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AGENDA

AT-693
23 August 1985
Original: English

TO: The Board of Executive Directors

FROM: The Secretary

SUBJECT: Barbados. Contingent Repayment Technical Cooperation for the preparation of final designs and complementary studies for the South Coast Sewerage System

Attached for your consideration is a plan of operations for contingent repayment technical cooperation with the Government of Barbados, in the amount of up to Can.\$2,430,000 from the Canadian Fund for the Preparation of Development Projects, to provide for the preparation of final designs and complementary studies for the South Coast sewerage system.

Any questions concerning this operation may be addressed to Mr. Peter Kalil, Preinvestment Section, (extension 48515). Oral presentation of this document is scheduled for the September 11, 1985 meeting of the Committee of the Whole.

If the operation is acceptable to the Committee, Management will negotiate the necessary agreement with the beneficiary. Upon conclusion of the negotiations, the text of the pertinent resolution will be presented in due course to the Board of Executive Directors for approval.

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INTER-AMERICAN DEVELOPMENT BANK

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OPERATIONS DEPARTMENT - PREINVESTMENT SECTION

B A R B A D O S

**Plan of Operations for Contingent Recovery
Technical Cooperation to Finance Final Designs and Complementary
Studies for Sewerage System in South Coast Area**

(TC-84-02-10-9)

I. BASIC DATA

- 1.01 Amount, Terms of the Contribution of the Bank and Fund:** (a) Total Cost of the project: estimated at equiv. US\$2.25 million (Can\$3.037 million); (b) Proposed Contribution by the Bank: up to Can\$2.43 million (80.0%), on a contingent recovery basis to be charged to the Canadian Fund for the Preparation of Development Projects; and (c) local counterpart contribution: equiv. US\$450,000 (Can\$607,000) (20.0%). The rate of exchange used to calculate the cost of this project in Canadian dollars is US\$1.00 = Can\$1.35.
- 1.02 Objective:** To assist the Government in carrying out final designs and complementary studies for a public sewerage system in the South Coast area of Barbados, which has received the country's priority through its Development Plan for 1983-1988.
- 1.03 Participants in the Project:** (a) Applicant: Ministry of Finance and Planning; and (b) Beneficiary and Executing Agency: Ministry of Tourism and the Environment.
- 1.04 Periods for execution and disbursement:** (a) Deadline to commence execution: the executor shall select and hire the consulting firm within 6 months of the date of the agreement; (b) Period of Execution: 18 months from the date the consulting firm begins work; (c) Deadline for presentation of the final report: 30 days from the end of the period of execution; (d) Deadline for the presentation of the final disbursement request: 32 months from the date of the agreement; (e) Deadline for disbursement in full: 35 months from the date of the agreement. A revolving fund of up to Can\$243,000 may be established according to the pertinent norms of the Bank.
- 1.05 Responsibility within the Bank:** In Headquarters (a) Basic Responsibility: Operations Department, Preinvestment Section (OPS/PRI); (b) Technical Responsibility: Project Analysis Department, Infrastructure Division, Sanitary Engineering Section

(PRA/PIN/SAN). The Field Office in Barbados would have the responsibility to supervise the direct execution of the project, in accordance with the pertinent norms of the Bank.

- 1.06 Agreement: A technical cooperation agreement would be signed between the Bank and the Ministry of Tourism and the Environment.
- 1.07 Classification of the Project for Statistical Purposes: (a) Sector: Basic Environmental Sanitation; (b) Field of Activity: Preinvestment; (c) Method of Execution: Consultancy; and (d) Relation to loans: Category A.I.2. - Preparation of Projects.

II. BACKGROUND

A. General Background of Barbados and its Economy

- 2.01 With a total area of 166 square miles and a population of some 256,000 inhabitants, Barbados is one of the most densely populated countries in the world (1,542 persons per square mile). The population is almost evenly divided between rural and urban areas and is growing at a net rate of less than one per cent a year.
- 2.02 Barbados has a long history of constitutional rule, attaining self-government in 1961 and independence in 1966. Since that time, economic development in Barbados has been achieved with social and political stability. Its income distribution is relatively even, and health, education, and welfare facilities are comparatively good, despite a shortage of adequate housing and persistent unemployment.
- 2.03 The country possesses very limited natural resources. Soil, topography and rainfall conditions have led to the traditional concentration on the production of sugar cane in the agricultural sector. Although no metallic deposits are known, petroleum and natural gas are being intensively exploited to the point where they satisfied about half of the country's domestic energy requirements by the end of 1984, compared to approximately 40% a year earlier and 25% in 1982. Perhaps the country's most valuable assets are its beaches and climate, which attracted an all-time high of some 371,000 tourists in 1979.
- 2.04 The openness of the Barbadian economy and its heavy dependence on tourism and sugar exports make it highly vulnerable to international economic conditions and price fluctuations in the international sugar market. Since 1980, the worldwide recession and drop in sugar prices have adversely affected the economy of the country, causing the GDP (at market prices) to drop 2.6% between 1980 and 1981 and another 5.0% between 1981 and 1982. In 1983, the GDP rebounded by some 0.5%, with only petroleum and non-sugar agriculture showing substantial growth, favorably influenced by good weather, better marketing arrangements, and improved infrastructure for the fishing subsector.

- 2.05 Nevertheless, the principal foreign exchange earning sectors - sugar, tourism, and manufacturing - remained depressed. Sugar production, which contributes about a fifth of the country's total yearly foreign exchange earnings, continued its decline by 5 percent, to a 25-year low of 25,000 tons, or about three-fourths the average output of the past decade, partly as a result of the continued effects of the severe flooding of 1981. Tourism, which accounts for over half of the country's annual foreign exchange earnings, declined by about 8.5% in terms of real output (measured in tourist-days), despite an 8% increase of tourist arrivals over 1982. This apparently contradictory performance reflects the continued fall in Canadian and European visitors, due to the slower recovery in those countries and to the relative appreciation of the Barbadian currency, which is tied to the U.S. dollar. At the same time, the number of U.S. visitors, whose average length of stay and expenditures are significantly lower, increased by more than 50% in 1983, to account for 35% of all tourists, up sharply from 25% in 1982.
- 2.06 The manufacturing sector remained depressed in 1983 as a result of weakness in both the domestic market and Barbados' CARICOM trading partners, where devaluations, import restrictions and payment delays seriously weakened demand for the country's manufactured exports. Nevertheless, exports of electronic components, by far the largest single manufactured export item, more than doubled in 1983 after almost a 60% increase in 1982, due to growing demand from non-regional markets, particularly the U.S. With declining output in both tourism and manufacturing and no real growth in public capital outlays, construction also stagnated. As a result, unemployment stood at 15.8% in 1983 compared with 13.3% at the end of 1982.

B. Barbados Development Plan 1983-1988

- 2.07 The "Barbados Development Plan 1983-1988" was approved and released by the Ministry of Finance and Planning at the beginning of 1984. The Plan describes recent economic developments, sets planning objectives, strategies, and targets, and programs public investment both in global terms as well as by sector, for the period involved.
- 2.08 The overall development strategy articulated in the Plan centers on the creation of a stable, socially cohesive and prosperous democracy, based on the following general objectives:
- (a) Stabilize the balance of payment situation and enable the national economy to be less subject to fluctuations in international economic conditions;
 - (b) Launch an assault on poverty and improve housing conditions of low-income households;
 - (c) Promote production of goods and services using local resources, with particular emphasis on service-related activities;

- (d) Make education and training programs relevant to an increasingly technological and competitive world;
- (e) Widen the scope of operation of small business and artisan sectors;
- (f) Improve health and welfare services (food, clothing, shelter, medical care, employment, and leisure); and
- (g) Preserve and enrich the national heritage through cultural and social expression.

2.09 The investment program, which totals equiv. US\$361 million, is broken down by sector in the following fashion:

<u>Sector</u>	<u>Approximate Percentage of Total Planned Capital Expenditure 1983-1988</u>
Infrastructure	25%
Social Services	19%
Industry	10%
Agriculture	10%
Housing	9%
Administrative Services	9%
Energy	5%
Tourism	4%
Fishing	3%
Other	6%
	<hr/>
	100%
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2.10 Of the total planned capital expenditure from 1983-1988, the Government estimates that some 60% will be financed from local sources and 40% from external sources, including, in order of amount of possible future participation, the IDB, World Bank, private market borrowing, CIDA, Venezuela Investment Fund, CDB, EEC, and USAID.

2.11 As can be seen from the percentage figures of proposed Government investment by sector, the social services sector, including education and public and environmental health, is an area of very high priority for future government involvement. The Plan describes the major projects in the social services sector during the period 1983-1988 to be:

- (1) Sewerage projects in South Coast, West Coast, and Greater Bridgetown areas (see paragraphs 2.13-16);
- (2) Improvements in the Psychiatric Hospital (see paragraph 2.19); and

(3) Upgrading of Queen Elizabeth Hospital (see paragraph 2.20).

The IDB is actively involved in this sector in Barbados, and in the three projects named above, as described in paragraphs 2.13-20.

- 2.12 The technical cooperation proposed in this document would finance the final designs and complementary studies for the South Coast sewerage project only, as the Government authorities have decided to postpone investments for the West Coast and Greater Bridgetown sewerage systems until the latter part of the Development Plan.

C. Bank Participation in the Sanitary Engineering Sector of Barbados

1. Background of the Proposed Operation

- 2.13 The Bank approved in mid-1981 a technical cooperation operation for the preparation of feasibility studies and preliminary designs for public sewerage systems in the areas of Greater Bridgetown, the South Coast, and West Coast of Barbados (ATC/CD(PP)-1990-BA, Can\$1.4 million). ^{1/} This technical cooperation, which has been fully executed by the Ministry of Health, serves as the basis for the technical cooperation proposed in this document.
- 2.14 The Ministry of Health hired a consortium of Canadian and Barbadian firms to carry out the feasibility study. Due to delays in the prequalification process and negotiations with the selected consortium, the contract was not signed between the Ministry of Health and the consultants until December 1982. Based on Bank observations to the signed contract, a letter of amendment was signed by the two parties and submitted to the Bank in February 1983. The Bank shortly thereafter declared the operation eligible for first disbursement. Since the period foreseen for the completion of the study was 15 months according to both the professional services contract and the T. C. agreement, the draft final report was submitted to the Ministry of Health and Bank at the beginning of 1984. In March of that year, a mission from Bank headquarters traveled to Barbados for a mid-term review of the forementioned draft final report, in which extensive modifications and additions to the report were requested of the consulting consortium in order for the original terms of reference to be considered fulfilled. The revised version of the final report, submitted to the Bank in July 1984, incorporated some of the supplementary information requested by the Bank in the mid-term review mission. However, the Bank reiterated its request for certain technical and socio-economic data, and this was not submitted to and approved by the Bank until March 1985. The final disbursement request was processed the same month.

^{1/} See document AT-542, Plan of Operations for Technical Cooperation for the Preparation of Feasibility Studies of Sewerage Systems for the Country's South and West Coasts (December 10, 1980).

- 2.15 The feasibility study, which is described in detail in paragraphs 2.29-37, outlines a possible future investment program which would be carried out in three consecutive phases. According to the report, the area of greatest and most urgent need for the construction of public sewerage facilities is the South Coast, followed by the West Coast and Greater Bridgetown Area, in order of priority (see map presented in Annex I).
- 2.16 The Bank considers the quality of the feasibility study to be acceptable, although it should be noted that neither the consultants' draft final report nor the final version of the final report were initially approved by the Bank. As stated previously, there was a significant delay in providing the missing information and in complying with the terms of reference to the satisfaction of the Bank.

2. Other Operations

- 2.17 The Bank has financed one investment project in this sector in Barbados, the Bridgetown Sewerage System project, through which Barbados' first public sewerage system was constructed in Central Bridgetown. ^{1/} This project, financed by loans 440/SF-BA and 440-A/SF-BA is discussed in paragraphs 2.21-24.
- 2.18 The Bank is presently financing a technical cooperation operation for prefeasibility studies and training for coastal conservation (ATN/CD(PP)-2013-BA, Can\$593,000, approved September 1981). The consortium hired to perform the study submitted to the executing agency and Bank in January 1984 a diagnostic survey of the country's beach coastline, outlining the major causes and locations of beach erosion. The study contends that the major reasons for beach erosion are poor storm water drainage, inadequate sea protection structures, and shoreline contamination, further pointing to the need for the construction of public sewerage systems in the country, especially along its densely populated coasts. The consultants' final prefeasibility report, which adequately incorporated the comments of the Bank and Government, was approved by the Bank in February 1985. Additionally, through this TC two local technicians were selected for training in coastal engineering and environmental studies for a two year period which commenced in September 1984.
- 2.19 As referred to in paragraph 2.11, the Bank also approved in December 1984 a TC operation to the Government of Barbados to finance feasibility studies for the improvement of psychiatric and geriatric medical care (ATC/SF-2521-BA, US\$300,000) which would be performed by PAHO under the supervision of the Ministry of Health.

^{1/} The preinvestment studies for the Bridgetown Sewerage System project were financed by a US\$210,000 technical cooperation operation (ATN/SF-1106-BA) approved by the Bank in 1971.

- 2.20 The Bank also approved in February 1985 two loans for a total of US\$11.7 million (155/IC-BA for US\$4.7 million and 768/SF-BA for US\$7.0 million) for the expansion and improvement of basic health care services at the Queen Elizabeth Hospital, including casualty (walk-in emergency care) services. This project, to be executed by the Ministry of Health, would entail the construction of facilities and purchase of equipment for the hospital. For training of personnel as well as for advisory services during the execution of this loan, the Bank also approved technical cooperation ATP/SF-2557-BA as part of the SF-financed loan.

3. Evaluation of Central Bridgetown Sewerage Project

- 2.21 The IDB has played a major role in the construction of the Central Bridgetown Sewerage System. The total cost of the project was originally estimated at US\$13.6 million, of which loan 440/SF-BA, approved in October 1975, financed US\$9.7 million. The project consisted of the construction of a sewage collector system (including 2,500 house connections), a sewage treatment plant, and an underwater discharge (ocean outfall) facility for effluent from the plant. A supplemental loan (440-A/SF-BA) was approved in 1979 and financed US\$2.6 million of the final US\$6.3 million necessary to finish the project. This was necessary after the Government made a decision to relocate the site of the plant, due to unsuitable soil conditions in its originally proposed location. This required new soils studies and major modifications of the designs of the plant, pushing the total cost of the project higher while leaving its original scope and objectives unchanged. The sewerage system was commissioned in August 1982 and since that date has been operating satisfactorily.
- 2.22 Within the execution of the forementioned Central Bridgetown Sewerage Project, house connections have been carried out at a slower rate than anticipated due to the fact that there were initial delays in this activity. According to the executing agency, one of the external construction contractors involved in the execution of the project did not honor its contractual obligations, thereby lowering manpower availability and causing delays in processing connection applications and inspections. Furthermore, local law requires that the occupants of the houses in the affected parts of the city obtain permission from landlords (or their agents) in order to permit sewer lines to be installed and in-house plumbing connections to be made. These problems, which affected mainly low-income "chattel" houses owned by absentee landlords, are being resolved, however: all sewer lines have been installed and as of April 1985 there were a total of 348 connections in the system, 261 in commercial properties, 20 in government buildings, and 67 in households.
- 2.23 The Government is making a concerted effort to accelerate the rate of connections to the Sewerage System through the following measures:

- 1) Letters and application forms are being distributed by hand to commercial and residential premises within the severed areas to encourage and facilitate owners in making sewer connections. There is a significant number of premises (496) that have received approval to connect but have not yet done so. There is an additional number of applications (29) currently being processed, while another 270 property-owners, both commercial and private households, have received letters instructing them to connect to the system.
 - 2) The Barbados Water Authority (BWA) on a district by district basis, has begun to serve 90-day notices to property owners that if they do not connect to the system within that period, BWA will exercise its authority to have the connections made and bill the owner. On failure to honor the bill, costs will be recovered through the courts.
 - 3) The Government has begun an "In-house Plumbing Program" by which the BWA is directly hiring small plumbing contractors to make some 300 connections in low-income homes, to be financed with the resources of the fund created for this purpose through loan 440-A/SF-BA.
- 2.24 Based on these actions, a total of some 1,143 connections either have been made, are being physically carried out, are in process of approval, or have been instructed to be made. The BWA has established and complied with a target of some 25 connections per month since the beginning of 1985. Although this is considered a positive step, at this pace it would take some four more years for the completion of the project, which the Bank finds unacceptable. Consequently, the Bank has insisted with the government of Barbados to increase the rate of connections to finish those remaining within a two year period. This would also be a condition for a future loan for the South Coast system.
- 2.25 The BWA considers that the types of delays incurred in the connections in the Central Bridgetown would not be as likely to occur in a South or West Coast sewerage system due to the fact that there are far fewer dwellings owned by absentee landlords in those areas compared to Central Bridgetown, causing fewer legal complications. The BWA has also gained ever increasing experience in the management of sewerage systems and promotion of connections, and the population in general is more aware of the importance of the public sewerage systems to the environment and economic livelihood of the country.
- 2.26 Parallel to Loan 440/SF-BA, the Bank approved a technical cooperation operation for institutional and tariff studies and the creation of a semi-autonomous entity for national water and sewerage management, the Barbados Water Authority (BWA). The execution and results of this technical cooperation (ATN/SF-1398-BA) were satisfactory. BWA has been in full

operation since 1981. The tariff studies led to the implementation of a rate system which is currently in effect and which complies with current Bank policy in this area.

D. General Background of the South Coast

- 2.27 The South Coast of Barbados is the area with the highest density of tourist facilities in the country. In this area, there are 92 hotels and large apartment buildings with a total of 6,230 beds, as well as approximately 150 unregistered, small guest houses and some 30 restaurants. Adjacent to the coastal hotel strip, there is also a low to upper middle income housing development with a resident population of 5,460. The total current population in the South Coast area which a sewerage system would be designed to benefit is approximately 22,295.
- 2.28 The South Coast area has a history of land and marine pollution problems due mainly to its topography and geology which result in a high ground water table near the coastline. This condition, coupled with high volume of waste water from the buildings in the area, results in:
- (a) the pollution of land around overflowing septic tanks and sewage absorption wells, posing a direct threat to health;
 - (b) the pollution of beaches at certain points with human and kitchen wastes, due to improperly constructed disposal systems or poorly designed marine outfalls which permit the return of wastes to shore;
 - (c) the progressive destruction of coral and other marine life by detergents and other organic and inorganic components of sewage discharged from coastal properties; and
 - (d) serious nuisance to residents and visitors as a result of offensive odors during the frequent pumping of septage from sewerage wells and septic tanks.

E. Major Conclusions and Results of the Feasibility Study

- 2.29 The feasibility study (see paragraphs 2.13-6), in describing existing conditions, states that the presence of coliform bacteria is widespread in the South Coast and other two areas in question and the total coliform count exceeds acceptable limits at most beaches on some occasions. The situation is more critical on the South Coast than on the West Coast. Ground water samples near the beach outflow zone were taken at a popular beach on the South Coast, showing high levels of coliform bacteria.
- 2.30 Except for some of the major hotels and industries, all properties discharge sewage directly into the ground. About 70% of the sewage is waterborne, discharged to absorption wells, while the remainder is disposed to pit privies. "Grey water" commonly discharges to roads and drainage channels and is carried to other areas when flooding occurs. Eight establishments have package

treatment plants with disposal either to the sea or to the ground, while the others utilize a septic tank within the ground disposal system. Through visual inspection, contacts with public health inspectors, investigation of septage haulier's records, and scientific analysis, the consultants concluded that existing conditions confirm the requirement that proper collection, treatment, and disposal of wastewater be implemented in the areas studied, beginning with the South Coast to be followed by the West Coast and Greater Bridgetown areas.

- 2.31 The consultants indicate that the most economical and practical solution to the sewerage disposal problem is the construction and implementation of a separate sewerage system in each of the three areas. In the South Coast area, Graeme Hall best satisfied the site evaluation requirements for a treatment plant. The consultants recommend at that site the construction of an aerated lagoon treatment facility, comprising two cells approximately 0.9 hectares in area. Floating aerators would be installed to provide mixing and aeration. Three alternatives were studied for the disposal of effluent treated at the proposed plant at the Graeme Hall site: land application for infiltration, irrigation, and ocean discharge.
- 2.32 Since the ocean discharge option is being used in the Central Bridgetown sewerage system, it was anticipated that a similar arrangement would be indicated for the South Coast System. Therefore, in compliance with the terms of reference, the consultants gathered oceanographic data showing that ocean discharge may be accomplished safely in a South Coast sewerage system. However, the economic analysis carried out during the course of the study indicated that land application would have a lower cost by a small margin.
- 2.33 At the present time, long term data on land absorption capacity in Barbados does not exist, i.e., the capacity of the ground to safely absorb properly treated sewage discharge and the possibility of recharging the underground water tables or aquifers with discharge filtered through the ground. The type of pilot study needed to determine this capacity was not included in the terms of reference of the feasibility study because an ocean discharge system was originally envisioned for the South Coast System and it was not anticipated that land application would be the least cost solution. Without this pilot study, it cannot be known whether a land absorption disposal system can be safely implemented or not, and therefore the final selection of the optimal project alternative depends on its results.
- 2.34 The consultants recommend in the feasibility study that such a site-specific, pilot-scale wastewater treatment plant be set up to gather the necessary data regarding the land application process and to permit definition of the basic parameters for the final design of the Graeme Hall plant. This study would be financed as the initial activity of the technical cooperation proposed herein

(see paragraph 4.02-3). The consultants to be hired would not proceed to design the outfall for final disposal until this pilot study is completed. It would, however, begin to carry out technical studies and designs for the wastewater treatment plant site during the execution of the pilot study (see paragraph 4.05 and Annex III, Tentative Schedule of Activities).

- 2.35 The feasibility study estimates that the sewerage system necessary to serve the South Coast Area would be required to handle in the year 2020 some 8,380 cubic meters per day of sewage flow within an area of 1,850 hectares, to serve a future population of 30,162 inhabitants.
- 2.36 The consultants further estimate in the study that the cost of construction of the South Coast sewerage system (in equiv. 1984 U.S. dollars), including direct costs, financial costs, land acquisition, engineering and administration, cost escalation, and contingencies, would be approximately US\$40.0 million. Of this total, direct costs would represent some US\$ 25.0 million.
- 2.37 The consultants conducted a cost-benefit analysis in which it was estimated that the internal rate of return would be 14.4% for the South Coast System alone with positive net present value of benefits at a 12% discount rate. Eighty six percent of benefits of the South Coast System would be derived from the reduction of tourism losses and savings in alternative methods of disposal, while 7% correspond to the reduction of losses in the fishing industry. However, the cost-benefit analysis was carried out assuming the ocean discharge option, even though land application was determined during the course of the study to be less expensive. In view of this, additional complementary cost-benefit analysis would be included in the proposed T. C. in order to cover both technical alternatives.

III. OBJECTIVES

- 3.01 The general objective of the proposed operation is to assist the Barbadian authorities to prepare an investment project to improve sewerage management facilities on the South Coast of the country, thereby reducing risks to health from sewage and commercial waste pollution, and improving environmental conditions for both the resident as well as the tourist population in that area.
- 3.02 The specific objective is to provide financing for the hiring of a consulting firm to complete, in cooperation with the national counterpart personnel, the final designs and complementary studies necessary to prepare an investment project for the construction of a sewage disposal system on the South Coast, including technical, socio-economic and financial aspects.
- 3.03 Additionally, the proposed TC would serve to institutionally strengthen the technical capability of the executing agency through on-the-job training to be received by the local technicians working in conjunction with the experts of the consulting firm.

IV. DESCRIPTION

- 4.01 The Beneficiary and Executing Agency of the proposed technical cooperation operation would be the recently established Ministry of Tourism and the Environment. As of January 1985, the functions of executing the services and works of sewerage studies, design, and construction were transferred from the Ministry of Health to the Ministry of Tourism and the Environment. Consequently, the project preparation unit which was created specifically by the Barbadian Government for the execution of the feasibility studies and preliminary designs under ATC/CD(PP)-1990-BA, has been transferred from the Ministry of Health to the Ministry of Tourism and the Environment, and will participate in the proposed study as was done in the previous stage. This mechanism, whereby a team of Government personnel form a project team with the experts from the consulting firm, functioned satisfactorily during the preparation of the feasibility studies and the same arrangement is proposed for the new operation, with the participation of basically the same individuals from the project preparation unit.
- 4.02 The proposed technical cooperation would include activities revolving around three basic components: a pilot scale project and alternatives study, final designs for the selected project, and preparation of the loan request. These activities, to be carried out by a fully proven and qualified consulting firm, would include the following elements: 1/
- I. Pilot Scale Project and Alternatives Study
- a. Set up and place into operation a long-term (24 month) pilot scale study of land disposal of sewage effluent;
 - b. Determine technical viability of land disposal based on results of pilot scale plant after six months of operation;
 - c. Perform economic analysis of the technically viable project alternatives (disposal options) and determine optimal alternative; and
 - d. Conduct survey to identify and quantify the social benefits to determine the income distribution of beneficiaries of project.
- II. Final Design for the Selected Project
- a. Review the design parameters of the system (design period, population densities, areas served, per capita contribution, infiltration, industrial wastes, design flows, etc.);

1/ See also Section 4.0 of the Proposed Terms of Reference (Annex II).

- b. Carry out detailed topographical and field survey work and geological and soil studies for the sewer lines, pumping stations, and treatment plant sites;
- c. Select proper pumping equipment and economic sizes of the transmission lines;
- d. Prepare final designs of sewers, pumping stations and treatment plant;
- e. Prepare final designs for final disposal method;
- f. Prepare final plans and specifications necessary for construction of the entire sewerage system; and
- g. Prepare bidding documents for procurement purposes, and a plan for the promotion of house connections.

III. Preparation of Loan Request

Prepare additional supporting technical, institutional, financial, and socio-economic information to allow the government of Barbados to present a loan request according to IDB guidelines.

- 4.03 This study would be completed by the consultants within a period of 18 months. The length of time estimated for these tasks and the general order in which they would be carried out are reflected in the Tentative Schedule of Activities (Annex IV).
- 4.04 With respect to the pilot plant (see paragraph 2.34), the consulting firm would be responsible for its construction and supervision for the first 12 months of operation. It would be the contractual obligation of the executing agency to assume responsibility for the operation and supervision of the pilot scale study for a period of one year after the completion of the first 12 months of operation of the plant under consulting firm's supervision. It is considered reasonable, however, for the firm to determine the technical viability of land disposal after an examination of the results of the first six months of operation of the plant (with Bank approval). It is considered necessary to follow-up the results of the study for a total of two years due to the experimental nature of the study. The longer the study is carried out, the more reliable its results are considered to be. In addition, the pilot scale study would serve to obtain the appropriate design parameters for the determination of the optimal method of disposal not only in the South Coast project, but also in the preparation of the other future stages of sewerage development (West Coast and Greater Bridgetown Areas).
- 4.05 The professional specialists to be represented among the consulting engineers are: Civil and Sanitary Engineers, Hydrologists, Soils Engineers, Mechanical Engineers, Oceanographers, Computer Technologists, Economists, and Financial Analysts.

- 4.06 The local counterpart personnel would include a government Senior Civil or Sanitary Engineer with related experience in wastewater projects, and a Senior Accountant. Clerical, drafting, surveying, and other auxiliary staff will also be assigned by the Ministry of Tourism and the Environment to the project execution unit. Local transportation will be supplied by the executing agency.
- 4.07 It is estimated that the consulting firm would complete the proposed studies within a period of 18 months from the date of initiation of work. Within this period, the firm would furnish some 83 man/months of professional expertise. It is foreseen that the firm to be hired would be a consortium between an international firm (57 man/months) and a national firm (26 man/months). Local counterpart personnel would contribute approximately 24 professional man/months.
- 4.08 In accordance with the rules governing the use of resources from the Canadian Fund for the Preparation of Development Projects, there will be an open competition among Canadian and national firms to be selected by the executing agency (with Bank approval) to carry out the proposed studies. Only qualified consulting firms with sufficient accredited experience in the design of similar projects may participate in the selection process for this study. The participants will clearly show their experience in the construction and running of pilot projects which include infiltration and rechargeable wells. This experience will be clearly exhibited by the firms competing for the contract or their associates.
- 4.09 Due to the highly specialized nature of this work, the consulting firm will be carefully selected and the Bank will closely monitor their performance during the execution of their work. In addition, the Bank will approve any change in the technical personnel assigned by the consulting firm to the study, based on their professional qualifications. This additional measure of supervision by the Bank, which shall be mentioned both in the agreement between the Bank and the beneficiary and in the contract between the executing agency and the consulting firm, is considered necessary based on the complexity and uniqueness of the work to be done, as specified in detail in the terms of reference.
- 4.10 The detailed Proposed Terms of Reference of the study are presented in Annex II of this document. A Tentative Schedule of Activities is included in Annex III.

V. COST AND FINANCING

- 5.01 The total cost of the proposed technical cooperation operation is estimated at equiv. US\$2.25 million (Can\$3.037 million), of which the Bank would finance up to Can\$2.43 million (80.0%). The government of Barbados would finance approximately equiv. US\$450,000 (Can\$607,000) (20.0%).

5.02 The estimated budget of the proposed operation in Canadian dollars utilizing an exchange rate of US\$1.00 = Can\$1.35, is as follows:

(in Can\$ 000)

	<u>IDB</u>	<u>Beneficiary</u>	<u>Total</u>
1. <u>Consulting Firm</u>	<u>2,184</u>	-	<u>2,184</u>
1.1 Fees	1,436	-	1,436
1.1.1 Honoraria	480	-	480
1.1.2 Overhead	720	-	720
1.1.3 Business Travel	236	-	236
1.9 Special Studies	748	-	748
6. <u>General Support</u>	<u>40</u>	<u>567</u>	<u>607</u>
98. <u>Contingencies (10%)</u>	<u>206</u>	<u>40</u>	<u>246</u>
<u>TOTAL</u>	<u>2,430</u>	<u>607</u>	<u>3,037</u>
	=====	===	=====
Percentage	80.0%	20.0%	100.0%

5.03 As shown, the Bank would finance the services of a consulting firm, which would include fees (honoraria, overhead, and business travel), costs of specific technical tests, surveys, or studies, and all costs relating to the set up and first twelve months of operation of the pilot study for land disposal. ^{1/} Bank financing for general support would consist of computer time and publications, while the Beneficiary's contribution toward the same category would cover technical counterpart and support personnel, communications, local travel, and the cost of operation of the pilot plant during its second year of operation.

5.04 The Bank's contribution of up to Can\$2.43 million would be approved on a contingent recovery basis to be charged to the Canadian Fund for the Preparation of Development Projects. If the Beneficiary subsequently obtains financing from the Bank or other external source of financing for the investment project resulting from the proposed technical cooperation, the operation would be reimbursable directly to the Bank. If no investment project results, the operation would be non-reimbursable.

^{1/} The pilot study, which would entail the construction of a pilot-scale plant and the supervision of its operation by the consultants for the first twelve months, (see par. 2.33-34), would cost approximately Can\$432,000 (equiv. US\$320,000) within the total allocated under the heading of Consulting Firm in paragraph 5.02.

- 5.05 Annex IV contains a more detailed version of the budget shown on page 15.

VI. JUSTIFICATION

- 6.01 Barbados's present sewage disposal methods urgently need to be improved to promote healthful living conditions for the resident population, protect the environment, and provide the tourist industry with proper facilities for the disposal of human and commercial wastes.
- 6.02 In all of Barbados at the present time, with the exception of the Central Bridgetown area served by the recently completed public sewerage system financed by loans 440/SF-BA and 440-A/SF-BA, disposal of human wastes is through the use of privy pits, septic tanks, or sewage absorption wells. Water from baths and kitchens is generally discharged into open drains which enter public storm drains and eventually are disposed directly into the sea.
- 6.03 Traditional soil absorption methods of sewage disposal are severely restricted in Barbados by a water table which is generally close to ground level (around one meter below the surface in some areas). This greatly increases the risk of contamination of the water supply. In certain other densely populated areas, untreated grease from restaurants coats the surface of the soil, further restricting the absorption process.
- 6.04 As stated in paragraph 2.29, elevated coliform bacteria counts have been shown to exist on the South and West Coasts and in areas of Greater Bridgetown not served by the Central Bridgetown public sewerage system, providing clear evidence that untreated sewage could cause the risk of sickness to both residents and tourists in these cases.
- 6.05 Furthermore, marine ecology studies have indicated that the offshore coral reefs and other nearby marine flora and fauna are being seriously damaged by untreated sewage disposal from the coast. Detergents, grease, and other effluents are being directly discharged into the sea, thereby polluting the ecologically delicate marine environment. Some studies have suggested that damage to coral reefs may diminish their breakwater effect, causing serious erosion of beaches as a result. In areas in which sewage was previously discharged directly into the sea but is now treated at the Bank-financed Central Bridgetown Treatment Plant, however, a notable recolonization of coral has been reported, indicating that a reversal of past damage may be possible in whole or in part if proper sewage treatment facilities are built and implemented in a timely fashion.

- 6.06 The Barbadian economy, as described in paragraphs 2.03-6, is heavily dependent upon the tourist industry for income and foreign exchange generation. The most densely populated tourist areas (the South and West Coasts) are among the areas in which the greatest sewage contamination problems exist. Improper sewage disposal methods threaten the cleanliness and attractiveness of the coastline and beaches, without which the tourist industry could not survive.
- 6.07 The feasibility study described in paragraphs 2.13-6 and 2.29-37 has shown the possible future investment projects for each of the sewerage systems in the South and West Coasts and Greater Bridgetown areas to be economically feasible. From a technical point of view, the need is greatest to provide proper sewage disposal facilities on the South Coast first, and therefore an investment project for a sewerage system on the South Coast alone is the priority of the Barbadian Government at the present time. The inclusion of the T. C. proposed herein, as well as the corresponding investment project, in the Bank pipeline was officially confirmed by the national authorities during the official visit of the President of the Bank to Barbados in May 1985. The investment project is tentatively included in the pipeline of the Bank for 1986 (BA-0036). The feasibility study estimates the total cost of the investment project at approximately US\$40.0 million.
- 6.08 The preparation of final designs and complementary studies, for which financing is proposed in this document, is the final step necessary to prepare this investment project for financing, construction, and placement into service.

VII. REPORTS

- 7.01 The consulting firm would be required to submit to the Ministry of Tourism and the Environment in seven copies each (three for the executing agency and four for the Bank) the following reports, as mentioned in the Terms of Reference (Annex II):
1. Work Program: Within 15 days from the commencement of work, setting out the nature and timing of each component and activity of the study.
 2. First Interim Report: Within 4 months from the commencement of work, describing activities carried out and results obtained to date, as well as actions programmed for the remainder of the study. Will include the methodology, model, and procedures to be used in the economic analysis.
 3. Second Interim Report: Within 8 months from the commencement of work, describing activities carried out and results obtained to date as well as actions programmed for the remainder of the study. Will include results of pilot scale study to date, economic analysis, and recommendations and justification of the selected alternative for disposal.

4. Third Interim Report: Within 12 months from commencement of work, describing activities carried out and results obtained to date as well as actions programmed for the remainder of the study.
 5. Draft Final Report: Within 16 months from the commencement of work, containing all elements and final results of the study.
 6. Final Report: Within 18 months from the commencement of work, containing all elements and final results of the study in final form, adequately incorporating the comments of the executing agency and IDB.
- 7.02 The executing agency will be required to submit to the Bank its comments on the above-mentioned reports within 30 days from their receipt from the consulting firm.
- 7.03 Within 60 days from the date of the final disbursement of the Bank contribution, the Beneficiary will present to the Bank a statement of expenses charged to the both the Bank's contribution and to its own resources, certified by auditors satisfactory to the Bank.

VIII. EVALUATION

- 8.01 The Project Completion Report (PCR) of the proposed technical cooperation, containing an evaluation of the achievement of the objectives of the operation, degree of fulfillment of the terms of reference, and quality of the reports, would be carried out by the Bank's Field Office in Barbados within six months from the date of the final disbursement, in accordance with the norms of the Bank.
- 8.02 The performance evaluation of the consulting firm would also be completed by the Field Office within the same period, according to Bank procedures.

IX. RECOMMENDATION

- 9.01 By virtue of the information presented herein, it is recommended to the Operations Manager that this Plan of Operations be presented for the consideration of Loan Committee (CEPPCT) and, subsequently, of the Committee of the Whole and Board of Executive Directors.

PROPOSED RESOLUTION

BARBADOS. CONTINGENT REPAYMENT TECHNICAL COOPERATION FOR THE
PREPARATION OF FINAL DESIGNS AND COMPLEMENTARY STUDIES
FOR THE SOUTH COAST SEWERAGE SYSTEM

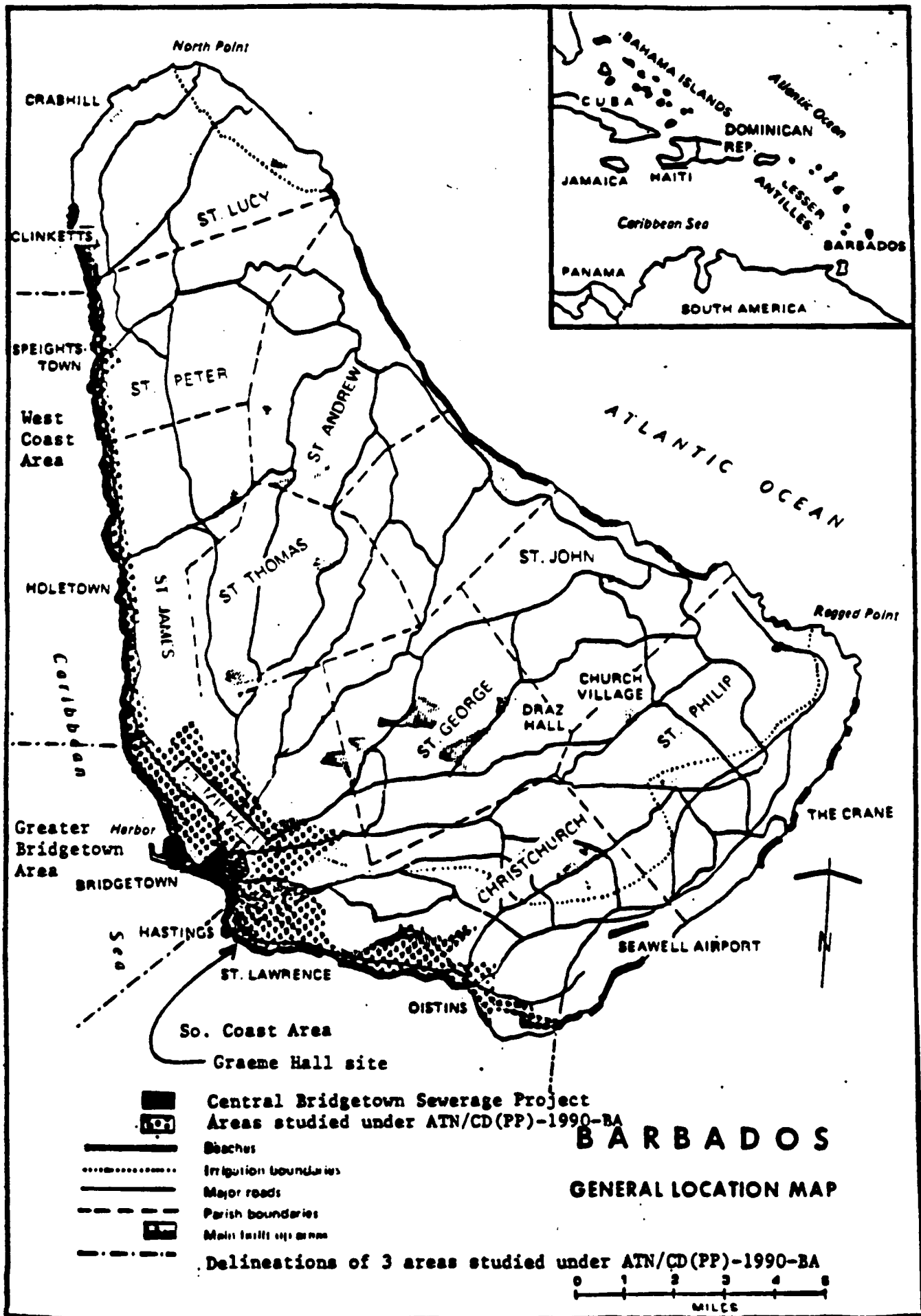
The Board of Executive Directors

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, to enter into such agreements as may be necessary and to adopt such other measures as may be pertinent for the execution of the plan of operations referred to in Document AT with respect to technical cooperation with the Government of Barbados for the preparation of final designs and complementary studies for the South Coast sewerage system.

2. That up to the sum of CAN\$2,430,000, is authorized for the purposes of this resolution, chargeable to the resources of the Canadian Fund for the Preparation of Development Projects.

3. That the above-mentioned sum is to be provided on a contingent repayment basis, in accordance with the respective conditions which shall be set forth in the agreement to be signed for this operation.



FINAL DESIGN OF THE SOUTH COAST AREA
SANITARY SEWERAGE SYSTEM
PROPOSED TERMS OF REFERENCE

- 1.0 GENERAL INFORMATION.- The consulting firm to be selected and hired to complete the study will carry out its contractual services according to the guidelines presented in these proposed terms of reference. The prequalified firms will be furnished a copy of the feasibility report and predesign report by the executing agency, and based on this documentation and the proposed terms of reference, they will develop their own technical proposals for consideration by the executing agency in the final selection of the firm. The final terms of reference negotiated between the executing agency and the selected firm must receive prior approval of the IDB before the work may begin.
- 2.0 TECHNICAL CHARACTERISTICS OF THE CONSULTING FIRM
 - 2.1 Only qualified consulting firms with sufficient accredited experience in the design of similar projects may participate in the selection process for this study. The participants will clearly show their experience in the construction and running of pilot projects which include infiltration basins and rechargable wells. This experience will be clearly exhibited by the firm or their associates.
- 3.0 TERM OF SERVICES.- It is estimated that the study will be completed within an 18 month period, including documentation necessary to submit a loan request to an international lending agency (I.D.B.), which forms an integral part of the services to be rendered.

4.0 CONTENT OF THE TERMS OF REFERENCE

- 4.1 The final disposal process (land or sea) would be selected based on the operation and results of a pilot project to be built by the consulting firm in the proposed area for the wastewater treatment plant. This pilot project will be operated by the consulting firm for the first 12 months. Upon the completion of the first 6 months of operation, sufficient information will be gathered to allow the consulting firm to obtain the necessary parameters to support the land disposal alternative.
- 4.2 This monitoring process and modeling would be extended by the executing agency for one year after the completion of the first 12 months of operation.
- 4.3 The test site would be located in the vicinity of Kingsland, Christ Church, approximately 2.8 km east northeast of Graeme Hall. The site is about 70 m above sea level and is agricultural land. Final selection of the specific site will involve the Health, the Lands and the Agriculture Ministries, as well as private owners. The executing agency will secure the land for the test site before the consultants begin work.
- 4.4 At the test site, the consulting firm will build the following works:
- a) access road
 - b) storage pond, capacity 400 m³
 - c) 2 infiltration basins, 80 m² each
 - d) 2 recharge wells, 1.5 m² x 5 m (depth)
 - e) piping and control valves
 - f) fencing and landscaping

- 4.5 Sewage effluent could be stored in the lagoon for about five days before being transferred to the infiltration basins and recharge well, which would be operated on a "rest and run" cycle of eight to ten days. The storage pond, in addition to facilitating the operation to the pilot scale facilities, will simulate the treatment process proposed at Graeme Hall and should ensure the use of a similar effluent quality in the test procedures.
- 4.6 The sources of treated sewage effluent presently existing on the South Coast and estimated average daily sewage volumes are:

Welcome Inn	80 m3
Southern Palm	30
Asta	50
Holiday Inn	100
Hilton	200

The above estimates of flow are conservative and for the use of this sewage effluent for pilot recharge purposes, a guaranteed daily volume must be available. A minimum of 80 m3/day is proposed for the pilot project and must be secured by the executing agency.

- 4.7 Monitoring of the operations would be required as well as of the effects (if any) on ground water level and ground water quality. For the latter, monitoring boreholes would be required which would be sited principally between the recharge facilities and the coast. The consulting firm would devise a mathematical model to define the type and extent of the shore pollution including but not limited to chloride ion, nitrogen, phosphorus, ammonia concentrations and total coliform/fecal concentrations.

- 4.8 Due to the nature of this experimental work, the consultants will be free to propose alternative procedures based on their own experience. Careful consideration will be given to this aspect within the technical proposals, for the purpose of final selection of the consultant.
- 4.9 The results of this phase will be sufficiently certain in order to facilitate the updating of the alternative technical-economic study which is also an obligation of the consulting firm before entering into the final design of the selected disposal alternative.
- 4.10 The technical and environmental feasibility of the land method of disposal will be determined through a pilot project and longer investigations as mentioned previously. A marine outfall disposal method and detailed designs will be prepared for the marine pipeline. During this phase, additional marine investigation will be required to secure data for this alternative. The consulting firm will prepare a predesign for each alternative.
- 4.11 Socio-Economic Aspect
- The consulting firm will carry out the benefit cost analysis for the investment program utilizing appropriate minimum cost solutions, and the SIMOP model described in Project Analysis Paper No. 5 (IDB, 1980).
- 4.12 In the First Interim Report due 4 months after initiation of work (see Section 6.1), the consultants shall set out the methodology, model, and procedures to be used in the economic analysis, for the comments of the executing agency and Bank. The Second Interim Report due 8 months after initiation of work, shall contain the results of the economic analysis. The economical analysis shall include, but not necessarily be limited to, the elements described herein.

4.13 Analysis of Economic Costs

For each alternative technical solution the consulting firm shall prepare:

- a) Initial investment costs broken down by expenditure categories, local and import material, equipment, fuel, and skilled and unskilled labour.
- b) Periodic costs broken down in the same manner as the initial investment costs.
- c) Operation and maintenance costs broken down by fixed and variable cost components, showing separately in each category, operating costs, the cost of labour, material, chemicals, energy and other overheads by domestic and import content.
- d) Make detailed calculations and display in appropriate tables the minimum cost analysis of the different alternatives using the discount rate of 12% per annum. Each cost component shall reflect the opportunity costs of resources in Barbados. Divergencies from market prices should be shown explicitly in particular for imported material, other imported goods, and unskilled labour.

4.14 Analysis of Benefits

The consulting firm shall estimate the following:

- a) Base year utilization by different income groups of residential users, commercial, industrial, and public institutions by means of existing sample survey results and/or cross sectional analysis of similar programs.

- b) Forecast the population, commercial, industrial and public institutional users of the program over the life of the program. Each category should be shown separately, all forecasting assumptions and forecasting procedures should be shown in support of analysis.
- c) Forecast the annual utilization of the program based on the initial year utilization and demand forecast. These demand estimates should be shown year by year over the 20 year life of the program.
- d) Consumer's willingness to pay for the service, measured by opportunity cost of alternative methods of disposal, over the project life.
- e) Annualized cost of maintaining beaches in the area of influence of the project free of contamination. These costs shall be based on engineering risk analysis models of beach contamination and erosion.
- f) Increase in water consumption of the beneficiaries using the price and income elasticities derived from existing sample surveys and/or statistics from the Barbados Water Authority.

4.15 Benefit Cost Analysis

The consulting firm shall prepare for each alternative solution on the basis of the demand analysis a benefit cost analysis, recommending the best alternative, with the highest net present value of benefits or Internal Rate of Return for implementation. The study shall also include appropriate sensitivity analysis of different levels of beach contamination and correction costs.

4.16 Low Income Distribution of Benefits

The consulting firm shall prepare data required to allocate the benefits of the project to low income beneficiaries. The data shall include frequency distribution tables of income and family size, as well as a summary of the number of families.

4.17 Final Designs

The consulting firm will carry out the final design for the first stage of the system as defined in the feasibility report (year 2005). This shall comprise the following:

a) Review the design parameters:

- i) design period
- ii) population densities - sites
- iii) areas served in hectares
- iv) per capita contribution - average and peak
- v) infiltration
- vi) industrial wastes
- vii) design flows - average and peak

b) Topography. The consulting firm will carry out all the necessary topographic works for the design of the system.

c) Design of the sewerage system:

1) Sewers

A comprehensive plan of the proposed sewers shall be submitted showing contour lines, all streams rivers, estuaries, size and direction of flow of all proposed sanitary sewers draining to the treatment plants.

ii). Pumping stations

Location and extent of tributary area, location of the pumping station and main force, a contour map of the property of the area to be used, proposed pumping station including provisions for auxiliary power where considered necessary.

iii) Secondary wastewater treatment plant

Layout of the proposed plant showing:

- topography of site
- size and location of plant structures
- schematic flow diagram showing the flow through various units
- piping
- provision for future expansion
- hydraulic profiles

iv) Final disposal method (land or sea), once the least cost alternative has been obtained and approved by the executing agency and the Bank:

- Should marine disposal be used, the position and tract of outfall location shall be clearly indicated; location, type and dimensions and elevations of outfall pipeline, details of the diffuser or other structures for maximum dispersion, type of joints used, cleaning facilities.
- Should land disposal be used, the location of absorption wells, infiltration basins, and irrigation systems shall be clearly indicated with reference to approved landmarks, geological nature of sub-surface.

- d) Description of the components of the system.- Appropriate justification for each element of the design will be required. The selection of pipe will be based on "economic diameter". Adoption of submersible or conventional pumping equipment will be justified taking into account operation and maintenance.
- e) Plans
- i) All plans shall bear a suitable title; they shall be in metric system and will indicate the North point.
 - ii) The plans shall be clear and legible and shall be drawn to a scale which will permit all necessary information to be clearly shown.
 - iii) It is suggested that 1:1000 scale be used for layouts; 1:50 for profiles; 1:20, 1:25 and 1:50 for detailed plans.
 - iv) The plans will show the location of equipment, pipe size and approximate water levels and ground elevations.
- f) Geology. The consultant will carry out the necessary test borings to ascertain the bearing capacity of the soils for the installations of sewers, construction of pumping stations and wastewater treatment plant. Design of the structures of these components will be based on this data. This information will also be shown in plans.
- g) Marine Studies. It shall be the responsibility of the consulting firm to perform marine studies necessary for the adequate siting of a proposed marine outfall (if any) for the disposal of the effluent from the proposed wastewater works.

These studies will also define the bearing capacity of the bedding for the outfall. A quality model of the shore will be used to measure contours of the nutrients and fecal contamination.

- h) Specifications. Complete technical specifications for all components of the project. The specifications accompanying construction drawing shall include, but not be limited to, all construction information necessary to inform the builder in detail of the design requirements as to the quality of materials and workmanship and fabrication of the project, and the type, size, strength, operating characteristics and rating of the equipment, allowable infiltration, complete replacements of all mechanical and electrical equipment, including machinery, valves, piping, electrical apparatus, wiring, laboratory fixtures, construction materials, operating tests for the complete works, also for laboratory equipment and the maintenance of an approved quality effluent.
- i) Cost estimates. The consulting firm will prepare the necessary estimates for every component of the project based on recent estimates. These estimates will clearly indicate cost of labor and materials for every item. The total cost of the project will include: engineering, administration and supervision, direct cost, concurrent cost, financial cost and unallocated cost, all expressed in US\$ equivalent.
- j) Bidding documents. The consulting firm will prepare bidding documents necessary for the construction of the project.

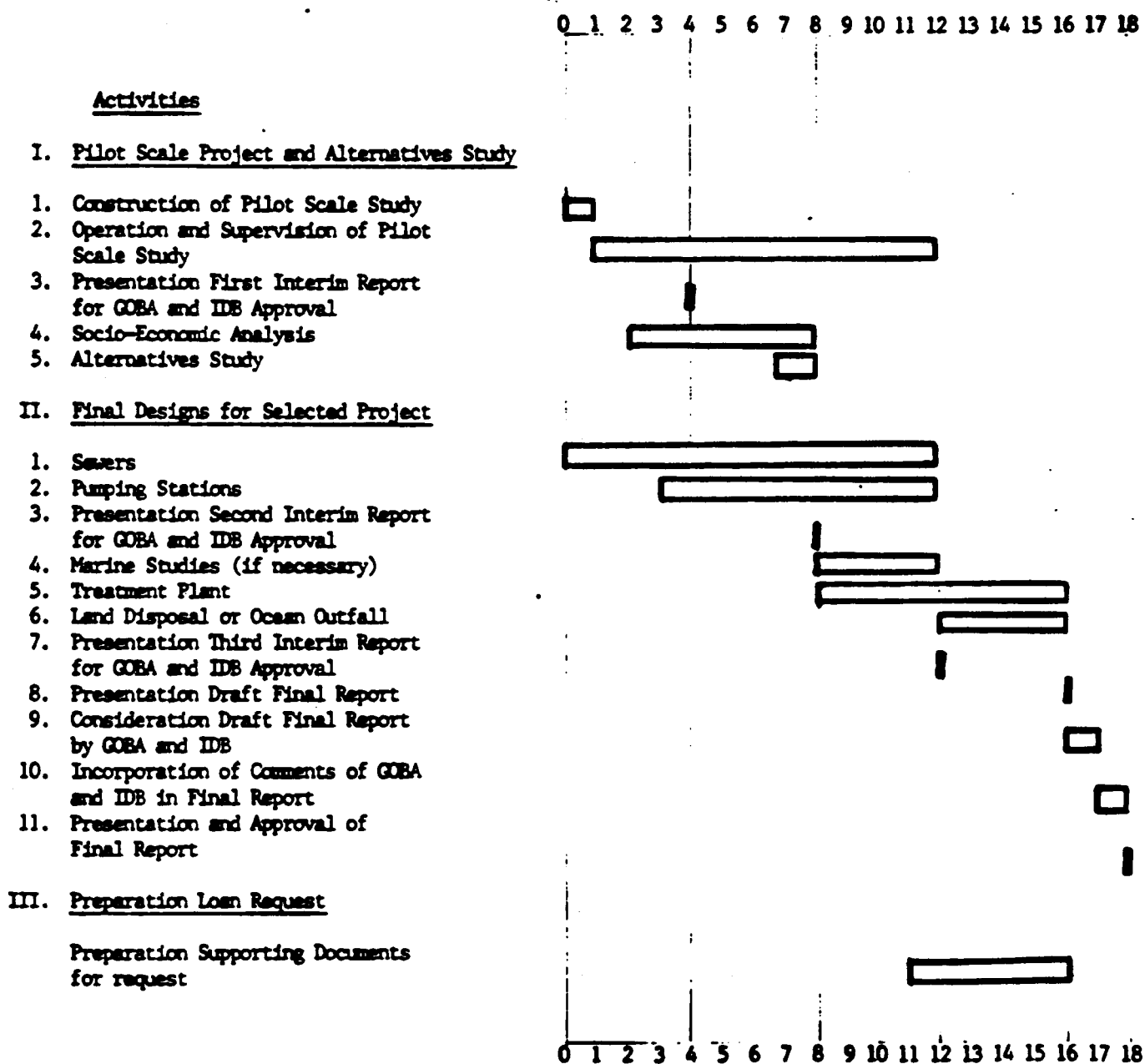
5.0 DOCUMENTATION FOR A LOAN REQUEST TO IDB

- 5.1 The consulting firm will prepare all supporting technical documentation that will permit the GOBA to submit a loan request for the partial financing of the first stage (year 2005) for the construction of the sanitary sewerage system of the South Coast.
- 5.2 In this regard, the consulting firm will follow IDB's guidelines for a loan request and will address to the IDB field office and headquarters requests for clarifications as necessary.
- 5.3 Detailed information about the technical, institutional, financial, socio-economic and legal aspects of the investment project will be prepared by the consulting firm, to allow IDB to make a complete appraisal of the project.
- 5.4 In addition, based on the experience of the GOBA in the execution of the Central Bridgetown Sewerage Project and the nature and characteristics of the So. Coast area, the consulting firm will prepare a plan for the promotion of house connections in said area during the execution of the future project, which will include specific recommendations on possible measures and options to be considered.

6.0 REPORTS

- 6.1 The consulting firm will be required to submit to the executing agency in 7 copies each (3 for the executing agency and 4 for the Bank) the following reports:

- a) Work Program: Within 15 days from the commencement of work, setting out the nature and timing of each component and activity of the study.
- b) First Interim Report: Within 4 months from the commencement of work, describing activities carried out and results obtained to date, as well as actions programmed for the remainder of the study. Will include the methodology, model, and procedures to be used in the economic analysis.
- c) Second Interim Report: Within 8 months from the commencement of work, describing activities carried out and results obtained to date, as well as actions programmed for the remainder of the study. Will include results of pilot scale study to date, economic analysis, and recommendation and justification of the selected alternative for disposal.
- d) Third Interim Report: Within 12 months from commencement of work, describing activities carried out and results obtained to date, as well as actions programmed for the remainder of the study.
- e) Draft Final Report: Within 16 months from the commencement of work, containing all elements and final results of the study.
- f) Final Report: Within 18 months from containing all elements and final results of the study in final form, adequately incorporating the comments of the executing agency and IDB.

Tentative Schedule of Activities

Annex IV

DETAILED BUDGET
 (Can \$000)
 (US\$1.00 = Can\$1.35)

	<u>IDB</u>	<u>GOBA</u>	<u>TOTAL</u>
1. <u>Consulting Firm</u>	<u>2,184</u>	-	<u>2,184</u>
1.1. <u>Fees</u>	<u>1,436</u>	-	<u>1,436</u>
1.1.1 Honoraria			
- International Firm (57m/m)	360	-	360
- National Firm (26 m/m)	120	-	120
1.1.2 Overhead (150%)	720	-	720
1.1.3 Business Travel (International Travel and Per Diem)	236	-	236
1.9 <u>Special Studies</u>	<u>748</u>		<u>748</u>
- Pilot Project Construction (270) Operation for first year (162)	432	-	432
- Marine	68	-	68
- Geophysical and Geologic	68	-	68
- Quality Model	140	-	140
- Topography and socio-economic survey	40	-	40
6. <u>General Support</u>	<u>40</u>	<u>567</u>	<u>445</u>
6.1 Office Space		27	27
6.3 Equipment (Vehicles for Local Transportation)		120	120
6.4 Supplies		14	14
6.6 Support Personnel		190	190
6.7 Publications	40	-	40
6.8 Communications		54	54
6.9 Other (Operation Pilot Project for second year)		162	
98. <u>Contingencies (10%)</u>	<u>206</u>	<u>40</u>	<u>246</u>
TOTAL	2,430	607	3,037
Percentage	80.0%	20.0%	100.0%