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**AGENDA**

AT-96  
13 April 1971  
Original: English

TO: The Board of Executive Directors  
FROM: The Secretary  
SUBJECT: Barbados. Technical assistance to the Ministry of Public Health and Social Welfare

Transmitted herewith is a plan of operations to provide technical assistance on a contingent-recovery basis in an amount equivalent to US\$149,000 to the Ministry of Public Health and Social Welfare of Barbados, for a feasibility study of the Bridgetown sewerage system.

This plan of operations would be charged to the technical assistance budget of the Social Progress Trust Fund for 1971. Should the Bank or another international organization grant a loan to Barbados for a project deriving from this technical assistance, the total amount of expenditures incurred by the Bank for the financing of this plan of operations would be charged to the resources of that loan.

The Executive Directors are requested to communicate to the Secretary, no later than April 27, any observations which they might have with regard to this plan of operations. If no observations are received by that date, it will be understood that there is agreement with respect to the plan of operations and the text of the relevant resolution will be submitted for approval in a subsequent meeting.

Other distribution:

Managers and Advisors  
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Area Chiefs: LON-IV/LAD-IV/ECO-II  
Representative in Barbados

B A R B A D O S

PLAN OF OPERATIONS

TECHNICAL ASSISTANCE TO BARBADOS (MINISTRY OF HEALTH  
AND SOCIAL WELFARE)

(Feasibility Study for Bridgetown Sewerage System)

SUMMARY

1.01 OBJECTIVES<sup>1/</sup>

As a necessary first step in the preparation of a project for installing a sewerage system for Bridgetown, for (the financing of which Barbados has already announced its intention of requesting a loan from the IDB) the objectives of the technical assistance operation would be the preparation of the following:

- (i) a "master plan" for the city of Bridgetown and certain areas surrounding the city;
- (ii) engineering designs for a sanitary sewerage system for central Bridgetown; and
- (iii) a study of the sewage disposal problem near the Belle water pumping station, the principal source of potable water for the city.

1.02 BENEFICIARY AND EXECUTING AGENCY

The beneficiary would be Barbados, and the executing agency would be the Ministry of Health and Social Welfare.

1.03 AMOUNT AND TYPE OF TECHNICAL ASSISTANCE

The equivalent of US\$149,000 on a contingent recoverable basis.

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<sup>1/</sup> Bridgetown's sewage disposal problems are currently handled by septic tanks, infiltration into the ground, or by the dumping of raw sewage into the ocean. (It has no public sewerage system)

1.04 DESCRIPTION OF THE PROJECT

The technical assistance would be carried out by a consulting firm which would be contracted directly by the Ministry of Health and Social Welfare in accordance with established Bank procedures. The Sanitary Engineering Unit of the Ministry of Health and Social Welfare would be responsible for the immediate supervision and administration of the operation. The Unit is headed by a qualified public health engineer, and the following provisions have been made to strengthen its management capabilities:

- (i) the Ministry has decided to hire an additional engineer;
- (ii) an inter-governmental agency consultation group, headed by the chief of the Sanitary Engineering Unit, would be formed to coordinate the technical assistance operation; and
- (iii) a tentative agreement with the Pan American Health Organization has been reached for that organization's assistance in executing the technical assistance operation.

1.05 RESPONSIBILITY WITHIN THE BANK

The Loan Division, Zone II, would have the basic responsibility for the operation until its approval and the signing of the agreement with the Government of Barbados. The basic responsibility would then pass to the corresponding Loan Administration Division. The technical responsibility would rest with the Division of Analysis of Social Development Projects of the Deputy Managership for Project Analysis.

## B A R B A D O S

### PLAN OF OPERATIONS

#### Technical Assistance for Barbados (Ministry of Health and Social Welfare)

#### (Feasibility Study for Bridgetown Sewerage System)

### I. APPLICATION

- 1.01 During various discussions with the Bank beginning in April, 1970, the Government of Barbados indicated that it wished to submit to the Bank a loan request to finance partially the construction of a sewerage system for Bridgetown, the capital city. Reviewing the data available on this project, the Government and members of a Bank Operational Mission to Barbados in August, 1970, determined the need for a technical assistance operation in order to prepare the feasibility study and necessary engineering designs for the project.
- 1.02 On November 13, 1970, the Government of Barbados formally requested from the IDB a technical assistance operation to finance partially the preparation of the following: (i) a master plan for a sewerage disposal system for Bridgetown and various areas surrounding the city; (ii) the engineering designs of a sewerage system for central Bridgetown; and (iii) a study of the sewage disposal problem near the Belle water pumping station, the principal source of potable water for Bridgetown. The results of the technical assistance would be utilized by the Government of Barbados as the basis for the preparation of a loan request to the Bank for the partial financing of the cost of constructing the central Bridgetown sewerage system. The amount of the technical assistance would be the equivalent of US\$149,000 and it would be granted on a contingent recoverable basis.

### II. BENEFICIARY AND EXECUTING AGENCY

- 2.01 The beneficiary would be Barbados, and the executing agency would be the Ministry of Health and Social Welfare. According to the Health Services Act of 1969, the Minister of Health has the principal responsibility in matters concerning health services. These responsibilities regarding sewerage disposal, include the following: (i) to construct, repair and maintain sewers; and

(ii) to make provision by means of sewage disposal works for effectively dealing with the contents of such sewers.

- 2.02 The Ministry's administration is headed by a civil servant, the Permanent Secretary. Its organization is made up of the following Divisions: (i) Planning and Capital Projects; (ii) General Services (includes maintenance, supplies, etc.); (iii) Personnel; (iv) Finance and Accounts; and (v) Technical Services. The Technical Services Division is divided into two Sections, Environmental and Institutional.
- 2.03 The Sanitary Engineering Unit, which forms part of the Environmental Section of the Technical Services Division, would be directly responsible for managing the proposed technical assistance operation. The Unit is headed by a qualified public health engineer, and the following provisions have been made to strengthen its management capabilities: (i) the Ministry has decided to hire an additional engineer; 1/ (ii) an inter-governmental agency consultation group, headed by the Chief of the Sanitary Engineering Unit, would be formed to coordinate the technical assistance operation; and (iii) a tentative agreement with the Pan American Health Organization has been reached for that Organization's assistance in executing the technical assistance operation, (See paragraph 3.03). 2/

### III. BACKGROUND

- 3.01 During the Bank's XI Meeting of the Board of Governors in April of 1970, the Barbados authorities first expressed interest in the possibility of the Bank's financing partially the construction of a sewerage system for Bridgetown.
- 3.02 Subsequently, the Bank's requirements for information to support a loan request for such a project were discussed in considerably greater detail with an official from the Barbados Economic Planning Unit during the latter's visit to Washington on May 8, 1970. (The Economic Planning Unit is the Barbados organization responsible for coordinating IDB/Barbados relations).
- 3.03 In discussions held with the corresponding Barbados authorities during the August, 1970, Operational Mission of the Bank, the general need for and the outline of the technical assistance

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1/ The fulfillment of this provision would be included in the agreement between the IDB and Barbados, as a condition prior to the first disbursement.

2/ While it is considered that such assistance would be helpful, it would not be essential to the completion of the technical assistance operation.

operation under review were agreed upon and a consensus was reached that the results desired of the technical assistance would be to serve as the basis for a loan request to the Bank for the partial financing of a sewerage project for central Bridgetown.

- 3.04 A Bank sanitary engineer, on a Mission to Trinidad, stopped off in Barbados in September, 1970, to orient the Ministry of Health and Social Welfare in preparing the formal technical assistance request and the draft terms of reference. (see Appendix I).
- 3.05 On November 13, 1970, the Government of Barbados submitted to the Bank a formal request for a contingent recoverable technical assistance operation to partially finance the previously described studies (see paragraph 1.02). The technical assistance request estimated the cost of the studies to be the equivalent of US\$199,000. However, in the course of the Bank's analysis of the request, the estimated cost was revised to the equivalent of US\$220,000 in order to include the local administration and supervision costs of the operation as well as to cover certain modifications which Barbados agreed to introduce in the proposal, (see paragraph 7.01).
- 3.06 As mentioned previously, the Pan American Health Organization (PAHO) has expressed an interest in assisting the Government in carrying out the study object of this technical assistance project. Contact on this possibility was first established by the Government with PAHO's permanent mission in Barbados and has since been followed up by direct conversation between officials of the Ministry of Public Health and Social Welfare and the PAHO officials. 1/ (See paragraph 2.03 and 5.05)

#### IV. OBJECTIVES

- 4.01 The basic objectives of the proposed technical assistance operation would be to provide the necessary studies for installing in the future a sewerage system for Bridgetown, (see Section V).
- 4.02 The specific objectives of the operation would be the following:  
(i) to prepare the final engineering designs of a sanitary sewerage system for central Bridgetown; (ii) to draw up a master

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1/ This proposed assistance of PAHO has been approved by PAHO's Zone Headquarters in Caracas. Formal approval awaits only the exchange of letters between PAHO & the Government of Barbados.

plan for the city of Bridgetown and certain areas surrounding the city; and (iii) to study the sewerage disposal problem near the Belle water pumping station, the principal source of potable water for the city.

V. DESCRIPTION OF THE PROJECT

- 5.01 The proposed technical assistance would cover the costs of contracting a consulting firm to execute the operation. This firm would be contracted directly by the Ministry of Health and Social Welfare in accordance with established IDB procedures, as specified in Section IX of this document. The draft terms of reference for the work to be performed are attached to this document, (see Appendix I).
- 5.02 The overall execution of the studies would take approximately eight months from the date of the hiring of the consulting firm. An engineering consulting firm would be retained for the execution of the studies, and certain specialists and/or consulting firms would be subcontracted by the consulting firm to carry out the necessary specialized studies (e.g. marine studies, soil borings, topographical surveys, etc.).
- 5.03 As mentioned in paragraph 2.03, the Sanitary Engineering Unit of the Ministry of Health and Social Welfare would be responsible for the immediate supervision and administration of the operation. The functions of the Unit would include: (i) the analysis of the professional service proposals and the selection of consulting firms to carry out the principal aspects of the studies; (ii) the general administration of the operation; and (iii) the technical decisions regarding the coordination of the consultants' work, the analysis of technical alternatives, the review of reports, etc.
- 5.04 The executing agent would provide such secretarial services, office space, auxiliary staff, printing, office supplies, communications, and local transportation as might be required to support the activities of the consultants in the fulfillment of their tasks. It also would be responsible for some preliminary mapping and topographical work.
- 5.05 The Pan-American Health Organization has reached a tentative agreement to cooperate with the Government of Barbados in the execution of the operation. This cooperation of PAHO would involve

the following aspects and would be duly coordinated with the work of the executing agency and the primary consulting firm: (i) to assign the two resident PAHO engineers in Barbados to cooperate with the corresponding Barbados authorities in reviewing the technical aspects of the studies; (ii) to provide for periodic visits by PAHO sanitary engineers from Zone Headquarters in Caracas; (iii) to provide short-term technical consultants when needed; (iv) to provide certain training for the staff of the Sanitary Engineering Unit; and (v) to grant a fellowship in sanitary engineering to the Barbadian engineer to be hired by the Unit. The assistance from PAHO will facilitate this operation though it is not essential to the carrying out of this technical assistance.

## VI. JUSTIFICATION

- 6.01 The rate of growth in real terms of the Barbadian economy declined to 3.1 per cent in 1969, from 5.3 per cent in 1968 and 7.9 per cent in the previous year. This was mainly the result of a reduction in sugar production, whose contribution to GDP decreased from 18 per cent in 1967 to only 11 per cent in 1969, primarily due to lower production levels arising from a high incidence of damaging fires, low yields, and generally unfavorable weather. This reduction in sugar production not only aggravated the unemployment currently estimated at some 13 per cent - but also has been responsible for lower foreign earnings at a time of rising import levels which reflect the expansion of tourism and other sectors of the economy.
- 6.02 The negative impact of GDP of the fall in sugar production has been softened by the rapid expansion of tourism, which, according to a recent study on this sector in the eastern Caribbean, is estimated to contribute some 40 per cent of the Barbadian GDP. During the last three years, the number of visitors to the island rose by some 22 per cent annually, while gross foreign receipts from tourism increased by more than 28 per cent per year and covered about half of the Barbadian trade deficit. To cope with all of this expansion, hotel accommodations almost doubled in the past three years, with most of the additions taking place in large and medium-sized hotels and apartment-type facilities, mainly in Bridgetown and its vicinity.
- 6.03 The Barbados Development Plan for 1969-1972 projected continued rapid growth of the tourism industry at a pace similar to that of 1967-1969, and that 3,000 additional beds in hotel accommodation



will be necessary during the next three years. Because the best and most accessible beaches are located near Bridgetown, most of the predicted increase in tourism accommodations is expected to take place in this area.

- 6.04 Related to and partially supported by the general expansion in tourism has been the growth of the service sector and industrial activities. Altogether the share of these sectors in GDP increased from 74.6 per cent in 1967 to 83.4 per cent in 1969. The expansion of the service sector, mainly trade, has contributed to a significant change in the physical characteristics of Bridgetown, since most of the traditional limestone block and brick buildings of the business section have been replaced by modern structures of up to seven stories.
- 6.05 All of these structural changes resulted in a further concentration of population in and around Bridgetown, where presently 115,000 persons or about half of the inhabitants live. Population grew at an annual rate of 1.5 per cent in the greater Bridgetown area in the past ten years as compared to less than one per cent in the whole country, both rates may have been held down by emigration.
- 6.06 Despite this expansion, the city of Bridgetown is not served by a public sewerage system. Aside from some private systems serving government institutions, hotels and housing developments, the vast majority of premises in the greater Bridgetown area utilize individual facilities for the disposal of sewage by infiltration into the ground, mainly through simple privy dry pits. This condition, besides being unsatisfactory from the sanitary point of view, is further aggravated because the concentration of population in the area is high and because ground infiltration is difficult, due to the low porosity of the underlying deposits and the low elevation of the ground in relation to the water table in the Bridgetown area as well as the coastal strip. Unfortunately, lack of data prohibits a quantitative appraisal of the effects of this situation on the health of the population, but it is estimated that at least 5 per cent of the known cases of death registered in recent years are due to infectious and parasitic diseases and gastroenteritis.
- 6.07 This situation looks worse yet when the detrimental effects of increased pollution of the beaches on further expansion of tourism are taken into account. In this regard, it should be noted that although the beaches are the primary source of tourist attraction for Barbados, the large hotels located along the

narrow coastal strip extending from Central Bridgetown to the south have been discharging their waste into the sea, very close to the beaches, due to the lack of an adequate sewerage system. Moreover, a substantial increase in Bridgetown's water supply is projected within the next three years, under an expansion plan partly financed with a Canadian Government loan. This will put additional pressure on the sewerage system.

- 6.08 In addition, it should be borne in mind that Bridgetown is expected not only to have a population of 150,000 inhabitants by 1984 (as 30 per cent increase above 1970) but also to continue as the most dynamic economic center of the country. However, no detailed study of the sewerage needs of the area has been made as yet. This technical assistance plan, therefore, would fill a basic need of the country by making it possible: (i) to draw up a master sewerage plan for the city of Bridgetown and its surrounding areas; (ii) to study the sewerage disposal problem in the area surrounding the Belle water pumping station, which is a prime source of potable water for the city; and (iii) to prepare engineering designs, plans and specifications for a sewerage system for the central district of Bridgetown.
- 6.09 It is noteworthy that the CIAP Subcommittee on Barbados, stated in November 1970, that among the immediate technical assistance needs in priority areas is a feasibility study of a Bridgetown sewerage project, which would serve as a basis for obtaining external financing in subsequent years. Moreover, this technical assistance operation is consistent with the priorities established by the Government of Barbados because it is directly related to public health improvement and to tourism development.

VII. OPERATIONS COST AND FINANCE

7.01 The total cost of the operation is estimated to be the equivalent of US\$220,000. The IDB contribution would be the equivalent of US\$149,000, or 67.7% of the total cost of the project. The operation would be financed as follows:

(equivalent in thousands of US\$)

	IDB			GOB <sup>1/</sup>		%
	<u>Foreign</u> <u>Exchange</u> <u>Costs</u>	<u>Local</u> <u>Costs</u>	<u>Total</u> <u>IDB</u>	<u>Local</u> <u>Costs</u>	<u>Total</u> <u>Costs</u>	
(1) Honoraria and other expenses for the primary foreign consulting firm. <sup>2/</sup>	55.1	23.4	78.5	--	78.5	35.7
(2) Honoraria and other expenses for consultants executing sub-contracts. <sup>3/</sup>	30.0	30.0	60.0	20.0	80.0	36.4
(3) Honoraria and other expenses for local personnel. <sup>4/</sup>	--	--	--	31.2	31.2	14.2
(4) General office expenses, local transportation, etc.	--	--	--	10.0	10.0	4.5
(5) Contingencies	10.5	--	10.5	9.8	20.3	9.2
TOTAL	95.6	53.4	149.0	71.0	220.0	100.0
PERCENTAGE	(43.4)	(24.3)	(67.7)	(32.3)	(100.0)	

<sup>1/</sup> Government of Barbados

<sup>2/</sup> This item includes the following cost items for a consulting firm: salaries, overhead of the firm and social benefits (calculated at 100% of salaries), subsistence allowance, the consulting firm's general fee, and international travel.

<sup>3/</sup> The principal components of this item include the following: marine surveys, topographical surveys, and soil borings and testing.

<sup>4/</sup> The costs of local personnel were calculated according to the following approximate breakdown: 2 engineers for a total of 9 man-months, 2 draftsmen for a total of 8 man-months and a secretary and certain auxiliary staff for the period of execution of the project. This item also includes a provision for the equivalent of US\$10,000 for supervision and administrative costs to be financed by the beneficiary. The latter would include such items as secretarial services and office space, auxiliary staff, printing, office supplies, communications, and local transportation as may be required to support the activities of the consultants in the fulfillment of their tasks.

- 7.02 The total cost of the technical assistance operation to the Bank, the sum of the equivalent of US\$149,000, has been estimated as follows:

(Equivalent in thousands of US\$)

	<u>Foreign Exchange</u>	<u>Local Costs</u>	<u>Total</u>	<u>%</u>
(1) Services of the Consulting Firm				
a. Honoraria and overhead costs	55.1	23.4	78.5	52.7
b. Sub-contracting expenses	30.0	30.0	60.0	40.3
(2) Contingencies	10.5	--	10.5	7.0
	<u>95.6</u>	<u>53.4</u>	<u>149.0</u>	<u>100.0</u>
	<u>95.6</u>	<u>53.4</u>	<u>149.0</u>	<u>100.0</u>
PERCENTAGES	(64.2)	(35.8)	(100.0)	

#### VIII. SOURCE OF FUNDS

- 8.01 The total cost of the technical assistance would be allocated on a contingent recoverable basis. In the event that the Bank or any other international agency makes a future loan to Barbados for a project derived from this technical assistance, the total amount of the expenses incurred by the Bank in financing this project would be charged to the new loan's resources. The total cost of the technical assistance to the Bank, a sum equivalent of US\$149,000 would be charged to the Technical Assistance Budget for 1971, (Item I. 1.b.i.) with the Social Progress Trust Fund resources.

#### IX. CONTRACTING OF CONSULTANTS

- 9.01 The Government of Barbados <sup>1/</sup> would select and contract directly the services of a consulting firm within 90 days after the signing of the technical assistance agreement. This firm would provide as many experts as necessary for the execution of this project. The selection of the firm would be done in accordance with the following procedures:

1/ Through the Ministry of Health and Social Welfare.

The Government of Barbados would submit in advance, for the approval of the Bank:

- (i) the selection procedure to be employed;
- (ii) the list of consulting firms among which the selection is to be made, and
- (iii) the terms of reference and the corresponding work schedules describing the work to be performed by the consulting firm.

Once the Bank has approved the above, the beneficiary would request that at least three of the firms submit proposals, without any indication of a price, each describing the manner in which it would solve the problem and the personnel it would assign to such work. The beneficiary would then select the one firm offering the best proposal from among these firms and negotiate the contract price with that firm. The text of the relevant draft contract would be submitted to the Bank for its prior approval.

- 9.02 There are no local funds (Eastern Caribbean dollars) presently included in the resources of the Social Progress Trust Fund, and as a result all payments for this technical assistance would be made in United States dollars or in other resources of the Social Progress Trust Fund.

X. DISBURSEMENTS

- 10.01 All disbursements would be made to the Ministry of Health and Social Welfare of Barbados. The disbursements of the Bank's contribution of up to the equivalent of US\$149,000 would be made within a period not to exceed 15 months from the date of the signing of the agreement with the Bank.
- 10.02 The Bank would establish within 45 days after the signing of an agreement a revolving fund equivalent to US\$30,000 to be replenished upon receipt from the Ministry of Health and Social Welfare of a statement of accounts containing details of expenses incurred in new commitments acquired in the execution of the project.
- 10.03 The Bank would retain the reimbursement of the final 10% due the consultants for professional services until the final report has been reviewed by both the Ministry of Health and Social Welfare and the Bank and is satisfactory to both entities.

XI. REPORTS

- 11.01 The agreement to be signed with the Government of Barbados would establish the following obligations:
- (i) that the Ministry of Health and Social Welfare would submit a quarterly report to the IDB which would describe the progress of the studies and the fulfillment of the terms of reference. The Bank would make observations regarding this report which would be taken into account in the following work;
  - (ii) That a copy of all reports and studies which are presented to the beneficiary by the consultants would be sent to the IDB;
  - (iii) that upon completion of the technical assistance and in a period no more than 60 days from the final disbursement, the Ministry of Health and Social Welfare would submit a final report which would serve as a basis for the Bank's evaluation as well as an accounting report itemizing the use made of the Bank's resources and the local contribution; and
  - (iv) a final report from the primary consulting firm shall be presented to the Ministry of Health and Social Welfare at a time not later than 30 days following the completion of the execution of the project. A copy of this report shall also and simultaneously be presented to the IDB.

XII. SUPERVISION

- 12.01 The contracts to be signed with the consulting firm would specify that the Bank may supervise the work of the consultants through its Representative to Trinidad and Tobago, Barbados and Jamaica.

XIII. EVALUATION CRITERIA

- 13.01 The results of this technical assistance operation would be submitted to an evaluation based on the following criteria:
- (i) The completion of the master sewage disposal plan for the metropolitan area of Bridgetown.

- (ii) The completion of the final engineering design of the sewerage systems for the Central District of Bridgetown.
- (iii) The completion of the feasibility study for the water protection area around the Belle well field and pumping station.
- (iv) The completion of the report on rates and of the operation manuals for the future system.
- (v) The improvements of the technical and administrative conditions of the Sanitary Engineering Unit as a result of its involvement in the project.
- (vi) The adequacy of the study made and in particular of the final engineering designs for central Bridgetown to serve as a basis for a request for the financing of the construction of the system.

#### XIV. AGREEMENT

- 14.01 A technical assistance agreement will be signed between the IDB and the Government of Barbados within 45 days after the approval of this Plan of Operations.
- 14.02 The technical assistance agreement would establish that the approval of this technical assistance would not commit the Bank to the approval of a possible loan for constructing the sewerage system.

#### XV. ELIGIBILITY

The Operations Manager in consultation with the Legal Advisor has affirmed that this Plan of Operations is eligible for financing with the resources of the Social Progress Trust Fund.

#### XVI. RESPONSIBILITY WITHIN THE BANK

- 16.01 The Loan Division, Zone II, would have the basic responsibility for the operation until its approval and the signing of the agreement with the Government of Barbados. The basic responsibility would then pass to the corresponding Loan Administration Division.
- 16.02 The technical responsibility would rest with the Division of Analysis of Social Development Projects.

XVII. RECOMMENDATION

- 17.01 The Operations Manager recommends this Plan of Operations to the President of the Bank through the Technical Assistance Committee for approval and for subsequent presentation of the related resolution to the Board of Executive Directors for consideration.



B A R B A D O S

SEWERAGE STUDIES FOR BRIDGETOWN

TENTATIVE TERMS OF REFERENCE FOR THE CONSULTANT

1. OBJECTIVES

The objectives of the work to be done by the consultant will be as follows:

- a) To present a master plan for the sewerage disposal system for Bridgetown, and adjacent areas;
- b) To develop engineering design for the sewerage system of the central area of Bridgetown;
- c) To present a plan for sewerage disposal in the Zone 1 water protection zone around the Belle water pumping station.

2. BASIC ELEMENTS FOR THE PROJECT

2.1 Areas to be included in the studies

2.1.1 General Area

For the purpose of these terms of reference the general area for the Master Sewerage Study is tentatively defined as that area within the parishes of St. Michael and Christ Church circumscribed by the coast line adjacent to St. Lawrence Church in the south to Exmouth in the southwest and limited on the north by Westbury Road, President Kennedy Drive, Bank Hall Cross Road and Bridge Road; to the East by Welches, Pine and Culloden Roads, Dalkeith Road to the 40 foot contour, along the 40 foot contour to Rendezvous Hill, then along the 20 foot contour to a point immediately east of Graeme Hall swamp from which a straight line is drawn to St. Lawrence Church.

2.1.2 Central area of Bridgetown

The central area of Bridgetown, for the purpose of these terms of reference is tentatively defined as the area within the coast line from opposite the Old Eye Hospital on Bay Street to Indian River and a line drawn along the Eastern side of Fontabelle, turns east on Lakes Folly, north along Mason Hall Street to junction with Baxters Road, turns into Lightfoot Lane, then north along western side of

White Park Road to Country Road, along Country Road, turns into Roebuck Street on the northern side to the Globe Theatre, then on to Halls and Martindale Roads, and along Jemmotts Lane to the Old Eye Hospital on Bay Street.

2.1.3 Belle Zone 1 Water Protection Area

For the purpose of these terms of reference this area around the Belle pumping station is limited by a line starting east from a point on Highway 4 near Rouen to south on Howells Cross Road, west to Station Hill near Glendairy Prison, north - north-westerly to Codrington Agricultural Station, east to a point on Salters, south to the starting point.

2.1.4 Review of the Study Area

It will be the responsibility of the consultants to review the tentative definitions mentioned in 2.1.1, 2.1.2 and 2.1.3 above, and present their own opinion on the subject for review and approval by the Ministry of Health.

2.2 Population and Land Use

The consultants are required to present projections of future population and land use for the study area, and its different sections for a period of not less than 15 years. For these projections the consultants shall take into account the official statistical data available and the elements of the Physical Development Plan for Barbados. It will be the responsibility of the consultants to present their own opinion on the subject for review and approval by the Ministry of Health.

2.3 Waste Water Flow

For determining the contribution of waste water to the sewer system, both for the purposes of the Master Plan and of the design for the central area of Bridgetown, and for the Belle Zone 1 area, the consultants should take into account the plans and projections of the Water Works Department for a period of not less than 15 years. It will be the responsibility of the consultants to establish their own estimate of the design flows.

2.4 Topographical Maps

The following topographical information will be made available to the consultants by the Ministry of Health.

### APPENDIX I-3

- (i) Topographical Maps to the scale of 1:10,000, with 20' contour lines. These maps have been compiled and printed in 1955;
- (ii) Air photography mosaics to the scale of 1:1250;
- (iii) Outline maps of Bridgetown to the scale of 1:1250;
- (iv) Spot levels of all intersections within the central area of Bridgetown as defined in 2.1.2.

It will be the responsibility of the consultants to perform any additional topographical survey studies where necessary.

#### 2.5 Marine Studies

It will be the responsibility of the consultants to perform marine studies necessary for the adequate siting of the proposed outfall for the sewage effluent of the central area of Bridgetown.

#### 2.6 Soil Studies

The geology and soil conditions of the study area is extensively described in studies and reports that can be made available to the consultants. It is anticipated that in the central area of Bridgetown soil and water conditions will require special attention for the specification of materials and methods of construction. It will be the responsibility of the consultants to perform all soil boring and other soil studies that may be necessary.

### 3. MASTER PLAN FOR THE AREA OF BRIDGETOWN

#### 3.1 General

For the development of a master plan for the disposal of sewage within the study area the consultants shall take into account the special topographical and geological features of the study area, in order to take maximum advantage of the continued use of the method of disposal by infiltration into the ground traditionally used in the region.

#### 3.2 Protection of Water Supply Sources

The consultants shall present specific recommendations regarding the protection of present and future sources of potable water within the study area. Work on this subject shall include a review of present legal and administrative dispositions and enforcement policies and the preparation of drafts of new documents deemed necessary.

3.3 Protection of Beaches

The protection of the beaches bordering Carlisle Bay and the south of Needham's Point, in the study area, shall receive special attention from the consultants. Definite proposals shall be presented for the disposal of the sewage of these areas, together with drafts of the regulatory acts and enforcement procedures deemed necessary for immediate application.

3.4 Existing Disposal Systems

All existing disposal systems of importance that discharge into the sea shall be investigated. Definite proposals shall be made on the subject, including recommendations regarding private facilities and pre-engineering design of all necessary public facilities.

3.5 Plans and documents to be presented

For the master plan for the area of Bridgetown the consultants shall present plans showing all areas to be sewerred and the areas to be served by means of other disposal systems. Separate sets of maps shall be presented for each stage of implementation that may be suggested. Special maps and drawing shall be presented to indicate and support the proposals for the protection of the beaches within Carlisle Bay and South, according to 3.3 and 3.4 above.

3.6 Report on the Master Plan

The plans and documents mentioned in 3.5 shall be included as annexes of a Report on a Master Plan for sewage disposal for the Bridgetown area. This report shall include the justification of the proposed scheme or project, and the steps or phases of implementation. Total estimated cost of the main phases showing a break-down of private and public expenditure with detailed costing of the latter shall also be presented.

4. ENGINEERING DESIGN FOR THE CENTRAL AREA

4.1 General

It is proposed that the sewage from the central area of Bridgetown shall be intercepted, to avoid discharge into the Constitution River, the Careenage and the sea coast and transported through an appropriate trunk sewer (emissary) to the Indian River area, where it will be subjected to the treatment deemed necessary, prior to its discharge into the sea. It will be the responsibility of the consultants to review the general concept of this scheme and present their own opinion on the subject for review and approval by the Ministry of Health.

4.2 Treatment of the Sewage

Special attention is required of the consultants regarding the treatment of the sewage, prior to its discharge into the sea. Before presentation of a final treatment design, alternatives shall be submitted to the Ministry of Health for approval. The consultants shall investigate systems or processes that will minimize or eliminate sludge handling. In siting the treatment works, considerations shall be given to the possibility of the future installation of pumping facilities for recycling the effluent into the ground, if the need for this measure arises in the future.

4.3 Connections to the Sewer System

For the lay-out and design of the sewer system in the central area at Bridgetown the consultants shall take into account the fact that most of the buildings in the area already have at the present some kind of disposal system for their sewage. The technical and economical problems for the conversion of those private systems for discharge into public sewer system shall be studied for the typical cases. Draft of regulatory acts and enforcement policies shall be presented if deemed necessary.

4.4 Plans and documents to be presented

The consultants shall present all the technical documents necessary for the construction of the sewerage system of the central area of Bridgetown including but not limited to: plans, specifications, cost estimates, chronogram of execution, plan of contracts and draft contract documents. All these plans and documents shall be presented in accordance with the usual requirements of international lending institutions. It will be the responsibility of the consultants to secure the necessary information on the above mentioned requirements.

4.5 Report on the Design for the Central Area

The plans and documents mentioned in 4.4 shall be included as annexes of a Report on a Sewerage system for the Central Area of Bridgetown. This report shall be presented as a comprehensive engineering report.

5. REPORT ON THE BELLE ZONE 1 AREA

The consultants shall present for approval by the Ministry of Health and by the Waterworks Department a plan for the adequate disposal of sewage and excreta from the developed sections inside the Belle Zone 1 Water Protection Area. The approved plan shall be developed to the stage of preliminary engineering design, including: justification;

general lay-out of the proposed system; expected flows; capacity and type of pumping stations and treatment works; sizes of trunk, emissary and interceptor sewers; cost estimate, etc. If a water borne sewerage system is proposed, the possibility of connecting it to the system to be designed for Central Bridgetown shall be studied.

6. OPERATION

6.1 Operation Manual

The consultants shall present a brief but comprehensive operation and maintenance manual for the sewer system, pumping stations, treatment plant and outfall works. Procedures for follow-up and control of pollution conditions shall also be proposed by the consultants.

6.2 Cost of Operation

The cost of operation of the system shall be estimated and presented with a detailed operational break-down, e.g. labour, materials, replacements, power, chemicals and all other relevant details. Projections of the cost of operation shall be presented for a period of not less than 10 years. Included in these projections shall be the extra cost of operation due to any stage of implementation of the Master Plan suggested for the period.

6.3 Revenue from Operation

The consultants shall propose a system of charges aiming, at the minimum, at the production of revenue sufficient to offset the cost of operation and maintenance of the system. An alternative shall be presented, to include the coverage of depreciation and debt service including amortization. Projections of estimated revenue shall be presented for a period of not less than 10 years.

7. OTHER WORK TO BE PERFORMED BY THE CONSULTANTS

It will be the responsibility of the consultants to perform any other work not specifically mentioned in these terms of reference that will be required by sound engineering practice, for the completion of the reports, plans, specifications, cost estimates and other documents that are to be produced by the consultants for the satisfaction of their responsibilities under the terms of the contract.