the first semester of 1994 with actual construction beginning in the second semester. Completion of this contract is expected by mid-1995. Contract No. 4 should be awarded during the second semester of 1993 for execution to begin immediately and completion by the end of 1996.

- 3.8 In addition to the main construction contract, other activities include: (a) reimbursing, shortly after first disbursement, the costs incurred for completing the hook-ups to the Bridgetown sewerage system; (b) contract No. 5 for the purchase and installation of 40,000 water meters (see paragraph 3.19); (c) contract No. 6 for additional equipment and spare parts for the efficient operation and maintenance of the sewerage system (Bridgetown and South Coast). These two latter contracts would be tendered in the second semester of 1993 and installation of the water meters by BWA would begin in 1994 for completion by the end of project execution in 1996; (d) a specialized consulting firm to carry out the water-quality monitoring program ^{23/}, and (e) a specialized consulting firm to carry out the operational assistance program. These two firms would be contracted in 1996 towards the completion of civil works to carry out these programs for two years to 1998. The hiring of the individual consultants for the institutional strengthening of the BWA would take place in 1993. Table III-1 shows the proposed construction schedule.

^{23/} See Annex II-1 for cost estimates and preliminary TOR.

Table III-1						
SCHEDULE OF ACTIVITIES						
ACTIVITIES	Y E A R S					
	1993	1994	1995	1996	1997	1998
I. <u>ENGINEERING & ADMIN.</u>						
1.1 Project Engineering	DDDDDD					
1.2 Supervision	CCCCCCCCCCCC	EEEEEEEEEEEE	EEEEEEEEEEEE	EEEEEEEEEEEE		
1.3 Administration	EEEEEEEEEEEE	EEEEEEEEEEEE	EEEEEEEEEEEE	EEEEEEEEEEEE	EEEEEEEEEEEE	EEEEEEEEEEEE
II. <u>DIRECT COST</u>						
2.1 Contract No. 1 WTP	TTTTTTTTTTEE	EEEEEEEEEEEE	EEEEEEEEEEEE			
2.2 Contract No. 2 Collection	TTTTTTTTTTEE	EEEEEEEEEEEE	EEEEEEEEEEEE	EEEEEEEE		
2.3 Contract No. 3 Outfall		TTTTTTEEEEE	EEEEEE			
2.4 Contract No. 4 Conn (in-house)	TTTTTTEEEEE	EEEEEEEEEEEE	EEEEEEEEEEEE	EEEEEEEEEEEE		
III. <u>CONCURRENT COST</u>						
3.1 Conn. Bridgetown	DDDDDD					
3.2 Contract No. 5 Water Meters	TTTTTT	EEEEEEEEEEEE	EEEEEEEEEEEE	EEEEEEEEEEEE		
3.3 Contract No. 6 Equipment O&M	TTTTTT	EEEEEEEEEEEE				
3.4 Land	PPPPPP					
3.5 Monitoring				CCCCCCCCCCCC	EEEEEEEEEEEE	EEEEEEEEEEEE
3.6 Operational Assistance				CCCCCC	EEEEEEEEEEEE	EEEEEEEEEEEE
3.7 Institutional Strengthening	CCCCCC	EEEEEEEEEEEE	EEEEEEEEEEEE			
	<----- Physical execution of the project ----->				<-Complement. activities->	
C= Contest D= Disbursement E= Execution P= Purchase T = Tenders DT = Design						

1. Procurement

- 3.9 Goods and services (see paragraphs 2.3 to 2.5, 3.7 and 3.8) above US\$1,000,000 for civil works and US\$250,000 for goods would be procured through international competitive bidding in accordance with standard policies and procedures of the Bank. Contractor's proposals would include unit construction costs for all works to be undertaken, equipment, labor, materials and supplies and installations required to execute the project as shown in the

construction plans and indicated in the bidding documents, specifications and special provisions.

- 3.10 EIB procurement requirements for goods and services are similar to those of the Bank. Given the features and scale of their proposed project component (contract No. 1, WTP entirely, and part of contract No. 2, collection), contract No. 1 for the WTP would be awarded through international competitive bidding from among the member countries of the EIB. In the case of contract No. 2 for the sewer collection system, the EIB has given its assurance that it will accept the international competitive bidding procedures of the Bank for their contribution of US\$1.8 million, as shown in Table II-1. On this basis, no procurement problems are envisaged for this contract. Procurement financed with local counterpart resources would be limited to national tenders or quotations in conformity with Barbados law which is compatible with the basic principles of Bank procurement policies.
- 3.11 According to Bank policy, and as a result of discussions during the analysis mission, prequalification of all contracts for civil works are justified.

D. Execution period and investment schedule

1. Execution period

- 3.12 The overall physical execution period of the project, including installation of water meters, would be four years from the effective date of the loan contract (see paragraph 2.10).

2. Investment schedule

- 3.13 Table III-2 below presents a summary of the projected investment schedule with sources of financing: 24/

24/ A more detailed projection is available in PRA/SUD.

Table III-2 Investment schedule (US\$000)								
Source of funds	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Total	%
IDB/IFF	3,054	9,497	8,410	6,284	378	377	28,000	38.3
IDB/OC	2,510	5,429	8,499	6,762	-	-	23,200	31.7
EIB	1,378	5,436	4,186	-	-	-	11,000	15.0
Local	2,496	4,044	2,216	2,144	-	-	10,900	15.0
TOTAL	9,438	24,406	23,311	15,190	378	377	73,100	100.0

E. Bridgetown connections

- 3.14 An amount of US\$1.6 million is allocated in the proposed project to retroactively finance, within twelve months prior to Board approval, investments made by the GOB for in-house connections of the central Bridgetown sewerage system [paragraph 2.4(a)]. ^{25/} Loans 440/SF-BA and 440A/SF-BA made no provisions to ensure that users would be connected to the system. This has hampered considerably the operations of the Bridgetown sewerage system (paragraph 1.20). Together with the future user connections in the south coast sewerage system, the Bridgetown in-house connections contribute greatly to improve BWA's operations and to realize project benefits.

F. Land and easements

- 3.15 The WTP will be constructed on land owned by the GOB. However, it is necessary to acquire land for 4 lift stations [paragraph 2.4(b)] and the easements for private property and private road for the construction of the collection system. It is recommended that the GOB submit to the Bank evidence that the necessary land is acquired prior to calling for bids or, if there is no bidding, prior to the initiation of works. ^{26/} In view of the relatively small amount of land and the corresponding low cost involved, the borrower foresees no problems in complying with this condition.

G. Operation and maintenance

- 3.16 In the current organization structure of the BWA, the engineering manager heads four engineering divisions: wastewater, water supply and maintenance, planning, and distribution. Under the Wastewater Division there are two superintendents for: (a) treatment plants

^{25/} See Resolution 8(d).

^{26/} See Recommendation 4(b).

including lift stations; and (b) collection systems. The Emmerton wastewater treatment plant experienced operational problems requiring special assistance from the Bank during 1990 (paragraph 1.7). For this reason, the standard maintenance clause was not complied with until the 1990 report. Compliance in subsequent years has been approved by the Bank.

- 3.17 Operation and maintenance including training of the personnel is critical for the proper implementation of the proposed project. Institutional strengthening assistance for the BWA (paragraphs 3.20 to 3.24) would be complemented by studies of unaccounted-for water (UFW) and of maintenance under the proposed multisector preinvestment program (BA-0028). The operation and maintenance crews for the collection system and lift stations would require equipment to carry out their tasks. In addition, a spare parts inventory consisting of replacement pumps, manhole covers and supports, assorted piping, and equipment repair kits would be required. These needs would be met under the proposed project (paragraph 2.4).
- 3.18 The BWA would submit to the Bank an annual maintenance plan within the first quarter of each year, beginning with the fiscal year in which the sewerage system is completed and until the tenth year of operation. The plan would indicate the works and equipment necessary to execute during the year as well as report on the status of works and equipment. The plan would also include details of the organization responsible for the maintenance; the personnel involved; the number, type and condition of the maintenance equipment; the location, size and condition of the repair and maintenance facilities; budget resources allocated for maintenance during the current year and the amount to be allocated in the following year. 27/

H. Water meters

- 3.19 The total number of water service connections is 85,000 of which 23,000 or 27% are metered. The percentage of metered connections is insufficient to manage, in a rational way, the commercial activities of the authority. One objective of the institutional strengthening assistance is to improve revenues for the BWA through an increase in the metered coverage. The installation of an additional 40,000 water meters under the proposed project would increase the coverage to 74% of water service connections, which is considered reasonable. To maximize the revenues from the increased metered coverage, the location and size of the water meters will be determined with the support of a water-meter expert financed by the Bank under the project (paragraph 3.21) The installation of water meters would also facilitate the execution of the unaccounted-for water study under the proposed multisector preinvestment program. The BWA would submit to the Bank an

27/ See Recommendation 11.

installation program along the lines previously agreed with the Bank within nine months of signature of the loan contract. 28/

I. Institutional strengthening of the BWA

1. Objectives

- 3.20 The proposed technical assistance aims at increasing BWA's financial and technical efficiency by: (a) improving its administrative, financial, commercial and operating capabilities; (b) increasing its efficiency to implement and manage the required programs and activities including the proposed project and likely future sewerage projects; (c) developing an improved system of water and sewerage rates; (d) improving the relation between water billed and produced; (e) increasing gradually the water supply through the reduction of UFW; (f) improving the efficiency and security of the water supply system including water quality; (g) increasing billings; (h) reducing the cost of water; and (i) enhancing water revenues through efficient distribution of water meters.

2. Description and execution

- 3.21 Three individual consultants would be hired within six months of signature of the loan contract 29/ as follows: (a) an institutional and financial analyst for seven months; (b) a commercial and rates specialist for seven months; and (c) a water-meter expert for two months. The estimated cost for these 16 expert/months would be US\$240,000 30/.
- 3.22 The BWA would be required to provide all the administrative and logistic support for the execution of the technical assistance. Within three months from the completion of each consultant's final diagnostic report, the BWA would submit to the Bank, for the Bank's acceptance, a plan for the implementation of the consultants' recommendations or an alternative plan. 31/
- 3.23 The institutional and financial consultants would be required to analyze in detail the present structure, operational activities and financial situation of the BWA including departmental functions, assessment of manpower requirements, management information systems, financial administration, commercial activities and rate structure. Based on these results, recommendations would be made to improve the administrative, financial and operating capabilities, water and sewerage rate system, a maintenance program including procedures, regulations and manuals, computer equipment and software and on-the-job training to cover the needs of the BWA

28/ See Recommendation 3.

29/ See Recommendation 1.

30/ See Annex III-2.

31/ See Recommendation 2.

personnel, and a revaluation procedure for the fixed assets of the BWA. The water-meter expert would be required to advise the BWA on the type and size of meters, the optimal amount of meters, assistance in preparing the meter installation program and, on the basis of the historical consumption patterns, the most efficient area distribution and location in order to maximize water meter revenues for the BWA. The TOR for the consultants are attached at Annex III-3.

3. Reports

- 3.24 Following the initiation of activities, the financial and commercial consultants would each submit to the BWA a draft diagnostic study after six months, and a final diagnostic study after seven months. The consultant for water metering would submit a draft report within six weeks of initiating activities and a final report within two months.

J. Environmental aspects 32/

- 3.25 The CMA classified this project as a category IV operation on December 16, 1991. An EIA was completed by an individual consultant and a summary of the EIA report was submitted to the CMA on September 9, 1991. This summary was circulated to the Executive Directors in compliance with the requirement for 120-day review on May 20, 1992 (see document GN-1760). An extract of the summary follows:

1. Positive impact

- 3.26 The benefits are in the operational phase and include: (a) avoidance of tourism decline due to cleaner beaches and better coastal water quality and coral reefs (for diving); (b) enhancement of south coast fisheries, and reductions in beach erosion; (c) corresponding decreases in the deterioration of near-shore coastal reefs; (d) improvement in coastal water quality (primarily bacteriological and nutrient quality) due to decreased untreated sewage discharges in the south coast area; and (e) reduction in the pollution risks to the groundwater (sheet water) in the south coast area to be sewered.

2. Negative impact

- 3.27 The key negative impacts of the proposed project are primarily related to the construction phase and include: (a) local decreases in air quality due to construction dust and carbon monoxide emissions from construction vehicles; (b) local increases in noise due to construction activities; (c) some terrestrial and aquatic disturbances in the Graeme Hall area due to construction of the

32/ See Annex III-4 for a brief description of the current environmental conditions in Barbados associated with the project.

sewerage treatment plant; (d) local increases in the turbidity of coastal waters and resultant small impacts on coastal fisheries due to construction of the outfall line; (e) disruptions in south coast area traffic, particularly along Highway 7, due to project construction activities; and (f) short-term disruption in some south coast tourism during construction activities.

- 3.28 The negative impact during the operational phase includes: (a) localized odors and noises at the four lift stations; (b) possible decrease in air quality in the vicinity of the sewerage treatment plant; (c) localized noise in the vicinity of the sewerage treatment plant; and (d) localized water quality disturbances in the vicinity of the marine outfall line discharge point. A very careful ecological analysis of the potential Graeme Hall site for the sewage treatment plant was conducted prior to its inclusion in the proposed project. In addition, the engineering consultants gave careful consideration to the need for and design of a screening incinerator and odor control system at the sewage treatment plant (paragraphs 3.30 to 3.35).

3. Public participation

- 3.29 The project team, during identification and orientation missions, and the consultants throughout the feasibility studies and design of the project discussed the overall sewerage program and various alternative solutions with the general public, specific potential users and with nongovernmental environmental organizations. NGOs consulted were the Barbados National Trust, the Keep Barbados Beautiful Committee and the Barbados Environmental Association. These organizations, and members of the Faculties of Zoology and Biology of the University of the West Indies at Cave Hill who were also consulted, raised questions about and provided input for selection alternative sites for the primary treatment plant and the location of the ocean outfall. All were satisfied with the final design and felt that with good construction practices there would be minimum negative impacts and that the overall program would have net positive impacts on the reefs and near-shore waters of the south coast. The general public was informed about the program through newspaper articles, tv programs and radio broadcasts over the past three years. The consultants conducted surveys of restaurateurs, hoteliers, business owners, bathers, fishermen and home owners, particularly during the economic studies, to determine perceived need, willingness to pay for sewage services and expected benefits from the program.

4. Protection and mitigation measures

- 3.30 A number of environmental protection and mitigation measures have been identified to minimize the adverse environmental impacts of the proposed south coast sewerage project. These measures include the following:

- a. routine mitigation measures would be used for the construction phase of the sewerage system, the sewage treatment plant, and the force main/outfall line. Examples of these mitigation measures are included in Appendices I and J of the EIA report. ^{33/} A plan has been developed by the PEU to be included as a part of the construction phase specifications and documentation (see paragraph 3.34). Special care would be taken to ensure that the Graeme Hall marsh would not be affected by sediment and run-off during construction of the treatment plant and that the construction of the outfall would minimize the disturbance of reefs;
- b. due to the potential reductions in adverse environmental impacts which can occur from the implementation of the "no-dig" sewer construction technology, use of this technology in areas deemed appropriate from an engineering perspective is recommended. This alternative would be requested during tendering for the collection system (contract No. 2) (see paragraphs 3.39 to 3.41).
- c. the proposed design for the sewage treatment plant includes an incinerator for the screening. Appendix E in the EIA report includes design and operational specifications for the incinerator. It is recommended that a decision on the purchase of this screening incinerator be postponed until the results of the on-going solid waste management study (paragraph 1.9) are known. This study would identify appropriate land disposal sites and incineration technologies for Barbados. Efforts should also be made to provide plant operators with appropriate training, and the sewage treatment plant must be operated in a manner that would allow sufficient data collection to ensure an efficient operation. A consulting firm would be hired for operational assistance for two years after the completion of physical works (paragraph 3.35);
- d. efforts should be made by both governmental and nongovernmental organizations to develop appropriate restrictions on land usage and encroachment in the Graeme Hall and Western Lake areas which are primarily associated with the proposed sewage treatment plant site. Efforts should also be made to preserve the existence of the ecological resources of the island to allow natural recovery processes to occur. In July 1991, the GOB approved new classifications of the areas as follows: (i) the lake and mangrove swamp, as special area for environmental control; and (ii) the rest of the area as major recreational open space;
- e. based on the experience with the maintenance of the Emmerton sewage treatment plant (see paragraphs 1.7 to 1.8), it is

^{33/} See document GN-1760. Available on request from PRA/SUD.

recommended that a spare parts inventory for both the collection system and the sewage treatment plant be included in this project [see paragraph 2.4(c)]. In every construction contract for the proposed project, a provision for spare parts has been made;

- f. job descriptions for all employees of the south coast project should be prepared to facilitate system operation. Again, recent efforts in this regard for the Emmerton sewage treatment plant are germane to the south coast project. Training is a component of the institutional strengthening for the BWA, and operational assistance through consultants is also included (paragraph 3.35);
- g. construction contract specifications should delineate the procedures to be followed in the event that previously unknown historic or cultural resources are found during the construction phase of the proposed south coast sewerage project;

5. Recommendations

- 3.31 In order to ensure that the monitoring and the operational assistance programs are being implemented, the Bank and the borrower have agreed as follows:

a. Monitoring program

- 3.32 The borrower would submit for Bank approval as a condition prior to first disbursement, an integrated and coordinated environmental monitoring program which will be carried out for 10 years after the completion of the physical works 34/. This program would take account of existing monitoring programs as well as the proposed project and include the following components: (a) coastal water quality monitoring (for point and diffuse sources); (b) coastal reef monitoring; (c) fisheries productivity monitoring; (d) groundwater monitoring in selected south coast wells, and (e) routine construction-phase mitigation measures. This monitoring program would be developed along the lines previously discussed and agreed with the Bank and would include a baseline year (before construction). Financing for this program would be provided by the Bank for the first two years of its execution. The program would include the requirement for a comprehensive report to be submitted to the Bank annually during the execution period of the program.
- 3.33 Within 42 months of the date of the loan contract, the borrower would contract, through public international bidding in accordance with Bank procedures, a consulting firm to carry out the monitoring program (see Annex II-1). 35/ In addition, for 10 years after

34/ See Resolution 8(c)(iii).

35/ See Recommendation 7.

the date of completion of the project, the borrower would submit to the Bank, within 60 days of the end of each year, a report containing the results of the environmental monitoring program carried out in the previous year. 36/ The format of the report would be previously agreed with the Bank. The environmental monitoring program would be the main instrument for the ex-post evaluation of the project. Economic benefit criteria would not be included in the ex-post evaluation.

b. Construction program

- 3.34 Prior to initiation of construction the guidelines for mitigation of construction impacts would be presented to the Bank for review and approval. Weekly supervision of activities during sewage outfall construction would be incorporated to ensure that no serious adverse terrestrial or aquatic impacts occur. 37/

c. Operational assistance program

- 3.35 Within 48 months of the date of the loan contract, the borrower would contract, through public international bidding in accordance with IDB procedures, a specialized consulting firm to carry out the operational assistance program for the new system, including the ozonation equipment unit at the WTP [paragraph 2.5(b)], in accordance with the TOR to be developed by the engineering consulting firm contracted for construction supervision. In addition, for two years after the date of completion of the project, the borrower would submit to the Bank quarterly reports in each year containing the results of the operational assistance program. 38/

K. Technology of the project

- 3.36 The proposed project design is a conventional wastewater system with a closed preliminary/primary sewage treatment plant that requires the installation of ozonation equipment for odor elimination. The BWA is not experienced with this technology and, therefore, requires training by a suitable consulting firm. It is proposed to provide this training for the first two years after completion of physical works. Another component of the project, which might be considered complex, is the installation of the ocean outfall which requires a contractor with appropriate knowledge and experience to ensure it is built strictly according to the design and that the maximum faecal coliform level established in the water-receiving criteria is not exceeded. The ten-year monitoring program of the water quality after project completion would be the basis for evaluating the impact of the project on the environment.

36/ Recommendation 9(a).
37/ See Recommendation 4(b).
38/ See Recommendations 8 and 9(b).

L. Industrial wastes

- 3.37 Barbados has limited industrial development. The BWA in 1990 started an industrial testing program involving major industrial establishments on the island with Bank assistance. The goal of Bank support was to provide the BWA with data on the wastewater characteristics and seasonal loading from industry. Training of the BWA personnel was performed using as a guideline a text entitled "Industrial Wastewater Control Program for Municipal Agencies". For training purposes, six industrial establishments in Bridgetown were selected and on the basis of a detailed survey of the characteristics of the plants and the quality of the effluents, it is considered that the BWA now has the capability to monitor the industrial wastes if additional industrial development should occur in this field in the future. 39/
- 3.38 The liquid toxic effluent and the hazardous waste produced in the island are currently disposed of in the existing landfills. This practice should be discontinued and the solid-waste management program now under study would make appropriate recommendations in this regard (paragraph 1.9).

M. No-dig construction method

- 3.39 The feasibility study and final designs made use of the conventional, open-cut technology. A consulting firm was subcontracted to consider the possibility of using an alternative no-dig technology in the conditions of Barbados. The results of this study showed its use throughout the project area to be uncertain except for some specific sections. In those sections, it was estimated that construction cost using this technology would be about 24% greater.
- 3.40 In these circumstances, the Bank and the borrower agreed that the use of the no-dig construction method should be reviewed at the time of tendering when updated technology and firm costs would be available. The following additional information would be requested for this review: (a) alternative price proposals for the use of the no-dig technology in designated sections of the project area (b) name and experience of the no-dig subcontractor including the engineers and other staff to be used in the preparation of the "residual design" (that is, that part of the design specific to the no-dig construction method), (c) detailed description of the equipment and pipe materials to be used in the no-dig construction, (d) detailed description of the actual construction method including connections in the no-dig sections and (e) a schedule of prices. It was further agreed that provided the technical aspects

39/ Published by the Pollution Control Federation (USA). Given the permanent nature of this program, it would allow the BWA to establish proper industrial rates in the future when other areas are sewered.

of these submissions are acceptable and the additional construction costs due to the use of the no-dig technology are not greater than 10% of the conventional method, this technology should be contracted for the designated sections of the project area.

- 3.41 The benefits from reduced traffic congestion which is the main benefit of this method are estimated to be larger than the additional cost. For these reasons, the proposed 10% maximum increase for use of this technology would not affect the economic viability of the project.

N. Advance of funds

- 3.42 To facilitate project execution, an advance of funds may, at the request of the borrower, be established up to the standard amount of 10% of the Bank loan. The advance would be used to make payments chargeable to the loan resources in a period of 120 days and justify such payments against the advance within 180 days from the date of disbursement.

O. Reports

- 3.43 The PEU would prepare an initial report following Bank guidelines. Thereafter, reports would be submitted semi-annually, evaluating quantitative and qualitative aspects of the project. Based on these reports, the borrower and the Bank, through the Country Office and with the collaboration of the project team, would jointly review the progress of project execution.

P. External auditing

- 3.44 It is recommended that 120 days from the end of each fiscal year starting with the fiscal year in which project execution begins, the borrower submit to the Bank audited financial statements. This requirement would extend to project execution for financial statements on the project funds, and to the life of the loan for statements of BWA as an institution. The statements would be submitted annually to the Bank certified by an independent firm of auditors acceptable to the Bank. 40/

Q. Inspection and supervision

- 3.45 The executing agency would be responsible for the inspection, supervision and technical work of the project. The Bank would supervise the project through the Barbados country office which would rely on the project documents and the detailed technical information available from the project files. 41/

40/ See Recommendation 12.

41/ See Resolution 8(g).

IV. EXECUTING AGENCY

A. The executing and operating agencies

1. The executing agency

- 4.1 The borrower and guarantor would be the Government of Barbados. The exchange rate risk would be borne by the borrower. The executing agency would be the MOH. Under the Health Services Act 1969, this ministry has primary responsibility for the provision of all government health services, including planning, administration and project development of environmental and public health, such as the construction of sewerage systems. Upon completion of the project, the borrower, through the MOH, would transfer the project assets and liabilities to the BWA. This agreement would be submitted to the Bank as a condition prior to first disbursement 42/
- 4.2 The MOH has in place the necessary policies and procedures to ensure that its financial resources are efficiently administered and controlled. To complement these procedures, the ministry's accounts are audited every year by the auditor general who, under the Financial Administration and Audit Act 1964, has the legal responsibility to conduct annual audits of all the public sector entities.
- 4.3 To ensure that adequate accounting and controls are maintained during the execution of the proposed project, a qualified finance officer would be hired to work exclusively on the PEU in the financial and accounting management of the project (paragraph 3.3).

2. The Barbados Water Authority (BWA)

- 4.4 The BWA was legally established in 1980 as an autonomous entity and is responsible for the management, allocation, and monitoring of water resources in Barbados including its effective utilization, conservation and protection. Its main functions are to: (a) design, construct, acquire, operate and maintain all water and sewerage works; (b) control and regulate the production, treatment, storage and transmission, distribution and use of water for public purposes; and (c) regulate the disposal of sewage through sewerage plants which are not part of the BWA system. Despite its responsibility for design and construction of sewerage works, the MOH has overriding constitutional responsibility under the Health Services Act 1969 for all health services, including public sanitation, and this takes precedence over the provisions of the BWA Act. Moreover, government policy on the construction of large externally financed projects is to use special executing units in order not to disrupt the normal administrative activities of its

42/ See Resolution 8(c)(1)(2).

agencies. For these reasons, the previous large sewerage project in central Bridgetown was constructed by the MOH. The experience of the BWA has been confined to small, locally-financed projects.

a. Organizational structure

- 4.5 The authority is governed by a 10-member board, responsible for carrying out the general policies of the government in all matters related to potable water and disposal of waste water.
- 4.6 The general manager is responsible for the overall management of the authority and is assisted by an engineering manager responsible for the coordination and control of all activities related to the construction, operation and maintenance of the water and wastewater systems, and an administrative manager responsible for all activities related to personnel management, budget and accounting, commercial activities and procurement.

b. Financial administration

- 4.7 The budget and accounts unit, within the Administrative Department, is responsible for budget preparation and monitoring as well as financial administration. The accounting activities are partially computerized, while activities related to payroll and inventory control are completely computerized.
- 4.8 The commercial unit is responsible for all commercial activities relative to billing and collection, meter reading and customer cadaster. Billing for water and sewerage is done quarterly for both fixed and metered rate customers, but while fixed rate bills are kept current, metered customers' bills are issued after the meters are read, and have a six-week lag from closing date. Billings for private development and plumbing works are not issued immediately upon completion of works as should be done. Steps have been taken to improve this situation and bills are now issued within six weeks from date of completion instead of the 12 weeks, as previously.
- 4.9 BWA's present quarterly billing and collection system combined with its inability to collect what it is owed in a timely fashion constrain the availability and timing of cash to meet obligations when due. While collections are done quarterly, salaries, payments to suppliers, and other financial obligations are due monthly.

c. Personnel

- 4.10 The personnel unit within the Department of Administration is responsible for personnel management. At March 31, 1991, BWA's total staff was 842, of which, 85% was assigned to the Engineering Department. The permanent staff level has remained basically unchanged since the authority's creation, but temporary personnel is hired from time to time to carry out specific tasks.

- 4.11 The BWA has a relationship of 9.9 employees per 1,000 water connections, a ratio that is considered high when compared with other entities of similar size. As part of the institutional strengthening component for the BWA, an evaluation of the present staff would be undertaken and recommendations would be made regarding optimal staffing needs by department and position as well as the strategy for reaching this level.

d. Internal control

- 4.12 Although there is no internal audit unit in the BWA, the existing systems, controls and procedures ensure a continuous review of the reliability and accuracy of all the financial activities. However, systematic appraisal of management performance regarding the extent of compliance with existing policies and procedures is still lacking. Internal control is an essential tool of management to independently review and evaluate the effectiveness of the established control mechanisms and procedures. The increased responsibilities of the BWA for the operation and maintenance of the proposed project after its construction makes the need for adequate internal control of even greater importance. Accordingly, it is recommended that within 24 months of signature of the loan contract, the borrower submits evidence to the Bank that an internal audit unit has been created and adequately staffed with an auditor, an assistant auditor and the required support staff. 43/

e. External control

- 4.13 BWA's financial records are audited every year by a firm of independent auditors. The last audited financial statements available are for year ending March 31, 1992, and contain recommendations regarding billings and collections and internal control. The auditors indicated that the statements represented fairly the financial position of the authority.

f. Water and sewerage rates

- 4.14 In exercise of the powers conferred by the Barbados Water Authority Act 1980, and with the approval of Cabinet, the BWA regulates the rates and charges for water and sewerage services. In determining these rates and charges, the Board may take into consideration whether the revenue derived from all sources would be sufficient to cover all expenses, interest payments, repayment of principal and amounts set aside for depreciation and reserve funds, a policy that is compatible with the objectives of the Bank's public utility tariff policy.
- 4.15 There is one rate structure applicable to the whole island. Fixed quarterly charges are based on the rateable value of the property

43/ See Recommendation 6.

plus the number of water closets, and number and type of bath fixtures. This structure does not take into account water consumed because its sole purpose is to make water available to all. The rates run from a minimum of B\$40 (US\$20) to a maximum of B\$160 (US\$80) per quarter. Metered charges are based on the rate for water actually consumed. Three rates are applicable: (a) domestic services are charged B\$1.50 per m³ for the first 150 m³, and consumption over 100 m³ per quarter is charged at the commercial rate; (b) commercial services, which include government, commercial establishments and hotels are charged at the rate of B\$2.12 per m³; and (c) ships are charged B\$3.50 per m³. Sewerage rates for domestic consumers is one-third of the water rate and for all other consumers two-thirds of water rate. The rate structure reflects the rate increase effective October, 1991.

3. Organizational and financial administration aspects

- 4.16 No major structural changes have been made to BWA organizational structure since its inception. The building of the south-coast sewerage project would entail additional administrative, operational and financial responsibilities, requiring increased management efficiency. It is also important for BWA to have a more active participation in the planning, development and execution of any major water and sewerage projects that might be built in the future. For these reasons, it is considered important to make an overall assessment of the entity's organizational framework to determine its ability to meet these new responsibilities and any structural changes necessary to improve its overall performance.
- 4.17 The commercial activities need to improve. A more efficient billing and collections system is required to provide cash on a timely basis to meet financial obligations. In this regard it is expected that a change to monthly billing and metering would contribute to improved cash generation, more efficient use of water, increased revenue flows and postponement of the need for new investments. The proposed project provides for the installation of up to 40,000 meters to connections which currently pay a fixed rate, as well as an institutional strengthening to, inter alia, convert to monthly billing (see paragraphs 3.20 to 3.24).

B. Historical financial analysis

- 4.18 The financial analysis is based on audited financial statements for years ending March 31, 1990, 1991 and 1992.

1. Balance sheet

- 4.19 Total assets increased during the period from the equivalent of US\$94.3 million to the equivalent of US\$97.1 million, a US\$2.8 million increase due to an increase in current assets. Fixed assets were last revalued in 1980, when the BWA was created, and all additions to property, plant and equipment since that time are carried in the books at cost. The proposed institutional

strengthening component would undertake an assessment and revaluation of BWA's property, plant and equipment and establish a mechanism for timely revaluations. It is recommended that within 36 months from the signature of the loan contract, BWA submits evidence to the Bank that it has revalued its fixed assets and that a mechanism has been established for periodic revaluation thereafter. 44/

- 4.20 Current assets at March 31, 1992 were equivalent to US\$26.9 million, a 15% increase from 1990, as a result of increases in accounts receivables, cash and other assets. Accounts receivables is the most important current asset component, representing 68% of total current assets, followed by marketable securities and inventories, representing 25% and 21%, respectively. Efficiency in collections has been as follows:

Table IV-1			
Efficiency in collections (in B\$000)			
	89-90	90-91	91-92
Beginning Balance, gross	23,510	27,000	28,614
Billed during year	<u>30,642</u>	<u>30,512</u>	<u>38,674</u>
Total accounts receivables	54,152	57,513	67,288
Amount not due for collection	<u>-5,191</u>	<u>-5,401</u>	<u>-6,813</u>
Amount due for collection	48,961	52,112	60,475
Total collected	33,845	34,896	37,893
Collection efficiency (%)	69.13%	66.96%	62.65%

- 4.21 The overall collection efficiency during the FY1989-90 to FY1991-92 period did not attain levels that can be considered adequate, going from 69% at March 31, 1990, to 63% at March 31, 1992. Except for FY1991-92, the amounts collected were greater than the amounts billed due to the fact that current billings rather than accounts in arrears were being paid.
- 4.22 Accounts receivables at March 31, 1992 were equivalent to US\$18.3 million: 72% for water and sewerage and 28% for plumbing, private development works and septage. The BWA is characterized by a high level of accounts receivables in arrears. At March 31, 1992, 56% of water and sewerage receivables were over two quarters in

44/ See Recommendation 10.

arrears, while 59% of plumbing, private development works and septage were over one year in arrears.

- 4.23 There are no penalties levied for late payment and the policy of disconnecting only after the account is three or more quarterly billings in arrears provides for an increased investment in accounts receivables. Efforts to enforce the disconnections policy have been made but were frustrated by the lack of adequate manpower and equipment. Because of this, consumer's perception is that BWA will not disconnect for non-payment. BWA is actively pursuing the procurement of suitable stop corks so as to be able to disconnect the water supply in a more efficient and effective manner.
- 4.24 Since the recovery of owed balances is secured by a lien on the property, BWA has not been actively pursuing collections, nor has it written off any customer accounts even though some are over two years in arrears and have been fully provided for in the allowance for doubtful accounts. An objective of the institutional strengthening component is to assess BWA's commercial activities and determine the feasibility of implementing monthly billings and collections, improve collection procedures and timely suspension of services for non-paying consumers. It is recommended that within nine months of the signature of the loan contract, the BWA submit to the Bank a plan detailing the measures it will take to ensure that by fiscal year ending March 31, 1997, a collection level of at least 85% of all amounts due for collection during the year, including pending balances at the beginning of said year, is achieved. Said plan shall also include measures to achieve collection levels of approximately 70% in fiscal year 1993/94, 75% in fiscal year 1994/95, 80% in fiscal year 1995/96 and 85% in fiscal year 1996/97. 45/
- 4.25 The increased net loss experienced during FY1989-90 and FY1990-91 eroded the equity base, but the net profit experienced the following year brought it back to 1989 level. Total current liabilities increased as accounts payable and other current liabilities increased. Other current liabilities comprise the funds provided by the government to complete the connections to the Bridgetown sewerage system. Customer deposits decreased as building activity in the country decreased. The BWA has no long or short-term debt.
- 4.26 At March 31, 1992, BWA's current assets were seven times greater than current liabilities reflecting the high investment in accounts receivables and marketable securities.

45/ See Recommendation 5.

2. Statement of revenues and expenses

- 4.27 Revenues to the BWA come from the sale of water, sewerage and septage services as well as plumbing and private development works. Total operating revenues increased 25% between 1990 and 1992, from the equivalent of US\$15.3 million in 1990 to US\$19.1 million in 1992. The operating deficits experienced in 1990 and 1991, representing 17% and 20%, respectively of total operating revenues, were the result of rising operating expenses with no corresponding adjustments in water and sewerage rates.
- 4.28 To increase revenues and improve the financial situation a program to revalue those properties paying a fixed water rate was undertaken, and a 25% increase in the tariff rate structure was approved. These two actions became effective on October 1, 1991, and together they enabled BWA to generate sufficient revenues to cover all operating expenses and leave a profit during FY1991-92.
- 4.29 During the 1990-92 period, the number of water connections increased 7% while the number of sewerage connections increased 51%. Fixed-rate water connections increased 4%, while metered connections increased 16%. At March 31, 1992 more than 70% of total water connections were paying a fixed rate, but 62% of total revenues from the sale of water came from metered connections.
- 4.30 During the period, the average income per water connection experienced a 13% increase, while the average income per sewerage connection grew 29% due, primarily, to the substantial increase in water rates. Average income per fixed-rate connection increased 25% during the period, due both to the impact of the revaluation of housing categories and the rate increase, but the average income per metered connection increased only slightly during the same period.
- 4.31 Net revenues from private development works and plumbing repairs increased 54% during the period. Non-operating income, which has represented approximately 4% of total sales revenues, came primarily from interest income on marketable securities and government debentures.
- 4.32 Total operating expenses decreased 7% during the period, as both operation and maintenance expenses for both water and sewerage decreased. This decrease was due to a significant reduction in overtime levels and to an overall 8% cut in salaries and wages during FY1991-92. General and administration expenses decreased 49% due primarily to decreases in the provision for bad debts and the provision for pension, while depreciation of plant in service increased 4%.

3. Sources and uses of funds

- 4.33 The statements on sources and uses of funds presented were compiled using the information from the statement of revenues and expenses and the balance sheet.

Table IV-3			
Sources and uses of funds Statements for years ended March 31 (in US\$000)			
Sources	1990	1991	1992
<u>Internal</u>			
Operations	(2,626)	(3,120)	2,414
Interest Income	566	672	769
Depreciation	2,489	2,495	2,592
Other	474	624	968
Total Internal Sources	903	672	5,973
<u>Uses</u>			
Plant, Property & Equip	1,994	2,224	2,071
Change in Working Capital	(1,091)	(1,552)	3,902
Total Uses of Funds	903	672	5,973

- 4.34 The accelerated increase in operating expenses relative to operating revenues, produced operating deficits which, in turn, resulted in substantial decreases in the internal sources of funds for 1990 and 1991. During these two years the internal generation of funds was not sufficient to cover capital expenditures, which were financed with resources arising from cash on hand and from the sale of marketable securities. The rate increase and the slight reduction in operating expenses during FY1991-92 enabled BWA to generate sufficient funds to meet its investment expenditures and increase its working capital.

4. Conclusions

- 4.35 The increasing operating deficits experienced during FY1989-90 and FY1990-91 were due to the non-adjustments in water and sewerage rates to offset the increase in operating expenses. As a consequence, the internal sources of funds declined substantially and were insufficient to cover total capital expenditures. This, in turn, resulted in a decrease in working capital. In spite of this, the entity still remained in a highly liquid position as evidenced by the high investment in marketable securities.

- 4.36 In October 1991, the BWA took action to increase revenues and reverse the deteriorating trend. A revaluation of the housing categories paying fixed rates was undertaken and a 25% rate increase was approved and implemented. These actions, coupled with the decrease in operating expenses, provided the entity with sufficient revenues to cover all of its operating expenses, including depreciation, and generate sufficient funds to cover all of its capital expenditures. Consequently, the entity complied for that year with the contractual obligation related to water and sewerage rates under loans 440/SF and 440A/SF-BA.
- 4.37 Based on an estimate for FY1992-93, the effect of the adjustments made would provide the BWA with a 24% increase in sales revenues over 1991-92, and provide the entity with a net operating profit equivalent to US\$4.8 million.

V. VIABILITY AND RISKS

A. Technical and environmental justification

1. Technical

5.1 The project corresponds to a least-cost technical solution (paragraphs 1.28 to 1.30) in final design. Drawings, specifications, bill of quantities and estimates for the four main construction contracts are ready and construction of the project can proceed immediately upon Bank's approval of the loan proposal. The division of the construction program into four main contracts would enhance international competition. The project includes assistance designed to strengthen the BWA's personnel (see paragraphs 3.20 to 3.24). In addition, a consulting firm would be contracted for engineering supervision. This task would require a close working relationship with the PEU. For two years after project completion, a consulting firm financed by the Bank, would assist in operating the new system in order to provide on-the-job training to the local staff.

5.2 Per capita cost of this project is high in relation to similar Bank financed projects. The reasons are: (a) population of the island is small and public sewerage systems are characterized by economies of scale; (b) all the pipes, equipment and accessories must be imported, only cement is produced in the country; (c) installation of pipes is expensive due to the high level of groundwater which requires special trenching and continuous dewatering. It is expected that the "no dig" system of construction would be competitive with the traditional one. International tender would call for both systems; (d) the project reflects in its design the great concern of the GOB for environmental quality and as a consequence there are some cost increases. For example, the location of the outfall reflects careful consideration to protect not only the beaches but the marine ecosystem as well; the closure of the WTP also increased the cost of the plant; and (e) the topography of the area is flat. This requires pumping to reach the control point (Graeme Hall) and a main transmission line to the outfall location; and (f) in-house connections are included in the cost of the project which is not usual in similar projects elsewhere.

2. Environmental

5.3 The project would have a positive environmental impact. All the environmental negative impacts have been assessed and mitigation measures have been proposed and would be implemented. The seawater and groundwater quality will be monitored for 10 years to make sure that the parameters (USEPA) adopted in the project design are achieved.

B. Administrative and financial viability

1. Administrative viability

- 5.4 The PEU has an established organizational structure that permits the distribution of functions and responsibilities and has the required internal control procedures to administer the loan resources for execution of the proposed project. The proposed project unit has the experience of having executed the Bridgetown sewerage project, as well as the studies for the preparation of the proposed project. The PEU, created in 1976 with the same project manager as today, provides continuity and is considered fit to execute the proposed project efficiently.

2. Financial viability

- 5.5 Annex V-1 shows the financial projections for the period 1993-2002.
- 5.6 The projections of the profit and loss statements indicate that the BWA will have sufficient revenues to cover all operating expenses, including depreciation, and have increasing net operating income reaching US\$7 million in 1998. As the project comes into full operation and operating expenses, particularly depreciation increase, the net operating income declines to US\$1.4 million by the year 2002.
- 5.7 The projection of the sources and uses of funds indicates that during the execution of the proposed project except for 1995, the BWA would have the ability to generate sufficient funds from this operation to contribute the necessary resources for the local counterpart.
- 5.8 The projection of the balance sheet shows that total net fixed assets would increase to US\$177.4 million equivalent in 1998, due primarily to the proposed project. The authority's liquidity position would vary substantially during the projected period from 7.41 in 1993 to 2.61 in 2002. The BWA does not have any other long-term debt, and by assuming the responsibility for the debt service ^{46/}, the debt to equity ratio in 1997, year when the IDB debt would be transferred, would be 0.51, and would decline to 0.29 by the year 2002 as the loans are amortized. The associated debt service would start in 1998. The projections show that for 1998 the debt-service coverage ratio would be 2.28 times, demonstrating that the entity (BWA) would be in a position to meet all of its financial obligations.
- 5.9 To ensure that the BWA maintains a level of revenues sufficient to cover total operating expenses and generate funds to cover the debt service and participate in its investment program, it is recommended that it be established in the loan contract: (a) the

^{46/} See Resolution 8(c)(1)(3).

rates charged for the sale of water and the provision of sewerage services produce revenues sufficient to cover all operating expenses of the water supply and sewerage systems, including those relating to administration, operation, maintenance and depreciation on revalued assets; and (b) if the application of the above does not generate sufficient funds to cover the debt service and 15% of BWA's annual investment program, the necessary measures, including rate increases, be adopted to attain such objective. 47/

C. Economic viability

- 5.10 The economy of Barbados depends on the maintenance of environmental quality. The sun, the beaches and the country's high sanitary standards attract tourists to Barbados. Over the last two decades, there has been a noticeable deterioration in the environment. Untreated sewage seeps from pits on shore to the sheet water and percolates into the coastal waters. Some sewage overflows into storm drains and directly through the beaches to the sea. In addition to the sanitation problem, contaminants in the water are badly stressing near-shore, patch and fringing reefs. The deterioration of reefs may have had two effects. First, it may have contributed to beach erosion because it has reduced the natural protection against wave action and, second, it may have affected the food chain for fish and caused a decrease in yields of trap fish and sea urchins.
- 5.11 Both the Government of Barbados and the Bank are concerned about the deterioration. The Bank financed the Bridgetown sewerage system to decrease contamination from sewage in the downtown Bridgetown area, and has under study: (a) a coastal conservation project; (b) the south coast sewerage project being presented here, and (c) the west coast sewerage project. All four projects attack the same problem in different areas with some overlap.

1. Summary

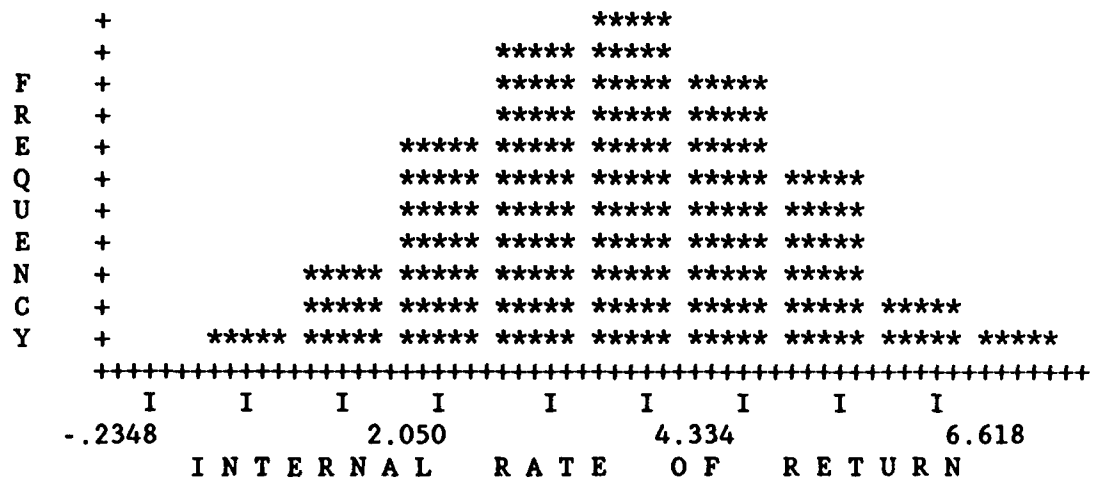
- 5.12 The south coast sewerage project has five benefits: (a) cost savings benefits; (b) willingness to pay benefits; (c) environmental benefits; (d) health benefits, and (e) protecting tourism benefits. None of these benefits may be estimated with precision. Accordingly, the analysis uses the probable range of each benefit. The range is large, so that it is certain to include the true benefit. The analysis uses stochastic simulation to make systematic use of this information. This method assigns a probability distribution to the range of values that each cost or benefit might take. A computer then selects one estimate for each cost and benefit from its probability distribution and calculates the internal rate of return and net present value. The computer calculates 500 results, each one based on the relative likelihood of the assumptions. The probability distribution of these results

47/ See Resolution 8(f).

characterizes the range of possible economic results and the probability of different results.

- 5.13 Table V-1 on page 47 presents the net present value of each cost and benefit ranked in order of importance. These values are calculated on the basis of the most likely value (modal value) for each assumption. Figure V-1 shows the complete probability distribution of rates of return calculated with the ranges of these same assumptions. Figure V-1 indicates that with the estimates used the project has a rate of return of between -0.2 and 6.6%.

Figure V-1
The Probability Distribution of Economic Rates of Return
of the South Coast Sewerage Project

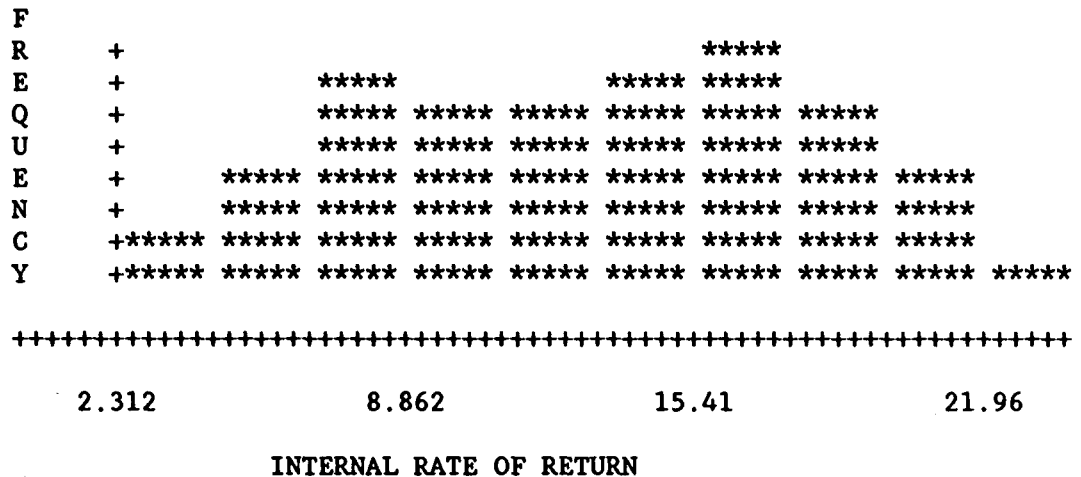


- 5.14 The analysis leaves out one important benefit. This is the avoidance of the economic loss that would occur if some percentage of tourists decided to go to some other destination because of the problems caused by the present sewerage system. This benefit was not included in the base simulation because the results are very sensitive to the range used and it is difficult to set a defensible upper bound to the range used. Because the median result is highly sensitive to this range, the reader needs to be careful in his interpretation of the results. It is important to note that the analysis shows that tourism on the island would have to decline only between 4% and 7% to make the project yields a 12% rate of return.
- 5.15 A second simulation was run which includes the benefits from avoiding a sewage related decline in tourism. This simulation incorporates the simulation that tourism could decline between 0% and 10% if the news leaks out that the south coast beaches exceed EPA bacteriological standards. There is no justification for truncating the upper bound at 10%, but higher bounds make the

project even more attractive. The results with a 0% to 10% range show a probability distribution of returns between 2% and 22% with a median rate of return of 12.9%. Figure V-2 summarizes these results.

Figure V-2

The Probability Distribution of Economic Rates of Return
of the South Coast Sewerage Project
Including the Benefits from Protecting the Tourist Industry



- 5.16 Given the above results and the possibility that the tourism decline could be even greater than 10%, the Bank concludes that there is a high probability that the project is economically feasible and recommends it for financing.
- 5.17 The paragraphs that follow present a brief discussion of the benefits of the project and the uncertainty with respect to quantifying the important ones.

Table V-1		
Summary of the Present Value of Economic Costs and Benefits		
	(In 1991 US\$000)	
Economic costs of the project		
Investment		
Collectors	20,285	
Engineering and supervision	6,622	
Treatment plant	5,057	
Connections	4,418	
Outfall	4,308	
Land	1,235	
Replacement of treatment plant in year	1,031	
Operating assistance	568	
Subtotal		45,524
Associated costs		
Traffic congestion during construction	2,788	
Tourism lost during construction	2,252	
Subtotal		5,040
Operating cost	3,249	3,249
Total economic costs		53,813
Economic benefits of the project		
Cost savings		
Reduced operating costs at Emmerton	5,037	
Replacement of Emmerton in year 10	3,863	
Savings on package plants	1,157	
Savings on septic tanks	950	
Suckwells forestalled	365	
Industrial outfall forestalled	284	
Subtotal		11,656
Willingness to pay benefits		
Users of the sewerage system	3,711	
Users of beaches affected by system	4,664	
Subtotal		8,375
Health benefits	3,076	3,076
Environmental benefits		
Prevention of decline and recovery of pot fish and urchin fishery	1,270	
Prevention of beach erosion	364	
Subtotal		1,634
Total benefits		24,741
1/ These numbers are calculated using the assumption thought to be most probable (i.e. the modal value of each probability distribution was used).		

2. Cost savings benefits

- 5.18 Table V-1 indicates that the largest expected benefits are from the private cost savings benefits that occur because existing residential, commercial and institutional entities would no longer have to maintain, operate and replace their current systems, and new entities would not have to install new private systems.

3. Willingness to pay benefits

- 5.19 Willingness to pay benefits are the second most important category. One of the things that people are willing to pay for is the savings that the new system will provide them. The other thing that people are willing to pay for is the "insurance" that the project provides that the sea water will not become unswimmable because of sewage contamination. This benefit was estimated using a contingent valuation approach. This particular application was done by a recognized expert in the field and was closely monitored by the Bank.

4. Environmental benefits

- 5.20 The project should have environmental benefits. Pollutants from many sources (sewage, fertilizers and pesticides from agricultural run-off, storm run-off, filtration from solid-waste disposal sites) are killing the fringe reef and the trap fishery that it supports. The reduction of the pollutants from sewage would remove one of the sources. It is difficult to estimate the likely impact of the south coast project on the reef and fisheries because there are no studies that indicate the relative importance of the various sources of pollutants. The Barbados Costal Conservation Commission and the Bank's environmental consultant made estimates of the impact of the project on coastal erosion and on the trap and sea urchin fisheries. The analysis values the benefits of beach erosion by estimating the cost of replacing beaches artificially ("beach nourishment"). The analysis assumes that the project would prevent further decline in fishery yields and that it will promote recovery to the 1980 yields. Other sources of pollution may prevent beach recovery or the rate of recovery may be so slow that the present value of benefits are much lower than estimated here. If pesticides in the food chain or overfishing is the primary cause of the decline in fish yields, in either case the benefits may not materialize.

5. Health benefits

- 5.21 Table I-1 in chapter I indicates that the waters of the south coast violate US bacteriological standards. This implies that swimming in these waters could cause health problems. The extent and severity of the health problems, however, should not be overstated. The standards that the USEPA has set for coastal waters do not have much grounding in research.

- 5.22 The epidemiological literature indicates that a number of infectious diseases can be contracted by swimming in sewage polluted water 48/, epidemiological research has only been able to establish a quantitative relationship for gastroenteritis, the most common of the diseases. The faecal coliform standard (of 200 faecal coliforms per 100 ml) is set consistent with the risk that 19 of 1,000 swimmers will contract gastroenteritis. If the standard were increased four times to 800 faecal coliforms per 100 ml, the incidence of gastroenteritis would increase 1.8 times. 49/
- 5.23 According to physicians in Barbados, the health problems experienced are less gastroenteritis and more skin and ear infections. Statistics available for tourists who visit physicians show a higher percentage of visits because of these infections than one would expect in the US or Canada. The physicians point out that this is partially attributable to the warm, humid climate which can activate latent infections incurred at home. Some part, however, is due to the level of pathogens in coastal waters--of which coliforms and streptococci are an index.
- 5.24 To estimate the health benefits from cleaning the water, data was obtained on risk of exposure. According to a survey, the 3,268 families who will receive sewage connections use the beaches of the south coast an average of between 9.4 and 29.4 times per year. 50/ In addition, the 52,381 families who live in the area of the influence of the project, but who will not be connected to the sewerage system, use the beaches of the south coast an average of 1.6 times per year. This give a weighted average range of between 2.06 and 3.23 uses per Barbadian family per year. To calculate health benefits, the analysis multiplies exposure to risk times probability of infection times cost of treatment. The analysis assumes that (a) there are between 229,000 and 719,000 chances for exposure of the Barbadian population per year; (b) the probability of infection attributable to sewage is between 1 in 25

48/ The diseases include hepatitis A, gastroenteritis, typhoid, shigellosis and cholera.

49/ Even very high levels of readings do not appear to have dramatic effects. A study of Hong Kong beaches with contaminations which ranged from 411 to 3,200 fecal coliform per 100 ml showed an illness rate of 22 per thousand, compared to 12 per thousand on beaches under 400 fecal coliforms per 100 ml.

50/ The questionnaire asked about frequency of use. The maximum frequency specified was fifteen or more times per year. Forty five percent of respondents chose this category. The average calculated with 15 uses is a lower bound estimate. If we assume that the true range is 15 to 104 visits (both days every weekend), the average would rise to 29.4 visits per family per year.

to 1 in 50 51/; and (c) the cost of treatment and drugs is US\$25.

6. Benefits from protecting tourism

- 5.25 The aesthetic and sanitary conditions of the south coast could cause tourism to decline. This could have an important effect upon national income (tourism accounts for about 10% of GDP). The root of the aesthetic and sanitary problem is the lack of a sanitary system. The majority of human waste on the south coast goes into dry pits, and suckwells, with some going into septic tanks. The dry pits and suckwells drain into the sheet water near the coast and percolate into the ocean. Some pits and septic tanks overflow into the streets or canals that flow into the ocean. These canals are point sources which have an unpleasant, although perhaps not identifiable, odor. At times solids can be seen. There is anecdotal evidence that, when hotels have problems with their package treatment plants or when the companies that empty septic tanks fail to appear on time, they pump their septage into the ocean late at night. It is also reported that the companies that clean septic tanks have clandestinely dumped waste into the sea (or inland over aquifers), rather than hauling it to the Emmerton treatment plant.
- 5.26 The Emmerton plant was not designed to treat large amounts of trucked in septage. There is a possibility that the Emmerton plant could break down forcing people with septic tanks to dump excreta directly into the sea. In addition to the aesthetic problem, there is a bacteriological problem. As Table I-1 indicates, eight of ten south coast beaches 52/ show statistically significant violations of bacteriological standards. It is reasonable to assume that either the aesthetic (odors and solids) or documented bacteriological problem could cause tourism to decline.
- 5.27 The magnitude and timing of an aesthetic bacteriological decline is impossible to foresee with precision, but it is likely that if potential visitors found out that the waters of the south coast violated US standards, they would choose another destination. Worse

51/ Violation of the mean EPA standard faecal coliform standard implies a 1 in 50 chance of gastroenteritis. Most south coast beaches do not violate this standard. However, since skin and ear infections are more common than gastroenteritis, 1 in 50 is used as the lower bound estimate for all problems and 1 in 25 is used as the upper bound.

52/ The two exceptions are Rockley and Dover beaches where no statistically significant violations were found. There were observations that exceeded the faecal streptococci limit. This standard is not a statistical standard (and on the average standard) but an absolute standard (any one observation can put a beach in violation).

still, it is possible that tourists would not distinguish between the south coast and other areas on the island and the decline would occur in all areas. This decline would probably occur irrespective of the actual danger implied by the fact that water quality exceeds these standards.

- 5.28 Table V-2 presents the results of six comparisons. The point of departure of each of these comparisons is the simulation of the net benefits. The table uses the results corresponding to the tenth, fiftieth and ninetieth percentiles. The table shows by what percentage tourism would have to decline for each of these three cases to yield a rate of return of 12%. This calculation is made two ways: one assuming that only tourism on the south coast is affected, the other assuming that all tourism is affected.

Table V-2		
Percent decline in tourism needed to bring the economic rate of return to 12%		
	Assuming tourism declines on south coast only	Assuming tourism declines for the whole island
Low estimate of other benefits	17%	7%
Mid estimate of other benefits	13%	5%
High Estimate of other benefits	10%	4%

D. Distributive impact

- 5.29 The distributive impact of the project was calculated from a simulation that used the modal value of each probability distribution. The economic benefit and cost data correspond to those presented in Table V-1. The financial flow corresponding to tariff payments for sewerage services are taken from the financial analysis with two modifications: (a) sewerage connections are assumed to grow at 1.5% per year in the service area and (b) all low-income households (80% of the connections in the service area) are assumed to pay a flat rate sewerage fee of US\$50 per year (one-third of the flat-rate water charge).
- 5.30 The benefits to low-income groups correspond to: (a) the difference between wages paid to unskilled construction workers and their economic opportunity costs; (b) the value of benefits provided by the project to low-income families (that either receive sewerage connections or swim at south coast beaches) less the amount they pay in sewerage charges; (c) 20% of health benefits (the other 60% goes to the government's Queen Elizabeth hospital in reduced costs (it treats patients free), and (d) the earnings of fishermen above their opportunity costs as fisheries recover. The low-income groups' losses result from reduced employment in tourism as hotel operations are interrupted during construction, from lost employment in the construction of suckwells and installation of

septic tanks and from time lost in traffic because of congestion during construction.

- 5.31 The distributive index (the ratio of low-income to private sector benefits) is .47.

Table V-3 Distributive Analysis						
	Private sector		Public sector		Not alloc.	Total
	Low- income	Other	BWA	GOB		
Investment	2,152	-	-41,977	-	-5,699	-45,524
Associated cost	-1,242	-3,423	-	-	-375	-5,040
Tourism	4,583	18,331	-	-	9,166	32,080
Cost savings	-267	3,121	8,158	-	644	11,656
Willingness to pay	6,117	-5,000	-	-	-	8,375
Health benefits	654	461	-	1,961	-	3,076
Environmental benefits	635	635	-	-	364	1,634
Total	12,632	14,125	-29,511	1,961	3,802	3,007

E. Community impact

- 5.32 This project was designed to benefit all segments of the community in which the project is located, including women. These benefits would be both economic and environmental in nature. To mitigate any negative reactions that may emanate from any future increases of water and sewerage rates to cover the investments costs, the borrower should consider using suitable, existing nongovernmental entities for continued public education on the benefits of the project for the community at large.

F. Risks

- 5.33 To achieve the planned improvements in water standards, the design of the system has to be without major flaws and the operation of the system well managed. The risk of sub-standard operation of the sewerage system will be minimized by a two-year operational assistance for the WTP and a 10-year monitoring program of the water quality. Both programs will permit to correct problems detected.
- 5.34 Reaching full project benefits will also depend upon the timely completion of the in-house connections. This risk is minimized through the financing of the in-house connections program in the project area, the costs of which would be recovered through the rates charged for water and sewerage services.

**Water Quality Testing
Bellairs Research Institute**

The USEPA standards against which the marine waters were tested are:

1. The median value for total coliform bacteria should not exceed 1000 per 100 ml, nor should more than 10% of the samples exceed 2400 per 100 ml. during any 30-day period;
2. the geometric mean value for faecal coliforms should not exceed 200 per 100 ml during any 30-day period, nor should more than 10% of the samples exceed 400 per 100 ml in the same period;
3. the geometric mean value for faecal streptococci should not exceed 35 per 100 ml, nor should any sample taken from a high-use beach exceed 104 per 100 ml.

The chemical standards against which these waters were tested are for nitrates, phosphates and suspended particulate matter. These standards are:

1. The mean nitrate concentration should not exceed 0.7 ug at/l, nor should more than 10% of the samples exceed 3.5 ug at/l during any 30 day period;
2. the mean phosphate concentration should not exceed 0.1 ug at/l, nor should more than 10% of the samples exceed 0.7 ug at/l during any 30-day period; and
3. the mean value for suspended particulate matter (SPM) should not exceed 5 mg/l, nor should more than 10% of the samples exceed 10 mg/l during any 30-day period.

Beaches identified for the statistical study on the South Coast are:

- i) Miami
- ii) Oistins
- iii) Graveyard off Casuarina
- iv) Dover
- v) St. Lawrence
- vi) Sandy Beach
- vii) Rockley
- viii) Hastings
- ix) Drill Hall
- x) Pebbles

Basic parameters of the bacteriological study

The pilot phase determined that observations on contamination depended on a number of factors which are, in order of importance: (a) tidal phase, (b) depth of water, 1/ and (c) time of day. Bacteriological counts are higher: (a) when the tide is coming in (because contaminants are pushed in towards shore), (b) in shallow water (where there is much less dilution), and (c) when the sun's rays are indirect. The Bank and the consultant agreed to sample at a depth of one meter, since a significant number of swimmers dive (get their heads) into the water at a depth of one meter, and to sample at ten in the morning, which is the time that tourists start to go into the water. 2/

-
- 1/ Tidal phase and depth may not be independent of each other. At low tide, samples must be taken farther from the coast line than at high tide. It is possible that distance to the shore is the important factor.
- 2/ Barbadians tend to go into the water much earlier in the morning and are therefore, on the average, exposed to higher level of bacteria than tourists. Barbadians also tend to stay closer to the one-meter depth than tourists who venture farther out.

Alternatives study

As a part of the TOR of the consultant firm contracted for the preparation of the final design of the south coast sewerage system, the Bank requested an evaluation in more detail of some alternatives considering different degree of wastewater treatment due to the complementary treatment to be obtained from dilution, transport and die away in a submarine discharge.

After studying of a set of alternatives which considered three possible locations for the ocean outfall, South Point, Worthing and Needham's Point, and possible locations for the wastewater treatment plant at Graeme Hall, Drill Hall, Pavillion and Maxwell, the consultant concluded that three locations for the outfall and the treatment plant had sufficient merit to be analyzed in depth to obtain the "least-cost alternative". These were:

- a. Alternative No. 1 - Outfall at Worthing, treatment plant at Graeme Hall. The analysis of this alternative concluded that it would be technically difficult and prohibitively expensive for an outfall at Worthing to go beyond the bank reef.
- b. Alternative No. 2 - Outfall at Needhams Point, treatment plant at Drill Hall. The marine studies and oceanographic modelling carried out by the consultants of this project have revealed that a depth of approximately 30 m required to obtain the minimum initial dilution complemented by primary treatment can be achieved by locating the outfall only at Needham's Point. Modelling has also shown that this depth which is reached approximately 1,100 m off Needham's Point would minimize the potential for the effluent plume to impinge on the shore or important marine environments. There would be no potential for the formation of a sludge bank or a sludge bank or surface slick. The marine studies have shown that there is a gap in the bank reef at this location.
- c. Alternative No. 3 - Outfall at Needhams Point, treatment plant at Graeme Hall. This alternative is similar to the alternative No. 2 but the treatment plant location is at Graeme Hall rather than Drill Hall.

Table II-I gives the cost comparison among the three final alternative location combinations. The capital costs include land costs, construction costs and engineering and administration costs. Present values have been calculated for a design period of 22 years and a discount rate of 125.

Alternative No. 1 with tertiary treatment at Graeme Hall and outfall at Worthing is the most expensive. Because it is also the alternative with the highest level of treatment, there is also a greater risk associated with a treatment plant having operational problems like the Emmerton plant of the Bridgetown Sewerage System.

Alternatives Nos. 2 and 3 have the same outfall and degree of treatment. The difference is the location of the treatment plant. Alternative No. 2 with the - Drill Hall location for the treatment plant is approximately 5.4% less in present value than alternative No. 3 with location of the plant at Graeme Hall.

The alternative comparison between Nos. 2 and 3 did take into account the advantages of the Graeme Hall site as compared with Drill Hall: (a) a treatment plant at Drill Hall reduces the potential for expansion of the Barbados Defense Force (BDF); (b) a treatment plant at Drill Hall, because of visual impact and possibility of odors, reduces the value of adjacent properties as well as the potential development value of adjacent sites; (c) locating a treatment plant at Drill Hall reduces the recreational value of the nearby beach (Palm Beach); (d) a treatment plant at Drill Hall has less opportunity for expansion should a higher degree of treatment be required at a later date; and (e) a treatment plant at Graeme Hall, because of the larger area available, can be constructed with much less effect on adjacent land areas and properties. The potential recreational value of the near-by marsh and swamp would not be affected.

The above-mentioned considerations were viewed by the Government of Barbados as sufficiently important to outweigh the relatively small difference in present value and therefore to conclude that the alternative No. 3 must be chosen.

The management of the BDF was firm in their refusal to relocate partly because of the scope in this area for expansion of their operations.

Table I-.... Economic comparison of alternatives			
Alternatives	No. 1	No. 2	No. 3
Outfall location	Worthing	Needhams Point	Needhams Point
Outfall depth (m)	40	30	30
Treatment plant location	Graeme Hall	Drill Hall	Graeme Hall
Type of treatment	Nutrient removal and disinfection (tertiary)	Primary	Primary
Capital costs (in US\$)			
Sewage collection	43,000	45,500	43,000
Sewage treatment	15,500	4,950	5,030
Outfall (2)	8,900	12,100	17,000
Total capital cost	67,400	62,550	65,030
Annual operation and maintenance costs	1,306	678	867
Present values (3) dr-12%	77,384	67,733	71,658
Notes:			
1. All costs in 1989 B\$000.			
2. Outfall costs include pumping from treatment plant to the outfall.			
3. Present values calculated for a 22-year design life.			
4. Costs do not include private property service connections.			

WATER QUALITY MONITORING PROGRAM

A. BEACHES

1. The water quality monitoring program should include weekly samples taken at eleven beaches. The recommended beaches are:

Discovery Bay (middle of the west coast)
Brandons Beach (south end of west coast)
Pebbles (in Carlisle Bay, relates to Bay Estates)
Drill Hall
Rockley Beach
Sandy Beach
Dover
Graveyard
Welches
Oistins
Miami
2. These beach sites were chosen for ease of access and because they are used extensively by the public. Eleven sites are also a suitable number for analysis. A good Quality Control/Quality Assurance (QC/QA) program can be developed for this sample number.
3. Only nitrates and bacteria need be measured. Nitrates pose potential problems and are very straightforward to analyze. Ammonia analysis need not be performed as it tends to be problematic and usually related to nitrate load. Generally, phosphates are not a problem as they may be easily controlled. Biochemical Oxygen Demand (BOD), Suspended Particulate Matter (SPM), and Volatile Particulate Matter (VPM), are generally acceptable, and sediment contamination may be monitored as described below. Bacteria are very important from a public health perspective and should prove to be the best indicators of the effectiveness of the sewerage system. Fecal coliform analyses are necessary but total coliform analyses could be omitted if these pose budgetary problems.
4. The weekly sampling program should commence early in the day (day at 07:00 hours) and the samples taken from the beach sites in the same order on each sampling day. From each site, a one liter sample for nitrate analysis and a half liter sample (autoclave bottle) for bacteria determination, should be taken. The samples should be packed in ice and carried in a cooler chest to the laboratory as soon as possible for immediate commencement of analysis. The QC/QA program must include one set of duplicate analysis and one standard reference for the nitrate. The duplicate sample could be taken at different stations each week in cycle, if desired.

B. SEDIMENT

5. The best method for monitoring sediment contamination will be photographed from a small aircraft. The limit of the impact can be determined and compared to rainfall data and ground sampling. A one hour flight would permit adequate coverage of the south and west coasts. An overlapping series of photographs should be taken which include the extents of any sediment plumes. The camera used should have a databack to imprint the time on each photo. A photo log must be maintained which includes height, focal length of lens, and estimated angle of photograph. Vertical photographs are best, but are not always attainable. The ground control for mapping plumes can be taken from identifiable features in each photograph and transferred to a 1:10,000 map. Seaward extent will have to be estimated, but is not as important as the shoreline limits. Ground sampling for sediment concentrations should be done by collecting samples from a boat at the time of overflight. SPM and VPM should be determined. A signal from the aircraft to the boat should be arranged so that photographs can include the exact sampling location. A flight should be done after each major rain event if possible as a large database is desirable. The prior organization of a program such as this is essential, as the days of heavy rain are only predictable at short notice. Thus aircraft charters should be tentatively arranged when rain warnings are in effect.

C. SHEET WATER

6. In addition to the beach monitoring program outlined above, sampling of sheet water from boreholes just back of the beaches before and after the sewer system is operational, is desirable for evaluating the impact of the project on the groundwater.

D. REEFS

7. The North and South reefs should be inspected at least annually to maintain the transect makers. Thereafter, annual surveys should be made for up to five years. If possible, both the chain method and photograph method should be used for each survey. Special attention should be paid to monitoring the nitrates, phosphates and suspended particulate matter that may affect the reefs, especially on the north-west of the marine outfall.

WATER QUALITY MONITORING ESTIMATE

A.	<u>Water Quality Beaches</u>	<u>TOTAL 2 YEARS</u>
	Weekly monitoring	
	Labor, transport, analysis,	
	(Nitrate, faecal coli, total coli)	
	Reporting/interpretation	129,000
B.	<u>Effluent Plume Monitoring</u>	
	Labor, transport, analysis,	
	Reporting/interpretation	
	Ten times	15,000
C.	<u>Bore Hole Monitoring</u>	
	Initial hole boring	
	Monthly monitoring	
	Labor, transport, analysis,	
	Reporting/interpretation	29,000
D.	<u>Benthic Monitoring</u>	
	Annual reef maintenance	
	(four divers, two reefs)	
	Labor, transport, analysis,	
	Reporting/interpretation	
	Reef monitoring chain and photographic method	<u>57,000</u>
	TOTAL	US\$ 230,000

TERMS OF REFERENCE

FOR THE SELECTION OF A CONSULTING FIRM

SUPERVISION OF CONSTRUCTION

I. Objectives

- 1.0 For the proper supervision of the construction program an international consulting firm with sufficient experience in this kind of works will be selected.

II. Scope of Work

- 2.0 The consulting firm will work under the heading of the manager of the PEU and will develop the following tentative activities:

- a) assist the PEU in the process of reviewing the bids of the contracts verifying that they conform to the tender documents and conditions of the bids. Make recommendations to award the contracts;
- b) assist the PEU in responding to the eventual claims to be submitted by the participants of the bids;
- c) exert quality control on materials and equipment to be provided by contractors. Verify that the construction works will be made according to the technical specifications and drawings of the project;
- d) provide technical input to the PEU and the contractors to better enable the finished project to satisfy the design intent;
- e) train the PEU staff in the administration and supervision of major construction projects, making efforts to technology transfers;
- f) control the physical progress and the quality of the works including measurements, laboratory test, etc. with the purpose of testify about the progress and recommend the payment of invoices submitted by the contractors;
- g) notify immediately to the PEU about errors and omissions in the execution of the program recommending the most practical and appropriate solutions;
- h) arbitrate disputes between the contractors and the PEU related to cost and contingencies;
- i) respond to questions from contractors about changes to the project and make the necessary corrections as deemed appropriate;

- j) carry out an updated schedule of execution activities to report to the PEU and eventually to the Bank;
- k) prepare final drawings after the completion of every contract to keep them in files for future reference;
- l) inspect and verify all test conducted by the contractors as stated in the contract documents;
- m) prepare in behalf of the PEU and for submission to IDB the following reports:
 - i) monthly progress reports,
 - ii) final report for every construction contract with proper indication of the technical problems that have arisen during execution, cost increments, time delays and how those problems were properly solved,
 - iii) special reports as required,
 - iv) final report at the completion of the whole construction program.

III. Term

- 3.1 The consulting firm will be contracted for 3-1/2 years until the completion of the construction program.

IV. Staffing

- 4.1 A consortium of international and local consulting companies will be selected. The estimate of cost and details of staff necessary to carry out the supervision of the project follows:

V. Cost Estimate

<u>A. Fee</u>		
1 Project director	6 m x 700	42,000
1 Resident manager	42 m x 5,000	210,000
1 Assistant manager	42 m x 4,000	168,000
1 Project engineer	42 m x 4,000	168,000
1 Administrator	42 m x 3,000	126,000
1 Mechanical engineer	2.5 m x 4,000	10,000
1 Electrical-Instrument	2.5 m x 4,000	10,000
1 Sanitary expert plants	3.0 m x 4,000	12,000
1 Structural	2.5 m x 4,000	10,000
1 Geotechnical	2.5 m x 4,000	10,000
1 Senior inspector outfall	6 m x 3,000	18,000
1 Sewer inspector structural	33 m x 3,000	99,000
1 Sewer inspector collection	42 m x 3,500	147,000
1 Surveyor	42 m x 2,000	84,000
1 Road person	42 m x 1,000	42,000
1 Inspector	42 m x 2,000	117,600
1 Expert outfall	3,5 m x 4,000	14,000
1 Assistant project	40 m x 3,000	126,000
	Sub-total	1,413,600
<u>B. Overhead 150%</u>		2,120,400
<u>C. Various</u>		
Travel 72 trips x 1,500		108,000
Staff mobilization		15,000
Subsistence allowance/per diem		244,000
Communications		30,000
Transportation		240,000
Survey equipment		180,000
Computer systems		29,000
Work permits		20,000
	Sub-total	866,000
	Total	4,400,000

**Institutional Strengthening Technical Cooperation
for the Barbados Water Authority (Reimbursable)**

<u>Honoraria</u>	<u>112,000</u>
1 - Institutional and Financial Analyst (7 m/m x 7000)	49,000
1 - Commercial and Tariff Specialists (7 m/m x 7000)	49,000
1 - Water Meter Expert (2 m/m x 7000)	14,000
<u>Per diem</u>	<u>57,600</u>
2 x 60 x 160 + 2 x 30 x 160 x 0.6	48,000
1 x 60 x 160	9,600
<u>Tickets</u>	<u>18,000</u>
4 R/T @ \$2000 x 4 x 2	16,000
1 R/T @ \$2000	2,000
<u>6. General Support</u>	<u>52,400</u>
Supplies materials (on the job training)	10,000
Hardware and software	19,400
Printing	8,000
Insurance and excess of weight	<u>15,000</u>
Total	<u>240,000</u>

**BARBADOS WATER AUTHORITY
(BWA)**

TERMS OF REFERENCE

I. OBJECTIVE

The overall objective of the technical cooperation would be to contribute to the institutional strengthening of the Barbados Water Authority (BWA). Specifically, it would seek to improve the administrative, commercial and financial management of the Authority, as well as its operating capabilities.

II. SCOPE OF ACTIVITIES

A. Organizational aspects

- 2.1 Evaluate the present organizational structure and propose changes if necessary, taking into account departmental functions, responsibilities, staffing and positions. Develop an implementation schedule with a specific timetable for implementation of the necessary changes.
- 2.2 Evaluate the present staffing levels, and make recommendations for optimal staffing needs by department, taking into account the additional responsibilities to be assumed by BWA with the proposed project, including, but not restricted to: (i) level of qualifications required, (ii) salary levels, relating them to the levels of responsibility and specialization, (iii) preparation of job descriptions, where necessary, taking into account functions and levels of responsibility and authority associated with the different positions; and (iv) the strategy necessary for reaching these levels, and a specific timetable for implementation.

B. Financial administration

- 2.3 Review the administrative-financial aspects of the BWA, identifying any necessary actions that would have to be carried out to enhance its activities, particularly (i) assessing the accounting system and making the necessary recommendations regarding hardware and software to mechanize it and integrate it to the existing system.
- 2.4 Review the control procedures and norms and make recommendations on how to improve them. Account should be taken that an Internal Audit Unit is to be established, and manuals should be elaborated for this unit.
- 2.5 Review any administration and procedure manuals, proposing revisions where necessary.

C. Commercial operations

- 2.6 Review and evaluate the present commercial activities and determine, if they meet the basic requirements, and detect and propose solutions to any deficiencies existing in the procedures followed as well as in the hardware and software.
- 2.7 Review procedures related to collection of accounts, and make recommendations regarding ways to expedite the collection process, including changes in legislation if required.
- 2.8 Review current billing systems, and make recommendations, particularly in the need to go to monthly billing.
- 2.9 Develop the necessary strategy to undertake this, particularly taking into account hardware and software requirements to accomplish all that is needed.
- 2.10 Review and make recommendations regarding the scope for privatization of commercial activities.

D. Tariffs

- 2.11 Review the legal, political, norms and procedures relative to water and sewerage rates.
- 2.12 Analyze the existing tariff structure and make recommendations as to any changes required in same, taking into account the affordability to pay of the low income consumers.
- 2.13 Taking into account the tariff structure, determine if the water and sewerage rates would generate income from operations to cover all operating costs, including depreciation, and if the generation of funds would be sufficient to cover the debt and service and a proportion of its investment plan.
- 2.14 Review and determine if the rates charged for each service cover the respective operation and maintenance of the respective system.

E. Fixed assets

- 2.15 Evaluate the fixed assets, revalue them and establish a mechanism whereby a periodical revaluation can be made.

Environmental Setting

- 1.1 Barbados, the most easterly of the Caribbean islands, is a coral covered island of approximately 431 km². The island is in the humid tropic zone and is influenced by the Northeast Trade winds. Rainfall is variable spatially on the island and seasonally with a mean annual rainfall of about 2000 mm annually falling mainly during the wet season of June to December. The remaining months are relatively dry. Air temperature is relatively constant with average daily values of 25°C in January to 28°C in June. Relative humidity is high throughout the year with average daily values ranging from the high 60's to the low 80's.

1. Surface and Groundwater

- 1.2 Surface drainage systems originate in the center of the island where the land rises to 340 m above mean sea level. Drainage is through gulleys, the surface water run-off channels, but primarily through sub-surface streams which are fissures through the 90 m thick porous limestone cap which covers an impervious oceanic rock layer. These sub-surface streams and channels drain to the coast and fresh water emerges as sheet water (the major water supply source for the island) at the beach front and in the near shore saline waters. It is through this subsurface system that the sewage material from soakaways or suckwells (pits dug in the limestone to dispose of domestic liquid waste) and septic tanks passes to the ground water, the sheet water and the near shore waters.
- 1.3 Public water supply is primarily from two groundwater sources located in the southern and western portion of the island, the Belle and Hampton Catchments. These sources are at risk from contamination from the increasing domestic population in these areas. In 1989, the Ministry of Health, the Pan American Health Organization and the British Geological Survey completed a ground water pollution risk assessment for the Belle Catchment and concluded that domestic and commercial sewage inputs into the sheetwater in this southwest section of the island should be restricted. Zoning regulations have been proposed that will curtail in critical areas new development and disposal of domestic and commercial wastewater.
- 1.4 Water quality in studies conducted in 1977 and 1978 by Stanley Engineering indicated that fecal coliform bacterial counts were non-existent in water supply wells and total coliform counts were low and acceptable. Nitrogen and phosphorus, nutrients responsible for increasing eutrophication, were moderate to high during this study period and were believed to be from domestic and agricultural sources. However, since that time the risk of contamination of the ground water has increased and nitrate levels are near or exceed WHO standards in the Belle Catchment according to the Ministry of Health studies in 1989.

2. Coral Reefs and Near-shore Waters

- 1.5 The coral reefs of Barbados provide habitat and substrate for fishes and

other marine organisms, natural calcium carbonate for beach nourishment and replenishment, protection against storm surges and an attraction for recreational divers. Coral reefs are the most diverse and productive of all natural ecosystems and have a high social and economic value for the country. Fringing reefs and patch reefs are found in the nearshore waters, the former almost exclusively in the calm waters of the leeward west coast extending 100-200 m from shore in shallow water, and the latter along the higher wave energy south coast a short distance from shore in 6-15 m of water. Bank reefs, occurring 800-1000 m from shore along the west and south shores, consist of narrow coral reefs approximately 18-24 m below the surface and sloping down to 120 m deep.

- 1.6 Increasing evidence indicates that human activity is causing deterioration of the reefs. Deterioration of coastal water quality is recognized as the principal cause of reef decline and in Barbados domestic sewage discharged into the nearshore coastal zone appears to be the major factor. The increased number of residents and increasing number of tourists as well as agricultural chemicals and sediment runoff and the seepage of nutrient rich groundwater threatens the nearshore water reef systems. High particulate matter loads, characteristic of sewage and land runoff, can physically smother corals and promote high levels of bacterial activity which stresses coral. Particulate matter in suspension over the coral interferes with light penetration needed for photosynthetic activity of the coral. Elevated levels of phosphates and nitrates characteristic of sewage and land runoff and groundwater discharge promote phytoplankton blooms in the water column, interfering with light penetration to the coral and in some cases covering coral. These algae when very abundant, may also wash up on the beach reducing the aesthetic appeal of the beaches.
- 1.7 Water quality samples taken in 1989 at 27 stations on the west and south coasts as part of the feasibility studies for the proposed South Coast Sewage Project showed that the coliform bacterial counts were generally below or slightly below the desired maximum limit of 200 fecal coliforms/100 ml but in two samples exceeded 1000 fecal coliforms/100 ml. No specific beach or area exceeded the guideline value consistently, but all beaches showed high bacterial counts at some time during the sample period. Nitrate, ammonia and phosphate values were within desirable levels in most case, but exceeded standards in two situations. Although the values are not excessive at the time of sampling, they are near desirable limits and are probably now affecting reef function and water quality. These data were utilized to model coastal water quality and the results predict that extreme concentrations of contaminants will increase with time and that severing the coastal areas will mitigate the problem. Water quality standards will not be exceeded if the hookups are made.

3. Sewage Treatment Plant Site

- 1.8 Graeme Hall has been selected as the site for the primary sewage treatment facility. The site is on a former plantation on the South Coast that is bounded on the north by Ministry of Agricultural Experimental Farm, on the west and south by the Graeme Hall Swamp and associated freshwater marsh, and on the east by the Farm and a housing

development. The plant will be located on high ground at the base of the experimental farm and out of the swamp and marsh. The swamp is a red and white mangrove ecosystem with open water and serves as an important rookery for cattle egrets and snowy egrets. The marsh is a freshwater sedge marsh that has been channeled to provide drainage and open water habitat. The marsh has been used as a hunting refuge for migratory waterfowl, and currently numerous migratory birds use the area for feeding and resting. The swamp/marsh complex is unique to the island.

4. Sewage Outfall Site

- 1.9 As a result of current and dispersion studies, a site 1.1 km off Needham's Point at the southwest tip of the island has been selected for the sewage outfall discharge. This site is beyond the opening where two bank reefs, the North and South, terminate. The area is mainly sand bottom with some patchy reef that is lower in quality than the two adjacent, diverse and healthy bank reefs. Bank reef surveys and water diffusion analyses were carried out in this area.

138		REAL											
139	REVENUES	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	TOTAL
140	-----	----	----	----	----	----	----	----	----	----	----	----	----
156	AVERAGE WATER CONNECTIONS												
157	FIXED RATE	63022	63306	63939	58939	50939	38939	23939	24178	24420	24664	24911	398176
158	METERED DOMESTIC	20283	20261	20464	25668	33925	46264	61727	62961	64221	65505	66815	467811
159	METERED COMMERCIAL	3100	2807	2807	2807	2807	2807	2807	2807	2807	2807	2807	28070
160	SEWERAGE CONNECTIONS	1174	1420	1420	1420	1420	1420	4696	4696	4696	4696	4696	30580
161													
162	TOT.UNITS SOLD	87579	87794	88630	88834	89091	89430	93169	94643	96144	97672	99229	924636
163													
164	AVG.INC./FIXED RATE CONN.	103	126	126	126	126	126	126	126	126	126	126	
165	AVG.INC/METERED.DOM.CONN.	226	281	281	281	281	281	281	281	281	281	281	
166	AVG.INC/MET.COMM.CONN.	1910	2637	2637	2637	2637	2637	2637	2637	2637	2637	2637	
167	AVG INC./SEWERAGE CONN.	336	377	377	377	377	377	377	377	377	377	377	
170													
171	REVENUE FIXED RATE	6460	7946	8026	7398	6394	4888	3005	3035	3065	3096	3127	49979
172	REVENUE METERED DOMESTIC	4584	5700	5757	7221	9544	13015	17365	17712	18067	18428	18796	131605
173	REVENUE METERED COMMERCIAL	5921	7402	7402	7402	7402	7402	7402	7402	7402	7402	7402	74020
174	REVENUE SEWERAGE SERVICES	395	535	535	535	535	535	1770	1770	1770	1770	1770	11529
175													
176	TOTAL SALES REVENUE	17360	21583	21720	22556	23875	25840	29542	29920	30304	30696	31096	267132
178	OTHER SALES REVENUE	804	600	600	600	600	600	600	600	600	600	600	6000
179	PRIVATE DEV. & PLUMBING	911	300	300	300	300	300	300	300	300	300	300	3000
180													
181	TOTAL OPERATING REVENUE	19075	22483	22620	23456	24775	26740	30442	30820	31204	31596	31996	276132
182													
183	OPERATING EXPENSE												
184	-----												
185	OPERATION	7251	7831	8144	8470	8809	9161	9528	9909	10305	10717	11146	94021
188	MAINTENANCE	2536	2739	2848	2962	3081	3204	3332	3466	3604	3748	3898	32883
190	OPER/MAINT NEW PROJECT	0	0	0	0	0	0	641	551	551	536	536	2815
191	SEWERAGE	1116	1205	1253	1304	1356	1410	1466	1525	1586	1650	1715	14471
193	DEPREC.PLANT IN SERVICE	2592	2547	2603	2655	2706	2757	3791	4836	4898	4942	4984	36719
199	GENERAL & ADMINISTRATION	3167	3372	3452	3534	3618	3703	4690	5590	6490	7390	8290	50129
204													
205	TOTAL OPERATING EXPENSE	16662	17694	18301	18925	19570	20236	23448	25877	27435	28983	30570	231038
206													
207	NET OPERATING INCOME	2414	4789	4318	4532	5205	6504	6994	4943	3770	2613	1426	45094
208	NON-OPERATING INC.(EXP.)												
209	-----												
210	OTHER INCOME	812	773	550	550	550	550	550	550	550	550	550	5723
212													
213	TOT.NONOPERATING INC(EXP)	812	773	550	550	550	550	550	550	550	550	550	5723
214													
215	PROFIT B/FINANCE CHGS.	3226	5562	4868	5082	5755	7054	7544	5493	4320	3163	1976	50817
216	FINANCIAL CHARGES												
217	-----												
219	LNG-TERM FINANCIAL CHGS.	0	0	0	0	0	0	2543	2445	2265	2145	2024	11422
221													
222	TOTAL FINANCIAL CHARGES	0	0	0	0	0	0	2543	2445	2265	2145	2024	11422
232													
233	NET PROFIT (LOSS)	3226	5562	4868	5082	5755	7054	5001	3048	2055	1018	-48	39395
234													

STATEMENT OF SOURCES AND USES OF FUNDS FOR YEAR ENDING MARCH 31,
(THOUSANDS OF US DOLLARS)

	REAL											
	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	TOTAL
SOURCES												
INTERNAL SOURCES												
NET OPERATING INCOME	2414	4789	4318	4532	5205	6504	6994	4943	3770	2613	1426	45094
TOT.NONOPERATING INC(EXP)	812	773	550	550	550	550	550	550	550	550	550	5723
DEPREC.& AMORT.DEFER.CHGS	2592	2547	2603	2655	2706	2757	3791	4836	4898	4942	4984	36719
TOTAL INTERNAL SOURCES	5817	8109	7472	7736	8461	9812	11335	10329	9218	8105	6960	87536
EXTERNAL SOURCES												
PROPOSED IDB LOAN	0	0	0	0	0	50445	378	377	0	0	0	51200
PROVISION FOR PENSIONS	156	-1662	-900	-900	-900	-450	0	0	0	0	0	-4812
TOTAL EXTERNAL SOURCES	156	-1662	-900	-900	-900	49995	378	377	0	0	0	46388
TOTAL SOURCES	5973	6447	6572	6836	7561	59807	11713	10706	9218	8105	6960	133924
APPLICATIONS												
DEBT SERVICE												
L/T FINANCIAL CHARGES	0	0	0	0	0	0	2543	2445	2265	2145	2024	11422
AMORTIZATION OF LOANS	0	0	0	0	0	0	2438	2438	2438	2438	2438	12190
TOTAL DEBT SERVICE	0	0	0	0	0	0	4981	4883	4703	4583	4462	23612
CONSTRUCTION COSTS												
PROPOSED PROJECT	0	0	3874	9480	6402	52589	378	377	0	0	0	73100
OTHER PROJECTS	2071	1905	2000	2000	2000	2000	2000	2000	2000	2000	2000	19905
TOTAL CONSTRUCTION COSTS	2071	1905	5874	11480	8402	54589	2378	2377	2000	2000	2000	93005
OTHER APPLICATIONS												
INC.(DECREASE)WORK.CAPIT.	3902	-263	-2306	-1892	-3160	316	302	23	40	-135	-978	-8053
TOT.OTHER APPLICATIONS	3902	-263	-2306	-1892	-3160	316	302	23	40	-135	-978	-8053
TOTAL APPLICATIONS	5973	1642	3568	9588	5242	54905	7661	7283	6743	6448	5484	108564
ANNUAL SURPLUS(DEFICIT)	0	4805	3004	-2752	2320	4902	4052	3423	2474	1657	1476	
ACCUM. SURPLUS(DEFICIT)	0	4805	7808	5056	7376	12278	16329	19752	22227	23884	25360	

PROPOSED RESOLUTION ¹

BARBADOS. LOAN /OC-BA TO THE GOVERNMENT OF BARBADOS
(South Coast Sewerage Project)

The Board of Executive Directors

RESOLVES:

That the President of the Bank, or such representative as he shall designate, is authorized, in the name and on behalf of the Bank, to enter into such contract or contracts as may be necessary with the Government of Barbados, as Borrower, for the purpose of granting it a loan to cooperate in the financing of the execution of the South Coast Sewerage Project (hereinafter referred to as the "Project"). This financing shall be subject substantially to the following conditions:

1. Amount and Currencies: Up to US\$28,000,000, or its equivalent in other currencies except that of Barbados, which are part of the ordinary capital resources of the Bank, to pay for goods and services acquired through international competition in the member countries of the Bank and for such other purposes as may be specified in the loan contract. Payments of amortization and interest shall be made in the currency or currencies specified by the Bank, in a quantity equivalent to the corresponding amount owed, calculated in units of account in terms of dollars of the United States of America, in accordance with provisions to be included in the loan contract.
2. Source of Funds: The ordinary capital resources of the Bank.
3. Guarantee: The general responsibility of the Borrower.
4. Credit Fee: 0.75% per annum on the undisbursed portion of the financing which fee shall commence to accrue 60 days after the date of the loan contract and payable in dollars of the United States of America on the same dates as the interest.
5. Amortization: The Borrower shall amortize the loan in a period of 25 years from the date of the loan contract, by means of semiannual, consecutive and, insofar as possible, equal installments. The first

¹ The provisions contained in this Appendix and in Appendices II, III, IV, and V will only be final when the Board of Executive Directors has approved the loan proposal.

installment shall be paid on the first interest payment date, six months after the date scheduled for the last disbursement of the financing relating to the works, the complementary components of the Project and the institutional strengthening referred to in paragraphs 2.01(a), 2.01(b)(i), 2.01(b)(ii), 2.01(b)(iii) and 2.01(c) of Appendix V.

6. Interest: The Borrower shall pay interest semiannually on the daily outstanding balances of the loan. The first payment shall be made six months after the date of the loan contract. The Bank shall determine the rates of interest to be applied during the life of the loan, in accordance with the lending rate policy of the Bank. At the request of the Borrower, resources of the financing may be used to pay interest during the period of disbursement thereof.
7. Disbursement: The term for disbursement of the financing shall expire four years after the effective date of the loan contract, except that the term for disbursement of the financing relating to the complementary components of the Project referred to in paragraphs 2.01 (b)(iv) and 2.01(b)(v) of Appendix V shall expire 6 years after the effective date of the contract.
8. Special Conditions:
 - (a) The execution of the Project and the utilization of the resources of the loan shall be carried out in their entirety by the Borrower through the Ministry of Health, hereinafter referred to as the "Executing Agency", which shall carry out the execution of the Project through the Project Executing Unit, hereinafter referred to as "PEU".
 - (b) The resources of the loan, together with the resources of Loan /OC-BA, shall be used to participate in the execution of a Project, the total cost of which is estimated at the equivalent of US\$73,100,000. Consequently, the loan contract shall contain the appropriate provisions to ensure that such additional resources as may be necessary for the complete execution of the Project, in addition to the loans, shall be duly provided, in an amount estimated at the equivalent of US\$21,900,000, in accordance with a schedule of investments satisfactory to the Bank. This amount may include the equivalent of US\$11,000,000 from the European Investment Bank ("EIB").
 - (c) Prior to the first disbursement of the financing, the Borrower through the Executing Agency shall present evidence to the satisfaction of the Bank that:
 - (i) it has signed an agreement or agreements with the Barbados Water Authority (BWA) setting forth, inter alia:

- (1) that the BWA shall comply with all pertinent clauses of the loan contracts to be signed between the Borrower and the Bank relating to the Project;
 - (2) that the Borrower shall transfer the Project assets and liabilities as well as all property and administration of the South Coast Sewerage System to the BWA, immediately after completion of the execution of the components of the Project referred to in paragraphs 2.01(a) and 2.01(b)(i), 2.01(b)(ii) and 2.01(b)(iii) of Appendix V;
 - (3) that the BWA shall reimburse the Borrower for the debt service obligations of the debt incurred by the Borrower in connection with the Bank's financing of the Project under the same terms as the loan contracts to be signed between the Borrower and the Bank, although the exchange rate risks shall be borne by the Borrower;
 - (4) that the BWA shall provide, without prejudice to the obligations of the Borrower, on a timely basis, the local counterpart resources referred to in clause 8(b) above; and
 - (5) that the BWA shall carry out, under the supervision of the PEU, the implementation of the institutional strengthening assistance referred to in paragraph 2.01(c) of Appendix V and the operational assistance referred to in paragraph 2.01(b)(v) of the same Appendix.
- (ii) the PEU has been staffed with a project director, a project engineer, a finance officer and, from the BWA, an engineer to effectively carry out the Project; and
 - (iii) it has submitted an integrated and coordinated environmental monitoring program, which shall include a baseline year (before the end of construction), according to guidelines previously agreed upon with the Bank, which shall include the components indicated in paragraph 2.01(b)(iv) of Appendix V.
 - (iv) it has contracted a consulting firm for the primary supervision of the execution of the Project according to the terms of reference previously agreed upon with the Bank.
- (d) Upon acceptance by the Bank, up to the equivalent of US\$1,000,000 of the resources of the financing may be utilized to cover the cost of connections to the Bridgetown Sewerage System incurred within the twelve months prior to the date of this Resolution, provided that requirements substantially similar to those of this resolution and the loan contracts have been fulfilled.

- (e) In the acquisition of machinery, equipment, and other goods for the Project, and in the awarding of construction contracts, the system of public bidding shall be followed in each case in which the value of such acquisitions exceeds the equivalent of US\$250,000 or the value of such contracts for the execution of works exceeds the equivalent of US\$1,000,000. The bidding shall be subject to the procedures to be appended as an annex to the loan contract. This provision shall not apply to acquisitions or contracts financed with resources provided by the EIB or other external source of financing.
 - (f) The Borrower shall take appropriate measures acceptable to the Bank to ensure that the BWA's revenues, resulting from the rates for water and sewerage services shall be sufficient to cover all operating costs of the systems, including those relating to administration, operation, maintenance and depreciation on revalued assets. If the application of the foregoing does not generate sufficient revenues to cover the timely service of the BWA's obligations including the service of its debt, and a proportional part of the investment program for the systems, as indicated in Section IV of Appendix V, the Borrower, in coordination with the BWA shall take the necessary measures, including rate increases, to obtain the additional resources required to achieve that purpose.
 - (g) The Bank shall establish such inspection procedures as it deems necessary to assure the satisfactory execution of the Project and the Borrower and the Executing Agency shall extend all cooperation which is required for the most effective accomplishment of this purpose. From the amount of the financing the sum of US\$280,000 shall be allocated for credit to the income accounts of the Bank to meet expenses of general inspection and supervision.
9. Conditional Provision: The contract or contracts which are executed pursuant to the authorization conferred upon the terms of this resolution shall enter into force only when the Board of Executive Directors has determined by means of resolution that the Bank has sufficient resources available in the Ordinary Capital, to cover the loan authorized by this resolution.

PROPOSED RESOLUTION ¹

BARBADOS. LOAN /OC-BA TO THE GOVERNMENT OF BARBADOS
(South Coast Sewerage Project)

The Board of Executive Directors

RESOLVES:

That the President of the Bank, or such representative as he shall designate, is authorized, in the name and on behalf of the Bank, to enter into such contract or contracts as may be necessary with the Government of Barbados, as Borrower, for the purpose of granting it a loan to cooperate in the financing of the execution of the South Coast Sewerage Project (hereinafter referred to as the "Project"). This financing shall be subject substantially to the following conditions:

1. Amount and Currencies: Up to US\$23,200,000, or its equivalent in other currencies except that of Barbados, which are part of the ordinary capital resources of the Bank, to pay for goods and services acquired through international competition in the member countries of the Bank and for such other purposes as may be specified in the loan contract. Payments of amortization and interest shall be made in the currency or currencies specified by the Bank, in a quantity equivalent to the corresponding amount owed, calculated in units of account in terms of dollars of the United States of America, in accordance with provisions to be included in the loan contract.
2. Source of Funds: The ordinary capital resources of the Bank.
3. Guarantee: The general responsibility of the Borrower.
4. Credit Fee: 0.75% per annum on the undisbursed portion of the financing, which fee shall commence to accrue 60 days after the date of the loan contract and payable in dollars of the United States of America on the same dates as the interest.
5. Amortization: The Borrower shall amortize the loan in a period of 25 years from the date of the loan contract, by means of semiannual, consecutive and, insofar as possible, equal installments. The first

¹ The provisions contained in this Appendix and in Appendices I, III, IV, and V will only be final when the Board of Executive Directors has approved the loan proposal.

installment shall be paid on the first interest payment date, six months after the date scheduled for the last disbursement of the financing relating to the works, the complementary components of the Project and the institutional strengthening referred to in paragraphs 2.01(a), 2.01(b)(i), 2.01(b)(ii), 2.01(b)(iii) and 2.01(c) of Appendix V.

6. Interest: The Borrower shall pay interest semiannually on the daily outstanding balances of the loan. The first payment shall be made six months after the date of the loan contract. The Bank shall determine the rates of interest to be applied during the life of the loan, in accordance with the lending rate policy of the Bank. At the request of the Borrower, resources of the financing may be used to pay interest during the period of disbursement thereof.
7. Disbursement: The term for disbursement of the financing shall expire four years after the effective date of the loan contract, except that the term for disbursement of the financing relating to the complementary components of the Project referred to in paragraphs 2.01(b)(iv) and 2.01(b)(v) of Appendix V shall expire 6 years after the effective date of the contract.
8. Special Conditions:
 - (a) The execution of the Project and the utilization of the resources of the loan shall be carried out in their entirety by the Borrower through the Ministry of Health, hereinafter referred to as the "Executing Agency", which shall carry out the execution of the Project through the Project Executing Unit, hereinafter referred to as "PEU".
 - (b) The resources of the loan, together with the resources of Loan /OC-BA, shall be used to participate in the execution of a Project, the total cost of which is estimated at the equivalent of US\$73,100,000. Consequently, the loan contracts shall contain the appropriate provisions to ensure that such additional resources as may be necessary, for the complete execution of the Project, in addition to the loans, shall be duly provided, in an amount estimated at the equivalent of US\$21,900,000, in accordance with a schedule of investments satisfactory to the Bank. This amount may include the equivalent of US\$11,000,000 from the European Investment Bank ("EIB").
 - (c) Prior to the first disbursement of the financing, the Borrower through the Executing Agency shall present evidence to the satisfaction of the Bank that:
 - (i) it has signed an agreement or agreements with the Barbados Water Authority (BWA) setting forth, inter alia:

- (1) that the BWA shall comply with all pertinent clauses of the loan contracts to be signed between the Borrower and the Bank relating to the Project;
 - (2) that the Borrower shall transfer the Project assets and liabilities as well as all property and administration of the South Coast Sewerage System to the BWA, immediately after completion of the execution of the components of the Project referred to in paragraphs 2.01(a), 2.01(b)(i), 2.01(b)(ii) and 2.01(b)(iii) of Appendix V;
 - (3) that the BWA shall reimburse the Borrower for the debt service obligations incurred by the Borrower in connection with the Bank's financing of the Project under the same terms as the loan contracts to be signed between the Borrower and the Bank, although the exchange rate risk shall be borne by the Borrower;
 - (4) that the BWA shall provide, without prejudice to the obligations of the Borrower, on a timely basis, the local counterpart resources referred to in clause 8(b) above; and
 - (5) that the BWA shall carry out, under the supervision of the PEU the implementation of the institutional strengthening assistance referred to in paragraph 2.01(c) of Appendix V and the operational assistance referred to in paragraph 2.01(b)(v) of the same Appendix.
- (ii) the PEU has been staffed with a project director, a project engineer, a finance officer and, from the BWA an engineer, to effectively carry out the Project; and
 - (iii) it has submitted an integrated and coordinated environmental monitoring program, which shall include a baseline year (before the end of construction), according to guidelines previously agreed upon with the Bank, which shall include the components indicated in section 2.01(b)(iv) of Appendix V.
 - (iv) it has contracted a consulting firm for the primary supervision of the execution of the Project according to the terms of reference previously agreed upon with the Bank.
- (d) Upon acceptance by the Bank, up to the equivalent of US\$600,000 of the resources of the financing may be utilized to cover the cost of connections to the Bridgetown Sewerage System incurred within the twelve months prior to the date of this Resolution, provided that requirements substantially similar to those of this resolution and the loan contracts have been fulfilled.

- (e) In the acquisition of machinery, equipment, and other goods for the Project, and in the awarding of construction contracts, the system of public bidding shall be followed in each case in which the value of such acquisitions exceeds the equivalent of US\$250,000 or the value of such contracts for the execution of works exceeds the equivalent of US\$1,000,000. The bidding shall be subject to the procedures to be appended as an annex to the loan contract. This provision shall not apply to acquisitions or contracts financed with resources provided by the E.I.B. or other external source of financing.
 - (f) The Borrower shall take appropriate measures acceptable to the Bank to ensure that the BWA's revenues, resulting from the rates for water and sewerage services shall be sufficient to cover all operating costs of the systems, including those relating to administration, operation, maintenance and depreciation on revalued assets. If the application of the foregoing does not generate sufficient revenues to cover the timely service of the BWA's obligations including the service of its debt, and a proportional part of the investment program for the systems, as indicated in Section IV of Appendix V, the Borrower, in coordination with the BWA, shall take the necessary measures, including rate increases, to obtain the additional resources required to achieve that purpose.
 - (g) The Bank shall establish such inspection procedures as it deems necessary to assure the satisfactory execution of the Project and the Borrower and the Executing Agency shall extend all cooperation which is required for the most effective accomplishment of this purpose. From the amount of the financing the sum of US\$232,000 shall be allocated for credit to the income accounts of the Bank to meet expenses of general inspection and supervision.
9. Conditional Provision: The contract or contracts which are executed pursuant to the authorization conferred upon the terms of this resolution shall enter into force only when the Board of Executive Directors has determined by means of resolution that the Bank has sufficient resources available in the Ordinary Capital, to cover the loan authorized by this resolution.

RECOMMENDATIONS

- A. It is recommended that the following conditions, to be fulfilled to the satisfaction of the Bank, be included in the loan contracts in addition to the conditions set forth in the proposed resolutions:
1. Within 6 months from the effective date of the loan contracts, the Borrower, through the Executing Agency, shall select and contract the following individual consultants: (a) an institutional and financial analyst; (b) a water and sewerage rate specialist; and (c) a water meter expert.
 2. Within 3 months of receiving the final reports of the consultants referred to in paragraph A.1 above, the PEU shall submit to the Bank for its approval a plan to implement the recommendations from said consultants.
 3. Within 9 months from the effective date of the loan contracts, the BWA through the PEU shall submit to the Bank an installation program for the meters to be purchased and installed with the resources of the Bank's financing. Such program shall ensure that these installations shall be completed within the Project execution period.
 4. Unless the Bank shall agree otherwise, prior to issuing each call for public bids, or if there is no bidding, prior to the acquisition of the goods or the initiation of works, the Borrower, through the Executing Agency, shall submit to the Bank:
 - (a) the general plans, specifications, budgets and other documents needed for the acquisition or construction and, where applicable, the specific requirements and other documents needed for the call for bids; and
 - (b) in the case of works, evidence that: (i) it has the legal possession, easements or other pertinent rights to the land required for their construction; and (ii) it has adopted the guidelines for mitigation of the negative impacts on the environment caused by the construction.
 5. Within 9 months from the effective date of the loan contracts, the BWA shall submit to the Bank a plan detailing the measures it will take to ensure that, by fiscal year ending March 31st, 1997 a level of collection equal to at least 85% of the balances outstanding of the accounts relating to the services it provides. For this purpose, balances outstanding are considered those accounts which became due during the respective fiscal year plus accounts owed from previous years. Such plan shall also specify the measures to achieve collection levels of approximately 70% in fiscal year 1993-94, approximately 75% in

fiscal year 1994-95, approximately 80% in fiscal year 1995-1996, and at least 85% in fiscal year 1996-97. The BWA shall present, within 120 days following the close of each fiscal year, during the life of the loan contracts, commencing with fiscal year beginning April 1, 1997, evidence of having achieved these levels of collection on accounts receivable.

6. Within 24 months from the effective date of the loan contracts, the Borrower, through the Executing Agency, shall submit evidence to the Bank that an internal audit unit has been created within BWA and has been adequately staffed.
7. Within 42 months from the effective date of the loan contracts, the Borrower, through the executing agency, shall contract a consulting firm or a specialized institution to carry out the integrated and coordinated environmental program, referred to in clauses 8 (c)(iii) of Appendices I and II, to monitor the ground and sea water quality, for two years after the completion of the works of the Project, according to the terms of reference agreed upon with the Bank. The Borrower shall continue to carry out said monitoring program for eight additional years and shall submit to the Bank annually the respective comprehensive reports according to the format previously agreed upon with the Bank.
8. Within 48 months from the effective date of the loan contracts, the Borrower, through the Executing Agency, shall: (a) contract a consulting firm to carry out for two years the operational assistance program, in accordance with terms of reference to be specified by the engineering consulting firm hired for construction supervision, and agreed upon with the Bank; and (b) submit to the Bank a quarterly report containing the resources of such operation assistance program carried out by said consulting firm.
9. The Borrower, through the Executing Agency, shall submit to the Bank:
 - (a) annually, within 60 days after the end of each fiscal year, for ten years after the date of the completion of the Project, a report in the format of the comprehensive report previously agreed upon with the Bank, containing the results of the environmental monitoring program carried out in the preceding year; and
 - (b) quarterly, for two years after the date of the completion of the Project, a report containing the results of the operational assistance program referred to in paragraph 2.01(b)(v) of Appendix V to be carried out by the consulting firm referred to in Recommendation 8 above.
10. Within 36 months from the effective date of the loan contracts, the BWA shall submit evidence to the Bank that it has revalued its fixed assets and that a mechanism has been established for periodic revaluation thereafter.

11. The Borrower, through the Executing Agency or the BWA, shall:

- (a) assure that the works involved in the Project be adequately maintained in accordance with generally accepted technical standards; and
- (b) submit to the Bank, during the 10 years following completion of the first of the works of the Project, and within the first quarter of each fiscal year, the annual maintenance report for the works and equipment of the Project for that year, as well as a report on the annual maintenance status of such works and equipment, in accordance with the provisions set forth in Section VII of Appendix V. If the inspections conducted by the Bank, or reports it receives, reveal that actual maintenance is below the agreed-upon levels, the Borrower shall take appropriate action to have the deficiencies fully corrected.

12. The annual financial statements of the BWA, during the life of the loans, and the annual financial statements of the Project during its execution, shall be presented to the Bank audited by an independent public accounting firm acceptable to the Bank.

B. The loan contracts shall include an annex substantially similar to Appendix V ("The Project").

PROPOSED RESOLUTION

BARBADOS. PARTIAL PAYMENT OF INTEREST ON LOAN NO. _____ TO
The Government of Barbados

(South Coast Sewerage Project)

The Board of Executive Directors

RESOLVES:

1. That the President of the Bank, or such representative as he shall designate, is authorized, in the name and on behalf of the Bank, as administrator of the Intermediate Financing Facility Account (hereinafter referred to as "the Account") to enter into such contract or contracts as may be necessary with the Government of Barbados, as Borrower, and to adopt other pertinent measures to use the resources of the Account to pay a part of the interest due by the Borrower on outstanding balances of the loan authorized by Resolution DE- /9_, for financing part of the cost of the South Coast Sewerage Project (hereinafter referred to as the "approved loan"). Such part shall represent up to 5% per annum of the outstanding balances of the loan.

2. That the Bank shall charge to the Account the amounts due by the Borrower and to be paid by the Account, in the currencies designated by the Bank and available in the Account, on the dates specified for the payment of interest or on the date or dates the Bank receives the payment of the remainder of the interest owed by the Borrower (hereinafter "Remainder"). Should the Borrower not have paid on the date due the Remainder, as well as any payment of principal or fees, the Bank shall withhold payment of the amount of interest authorized to be paid from the Account to the Bank. In such event, the Borrower shall remain liable for the total amount of the interest due and owed until such time as the Bank has received payment of the Remainder and of the respective amounts for amortization and fees.

3. That to the extent that the Bank receives payments from the Account for interest on the approved loan, the Borrower shall not be liable for the payment of such amounts and, consequently, it shall not be obligated to repay to the Bank any amounts of interest paid from the Account to the Bank.

4. That the borrower may decide to pay the whole amount of the interest accrued on the outstanding balances of the approved loan either during the life of the loan or only during the amortization period of said loan. In both cases the Bank shall, as soon as possible, reimburse the country for interest paid to the Bank and which may be charged to the Account in accordance with Clauses 1 and 2 above.

5. That to the extent that the Bank determines that there are not sufficient resources available in the Account for making the payments referred to in Sections 2 and 4 above, the country shall pay the interest due on the dates and the amounts specified in the loan contract, up to the full amount accrued on the outstanding balances of the approved loan without obligation of the Bank to reimburse any amount whatsoever.

THE Project

(Annex A to the loan contracts)

I. Objectives

- 1.01 The primary objective of the Project is to achieve for the near-shore waters on the south coast of the country a bacteriological condition that corresponds to accepted international standards and at the same time to reduce the chemical contamination that affects the reefs, marine life and beach erosion.
- 1.02 Specifically, the Project shall: (a) prevent further contamination of the groundwater reserves in the Project area; (b) prevent further contamination of the near-shore seawater and of deterioration of the coral reefs and other marine life, and (c) improve general sanitary conditions.
- 1.03 The Project shall also contribute to improving the operation and maintenance of the existing Bridgetown sewerage system as well as the capability of the BWA in the commercial and financial management areas.

II. Description

- 2.01 The Project shall consist of the following components:

a. Works

- (i) A collection system composed of approximately 40 km of gravity and the corresponding service connections.
- (ii) Five lift stations located at Aquatic Gap, Palm Beach, Deal Gardens, Welches and Hastings.
- (iii) A force main line of approximately 4 km.
- (iv) A wastewater treatment plant and main pumping station with 27,930 m³ per day of peak hydraulic capacity.
- (v) An outfall line of approximately 1 km seaward from Needhams's point.
- (vi) All the in-house installation for the service area which include approximately 3,269 connections for private residences as well as commercial and public buildings.

b. Complementary components

- (i) The Bridgetown in-house connections - The Project makes provision to reimburse the GOB for the investments made in the in-house connections program being carried out by BWA.
- (ii) Water meters - Purchase and installation of approximately 40,000 water meters and twenty macro meters.
- (iii) Equipment for operation and maintenance of the system (Bridgetown and South Coast).
- (iv) The environmental monitoring program referred to in clauses 8(c)(iii) of Appendices I and II, and in Recommendations 7 and 8 of Appendix III, shall include the following elements: (1) the routine construction phase mitigation measures that shall be used during the construction of the collection system, pumping stations, treatment plant, transmission line and outfall; (2) coastal water quality monitoring (for point and diffuse sources); (3) coastal reef monitoring; (4) fisheries productivity monitoring; and (5) groundwater monitoring.
- (v) Operational Assistance for the handling of the system and the provision of the on-the-job training for the BWA's operators.

c. Institutional strengthening assistance

The institutional strengthening assistance shall consist of a diagnostic report and recommendations. The consultants shall be required to analyze in detail the present structure, operational activities and financial situation of the BWA, including departmental functions, assessment of manpower requirements and qualifications, commercial activities and water and sewerage rate system.

III. Total Cost of the Project and Financing Plan

- 3.01 The estimated cost of the Project is the equivalent of US\$73,100,000, in accordance with the following investment categories and sources of financing:

TABLE II-1 Project Cost and Financing (in US\$000)						
Categories	IDB		COUNTERPART ¹		TOTAL	Z
	IFF	OC	EIB	LOCAL		
I. Engineering	4,216	1,760	-	1,450	7,426	10.2
1.1 Project engineering	1,576	-	-	150	1,726	
1.2 Supervision	2,640	1,760	-	-	4,400	
1.3 Administration	-	-	-	1,300	1,300	
II. Direct cost	16,289	12,131	8,836	5,539	42,795	58.5
2.1 Contract No.1 - WTP	-	-	6,989	-	6,989	
2.2 Contract No.2 - Collection	13,440	7,300	1,847	2,118	24,705	
2.3 Contract No.3 - Outfall	2,849	2,229	-	-	5,078	
2.4 Contract No.4 - Connection (in-house)	-	2,602	-	3,421	6,023	
III. Concurrent cost	1,995	3,040	-	840	5,875	8.0
3.1 Contract No.5 - Equipment O&M	-	840	-	-	840	
3.2 Land	-	-	-	840	840	
3.3 Connection Bridgetown	-	1,600	-	-	1,600	
3.4 Contract No.6 - Water meters	1,000	600	-	-	1,600	
3.5 Monitoring	230	-	-	-	230	
3.6 Operational assistance	525	-	-	-	525	
3.7 Inst.Strengthening	240	-	-	-	240	
BASIC COST	22,500	16,931	8,836	7,829	56,096	
IV. Unallocated	3,756	3,010	1,378	2,127	10,271	14.1
4.1 Contingencies	2,093	1,692	885	784	5,454	
4.2 Escalation	1,663	1,318	493	1,343	4,817	
V. Financial cost	1,744	3,259	786	944	6,733	9.2
5.1 Interest	1,464	3,027	786	-	5,277	
5.2 Credit fee	-	-	-	944	944	
5.3 ISF	280	232	-	-	512	
TOTAL	28,000	23,200	11,000	10,900	73,100	100.0
Percentage	38.3	31.7	15.0	15.0	100.0	

¹It includes EIB's resources, if available.

IV. Proportion of Investment Program

- 4.01 The proportion of the investment program corresponding to the systems referred to in clause 8(f) of the resolutions is 15% determined by relating the net internal generation of funds to the BWA's total investment program.
- 4.02 Internal generation shall mean total operating revenues minus operating expenses, excluding depreciation and amortization costs and financial expenses. Net internal generation is internal generation minus the debt service.

V. Procurement

- 5.01 (a) When the goods to be procured or services to be contracted for the Project, including those related to any form of transportation or insurance are to be financed in whole or in part with foreign exchange from the financing, the procedures and specific requirements for the bidding or other forms of contracting, shall permit the unrestricted participation of goods and services from member countries of the Bank. Consequently, no conditions that would prevent or restrict the offer of goods or the participation of contractors from such countries shall be established in such procedures or specific requirements.
- (b) When sources of credit other than the resources of the financing or the local counterpart are to be used, the Borrower may agree with the creditor upon the procurement procedure to be followed. However, upon the Bank's request, the Borrower shall demonstrate the reasonableness of both price agreed upon or paid for the purchase of goods and services and the financial conditions of the credits. The Borrower shall also demonstrate that the quality of the goods is in conformity with the technical requirements of the Project.

VI. Consulting Services

- 6.01 In the selection and contracting of consulting services financed in whole or in part with the resources of the financing:
- (a) the procedures agreed upon with the Bank shall apply, and (b) no conditions or stipulations may be established that would restrict or prevent the participation of consultants from the Bank's member countries.
- (b) With respect to consulting services financed with resources of the local counterpart, the Bank reserves the right to review and approve, prior to the Borrower proceeding with the corresponding hire, the names and background of the firms or individual consultants selected, their terms of reference, and the agreed fees.

This provision does not apply when resources from the suppliers' credits are used for such contracts.

VII. Maintenance

- 7.01 The purpose of the maintenance shall be to preserve all the works of the Project in operating conditions in which they were upon their completion, at a level compatible with the services they should provide.
- 7.02 The first annual maintenance report shall correspond to the fiscal year subsequent to that in which the first work of the Project went into operation.
- 7.03 The annual maintenance report referred to in paragraph 10 of Appendix III of this document shall include at least the following:
 - (a) details of the organization responsible for the maintenance, the personnel involved, and the number, type, and condition of the maintenance equipment;
 - (b) the location, size, and condition of the repair, storage, and maintenance facilities;
 - (c) information pertaining to the resources to be allocated for maintenance during the current year and the amount to be allocated in the budget during the following year; and
 - (d) a report on the status of maintenance, based on the evaluation system established by the Borrower.