

The Inspection Panel

Investigation Report

Colombia: Cartagena Water Supply, Sewerage and
Environmental Management Project (Loan No. 4507-CO)

June 24, 2005

About The Panel

The Inspection Panel was created in September 1993 by the Board of Executive Directors of the World Bank to serve as an independent mechanism to ensure accountability in Bank operations with respect to its policies and procedures. The Inspection Panel is an instrument for groups of two or more private citizens who believe that they or their interests have been or could be harmed by Bank-financed activities to present their concerns through a Request for Inspection. In short, the Panel provides a link between the Bank and the people who are likely to be affected by the projects it finances.

Members of the Panel are selected “*on the basis of their ability to deal thoroughly and fairly with the request brought to them, their integrity and their independence from the Bank’s Management, and their exposure to developmental issues and to living conditions in developing countries.*”¹ The three-member Panel is empowered, subject to Board approval, to investigate problems that are alleged to have arisen as a result of the Bank having ignored its own operating policies and procedures.

Processing Requests

After the Panel receives a Request for Inspection it is processed as follows:

- The Panel decides whether the Request is prima facie not barred from Panel consideration.
- The Panel registers the Request—a purely administrative procedure.
- The Panel sends the Request to Bank Management, which has 21 working days to respond to the allegations of the Requesters.
- The Panel then conducts a short 21 working-day assessment to determine the eligibility of the Requesters and the Request.
- If the Panel does not recommend an investigation, and the Board of Executive Directors accepts that recommendation, the case is considered closed. The Board, however, may approve an investigation against the Panel’s recommendation if it so warrants.
- Three days after the Board decides on whether or not an investigation should be carried out, the Panel’s Report (including the Request for Inspection and Management’s Response) is publicly available at the Bank’s Info Shop and the respective Bank Country Office.
- If the Panel recommends an investigation, and the Board approves it, the Panel undertakes a full investigation, which is not time-bound.

¹ IBRD Resolution No. 93-10; IDA Resolution No. 93-6.

- When the Panel completes an investigation, it sends its findings and conclusions on the matters alleged in the Request for Inspection to the Board as well as to Bank Management.
- The Bank Management then has six weeks to submit its recommendations to the Board on what actions the Bank would take in response to the Panel's findings and conclusions.
- The Board then takes the final decision on what should be done based on the Panel's findings and the Bank Management's recommendations.
- Three days after the Board's decision, the Panel's Report and Management's Recommendation are publicly available through the Bank's Info Shop and the respective Country Office.

Table of Contents

About The Panel.....	i
Table of Contents.....	iii
Acknowledgements	vi
Abbreviations	vii
Executive Summary	ix
CHAPTER ONE: INTRODUCTION.....	1
1. Request for an investigation.....	2
1.1 Background	2
1.2. The Request.....	4
1.3. Management Response	6
1.4. Eligibility of the Request	8
1.5 The Board Decision	9
1.6 The Investigation.....	9
2. The Project	10
2.1. Context	12
2.1 Project Financing	12
3. Applicability of the Bank Operational Policies and Procedures to the Project	13
CHAPTER TWO: ENVIRONMENTAL COMPLIANCE	14
1. The Project's Environmental Assessment	15
1.1. Screening.....	18
1.2. Stage in Project Cycle	18
1.3. Analysis of Alternatives.....	18
1.3.1. Disposal Alternatives	22
1.4. The selected option: the submarine outfall	24
1.4.1. Punta Canoa as the Location for Outfall	25
1.4.1.1. Bathymetry of Selected Site.....	26
1.4.1.2. Relevance of Magdalena River.....	27
1.4.1.3. Winds of the Area	28
1.4.1.4. Coastal Ocean Currents.....	29
1.4.3. The proposed design of the submarine outfall	29
1.4.3.1. The risk of diapirism (mud volcanism).....	34
1.4.4. Level of Treatment and Ultimate Disposal	38
1.4.5. The land conveyance system: overland route, pumping stations and treatment plant locations	40
1.4.5.1. Evaluation of alternatives	40
1.4.5.2. The overland pipeline design	41
1.4.5.3. Disposal of Sludge	43
1.4.5. The monitoring program.....	44
1.4.6. Project impacts on locally affected communities	46
2. Natural Habitats and Water Resources Management	47
2.1. Natural Habitats, OP 4.04	47

2.2. Water Resources Management	50
3. Legal Requirements	51
3.1. Environmental License	52
3.2. International Agreements	54
CHAPTER THREE: SOCIAL COMPLIANCE	58
1. Communities living in the North Zone of Cartagena: are they Indigenous Peoples under OD 4.20?	59
2. Indigenous Peoples Development Plan.....	62
3. Prevention and Mitigation of Impacts for the Affected Communities and Benefits	63
3.1 Identification of the Project's impacts upon the affected communities.....	63
3.2. Risks perceived by the Afro-Colombian communities in relation to fishing and other activities	67
3.3. Benefits for the Afro-Colombian communities in the North Zone	70
4. Consultation and participation of affected people	73
4.1. Communities' consultations and willingness to pay for water services	78
CHAPTER FOUR: ECONOMIC COMPLIANCE	81
1. Economic Evaluation.....	82
1.1 The Economic Analysis and Compliance with OP 10.04.....	82
1.1.1 The Material in the Project Appraisal Document	83
1.1.2 Cost Benefit Analysis	86
1.1.3 Economic Viability and Willingness to Pay.....	90
1.1.4 Distribution of Benefits.....	99
1.1.5 Poverty Impact Analysis	101
1.1.6 Sensitivity and Risk Analysis	101
1.1.7 Conclusions of the Cost Benefit Analysis (CBA) Summary.....	102
2 The Economic Evaluation of Alternatives.....	104
2.1. The PAD and the Alternatives	105
2.2. The Feasibility Study	106
2.3. The Effects of Alternative Land Cost Estimates.....	111
2.4. The Environmental License Requirement for Primary Treatment after 10 years....	115
2.5. The Composition of the Panel of Experts	115
3. Poverty Reduction.....	116
3.1. The PAD's Poverty Impact Analysis	118
3.2. Effects on the Three Communities Referenced in the Request	120
3.3. Potential Impacts on Other Poverty-Reducing Investments by the District	122
CHAPTER FIVE: FINANCIAL COMPLIANCE AND SUPERVISION	124
1. Financial Management Assessment and Financial Management Capacity of the District of Cartagena	125
1.1. Financial Management Assessment	127
1.2. Project Financial and Accounting Statements	131
1.3. Financial Capacity of the District of Cartagena	132
2. Financial Management Assessment and Financial Capacity of ACUACAR.....	136
2.1. Financial Management Assessment ACUACAR	136
2.2. Financial Capacity—ACUACAR.....	137
2.3. Bank Supervision of ACUACAR	138
3. Risk of default on the Bank loan.....	139

Annexes

- Annex A: Table of Findings
Annex B: Report on Analysis of the Proposed Waste Disposal System: the Submarine Outfall
Annex C: Biographies

Maps

- Map 1: IBRD No. 33296 – Main Wastewater Conveyance System, Treatment Installations and Submarine Outfall
Map 2: IBRD No. 33297 – Secondary Sewerage Networks
Map 3: IBRD No. 33298 – Current State of Contamination by Sewage (Without Project)
Map 4: IBRD No. 33299 – Effect on Contamination by Sewage (With Project)

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Abbreviations

ACUACAR	Aguas de Cartagena, S.A. E.S.P.
AGBAR	Aguas de Barcelona
BOD	Biological Oxygen Demand
CARDIQUE	Corporación Autónoma Regional del Canal del Dique
CBA	Cost Bene fit Analysis
CCH	Corporación Cartagena Honesta
CIOH	Centro de Investigaciones Oceanograficas e Hidrograficas
DAF	Dirección de Apoyo Fiscal
EA	Environmental Assessment
EMP	Environmental Management Plan
FS	Feasibility Study
FMR	Financial Monitoring Report
FMS	Financial Management Specialist
IBRD	International Bank for Reconstruction and Development
INGEOMINAS	Instituto de Investigación e Información Geocientifica, Minero-Ambiental y Nuclear
INVEMAR	Instituto de Investigaciones Marinas y Costeros
IPDP	Indigenous Peoples Development Plan
IPU	Impuesto Predial Unificado
LBS	Protocol Concerning Pollution from Land-Based Sources
NGO	Non-Governmental Organization
OD	Operational Directive
OP	Operational Policy
PAD	Project Appraisal Document
PAHO	Pan American Health Organization
PMR	Project Management Report
POE	Panel of Experts
QAT	Quality Assurance Team (World Bank Latin America and Caribbean Region)
SA/SIA	Social Assessment/Social Impact Assessment
SI	Soluciones Integrales
SIAB	Sociedad de Ingenieros y Arquitectos de Bolivar
SSPD	Superintendencia de Servicios Publicos Domiciliarios (Superintendency of Public Households Services)
TOR	Terms of Reference
TSS	Total Suspended Solids
WHO	World Health Organization
WTP	Willingness to Pay

Measurements

Km	kilometer
m	meter
m ³ /s (cms)	cubic meters per second
Mg/l	milligrams per liter

Executive Summary

INTRODUCTION

On April 20, 2004, the Inspection Panel received a Request for Inspection (“the Request”) alleging that the World Bank violated its own policies and procedures in the design, appraisal and implementation of the Colombia: Cartagena Water Supply, Sewerage and Environmental Management Project (“the Project”). The Request claimed that the violations caused and will cause harm to the communities living in areas north of the city of Cartagena and to human health and the environment. The Panel registered the Request on April 22, 2004, and notified the World Bank Board of Executive Directors (“the Board”) and the President of its receipt.

The Corporación Cartagena Honesta (CCH), a local non-governmental organization, submitted the Request on its own behalf and on behalf of 125 residents of Punta Canoa, 139 residents of Arroyo de Piedra, 41 residents of Manzanillo del Mar, and 119 residents of Cartagena.

The Project provides for the disposal of Cartagena municipal wastes by a submarine outfall located about 20 km north of Cartagena, near Punta Canoa and the other villages who have made the Request to the Panel. The proposed waste disposal system consists of a 23.85km main wastewater conveyance system by land pipeline, a plant for preliminary treatment of the wastes at Punta Canoa, and a submarine outfall for the disposal of the wastes 2.85km off the coast of Punta Canoa at a depth of 20 meters.

After the construction period –estimated as five years (1999-2004) at the time of PAD preparation– the operation of the outfall is to be implemented in two phases: Phase 1 (2005-2015) and Phase 2 (2015-2025). The first phase, which is part of the Bank-financed Project, includes construction of the pumping station, the land conveyance system, the preliminary treatment installation and the submarine outfall. During the second phase the preliminary treatment plant must be upgraded to primary treatment or the equivalent. CARDIQUE, the Regional Environmental Authority, imposed this requirement when it issued the environmental license for the Project in June 2001 and it modifies the original design of the system.

The Requesters claim that the proposed submarine outfall for the disposal of Cartagena municipal wastes will pollute the marine environment and cause harm to their health and economic well-being, because “untreated” wastewater will be discharged into the marine environment. The sea supports fisheries. Fisheries and tourism are the primary sources of income for the local people who live near the submarine outfall.

The Requesters challenge the adequacy of the documents supporting the Project, in particular the Feasibility Study and the Environmental Assessment. They claim that the studies’ analysis of alternatives dismissed more environmentally and economically viable options than the submarine outfall, and did not adequately take into account the sensitive

geological conditions of the area where the outfall and the conveyance system are to be constructed in contravention of OD 4.01. Moreover, they claim that the Bank did not comply with OP/BP 10.04 (Economic Evaluations on Investment Operations) because it did not adequately evaluate the economic costs and environmental risks associated with the outfall or the alternative options for disposing of wastes. They also claim that the Bank did not comply with OD 4.15 on Poverty Reduction.

The Requesters believe that the social and economic effects of the Project were considered only in a cursory fashion and that the consultation process was inadequate because the people's concerns were not taken into account. They are concerned that they will receive few benefits from the Project but will bear most of the risks and heavy costs, both now and in the future.

They allege that the Bank violated the policy on Indigenous Peoples (OD 4.20) because the Project failed to identify the affected communities living in Punta Canoa, Arroyo de Piedra, and Manzanillo del Mar as indigenous peoples, and thus failed to prepare an Indigenous Peoples Development Plan (IPDP).

According to the Request, the Project could also harm people because of the potential fiscal instability of the Borrower and the expected increase in the total cost of the Project, which could cause the Borrower to default on the loan. This would violate OP/BP 10.02 on Financial Management.

Management submitted its Response to the Request for Inspection on May 21, 2004.

The Response states that the Bank complied with its policies and procedures. According to the Response, the Project Feasibility Study addressed a comprehensive set of alternatives, and the Environmental Assessment's analysis of the impacts of the Project indicated that the design of the submarine outfall would minimize the risk that the effluent would have harmful effects on the coastal zone, including in the area of the Requesters, all in compliance with OD 4.01. The Response further states that the people living in the North Zone (the Requesters) do not meet the criteria of OD 4.20 for indigenous people, that they were consulted during Project preparation, and that they will benefit from the Project, in compliance with OD 4.15 (Poverty Reduction).

The Response asserts that the Bank has complied with OP10.02 on financial management of the Project, both in Project preparation and supervision. Moreover, Management maintains that the cost benefit analysis conducted by Bank staff and a local consulting firm, and the cost effectiveness analysis carried out by Hazen & Sawyer comply with OP 10.04 on Economic Evaluation of Investment Operations. The Response claims that supervision of the Project has been thorough and complies with OD 13.05 and OP/BP 13.05.

To determine the eligibility of the Request and the Requesters the Panel visited the Project area and met with the Requesters and other people in affected communities, representatives of ACUACAR, national, regional and local government officials, local

NGOs, technical experts and prominent citizens of Cartagena. The Panel determined that the Request and the Requesters met the eligibility criteria set forth in the Resolution that established the Inspection Panel and recommended that an investigation be conducted. The Board of Executive Director approved the Panel's recommendation on July 13, 2004.

This report concludes the Panel's investigation into the matters alleged in the Request for Inspection. The Panel's current chairperson, Ms. Edith Brown Weiss and Panel member Tongroj Onchan led the investigation. Six expert consultants on environmental assessment, water resources, submarine outfalls, social, economic and financial issues assisted the Panel in the investigation.

This report examines the merits of the claims presented in the Request and Management's Response to the claims. During its investigation the Panel team interviewed Bank management and staff, visited the Project area, met with the Requesters and other Project affected people throughout the area, met with local and national authorities in Colombia, with ACUACAR officials and with other relevant experts. The Panel also identified and reviewed relevant Project documents that the Requesters, Bank staff, ACUACAR officials and other sources provided to the Panel.

With respect to the Project, the Panel assessed whether the Bank complied with the following applicable operational policies and procedures:

OD 4.01	Environmental Assessment
OP/BP 4.04	Natural Habitats
OP 4.07	Water Resources Management
OD 4.15	Poverty Reduction
OD 4.20	Indigenous People
OP/BP 10.02	Financial Management
OP/BP 10.04	Economic Evaluation Investment Operations
OD/OP/BP 13.05	Project Supervision

The total cost of the Colombia: Cartagena Water Supply, Sewerage and Environmental Management Project is, according to Management, US\$117.2 million. On December 10, 1999, the Bank entered into a Loan Agreement with the Distrito Turístico y Cultural de Cartagena de Indias providing for a US\$85 million loan to finance about 72% of the total Project cost. In addition to the IBRD Loan, the Project's financing structure includes US\$7.58 million from the Borrower, US\$4.6 million from ACUACAR, the Project's implementing agency, and US\$20 million from the Government of Colombia, the guarantor of the Loan. The Loan is scheduled to close on June 30, 2005, unless extended.

Context

The Panel notes the urgent need for Cartagena to have in place a sustainable system for disposing of its wastes. This is especially essential when the population of the city is growing rapidly. Submarine outfalls are an established method for disposing of municipal

sewage and organic wastes. The choice of the submarine outfall as the preferred method for disposing of wastes takes place, however, in the context of growing global concern about the pollution of the marine environment. While submarine outfalls have long served as a method for disposing of land-based wastes, there is increasing attention to ensuring that the wastes are properly treated before discharge into the oceans and released at sufficient distance and depth to protect against harm to the marine environment or nearby coastal areas. Moreover, as the need grows for disposing of wastes, there is increasing attention to methods for disposing of land-based wastes other than in the marine environment.

In the Project before us, the Panel takes note of the very significant efforts by Management and staff in the preparation and initial supervision to ensure that the Project is appropriately designed and implemented. The Panel hopes that its Report will be of value in assessing Bank's compliance with its policies and procedures and in furthering the development of a sustainable and equitable waste disposal system.

Findings

ENVIRONMENTAL COMPLIANCE

Environmental Assessment

The environmental safeguard policies of OD 4.01 require environmental screening and proper environmental assessment.

Environmental Screening

The Bank assigned the Cartagena Water, Sewerage and Environmental Management Project to category A under OD 4.01. **The Panel finds this to be appropriate and in compliance with OD 4.01.**

Stage in Project Cycle

The Panel finds that the Environmental Assessment was initiated early in the project cycle and in this respect complied with OD 4.01.

Analysis of Alternatives

OD 4.01 requires that an Environmental Assessment analyze alternatives to those proposed in the Project.

The Panel finds that the study of alternatives covered most of the alternatives for this type of project and evaluated the basic parameters. In this respect, the Panel finds the Bank in compliance with OD 4.01, paragraph 4 and Annex B (f). However,

the Panel is concerned about the diligence with which alternatives other than the preferred alternative of a submarine outfall were studied. The voluminous feasibility study and the environmental assessment, which closely follows the feasibility study, give greater attention to the submarine outfall than to other options. They do not demonstrate a systematic comparative study of all the alternatives as required by OD 4.01. The Panel could find only cursory consideration of the option of constructing a sewage treatment plant near Cartagena, with the treated waters going to a marine area or alternatively used for agriculture as a supplement to the recommended disposal system.

The Bank required that a Panel of Experts be appointed to review the technical quality of the Project and to determine the cost-effectiveness of the proposed outfall design. The Panel finds that the appointment of a panel of experts to review the technical work in the feasibility study and the design of the Project is consistent with Bank policies, particularly OD 4.01 Para. 13, but is not convinced that there was a sufficiently thorough analysis of alternatives before a decision on the outfall was made.

Selected Option: Submarine Outfall

The Panel notes that disposal of sewage to sea via a submarine outfall is a tried and proven technology which, under suitable conditions, offers a low-cost low-maintenance solution for acceptable disposal of human wastes.

The Panel observes that the Feasibility Study and the Environmental Assessment did not address the possible long term environmental and health effects on the coastal and marine environment in the area if there were to be multiple outfalls in the area and the volume of sewage and organic wastes increased significantly so as to exceed the absorptive capacity of the marine area. This is an issue that may need to be addressed in the future.

Punta Canoa as the Location for the Outfall

The submarine outfall is to be located 2.85 km offshore from Punta Canoa, which is 20 km north of Cartagena. The Panel notes that in terms of assimilative capacity the Punta Canoa coastal waters could be a suitable site for an outfall, if necessary precautionary measures are taken in the design to ensure proper dilution of the effluent so that nutrients are at an acceptable level, and to ensure decay of pathogens to a level safe for human contact.

Proposed Design of the Submarine Outfall

Bank Management relied on a robust two dimensional model to assess risk of contamination near shore from the outfall and used actual field data taken over an extended period of time. The Panel notes that while the necessary ocean modeling studies were conducted, the methodology used did not capture the possibly important influence of the wind on near surface currents in a stratified water

column. This influence could affect the assessments of the dilution of effluent and hence the risks of contamination to the marine and coastal environments. Preliminary calculations by the Panel's outfall expert suggest that by not adequately considering the near surface stratification and by being overly optimistic about the rate of decay of pathogens, the far field analysis may not be reliable. The Panel notes that according to the Panel's expert's preliminary calculation, the proposed outfall design may not achieve safe disposal of the effluent and meet safe pathogen standards close to 75% of the time.

The Panel finds that if a three-dimensional model, rather than two dimensional, were used to assess risk, the diffusion patterns and estimates of shoreline concentrations might be different and that greater certainty regarding the risk could be secured. The results could affect the distance from shore and the depth required for safe disposal of the Cartagena wastes.

With respect to the selection of pipe materials, the Inspection Panel was variously informed that: (1) both on-shore and submarine portions of the pipeline would consist of reinforced concrete pipes; (2) that the on-shore pipes would be reinforced concrete but that no decision had yet been made with respect to the submarine pipes; (3) that selection of pipe materials is at the discretion of contractors bidding for the work and has yet to be decided. **The Panel notes that after a first bidding process that resulted in costs much higher than those estimated in the PAD and the Engineer's cost estimate, new specifications are being prepared calling for the use of High Density Polyethylene (HDPE) for the construction of the outfall.** According to Management, this alternative should result in lower costs because, unlike reinforced concrete pipes, HDPE pipes would not have to be trenched in the bottom of the sea over all its length but only in the surf zone.

The Panel notes that HDPE pipes are a proven technology and widely used for pipelines carrying water and sewage. While HDPE pipes have certain advantages, the Panel's experts have expressed some concerns about the proposed solution, because these HDPE pipes have until recently been of fairly small diameter. Also, the pipe would have to be well anchored onto the sea floor as both a pipe of this diameter and the effluent it carries would have a density less than sea water, making the pipes buoyant in sea water. By not burying the pipeline there could be a danger that it will scour over certain span lengths and this could lead to pipe ruptures. Pipe scour is a well known phenomenon in the gas industry. Whether a pipeline will scour and hang free depends on the soil material, the ocean current regime and the periodicity of the currents. The Panel hopes that proper design and specifications will be able to deal with all of these issues.

Risk of Diapirism

Diapirism (or mud volcanism) is the upward-and sometimes sideward-movement of less dense sediments through denser materials due to buoyancy forces. The occurrence of surface extrusion of mudflows in the vicinity of Punta Canoa is well known. The Bank

investigated this by commissioning a geophysical study and by seeking the opinion of an authority on diapirism in the proposed Punta Canoa location.

The geophysical investigation identified a diapiric feature of approximately 250m diameter about 300m southwest of the proposed pipeline route. Recent historical records document another diapirism feature in the area. Eye witness accounts cite a diapirism event in 1979 off the coast of Punta Canoa.

The Panel notes that the expert study cited in World Bank documents found no evidence that diapirism vents are located at the proposed Punta Canoa site, and the detailed bathymetry survey did not show submerged mounds in the bathymetry. **The Panel finds that the potential for the pipeline to be ruptured or otherwise significantly disturbed by diapirism appears to be low.** However, given that the study found diapirism about 300 meters from the proposed outfall, it may be reassuring to clarify what distance is “a safe distance” from the mud volcanism. **The Panel notes that a side scan sonar survey of the surface of an area of 25 km was done as part of the Geophysical Investigations. It may be useful to have a side scan sonar survey of the proposed outfall trajectory to map the subsurface soil structure to a depth of low frequency sonar penetration in order to reduce any remaining uncertainty regarding the possibility of a diapirism extending to the outfall, and to publish the results.**

Land Conveyance System: Routing, Pumping Stations and Treatment Plant Locations

Evaluation of Alternatives

The environmental assessment identified and evaluated four different overland routes for the pipeline and various alternatives at the Paraíso pumping station and the treatment works near Punta Canoa. **The Panel finds that for the selected option of a submarine outfall, the analysis of the alternatives for the land conveyance systems, liquid disposal location and pipeline corridors, in terms of their potential health and environmental impacts, meets the OD 4.01 requirement that alternatives be considered. Bank staff have exercised due diligence in considering alternatives and mitigation measures and have complied with OD 4.01 on Environmental Assessment.**

Overland Pipeline Design

There will be one 72 inch in diameter pipeline to convey the wastes from the Paraíso pumping station in Cartagena over land to the submarine outfall. The wastes will be pumped through the pipeline to the preliminary treatment plant at Punta Canoa and thereafter flow by gravity to the sea. The Panel notes that a land pipeline conveying the waste to Punta Canoa and thence to the marine area is subject to the risk of rupture, intentional or accidental, and to other disabling events, such as disruptions of electrical service. The contingency manual presents a review of these risks and the ways to deal with each of them. **However, after reviewing the contingency manual, the Panel**

remains concerned about the adequacy of the planning for emergencies. The records examined by the Panel do not clarify whether the Paraíso pumping station system provides for a storage area in case of emergencies. The Panel notes that in case of operation failure because of lack of energy or other potential problems along the land conveyance system, the waste will flow to the Ciénaga de la Virgen unless there is a storage area and this may affect the odor in the neighborhoods where the Paraíso Station is located. The Panel notes that the Panel of Experts and the Environmental Assessment emphasized the importance of a storage area for the wastes during periods when the pipeline fails to operate or is taken out of commission.

The Panel also notes that two pipelines 72 inch in diameter were originally considered so as to handle disruptions to waste transport in one pipeline. This appears to have been abandoned for reasons of cost.

The Panel also observes that waste leakage from the pipeline could contaminate both surface and ground water. **The Panel finds that this issue was neither analyzed in the 1999 EA nor included in the Environment Management Plan. The Panel finds that ground water monitoring is important in order to identify leakage and actions to mitigate it.**

Disposal of Sludge

The Panel finds that the Project environmental studies did not consider alternatives for the disposal of the solids recovered during the preliminary treatment of the sewage stream. In this respect, Management was not in compliance with OD 4.01. The Panel further notes that although Management now asserts that a plan exists for the disposal of sludge, the Panel has not been able to find a consideration of alternatives for the disposal of sludge as required by Bank policies before finalizing a plan.

The Monitoring Program

The Panel reviewed monitoring reports of several hundred pages prepared by ACUACAR to establish initial baseline data for water quality in the Ciénaga and along the coast up to Punta Canoa. **The Panel finds that the Bank in requiring an adequate monitoring plan with adequate baseline data has complied with the provisions of OD 4.01. The Panel also notes that ACUACAR, as of summer 2003, had prepared baseline data regarding fisheries in the area. The Panel again finds this to be in compliance with OD 4.01.** In both cases the baseline data should provide a reasonable basis for evaluating the effects of the submarine outfall. **The Panel notes, however, that it is essential that these studies be periodically updated to maintain their relevance and to identify changes in water quality or in fisheries.**

Project Impacts on Locally Affected Communities

The Panel observes that while the outfall was designed so as to minimize the impacts of waste water discharged in the sea, it is likely that the fishing conditions will change as a result. **The Panel finds that in Project preparation the Project's potential effects on fishing were not adequately addressed. The Panel examined the Project records but did not find adequate social evaluation and mitigation proposals of these potential impacts on the local population's lives and livelihood. The Panel finds that this did not comply with OD 4.01.**

Compliance with OP 4.04 on Natural Habitats

Although item (ii) of Project component G on Restoration and Conservation of the Ciénaga de la Virgen Natural Reserve has yet to be implemented (because the Project has not yet advanced to a stage where this is applicable) the Panel finds that the Bank is otherwise in compliance with OP 4.04.

Water Resource Management

The Panel finds that the decision to disregard the Ciénaga of Tesca as a potential place for the final disposal of the waste after treatment allows for the preservation of an important ecosystem. The Panel also finds that the Feasibility Study, the Environmental Assessment, and supplementary studies document well and analyze the condition of the biophysical environment, particularly of the Caribbean Sea, Bahía de Cartagena and the Ciénaga de la Virgen. However, they do not consider the terrestrial environment in as great a depth.

The Panel finds that the Bank is in compliance with OD 4.07 on Water Resources Management and with OD 4.01 which requires that “*water resources management should be environmentally sustainable.*”

SOCIAL COMPLIANCE

Indigenous Peoples

The Panel notes that the issue under investigation is whether the Bank followed OD 4.20 on Indigenous Peoples during the design, appraisal and execution of the Project with regard to the Afro-Colombian communities living in the area of the proposed outfall. Under Colombian legislation the communities living in the North Zone of Cartagena are not recognized as indigenous peoples, but are classified as black communities and other ethnic groups. The classification of certain groups as indigenous peoples under Bank policy OD 4.20 is not necessarily the same as the treatment in local legislation.

The Panel could find no discussion as to whether the Afro-Colombian communities should trigger the Indigenous Peoples Policy. Management states that the World Bank's Quality Assurance Team approved the decision reflected in the Project's Social Assessment that no indigenous people would be affected by the Project.

The Panel finds that in the case of the Afro-Colombians who submitted the Request, the affected community meets most of the OD's criteria, except for an “indigenous language” and arguably a predominant “primarily-oriented subsistence production.” The Panel finds that Afro-Colombians could reasonably have been regarded as indigenous peoples under Bank policies. But because of the absence of arguably two of the policy criteria, the failure to do so in this specific case may not be deemed as noncompliance with the “judgment” called for in OD 4.20, paragraph 5. If the Afro-Colombians were regarded as indigenous peoples, the provision of OD 4.20 would have applied.

Indigenous Peoples Development Plan

If the affected Afro-Colombian communities had been categorized from the outset as indigenous peoples under OD 4.20, an IPDP would have been prepared in order to prevent or mitigate the impacts and to ensure that net benefits would accrue to the affected indigenous peoples. **The Panel finds that there is no complete list, schedule or financial arrangements of mitigatory measures or compensation for the Project's risks for the people living in the area of the proposed outfall.** The risks are significant and the mitigatory measures found in the documentation, while strengthened over time, are weak.

Since the Afro-Colombians could reasonably have been regarded as indigenous peoples within the indigenous peoples policy, the Panel finds that the Bank would have been well advised to require an Indigenous Peoples Development Plan (IPDP) or a similar document identifying impacts of the Project on these people and providing mitigation measures for risks and potential harm, particularly in light of the inadequacies of the Social Impact Assessment.

The Panel notes that the subsequent studies carried out by ACUACAR to develop a base line for Project monitoring contain a comprehensive set of socio-economic data about the Project affected communities. This can be used as a basis for developing a set of suitable compensatory measures.

Social Impact Assessment

Identification of Impacts on Affected Communities

The social impacts of the Project were assessed in the Social Impact Assessment (SIA) prepared in 1998. The Panel notes that most of this social assessment focuses on the major social benefits to the target population in the city of Cartagena, namely the Southeast Urban Area. **The Panel finds that the full SIA does not adequately address**

compensation for the affected Afro-Colombian communities in the North Zone for bearing most of the risk of negative impacts of the sewerage component for the Project.

The Panel finds that the Social Impact Assessment (SIA) is unsatisfactory with respect to its analysis of the Project's impacts upon the communities living in the North Zone of Cartagena who presented the Request for Inspection. Irrespective of whether Afro-Colombians are classified as indigenous peoples or not, they are affected by the Project because they will be exposed to a wide range of risks as a result of the construction and operation of the Project.

The Panel notes that fishing is one of the traditional occupations of the villages of Punta Canoa, Manzanillo del Mar and Arroyo de Piedra. The EA itself acknowledges that a decrease in fishing resources was one of the main concerns expressed by the people living in the North zone (the area near Punta Canoa). A 2003 study carried out by INVEMAR (Instituto de Investigaciones Marinas y Costeros) documents the bountiful fisheries caught in the Punta Canoa area and confirms that fishing is the mainstay of Punta Canoa's economy. Income from seafood pays for all schooling, water, electricity and housing. In addition, seafood is related to the communities' second and third biggest contributors to their livelihoods, namely tourism and employment in the shrimp facilities. In light of the foregoing, the Panel emphasizes that since the sewage outfall is designed to be located near the main Afro-Colombian fishing grounds, any risks to their seafood must be taken seriously. **The Panel finds that the EA and Management erred in concluding that fishing in the area of influence of the outfall is negligible or unimportant in the affected communities, without more detailed studies about the issue.**

Benefits for Afro-Colombian Communities in the North Zone

The Panel notes that the Afro-Colombian communities in the North Zone seem to have been considered less important than the major beneficiaries of Cartagena. They are relatively small in numbers, quiet, weak in political power, and lack voice in decisions that affect them severely. **The Panel notes that these communities may be exposed to significant risks under the Project.**

Some compensation for the potential impacts is provided under the Project, e.g. water and sanitation services in accord with OD 4.01. The Panel notes that the community will receive piped water, which will be less expensive and of better quality than trucked water. This will be a significant benefit for the community. However, it is unclear whether appropriate financial arrangements have been made to implement other benefits, such as sanitation services, and the maintenance and operation of community centers. Implementation of the beneficial measures seems to be lagging behind. Information about these compensatory measures has been inadequately disseminated to the villages.

The Panel welcomes the proposed benefits for the people living in the Project area but notes that there seems to be no direct relation between such benefits and the risks that

may be exposed to as a consequence of Project construction and operation. There is no graduated approach to compensate the population for – or mitigate – the different risks as they materialize. For example, there are no social mitigation or compensatory measures in case of severe malfunction of the outfall that could lead to high presence of pathogens or other contaminants and/or a need to chlorinate the outfall discharge. This could affect the water quality near Punta Canoa and may affect people's health and their social and economic activities. **In this sense, the proposed Social Impact Mitigation and Community Development Program seems to fall short in addressing the mitigation or compensation for harm related to potential adverse impacts of the Project as required by OD 4.01.**

Consultations

The Panel finds that during Project preparation there were extensive consultation efforts with the people in Cartagena. This accords with OD 4.01. Two local NGOs – Fundación Vida and Fundación Jorge Artel – carried out the consultations in the context of preparing respectively the environmental and the social assessment. **However, OD 4.01 requires that there be extensive consultations with all affected people and that these consultations be timely, meaningful and relevant to Project design and execution. This is particularly important in the case of the affected Afro-Colombian communities living in the area of the proposed outfall, who informed the Panel that they were not consulted about the location of the outfall but rather only informed about its construction and operation.** ACUACAR arranged for a cross-section of society to inspect existing outfalls, similar to the proposed one for Punta Canoa. Representatives from all three affected villages visited outfalls in Valparaíso, Chile and in Montevideo. Unfortunately, this visit took place after the Project had been designed and its location determined, while **OD 4.01 requires this kind of interaction during the preparation of the Project.**

While the Project commendably included a communications strategy, the Panel observed that it failed to reach most members of the affected communities in the North Zone. An outreach strategy was added too late to deal effectively with the Project-related trauma and stress in these communities. The Panel finds that consultations and communications with the affected Afro-Colombian communities in the area of the submarine outfall did not comply with OD 4.01.

Consultations and Willingness-to-Pay Surveys

The Panel recognizes that the connection to the water and sewerage network is of the utmost importance for the North Zone communities. However, the Panel did not find any evidence that a formal consultation process on all the aspects of water and sewerage issues took place with the community of Punta Canoa. The Panel finds that the willingness-to-pay surveys did not include Punta Canoa (or Manzanillo) and these communities were not adequately consulted on the issues of willingness to pay and water tariffs.

ECONOMIC COMPLIANCE

Economic Evaluation of Alternatives

The feasibility study includes economic analysis of alternatives for disposal of the waste (except for a land application option, RG 1, that was not costed), and so broadly complies with OP 10.04

The Panel notes that after the Board approved the Project, CARDIQUE, the regional environmental authority, issued in 2001 the environmental license for the submarine outfall, which required the installation after ten years of primary treatment of the wastes at the preliminary treatment plant at Punta Canoa. This requirement for primary treatment in ten years significantly raises both the costs of investment and of operation and maintenance of the submarine outfall option, according to the figures given in the feasibility study. The Management Response confirms that the District will be responsible for upgrading the plant to primary treatment.

When the estimates from the feasibility study are reworked to allow for the upgrading to primary treatment, they suggest the following: compared with what they would otherwise have been, investment costs after 10 years could rise by between about US \$24 and \$32 million, while the present value of total costs (including operation and maintenance), could increase by between about US \$30 to \$34 million, thus raising total costs for the Project from the original value of about US\$ 62 million to US \$93 to \$96 million (or about \$3 million less, using alternative land prices as discussed below). These values are close to those of options MC-5 (Land Application – submarine outfall) and C-4 (Stabilization lagoons – discharge to the Cienaga) given in Table 6-28 of the feasibility study.

OP 10.04 provides that the “[c]onsideration of alternatives is one of the most important features of proper analysis throughout the project cycle.” **The Panel finds that when the environmental license was issued for the submarine outfall requiring primary treatment in ten years, the Bank should have recalculated the costs of the alternative and reviewed the economic analysis in light of this new licensing requirement, to be consistent with OP 10.04.**

The Panel also observes that the prices used for the evaluation of land that needed to be acquired for the options greatly exceeded estimates prepared in 2001 by local real estate corporations. When the costs of the alternatives that appeared in the feasibility study (Table 6-28) were re-calculated, to take into account the ranges of these alternative land costs (adjusted to the base year of the study), the gap between the three lowest cost options narrowed significantly. In particular, the gap between the chosen option (MC-1: preliminary treatment with the submarine outfall) and option MC-5 (land application with the outfall) fell from US\$35 million to US\$23-27 million, i.e. by almost one third to one seventh of its original size. Also the gap between the chosen option and option C-4 (stabilization ponds and discharge to the Lagoon) fell by one half to almost one third of its original size, i.e. from US\$32 million to US\$16-20 million.

The Panel finds that, having acknowledged uncertainty about land prices, the analysis in the feasibility study did not then provide a clear justification for the prices used in the costing of the Project alternatives.

As noted earlier, the Bank appointed an international Panel of Experts in the field of sewage, waste water treatment, and marine outfall technology to review and advise on the ongoing work in the feasibility study of alternatives and in Project design. This offered a potentially valuable additional avenue of scrutiny. **However, in the Panel's view, given the longstanding controversy concerning the preferred option to address the City's wastewater problems, it would have been appropriate to have had the Panel of Experts include a wider range of expertise, to provide more authoritative findings about both the socioeconomic impacts and the economic costs of the alternatives considered.**

The Economic Analysis and Compliance with OP 10.04

Key parts of the Project Appraisal Document (PAD) discuss aspects of the economic analysis as required by OP 10.04. Part 3 of Section F discusses *Possible Controversial Aspects* and identifies two issues, the use of a submarine outfall as part of a wastewater treatment and disposal system, which it suggests “*may cause some controversy due to lack of understanding of the technology*”, and the already planned increase in tariffs. It is acknowledged that “*The authorized annual tariff increase is a controversial issue, and ACUACAR considers that it will become more and more difficult to generate the corresponding revenues,*” and that consequently there is a need to avoid further increases above those already authorized. **The Panel observes, however, that there is little discussion about connection fees for access to new water and sewerage services, although they are potentially controversial and might influence the economic performance of the Project, particularly in relation to poorer consumers, as previous Bank experience confirms.**

Cost Benefit Analysis

In the PAD, Annex 4, Part III (*Assumptions*), outlines the data sources and assumptions used in the analyses. It notes that ACUACAR was the primary source of data “*regarding market demand and supply, project specifics, comprehensive cost and investment data, project financing details, expected financial returns, and market distortions.*” These data include coverage levels. **However, no reference is made as to whether the Bank performed any checks on the validity and reliability of these data, although they formed essential building blocks for the analyses. The Panel finds that, even though it would not have been feasible to scrutinize and validate all parts of these data, the PAD should have examined the issue of data reliability as part of showing compliance with OP 10.04.**

Economic Viability

The PAD states that the Project's economic viability was appraised for each subproject after converting financial cash flows into economic cash flows through the use of conversion factors and of willingness to pay estimates that included use and non-use values of water supply and sewerage services. This is consistent with OP10.14. However, **the Panel finds that the PAD did not try to make further - necessarily approximate - estimates of the enhanced tourism and recreational benefits likely to be associated with the Project, which is surprising given the acknowledged importance of tourism to the economy of Cartagena.**

The PAD notes that tourism is the main income source in the city and quotes 700,000 annual visitors and estimated revenues of US\$315 million generated. The Panel finds that the Bank should have considered these benefits to be consistent with OP 10.04, which says that: “[t]he economic evaluation of Bank-financed projects takes into account any domestic and cross-border externalities.” Such estimates might possibly have been attempted using a ‘benefit transfer approach’ and hence drawing on other existing studies from Colombia or elsewhere.

Sensitivity and Risk Analysis

Annex 4 of the PAD describes the sensitivity and risk analysis and defines major risk variables: investment cost overruns, project delays, changes in the unaccounted for water, labor productivity, collection efficiency and the willingness to pay for access to new and improved services. Table 7 on Risk Variables and Their Impact and Risk Significance describes seven variables, only three of which are included in the previous list. This suggests a total of ten key risk variables.

While the PAD says that the risk analysis recalculated the results of the financial and economic analysis by changing “these major risk variables all at the same time,” it is unhelpful because it only sets out the probability distributions and ranges that were used for five of the variables. **There is no obvious reason why this was not done for the remaining variables and it makes it impossible for the reader to gain a full picture of the procedures, underlying rationales and results of the sensitivity and risk analysis.** The analysis does not discuss the responsiveness of net present values to variations in Willingness-to-Pay (WTP), a key variable, and, although OP 10.04 says that “*The analysis estimates the switching values of key variables (i.e., the value that each variable must assume to reduce the net present value of the project to zero)[...]*” the economic sensitivity analysis does not mention them.. The presentation of the sensitivity and risk analysis in this Part of the PAD compares relatively poorly with the more detailed corresponding presentation in the Financial Assessment (Annex 5 and Attachment 3), which - amongst other details - does present switching values. **In the Panel's view, therefore, the PAD's sensitivity and risk analysis is inadequate under OP 10.04's provisions relating to risk.**

Cost Benefit Analysis Summary in the PAD

In the Panel's view, although the underlying economic evaluation may have been carried out competently and broadly in line with OP 10.04, parts of the material in Annex 4 are not presented and explained in the PAD with sufficient clarity, transparency and consistency to *demonstrate* this compliance. This matters because partial or confusing explanations in the PAD risk failing successfully to communicate and confirm to stakeholders the nature and robustness of the appraisal processes that the Bank's operational procedures like OP 10.04 promote and require. This could be important for a Project that is acknowledged to have controversial aspects.

Poverty Reduction

In view of the Project's design and the locations that will be affected, there seems little doubt that substantial numbers of poor people in the city of Cartagena are intended to and seem likely to experience significant benefits associated with the provision of enhanced access to and quality of water and sewerage services. However, the effects on the poverty of affected communities near Punta Canoa are less clear.

In relation specifically to the economic analysis, OP 10.04 requires that it examine "the Project's consistency with the Bank's poverty reduction strategy." The PAD observes, however, that the income data collected during the WTP surveys made it *"impossible to calculate with any accuracy the impact of the project on the poor."* **The evidence on poverty impact analysis in the PAD is limited to the highly aggregated 'poor'/'non-poor' columns of Table 6 in Annex 4 and eight lines of text. In the Panel's view, this is an issue of great importance to the Project. Given that the first of the Project development objectives is to improve water and sewerage services and sanitary conditions of the city's poorest population, and where – as with many projects that may benefit poor people – it is possible that some of the poor may gain while others lose, it is disturbing that more effort was not put in during the Project preparation and appraisal to enable sufficient income and/or other data to be assembled to assess the Project's impacts on the poor "with any accuracy."**

Effects on the Three Communities

Management maintains that no evidence supports the claim that the outfall will be detrimental to the economic activity of fishermen from Punta Canoa, Arroyo de Piedra and Manzanillo and that *"fishing activity, to the extent that it might occur in these areas would not be adversely affected."* However, apart from any scientific analysis of the probable impacts of the outfall, there are also issues of perceptions and public acceptability which can have real impacts on Project outcomes. Thus, if the outfall were *perceived* to be polluting, and if the evidence to the contrary were not trusted by the public at large, including tourists, then there would be a potential for damage to the

markets for local fish. This could significantly affect livelihoods in Punta Canoa and nearby villages.

While the Management Response points appropriately to the environmental monitoring program and the “*availability of technical mitigatory measures if needed (chlorination and/or future waste stream treatment beyond preliminary treatment)*,” such measures alone might be seen by the fishing communities as being reactive and insufficient to address the harm they might suffer before the mitigating measures were both put into effect and widely accepted by the wider community of residents and tourists as being effective. Moreover, chlorination may pose its own risks.

There are, therefore, risks to these poor communities which have not been properly and explicitly addressed in the appraisal of the Project. Had this been done, it might then have been possible both to reassure the concerned communities about the levels of risk and/or to put in place fall-back mechanisms that would provide trustworthy and timely “insurance” or compensation were the events to arise. In the Panel’s view, therefore, in relation to risk the Bank has not complied with OD 4.15. Compliance would have meant giving greater and earlier attention to the risks to and concerns of these communities, whose willingness to accept the location and consequences of the outfall was key to the successful delivery of the potentially very substantial benefits intended for so many of Cartagena’s other poor citizens.

Potential Impacts on Other Poverty-Reducing Investments by the District

The Management Response states that the District was required to keep other infrastructure investments apart from this project “*to a minimum.*” **In the Panel’s view, the decision to focus on water and sewerage investments was not inappropriate, but given the Project’s potential consequences in keeping other alternative poverty-reducing infrastructure investments “to a minimum”, the potential impact on other poverty reducing investments should have been properly addressed. This could have given confidence that the Project was the best use of the scarce financial resources of the District, and thus shown compliance with OD 4.15.**

FINANCIAL COMPLIANCE AND SUPERVISION

Financial Management Assessment of the District of Cartagena

Because the District would not be in charge of Project implementation, the Bank decided it would not need to carry out a financial management assessment for the District. **Given the assumptions reflected in the PAD—that about 55% of the funds to be made available by the District would come from Unified Property Tax/Impuesto Predial Unificado (IPU) revenues—the Panel finds that the Bank should have paid more attention to the District’s internal control and management problems and should have carried out an in-depth financial management assessment of the District. The Bank should then have worked with the District on an action plan to improve the District’s property tax registers and its billing and collection systems.**

Since the Bank was aware of the District's internal control and management problems, it should have required that the District, as the borrower of the Bank loan, have its accounts and financial statements audited by independent auditors each year and provide a copy of the audit report to the Bank. The independent auditors would have highlighted these problems in their report, and the Bank could have addressed any emerging problems early on during Project supervision, including seeking actions by the District and obtaining the support of the Ministry of Finance to find a satisfactory solution to this problem.

The Panel finds that the Bank should have carried out a financial management assessment for the District of Cartagena, as the borrower of the Bank loan, at the time of Project preparation and appraisal. Since it did not, it did not comply with its own policies and procedures set out in OP/BP 10.02. Furthermore, during supervision, while the Bank had an opportunity to address the problem of the shortfall in IPU receipts, it did not actively pursue that matter. The Panel also finds that the decision making within the Bank, as it refers to accepting audit reports that are not fully in compliance with the requirements of the Loan Agreement, did not follow Bank procedures. Hence, it did not comply with its own policies and procedures set out in OP/BP 13.05.

Project Financial and Accounting Statements

The Panel notes that the Project funds are channeled directly to ACUACAR, the Project implementing agency. The Bank ensured that the District would earmark and pledge a percentage of its tax receipts to fund its share of the Project and to repay the Bank loan. The funds from the tax receipts go directly into a fiduciary trust fund managed by an independent financial administrator. **The Panel finds that the agreed institutional and financial arrangements for the Project specifically address the uncertainties in the claimants' complaint, and that the processes followed comply with the Bank's OP 10.02.**

Given the supervision and scrutiny of ACUACAR, the Panel finds that the District of Cartagena receives sufficient information and assistance from other Government institutions to manage adequately the partnership agreements.

Financial Capacity of the District of Cartagena

The Panel notes that although from a strict Project point of view the Bank carried out its due diligence in accordance with its policies and procedures, it misjudged the importance to the Project of improving the borrower's capacity to collect the IPU taxes. Pledging a percentage of IPU revenues was not enough to guarantee that the District would be able to meet its financial obligations to the Project.

Financial Management Assessment—ACUACAR

The Panel finds that the Bank carried out an adequate financial management assessment on ACUACAR in accordance with Bank policies and procedures.

With respect to supervision of ACUACAR, the Panel finds that the supervision reports on financial management by ACUACAR are complete and informative. Aside from some shortcomings of the audit reports that are noted in the main text of the Investigation Report, the Bank has covered this aspect, including financial and operational internal control matters, very thoroughly.

Financial Capacity—ACUACAR

The Panel finds that the Bank satisfactorily carried out its due diligence during Project preparation with regard to ascertaining the financial capacity of ACUACAR. This is in line with its policies and procedures.

Bank Supervision of ACUACAR

With regard to ACUACAR, the Panel finds that the Bank closely supervises the performance of ACUACAR and is in compliance with its policy on Project supervision, OP/BP 13.05.

Risk of Default on the Bank Loan

The Panel finds that at the time of Project preparation the Bank carried out detailed financial analyses and projections, including sensitivity tests, on the revenue and cost statements for the District of Cartagena and ACUACAR.

The Panel finds that the Bank adequately carried out financial projections for the District as well as for ACUACAR and reached satisfactory institutional arrangements to ensure proper Project financing and loan repayment. The Panel finds that the Bank carried out its due diligence with regard to repayment of the loan in line with OP/BP10.02.

CHAPTER ONE: INTRODUCTION

1. Request for an investigation

1. On April 20, 2004, the Inspection Panel received a Request for Inspection² (“the Request”) alleging that the World Bank violated its own policies and procedures in the design, appraisal and implementation of the Colombia: Cartagena Water Supply, Sewerage and Environmental Management Project (“the Project”). The Request claimed that this violation caused and will cause harm to the communities living in areas north of the city of Cartagena and to human health and the marine environment.
2. The Panel registered the Request on April 22, 2004, and notified the World Bank Board of Executive Directors (“the Board”) and the President of its receipt.
3. On May 21, 2004, Management submitted its Response to the Request for Inspection.

1.1 Background

4. Cartagena de Indias is the fifth largest city in Colombia and its most important tourism area. It is also the site of the most extensive Spanish colonial fortifications in South America. In 1984, Cartagena’s Port, the Fortresses and a Group of Monuments were inscribed in the UNESCO’s World Heritage List.³
5. According to the PAD, Cartagena’s population of about 900,000 people has grown in recent years at a rate of 2.5 percent per year and has doubled in the past twenty years.⁴ This increase is mainly due to migration from rural Colombia of people displaced by violence in the countryside and in search of new economic opportunities. Because of the high immigration of poor people, 84 percent of Cartagena’s population is of low and medium income, 31 percent of which is extremely poor.⁵
6. Cartagena is surrounded by the Caribbean Sea, the Cartagena Bay and the Ciénaga de la Virgen, a lagoon also known as Ciénaga Tesca, and is

² Request for Inspection of the Cartagena Water Supply, Sewerage, and Environmental Management Project on behalf of residents of Cartagena, Punta Canoa, Arroyo de Piedra, and Manzanillo, April 19, 2004, in Inspection Panel Report and Recommendation, June 30, 2004, Annex I, [hereinafter “Request”]

³ Convention concerning the Protection of the World Cultural and Natural Heritage, Paris, November 16, 1972. See at www.unesco.org last visited on June 13, 2005.

⁴ World Bank, Project Appraisal Document on a proposed loan in the amount of US\$85 million to the District of Cartagena with the Guarantee of the Republic of Colombia for the Cartagena Water Supply, Sewerage and Environmental Management Project, (June 28, 1999), p. 4, [hereinafter “PAD”].

⁵ PAD, p. 4.

traversed by interconnected water courses. These water bodies are seriously contaminated by wastewater because they are the repositories of the untreated municipal and industrial liquid wastes of the city, 30% of which is discharged into the Cartagena Bay, 60% into the Ciénaga de La Virgen and 10% into the water courses.⁶ In addition, as Cartagena's population is growing rapidly, the city is experiencing rapid expansion of informal settlements, the largest of which is encroaching into the wetlands along the southern shores of the Ciénaga de la Virgen. As a result, many poor people are living in damp squalid conditions with an exceptionally low quality of life, the lagoon margin is being destroyed, and the already poor quality of the lagoon waters is further deteriorating because of the direct discharge of human wastes into it.

7. The poor neighborhoods of Cartagena, which are mainly concentrated around the Ciénaga de la Virgen, lack sewerage networks; raw sewage also flows in the streets creating alarming sanitary conditions. Because the provision of water and sanitation infrastructure in the Cartagena's poor areas has not kept pace with the rapid growth of the city, the rich parts of Cartagena have high coverage of water and sewerage, while the poorer areas still lack these basic services. The present situation has generated public health, sanitation and environmental problems that deteriorate the population's quality of life and threaten both the tourism sector – the main income source of the city – and Cartagena's general economic development.
8. According to Management, in an effort to improve both the efficiency and extent of water and sanitation delivery, a major restructuring of the water and sanitation sector in Colombia took place in 1991. In Cartagena, in 1993, poor quality of services and inefficiencies led the municipality to close out, with Bank assistance, the municipal water and sewerage utility and to introduce private sector participation for providing these services. In 1994, the municipality of Cartagena and the Spanish "Aguas de Barcelona" (AGBAR), Barcelona's water company, partnered to create a public-private entity, Aguas de Cartagena (ACUACAR), which took over responsibility for provision of water and sewerage services to the city in June 1995. Attempts to improve the Cartagena water supply, sewerage system and environment have been made for at least 20 years and there has been ongoing involvement of the World Bank in this sector together with the City of Cartagena and ACUACAR⁷. Since the creation of ACUACAR in 1995 these efforts have been accelerated and have led to the present Water Supply, Sewerage and Environmental Management Project, which is the subject of the Panel's investigation.

⁶ PAD, p. 4.

⁷ PAD, p. 5. The Bank provided technical assistance to the municipality of Cartagena to liquidate the municipal water company and create a new public-private enterprise through Loan 2961-CO for the Colombia Water Supply and Sewerage Project.

9. The Project, as described in the Project Appraisal Document (PAD), focuses on improving infrastructure services and ensuring sustainable development. It aims at expanding the water supply and sanitation coverage in Cartagena and improving water supply and sewage services, particularly in the city's poor neighborhoods. To increase the collection, treatment and adequate disposal of sewage in Cartagena would allow to reduce pollution of the Cartagena Bay, the Ciénaga, and the Caribbean beaches, as well as to decrease environmental health risks faced by the population, particularly the urban poor.⁸ As described in more detail below,⁹ the Project main components include the expansion of the water supply and sewerage systems; the construction of a main wastewater conveyance system, of wastewater treatment installations and of a submarine outfall 2.85km off the coast of Punta Canoa, about 20km north of Cartagena. The Project description includes also mitigation measures to address the Project's environmental and social impacts.

1.2. The Request

10. The **Corporación Cartagena Honesta (CCH)**, a local non-governmental organization, submitted the Request on its own behalf and on behalf of 125 residents of Punta Canoa, 139 residents of Arroyo de Piedra, 41 residents of Manzanillo del Mar, and 119 residents of Cartagena.
11. The Requesters claim that the proposed submarine outfall to be constructed off the coast of Punta Canoa will pollute the marine environment, which supports fisheries that, together with tourism activities, provide the people of the area with their primary source of food and income. They believe that, as a result of the Project, untreated wastewater will be discharged into the sea, and will contaminate the marine life and have a serious and permanent impact on the people's health and livelihood.
12. The Requesters challenge the soundness of the Project design, in particular the degree of treatment to which the effluent discharged by the outfall into the Caribbean Sea will be subject. They argue that preliminary treatment will not remove bacteria or chemical pollutants, thus causing pathogenic and chemical contamination of the coastal waters. The Requesters add that the monitoring program, designed to deal with events where harmful bacteria from the waste flow may reach nearby beaches, will not provide adequate protection against potentially life-threatening pollution. They assert that chemical contamination would deplete the fish stocks and could have severe human health impacts for fishermen and anyone else exposed to the tainted fish or contaminated water.

⁸ PAD, p.2.

⁹ See infra Chapter 1, section 2.

13. The Requesters allege that the Bank violated its policy and procedures on Environmental Assessment because the Project's environmental assessment (EA) carried out by the Borrower failed to consider adequately potential damage to human health and the marine environment and dismissed more environmentally sound and financially viable alternatives to the submarine outfall option. Further, they believe that the EA did not properly take into account the geological conditions of the area around Punta Canoa, which is subject to diapirism or mud volcanism. This phenomenon, the Requesters argue, could rupture the outfall pipeline without warning and cause the effluent to be accidentally discharged much closer to the shore. They also allege that the consultation requirements of the Bank policy on Environmental Assessment were not complied with. The Requesters believe that, in spite of the residents' level of concern and opposition to the submarine outfall, the EA addressed the social and economic effects on the villages only in a cursory fashion.
14. The Requester claim that the EA also failed to identify and to address adequately the requirements of the domestic laws and regulations and to take into account the 1983 Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region. In their views, the construction of the outfall, as designed, will violate the convention's provisions and those of the 1999 Aruba Protocol to the Cartagena Convention on Land-based Sources of Pollution signed by the Republic of Colombia in 2000.
15. The Requesters allege that the Bank violated its policy on Indigenous Peoples (OD 4.20) because the Project failed to identify the affected communities living in Punta Canoa, Arroyo de Piedra, and Manzanillo del Mar as indigenous peoples, and thus failed to prepare an Indigenous Peoples Development Plan (IPDP) to avoid and mitigate the Project's adverse impacts on these communities. In the Requester's view, the people living in Punta, Canoa, Arroyo de Piedra, and Manzanillo del Mar are Afro-Colombian indigenous peoples who meet the requirements of OD 4.20.
16. The Requesters further claim that the potential fiscal instability of the Borrower and the expected increase in the total cost of the Project, which could cause the Borrower to default on the loan, will cause them harm. They also allege that by accepting inaccurate financial and accounting statements from the Borrower, the District of Cartagena, the Bank violated OP/BP 10.02 – Financial Management. In addition, by failing to scrutinize adequately and effectively the economic and environmental risk evaluations of the outfall and the alternative options for disposing of wastes, the Bank did not comply with OP/BP 10.04, on Economic Evaluation of Investment Operations.

17. With respect to Project supervision, according to the Requesters, the Bank did not comply with OD/OP/BP 13.05 – Project Supervision. The Requesters finally state that they have raised the issues described in the Request with the Bank on numerous occasions, but were not satisfied with the responses and explanations they have received from Bank staff.

1.3. Management Response

18. On May 21, 2004, the Panel received Management's Response to the Inspection Panel Request, which is briefly summarized below.¹⁰
19. Management claims that the Bank correctly applied its policies and procedures and that the Project will not cause any harm to the marine environment or to human health. As a result, according to Management, the Requesters' rights have not been, nor are likely to be, adversely affected by a failure of the Bank to follow its own policies and procedures.
20. In response to the Request's claims regarding the Project's Environmental Assessment, Management contends that the EA - as well as the process of preparing the EA - for the wastewater treatment plant, the wastewater conveyor and the submarine outfall comply with OD 401. Management also notes that the EA was based on a Feasibility Study for Wastewater Treatment and Disposal (FS), which addressed issues of human health and the marine environment. This FS study also analyzed, from the technical, economic, environmental, and social perspectives, a comprehensive set of alternatives combining different treatment and final disposal sites including all but one of the options proposed by the Requesters. Management emphasizes that "*an international firm of high repute*¹¹" conducted the FS study, which a Panel of Experts (POE) composed of internationally recognized wastewater management experts; the Colombian Oceanographic Institute (CIOH); and the regional environmental authority, CARDIQUE, reviewed. CARDIQUE subsequently issued the environmental license ratified by the Ministry of Environment.
21. Management asserts that the EA analyzed the impacts of the Project on the coastal zones and concluded that the planned outfall would minimize the risk that the discharged effluent would have any harmful effects, such as pathogenic bacterial contamination, on the coastal zones, including those near Punta Canoa, Arroyo de Piedra and Manzanillo del Mar and those near Cartagena. However, Management adds that to mitigate potential negative environmental impacts, a set of precautionary measures was designed, such

¹⁰ Bank Management Response to Request for Inspection Panel Review of the Cartagena Water Supply, Sewerage, and Environmental Management Project (IBRD Loan No. 4507-CO), May 21, 2004, in Inspection Panel Report and Recommendation, June 30, 2004, Annex 2 [hereinafter "Management Response"].

¹¹ Management Response, Annex 1, Item 4, p. 32.

as monitoring, chlorination installations, and a contingency plan for the collection, treatment and disposal of wastewater.

22. With respect to the geological conditions of the Project area, Management contends that the FS, the EA, and the studies conducted by the Marine Resources and an expert hired by ACUACAR addressed this issue and confirmed that the risk of diapirism, or mud volcanism, in the area is low because there is an absence of large magnitude seismic activity and magmatic volcanism.
23. As to the issue of inadequate consultations raised by the Requesters, Management claims that consultations were conducted in compliance with OD 4.01 and that during project preparation a participatory approach was used.
24. Management also contends that, under domestic laws and regulations, marine outfalls are permissible provided that appropriate studies are conducted. The Response adds that the Requesters have previously raised these legal arguments with the Colombia administrative adjudication process which has already adjudicated each of them. Management emphasizes, however, that even if the claims had not been adjudicated under Colombian law, they do not arise out of an act or omission of the Bank in failing to follow its own policies and procedures. As to the claims regarding the violation of international law, according to the Response, Colombia is a party to the 1983 Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region, but not to the 1999 Protocol Concerning Pollution from Land-based Sources and Activities in the Wider Caribbean Region. The Protocol is thus not binding and its provisions not applicable to Colombia.
25. In response to the claim that the communities living in the north zone of Cartagena are indigenous peoples, Management claims that these communities do not meet the criteria set forth in OD 4.20, and thus, there was no need to develop an Indigenous Peoples Development Plan during Project preparation. Nonetheless, Management claims that consultations with these communities were conducted as part of the Social Assessment process and in order to prepare the Social Impact Mitigation and Community Development Program, and that the concerns expressed by the affected people were reflected in the Project design.
26. With respect to the financial management of the Project, including the possible risk of default of the borrower and inaccuracies in the financial and accounting statements, Management states that the work carried out in Project preparation and supervision is in line with good practice on financial analysis. Management contends that the Project complies with OP 10.02. Similarly, Management maintains that the cost effectiveness analysis

carried out by Hazen & Sawyer and the cost benefit analysis conducted by Bank staff and Soluciones Integrales (SI), a local consultancy firm, comply with OP 10.04.

27. As to Project supervision, Management claims that the supervision of the Project has been thorough and in compliance with OD 13.05 and OP/BP 13.05. The Response adds that the Bank has conducted 13 missions to the Project area, has reviewed quarterly Project Management Reports (PMRs) that ACUACAR prepared and submitted, and has participated in several consultation meetings making presentations on the technical aspects of the Project. Management Response also rejects the allegations regarding conflict of interest situations between Bank Staff, ACUACAR's and CARDIQUE's officials.
28. Management states that, under the Project, the communities of Punta Canoa, Arroyo de Piedra and Manzanillo will receive benefits such as piped water services; in-house sanitation facilities; community centers; an orchard for Punta Canoa to support post-construction reforestation facilities; work opportunities during Project construction; improvement of the environment; and, "[s]hould additional funds exist from project savings" sanitation services through a sewerage network. According to Management, the Project thus complies with OD 4.15 on Poverty Reduction.
29. Finally, Management claims to have responded in a timely fashion to all letters sent by the Requesters and to have provided available material when requested.

1.4. Eligibility of the Request

30. To determine the eligibility of the Request and the Requesters the Panel reviewed the Request for Inspection and Management Response. The Panel Chairperson, Professor Edith Brown Weiss, together with Executive Secretary Eduardo Abbott and Operations Officer Tatiana Tassoni, visited Bogotá, Cartagena, and villages north of Cartagena, Colombia, from June 10 through June 16, 2004.
31. During the field visit, the Panel team met with the Requesters and other people in affected communities, representatives of ACUACAR, CARDIQUE and INGEOMINAS, national, regional and local government officials, local NGOs, technical experts and prominent citizens of Cartagena.
32. The Panel determined that the Request fulfilled the eligibility requirements for Inspection. Because the Request and the Management Response contain conflicting assertions and interpretations concerning the issues, the facts, compliance with Bank policies and procedures, actual harm, and potential

harm, the Panel recommended an investigation to the Board of Executive Directors.

1.5 The Board Decision

33. On July 13, 2004, the Board approved the Panel's recommendation to conduct an investigation into the matters alleged in the Request for Inspection. The Request, Management Response, and the Panel's Report and Recommendation, in English and Spanish, were made public shortly after the Board authorized the inspection sought by the Requesters.

1.6 The Investigation

34. The purpose of the investigation was to establish whether the Bank complied with its own policies and procedures in the design, appraisal and implementation of the Colombia: Cartagena Water Supply, Sewerage, and Environmental Management Project, and whether, if instances of non-compliance were found, they caused, or were likely to cause, harm to the Requesters and the people they represent.
35. The Panel conducted a two-part investigation. The first part involved detailed research into Bank records related to the Project and interviews with Bank management and staff. The second part took the form of an in-country fact-finding visit. To assist in its investigation, the Panel hired six consultants, who are internationally recognized experts in their respective fields: Professor Richard Fuggle, environmental scientist, Robert Goodland, social scientist and ecologist, Professor Jorg Imberger, environmental engineer and ocean outfalls specialist, Roberto Mosse, financial specialist, Professor Peter Pearson, economist, and Professor Carlos Tucci, hydrologist¹².
36. Panel member Tongroj Onchan accompanied by Executive Secretary Eduardo Abbott and the expert consultants visited Bogotá, Cartagena, and villages north of Cartagena, Colombia, from October 21 to October 30, 2004. The Panel met with the Requesters, with high officials of the Government of Colombia (GOC), and with ACUACAR officials and staff, who had an open and frank dialogue with the Panel and were very helpful in assisting in its investigation. Consistent with its mandate, the Panel independently visited the Project areas and consulted with affected people.

¹² The Panel would also like to thank Dr. Jake Piper, environmental assessment specialist and Research Fellow, Oxford Institute for Sustainable Development, for her comprehensive review of the Project Feasibility Study (Estudio de Factibilidad para el Tratamiento de las Aguas Residuales de Cartagena y para la Disposición Final del Efluente al Mar Adyacente a través de un Emisario Submarino, Informe Final, Hazen and Sawyer, October 1998).

37. The Panel also conducted interviews with the Bank's management and staff in Washington, D.C. before and after visiting the Project affected area. In its investigation, the Panel identified and carefully reviewed all documents relevant to the case that the Requesters, Bank staff, ACUACAR officials, CARDIQUE officials and other sources provided to the Panel. The Panel also analyzed other evidence gathered during the field visits or otherwise in its research.
38. This Report presents the results of the Panel's investigation regarding the different set of environmental, social, financial and economic issues the Requesters raise in their submission to the Panel.

2. The Project

39. According to the Loan Agreement, the objectives of the Project are to: *“(a) improve the water and sewerage services in the territory of the Borrower and the sanitary conditions of the Borrower's poorest population (b) facilitate the environmental cleanup of water bodies surrounding the territory of the Borrower (Cartagena Bay, Caribbean beaches, and Ciénaga de la Virgen lake); and (c) improve the sustainability of water and sewerage services in the Borrower territory through a private sector participation model.”*¹³
40. The Project includes the following components:¹⁴
 - a. Expansion of the water supply system: expanding the water production system, replacing the primary distribution mains, and other measures;
 - b. Expansion of the sewerage system in the Ciénaga Basin: improving sanitation conditions by enhancing the conveyance capacity of existing sewage collectors and expanding the secondary sewerage network in the southwest, southeast, and central parts of the city which currently drain to the Ciénaga, and by constructing new pressure lines, pumping stations and gravity collectors;
 - c. Construction of the main conveyance system of the wastewater to the treatment plant: clean-up of the water bodies surrounding Cartagena which currently receive wastewater – the Bay, the Ciénaga, the beaches and the water courses. This component includes upgrading the Paraíso pumping station, constructing the pipeline from Paraíso pumping station to the treatment plant site and constructing the effluent pipeline from the plant to the submarine outfall. The

¹³ Loan Agreement (Cartagena Water Supply, Sewerage and Environmental Management Project) between International Bank for Reconstruction and Development and Distrito Turístico y Cultural de Cartagena de Indias, Loan No. 4507-CO, (December 10, 1999), Schedule 2 [hereinafter “Loan Agreement”].

¹⁴ Loan Agreement, Schedule 2 (Description of the Project).

conveyance system would consist of a 72 inch in diameter pressure pipe with a total length of 23.85km;

- d. Construction of treatment installations: providing preliminary treatment to remove floatable materials, grease, oil, sand, and grit;
 - e. Construction of a submarine outfall for the discharge of the treated effluent to the Caribbean Sea near Punta Cana;
 - f. Industrial wastewater discharge control: identifying key sources of industrial pollution in the city of Cartagena, establishing a system for regulating the discharge of industrial wastes, and a system for auditing industrial waste discharge, defining strategies to control small and dispersed sources of industrial pollution, and providing technical assistance for the pretreatment process;
 - g. Environmental and social component: measures mitigating the environmental and social impacts of the Project, including environmental supervision during construction, the restoration and conservation of the Ciénaga de la Virgen nature reserve, a monitoring program before and after construction of the submarine outfall to study pathogenic coliforms and other contaminants discharged through the outfall and an environmental institutional strengthening program. A Social Impact Mitigation and Community Development Program includes organization and strengthening of the communities and other measures. The District will also supply piped water to the communities of the North Zone as a condition of the Loan;¹⁵
 - h. Project management: technical assistance, studies, design and supervision of works: support and partial financing for Project management, design and supervision of the water supply systems and the sewerage systems works; design of the main wastewater conveyance system, treatment installations and submarine outfall; supervision of the main conveyance system works, the treatment installation, the submarine outfall works; and procurement audits.
41. According to the PAD, the submarine outfall will be 2.850km long, have 72" diameter, discharge wastewater at a seawater depth of 20 m, with a total capacity of 4 m³/s by year 2025; and will have a 0.5km long diffuser with 27 vertical riser pipes and 2 ports each for a total of 54 ports.¹⁶ The submarine outfall will be built off the coast of Punta Canoa, a village located some 20 km north of Cartagena.

¹⁵ See Loan Agreement, Art. III, § 3.04(b).

¹⁶ PAD, p. 18.

42. The PAD provides that after the construction period –estimated in five years (1999-2004)¹⁷ at the time of PAD preparation– the operation of the outfall will be implemented in two phases: Phase 1 (2005-2015) and Phase 2 (2015-2025). The first phase, under the Bank-financed Project, includes the pumping station, the land conveyance system, the preliminary treatment installations and the submarine outfall. Management states in the Response that the second phase was modified from its original design after CARDIQUE, the Regional Environmental Authority, issued the environmental license for the Project in June 2001 to provide for the “*upgrading of the treatment plant from preliminary treatment to primary or the equivalent*.”¹⁸”

2.1. Context

43. The Panel notes the urgent need for Cartagena to have in place a sustainable system for disposing of its sewage and organic wastes. This is especially essential when the population of the city is growing rapidly. Submarine outfalls are an established method for disposing of municipal wastes. The choice of the submarine outfall as the preferred method for disposing of wastes takes place, however, in the context of growing global concern about the pollution of the marine environment. While submarine outfalls have long served as a method for disposing of land-based wastes, there is increasing attention to ensuring that the wastes are properly treated before discharge in the oceans and released at sufficient distance and depth to protect against harm to the marine environment or nearby coastal areas. Moreover, as the need grows for disposing of wastes, there is increasing attention to other methods for disposing of land-based wastes, other than in the marine environment.
44. In the Project before us, the Panel takes note of the very significant efforts by Management and staff in the preparation and initial supervision of this Project to ensure that the Project is appropriately designed and implemented. The Panel hopes that its Report will be of value in assessing Bank’s compliance with its policies and procedures and in furthering the development of a sustainable and equitable waste disposal system.

2.1 Project Financing

¹⁷ In its Response to the Request for Inspection, Management states that Project’s Component A is fully committed, the majority of its works have been completed and the rest “*will be completed before the end of calendar year 2004.*” Component B is also fully committed and “*will be completed before the end of 2004.*” As to Component C, D, and E Management states that delays in obtaining the environmental license for the works have postponed their implementation, which is currently at the bidding stage. Finally, components F, G, and H “*are well advanced and will continue for the entire implementation period as planned.*” Management Response, ¶ 25-26.

¹⁸ Management Response, ¶ 22.

45. The total cost of the Colombia: Cartagena Water Supply, Sewerage and Environmental Management Project is US\$117.2 million.¹⁹ On December 10, 1999, the Bank entered into a Loan Agreement with the Distrito Turístico y Cultural de Cartagena de Indias providing for a US\$85 million loan to finance about 72% of the total Project cost.²⁰ In addition to the IBRD Loan, the Project's financing structure includes US\$7.58 million from the Borrower, US\$4.6 million from ACUACAR, the Project's implementing agency, and US\$20 million from the Republic of Colombia, the guarantor of the Loan. The current closing date for the Loan is June 30, 2005.

3. Applicability of the Bank Operational Policies and Procedures to the Project

46. With respect to this Project, the Panel assessed whether the Bank complied with the following applicable operational policies and procedures:

OD 4.01	Environmental Assessment ²¹
OP/BP 4.04	Natural Habitats
OP 4.07	Water Resources Management
OD 4.15	Poverty Reduction
OD 4.20	Indigenous People
OP/BP 10.02	Financial Management
OP/BP 10.04	Economic Evaluation of Investment Operations
OD/OP/BP 13.05	Project Supervision

¹⁹ Management Response, ¶ 9.

²⁰ In April 2004, when the Request for Inspection was filed with the Panel, about 31 percent of the loan had been disbursed.

²¹ The Requesters allege the Bank's non compliance with OP/BP 4.01. However, the applicable Bank policy for this Project is OD 4.01, as the Project Information Document was first issued before March 1, 1999. See World Bank Operational Policy 4.01 – Environmental Assessment.

CHAPTER TWO: ENVIRONMENTAL COMPLIANCE

1. The Project's Environmental Assessment

47. The Request for Inspection alleges that, in approving and appraising the Project, the Bank has not complied with the standards set out in its operational policies and procedures, in particular the policies on Environmental Assessment, Natural Habitats and Water Resources Management. The following sections of this report address the Requesters' specific complaints related to environmental issues.
48. The Requesters believe that the EA did not adequately consider potential adverse impacts of the Project on human health and the marine environment. They argue that the coastal zone supports fisheries that supply the people of the area with their primary source of food and income. They believe that, as a result of the Project, "*untreated wastewater*"²² will be discharged into the sea and will contaminate marine life and have a serious and permanent impact on the people's health and livelihood, especially the people of Punta Canoa, Arroyo de Piedra and Manzanillo del Mar, whose lives are "*inextricably linked to the health of the Caribbean Sea.*"²³
49. Moreover, they claim that the EA focused on potential risks to the tourist areas around Cartagena, but did not adequately analyze how the Project will similarly affect the immediate coastal zones near Punta Canoa, Arroyo de Piedra, and Manzanillo del Mar.
50. The Requesters' main complaint with respect to the Project's Environmental Assessment focuses on their claim that the analysis of alternatives required under the Bank policy on Environmental Assessment was inadequate. The Request states that the studies approved by the Bank "*clearly lacked the requisite comprehensive and accurate analysis of viable project alternatives*"²⁴ The Requesters also allege that the EA and the Project Feasibility Study "*unjustifiably dismissed more environmentally-sound and financially-viable (and certain) alternatives*" to the outfall option that was finally selected. The Request lists a number of alternatives that, in the Requesters' view, were rejected because of the "*cursory and misleading nature*" of the analysis of alternatives. The Requesters mention, for example, a wastewater treatment plant and reuse system, and oxidation lagoons and irrigation of mangrove swamps as possible "*ecologically sustainable*" solutions for the sanitation problem of Cartagena. They believe that these options were discarded because "*ACUACAR and the World Bank had decided from the beginning that the solution to Cartagena's sewage problem was a major submarine outfall.*"²⁵

²² Request, p.1.

²³ Request, p. 3.

²⁴ Request, p.14.

²⁵ Request, p. 14.

51. In Response to the complaints raised in the Request for Inspection, Management states that the Project “*will not cause any harm to the marine environment or to human health.*”²⁶ The Response also maintains that the EA for the wastewater treatment plant, the wastewater conveyor and the submarine outfall, as well as the process of preparing the EA, complies with OD 4.01.²⁷
52. Management notes that the EA was based on a Feasibility Study for Wastewater Treatment and Disposal (FS), which addressed issues of human health and the marine environment. A Social Impact Assessment (SIA) also analyzed human health impacts of the Cartagena Sanitation Project.²⁸
53. Management states that the FS study analyzed a “*comprehensive set of alternatives*”²⁹ combining different treatment and final disposal sites, including all but one of the options proposed by the Requesters,³⁰ and that “*all alternatives were evaluated from technical, economic, environmental, and social perspectives.*”³¹ According to Management, the FS study “*identified the submarine outfall as the preferred alternative.*”³² Management emphasizes that an international firm of high repute conducted the FS study³³ and a Panel of Experts (POE) composed of internationally recognized experts “*conducted six meetings to review the FS, EA and final design specifications for the marine outfall.*”³⁴ According to Management, the Colombian Oceanographic Institute (CIOH) reviewed and approved the EA and the FS, and the regional environmental authority, CARDIQUE, issued an environmental license ratified by the Ministry of Environment.
54. Management also emphasizes that the decision regarding the selected wastewater management system “*coincides with the position of the World Health Organization*” (WHO), which in its recent guidelines identifies an effective outfall preceded by preliminary treatment to have low risk of

²⁶ Management Response, p. 23.

²⁷ Management Response, Annex 1, Item 1, p. 25.

²⁸ Management Response, ¶ 34.

²⁹ Management Response, Annex 1, Item 4, 30. Fifteen alternatives were addressed.

³⁰ Management Response, Annex 1, Item 4, 31, 32. According to the Response, only the Requesters’ proposal for a “*combination of biological treatment in oxidation lagoons and irrigation of Cartagena’s mangrove swamps with the treated effluent*” was not taken into consideration. This proposal was excluded because of “*the sensitivity of the mangrove ecosystems, considered to be natural habitats under OP 4.04.*”

³¹ Management Response, Annex 1, Item 4, p. 31. The Response includes a description of some of the alternatives analyzed, namely those also raised by the Request, and their degree of viability with respect to the one eventually selected, the submarine outfall.

³² Management Response, Annex 1, Item 1, p. 26.

³³ Management Response, Annex 1, Item 1, p. 26. The Response states that the consulting firm, Hazen & Sawyer, also prepared a stand alone document, “Environmental Diagnostic of Outfall Alternatives for the Disposal of Wastewater in Cartagena,” to be submitted as part of the licensing process, which presented an “*analysis of alternatives with particular emphasis on environmental impacts.*”

³⁴ Management Response, ¶ 34.

human health impacts.”³⁵ In addition, Management states that, according to the Pan American Health Organization (PAHO), about 100 outfalls similar to the one proposed for Cartagena are in operation in other Latin American countries such as Brazil, Chile and Uruguay, where they have functioned with no problems.³⁶

55. In response to the Requesters’ claim that the EA did not analyze the Project’s adverse impacts on the immediate coastal zones of Punta Canoa, Arroyo de Piedra, Manzanillo del Mar and Cartagena, Management asserts that extensive studies were conducted to analyze the impacts on the coastal zones.³⁷ The Response adds that all the studies concluded that *“the planned outfall would minimize the risk that the discharged effluent would have any harmful effects on the coastal zones, including those near Punta Canoa, Arroyo de Piedra and Manzanillo and those near Cartagena.”*³⁸
56. The Response indicates that the submarine outfall as designed *“provides adequate protection against harmful bacteria from the waste flow reaching nearby beaches.”*³⁹ Although *“pathogenic bacterial contamination is the main public health risk posed by the proposed outfall [...] [t]his risk is reduced by appropriate choice of the outfall location.”*⁴⁰ The Response explains that bacteria undergo a process of physical dilution and of biological decay in the marine environment. Management states that *“[t]he bacterial die off can be controlled by proper selection of the outfall length, since a longer outfall means a longer travel time towards the shore and thus a higher die off.”*⁴¹ The proposed outfall extends 2.85km from the shore and discharges the wastes at a depth of about 20m.⁴²
57. Management states that because a submarine outfall, if not properly mitigated, could cause negative environmental impacts, the Project was categorized as A to *“ensure that proper analysis and mitigation measures were incorporated in its design and implementation.”*⁴³ Management states that the Project design includes precautionary measures such as chlorination installations, support for the development of a contingency plan for the collection, treatment and disposal of wastewater, and *“intensive monitoring.”*⁴⁴

³⁵ Management Response, ¶ 24. Note 1 of Management Response was omitted from the quotation. See also ¶32.

³⁶ Management Response, ¶ 29.

³⁷ Management Response, Annex 1, Item 3, p. 28.

³⁸ Management Response, Annex 1, Item 3, p. 29.

³⁹ Management Response, Annex 1, Item 2, p. 27.

⁴⁰ Management Response, Annex 1, Item 3, p. 29.

⁴¹ Management Response, Annex 1, Item 2, p. 29.

⁴² Management Response, Annex 1, Item 3, p. 29.

⁴³ Management Response, Annex 1, Item 2, p. 27.

⁴⁴ Management Response, Annex 1, Item 2, pp. 27, 28.

1.1. Screening

58. Screening is the critical initial phase in Environmental Assessment. OD 4.01 paragraph 17 requires the Bank “to decide the nature and extent of the EA or environmental analysis to be carried out.” Screening assigns a project to one of three categories. **Category A:** A full Environmental Assessment is required. **Category B:** Environmental Analysis is required but not a full environmental assessment. **Category C:** No environmental assessment or environmental analysis is required. **The Cartagena Water, Sewerage and Environmental Management Project was assigned to category A under OD 4.01. The Panel finds this to be appropriate and in compliance with OD 4.01.**

1.2. Stage in Project Cycle

59. OD 4.01 requires that the Environmental Assessment occur during project preparation so that all environmental consequences are recognized early in the project cycle⁴⁵. Defining precisely the start of the Cartagena Water Supply, Sewerage and Environmental Management Project Cycle is problematic. The Loan Agreement with the District of Cartagena (Loan No. 4507-CO) to finance the Cartagena Water Supply, Sewerage and Environmental Management Project was prepared during the period 1995-1999, and approved by the Bank Board of Directors in July 1999. The legal agreements became effective in January 2000.⁴⁶ The initiation date for the Environmental Assessment is officially recorded as August 1998. A first draft was submitted in December 1998, and the Bank reviewed a final draft in March 1999.⁴⁷ However, after the Project Concept Meeting on December 15, 1995, the Task Manager for the “Colombia Cartagena Water Supply, Sewerage, and Environmental Cleanup Project” provided detailed specifications for an Environmental Assessment (EA) Study in a Memorandum dated December 21, 1995. **The Panel finds that the EA for the Project was initiated early in the project cycle, and in this respect complied with OD 4.01.**

1.3. Analysis of Alternatives

60. A basic principle of environmental assessment is that there can be no choice if there is no alternative. This was recognized as early as the late 1960s. The purpose of environmental assessment is to improve decisions by

⁴⁵ OD. 4.01, ¶ 2

⁴⁶ Management Response, ¶ 9.

⁴⁷ Estudio de Impacto Ambiental del Emisario Submarino de Cartagena, Neutrópicos, Medellín, March 1999, [hereinafter “Environmental Assessment, Fundación Neutrópicos, 1999”]. See PAD, p. 22. See also Management Response, ¶ 21, Table 2.

making appropriate choices, so it follows that careful comparison of realistic alternatives is an important feature of environmental assessments. Without systematic consideration of realistic alternatives, any environmental impact assessment is seriously flawed. The Bank's own policies provide for the consideration of alternatives. Paragraph 4c of OD 4.01 of October 1991 states that project specific EA's should normally include: *"systematic environmental comparison of alternative investments, sites, technologies and designs"*. Paragraph (f) of Annex B of OD 4.01 amplifies this: *"The EA report should include the following items (f) Analysis of alternatives. Systematic comparison of the proposed investment design, site, technology and operational alternatives in terms of their potential environmental impacts... For each of the alternatives, the environmental costs and benefits should be quantified to the extent possible, and economic values should be attached where feasible. The basis for the selection of the alternative proposed for the project design must be stated"*.

61. To ensure that the importance of alternatives is fully understood, Task 5 of the Bank's Sample Terms of Reference (TOR) for Environmental Assessment states as follows: *"Task 5. Analysis of Alternatives to the Proposed Project. Describe alternatives that were examined in the course of developing the proposed project and identify other alternatives which would achieve the same objectives. The concept of alternatives extends to siting, design, technology selection, construction techniques and phasing, and operating and maintenance procedures. Compare alternatives in terms of potential environmental impacts; capital and operating costs; suitability under local conditions; and institutional, training, and monitoring requirements. When describing the impacts, indicate which are irreversible or unavoidable and which can be mitigated. To the extent possible, quantify the costs and benefits of each alternative, incorporating the estimated costs of any associated mitigating measures. Include the alternative of not constructing the project, in order to demonstrate environmental conditions without it."*
62. The Bank has been involved with water and sewage projects in Colombia from the mid 1980's. Since then, there has been controversy in Cartagena as to whether it is more desirable to have sewage disposal through an outfall to the sea or by means of conventional primary treatment with discharge of water to the Ciénaga de la Virgen. Before 1995 – when ACUACAR (a mixed private-public company created with Bank assistance) was established to manage the supply of water, and sewage disposal in Cartagena – the preferred option appears to have been for primary treatment of the city's sewage in stabilization and oxidation lagoons, with discharge

of the effluent into the Ciénaga de la Virgen⁴⁸. The Panel was informed that the Cartagena Municipality initially favored this solution.⁴⁹

63. The Panel reviewed a 1994 study that contains a technical and economic evaluation of the marine outfall for the discharge of Cartagena's wastewaters (1994 CHS Study).⁵⁰ According to this document, the evaluation was prompted by concerns about the nutrient concentration resulting from the use of stabilization ponds that may cause eutrophication in the Ciénaga de la Virgen.⁵¹ (A feasibility study also carried out by CHS in 1985 had recommended the use of stabilization lagoons.) According to the 1994 CHS Study, government officials, the World Bank, Cartagena's mayor, municipality officials and members of CHS held a meeting in 1993, in which they discussed the nutrient concentration problem and agreed to review the options of discharging the wastewater through a submarine outfall by itself or as a complement of treatment by means of stabilization lagoons.⁵² The 1994 CHS Study concluded that more studies were required if a submarine outfall option – with or without lagoon prior treatment – were to be considered.
64. The Inspection Panel was also told that the licensing authorities in Bogotá had rejected the proposal for oxidation lagoons, and that this had led the Bank to propose the consideration of a marine outfall for Cartagena's sewage.⁵³ The Aide Memoire related to a February 1998 Bank supervision mission indirectly supports this. In addressing issues to discuss with the Panel of Experts (POE) appointed in 1998 to review the feasibility of the proposed project, the report states *"The consultant should present a technical and economic comparison of the Bank-proposed project with the previously mentioned alternative (oxidation ponds and disposal to Ciénaga)."*⁵⁴ In addition, according to this report, *"[t]he cost of the land-disposal alternative with or without [effluent] storage should be evaluated and compared with marine disposal [...]"*.⁵⁵ This international POE in reviewing the feasibility and technical solutions proposed for Cartagena, including the FS, also stated that *"[t]he Panel of Experts recommends a*

⁴⁸ Panel of Experts Reports of the Review of the First Progress Report of the Feasibility Study for Treatment and Disposal of Cartagena's Wastewater, Section 1.3(ii).

⁴⁹ Staff Interviews, Washington DC, 2004.

⁵⁰ Civil Hidráulica Sanitaria, CHS Ltda., Evaluación técnico-económica de un emisario submarino para la descarga de las aguas residuales del alcantarillado sanitario de Cartagena, Informe Final, Febrero 1994, [hereinafter "CHS 1994"].

⁵¹ CHS 1994, p. 2.

⁵² CHS 1994, p. 2.

⁵³ Staff Interviews, Washington DC, 2004.

⁵⁴ Aide Memoire, February 22-28, 1998, Annex 1(Issues discussed and Recommendations made by the Panel of Experts, February 23-26 1998).

⁵⁵ Aide Memoire, February 22-28, 1998, Annex 1(Issues discussed and Recommendations made by the Panel of Experts, February 23-26 1998).

*change in concept from the Ciénaga receiving discharge to a marine outfall.”*⁵⁶

65. It is clear that by the mid-1990's the preferred option for Cartagena sewage effluent disposal changed from a land based sewage treatment plant to a marine outfall option.
66. The Executive Summary of the FS states that *“the wastewater management studies conducted during the 70's, 80's and 90's have recommended constructing a Submarine Outfall, to discharge the treated effluent into the Caribbean Sea.”*⁵⁷ The ES also refers to the Sewerage Master Plan originally prepared by the District of Cartagena and updated by local consultants, regulatory agencies, the World Bank and ACUACAR.⁵⁸ The Executive Summary notes that the recommendations of the Sewerage Master Plan in relation to water quality and the disposal of the effluent, were (1) to eliminate the discharges of wastewater into Cartagena Bay and the Tesca Lagoon; and (2) to plan and build a submarine outfall into the Caribbean to dispose of the City's residential liquid waste. The ES also notes that Hazen and Sawyer, the consultant who prepared the FS, *“were selected to review the feasibility of the basic recommendations of the Sewerage Master Plan [...] and outline the works needed to implement the plan.”*⁵⁹
67. The Panel notes that the FS does not refer to or explain any change of policy during the 1990s regarding the preferred ways of addressing Cartagena's wastewater problems or to any controversy over the most appropriate solution. In the Panel's view, the absence of explanation about the apparent change from an earlier policy favoring stabilization ponds may have exacerbated a public sense of unease or suspicion about the choice of a submarine outfall.⁶⁰
68. An analysis of the different alternatives considered in the Feasibility Study and the Environmental Assessment follows.

⁵⁶ Memorandum from Panel of Experts dated July 1998. However, in an interview with a member of the Panel of Experts, the member stated that in all meetings of the Panel the focus had been on a marine outfall as if the decision that this was the best solution for Cartagena had already been made.

⁵⁷ Estudio de Factibilidad para el Tratamiento de las Aguas Residuales de Cartagena y para la Disposición Final del Efluente al Mar Adyacente a través de un Emisario Submarino, Informe Final, Hazen and Sawyer, October 1998, [hereinafter “Feasibility Study, Hazen and Sawyer, 1998”], Executive Summary, p. 2.

⁵⁸ Feasibility Study, Hazen and Sawyer, 1998, Executive Summary, p. 4.

⁵⁹ Feasibility Study, Hazen and Sawyer, 1998, Executive Summary, p. 4.

⁶⁰ At least one member of the Panel of Experts was aware of the sensitivity of the choice, when the member wrote: *“Suggest deleting the map showing settleable solids zone of impact from E.S. This is rather alarming and does little to help “sell” the concept of an outfall at Punta Canoa,”* Technical Review of Hazen and Sawyer Feasibility Study Preliminary Report No. 1, April 2 1998, ¶ 2.2 (Additional Comments and Recommendations).

1.3.1. Disposal Alternatives

69. The analysis of alternatives in the FS addresses various combinations of (1) treatment levels and (2) effluent disposal locations, against the criteria of possible effects on (a) human health, (b) marine environment, (c) natural areas, (d) human populations, (e) technical feasibility and (f) cost effectiveness.⁶¹ The combinations of the factors resulted in 15 alternatives. The alternatives were based on future scenarios of 2015 and 2025 with discharges of 227,000m³/day and 303,000m³/day, respectively.
70. The FS and the EA analyze various disposal alternatives for liquid effluent. They consider the various Cartagena water bodies capable of receiving sewage effluent: to the north the Ciénaga de la Virgen (or Ciénaga Tesca); to the south the Bahía de Cartagena (Cartagena Bay); and to the west the Caribbean Sea. As possible alternatives, the studies consider the discharge of sewage effluent to each of these receiving waters, as well as the potential to use the effluent for irrigation. The documents address the following levels of treatment of the wastes before disposal: preliminary, primary, secondary, and advanced treatment.
71. The FS and EA also address the biological condition of the Bahía, the Ciénaga and the ocean area close to Cartagena. They particularly consider mangroves, water quality, and pathogens, and consider fish only to a lesser extent. In 2003, an inventory of fishing activities in the area likely to be affected by the submarine pipeline and special studies of biodiversity was undertaken.⁶²
72. The Cartagena Bay receives pollution via a channel, the “*canal del dique*,” from the Magdalena River. This river crosses the developed part of Colombia and mostly transports pollutants from agriculture and urban and industrial sources.⁶³ The Bay also receives the industrial pollution and storm water from the city of Cartagena. An undersea wall constructed by governmental authorities during the Spanish colonization reduces the rate at which water is exchanged between the sea and the Bay, which affects the Bay’s capacity to dilute pollutants.
73. The Ciénaga de la Virgen is an internal lagoon that forms part of the coastal ecosystem of the Cartagena area. It is polluted by domestic waste and storm water flow (total solids and overland flow that washes the contaminated surfaces) and agriculture. According to the FS, the Project would reduce the

⁶¹ Feasibility Study, Hazen and Sawyer, 1998, Chapter 6. See also Management Response, ¶ 24 and 34.

⁶² Instituto De Investigaciones Marinas Y Costeras (INVEMAR), Informe del censo de pescadores y avance de las caracterización de pesca artesanal en la zona de influencia del proyecto para el manejo y disposición de las aguas residuales de la ciudad de Cartagena, ecoquímica S.A. - BSI Inspectorate, December 2003. See also ACUACAR, Línea Base Del Plan De Tratamiento Y Disposición De Aguas Residuales De Cartagena De Indias - - ACUACAR S.A. E.S.P.

⁶³ The Magdalena River is also considered in paragraphs 88 and 89.

domestic waste into the lagoon but would not eliminate the other sources of pollution. The pollution reduction would not be enough to let the Ciénaga recover all its environmental functions.⁶⁴ The Panel of Experts dismissed the Ciénaga de Tesca as appropriate for receiving wastes, even if they are treated, because it has a low absorptive capacity and is part of an ecosystem that needs to be protected.⁶⁵ (The Bank-financed Project deals only with the reduction of the pollutant load, not with the ecosystem recovery.) The construction of automatic hydraulic gates, which increases the influx of unpolluted sea water into the Ciénaga, has improved the water quality of the lagoon by decreasing the residence time of pollutants and increasing its dilution capacity. However, the Panel notes that this is not a sustainable solution since it transfers the contamination to the coast near the lagoon, affecting the beaches.

74. The FS also dismisses the land disposal option as a viable solution because the use of treated wastewater for agriculture activities would be feasible only in summer months only (five months per year), and, according to the FS, the storage of the water for reuse would require a substantial amount of land near Cartagena.⁶⁶
75. As compared to the selected alternative, the Panel could find only cursory consideration to the option of constructing a sewage treatment plant near Cartagena, with the waters going to a marine area or alternatively reused for agriculture as a supplement to the recommended disposal system.
76. **The Panel finds that the study of alternatives covered most of the alternatives for this type of project and evaluated the basic parameters. In this respect, the Panel finds the Bank in compliance with OD 4.01, paragraph 4 and Annex B (f). However, the Panel is concerned about the diligence with which alternatives other than the preferred alternative of submarine outfall were studied. The voluminous feasibility study and the environmental assessment, which closely follows the feasibility study, give greater attention to the submarine outfall than to other options. They do not demonstrate a systematic comparative study of all the alternatives as required by OD 4.01.**
77. **The Panel finds that the appointment of a panel of experts to review the technical work in the feasibility study and the design of the Project is consistent with Bank policies, particularly OD 4.01 paragraph 13, but is not convinced that there was a sufficiently thorough analysis of alternatives before a decision on the outfall was made.**

⁶⁴ Feasibility Study, Hazen & Sawyer, 1998. See also Environmental Assessment, Fundación Neotrópicos, 1999.

⁶⁵ Report on the First Meeting, Cartagena Water Supply, Sewerage, and Environmental Cleanup Project, February 23-26, 1998.

⁶⁶ Feasibility Study, Hazen and Sawyer, 1998, Chapter 6, p. 6-28-40.

1.4. The selected option: the submarine outfall

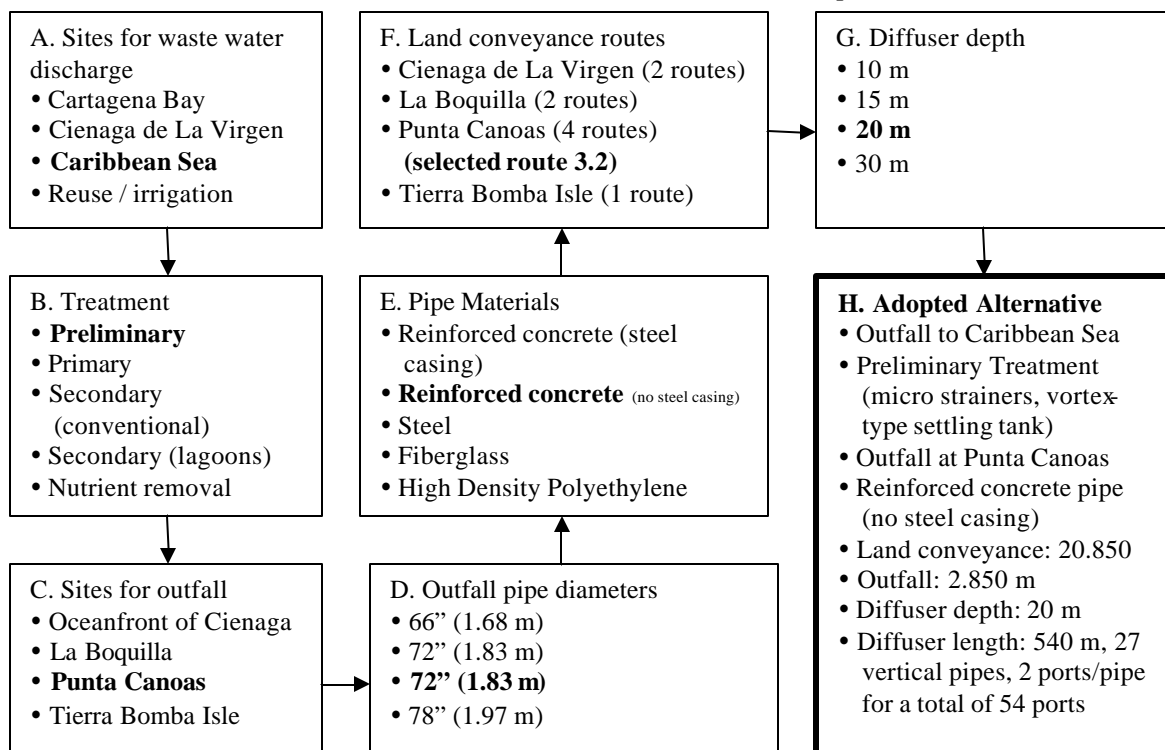
78. Management states that the analysis of alternatives led to the selection of a submarine outfall as the preferred option to dispose of Cartagena's wastewater. **The Panel notes that disposal of sewage to sea via a submarine outfall is a tried and proven technology which, under suitable conditions, offers a low-cost low-maintenance solution for acceptable disposal of human wastes.**⁶⁷
79. **The Panel observes that the Feasibility Study and the Environmental Assessment did not address the possible long term environmental and health effects on the coastal and marine environment if there were to be multiple outfalls in the area and the volume of sewage and organic wastes increased significantly so as to exceed the absorptive capacity of the marine area. This is an issue that may need to be addressed in the future.**
80. The Project EA includes a diagram outlining seven steps in the outfall-decision making process, which were intended to generate a range of Project choices in designing a submarine outfall.⁶⁸

⁶⁷ Henry J. Salas, *Submarine Outfalls A Viable Alternative For Sewage Discharge Of Coastal Cities In Latin America And The Caribbean*, Pan American Center For Sanitary Engineering And Environmental Sciences, (Cepis), November 2000. The "Outfall Site" of the University of Karlsruhe provides many helpful links for those wanting to gain understanding of submarine outfalls as well as the factors that influence effluent diffusion from submarine outfalls. See <http://www.ifh.uni-karlsruhe.de/outfalls/links.htm>

⁶⁸ Environmental Assessment, Fundación Neotrópicos, 1999, Executive Summary.

Figure 1. Steps in Outfall Decision Making Process

(Bold: Selected alternatives at each step)



81. In response to the Requesters' complaints, the Panel will analyze in detail the following aspects of the proposed submarine outfall: (a) the location of the outfall; b) the design of the outfall so as to meet the requirements for environmental robustness and human contact safety; (b) treatment of the wastes before disposal; d) the land conveyance system for the wastes; and e) the potential impacts on the locally affected communities in the North Zone.

1.4.1. Punta Canoa as the Location for Outfall

82. The FS evaluated alternative offshore locations for the marine outfall: (a) Oceanfront of the Ciénaga, (b) La Boquilla, (c) Punta Canoa, to the north of Cartagena, and (d) Tierra Bomba Island to the south of the city. These alternatives were considered in terms of (i) bathymetry, (ii) ocean currents and winds, (iii) marine biodiversity, (iv) proximity to coral reefs and sites of particular biodiversity, (v) human health, (vi) tourist beaches, (vi) fishing, (vii) geology and (viii) cost effectiveness.
83. These evaluations, together with two hydrographic dispersion-modeling exercises were used to select a site 2.85km offshore from Punta Canoa as the preferred location for the marine outfall. Management states that Punta Canoa was selected as the outfall site because its very steep bottom sea

slope made it the “*least cost alternative.*”⁶⁹ Management indicates that the steep sea slope allows construction of an outfall that reaches deep water in only 2.85km, as opposed to other sites near the city, where reaching the same water depth would require a longer outfall of approximately 9km.⁷⁰ It adds that “*the combined cost of the onshore and offshore pipes was lowest for the Punta Canoa site.*”⁷¹

84. Punta Canoa is a small village located in the North Zone of Cartagena, about 20km from the city, which is the home of “*established black communities that have lived there for at least three generations*”⁷² who, as the PAD recognizes, live mainly “*from fishing*”.⁷³
85. The selection of Punta Canoa as the site for the marine outfall raises several issues that are outlined in the Request for Inspection. As already noted, the communities living in the North Zone – Punta Canoa, Manzanillo del Mar, Arroyo de Piedra and La Boquilla – are concerned that the outfall will contaminate the waters and harm the fish population which, they state, is their main source of income and livelihood. The Requesters are also concerned about the monitoring and retrofitting measures planned under the Project because they believe the former will not provide adequate protection and the latter will intervene too late, once harm has already occurred. As the PAD describes, they further fear “*possible leakage and ‘explosions’ along the conveyance pipeline and/or in the pumping stations sites that might affect their neighborhoods.*”⁷⁴ The Requesters also worry about the phenomenon of mud diapirism, which, according to senior community leaders, occurred several decades ago in the Punta Canoa area.
86. The Panel asked an expert, Prof. Jorg Imberger of the University of Western Australia, who has done work in Latin American for many years, to address these concerns about the location of the submarine outfall. The Panel’s report examines the bathymetry of the area, the influence of the Magdalena River, the wind, the ocean currents, the design of the proposed outfall and the mud diapirism issue. The report of the Panel’s expert provides more detailed analysis and appears as Annex B to this report.

1.4.1.1. Bathymetry of Selected Site

87. Bathymetry refers to the measurement of underwater topography. Figure 1 shows that the bathymetry of the proposed outfall site is such that the depth

⁶⁹ Management Response, ¶ 35.

⁷⁰ Management Response, ¶ 35.

⁷¹ Management Response, ¶ 35.

⁷² PAD, p. 103.

⁷³ PAD, p. 104. The PAD states that “*Punta Canoa is a small village of only 500 inhabitants mainly living from fishing; there are no agricultural lands to be directly affected by the works.*”

⁷⁴ PAD, p.104.

falls off quite rapidly, particularly opposite Punta Canoa, where the outfall will be located. This was an important consideration in the selection of the proposed site for the outfall.

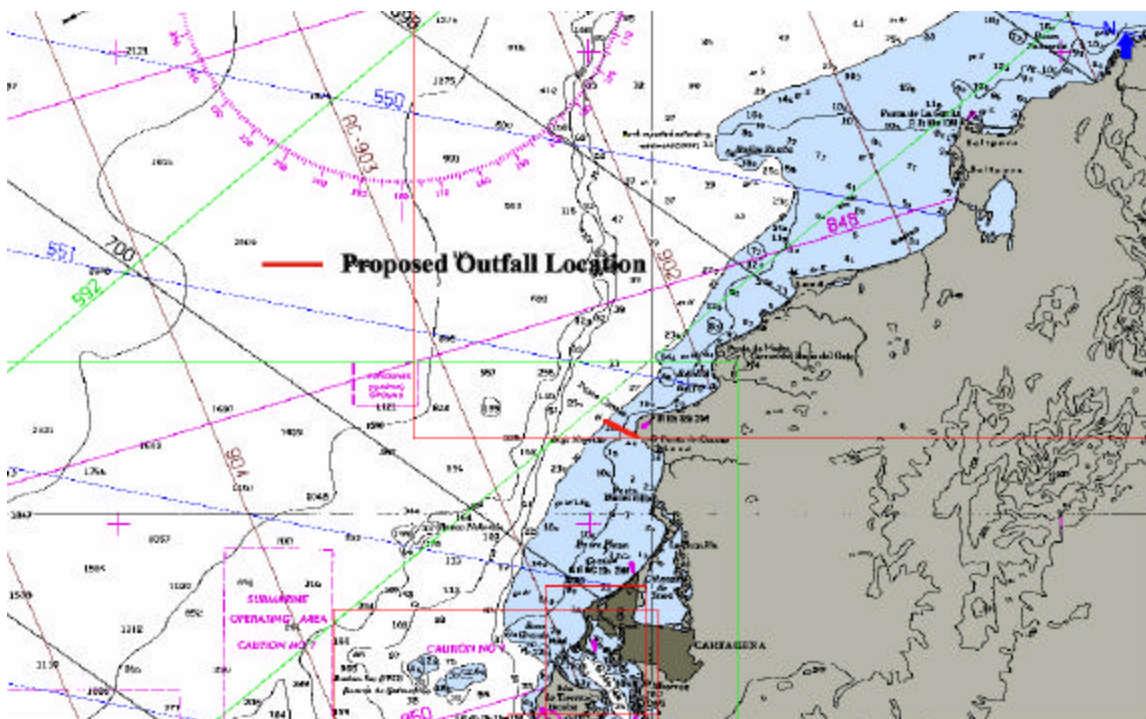


Figure II-1 Bathymetric map of coastal waters off Cartagena (Courtesy CIOH)⁷⁵

1.4.1.2. Relevance of Magdalena River

88. To appreciate the potential regional influence of the proposed outfall and to assess the assimilative capacity of the region, it is useful to compare the loads from the proposed outfall to those originating from the Magdalena River, which drains most of Colombia and enters the ocean near Barranquilla about 100km north of Cartagena. Table 1, which appears in the Panel expert's report in Annex B shows that the impact of the proposed outfall compared to the pollution received from the Magdalena River in the same area is very small in freshwater input, minimal in nutrient and organic load, but comparable in pathogen load. However, it is important to note that, when considering pathogens, the concentration is what counts rather than the total load. In terms of concentration, the water from the Magdalena River is marginally acceptable (approximately equal to upper immersion limit), but the concentration of the outfall effluent is 10,000 times too high for pathogens and 1,000 times too high in terms of nutrients.

⁷⁵ Courtesy Serguei Lonin, CIOH.

89. **The Magdalena River has one further very important regional influence on the outfall design: it produces a stratified water column off the coast of Punta Canoa. The strength of the stratification was documented as part of the EIA monitoring program.** The freshwater plume from the Magdalena River ($\sim 8,000 \text{ m}^3/\text{s}$) extends in front of Cartagena introducing a strong near surface density stratification. The density differences between the surface and bottom water can reach as much as 1.8 kgm^{-3} in the months from March to September.



Figure II-2 Modis Satellite photograph March 2004, showing the extent of the Magdalena River during the time of the photo

1.4.1.3. Winds of the Area

90. The Feasibility Study (FS) presents results from a depth averaged numerical model (RMA, Ian King) with different wind fields. The Panel notes that this methodology does not capture the possibly important influence of the wind on near surface currents in a stratified water column. This influence could affect the assessments of the dilution of effluent and hence the risks of contamination to the marine and coastal environments. Historical data gathered in the FS show that the wind has an “onshore component” for about 40% of the time (N, NW, and W) and is “tranquil” for about 25% of the time. (See Figures 6- 8 in Annex B of this Report). Speeds for winds with an onshore component range from zero to 15m/s. The Panel expert’s

report in Annex B describes the winds in greater detail and their implication.

1.4.1.4. Coastal Ocean Currents

91. Ocean currents in the area are available from a number of current meters. The FS deployed an Acoustic Doppler Current Profiler (ADCP) for an extensive period at a number of sites, including at the proposed outfall location.⁷⁶ From the beginning of December to the end of May the ocean water at Punta Canoa flows south-west with a mean velocity of around 0.2 m/s. In the period from the beginning of June to the end of November the water flows north-east with a velocity of about 0.2 m/s. The data used in the FS and additional studies⁷⁷ for the design of the outfall were depth averaged over the bottom 15m and did not include the velocities in the upper 5m. The Panel's expert noted that the currents in the top 5m, the stratified upper layer of surface water, were not considered. This omission has consequences during periods where the water column currents are relatively weak and the water column is stratified, because under such conditions the stratification suppresses vertical mixing of the surface plume water and allows the surface water to "slip" over the top of the stratified layers. This, together with an onshore wind, has the potential for sweeping the surface effluent plume onto shore. This issue needs further clarification.
92. **The Panel notes that in terms of assimilative capacity, the Punta Canoa coastal waters could be a suitable site for an outfall if necessary precautionary measures are taken in the design of the outfall to ensure proper dilution of the effluent so that nutrients are at an acceptable level, and to ensure decay of pathogens to a level safe for human contact.** According to the Panel expert's calculation, the outfall in that location should produce at least a dilution of 1:1,000 in order to produce acceptable nutrient levels and have a decay rate for pathogens of at least 1:10.

1.4.3. The proposed design of the submarine outfall

93. The Project design provides that wastewater would be collected and transported via trunk sewers to the Paraíso pumping station. According to the PAD, the wastewater would be pumped from the Paraíso pumping station to the treatment plant site through an 18km conveyance system.⁷⁸

⁷⁶ Feasibility Study, Hazen and Sawyer, 1998.

⁷⁷ Feasibility Study, Hazen and Sawyer, 1998, see also P.G. Roberts, 'Dilution Modeling for the Cartagena Ocean Outfall', 2003, P. G. Roberts, 'Additional Water Quality Modeling for the Cartagena Ocean Outfall', 2004.

⁷⁸ The exact length of the main conveyance system is not clear to the Panel. While the detailed Project description in the PAD states that the pipeline from Paraíso pumping station to the treatment plant site is 18km long and the effluent pipeline from the treatment plant to the submarine outfall at the Caribbean shoreline is 2.85km long (PAD, p. 40, 41) for a total length of 22.85km, the Loan Agreement states that the

The wastewater would be subject to preliminary treatment, which removes floatable materials, grease, oil, sand, and grits, prior to its discharge to the Caribbean Sea. The effluent would then be transported through a gravity-based conveyance system (of the same diameter as the pressure pipe, i.e., 72") to the outfall. The total outfall length would be 2.850km and the discharge point (diffuser area) would be submerged at a depth of 20m.⁷⁹ The total number of discharge ports would be 54 with a combined flow rate of $3.9\text{m}^3\text{s}^{-1}$.

94. The Panel notes that the proposed outfall design is based on extensive analysis and modeling. The climate and oceanographic data were used as input to two-dimensional computer models to simulate the diffusion patterns from the submarine outfall.⁸⁰ The greater the distance of the outfall's point of emission from the shoreline, the deeper the point of emission, and the larger the number of discharge points and the greater the dilution of the effluent—with consequent reductions in most, if not all, indices of potential contamination.
95. Marine outfalls achieve their effectiveness by two principles, dilution and increased residence time of the effluent before affecting either the coastal margin, a marine protected area or an area used for recreation or fishing. Typically, an outfall configuration is designed to use both actions to address the safe disposal of different classes of pollutants in a domestic sewage effluent.
96. Outfall models are used to estimate the shortest distances from a shoreline and the minimum depth of emission that will be required to meet predetermined standards. All models make assumptions and if these are changed or deemed inappropriate the results from any model can be questioned. Greater margins of safety for prevention of possible shoreline contamination can always be achieved by having longer and deeper submarine outfalls—at greater cost.
97. As discussed earlier in this report, the models were made under the assumption that the water column in the area of the outfall was well mixed vertically. The FS and additional studies⁸¹ came to the conclusion that the

total length of the wastewater conveyance system is 23.85km (Loan Agreement, Schedule 2, Part C). In addition, the Feasibility Study states that the land conveyance system will be 20.85km long. The submarine outfall, which is not a part of the main conveyance system, is consistently defined as 2.85km.

⁷⁹ The diffuser would have a length of 540 m, with a riser spacing of 20 m, for a total of 27 risers. Each riser would be made of a 12" diameter pipe, 2 m long. The upper end of each riser pipe would be sealed by a welded plate, and would have 2 openings close to the plate, each of 8" diameter.

⁸⁰ Philip. J. W., Roberts, *Dilution Modeling for the Cartagena Ocean Outfall*, Atlanta, October 31, 2003. [hereinafter "Roberts 2003"]. (Prepared for ACUACAR) See also Philip J. W., Roberts, *Additional Water Quality Modeling for the Cartagena Ocean Outfall*, Atlanta, May 19, 2004 [hereinafter "Roberts 2004"]. (Prepared for the World Bank).

⁸¹ Roberts 2003.

initial dilution, due the action of the rising buoyant jet, would range from 84 (no cross current) to 860 (for cross currents of magnitude 0.2ms^{-1}).

98. The Panel notes that in order to design an outfall with an appropriate treatment of wastes, it is important to know the characteristics of the waste to be disposed and its impacts on the sea. Possible pollutants include pathogens, nutrients, organics, and synthetic organics.
99. Pathogens,⁸² the first class of pollutants, measured by means of indicator species such as total (or fecal) coliforms, occur in raw effluents in concentrations of about $10^{11} \text{ counts m}^{-3}$. In order to be safe for human contact their concentration must, in general, be reduced to $10^7 \text{ counts m}^{-3}$, a reduction of 10^4 .⁸³ This may be achieved by bringing the effluent water close to the ocean water surface so that sunlight can kill the pathogens after the effluent has been diluted by the action of the outfall diffuser.
100. Nutrients, the second class, lead to enrichment of the receiving waters.⁸⁴ The concentrations must be diluted close to the background levels in a contained area.
101. Organic load, the third class, can draw down the oxygen levels in the surrounding waters to undesirable levels. Typically, untreated effluent has a BOD (Biological Oxygen Demand or the loss of oxygen concentration in 5 days) of around 100mg/l .⁸⁵
102. Synthetics Organics, which are sometimes found in domestic effluent, refer to a large number of substances, such as pesticides, herbicides and hormones. The latter has received attention most recently receiving attention, because they interrupt the natural genetic balance of secondary products, including fish.
103. The project design assumed that pathogens decayed by a factor of 10 every 2 hours (Hazen and Sawyer, Fig 1). For this to occur, neglecting the dilution effect, the effluent plume water must be brought to the ocean surface and remain in direct sunlight for a period of 8 hours before affecting either the

⁸² A pathogen is a microbial species that can cause disease under certain conditions. Common examples of bacterial pathogens are *Shigella* (dysentery) and *Salmonella* (gastrointestinal disease). The risk of contracting a disease from a pathogen depends on different factors, such the method of exposure or transmission, the concentration, incubation period and the age and health condition of the infected person. See *Concentration, Sources and Pathways*, in *Watershed Protection Techniques*, Vol. 3, No. 1, April 1999.

⁸³ Roberts 2004.

⁸⁴ Nutrients are abundant in domestic waste. Although not harmful, too much nutrients in rivers or coastal waters usually leads to over fertilization and eutrophication (excessive growth of micro-organisms, plants or higher organisms that can cause actual danger). See *Strategy Options for Sewage Management to Protect the Marine Environment*, commissioned by UNEP/GPA, The Hague Netherlands, 7.

⁸⁵ High BOD levels in natural waters can result in death of fish and anaerobic conditions which in turn result in release of bad odors – from *Strategy Options for Sewage Management to Protect the Marine Environment*, commissioned by UNEP/GPA, The Hague Netherlands, 8.

Punta Canoa shore area or the traditional fishing areas of the Afro-Columbian community. These data are reproduced in the Panel Expert's report in the Annex B.

104. The Panel notes that the decay rate is a strong function of light intensity, temperature and salinity, which are not detailed in the reports. The temperature and salinity do not vary greatly at the site under consideration, but the light intensity does. The Panel's expert noted that in general the cumulative death of pathogens is a function of total irradiance and that it has been shown that pathogens that normally require 8 hours of constant sunlight of the intensity found at the site require closer to 72 hours immersion in the surface layer before being reduced by the required factor of 10,000, a ten fold decay in 18 hours. The light extinction effect needs to be considered.⁸⁶
105. The Panel notes the model used was based on a turbulent dispersion diffusion coefficient and the assumption that the water column was well mixed vertically. The Panel observes that the calculations performed as far as the near field dilution is concerned are accurate. However, preliminary calculations by the Panel's expert suggest that by not adequately considering the near surface stratification and by being overly optimistic about the rate of decay of pathogens, the far field analysis may not be reliable. The proposed outfall design may not produce the necessary dilution for the nutrient and organic loads and would not be far enough from the shoreline to ensure the necessary decay of pathogens. The Panel notes that according to the Panel's expert's preliminary calculation, the proposed outfall design may not achieve safe disposal of the effluent and meet safe pathogen standards close to 75% of the time.⁸⁷ The Panel expert's report appears in Annex B to this report.
106. In order to ensure that appropriate models had been used by the consultants and to determine the cost-effectiveness of the proposed outfall design the Bank required that a Panel of Experts be retained to "provide advice on technical design, technology, dispersion modeling and construction methods", as well as to "review technical studies, participate in public

⁸⁶ The Panel notes that according to its Expert, other factors that strongly influence decay rates of pathogens are missing in the analysis/studies carried out during Project preparation. These include recent evidence that under some conditions, coliforms grow in the water column rather than die, and new evidence that fecal and total coliform are not good indicator species when pathogens such as cryptosporidium are present. The latter organisms can be very dangerous to human health and show much more resistance to decay than the coliforms. The Panel observes that these points have only recently been documented and so it is reasonable to assume that Hazen and Sawyer may not have been aware of these complications. For details, see Prof. Imberger's report in Annex B.

⁸⁷ According to the expert, preliminary feasibility calculations suggest that a diffuser at Punta Canoa extending 7000m offshore to a depth of 60m with 152 ports would provide a satisfactory solution with safe disposal of the nutrient, organic and pathogen load. The expert cautions that these preliminary feasibility calculations would have to be verified, as by running a fully coupled hydrodynamic-pathogen three dimensional regional model with an embedded diffuser algorithm.

consultation meetings and provide training to ACUACAR and CARDIQUE.”⁸⁸ This is consistent with paragraph 13 of OD 4.01, which provides that for major projects with serious and multi-dimensional environmental concerns “the borrower should normally engage an advisory panel of independent, internationally recognized, environmental specialists to advise” inter alia on the Terms of Reference (TORs) and methods of preparation of the EA, and to discuss the EA’s recommendations and findings and their implementation.⁸⁹ The reports from the Panel of Experts reflect that they met on six occasions and commented on the design of the proposed submarine outfall. There is no indication that they disagreed at the time with the choice of model or with the assumptions under which it was run. Subsequent interviews with some members of the Panel of Experts have confirmed that certain factors enumerated above (e.g. water column stratification and action of onshore winds) were not fully considered. They viewed the likely risk posed by these factors as low, and there was concern about costs in designing the Project.

107. **The Panel is aware that no consensus exists as to whether the risk is high or low that disposal of the effluent under current outfall design will not be safe. Bank Management relied on a robust two dimensional model to assess risk of contamination near shore from the outfall, and used field data taken over an extended period of time. The Panel notes that, while the necessary ocean modeling studies were conducted, the methodology used did not capture the possibly important influence of the wind on near surface currents in a stratified water column. This influence could affect the assessments of the dilution of effluent and hence the risks of contamination to the marine and coastal environments.**
108. **The Panel finds that if a three-dimensional model, rather than two dimensional, were used to assess risk, the diffusion patterns and estimates of shoreline concentrations might be different and that greater certainty regarding the risk could be secured.** ⁹⁰ **The results could affect the distance from the shore and the depth required for safe disposal of Cartagena wastes.**
109. **The Panel notes that after a first bidding process that resulted in costs much higher than those estimated in the PAD and the Engineer’s cost**

⁸⁸ Management Response, Annex B, Item 1, p. 26.

⁸⁹ OD 4.01, paragraph 13.

⁹⁰ Although it may be argued that the use of three-dimensional models will require numerous assumptions as to boundary conditions and that the results of such models are as dependent on the assumed boundary conditions as they are on actual field data, the Panel’s outfall expert recommends verifying the feasibility calculations. According to him, these calculations should be now verified with a fully coupled hydrodynamic-pathogen three dimensional regional model with an embedded diffuser algorithm. He suggests that an appropriate model could be ELCOM-CAEDYM, an open source model available for download. See Annex B of this Report for a more complete discussion on this subject matter.

estimate, new specifications are being prepared calling for the use of High Density Polyethylene (HDPE) for the construction of the outfall. According to Management, this alternative should result in lower costs because, unlike reinforced concrete pipes, HDPE pipes would not have to be trenched in the bottom of the sea over all its length but only in the surf zone. **Analysis of the original bids showed that the cost of trenching was very high and now should be partially saved.**⁹¹

110. The Panel notes that HDPE pipes are proven and widely used for pipelines carrying water and sewage both underground and under water in most parts of the world. HDPE pipes have advantages: flexibility, easily welded and repaired, able to be pulled or floated into position; long life-spans, and not as subject to corrosion as concrete or steel pipes. The Panel's experts have expressed some concerns about the proposed solution, however, because these HDPE pipes have until recently been of fairly small diameter (less than 36 inches), and they are not certain about how well established the manufacturing techniques are for larger diameters such as the proposed 72 inch for this outfall.⁹² Also, the pipe would have to be well anchored onto the sea floor as both a pipe of this diameter and the effluent it carries would have a density less than sea water, making the pipes buoyant in sea water. Some sort of anchoring would be required if the pipes are not to be buried below the seabed. By not burying the pipeline, there could be a danger that, it will scour over certain span lengths and this could lead to pipe ruptures. Pipe scour is a well known phenomenon and has caused many problems in the gas industry. Whether a pipeline will scour and hang free depends on the soils material, the ocean current regimes and the periodicity of the currents. The Panel hopes that proper design and specifications will be able to deal with all of these issues.⁹³

1.4.3.1. The risk of diapirism (mud volcanism)

111. The Requesters claim that the site selected for the marine outfall is geologically sensitive. They believe that this represents a major environmental risk of the Project. According to the Requesters, *“the area around Punta Canoa and Arroyo de Piedra is subject to diapirism, also known as mud volcanism. This phenomenon is characterised by the sudden, violent expulsion of thousands of cubic metres of mud, clay and gases. A*

⁹¹ Management Memorandum to the Inspection Panel, June 20, 2005, [hereinafter “Management Memorandum, June 20, 2005”].

⁹² According to the original bidding document for the submarine outfall, several manufacturers of this type of pipes had informed the Bank and ACUACAR that they expected to be able to manufacture a 72inch (1800mm) polyethylene pipe in 2004.

⁹³ Management's June 20, 2005 Memorandum refers to a bidding process for a similar marine pipeline of 3km length and 1600mm diameter in Ashkelon, Israel, but notes that the pipeline will be “*completely trenched in the sea bed.*”

geological event [of this nature] could rupture the line without warning at any time and cause waste water to be released much closer to the shore.”⁹⁴

112. The Requesters argue that the Bank did not consider that a geological event could have potential harmful impacts on the outfall pipeline, thus on the environment, the health and safety of the villages of Punta Canoa, Arroyo de Piedra and Manzanillo del Mar.⁹⁵ They claim that INGEOMINAS, the Colombian Institute for Geology and Mining, had warned about the diapirism risks in a Seminar on Geoenvironmental Risks held in Cartagena in 2000. According to the Request, INGEOMINAS’ experts “announced that no engineering design could provide an outfall that could withstand the effects of a submarine explosion like those that have already occurred in the Caribbean near Punta Canoa.” In light of this, the Requesters allege that “[t]he complete failure of those preparing and approving the EA to recognize and discuss this potentially grave geological and environmental risk renders the EA an incomplete and highly misleading report.”⁹⁶ In their view “the Bank has done nothing to correct it or make sure the precautionary principle it promotes is followed.”⁹⁷
113. Management Response states that not only did the FS and EA analyze the issue, but additional studies were conducted by Marine Resources Inc. and an expert hired by ACUACAR. These studies confirmed the conclusions of the EA and the FS that the risk of diapirism, or mud volcanism, in the area is low “because there is an absence of large magnitude seismic activity and magnetic [sic] volcanism.”⁹⁸ Management adds that in the course of the licensing process, CARDIQUE reviewed the Marine Resources study and agreed with the findings, although it recommended that the District of Cartagena take the low geological risk into account in the technical specifications for the outfall.⁹⁹
114. The Bank policy on Environmental Assessment requires that all the environmental consequences of a Project be assessed early in the project cycle and taken into account in the Project design to prevent, minimize, mitigate or compensate for Project adverse impacts¹⁰⁰.
115. Diapirism is the upward—and sometimes sideward—movement of less dense sediments through denser materials due to buoyancy forces. Mud volcanism is not equivalent to the more familiar volcanic eruptions involving molten lava. The occurrence of surface extrusion of mudflows in the vicinity of Punta Canoa is well known and was a factor considered from

⁹⁴ Request for Inspection, p. 14.

⁹⁵ Request, p. 14.

⁹⁶ Request, p. 15.

⁹⁷ Request, p. 15.

⁹⁸ Management Response, Annex 1, Item 5, p.33. “Magnetic” may be a misprint for “magmatic.”

⁹⁹ Management Response, Annex 1, Item 5, pp.33, 34.

¹⁰⁰ OD 4.01, paragraph 2.

the first stages of project design¹⁰¹ and subsequently investigated further through geophysical testing¹⁰² and by seeking the opinion of an expert on diapirism in this location¹⁰³.

116. The 2000 Geophysical Investigations conducted by the Marine Resources mention that *“mud diapers are a common feature around the study area”* which is *“located just offshore a headland known as Punta Canoa.”*¹⁰⁴ The study states that it identified a diapiric feature (line 04) of 250m diameter about 300m southwest of the proposed pipeline.¹⁰⁵ It adds that this was the *“only diapiric feature in over 25km”* of collected data. The Marine Resources study also mentions that historical records of Punta Canoa document one other diapirism event occurred in the area.¹⁰⁶
117. The conclusion of the Marine Resources’ study is that in general terms *“These features [mud diapers] are of moderate concern in terms of potential geologic hazard.”*¹⁰⁷ The study adds that *“the low density and small sizes of these features in the immediate area indicates that they have a limited spatial influence.”*¹⁰⁸ With respect Punta Canoa, site specific investigations of the proposed outfall site found that *“The line 04 diapir, even if reactivated, is of sufficient distance from the proposed outfall that no deformation would occur in the area of the proposed pipeline. Sediment generated from the outflow cone of a mud diapir appears to be limited to the immediate area overlying the deformation zone.”*¹⁰⁹
118. To grant the environmental license for the Project CARDIQUE reviewed the Marine Resources’ study. While agreeing with the general conclusion that the risk of diapirism is small, it nevertheless required that a contingency plan be developed to address the situation in the event of mud-diapirism affecting the pipeline.¹¹⁰
119. An expert hired by ACUACAR, Dr. George Vernet, also reviewed the conclusions of the Feasibility Study pertaining to geological conditions, and confirmed that the risk diapirism poses to the pipeline is small.¹¹¹ He

¹⁰¹ Feasibility Study, Hazen and Sawyer, 1998.

¹⁰² Marine Resources Inc, Geophysical Investigations Offshore Punta Canoa, Colombia, November 7, 2000, [hereinafter Marine Resources study].

¹⁰³ G. Vernet, Informe de Consultaría sobre la Evaluación Geológica del Emisario de Cartagena (Colombia), March 7, 2001, [hereinafter “Vernet report”].

¹⁰⁴ Marine Resources study, p. 5. The study states that « the survey area was composed of three sections » the first of which was « the primary survey area where the proposed outfall corridor is contemplated.”

¹⁰⁵ Page 37 of Marine Resources Inc (2000)

¹⁰⁶ Marine Resources study, p. 37.

¹⁰⁷ Marine Resources study, p. 37.

¹⁰⁸ Marine Resources study, p. 37.

¹⁰⁹ Marine Resources study, ¶ 38

¹¹⁰ See Management Response, Annex 1, Item 5, p. 33.

¹¹¹ Vernet report, p.10.

wrote: “I was surprised that diapirism is a matter of such great concern. The risk that could result from this phenomenon is really minimal.”¹¹²

120. The Vernette Report concluded that, based on available data and information about the area, diapirism is a phenomenon of small extension.¹¹³ According to this study, mud volcanism events may indeed occur in the area between the Magdalena River’s mouth in the Sea and the Darien Gulf.¹¹⁴ The report cited a mud diapirism event that occurred in 1996 and stated that the area of influence of the mud volcanism was about 200m, while the indirect effect on soil fracturing was about 600m.¹¹⁵ Vernette also discussed a further diapiric event allegedly occurred in 1979 off the coast of Punta Canoa, whereby, following a big earthquake, an island made of mud/clay appeared in the sea and disappeared fifteen days later as a result of the surf. After examining a picture of this island and the site where it allegedly appeared, Vernette concluded that this mud diapirism event was an anomaly, because it was the only event of the kind detected in the area. He added nonetheless that the island emerged “*more than 2km far from the route of the proposed outfall.*”¹¹⁶
121. Based on the geological and geophysics studies conducted in the Project area, the Vernette report concluded that the Project’s system of conduits in land and the outfall in the sea are outside the area of influence of these known diapiric events (at least 1km in the ocean and 5km in the land¹¹⁷). Thus, according to Vernette, “*it can be correctly assumed that clay diapirism should not directly affect the route of the planned outfall.*”¹¹⁸
122. The above-mentioned studies present two technical evaluations of the problem based on collected data from the area. In addition, INGEOMINAS staff interviewed by the Panel during its visits to the Project area mentioned that there seems to be a mud volcano about 300m from the proposed outfall. During its visit to the Project area, affected people from Punta Canoa that the Panel team met referred to the 1979 diapiric event and the island emerged in the sea. An eye witness account of the eruption near Punta Canoas was related to the Panel as “an island had formed overnight, which was washed away over a period of weeks.”

¹¹² Letter, from G. Vernette to Director, CARDIQUE, March 12, 2001.

¹¹³ Vernette report, p. 10

¹¹⁴ Vernette report, p. 5.

¹¹⁵ Vernette report, p. 5. The report refers to the eruption of the Vulcan Reposo as reported by H. Carvajal from Ingeominas in 1996.

¹¹⁶ Vernette report, p. 7. The original version of the Report, in Spanish, reads: “...ese diapiro del lodo pudo salir de una anomalía, puesto que es el único evento detectado por la sismica realizada en este sector. Es de anotar que se encuentra a mas de 2.0 kilómetros del trazado del Emisario propuesto.” The Panel was also informed about this occurrence during its visits to the Project area.

¹¹⁷ Vernette report, p. 10.

¹¹⁸ Vernette report, p. 10.

123. The Panel notes that the Vernet study found no evidence that diapirism vents are located near the proposed Punta Cana site and the detailed bathymetry survey obtained from CIOH shows no sign of submerged mounds in the bathymetry. **The Panel finds that the potential for the pipeline to be ruptured or otherwise significantly disturbed by diapirism appears to be low.**
124. However, given that the study found a mud volcano in the outfall area that has been estimated as close as about 300 meters from the proposed outfall, it may be reassuring to clarify what distance is “a safe distance” from the mud volcanism. **The Panel notes that a side scan sonar survey of the surface of an area of 25km was done as part of the above-mentioned Geophysical Investigations.¹¹⁹ It may be useful to have a side scan sonar survey of the proposed outfall trajectory to map the subsurface soil structure to a depth of low frequency sonar penetration to reduce any remaining uncertainty regarding the possibility of a diapirism extending to the outfall, and to publish the results.**

1.4.4. Level of Treatment and Ultimate Disposal

125. All sewage treatment systems must ultimately dispose of both water and solids (sludge). The options for disposal depend to a high degree on the extent to which effluent has been treated and purified prior to discharge. As the methods of treatment are additive, installation costs increase as more levels of treatment are added. Treatment alternatives¹²⁰ are considered in the analysis of alternatives undertaken in the feasibility study.¹²¹

¹¹⁹ Marine Resources, p. 12.

¹²⁰ **Preliminary treatment** removes large and heavy solid materials from sewage. Screens trap these items while grit chambers remove sand, gravel and heavy inorganic matter. Oil and grease and other floating compounds are skimmed from the effluent. Only about 10% of oxygen consuming waste is removed and virtually no nutrients or pathogens. Preliminary and Primary treatment are frequently combined into a single stage of sewage treatment. Solid residues from the process must ideally be disposed of in a properly constructed and managed sanitary landfill site.

Primary treatment removes about 30% of organic oxygen consuming waste as from sewage. Bacterial counts are also reduced to about half of their pre-treatment numbers. Treatment consists mainly of allowing sewage to stand or move slowly through settling and oxygenation ponds. The solid residue (sludge) from the process is dried and either used as compost or burned. Primary treatment is the most common form of sewage treatment before effluent is discharged. The receiving waters should have a high assimilative capacity: near the outfall the receiving waters should not be used for recreation or human consumption.

Secondary treatment is common in developed countries. After either the activated sludge or trickling filter process some 85 to 90% of solids and oxygen consuming wastes are removed from the waste stream. The resulting effluent is discharged to a receiving water body; most usually a river or the ocean. Although the receiving waters close to the outfall should not be used for human consumption recreational use of the water body is possible. The solid residue (sludge) from the process is dried and used as compost or burned.

Tertiary treatment: after tertiary treatment effluent water can be used for industrial purposes, to irrigate golf courses, city parks, crops and animal pastures without danger to public health. After tertiary treatment less than 1% of nutrients and oxygen consuming compounds remain in the water and pathogens are reduced to negligible counts. Tertiary treatment of sewage effluent is not common, even in rich countries.

126. The Panel notes that to safeguard human health, the greater the level of treatment prior to discharge to the sea the better. Preliminary treatment is better than no treatment, primary better than preliminary and secondary treatment would be better than primary. However, the Panel notes that costs increase significantly with greater levels of treatment. In addition, allowance for possible future upgrading of treatment prior to ocean disposal underlies the decision not to undertake treatment at the site of the Paraíso pumping station and to develop a treatment site near Punta Canoa.¹²²
127. According to Management, the analysis of various levels of treatment alternatives led to the selection of a marine outfall with preliminary treatment. As Bank staff told the Panel, the basis for the decision was cost-effectiveness without undue risk to human health or the environment. It may be argued, however, that the decision as to whether wastewater will be subject to primary, secondary or tertiary treatment should be made before deciding where the water will be discharged. In effect, the two decisions are closely inter-related with feedback occurring between them.
128. Management Response refers to a study published by the Pan-American Health Organization¹²³ (2000) and to one published by the WHO (2003),¹²⁴ which assert that submarine outfalls and preliminary treatment are sound solutions with low impact. They are often used in Latin America.¹²⁵ The PAHO (2000) study presented 84 examples of outfalls in Puerto Rico, Mexico and other Latin American countries, with 17 of these outfalls having a discharge depth greater than 20m, which is the depth proposed for the outfall off Punta Canoa. The Panel observes that the study does not provide monitoring data for the outfalls. Rather it shows the date the outfalls were constructed and the treatment provided at that time. The data indicate that for outfalls constructed after 1979 with a discharge of 20m or more in depth, all but two have been built with primary or secondary treatment of wastes.¹²⁶ The two exceptions are in Venezuela, where no treatment has been required.¹²⁷

With further chemical, radiation and gas treatments the discharge water can be safely input to human drinking water supplies: this is rarely done except in exceptionally water-stressed locations.

¹²¹ Feasibility Study, Hazen and Sawyer, 1998. See also PAD, p.92 which considers a synopsis of the alternatives.

¹²² See Panel of Experts, Reports February 23-28, 1998, paragraph 8 and July 1998, paragraph 2.

¹²³ See Henry J. Salas, *Submarine Outfalls: a Viable Alternative for Sewage Discharge of Coastal Cities in Latin America and the Caribbean* (PAHO, November 2000) cited in Management Response, Annex 1, Item 2, p.28 [hereinafter "PAHO study"].

¹²⁴ World Health Organization (WHO), *Guidelines for Safe Recreational Waters Environments*, Volume 1, Coastal and Fresh Waters, 2003, ISBN 92 4 154580 1.

¹²⁵ Management Response, p.12.

¹²⁶ The study shows no marine outfalls constructed in Brazil after 1975.

¹²⁷ The database on outfalls at the University of Karlsruhe lists the Venezuelan outfall shown in the PAHO study as still in process as commissioned in 2003, with no treatment of waste required. See <http://outfalls.ifh.uni-karlsruhe.de/output/asp>, last visited on June 23, 2005.

129. Figure II-3 below suggests the trends in the level of treatment associated with the construction of submarine outfalls more generally. It shows that the percentage of submarine outfalls designed for discharge of untreated wastes has declined dramatically, while the percentage of those designed with primary treatment has increased significantly. The Panel notes that the Colombian licensing authorities for the outfall for the Cartagena wastes have required that the wastes be subject to primary treatment after 10 years.

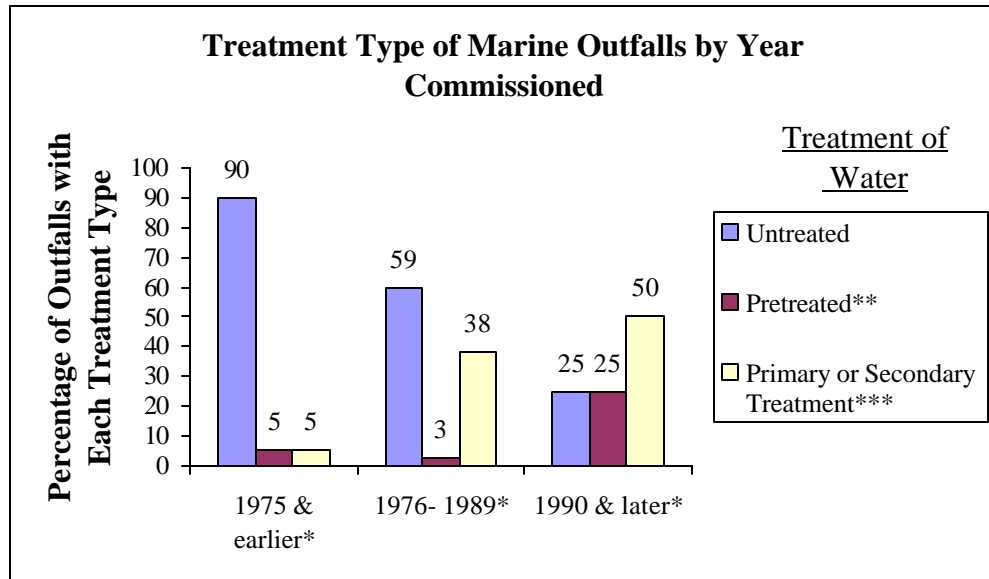


Figure II-3 Note: Excluding industrial water, non-marine outfall locations, Colombia, and industrialized countries (United States, United Kingdom, Spain, Portugal, Australia, Iceland, and Italy). Included countries: Argentina, Brazil, Chile, Ghana, Lebanon, Martinique, Mexico, Puerto Rico, Republic of Korea, Taiwan (China), Thailand, Turkey, Venezuela.

*: There are 20 locations for 1975 & earlier, 37 locations for 1976-1989, and 24 locations for 1990 & later.

**: Pretreatment uses a fine screen for grit removal, is generally not aerated, and rarely uses primary sedimentation units.

***: Only two of the locations have secondary treatment.

Source: University of Karlsruhe's Outfalls Database, at <http://outfalls.ifh.uni-karlsruhe.de/output/asp>, accessed June 23, 2005.

1.4.5. The land conveyance system: overland route, pumping stations and treatment plant locations

1.4.5.1. Evaluation of alternatives

130. Four significantly different overland routes between the Paraíso pumping station and the sea were identified from aerial photographs and field observations. Variations on each of these routes gave rise to a total of 21 corridors that were compared to each other via a scoring system. The criteria for semi-quantitative comparison were: technical considerations

(difficulty of construction, accessibility); environmental factors (impact on five categories of wetlands, water level fluctuations, areas of special interest); socio-political considerations (duration of construction activities, proximity to habitations, disruption to traffic and communications, degree of public acceptance).

131. Alternatives at the Paraíso pumping station and at the treatment works near Punta Canoa were also evaluated. The locations of the pumping station and the treatment works were determined in part by the availability of land to allow for future expansion and additional treatment facilities.
132. **The Panel finds that for the selected option of a submarine outfall, the analysis of the alternatives for the land conveyance systems, liquid disposal locations and pipeline corridors, in terms of their potential health and environmental impacts, meets the OD 4.01 requirement that alternatives be considered. Bank staff have exercised due diligence in considering alternatives and mitigation measures and have complied with OD 4.01 on Environmental Assessment.**

1.4.5.2. The overland pipeline design

133. The overland conveyance system, as designed, consists of a pipeline of 1.80m (72in) in diameter and 20.85km in length, split up in two stretches. The first section of the pipeline extends from the Paraíso pumping station 18km¹²⁸ north to the wastewater treatment plant. The second tract will transport the treatment plant effluent 2.85km to the shore of Punta Canoa, from where the submarine outfall stretches out 2.85km into the Caribbean Sea. The Panel understands that early in the review of the design of the outfall, the issue of a need for two parallel pipelines was raised but not pursued for reasons of economy. The Panel did not find evidence that the costs and benefits of a second pipeline were systematically explored.
134. The system as designed provides for pumping of effluent from the Paraíso station at Cartagena, where the wastes are gathered, to the preliminary treatment site at Punta Canoa. The wastes will be transported by gravity from the site of the preliminary treatment plant to the sea.
135. The Panel notes that a land pipeline conveying the waste to Punta Canoa and thence to the marine area is subject to the risk of rupture, intentional or accidental, and to other disabling events, such as disruptions of electrical service. The contingency manual, developed under the Project, presents a review of these risks and the ways to deal with each of them.¹²⁹ However,

¹²⁸ See PAD, p. 40.

¹²⁹ The Project's Contingency Plan outlines the actions that ACUACAR shall carry out in case of major problems with the pipes of the land conveyance system or the submarine outfall. The Plan shall also be implemented only in cases of major failures in the system that would cause wastewater discharge in the Ciénaga, in the Caribbean Sea or in other areas where such problems would put public health at risk. The

after reviewing the contingency manual, the Panel remains concerned about the adequacy of the planning for emergencies.

136. With respect to the design of the pressure pipe, records examined by the Panel do not clarify whether the Paraíso pumping station system provides for a storage area in case of emergencies. During its visit to the Project area, the Panel was shown drawings and plans of the pipeline and noted that while a storage area has been planned, the Contingency Plan Manual does not mention it. The Panel notes that in case of operation failure because of lack of energy or other potential problems along the land conveyance, without the storage area the waste will flow to the Ciénaga de la Virgen and will have an odor impact in the neighborhoods where the Paraíso Station is located. The Panel notes that the Panel of Experts and the environmental assessment emphasized the importance of a storage area as well.¹³⁰
137. The Panel also observes that waste leakage from the pipeline could contaminate both surface and ground water resources. **The Panel finds that this issue was neither analyzed in the 1999 EA nor included in the Environment Management Plan. The Panel finds that ground water monitoring is important in order to identify leakage and actions to mitigate it.**
138. The Panel of Experts raised the issue of odor control. In a letter addressed to ACUACAR, Hazen and Sawyer discuss the possibility of odors emanating from the treatment plant and indicated that there are four available options to deal with this problem.¹³¹ Option A would *“postpone any installation of odor collection,”* and *“design a closed system”* because *“[d]ue to the isolated location of the treatment plant, the offsite odor impact may be acceptable for many years until local development occurs.”* Under option B a compost pile scrubber system would be installed. According to Hazen and Sawyer, this would be a simple and inexpensive proposition, although *“odor treatment is marginal to good.”* Option C would provide for a single stage chemical odor treatment system, by which *“most odors are removed,”* while option D would entail a *“two-stage odor chemical control system which provides excellent odor control performance.”* No cost indication is given for these last two options. According to Hazen and Sawyer, the World Bank decided to encourage the postponement of *“any*

plan indicates which events trigger its activation: general or major failures including damage to the pipes, the electric system or the overall structure of the Paraíso pumping station or the treatment plant; and major breaks of the land conveyance system or the marine outfall caused by, inter alia, telluric movements, other geological events and sabotage. The contingency plan includes the following sub-plans: Information to the public; Notification to authorities; Emergency plan for control of the wastewater flow; Administrative action; Emergency operational plan; Training program; Emergency monitoring plan; and Information for public access.

¹³⁰ Informe sobre Saneamiento de Cartagena de Indias, July 1998 p. 3 (Condiciones de seguridad de la Estación del Paraíso). See also Environmental Assessment, Fundación Neutróticos, p. 80.

¹³¹ Hazen and Sawyer, letter to ACUACAR, (Subject: Preliminary Treatment Process Cartagena, Colombia) May 3, 2000.

installation for odor control/treatment works” “*due to project cost constraints.*” The Panel notes that according to the Hazen and Sawyer’s letter “*the odor control treatment costs are not included in the project budget.*” The Panel notes that the PAD does not mention odor treatment. However, the Panel also reviewed the bidding documents related to the construction of the treatment plant and notes that they include specifications for an odor treatment system at the treatment plant as well as at the Paraíso pumping station.

139. With respect to the selection of pipe materials the Inspection Panel was variously informed¹³² that: (1) both on-shore and submarine portions of the pipeline would consist of reinforced concrete pipes; (2) that the on-shore pipes would be reinforced concrete but that no decision had yet been made with respect to the submarine pipes; (3) that selection of pipe materials is at the discretion of contractors bidding for the work and was yet to be decided.

1.4.5.3. Disposal of Sludge

140. The Terms of Reference for the Environmental Assessment require that sludge disposal be considered.¹³³ However, the Panel notes that this appears to have escaped attention in the final report.¹³⁴ The Panel interviews conducted in fall 2004 with staff¹³⁵ of both ACUACAR and the Bank were inconclusive as to whether adequate attention had been given to sludge disposal. During the field visit, the Panel was informed that the problem had yet to be addressed and it was variously suggested that sludge would be disposed of either in a yet to be constructed landfill for Cartagena or in landfill sites to be constructed on the ground acquired for the treatment plant, (allegedly only a small site being required as the volume of solids would be less than 10m³ per day). Following the Panel’s request for additional information on this subject, Management informed the Panel that “*given the small magnitude of the solid waste generated by the plant, and the low level of potential impacts, (...) solid waste management was not specifically addressed in the loan agreement nor was it deeply dealt with during project preparation, but rather thoroughly addressed during implementation.*”¹³⁶

141. Management also stated that a solids waste management plan as well as a report on the plan was to be prepared for submission to CARDIQUE, the

¹³² Hazen and Sawyer, letter to ACUACAR, (Subject: Preliminary Treatment Process Cartagena, Colombia) May 3, 2000.

¹³³ Paragraph 8 (iii) of the Terms of reference for the Evaluación Ambiental.

¹³⁴ A Bank memorandum dated December 21, 1995 recommends *inter alia* that the Environmental Assessment should address the question of sludge disposal in a landfill and that the project might usefully support such disposal facilities.

¹³⁵ Staff interviews, Washington DC, 2004. ACUACAR, Cartagena 29 October 2004

¹³⁶ Memorandum to the Inspection Panel, *Management of the Solid Wastes which will be Generated in the Cartagena Preliminary Wastewater Treatment Plant*, December 13, 2004, [hereinafter “Management Memorandum, December 13, 2004”].

environmental authority, in January 2005. According to Management, the new plan provides that the solid waste be compacted at the treatment plant and then hauled to a landfill.¹³⁷ Management states that this is a legal landfill operated by the firm Ingeambiente under a license issued by CARDIQUE.¹³⁸ Specifically, the solids from wastewater treatment are to be transported 17km north of Cartagena to the La Paz Regional Landfill in the municipality of Turbana, in the Bolivar Department. Before being transported to the landfill site, the waste is to be stored for a number of hours in hermetic containers. Transport then occurs in hermetic conditions to avoid leaks in the road and problems for the communities. Management states that this process is in compliance with the Ministry of Environment resolution No. 541 of 1998.¹³⁹

142. **The Panel finds that the Project environmental studies did not consider alternatives for the disposal of the solids recovered during the preliminary treatment of the sewage stream. In this respect, Management was not in compliance with OD 4.01. The Panel further notes that although Management now asserts that a plan exists for the disposal of sludge, the Panel has not been able to find a consideration of alternatives for the disposal of sludge as required before finalizing a plan, as required by Bank policies.**

1.4.5. The monitoring program

143. The Requesters argue that the EA “*ignored the preference*” of the Bank policy on Environmental Assessment for preventive measures, and adopted a “*‘wait and see’ monitoring and retrofitting approach.*”¹⁴⁰ According to the Request, “*simply monitoring bacteria levels (...) will not provide adequate protection against potentially life-threatening pollution.*”¹⁴¹ They add that retrofitting the system will require installation of new treatment facilities, with “*significant*” financial implications.¹⁴² In addition, the Requesters believe that “[b]y the time any retrofit might be put into place, the outfall would have taken a huge toll on human health, the marine environment, and the general well being of these affected communities.”¹⁴³
144. Management responds that, as designed, the outfall, “*provides adequate protection against harmful bacteria from the waste flow reaching nearby*

¹³⁷ Management Memorandum, December 13, 2004. The memo states that “the quantities of solid waste that will be generated in the Cartagena plant will be 14 m3/d at the initial stage of operation and 24 m3/d at final stage (after 20 years), which means about one truck per day at first stage and 2 trucks at final stage.”

¹³⁸ Management Memorandum, December 13, 2004. Management refers to CARDIQUE Resolution N. 1288, 15 December 2000.

¹³⁹ Management Memorandum, December 13, 2004.

¹⁴⁰ Request, p. 4.

¹⁴¹ Request, p. 4.

¹⁴² Request, p. 4.

¹⁴³ Request, p. 4.

beaches.”¹⁴⁴ Management claims that precautionary measures, such as chlorination installations and addition of coagulants to the raw wastewater prior to entry to the treatment plant, have been included in the design of the treatment plant. The Project provides also for a contingency plan to collect, treat and dispose of the wastewater. The Response also states that the intensive monitoring referred to by the Requesters has been required under the Environmental License issued by CARDIQUE, as a precautionary measure and for gathering information for the second stage of the Project.¹⁴⁵

145. Monitoring “*before and after construction of the marine outfall to study the fate of pathogenic coliforms and other contaminants discharged through the outfall*” is part of the Project’s Component G (Environmental and Social Component), which requires the implementation of mitigating measures for the environmental and social impacts of the Project.¹⁴⁶ According to the PAD, the Environmental Management Plan (EMP), developed upon recommendation of the EA, includes a number of environmental activities that “*will assure achievement of the project’s environmental objectives.*”¹⁴⁷ Among this is the “implementation of an environmental baseline program to monitor oceanographic, biological and ecological indicators.” The PAD adds that “[a]fter construction, this program will be converted to a long-term monitoring program.”¹⁴⁸ The EMP provides for a comprehensive monitoring of the quality of the sea water and sea bed which is also intended to help “in formulating a decision regarding the need for upgrading the treatment facilities.”¹⁴⁹
146. The environmental license, article 9, requires the development of a monitoring program to be carried out before and after the Cartagena’s proposed wastewater disposal system begins working. Monitoring is required in the treatment plant, and in the sea waters at the discharge point and in other mayor sensitive areas. CARDIQUE requires ACUACAR to present quarterly reports of the results and the evaluation of the monitoring conducted before the treatment plant and the marine outfall begin working. Samples must be taken particularly in the area of Punta Canoa. When the marine outfall starts functioning, ACUACAR must monitor the water quality daily for the first month and monthly later on.
147. The Panel reviewed monitoring reports of several hundred pages prepared by ACUACAR to establish initial baseline data for water quality in the Ciénaga and along the coast up to Punta Canoa. **The Panel finds that the Bank in requiring an adequate monitoring plan with adequate baseline data has complied with the provisions of OD 4.01. The Panel also notes**

¹⁴⁴ Management Response, Annex 1, Item 2, p. 27.

¹⁴⁵ Management Response, Annex 1, Item 2, p. 28.

¹⁴⁶ Loan Agreement, Schedule 2.

¹⁴⁷ PAD, p. 22.

¹⁴⁸ PAD, p. 22.

¹⁴⁹ PAD, p. 43.

that ACUACAR, as of summer 2003, had prepared comprehensive baseline data regarding fisheries in the area. The Panel again finds this to be in compliance with OD 4.01. In both cases the baseline data should provide a reasonable basis for evaluating the effects of the submarine outfall. **The Panel notes, however, that it is essential that these studies be periodically updated to maintain their relevance and to identify changes in water quality or in fisheries.**

1.4.6. Project impacts on locally affected communities

148. The Panel notes that the existence of an outfall near the beach in Punta Canoa is likely to introduce a degree of awareness in the public that may decrease the recreational use of the beaches and adversely affect the generation of income from tourism and fishing activities. The Panel notes that, although an impact of this kind may stem from people's perceptions rather than reality, it may cause actual harm to economic activities. The Panel also observes that the tourism activities as well as the people's quality of life in and around the Punta Canoa area may be adversely affected by the presence of the treatment plant and the conduits of the land conveyance system, particularly if odors emanate from these facilities.
149. The Requesters state that the men and boys of the affected villages fish each morning and evening. They use canoes and nets in traditional fishing techniques to catch small fish, shrimp, and lobster for daily consumption and also for sale of any surplus. The Requesters claim that biological and chemical contamination would deplete the fish stocks and could have *"severe human health impacts for fishermen and anyone else exposed to the tainted fish or water."*¹⁵⁰ According to the Request, the EA claims that there is little marine life off the coast of Punta Canoa, and that the *"untreated discharge will add to the biological life along the coast of Punta Canoa."* The Requesters fear that the *"primary life form that will be added to these waters is harmful bacteria and that any fish able to inhabit such an environment will be toxic."*¹⁵¹
150. As already noted, Management states that the impacts of the outfall on fishing would be negligible and in any event, fish are not abundant in the area where the proposed outfall would be located.
151. The Panel notes that in order to determine whether the Project will affect the fisheries, it is necessary to study the oceanographic conditions and the assimilative capacity of the disposal site. In normal years during spring time nutrients to the water surface provide ample bio-stimulation to support the food chain for local fish and crustaceans. However, there are periods, especially during calmer, summer oceanic conditions, when various types of

¹⁵⁰ Request, p.4.

¹⁵¹ Request, p.20

algae bloom cause oxygen depletion and toxicity problems, which in turn cause fish kills near the shoreline. In addition, sewage contain significant amount of mercury and other metals which bio-accumulate within the food chain leading to health advisories for restricted consumption of fin fish.

152. The Panel observes that while the outfall was designed so to minimize the impacts of waste water discharged in the sea, it is likely that the fishing conditions would change as a result. **The Panel finds that in Project preparation the Project’s potential effects on fishing in the area were not adequately addressed. The Panel examined the Project records but did not find adequate social evaluation and mitigation proposals of these potential impacts on the local population’s lives and livelihood. The Panel finds that this does not comply with OD 4.01.**¹⁵²

2. Natural Habitats and Water Resources Management

2.1. Natural Habitats, OP 4.04

153. The Requester state that the Bank did not comply with the precautionary principle set forth in the policy on Natural Habitats - OP 4.04 – “*as a guide for projects that affect natural resources like the fisheries at stake here.*”¹⁵³ They also argue that the Bank has supported a Project that is not environmentally sustainable and that will “*degrade a critical marine habitat.*”¹⁵⁴
154. Management Response states that “[w]ater at the Punta Canoa site is highly turbid due to current from the Rio Magdalena.”¹⁵⁵ As a result, “[a]t the location of the effluent discharge point, the water is obscure; light does not penetrate even during daytime and visibility is limited to approximately 50 cm. Fish and other marine organisms are not abundant in this area.”¹⁵⁶ The Response adds that “[u]nderwater surveys at the outfall site show that the area has poor benthic activity and almost non-existent biological resources. This situation, together with the low context of toxic materials and heavy metals in the effluent discharge, precludes the risk of biological assimilation at the outfall site.”¹⁵⁷ In Management’s view, the impacts of the outfall “*would be negligible*” and the work “*conforms to the precautionary approach referred to in OP 4.04 and is in compliance with that policy.*”¹⁵⁸ The analysis of alternatives had also considered shorter

¹⁵² See also infra Social Compliance, Section 3.3.

¹⁵³ Request, p. 12.

¹⁵⁴ Request, p. 11.

¹⁵⁵ Management Response, ¶ 36.

¹⁵⁶ Management Response, ¶ 36.

¹⁵⁷ Management Response, Annex 1, Item 10, p. 37.

¹⁵⁸ Management Response, Annex 1, Item 10, p. 37.

outfalls but then rejected them because they would be in proximity of coral reef ecosystems.¹⁵⁹

155. Management also states that during Project preparation the environmental studies, as well as the POE and the GOC, “fully” assessed the impacts of the Project on the local environment and on the fishing activities, and concluded that *“the risk of environmental damage from the outfall would be minimal.”*¹⁶⁰ The Response adds that *“there is no evidence that the outfall will interrupt the economic activity of fishermen from Punta Canoa, Arroyo de Piedra and Manzanillo”* because, it claims, the *“area in the vicinity of the outfall has little marine life.”* According to Management, *“fishing activity, to the extent it might occur in these areas, would not be adversely affected.”* However, Management states that the monitoring program provided under the Project, and the *“availability of technical mitigatory measures if needed (chlorination and/or future waste stream treatment beyond preliminary treatment), will continue to ensure that fishing and tourism in the North Zone will not be affected by the proposed outfall.”*¹⁶¹
156. Natural Habitats are defined in OP 4.04 as: *“[l]and and water areas where (i) the ecosystems' biological communities are formed largely by native plant and animal species, and (ii) human activity has not essentially modified the area's primary ecological functions.”*¹⁶² And include: *“[m]angrove swamps, coastal marshes, and other wetlands; estuaries; seagrass beds; coral reefs; freshwater lakes and rivers (...).”*
157. In the Cartagena Water Supply, Sewerage and Environmental Management Project the relevant natural habitats are the mangrove swamps of the Ciénaga and the Bahía and the coral reefs in the Caribbean Sea south-west of Tierra Bomba Island.
158. The relevant objectives and requirements of OP 4.04 are: *“Support for the protection, maintenance, and rehabilitation of natural habitats and their functions.... a precautionary approach to natural resource management to ensure opportunities for environmentally sustainable development.”*¹⁶³ *“Identification of (a) natural habitat issues and special needs for natural habitat conservation, including the degree of threat to identified natural habitats (particularly critical natural habitats); and (b) measures for protecting such areas in the context of the country's development strategy.”*¹⁶⁴ *“The Bank promotes and supports natural habitat conservation and improved land use by financing projects designed to integrate into*

¹⁵⁹ Management Response, Annex 1, Item 10, p. 37.

¹⁶⁰ Management Response, ¶ 45

¹⁶¹ Management Response, ¶ 45.

¹⁶² Definitions OP 4.04a (a)

¹⁶³ OP 4.04, ¶ 1.

¹⁶⁴ OP 4.04, ¶ 2.

*national and regional development the conservation of natural habitats and the maintenance of ecological functions. Furthermore, the Bank promotes the rehabilitation of degraded natural habitats.”*¹⁶⁵ *“In deciding whether to support a project with potential adverse impacts on a natural habitat, the Bank takes into account the borrower's ability to implement the appropriate conservation and mitigation measures. If there are potential institutional capacity problems, the project includes components that develop the capacity of national and local institutions for effective environmental planning and management. The mitigation measures specified for the project may be used to enhance the practical field capacity of national and local institutions.”*¹⁶⁶ *“In projects with natural habitat components, project preparation, appraisal, and supervision arrangements include appropriate environmental expertise to ensure adequate design and implementation of mitigation measures.”*¹⁶⁷

159. The Project’s primary objectives are to improve the water and sewerage services of Cartagena and the sanitary conditions of the city's poorest population; to *“facilitate the environmental cleanup of water bodies surrounding the city (Cartagena Bay, Caribbean beaches and Ciénaga de la Virgen lake) by providing adequate collection, treatment and disposal of the entire flow of the city's wastewater;”* and to improve the sustainability of water and sewerage services in the city.
160. While the first and the third Project’s objectives relate to environmental matters, the second objective relates specifically to natural habitat. The Panel notes that these objectives are being addressed by the project. Interviews with Bank staff¹⁶⁸ indicated that portions of the Ciénaga de la Virgen have already been declared a nature reserve by CARDIQUE, and that improvement of the Ciénaga water quality is a top priority for the city as the aquatic events of the Central American and Caribbean Games scheduled for 2006 will use the Ciénaga.
161. Project component “G” specifically addresses the objectives and requirements of OP 4.04. These are: *“(i) environmental supervision during construction; (ii) restoration and conservation of the Ciénaga de la Virgen nature reserve; (iii) carrying out a monitoring program before and after construction of the marine outfall to study the fate of pathogenic coliforms and their contaminants discharged through the outfall; and (iv) an environmental institutional strengthening program.”*
162. **The Panel finds that the mangrove swamps of the Ciénaga and Bahía de Cartagena and the coral reefs in the Caribbean Sea have been fully**

¹⁶⁵ OP 4.04, ¶3.

¹⁶⁶ OP 4.04, ¶6.

¹⁶⁷ OP 4.04, ¶7.

¹⁶⁸ Interviews, Washington D.C. 2004.

considered in the Feasibility Studies and the Environmental Assessments. Although item (ii) of Project component G on restoration and conservation of the Ciénaga de la Virgen Natural Reserve has yet to be implemented (because the project has not yet advanced to a stage where this is applicable,) the Panel finds that the Bank is otherwise in compliance with OP 4.04.

2.2. Water Resources Management

163. The relevant environmental objectives of OP 4.07 are: “Support for providing potable water, sanitation facilities, flood control, and water for productive activities in a manner that is economically viable, environmentally sustainable, and socially equitable;”¹⁶⁹ and “Restoring and preserving aquatic eco-systems and guarding against overexploitation of groundwater resources, giving priority to the provision of adequate water and sanitation services for the poor.”¹⁷⁰
164. From an environmental perspective, the Cartagena Water Supply, Sewerage and Environmental Management Project complies fully with the applicable objectives. The project will not exploit ground water resources and flood control is not a requirement. A major driver for the project is the need to preserve the Ciénaga de la Virgen and the Bahía de Cartagena aquatic systems while at the same time providing adequate water and sanitation for the poor of Cartagena in an economically viable manner. **This is in compliance with OP 4.07.**
165. **The Panel finds that the decision made to disregard the Ciénaga de la Virgen as a potential place for final disposal of the waste after treatment allows for the preservation of this important ecosystem. The Panel also finds that the Feasibility Study,¹⁷¹ the Environmental Assessment¹⁷² and supplementary studies document well and analyze the condition of the biophysical environment, particularly of the Caribbean Sea, Bahía de Cartagena and the Ciénaga de la Virgen. However, they do not consider the terrestrial environment in as great a depth.**
166. **The Panel finds that the Bank is in compliance with OP 4.07 on Water Resources Management and with OD 4.01 which requires that “water resources management should be environmentally sustainable.”**

¹⁶⁹ OD 4.07, ¶ 1.

¹⁷⁰ OD 4.07, ¶ 2(d).

¹⁷¹ Feasibility Study, Hazen and Sawyer, 1998.

¹⁷² Environmental Assessment, Fundación Neutrónicos, 1999.

3. Legal Requirements

167. The Project's EA and the Feasibility Studies respectively include a section dealing with the legal framework within which the Project was to be designed and implemented.¹⁷³ As well, the text of the Environmental License indicates the legal requirements based on which the license was to be granted.
168. According to the Project's EA prepared in 1999, Colombian legislation in force at the time of Project preparation, although not dealing specifically with waste discharges through submarine outfalls,¹⁷⁴ included the Decree 1594 of 1984, which establishes water quality standards, and regulates relevant provisions of the Colombian Code of Natural Resources – Law 2811 of 1974 – with respect to water uses and wastewaters discharge in water bodies.¹⁷⁵ The Decree establishes, inter alia, quality standards for waters intended for recreational use, which are those that allow primary contact – e.g. swimming – or secondary contact – e.g. water sports.¹⁷⁶ It also regulates the disposal of wastewaters in water bodies and sets forth standards for the wastewaters based on the designated use of the recipient waters and the nature of the disposing entity, whether new or existing user.¹⁷⁷
169. Article 42 of the Decree 1594/84 states that waters intended for primary contact must not contain oil, grease, other floating compounds, and toxic and irritating substances that negatively affect human health.¹⁷⁸ Further, it sets specific limits for, inter alia, total and fecal coliforms in waters respectively intended for primary and secondary contact.¹⁷⁹ According to the Project's EA, since specific laws regulating submarine outfalls were not in force when the Project was designed, this norm was taken as the quality criterion for designing the proposed outfall.¹⁸⁰
170. On November 17, 2000, Colombia adopted the technical regulations for water and sanitation – RAS 2000 – which also deal with submarine

¹⁷³ Environmental Assessment, Fundación Neutrónicos, 1999 Section II (Marco Legal), p. 14. See also Feasibility Study, Hazen and Sawyer, Chapter 3.0 (Marco Administrativo, Legal y Político), p. 3-1.

¹⁷⁴ Environmental Assessment, Fundación Neutrónicos, 1999 p. 15.

¹⁷⁵ Decreto 1594 del 26 de Junio de 1984, por el cual se reglamenta parcialmente el Título I de la Ley 9 de 1979, así como el Capítulo II del Título VI – Parte III – Libro II y el Título III de la Parte III – Libro I – del Decreto – Ley 2811 de 1974 en cuanto a usos del agua y residuos líquidos [hereinafter Decree 1594/84].

¹⁷⁶ Decree 1594/84, Art. 34.

¹⁷⁷ Decree 1594/84, Art. 72. New and existing users are defined as such depending on whether their activity has begun respectively after or before the entering into force of the decree 1594 of 1984.

¹⁷⁸ Decree 1594/84, Art. 42, Paragraph 1.

¹⁷⁹ Decree 1594/84, Art. 42. See also Environmental Assessment, Neutrónicos, p. 15, Table 3.

¹⁸⁰ Environmental Assessment, Fundación Neutrónicos, 1999 p. 15.

outfalls.¹⁸¹ Articles 177 through 180 of the technical regulations defined submarine outfalls;¹⁸² described what studies must be carried out previous to designing a submarine outfall to determine, among others, which primary treatment will be necessary;¹⁸³ set forth general guidelines to design an outfall;¹⁸⁴ and established that wastewaters discharged through a submarine outfall must undergo primary treatment to guarantee removal of at least 60% of BOD, before being discharged into water bodies.¹⁸⁵ According to a legal opinion regarding the submarine outfall prepared for the Bank on May 3, 2004, by a Colombian law firm, Articles 178 and 180 of the RAS 2000 were modified in May 2001.¹⁸⁶ The legal opinion states that, as amended, the technical regulations no longer require primary treatment of the wastewaters before disposing of them in water bodies. Art. 178, as amended, would provide that among the studies to be conducted before designing an outfall is the evaluation of the wastewaters to determine what type of treatment is necessary; and Art 180, as amended, would now require the design, construction and operation of a system of prior treatment of wastewaters before the disposal, so as to meet the water quality standards set forth in the Colombian environmental and sanitary legislation in force.¹⁸⁷ According to the opinion, there is an obligation to maintain certain quality standards for the body of water that receives the wastewater but not for quality of the wastewater itself.¹⁸⁸

3.1. Environmental License

¹⁸¹ Ministerio de Desarrollo Económico, Resolución 1096 de 17 Noviembre 2000, “Por la cual se adopta el Reglamento Técnico para el Sector de Agua Potable y Saneamiento Básico – RAS” [hereinafter RAS 2000].

¹⁸² RAS 2000, Art. 177.

¹⁸³ RAS 2000, Art. 178.

¹⁸⁴ RAS 2000, Art. 179.

¹⁸⁵ RAS 2000, Art 180, which reads “*Tratamiento Primario Previo Al Vertimiento Con Emisarios Submarinos. Se debe diseñar, construir y operar una planta de tratamiento primario de aguas residuales que garantice una eficiencia de remoción de la DBO5 como mínimo del 60%.*”

¹⁸⁶ Legal opinion, Concepto Emisario Submarino Cartagena, dated May 3, 2004, prepared for the Bank by Mr. Luis Fernando Macia Gomez, provided to the Inspection Panel [hereinafter “legal opinion”]. According to this opinion, the Resolución 1096 de 17 Noviembre 2000 (RAS 2000) was amended by Resolución 0424 of May 18, 2001, and its Art. 180 as amended now reads, “*Tratamiento previo al vertimiento con emisarios submarinos. Se debe diseñar, construir y operar un sistema de tratamiento previo de aguas residuales [...]*” The Panel was informed about this amendment during its June 2004 eligibility visit to the Project area. The Panel met with a government official who told the Panel team that certain provisions of the RAS 2000 were amended to require preliminary treatment in lieu of primary treatment mainly because of economic considerations. According to this official, primary treatment for the Cartagena Project would have entailed prohibitive Project costs. Allegedly, the authorities looked into the possibility of requiring a lesser treatment. After researching and evaluating submarine outfalls in other areas and discussing with an expert in the field, Henry Salas, they allegedly decided that preliminary treatment was sufficient to meet the water quality standards provided by Colombian environmental and health legislation.

¹⁸⁷ Legal opinion, p. 6.

¹⁸⁸ Legal opinion, p. 7.

171. Pursuant to Colombian law, projects for treatment and disposal of wastewater are subject to obtaining an environmental license from the regional environmental authority as a condition for their implementation and operation.¹⁸⁹ In 1998 ACUACUAR filed with CARDIQUE the request to obtain the environmental license for the proposed submarine outfall. On June 5, 2001, CARDIQUE issued License No. 345 granting the permit for the construction and operation of the outfall off the coast of Punta Canoa for disposal of Cartagena's wastewaters into the Caribbean Sea.¹⁹⁰
172. During its visit to the Project area the Panel team met with officials from CARDIQUE. They explained to the Panel that Colombian law requires the suspension of the license-issuance procedures under certain circumstances, namely public hearings and prior consultations about the project for which the license has been requested, and claims filed against the granting of the license.¹⁹¹ CARDIQUE officials informed the Panel that, as required by Colombian law, ACUACUAR conducted (a) public hearings about the outfall project with the Cartagena community, and (b) prior consultations of black communities that will be affected by the Project.¹⁹² This, they added, suspended the procedure to issue the license, which was then released in 2001, three years after ACUACAR submitted the application. In addition, SIAB, the association of engineers and architects of the Bolivar department,¹⁹³ filed an action with CARDIQUE against the resolution granting the license and subsequently with the ministry of Environment. CARDIQUE and the Ministry of Environment ratified the license, which became effective in 2002.¹⁹⁴
173. CARDIQUE's Resolution No. 345 granted the environmental license but imposed a number of obligations. According to the first of these obligations, ACUACAR must submit to CARDIQUE by 2010 alternative proposals and the design of a treatment system that meets the removal standards set forth in the Decree 1594/84 for existing users¹⁹⁵ and must build and operate the approved alternative treatment system by the second phase of the Project, (2015-2025). The license adds that the approved alternative will be an integral part of the treatment system proposed for the Project's second phase.¹⁹⁶ CARDIQUE officials informed the Panel that the standards set in Decree 1594 /84 will require the District of Cartagena to upgrade the

¹⁸⁹ Decreto Numero 1180 de 2003, por el cual se reglamenta el Titulo VIII de la Ley 99 de 1993 sobre Licencias Ambientales, Título II, Art. 9 (9).

¹⁹⁰ Corporación Autónoma Regional Canal del Dique, CARDIQUE, Resolución No 0345 (junio 5 del 2001) "Por medio del la cual se otorga una licencia ambiental y se dictan otras disposiciones", [hereinafter CARDIQUE, Resolution 345].

¹⁹¹ Panel interviews, Cartagena, Colombia, June 2004.

¹⁹² CARDIQUE stated that public hearings are required under Law 99 of 1993 and consultations of black and/or indigenous communities under Law 70 of 1993.

¹⁹³ Sociedad de ingenieros y arquitectos de Bolivar.

¹⁹⁴ Management Response, paragraph 38. See also Management Response, Annex 8, Colombian Ministry of Environment Ratification of the Environmental License.

¹⁹⁵ Decree 1594/84, Art. 72.

¹⁹⁶ CARDIQUE Resolution no. 345, Art. 2 (a).

treatment plant from preliminary to primary treatment.¹⁹⁷ A further condition to which the license was subjected provides for the implementation of the monitoring program that, under the Project, should commence before the construction of the outfall and continue afterwards to study the behavior of pathogenic coliforms and other contaminants discharged through the outfall.¹⁹⁸

174. The license required also, inter alia, that ACUACAR carry out a census of the fishermen in Punta Canoa, design and implement a fishing program before operating the outfall for the community of Punta Canoa, and prepare a project to supply water and sewage services for the communities of Punta Canoa, Manzanillo del Mar and Arroyo de Piedra.¹⁹⁹

3.2. International Agreements

175. The Requesters claim that the outfall Project violates the Cartagena Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region,²⁰⁰ in particular Article 7, which covers “*Pollution from Land-Based Sources.*” They believe that the Project does not comply with the Convention’s obligation to “*take all appropriate measures to prevent, reduce and control pollution of the Convention area caused by coastal disposal or by discharges emanating from rivers, estuaries, coastal establishments, outfall structures, or any other sources on their territories.*”²⁰¹ According to the Requesters, Colombia is also bound by the Protocol to the Cartagena Convention Concerning Pollution from Land-Based Sources and Activities signed in Aruba in 1999, because, under the Protocol, “*wastewater dumped into Class 1 Caribbean waters (including water used for recreation and mangrove swamps) must meet stringent standards for total suspended solids, biological oxygen demand, pH, greases and oils, fecal coliforms, enterococci (fecal bacteria), and floating substances.*”²⁰²
176. Management responds that “[a]s noted in the ruling by the Ministry of Environment (...) while Colombia is party to the Cartagena Convention it is not a party to the Land-Based Sources Protocol of the Cartagena

¹⁹⁷ According to the license the Project has three phases: the Interim Phase (until 2005) when wastewaters will continue being discharged into the Ciénaga, while the Project works are carried out; the First phase (2005-2015) which provides for, inter alia, the construction of the outfall, the conveyance system, and the treatment plant; and the Second Phase (2015-2025) during which works to upgrade the treatment plant from preliminary to primary treatment are to be carried out to deal with, inter alia, the population increase, and thus the increase in the wastewater volume. CARDIQUE Resolution 345, p. 12. See also Management Response, ¶ 38.

¹⁹⁸ CARDIQUE Resolution no. 345, Art. 2 (e), 3 (a).

¹⁹⁹ CARDIQUE Resolution no. 345, Art. 3 (c, d, and f).

²⁰⁰ Request, p. 17.

²⁰¹ Request, p. 18 quoting Article 7 of the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region (Cartagena Convention).

²⁰² Request, p. 18, citing the Protocol Concerning Pollution from Land-Based Sources and Activities,

*Convention (LBS).*²⁰³ Management adds that, based on the wording of the Convention's Article 7, which “*urged countries in general terms to ‘prevent, reduce, and control pollution’ from land based sources,*” “*it appears that the Convention recognized that such practices would continue.*”²⁰⁴ In any event, the Response continues, any more specific obligations related to marine outfalls are included in the LBS Protocol, which is not applicable to the Project. Management also maintains that, were the LBS Protocol to apply, the Colombia government has already classified the waters as Class II; and the parties to the Protocol would have “*up to ten years to implement provisions that enable the standards of the Protocol to be met.*”²⁰⁵

177. The Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region was adopted in Cartagena on March 24, 1983.²⁰⁶ As of June 1, 2005, 21 States are party to the Convention. Colombia signed the Convention in 1983 and ratified it on March 3, 1988,²⁰⁷ so the provisions are binding upon Colombia. Three Protocols to the Cartagena Convention address specific environmental issues in the wider Caribbean region. The Protocol Concerning Pollution from Land-Based Sources and Activities (LBS Protocol), the relevant Protocol for this Project, was adopted in Aruba on October 6, 1999.²⁰⁸ However, the Protocol is not yet in effect since as of June 1, 2005, only two countries have ratified it.²⁰⁹ While Colombia signed the Protocol on October 2, 2000, it has not ratified it. Hence the Protocol is not yet binding upon Colombia, even if it were in effect. It should be noted that the

²⁰³ Management Response, Annex 1, Item 7, p. 35. The Panel notes that according to the 2002 Ministry of Environment's decision on the appeal against the environmental license Colombia has yet to ratify the Convention. See Management Response, Annex 8, p. 165 and Spanish original, p. 18(4).

²⁰⁴ Management Response, Annex 1, Item 7, p. 35.

²⁰⁵ Management Response, Annex 1, Item 7, p. 35.

²⁰⁶ Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region (Cartagena Convention), 1988 UNTS 157, Vol. 1506, I-25974.

²⁰⁷ See Acuerdo Regionales, available at

<http://web.minambiente.gov.co/html/neginternal/Home.htm#AcuerdosRegionales>

²⁰⁸ Protocol Concerning Pollution from Land-Based Sources and Activities to the Cartagena Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region (LBS Protocol), available at

http://www.cep.unep.org/pubs/legislation/lbsmp/final%20protocol/lbsmp_protocol_eng.html. The other two Protocols are: Protocol Concerning Co-operation in Combating Oil Spills (Oil Spills Protocol) adopted in 1983 and entered into force in 1986; and the Protocol Concerning Specially Protected Areas and Wildlife (SPAW Protocol) adopted in 1990 and entered into force in 2000.

²⁰⁹ See for reference <http://www.cep.unep.org/law/cartstatus.php#lbs>. The Panel notes that, while Management Response, Annex 1, Item 7, p.35, claims that “*not a single country that is party to the Cartagena Convention has ratified the Protocol since the Protocol opened for ratification in 2000*” providing a reference website address (<http://www.cep.unep.org/law/cartstatus.html#lbs>), indeed two countries, Panama and Trinidad and Tobago, parties to Convention, ratified the Protocol respectively on July 9, 2003 and March 28, 2003. See <http://www.cep.unep.org/law/cartstatus.php#lbs>. The Panel also received confirmation of the ratification of these two countries from the Caribbean Regional Coordinating Unit of the UNEP's Caribbean Environmental Program on April 22, 2005.

Vienna Convention on the Law of Treaties, Article 18, obligates a State to “refrain from acts which would defeat the object and purpose of the treaty” if “it has signed the treaty (...)”, or “it has expressed its consent to be bound by the treaty, pending the entry into force of the treaty and provided that such entry into force is not unduly delayed.”²¹⁰ **The Panel notes that the license granted by CARDIQUE states that the Project shall adjust its treatment system to all requirements for the protection of water bodies and submarine ecosystems resulting from national legislation or international agreements to which Colombia will become a party.**²¹¹

178. The Cartagena Convention applies to the wider Caribbean Region; the “Convention area” comprises the Gulf of Mexico, the Caribbean Sea and the Atlantic Ocean adjacent south of 30 degree north latitude and within 200 nautical miles of the Atlantic coasts of states parties to the Convention.²¹² The Convention requires the parties, inter alia, “to prevent, reduce and control pollution of the Convention area and to ensure sound environmental management (...)”.²¹³ Of particular relevance to the outfall Project, the Convention states that the “Contracting Parties shall take all appropriate measures to prevent, reduce and control pollution of the Convention area caused by coastal disposal or by discharges emanating from rivers, estuaries, coastal establishments, outfall structures, or any other sources on their territories.”²¹⁴ Further, Article 12 provides that technical and other guidelines should be developed for development projects “in such a way as to prevent or minimize harmful impacts on the Convention area,” and requires the assessment of “the potential effects of such projects on the marine environment, particularly in coastal areas, so that appropriate measures may be taken to prevent any substantial pollution of, or significant and harmful changes to, the Convention area.”²¹⁵
179. The LBS Protocol, adopted to implement in particular Article 7 of the Cartagena Convention, sets forth general obligations upon the parties and the legal framework for regional co-operation. The Protocol includes four annexes, but it envisions the development and adoption of future annexes to address other sources of pollution. Relevant to the outfall Project, Annex III addresses discharges of domestic wastewaters and determines specific regional effluent limitations for domestic sewage. The Protocol identifies two classes of receiving waters: “Class I” and “Class II” waters.²¹⁶ Class I

²¹⁰ Vienna Convention on the Law of Treaties, May 23, 1969, U.N. doc. A/Conf. 39/27. 1155 UNTS 331. Colombia is a party to the Vienna Convention.

²¹¹ CARDIQUE, Resolution 345, Art. 16. “El proyecto deberá ajustar su sistema de tratamiento a las exigencias que puedan resultar de acuerdos internacionales que para la protección de las aguas y ecosistemas submarinos suscriba el país o la legislación Nacional que se promueva.”

²¹² Cartagena Convention, Art. 1, 2.

²¹³ Cartagena Convention, Art. 4.

²¹⁴ Cartagena Convention, Art. 7.

²¹⁵ Cartagena Convention, Art. 12.

²¹⁶ LBS Protocol, Annex III, A (Definitions).

waters are those that are ‘*particularly sensitive to the impacts of domestic wastewater.*’²¹⁷ Class II waters are waters ‘*less sensitive to the impacts of domestic wastewaters*’ than Class I.²¹⁸ Effluent limitations are established by the protocol for Class I and for Class II waters, with the more stringent limitations applying to Class I waters.²¹⁹ The Protocol also sets the distinction between new and existing domestic wastewater systems and states that new domestic wastewater systems are to comply with these effluent limitations immediately after the Protocol enters into force, whereas existing ones must comply with the effluent limitations within 10, 15 or 20 years of the entry into force depending on the size of communities and the status of their current wastewater infrastructure.²²⁰

180. When the Protocol comes into effect and if Colombia becomes a party to the Protocol, these provisions will be relevant to compliance with the license granted from CARDIQUE, since, as noted before, the license requires that the Project adjust its treatment system as a result of international agreements to which Colombia becomes a party.

²¹⁷ LBS Protocol, Annex III, A (2).

²¹⁸ LBS Protocol, Annex III, A (3).

²¹⁹ LBS Protocol, Annex III, C (Effluent Limitations).

²²⁰ LBS Protocol, Annex III, A (4 and 5), C (1 and 2).

CHAPTER THREE: SOCIAL COMPLIANCE

1. Communities living in the North Zone of Cartagena: are they Indigenous Peoples under OD 4.20?

181. The Requesters state that the Bank failed to “*identify the affected communities as indigenous*,”²²¹ while in their view the people living in Punta Canoa, Arroyo de Piedra, and Manzanillo clearly meet the requirements of the Bank policy OD 4.20 to be classified as Indigenous Peoples. According to the Request, the communities living in these villages “*constitute a group with a social and cultural identity distinct from the dominant society that makes them vulnerable to being disadvantaged in the developmental process*’.”²²² The Requesters believe that the people living in the villages of Punta Canoa, Arroyo de Piedra and Manzanillo meet many of the criteria the Bank policy requires to recognize certain groups as indigenous, such as “*close attachment to ancestral territories and natural resources in the area; self-identification and identification by others as members of a distinct cultural group; distinct customary social and political institutions; and engagement in primarily subsistence oriented-production.*”
182. The Requesters state that Punta Canoa is a centuries-old village that has remained a “*traditional fishing village*” and where the majority of the families “*go back at least three generations.*”²²³ They add that the three villages have a “*way of life distinct from the rest of Colombian society.*”²²⁴ According to the Request, the Bank’s Project Appraisal Report also noted that “*the residents “live under the traditions and culture of their ancestors and keep the structure of rural families;” that the “villagers make a living through subsistence farming and fishing, for which they use their own hand-crafted boats and tools;” and that “Punta Canoa also has a number of unique religious and social customs derived from their ancestors, including festivals, games, dances, and marriage rituals.*” However, the Requesters claim, the Bank did not appreciate these cultural characteristics and “*the extent to which they are vulnerable to destruction by the outfall.*”²²⁵
183. Management states that the Project’s Social Assessment recognizes that the communities of La Boquilla, Manzanillo, Arroyo de Piedra and Punta Canoa are “*long-established communities with strong family ties and traditions.*” However, according to the Bank “*they do not meet the criteria for OD 4.20 with regard to ancestral territory, self-identification, indigenous language or presence of customary social and political institutions.*” Management states that the Bank “*correctly determined that OD 4.20 does not apply.*”

²²¹ Request, p. 20.

²²² Request, p. 21.

²²³ Request, p. 21.

²²⁴ Request, p. 22.

²²⁵ Request, p. 22.

184. Management argues that the communities living in the North Zone of Cartagena are also not recognized as indigenous people under Colombian Law. Management Response refers to two rulings from the Government of Colombia requested by ACUACAR in this regard. The first is contained in a letter dated August 11, 1998, where the “*Minister of the Interior determined that the communities in question were not considered ‘indigenous’ under Colombian law*”²²⁶ In addition, in a further letter dated July 30, 1999, “*the Ministry of Interior certified that the communities were, however, considered Afro-Colombian under the provisions of Law 70 (1993).*”²²⁷ Management adds that ACUACAR requested these rulings because the North Zone communities were not included in the official register of Afro-Colombian communities. The Jorge Artel foundation, a local NGOs, subsequently appointed by the “*Negritude Commission*” of the Ministry of Interior, certified that these communities are considered Afro-Colombians under Colombian Law 70.

185. The Panel takes note that under Colombian legislation the communities living in the North zone of Cartagena are not recognized as indigenous peoples. The Panel emphasizes that the issue under investigation is whether the Bank followed OD 4.20 on Indigenous Peoples during the design, appraisal and execution stages of the Project with regards to the Afro-Colombian communities living in the area of the proposed outfall. The classification of certain groups as indigenous peoples under Bank policy OD 4.20 is not necessarily consistent with, or subject to, local legislation, but is still binding on the Bank.

186. OD 4.20 defines “*indigenous peoples*” as “*social groups with a social and cultural identity distinct from the dominant society that makes them vulnerable to being disadvantaged in the development process.*” The policy recognizes that no single definition is available to embrace all indigenous peoples and their “*diversity*”. Thus, it provides for a number of criteria, whose “*presence in varying degrees*” is useful to identify indigenous peoples in particular geographical areas:

“(a) *close attachment to ancestral territories and to the natural resources in these areas;*

(b) *self-identification and identification by others as members of a distinct cultural group;*

(c) *an indigenous language, often different from the national language;*

(d) *presence of customary social and political institutions; and*

²²⁶ Management Response, Annex 1, Item 12, p. 39.

²²⁷ Management Response, Annex 1, Item 12, p. 39.

(e) primarily subsistence-oriented production.”

Some Indigenous Peoples can be wage earners, or can be small-scale market oriented people. The policy adds that “*Task managers (TMs) must exercise judgment in determining the populations to which this directive applies and should make use of specialized anthropological and sociological experts throughout the project cycle.*” (Emphasis added)

187. Management states that the World Bank’s Quality Assurance Team approved the decision reflected in the Project’s Social Assessment that no indigenous people would be affected by the Project.²²⁸ **However, the Panel finds that no “specialized anthropological and sociological experts” were consulted in this decision, contrary to the intention of OD 4.20.** The Panel could find no discussion during project preparation as to whether the presence of Afro-Colombian communities should trigger application of the Indigenous Peoples Policy.
188. The Panel notes that the criteria OD 4.20 requires to identify a particular group as indigenous people are shared by most vulnerable ethnic minorities. However, the Panel also notes that the policy does not say that all the criteria have to be met in order for the policy to be triggered. Moreover, neither are these criteria ranked in any hierarchy of importance.
189. Colombia and the Americas in general contain many peoples who were ethnic minorities in Africa, deracinated from West Africa by slavery, and forced to the Americas. Their languages and cultures were penalized to such an extreme degree that most of their language and culture was lost during 400 years of slavery. There is no dispute that slaves had clearly different languages, culture, and ethnicity -- all distinct from the dominant society. In those groups of escaped or freed slaves who fled from the dominant society to safety in remote and inaccessible sites, some of their original language and culture persists or has been restored.²²⁹
190. The Afro-Colombians potentially affected by the project are located in several villages on the coast north of Cartagena. Estimates of the populations differ greatly and the latest is from 1996. The 1999 EA recommends a survey of the potentially affected population, but this was not carried out at the time of Project preparation. The communities may be

²²⁸ An internal World Bank memo dated April 14, 1999 stated: “...nor is there any indication that indigenous peoples will be affected by the proposed works.”

²²⁹ One of the best examples of a distinct ethnic minority totaling losing all its land, and almost totally losing its language and culture and subsequently remembering it and restoring their cultural identity is one group of the Kung Nam San people of the Kalahari, Botswana, Namibia and Zimbabwe. Most lost their language and culture. Anthropologist Hugh Brody found individuals who remembered some words. Restoration of land rights and resumption of living together they found their language was being re-learned and aspects of their culture were remembered.

more than two centuries old. Arroyo de Piedra dates from 1550 (*fide* Fund. Jorge Artel). Over 90% own their own homes. They are tightly knit and cousin marriages are common. The best guess for current populations of the three communities are Arroyo de Piedra (3200), Punta Canoa (900), and Manzanillo del Mar (1400). Other villages nearby are marked on some maps but do not seem to have been acknowledged during the Environmental Assessment. There are few if any non-Afro-Colombians living in the communities. They rarely leave the community to live elsewhere, as provided for the GOC's specifics on Raizales. More than half have had no schooling. Practically all are in the poorest stratum of the poverty classification. They fish cooperatively by necessity. Surplus seafood is sold to middlemen, in the city of Cartagena, especially to Mercado Bazurto. The three main communities have 8-10 outboard motors each. About 30 are employed in menial jobs in the three adjacent modern shrimp corporations in Punta Canoa and at the Hidrocultivos shrimp facility in Arroyo de Piedras. Weekend tourism to eat reputable seafood on an unpolluted beach is the second most important income earner for the three communities. Because the vicinity is known for its unpolluted beaches and ocean, several modern hotels have been built just south and just north of Punta Canoa. This is a source of wage employment for Afro-Colombians.

191. The Panel notes that the Afro-Colombians are vulnerable to being disadvantaged by economic development as the policy specifies. They suffer disproportionately from social exclusion. They are closely attached to their natural resources of the ocean and some practice subsistence-oriented production. The Afro-Colombians living in the North Zone of Cartagena identify themselves as a distinct society different from the dominant society and they are treated in Cartagena as being a separate group. The main OD 4.20 criterion they lack is an indigenous language. After all these years, their language has been largely lost during 400 years of slavery, although it has been reported to linger on elsewhere in the Palenque community. **The Panel finds that in the case of the Afro-Colombians who submitted the Request, the affected community meets most of the OD's criteria, except for an "indigenous language" and arguably a predominant "primarily-oriented subsistence production."** The Panel finds that Afro-Colombians could reasonably have been regarded as indigenous peoples under Bank policies. But because of the absence of two of the policy criteria, the failure to do so in this specific case may not be deemed as noncompliance with the "*judgment*" called for in OD 4.20, paragraph 5. If the Afro-Colombians were regarded as indigenous peoples, the provision of OD 4.20 would have applied.

2. Indigenous Peoples Development Plan

192. According to the Requesters, as the Afro-Colombian communities meet the criteria of OD 4.20 to be identified as indigenous peoples, *“the Bank should not have approved the project or loan without an appropriate ‘indigenous peoples development plan’ as required under OD 4.20.”*
193. Management objects that the North Zone communities trigger the Bank policy on Indigenous Peoples as they cannot be recognized as such. Therefore, *“there was no need for an Indigenous Peoples Development Plan.”*
194. The Panel notes that the goal of preparing an IPDP is to foster compliance with the Bank’s Indigenous Peoples policy. The IPDP specifies how to reduce impacts and calculate adequate compensation for vulnerable communities. Preparation and implementation of an IPDP is the process by which social and environmental impacts are identified so that they can be prevented. If it is demonstrated that certain impacts cannot be prevented, they must be minimized, compensated for, or otherwise mitigated.
195. The Panel notes that had the affected Afro-Colombian communities been categorized from the outset as indigenous peoples under OD 4.20, an IPDP would have been prepared in order to prevent or mitigate the impacts and to ensure that net benefits would accrue to the affected indigenous peoples. **The Panel finds that there is no complete list, schedule or financial arrangements of mitigatory measures or compensation for the project’s risks for the people living in the area of the proposed outfall.** The risks are significant and the mitigatory measures found in the documentation, while strengthened over time, are weak.
196. **Since the Afro-Colombians could reasonably have been regarded as indigenous peoples within the Indigenous Peoples policy, the Panel finds that the Bank would have been well advised to require an Indigenous Peoples Development Plan (IPDP) or a similar document identifying impacts of the Project on these people and providing mitigation measures for risks and potential harm, particularly in light of the inadequacies of the Social Impact Assessment.**
197. The Panel notes that the subsequent studies carried out by ACUACAR to develop a baseline for Project monitoring contain a comprehensive set of socio-economic data about the Project affected communities. This can be used as a basis for developing a set of suitable compensatory measures.

3. Prevention and Mitigation of Impacts for the Affected Communities and Benefits

3.1 Identification of the Project’s impacts upon the affected communities

198. The Requesters believe that the construction of the submarine outfall will threaten “to upset and even destroy the culture and way of life that has existed in these villages for generations.”²³⁰ In their opinion, construction works will increase noise, traffic, and workers in the area and will ‘bring rapid and unwelcome change to these peaceful and close-knit Afro-Colombian villages that currently live without even basic modern amenities.’²³¹ The Requesters also argue that the Project will force these communities, which are among the Colombia’s poorest but mostly self-sufficient, “to bear the cost of (...) long-term, disruptive construction,²³² foul-smelling, noisy, and ugly sewage conveyance infrastructure; pathogenic bacteria and chemical contaminants in their coastal waters and fisheries, their most important natural resource; and sewage matter on their beaches.” They also claim that these adverse impacts may drive these people to move somewhere else.
199. According to the Request, the Bank failed to ensure that the Project’s potential adverse impacts on the communities living in the North Zone be adequately prevented and mitigated, and that net benefit would result for these communities.²³³ The Requesters complain that the EA addressed the social and economic effects that the Project will have on the villages of Punta Canoa, Arroyo de Piedra, and Manzanillo “only in the most cursory fashion.” As a result, they believe that neither the PAD nor the EA adequately took into account ‘the magnitude of the project’s impact on these communities nor their residents’ level of concern and opposition.’²³⁴ In particular, the Requesters state that while they fear that the Project will adversely affect fishing, which they claim is their primary source of livelihood and income, the Project authorities dismissed their concerns.
200. Management Response states that the Project has assessed adequately the social and economic effects on the villages of Punta Canoa, Arroyo de Piedra and Manzanillo. Management believes that both Bank and ACUACAR staff “have taken adequate steps to address the concerns of the village residents.”²³⁵ Management claims that the Social Assessment prepared under the Project identified, inter alia, the social and economic conditions of the project affected population, including the villages of the

²³⁰ Request, p. 6.

²³¹ Request, p. 6.

²³² The outfall pipeline and other infrastructure will be built through or near the village of Punta Canoa. According to the Project Appraisal, “[t]he construction of a pipeline and outfall of such length and diameter will entail potentially significant negative impacts on communities and surrounding natural habitats. The proper management of excavation materials, river and drainage crossings, and the reduction of nuisances such as dust, noise, increased traffic, pedestrian safety concerns, and the presence of a large work force in or near small rural communities, will necessitate careful engineering planning, closed [sic] supervision, and a continuous and intense community information program.” PAD p. 95-96.

²³³ Request, p. 20.

²³⁴ Request, p. 19.

²³⁵ Management Response, Annex 1, Item 9, p. 36.

North Zone, and consequently an impact mitigation program was prepared.²³⁶ The Response adds that *“the main outcomes and recommendations of the SA were built into project design to better target beneficiaries and enhance project quality.”*²³⁷

201. Management states that one of the Project’s components includes Environmental and Social measures. In addition, the Project finances the Social Impact Mitigation and Community Development Program which provides for activities that will be co-financed by the District Government. With particular respect to the communities in the North Zone, the Response points out that *“provision of piped water services for Manzanillo, Punta Canoa and Arroyo de Piedra is a condition of the Loan Agreement for the project prior to construction of the outfall.”*²³⁸ It adds that the *“works to provide these communities in the North Zone with water services are about to begin.”* Moreover, *“‘sanitation packages’ comprising in-house facilities will be installed in the poorest households in La Boquilla”* and *“two community centers, one in La Boquilla and another in Punta Canoa, will be built (...).”*²³⁹
202. Finally, Management emphasizes that *“the analysis conducted under the SA, the resulting North Zone water supply and the Social Impact Mitigation and Community Development Program, together with the activities to be supported by the District, address the project’s social and economic impacts in general, and, in particular, impacts on the communities of Punta Canoa, Arroyo de Piedra and Manzanillo.”*²⁴⁰
203. As already noted, the Panel finds that the Afro-Colombians affected by the project could reasonably have been regarded as indigenous peoples under the Bank policy OD 4.20. However, since Management did not apply this policy, this report considers how the provisions of OD 4.01 on Environmental Assessment, which the Bank regarded as the applicable policy, were applied with respect to the Requesters’ above mentioned complaint. OD 4.01 requires recognizing and taking into account *“all environmental consequences of a project (...) early in the project cycle”* so as to ensure that projects are environmentally sound and sustainable. *“EAs identify ways of improving projects environmentally, by preventing, minimizing, mitigating, or compensating for adverse impacts.”*²⁴¹ The policy adds that the views of affected communities and NGOs should be taken *“fully”* into account, because this is *“important in order to understand both the nature and extent of any social or environmental impact and the*

²³⁶ Management Response, Annex 1, Item 9, p. 37.

²³⁷ Management Response, Annex 1, Item 9, p. 37.

²³⁸ Management Response, Annex 1, Item 9, p. 37.

²³⁹ Management Response, Annex 1, Item 9, p. 37.

²⁴⁰ Management Response, Annex 1, Item 9, p. 37.

²⁴¹ OD 4.01, ¶ 2.

*acceptability of proposed mitigatory measures, particularly to affected groups.”*²⁴² Annex B of OD 4.01 requires the EA to identify inter alia “*the socio-economic conditions, including any changes anticipated before the Project commences*” and to identify and assess “*the positive and negative impacts likely to result from the proposed project*” as well as the “*mitigation measures, and any residual negative impacts that cannot be mitigated.*”²⁴³

204. The Panel notes that, as the Project has not been constructed yet, the impacts from the pipeline, sewage treatment plant and the ocean sewage diffuser have not yet emerged. However, the risks of the Project have already caused turmoil and consternation in all three ethnic communities. ACUACAR’s social communications contractor described the Project to the Panel during its visit to the Project area as “*a nuclear bomb ticking*” in the three villages.²⁴⁴ The Panel was also informed about an incident where ACUACAR’s topographic surveyors were physically denied entry to Punta Canoa by the Afro-Colombians communities because these felt they threatened by the Project.
205. The social impacts of the Project were assessed in the Social Impact Assessment (SIA) prepared in 1998.²⁴⁵ The Panel notes that most of this social assessment focuses on the major social benefits to the target population in the city of Cartagena, namely the Southeast Urban Area. **The Panel finds that the full SIA does not adequately address compensation for the affected Afro-Colombian communities in the North Zone for bearing most of the risk of negative impacts of the sewerage component for the Project.** Some attention is focused on La Boquilla, which is a community furthest from the impact zone. The “SA summary” does not summarize the SA, but is a stand alone document, and in some ways is more useful than the full SIA.
206. **The Panel finds that the Social Impact Assessment (SIA) is unsatisfactory with respect to its analysis of the Project’s impacts upon the communities living in the North Zone of Cartagena who presented the Request for Inspection. Irrespective of whether Afro-Colombians are classified as indigenous peoples or not, they are affected by the Project because they will be exposed to a wide range of risks as a result of the construction and operation of the Project.**

²⁴² OD 4.01, ¶ 19.

²⁴³ OD 4.01, Annex B, ¶ 2 (d) and (e).

²⁴⁴ Panel Interviews, Cartagena, Colombia, October 22-31, 2004.

²⁴⁵ Proyecto alcantarillado y emisario submarino en Cartagena: Evaluación Social, 1998. The SIA is accompanied by a 7-page length summary prepared by the World Bank Banco Mundial, Distrito de Cartagena, Aguas de Cartagena, Evaluación Social LCSES, Sumario 7 pp.

3.2. Risks perceived by the Afro-Colombian communities in relation to fishing and other activities

207. The Panel notes that one of the biggest contradictions in the Project documentation concerns the role of the fishing activity in the area of the proposed outfall in the Afro-Colombian economy.
208. The EA states that there is very little sea life near Punta Canoa: “*No se observó ningún tipo de flora y fauna*” off the coast of Punta Canoa.²⁴⁶ Management reiterates this statement in its July 2004 Response to the Request for Inspection– “*The area in the vicinity of the outfall has little marine life*”²⁴⁷ – and in staff interviews with the Panel. Management seems to dismiss the importance for these communities of the fishing activity around the area of the proposed outfall and their concerns by simply stating that “*fishing activity, to the extent it might occur in this area, would not be adversely affected.*”²⁴⁸
209. On the other hand, the EA acknowledges that a decrease in fishing resources was one of the main Project-related concerns expressed by the people living in the North Zone.²⁴⁹ These fishing resources are described in a 2003 study carried out by INVEMAR (Instituto de Investigaciones Marinas y Costeros) that documents the bountiful fisheries caught in area of influence of the Project– the tonnage of the about 50 species of fish caught, together with statistics on the lucrative catches of crabs, lobsters, prawns, shrimp, oysters, and mollusks.²⁵⁰ According to the study, there are 132 fishermen in Punta Canoa, 49 in Manzanillo del Mar and 201 in Arroyo de Piedra.²⁵¹ The INVEMAR study also confirms that fishing is a mainstay in the economy of the area of influence of the Project. Seafood pays for all schooling, water, electricity and housing. According to this document, earnings can exceed 1 million pesos/month/fishing group. An average harvest would be about 200,000 pesos. Half of the fishing population earn over 500,000 Pesos/month. All three Afro-Colombian communities own outboard motors; about 8 in Punta Canoa, 10 in Manzanillo del Mar, and 9 in Arroyo de Piedra. Each community owns numbers of fiberglass and wooden vessels, long lines of hooks, and expensive drift nets. All three affected communities own at least one motorized vehicle to transport surplus fish to Cartagena’s fish market and elsewhere, where Punta Canoa

²⁴⁶ Environmental Assessment, Fundación Neutrónicos, p. 65. « No kind of flora and fauna was observed » off the coast of Punta Canoa.

²⁴⁷ Management Response, p. 40.

²⁴⁸ Management Response, ¶ 45.

²⁴⁹ Environmental Assessment, Fundación Neutrónicos, p. 110.

²⁵⁰ Instituto de Investigaciones Marinas y Costeros (INVEMAR), Informe del Censo de Pescadores y Avance del la Caracterización del Pesca Artesanal en la Zona de Influencia del Proyecto para el manejo y Disposición de las Aguas Residuales de la Ciudad de Cartagena, Santa Marta, December 2003, [hereinafter INVEMAR 2003], pp.37-40.

²⁵¹ INVEMAR 2003, Table 3.6, p. 22.

seafood commands a reputation as less polluted than seafood from La Bocana, La Boquilla and the Ciénaga. Seafood is also related to the communities' second and third biggest contributors to their livelihoods, namely tourism and employment in the shrimp facilities.

210. Seafood and fishing in the outfall area are indeed the core of the North Zone communities' economy and livelihood. The PAD states that *"Punta Canoa is a small village of only 500 inhabitants mainly living from fishing."*²⁵² The Project 1999 EA also cites a CIOH 1998 Study according to which fishing is identified as one of the traditional occupations of the villages of Punta Canoa, Manzanillo del Mar and Arroyo de Piedra.²⁵³ In light of the foregoing, the Panel would like to emphasize that, as the sewage outfall is designed to be located in the main Afro-Colombian fishing grounds, any risks to their seafood must be taken seriously. **The Panel finds that the EA and Management erred in concluding that fishing in the area of influence of the outfall is negligible or unimportant in the affected communities without more detailed studies about this issue.**²⁵⁴
211. Awareness of the presence of an outfall is likely to create impacts in the areas where the outfall is located. All identified risks are perceived until some of them happen. Environmental and social assessments are based on best efforts, combined with experience, of perceived risks or impacts. Prudence leads us to take a precautionary approach so that if perceived risks actualize, the predicted impacts are prevented or are not as severe as they would have been without the mitigatory measures. Clearly, some of these sewage risks are perceived and may transpire.
212. The Panel notes the following risks perceived by the Afro-Colombian communities:
- a. Pollution of fish, crustaceans and mollusks near the submarine outfall, which may decrease harvests. Red tides from Cartagena are spreading outwards from the city towards La Boquilla, but are still not affecting the three communities yet;
 - b. Possible harm of pathogenic infection of sea food consumers;
 - c. Damage to the reputation of Punta Canoa seafood in Cartagena market, thus decreasing prices and sales;

²⁵² PAD, p. 104.

²⁵³ Environmental Assessment, Fundación Neutrónicos, 1999 p. 73.

²⁵⁴ For example, the ACUACAR's baseline study (Línea Base del Plan the Tratamiento y Disposición de Aguas Residuales de Cartagena de Indias – ACUACAR S.A. E.S.P. Recursos Pesquero y Aprovechamiento) of July/August 2003, that is after Board approval of the Loan, contains detailed information about fish population in the Punta Canoa, Ciénaga and Municipality of Cartagena areas (in fishing point indicated by the communities) and does not show substantial differences in the fish population in these areas. Similar results are shown in the above-mentioned INVEMAR study.

- d. Damage to the three modern shrimp-based facilities²⁵⁵ all of which were sited at Punta Canoa because of the clean sea water. All depend on intakes of clean sea water;
- e. Any harm to the shrimp industry, the biggest employer in the community, will decrease employment of villagers. The shrimp industry is deeply concerned about the proposed sewage outfall. The EA does not seem to take the three modern shrimp facilities into consideration;
- f. The sewage treatment facility to be located adjacent to Punta Canoa may harm tourism, the second biggest economic mainstay of the village;
- g. Shellfish (e.g., oysters, clams, and scallops), other filter feeders and mollusks are important in the nutrition and market economy of the villagers. The risk is that such animals will bioaccumulate phytotoxins and heavy metals from the submarine outfall whatever the dilution rate may be;
- h. There will be foul odors from the sewage treatment adjacent to Punta Canoa plant and sludge disposal when the winds blow towards the village (i.e.: when the sea breezes reverse);
- i. Preliminary sewage treatment is expected to be upgraded to primary treatment in ten years. This implies expansion of sewage treatment close to the village. This is a cost to tourism and aesthetics as it is on the only road leading into the village;
- j. The village is being used as a risky experiment without consent. If monitoring detects problems, sewage will be chlorinated, which may create carcinogenic compounds in the effluent as it is released to sea water;
- k. If damage to the community continues (i.e. “*if needed*”), primary and secondary sewage treatment may be added. This implies that the village

²⁵⁵ Although shrimp farming began near Punta Canoa in the 1980s, an advanced public/private research institute (Ceniaqua: Centro de Investigaciones de Colombia) and two modern shrimp breed stock facilities IdelCaribe and Aquatec are located adjacent to Punta Canoa and create their biggest source of wage labor for the community. These three shrimp facilities are socio-economically important, yet seem to have been overlooked in the social and environmental assessments, as possibly with Hidrocultura in Arroyo de Piedras. The three facilities might be seriously affected by the sewage project if water quality deteriorates at the shrimp facilities water intakes. Problems and declining production at the three other shrimp facilities around La Boquilla (Rancho Chico, Acacia del Mar, Inamar) may already have set in as the red tides and pollution from Cartagena is reaching La Boquilla with increasing frequency.

will have to be damaged before investing in safer sewage treatment. This violates the precautionary approach mandated in OP 4.04;²⁵⁶

- l. Monitoring, no matter how diligent, does not protect people if an emergency arises. Monitoring may raise the alarm in an emergency, but has little to do with protecting people from harm;
- m. Punta Canoa has only muddy or dusty dirt lanes in the village. The blacktop roads ends just before the village near the site of the sewage treatment plant. This may create significant impacts on the whole village, such as noise, accidents, dust, vibrations, and social risks, because of (a) construction of the major preliminary treatment plant adjacent to the community, (b) construction of the submarine conveyor on the other (coastal) side of the village, and (c) construction and burial of the sewage pipe connecting the two facilities. All of this suggests that there will be a major increase in heavy traffic. No mention has been seen of blacktopping Punta Canoa main street before construction, use of an access road bypassing the village, speed limits or other means of traffic management to reduce such impacts. As dwellings of poorer households are made of wattle-and-daub, vibration from heavy trucks may damage such dwellings unless prevented in advance;
- n. Dredging and excavation during construction of the submarine outfall may raise turbidity, harm filter feeders in the vicinity, and reduce seafood.

3.3. Benefits for the Afro-Colombian communities in the North Zone

213. The Requesters argue that “[w]hile project planners have set aside money for constructing water and sewerage facilities to service the villages in an attempt to compensate them for these burdens [...] such facilities will not provide adequate compensation for permanent negative impacts on the health, food sources, and way of life of these indigenous people.”²⁵⁷
214. Management claims that the North zone communities “will benefit from the project in many ways.”²⁵⁸ The Response lists a number of benefits that will stem from the Project: piped waters services to Punta Canoa, Arroyo de Piedra and Manzanillo del Mar; sanitation services for these communities, “should additional funds exist;”²⁵⁹ in-house sanitation facilities; two communities centers in La Boquilla and Punta Canoa; an orchard for Punta Canoa for post-construction reforestation activities and to provide an

²⁵⁶ There seems to be a logical fallacy in waiting for damage and then moving to primary and secondary treatment as insisted on by LAC’s QAT. If primary and secondary treatments are to be retrofitted, and if harm to the Afro-Colombians accrues, a submarine outfall in that location may not be needed, nor would the 21 km-long pipe, nor the major recurrent energy costs of pumping.

²⁵⁷ Request, p. 7.

²⁵⁸ Management Response, ¶ 47.

²⁵⁹ Management Response, ¶ 47.

additional revenue source; work opportunities during construction; and improvement of the environment in general, which will enhance tourism in the area creating economic opportunities. Management also claims that ACUACAR is studying how to optimize the fishing activity in Punta Canoa and that *“project funds will be available to implement the study recommendations.”*²⁶⁰

215. Management also states that a Social Impact Mitigation and Community Development Program has been developed and will be financed jointly with the Borrower.²⁶¹ The program for the communities around the Ciénaga and the North Zone, inter alia, provides *“these two areas with priority attention through the Citizens Participation and People Development Program, which offers training and assistance to develop small productive activities.”*²⁶²
216. The Bank policy on Environmental Assessment states that an EA has to *“identify ways of improving projects environmentally, by preventing, minimizing, mitigating, or compensating for adverse impacts.”*²⁶³ It adds that an EA is a formal mechanism to address the concerns of affected people and local NGOs. The policy calls for meaningful consultations of affected communities, which improve the decision-making process and *“increase community cooperation in implementing the recommendations of the EA.”*²⁶⁴ To do so the policy requires that affected group and NGOs be informed in a timely manner and in a form understandable to the people being consulted about the project and its objectives.²⁶⁵ When describing an EA Report in Annex B, OD 4.01 also requires the identification of both the positive and the negative impacts deriving from the Project.
217. The Panel notes that the PAD mentions two benefits, potable water and sewerage services that will be provided to the Northern communities. The PAD also affirms that the Afro-Colombian Northern Communities were complaining before 1999 that they will not receive any benefit from the Project.²⁶⁶ Commendably, the PAD continues: *“[t]o relieve their concerns, a condition that the District of Cartagena would ensure that, within four years from loan signing, piped water supply service will be provided to the north zone communities, has been incorporated in the loan agreement.”*²⁶⁷ This important benefit for the affected communities looks well on the way to being fulfilled.

²⁶⁰ Management Response, ¶ 47.

²⁶¹ Management Response, ¶ 48.

²⁶² Management Response, ¶ 48.

²⁶³ OD 4.01, ¶ 2.

²⁶⁴ OD 4.01, ¶ 19.

²⁶⁵ OD 4.01, ¶ 21.

²⁶⁶ PAD, p. 20.

²⁶⁷ PAD, p. 20.

218. During the Inspection Panel's October 2004 visit to the project area, steel water pipes have been stored all along the roads into Manzanillo del Mar and to Punta Canoa. However, in interviews with Bank staff the Panel found that communications between the Requesters and the Project officials on this and other aspects of the Project have broken down and misinformation is rife. ACUACAR asserts that they have informed Punta Canoa and Manzanillo del Mar villagers that they will receive potable water in the near future and that house connections are planned by self-help to improve affordability. However, the Panel notes that the Afro-Colombians communities seem not to know whether their houses will be connected, or whether there will be three standpipes in each village, or there will be one central community water tank. Bank records reviewed by the Panel show that a decision on such matters had not been taken as of late 2004 nor were options concerning sanitation improvements and their financing.
219. The Panel notes that because water bought from tanker trucks is very expensive, most villagers currently catch rain water from their roofs and store it in large drums. Depending on how many drums each householder can afford, such water lasts into the dry season, at which time householders purchase water from trucks. **The Panel notes that the piped water is expected to be of safer and less expensive than the trucked water, which will be a significant benefit for the community. The Panel finds that this is compliance with OD 4.01.**
220. According to the PAD, the second benefit the affected communities will receive is the provision of sanitary services.²⁶⁸ The PAD, however, does not provide details of when sanitation will be provided, not what type, nor who will pay for what.
221. The third benefit may be support for fishing. The Panel was informed that ACUACAR is planning a fishery support component for the villages. However, the Panel was unable to find additional information on this subject.
222. Bank staff interviewed by the Panel also stated that the Afro-Colombian communities will also receive a kitchen and bathroom kit for some households, although staff was vague on specifics. The Panel notes that during its field visit the Panel team met nobody in these communities aware of the kitchen and bathroom kit.
223. The Panel notes that the Afro-Colombian communities seem to have been considered less important than the major beneficiaries of Cartagena. They are relatively small in numbers, quiet, weak in political power, and lack

²⁶⁸ PAD, p. 21.

voice in decisions that affect them severely. **The Panel notes that these communities may be exposed to significant risks under the project. Some compensation for the potential impacts is provided under the Project, e.g. water and sanitation services, in accord with OD 4.01. The Panel welcomes the initiative to provide compensation for the Afro-Colombian minorities, but finds that details about some of the compensation measures are not specific, and it is unclear whether appropriate financial arrangements have been made to implement benefits, such as sanitation services and maintenance and operation of community centers. The Panel also finds that implementation of these measures seems to be lagging behind.**

224. **The Panel also finds that information about these compensatory measures has been inadequately disseminated to the villages.** The Panel observes that the North zone communities have been suffering from fears of low benefits and potentially big costs as a result of this Project. The Panel notes that there is real fear of major potential negative impacts of the project. The Panel also observes that the Requesters feel resentment that this compensation has not been agreed on and clarified. Many people seem not to be aware about the details of the benefits they are supposed to receive, including their timing. The possibility of some menial jobs for the short period during construction is not factored here. This is partly because although the wages will be real, the duration (c.18 months) is so ephemeral as to be a distraction, which could lead to heightened expectation, and divert attention away from more sustainable priorities of fishing and tourism.
225. The Panel welcomes the proposed benefits for the people living in the Project area but notes that there seems to be no direct relation between such benefits and the risks that people may be exposed to as a consequence of Project construction and operation. There is no graduated approach to compensate the population for – or mitigate – the different risks as they materialize. For example, there are no social mitigation or compensatory measures in case of severe malfunction of the outfall that could lead to high presence of pathogens or other contaminants and/or a need to chlorinate the outfall discharge. This could affect the water quality near Punta Canoa and may affect people's health and their social and economic activities. **In this sense, the proposed Social Impact Mitigation and Community Development Program seems to fall short in addressing the mitigation or compensation for harm related to potential adverse impacts of the Project as required by OD 4.01.**

4. Consultation and participation of affected people

226. This section of the report addresses the information and consultation process that took place during Project preparation and a communication

strategy which was developed and implemented after the Loan had been approved by the Board of Executive Directors of the World Bank on July 20, 1999.

227. The Requesters believe that the Bank failed to take public concerns into consideration. According to the Request, the Bank claims that “*public consultation meetings were held in Punta Canoa and the other villages, that ‘community concerns were registered’.*”²⁶⁹ The Requesters state that ACUACAR held two public hearings or meetings in Punta Canoa in 1998. However, they claim, “*these meetings did not adequately register public concern. Residents’ accounts of at least two meetings indicate that executing agency ACUACAR was not honest with them about the potential effects of the outfall and even used deception to portray village support for the project as higher than it actually was.*”²⁷⁰
228. Management claims that “*extensive consultations were carried out under the project*” and “*a participatory approach was used during project preparation, starting in February 1998.*”²⁷¹ Consultations were carried out, as required by OD 4.01, during the preparation of the Environmental Assessment. At a two-day seminary held in 1998 the TORs for the EA were discussed with all stakeholders including local NGOs, such as SIAB (the Association of Engineers and Architects of Bolivar). Management states that about 250 events took place between 1998 and 2003 and involved affected communities and other stakeholders.²⁷²
229. Further, the Response states that consultations “*were conducted as part of the SA process and the discussion of the preparation and results of the Social Impact Mitigation and Community Development Program*”²⁷³ and focused on two areas, the neighborhoods south of Ciénaga de la Virgen and the community in the North Zone of Cartagena. Management adds that the Fundación Jorge Artel carried out this consultation process, which consisted in community meetings, general assembly meetings and selection of community representatives and “*took place March 9-30, 1999.*”²⁷⁴ Management further claims that the concerns expressed by the communities during consultations were taken into consideration in the project design. In particular, as people expressed concerns about the impact of the Project on fishing and their future employment opportunities, the Response claims, the “*Environment and Social Component supports—among other activities—promoting the integration of community based groups, in particular to develop income-generating activities (...) [and] communications campaign*

²⁶⁹ Request, p. 22.

²⁷⁰ Request, p. 23.

²⁷¹ Management Response, Item 8, p. 35.

²⁷² Management Response, Item 8, p. 36.

²⁷³ Management Response, Item 13, p. 39

²⁷⁴ Management Response, Item 13, p. 40.

to keep the population of Cartagena informed about progress on the project.”

230. “*Meaningful consultations*” of affected groups and NGOs are required under the policy on Environmental Assessment, OD 4.01. The policy states that the views of the affected people and local NGOs should be taken fully into account in particular while preparing the EA.²⁷⁵ This is important to allow the people to “*understand both the nature and extent of any social or environmental impact and the acceptability of proposed mitigatory measures, particularly to affected groups.*”²⁷⁶ Consultations should occur after the Project has been assigned an EA category and once the draft EA has been prepared.²⁷⁷ Consultations on social issues may be linked to the EA consultations, and “*should pay particular attention to those issues most likely to affect the people being consulted.*”²⁷⁸ The policy also requires that the affected people are given all relevant Project information prior to the consultations for these to be meaningful.²⁷⁹
231. The Panel examined the Project records, and met with Bank staff, Project officials and the Requesters. During these meetings the Requesters emphasized to the Panel that consultations during the Project preparation were inadequate and that the people views, concerns and fears had not been taken into account. Bank staff, on the other hand, described at length their efforts to inform and consult the affected people, including those living in the North Zone of Cartagena.
232. The PAD states that “*public consultation meetings were held in the communities that would be most affected by the project: Arroyo de Piedra, Manzanillo del Mar, La Boquilla, Sur Oriental zone and Punta Canoas. Community concerns were registered and taken into account in the preparation of the Environmental Management Plan.*”²⁸⁰ The PAD adds that “*perhaps the most important result of the consultation process was the decision by the Municipality to include a small yet important water supply component for the rural communities north of Cartagena.*”²⁸¹ The EA includes similar statements²⁸² and descriptions of workshops which took place in Punta Canoa, Arroyo de Piedra and Manzanillo del Mar during the EA preparation process.
233. The Panel notes that two local NGOs – Fundación Vida and Fundación Jorge Artel – carried out the consultations in the context of preparing

²⁷⁵ OD 4.01, ¶ 19.

²⁷⁶ OD 4.01, ¶ 19.

²⁷⁷ OD 4.01, ¶ 20.

²⁷⁸ OD 4.01, ¶ 21.

²⁷⁹ OD 4.01, ¶ 21.

²⁸⁰ PAD, p. 96.

²⁸¹ PAD, p. 97.

²⁸² Environmental Assessment, Fundación Neutrónicos, 1999, p. 89, 126.

respectively the environmental and the social assessment. As already noted, Management states that the consultations conducted by Jorge Artel took place between March 9-30, 1999. However, a document obtained by the Panel during the investigation entitled ‘*Proyecto the Agua y Saneamiento de Cartagena Informe de Negritudes*’ by the Fundación Jorge Artel ostensibly dated 1999 contains references to meetings and workshops with the communities in the North Zone dated March 9-30, 2000, that is after the Project preparation had been completed and the Loan for the Project approved by the Board of Executive Directors. In any event, this document does not make any references to any consultations carried out by the same Fundación Jorge Artel in the same area, for the same purposes exactly one year before. The Panel received no other evidence regarding the 1999 consultation. **The Panel finds that during Project preparation there were extensive consultations efforts with the people of Cartagena. This is in accord with OD 4.01. However, OD 4.01 requires that these consultations be timely, meaningful and relevant to Project design and execution. This is particularly important, in the case of the Afro-Colombians living in the area of the proposed outfall, who informed the Panel that they were not consulted about the location of the outfall but rather only informed about its construction and operation.**

234. **Communication Strategy** Management states that ACUACAR implemented a communication strategy, at Bank’s request, between 2001 and 2002, that is after the Loan had been approved by the Bank’s Board of Executive Directors. As part of this strategy, ACUACAR carried out a survey, according to which *“79 percent of Cartagena’s overall populations support the project and 36 percent of the North zone communities oppose it.”*²⁸³
235. The Response further adds that workshop and various events took place, the most important of which was a *“study tour for 23 community leaders, including representatives from the North Zone communities, to 6 similar outfall sites in Colombia, Chile and Uruguay; and participation of 23 key stakeholders, including community representatives, in an international course on the submarine outfall alternative for coastal cities in the Caribbean, organized by PAHO/WHO in Barbados.”* This study tour took place from September 3-9, 2001.²⁸⁴
236. To implement the communication strategy, ACUACAR contracted Gran Publicidad Cia, a local company, to produce documentaries, videos and glossy brochures. The Panel notes that this expensive strategy may have worked well for the urban Cartagena beneficiaries, but has scarcely penetrated to the affected communities who submitted the Request to the Panel. The main brochure costs about US\$15 each so few copies were

²⁸³ Management Response, Annex Item 8, p. 36.

²⁸⁴ Management Response, p. 11.

printed and allegedly not one was seen in the affected villages. The strategy of producing many simple leaflets, posters and cartoons may have been overlooked.

237. Commendably, ACUACAR arranged for a cross-section of society to inspect existing outfalls, similar to the proposed one for Punta Canoa. Representatives from all three affected villages visited outfalls in Valparaiso, Chile and in Montevideo. The Panel finds that this is best practice. Unfortunately, this visit took place after the Project had been designed and its location determined, while **OD 4.01 requires this kind of interaction during the preparation of the Project.**
238. The Panel met with officials from the Fundación Vida, who is also involved in the implementation of the communication strategy. Fundación Vida has one office/house in Punta Canoa staffed by two part-time apparently unpaid facilitators, who are from the village and started work in February 2004. They report monthly to Fundación Vida for ACUACAR. They are helped by 20 multipliers who get basic training of a day or so per month and no pay. They have a few explanatory posters and some documents (although few villagers are literate). There are no leaflets to be handed out to visitors. As most villagers have misgivings about the Project, the Vida office has few visitors.
239. Calming down a stressed community will be far more difficult than maintaining good relationships with a neutral pre-project community. The Vida Foundation communications program was started over one year ago for Punta Canoa and Manzanillo del Mar.²⁸⁵ The Panel found that Arroyo de Piedra is excluded from this program. **Starting a communications strategy for the affected communities five years after appraisal is more expensive and less effective than starting it during project preparation, the time as it was done for the citizens of Cartagena.**
240. To be effective, communications and consultation need to begin as soon as possible, and certainly no later than loan signing. This enables the strategy to be proactive and preventive, rather than defensive, reactive and curative. It is odd that Arroyo de Piedra has been excluded from the communications strategy. This needs to be rectified as soon as possible.
241. With hindsight, it would have been better to prevent Afro-Colombian consternation and stress beforehand in two ways, by building effective and permanent channels of communication in 1998 or earlier and by agreeing on unambiguous net benefits in compensation for the significant impacts

²⁸⁵ (a) Fundación Vida Caribe, 2004 (Augusto) Cuarto Informe de Avance: Plan de Gestión social: Emisario submarino de Cartagena. Cartagena, 1 vol. (vp). (b) Alcaldía Mayor de Cartagena DT y C, Abril de 2003. Selección de Consultores para el fortalecimiento de las organizaciones comunitarias localizados en le área de influencia de proyecto emisario submarino de Cartagena: Términos de Referencia 81 pp.

threatening the Afro-Colombian communities. The compensation for tolerating the impacts should have been negotiated at the same time Cartagena citizens were negotiating their net benefits, and in any event long before the Afro-Colombian minorities became hostile to the project. The communities voiced their concern long ago about water and dust. Provision of low-cost plastic tanks to catch roof rainwater for those households lacking capacity for storage would have been an instantaneous benefit. Sealing the two main streets in Punta Canoa from the end of the blacktop would prevent the main complaint of dust, could have boosted tourist revenues, and decreased fish handling costs.

242. **While the Project commendably included a communications strategy, the Panel observed that it failed to reach most members of the affected communities in the North Zone. An outreach strategy was added too late to deal effectively with the Project-related trauma and stress in these communities. The Panel finds that consultations and communications with the affected Afro-Colombian communities in the area of the submarine outfall did not comply with OD 4.01.**

4.1. Communities' consultations and willingness to pay for water services

243. The Requesters' complaint that they have not been adequately consulted during the design and preparation phase of the Project extends also to the economic issues such as the willingness and capacity of the communities—particularly the poor areas of Punta Canoa and Manzanillo del Mar—to pay for future water and sewerage services.
244. Annex 4 of the PAD discusses at length the issue of willingness to pay (WTP) for services and describes the surveys that were conducted in this regard.²⁸⁶ The Panel notes that the WTP studies did not include Punta Canoa and Manzanillo del Mar. At the time of appraisal, these very poor communities contained relatively few potential users of services. Although they were included in the Project, they appear not to have been included in the willingness-to-pay surveys. During the Panel's visit to these communities, community members in Punta Canoa indicated that they were not even sure whether the community would be connected to the sewer system, and if they were, who would finance the individual sewerage connections.²⁸⁷ Moreover, community members pointed out that they were still not sure about (a) whether water supply services would be delivered to the front or inside of each property, (b) who would pay for the water connection costs, and (c) whether standpipes would be placed on each street block.

²⁸⁶ PAD, p. 55. For an extensive analysis of the willingness to pay studies see *infra* Chapter 4, section 1.1.3.

²⁸⁷ See also Environmental Assessment, Fundación Neutrónicos, 1999, p. 8.

245. For Punta Canoa, the question of willingness and capacity to pay points toward the benefits that this project would bring to this poor community: water supply and sewerage services. As of October 2004, private water distributors (in trucks) sell drinking water in Punta Canoa at Col\$100 per five liters. This represents US\$7.776 per 1 cubic meter of water. If the Punta Canoa community, classified under “*estrato No.1*” (the poorest population within the system), were connected today to ACUACAR’s system, they would be paying the equivalent of US\$0.33 per cubic meter of water. Even if the cost of sewerage service is included, the price for a cubic meter of water would be only US\$0.52. The tariff agreement among ACUACAR, the District, and the SSPD, provides a cross-subsidy between higher- and lower-income consumers. By December 2005, when this subsidy will be reduced, estrato No.1 will be paying about US\$0.51 per cubic meter of water and US\$0.80 if sewerage service is included. All these prices assume an average household consumption of about 20 cubic meters of water per month, which is realistic when people are connected to a safe water distribution system. The tariff system takes into account the fixed costs of supplying water and sewerage services: a household that consumes only one cubic meter of water per month—a very improbable scenario—would pay US\$2.13 for the water, or US\$ 3.26 if it is connected to the sewerage system.
246. It is clear that at present, willing or unwilling, the households of Punta Canoa are paying an enormous price for drinking water, and that this price would be reduced substantially if they were connected to ACUACAR’s system. There is a general assumption, however, that once poor communities are connected to the system they fail to pay their water bills. By mid-2004 the collection rate for “*estrato 1*” was 78.1% and for “*estrato 2*” was 92.5%; by comparison, the collection rate for the commercial business estrato was 82.7%. According to ACUACAR the consumers with the largest outstanding bills (other than estrato 1) generally belong to the highest estratos.²⁸⁸ To improve water (and sewerage) collection rates in poor communities such as Punta Canoa and Manzanillo del Mar, ACUACAR will place a water meter at the entrance of the community and bill the community for the water consumption. It will then be the community’s responsibility to collect the payment from each of its members.
247. The question of capacity to pay still lingers. The average household income in Punta Canoa is said to be about US\$2 a day, or about \$60 per month. If Punta Canoa were connected to ACUACAR’s water distribution system today, each Punta Canoa household that consumes 20 cubic meters of water

²⁸⁸ Given the low consumption rates and low billings of Estrato 1; a collection rate of 78.1% does not represent a serious financial constraint to ACUACAR. The collection rate for Estrato 6—the richest segment of the population—was 89.8%; the average collection rate in mid-2004 for all ACUACAR was 91.7%.

would be paying a monthly water bill of about US\$7, and in 2006 this amount will increase to about US\$9 as cross-subsidies between estratos are reduced considering local income levels. This is an expensive bill to pay.

248. **The Panel recognizes that the connection to the water and sewerage network is of the utmost importance for the North zone communities. However, the Panel did not find any evidence that a formal consultation process on all the aspects of water and sewerage issues took place with the community of Punta Canoa. The Panel finds that the willingness-to-pay surveys did not include Punta Canoa (or Manzanillo) and these communities were not adequately consulted on the issues of willingness to pay and water tariffs.**

CHAPTER FOUR: ECONOMIC COMPLIANCE

1. Economic Evaluation

1.1 The Economic Analysis and Compliance with OP 10.04

249. The Requesters allege that the Bank failed to comply with OP 10.04 on Economic Evaluation of Investment Operations, because, in their opinion, it failed to “adequately and effectively scrutinize the economic investment and environmental risk evaluations of the outfall and alternative sanitation solutions.”²⁸⁹ The Requesters also complain that, according to the PAD, “ACUACAR has been the primary source of all project data, including ‘data regarding market demand and supply, project specifics, comprehensive cost and investment data, project financing details, expected returns, and market distortions.’”²⁹⁰
250. OP10.04: Economic Evaluation of Investment Opportunities (September 1994) includes the following provisions: “1. [...]For every investment project, Bank staff conduct economic analysis to determine whether the project creates more net benefits to the economy than other mutually exclusive options for the use of the resources in question” Paragraph 2 adds defines the **Criterion for Acceptability** as follows: “[t]o be acceptable on economic grounds, a project must meet two conditions: (a) the expected present value of the project's net benefits must not be negative; and (b) the expected present value of the project's net benefits must be higher than or equal to the expected net present value of mutually exclusive project alternatives.” Note 3 states that “standard practice has been to calculate the expected internal rate of economic return (...)” Paragraph 3 refers to the Analysis of **Alternatives** as “one of the most important features of proper project analysis throughout the project cycle” adding that “[t]o ensure that the project maximizes expected net present value, subject to financial, institutional, and other constraints, the Bank and the borrower explore alternative, mutually exclusive, designs (...)” Paragraph 5 refers to the **Sustainability** of the proposed project and provides that “[t]o obtain a reasonable assurance that the project's benefits will materialize as expected and will be sustained throughout the life of the project, the Bank assesses the robustness of the project with respect to economic, financial, institutional, and environmental risks (...)” Acknowledging that the “economic analysis of project is based on certain future events and inexact data,” Paragraph 6 on **Risk** provides that “[t]he Bank's economic evaluation considers the sources, magnitude, and effects of the risks associated with the project by taking into account the possible range in the values of the basic variables and assessing the robustness of the project's outcome with respect to changes in these values (...)” Paragraph 7 on **Poverty** adds that “[t]he economic analysis examines the project's consistency with the Bank's

²⁸⁹ Request, p. 29.

²⁹⁰ Request, p. 27.

poverty reduction strategy.²⁹¹ If the project is to be included in the Program of targeted Interventions, the analysis considers mechanisms for targeting the poor.” Finally, Paragraph 8 deals with **Externalities** as follows: “[a] project may have domestic, cross-border, or global externalities (...). The economic evaluation of Bank-financed projects takes into account any domestic and cross-border externalities (...).”

251. Management responds that “the comprehensive economic analysis carried out during project preparation is in compliance with OP 10.04. This included the cost efficiency analysis in the FS and the subsequent cost-benefit analysis carried out by the Bank team and consultants.”²⁹² In addition, the Management Response states that a consulting firm, *Soluciones Integrales*, as well as Bank staff conducted “additional economic and financial analysis (...) to improve project design and eliminate investments for which the estimated return was negative.” The Response explains that such analysis “included a discussion of non-monetary benefits, looked at the project from the financial, economic and distributional aspects, assessed the poverty impacts and externalities, and included a sensitivity and risk analysis.” Management further notes that an evaluation of the net fiscal impact “stated that the cost of the project for the District of Cartagena would be significant due to future large debt service payments. A risk analysis was carried out and subprojects with negative benefits were dropped or re-designed to improve project design, and increase both net economic benefits and sustainability.”
252. In relation to “the sources and validity of data used” Management informs that “ACUACAR was a primary source for data” especially with respect to the financial analysis. Additional data included “(i) investment cost data from the FS; (ii) a willingness-to-pay study commissioned as part of project preparation, which entailed collecting data through a household survey to derive demand estimates independent from those provided by ACUACAR; and (iii) shadow prices reflecting market distortions that were derived by *Soluciones Integrales*.”²⁹³

1.1.1 The Material in the Project Appraisal Document

253. In Bank projects, compliance with OP 10.04 is normally signaled in various key parts of the Project Appraisal Document (PAD), such as those relating to *Project Rationale* (PAD’s Section D) and *Summary Project Analysis* (Section E), and in Annexes that summarize the Economic Analysis and include a quantitative analysis of expected net benefits and rates of return.

²⁹¹ See OD 4.15 on Poverty Reduction.

²⁹² All quotations in this paragraph are from the Management Response, Annex II, Inspection Panel Report No. 29360, June 22 2004, pp. 42-43.

²⁹³ Management Response, p.44.

254. The Cartagena PAD's Section E: *Summary Project Analysis* has separate economic and financial subheads that report details of the cost-benefit and financial analyses that were carried out. Thus there are estimates of expected net present values (NPVs) and internal rates of return (IRRs), including a probability/risk analysis, financial projections and a sensitivity analysis, and significant *Institutional*, *Social* and *Environmental* sub-sections. Annex 4 of the PAD, *Cost-Benefit Analysis Summary* and Annex 5, *Financial Assessment of Project Entities*²⁹⁴ augment these analyses, while other annexes provide some further relevant information. Section F: *Sustainability and Risks* explores various aspects of risk: sub-section 3, on *Possible Controversial Aspects* discusses two aspects – (a) the use of a submarine outfall as part of a wastewater treatment and disposal system; and (b) tariff increases (those already projected and authorized for ACUACAR by the Water Regulating Committee (CRA the Comisión Reguladora de Agua) since privatization) – and the need because of controversy to avoid additional tariff increases over and above the existing authorization of the CRA.
255. Part 1 of the PAD's Section E, *The Summary Project Analysis*, records the following economic indicators from the cost-benefit analysis that was carried out:²⁹⁵

Type of Indicator	Total Project
Net Present Value (Col.\$ billion)	14
Internal Rate of Return	16%
Benefit - Cost Ratio (BCR)	1.17
Fiscal Impact (Col.\$ billion)	48

The first three indicators suggest a project that meets the first of the two criteria of acceptability in paragraph 1 of OP 10.04.²⁹⁶ The fourth indicator, a negative fiscal impact of Col\$48 billion, is “*due to the large capital subsidies for the sewage collection and treatment infrastructure. Although the overall fiscal impact is negative, the Central Government is actually benefiting from the project, and most of the costs of this project are hence being borne by the District of Cartagena. The distributive analysis shows that especially the consumers will gain from the implementation of the project. Also ACUACAR will substantially benefit from this project, especially the water supply sub-component will generate substantial incremental revenues.*”²⁹⁷ We will return to the issue of the distribution of costs and benefits later, in the discussion of Annex 4 of the PAD.

²⁹⁴ This Annex is discussed in the earlier chapter on financial evaluation.

²⁹⁵ PAD, p. 15

²⁹⁶ OP 10.04: “*To be acceptable on economic grounds, a project must meet two conditions: (a) the expected present value of the project's net benefits must not be negative; and (b) the expected present value of the project's net benefits must be higher than or equal to the expected net present value of mutually exclusive project alternatives.*”

²⁹⁷ PAD, p.16.

256. Section E notes that the economic feasibility of the overall Project, “*was determined by evaluating all infrastructure subprojects, that account for more than 88 percent of the total project costs.*”²⁹⁸ Most but not all of the subprojects are said to be economically viable. In water supply, two subprojects (in Falda de la Popa and Zonas de Invasión) were dropped because of this; the project in Zona de Norte was dropped because it was profitable and so could be easily financed privately by ACUACAR and two other projects (in El Pozón and Plan Barrios) were to be re-designed or dropped. Two of the sewage collection subprojects (in El Pozón and Paseo Bolívar) just failed to meet the cut-off 12% internal rate of return (IRR), but were in very poor neighborhoods, and it is argued that there could be a social rationale to include these subprojects because “*the willingness to pay for sewerage services only partially captures the environmental and public health benefits related to this service.*”²⁹⁹ Consequently, it was recommended that they be redesigned to ensure viability. Because the risk analysis suggests an inverse relationship between the economic viability of the subprojects and their risk profiles, it is recommended that projects with an internal rate of return of 12% or below be redesigned, to decrease their risks.³⁰⁰
257. Part 2 of the PAD’s Section E summarizes the financial analysis. Section E warns that the project’s financial success, in terms of timely provision of counterpart funding and debt service coverage, is heavily dependent on the District’s capacity to improve tax collection rates and on the stability of the exchange rate. The financial analysis and the role of the exchange rate in the projections have been addressed later in the Panel’s report.
258. Part 3 of Section E of the PAD discusses the selection and analysis of alternatives. This issue was raised specifically in the Request and is addressed separately in the section on the economic evaluation of alternatives.
259. Section F of the PAD addresses *Sustainability and Risks* and notes various measures that will be taken to mitigate risk, both in relation to the performance (and operational independence) of ACUACAR and the capacity of the District to provide counterpart funding and pay debt service in a timely manner.³⁰¹ It also states that “*Consultations with different stakeholders will reduce the risk of objection to the selected option to reduce water pollution in the city.*”³⁰² In Part 2, a table of seven *Critical*

²⁹⁸ PAD, p. 15. Part 2 of the PAD’s Section E summarizes the financial analysis, which is addressed in Section X of this report.

²⁹⁹ PAD, p. 15.

³⁰⁰ PAD, p. 16.

³⁰¹ See *infra* Chapter 5 on Financial Compliance and Supervision.

³⁰² PAD, p. 24.

Risks gives each a risk rating, ultimately aggregating them into an overall risk rating of *modest risk*.³⁰³ The table also summarizes various risk minimization measures.

260. Part 3 of Section F discusses *Possible Controversial Aspects* and identifies two issues, the use of a submarine outfall as part of a wastewater treatment and disposal system, which it suggests “*may cause some controversy due to lack of understanding of the technology*,”³⁰⁴ and the planned increase in tariffs. It is acknowledged that “[t]he authorized annual tariff increase is a controversial issue, and ACUACAR considers that it will become more and more difficult to generate the corresponding revenues.” The PAD further notes that no tariff increases are planned as part of the proposed Project, and states that “[t]he potential controversy was the reason for avoiding additional tariff increase, over and above the existing authorization of the CRA. As a result, the additional financing will now be paid through the national and municipal government through an implicit policy that will subsidize sewage treatment investments.”³⁰⁵
261. **This section of the PAD also cites average tariff levels and projected increases in them. However, these averages provide no information about any differential effects on different groups in the population. This is relevant because it is an issue of some potential significance, particularly where poorer groups are concerned.** In its financial projections in Annex 5, the PAD notes that “[i]n the base case scenario, we are conservatively assuming the following: (i) real increase in average tariff of 7%, 4%, and 0.9% per year in 1999, 2000, and 2001 respectively, but almost 90% increase in category 1 and 2 customers (following the guidelines of the National Tariff Law).”³⁰⁶ This makes the omission of the differential effects of tariffs surprising.
262. **The Panel observes, however, that there is little discussion about connection fees for access to new water and sewerage services, although they are potentially controversial and might influence the economic performance of the Project, particularly in relation to poorer consumers, as previous Bank experience confirms.**

1.1.2 Cost Benefit Analysis

³⁰³ PAD, p. 25. Of the seven “critical risks”, one is rated as *negligible risk*, three are rated as *modest risk* and two (“consumers are not willing to pay for water supply and sewage services” and “Cost overruns (...) because of higher than projected currency devaluation and interest rates”) are rated as *substantial risk*.

³⁰⁴ PAD, p. 26.

³⁰⁵ PAD, p. 26.

³⁰⁶ PAD, Annex 5, p. 69.

263. Annex 4 summarizes the cost benefit analysis and says that the conclusion of “*a detailed financial, economic and distributive analysis, enhanced by elaborate sensitivity and risk analyses,*” is that the Project “*is financially and economically viable when some of the components of the project will be either redesigned or discarded from the investment program.*” The cost benefit analysis was used to measure: “*(i) the financial and economic viability of the investment projects that will be partially financed by the Bank; and (ii) the distributive impact of those subprojects; and (iii) the risk profile of each subproject.*”³⁰⁷
264. The PAD states that the steps undertaken in the cost benefit analysis included: specifying the ‘with’ project scenario (i.e. including “*the proposed investments and their associated targets*”) and the ‘without’ scenario (“*current coverage levels will be maintained over time*”) for each subproject - and projecting them until the full impact of the subprojects occurs; identifying project components; carrying out willingness to pay studies; analyzing the benefits of the water supply projects; and preparing the financial and economic analyses of the water supply, sewage collection and treatment subprojects.³⁰⁸ The PAD notes that the evaluated infrastructure components represent 88 percent of the total project cost. **The Panel finds that no description or explanation is offered in relation to the remaining 12 per cent.**
265. Thus, to identify the incremental costs and benefits from each subproject, ‘with’ and ‘without’ project scenarios for each of them were assembled and projected for 30 years, “*that is, during the implementation period and until the full impact of the subprojects is obtained.*”³⁰⁹ However, the Soluciones Integrales Cost Benefit Analysis Study’s Final Report (SI CBA), which provided significant parts of the background data and analysis for the PAD’s cost-benefit analysis, says that “[t]he project’s analysis horizon is 20 years of operation,”³¹⁰ and to evaluate the sewage treatment and sewage collection subprojects they used periods of 21 years and 25 years, respectively.³¹¹ The cash flows in the PAD were then discounted³¹² at a rate

³⁰⁷ PAD, p. 50.

³⁰⁸ PAD, p. 50.

³⁰⁹ PAD, p. 50.

³¹⁰ *Análisis Costo -Beneficio del Proyecto de Alcantarillado y Manejo Ambiental de Cartagena*, Jorge Ducci, Soluciones Integrales S.A., Octubre de 1998. Translated as *Soluciones Integrales Cost Benefit Analysis - Final Report, Oct 1998*, Part I, p. 10 (English Translation). Note: document hereafter referred to as SI CBA.

³¹¹ The lengthening of the time horizon might have some limited effect of increasing the present value of the net benefits – because the major investment costs happen at the beginning of the project so that in later years, apart possibly from some replacement of equipment, the costs would be mainly O & M and the full benefits would continue to flow, although heavily discounted over the later years.

³¹² *Discounting* is the process whereby the values of future effects are adjusted to make them comparable to the values placed on current costs and benefits, because a given amount of future costs or benefits is worth less than the same amount experienced today.

of 12 per cent, estimated to be a proxy of Colombia's cost of capital, in order to estimate present values and rates of return on the subprojects.

266. The estimated benefits from the water supply subprojects included *“the elimination of rationing and intermittent supplies and service coverage increases.”* The benefits from sewage collection and treatment subprojects included a reduction of water pollution levels through service coverage increases (*“[t]he improved hygienic and environmental conditions that result from increasing water supply and sewerage coverage will translate into improved hygienic conditions that will result in decreases in infant mortality and a reduction in the incidence of water-borne diseases”*). However, according to the PAD, although improved environmental conditions contribute to the recovery of beaches, enhance tourism activities and other water uses, and increase recreational activities, *“no effort is made to quantify these benefits.”*³¹³
267. The PAD notes that the project is evaluated from several viewpoints. (a) A financial viewpoint: the *“financial viability of each subproject is appraised measuring its flows of costs and benefits in market prices. Under a financial perspective, benefits are assumed equal to the estimated flow of financial revenues.”* But it notes that, *“[b]ecause of the particular financing structure of this project, a very large part of the investments are actually subsidized;”* (b) an economic viewpoint: *“[t]he economic viability is determining the flows of costs and benefits in economic or shadow prices.”* And it is said that this matters particularly *“because of the project's intangible environmental benefits.”* Here, *“benefits are assumed equal to the willingness to pay (WTP) for sewage collection, treatment and disposal services for each beneficiary household.”* However, *“As no WTP studies were undertaken for the water supply subprojects, as they were added on to the project in a later stage, it was generally assumed that current water rates reflect customers' willingness to pay.”* (We return to this issue below.) And, it is explained that to obtain the values for the economic analysis, *“[t]he flow of financial cost is transformed into economic costs through the use of conversion factors.”*³¹⁴ Thirdly, the project is evaluated (c) from a distributional viewpoint: *“[t]he distributive analysis identifies the winners and losers among the different groups with interests and stakes in the project (...).”* It is also said that *“[t]he sensitivity and risk analysis enhances the accuracy of the financial and economic analyses by incorporating uncertainty into the project analysis.”*
268. Annex 4, Part III (*Assumptions*), outlines the data sources and assumptions used in the analyses. It notes that ACUACAR was the primary source of data *“regarding market demand and supply, project specifics,*

³¹³ PAD, p. 51. The PAD also argues that, *“Additional benefits, that were not included in the analysis, comprise of a temporary but significant generation of jobs during project implementation.”*

³¹⁴ All quotations in this paragraph are from the PAD, p. 51.

comprehensive cost and investment data, project financing details, expected financial returns, and market distortions.”³¹⁵ These data include coverage levels. **However, no reference is made as to whether the Bank performed any checks on the validity and reliability of these data, although they formed essential building blocks for the analyses. The Panel finds that, even though it would not have been feasible to scrutinize and validate all parts of these data, the PAD should have examined the issue of data reliability as part of showing compliance with OP 10.04.**

269. The PAD also states that in April 1998 consultants carried out a willingness to pay survey for sewage collection, treatment and final disposal in different areas of intervention.³¹⁶ As noted above, the same process was not repeated in relation to water supply. The PAD concludes that because of government subsidies to almost all investments, their “*actual financial costs are negligible.*”³¹⁷
270. The PAD notes that the “[w]ater billed for metered connections is based on the volume of water billed multiplied by the average water tariff. Sewage billed is assumed equal to the sewage volume given by the number of connections, and the average tariff for the appropriate income groups.” **The PAD does not explain whether water billing took into account the six-part tariff structure for different income groups.** In all scenarios the collection rate was assumed to stay constant, at 85% (As noted in Chapter Five of this report “[d]uring the first six months of 2004 the collection rate was 91.71%, a large improvement over the 85.2% rate achieved in 2002 and 2003”).³¹⁸ Tariff structures and levels were assumed to change between 1998 and 2001 for the ‘with’ project scenario, while the responsiveness of demand to changes in price (the *price elasticity*) was estimated to be -0.28 and in income (*income elasticity*) to be 0.41.³¹⁹ Also, “[i]t is assumed that the introduction of sewage treatment will not result into the establishment of a separate tariff for sewage treatment.”³²⁰ This leads to the anomaly that in the financial analysis there are no corresponding benefits.
271. Table 1 in Annex IV, Part IV presents the *Results of the Financial Analysis (excluding investment subsidies)*.

Table 1: Results of the Financial Analysis (excluding investment subsidies)				
Net Present Value (Col\$million), prices of April 1998				
Project	Benefits	Costs	Net benefits	Internal rate of return

³¹⁵ PAD, p. 51.

³¹⁶ This is presumably the survey described in the October 1998 SI CBA report.

³¹⁷ PAD, p. 51.

³¹⁸ See *infra* Chapter Five, ¶ 388.

³¹⁹ Implying that a 10 per cent rise in price would lead to a 2.8 per cent fall in demand.

³²⁰ PAD, p. 52.

San Jose de los Campanos	2,121	2,432	(311)	11%
El Pozón - Villa Estrella	2,412	8,678	(6,266)	1%
La Boquilla	714	1,719	(1,006)	4%
Crespo - El Oro	1,337	392	945	39%
Paseo Bolivar	180	839	(660)	0%
Zona Suroccidental	1,101	2,154	(1,053)	5%
Zona Suroriental	1,403	2,585	(1,182)	5%
Sewage Collection	9,266	18,799	(9,533)	4%
(a) Sewage Treatment	0	64,291	(64,291)	n.a
System Improvement	11,198	10,658	540	13%
Expansion El Pozón	2,803	3,159	(356)	11%
Expansion Falda de la Popa	369	2,013	(1,645)	n.a.
Expansion Plan Barrios	240	323	(83)	9%
Expansion Zona Suroriental	723	502	222	17%
Expansion Zonas de Invasión	519	1,140	(621)	4%
Zona Norte	28,702	6,579	22,122	38%
(b) Water Supply	44,554	24,376	20,178	18%
(c) TOTAL	53,820	109,829	(56,009)	3%

Source: PAD, Annex 4, Table 1, p. 54.

272. Table 1 suggests that all the sewage collection and treatment subprojects, except one sewage collection project, in Crespo-El Oro, have insufficient benefits to justify these investments on financial grounds. But the PAD says that when the investment subsidies are taken into account, all of the subprojects generate positive financial returns except, of course, the sewage treatment subproject.³²¹

273. For water, the system improvement project (which, amongst other things, aims at eliminating rationing and intermittent supplies) appears financially viable (internal rate of return at 13%) on the basis of revenues anticipated through resulting increases in consumption. However, Table 1 suggests that even after “sharp real rate increases for especially the poor(est) customers” associated with a change in cross-subsidies (as noted, poor customers in strata 1 and 2 would have to pay about 90% higher rates between 1998 and 2001), only one of the expansion of water supply subprojects – that in Zona Suroriental - is financially viable. However, it is also said that: “[t]he subproject “Zona Norte” is highly beneficial due to the large benefits it generates because of the future development of this area, resulting in the construction of up-scale residences and the construction of hotels to cater the development of tourism (the latter benefit has not been quantified). In addition, the project will benefit households in three poor communities in this area. As a result, net benefits are very high and the internal rate of return of this subproject is 38 percent.”³²²

1.1.3 Economic Viability and Willingness to Pay

³²¹ PAD, p. 53.

³²² PAD, p. 53.

274. The PAD notes that each subproject's economic viability was appraised after converting financial cash flows into economic cash flows through the use of conversion factors and of willingness to pay (WTP) estimates that included *"the use and non-use values of water supply and sewerage services."* These flows were then also discounted at 12 per cent.
275. The conversion factors were applied to *"eliminate market distortions created by taxes, tariffs and subsidies, add a premium on foreign exchange on the tradable components of each input, and account for any changes in domestic prices that may occur as a result of the project."*³²³ It is noted that *"[a]ll economic costs of the project inputs are lower than the market costs due to the high taxes and tariffs charged in Colombia that offset the impact of the foreign exchange premium."*³²⁴
276. Data from *contingent valuation* (i.e. hypothetical valuation) surveys of willingness to pay³²⁵ for improved sewerage services were used (i) *"to capture the non-use value of sewage disposal services (...);"* and (ii) *"to study the perceived value of sewerage services vis-à-vis their current prices."*³²⁶
277. The PAD says that separate surveys of WTP were carried out: (a) for improved sewerage collection; and (b) for improved sewerage treatment services, to reflect differences in the areas to be affected by these two elements of the project. In (a) surveys for sewage collection were conducted for 500 households in the districts of Campanos, El Pozon, La Boquilla and Zona Suroccidental. WTP estimates for the three other project areas (Crespo, Paseo Bolivar and Zona Suroriental) *"were taken from the survey localities most similar to those project areas."* The Soluciones Integrales Cost-Benefit study, which reports on these surveys, explains that this was because of changes in the project: *"[t]he three sub-basins where the survey was not performed were included in the program after the execution of the field work. For the determination of the WTP, they were assimilated to the El Pozón sub-basin."*³²⁷
278. The WTP study for sewage collection and treatment was conducted over 500 households in the city of Cartagena *"as this subproject will benefit the total population of the city."*³²⁸ The results of the surveys are summarized in Table 3 of Annex 4, reproduced below.

³²³ PAD, p. 54.

³²⁴ PAD, p. 54.

³²⁵ The SI CBA study explains (English translation, p. 12): *"This methodology bases the analysis on the execution of a careful process of interviewing the project beneficiaries with the aim of obtaining from them a willingness to pay for it. Following economic theory, this declared willingness to pay, in hypothetical (or contingent) conditions, is then the measure of the project benefits."*

³²⁶ PAD, p. 55.

³²⁷ SI CBA, English translation, Part II, footnote 13, p. 14.

³²⁸ PAD, p. 55.

Table 3: Absolute and Relative Willingness to Pay for Water and Sewerage Services

Barrio	WTP (C\$/hh/month)	WTP/ Current bill	WTP as % of income
Sewage Collection			
San Jose de los Campanos	20,230	2.87	4.8%
El Pozon	15,900	2.77	5.7%
La Boquilla	14,570	2.76	4.9%
Zona Suroccidental	20,210	3.24	5.2%
(d) Sewage Treatment	9,227	0.33	1.0%

Source: PAD, Table 3, Annex 4, p. 56.

279. The WTP estimates in Table 3 were sourced from the SI CBA study, which in Part II used a process known as “benefits transfer”, in which a WTP equation estimated from a survey carried out in a “*study by the Inter American Development Bank for the part of the city that drains into the Bay,*”³²⁹ was used to adjust the WTPs estimated for the Bay neighborhoods³³⁰ by estimating for each project to be evaluated in the Lagoon neighborhoods the average value for each independent variable in the equation.³³¹ The CBA study suggests, however, that an attempt to validate the use of the benefits transfer procedure from the Bay study “*seemed to confirm the results observed in the focus groups and some in-depth interviews according to which there would indeed be less willingness to pay for sewerage in the Lagoon neighborhoods, and possibly that the simple application of the benefit transfer method has a limited validity. [...] one of the main conclusions from said focus groups was that “there seems to be NO significant concern in these neighborhoods about the sewerage issue in comparison with neighborhoods of similar socioeconomic level in the Bay basin. A greater relative deficiency is noticed in various services, including water, electricity and garbage collection.”*”³³² It also goes on to put forward, however, several reasons why the WTP estimates for the lagoon might be understated. Overall, it concludes that, “*probably the direct use of the values [i.e. those in Table No. 3.2, cited in Table 3] representing a simple transfer between the benefits estimated in the neighborhoods of the Bay and those of the Lagoon, overestimates the true willingness to pay [p. 16] for the works (...). It is therefore suggested that for the purposes of the economic evaluation of the*

³²⁹ SI CBA study (English translation), p. 12.

³³⁰ Average Col.\$15750 per household per month - US\$ 12.83 in currency of September 1997.

³³¹ SI CBA study, p. 13.

³³² SI CBA study, p.16.

works, the figures [...] are adopted as base case, and figures 23% lower are considered as a sensitivity level test."³³³

280. The PAD's Table 3 suggests that average WTP for sewage collection varies between Col.\$14570 and Col.\$20230 per household per month (US\$8.89 to US\$12.35, at the exchange rate used in the PAD). The Table's third column estimates the WTP to be around three times the current bill, and that it also amounts to around 5% of average income. A comparison between the PAD's figures of household WTP as a percentage of income and corresponding figures obtainable from the SI CBA suggests, however, that each of the CBA's figures is 0.7% higher than those in the PAD, with values ranging from 5.5% to 6.4% of income, compared with the PAD's 4.8% to 5.7%.³³⁴
281. The PAD comments that around 5% of average income seems a high percentage and acknowledges that while it could indicate the urgent need felt for sewage collection projects in poor neighborhoods, *"It is likely that because of the separate surveys, households tend to overlook their budget constraints and hence have overestimated their overall WTP for water supply, sewage collection, treatment and final disposal."* It promises that these *"very high levels"* of WTP will be tested in more detail in the sensitivity analysis.³³⁵ **The Panel notes, however, that the PAD's sensitivity analysis does not report the responsiveness of net present values to variations in WTP.**
282. A review of the use of contingent valuation methods in project analysis at the Inter-American Development Bank,³³⁶ published the year before the PAD, cites several 'Contingent Valuation Estimates of Willingness to Pay for Local Sewer and Drainage'. In its Table 1 mean WTP and monthly income data are cited for nine out of thirteen projects in four countries, including the IDB project in Cartagena (CO-0227). On average, households were willing to pay three per cent of their income each month to have a sewer connection and drainage services, while the values for individual projects ranged from 2.6% to 7.7% (the IDB Cartagena project value cited was 6.7%). This suggests that the percentages in the PAD's Table 3 may lie at the high end of experience.
283. Table 3's estimate of household monthly WTP for sewage treatment at Col.\$9227 (US\$5.63) comes from Part I of the SI CBA, which states that *"it*

³³³ SI CBA study, pp. 16-17.

³³⁴ WTP/income figures calculated from SI CBA, Part II, Table 3.2, p. 18

³³⁵ PAD, p. 56.

³³⁶ Ardila, S, Quirogar, R and W J Vaughan (1998), *A Review of the Use of Contingent Valuation Methods in Project Analysis at the Inter-American Development Bank*, Washington, DC., December 1998 No. ENV-126: <http://www.iadb.org/sds/doc/ENV126e.pdf>

*represents around 2.3% of the reported monthly income of the family.*³³⁷ However, in a garbled sentence the PAD suggests that the WTP³³⁸ is at 1% of average income. The CBA suggests that Col.\$9227 “*is considered to be reasonable.*” It is not clear why the PAD suggests only 1%.

284. The SI CBA explains how the sewage treatment WTP estimate was developed, through applying econometric estimation methods to “*data gathered by means of a survey of a representative sample of 500 heads of household of the city of Cartagena, Colombia, conducted between April 18 and 27, 1998.*”³³⁹ With a population of almost 135000 households in Cartagena in 1998, this represents a sample of less than 0.4%. “*However, a preliminary analysis of the information showed that there is a potential representativeness bias in the data. [...] when the number of houses connected to the water network is tabulated according to the socioeconomic strata they belong to), a significant divergence is observed with the records of Aguas de Cartagena and other data available at the city level.*” Consequently, “*The sample importantly subrepresents the number of cases in strata 1, 2 and 6, and over-represents strata 3 and 4.*” To avoid biased estimates, “*it was decided to correct the sample ex post to ensure an adequately balanced representativeness of the same.*” The study correctly suggests that, “*It is not unusual to have important discrepancies in the distribution of individual variables in samples that are relatively small with respect to the population*”³⁴⁰ It is worth noting, however, that the study of the benefits of improved water quality anticipated by beach-using residents of Cartagena,³⁴¹ discussed below, used a significantly larger sample of 1200 Cartagena residents.

285. In the SI CBA the survey and the econometric estimation relating to the enhanced sewage treatment were designed to capture benefits perceived by City residents: “*[...] it is assumed that all those benefits that are correctly perceived by the populating residing in Cartagena are measured, and [...] there is a rigorous inclusion both of the benefits associated to enabling recreational uses of the Bay and the Lagoon as the reduction of health risks associated to the consumption of sea products and eliminating the disturbances caused by bad odors (due to the death of fish). [...] the emphasis of the analysis is placed in connection with the improvements linked to the clean up of the Lagoon.*”³⁴²

³³⁷ SI CBA study, Executive Summary (English translation), p. ii. See also Table 17, p. 93 in Part I of the Spanish original.

³³⁸ Willing-to-Pay is equal to one-third of the value of the current bill.

³³⁹ SI CBA study, Part I, p. 28.

³⁴⁰ SI CBA study, p. 29.

³⁴¹ Ana Maria Ibanez, Nancy Lozano Garcia and Kenneth McConnell, *The Benefits of Improving Water Quality in Cartagena Bay*, Colombia, Sept. 1998.

³⁴² SI CBA study, Part I (English translation), p. 15.

286. The SI CBA then explains that the WTP estimates do not cover all of the benefits that might be expected to flow from the sewage treatment works: *“From the above, this study does not consider the potential benefits to be perceived by the Colombian tourists visiting the city nor the potential benefits for the Colombian economy that would result from a greater flow of foreign tourists. On the other hand, the effect of the project on the commercial activities connected with fishing or the exploitation of these natural resources is not considered either.”*³⁴³
287. With much less clarity, the PAD says that, *“Other benefits arising from improved environmental conditions that will contribute to the recovery of beaches, enhance tourism activities and other water uses, and increase recreational activities have not been quantified. Preliminary studies show that these benefits can be substantially (sic).”*³⁴⁴ It references the Ibañez et al. study of the benefits of improved water quality in Cartagena Bay, noting that *“Using a travel cost method, the annual benefits of improved water quality by beach users was estimated at US\$969,000.”*³⁴⁵ This latter study, however, only refers to benefits experienced by beach users who are residents of Cartagena – and it is not made clear in the PAD that these benefits are likely to overlap partially with those estimated in the SI CBA willingness to pay survey of Cartagena.
288. **However, the Panel finds that the PAD did not try to make further - necessarily approximate - estimates of the enhanced tourism and recreational benefits likely to be associated with the project, which is surprising given the acknowledged importance of tourism to the economy of Cartagena.**
289. **The PAD notes that tourism is the main income source in the city and quotes 700,000 annual visitors and estimated revenues of US\$315 million generated. The Panel finds that the Bank should have considered these benefits in order to be consistent with OP 10.04, which says that: “The economic evaluation of Bank-financed projects takes into account any domestic and cross-border externalities.”** Such estimates might possibly have been attempted using a ‘benefit transfer approach’ (analogous to that used in Part II of the SI CBA, see below) and hence drawing on other existing studies from Colombia or elsewhere.

³⁴³ SI CBA, p.15.

³⁴⁴ PAD, p. 56.

³⁴⁵ Ana Maria Ibañez, Nancy Lozano Garcia and Kenneth McConnell, *The Benefits of Improving Water Quality in Cartagena Bay*, Colombia, Sept. 1998. The study used two approaches to estimating WTP, the travel cost method and a contingent valuation approach: *“Thus moderate estimates from each method bracket the [present value of] benefits from improved water between five and ten million dollars,”* p. 20, [hereinafter the “Ibañez et al. study”]. The first value was from the contingent valuation method and the second from the travel cost approach.

290. The PAD says that WTP studies were not undertaken for the water supply “as they were added on to the project in a later stage [...].”³⁴⁶ Consequently, “For improved water supplies, it has been assumed that the willingness to pay of existing customers is equal to the increased financial revenues because of higher monthly consumption as rationing is eliminated.”³⁴⁷ Moreover, “For the expansion of water supply services in poor neighborhoods, water consumption levels in other poor neighborhoods are used as a yardstick, and multiplied by the average tariff levels for the lowest income groups.”³⁴⁸ This approach, i.e. valuing enhanced water consumption and reliability at parity with the tariff, is strikingly different from the estimates of the WTP for improved sewage collection (Table 3 above), where WTP was valued at around three times the value of the current bill. The PAD does not explain why it was judged reasonable to assume that the tariff charged to a particular group/stratum would appropriately reflect the expected benefit from/willingness to pay for enhanced water supplies, nor does it discuss the circumstances in which this approach might be expected to lead either to an under or an overestimate. Moreover, as noted, the tariff levels themselves changed markedly during the early period of the project, with high increases for the poorest groups. **Given that the Bank and other international agencies have carried out or sponsored numerous studies of willingness to pay for water and of water tariffs,³⁴⁹ the Panel expected the PAD’s economic analysis explicitly to draw on and comment on this experience, in order to explain and validate the approach taken to valuing the benefits of improved water services. The Panel observes that the economic analysis does not do so.**
291. Table 4 of Annex 4 of the PAD presents the results of the economic analysis. These results were developed by converting the financial flows in Table 1, through the introduction of the WTP estimates (which would be expected to raise the value of the benefits to which they are applied) and through the use of conversion factors (shadow prices), which range between zero and less than one.³⁵⁰ It is noted that “All economic costs of the project

³⁴⁶ PAD, p. 51.

³⁴⁷ Earlier in the PAD (p. 16), it is also suggested that for the water supply subprojects “economic benefits are estimated to be reflected by the current water rates, which are adjusted for the impact of shadow pricing.”

³⁴⁸ PAD, p. 56.

³⁴⁹ See, for example, Foster, V, Gomez-Lobo, A and J Halpern (2000), ‘Designing Direct Subsidies for Water and Sanitation Services - Panama: A Case Study,’ *Policy Research Working Paper 2344*, The World Bank. <http://rru.worldbank.org/Documents/PapersLinks/32.pdf>; Walker, I, Ordoñez, F and P Serrano (2000), ‘Pricing, Subsidies and the Poor - Demand for Improved Water Services in Central America - <http://rru.worldbank.org/Documents/PapersLinks/433.pdf>. See also the IADB review cited earlier: Ardila, S, Quirogar, R and W J Vaughan (1998), *A Review of the Use of Contingent Valuation Methods in Project Analysis at the Inter-American Development Bank*, Washington, DC., December 1998 No. ENV-126: <http://www.iadb.org/sds/doc/ENV126e.pdf>.

³⁵⁰ See PAD, Annex 2, Table 2: *Conversion factors*, p. 55 and the comment (p. 54) that “The standard conversion factor was calculated at 0.92.” The conversion factors were developed in the SI CBA.

inputs are lower than the market costs due to the high taxes and tariffs charged in Colombia that offset the impact of the foreign exchange premium.”³⁵¹ The economic analysis results, discounted at 12%, “improve the financial estimates significantly.”³⁵² However, they do so in a non-uniform manner, which is not clearly explained. A comparison of the financial benefits, in Table 1, and the economic benefits, in Table 4, shows that for the sewage collection subprojects the ratios of the economic to the financial values range between 1.1 and 3.9, although the ratios of the WTP to the current bill in Table 3 only range between 2.8 and 3.2. While there may be sound reasons for these big differences, an explanation is not offered. In the water supply subprojects, where water rates are assumed to reflect WTP, the ratios of the economic to financial flows lie between 0.9 and 1.4,³⁵³ on which again no comment is made.

Table 4: Results of the Economic Analysis

Project	Net Present Value (Col\$ million), prices of April 1998			
	Benefits	Costs	Net Benefits	Internal rate of return
San José de los Campanos	2,404	2,198	6	12%
El Pozón - Villa Estrella	6,130	7,073	(943)	10%
La Boquilla	1,970	1,437	533	16%
Crespo - El Oro	5,056	695	4,360	171%
Paseo Bolivar	487	670	(182)	8%
Zona Suroccidental	2,500	1,785	715	17%
Zona Suroriental	5,502	2,104	3,398	32%
Sewage Collection	24,051	16,163	7,888	16%
Sewage Treatment	56,620	52,633	3,988	15%
System Improvement	11,483	10,533	950	14%
Expansion El Pozon	2,656	3,048	(483)	9%
Expansion Falda de la Popa	337	1,490	(1,152)	n.a.
Expansion Plan Barrios	220	292	(73)	8%
Expansion Zona Suroriental	662	557	103	15%
Expansion Zonas de Invasión	706	904	(432)	4%
Zona Norte	25,548	9,516	16,031	45%
Water Supply	14,929	13,015	1,915	15%*
TOTAL	95,601	81,811	13,790	16%*

Note: * excluding the water supply projects in Falda de la Popa, the Zonas de Invasión and Zona Norte and adjustments in system improvement subproject.

Source: PAD, Annex 4, Table 4, p. 57.

292. For the sewage treatment subprojects, Table 4 suggests that although the economic net benefits are higher than the financial net benefits, two of the projects (El Pozón and Paseo Bolivar) had internal rates of return which lay below the cut-off rate of 12%. Nevertheless, the PAD asserts that they “are very reasonable for sewage collection projects, especially taken into account that they serve the poorest populations of Cartagena,” although it is not explained why it would be reasonable to expect a social cost benefit

³⁵¹ PAD, p. 54.

³⁵² PAD, p. 57.

³⁵³ As expected, this is a much narrower range than in the sewage collection case.

analysis of a sewage collection project to be economically unviable. The PAD goes on to suggest the (more reasonable) possibility that the actual benefits had been understated because not all of the externalities of sewage collection had been valued. Nevertheless, it recommends *“that these two projects be redesigned so as to ensure that they will generate sufficient cash flow.”*³⁵⁴ The sewage treatment project has positive net benefits and an internal rate of return of 15%, well above the cut-off rate.

293. There are, however, significant differences between the estimates for the discounted present values of net benefits and internal rates of return (IRRs) of the sewage collection subprojects in the PAD’s Table 4 and the earlier estimates given in Tables 4.1 to 4.7 of Part II of the SI CBA. For example, whereas in the PAD five out of seven subprojects (more than two thirds) have positive net benefits, only two of the seven (less than one third) in the SI CBA have positive net benefits. Correspondingly, while the IRRs in the PAD range from 8% to 171%, with five greater than or equal to the cut-off rate of 12%, the IRRs in the CBA range from 3% to 49%, with only two that exceed 12%. The estimates in the PAD and the CBA are both discounted at 12%, although the time periods differ: the PAD’s scenarios are projected for 30 years, while those in the SI CBA run for 21 years.
294. In Table 4 of the PAD, the sewage treatment project yields a positive net benefit of nearly \$4 billion and an IRR of 15%. There are, however, significant differences between these estimates and the earlier estimate given in the SI CBA. In terms of the overall outcomes, while the PAD shows net benefits of almost Col.\$4 billion and an IRR of 15%; the SI CBA shows corresponding figures of Col.\$27 billion with an 18% IRR. The major difference lies in the Col.\$20 billion gap in benefits: the PAD’s benefit estimate is Col.\$56.6 billion while the CBA’s estimate is more than one third larger, at Col.\$76.7 billion.³⁵⁵ Both reports discounted flows at 12%, although the CBA considers flows for 25 years between 1999 and 2024,³⁵⁶ whereas the PAD assumes 30 years. Both used the WTP estimate of Col.\$9,227 per household per month that was developed in the CBA’s contingent valuation exercise. Similar issues arise to those raised in relation to the estimates for the sewage collection subprojects – but with the key difference that in this case the net benefits and IRR are very much *lower* in the PAD than in the SI CBA.

³⁵⁴ PAD, p. 58.

³⁵⁵ *“The above value, converted into a social price by applying the standard conversion factor of 0.915, was applied to all the families residing in Cartagena, which in 1998 represented around 135,000 and growing at the rate of 2.18% per year. Thus, the present value of these benefits, accounted for between 2004 and 2024 and discounted at 12%, amounted to Col.\$ 76.7 billion.”* (SI CBA study, Executive Summary (English translation), p. ii).

³⁵⁶ SI CBA study (English Translation), Part I, p. 18.

295. The PAD text says that the water supply ‘system improvement’ project generates a positive net benefit of Col.\$910 million (although Table 4 actually shows Col.\$950 million, which is the difference between benefits and costs) and an internal rate of return of 14%, above the cut-off rate of 12%. Except for the project in Zona Suroriental, the water supply subprojects do not produce positive net benefits and so they yield internal rates of return of less than 12%. The PAD suggests that these underperforming subprojects be either redesigned or “*dropped off the current project.*”³⁵⁷ The Zona Norte subproject was dropped from the project because of “*the need to scale it down*” and its high profitability meant that it could be easily financed privately by ACUACAR.
296. Table 4 also indicates that the project as a whole, now excluding the water supply projects in Falda de la Popa, the Zonas de Invasión and Zona Norte and allowing for adjustments in the system improvement subproject, yields net benefits of Col.\$13.8 billion and an internal rate of return of 16%, well above the 12% cut-off rate.

1.1.4 Distribution of Benefits

297. The analysis of the distribution of benefits from the project is briefly outlined in section VI of Annex 4 of the PAD, *Distributive Analysis*. It includes Table 5 (below).

Table 5: Distribution of Benefits

Project	Net Present Value (Col.\$ million), prices of April 1998						
	Consumers	Central Government	District of Cartagena	Acuacar	Labor	Other	Total
San José de los Campanos	117	383	(1,354)	1,213	192	41	594
El Pozón	3,316	(611)	(6,531)	677	687	11	(2,450)
La Boquilla	918	(29)	(1,195)	495	127	6	323
Crespo - El Oro	3,111	460	118	1,497	31	34	5,251
Paseo Bolívar	241	(63)	(635)	75	65	0	(317)
Zona Suroccidental	1,154	(83)	(1,563)	398	167	6	80
Zona Suroriental	3,438	(149)	(1,919)	759	201	4	2,335
Sewage Collection	12,297	(91)	(13,079)	5,115	1,470	103	5,814
Sewage Treatment	56,620	848	(52,965)	0	4,164	0	8,668
System Improvement	285	6,008	3,655	7,064	652	249	17,914
Expansion El Pozón	(1,107)	5,114	898	2,621	210	63	7,799
Expansion Plan Barrios	(95)	438	69	215	21	5	652
Expansion Zona Suroriental	(286)	1,292	221	702	31	17	1,979
Water Supply	(1,201)	12,570	4,827	10,847	772	342	28,158
TOTAL	67,716	13,327	(61,216)	15,962	6,405	446	42,640

Source: PAD, Annex IV, Part VI, Table 5, p. 59.

³⁵⁷ PAD, p. 57.

298. Section VI is intended to identify “*who benefits and who pays for the costs of the subprojects.*” The analysis finds that “*The big winners are the customers of ACUACAR, but also ACUACAR and other shareholders that realize benefits in the form of dividend payments...*” (See bottom row of Table 5). Benefits to consumers are explained thus: “*Consumption externalities result from the prices that are actually charged and the WTP for water supply and sanitation services. Consumption externalities for the total projects are positive and estimated at C\$68 billion.*”³⁵⁸ The first column of Table 5, ‘Consumers’, suggests that while they gain benefits from the sewage collection and treatment projects, they lose from three of the water supply expansion projects. However, the reasons for the disparity are not discussed. It may be that a part of the losses in these three projects and some of the differences between the flows of financial and economic benefits in Tables 1 and 4 is explained by connection costs. During the draft PAD’s internal review process, one peer reviewer commented that “*It will be important to know how connection fees will be handled as the neighborhood environmental benefits depend directly on a high connection level (from current 65% level up to 90% by project end).*”³⁵⁹ However, as noted earlier, there appears to be little discussion of connection costs to new water and sewerage services in the PAD (except for a component of “*support to in house basic sanitation at La Boquilla,*”³⁶⁰ associated with the social management program **The Panel finds this a potentially important issue for consumers and the utility, and much may depend on how it is addressed, particularly in relation to poorer consumers, as previous Bank experience confirms.**³⁶¹
299. In relation to other stakeholders, “*the net fiscal impact for the District of Cartagena will be very negative at almost C\$61 billion*” (mainly through the debt service payments relating to repayment of the World Bank loan), while the central government experiences a positive net fiscal impact of Col.\$13 billion, because of tax income generated. The sewerage projects are a “*drain on the government’s resources*”³⁶² through capital subsidies, while the remaining water supply projects generate incremental tax revenues to offset their subsidies. While ACUACAR’s gain is Col.\$16 billion, its workers also gain Col.\$6 billion through wage premiums.

³⁵⁸ PAD, p. 58.

³⁵⁹ Project files.

³⁶⁰ In Component G of the project, as part of the social management program (see PAD, p. 8, p. 21 and p. 43), which would benefit some 500 extremely poor (stratum 1) families in the North Zone and around the Ciénaga.

³⁶¹ See, for example, van den Berg, C and Katakura, Y (1999), ‘Winners and Losers in Argentina’s Water Utility Reform: An Analytical Economic and Financial Framework,’ World Bank: http://poverty.worldbank.org/files/15061_argentina_winners_losers.pdf

³⁶² PAD, p. 58.

1.1.5 Poverty Impact Analysis

300. The poverty impact analysis in Section VII of Annex 4 of the PAD, which “*measures how much of the consumer benefits accrue to poorer consumers,*” is treated in Table 6 and eight lines of text. The PAD says that the income data collected during the WTP surveys³⁶³ made it “*impossible to calculate with any accuracy the impact of the project on the poor.*” **The Panel finds this a surprising omission, in a project explicitly aimed at improving water and sewerage services to the city’s poorest population,³⁶⁴ and where – as with many projects that may benefit poor people – because there is the possibility that some of the poor may gain and others lose, ‘accuracy’ may matter. We return to this in the discussion on Poverty Reduction, in Section 4.3 below.**

1.1.6 Sensitivity and Risk Analysis

301. Section VIII of Annex 4 of the PAD describes the sensitivity and risk analysis. It reports that this analysis “*defined the following major risk variables: investment cost overruns, project delays, changes in the unaccounted for water, labor productivity, collection efficiency and the willingness to pay for access to new or improved services.*” The PAD then says that “*Most of these variables are largely beyond management control,³⁶⁵ with the exception of the willingness to pay for access to or an improvement in water and sewerage services which is based on consumer’s preferences and is largely beyond management control.*”³⁶⁶ Below this, Table 7, entitled *Risk Variables and their Impact and Risk Significance*, names and describes seven variables, only three of which are included in the previous list of ‘major risk variables’. It then says that “*The risk analysis recalculated the results of the financial and economic analysis by changing these major risk variables all at the same time using the Crystal Ball software.*”³⁶⁷
302. However, it is unclear whether these ‘major risk variables’ include all of the ten overlapping variables in the text’s list of six ‘major risk variables’ and Table 7’s seven ‘Risk Variables.’ The PAD is unhelpful here because it only sets out the probability distributions and ranges that were used for five of the variables. **There is no obvious reason why this was not done for the remaining variables and it makes it impossible for the reader to gain a full picture of the procedures, underlying rationales and results**

³⁶³ Which, in any case, did not cover “*improved water supplies and expansion of water supplied in the poorest neighborhoods*” (PAD, p. 56).

³⁶⁴ See PAD, p. 2.

³⁶⁵ Presumably a slip, since Table 7 indicates that most of them are *under* management control.

³⁶⁶ PAD, p. 60,

³⁶⁷ This appropriately enables a Monte Carlo analysis to be performed, yielding distributions for the net present values.

of the sensitivity and risk analysis. It was noted earlier, for example, that the PAD commented on the “*very high levels*” of WTP for sewage services and stated that they would be tested in more detail in the sensitivity analysis.³⁶⁸ However, although it is recorded in the PAD that for the WTP for sewage services a normal distribution was used with a standard deviation of 20 per cent, the analysis does not discuss the responsiveness of net present values to variations in WTP. And, although OP 10.04 says that “*The analysis estimates the switching values of key variables (i.e., the value that each variable must assume to reduce the net present value of the project to zero)[...]*” the economic sensitivity analysis does not mention them. The presentation of the sensitivity and risk analysis in this Part of the PAD compares relatively poorly with the more detailed corresponding presentation in the Financial Assessment (Annex 5 and Attachment 3), which - amongst other details - does present switching values. **In the Panel’s view, therefore, the PAD’s sensitivity and risk analysis is inadequate under OP 10.04’s provisions relating to risk.**

303. The results of the economic risk analysis, in terms of the probability of positive net present values and their means, are shown in Table 8. The PAD comments that “*the projects that turn out to be unviable have high risk profiles, while the projects that are economically viable in general have low risk profiles.*”³⁶⁹ For the sewage collection and treatment projects, the three projects with internal rates of return below the cut-off 12% rate - Campanos, El Pozón and Paseo Bolivar - also show low probabilities of generating net positive benefits, while the others have probabilities of doing this that range between 60% and 100%.³⁷⁰ “*However, the sewage treatment project has a sufficient rate of return, yet the risk involved in this project is substantial.*”³⁷¹

1.1.7 Conclusions of the Cost Benefit Analysis (CBA) Summary³⁷²

304. The PAD’s cost benefit analysis summary concludes that “*The Cartagena project looks sufficiently robust if the non-viable subprojects will be either redesigned or dropped from the project. The water supply expansion subprojects - with the exception of that in Zona Suroriental - can not be justified on economic grounds, and should not to be undertaken in their current form.*” And, despite their possibly substantial health and environmental benefits in poor neighborhoods “*that are not captured in individual households’ willingness to pay,*” it recommends that the two “*currently unviable sewage collection projects as well as the subproject in*

³⁶⁸ PAD, p. 56.

³⁶⁹ PAD, p. 61.

³⁷⁰ Shown in Table 8, PAD, p. 61.

³⁷¹ PAD, p. 61.

³⁷² PAD, pp. 61-62.

San Jose de los Campanos that faces a higher risk profile should be redesigned to ensure their long-term sustainability.”

305. It is stated that “*All other subprojects will generate substantial net benefits to society. [...],*” and it is argued that all the main stakeholders “*will reap benefits when the subprojects are being implemented.*” However, the PAD comments that there are distinct differences between the patterns of fiscal impact of the sewerage and water supply projects: “*The water supply subprojects show a positive net fiscal impact, while the sewerage projects show a negative fiscal impact. The total fiscal impact of the project is negative at C\$48 billion. However, the distribution of these benefits are rather unequal, with the central government benefiting from additional tax revenues will see a total positive net benefit of C\$13 billion, while the impact on the District of Cartagena will be negative at almost C\$6 1 billion.*”³⁷³
306. The appraisal in Annex 4 is a curious mixture of sophistication and carelessness. It has used modern, sophisticated methods of analysis, including contingent valuation estimates of WTP and Monte Carlo approaches to sensitivity and risk analysis, yet it gives signs (e.g. textual slips, inconsistencies and poor proof-reading) of having been written up carelessly or hurriedly. The fact that, in relation to the sewage collection WTP surveys, the SI Cost-Benefit study says that “*The three sub-basins where the survey was not performed were included in the program after the execution of the field work,*”³⁷⁴ while WTP studies were not undertaken for the water supply projects “*as they were added on to the project in a later stage [...],*”³⁷⁵ and the fact that the benefit, cost, NPV and IRR values for some of the projects differ between the October 1998 SI CBA report and the June 1999 PAD, suggest a rapidly evolving project, with significant changes in the period leading up to the PAD. This may have been driven partly by the project’s third development objective, to “*improve the sustainability of water and sewerage services in Cartagena by leveraging Bank support to shore up the private sector participation (PSP) model pioneered by ACUACAR [...], against the prospect of political interference.*”³⁷⁶
307. **In the Panel’s view, although the underlying economic evaluation may have been carried out competently and broadly in line with OP 10.04, parts of the material in Annex 4 are not presented and explained in the PAD with sufficient clarity, transparency and consistency to demonstrate this compliance. This matters because partial or confusing explanations in the PAD risk failing successfully to communicate and**

³⁷³ PAD, p. 62.

³⁷⁴ SI CBA study, English translation, Part II, footnote 13, p. 14.

³⁷⁵ PAD, p. 51.

³⁷⁶ Project Development objective (iii), PAD, p. 2.

confirm to stakeholders the nature and robustness of the appraisal processes that the Bank’s operational procedures like OP 10.04 promote and require. This could be important for a project that is acknowledged to have controversial aspects.³⁷⁷

2 The Economic Evaluation of Alternatives

308. The Requesters allege that the Bank failed to comply with OP 10.04 on Economic Evaluation of Investment Operations because it failed “*to adequately and effectively scrutinize the economic investment and environmental risk evaluations of the outfall and alternative sanitation solutions.*”³⁷⁸ The Request claims that the Bank approved an “*inadequate*” economic analysis of alternatives³⁷⁹, while the analysis of options different from the outfall were based on “*unrealistic*” or “*suspicious*” cost figures “*that effectively inflated their [other alternatives] costs in comparison to those of the chosen outfall system*”. In the Requesters’ view, this happened with respect to the use of oxidation lagoons for treatment before dumping the waste in the sea, as the prices for the land necessary to implement this solution were deemed “*prohibitively expensive.*”³⁸⁰ The Requesters complain further that one “*ecologically sustainable and economically advantageous alternative*”, the combination of biological treatment lagoons and irrigation of mangrove swamps with the treated effluent was not considered in the EA³⁸¹.
309. The Requesters cite, among others, a report issued by the Comptroller of Cartagena, according to which a “*reconsideration of alternative solutions to the City’s sanitation problems, especially those that provide for water reuse*” was recommended.³⁸² They further refer to the “*findings of the Outfall Commission appointed in 2000*” which “*strongly criticized the economic and environmental evaluation of alternatives to the submarine outfall.*”³⁸³
310. Management believes that “*the comprehensive economic analysis carried out during project preparation is in compliance with OP 10.04.*”³⁸⁴ It also states that the analysis of alternatives included in the FS is in “*exhaustive and sound and is in compliance with OD 4.01*” because all alternatives were

³⁷⁷ See PAD, Section F.3, on *Possible Controversial Aspects*, there identified as concerns about the use of a submarine outfall and fears of tariff increases.

³⁷⁸ Request p 29.

³⁷⁹ Request, p. 25.

³⁸⁰ Request, p. 14. The Requesters state that the valued of the land where the lagoons would be located was estimated at 60million pesos/hectares while professionals in the local real estate industries considered around 10million pesos/hectares a more appropriate price for this land.

³⁸¹ Request, p. 14.

³⁸² Request, p. 30.

³⁸³ Request, p. 30.

³⁸⁴ All quotations in this paragraph are from the Management Response.

evaluated under an economical standpoint (as well as technical, environmental and social) and “...initial investment costs, operation and maintenance costs and land uptake” were among the main comparison criteria. The Response states that the FS analyzed “*six wastewater disposal alternatives combining different treatment levels and final disposal sites (...) based on cost efficiency (among other criteria, including technical, environmental and social criteria.*” This analysis “*concluded that the net present value cost of the outfall was about USD 35 million less than the next best alternative, land application, and about USD 60 million less than lagoons.*” In relation to the location of the outfall, Management claims that that the submarine outfall “*was then further analyzed to determine the optimum location, based on economic as well as environmental criteria.*”

2.1. The PAD and the Alternatives

311. As stated before, OP 10.04: Economic Evaluation of Investment Opportunities (September 1994) includes the following provision: “*Paragraph 3 **Alternatives** Consideration of alternatives is one of the most important features of proper project analysis throughout the project cycle. To ensure that the project maximizes expected net present value, subject to financial, institutional, and other constraints, the Bank and the borrower explore alternative, mutually exclusive, designs. The project design is compared with other designs involving differences in such important aspects as choice of beneficiaries, types of outputs and services, production technology, location, starting date, and sequencing of components. The project is also compared with the alternative of not doing it at all.*”
312. In relation to the requirement for comparison with a no-project alternative, the PAD notes in its *Project Rationale* section that when assessing the options for continuing Bank support for Cartagena’s water and sanitation sector, “*we considered the possibility of terminating the support to the sector, considering the fact that the previous Bank project [...] was successful in bringing in a private operator to manage and operate the system.*” However, it was decided that the Bank’s participation “*would reinforce the credibility of the mixed (public and private) capital enterprise model, when any form of PSP, especially in the water sector, is still under public scrutiny. Furthermore, ACUACAR’s negotiations with IFC for the latter to finance a part of the investment program were not successful, because of ACUACAR’s ownership structure, i.e., 50% owned by the public sector.*”³⁸⁵
313. The PAD also explains the background to the decision, stating that in light of their experience of the mixed success of past water and sanitation projects in Colombia in carrying out major institutional reforms alongside

³⁸⁵ PAD, p. 11.

physical investment programs, *“the project team pushed hard for the creation of ACUACAR, a mixed capital enterprise, during the latter half of the previous Bank project, by leveraging the prospect of additional Bank financing for Cartagena’s WSS sector under the proposed operation.”*³⁸⁶

314. The PAD also says that the alternative of general financing support to ACUACAR’s investment program, *“was rejected since ACUACAR can achieve full cost recovery from its investments in rehabilitation and extension water supply in affluent neighborhoods and hotel areas.”* Instead, it states that the project’s financial support *“is targeted to those which full cost recovery is hard to achieve, namely, sewerage networks for low-income neighborhoods surrounding the Ciénaga, wastewater conveyance, treatment and disposal systems.”*³⁸⁷
315. According to the PAD, a comprehensive set of project alternatives was identified and analyzed,³⁸⁸ among which *“Discharge of treated effluent to the Ciénaga resulted highly expensive, since treatment before such discharge should include nutrient removal.”* It is also said that *“Wastewater reuse for irrigation is not feasible at the present time in the Cartagena region given the lack of suitable areas to receive the entire wastewater volumes both during the dry and rainy seasons,”* while suggesting that the project does not exclude future partial reuse initiatives for wastewater and that, *“the conveyance and submarine outfall systems could well support any such initiatives in the future.”*³⁸⁹ The PAD maintains that, *“All alternatives were evaluated from technical, economic, environmental and social perspectives,”* and concludes that the comparison of alternatives indicated that *“disposal of all the wastewater into the Caribbean sea is the most feasible option.”* Furthermore, it is argued that the selected location of the outfall at Punta Canoa, although the furthest away from the City of all the compared outfall locations, has a steeper sea bottom (requiring a comparatively short outfall to reach deep water) and so has *“the lowest combined cost of on-shore and off-shore pipes.”*³⁹⁰

2.2. The Feasibility Study

316. Much of the detailed specification and evaluation of alternatives was done in the Feasibility Study (FS).³⁹¹ The Study’s Executive Summary (ES) refers to the Sewerage Master Plan, noting that it *“was originally prepared*

³⁸⁶ PAD, p. 12. On p. 13 the PAD suggests that because of political interference and non compliance with commitments by the public sector, *“one of the project conditions specifically requires District authorities to maintain private sector participation in the provision of the water and sewerage services in Cartagena.”*

³⁸⁷ PAD, p. 12.

³⁸⁸ PAD, Section E, Part 3.

³⁸⁹ PAD, p. 17.

³⁹⁰ PAD, p. 18.

³⁹¹ Feasibility Study, Hazen and Sawyer, 1998.

by the District of Cartagena and updated by local consultants, regulatory agencies and the World Bank. ACUACAR was responsible for updating the Plan in 1997 and for coordinating the implementation of the works recommended.”³⁹²

The Executive Summary notes that the recommendations of the Sewerage Master Plan in relation to water quality and the disposal of the effluent, were:

- The elimination of the discharges of wastewater into (a) Cartagena Bay; and (b) the Tesca Lagoon.
- To plan and build a submarine outfall into the Caribbean to dispose of the City’s residential liquid waste.

And it is stated that Hazen and Sawyer (who prepared the FS) “were selected to review the feasibility of the basic recommendations of the Sewerage Master Plan [...] and outline the works needed to implement the plan.”³⁹³

317. In its section on *Selection of Alternatives*, the Executive Summary says that three groups of alternatives were developed: “Continue Discharge into Cartagena Bay and Tesca Lagoon;” “Eliminate discharge into the Bay and discharge all the wastewater into Tesca Lagoon;” and “Eliminate discharge into the Bay and Lagoon and discharge into the Caribbean.”³⁹⁴ Overall, a total of 15 alternatives with different treatment levels were evaluated: “The selection criteria were: water quality, investment costs, resources allocated to the operation and maintenance, and use of land.”³⁹⁵
318. The Executive Summary discusses option sets in which wastewater is to be discharged into Cartagena Bay and/or the Tesca Lagoon, with various levels of treatment. The estimated stage 1 investment costs lie between US \$73 million and US \$206 million, while the present values of the costs lie between US \$109 million and US \$310 million.³⁹⁶ The ES says that options of treatment and then discharge into *both* Bay and Lagoon are rejected because “These options do not have an acceptable cost-benefit ratio.”
319. The Executive Summary then examines a set of three options in which treated effluent is discharged only into the Lagoon. These options have estimated stage 1 investment costs that lie between US \$49 million and US \$162 million, and present value costs between US \$75 million and US \$267

³⁹² Feasibility Study, Hazen and Sawyer, 1998, Executive Summary, (English translation), p. 2. There is no reference here to any change of policy or controversy during the 1990s in relation to preferred ways of addressing Cartagena’s wastewater problems, although the Panel noted earlier that such controversy existed.

³⁹³ Feasibility Study, Hazen and Sawyer, 1998, p. 2.

³⁹⁴ Feasibility Study, Hazen and Sawyer, 1998, p.5.

³⁹⁵ Feasibility Study, Hazen and Sawyer, 1998 p. 5.

³⁹⁶ Discussed further in section 6.6 of the FS. For costs, see Tables on pages RE-6 and RE-7 of the ES Spanish original. Table 6-14 provides more detail, and summarizes the costs and impacts on water quality of the alternative combinations of treatment levels and receptors (B1 to B3 and C-1 to C-6).

million. Although the option of advanced treatment (BNR) and subsequent discharge only into the Lagoon (option C-6) “*produces the best effluent quality*”, the ES and Section 6.6 of the FS reject it, “*due to the high costs*” (which are more than double those of option C-4, discussed below),³⁹⁷ and concern is expressed about some continued use of the Lagoon’s assimilative capacity.

320. In option C-4 all the sewage collected in the City will be transported to a stabilization pond system before discharge into the Lagoon. This “*could be used in the south zone of the Lagoon, as an extension of the system of ponds.*”³⁹⁸ The option has estimated stage 1 investment costs of US \$74 million and a present value of US \$94 million.³⁹⁹ According to Section 6.6 of the FS, of the three options, “*The only potential option is alternative C-4.*” However, the section then identifies a variety of undesirable impacts that could arise, including continued use of the assimilative capacity of the Tesca Lagoon, water quality deterioration in the rainy season, creation of conditions for algae growth in the lagoon, poorer water quality in adjacent sea beaches, and “other impacts”. These impacts include smells from plant operation and a need for slurry management. Also, there will be “*The purchase and use of an area of 490 Ha. for treatment works,*”⁴⁰⁰ and it is said that “*Currently urban development is taking place in the area designated for the treatment works.*”⁴⁰¹ We return below to the matter of land costs and their potential influence on project costs.
321. Section 6.6 then says that the alternative of stabilization ponds was rejected. It also says that “*In previous projects, adverse impacts were identified,*” although it does not specify the projects or the impacts, and that the Wastewater Master Plan recommends “*ceasing the discharge of wastewater into the Tesca lagoon in Cartagena Bay.*” However, since, as noted, the ES says that “*Hazen and Sawyer were selected to review the feasibility of the basic recommendations of the Sewerage Master Plan [...],*” in this instance appealing to the authority of the Master Plan’s recommendations, rather than reviewing them, is inappropriate. Table 2 in The *Environmental Assessment Summary* in Annex 9 of the PAD⁴⁰² suggests that “*Recommendations of Water & Sewerage Master Plan*” formed one of the

³⁹⁷ Section 6.6 says this option has Stage 1 capital costs of US \$162 million and O & M costs of US \$6 million (possibly US \$10 million, see table on page 6-25 of the FS in Spanish) and present value of costs of US \$267 million (see Table on page RE-8 of the Spanish original of the ES and Table 6-14 in the FS).

³⁹⁸ The ES also suggests that “*The effluent could be discharged outside the Lagoon, using the Bocana project works, into the Caribbean Sea, impacting the neighboring beaches.*” (ES, p. 6)

³⁹⁹ See Table on page RE-8 of the Spanish original of the ES, and Table 6-14 in the FS.

⁴⁰⁰ However, the ES, p. 8, says that “*The system of ponds would occupy appropriately 390 hectares,*” so there is a discrepancy.

⁴⁰¹ FS, section 6.6.

⁴⁰² PAD, p. 93.

two environmental criteria that were used to evaluate the final site for the outfall, (i.e. ocean, Cartagena Bay, or Tesca Lagoon).⁴⁰³

322. Section 6.6 goes on to say “*If it is proposed that the discharge of the treated effluent of the secondary treatment works, both on an intermediate or long term basis, this would bring about an important change of policy in the City of Cartagena.*” There is no discussion there of whether the current policy was of long standing or had itself reflected relatively recent changes in thinking.
323. The ES says that the use of the Lagoon to assimilate waste “*would be contrary to the objective of restoring water quality and the ecology of the Tesca Lagoon. The results of the surveys of independent investigators, made by World Bank consultants, indicate that the residents of Cartagena value the resource of the Lagoon and favor its restoration. The construction of the stabilization ponds could compromise, in the long term, the assimilation capacity of the Lagoon. This option was rejected for being inconsistent with the long term goal of restoring the Tesca Lagoon.*”⁴⁰⁴
324. Thus from the Executive Summary and Section 6.6 of the FS, it seems that the stabilization ponds and discharge into the Lagoon were rejected principally on environmental and related grounds. This suggests that in this instance these environmental criteria dominated the decision-making process. In contrast, as noted earlier, the advanced treatment (BNR) alternative (C-6), was rejected “*due to the high costs,*” suggesting that for that option the value of the economic cost criterion dominated, although the ES also implies that the option is rejected due “*to the continued use of the limited assimilation capacity of the Lagoon.*”
325. The third option set discussed in the Executive Summary of the FS concerns disposal into the Caribbean Sea: “*Several submarine outfall alternatives were evaluated with the discharge of different levels of treated effluent. The level of treatment of the effluent varied between preliminary and secondary treatment, conventional and non conventional.*”⁴⁰⁵ The estimated present values of the costs of the submarine outfall alternatives ranged between US \$62 million and US \$250 million, with the lowest cost alternative being the 2.9 km outfall discharging at 20 meter depth at Punta Canoas.⁴⁰⁶
326. The ES explains that four alternative conveyance pipe and outfall routes were evaluated (Ciénaga de Tesca, La Boquilla, Punta Canoa and Isla de Tierra Bomba). The last of these was discarded because of potential

⁴⁰³ The other criterion involved water quality restrictions in the receiving water body.

⁴⁰⁴ Feasibility Study, Hazen and Sawyer, 1998, p. 6.

⁴⁰⁵ Feasibility Study, Hazen and Sawyer, 1998, p. 7.

⁴⁰⁶ See Table on page RE-9 of the Spanish original of the Feasibility Study Executive Summary. See also Table 6-28.

permanent impacts on coral ecosystems from the outfall's construction,⁴⁰⁷ leaving the remainder as viable, feasible outfall routes. Each alternative “offers different possible routes on land to link up with the starting point of the respective outfall. The selection of the best combination of possible routes was developed [based on] a system of priority analysis [...]. Based on the priority analysis established, we recommend Alternative 3-2 as the land route and the outfall in Punta Canoa as the baseline project.”⁴⁰⁸ Section 6.10 of the FS comments that this option (MC-1) “is 40% less in cost than any other technical solution and it provides the immediate means to improve the water quality in Cartagena Bay and Ciénaga de Tesca.”

327. Section 11 (*Cost analysis and ranking of alternatives for the outfall*) of the FS says that alternative 3-2 had the lowest estimated present value of total costs, and further explains the priority analysis. The costs of the alternatives were used, along with the three other criteria, to achieve an overall ranking of alternatives. These non-economic criteria (discussed in Ch. 10⁴⁰⁹) were: *Technical/physical* (with three sub-factors: construction capacity; crossings; and access); *environmental* (with sub-factors: impacts on wetlands due to pipeline construction; water fluctuations; and areas of special interest); and *socio-political* (with sub-factors: adjacent houses; traffic disturbance; and public acceptance – and it may be observed that Section 10.3.3 says that the ‘adjacent houses’ and public acceptance factors are “almost insignificant” because of “the rural aspect of this project.”). Section 11.6 says that the non-economic criteria “are allocated as criteria values for each alternative on a subjective basis,” while the economic factors related with the construction costs “will receive a ranking on the basis of the relative magnitude of their cost. The preferred route will be the alternative with the lowest results, on the basis of the total factors, both economic and non economic.”
328. For each alternative, the level for each criterion was developed and assigned (and aggregate values are shown in Table 11-24 (*Ranking of Alternatives*)). Section 11.6 comments: “The Punta Canoa outfall alternatives had the most positive results. [...] A more detailed participation by the regulatory agencies and ACUACAR personnel in the selection of a land corridor could alter the ranking. [...] Based on the classification method employed, alternative 3-2 is recommended for the basic project.” In the ranking, in which fewer points means a higher score, scores for the Punta Canoa alternatives ranged between 16.5 and 20 points, while the scores for the other two ranged between 22 and 30.5. Table 11-23, from which Table 24 is derived, contains several columns giving values to each alternative according to several criteria grouped in the following categories: (1) Non

⁴⁰⁷ Feasibility Study, Hazen and Sawyer, 1998, Executive Summary, p. 10.

⁴⁰⁸ Feasibility Study, Hazen and Sawyer, 1998, Executive Summary, p.10.

⁴⁰⁹ See Feasibility Study, Hazen and Sawyer, 1998, Section 10.3.

Economic ((A) Technical and Physical (4 sub-categories); (B) Environmental (3 sub-categories); (C) Socio Political (3 sub categories)); and (2) Economic (simply the present value). The grand totals for each alternative are the result of equally weighing the values for each of the four factors.

2.3. The Effects of Alternative Land Cost Estimates

329. In discussing Alternatives C-3 and C-4, the feasibility study acknowledges uncertainty about land costs, when it notes that: *"La incertitudo mayor en el costo es la obtención de 300 ó 490 Ha de terrenos para las Alternativas C-3 y C-4. Se estimaron los costos del terreno en \$3/m2. Sin embargo, se han citado valores de la tierra tan altos como \$5/m2. El sitio es un área residencial potencial para la Ciudad en vias de expansion."*⁴¹⁰ However, it does not discuss the source or the reliability of the land cost estimates. **The Panel finds that, having acknowledged uncertainty about land prices, the analysis in the feasibility study did not then provide a clear justification for the prices used in the costing of the project alternatives.**
330. Various tables in the FS estimate the cost of land at values ranging from US\$20,000 to \$50,000 per hectare.⁴¹¹ Some tables include a 16% IVA (VAT) tax in the land price, while others record it as a separate charge, although a consistent treatment would have made them more simply comparable. In the tables for some options there are also charges for rights of way. During the investigation the Panel received two letters signed by local real estate corporations, in which they estimated the price of the land in basically the same area at values ranging between Col\$5 million and Col.\$15 million per hectare in September 2001.⁴¹² These figures convert to values of about US\$2746 per hectare and US\$8237 per hectare at the time of the FS.⁴¹³
331. Both estimates are greatly exceeded by the lowest value in the cost range used in the feasibility study, and if accurate would affect the cost estimates of the alternatives in the relevant feasibility study tables. Consequently the

⁴¹⁰ Feasibility Study, Hazen and Sawyer, 1998, p. 6-20.

⁴¹¹ Feasibility Study, Hazen and Sawyer, 1998, Table 6.12, p. 6-21; Table 6-21, p. 6-46; Table 6.22, p. 6-49; Table 6.23, p. 6-52; Table 6.24, p. 6-56; Table 6.25, p. 6-60. The latter table's footnote 6 states that the price of land varies between US\$2 and US\$5/m² depending on its location. The option of leasing the land is estimated at US\$2/m on the basis of a 5% interest rate. The footnote adds that for future development of treatment facilities this lease price estimation may not be appropriate.

⁴¹² These letters are dated September 6 and 7, 2001, and were issued respectively by "Lonja de Propiedad Raiz de Cartagena, and the "Corporación Lonja Inmobiliaria de Cartagena." They calculate the price per hectare between Col.\$ 5,000,000 to Col.\$ 15,000,000.

⁴¹³ The figures were converted to Colombian peso prices of July 1998, by 'deflating' by the Cartagena inflation rate, and then to US dollars by using the peso-dollar exchange rate of July 1998.

Panel reworked the costs of the alternatives that appeared in Table 6-28 of the feasibility study, to take into account the suggested upper and lower values.⁴¹⁴ The results are shown in the revised Table 6-28 and in the Figure below.

332. On the basis of these revisions to Table 6-28, the Panel observes that the gap between the three lowest cost options narrows significantly. In particular, the gap between the chosen option (MC-1: preliminary treatment with the submarine outfall) and option MC-5 (land application with the outfall) falls from US\$35 million to US\$23-27 million, i.e. by almost one third to one seventh to of its original size. Also the gap between the chosen option and option C-4 (stabilization ponds and discharge to the Lagoon) falls by one half to almost one third of its original size, i.e. from US\$32 million to US\$16-20 million.

⁴¹⁴ The Panel found some errors in the original tables in chapter 6, although fortunately they do not materially affect the outcomes.

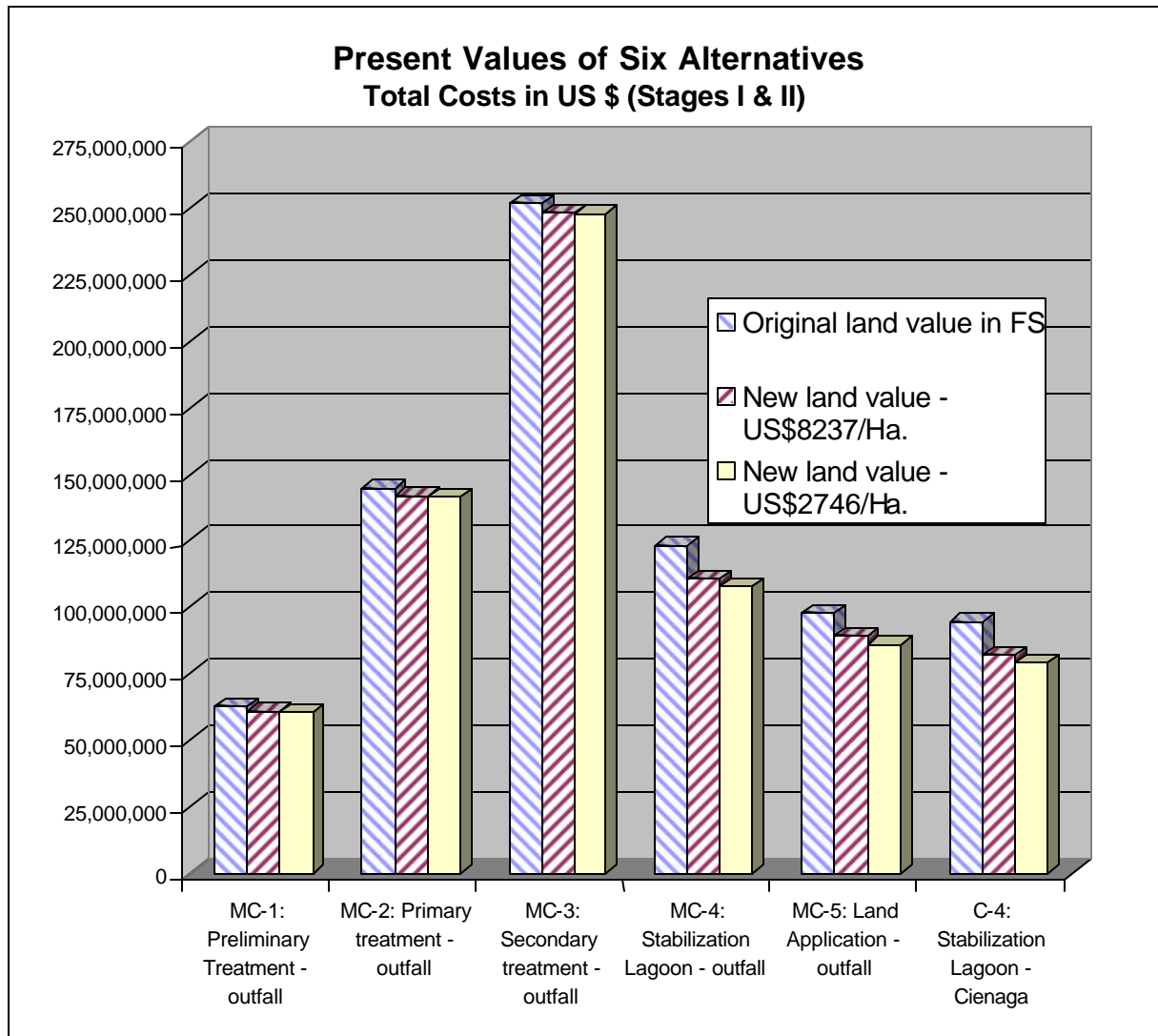
Revised Table 6-28 (Summary of Costs) from Feasibility Study [using alternative land values]

Description of the Alternative	Cost of Investment (US\$)(1)	Cost of Operation & Maintenance (US\$)(1)	of Present Value (US\$)(2)	Difference from MC-1 (Us\$)	Alternative as multiple of MC-1	Rank (1=lowest cost)
MC-1: Preliminary Treatment - outfall						
Original land value in FS	49,300,000	1,200,000	62,400,000	0	1.00	1
New land value - US\$8237			60,533,000	-1,867,000	0.97	1
New land value - US\$2746			60,284,000	-2,116,000	0.97	1
MC-2: Primary treatment - outfall						
Original land value in FS	94,000,000	4,700,000	145,000,000	82,600,000	2.32	5
New land value - US\$8237			142,145,000	79,745,000	2.28	5
New land value - US\$2746			141,769,000	79,369,000	2.27	5
MC-3: Secondary treatment - outfall						
Original land value in FS	149,000,000	9,900,000	252,000,000	189,600,000	4.04	6
New land value - US\$8237			248,392,000	185,992,000	3.98	6
New land value - US\$2746			247,889,000	185,489,000	3.97	6
MC-4: Stabilization Lagoon - outfall						
Original land value in FS	102,000,000	1,800,000	123,000,000	60,600,000	1.97	4
New land value - US\$8237			110,542,000	48,142,000	1.77	4
New land value - US\$2746			107,357,000	44,957,000	1.72	4
MC-5: Land Application - outfall						
Original land value in FS	71,000,000	2,700,000	97,400,000	35,000,000	1.56	3
New land value - US\$8237			88,958,000	26,558,000	1.43	3
New land value - US\$2746			85,751,000	23,351,000	1.37	3
C-4: Stabilization Lagoon - Ciénaga						
Original land value in FS	74,000,000	1,700,000	94,300,000	31,900,000	1.51	2
New land value - US\$8237			81,912,000	19,512,000	1.31	2
New land value - US\$2746			78,791,000	16,391,000	1.26	2

Notes: (1) Total Cost of Stage I; (2) Total Cost (Stages I & II).

Original Source for Table 6-28: *Feasibility Study*, p. 6-69 (Hwd:4655R214.doc)

Figure 3 Present Values of Six Alternatives from Revised Table 6-28 of the Feasibility Study



2.4. The Environmental License Requirement for Primary Treatment after 10 years

333. The Panel also notes that after the Board approved the Project, the environmental license for the submarine outfall issued in 2001 by CARDIQUE, the regional environmental authority, required the installation after ten years of primary treatment of the wastes at the preliminary treatment plant at Punta Canoa. This requirement for primary treatment significantly raises both the costs of investment and of operation and maintenance of the submarine outfall option, according to the figures given in the feasibility study. The Management Response confirms that "...the District will be responsible for upgrading the plant to primary treatment."⁴¹⁵ However, the Response does not appear to place a value on these costs – nor is it said that this was done after the issue of the license in 2001.
334. When the estimates from the feasibility study are reworked to allow for the upgrading to primary treatment, they suggest the following: compared with what they would otherwise have been, investment costs after 10 years could rise by between about US \$24 and \$32 million, while the present value of total costs (including operation and maintenance), could increase by between about US \$30 to \$34 million, thus raising total costs for the project from the original present value of about US\$ 62 million to US \$93 to \$96 million (or about \$3 million less, using the alternative land prices).⁴¹⁶ These values are close to those of options MC-5 (Land Application – submarine outfall) and C-4 (Stabilization lagoons – discharge to the Ciénaga) given in Table 6-28 of the feasibility study.
335. OP 10.04 provides that the “[c]onsideration of alternatives is one of the most important features of proper analysis throughout the project cycle.” **The Panel finds that when the environmental license was issued for the submarine outfall requiring primary treatment in ten years, the Bank should have recalculated the costs of the alternative and reviewed the economic analysis in light of this new licensing requirement, to be consistent with OP 10.04.**

2.5. The Composition of the Panel of Experts

336. As noted earlier in this report, the Bank appointed an international Panel of Experts in the field of marine outfall technology to review and advise on the ongoing work in the feasibility study on alternatives in. This offered a potentially valuable additional avenue of scrutiny. **However, in the Panel’s view, given the longstanding controversy concerning the preferred**

⁴¹⁵ Management Response, ¶ 38, p. 18.

⁴¹⁶ The lower bound on the new present values of total costs assumes that there would be some economies in the investment costs of establishing the primary treatment after ten years, compared with the two-stage process suggested for MC-2 in Table 6-23 of the feasibility study..

option to address the City's wastewater problems, it would have been appropriate to have had the Panel of Experts include a wider range of expertise, to provide more authoritative findings about both the socioeconomic impacts and the economic costs of the alternatives considered.

3. Poverty Reduction

337. The Requesters allege that the Bank failed to comply with OD 4.15 on Poverty Reduction.⁴¹⁷ They claim that the Project's *'deficient alternatives analysis and risk assessment fail to account for potential negative impacts on the poor both within and outside the district that will be served by the outfall.'* They also argue that *'it is very unlikely that the submarine outfall project is the kind of "sustainable, high return project" that OD 4.15 indicates the Bank will support.'*⁴¹⁸
338. Two of the Bank policies raised by the Requesters in the claim address poverty reduction as the greater goal of World Bank-financed Projects: OP 10.04, Economic Evaluation of Investment Opportunities and OD 4.15, Poverty Reduction. OP 10.04 states that *'The economic analysis examines the project's consistency with the Bank's poverty reduction strategy. [see OD 4.15, Poverty Reduction] If the project is to be included in the Program of targeted Interventions, the analysis considers mechanisms for targeting the poor.'*⁴¹⁹
339. OD 4.15 Poverty Reduction summarizes Bank procedures and guidelines for operational work on poverty reduction. It states that: *"Sustainable poverty reduction is the Bank's overarching objective. The Directive also includes the following:*

"27. (...) Country circumstances, as analyzed in the CAS, will determine when individual Bank-supported investment operations should focus more specifically on poverty reduction. Such operations aim to (a) raise the productivity of the poor's physical assets and increase their incomes, through the provision of infra-structure, credit, technology, and complementary inputs and by regularizing de facto land tenure rights; (b) develop human capital by improving access to (and the quality of) basic health, nutrition, family planning, and education services; (c) improve living conditions by providing basic infrastructure and social services; and/or (d) provide a safety net."

"28. Role of the Bank. The Bank's role in supporting poverty reduction through individual investment operations goes beyond financing. The Bank supports

⁴¹⁷ Request, p. 31.

⁴¹⁸ Request, p. 31.

⁴¹⁹ OP 10.04, ¶ 7. The first page of the Cartagena Project's PAD confirms that the project is included in the Program of Targeted Interventions.

sustainable, high return projects and project components that benefit the poor and that would not be done, or would be done differently, without the Bank.”

“30. Risk Analysis. The economic analysis considers project risks, including risks to institutional, political, and financial sustainability that will jeopardize project benefits if project assumptions are not met. Since poor people live at the margin of existence, downside risks are life threatening. Therefore, risk analysis is essential for poverty-reducing projects (...). These projects may also have important side effects for environmental and demographic outcomes, which should be carefully analyzed.”

340. As noted earlier, Management responds in relation to OP 10.04, that *Management takes the view that the comprehensive economic analysis carried out during project preparation is in compliance with OP 10.04.*⁴²⁰

341. In relation to OD 4.15 *“Management takes the view that the project is in compliance with OD 4.15 on poverty”* because all studies and reviews conducted with respect to this Project determined that the outfall will pose a *“minimal”* risk of environmental damage. Management adds that *“There is no evidence that the outfall will interrupt the economic activity of fishermen from Punta Canoa, Arroyo de Piedra and Manzanillo. Moreover, the three villages will benefit and economic activities in the larger also should benefit from the project for the following reasons: (i) the new wastewater disposal system will reduce contamination of Cartagena’s beaches, Cartagena Bay and the Ciénaga de la Virgen; (ii) the project will provide water and most probably sanitation services to the three villages;[...]* (iii) *the project provides support for community development and organization; and (iv) the improvement in the environment due to better wastewater disposal will help bolster tourism in the area, creating jobs and economic opportunities. Both the technical design of the project and the monitoring program will ensure that fishing and tourism in the North Zone will not be impacted. [...]*⁴²¹

342. Management claims that the outfall project will benefit a large part of the poor communities of Cartagena and will cause *“negligible negative impacts.”*⁴²² It also emphasizes that *“the project aims to bring public health benefits in terms of sanitation services especially to the city’s poor and marginal areas.”* Thus, in Management’s view, the Project has to be considered in terms of benefiting the entire Cartagena area, *“rather than solely the three communities referenced in the Request.”*⁴²³ Among these benefits, Management lists the *“expansion of services to poor neighborhoods”* which will reduce the families’ expenses for water. The Response reports that *“Monthly water expenses of the poor population not*

⁴²⁰ Management Response, Annex I, p. 43.

⁴²¹ Management Response, ¶ 45.

⁴²² Management Response, Annex 1, Item 26, p. 48.

⁴²³ Management Response, Annex 1, Item 26, p. 48.

*connected to the public water network are 10 to 50 times higher than those of the connected population.”*⁴²⁴ In addition, once the sewerage system improves the standard of living of the poor neighborhoods “*upgrading of other neighborhood infrastructure is anticipated*”.⁴²⁵

343. However, Management claims, “*These benefits will not come at the cost of poverty reduction and environmental impacts in the three villages near the outfall site as stated in the Request. To the contrary, based on analytical work prepared for the project, Management concludes that the risk of environmental damage to the three villages is minimal and the project contains targeted interventions that will clearly benefit these groups.*”⁴²⁶

3.1. The PAD’s Poverty Impact Analysis

344. The PAD emphasizes poverty reduction as an objective when it states that the first of the project’s development objectives is to “*(i) improve the water and sewerage services of Cartagena and the sanitary conditions of the city’s poorest population, by expanding water and sewerage coverage, particularly in the city’s poor neighborhoods [...].*”⁴²⁷ The PAD’s section C3 discusses the Benefits to the target population, beginning with the statement that “*The project is expected to bring public health benefits in terms of sanitation services especially in the city’s poor and marginal areas.*”⁴²⁸ The section goes on to supply more detail of which of the City’s poorest neighborhoods is expected to benefit from the project. **In view of the Project’s design and the locations that will be affected, there seems little doubt that substantial numbers of poor people in the city of Cartagena are intended to and seem likely to experience significant benefits associated with the provision of enhanced access to and quality of water and sewerage services.**
345. In relation specifically to the economic analysis, OP 10.04 requires, as noted, that it “*examines the project’s consistency with the Bank’s poverty reduction strategy.*” The *Summary Project Analysis* in Section E.1 (*Economic*) of the PAD makes relatively little reference to poverty reduction.⁴²⁹ However, as noted earlier, Section VII of Annex 4, *Poverty Impact*, contains a brief analysis - treated in a table (Table 6) and eight lines of text. - that “*measures how much of the consumer benefits accrue to poorer consumers.*” The PAD observes, however, that the income data

⁴²⁴ Management Response, Annex 1, Item 26, p. 49.

⁴²⁵ Management Response, Annex 1, Item 26, p. 49.

⁴²⁶ Management Response, Annex 1, Item 26, p. 49.

⁴²⁷ PAD, p. 2.

⁴²⁸ PAD, p. 9.

⁴²⁹ Although it mentions the value of benefits that might occur in two very poor neighborhoods, in which the internal rate of return just fails to meet the cut-off rate of 12 per cent.

collected during the WTP surveys⁴³⁰ made it “impossible to calculate with any accuracy the impact of the project on the poor.”

346. In the absence of appropriate income data, the PAD says, “Assuming that (i) poor consumers are defined as customers that fit into the first three strata of the tariff structure; and (ii) that most rich households will already been connected to the water supply system, and hence new customers will mainly be poorer households. On the basis of these assumptions, poor consumers will receive most of the benefits of the project as can be seen in Table 6.”⁴³¹ Table 6 of the PAD is reproduced below (with some amendments in the third column).

Table 6: Distribution of Consumption Benefits between Poor and Non-Poor (in Col.\$ billion)			
Project	Poor	Non-Poor	Total
Water supply projects	(1201)	0 [83 in original]	(1201)
System Improvements	203	83	285
Expansion Projects	(1487)	0	(1487)
Sewage Collection Projects	12297	0	12297
Sewage Treatment Projects	47958	8663	56621
Total Project	58970	8663 [8746 in original]	67716
Note *: the negative impact is mainly due to shadow pricing the financial benefits in order to obtain the economic benefits ⁴³²			
Source: PAD, Annex 4, Table 6, p. 60			

347. The footnote to Table 6 says that the negative impact (presumably the loss to the poor associated with the water supply projects) “is mainly due to shadow pricing the financial benefits in order to obtain the economic benefits.” **In the Panel’s view a fuller explanation should have been supplied**, since it is not obvious, for example, how in the *Expansion El Pozón* subproject the difference of –\$147 thousand between the economic and the financial benefits shown in Table 4 and Table 1 (Col.\$2656 thousand minus Col.\$2803 thousand), multiplies more than seven times to reach its level of –Col.\$1107 thousand in Table 5, which appears to make up most of the Col.\$1201 thousand negative benefit to the poor shown in the second column of Table 6.

348. **The evidence on poverty impact analysis in the PAD is limited to the highly aggregated ‘poor’/‘non-poor’ columns of Table 6 in Annex 4 and**

⁴³⁰ As noted, they did not, in any case, cover WTP for “improved water supplies and expansion of water supplied in the poorest neighborhoods” (PAD, p. 56), while for the sewage collection WTP surveys, “The three sub-basins where the survey was not performed were included in the program after the execution of the field work.” (SI Cost-Benefit study, English translation, Part II, footnote 13, p. 14.).

⁴³¹ PAD, pp. 60-61.

⁴³² In the original table, the * presumably refers to the negative numbers indicated by parentheses.

eight lines of text. In the Panel's view, this is an issue of great importance to the Project. Given that the first of the Project development objectives is to improve water and sewerage services and sanitary conditions of the city's poorest population, and where – as with many projects that may benefit poor people – it is possible that some of the poor may gain while others lose, it is disturbing that more effort was not put in during the Project preparation and appraisal to enable sufficient income and/or other data to be assembled to assess the Project's impacts on the poor "*with any accuracy.*"

349. It might have been possible, for example, to augment the analysis by introducing other related evidence, such as that in the social assessment, which the PAD (p. 20) states, "*proved that the project will benefit the poorest communities in Cartagena which currently lack sanitary services.*" Indeed, the Panel notes that Management may well have missed an opportunity to demonstrate clearly the extent to which the project design might be consistent with the Bank's poverty reduction strategy, as OP 10.04 requires.

3.2. Effects on the Three Communities Referenced in the Request

350. As noted earlier, Management maintains that no evidence supports the claim that the outfall will be detrimental to the economic activity of fishermen from Punta Canoa, Arroyo de Piedra and Manzanillo and that "*fishing activity, to the extent that it might occur in these areas would not be adversely affected.*"⁴³³ Moreover, the environmental monitoring program and additional technical measures "*will continue to ensure that fishing and tourism will not be impacted.*"⁴³⁴ However, the evidence to which the Response refers is principally scientific and environmental evidence. While it is clearly essential to exercise due diligence in a scientific analysis of the probable impacts of the outfall, there are also issues of perceptions and public acceptability which can have real impacts on project outcomes, even if some regard them as mis-perceptions of an underlying reality. The importance of such issues is acknowledged elsewhere in the appraisal process – for example, in discussing *Possible Controversial Aspects*, the PAD states that the use of a submarine outfall "*may cause some controversy due to lack of understanding of the technology,*"⁴³⁵ and in the Feasibility Study 'public acceptability' was used as a criterion in examining the impacts of construction routes.⁴³⁶

351. Thus if the outfall were *perceived* by the public at large, including tourists, to be polluting, and if the evidence to the contrary were not trusted, then

⁴³³ Management Response, Annex 1, Item 14, p. 40.

⁴³⁴ Management Response, ¶ 45.

⁴³⁵ PAD Section F, Part 3, p. 26.

⁴³⁶ See Feasibility Study, Hazen and Sawyer, 1998, Section 10.3.

there would be a potential for real damage to the markets for local fish and perhaps also for the products of the shrimp farms/hatcheries, which might impact significantly on livelihoods and employment opportunities in Punta Canoa. There would also be the potential for significant damage to earnings from recreational beach activity and fish sales, for example in Manzanillo. The PAD says that: "[...] *restrictions on fishing, widely disseminated throughout local communities, in the mix zone of the discharge will have to be closely monitored during outfall operation.*"⁴³⁷ These restrictions, although clearly designed to ensure safer fishing and to allay fears of contamination, might also through this wide dissemination become associated with public suspicion of fishing and other activities in the vicinity of the outfall and even at some distance from it. While the Management response points appropriately to the environmental monitoring program and the "*availability of technical mitigatory measures if needed (chlorination and/or future waste stream treatment beyond preliminary treatment)*," such measures alone might be seen by the fishing communities as being reactive and insufficient to address the harm they might suffer before the mitigating measures were both put into effect and widely accepted by the wider community of residents and tourists as being effective. Moreover, chlorination might pose its own risks.

352. **There are, therefore, risks to these poor communities which have not been properly and explicitly addressed in the appraisal of the Project. Had this been done, it might then have been possible both to reassure the concerned communities about the levels of risk and/or to put in place fall-back mechanisms that would provide trustworthy and timely "insurance" or compensation were the events to arise. In the Panel's view, therefore, in relation to risk the Bank has not complied with OD 4.15. Compliance would have meant giving greater and earlier attention to the risks to and concerns of these communities, whose willingness to accept the location and consequences of the outfall was key to the successful delivery of the potentially very substantial benefits intended for so many of Cartagena's other poor citizens.**

353. The Management Response's discussion includes a section. *Sharing in Project Benefits*. Here, the Response accepts that the promised piped water services to the North Zone villages of Punta Canoa, Manzanillo and Arroyo de Piedra, which were to have been completed by the end of 2003, as set out in the Loan agreement, had not been completed. This was because of fiscal restrictions on the Municipality - and because investments for the communities' water systems were not protected by the financial structure that had earmarked counterpart funds for loan execution and passed them to trust funds. That the provision of water supply to the three communities appears to have been added at the final stages of the project, and in a way that did not ensure their protection, raises questions about whether the

⁴³⁷ PAD, Annex 9, p. 95.

interests of the villages were fully taken account in the project appraisal/feasibility stages.

354. The Response says that the project will provide water “*and most probably sanitation services to the three villages.*” It is explained in a footnote that “*While water services to the North Zone were a condition in the project Legal Agreements, sanitation services were not due to lack of financing. [...] It is the intention of the project counterparts to use these additional project funds to extend sewerage services to the North Zone.*”⁴³⁸ The body text confirms that “*Should additional funds exist from project savings, sanitation services through a sewerage network will be provided to the same communities.*” However, the provision of the promised water services has been delayed,⁴³⁹ while the provision of these sewerage services appears to be of uncertain timing and extent. Paragraph 47 in the Management response lays out - with greater clarity than in the PAD - some of the ways in which the North Zone communities are likely to benefit significantly from provisions now associated with the project. Nevertheless, when the Panel visited Manzanillo and Punta Canoa, the inhabitants seemed unclear about the nature, timing, extent and costs of future water and/or sewerage provision, and of some of the other benefits that may flow from the project.⁴⁴⁰
355. Management rightly draws attention to the very considerable benefits that could flow to much larger poor communities than those in the North Zone. Nevertheless, **in the Panel’s view compliance with OD 4.15 would have meant giving greater and earlier attention to the risks to and concerns of those communities, whose willingness to accept the location and consequences of the outfall was key to the successful delivery of the potentially very substantial benefits intended for so many of Cartagena’s other poor citizens.**

3.3. Potential Impacts on Other Poverty-Reducing Investments by the District

356. A further issue that was drawn to the Panel’s attention during its visit to Cartagena concerned the extent to which the Municipality’s financial commitments to this project had led or might in the future lead to difficult or inappropriate trade-offs between investment in water and sewerage services and expenditures in other potentially poverty-reducing areas, such as the ongoing provision of health or transport infrastructure and services. The financial evaluation in this report describes the effectiveness of the measures designed to ensure a sustained, secure flow of funds from the District. These measures are also described in section 15 of Annex 1 of the Management Response, which states that “*The District was also required*

⁴³⁸ Management Response, note 5, p. 20.

⁴³⁹ Although the Response (¶ 47, p. 20) says that works to provide water services “*are about to begin.*”

⁴⁴⁰ See also *supra* ¶ 223.

to: (i) obtain an operational surplus in order to reduce its unpaid debt [...] and (ii) keep other infrastructure investments to a minimum.” This meant prioritizing water and sewerage investments over other investments. Such a decision might or might not have been the most appropriate strategy for poverty reduction - but the issue merited analysis or discussion because of the potentially foregone opportunities⁴⁴¹ involved. Yet there appears to be little or no analysis or examination of this in the PAD, nor an attempt to set this project in the wider context of poverty reduction challenges and opportunities in the City.

357. The Management Response states that *‘the project is consistent with the approach laid out in the World Bank Environment Strategy for Latin America and the Caribbean [...], which prioritizes access to safe water and improving collection and disposal of wastewater.’* Nevertheless, as OD 4.15 makes clear, the Environmental Strategy for Latin America and the Caribbean is only one element in the strategies that can contribute to poverty reduction. **In the Panel’s view, the decision to focus on water and sewerage investments was not inappropriate, but given the Project’s potential consequences in keeping alternative infrastructure investments “to a minimum”, the potential impact on other poverty reducing investments should have been properly addressed. This might have given confidence that the project was the best use of the scarce financial resources of the District, and thus have showed compliance with OD 4.15.**

⁴⁴¹ ‘Opportunity costs’ in economic terminology.

CHAPTER FIVE: FINANCIAL COMPLIANCE AND SUPERVISION

1. Financial Management Assessment and Financial Management Capacity of the District of Cartagena

358. The Request for Inspection claims that *“the Bank has violated the financial management standards of OP 10.02 by accepting inaccurate financial and accounting statements from the borrower.”*⁴⁴² According to the Requesters, during the Project’s preparation and appraisal phases (1999 and 2000) the Mayoral Office of Internal Control of Cartagena *“issued reports”*⁴⁴³ revealing the *“unreliability of the City’s accounting system”* which, according to these reports, *did not provide an accurate assessment of the City’s economic situation.”*⁴⁴⁴ The Request reports also about investigations and corruption charges moved to three successive mayors of Cartagena during the 1990s. In the Requesters’ view, it is unclear whether *“the Bank appropriately considered these and other uncertainties about Cartagena’s capacity either to responsibly manage public funds and partnerships with private companies like AGBAR or to take on the large loan and long-term capital commitment associated with the outfall project.”*⁴⁴⁵
359. Management responds that *“the project is in compliance with the financial management covenants in the Loan and Project Agreements.”*⁴⁴⁶ because *“[i]n accordance with OP 10.02, the Bank has required audited financial statements for both ACUACAR and the project to be submitted to the Bank on an annual basis (see Article IV, Section 4.01 of the Project Agreement), and ACUACAR has maintained financial management systems to assure accurate and timely information regarding project resources and expenditures.”*⁴⁴⁷ In addition, based on the Loan Agreement, the District must ensure *“that the required audits supporting loan withdrawals made under Project Management Reports (PMRs) are carried out in keeping with standards acceptable to the Bank.”* The Response adds that independent auditors have submitted *“consistently unqualified annual audits”*⁴⁴⁸, regarding the financial statements of ACUACAR and the Project accounts. ACUACAR has also submitted quarterly PMRs, which require detailed and comprehensive information on financial, physical, and procurement processes. The Bank reviewed them and found ACUACAR’s record in preparing them to be excellent.

⁴⁴² Request, p. 25.

⁴⁴³ Request, p. 25.

⁴⁴⁴ Request, p. 26.

⁴⁴⁵ Request, p. 26.

⁴⁴⁶ Management Response, Annex 1, Item 17, p. 41.

⁴⁴⁷ Management Response, Annex 1, Item 17, p. 41.

⁴⁴⁸ Management Response, Annex 1, Item 17, p. 41. Footnote 2 states that “[p]er standard accounting usage, “unqualified” here refers to “without reserve.”

360. Management also claims that the Bank carried out a work “*in line with good practice on financial analysis*” in Project preparation and supervision, including work on the financial assessment of the District and ACUACAR, the financial structure of the operation and the financial performance of ACUACAR and the District as well as financial management of the Project. According to Management, during Project preparation the Bank reviewed the District capacity to manage public funds and concluded that it had “appropriate capacity”.⁴⁴⁹
361. The Bank policy on Financial Management – OP 10.02 – requires the Borrower and the Project implementing agency to maintain adequate financial management systems so as to provide accurate and timely information to the Bank with respect to Project resources and expenditures.⁴⁵⁰ The financial management system includes accounting, financial reporting and auditing systems. As provided in the policy, since the beginning of Project implementation the Borrower and the implementing agency “*must have in place accounting and internal control systems that [...] (a) reliably record all assets and liabilities and financial transactions of the project [...] and (b) provide sufficient financial information for managing and monitoring project activities.*”⁴⁵¹ In addition, the borrower and the executing agency are required to submit to the Bank “*annual audited financial statements of the project that are acceptable to the Bank*”⁴⁵² and to have these financial statements audited each year in accordance with standards acceptable to the Bank⁴⁵³.
362. The Bank Procedure (BP) 10.02 requires that during Project preparation, Bank Regional staff inform the borrower and the Project implementing agency about the Bank requirements for financial management systems, and make sure that an adequate financial management system is in place. Regional staff also assess the adequacy of the accounting and auditing practices, of standards, and internal and other controls systems. According to the procedure, Regional staff further agree with the borrower and the Project implementing agency on remedial actions and on a timetable if the financial management system needs improvement.
363. In response to the Requesters’ complaints this Report reviews the adequacy of the analyses made by the Bank in (a) assessing the financial management capacity of the District and of ACUACAR, and (b) evaluating their financial capacity to provide the financial resources to implement the Project and repay the Bank loan in accordance with the agreements reached

⁴⁴⁹ Management Response, Annex 1, Item 16, p. 42.

⁴⁵⁰ OP 10.02 – Financial Management (revised April 2004), August 1997, ¶ 1.

⁴⁵¹ OP 10.02, ¶ 2.

⁴⁵² OP 10.02, ¶ 3.

⁴⁵³ OP 10.02, ¶ 4.

among the Bank, the District, and ACUACAR. This Report addresses these issues following the sequence of phases of a project cycle, in particular Project preparation, appraisal and implementation/supervision.

1.1. Financial Management Assessment

364. **Project preparation and appraisal.** The Panel observes that the Project records examined show that the Bank's main financial concern with the District of Cartagena was to ensure that the District contributed the agreed amount of Project funding (US\$7.58 million equivalent) and that it had the capacity to repay the Bank loan (including interest). To avoid getting deeply involved in District management and financial matters,⁴⁵⁴ the Bank ensured that the District would earmark and pledge a percentage of its tax receipts to fund its share of the Project (the equivalent of about US\$7.58 million) and to repay the Bank loan (US\$85 million).⁴⁵⁵ Financial projections prepared by the District and reviewed by the Bank at Project appraisal showed that these tax receipts would be sufficient to cover the District's financial obligations to the Project.
365. The Panel notes that the Project records reveal that the Bank was aware of the District's internal control and financial management problems noted by the Report. For the past five years the Contralor Distrital's audit opinion on the District's accounts has stated that "*these do not reasonably represent the fair account balances*" and that because of this fact and other financial internal control problems the Contralor Distrital "*cannot provide an opinion on the fairness of the District's financial statements.*"⁴⁵⁶ This is important because of the three tax revenues that the District had pledged to the Project, the Impuesto Predial Unificado (IPU-Unified Property Tax) is the only one the District itself bills and collects; the national Government channels the other two to the District's bank accounts. Hence, if the District had serious internal management and financial deficiencies in billing and collecting the IPU, this could have a negative effect on Project financing and loan repayments.
366. The appraisal assumptions for the IPU tax were that the District would improve its tax collection rate from 44% in 1998 to 51% by 2002 and that, as a result of reassessments, the tax base would increase in 2002 by 15%, in real terms. The PAD's financial projections for 18% of IPU receipts show an increase from US\$3.5 million in 1998 to US\$5 million in 2002

⁴⁵⁴ Panel Interviews.

⁴⁵⁵ The Bank agreed to the District's pledge to earmark the following funds for the Project: 18% of the District's receipts of the Impuesto Predial Unificado (IPU); 10% of its receipts of the oil tax Aportes de Regalias (ARs); 20% ⁴⁵⁵ of its receipts of Aportes por ICN/Sistema General de Participaciones (AICN); and annual payments of US\$2.2 million that the District will receive from ACUACAR from January 2005 through December 2011, as ACUACAR's contribution to the Project.

⁴⁵⁶ Project files.

(remaining constant at US\$5 million for 2003 and 2004).⁴⁵⁷ Actual collection rates were 42% and 41% in 2002 and 2003, respectively, and the actual revenue collected in those years was US\$3.1 million and US\$2.8 million. The Panel was informed that the District did indeed increase property assessments in line with the financial projections and assumptions made in the PAD. However, there is still a large shortfall in actual IPU revenues compared to appraisal estimates. This shortfall can be explained partly by the difficult economic conditions in Cartagena, where about 80% of the population has a medium or low income, and partly by an alleged lack of pay culture. However, many audit reports, including those of the Contralor Distrital, point to another important factor: the District's inability to properly bill and collect property taxes. The Panel was informed that the property registers are so outdated that many properties have yet to be registered and assessed correctly.

367. Fortunately for both the District and the Project, the actual revenues from the ARs were US\$0.43 million and US\$0.80 million in 2002 and 2003, respectively, substantially higher than PAD projections of US\$0.27 million for each of those years. The AICN was also higher in 2002 (US\$4.6 million compared to the PAD estimate of US\$ 3.8 million) but lower in 2003 (US\$3.3 million compared to a projection of US\$ 3.8 million). It should be noted that this analysis is based on US dollar terms—and the US dollar has been declining in value against most major currencies as well as in relation to the Colombian peso, and is expected to continue doing so according to the Ministry of Finance and projections by The Economist .⁴⁵⁸ If the dollar's future appreciation vis-à-vis the Colombian peso keeps pace with Colombian inflation, and if there is no growth in the Colombian economy,⁴⁵⁹ it is projected that, in dollar terms, the District will have sufficient accumulated revenues from pledged and earmarked taxes to repay the Bank loan. Furthermore, according to information provided to the Panel by Bank Management on June 21, 2005, the District has been collecting increased revenues, in current Colombian peso terms, from each of the pledged and earmarked taxes.⁴⁶⁰

368. The Panel notes that, because the District would not be in charge of Project implementation, the Bank decided it would not need to carry out a financial

⁴⁵⁷ In Current Col.\$ the PAD projected that 18% of IPU receipts for 2002 and 2003 would amount to Col.\$ 11,969 million and Col.\$ 13,166 million, respectively. Actual receipts were Col.\$ 7,638 million and Col.\$ 7,835 million for 2002 and 2003, respectively.

⁴⁵⁸ The US dollar reached a peak exchange rate value in March 2003 vis-à-vis the Colombian peso of about Col. \$ 2, 957 per US\$1. The November 17, 2004, rate was Col.\$ 2,523 per US\$1, while the June 21, 2005 exchange rate was Col.\$2,321 per US\$1. (Source World Bank)

⁴⁵⁹ These are very conservative assumptions.

⁴⁶⁰ It should be noted that in the future these revenue increases may not fully compensate for the reduced IPU tax revenues noted above.

management assessment for the District.⁴⁶¹ **Given the assumptions reflected in the PAD—that about 55% of the funds to be made available by the District would come from IPU revenues— the Panel finds that the Bank should have paid more attention to the District’s internal control and management problems and should have carried out an in-depth financial management assessment of the District. The Bank should have worked with the District on an action plan to improve the District’s property tax registers and its billing and collection systems.** Failure to do this shows a certain degree of financial management shortsightedness on the Bank’s side.

369. Furthermore, **since the Bank was aware of the District’s internal control and management problems, it should have required that the District, as the borrower of the Bank loan, have its accounts and financial statements audited by independent auditors each year and provide a copy of the audit report to the Bank.** The independent auditors would have highlighted these problems in their report, and the Bank could have addressed any emerging problems early on during Project supervision, including seeking actions by the District and obtaining the support of the Ministry of Finance to find a satisfactory solution to this problem.
370. The District’s obligations under the Project are channeled directly into a trust fund that is managed by an independent financial administrator (La Previsora), and withdrawals from this account are made exclusively to fund the Project and to repay the Bank loan. However, the Bank did not require that the trust fund account be audited each year by independent auditors (as it requires for all other Project accounts, such as the special account). In fact, the trust fund account is to remain open until the Bank loan is fully repaid by the District. **The Panel notes that the Bank did not pay sufficient attention to the design of the financial management information requirements for the Project.** Moreover, although paragraph 14 of section 6 of the Fiduciary Trust Fund Agreement between the District and La Previsora allows the Ministry of Finance to carry out audits of this trust fund, the Agreement does not specifically require that such audits be performed each year by independent auditors. La Previsora, however, does have its accounts audited by independent auditors (KPMG), who perform yearly audits on each individual trust fund account La Previsora manages, including the one related to Loan 4507-CO. **The audit report for the year ending December 31, 2003, provides an “unqualified opinion” on the**

⁴⁶¹ Financial management assessment (which is distinct from financial analysis work, which deals mainly with financial statements and forecasts of revenues and expenses) reviews accounting policies and procedures and information systems, budgeting controls, and more generally the internal controls of the institution. The Bank guidelines for “Reviews of Financial Management and Accounting Systems” that were applicable at the time of Project preparation and appraisal are provided in Annex V of the Financial, Accounting, Reporting and Auditing Handbook (FARAH) of January 1995.

Project's Trust Fund Financial Statements No evidence was found on file that the Bank had received this audit report.

371. In addition, in order for the national Government to extend its guarantee to the Loan Agreement,⁴⁶² it first had to sign a Counter-Guarantee Agreement⁴⁶³ with the District of Cartagena under which the District, if it defaulted on the Bank loan, would hand over to the Government the funds it had pledged for this Project. The Loan, Project, and Guarantee Agreements do not make any reference to this Counter-Guarantee Agreement, although this agreement contains a number of covenants that have a direct bearing on Project implementation and loan repayments. The Panel is concerned that the Bank may have overlooked this matter.
372. **Project implementation/supervision.** The Panel finds that the Project supervision reports are generally satisfactory and quite informative. However, the Panel notes that the supervision reports show that the District had management problems with billing and collecting the IPU. The Panel found one aide-Memoire where the Bank recommended that the District improve its IPU tax collection but there is little evidence on file that the Bank actively pursued this matter or carried out an in-depth analysis during supervision. If this analysis was carried out, the Bank should have then prepared a plan of action and discussed it with the District authorities to obtain their agreement on the actions to be taken. The Bank could also have obtained the endorsement for this plan of action from the Dirección de Apoyo Fiscal (DAF) of the Ministry of Finance, the Contralor Distrital, and the Contralor Regional. Since the District's loan repayments to the Bank depend on tax receipts from the IPU, the issue of the shortfall in IPU receipts and the District's underlying financial management weaknesses, which the Bank has not yet addressed properly during supervision, remain important issues for the Bank to pursue.
373. **The Panel finds that the Bank should have carried out a financial management assessment for the District of Cartagena, as the borrower of the Bank loan, at the time of Project preparation and appraisal. Since it did not, it did not comply with its own policies and procedures set out in OP/BP 10.02. Furthermore, during the initial Project supervision, while the Bank had an opportunity to address the problem of the shortfall in IPU receipts, it did not actively pursue that matter. The Panel also finds that the decision making within the Bank, as it refers to accepting audit reports that are not fully in compliance with the requirements of the Loan Agreement, did not follow Bank**

⁴⁶² Loan, Project, and Guarantee Agreements were signed on December 10, 1999.

⁴⁶³ The Counter-Guarantee Agreement between the Government and the District was signed on November 23, 1999.

procedures. Hence, it did not comply with its own policies and procedures set out in OP/BP 13.05.

1.2. Project Financial and Accounting Statements

374. **Project preparation and appraisal.** The Requesters claim that the Bank accepted inaccurate accounting and financial statements from the city of Cartagena and did not take into accounts reports by Cartagena's Mayoral Office of Internal Control showing the unreliability of the city's accounting system and indicating that the city's Statement of Finances did not provide an accurate assessment of the city's economic situation. As stated, the records reviewed by the Panel show that the Bank realized early in Project preparation and at appraisal that the District of Cartagena did not have the capacity to properly implement the Project and, specifically, to handle Project funds. Audit reports prepared by Government auditors had highlighted internal control problems in municipal management. Therefore, to ensure reliable Project management and control of Project funds, the Bank sought to obtain an agreement to appoint ACUACAR as the Project's implementing entity and the District as the borrower of record.
375. The Panel notes that part of the reason for channeling Project funds directly to ACUACAR, the Project implementing agency, and having ACUACAR manage the Project rather than passing through normal municipal processes was to ensure proper Project accounting and the preparation of reliable Project financial statements.⁴⁶⁴ In other words, to avoid, inter alia, any accounting problems, the Project was designed in such a way that the District would not handle any Project funds. **Thus the Panel finds that the agreed institutional and financial arrangements for the Project specifically address the uncertainties in the claimants' complaint, and that the processes followed comply with the Bank's OP 10.02.**
376. The Panel notes that the Request points out that there are also other uncertainties about Cartagena, such as its capacity to responsibly manage partnerships with private companies like AGBAR, which is the other main shareholder of ACUACAR. To ensure that the partnership agreements are being carried out satisfactorily - particularly regarding ACUACAR's operations, tariff structure and levels, service efficiency, and investment requirements - an independent operational audit⁴⁶⁵ is carried out each year

⁴⁶⁴ ACUACAR keeps the Project accounts and corresponding financial statements separately from its own accounts, and has both sets audited each year by external independent auditors—for 2000 and 2001 Arthur Andersen, and for 2002 and 2003 Deloitte, Touche, and Tohmatsu. In each of these years, the auditors' opinion on the Project accounts and financial statements and on ACUACAR's accounts and financial statements was "unqualified"—that is, in the auditors' opinion the accounts and statements gave a true and fair view of the financial position of the Project and of ACUACAR. ACUACAR is also audited by both the Contraloría Distrital and the Contraloría General de la República.

⁴⁶⁵ For more details about the audit process see *infra* paragraph 397.

at the request of ACUACAR's Board of Directors⁴⁶⁶. **Given the supervision and scrutiny of ACUACAR, the Panel finds that the District of Cartagena receives sufficient information and assistance from other Government institutions to manage adequately the partnership agreements adequately.**

1.3. Financial Capacity of the District of Cartagena

377. The Requesters complain that the potential for the fiscal instability of the borrower, due to “*fiscal disarray and increasingly strained resources*,” coupled with “*the expected increase in the total cost of the outfall project*” will lead the District to default on the Bank loan.⁴⁶⁷ The Requesters argue that “[b]ecause the City of Cartagena has been plagued by fiscal mismanagement and corruption for decades and has only recently and slowly begun working to put its finances in order, it is not at all clear that it is currently equipped to take on a US\$85 million debt from the World Bank [...]”⁴⁶⁸. In the Requesters’ view, the residents of Cartagena will ultimately be those who bear the consequences of such event. They believe that a default would “*hit hardest at home by sending the City into a cycle of restructuring that would extend the burden of the loan(s) far longer than anticipated, divert resources from other social projects, and generally injure the already fragile local economy*”⁴⁶⁹. In addition, such default would damage future prospects for Cartagena as it would “*prevent it [the City] from obtaining funding for municipal projects for years to come*.”⁴⁷⁰
378. In its Response, Management argues that because of the work carried out in Project preparation and supervision “*along with the successful outcome of the project financial structure to date, the risk that the District of Cartagena would default on its debt service obligations for the project is small*.”⁴⁷¹ The Response explains that during Project preparation, analysis of the District’s financial capacity led to reduce the “*District’s level of commitment and the overall initial loan amount*.”⁴⁷² In addition, “*assumptions and analysis results were discussed extensively with the District, the Government and ACUACAR, and the parties agreed on the viability and risk level of the revised financial structure*.”⁴⁷³ Management concludes that “*the past two years have demonstrated that the financial mechanisms of the loan are robust with the District reducing its cash debt from 62 billion Colombian*

⁴⁶⁶ The District has two representatives on that Board of five Directors—one of which is the Mayor of Cartagena. Any Board resolution requires at least 80% of shareholder approval.

⁴⁶⁷ Request, p.8.

⁴⁶⁸ Request, p.7.

⁴⁶⁹ Request, p.8.

⁴⁷⁰ Request, p. 8.

⁴⁷¹ Management Response, Annex 1, Item 15, p.40.

⁴⁷² Management Response, Annex 1, Item 15, p.41.

⁴⁷³ Management Response, Annex 1, Item 15, p.41.

*Pesos to nearly zero by the end of 2003, while all the funds earmarked for Project investment and loan repayment have been transferred to the trust funds”. Management believes thus that the risk of default raised by the Requesters “is minimal.”*⁴⁷⁴

379. The Panel observes that the District’s financial projections, which the Bank reviewed during Project preparation, showed that the District could afford the level of financial obligations that the Project required. However, other than agreeing on performance indicators with the District to improve IPU collection rates, improve debt coverage ratios, and increase operational surpluses, the Bank neither sought nor included as part of the Project any technical assistance or a plan of action to improve IPU billings and collections and reduce the District’s operating costs. These actions were necessary to achieve the District’s financial projections.
380. At the time of the Bank’s appraisal of the Project, the Ministry of Finance, Dirección de Crédito Público (DCP), independently carried out its own appraisal of the District’s financial situation, a step the Government requires before extending a guarantee of the Loan Agreement made by the Bank to the District. The DCP report of May 31, 1999, concluded that the District was in viable financial condition to assume a Bank loan of US\$85 million and recommended that the Government provide the guarantee to the Bank. That same report recommended that the District strengthen its capacity to collect taxes and rationalize its expenses. As a counter-guarantee, the Government requested that the District pledge to the Government the same funds it had pledged to the Project.
381. In 2000 the District fell into a financial crisis. On June 27, 2001, the Ministry of Finance, through the DAF, agreed with the District on a five-year structural adjustment program that includes debt rescheduling, drastic cuts in operating expenses, and limits on indebtedness. DAF closely supervises the structural adjustment program. Its supervision report of June 30, 2004, concluded that the District’s finances are clearly improving but that it has to continue generating operational surpluses to fully comply with its agreements with DAF.
382. Pledged and earmarked tax revenue projections⁴⁷⁵ up to 2016 show that these sources of funds should be sufficient to repay the Bank loan. Depending on the assumptions made, by September 15, 2016—the date the District’s last loan installment is due to the Bank—the trust fund at La Previsora is estimated to show a balance between zero and US\$8 million.⁴⁷⁶

⁴⁷⁴ Management Response, Annex 1, Item 15, p.40.

⁴⁷⁵ These projections are available in the Project file. A sensitivity analysis was made assuming different growth, inflation, and exchange rates.

⁴⁷⁶ Assuming no growth in the Colombian economy and a 6% annual inflation rate and Col.\$ devaluation rate vis-à-vis the US\$, the trust fund would end with a surplus balance of about US\$1 million.

The District's financial position as of September 30, 2004, showed a budget surplus of about Col.\$20 billion or US\$7.8 million.⁴⁷⁷ A surplus of about Col.\$22 billion was estimated for the end of 2004.

383. Several people interviewed by the Panel stated that great political pressures were directed toward renegotiating the DAF's program, including another rescheduling of the District's internal national debts and an attempt to de-pledge tax revenues, including those that guarantee loan repayments to the Bank. For the near future, the District is considering large investments that are estimated to cost about US\$250 million equivalent: (a) a mass transit system in Cartagena, (b) the construction of a road bordering the Ciénaga de la Virgen, (c) the completion of civil works for a hospital, and (d) city infrastructure improvements to enable the District to host the Pan-American Games. On August 2, 2004, one of the district's senators requested the President of the Republic to transfer to the District the funds that are in the trust fund at La Previsora—which are to be used exclusively to repay the loan to the Bank. Answering in the name of the President, DAF indicated that the Government is willing to review the request as long as it is in compliance with the international agreements signed with the Bank, the fiduciary trust fund agreement signed between the District and La Previsora, and the counter-guarantee agreement signed between the District and the Government. The Director of DAF indicated to the Panel that Colombia would ensure that the District fully honors its commitments under the Loan Agreement. As of October 26, 2004, the trust fund account amounted to the equivalent of US\$14.8 million; however, in 2005 the District will have to make about US\$8.7 million in principal and interest repayments to the Bank.
384. On the basis of present cost estimates, there should be sufficient funds available to complete Project implementation. Since the outcome of the first bidding process for the main Project components was well over the PAD's and the detailed Engineer's cost estimates, ACUACAR proposed a different procurement approach to generate more competition and get prices more in line with original estimates and available Bank financing. As a result of the re-bidding, several contracts came below these original estimates. In dollar terms these revised prices were also the result of the depreciation of the US dollar vis-à-vis the Colombian peso. On the basis of the actual results of these new bids, Management informed the Panel that the cost of all works and equipment procured under the Project up to June 20, 2005, (including the Paraíso pumping station, the on-shore pressure pipe and works for the wastewater treatment plant) amounts to the equivalent of about US\$84 million. The only components yet to be procured are the wastewater treatment plant equipment (with an Engineers's cost estimate equivalent to Col.\$6 million) and the submarine outfall (with an Engineers's cost estimate

⁴⁷⁷ 2005 through 2010 financial projections show increasing operational surpluses from Col.\$21 billion (or US\$7.2 million equivalent) in 2005 to Col.\$50 billion (or US\$12.8 million equivalent) in 2010.

equivalent to US\$23 million). According to Management, although these Project costs may be affected by exchange rates movements and the actual bids for the remaining components, the results of the successful re-bidding process indicate that *“the entire project cost will be no higher than the estimated cost at appraisal, and might be even lower.”*⁴⁷⁸

385. **Project implementation/supervision.** Bank supervision reports provide a great deal of information about the District’s compliance with the performance monitoring indicators that had been agreed with the Bank. However, the Panel found no information on file about the District’s efforts to improve IPU billings and collections and reduce its operating expenses, although the Bank recommended many times that the District do so. No evidence was found that the Bank ever developed a plan of action for its recommendations to the District. In addition, the Panel found no discussion on file about the District’s progress toward and compliance with targets and agreements specified in the adjustment program with DAF. The Bank appears to have been oblivious to this adjustment program, which seems to have been a separate and unrelated exercise that had no relation to the Project. According to statements made to the Panel’s financial consultant, DAF would have been interested in, and would have supported, Bank recommendations in the financial area. The Panel was informed that the Panel’s consultant was the first person from the Bank working on this Project to visit DAF. Thus it appears that the Bank’s financial supervision was limited to discussions with and receipt of information from the District. Furthermore, no evidence is on file that the Bank discussed its recommendations on financial matters with the Contralor Distrital or the Contralor Regional to enlist their support.
386. The Panel observes that it appears that the Bank’s main concern was to ensure that the District had the funding required to finance its share of Project costs and to repay the Bank loan. There is little evidence that the Bank made efforts to improve the District’s financial management and finances in general, beyond seeking agreements on certain performance monitoring targets with the District. By failing to take full advantage of Project supervision work, the Bank missed an opportunity to strengthen the District’s financial capacity. **The Panel notes that although from a strict Project point of view the Bank carried out its due diligence in accordance with its policies and procedures, it misjudged the importance to the Project of improving the borrower’s capacity to collect the IPU taxes.** Pledging a percentage of IPU revenues was not enough to guarantee that the District would be able to meet its financial obligations to the Project.

⁴⁷⁸ Management Memorandum to the Inspection Panel, June 20, 2005.

2. Financial Management Assessment and Financial Capacity of ACUACAR

2.1. Financial Management Assessment ACUACAR

387. **Project preparation and appraisal.** The PAD indicates that “*a project financial management assessment was carried out by a LAC Region Financial Management Specialist (FMS),*” who “*concluded that ACUACAR has all the necessary capacity to manage the financial affairs of the project in accordance with Bank standards.*”⁴⁷⁹ As a result of its review of ACUACAR, the Panel confirms the Bank’s assessment. However, although the PAD provides a brief summary of the assessment, the Panel found no evidence on file showing that an assessment was made in line with the Bank guidelines of that time (the FARAH of January 1995).
388. Because ACUACAR has strong capacity to manage Project funds, during loan negotiations the Bank agreed to ACUACAR’s request that the Bank loan would be disbursed on the basis of quarterly Project management reports (PMRs). According to Section 4.01(b) of the Loan Agreement, the PMRs should be audited each year by independent auditors who should provide a separate audit opinion on the PMRs. Although the external audit reports⁴⁸⁰ for the Project accounts, Project financial statements, and special account have all been received and provide the auditor’s “unqualified opinion,” they do not contain a separate opinion on PMRs. Bank FMSs are of the view that since the audit reports and auditor’s opinion refer to the relevant legal agreement clauses—Section 4.01 (a) and (b)—the auditor has indicated that it has examined the PMRs. These PMRs are the instrument for disbursing the loan. In addition to Project financial reporting, they include both a Project progress report on output monitoring and a procurement management report. Therefore, the Panel notes that it would have been more appropriate for the auditors to provide a separate opinion on the PMRs. The Panel did not find any evidence on file showing who approved the decision that there was no need for a separate audit opinion on PMRs, in spite of the provision in the Loan Agreement and that the Loan Department consulted about this decision.
389. **The Panel finds that the Bank carried out an adequate financial management assessment on ACUACAR in accordance with Bank policies and procedures.**
390. **With respect to supervision of ACUACAR, the Panel finds that the supervision reports on financial management are very complete and informative. Aside from the shortcomings of the audit reports noted above, the Bank has covered this aspect, including financial and operational internal control matters, very thoroughly.**

⁴⁷⁹ PAD

⁴⁸⁰ Audit Reports for years ending 2000 and 2001 by Arthur Andersen, and for 2002 and 2003 by Deloitte, Touche, Tohmatsu.

2.2. Financial Capacity—ACUACAR

391. **Project preparation and appraisal.** The Panel notes that the PAD shows that the Bank carried out an in-depth financial analysis of ACUACAR and ascertained that ACUACAR was able to fulfill all its financial obligations under the Project. The analysis showed that ACUACAR had the financial capacity to repay all of its outstanding debts, including a total of US\$15.4 in debt service, payable to the District in annual amounts of US\$2.2 million between 2005 and 2011. Actual financial results show that ACUACAR has not only been able to fulfill all of its financial obligations to date, but has also generated sufficient profits between 2000 and September 2004 to pay dividends of the equivalent of US\$4 million and US\$3.67 million, respectively, to the District and to Aguas de Barcelona (AGBAR), the private company that manages ACUACAR and holds 45.913% of its shares.⁴⁸¹ Furthermore, between January 1, 2000, and September 30, 2004, ACUACAR also provided AGBAR with additional payments amounting to the equivalent of US\$5.42 million (for a total of US\$ 9.1 million when dividend payments are included). A breakdown of the US\$ 5.42 million shows that ACUACAR paid AGBAR (a) a “technical assistance fee” of about 3.5%⁴⁸² of total billing revenues collected, or US\$4.6 million, and (b) return on capital or “Fondo de Recuperacion de Capital Privado,” which amounted to US\$0.82 million.
392. ACUACAR’s recent financial projections for the period 2004 through 2011 show that it has the capacity to fulfill its obligations under the Project Agreement—it can continue paying off its debts and still make dividend payments to its shareholders and technical assistance fees to AGBAR. A detailed copy of these projections is available in the Project file. The most important assumptions made in preparing the 2004-2011 financial projection refer to tariffs and water/sewerage bill collection rates. As far as tariffs are concerned, the forecast assumption is that the tariff structure and levels agreed with the Water and Sewerage Regulatory Authority (CRAPS) under resolutions CRA 08 and 09 of 1995 and CRA 151 of 2000, which are in force until December 2005, will be applied, and that after that date, no “real” increases will be made (tariff increases will only keep up with inflation). Regarding collection rates, it was assumed that average collection efficiency rates would be 90%; that is, 10% of the billing would remain outstanding. During the first six months of 2004 the collection rate was 91.71%, a large improvement over the 85.2% rate achieved in 2002 and 2003. Moreover, a resolution—CRA287 of May 2004—introduces efficiency factors into the tariffs to be charged by all water and sewerage service providers. ACUACAR believes that the tariff levels, which will

⁴⁸¹ Other private shareholders that hold 4.087% of total shares were paid US\$ 0.33 million.

⁴⁸² This percentage varies and is established each year by ACUACAR’s Board of Directors

have to be renegotiated with CRAPS and the Superintendencia de Servicios Publicos Domiciliarios (SSPD) before the end of 2005, will not change significantly.

393. As of September 30, 2004, ACUACAR had spent the equivalent of about US\$3.5 million in energy costs, and it expected to have spent about US\$4.7 million by year-end. However, in 2006, when the submarine outfall is expected to become operational and all the planned water and sewerage connections are in place, the energy costs will jump to about US\$5.6 million, mainly because of the very large increase in pumping required to send the sewerage over more than 20 km north and into the sea. It is estimated that about one-third of the total energy costs from 2006 on will be related to sewerage. In 2004 energy costs represented about 45% of direct operational costs, and in 2006 this percentage will increase to about 51%. ACUACAR foresees that increases in services, in both sewerage and water connections, will increase total revenues and hence cover most of the energy cost increases.
394. **The Panel finds that the Bank satisfactorily carried out its due diligence during Project preparation with regard to ascertaining ACUACAR's financial capacity in line with its policies and procedures.**

2.3. Bank Supervision of ACUACAR

395. The Panel notes that the Bank has supervised financial and operating matters closely. Not only did the Bank monitor compliance with performance monitoring indicators, but it also kept in close contact with ACUACAR's management, suggesting improvements in both financial management and operational matters. The relationship with ACUACAR was and remains very close. The Bank discusses its supervision report recommendations with ACUACAR. It appears that there was no need to develop action plans on the Bank's recommendations since ACUACAR was receptive to making improvements as recommended.
396. The Request states that *"ACUACAR now operates almost beyond any external checks on its control over designing and executing the City's Master Water and Sewerage Plan, of which the outfall project is a major component; evaluating bids and awarding contracts; and managing project finances."*
397. The Panel notes that the Superintendencia de Servicios Publicos Domiciliarios (Superintendence for Public Household Services- SSPD) carries out yearly operational audits on ACUACAR, and particularly reviews whether (a) the yearly investments agreed under the City's Master Plan have been implemented, and (b) as stated before the tariff structure and levels applied by ACUACAR are in line with the tariffs that have been

approved under resolutions CRA 08 and 09 of 1995 and CRA 151 of 2000. SSPD also ensures that the quality and efficiency of service are in line with agreed targets. In addition, at the request of ACUACAR's Board of Directors, ACUACAR has hired external independent auditors (PriceWaterhouseCoopers) to carry out yearly operational audits that use terms of reference that are similar to SSPD's but also include a review of ACUACAR's financial internal control procedures and cost and revenue projections. Moreover, ACUACAR's accounts, financial statements, and the processes by which it procures goods, works, and services are also audited each year by external independent auditors (Deloitte, Touche, and Tohmatsu), and the audit report is sent to ACUACAR's Board, where the District has two representatives—one of them the Mayor of Cartagena. Furthermore, ACUACAR's operations and accounts are also audited by the Contraloría General de la República on a rotating basis, as well as by the Contraloría Distrital.

398. In addition, to all this, at least twice a year the Bank carries out formal Project supervision missions in line with standard Bank practices reflected in OP/BP 13.05 and ascertains that Project implementation is in compliance with the Loan and Project Agreements. Project supervision reports prepared by the Bank show that ACUACAR executes procurement processes, signs contracts, and manages Project funds as part of standard implementing agency responsibilities. So far ACUACAR has complied strictly with the provisions of the Project Agreement, including seeking the Bank's no-objection for all important activities related to Project execution. Hence, **the Panel finds that the Bank closely supervises the performance of ACUACAR and is in compliance with its policy on Project supervision, OP/BP 13.05.**

3. Risk of default on the Bank loan

399. The Requesters claim that the District of Cartagena did not have the financial capacity to take a US\$85 million loan and the citizens of Cartagena will ultimately bear the consequences of this. In responding to this complaint it would be useful first to explain the Project finances and forecast, and the District's financial obligations toward the Project. With this perspective it is easier to judge the likelihood of default.
400. The original total Project cost estimates were US\$117.18 equivalent. This amount was to be financed by a Bank loan to the District of US\$85 million, a contribution from the national Government of US\$20 million equivalent, a contribution from the District of US\$7.58 million equivalent,⁴⁸³ and a contribution from ACUACAR of US\$ 4.60 million equivalent. In addition to its Project contribution, the District is responsible for repaying the US\$85

⁴⁸³ This amount has already been transferred to ACUACAR. Therefore, the District has already fulfilled its Project funding obligation.

million Bank loan plus the interest and other charges on the outstanding principal of said loan. ACUACAR will shoulder US\$15.4 million of loan repayments, reducing the District's loan (principal) repayment liabilities to US\$69.6 million. As of June 21, 2005, the equivalent of US\$36million had been disbursed from the Loan account, and thus about US\$49 million remained to be disbursed. To fund the remaining Project costs the following amounts are also available: US\$20 million equivalent in interest-bearing bank accounts held by ACUACAR on behalf of the Project; and US\$1.8 million equivalent which has been included by the national Government in its 2005 budget.⁴⁸⁴

401. **The Panel finds that at the time of Project preparation the Bank carried out detailed financial analyses and projections, including sensitivity tests, on the revenue and cost statements for the District of Cartagena and ACUACAR.** These are summarized in the PAD. Also, to ensure that the District would not default on Bank loan repayments, the District agreed with the Bank (aside from the guarantee of the national Government) to pledge and earmark specific tax receipts⁴⁸⁵ for Project funding and loan repayment. Moreover, ACUACAR's financial projections, which have also been reviewed by the IP's financial specialist, indicate that ACUACAR has the capacity to fulfill its obligations under the Project Agreement. **The Panel finds that the Bank adequately carried out financial projections for the District as well as for ACUACAR and reached satisfactory institutional arrangements to ensure proper Project financing and loan repayment. The Panel finds that the Bank carried out its due diligence with regard to repayment of the loan in line with OP/BP10.02.**

⁴⁸⁴ The difference between Project cost savings and the surplus available is the payment of the Bank fee out of the loan.

⁴⁸⁵ See supra note 457.

TABLE OF FINDINGS

ISSUE	MANAGEMENT RESPONSE	PANEL'S FINDINGS
ENVIRONMENTAL COMPLIANCE		
Environmental Assessment: Project Screening	EA process was in compliance with OD 4.01 for Category A Projects and takes into account the goal of avoiding damage to human health and the marine environment. Because a submarine outfall, if not properly mitigated, could cause negative environmental impacts, the Project was categorized as A to ensure that proper analysis and mitigation measures were incorporated in its design and implementation.	Environmental screening appropriate and in compliance with OD 4.01.
Stage in Project Cycle	In determining how to proceed with identifying the appropriate wastewater disposal solution for Cartagena, multi-phased approach used, which included: the Feasibility Study (FS) for Wastewater Treatment and Disposal in Cartagena, containing the analysis of alternatives (Hazen & Sawyer, 1998) Environmental Diagnostics of Outfall Alternatives for the Disposal of Wastewater in Cartagena (Hazen & Sawyer, 1998), the Social Impact Assessment of Cartagena Sanitation Project (Vasquez and Baquero, 1998) and the EA for the Wastewater Management Plan of Cartagena (Fundación Neutrónicos, March 1999).	EA for the Project initiated early in the Project cycle, and in this respect complied with OD 4.01.
Analysis of Alternatives	FS analyzed comprehensive set of alternatives combining different treatment and final disposal sites, including all but one of the options proposed by Requesters, and all alternatives were evaluated from technical, economic, environmental, and social perspectives. FS study identified submarine outfall as the preferred alternative. International consulting firm conducted FS study; Panel of Experts (POE) reviewed FS, EA and final design specifications for marine outfall. The Colombian Oceanographic Institute (CIOH) reviewed and approved EA and FS, and regional environmental authority, CARDIQUE, issued environmental license ratified by Ministry of Environment.	Study of alternatives covered most of the alternatives for this type of Project and evaluated basic parameters. In this respect, Bank complies with OD 4.01, paragraph 4 and Annex B (f). Panel is concerned about diligence with which alternatives other than the preferred alternative of submarine outfall were studied. Voluminous FS and EA, which closely follows the FS, give greater attention to submarine outfall and do not demonstrate systematic comparative study of all alternatives as required by OD 4.01.
Selected Option:	Extensive studies determined that from	Disposal of sewage to sea via a

ISSUE	MANAGEMENT RESPONSE	PANEL'S FINDINGS
Submarine Outfall	technical, economic, environmental and social perspective, optimum alternative for disposal of Cartagena's wastewater was preliminary treatment and marine outfall to the Caribbean Sea.	<p>submarine outfall is tried and proven technology which, under suitable conditions, offers low-cost low-maintenance solution for acceptable disposal of human wastes.</p> <p>FS and EA did not address possible long term environmental and health effects on coastal and marine environment if there were multiple outfalls in the area and volume of sewage and organic wastes increased significantly so as to exceed absorptive capacity of marine area. This is issue that may need to be addressed in future.</p>
Punta Canoa as the Location for the Outfall	<p>Oceanographic studies used to determine best discharge site. After consideration of patterns of wind, current speed and direction, wastewater coliform loadings, and bacterial decay rates, Punta Canoa, located about 20 km north of Cartagena, was selected. Site is least cost alternative because sea bottom slope is quite steep, so length of outfall that reaches deep water at that site is only 2.85 km. Other sites nearer the city have very mild bottom slopes, requiring very long outfall (about 9 km) to reach deep enough water. Combined cost of onshore and offshore pipes was lowest for Punta Canoa site. Water at Punta Canoa site is highly turbid due to current from the Rio Magdalena and obscure; light does not penetrate even during daytime and visibility is limited to approximately 50 cm.</p>	<p>In terms of assimilative capacity Punta Canoa coastal waters could be a suitable site for outfall if necessary precautionary measures are taken in design to ensure proper dilution of effluent so that nutrients are at acceptable level, and to ensure decay of pathogens to level safe for human contact.</p>
Proposed Design of the Submarine Outfall	<p>Submarine outfall as designed provides adequate protection against harmful bacteria from waste flow reaching nearby beaches. For purpose of modeling and to predict shore contamination levels, extensive baseline measurements of currents, temperature, salinity, waves, density stratifications, and tidal height carried out. Extensive mathematical modeling was done.</p>	<p>While necessary ocean modelling studies were conducted, methodology used did not capture possibly important influence of wind on near surface currents in stratified water column. This influence could affect assessments of dilution of effluent and the risks of contamination to marine and coastal environments.</p> <p>If three-dimensional model, rather than two dimensional, were used to assess risk, diffusion patterns and estimates of shoreline concentrations may be different and greater certainty regarding risk could be secured. Results could affect distance from shore and depth required for safe disposal of Cartagena wastes .</p>

ISSUE	MANAGEMENT RESPONSE	PANEL'S FINDINGS
Use of a Panel of Experts	Panel of Experts composed of internationally recognized experts conducted six meetings to review FS, EA and final design specifications for marine outfall. After feasibility stage, three members with broad wastewater management expertise were replaced by two new experts in pipe design and installation and one in High Density Polyethylene outfall installation.	Appointment of a Panel of Experts to review technical work in feasibility study and design of Project consistent with Bank policies, particularly 4.01 para. 13. Panel is not convinced there was sufficiently thorough analysis of alternatives before decision on outfall was made.
Risk of Diapirism (mud volcanism)	FS and EA analyzed the issue. Additional studies conducted by Marine Resources Inc. and expert hired by ACUACAR confirmed conclusions of EA and FS that risk of diapirism, or mud volcanism, in the area is low because of absence of large magnitude seismic activity and magmatic volcanism. During licensing process, CARDIQUE reviewed Marine Resources study and agreed with findings, but recommended that District of Cartagena take low geological risk into account in technical specifications for outfall.	Potential for pipeline to be ruptured or otherwise significantly disturbed by diapirism appears to be low. Since study cited by Bank found diapirism about 300 meters from outfall and eyewitness accounts cite diapirism of Punta Canoa in 1979, it may be useful to have side scan sonar survey of proposed outfall trajectory to map subsurface soil structure to depth of low frequency sonar penetration to reduce any remaining uncertainty regarding possibility of diapirism extending to the outfall, and to publish results.
The Land Conveyance System (Routing, Pumping Stations and Treatment Plant Locations)	Analysis of alternatives carried out in FS is exhaustive and sound. FS identified and analyzed comprehensive set of alternatives. Study considered nine land conveyance routes in four corridors. All alternatives evaluated from technical, economic, environmental and social perspectives.	For selected option of submarine outfall, analysis of alternatives for land conveyance systems, liquid disposal locations and pipeline corridors, in terms of their potential health and environmental impacts, meets OD 4.01 requirement that alternatives be considered. Bank staff exercised due diligence in considering alternatives and mitigation measures and complied with OD 4.01 on EA.
Overland Pipeline Design	Analysis of alternatives carried out in FS is exhaustive and sound. FS identified and analyzed comprehensive set of alternatives. Study considered four outfall pipe diameters, five types of pipe material. Project supports development of contingency plan for collection, treatment and disposal of wastewaters. Plan can be activated in case of emergency of any sort in outfall line and involves deployment of geotechnical specialists and engineers specialized in this type of work.	Ground water monitoring is important to identify leakage and actions to mitigate it. Issue was neither analyzed in 1999 EA nor addressed in the Environment Management Plan. After reviewing contingency manual, the Panel remains concerned about the adequacy of the planning for emergencies. Records examined do not clarify whether Paraíso pumping station system provides for storage area in case of emergencies.
Disposal of Sludge		Project environmental studies did not consider alternatives for disposal of solids recovered during preliminary treatment of sewage stream. In this respect,

ISSUE	MANAGEMENT RESPONSE	PANEL'S FINDINGS
		<p>Management does not comply with OD 4.01. Although Management now asserts that plan exists for disposal of sludge, Panel has not been able to find consideration of alternatives for disposal of sludge as required before finalizing plan.</p>
<p>The Monitoring Program</p>	<p>In period leading up to Project Phase II, intensive monitoring program of sea water and sea bed at outfall will be carried out. If monitoring indicates that fecal coliform discharged through outfall are reaching bathing beaches or points to any other water quality problems resulting from effluent discharge, design of Phase I treatment plant includes as a precautionary measure chlorination installations that would eliminate or greatly reduce pathogenic organisms in the effluent discharged into the sea. Other possible measure would be to add coagulants to raw wastewater prior to entry to treatment plant to remove solids and organic material. Intensive monitoring has been required under Environmental License issued by CARDIQUE, as precautionary measure and for gathering information for second stage of the Project</p>	<p>In requiring monitoring plan with adequate baseline data, Bank complied with provisions of OD 4.01. ACUACAR, as of summer 2003, had prepared baseline data regarding fisheries in the area. This complies with OD 4.01. Essential that these studies be periodically updated to maintain their relevance and to identify changes in water quality or in fisheries.</p>
<p>Project Impacts on Locally Affected Communities</p>	<p>Extensive studies were conducted to analyze impacts on coastal zones. All studies concluded that the planned outfall would minimize risk that the discharged effluent would have any harmful effects on coastal zones, including those near Punta Canoa, Arroyo de Piedra and Manzanillo and those near Cartagena. Impact on local environment and fishing activities were fully assessed under Project. EA, POE review, and assessment by Government of Colombia and Bank all concluded that risk of environmental damage from outfall would be minimal. No evidence that outfall will interrupt economic activity of fishermen from Punta Canoa, Arroyo de Piedra and Manzanillo. Area in vicinity of outfall has little marine life and dilution modeling work has shown no effects on near shore areas and beaches. Fishing activity, to extent it might occur in these areas would not be adversely affected.</p>	<p>In Project preparation, Project's potential effects on fishing not adequately addressed. Panel examined Project records but found no adequate social evaluation and mitigation proposals of potential impacts on local population's lives and livelihood. This not in compliance with OD 4.01.</p>

ISSUE	MANAGEMENT RESPONSE	PANEL'S FINDINGS
Natural Habitats OP 4.04	Studies carried out as part of Project preparation concluded that impacts of proposed outfall on natural habitats and fishing would be negligible. Management concludes that this work conforms to the precautionary approach and complies with OP 4.04. Underwater surveys at outfall site show that area has poor benthic activity and almost non-existent biological resources. This situation, together with low context of toxic materials and heavy metals in effluent discharge, precludes risk of biological assimilation at the outfall site.	Although item (ii) of Project component G on Restoration and Conservation of the Ciénaga de la Virgen Natural Reserve has yet to be implemented (because Project has not yet advanced to a stage where this is applicable,) Bank has otherwise complied with OP 4.04.
Water Resources Management OP 4.07	Analyses undertaken in FS, EA, SA, dilution modeling, and financial and economic analysis have been sound and exhaustive and contain sufficient evidence to demonstrate that effluent disposal through submarine outfalls are highly sustainable on technical, economic, environment and social grounds.	Bank complied with OP 4.07 on Water Resources Management and with OD 4.01 which requires that “water resources management should be environmentally sustainable”. Decision to disregard Ciénaga de la Virgen as a potential place for final disposal of waste after treatment allows for preservation of important ecosystem. FS, EA and supplementary studies document well and analyze condition of biophysical environment, particularly of Caribbean Sea, Bahia Cartagena and Ciénaga de la Virgen. However, they do not consider terrestrial environment in as great a depth.
	SOCIAL COMPLIANCE	
<i>Indigenous Peoples</i>	Social Assessment recognizes that communities of La Boquilla, Manzanillo del Mar, Arroyo de Piedra and Punta Canoa are long-established communities with strong family ties and traditions. However, they do not meet criteria for OD 4.20 with regard to ancestral territory, self-identification, indigenous language or presence of customary social and political institutions. OD 4.20 does not apply. Further, the communities living in the North Zone of Cartagena are also not recognized as indigenous people under Colombian Law.	No “specialized anthropological and sociological experts” consulted in this decision, contrary to intention of OD 4.20. Afro-Colombians who submitted Request meet most of OD’s criteria, except for “an indigenous language,” and arguably a “primarily subsistence-oriented production.” Afro-Colombians could reasonably be regarded as “social groups, with social and cultural identity distinct from the dominant society,” and hence as indigenous peoples. But because of the absence of arguably two of the policy criteria failure to do so in this specific case may not be noncompliance with “judgment” called for in OD 4.20, para 5. If Afro-Colombians were regarded as

ISSUE	MANAGEMENT RESPONSE	PANEL'S FINDINGS
		indigenous people, provisions of OD 4.20 would have applied.
Indigenous Peoples Development Plan	No indication that indigenous peoples would be affected by the proposed works. Therefore, no need for indigenous peoples development plan.	<p>No complete list, schedule or financial arrangements of mitigatory measures or compensation for Project's risks for people living in area of proposed outfall.</p> <p>Since Afro-Colombians could reasonably have been regarded as indigenous peoples within indigenous peoples policy, Bank would have been well advised to require Indigenous Peoples Development Plan (IPDP) or similar document identifying impacts of Project on these people and providing mitigation measures for risks and potential harm, particularly in light of inadequacies of the Social Impact Assessment.</p>
Social Impact Assessment Identification of Impacts on Affected Communities	Social and economic effects of Project on villages of Punta Canoa, Arroyo de Piedra and Manzanillo del Mar (the North Zone) have been appropriately assessed and ACUACAR and Bank staff have taken adequate steps to address concerns of village residents. The SA: (i) assessed social and economic conditions of target population, including the communities of the North Zone, and established baseline for monitoring and evaluation purposes; (ii) consulted beneficiaries about priority needs and concerns about the Project; (iii) identified community-based organizations to support Project execution; (iv) identified obstacles and social risks; and (v) prepared, as required, an impact mitigation program. Resulting North Zone water supply and Social Impact Mitigation and Community Development Program, together with activities to be supported by District, address Project's social and economic impacts in general, and, in particular, impacts on communities of Punta Canoa, Arroyo de Piedra and Manzanillo del Mar.	<p>Social Impact Assessment (SIA) unsatisfactory with respect to analysis of Project's impacts upon communities living in North Zone of Cartagena who presented the Request. Irrespective of whether Afro-Colombians are classified as indigenous peoples or not, they are affected by Project because of exposure to wide range of risks as a result of construction and operation of the Project.</p> <p>EA and Management erred in concluding that fishing in area of influence of outfall is negligible or unimportant in affected communities without more detailed studies about the issue.</p> <p>SIA does not adequately address compensation for bearing most of the risk of negative impacts of sewerage component for Project.</p>
Benefits for Afro-Colombian Communities in the North Zone	North Zone communities will benefit from the Project in many ways: piped waters services to Punta Canoa, Arroyo de Piedra and Manzanillo del Mar; sanitation services for these communities, should additional funds exist, in-house sanitation facilities; two communities	These communities may be exposed to significant risks under Project. Some compensation for potential impacts provided under Project, in accord with OD 4.01. Communities will receive piped water, a significant benefit for communities. However, unclear whether

ISSUE	MANAGEMENT RESPONSE	PANEL'S FINDINGS
	<p>centers in La Boquilla and Punta Canoa; orchard for Punta Canoa for post-construction reforestation activities and to provide additional revenue source; work opportunities during construction; and improvement of environment in general, which will enhance tourism in area creating economic opportunities. ACUACAR is studying how to optimize fishing activity in Punta Canoa and Project funds will be available to implement study recommendations.</p> <p>Social Impact Mitigation and Community Development Program has been developed and will be financed jointly with Borrower. Program for communities around Ciénaga and the North Zone, inter alia, provides these two areas with priority attention through the Citizens Participation and People Development Program, which offers training and assistance to develop small productive activities.</p>	<p>appropriate financial arrangements have been made to implement other benefits, such as sanitation services, and maintenance and operation of community centers. Implementation of beneficial measures seems to be lagging behind. Information about compensatory measures inadequately disseminated to the villages.</p> <p>Panel welcomes proposed benefits for people living in Project area but notes there seems to be no direct relation between such benefits and risks that people may be exposed to as consequence of Project construction and operation. No graduated approach to compensate population for – or mitigate – different risks as they materialize. In this sense, proposed Social Impact Mitigation and Community Development Program seems to fall short in addressing mitigation or compensation for harm related to potential adverse impacts of Project as required by OD 4.01.</p>
Consultations	<p>Provisions of OD 4.01 on EA consultation have been met. Following good practice on consultation, participatory approach used during Project preparation, starting in February 1998, with first Stakeholders Workshop, where first draft of Project design was discussed. In February 1999, second general Stakeholders Workshop took place to discuss final Project design, environmental and social impact mitigation programs, and monitoring processes. Consultations were also undertaken for the Environmental and Social Assessments.</p> <p>Social Assessment – Consultations : local team, comprised of a sociologist and social workers, carried out SA in 1998 under TORs prepared by Bank social specialist who also oversaw execution. SA focused on two areas: (i) urban neighborhoods in southeast Cartagena along the Cienaga de la Virgen; and (ii) rural communities in North Zone of the city where outfall would be built.</p> <p>Environmental Assessment -</p>	<p>During Project preparation there were extensive consultation efforts with people in Cartagena. This accords with OD 4.01. However, OD 4.01 requires that there be extensive consultations with all affected people and that these consultations be timely, meaningful and relevant to Project design and execution. This is particularly important in the case of affected Afro-Colombian communities living in area of proposed outfall, who state they were not consulted about location of the outfall but rather only informed about construction and operation. OD 4.01 requires interaction during preparation of Project.</p> <p>While Project commendably included communications strategy, it failed to reach most members of affected communities in North Zone. Outreach strategy was added too late to deal effectively with Project-related trauma and stress in these communities. Thus, consultations and communications with affected Afro-Colombian communities in area of the submarine outfall did not</p>

ISSUE	MANAGEMENT RESPONSE	PANEL'S FINDINGS
	<p>Consultations: In compliance with OD 4.01, consultations comprising around 250 events involving communities and other stakeholders carried out between 1998 and 2003; these included a study tour for 23 community leaders, including representatives from North Zone communities, to outfall sites in Colombia, Chile and Uruguay; and participation of 23 key stakeholders, including community representatives, in international course on the submarine outfall alternative for coastal cities in the Caribbean, organized by PAHO/WHO.</p> <p>Communication Strategy: ACUACAR, at request of the Bank, implemented Communication Strategy between 2001 and 2002. Specific activities with community leaders in North Zone included: (i) support for creation of association of La Boquilla organizations supporting Project; (ii) support to strengthen Fishing Association in Manzanillo; (iii) information meetings with young leaders in Punta Canoa; and (iv) specific campaigns addressing community fears about outfall.</p>	<p>comply with OD 4.01.</p>
Consultations and Willingness-to-Pay Surveys		<p>Connection to water and sewerage network of utmost importance for North Zone communities. However, no evidence that formal consultation process on all aspects of water and sewerage issues took place with community of Punta Canoa. Panel finds willingness-to-pay surveys did not include Punta Canoa (or Manzanillo) and these communities were not adequately consulted on issues of willingness to pay and water tariffs.</p>
ECONOMIC COMPLIANCE		
Economic Evaluation of Alternatives	<p>Comprehensive economic analysis carried out during Project preparation complies with OP 10.04. In FS all alternatives evaluated under an economical standpoint (as well as technical, environmental and social) and initial investment costs, operation and maintenance costs and land uptake were among the main comparison criteria. Analysis concluded that net present value cost of outfall was about USD 35 million less than next best</p>	<p>When environmental license was issued for submarine outfall requiring primary treatment in ten years, under OP 10.04, Bank should have recalculated costs of selected alternative and reviewed economic analysis in light of new licensing requirement. Panel estimates from recalculated costs appear to be close to those of several other options.</p> <p>Having acknowledged uncertainty about</p>

ISSUE	MANAGEMENT RESPONSE	PANEL'S FINDINGS
	alternative, land application, and about USD 60 million less than lagoons. In relation to location of outfall, submarine outfall was further analyzed to determine optimum location, based on economic as well as environmental criteria.	land prices, analysis in FS did not provide clear justification for prices used in costing of Project alternatives involving land. Given longstanding controversy concerning preferred option to address city's wastewater problems, it would have been prudent to have had Panel of Experts include a wider range of expertise, to provide more authoritative findings about both socioeconomic impacts and economic costs of the alternatives considered.
Economic Analysis and Compliance with OP 10.04	Comprehensive economic analysis carried out during Project preparation complies with OP 10.04. This included cost efficiency analysis in FS and subsequent cost-benefit analysis carried out by Bank team and consultants. Additional economic and financial analysis done to improve Project design and eliminate investments for which estimated return was negative. Analysis included non-monetary benefits, financial, economic and distributional aspects, poverty impacts and externalities, and sensitivity and risk analysis.	Little discussion about connection fees for access to new water and sewerage services, although they are potentially controversial and might influence economic performance of Project, particularly in relation to poorer consumers, as previous Bank experience confirms.
Cost Benefit Analysis	Comprehensive economic analysis carried out during Project preparation complies with OP 10.04.	No reference made as to whether Bank performed any checks on validity and reliability of data, although they formed essential building blocks for analyses. Even though it would not have been feasible to scrutinize and validate all parts of these data, PAD should have examined issue of data reliability as part of showing compliance with OP 10.04.
Economic Viability		PAD did not try to estimate enhanced tourism and recreational benefits likely to be associated with Project. PAD notes that tourism is main income source in city and quotes 700,000 annual visitors and estimated revenues of US\$315 million generated. Under OP10.04 Bank should have considered estimates of these benefits.
Sensitivity and Risk Analysis	Risk analysis was carried out and subprojects with negative benefits dropped or re-designed to improve Project design, and increase both net economic benefits and sustainability.	PAD's sensitivity and risk analysis is inadequate under OP 10.04's provisions relating to risk, because it does not discuss responsiveness of net present values to variation in WTP, explain why

ISSUE	MANAGEMENT RESPONSE	PANEL'S FINDINGS
		calculations for only some of key risks variables are set forth, and presents analysis poorly.
Cost Benefit Analysis Summary in the PAD		Although underlying economic evaluation may have been carried out competently and broadly in line with OP 10.04, parts of material in Annex 4 are not presented and explained in PAD with sufficient clarity, transparency and consistency to demonstrate this compliance. This matters because partial or confusing explanations in PAD risk failing successfully to communicate and confirm to stakeholders nature and robustness of appraisal processes that Bank's operational procedures like OP 10.04 promote and require. This could be important for Project acknowledged to have controversial aspects.
Poverty Reduction	Project complies with OD 4.15 because all studies and reviews conducted with respect to this Project determined that outfall will pose a minimal risk of environmental damage. No evidence that outfall will interrupt economic activity of fishermen from Punta Canoa, Arroyo de Piedra and Manzanillo. Moreover, the three villages will benefit and economic activities in larger area should benefit from the Project.	<p>In view of Project's design and locations that will be affected, there seems little doubt that substantial numbers of poor people in Cartagena are intended to and seem likely to experience significant benefits associated with provision of enhanced access to and quality of water and sewerage services.</p> <p>Evidence on poverty impact analysis in PAD is limited to the highly aggregated 'poor'/'non-poor' columns of Table 6 in Annex 4 and eight poorly proof-read lines of text. Given that the first of the Project development objectives is to improve water and sewerage services and sanitary conditions of the city's poorest population, and where – as with many Projects that may benefit poor people – it is possible that some of the poor may gain while others lose, it is disturbing that more effort was not put in during Project preparation and appraisal to enable sufficient income and/or other data to be assembled to assess Project's impacts on the poor "with any accuracy."</p>
Effects on the Three Communities	No evidence supports claim that outfall will be detrimental to economic activity of fishermen from Punta Canoa, Arroyo de Piedra and Manzanillo and that fishing activity, to extent that it might occur in these areas would not be adversely	Risks of loss of earnings in poor communities which have not been properly and explicitly addressed in Project appraisal. Had this been done, it might have been possible both to reassure concerned communities about levels of

ISSUE	MANAGEMENT RESPONSE	PANEL'S FINDINGS
	affected. Moreover, the environmental monitoring program and additional technical measures will continue to ensure that fishing and tourism will not be impacted.	risk and/or put in place fall-back mechanisms that would provide trustworthy and timely "insurance" or compensation were events to arise. Compliance with OD 4.15.would have meant giving greater and earlier attention to risks and concerns of these communities, whose willingness to accept the location and consequences of the outfall was key to successful delivery of potentially very substantial benefits intended for so many of Cartagena's other poor citizens.
Potential Impacts on Other Poverty-Reducing Investments by the District	Project is consistent with approach laid out in the World Bank Environment Strategy for Latin America and the Caribbean, which prioritizes access to safe water and improving collection and disposal of wastewater. Nevertheless, as OD 4.15 makes clear, the Environmental Strategy for Latin America and the Caribbean is only one element in the strategies that can contribute to poverty reduction.	Decision to focus on water and sewerage investments was not inappropriate, but given the Project's potential consequences in keeping other alternative poverty-reducing infrastructure investments "to a minimum". Potential impact on other poverty reducing investments should have been properly addressed. This could have given confidence that the Project was best use of the scarce financial resources of the District, and thus shown compliance with OD 4.15.
FINANCIAL COMPLIANCE AND SUPERVISION		
Financial Management Assessment of the District of Cartagena	<p>Project complies with financial management covenants in Loan and Project Agreements. In accordance with OP 10.02, the Bank has required audited financial statements for both ACUACAR and Project to be submitted to the Bank on an annual basis. ACUACAR has maintained financial management systems to assure accurate and timely information regarding Project resources and expenditures. In addition, based on Loan Agreement, the District must ensure that the required audits supporting loan withdrawals made under Project Management Reports (PMRs) are carried out in keeping with standards acceptable to the Bank.</p> <p>Bank carried out work in line with good practice on financial analysis in Project preparation and supervision. During Project preparation Bank reviewed the District capacity to manage public funds and concluded that it had appropriate</p>	<p>Because District would not be in charge of Project implementation, Bank decided it would not need to carry out a financial management assessment for the District. Given the assumptions reflected in the PAD—that about 55% of the funds to be made available by the District would come from Unified Property Tax/Impuesto Predial Unificado (IPU) revenues - Bank should have paid more attention to District's internal control and management problems and should have carried out an in-depth financial management assessment of the District. Bank should then have worked with District on an action plan to improve District's property tax registers and its billing and collection systems. Since Bank was aware of District's internal control and management problems, Bank should have required that District, as the borrower of Bank loan, have its accounts and financial statements audited by independent auditors each year and</p>

ISSUE	MANAGEMENT RESPONSE	PANEL'S FINDINGS
	capacity.	<p>provide a copy of the audit report to Bank.</p> <p>Bank should have carried out financial management assessment for District, as the borrower of the Bank loan, at time of Project preparation and appraisal. Since it did not, it did not comply with its own policies and procedures set out in OP/BP 10.02. Furthermore, during initial supervision, while Bank had an opportunity to address problem of shortfall in IPU receipts, it did not actively pursue that matter. Decision making within Bank, as it refers to accepting audit reports not fully in compliance with Loan Agreements, did not follow Bank procedures. Hence, Bank did not comply with OP/BP 13.05.</p>
Project Financial and Accounting Statements		<p>Agreed institutional and financial arrangements for the Project specifically address uncertainties in Requesters complaint, and processes followed comply with the Bank's OP 10.02.</p> <p>District of Cartagena receives sufficient information and assistance from other Government institutions to manage adequately the partnership agreements.</p>
Financial Capacity of the District of Cartagena	<p>Because of work carried out in Project preparation and supervision along with successful outcome of Project financial structure to date, risk that District of Cartagena would default on its debt service obligations for Project is small. During Project preparation, analysis of District's financial capacity led to reduce District's level of commitment and the overall initial loan amount. In addition, assumptions and analysis results were discussed extensively with District, Government and ACUACAR, and parties agreed on viability and risk level of revised financial structure. Past two years have demonstrated that financial mechanisms of loan are robust with District reducing its cash debt from 62 billion Colombian Pesos to nearly zero by end of 2003, while all funds earmarked for Project investment and loan repayment have been transferred to trust funds. Management believes risk of</p>	<p>From strict Project point of view, Bank carried out its due diligence in accordance with its policies and procedures. However, it misjudged importance to Project of improving borrower's capacity to collect the IPU taxes.</p>

ISSUE	MANAGEMENT RESPONSE	PANEL'S FINDINGS
	default raises by Requesters is minimal.	
Financial Management Assessment - ACUACAR	See above.	Bank carried out adequate financial management assessment on ACUACAR in accordance with Bank policies and procedures. With respect to supervision of ACUACAR, supervision reports on financial management are complete and informative. Aside from shortcomings of audit reports that are noted in main text of Investigation Report, Bank has covered this aspect, including financial and operational internal control matters, very thoroughly.
Financial Capacity - ACUACAR		Bank satisfactorily carried out its due diligence during Project preparation with regard to ascertaining ACUACAR's financial capacity - in line with its policies and procedures.
Bank Supervision of ACUACAR		Bank closely supervises performance of ACUACAR and complies with OP/BP 13.05 in this respect.
Risk of Default on the Bank Loan	Work carried out in Project preparations and supervision is in line with good practice on financial analysis. This work entailed a financial assessment of the District and ACUACAR, financial structure of the operation, continued review of both financial performance of ACUACAR and the District as well as financial management of Project. Risk that District would default on its debt service obligation for the Project is small.	<p>At time of Project preparation, Bank carried out detailed financial analyses and projections, including sensitivity tests, on revenue and cost statements for District of Cartagena and ACUACAR.</p> <p>Bank adequately carried out financial projections for District as well as for ACUACAR and reached satisfactory institutional arrangements to ensure proper Project financing and loan repayment. Bank carried out its due diligence in line with OP/BP10.02.</p>

Analysis of the Proposed Waste Disposal System: the Submarine Outfall

**Report by Jorg Imberger, Professor of Environmental Engineering
Centre for Water Research, University of Western Australia**

1.0 Introduction

The following is a relatively detailed assessment of the proposed outfall design put forward by the consultant firm Hazen and Sawyer for the disposal of the wastewater originating from the greater city of Cartagena. Currently this wastewater is allowed to flow or seep into either the Bay of Cartagena or the Tesca Lagoon to the immediate north of the main city. It is important to keep in mind that any disposal system will be an improvement on the current situation, but it is also important to ensure, from the Bank's perspective that any new disposal system should be designed according to "best practice" even though the loan is to a developing country and the current situation can only be described as disastrous. In this report I shall confine my comments to the design of the proposed outfall, other members of the Inspection Panel will report on the various other aspects of the whole World Bank Loan project.

2.0 General Design Considerations

2.1 Dilution

Outfalls achieve their effectiveness by two principles, dilution and increased residence time of the effluent before impacting on either the coastal margin, a marine protected area or on areas used for recreation or fishing. The dilution is achieved first directly by plume mixing as the lighter effluent water rises vertically through the coastal water column; this is called near field dilution. Once at the surface the background oceanic dispersion and or buoyant spreading further mixes the surface effluent plume, but this additional mixing is usually much slower than the near field dilution and requires a large area before becoming an effective mechanism; this is called far field dispersion. Far field dispersion and transport, however, are also used, in a properly designed outfall system, to prevent the effluent-ocean water mixture from impacting on sensitive areas for a time sufficient to allow the sunlight and the ocean salinity to break down potentially dangerous pathogens. Typically, an outfall configuration is designed to use both the initial dilution in the near field and the retention time in the far field to ensure the safe disposal of the three different classes of pollutants in a domestic sewage effluent; pathogens, nutrients and synthetic organics.

2.2 Pathogens

Pathogens, measured with indicator species such as total or fecal coliforms, occur in raw effluents in concentrations of about 10^{11} counts m^{-3} . In order to be safe for human contact

their concentration must, in general, be reduced to 10^7 counts m^{-3} , a reduction of 10^4 (Roberts (2004)). This may be achieved by bringing the effluent water close to the ocean water surface so that sunlight can kill the pathogens after the effluent has been diluted by the action of the outfall diffuser. The project assumed that pathogens decayed by factor of 10 every 2 hours (Hazen and Sawyer (1998), Figure 1).

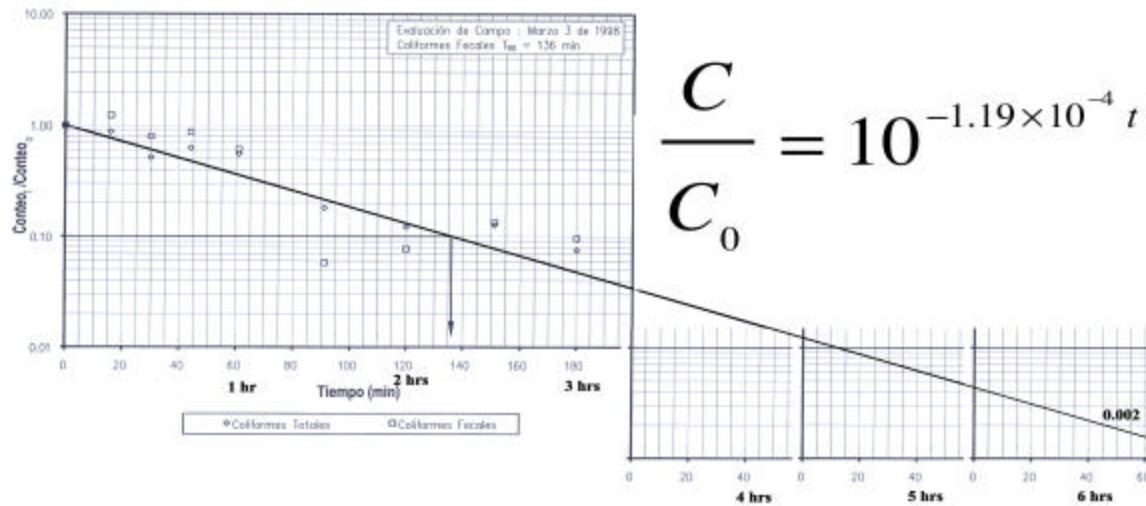


Figure 1: Total Coliform Decay Rate, based on Figure 8-21 Hazen and Sawyer (1998). No description is given on the environmental conditions at which the tests were carried out.

With this assumption the effluent plume water must be brought to the ocean surface with a dilution of 10 and then remain in direct sunlight for a period of 8 hours before impacting on either the Punta Canoas shore area or the traditional fishing areas of the Afro-Columbian community. This time may be a shorter depending on the dilution in the diffuser plume. The above assumed death rate was based on tests carried out by Hazen and Sawyer (1998) and these data are reproduced in Figure 1. The graph was extrapolated to about 8 hours for convenience.

Four major issues must be raised with respect to the data shown in Figure 1.

- The decay rate is a strong function of light intensity, temperature and salinity.

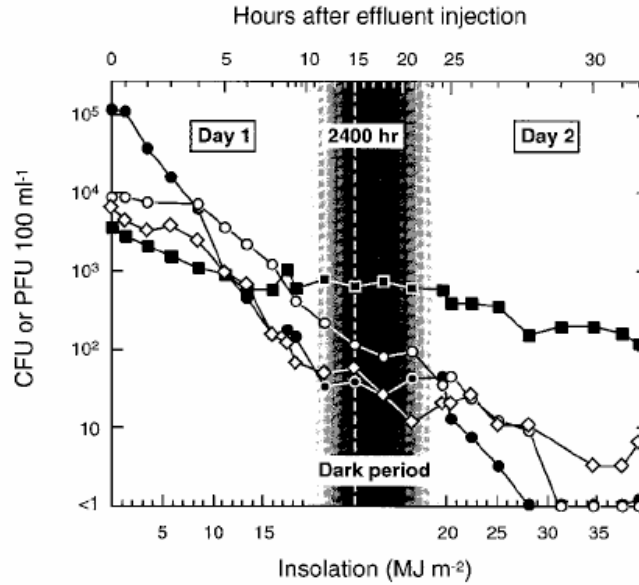


FIG. 6. Inactivation in seawater of somatic coliphages (■), F-RNA phages (◇), enterococci (○), and fecal coliform bacteria (●) from untreated sewage, as a function of insolation and time. The insolation scale is linear during daylight hours; the time scale is linear during the overnight period. Samplings in which no CFU were detected in 100 ml are presented as <1 on the (\log_{10}) y axis.

Figure 2a: Decay Properties of Coliform as a Function of Insolation (Sinton et al (1999)).

Neither the temperature nor the salinity vary greatly at the site under consideration, but the light intensity does. In general the cumulative death is a function of total irradiance as seen in Figure 2 (Sinton et al (1999)). The Solar insolation in Cartagena would most likely vary from 10 to 20 MJm⁻²d⁻¹ so from Figure 2, an organisms close to the water surface would decay by a factor of 10⁴ in the 12 hour of daylight. This agrees with the data presented by the proponents.

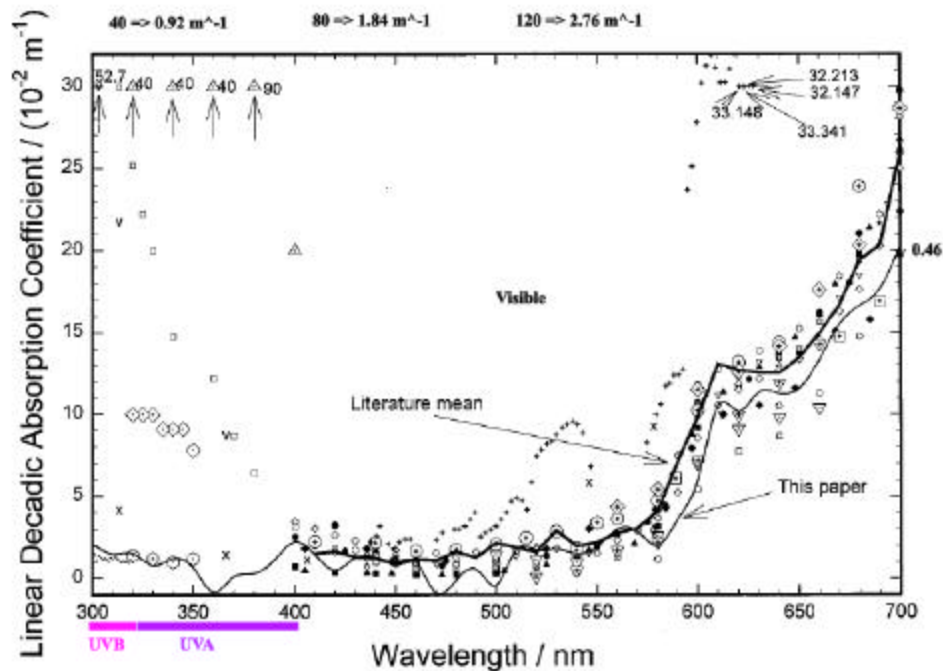


Figure 2b: Published linear decadic absorption coefficients of pure liquid H₂O in the 300–700-nm region. Caption and figure from Litjens et al (1999).

The key that relates the symbols in this figure with the authors and references and detailed conditions of measurement are given in Litjens et al (1999). The thick curve shows the means of 27 literature values, plotted at 10-nm intervals from actual data or interpolated data ~provided that a sufficient number of points were available. Because of the large divergences of literature values in the 300–400-nm region, the literature mean is not continued below 400 nm. The thin curve shows the means, similarly plotted, of triplicate determinations from the present study at 298.1 K. Many of the literature values in the 300–400-nm region are so large they do not fit on the graph. Each of these values is designated by an arrow that marks the wavelength and by a number that indicates the linear decay absorption coefficient in inverse meters. A similar problem associated with the recent determination by Ravisankar *et al* (1988) in the 400–700-nm region is dealt with in the same way. The small dots between 300 and 320 nm represent the edge of the accurate data for the 200–320-nm region determined on highly pure water in a previous study from our laboratory.

However, organisms in an effluent plume do not all aggregate near the water surface, but rather are contained, most likely, uniformly in the surface layer. Below we derive an

expression for the thickness of the surface layer, but let us assume here that it is h and that all organisms are mixed uniformly within this surface layer. Further if H_0 is the insolation at the water surface then the insolation H at depth z is given by (Fischer et al (1979)):

$$\frac{H}{H_0} = e^{-kz},$$

where z is the water depth and k is the extinction coefficient for the radiation wavelength that has the maximum impact on such micro-organisms (the most effective wavelength depends on the organism, but the UVA and UVB wavelength is usually most effective, see Figure 2b) . Hence if h is the depth of the layer of effluent and H_0 is the surface radiation then the average radiation for the surface effluent plume is given by the

$$\bar{H} = \frac{H_0}{h} \int_0^h e^{-kz} dz = \frac{H_0}{kh} (1 - e^{-kh})$$

As seen from Figure 2b the extinction coefficient for wavelengths in the UVA range is very sensitive to organic impurities in the water column (Litjens et al (1999)); pure water has a value $k=0.05$, but even a small amount of impurities takes this up to around $k=3.0$. For the case where $k = 3$ and $h = 1$, typical for Cartagena waters; one insolation day becomes three actual days. Hence since little decay occurs over night (Figure 2.) the effluent water would need to remain “out of harms way” for about three full days, not simply 8 hours as assumed by the proponents. Further, it must be stressed that different organisms respond very differently to insolation, with Fecal Coliforms being the most susceptible to decay and cryptosporidium being most resistant.

- Recently Littlefield-Wyer (2004) and Power et al (2004) found that under some conditions, Coliforms actually grow in the water column, rather than die. It is difficult to be quantitative as this work is very new.
- New evidence has now shown that Fecal and Total Coliform are not good indicator species when pathogens such as Cryptosporidium are present (Hipsey et al (2004a, b, c) Brookes et al (2004)). These latter organisms can be very dangerous to human health and show very much more resistance to decay than Coliforms. They also have different binding properties to sediments and so are less likely to settle out with any sedimentation. To take this into account a much more detailed analysis of the raw sewage would need to be carried out.

The last two points have only recently been documented, so it is reasonable to assume that Hazen and Sawyer may not have been aware of these complications, but the light extinction effect is obvious and should have been included.

2.3 Nutrients

Nutrients in an effluent lead to enrichment of the receiving waters. The concentrations must be diluted close to the background levels in a contained area. Typical concentration of mineral content in an effluent both dissolved and particulate is around $3 \times 10^{-1} \text{ kgm}^{-3}$ whereas the average concentration around Punta Canoas is about $3 \times 10^{-4} \text{ kgm}^{-3}$,

requiring a dilution of $1:10^3$ or a factor of 10 less than what is required for safe pathogen disposal without decay. It would be interesting to know whether the primary production in the coastal area adjacent to the proposed site is nutrient limited. It is not nutrient limited then a properly designed outfall would have a negligible impact on the area. On the other hand if phosphorous is limiting then the outfall effluent would stimulate primary production which in turn would faster growth in the upper levels of the trophic food chain; most likely the fish density would increase. There did not appear to be any discussion in the various reports on the nutrient status of the water, but given that the Magdalena River has a strong influence in the area it is likely that light is the limiting factor.

2.4 Organic Load

Organic load from an effluent, without appropriate dilution, can draw down the oxygen levels in the surrounding waters to undesirable levels. Typically, untreated effluent has a BOD (Biological Oxygen Demand or the loss of oxygen concentration in 5 days) of around 100mg/l. The receiving water near Punta Canoas has a BOD (Red de Vigilancia para la Conservación y las Aguas Marinas y Costeras de Colombia (REDCAM (2003)) of around 0.1 mg/l. Hence BOD again requiring a dilution of around $1:10^3$.

2.5 Synthetic Organics

Typically, domestic effluent contains a large number of substances such as pesticides, herbicides and hormones, the latter being the substances most recently receiving attention because they interrupt the nature genetic balance of secondary produces, including fish. There is no discussion in the report about the probability that such substances could lead to problems. Given that the Magdalena is essentially a sewer for all of Colombia, it is unlikely that such substances will have a greater impact than already exists. However, a discussion about the potential problems would have been useful.

3.0 The Proposed Outfall Design

3.1 The Location

The Municipality of Cartagena is situated on the coast of the Caribbean Ocean as shown in Figure 3a. The City has a population of about 1 million people, 750,000 of who are classified in the 1, 2 or 3 poverty categories. The site on which the city was built contains the Bay of Cartagena to the south of the city and the Lagoon of Tesca to the immediate north of the main city. The other feature that is noteworthy is the Marine National Park about 30 km south of the City, the main attraction there being the coral reef ecology. As seen from Figure 3b the bathymetry (Courtesy Serguei Lonin, CIOH) is such that the depth falls of quite rapidly, particularly opposite Punta Canoas, the proposed site for the outfall.

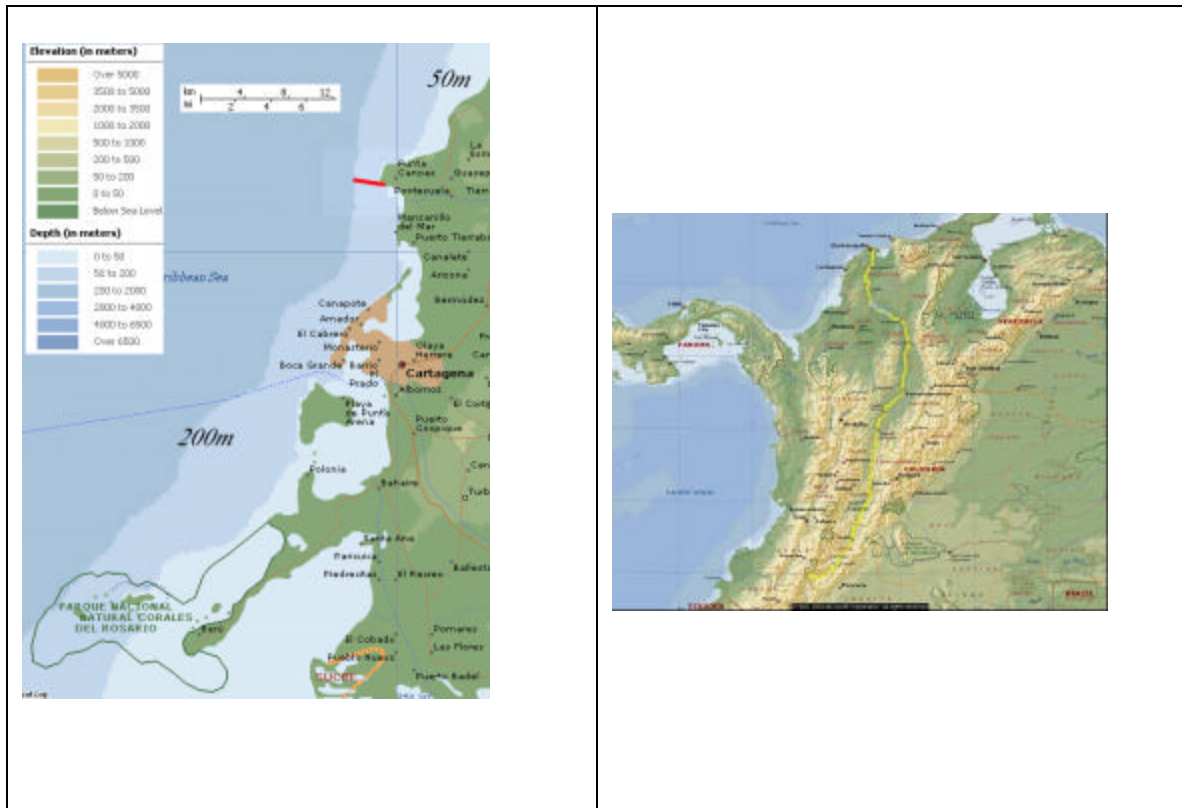


Figure 3a General Overview of Cartagena and b) the Magdalena Drainage Basin (Courtesy CIOH)

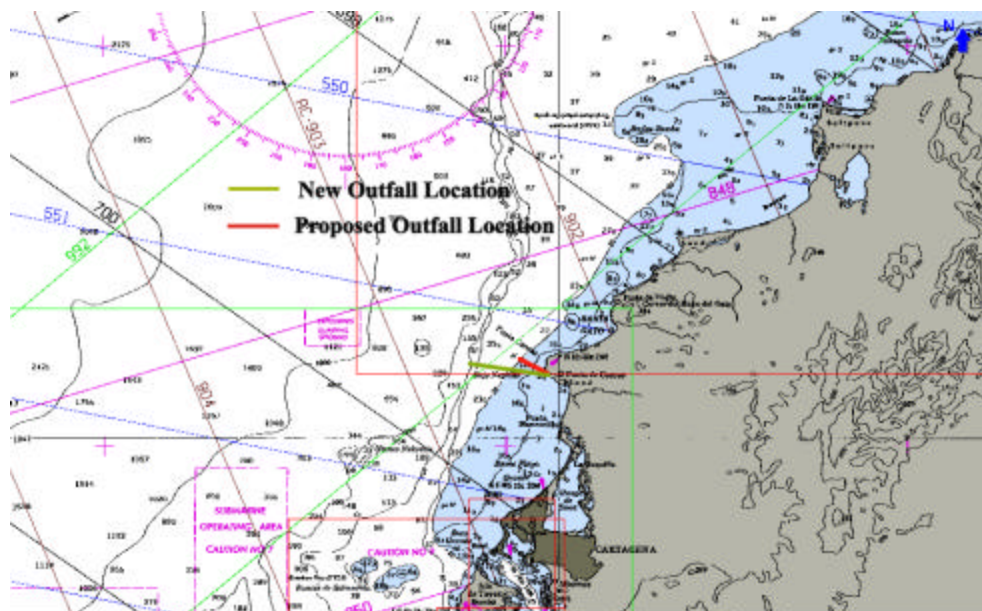


Figure 3c Bathymetric map of Coastal Waters off Cartagena (Courtesy CIOH)

3.2 The Assimilative Capacity of the Area

The Colombian Caribbean Coast comprises complex and dynamic ecosystems whose main biological environments are estuaries, bays, coastal lagoons, coral reefs and mangrove ecosystems. The region is home to many different activities from manufacturing industries, located mainly in Cartagena and Barranquilla-, an oil terminal and refinery, international maritime and trade terminals, the Carrejón minefield, the tourism industry, the agrochemical industry, small-scale and industrial fishing, agriculture, salt mines, among others.

The continental Caribbean region, through its water systems, is receptor of the environmental impacts of the natural and anthropogenic processes of the Andean region that, together with the Caribbean region itself, houses nearly 90% of the population of the Columbia. The main hydrographical basin influencing the Caribbean Coast is the Magdalena Basin, covering a large portion of the centre and north of Colombia. The Magdalena river flows northward through the Colombia's Andes along 1540 km down to the Caribbean Sea (Figure 3b). Along the way, this River is the main pathway for organic and particulate material generated by the main Metropolitan areas of Colombia. The river has an average discharge of $7100 \text{ m}^3/\text{s}$ and a watershed of 250000 Km^2 . Although it is known that this River carries high levels of contaminants to the Sea, the influence these substances have on the biological and chemical process of this Region is largely unknown.

In order to gain an appreciation of the potential influence of the proposed outfall on a regional scale and assess the assimilative capacity of the region it is useful to compare the loads from the proposed outfall to those originating from the Magdalena River that drains most of Columbia and enters the ocean near Barranquilla about 100 km north of Cartagena. The comparisons are shown in Table 1. From Table 1 it is seen that the impact of the proposed outfall is very small in terms of freshwater input, small in terms of nutrient and organic load, but comparable in terms the pathogen load. However, it is important to note that when considering pathogens it is the concentration that counts and not the total load. In terms of concentration, the water from the Magdalena is marginally acceptable (approximately equal to upper immersion limit), but the concentration of the outfall effluent is 10^4 too high for pathogens and 10^3 too high in terms of nutrients. Thus in terms of assimilative capacity the Punta Canoas coastal waters are a suitable site for an outfall, but the outfall must produce at least a dilution of $1:10^3$ in order to produce acceptable nutrient levels and must have a decay rate for pathogens of at least 1:10 combined with the dilution to reduce the pathogens to an acceptable level.

Table 1: Properties of Water in the Outfall, Magdalena River and Coastal Waters (Source, various INVEMAR Reports)

Description	Outfall	Magdalena River	Coastal Waters off Punta Canoas	Reduction Required	Description
Flowrate	$3.9 \text{ m}^3 \text{ s}^{-1}$	$8000 \text{ m}^3 \text{ s}^{-1}$ (2,051 times outfall)			
Water Density	998.0 kg m^{-3}	998.0 kg m^{-3}			
Diffuser length	540m				
Number of ports	54				
Port diameter	0.203m				
Port spacing	20 m				
Discharge depth	20 m	Surface			
Ocean water density	1025 kg m^{-3}	1025 kg m^{-3}			
Total Coliforms Concentration	$10^{11} \text{ counts m}^{-3}$	$5 \times 10^8 \text{ counts m}^{-3}$	$< 5 \times 10^7 \text{ counts m}^{-3}$	10^4	10
Total Coliform load	$3.9 \times 10^{11} \text{ counts s}^{-1}$	$5 \times 10^{12} \text{ counts s}^{-1}$ (12.8 times outfall)			
Fecal Coliforms Concentration	$2 \times 10^{10} \text{ counts m}^{-3}$	$10^7 \text{ counts m}^{-3}$	$< 2 \times 10^6 \text{ counts m}^{-3}$	10^4	10
Total Fecal Coliform load	$7.8 \times 10^{10} \text{ counts s}^{-1}$	$10^{11} \text{ counts s}^{-1}$ (1.3 times outfall)			
Total mineral concentration	0.35 kg m^{-3} (Fair and Geyer 1959)	$0.5 \times 10^{-3} \text{ kgm}^{-3}$	$\sim 10^{-4} \text{ kgm}^{-3}$	10^3	5
Total load mineral	1.37 kg s^{-1}	4 kg s^{-1} (2.4 times outfall)			
Organic concentration	0.49 kg m^{-3} (Fair and Geyer 1959)	9.5 mg/l		n/a	n/a
Total organic load	1.91 kg s^{-1}	75.8 kg s^{-1} (39.7 times outfall)			
Lead Concentration			$\sim 100 \text{ microg/l}$	n/a	n/a
Total load of lead	None	0.54 kg s^{-1} (Much larger)			
Concentration of chrome			$\sim 3 \text{ microg/l}$	n/a	n/a
Total load of Chrome	None	0.008 kg s^{-1} (Much larger)			
concentration of			$\sim 2 \text{ microg/l}$	n/a	n/a

cadmium					
Total load of Cadmium	None	0.03 kg s ⁻¹ (Much larger)			

3.3 Regional Ocean Currents

The meteorology of the Caribbean region is dominated by the seasonal movement of the Intertropical Convergence Zone (ITCZ). From November to March the ITCZ is located over South America, resulting in relatively uniform strong easterly trade wind over the Caribbean region. From July to September the location to the ITCZ shifts northward to the middle of the Caribbean Sea with a corresponding weakening of the winds (Andrade, 1993).

The Caribbean Basin has been extensively studied. Gyory et al (2004) provide a summary of the work including the historical hydrographical surveys of Wust (1964) and Gordon (1967), the Caribbean circulation observations and numerical modelling of Kinder (1985), results of satellite tracked drifting buoy experiment conducted by Molinari (1981), Morrison and Smith (1990), studies of seasonal variability of Geostrophic transport, along with the observations and numerical models of Johns et al (2002). These studies indicated that the water flows into The Caribbean Sea mostly through de Grenada, San Vincent and Santa Lucia Passages in the southeast. Once inside the Caribbean basin the water continues westward as the Caribbean Current (CC) as shown in Figure 4, the main surface circulation in the Caribbean Sea.

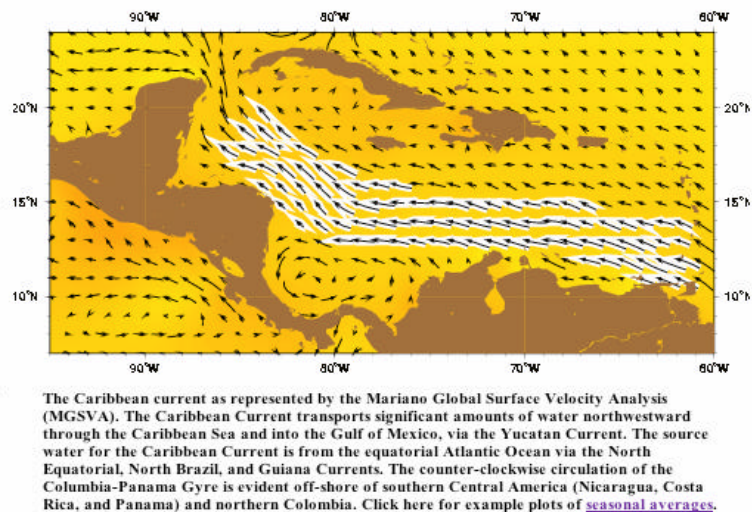


Figure 4: Regional annual average current in the Caribbean (reproduced from Gyory et al (2004)).

The Panama-Columbian gyre has also been verified with extensive drogue tracking by Molinari (1981); some results are reproduced in Figure 5a and b.

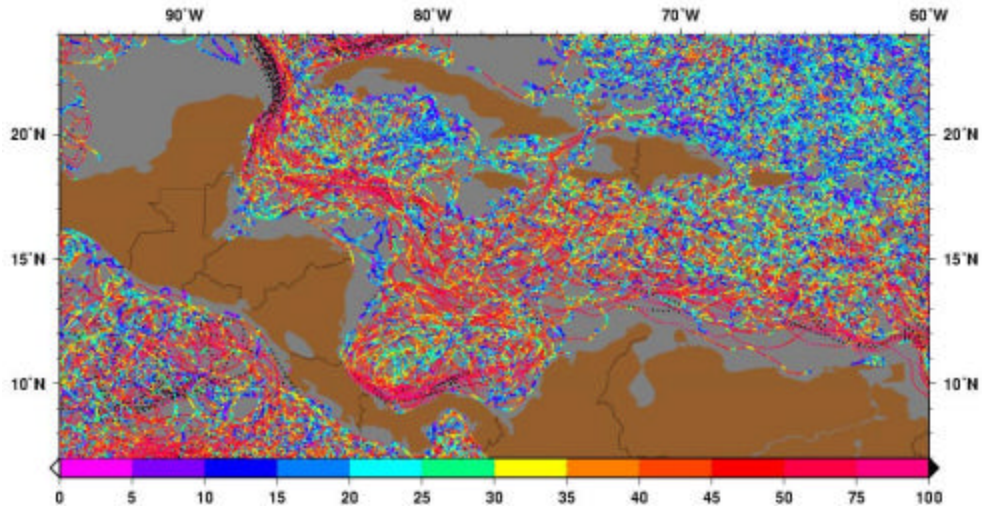


Figure 5a: The corresponding speeds of the trajectories, shown in the spaghetti plots, are color-coded from low speeds in purples and dark blue colors to measured buoy speeds of over 100 cm/s in black. Major currents are clearly visible in these plots with concentrated "ribbons" of red, pink, and black. Also note that in the ocean interior, the predominant speed is 5-15 cm/s, and that in the more energetic eddy regions near the major currents, the predominant speed is from 20-40 cm/s. (Reproduced from Gyory et al (2004)).

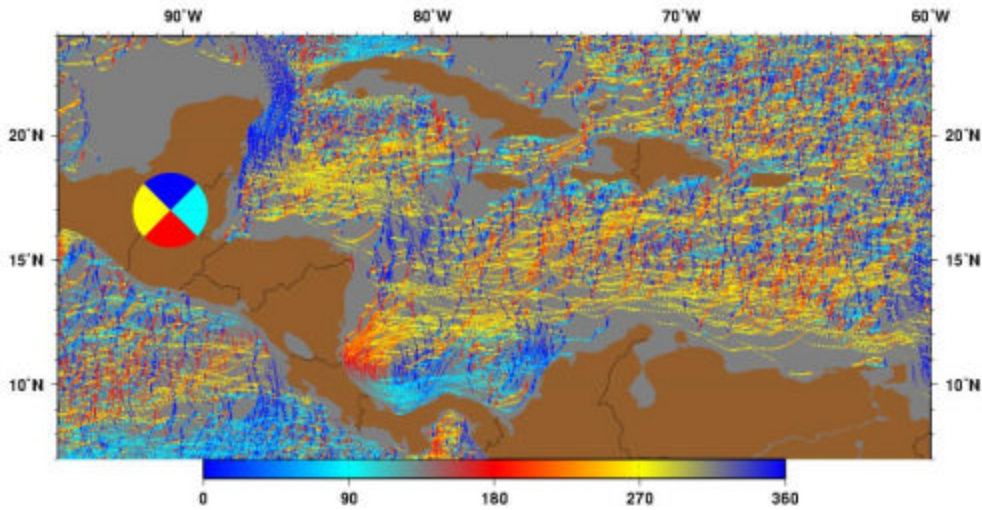


Figure 5: The corresponding direction (heading/bearing) of the buoys in degrees relative to North (0/360°) which is dark blue. Due south (180°) is red, while due west (270°) is yellow and due east (90°) is cyan. So for example, light blue implies the buoy is heading toward the northeast and orange implies the buoy is heading toward the southwest. (Reproduced from Gyory et al (2004)).

However, the circulation in the gyre is highly variable in both space and time with evidence from numerical simulations indicating a periodicity in the gyre of about 4 days

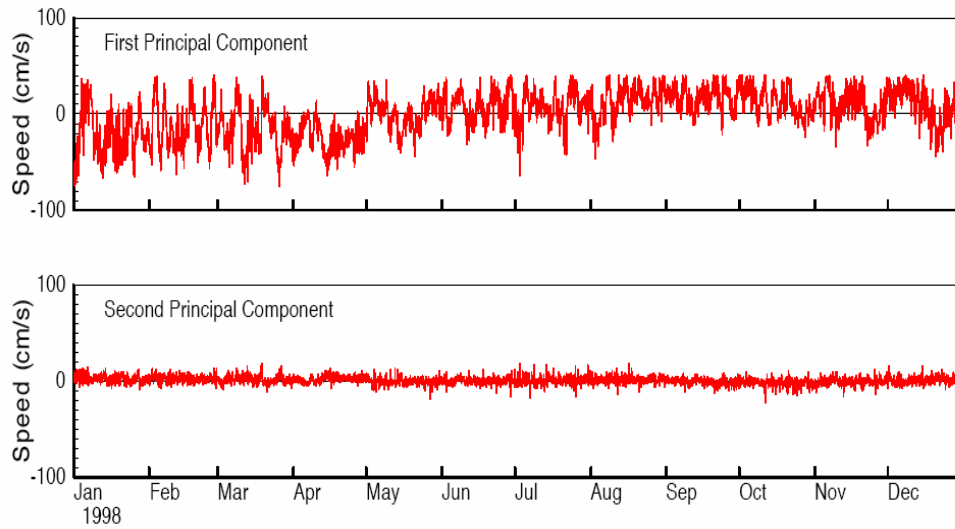
(Villegas and Imberger, 2005), but a consistent stagnation point along the Colombian coast close to where the Magdalena River enters the ocean.

The unsteady nature of the regional circulation was investigated by Pujos et al (1986) who conducted a field campaign in November 1981 in which he documented the temperature and salinity field. He found two cyclonic cells, the first located on the west of the El Rosario Islands and the second to the west of the Magdalena river mouth. (see also Rodríguez and Galvis, 1999, Cañon and Santamaría, 2003, Andrade, 2000). Nystuen and Andrade (1993) used Geosat Exact Repeat Mission altimetry data to detect and track the movement of mesoscale sea surface height anomalies. Quasi-permanent cyclonic eddies were detected near the south western portion of the Colombia basin in agreement with the model predictions of Semtner and Chervin (1992) and Thompson et al (1992).

Andrade and Barton (2000) followed up this earlier work of the eddy development and motion in the Caribbean Sea by using the ERS-1 altimetry data corrected by TOPEX/Poseidon data. For the first time results indicate that not just anticyclones but also cyclones eddies travelled along the Caribbean Sea north of 15°N. The outcome of their work refers at the Panama-Colombia Gyre as a feature evident only during the tropical rainy season. However, very recent work by Villegas and Imberger (2005) suggests that the Panama-Colombian gyre is actually a series of gyres that progressively move towards the Colombian coast with a period of about 4 days and which induce a maximum current at about 50m. Analysis of Hydrographic data together with current measurements take during the 1990s in the Colombia, Venezuela and Granada Basins also suggested an eastward flowing subsurface current along the entire southern boundary of the Caribbean Sea (Andrade, Barton and Mooers (2003)). However, the easterly trade winds induce a westward flowing surface current throughout most of the region. (Villegas and Imberger (2005))

3.4 The Near Coastal Regime

The coastal ocean currents off Punta Canoa are available from a number of current meters and the EIA deployed an ADCP for an extensive period at a number of sites, including at the proposed outfall location. A sample of the depth averaged velocity is shown in Figure 6. From the beginning of December to the end of May the water off Punta Canoas flows south-west with a mean velocity of around 0.2 m/s and in the period from the beginning of June to the end of November the water flows north-east with a velocity of about 0.2 m/s. However, it is important to note that the data, used by both Sawyer and Hazen and by Roberts (2003, 2004) for the design of the outfall and shown in Figure 6, are the depth averaged currents from the bottom to 15 m above the bottom. The currents in the top 5m, the stratified upper layer, were never considered. This has important consequences, as we shall see below, during periods where the water column currents are relatively weak and the water column is stratified. Under such conditions the stratification suppresses vertical mixing of the surface plume water and also allows the surface water to “slip” over the top of the stratified layers. An onshore wind thus has the potential for sweeping the surface effluent plume onto shore.



b) Time Series of Principal Components

Figure 6 : Currents of Punta Canoas in 20m depth along the principal axis (northeast) and the minor axis (southwest) from Roberts (2004) “The top bins were often above the water surface and were not judged to be reliable, so only the bottom four bins, ranging from heights of 5.3 to 14.3 m (depths of 3.4 to 12.4 m) were used.” Note that currents in the period from about the beginning of December to the end of May flow south-westward and from the beginning of June to the end of November flow north-eastward.

Clearly evident in the currents depicted in Figure 6 is also a 4 to 6 day periodicity that is similar to that found in the simulations by Villegas and Imberger (2005), the result of the multiple gyres in the Panama-Columbian gyre of recirculation region progressively moving eastward. No mention was made in the Hazen and Sawyer report about these oscillations.

A sample of the tidal signal, taken near Cartagena, is shown in Figure 7, from which it may be observed that the tide in the area is predominantly diurnal (once a day) with a weak semi diurnal signal being evident. A longer record would be required in order to assess the annual variation between the diurnal and semi-diurnal tides. The amplitude is about 0.2m, small enough to suggest that near Punta Canoas the tidally induced current should be quite small. This is confirmed by the measurements shown in Figure 6 that do not show a significant periodicity at 24 hours.

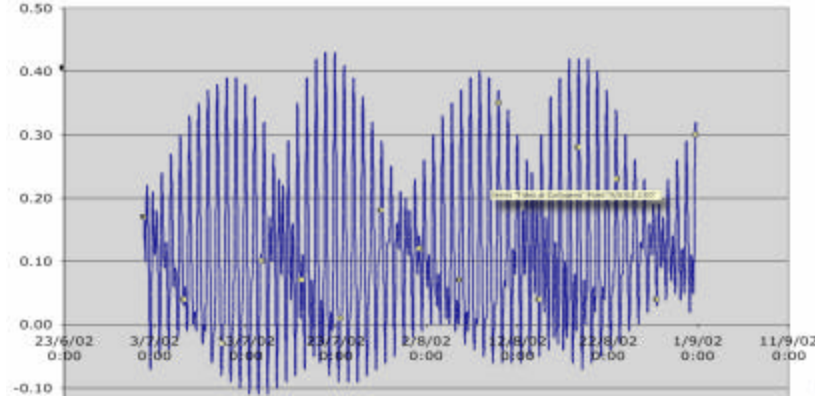


Figure 7: Tides at Cartagena (Data from Dalai Moreno Engel 2004)

The near coastal circulation is thus in a seasonal balance between the propagating separation eddy that moves eastward with a period of about 4 to 6 days, inducing a north-east current off Punta Canoa and the south-westerly current surface current induced by the easterly wind; in Dec to May the wind induced current predominates and in the rest of the year the separation circulation dominates; there is considerable energy between 4 and 7 days, but little current variation on a diurnal or semi-diurnal time scale.

There seems to be little information on surface coastal currents offshore from Punta Canoas, but we may obtain a good estimate of such currents from a simple momentum analysis (Fischer et al 1979). Suppose a wind U_w acts on the surface of the water column stratified as discussed below. The shear velocity exerted by the wind is given by:

$$u_* = \left(\frac{C_D \mathbf{r}_a}{\mathbf{r}_w} \right)^{\frac{1}{2}} U_w = 1.2 \times 10^{-3} U_w$$

Now, if h is the depth of the layer adjacent to the water surface that is well mixed by the turbulence of the wind, called the surface layer and U_s is the velocity of the water in the surface layer, then momentum requires:

$$\frac{d(U_s h)}{dt} = u_*^2 = 1.44 \times 10^{-6} U_w^2,$$

for a suddenly started wind and before any pressure gradients are set up.

For the sake of the present discussion, the water column may be approximated as having a linear stratification (see Figure 8. below) with 0.5 kgm^{-3} over the top 5m then the buoyancy frequency N is constant and given by:

$$N = \left(\frac{g}{\mathbf{r}_0} \frac{\partial \mathbf{r}}{\partial z} \right)^{\frac{1}{2}} = \left(\frac{9.8 \times 0.5}{1025 \times 5} \right)^{\frac{1}{2}} = 3.1 \times 10^{-2} \text{ s}^{-1}.$$

If we only account for surface layer deepening due to turbulent stirring then the entrainment law (Fischer et al 1979) reads:

$$h = 1.4 \frac{u_*}{N} (Nt)^{\frac{1}{3}}.$$

Combining the above equations yields a relationship for the surface layer water speed:

$$U_s = 0.714 u_* (Nt)^{\frac{2}{3}}.$$

Integrating U_s with respect with time yields an expression for the distance L the water in the surface layer would travel in time t :

$$L = 0.429 u_* (N)^{\frac{2}{3}} t^{\frac{5}{3}}.$$

To make this calculation more specific suppose the wind has a speed of 5m/s and acts for 6 hours, then the distance travelled by the water may be obtained by substituting $t = 6 \text{ hrs} = 2.16 \times 10^4 \text{ s}$ which leads to:

$$U_s = 0.32 \text{ ms}^{-1}; h = 0.9 \text{ m}; L = 4081 \text{ m}.$$

To first approximation this current will move in the direction of the wind; for a wind with an onshore component it will move the surface water towards the shore. The wind speed of 5 m s^{-1} was chosen as representing the average minimum wind speed (see Figure 7.) and thus the smallest distance. Larger wind speeds would lead to larger water excursions. The 4km is thus a lower limit of the distance the surface water may be expected to move under the action of the wind.

3.5 Water Column Stratification: The Magdalena Plume

The Magdalena River has one further very important regional influence with respect to the outfall design; it produces a stratified water column off the coast of Punta Canoas as seen very clearly from the profile data collected as part of the study (see Figure 8).

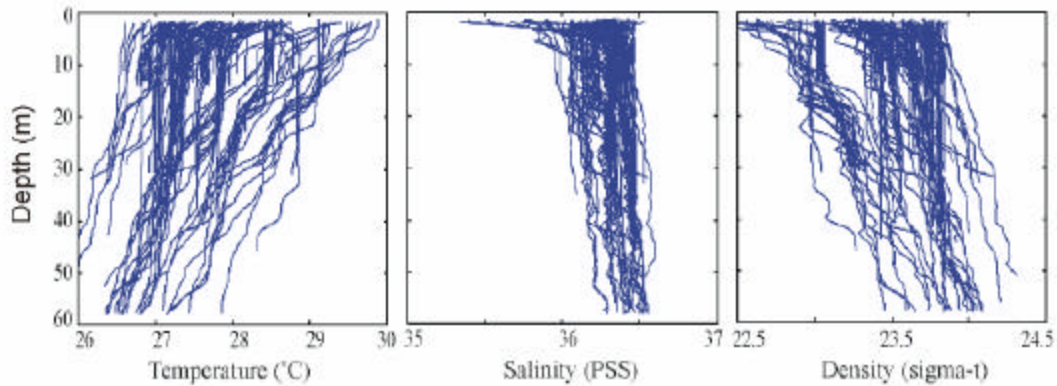


Figure 8a: Stratification of the water column off Punta Canoas. Note strong stratification (~ 0.2 to 1 kg/m^3) over the top 3 to 5 meters of the water column in about 50% of the profiles. (From Roberts (2003)).

Clearly visible from the CTD profiles shown in Figure 8a is a density decrease in the top 5 meters of the profiles of around 0.5 kgm^{-3} . As seen from the summary graph, Figure

8b, this difference can reach 1.8 kgm^{-3} in the months from April to August. If it is assumed that the density increases linearly with depth in the top 5m then the buoyancy frequency is given by:

$$N = \left(\frac{g}{r_0} \frac{\partial r}{\partial z} \right)^{\frac{1}{2}} = \left(\frac{9.8 \times 0.5}{1025 \times 5} \right)^{\frac{1}{2}} = 3.1 \times 10^{-2} \text{ s}^{-1},$$

providing a measure of the stability of the water column used below in the calculations of the effluent surface buoyant plume. The density gradient is too weak to prevent the rising diffuser plume from surfacing, but it is critically important, as shown above, in determining the behaviour of the far field plume.

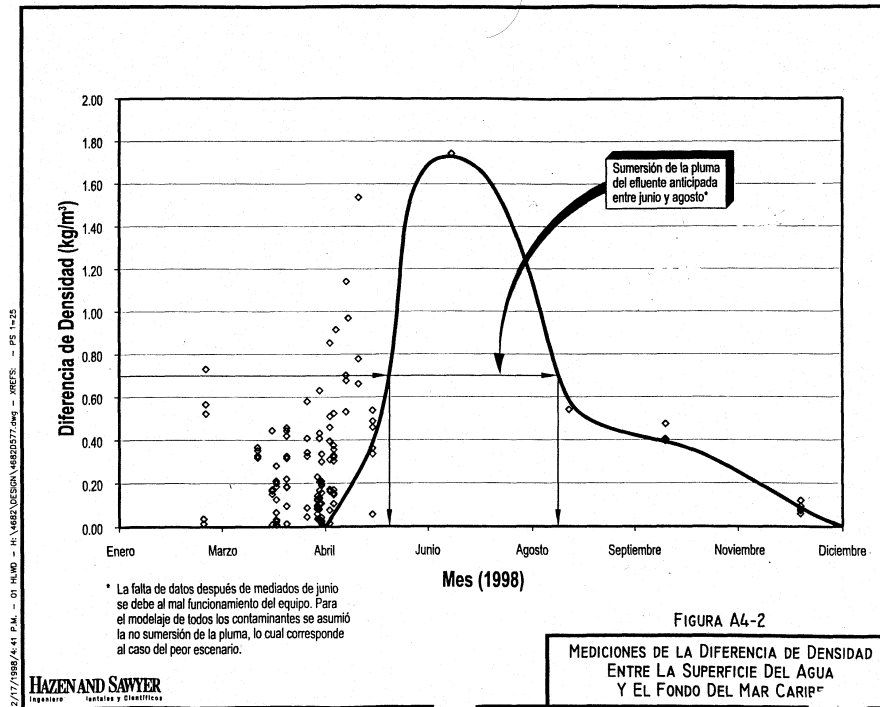


Figure 8b: Density difference between surface and bottom water near Punta Canoas over the year 1998. (Roberts (2003)).

The Magdalena River is the dominant regional freshwater influence and clearly contributes to the stratified water column off the coast as seen very clearly from satellite imagery. (Figures 9 a, b, c and d). Other important fluvial sources of freshwater at the Colombian Caribbean Coast are the Atrato and Sinu Rivers. The Atrato river, with a monthly average flow rate of $1000 \text{ m}^3/\text{s}$, outflow at the Uraba Gulf; the Sinu river outflow at the Morrosquillo Gulf with an average flow rate of $340 \text{ m}^3/\text{s}$. Although seasonal variability is suggested from an along year satellite imaginary analysis, research has to be done if the real effect of this effluent along the coast has to be established. The satellite images suggest that the stratification is the result of all the above rivers contributing a buoyancy flux and the prevailing surface currents determine which is the most important at a particular time.



Figure 9a: Rainy Season 10 October 2004, 18:40



Figure 9b: Transition Season 11 June 2004, 18:45



Figure 9c: Dry Season, 24 February 2004, 18:20

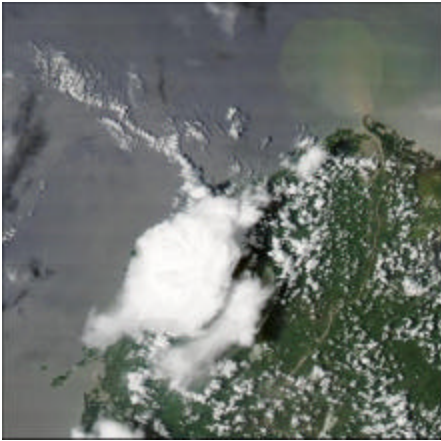


Figure 9 d: Rainy Season, 28 September 2004, 18:15

The plumes from the three rivers would be governed by Coriolis, wind speed and direction and the buoyancy flux. However, as seen from the density profiles the buoyancy flux associated with the discharges ensures that the stratification remains close to the water surface.

3.6 Winds of the Area

In the analysis of the near field and far field behaviour of the diffuser plume the design or the EIA did not consider the action of the wind on a stratified water body. Rather the report presents results from a depth averaged numerical model (RMA Ian King) with different wind fields, a methodology that does not capture the important influence of the wind on near surface currents in a stratified water column. Below it is shown that

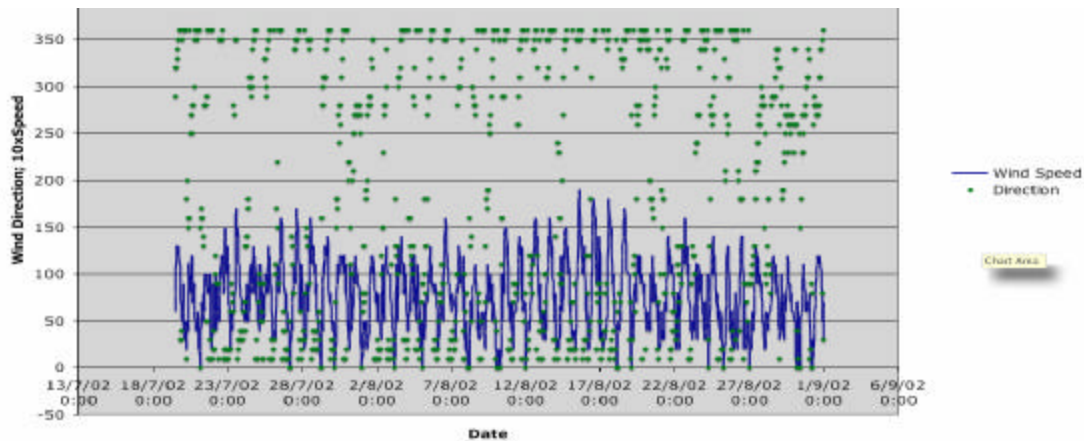


Figure 10 a: Wind Direction and 10 x Wind Speed July and Aug 2002. Note predominant wind direction is between 250 and 100 Degrees, with 250 to 360 having a strong onshore direction. (From Dalia Moreno Engel (2004)).

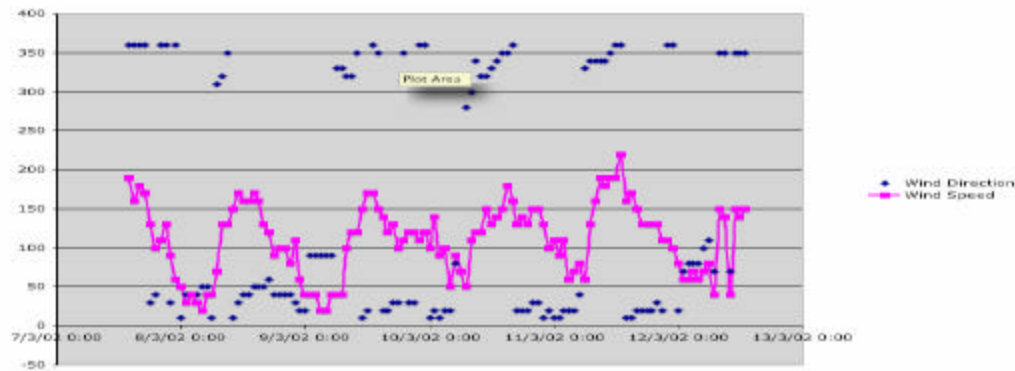


Figure 10 b: Wind Direction and 10 x Wind Speed March 2002. Note predominant wind direction is between 250 and 100 Degrees, with 250 to 360 having a strong onshore direction. (From Dalia Moreno Engel (2004)).

the wind has a critical influence on the far field plume behaviour and hence we give here a brief summary of the wind behaviour in the outfall area. Data obtained from Dalia Moreno Engel (Personal communication) was plotted and is shown in Figures 10a and b. In order to plot both the wind direction and the speed on the same axis the wind speed was multiplied by 10. The two time periods show much the same behaviour. The predominant

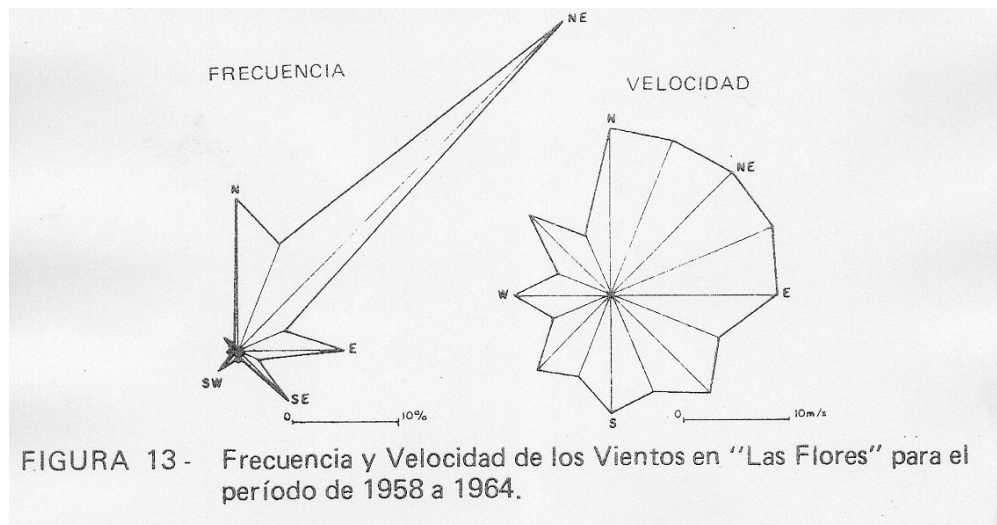


Figure 11: Wind speed and direction, 6 year average from 1958 to 1964 (Vermette et al (1984)). These data show that a mean wind speed for winds with an onshore component is between 5 and 15 m/s, the largest winds being from the north. The frequency of occurrence of such onshore winds was about 30% of the time, the predominant direction for onshore winds being from the north.

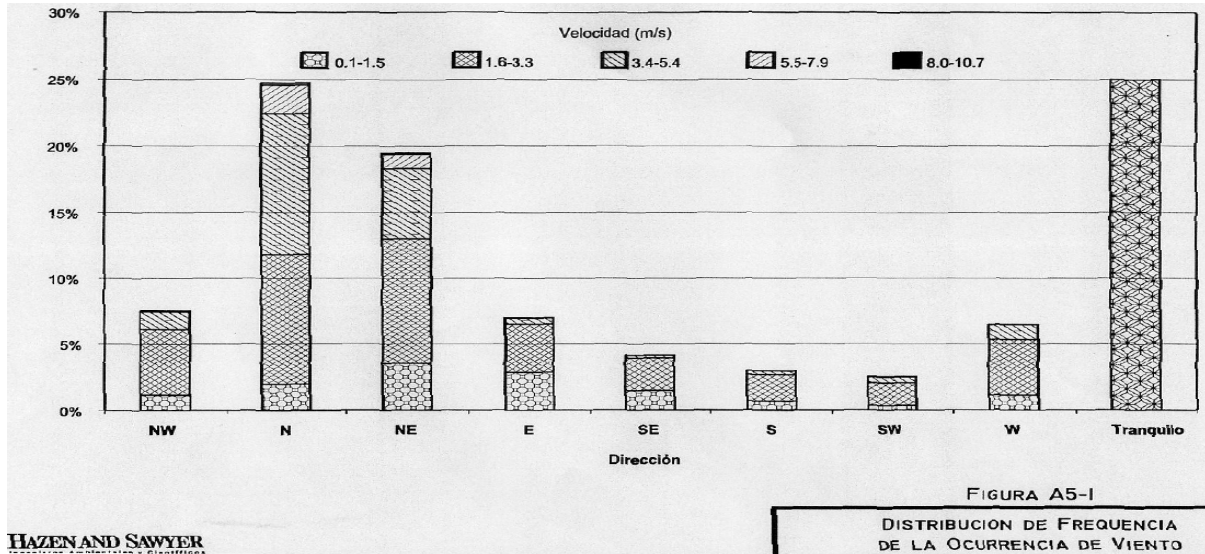


Figure 12: Wind speed and direction bins from the Hazen and Sawyer report indicating that when averaged over a year winds blow with an on shore component (from the west, north west or north) for a total of about 50 % of the time and the winds are below the measurement threshold (about 0.1m/s) for nearly 25% of the time. Time period is unknown, but data are similar to those from Vernet et al (1984), shown in Figure 3c.

wind direction is from the north, but there are an appreciable number of times when the wind comes from the north-west or west, meaning that the wind has an onshore component at those times. This is confirmed by the historical data presented by Vernet et al (1984), shown in Figure 11. In the Hazen and Sawyer Report there is a bar chart, reproduced in Figure 12, that substantiates the same behaviour; these data show that the wind has an “onshore component” for about 40% of the time (N, NW, Tranquil and W). This includes the northerly wind direction as for this case there is a coast line due south from the proposed diffuser. Speeds for winds with an onshore component range from zero to 15m/s.

4.0 Harm to Marine Environment and Local Population

4.1 Proposed Outfall Design

The proponents arrived at the proposed outfall design after extensive analysis and modelling under the assumption that the water column in the area of the outfall was well mixed vertically. Hazen and Sawyer and Roberts (2003) both came to the conclusion that the initial dilution, due the action of the rising buoyant jet, would range from 84 (no cross current) to 860 (for cross currents of magnitude 0.2ms^{-1}). The characteristics of the proposed outfall are given in Table 1. The proposed outfall contains 54 ports each with a diameter of 0.2m, a combined flow rate of $3.9\text{ m}^3\text{s}^{-1}$ and was to be located at a depth of

20 m, a distance of approximately 3 km from Punta Canoas. It should be remembered that in 2 we showed that it was necessary, for safe disposal of the nutrient and organic load, to achieve a dilution of 10^3 and from the perspective of the pathogen concentration a reduction through dilution and decay of at least 10^4 was necessary. The near field dilution results are validated below using simple plume formulae described in Fischer et al 1979 and appear to be sound estimates. However, by themselves these dilution rates are insufficient to meet the dilution and residence requirements. We show that the far field modelling by the proponents does not account the presence of a surface layer and preliminary calculations show that the present proposed design is unlikely to meet the requirements for a safe disposal of the effluent.

4.2 Near Field, No Cross Current

Dilution may be calculated from a simple plume volume flux formula (Fischer et al 1979)

$$\text{Volume flux: } m = 0.15 B^{\frac{1}{3}} z^{\frac{5}{3}},$$

where the buoyancy flux is given by $B = \frac{\Delta r}{r} g Q_i$, z is the vertical coordinate and Q_i is the flow rate per port.

With 54 ports located in 20m of water:

$$\begin{aligned} Q_i &= 0.072 \text{ m}^3 \text{ s}^{-1}, \\ g &= 9.8 \text{ m s}^{-2}, \\ \frac{\Delta r}{r} &= \frac{1025 - 998}{1025} = 0.0263, \end{aligned}$$

leading to $m = 5.86 \text{ m}^3 \text{ s}^{-1}$,
yielding a dilution of $S = 79.8$.

This dilution is, within the accuracy of the simple plume formula, the same as the lower limit calculated by Roberts (2003) and (2004) using a more detailed numerical model.

4.3 Near Field, Cross Current ($U = 0.2 \text{ m/s}$)

In the studies by Hazen and Sawyer (1998) and those of Roberts (2003), the effect of cross currents were included leading to a maximum dilution during periods of maximum cross currents, of around 860. These maximum dilutions were associated with strong northward flowing currents observed during the period from June to November (see Figure 11). The effective dilution with a cross current may again be estimated from simple formulae given in Fischer et al (1979); Tables 9.5 and 9.6. From this reference it follows:

Port Properties

$$\text{Port diameter } A_i = \frac{p d^2}{4}$$

Flow rate per port $Q_i = 0.072 \text{ m}^3 \text{s}^{-1}$

Area of port $A_i = \frac{\rho d^2}{4} = 0.0314 \text{ m}^2$

Buoyancy flux per port $B_i = \frac{\Delta \mathbf{r}}{\mathbf{r}} g Q_i = 0.0186 \text{ m}^4 \text{s}^{-3}$

Momentum flux per port $M_i = Q_i u_i = 0.1656 \text{ m}^4 \text{s}^{-2}$

Port Length Scales

Port geometry scale $\ell_Q = \frac{Q_i}{M_i^{\frac{1}{2}}} = 0.177 \text{ m}$

Port momentum-buoyancy transition length scale $\ell_M = \frac{M_i^{\frac{3}{4}}}{B_i^{\frac{1}{2}}} = 1.9 \text{ m}$

Port cross current-momentum length scale $z_M = \frac{M_i^{\frac{1}{2}}}{U} = 2.0 \text{ m}$

Port cross current-buoyancy length scale $z_B = \frac{B_i}{U^3} = 2.3 \text{ m}$

Length Scale hierarchy

$$z_B > z_M > \ell_M > \ell_Q$$

Port Dilution Calculation with Cross Current

First assume the following values for the various coefficients (see Fischer et al 1979):

$$C_1 = 2.0; C_2 = 2.0; C_3 = 1.6; C_4 = 1.0; D_1 = 2.4\partial$$

$$\hat{k} = \left(\frac{C_4}{C_3} \right) \left(\frac{C_3}{C_1} \right)^{\frac{1}{3}} = 0.58$$

$$\hat{x}_c = \hat{k}^{\frac{1}{2}} \left(\frac{z_B}{z_M} \right)^2 = 0.767$$

$$\text{Non dimensional vertical distance } \hat{z} = \left(\frac{z}{z_M} \right) \left(\frac{z_B}{z_M} \right)^{\frac{1}{2}} \left(\frac{C_3}{C_1} \right)^2 \left(\frac{1}{C_1} \right) = 0.172z$$

$$\text{Which at } z=20 \text{ m becomes } \hat{z}_{20} = 3.43$$

$$\text{Non-dimensional horizontal length scale } \hat{x} = \left(\frac{x}{z_M} \right) \left(\frac{z_B}{z_M} \right) \left(\frac{C_3}{C_1} \right)^4 = 0.236x$$

$$\text{Trajectory } \hat{z} = \hat{k} \left(\frac{z_B}{z_M} \right)^{\frac{1}{6}} \hat{x}^{\frac{2}{3}} = 0.594 \hat{x}^{\frac{2}{3}}$$

$$\text{Distance downstream when buoyant jet reaches surface } \hat{x}_{20} = 13.89$$

$$\text{Non dimensional dilution } \hat{S}_{20} = \left\{ \left(\frac{\mathbf{m}_i U}{M} \right) \left(\frac{1}{D_1} \left(\frac{z_M}{z_B} \right)^{\frac{1}{2}} \left(\frac{C_1^3}{C_3^2} \right) \right)^{-1} \right\} = \left(\frac{z_M}{z_B} \right)^{\frac{1}{6}} \frac{\mathbf{x}_{20}^{\frac{4}{3}}}{\hat{k}} = 50.0$$

Volume flux at $z = 20 \text{ m}$

$$\mathbf{m} = \frac{\hat{S}_{20} M}{U} \left(\frac{1}{D_1} \left(\frac{z_M}{z_B} \right)^{\frac{1}{2}} \left(\frac{C_1^3}{C_3^2} \right) \right) = 50.26 \text{ m}^3 \text{ s}^{-1}$$

Yielding a dilution:

$$S_{20} = \frac{m}{Q_i} = 698.2$$

A value very similar to that presented by Roberts (2003) obtained with numerical model runs.

We therefore have excellent consistency between the above simple buoyant jet formulae and the more complex numerical models of Robert (2003 and 2004) and those described in Hazen and Sawyer, the latter being a derivative of those published by Roberts (2003). It is worth noting at this stage that the cross current dilution would almost satisfy our prescribed dilution design criteria, but the still water column conditions fail the design requirements by a factor of 10.

4.4 Far Field Dispersion and Residency, Vertically Mixed Water Column

From above it is seen that the near field dilution rates are insufficient and we require an additional 10 fold dilution for the safe disposal of nutrients and organic matter and either a 100 fold further dilution in the far field or at least an ocean residency of 36 hours before making landfall or encroaching into the traditional fishing areas. The location of the traditional fishing areas is discussed elsewhere in the Panel's report and is not well documented. For the sake of the present discussion of far field dispersion and residency we shall assume that fishing takes place out to a distance of 2000m from the shoreline.

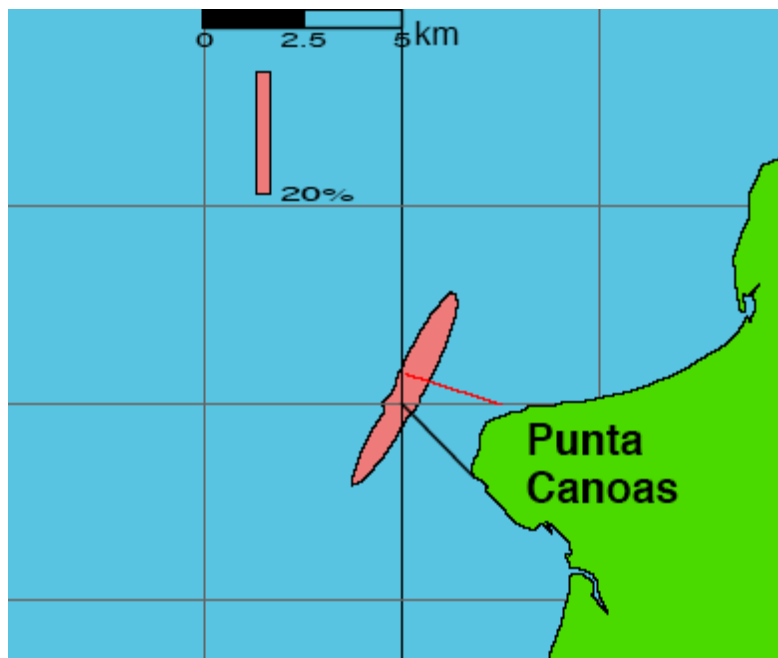


Figure 13. Frequency of Exceedance of Levels of Total Coliforms for Unchlorinated Effluent. Areas in which California Standards may be exceeded are shown in Red. Actual current record used. (Total coliforms, 1,000 per 100 ml) (Reproduced from Roberts (2004) Figure 4).

We must therefore estimate the additional dilution possibly obtained by natural horizontal dispersion once the plume has surfaced. Once again Roberts (2003 and 2004), as well as Hazen and Sawyer (2000) used numerical models to calculate the rate of spread of the outfall cloud once it had reached the water surface. In Figure 13 we have reproduced one of the model run results from Robert (2004).

Their model was based on a turbulent dispersion diffusion coefficient as described in Fischer et al (1979) (see also the more recent account in Stocker and Imberger (2003)). Such an analysis is valid when the currents shown in Figure 6 are relevant, as would be the case when the ocean currents are relatively strong ($U > 0.05 \text{ m s}^{-1}$). Once again we can verify the proponents' analysis with a simple analytical calculation. This is useful as it once again allows us to see the key issued in their analysis. Once the buoyant plume has surfaced it will be advected with the current speed U_s and dispersing as it moves with the water. The proponents assumed a dispersion coefficient

$$k = 10^{-4} \ell^{\frac{4}{3}} \text{ m}^2 \text{ s}^{-1},$$

where ℓ is the length scale of the pollutant cloud and where the coefficient has been changed from that in Roberts (2003) to conform to standard mksa units. As the pollutant cloud is swept downstream it will disperse in all directions, but the stream wise dispersion will be very small compared to the stream wise advection and may thus be neglected to first order. The dispersion is thus given, to a good approximation by a simple source diffusing with time in a direction transverse the flow. Solutions of the diffusion equation have the property that (see Fischer et al 1979) that

$$\frac{d\ell^2}{dt} = 2k,$$

substituting for k and carrying out the integration yields an expression for ℓ :

$$\ell = \left(\frac{2a}{3} \right)^{\frac{3}{2}} (t + t_0)^{\frac{3}{2}} ; a = 10^{-4},$$

where it was assumed that at $t = 0$, the width of the plume is given by the width of the vertical simple plume (20% Of the water depth):

$$\ell_0 = 4 \text{ m},$$

so that

$$t_0 = 3.8 \times 10^4 \text{ s}.$$

Now if the plume surfaces with a concentration of C_0 and a width of $2\ell_0$, then it follows from conservation of pollutant mass that the mean concentration of the pollutant C as the effluent is swept downstream becomes:

$$\frac{C}{C_0} = 10^{-\frac{bx}{U_s}} \frac{8.6 \times 10^6}{\left(\frac{x}{U_s} + 3.8 \times 10^4 \right)^{\frac{3}{2}}} ; b = 0.00012,$$

where the first term captures the assumed decay rate of pathogens and the second accounts for the lateral dispersion and the value of the decay coefficient b has been

adjusted to give a factor 10 decay in 140 minutes (see Figure 2.). Substituting $U_s = 0.15 \text{ ms}^{-1}$ and $x = 5000 \text{ m}$ yields:

$$\frac{C}{C_0} = (10^{-4}) (0.451) = 4.5 \times 10^{-5}.$$

The reduction of 10^{-4} is the effect of the pathogen decay rate and the factor 0.451 is due to lateral dispersion. This simple calculation clearly shows that the effectiveness or otherwise of the outfall depends completely on the near field dilution ($S = 79.8$) and the assumed rapid decay of the pathogens.

Conclusion: The dilution rates assumed by the proponents agree quantitatively with values obtained by simple analytical buoyant jet formulae lending support to the assumed design for the case of an unstratified water column.

4.5 Far Field Dispersion and Residency, Implications of the water column stratification

We now examine the implications of the near surface stratification as observed at the proposed site and detailed in Figure 8a.

Case 1: Winds greater than 5 ms^{-1} . Stratified water columns develop surface layers that trap the momentum introduced by the wind. In the presence of a surface layer, the surface currents would most likely be better approximated by estimates obtained from the simple momentum analysis detailed in 3.4 above. From this analysis it follows that during the months from April to August, when the stratification is maximum, the wind driven currents will be such as to carry the effluent plume at least a distance of 4km. Given that the wind has a onshore component for over 50% of the time we may reach the conclusion that the effluent plume will make contact with the shore line 50% of the time within 6 hours. For this case the initial dilution would be 1:100, the far field dispersion would be negligible and the time for decay time (residence time) would be 6 hours. The diffuser design thus fails marginally for nutrients (a factor of 1 to 10 too high) and fails completely for pathogens (a factor of a little less than 100 too high for pathogens residing out of the immediate surface light).

Case 2: Periods when there is a lull in the wind: The wind data in Figure 12 shows that 20% of the time the wind is “tranquil” meaning it is below the threshold of the instrument. For such situations a more realistic analysis for the far field spreading of the plume is obtained by assuming that the outfall plume rises to the surface with a surface dilution predicted by the simple plume formula, with a total volume flux from the whole diffuser:

$$m = QS = 311.2 \text{ m}^3 \text{ s}^{-1}.$$

In the absence of wind, this may be assumed to spread radially as a surface buoyant plume (Fischer et al 1979). For a radially spreading surface plume, of radius R we may write:

$$\frac{dR}{dt} = (g_s' h)^{\frac{1}{2}}$$

and

$$h = \frac{QSt}{pR^2}$$

Eliminating the depth h of the buoyant plume between these two equations and then integrating with respect to t yields:

$$R = \frac{2}{\sqrt{3}} \left(\frac{g'_s QS}{p} \right)^{\frac{1}{4}} t^{\frac{3}{4}} = 0.869 t^{\frac{3}{4}},$$

where we have used the relationship $g'_s = \frac{g'}{S}$.

It should be noted that while the buoyant plume spreads over the water surface there is little further dilution. This means that if the dilution in the near field is 1:100 then a further 1:100 dilution is required for the pathogens to be of concentrations low enough to be safe for human immersion. Given that a more realistic time for a 1:100 decay is around 36 hours of sunshine the surface plume will have reached a radius and overflow depth of

$$R = 5,930 \text{ m}; \quad h = 0.364 \text{ m},$$

respectively. The proposed design the diffuser resides only 1000m from the assumed fishing grounds and 3000m from the coastline. Hence the decay will be inadequate as approximately 6000m are required for safe disposal during such tranquil times. Given that the wind is tranquil for about 25% of the time (Figure 12) this condition is conservatively likely to prevail for the same percentage of time, namely 25% of the time.

5.0 Modified Outfall Design (New Outfall Design)

It is clear from the above that the proposed outfall design will not produce the necessary dilution for the nutrient and organic loads and will not be far enough from the shoreline to ensure the necessary decay of pathogens. However, from 4.3 it is shown that the general site offshore from Punta Canoas is a suitable site for the location of an outfall. To demonstrate that placing the diffuser in deeper water will overcome the above problems with the proposed design we now present a modified design that should meet both the dilution and decay specifications. This modification should now be tested with a suitable 3D coupled hydrodynamic-pathogen model.

5.1 Near Field Dilution

The near field dilution can be increase by either taking the diffuser into deeper water or by increasing the number of port. As seen from above the near field dilution with no cross current presents the most critical case and for this case the far field dilution is most likely minimal. This means that the design should be such as to provide a 1000 times dilution in the near field. From above we see that the volume flux in a simple plume is given by:

$$m = 0.15 (B_i)^{\frac{1}{3}} z^{\frac{5}{3}},$$

where the buoyancy flux is given by:

$$B_i = \frac{\Delta \mathbf{r}}{\mathbf{r}} g Q_i,$$

and the volume flux from port i is given by.

$$Q_i = \frac{Q}{n} m^4 s^{-3},$$

where n is the number of port in the diffuser.

Combining these leads to an expression for the dilution S:

$$S_i = \frac{m}{Q_i} = 0.15 \left(\frac{\Delta \mathbf{r}}{\mathbf{r}} g \right)^{\frac{1}{3}} \left(\frac{n}{Q} \right) \left(\frac{Q}{n} \right)^{\frac{1}{3}} z^{\frac{5}{3}},$$

from which it follows immediately that

$$S_i \sim \left(z^5 n^2 \right)^{\frac{1}{3}}$$

so that the dilution can be increased by either increasing the number of port or the depth, but increasing the depth is more effective as the dilution depends on the 5/3 power of the depth. With the proposed design the dilution was 80 and we require a dilution of 1000, hence we need an increase of a factor of 12.5. Increasing the depth of the diffuser to say 60m yields an increase in dilution of 6.2 requiring a further dilution by increasing the number of ports of a factor of 2. This can be achieved by increasing the number of port to 152, implying a considerably longer diffuser (1,520m) and also an outfall length of about 7,000m. Both extensions imply a considerable increase in cost of the diffuser (see Figure 3c for new location).

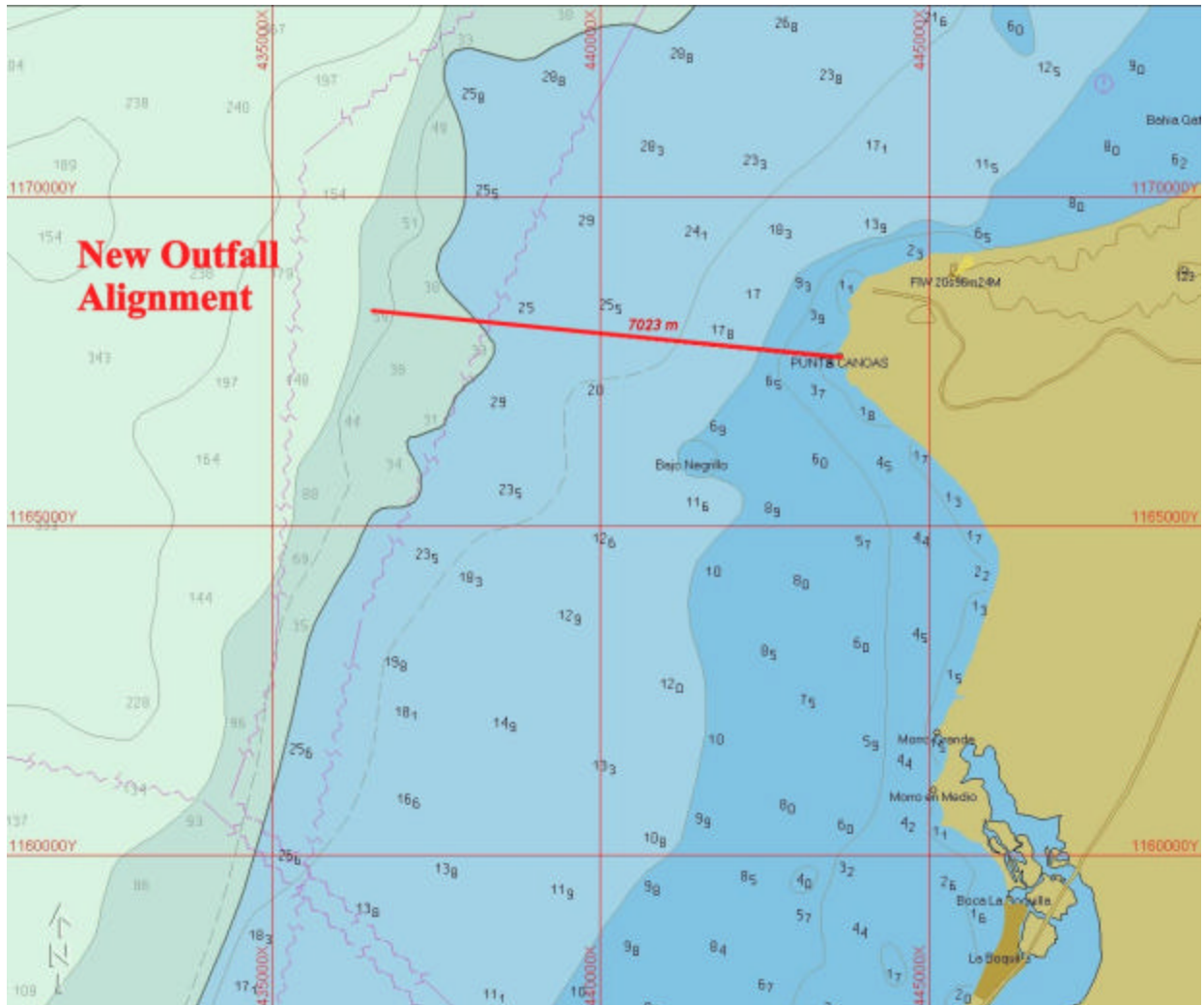


Figure 16: Detailed Bathymetry showing new alignment of outfall. Length of pipeline 7023m and length of diffuse is 1520m, 152 port. Bathymetry supplied by CIOH and differs considerable from that shown in the Hazen and Sawyer (1998) document.

5.3 Far Field Decay

The deeper location provides sufficient near field dilution to satisfy the criterion for nutrients and organic load, but we still require a factor 10 decay or dilution for the pathogens before the effluent impacts on the assumed fishing boundary 2000m from the shoreline. This added dilution and decay must therefore take place in a time the surface plume moves a distance of 5000m.

- 1) Tranquil conditions. For this case we may prorate the results obtained in 44. from the required 36 hours to 18 hours. Given that the distance travelled under these conditions scales with time to the three quarters power this leads to a distance of 3,525m, somewhat smaller than the 4000m available.

- 2) Onshore wind of 5 m/s. From above we see that for this case it takes about 7 hours for the wind to move the effluent plume a distance of about 5000 m and at the same time the surface layer deepens by about 1 m., in other words approximately three times the original thickness of the buoyant effluent surface plume under tranquil conditions. Hence we would achieve a three fold dilution and a three fold decay decrease and when combined with the slight increase in the near field dilution due to the cross current we achieve the necessary reduction of pathogens before encroaching on the fishing grounds.
- 3) Winds greater than 5 ms⁻¹. The cross current initial plume mixing, the added vertical mixing and horizontal dispersion would all add to provide a total dilution of around 1:10,000.

5.4 Summary

This reviewer agrees with the calculations performed by the proponents as far as the near field dilution is concerned. However, preliminary calculations suggest that by neglecting the near surface stratification and by being overly optimistic about the rate of decay of pathogens, the far field analysis is unreliable. The above results strongly suggest a failure to comply rate of close to 75% of the time. Feasibility calculations suggest that a diffuser at Punta Canoas extending 7000m offshore to a depth of 60m with 152 ports would provide a satisfactory solution with safe disposal of the nutrient, organic and pathogen load. These feasibility calculations should now be verified with a fully coupled hydrodynamic-pathogen three dimensional regional model with an embedded diffuser algorithm. One such model is ELCOM-CAEDYM an open source model available for download. In order to be applicable the simulations must include the inflow from the three adjacent rivers, regional winds and open boundary conditions and be validated against the stratification document in the proponent's documents (see §2).

6.0 Diapirism Risk

The phenomenon of diapirism was described to the Panel by officers from the Colombian Geological Survey, and is also discussed in the report by Vernet (2001). An eye witness account of an eruption near Punta Canoas was related to the Panel with the statement “an island had formed overnight, which was washed away over a period of weeks”. Vernet (2001) offers no concrete evidence that diapirism vents are located near the proposed Punta Canoas site and the detailed bathymetry survey obtained from CIOH shows no sign of submerged mounds in the bathymetry. In the Hazen and Sawyer report there was mention of a surface manifestation similar to a diapir 350m south west, but no conclusive results were presented. It is unlikely that such a risk exist, but given the contradictory evidence AQUACAR should clearly carry out a sonar survey of the proposed and new outfall trajectory (with a sonar that has some penetration into the sediments) .

7.0 Assessment of Other Locations

It is not clear how the choice of Punta Canoas came about, except for the wish to locate the outfall away from the clearer water of the Del Rosario National park to the south of

Cartagena. I have no argument with the chosen site. Further, many of the earlier drawings of the outfall option at Punta Canoas show the diffuser extending out to somewhere around 30 m depth and a number of people interviewed confirmed that the length was decreased to a depth of 20m in order to reduce costs.

8.0 Conclusions

The Site: The Punta Canoas site has the necessary assimilative capacity to absorb the impacts of the proposed outfall discharge without loss of any functionality, but not with the current design. This conclusion is based on the observation that the outfall discharge is relatively small compared to the load from the Magdalena River for all constituents except pathogens. *The proposed site has the necessary assimilative capacity to absorb the impact of the outfall without any loss of marine functionality.*

8.1.The Proposed Design: The current design neglected to account for the water column stratification, the action of an onshore wind and was overly optimistic about the pathogen die off rates. Further, the design appeared to completely neglect the recent evidence that Coliforms are not a good indicator species for pathogens as a whole and dangerous pathogens exist in sewage water that decay much slower. Further, the current design totally neglected the need to disperse nutrient and BOD, and indeed fails to satisfy the necessary dilution with respect to these pollutants. *The proposed outfall design is unlikely to achieve safe disposal of the effluent and is estimated that it would fail safe pathogen standards nearly 75% of the time.*

8.2.New Design: A new design was conceived and involves extending the outfall to 60m water depth and increasing the number of ports to 152: *The new diffuser was provided only as an illustration of what would likely be required to render the outfall safe for coastal swimmers.*

8.3.Other externalities: Given that fishing is an important activity of the locals living near the proposed outfall site, it was surprising that Hazen and Sawyer (1998) made no mention of the effluent constituency in terms of synthetic organics that are known to enter the food chain. *No assessment was made of any likely genetic damage to fisheries from the introduction of synthetic organics via the outfall.*

8.4.Diapirism Risk: There does not appear to be any danger from diapirisms, but the geotechnical work, although extensive, did not include a precautionary assessment of this risk. *A sediment penetrating sonar survey of the outfall alignment was not carried out increasing the risk associated with pipe line fracture.*

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BIOGRAPHIES

Panel Members

Ms. Edith Brown Weiss was appointed to the Panel in September 2002 and is an outstanding legal scholar who has taught and published widely on issues of international law and global policies, including environmental and compliance issues. She is the Francis Cabell Brown Professor of International Law at Georgetown University Law Center, where she has been on the faculty since 1978. Before Georgetown, she was a professor at Princeton University. Ms. Brown Weiss has won many prizes for her work, including the Elizabeth Haub prize from the Free University of Brussels, the International Union for the Conservation of Nature (IUCN) for international environmental law, and the 2003 American Bar Association Award in recognition for distinguished achievements in Environmental Law and Policy. She has also received many awards for her books and articles. She served as President of the American Society of International Law and as Associate General Counsel for the U.S. Environmental Protection Agency, where she established the Division of International Law. Ms. Brown Weiss is a member of many editorial boards, including those of the American Journal of International Law and the Journal of International Economic Law. She has been a board member, trustee, or advisor for the Japanese Institute for Global Environmental Strategies, the Cousteau Society, the Center for International Environmental Law, and the National Center for Atmospheric Research, among others. Ms. Brown Weiss has been a Special Legal Advisor to the North American Commission on Environmental Cooperation. She has been a member of the U.S. National Academy of Sciences' Commission on Geosciences, Environment, and Resources; the Water Science and Technology Board; and the Committee on Sustainable Water Supplies in the Middle East. She is an elected member of the American Law Institute, the Council on Foreign Relations, and the IUCN Commission on Environmental Law. Ms. Brown Weiss received a bachelor's of arts degree from Stanford University with Great Distinction, an LL.B. (J.D.) from Harvard Law School, a Ph.D. in political science from the University of California at Berkeley, and an Honorary Doctor of Laws from Chicago-Kent College of Law.

Mr. Tongroj Onchan was appointed to the Panel in September 2003. He has a Ph.D. in agricultural economics from the University of Illinois. Professor Onchan taught on the Faculty of Economics at Kasetsart University in Thailand for 26 years, including a term as Dean. He later served as vice president of Huachiew Chalermprakiat University; then joined the Thailand Environment Institute (TEI) as vice president. In 1998, Mr. Onchan was appointed president of TEI. He helped establish and was appointed president of the Mekong Environment and Resource Institute (MERI) in 2000. He has served as advisor to the Prime Minister and to the Minister of Science, Technology and Environment, as

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Mr. Werner Kiene was appointed to the Panel in November 2004. He holds a Masters of Science degree and a Ph.D. in Agricultural Economics from Michigan State University. He has held leadership positions with the Ford Foundation and German Development Assistance. In 1994, Mr. Kiene became the founding Director of the Office of Evaluation of the United Nations World Food Programme (UN WFP). He was the World Food Programme Country Director for Bangladesh from 1998 through 2000 and also served as UN Resident Coordinator during this period. From 2000 to 2004 he was a Representative of the UN WFP in Washington, D.C. Mr. Kiene's focus has been on the design, implementation and assessment of sustainable development initiatives. His professional writings have dealt with issues of rural poverty and social services delivery; food security, agricultural and regional development; emergency support and humanitarian assistance; international trade and international relations. Mr. Kiene is involved in professional organizations such as the American Evaluation Association; the Society for International Development; the American Association for the Advancement of Science; and the International Agriculture Economics Association.

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BIOGRAPHIES

Consultants

Richard Fuggle holds the Shell Chair of Environmental Studies at the University of Cape Town. He is Director of the Environmental Evaluation Unit. Prof. Fuggle is a Founder Member of the Academy of Science of South Africa and is a Registered Natural Scientist a Board Certified Environmental Practitioner in South Africa and a Professional Member of the South African Institute of Ecologists and Environmental Scientists. He has edited two books on environmental management in South Africa and has published over 100 academic papers on environmental topics. He led the team which developed the South African Guidelines for Integrated Environmental Management. Prof. Fuggle has served on numerous Commissions of Enquiry related to Environmental Assessments. He has received awards and distinctions for his contributions to the advancement of EIA both nationally and internationally. Prof. Fuggle earned his Ph.D from McGill University in Montreal.

Robert Goodland is a tropical ecologist and served the World Bank as environmental adviser from 1978 until his retirement in 2001. He advised the independent Extractive Industries Review of the World Bank Group's oil, gas and mining portfolio from 2001 to 2004. His latest book is "The Social and Environmental Impacts of Oil and Gas Pipelines" (2005). Mr. Goodland has been involved in the social and environmental assessment of five pipelines: Thailand's Yadana Gas, Chad-Cameroon Oil, Ecuador's OCP, Peru's Camisea gas, and the BTC oil pipelines. He serves as Metropolitan Chair of the Ecological Society of America, and Past President of IAIA. Mr. Goodland has published approximately 20 books on environment and sustainability of major infrastructure projects. He earned his Ph.D from McGill University in Montreal.

Jörg Imberger is a Professor of Environmental Engineering at the Centre for Water Research, Vice-Chancellor's Distinguished Fellow at the University of Western Australia, and a Corresponding Fellow, Academy of Science, Argentina. His main research interest is in the motion of stratified fluid in the context of environmental fluid dynamics. Specifically, this research includes the study of the motion and quality of water in estuaries, reservoirs and lakes. The interaction of the biological system and the water motion is also a primary focus. He was the former Scientific Advisor to Earthwatch and former member of the United Nations High Level Advisory Board on "Sustainable Development." Prof. Imberger has held various visiting and academic positions at the University of Padova, University of California (Berkeley), Stanford University, Caltech, University of Karlsruhe and The University of Western Australia. He is the recipient of numerous local, national and international awards. Nationally he has received the James N. Kirby Award, the Kernot Medal, the Clunies Ross National Science & Technology Award, the Peter Nicol Russell Memorial Medal and the Jolly Award. In 1996 he was

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Prof. Imberger is one of a handful of people in Australia to be elected to both the Australian Academy of Science and the Australian Academy of Technological Sciences and Engineering. Prof. Imberger was the 2001 Walter Bean Scholar at the University of Waterloo in Canada, and recently, Fellow to the Sackler Institute of Advanced Studies in Israel. He has published 21 books, 135 journal papers, 79 conference papers and 114 report publications, and takes part in water resource projects throughout the world.

Roberto Mosse retired from the World Bank after serving 27 years as an Operations Officer and Financial Analyst. From 1972-75, he served as an Internal Auditor counselling Bank management in financial and administrative matters. From 1975 to 1983 Mr. Mosse was a team member and later a team leader for transportation projects, including highway, urban transport, port, railway, inland waterways and airport projects in Central and South America. From 1983 to 1993 he was a team leader for industrial and energy privatization projects in Brazil and Peru; for financial sector reform projects, and for micro/small enterprise projects in Brazil, Colombia, Ecuador, Peru, and Venezuela. Mr. Mosse served as the Operations Adviser to the Managing Directors from 1993 to 1999. Mr. Mosse has authored or co-authored several publications issued by the World Bank.

Peter Pearson received his degrees in economics from the Universities of Keele, London and Surrey. Dr Pearson is Director of the Environmental Policy and Management Research Group, and also of the Centre for Energy Policy and Technology, in the Department of Environmental Science and Technology at Imperial College London. He has also held academic posts at the Universities of Glasgow and at the University of Surrey, where he is a Visiting Reader. From 1989-94, he headed Surrey University Energy Economics Centre (SEEC), and in 1993 held a UK Economic and Social Research Council Global Environmental Change Research Fellowship in international environmental priorities. He has been Secretary (1984-1991) of the Input-Output Research Association, Vice President for Publications (1994-97) of the International Association for Energy Economics, and Chair (1992, 2002) of the British Institute of Energy Economics. He is the author/co-author of 150 scholarly publications in the area of energy, environment and water.

Carlos E. M. Tucci, Civil Engineer and Professor at the Institute of Hydraulic Research of the Federal University of Rio Grande do Sul. Mr. Tucci holds a Ph.D. from Colorado State University, 1978. He is currently the president of the SAMTAC South American Advisee Committee of GWP Global Water Partnership for South America. He is also a former vice-president of the International Association of Hydrologic Science, a former president of the Brazilian Water Resources Association, and a former executive secretary for the Water Resource Research and Investment fund in Brazil. He is now Chief-editor of the Brazilian Water Resources Journal and REGA Water Resource Management Journal for Latin America.. Mr. Tucci has about 300 publications in books, book chapters, papers in journals, essays and conferences. He was honored by the Civil Defense of the State of Rio Grande do Sul and for the best scientific book published in 1993 in the State of Rio Grande do Sul.

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