



GEORGETOWN SANITATION IMPROVEMENT PROGRAM (GY-L1025/2428/BL-GY)

Project Completion Report (PCR)

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Electronic Links

1. [Development Effectiveness Matrix \(DEM\)](#)
2. [Final Version of the Progress Monitoring \(PMR\) Development Effectiveness Matrix \(DEM\)](#)
3. [Ex post Analysis Cost Report](#)
4. [Results and Procedures Report \(QRR\)](#)
5. [Exit Workshop Meetings](#)

Acronyms and Abbreviations

DEM	Development Evaluation Matrix
EA	Executing Agency
EIA	Environmental Impact Assessment
EMCP	Environmental Monitoring and Control Plan
EPA	Environmental Protection Agency
ERM	Environmental Resource Management
ESMP	Environmental and Social Management Plan
GDP	Gross Domestic Product
GOG	Government of Guyana
GWI	Guyana Water Incorporated
IDB	Inter-American Development Bank
LP	Loan Proposal
MC	Ministry of Communities
MF	Ministry of Finance
MH	Ministry of Health
MTR	Medium-Term Review
O&M	Operation and Maintenance
OP	Operation Manual
PEU	Project Executing Unit
PUC	Public Utilities Commission
TOR	Terms of Reference

BASIC INFORMATION (US\$ AMOUNT)

PROJECT NUMBER: GY-L1025 TITLE: GEORGETOWN SANITATION IMPROVEMENT PROGRAM LENDING INSTRUMENT: INL-INVESTMENT LOAN COUNTRY: GUYANA BORROWER: GUYANA - MINISTRY OF FINANCE LOAN: 2428/BL-GY SECTOR/SUBSECTOR: AS
DATE OF BOARD APPROVAL: 27 OCTOBER 2010 DATE OF LOAN CONTRACT EFFECTIVENESS: 08 DECEMBER 2010 DATE OF ELIGIBILITY FOR FIRST DISBURSEMENT: 16 MAY 2011
<u>LOAN AMOUNT (US\$)</u> ORIGINAL AMOUNT: 9,500,000.00 CURRENT AMOUNT: 9,500,000.00 PARI PASSU: 500,000.00 TOTAL PROJECT COST: 10,000,000.00
<u>MONTHS IN EXECUTION:</u> (TO CURRENT EXPIRATION DATE OF JUNE 8 TH , 2016) FROM APPROVAL: 67.5 FROM CONTRACT EFFECTIVENESS: 66
<u>DISBURSEMENTS PERIODS</u> ORIGINAL DATE OF FINAL DISBURSEMENT: 8 DECEMBER 2015 CURRENT DATE OF FINAL DISBURSEMENT: 8 JUNE 2016 CUMULATIVE EXTENSION (MONTHS): 6 SPECIAL EXTENSIONS (MONTHS): N/A <u>DISBURSEMENTS</u> TOTAL AMOUNT OF DISBURSEMENTS TO DATE: 9,500,000.00
<u>REDIRECTIONING:</u> HAS THIS PROJECT?: RECEIVED FUNDS FROM ANOTHER PROJECT [No] SENT FUNDS TO ANOTHER PROJECT [No]
EX POST ECONOMIC ANALYSIS METHODOLOGY: BEFORE/AFTER EX POST EVALUATION METHODOLOGY: N/A
DEVELOPMENT EFFECTIVENESS CLASSIFICATION: SATISFACTORY

I. Introduction

The city of Georgetown has a population of approximately 175,000 people, equivalent to about 23% of the country's total population. The sewerage system rehabilitated through this project was built between 1924 and 1929, to serve central Georgetown, the most densely populated urban area (460 hectares), where 50,000 people live and where many institutions, markets, and businesses thrive. Due to the flat topography, the sewerage network was divided into 24 sub-basins that flow by gravity to separate pumping stations, which in turn deliver the untreated wastewater into a common ring main. From this ring main, the wastewater is discharged into the ocean, through a subaquatic outfall, near the mouth of the Demerara River. Except for urgent repair works and some equipment replacement, the main components of the system had remained largely unaltered since it was built nearly 90 years ago. In 2009, some pumping stations were repaired and 15 pumps were replaced with IDB financial support.

The main problems encountered by the sewerage system were thus related to obsolescence and deterioration of many of its components, and to greater demands due to population and commercial growth within Georgetown's central area. The consequences were an unacceptably high frequency of system failures and periodic interruptions due to bursts, blowouts, and overflows. The main problems were technically described as: (i) filtration of wastewater from street sewers and manholes into the environment due to pipe corrosion and frequent pump malfunctioning and inactivity; (ii) corrosive gas formation linked to the excessive retention of organic matter in gravity sewers, and (iii) leakage from the ring main, trench crossings and delivery mains, due wear and inadequacy of materials used. Those problems led to risks of wastewater overflows into drainage channels and sewage back-ups onto streets and backyards, posing unacceptable health risks¹.

Guyana Water Incorporated (GWI), the public utility responsible for the design, construction, operation and maintenance of the sewerage system, operates under a license issued by the Ministry of Communities (formerly the Ministry of Housing and Water). This Ministry is in charge of sector policies and, along with the Public Utilities Commission (PUC), monitors the services

¹ W&S Sector Framework: The positive relationship between water and sanitation (W&S) availability and health is amply documented. Worldwide, 88% of infectious childhood diseases are linked to the lack of water and sanitation (Black et al., 2003), and 61% of child mortality can be traced to diarrhea caused by intestinal parasites (Mascarini et al., 2009; Ahs et al., 2010). The high incidence of diarrhea is associated with high levels of malnutrition (World Bank, 2008a), which can result in high levels of anemia and low levels of early cognitive and psychomotor development and physical growth in children (Humphrey 2009, Fewtrell et al., 2005), thus affecting their capacity to learn. Ensuring access to water and sanitation is one of the most efficient mechanisms for avoiding these effects. Better health will be reflected directly in better levels of education (reducing nonattendance and increasing the capacity to acquire knowledge) and greater productivity, which in turn will offer access to better employment opportunities, higher incomes, and a better quality of life (World Bank, 2013), thereby contributing to the countries' economic growth and development (Agénor, 2013). Beyond the impact on health, access to W&S services creates opportunities for the development of nonproductive (recreational) activities, especially for women and children, who are most affected by the lack of services, as well as productive activities (tourism, regional and urban competitiveness). Moreover, a lack of sanitation (treatment of wastewater and proper disposal of solid waste) can generate significant negative externalities if it has an adverse impact on biodiversity or if it reduces the availability of sufficient volumes of water that is safe for human consumption or for productive and ecological uses. In addition, given the great economies of scale in the delivery of these services in urban areas, a situation of natural monopoly can arise, leading to inefficient and inequitable service (Noll, 2012).

provided by GWI. GWI has a total staff of 610, of which 335 are assigned to the Operations Department. The total energy consumption of GWI was estimated at 35,500,000 kWh in 2010, which was used mainly to produce 120,500,000 m³ of drinking water throughout the country. The resulting energy index, 0.29 kWh/m³, is considered relatively low due to the country's predominantly flat topography. However, the high cost of electricity (US\$0.32/kWh) causes significant energy costs, estimated at 70% of the overall GWI operating costs². A comprehensive energy audit conducted before project approval, identified several equipment deficiencies that could be addressed, as a first step, through an energy efficiency pilot plan. The program also recognized that GWI's operation and maintenance activities needed to be better planned and executed.

II. Project performance

2.1 Effectiveness

The three main objectives of the Georgetown Sanitation Improvement Program (GSIP) were to: (i) improve the operational performance of the city's sewerage system through the reconstruction of its most critical components; (ii) strengthen GWI operational and financial performance by improving asset management and promoting energy efficiency; and (iii) limit the transmission of the water-related diseases, specifically lymphatic filariasis and intestinal helminthiasis. The assessment of the project effectiveness was based on a factual assessment of the extent to which the project achieved its intended objectives, as described by the outputs and outcomes established at the project's outset.

a. An analysis of the Vertical Logic

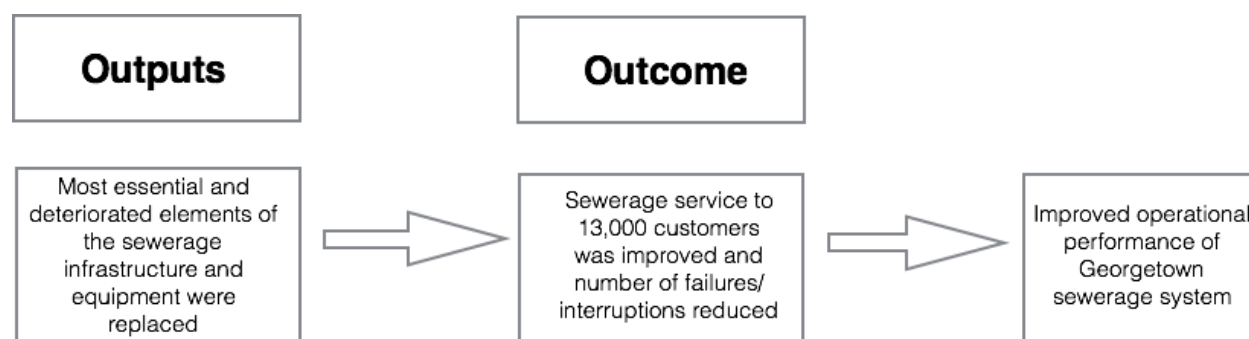
The vertical logic of the project was examined through an evaluation of the rationale behind each of the four components that comprised the GSIP project, as explained below:

Component 1. Rehabilitation of Georgetown's sewerage system

Taking into account the problems encountered by the sewerage network (see introduction), the project included the following activities: (i) the replacement of the complete ring main (5.5 Km), (ii) the replacement of the delivery mains from each of the 24 pumping stations (6.0 Km), (iii) the purchase and replacement of 24 additional pumps, (iv) the rehabilitation of nine pumping stations, (v) an assessment of the condition of the gravity street sewers (900 m), and (vi) the purchase of maintenance equipment. The resulting outcome, identified as the "*number of households that would benefit from an improved sewerage system*", is considered valid and straightforward since it constituted a logical cause-effect link between the proposed outputs and

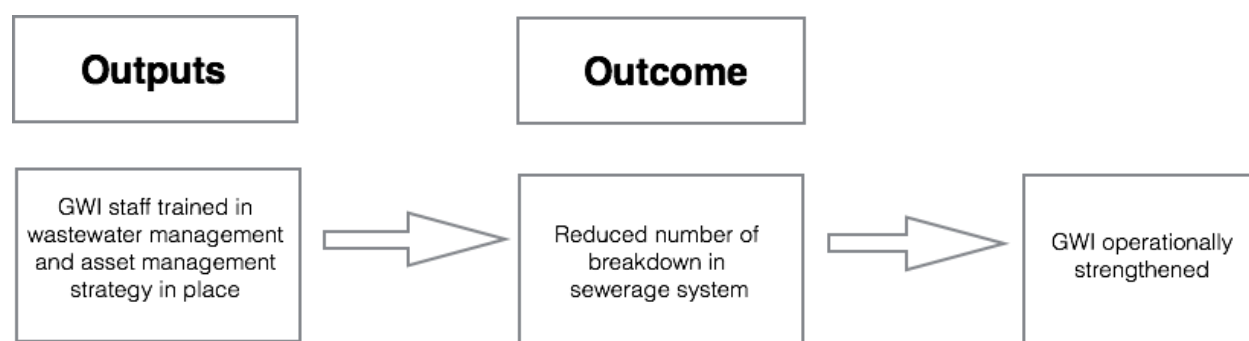
² See: The Energy Efficiency Program for Guyana Water Incorporated. Energy Efficiency for Caribbean Water and Sanitation Companies (RG-T1605-SN1). ECONOLER International, Alliance to Save Energy. February 2010.

the expected outcome. The following figure summarizes this causal relationship. Section 2.1 b, below, describes the results achieved.



Component 2. Institutional strengthening of GWI

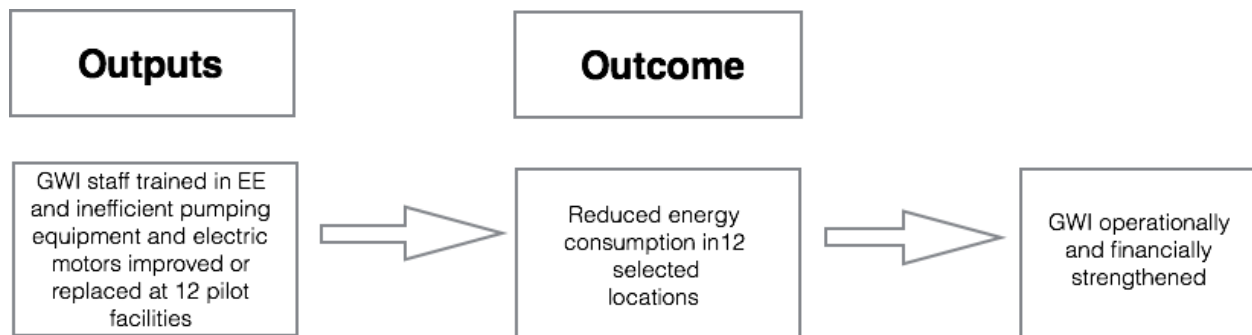
Considering the administrative and operational challenges faced by GWI, the project included support for: (i) the development of an asset management strategy, (ii) a number of training sessions seeking to improve knowledge on wastewater management and energy efficiency, (iii) school awareness campaigns, and (iv) seminars for hotel and restaurant owners. The principal outcome expected from these activities was established as the “*reduction of the number of breakdowns in the system per year*”. This outcome seems to adequately reflect the expected result from the first two activities, but in conjunction with the civil works and equipment included under Component 1. The other two activities sought to facilitate operation and maintenance by educating key segments of the population (school children and business owners) on the proper ways to make use of the sewerage system. For practical reasons, these latter activities were grouped under the heading of institutional strengthening (Component 2).



Component 3. Energy efficiency (EE) pilot project

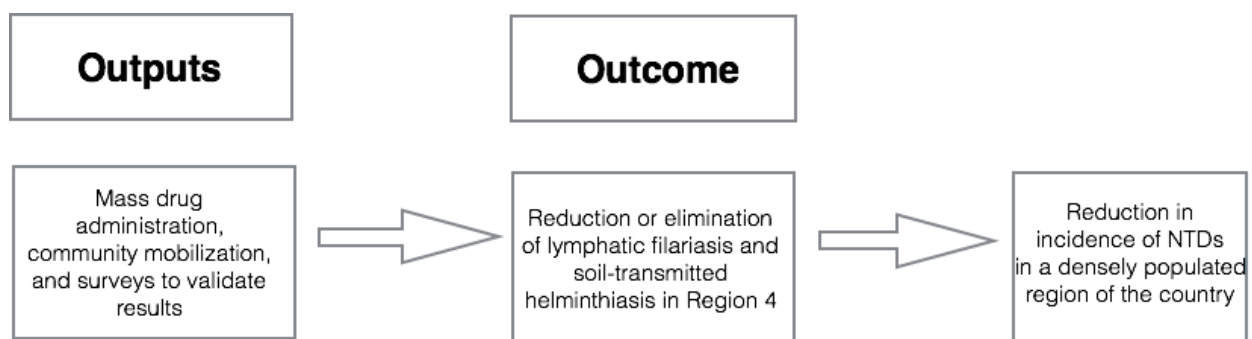
Taking into consideration the high energy costs experienced by GWI, the project included as a pilot case the replacement of inefficient pumping equipment and improvements to electric motors in 12 selected GWI facilities (water wells). The project also included the purchase of portable measuring equipment and hydraulic modeling for two water distribution systems to detect potential inefficiencies. The principal outcome to be obtained from this effort was

identified as the “*reduction in energy consumption in the 12 pilot facilities*”, which could serve as an example to other GWI facilities throughout the country. The replicability achieved with this intervention will be examined in Section 2.1d below.



Component 4. Prevalence reduction in water-related diseases in Region 4

Bearing in mind the public health concerns associated with neglected tropical diseases (NTDs), especially those triggered by mosquitos breeding in standing water, the project included: (i) baseline surveys, (ii) mass drug administration (MDA), (iii) community mobilization, communication activities, and (iv) surveys to validate reported coverage and obtain valuable information on relevant public attitudes. Region 4 was deemed critical based on its demographic importance and on the results of previous surveys, which indicated that the incidence of water-related NTDs was high. The expected outcome was a reduction in the percentage of the population infected with lymphatic filariasis (LF) and soil-transmitted helminthiasis (STH), and an increase in the percentage of individuals knowledgeable about symptoms and disease prevention. Although the logic seemed satisfactory, the outcome was not fully attained for reasons that will be examined in Section 2.1b below.



b. Results Achieved

As stated before, the effectiveness assessment was based on an evaluation of the extent to which the program achieved its intended objectives, as established by the outputs and

outcomes initially planned or modified during project execution. A review of the changes introduced to the Results Matrix during program execution indicates that, although numerous, these changes did not significantly alter the basic project objectives, nor modified the essence of each of the four components. As Table 1 shows, these modifications were mainly introduced to replace indicators that were not easily measured or verified, or were not sufficiently descriptive of the corresponding output or outcome. In a few cases, the baseline or end-of-project targets were adjusted to more accurately reflect values obtained by further evaluations or through knowledge acquired during project execution.

Table 2 displays the outcomes and outputs originally planned under each component and the actual results obtained. In relation to the **outcomes**, the results indicate that the first three components achieved their original targets but that the fourth component, *prevalence reduction of water-related diseases*, revealed serious shortcomings that ultimately indicate that its particular objective will not be achieved within the program's execution period, unless this period were extended for another two years³. It should be emphasized that Component 4 is the smallest of the four components (equivalent to less than 3% of total program costs) and the least associated with GWI's core institutional objectives. Its execution called for close coordination with the Chief Medical Officer of the Ministry of Health, which took a long time to establish and was not always accomplished. This caused initial delays that contributed to the current predicament. Based on a review of the component's situation, the GOG and the IDB jointly decided to seek external financial support for the continuation of the remaining activities, in order to expedite the closing of the GSIP program. The financing needed to complete the unfinished tasks under Component 4 was estimated at approximately US\$250,000, which will have to be obtained from other sources. Considering the recent interest shown by the health authorities, particularly the offices of Vector Control Services and Neglected Tropical Diseases, within the Ministry of Health, the risk of discontinuing the work conducted during the last three years is considered minor. However, a well-defined action plan to raise the needed funds and assure the successful completion of the MDAs is recommended.⁴

Table 2 also shows that most of the 21 program **outputs** were achieved. However, three cases stand out as incomplete: (i) the length of street sewers rehabilitated (Output 1.7), (ii) the development of an asset management strategy (Output 2.1), and (iii) the amount of surveys conducted and drugs successfully distributed (Outputs 4.2 - 4.5). In the first case, a street sewer assessment carried out by visual inspection and with the assistance of a CCTV camera, determined that the sewers in the sewerage basin selected for this pilot assessment were in working condition and therefore did not need immediate rehabilitation.⁵ In the second case, a very preliminary asset management strategy was developed with the assistance of a consultant,

³ WHO protocol recommends 5 yearly rounds of mass drug administration covering at least 60% of the target population. The GSIP program has conducted three rounds during 2013, 2014 and 2015. The remaining rounds should be conducted during 2016 and 2017.

⁴ The MOH has recently obtained funding and conducted a 4th round of mass drug administration (MDA), which diminishes the amount required to complete the rounds to US\$125,000.

⁵ GITEC Consult GmbH with E & A Consultants. Final Completion Report. Georgetown Sanitation Improvement Program.

but using non-program resources.⁶ In retrospect, it seems that the asset management strategy required at the outset could have contained more specificity and a better-defined scope in order to be more helpful and practical. In the third case, a longer execution period – two more years – would have been required to complete the drug distribution rounds and the surveys proposed, as explained before. Another activity that fell short of its target was the number of seminars for hotel and restaurant owners, since only two out of ten originally planned were carried out. These seminars constituted an opportunity for GWI to disseminate knowledge on wastewater infrastructure conservation and establish a mutually beneficial relation with stakeholders in the business community. Due to poor seminar attendance, this output was substituted with written materials suitable for distribution.

With respect to the institutional strengthening component, it should be noted that GWI conducted several training activities during the last three years of program implementation. These activities generated notable interest, with more than 60% of the 610 staff members participating. Areas of training included: (i) revenue generation strategies; (ii) general management and project management; (iii) environmental issues; (iv) physical assets maintenance; (v) human resources issues, etc. Specific topics varied from applied plumbing and basic electricity to customer service and commercial management. These training activities were considered highly beneficial to GWI staff, and the utility plans to preserve them as a permanent human resources development mechanism.

⁶ GWI. Work and Asset management at Guyana Water Inc.: Assessment and Roadmap for Strengthening Current Practices (a 28-page report submitted by an individual consultant), 2015.

Table 1
Changes to the Results' Matrix

Section of the Results Matrix where change took place	Name of the change	Type of change	Reasons for change	Date of change	Date of change agreed with Executing Agency
Outcome Indicator 1.1	People served by an improved sewerage system (#) was transformed into household served by an improved sewerage system (RF – flagged indicator subject to consolidation)	Change of units without affecting the actual end result. (Conversion at 4 persons per household)	Adjust the indicator to match the Results Framework Indicator (RF – flagged indicator subject to compilation).	The modification was introduced at Project Inception	The modification was introduced at Project Inception
Outcome Indicator 2.1	Staff-hours spent on preventive maintenance activities per year (# of hours) was changed to Number of Breakdown per year	Indicator changed	New indicator is easier to monitor	The modification was introduced during the establishment of the Second Period of 2012 PMR Cycle.	The modification was introduced during the establishment of the Second Period of 2012 PMR Cycle.
Outcome Indicator 2.2	Population targeted by awareness campaign properly using sanitation infrastructure (%)	Indicator was removed from the Results Matrix	Simplification of the Results Matrix	The modification was introduced at Project Inception	The modification was introduced at Project Inception
Outcome Indicator 3.1	Energy consumption in 12 pilot facilities	Baseline and EOP target modified	Results of the detailed Energy Efficiency Study for the 12 Stations.	The modification was introduced during the establishment of the Second Period of 2013 PMR Cycle.	The modification was introduced during the establishment of the Second Period of 2013 PMR Cycle.

Section of the Results Matrix where change took place	Name of the change	Type of change	Reasons for change	Date of change	Date of change agreed with Executing Agency
Output 1.1	Ring Main replaced	Change to the End of Project Target quantity from 5.5 to 5.4 km	Adjustment to real measured quantities	March 26, 2015 (PMR Update)	December 31 st , 2013
Output 1.2	Delivery Mains replaced	Change to the End of Project Target quantity from 6.0 to 4.4 km	Adjustment to real measured quantities	March 26, 2015 (PMR Update)	December 31 st , 2013
Output 1.5	Gravity street sewers assessed	Change of EOT quantities / (From 1 to 2)	Additional street sewer to be assessed with savings obtained under the program	March 26, 2015 (PMR Update)	March 26, 2015 (PMR Update)
Output 1.7	Gravity street sewers rehabilitated	Change of quantities / (From 200 m to 0 m) Suppression of the corresponding activity	Condition of the pipes (assessed under 1.5) indicated that rehabilitation was not required	April 9, 2015 (PMR Update)	April 9, 2015 (PMR Update)
Output 2.2	Training sessions performed within GWI on Wastewater management and Energy Efficiency	Change of EOT quantities / (From 10 to 11)	Additional training (WW Study) financed with savings obtained under the program	March 26, 2015 (PMR Update)	March 26, 2015 (PMR Update)
Output 2.3	Schools where awareness campaigns have been completed	Change of EOT quantities / (From 20 to 26)	Initial target surpassed	March 26, 2015 (PMR Update)	March 26, 2015 (PMR Update)
Output 2.4	Seminars for hotels and restaurant owners carried out	Change of EOT quantities / (From 10 to 3)	Change of Strategy (Low attendance at seminars, pamphlets will be distributed and accounted as 1 workshop)	March 26, 2015 (PMR Update)	March 26, 2015 (PMR Update)
Output 4.2	Knowledge attitudes and Practices surveys carried out.	Change of EOT quantities / (From 3 to 1)	Timeframe for the operation vs. Component 4	March 26, 2015 (PMR Update)	March 26, 2015 (PMR Update)
Output 4.3	Drugs (donated or purchased) successfully distributed	Change of EOT quantities / (From 3 to 1)	Timeframe for the operation vs. Component 4	March 26, 2015 (PMR Update)	March 26, 2015 (PMR Update)

Table 2
Results Achieved Matrix

Outcome/Indicator	Unit of Measure	Baseline value	Baseline year	Means of verification	Targets and Actual Achievement		Date when target was achieved
Outcome #1: Georgetown sewerage system performance improved							
Indicator #1.1 Households served by an improved sewerage system	Households	0	2010	GWI Statistics; Semi Annual Reports	Original target value	13,000	2014
					Revised target value	13,000	
					Actual amount achieved	13,000	
Outcome #2: GWI capacity to Operate and Maintain assets increased							
Indicator #2.1 Number of breakdowns per year	Breakdowns	354	2012	GWI work sheet orders, monthly Board Reports, Semi-annual reports	Original target value	(See Table 1)	2015
					Revised target value	217	
					Actual amount achieved	30	
Outcome #3: Energy use in Guyana Water Incorporated (GWI) improved							
Indicator #3.1 Energy consumption in 12 pilot facilities	MWh/year	5,946	2013	GWI Station Consumption Report, monthly Board Reports, Semiannual reports	Original target value	2,600	2015
					Revised target value	4,625	
					Actual amount achieved	4,700	
Outcome #4: Water-related Neglected Tropical Diseases controlled and, where feasible, eliminated in Region 4 Note: (component still in execution with other funding sources)							
Indicator #4.1 Soil-Transmitted Helminthiasis (STH) and Lymphatic filariasis (LF) prevalence estimated	Assessments	0	2010	Ministry of health report of prevalence assessments	Original target value	3	(2017 est.)
					Revised target value	3	
					Actual amount achieved	1	
Indicator #4.2 Prevalence of Lymphatic filariasis (LF) infection	% of population infected	20	2001	Ministry of health report of prevalence	Original target value	<1	(2017 est.)
					Revised	<1	

				assessments	target value		
					Actual amount achieved	3	
Indicator #4.3 Prevalence of Soil-Transmitted Helminthiasis (STH) infection	% of population infected	25	2009	Ministry of health report of prevalence assessments	Original target value	10	(2017 est.)
					Revised target value	10	
					Actual amount achieved	1	
Indicator #4.4 % of surveyed individuals who know key facts about the diseases (e.g. their causes and symptoms) and about MDA (e.g. that it is harmless, free, targeted at the entire population etc.)	Percentage	0	2009	Ministry of health report of KAP survey	Original target value	80	(2017 est.)
					Revised target value	80	
					Actual amount achieved	40.25	

Outputs/Indicator	Unit of Measure	Baseline value	Baseline year	Means of verification	Targets and Actual Achievement		Date when target was achieved
Component #1: Rehabilitation of Georgetown's sewerage system							
Output #1.1 Ring main replaced	Kilometers	0	2010	GWI approved construction supervision reports, monthly Board Reports, semi-annual reports.	Original target value	5,5	2014
					Revised target value	5,4	
					Actual amount achieved	5,4	
Output #1.2 Delivery mains replaced	Kilometers	0	2010	GWI approved construction supervision reports, monthly Board Reports, semi-annual reports.	Original target value	6,0	2014
					Revised target value	4,4	
					Actual amount achieved	4,4	
Output #1.3 Sewerage pumps (purchased and) installed	Pumps	0	2010	GWI approved construction supervision reports, monthly Board Reports, semi-	Original target value	24	2014
					Revised target value	24	
					Actual amount	24	

				annual reports.	achieved		
Output #1.4 Existing sewerage pumps installed	Pumps	0	2010	GWI approved construction supervision reports, monthly Board Reports, semi-annual reports.	Original target value	9	2014
					Revised target value	9	
					Actual amount achieved	9	
Output #1.5 Gravity street sewers assessed	Sewer basins	0	2010	GWI approved construction supervision reports, monthly Board Reports, semi-annual reports.	Original target value	1	2014
					Revised target value	2	
					Actual amount achieved	1	
Output #1.6 Pumping stations rehabilitated	Pumping stations	0	2010	GWI approved construction supervision reports, monthly Board Reports, semi-annual reports.	Original target value	9	2014
					Revised target value	9	
					Actual amount achieved	9	
Output #1.7 Gravity street sewers rehabilitated	Meters	0	2010	GWI approved construction supervision reports, monthly Board Reports, semi-annual reports.	Original target value	200	N/A
					Revised target value	0	
					Actual amount achieved	0	
Output #1.8 Combination sewerage tanker purchased	Tankers	0	2010	GWI approved construction supervision reports, monthly Board Reports, semi-annual reports.	Original target value	1	2012
					Revised target value	1	
					Actual amount achieved	1	
Component #2: Institutional strengthening of Guyana Water Inc. (GWI)							
Output #2.1 Asset management strategy developed	Strategies	0	2010	Consultant's report, GWI's monthly Board Reports, Semi-annual reports	Original target value	1	-
					Revised target value	1	
					Actual amount achieved	1	
Output #2.2 Training sessions performed within GWI on wastewater management and energy efficiency	Training sessions	0	2010	Attendance records; Course outlines and materials, GWI's monthly Board Reports, Semi-annual reports	Original target value	10	2014
					Revised target value	10	
					Actual amount achieved	10	

Output #2.3 Schools where awareness campaign has been completed	Schools	0	2010	Attendance records; Course outlines and materials, GWI's monthly Board Reports, Semi-annual reports	Original target value	20	2015
					Revised target value	20	
					Actual amount achieved	26	
Output #2.4 Seminars for hotel and restaurant owners carried out	Seminars	0	2010	Attendance records; Course outlines and materials, GWI's monthly Board Reports, Semi-annual reports	Original target value	10	-
					Revised target value	3	
					Actual amount achieved	2	
Component #3: Energy efficiency pilot project							
Output #3.1 Portable measuring equipment purchased	Equipment	0	2010	Receipts, GWI's monthly Board Reports, Semi-annual reports.	Original target value	9	2012
					Revised target value	9	
					Actual amount achieved	9	
Output #3.2 Hydraulic efficiency models completed	Hydraulic models	0	2010	Consultant Report, GWI's monthly Board Reports, Semi-annual reports.	Original Target value	2	2013
					Revised target value	2	
					Actual amount achieved	2	
Output #3.3 Pumping stations optimized (rehabilitated, calibrated, etc.)	Pumping stations	0	2010	Consultant Report, GWI's monthly Board Reports, Semi-annual reports.	Original target value	12	2015
					Revised target value	12	
					Actual amount achieved	54	
Component #4: Prevalence Reduction in Water Related Diseases							
Output #4.1 Baseline survey of Lymphatic Filariasis (LF) and Soil-Transmitted Helminthiasis (STH) prevalence carried out	Surveys			Ministry of health baseline report of prevalence assessments	Original target value	1	2012
					Revised target value	1	
					Actual amount achieved	1	
Output #4.2 Follow up Lymphatic Filariasis (LF) and Soil-Transmitted Helminthiasis (STH) prevalence surveys carried out	Surveys			Ministry of health baseline report of prevalence assessments	Original target value	2	
					Revised target value	2	
					Actual amount	1	

					achieved		
Output #4.3 Knowledge Attitudes and Practices surveys carried out	Surveys			Ministry of health report of KAP survey	Original target value	3	
					Revised target value	2	
					Actual amount achieved	1	
Output #4.4 Drugs (donated or purchased) successfully distributed	Drugs	0	2010	Ministry of health report on implementation of Massive Drug Administration campaign	Original target value	5,226,410	
					Revised target value		
					Actual amount achieved	1,746,692	
Output #4.5 Surveys to validate reported drug coverage carried out	Surveys	0	2010	Mass drug administration validation report	Original target value	5	
					Revised target value	1	
					Actual amount achieved	0	
Output #4.6 Neighborhood Democratic Councils (NDCs) in which social mobilization and health education workshops are carried out	Councils	0	2010	Ministry of health report on implementation of Massive Drug Administration campaign	Original target value	60	2015
					Revised target value	60	
					Actual amount achieved	60	

c. An analysis of the Results Attribution

The first and most significant outcome of the GSIP project was the improvement in sewerage performance, which was measured by the population benefitting from the improved network (13,000 households or 52,000 people). This outcome is closely associated with the second, GWI's increased capacity to operate and maintain its assets, measured by the number of breakdowns per year. The initial value of this indicator was 354 breakdown/year while the target was stipulated at 217. Since an impact evaluation for this project was not carried out, this affirmative judgment on results attribution is based on empirical evidence, as summarized by the following considerations: (i) the system was experiencing serious breakdowns before the program interventions were made due to obsolescence, wear and tear and decay, (ii) the deteriorated condition of the materials (pumping stations, pipes, valves, etc.) and equipment (pumps, motors, electrical panels, etc.) was confirmed during project execution, (iii) the number of system breakdowns, failures and malfunctions was reduced from more than 300/year to less than 30, (iv) no other interventions took place in parallel with the GSIP project on the sewerage system. This empirical evidence is congruent with theoretical substantiation that indicates that pipes and equipment have a predetermined service life, beyond which failures begin to occur and replacement is needed.^{7,8} Information from GWI indicates that the volumes of wastewater pumped by the stations raised from 305,936 m³ in 2011 to 22,212,907 m³ in 2014, confirming the increase in service provision (proper evacuation of wastewater) by the rehabilitated system.

The third project outcome stipulated that energy use in GWI could be decreased by a series of interventions (such as replacing, calibrating or repairing inefficient pumps and motors) in 12 pilot facilities -mainly pumping stations- where energy losses had been clearly identified.⁹ Thus, energy consumption at these 12 facilities was expected to markedly decrease from the current usage of 6,123 MWh/year in 2011 to generate financial savings in a short payback period.¹⁰ The consumption measured in these 12 facilities was 4,985 MWh/year in 2015, a 18,6% reduction, equivalent to savings of US\$355,000/year. The payback period was estimated at 3,6 months and the energy index decreased from 0.31 to 0.24 KWh/m³.¹¹ These successful results can clearly be attributed to the project, since no other interventions took place at these 12 facilities during project execution. This empirical evidence is congruent with theoretical considerations that indicate that pumps and motors utilize less energy when they function properly and at their most efficient point in the pump and motor curves.¹²

⁷ See Chapter 13 "Sewer Materials, Appurtenances and Maintenance" in Water Supply and Wastewater Engineering. Nazih Shammas and Lawrence Wang. 3rd Edition. 2011.

⁸ See Design period or life expectancy considerations (page 2/2) and Chapter 19 "Sanitary Sewer Design" in Water and Wastewater Engineering: Design Principles and Practice. Mackenzie L. Davis. 2010.

⁹ ECONOLER International, Alliance to Save Energy. Energy Efficiency Program for GWI. February 2010.

¹⁰ WATERGY Audits, Action Plan and Hydraulic project. 2012-2013.

¹¹ GWI Report on GSIP – Energy Efficiency Component. 2015.

¹² See pump performance characteristics (Section 8.2.3) in Water Supply and Wastewater Engineering. Nazih Shammas and Lawrence Wang. 3rd Edition. 2011.

In the case of the fourth component, the partial results obtained from 3 rounds of MDAs have not been adequately confirmed through surveys and public health statistics. However, there is no reason to doubt its attribution, since no other widespread public health campaign to control LF and STH has been conducted in Region 4. The two additional rounds are recommended by WHO protocols in order to consolidate and strengthen the results thus far obtained.

d. Unanticipated outcomes

Based on the successful results of the energy efficiency pilot project (Component 3), GWI decided to replicate the methodology applied in the 12 drinking water wells and extend it to 42 additional facilities throughout the country. The results of this expansion continue to be advantageous and well received within GWI. The methodology will also be widened to include booster pumps throughout the country in the near future. Although the lessons learned from pilot project were intended to serve a potentially replicable example, its rapid expansion to other facilities, within the execution period, was not anticipated.

2.2 Efficiency

An important element in assessing project efficiency is the examination of the actual use of loan and counterpart resources. In this case, no significant cost variations or cost over-runs were identified and no noteworthy delays in project execution were experienced. Table 3 shows the planned, revised costs, and actual cost, for each of the project components. As can be observed, with all of the activities completed, except for Component 4, the loan resources have not been completely utilized, with a remaining balance of approximately US\$956,000. Additionally, there has been no need to utilize counterpart resources (\$500,000), which were intended to cover project contingencies.

In Table 3, the project outputs have been grouped under each component, since most of these were not contracted, acquired or executed under separate contracts. For example, in the case of Component 1, which constituted more than 90% of the project's direct costs, the incurred expenditures were associated with four mutually interdependent contracts: (i) the priority works construction contract, which included all civil works, as well as equipment acquisition and installation, (ii) the construction supervision and mentoring consultancy, (iii) the procurement of HDPE pipes, and (iv) the procurement of a jet-vacuum truck-mounted sewer cleaner. A comparison between the planned and the actual costs of this component reveals an increment of 6.6%, which is considered reasonable and well within the amount expected and initially allocated to project contingencies.

In the case of the institutional strengthening component (Component 2), the low expenditures, relatively to initial or planned costs, are due to the fact that the construction supervision and mentoring consultancy included most of the activities established under this component: (i) mentoring GWI staff on supervision of civil works; (ii) development of standard operating procedures for the upgraded system; (iii) staff training programs on operation and maintenance practices and on environmental and social issues, and (iv) public awareness campaigns,

specifically targeted toward schools, hotel and restaurant owners. No attempt was made to try to separate these costs (ii, iii and iv, above), which were mingled with those more closely related to construction supervision.

With respect to the remaining resources, there are current discussions between the GOG (Ministries of Finance, Public Health, Communities, and GWI) and the IDB to use approximately US\$350,000 to address the challenges posed by the Zika outbreak in the country. In relation with these discussions, the GOG has requested the IDB to extend the last disbursement date for the Loan until December 9, 2016.

A cost-benefit analysis was performed for component 1 (sewerage system rehabilitation) and component 3 (energy efficiency) by the IDB project team at the time of project analysis and before loan approval. Component 1 showed an economic rate of return of 13%. This analysis was complemented with appropriate sensitivity and risk assessments. Additionally, each individual energy efficiency project was separately evaluated and all were considered economically feasible. Their aggregate rate of return was 76.7%. As shown in Table 3, these activities did not experience significant cost variations from the estimated to the actual costs.

An Ex-Post Cost Benefit analysis was performed, demonstrating an ERR of 15.33% exceeding the ex-ante ERR of 13% (Results shown below – Electronic link 3 – methodology as per Loan Proposal).

Discount rate	12%
ENPV (GY\$)	171,965,868
ERR	15.33%
ENPV (US\$)	829,951

Table 3
Costs of the Project

Component	Output	Planned Total Cost (US\$ thousands)				Revised Total Cost (US\$ thousands)				Actual Total Cost (US\$ thousands)			
		BID	Local	Total	%	BID	Local	Total	%	BID	Local	Total	%
1. Rehabilitation of Sewerage System	Key sewerage network infrastructure and equipment assessed, purchased, rehabilitated and/or replaced. Maintenance tanker purchased.	7,341		7,341	73	8,111		8,111	81	7,827		7,827	78
2. Institutional Strengthening	Asset management strategy developed. Training sessions performed. Seminars for business owners and awareness campaigns for schools carried out	342		342	3	342		342	3	59		59	1
3. Energy Efficiency	Measuring equipment acquired and pumping stations optimized	272		272	3	258		258	3	209		209	2
4. Water-related Diseases	Surveys conducted, drugs distributed and social mobilizations workshops carried out	285		285	3	285		285	3	284		284	3
Sub-Total (Components)		8,240		8,240	82	8,996		8,996	90	8,379		8,379	84
Administration and Other Costs ¹³		1,260	500	1,760	18	504	500	1,004	10	165	0	1,121	11
Total (Project)		9,500	500	10,000	100	9,500	500	10,000	100	8,544	0	8,544	85

¹³ Interests, audits, incidentals, and other costs not related to outputs.

2.3 Relevance

The need for investments in water and sanitation infrastructure and institutional development in Guyana continues to be extensive. While the demand for better drinking water facilities has traditionally received consistent support from the Bank and other lending institutions, the need for comprehensive rehabilitation of the sewerage system in Georgetown had remained a secondary concern over the years. This lack of attention to this crucial infrastructure resulted in a series of system failures and interruptions such as bursts, blowouts, and overflows that had a detrimental effect on the most central neighborhoods of Georgetown, an area thriving with residents, visitors, institutions and businesses¹⁴. These incidents inconvenienced the population and created health and environmental risks. In consultation with the Government, it was jointly decided to address this situation through an IDB rehabilitation program of the key sewerage system components.

In addition to the need for rehabilitation of the sewerage system, the program also included supplementary components, which sought to: (i) provide GWI with the tools that would make it a stronger public service provider through an institutional strengthening component which attempted to improve operation and maintenance of physical assets, staff training programs on relevant topics, and public awareness campaigns to assure customers' support; (ii) address energy efficiency through a limited pilot program that would shed light on ways to decrease energy use and help cope with excessive consumption and significant financial expenditures; and (iii) combat water-related diseases, such as intestinal helminthiasis and Lymphatic Filariasis, in the Georgetown region.

Based on a review of these considerations, this report concludes that the program constituted an appropriate and measured response to the urgent needs for rehabilitation identified in 2010 and the years before. These conditions would have gotten increasingly worse had the program not been implemented. Thus, the original assessment of the pertinence and relevance of the program vis-a-vis the needs of the beneficiaries and the priorities of the country at the time of approval was well justified. That assessment maintained its validity throughout the execution period and continues to seem well founded. The need for the project was also in line with the Guyana's development priorities and the Bank's country strategy as will be explained in Sections 3.1 and 3.2 below.

2.4 Sustainability

A review of the factors that contribute to, or could potentially undermine project sustainability revealed that no significant or insurmountable risks exist that could erode long-term sustainability, nor that identifiable risks could not be properly mitigated. The widely recognized

¹⁴ The IDB Loan Document (2010) list two incidents, which occurred on July 11 and July 20, 2010, when ruptures in sections of the ring main and sewer lines damaged the pavement of the street above and caused wastewater overflows near the center of town.

overriding risk is the lack of proper operation, or adequate maintenance, of the renovated sewerage infrastructure and equipment. It was noted, however, that GWI is thoroughly familiar with the infrastructure rebuilt, as it had satisfactorily operated it for several years under more difficult conditions. In spite of this unquestionable familiarity, two areas require GWI's special attention to lessen institutional weaknesses: (i) the need to strengthen operation and maintenance practices for all physical assets owned by the institution, including the assignment of sufficient and qualified human resources to this task, and (ii) the need to redouble its effort to maintain sufficient spare parts in store to attend frequently occurring sewerage system failures. As explained in Section 2.1b, the *asset management strategy*, a critical output under the institutional strengthening component, was prepared in a very preliminary fashion and using non-program resources.¹⁵ Thus, a much more focused and detailed strategy is recommended to effectively move forward in this critical area.

With respect to energy efficiency component, the positive results achieved within the pilot water pumping stations and the decision to extend this type of energy-saving measure to 75% of GWI facilities, clearly indicate the long-term advantages of the practice and its significant impact on GWI's financial sustainability. However, in this case the need for a solid asset management strategy, including the necessity of maintaining adequate supplies of spare parts is equally recommended.

In relation to the component on *prevalence reduction of water-related diseases*, the sustainability analysis indicated that the completion of the missing rounds of drug administration would assure the lasting effects sought (i.e. reduction in NTDs incidence). At this point, there is no reason to doubt that the successful termination of the rounds needed to consolidate the effects of the medicines distributed would not accomplish their intended results.

III. Non-Core Criteria

3.1 Contribution to the Bank's Strategic Development Objectives

The program contributed to the IDB's Ninth General Capital Increase (GCI-9) lending target: "*support development to small and vulnerable countries*", and the second GCI-9 regional development goal: *Infrastructure for competitiveness and social welfare*. The proposed program was also well in line with the Government's commitment to achieve the Millennium Development Goals by 2015 on assuring reliable access to adequate sanitation services, improving health and combating diseases. The program was consistent with the IDB's Water and Sanitation Initiative, as it contributed to the goals set under the programs: "100 Cities" and "Efficient and Transparent Utilities" (GN-2446-2).

¹⁵ IDB programme GY-L1040 in execution includes an institutional strengthening component that includes those requirements: capacity building activities on asset management and support for the implementation of a monitoring and evaluation system to track the GWI performance in time.

3.2 Contribution to the Country Strategy Development Objectives

The program was consistent with the IDB's Country Strategy for Guyana (2008-2012), which sought to support the Government's plans to accelerate economic growth through economic diversification and targeted social development. In particular, the Strategy stressed the importance of carrying out significant work to increase access to potable water and adequate sanitation. The program is also consistent with IDB's Country Strategy for Guyana (2012-2016), which seeks to enhance transparency, efficiency, and effectiveness of public sector management and increase access to high quality social services that improve quality of life. *Water and sanitation* is listed as an area of continued dialogue between the GOG and the IDB.

3.3 Monitoring and Evaluation

The Program's Loan Proposal indicated that GWI, through its Capital Investment and Planning Department (CIPD), would designate appropriate staff to the Project Executing Unit (PEU), including a project manager, to carry out all tasks directly related to program execution¹⁶. Among these tasks, progress monitoring throughout the five-year execution period was one of the most central activities of this unit. Detailed program activities were described in the project's Operational Manual (OM). An assessment of the adequacy of the monitoring and evaluation (M&E) mechanisms is presented in the following subsections.

i) M&E design

Program monitoring was based on the Results Framework originally prepared, periodic evaluations of the Progress Monitoring Reports (PMR), and reviews of the Annual Operation Plans (AOP). GWI submitted semi-annual progress reports, which included reviews of the program's implementation status, issues and actions taken during the respective periods, financial progress, contract compliance, procurement plan updates, lessons learned, and results matrix updates. In addition to these documents, the consulting firms hired to supervise construction and rehabilitation of the sewerage facilities and carry out mentoring activities submitted monthly progress reports. These reports included observations on environmental and social procedures followed during construction. Furthermore, specific reports, prepared in relation to the three non-construction components¹⁷, served as means to properly gauge progress and identify potential obstacles.

Besides the monitoring mechanisms described, the project also stipulated that two independent evaluations had to be carried out: (i) a mid-term evaluation to be conducted at the end of 30 months, or after 50% of the loan resources had been committed, and (ii) a final evaluation to be

¹⁶ See Section 4.3 for a summary of the overall experience with project administration.

¹⁷ The other three components were institutional strengthening, energy efficiency and reduction of water-related diseases.

conducted at the end of the program, or when more than 90% of the resources had been committed. These evaluations were designed to help assess progress, identify problems, review results, and learn potentially beneficial lessons. Annual audited financial statements were also required.

ii) M&E implementation

Overall, GWI developed a satisfactory system for gathering and maintaining information related to the various indicators included in the Results Framework, as well as for collecting and retaining updated documentation on the performance indicators and implementation plans. The output and outcome indicators were acceptably measured and useful to follow progress and discern difficulties encountered under each component. The Program Manager was able to monitor progress by component, against agreed yearly benchmarks, and assess unforeseeable needs during program execution.

An area where GWI needs to improve its monitoring capabilities is on assessing the water quality conditions in the proximity of the outfall to determine potential levels of contamination caused by the sewage discharge or by any other sources in the surrounding environment. Due to logistical challenges, the recommendations described in the project's M&E annex (see Loan Proposal) have been difficult to implement.

An external consultant conducted mid-term and final reviews in 2013 and 2015, following M&E recommendations. The mid-term evaluation examined the organization established to execute the project, the level of progress in attaining the project objectives, the level of acceptance of IDB procedures, the effectiveness of the M&E mechanisms, the lessons learned, and the sustainability of results in the long term. These reviews contained information that was useful in the preparation of this PCR report. Audited financial statements have also been conducted, in compliance with contractual obligations.

iii) M&E utilization

In general, the M&E tools described above were adequately utilized during project execution. The logical framework, in conjunction with the program's procurement plan, and the PMR contributed to a well-formulated, sequential plan of activities that, with few exceptions, was conducted within the expected 5-year execution period.

3.4 Use of Country Systems

The project did not intend to use country systems, however, with respect to Country Indicators, IDB Program GY-L1040 in execution includes an institutional strengthening component that includes those requirements: support for the implementation of a monitoring and evaluation system to track the GWI performance in time.

3.5 Environmental and Social Safeguards

The main stakeholders of this operation were the residents of central Georgetown, who live within the area drained by the sewerage system (460 hectares). In addition, several commercial establishments, public and private institutions, are located within this area and receive daily visitors. These stakeholders were negatively affected by the problems encountered by the old network and had an interest in promoting its proper operation. The Environmental and Social Assessment (ESA) prepared before approval considered measures to minimize construction impacts, which were generally applied.

The main environmental and social difficulties encountered by this type of infrastructure intervention in an urban environment commonly occur during the construction phase, which entailed street closings, trench excavation, dirt removal, noise, dust, pipe and equipment installation, and other potentially disturbing activities to a relatively dense and dynamic urban environment. These temporary impacts were addressed through the construction contract, by requiring adequate mitigation measures. The mid-term and final evaluations conducted did not identify the occurrence of serious construction complications or conflicts with stakeholders, based on the reports reviewed and the interviews conducted¹⁸. The only concern found was related to the final reparations to roads and streets after excavation and pipe installation. In this case, the Ministry of Public Works indicated its concern with the quality and timely completion of road reinstatement works. These concerns were especially noticeable when the road condition was already defective before excavation began. Joint coordination was reportedly attained between GWI, the Georgetown City Council and the Ministry of Public Works to resolve the complaint during the construction's "defects and liability period" which ended in August 2015.

IV. Findings and Recommendations

Based on the aforementioned considerations, this report concludes that the program constituted a suitable response to the urgent needs for rehabilitation of the Georgetown's sewerage system, identified before 2010. The precarious conditions of the network and its more essential components would have gotten increasingly worse had the program not been implemented. The needs of the beneficiaries, as well as the priorities of the country, were appropriately taken into account in defining the scope of the program in relation to the financial resources available. In addition, a review of the factors that contribute to project sustainability revealed that no significant or insurmountable risks exist that could undermine long-term benefits, or that identifiable risks could not be properly mitigated. Table 4 and the following subsections summarize the main findings and recommendations.

¹⁸ See Mid-Term and Final Evaluations conducted in 2013 and 2015, respectively.

4.1 Vertical Logic

The preparation and design of the program's components were the result of a number of studies and activities carried out before 2010. The most relevant was the preparation of the *Water and Sanitation Upgrade Program* study (ATN/OC-11805-GY) to update the 1995 sewerage master plan, prepare final designs for priority interventions and determine appropriate tariffs to ensure financial sustainability. The engineering designs were prepared after careful consideration of a range of technical alternatives and investment approaches. Since the project was basically a rehabilitation program, GWI was considered to be sufficiently familiar with the operation of the new (replaced) assets, but it was also recognized that GWI needed to improve its maintenance programs and practices. The latter concern was therefore included as an essential project component.

As explained before, GWI's total energy consumption, estimated at 35,500,000 kWh in 2010, contributed to 70% of the overall operating costs. Thus, a comprehensive energy audit was also conducted with IDB assistance¹⁹, which identified several equipment deficiencies that could be initially addressed through a demonstrative energy efficiency pilot plan, with a cost recovery period of 0.62 years. The pilot program identified 12 water-pumping stations whose equipment could be upgraded or replaced.

A comprehensive logical framework was then assembled at the outset, which included well-developed output and outcome indicators²⁰. Minor changes were introduced when it was adapted to the IDB's Progress Monitoring Report (PMR) system. In general, the indicators selected enabled reliable measurement of outputs, which was necessary to monitor the progress and efficacy of results. The means of verification in some cases could have been more specific. The logical framework, in conjunction with the program's procurement plan, contributed to a well-formulated, sequential plan of activities.

The *vertical logic* of the operation was reexamined and considered adequate, since there were well-established cause-effect links between the program outputs and its intended outcomes. The program's results matrix was deemed generally coherent and well organized. Based on the aforementioned considerations, this evaluation believes that the program constituted a suitable and organized response to the urgent needs for rehabilitation identified before 2010.

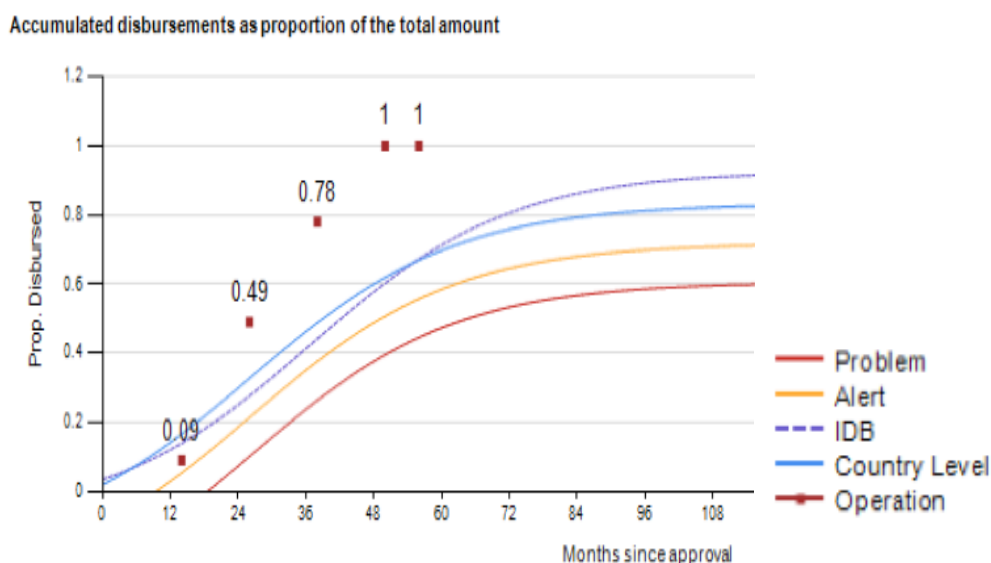
4.2 Execution and Budget

In spite of a relatively slow start, the overall execution of the main program components can be considered highly satisfactory as shown in the figure that follows, which depicts the accumulated disbursements as a proportion of the total amount (red dots). Comparatively, the

¹⁹ ECONOLER International. Alliance to Save Energy. Energy Efficiency Program for GWI. February 2010. Financed by IDB (RG-T1605-SN1).

²⁰ See Results Framework and Summary Procurement Table in IDB Loan Proposal. *Georgetown Sanitation Improvement Program* (GY-L1025). October 2010.

resulting curve would be well above the curves that illustrate typical IDB and country projects, as well as those classified as “alert” or “problem” projects.



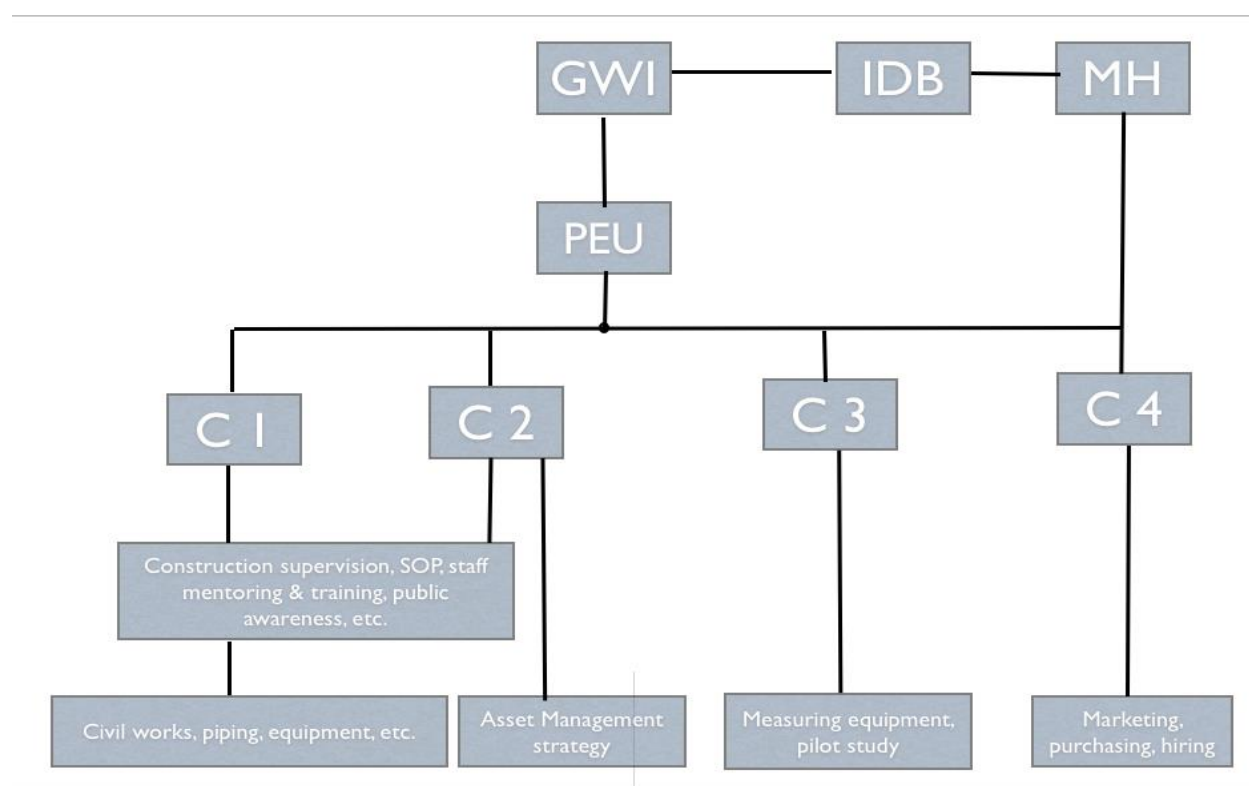
The unfinished condition of Component 4 (*prevalence reduction of water-related diseases*) could be ascribed to the overly optimistic proposition that assumed that the inter-institutional coordinating mechanisms could be put effectively in place in a short period of time. The design of the component also seemed to have overestimated the ease with which prevalence assessment surveys could be conducted and underestimated the need for significant community collaboration and support during Mass Drug Administration (MDA) activities. Furthermore, the design miscalculated the ease in engaging voluntary work, which resulted in delays during the early phases and the need to resort to paid labor. For these reasons, the component ended up becoming the slowest element of the project. However, since it is also the smallest of the four components and the least associated with GWI’s institutional objectives, the executing agency, in consultation with IDB and GOG, decided to seek external financial assistance to complete the activities remaining. This decision seems reasonable and well justified.

4.3 Overall experience with project management

The executing agency was Guyana Water Inc. (GWI) through its Capital Investment and Planning Department. The project execution unit (PEU), ascribed to this department, was to be comprised of a project manager assisted by a variable number of design engineers and a procurement officer designated by GWI. This position within GWI’s organizational chart seems to have provided adequate institutional hierarchy to the program and ensured timely decision-making. The project’s organizational structure, depicted in Figure 1, represents the arrangement envisioned at the project’s outset. During execution, Component 4 was implemented by GWI with the Ministry of Health (MH) providing technical inputs only as needed. The interaction between IDB and MH in relation to this component was also minimal. The staff that participated

in the various program tasks throughout the last five years generally shared their time between regular duties and program implementation tasks, and did not work exclusively on the program. The arrangement had the following benefits: (i) permanent staff will be more capable of carrying out all operation and maintenance tasks required by the rehabilitated facilities since the knowledge acquired during contract supervision was generally kept within the institution; and (ii) participating staff received financial incentives, funded by the program, which were added to their regular salaries. However, there were concerns that the strength of the program team was not always optimal, being at times understaffed, and that its members overcommitted. Concerns were also expressed in relation to the availability of adequate material resources, such as means on transportation for proper program supervision. The PEU also received assistance from other GWI departments in order to complete specific tasks. For example, a Knowledge Management Officer, working under the Human Resources Department Head, coordinated the training activities planned under the program.

Figure 1. Project's Organizational Structure



The program as a whole advanced at an acceptable pace in spite of some initial procurement-related delays, referenced under the Mid-Term Review. The Program successfully resolved nearly all the difficulties encountered since its starting point. A qualified consortium of firms was contracted to supervise all construction and equipment installation activities included under component 1. This consortium was also obligated to transfer knowledge on proper construction practices to GWI and to impart training to its staff on various sanitation topics (part of component 2).

The construction works did not experience any major delays once they were started in 2013, and the coordination between the PEU, the Contractor and the Contract Supervisor was considered generally adequate and efficient. The support provided by the IDB country office was also recognized as prompt and effective. However, the civil works did encounter some obstacles that were successfully resolved. These were mainly due to lack of precision in the bidding documents with respect to pipe alignment for the ring main and forced mains, interferences with other utilities and a lack of defined plans for interconnecting the old and the new sewerage systems without interrupting service. An option considered during the Exit Workshop, to diminish these types of problems in future projects, is the appointment of the PEU as early as possible for it to participate in the preparatory tasks related to engineering design supervision. Additionally, the initial plan to adapt all 24 pumping stations for the use of submersible pumps was deemed impractical and was modified; thus 12 stations were kept with wet-well/dry-pit configuration. Also, in some cases, the bill of quantities did not account for all materials needed. In spite of these complications, the works were completed on budget and on time. Thus, three of the four program components finished within the 5-year execution period.

The fourth component (reduction of water-related diseases) experienced organizational difficulties at the outset and will require a much longer time to be properly completed. It was to be executed by the Ministry of Health (MH), through an internal unit coordinated by the Chief Medical Officer. This unit should have included a logistics coordinator, a doctor, a nurse, a lab technician, and an accountant. An inter-institutional implementation agreement was signed between GWI and the Ministry of Health to that effect. This arrangement did not work as expected and the IDB, with its own resources and in coordination with MH and GWI, had to initially retain a dedicated consultant to support and coordinate the activities under this component. This consultant was later absorbed into the project's executing unit.

4.4 Impact evaluation

The overall conclusion is that the program achieved nearly all the outcomes initially established. The only setback was the delay observed in the execution of Component 4 (*Prevalence Reduction in Water Related Diseases*) that will require another two years to complete. It should be noted that the cost of this component is equivalent to less than 3% of the total program costs. It is also worth mentioning that the mid-term evaluation had already documented this delay, but that due to the nature of recommended health protocols, it was impossible to accelerate the remaining tasks.

4.5 Unresolved issues

Given the critical importance of a workable Asset Management Strategy, focused on proper operation and maintenance, GWI is advised to expedite its development and application to at

least a limited part of its operations, as a pilot case. This evaluation thus recommends starting with the Georgetown sewerage system (equipment and facilities), that had its most critical elements rehabilitated under the program, and which operate under harsh and difficult environmental conditions. Thus, these facilities would greatly benefit from a systematic and rigorous *asset management* plan, which could then be gradually expanded to other GWI facilities. IDB is starting a new US\$31.7 million water and sanitation infrastructure improvement operation²¹ that seeks, among other objectives, to continue strengthening GWI performance in its operational and management practices. This is a welcome development that can provide continuity to the preliminary efforts carried out, at the urging of the program under review, to put together a cohesive and actionable asset management strategy.

The *Prevalence Reduction in Water Related Diseases* component will require added attention in order to assure its proper completion. The financing needed to complete the remaining tasks, approximately US\$250,000, should become a priority to be supported by the IDB. A well-defined plan to raise the needed funds should be actively pursued.²²

²¹ IDB. Water Supply and Sanitation Infrastructure Improvement Program (GY-L1040). Loan Proposal.

²² It should be noted that the MOH recently obtained funding and conducted a 4th round of mass drug administration (MDA), diminishing the amount required to complete the rounds to US\$125,000.

Table 4
Findings and Recommendations

Findings	Recommendations
Vertical Logic	
<p>Finding # 1</p> <p>In general, the <i>vertical logic</i> within the operation was found to be adequate, with well-established cause-effect links between program outputs and outcomes. The program's results matrix was deemed generally coherent and well organized.</p>	<p>Recommendation # 1</p> <p>Overall, the program constituted a suitable and organized response to the urgent needs for sewerage system rehabilitation. Therefore, no specific recommendation is formulated in relation to this finding.</p>
<p>Finding # 2</p> <p>The unfinished condition of Component 4 (<i>Prevalence reduction of water-related diseases</i>) could be ascribed to inadequate program design, since a five-year execution period seemed insufficient, given the complexities encountered in the field. The design appears to have overestimated the ease with which prevalence assessment surveys could be conducted and underestimated the difficulties of engaging community collaboration and support for Mass Drug Administration (MDA) activities.</p>	<p>Recommendation # 2</p> <p>This component would have been more compatible within a health-oriented project, administered directly by a specialized health sector institution.</p>
Execution and Budget	
<p>Finding # 3</p> <p>The construction works did not experience any major delays once they got under way in 2013, and the coordination between the PEU, the Contractor and the Contract Supervisor was considered generally adequate and efficient. The support provided by the IDB country office was also recognized as prompt and effective.</p>	<p>Recommendation # 3</p> <p>The main program components were executed on time and on budget. Therefore, no specific recommendation is formulated in relation to this finding.</p>
<p>Finding # 4</p> <p>The civil works encountered some subsidiary obstacles that were successfully resolved. These were due to lack of precision in the bidding documents with respect to pipe alignment, interferences with other utilities, and a lack of detailed plans for interconnecting the old and the new sewerage systems. In some cases, the bill of quantities did not account for all materials needed.</p>	<p>Recommendation # 4</p> <p>To minimize these problems, GWI leans toward the use of the turn-key modality (design-build) to hire contractors, where final designs are prepared directly by the contractor. Alternatively, design work could be conducted with much greater detail and considerably more supervision. Construction supervision could also be made responsible for solving minor design shortcomings and unforeseen circumstances. An option considered during the Exit Workshop, to minimize these types of problems in future projects, is to appoint the PEU as early as possible so that it can</p>

	participate in the preparatory tasks related to engineering design supervision. A careful consideration of these various options is recommended.
<p>Finding # 5</p> <p>The 2009 plan to convert dry wells into wet wells (equipped with submersible pumps) at the existing sewage pumping stations made pump maintenance activities more difficult. This was mostly due to the stations' structural configuration, which made pump access and disassembling cumbersome. GWI opted for discontinuing the plan to reconfigure the 12 stations remaining in order to preserve their original wet-well/dry-pit configuration. This decision was adopted mid-way through the program.</p>	<p>Recommendation # 5</p> <p>GWI should maintain separate logs of the maintenance activities carried out on each type of pumping station configuration. This will provide firm economic and technical evidence to make well-justified decision on future pumping station rehabilitation activities.</p>
<p>Finding # 6</p> <p>The reduction of water-related diseases (component 4) experienced organizational difficulties at the outset. It was to be executed by the Ministry of Health, through an internal unit coordinated by the Chief Medical Officer. An inter-institutional implementation agreement was signed between GWI and the Ministry of Health to that effect. This arrangement did not work as expected. A dedicated consultant has to be retained first by the IDB and then by the PEU to support and coordinate the activities planned under this component.</p>	<p>Recommendation # 6</p> <p>Inter-institutional arrangements between public institutions are frequently difficult to operationalize and maintain. This component could have been more compatible within a health-oriented project, administered directly by a specialized health sector institution (see Rec. #2).</p>
Overall experience with project management	
<p>Finding # 7</p> <p>The program as a whole advanced at an acceptable pace in spite of some initial procurement-related delays. The Program successfully resolved nearly all the difficulties encountered. Three of the four program components finished within the pre-established 5-year execution period.</p>	<p>Recommendation # 7</p> <p>These delays point to the need to simplify institutional arrangements in IDB operations and to seek greater affinity among program components.</p>
<p>Finding # 8</p> <p>GWI needs to improve its monitoring capabilities to properly assess water quality conditions in the proximity of the outfall.</p>	<p>Recommendation # 8</p> <p>A well-planned and adequately funded monitoring activity should be carried out in cooperation with other relevant public institutions to evaluate conditions principally near the shore where human activity is more frequent. The complexity of the ocean environment at the discharge point would probably require a rigorous methodology, able to discriminate between pollution sources and capable of providing useful information to confidently establish the need for</p>

	treatment in the future.
Impact Evaluation	
<p>Finding # 9</p> <p>The program achieved nearly all the outcomes initially established. The only setback is due to the delay observed in the execution of Component 4 (<i>Prevalence Reduction in Water Related Diseases</i>) that will require another two years to complete. Due to recommended health protocols, the remaining tasks cannot be expedited.</p>	<p>Recommendation # 9</p> <p>This component would have been more compatible within a health-oriented program, administered directly by a health sector institution (see Rec. 6).</p>
<p>Finding # 10</p> <p>Successful results were achieved under the energy efficiency pilot program (component 3). These energy saving measures are currently being extended to 75% of GWI facilities.</p>	<p>Recommendation # 10</p> <p>The need for a solid asset management strategy in the area of energy efficiency, coupled with necessary supplies of spare parts, is highly recommended in order to sustain the savings accomplished.</p>
Unresolved issues	
<p>Finding # 11</p> <p>GWl does not yet possess a workable Asset Management Strategy.</p>	<p>Recommendation # 11</p> <p>Given the importance of an actionable asset management strategy, GWl is advised to expedite its development and application to at least a limited part of the institution, as a pilot case. The Georgetown sewerage system (equipment and facilities) would greatly benefit from a systematic and rigorous asset management plan, which if successful could then be incrementally expanded to other GWl facilities.</p>
<p>Finding # 12</p> <p>The <i>Prevalence Reduction in Water Related Diseases</i> component will require adequate IDB attention in order to assure its proper completion.</p>	<p>Recommendation # 12</p> <p>The financing needed to complete the remaining tasks, estimated at approximately US\$250,000, should become a health sector priority, supported by the IDB. A well-defined plan to raise the needed funds should be immediately pursued.</p>