



Project Completion Report

PCR

Project Name:	Main Road Rehabilitation Program Phase II - Bridges Rehabilitation Program Phase I
Country:	Guyana
Sector:	Transportation
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Project Number:	GY0026
Loan Number:	999/SF-GY
QRR Date:	January 6th, 2011
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PCR Team:

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ACRONYMS AND ABBREVIATIONS

AFS	Audited Financial Statements
BBCI	Berbice Bridge Company Incorporated
CDB	Caribbean Development Bank
CTPU	Central Transport Planning Unit
DO	Developmental Objective
EA	Executing Agency
GOG	Government of Guyana
HIPC	Highly Indebted Poor Country
GmbH	Company with limited liability
GPF	Guyana Police Force
IDB	Inter-American Development Bank
IP	Implementation Progress
MPW&C	Ministry of Public Works and Communication
NDS	National Development Strategy
NPV	Net Present Value
PCR	Project Completion Report
PEU	Project Execution Unit
PPMR	Project Performance Monitoring Report
RMMS	Routine Maintenance Management System
TC	Technical Cooperation
VOC	Vehicle Operating Cost
vpd	vehicle per day
WSG	Work Services Group

I. BASIC INFORMATION

BASIC DATA (AMOUNTS IN US\$)	
Project No: GY0026	Title: Bridge Rehabilitation Program Phase I
Borrower: Cooperative Republic of Guyana	Date of Board Approval: 25 Nov 1997
Executing Agency (EA): Ministry of Public Works & Communication	Date of Loan Contract Effectiveness: 18 Mar 1998
Loan: 999/SF-GY	Date of Eligibility for First Disbursement: 26 June 1999
Sector: Transportation	Months in Execution
Lending Instrument: Investment / Multi-Phase Lending Project	* from Approval: 140
	* from Contract Effectiveness: 136
	Disbursement Periods
	Original Date of Final Disbursement: 18 Mar 2003
	Current Date of Final Disbursement: 31 May 2009
	Cumulative Extension (Months): 74
	Special Extensions (Months): 0
	Loan Amounts
	* Original Amount: 41,000,000
	* Current Amount: 41,000,000
	* Pari Passu (if applicable): 81.72%
Poverty Targeted Investment (PTI): No	Disbursements
Social Equity (SEQ): No	* Amount to date: 39,257,793.11 (%) 95.75
Environmental Classification:	Total Project Cost (Original Estimate): 45,600,000
	Redirectioning
	Has this Project?
	Received funds from another Project []
	Sent funds to another Project []
	N/A [X]
On Alert Status	
Is project currently designated "on alert" by PAIS: Yes	
If yes then why is the project on alert (DO, IP Ratings and/or relevant PAIS indicators): N/A	
Comments on relevance of "on alert" status for this project	
N/A	

Summary Performance Classifications				
DO	<input type="checkbox"/> Highly Probable (HP)	<input checked="" type="checkbox"/> Probable (P)	<input type="checkbox"/> Low Probability (LP)	<input type="checkbox"/> Improbable (I)
IP	<input type="checkbox"/> Highly Satisfactory (HS)	<input checked="" type="checkbox"/> Satisfactory (S)	<input type="checkbox"/> Unsatisfactory (US)	<input type="checkbox"/> Very Unsatisfactory (VU)
SU	<input type="checkbox"/> Highly Probable (HP)	<input checked="" type="checkbox"/> Probable (P)	<input type="checkbox"/> Low Probability (LP)	<input type="checkbox"/> Improbable (I)

* Current amount (adjusted for redirection): **41,000,000**

II. THE PROJECT

A. Project Context

- 2.1 The Main Road Rehabilitation Program Phase II - Bridge Rehabilitation Program Phase I was a continuation of the Main Road Rehabilitation Program (LO 890/SF-GY). The operations was conceptualized in the year 1997 at a time when the Guyana economy was recovering from two decades of decline and had completed six consecutive years of positive growth at rate of 7.9%. The main sectors contributing to the growth were agriculture, mining, construction and services which all grew at high rates and exceed outputs of the early 1990's. In 1996, Guyana benefitted from the Paris Club debt relief which amounted to US\$531 million. This along with the Highly Indebted Poor Country (HIPC) Initiative helped the country to re-establish creditworthiness in the international financial community.
- 2.2 Guyana's road network is sparse and relies heavily upon its bridges and culverts. Much of the Atlantic coastal plain and the littoral areas of the country are below mean sea level necessitating a dense system of drains, canals and sluices to permit habitation and agriculture. Most of these works run perpendicular to the shoreline and consequently must be crossed by the main roads, thus substantially increasing construction and maintenance costs of the network. For nearly two decades Guyana's expenditures on routine road and bridge maintenance was limited by budgetary pressures, leading to accelerated road degradation. In the early 1990s the Government, aware that most main roads needed at least periodic maintenance or rehabilitation, negotiated loans with the IDB, the CDB and the World Bank to begin a major rehabilitation program.
- 2.3 The Bridge Rehabilitation Program Phase I was designed to improve driving conditions and road safety along Timehri to Georgetown and Georgetown to Rosignol artery which serves over 70% of Guyana's population. Together with the road improvements partially financed with resources of loan 890/SF-GY, the Project will provide a rapid link between the capital city, the international airport, and the agricultural center in the east. The operation also intended to address institutional issues which were critical to the development of the sector.
- 2.4 There are 284 bridges and culverts along the main roads connecting Timehri with Georgetown and Rosignol. Most of these were designed and built more than 30 years ago and have exceeded their useful lifetimes. Increased traffic over the years has brought with it congestion, particularly around structures crossing canals and rivers, where pedestrians and other non-motorized traffic share the roadway with motorized vehicles. In addition, vehicles have grown in weight, placing more stress on bridge structures, many of which are partially made from greenheart wood.
- 2.5 The Berbice River Crossing was served by ferries which was the only means of crossing the 1 1/2 miles between Rosignol on the west bank of the river and New

Amsterdam on the east. The Transport & Harbours Department of the Ministry of Public Works and Communication (MPW&C); operated the ferry service which had an irregular day and night schedule. The ferries carried 2.1 million passengers and 226,000 vehicles over the river in 1996. This was expected to rise to over 3.3 million passengers and nearly 310,000 vehicles by the year 2000. At that point the service would have been unable to handle expected traffic and will become a serious obstacle to continued economic growth in Berbice region

- 2.6 In the late 1990's there were approximately 4,000 accidents recorded annually in Guyana leaving 2,000 people injured and over 150 dead each year. Most fatal accidents occur between Timehri and Georgetown, followed closely by the Georgetown-Rosignol road. Pedestrians account for one in every three deaths.
- 2.7 Problems in the MPW&C mirror those of the entire public sector in Guyana: low salaries, lack of qualified staff, insufficient recruitment, a need for training, inadequate budgeting process, paucity of system information, lack of clear lines of responsibility and accountability, no national level planning, and poor donor coordination.

B. Project Description

- 2.8 The project consisted of four components which were:
 - 1. Civil Work: rehabilitation or reconstruction of bridges on the main roads including rehabilitation or construction of approaches and related drainage facilities and sluices.
 - 2. Road Safety: infrastructure improvements and institutional planning to develop a comprehensive road safety program.
 - 3. Berbice River Crossing: funding of a feasibility study of the proposed Berbice River crossing, improving of the existing ferry service, and partial funding of the construction of a new bridge if found feasible.
 - 4. Technical Cooperation (TC) to strengthen the MPW&C in three aspects; (i) institutional organization, (ii) capacity to operate and maintain the main roads and bridges network, and (iii) development of a transport sector policy.

i. Development Objective

- 2.9 The general objective of the Project was to reduce overall road transportation costs along the main road network, improve vehicular and pedestrian safety and alleviate congestion around bridges, particularly in urban areas. By doing so, the Project would contribute towards attaining one of the country's primary objectives of improving infrastructure required to stimulate greater production.

ii. Components

The program was designed with the following components.

Component 1: Civil Works - Total Financing \$18.60 million, IDB \$17.10 million, GOG \$1.50 million

- 2.10 Component 1 was intended raise the standards of structures along the main roads connecting Timehri with Georgetown and Rosignol to modern levels. The designs proposed were modular structures which could be simply adapted to all bridges along the route. The roadway width of each structure conformed to the road itself, including two 3.3 meter lanes and 1.8 shoulders on both sides. Where pedestrian and other non-motorized traffic warrants; principally near towns and villages one or two pedestrian sidewalks were to be added. The structures along project corridor included two major bridges and 270 smaller structures. The larger structures cross the Mahaica and Mahaicony Rivers and are 53 meters and 69 meters, respectively. Sixty-nine structures were selected for the initial construction package which represent about half the total length and repair cost of the project bridges.
- 2.11 Funds for the administrating the loan and hiring of international consultants to supervise the construction of the sixty nine structures and prepared designs and bidding documents for another 60 structures were also included in the component.

Component 2: Road Safety - Total Financing \$2.20 million, IDB \$2.20 million.

- 2.12 The Road Safety component proposed two parallel approaches to improve road safety; civil works and technical cooperation. Civil works to be included were protected sidewalks around schools, signaled pedestrian crosswalks in urban areas, crash barriers on bridge approaches and guard rails on the outside edges of sharp curves, rumble strips and traffic chokers in sensitive areas, and retro-reflective signs. The purpose is generally to "calm" traffic and bring speeds and driver attention into harmony with the multiple uses that roads serve in Guyana.
- 2.13 The Technical Cooperation sub-component was directed towards specific activities designed to organize traffic and educate the Guyanese population on road safety-related matters. The components of the TC were:
- (a) development of school safety patrols and hiring adult crossing guards ;
 - (b) creation of a traffic safety unit within the MPW&C and development of a sign and road marking maintenance program;
 - (c) purchasing police vehicles and other hardware to be used within a well-developed program of traffic enforcement;
 - (d) national campaigns on minibus and pedestrian safety;
 - (e) improvement of the accident data management system; and
 - (f) training in traffic engineering and road safety.

Component 3: Berbice River Crossing - Total Financing \$11.6 million, IDB \$11.6 million

- 2.14 The component envisaged two basic options for improving the Berbice River Crossing; an improved ferry service or a bridge. The replacement of the existing ferryboats would be with simple modern vessels that load and discharge vehicles from the bow and stern and these would increase the carrying capacity sufficient to meet expected demand until the year 2005. Such boats could be modified to nearly double their capacity if required. A new bridge over the Berbice River would increase crossing capacity significantly, and hence generate more developmental benefits for the region.
- 2.15 The Project therefore included funding for final designs and construction of replacement ferryboats and stellings pending the outcome of the feasibility study. Should the outcome favor the ferry system, construction could begin almost immediately following the decision; should it favor the bridge option, resources of the Project be reallocated to such items as final designs, access roads and/or temporary repairs to the existing ferryboats and stellings.

Component 4: Technical Cooperation - Total Financing \$4.90 million, IDB \$2.50 million, GOG \$2.40 million

- 2.16 The Bank, in conjunction with the Guyanese authorities, detected three areas in which technical cooperation might assist the MPW&C to improve its planning, construction and maintenance of the transportation system:
- (a) Development of a transport sector policy;
 - (b) Institutional organization; and
 - (c) Capacity to operate and maintain the main roads and bridges network.
- 2.17 **Development of a transport sector policy:** The policy and institutional setting of the transport sector was unclear. In May 1997 the Government released the draft National Development Strategy (NDS), prepared in cooperation with the Carter Center. Chapter 38 of the NDS, dealt with Transport Development, and outlined six areas for priority attention; (i) Cost recovery, (ii) Expansion of infrastructure, (iii) Human resources development, (iv) Regulatory framework (v) Public transport and (v) Investment strategies. The NDS prescribed a policy framework for the sector but did not provide an operating mechanism to implement this policy. Therefore, the Project included funds to hire specialized consultants to help the authorities through the decision-making process and into policy implementation.
- 2.18 **Institutional Organization:** From the NDS it was clear that one of the major limitations to improving land transportation is the inadequacy of the MPW&C. A study commissioned by the Bank recommended that the administration of roads and sea defenses be separated into an autonomous agency to attract qualified staff and provide greater administrative independence. The Agency would be divided broadly into five divisions Planning & Project Development, Rehabilitation &

Construction, Maintenance, Management Information, and Finance & Procurement. Overall, the operations of the Ministry would be oriented towards management of out-sourcing contracts for most works and even some planning and Management Information System activities. Funding would come from a dedicated budget. A reorganization of the Ministry on the scale proposed would take several years of careful planning. In discussions with Guyanese authorities an agreement was reached and that the Bank provided funds within the loan to hire a consultant to help Government design a reorganization plan.

- 2.19 **Capacity to operate and maintain the main roads and bridges network:** Maintenance activities were decentralized to the ten regional offices which usually contract out works. There was inadequate planning, programming reporting and monitoring tools to administer routine maintenance systematically. The result has been an excessive reliance upon road rehabilitation and reconstruction. The Project intended to introduce a very simple Routine Maintenance Management System (RMMS) program for the main roads and bridges to be operated by the MPW&C. Funding was provided within the Project to develop, establish and implement the RMMS, including the financing of maintenance activities on the main road network during the execution period of the loan.

C. Quality -At- Entry Review

- 2.20 The Project was approved in 1997 and at that time the quality-at-entry review had not been adopted as an element within the approval process. However, from a qualitative perspective, the quality-at-entry was satisfactory.

Quality -At- Entry Review			
<input type="checkbox"/> Highly Satisfactory (HS) - 1	<input type="checkbox"/> Fully Satisfactory (S) – 2	<input type="checkbox"/> Less than Satisfactory (LS) – 3	<input type="checkbox"/> Unsatisfactory (U) – 4

III. RESULTS

A. Outcomes

- 3.1 Ultimately the success or failure of any program is assessed by the extent to which it has met its objectives. Since the goal and objective of the Bridge Rehabilitation Program Phase I are given in its logical framework the key concepts contained in these are evaluated to determine the outcomes of the project.

Goal: To “Create a self-sustaining system for maintaining the main road and bridge network after ten years, gradually extending the network by absorbing selected secondary roads”.

Objectives:

1. A more efficient Ministry of Public Works & Communication with an established systematic approach to ordering expenditures on the main road network and for developing budgetary requirements.
2. Decreased generalized transportation costs along main road network between Timehri and Rosignol.
3. Ongoing improvements in road safety.
4. Reduced travel time for vehicles and persons crossing the Berbice River between Rosignol and New Amsterdam.

1. Has the efficiency of the MPW&C increased?

- 3.2 The Institutional Capacity of the MPW&C has improved significantly with the formation of the WSG. This model work well since it rationalized the number of personnel needed to execute the programs and offered attractive packages to retain staff. WSG has now taken on the role as the technical arm of the Ministry of Transport and Hydraulics thus increasing that ministry's capacity to implement programs of its own thereby increasing efficiency.

2. Has generalized transportation costs along main road network between Timehri and Rosignol decreased?

- 3.3 The reduction in generalized transportation cost was evaluated in an Ex-Post Economic Analysis (see Annex III) carried out for the bridges that were constructed. The reduction in cost was measured using the following indicators.
- (i) Vehicle Operating Cost (VOC) before and after construction.
 - (ii) Vehicle speeds past the structures.
 - (iii) Ex-post Net Present Value (NPV) of Benefits using actual traffic and HDM4 with 12% discount rate compared to Economic Cost.
- 3.3 The Ex-post evaluation for the project examined two scenarios; where the structures were replaced in congested areas and low traffic zones. Both scenarios showed savings in VOC, positive NPVs and increase vehicle speeds as demonstrated below.
- 3.4 *Narrow Bridges in High Volume Congested Zones.* For bridges less than 6.7 meters wide, where it is necessary for vehicles to slow down, in the more congested areas between Georgetown and Vigilance along the East Coast Demerara, and between Georgetown and Golden Grove along the East Bank Demerara. It was assumed that without project a vehicle traveling 32kmph would have to slow down to 8kmph for 200 meters to negotiate the bridge and the average speed over a 400 meters segment would be 16kmph. With the project, vehicles were able to travel the entire 400 meters distance at 32 kmph. Based on

VOC for a car, the costs per km would decrease from US\$0.60 per km to \$0.3710 per km with the new bridge, for a difference of \$0.229 per km, or \$0.0916 for 400 meters. In 2004 the traffic count was estimated to be 13,007 vehicles per day (vpd), for all vehicle types. This would yield first year savings of US\$169,155 per year or a NPV of over \$1,573,423 with a 3% annual growth for 20 years at a 12% discount rate for the car. To this must be added the VOC savings for the other vehicle types. For these high volume areas where there was significant congestion, clearly the projects have high returns to the investment.

- 3.5 *Narrow Bridges in Low Traffic Zones.* This represents VOC savings for bridges between Vigilance and Rosignol on the East Coast Demerara/West Coast Berbice Highways and between Golden Grove and Timehri along the East Bank Demerara. In these cases it is assumed that traffic is flowing at 72kmph and without the project must slow to 32kmph to cross the bridge or culvert. With the project, the traffic would be able to maintain the 72kmph. In the case of the structure MG54 where the 2004 traffic was 6,502 vpd, the first year VOC savings under this scenario will be less than \$10,000 and a positive NPV of \$88,747 for cars.
- 3.6 The ex-post economic analysis using a 12% discount rate showed that 84 % of the structures yielded robustly positive economic returns and only 6 % were negative. Further it should be noted that these program results are very positive despite major increases in the costs of some of the bridges. In particular, Mahaica and Mahaicony increased almost by a factor of five from the original estimates. It should be said, however, that the modifications that were made also significantly facilitated the traffic flow through these critical areas. Even with these increases, the large bridge at Mahaica has an internal rate of return of over 12% and the one at Mahaicony approximately 11%. The increased vehicle speeds as a result of the improved structures translates into approximately 5% reduction in travel time along the corridor.

3. Has road safety improvements contributed to reductions in accidents on Guyana's roads?

- 3.7 As study in 2001 established the ten most dangerous road corridors in Guyana. A comparison was done of fatalities occurring along these corridors during the early years (1998-2000) and latter years (2005-2007) of the program; this showed that some corridors improved while other got worse. The corridors which had worse statistics are those that are becoming more urbanized and congested. The combined results for the ten most dangerous corridors indicated that the fatality rate per million kilometer of vehicle travel was the same at the beginning and end of the program.
- 3.8 The occurrence of accidents along Guyana roads showed a downward trend during the execution of this program, that is, between 1998 and 2008. The authorities made a concerted effort in area of traffic enforcement between 2008 and 2010 which resulted in a 35% reduction in road fatalities over the previous

three years average for the country. These reductions are demonstrated in the graphs shown in Annex IV.

4. Has travel time for vehicles and persons crossing the Berbice River between Rosignol and New Amsterdam reduced?

- 3.9 The reduction of travel time between Rosignol and New Amsterdam has reduced significantly since the opening of the Berbice River Bridge. The ferry operation would take a minimum of one hour to load, cross the river and offload. With the bridge in operation, the trip now takes 10 minutes to cross the river and a total of 20 minutes between Rosignol and New Amsterdam.

ACHIEVEMENT OF DEVELOPMENT OBJECTIVES (DO)		
Development Objective(s) (Purpose)		Key Outcome Indicators
1. More efficient Ministry of Public Works & Communication (MPW&C) with an established systematic approach to ordering expenditures on the main road network and for developing budgetary requirements. <i>Classification: Probable</i>		
<u>Planned Outcomes</u> 1.1. Declared public road network maintained under RMMS operating system at established MPW&C standard by March 2005. Unit: Percentage (%) <u>Baseline</u> <u>Intermediate</u> <u>End of Project</u> 0 (25 Nov 1997) 90 (31 Mar 2005) 90 (31 May 2009)		<u>Outcomes Achieved</u> 1.1 87% (16 Nov 2007) 87 percent of the public road network was under was under the RMMS system at the end of project. The 13 percent not under the RMMS was being rehabilitated under another Bank funded project.
2. Decreased generalized transportation costs along main road network between Timehri and Rosignol. <i>Classification: Probable</i>		
<u>Planned Outcomes</u> 2.1. Travel time reduced. Unit: Percentage (%) <u>Baseline</u> <u>Intermediate</u> <u>End of Project</u> 0 (25 Nov 1997) 5 (30 Jul 2005) 5 (31 May 2009)		<u>Outcomes Achieved</u> 2.1 5% (July 30, 2007) The rehabilitation of the bridges on the Timehri-Georgetown-Rosignol corridor reduced the travel time on that corridor by at least 5 percent.
3. Ongoing improvements in road safety. <i>Classification: Probable</i>		
<u>Planned Outcomes</u> 3.1. 20% reduction of year 2000 reported accident rate per million vehicle-km on the main road network by December 2007 Unit: accidents million vehicle –km <u>Baseline</u> <u>Intermediate</u> <u>End of Project</u> 8.37 (01 Jan 2001) 6.70 (31 Dec 2007) 6.70 (31 May 2009)		<u>Outcomes Achieved</u> 3.1 8.37 (01 Dec 2008)
4. Reduced travel time for vehicles and persons crossing the Berbice River from Rosignol to New Amsterdam. <i>Classification: Improbable</i>		
<u>Planned Outcomes</u> 4.1. Description: 50% reduction in travel time to cross the Berbice River for all categories of users over 1998 Berbice River ferry data by December 2007. Unit: Hour <u>Baseline</u> <u>Intermediate</u> <u>End of Project</u> 1 (25 Nov 1997) 0.5 (31 Dec 2007) 0.5 (31 May 2009)		<u>Outcomes Achieved</u> 4.1 0.33 (31 May, 2009) With the bridge in operation, the journey from Rosignol to New Amsterdam now takes 20 minutes.
Reformulation N/A		
PPMR Retrofitting. Indicate if and when the PPMR was retrofitted and explain any changes resulting from this exercise. N/A		

Development Objective(s) Classification (DO):			
<input type="checkbox"/> Highly Probable (HP)	<input checked="" type="checkbox"/> Probable (P)	<input type="checkbox"/> Low Probability (LP)	<input type="checkbox"/> Improbable (I)
<p>Briefly justify DO classification, based on degree to which planned targets were met, explaining the differences between planned and achieved outcomes as well as any other relevant factors. Include references to evidence that can support these results.</p> <p>Whilst the implementation of the Program has been severely delayed the DOs related to decreasing generalized transportation costs and improving the efficiency of the MPW&C should be realized once the components are executed as designed since the aggregate assumptions classification remain high. DOs related to road safety improvements and reduced travel times for crossing the Berbice River would be realized once the GOG implements these components.</p>			
<p>Country Strategy: At the time of approval this project was expected to contribute to the following Country Strategy objective(s): Expanding and maintaining public infrastructure investments in priority areas as required for private sector development.</p> <p>Given the results described above, briefly discuss how the project contributed to the Bank's strategy in the country.</p> <p>This project is directed towards the infrastructure sector where improvements will unleash the potential for economic growth and promote a more active participation of the regions in the use of the vast natural resources of the country. Institutional measures related to the program will be directed towards strengthening the capacity of the MPW&C to administer and maintain the road network. In addition, infrastructure improvements to be implemented with resources from the program will be supported by increased user charges. This was designed in such a way that the people and industries that the system is to serve will not be adversely penalized.</p>			

B. Externalities

- 3.6 The GOG was interested in a bridge across the Berbice River and were not in favor of studying alternatives as was stated in the loan documents. The GOG opted to explore the design, build and finance options for the river bridge with international firms during the initial stages of the program. This was done through public invitation for proposals and a preferred offer was identified, however, a contract between the GOG and the firm was not successfully negotiated. The GOG and the Bank eventually agreed in 2003 to study the feasibility of bridging the Berbice River and a bid was launched to procure a constant to undertake the study.
- 3.7 The Bank and the EA agreed to rehabilitate the traffic light in Georgetown which had been in disrepair and posed a safety issue to the traveling public. This intervention was not implemented since the MPW&C was unable to reach an agreement Ministry of Home Affairs which has jurisdiction over the traffic light infrastructure but did not have a structure in place to ensure the operation and sustainability of the lights. The time lost pursuing the traffic light project delayed the implementation of the road safety civil works sub-component.

- 3.8 A Special Purpose Company named the Berbice Bridge Company Incorporated (BBCI) was incorporated to finance, build and operate a floating bridge across the Berbice River Bridge under a 21 year concession agreement. The BBCI obtained its funding for the project from the local private sector making the Berbice river Bridge first piece of transport infrastructure funded by private resources raised from the financial institutions present in the country.
- 3.9 Based on the feasibility studies for the Berbice River Bridge, the Bank and GOG agreed that the Bridge project would be feasible once the cost associated with the floating bridge fell under the amount of US\$37.3 million. It was agreed that loan resources would be released to fund the approach roads to the bridge once the final bridge cost is known. BBCI tendered the bridge works as design and build project and hired a consultant to supervise the construction on their behalf. After the preferred bidder for the works was identified, it took almost six months for financial closure on the contract and this delayed the start of the approach roads and the loan execution.

C. Outputs

Civil Works

- 3.10 The rehabilitation of structures along the main roads connecting Timehri with Georgetown and Rosignol was the main component of the program. Dywidag International GmbH was the contractor procured to carry out the works under Lot 1 at a cost of \$US21,738,152 under a hybrid lump sum contract. The works were completed in April 2005 and included:
- a. Construction of 32 short span bridges spanning canals ranging in widths from 9 meters to 20 meters. The width of the bridge decks are 11.27 meters which accommodates two driving lanes, shoulders and rails. The bridges included concrete approach slabs at both abutments.
 - b. Bridges on new upriver alignments across the Mahaica and Mahaicony Rivers which are 53 meters and 69 meters long respectively and 11.27 meters wide. The bridges were constructed with enough clearance to allow small boats to navigate under them since river transport is considered a key transport resource for the country.
 - c. Construction of 35 culverts with aperture varying from 0.9 meters to 4.3 meters and widths between 11.27 to 15.85 meters.
 - d. Extension, refurbishing/repairs and backfilling of 12 culverts to widths of 11.27 meters.
 - e. Construction of 1kilometer of roadway for road for realigned bridges.
- 3.11 The locations of the bridges across the Mahaica and Mahaicony were both moved upriver due to constraints at the existing sites. This benefitted the traveling public by improving safety and reducing the congestion and travel time at the bridge locations. At the Mahaicony bridge site, a Hostel used by Amerindian people

traveling for the interior was in the new alignment. A new Hostel was constructed to replace the existing one in consultation with the Amerindian Affairs Ministry and the management and users of the facility. The new facility was completed prior to the demolition of the existing one.

- 3.12 The firm Figg Bridge Inspection Limited was procured to supervise the civil works under Lot 1 and provided good support to the Employer and Contractor during the execution of the works which ensured that a quality product was delivered by the Contractor. The cost of the contract was \$2,123,266.
- 3.13 The component provided for design services Engineering Studies to support the implementation of the program. Figg Bridge Engineering Incorporated which previously was contracted during loan preparation phase to prepare the designs for Lot 1; was rehired to re-design twenty structures in Lot 1 including the Mahaica and Mahaicony bridges. The designs for another 65 structures along the Timehri to Georgetown and Rosignol main road corridor was completed under this component by the firm GAEA Engineering Limited. These structures termed "Lot 2" supported the preparation of the Transport Infrastructure Rehabilitation Program - GY-L1008. The total cost of the design works under the component was \$1,304,405.
- 3.14 Funds were also provided to support administration of the loan by the Borrower. A total of \$392,245 was expended on staff salaries, equipping of the executing unit and consumable office supplies. From 2002, the administration cost for the loan was paid for with counterpart recourses.

Road Safety

- 3.15 A comprehensive traffic study was conducted under the program for the main road network. The study collected and analyzed accident data for a three year period and identified accident black spot areas to be target under the program. The worse corridors in terms of fatal accidents were also identified and interventions proposed to militate against the high accident rate. The amount of \$1,111,265 from this category was used to procure the following Road Safety works in line with the mitigation measures identified in the study:
 - a. Erection of street lights along the East Coast Demerara Main Road between Kitty and Better Hope.
 - b. Erection of street lights at road junctions along the East Bank Demerara Main Road.
 - c. Construction of sidewalks along the main roads at Haslington, Golden Grove and Mon Repos on the East Coast Demerara, Stanleytown on the West Bank of Demerara and Uitvlugt along the West Coast of Demerara.
 - d. Installation of traffic signs, road markings and reflective spikes along 260 kilometers of main road. Another 66 kilometer was funded under LO 1094/SF-GY.

- 3.16 The Technical Cooperation sub-component was not fully executed with more than 80 percent of the funds being cancelled at the end of the program. The major achievement was the procurement of thirteen motorcycles equipped with sirens and flashing lights along with accessories and spares to aid the Guyana Police Force in traffic enforcement.

Berbice River Crossing

- 3.17 At the end of 2003, the Louis Berber Group was contracted to undertake a feasibility study for a bridge across the Berbice River at a cost of \$569,050. The firm's final report was submitted in 2004 and it recommended a floating bridge close to the mouth of the Berbice River over fixed structures further upstream. The Bank identified some weaknesses in the study as presented by the Consultant and this led to a further review by a Consultant hired by the Bank which concluded that the Bridge project would be feasible once the cost associated with the floating bridge fell under the amount of US\$37.3 million.
- 3.18 The designs for the access and the necessary resettlement plan were contracted to the firm SRKN'gineering at a cost of \$199,000. This was completed in 2006 and provided the tender documents for the tendering of the works.
- 3.19 The construction of the approach roads to the Berbice River Bridge was undertaken by Dipcon Engineering Services Limited at a cost of \$9,711,103. The works completed in May 2009 and included:
- a. Construction of a total 3.7 km of road comprising of two driving lanes of 3.5m each and two shoulder of 1.8 m each.
 - b. Driving of wick drains, placing geotextile fabric and preloading for the construction 500m of road on the eastern bank of the river.
 - c. Construction of semi-ridged bridge approaches utilizing timber piles, geotextile fabric and granular fill material.
 - d. A toll booth area to accommodate 5 lanes of traffic on the western end of the bridge.
 - e. Construction of 13 drainage culverts.
 - f. Placing of 1 km of earthen dam to prevent flooding of the road in the event of unusually high water in the river.
 - g. Installation of 47 traffic signs and road markings along the length of the roadway.
 - h. Installation of 43 street lamps along the road.
 - i. Three years routine maintenance works.
- 3.20 The firm ND Lea was procured to at a cost of \$998,500 supervise the civil works and provided good support to the Employer and Contractor during the execution of the works which ensured that a quality product was delivered by the Contractor.

Technical Cooperation

- 3.21 A study was funded to develop an organizational structure and staffing requirements for a project execution unit within the MPW&C which would be capable of undertaking the implementation of donor funded programs in the transport sector. The Works Services Group (WSG) was formed in January 2002 based on the recommendations of that study. The mandate of the WSG is to plan, design and implement all contracts for investment and maintenance of roads and bridges. The unit was established with a complement of management, engineering and support staff to undertake the tasks assigned to that unit and the group is funded by the GOG. A total of \$652,752 was expended on institutional reorganization.
- 3.22 The component supported studies to establish a Routine Maintenance Management System (RMMS) under the WSG to execute continuous routine maintenance on the main road network. The RMMS as established in 2004 utilizes multi-year performance based contracts with local contractors to execute the routine maintenance works and these contracts are funded by the Guyana Treasury as counterpart to Bank loans. This RMMS model is working and the quality of the main roads in the country remain in good driving condition. A total of \$1,745,766 was spent from loan resources toward consultancies to support the RMMS and \$2,455,882 was expended from counterpart resources to fund the maintenance works.
- 3.23 A consultancy to develop a transportation sector policy was to be financed by the program but was instead financed by the 9th European Development Fund. The study has been completed and accepted by the GOG thus fulfilling the objective of this aspect of the component.

IMPLEMENTATION PROGRESS (IP)		
Components (Outputs):		
1. Component 1: Civil Works Total cost of Component 1: \$28,195,274.62 Counterpart: \$5,053,359 IDB: \$23,141,915.62 IDB Disbursement: 100% <u>Classification:</u> S		
Key Output Indicators:		
<u>Planned Outputs</u>	<u>Outputs Achieved</u>	
1.1 Description: 81 structures rehabilitated between Timehri and Rosignol by June 2005. Unit: Strengthened Areas <u>Baseline</u> <u>Annual/Intermediate</u> <u>End of Project</u> 0 (25 Nov 1997) 81 (30 Jun 2005) 81(31 May 2009)	1.1 81 (April, 2005) 81 structures were reconstructed or rehabilitated.	
Briefly explain differences between planned and actual outputs (if applicable). N/A		
Restructuring. Indicate if this component was restructured (date of approval by Manager). Briefly discuss the consequences of these changes. N/A		
2. Component 2: Road Safety Total cost of Component 2: \$1,231,350.38 Counterpart: 0 IDB: \$1,231,350.38 IDB Disbursement: 100% <u>Classification:</u> S		
Key Output Indicators:		
<u>Planned Outputs</u>	<u>Outputs Achieved</u>	
2.1. Description: 400 km of main road network properly signed and marked including reflectorized spikes in accordance with nationally approved standards by December 2007. Unit: Kilometer <u>Baseline</u> <u>Annual/Intermediate</u> <u>End of Project</u> 0 (25 Nov 1997) 400 (31 Dec 2007) 400(31 May 2009)	2.1. 326 (31 May, 2005)	
Briefly explain differences between planned and actual outputs (if applicable). The 400 kilometer target was not met since the remaining length of road was under a rehabilitation contract.		
Restructuring. Indicate if this component was restructured (date of approval by Manager). Briefly discuss the consequences of these changes. N/A		
3. Component 3: Berbice River Crossing Total cost of Component 3: \$11,562,536.32 Counterpart: 0 IDB: \$11,562,536.32 IDB Disbursement: 100% <u>Classification:</u> S		

Key Output Indicators:			
<p align="center"><u>Planned Outputs</u></p> <p>3.1 Description: Feasibility Study completed. Unit: Study <u>Baseline</u> <u>Annual/Intermediate</u> <u>End of Project</u> 0 (25 Nov 1997) 1 (31 Dec 2007) 1(31 May 2009)</p> <p>3.2 Description: Berbice River crossing improved by December 2007 through either improved ferry service or bridge depending on feasibility study. Unit: Improved Crossing <u>Baseline</u> <u>Annual/Intermediate</u> <u>End of Project</u> 0 (25 Nov 1997) 0 (31 Dec 2007) 1(31 May 2009)</p>		<p align="center"><u>Outputs Achieved</u></p> <p>3.1. 31 (30 July 2004) The Final Report of the Feasibility Study funded by the project was submitted on in July of 2004.</p> <p>3.2 1 (23 Dec, 2008) The Berbice River Bridge was opened to light vehicle traffic on December 23, 2008.</p>	
<p><i>Briefly explain differences between planned and actual outputs (if applicable).</i> The construction work on the river crossing commenced later than anticipated due to delay in Financial Closer of the privately funded river bridge.</p>			
<p>Restructuring. Indicate if this component was restructured (date of approval by Manager). Briefly discuss the consequences of these changes. N/A</p>			
<p>4. Component 4: Technical Cooperation Total cost of Component 4: \$4,854,399.30 Counterpart: \$2,455,882 IDB: \$2,398,517.30 IDB Disbursement: 100% <u>Classification:</u> S</p>			
Key Output Indicators:			
<p align="center"><u>Planned Outputs</u></p> <p>4.1. Description: MPW&C working under established RMMS with counterpart funding of US\$2.4M applied to road maintenance on 400km of declared public road network by March 2005. Unit: Kilometer <u>Baseline</u> <u>Annual/Intermediate</u> <u>End of Project</u> 0 (25 Nov 1997) 400 (31 Dec 2007) 400(31 May 2009)</p>		<p align="center"><u>Outputs Achieved</u></p> <p>4.1. 342 (31 Mar, 2005)</p>	
<p>Briefly explain differences between planned and actual outputs The 400 kilometer target was not met since the remaining length of road was under a rehabilitation contract.</p>			
<p>Restructuring. Indicate if this component was restructured (date of approval by Manager). Briefly discuss the consequences of these changes. N/A</p>			
Summary Implementation Progress Classification			
[] Highly Satisfactory (HS)	[X] Satisfactory (S)	[] Unsatisfactory(U)	[] Very Unsatisfactory (VU)

D. Project Costs

Total Project Cost – Planned (US\$)		Total Project Cost - Actual (US\$)	% Difference
Category	Bank	Bank	Bank
Civil Works	17,100,000	23,141,916	35.3
• Direct Construction Cost	14,700,000	19,286,000	31.2
• Engineering Studies	700,000	1,340,405	91.5
• Supervision	1,500,000	2,123,266	41.6
• Administration	200,000	392,245	96.1
Road Safety	2,200,000	1,231,350	(44.0)
• Physical Works	1,500,000	1,111,265	(25.9)
• Technical Cooperation	700,000	120,085	(82.8)
Berbice River Crossing	11,600,000	11,562,536	(0.3)
• Feasibility Study	600,000	569,050	(5.2)
• Ferry, Stellings / Bridge	11,000,000	10,993,486	(0.1)
Technical Cooperation	2,500,000	2,398,517	(4.1)
• Policy Implementation	300,000	0	(100.0)
• Institutional Reorganization	700,000	652,752	(6.7)
• RMMS	1,500,000	1,745,766	16.4
Financial Cost	1,600,000	923,473	(42.3)
Unallocated Expenses	6,000,000	0	(100.0)
• Contingencies	4,000,000	0	(100.0)
• Price Escalation	2,000,000	0	(100.0)
TOTAL	41,000,000	39,257,793	(4.2)
Explanation of difference: Cancellations of unspent amount mainly from the Road Safety and Financial Cost categories.			

IV. PROJECT IMPLEMENTATION

A. Analysis of Critical Factors

- 4.1 The compliance prior condition prior to first disbursement for this operation took 15 months owing to an understaffed and under resourced Project Execution Unit (PEU) at the start up of the project rather than the conditions themselves. The initial PEU comprised of a Project Manager and a Secretary and did not have appropriate budget, office space and equipment to execute the project. The factors that affected implementation of the specific components were as follows.

Civil Works

- 4.2 At the time of the execution of the design consultancy for Lot 1 structures in 1997, the GOG was represented by Road Administration Division, PEU which

- was at time dedicated to IDB projects. This unit did not have the requisite specialization to guide the design process and this resulted in a product which was not satisfactory when reviewed by GOG experts Bridge Administration Unit which was at the time working on World Bank funded projects. This situation of having multiple PEU in the Transport Sector was recognized as an obstacle to project design and implementation, and the Bank along with GOG agreed to resolve this situation through the formation of the WSG in 2002, which is a multidisciplinary unity geared towards improving the planning and execution donor funded projects in the sector.
- 4.3 Some of the bridge and culvert designs proposed by the design consultant did not take fully into account changes in drainage flow, culvert maintenance and existing features in the field. These issues were resolved through field visits between the Bank, GOG and design consultant, while, 18 short span structures had to be redesigned under another contract with the same consultant. This situation resulted in delays in the tendering of the Lot 1 structures until April 2002.
 - 4.4 The designs proposed for the bridges across the Mahaica (53m long) and Mahaicony (69 m long) Rivers utilized the same bridge deck elements from the shorter 12m span bridges and would have required a number of pile bents being placed in the river channel restricting of the uses of the river for navigation. This proposal conflicted with the country's National Development Strategy which envisaged rivers as a key resource for transport. GOG's technical team visited the Design Consultants head office in the USA to resolve the design issues and the new bridges were eventually designed incorporating long spans and sufficient clearance between the water surface and bridge beams to allow navigation.
 - 4.5 The pre-qualification criteria set for the prospective Works Contractors required them to have in-house capability for producing the pre-stress element necessary for the structures and for the equipment to be located in Guyana for the production of the elements. This resulted in only two Contractors being pre-qualified to tender for the works out of twenty applicants. During the tendering, one of the two prequalified firms did not submit its Bid Security and was disqualified leaving only one bid which was significantly above the budget. There was miscommunication on the Bank's Procurement Policies with regards to negotiation of the bid price with the qualified bidder. This resulted in the Executing Agency (EA) spending several months negotiating reductions of the bid price with the qualified bidder and later being informed that reducing the price before contract signing not in keeping with Bank's Policies.
 - 4.6 A Value Engineering exercise was carried out for the first time between the EA and the Contractor, which looked at the Contractors proposed methodology, the requirements for implementation and risks associated with the contract. One of the main cost factors was associated in traffic control and bypasses; the EA provided the Contractor with steel bridge elements which it had in stock which allowed a reduction in cost and simplification of the traffic management. This along with other trade off allowed the number of structures being rehabilitated

under the contract increase to 81 from 59 at the time of tendering. No additional design work was required due to the modular nature of the designs.

- 4.7 The culverts designed for the project proposed cast in place solutions rather than precast. The Contractor, Dywidag International GmbH, chose to subcontract these structures to local sub-contractors who encountered difficulties managing traffic during the three month construction period (a bridge took five weeks) where only one lane was open to vehicles causing severe traffic delays. The Contractor did little to help the sub-contractors in the area of planning and management of the work. The Contractor elected to construct a few more bridges instead of culverts at his cost since the contract period was coming to an end and the application of liquidated damages was imminent.
- 4.8 The designs required an asphaltic overlay over the structures and road construction to connect the new Mahaica and Mahaicony bridges to the main roads. These works required a small quantity of asphaltic concrete and did not warrant the Contractor mobilizing asphalt plant and placing equipment. The Contractor opted to sub-contract these works to road contractors already mobilized in Guyana and this resulted in poor progress of these works due to the sub-contractor being behind on their own contracts.
- 4.9 The works contract used the Lump Sum contract for the first time in Guyana; the contract was hybrid in nature using Lump Sum for the defined works such as the bridge superstructure and measured works for the uncertain items such as driven pile lengths. The administration of the contract had its difficulties due to the inexperience of the EA with the contract form; however, the overall outcome was a positive one.
- 4.10 The loan requirement for the EA to hire an Environmental Specialist resulted in heightened awareness of environmental matters by the Contractors and Supervisors. This resulted in issue such as traffic management and safety, water management and waste disposal amongst others being addressed in a satisfactory manner.

Road Safety

- 4.11 The TC sub-component was not fully executed with more than 80 percent of the funds being left unspent at the end of the program. Reasons for the low commitment of funds included (i) the failure to get the Cabinets no objection to two key interventions for an accident data collection system and training for the MPW&C and GPF and road safety awareness publicity champagne and (ii) not committal of resources for computer equipment and literature during the execution period of the loan.

Berbice River Crossing

- 4.12 After exploring the design, build and finance options for the river bridge the GOG and the Bank eventually agreed in 2003 to study the feasibility of bridging the Berbice River and a bid was launched to procure a constant to undertake the study. The feasibility study was submitted in 2004 recommending a floating bridge close to the mouth of the river over fixed structures further upstream and the Bank identified some weaknesses in the study as presented by the Consultant. This led to a further review by a Consultant hired by the Bank which concluded that the Bridge project would be feasible once the cost associated with the floating bridge fell under the amount of US\$37.3 million. It was agreed that loan resources would be released to fund the approach roads to the bridge once the final bridge cost is known.
- 4.13 The soil conditions along the alignment were poor and required the adoption engineering techniques to accelerate the consolidation in those soils. The adverse soil conditions and unusual rainfall affected progress of the works and necessitated changes in construction material in order for the project to be completed on time to match the opening of the bridge. The completion date of the approach roads was fixed in the Concession agreement for the river bridge and the GOG would have faced penalties if the road was not in a drivable condition on the specified date.

Technical Cooperation

- 4.14 The implementation of RMMS saw the introduction of performance based contracts to local contractors who were accustomed to measured works contracts. The RMMS Contractors were now required to identify where works were necessary in accordance with the contract rather than being informed by the contract or Engineer and this took some time for them to become familiar with.
- 4.15 The poor condition of some roads in the network required these roads to be repaired before routine maintenance could be performed, as such, the RMMS contracts catered for a quantity of Back Logged works such as pot hole repair and thin overlays before the routine maintenance commences.

B. Borrower/Executing Agency Performance

- 4.16 Executing Agency performance in key areas. The Executing Agency Performance in the following areas is as follows:

- | | |
|--|-------------------------------------|
| 1. Participation and quality of its contributions during project design | Low ← 1 2 3 4 → High ○ ○ N/A |
| 2. Organization for project execution (Executing / Coordinating Unit's staff, infrastructure, coordination, communication, etc.) | Low ← 1 2 3 4 → High ○ N/A |

3. Coordination and integration of the project executing/Coordinating Unit with the Executing Agency	Low ← 1 2 3 4 → High	<input type="radio"/> N/A
4. Establishing a monitoring and results framework (baseline data, systems, procedures, data analysis and reporting, etc.)	Low ← 1 2 3 4 → High	<input type="radio"/> N/A
5. Executing/Coordinating Unit's management and decision-making capacity	Low ← 1 2 3 4 → High	<input type="radio"/> N/A
6. Timeliness in the fulfillment of the Bank's policies, procedures and contractual clauses	Low ← 1 2 3 4 → High	<input type="radio"/> N/A
7. Financial management (securing counterpart resources, disbursements, quality and timeliness of AFS, etc.)	Low ← 1 2 3 4 → High	<input type="radio"/> N/A
8. Timeliness and efficiency for procurement of goods, works and consulting services	Low ← 1 2 3 4 → High	<input type="radio"/> N/A
9. Executing Agency top-level management's leadership, ownership and support to project execution	Low ← 1 2 3 4 → High	<input type="radio"/> N/A
10. Concrete actions to secure project sustainability	Low ← 1 2 3 4 → High	<input type="radio"/> N/A

4.17 The two areas with low ratings were because (i) the PEU assigned to the project during the preparation phase was weak and resulted in difficulties during the execution of the project and (ii) the efficiency of the countries procurement system could be improved.

Borrower/Executing Agency			
<input type="checkbox"/> Highly Satisfactory (HS)	<input checked="" type="checkbox"/> Satisfactory (S)	<input type="checkbox"/> Unsatisfactory (U)	<input type="checkbox"/> Very Unsatisfactory (VU)

C. Bank Performance

4.18 Bank Performance in critical areas. Evaluate the Bank's performance in the following areas:

1. Extent to which the Bank facilitated the project design in a participatory manner with the Borrower and Executing Agency	Low ← 1 2 3 4 → High	<input type="radio"/> N/A
2. Technical assistance and training as well as consistent follow-up provided so that the Executing Agency follow the Bank's policies and procedures	Low ← 1 2 3 4 → High	<input type="radio"/> N/A

3. Technical assistance and training provided to the Executing Agency to improve project management Low ← 1 2 3 **4** → High ○ N/A
4. Benefits of the Bank's supervision and assistance to improve project management Low ← 1 2 3 **4** → High ○ N/A
5. Timeliness in the Bank's response to the needs of the Executing Agency during project implementation Low ← 1 2 **3** 4 → High ○ N/A
6. Bank flexibility to respond to emergencies during project implementation Low ← 1 2 3 4 → High ☒ N/A

4.19 The area with low ratings was because this operation introduced the concept of the Lump Sum Works Contract for the first time into Guyana. The PEU was unfamiliar with the implementation and administration of the contract and expected the Bank's team to provide more training/guidance on the implementation and administration of these contracts than was received.

Bank Performance			
<input type="checkbox"/> Highly Satisfactory (HS)	<input checked="" type="checkbox"/> Satisfactory (S)	<input type="checkbox"/> Unsatisfactory (U)	<input type="checkbox"/> Very Unsatisfactory (VU)

V. SUSTAINABILITY

A. Analysis of Critical Factors

- 5.1 The bridges and culverts constructed under Lot 1 are robust and low maintenance. However, some attention has to be paid to inspecting these structures for clogged channels, damaged head wall and guard rails resulting from traffic accidents and signs of distress and settlement. Bridge and culvert maintenance should be included as part of the RMMS contracts to ensure sustainability of these interventions.
- 5.2 The road safety component piloted the introduction of international road signs convention in Guyana and these signs are being placed on the country's main road. However, the Highway Code has not been amended to reflect the new sign convention; this is required to formalize the move to the new sign convention. The Ministry of Home Affairs is the entity with jurisdiction over the aspect of road traffic act regarding sign convention.
- 5.3 Road accidents involving vehicle collision frequently damage the road signs and street lights installed under the project and these are proving costly for the MPW&C to replace. Claims have been made against the vehicle insurance but not all accidents are reported and the vehicles are removed from the scene of the accidents before the police could conduct their investigation. Education, policing

and prosecution in this area have to be more visible to sensitize the public on the consequences of damaging road safety infrastructure.

- 5.4 In the area of road safety, comprehensive data collection and analysis is needed to differentiate whether lack of road safety features on the road or road user error is the primary cause for accidents. The Guyana Police Force (GPF) is responsible for collecting and storing the data and this done manually. The manually process makes it difficult to assemble and analyze the data. Apart from data collection, the GPF is responsible for the enforcement of traffic law and regulations; this is an important contributor to reducing accidents on improved roads since motorists have the tendency to take advantage of the improved driving conditions and increase their vehicle speeds.
- 5.5 The RMMS provides for multi-year routine maintenance contract for the entire main road network. The sustainability of the Berbice River Bridge approach road was addressed through the inclusion of a requirement in the works contract for three years of routine maintenance which adheres to the RMMS and the road has to be fully integrated into the RMMS at the end of this contract. Thus far the funding for the RMMS has been from counterpart funds in the loan contracts and is sustainable if this arrangement continues.
- 5.6 The creation of the WSG in 2002 was a good initiative by the MPW&C. During the implementation life of this project, the WSG has experienced high staff turnover which saw the change of personnel for many of key staff positions. These positions included the Highway Engineer, Bridge Engineer, Maintenance Engineer, Road Safety Engineer, Materials Engineer, Environmental Engineer, Head of CTPU, CTPU Economist and Engineer, Finance Controller and Administrative Officer. Most of the technical positions were filled by promoting staff from within the group. WSG has to focus on retaining and training staff to create specialization in the various facets of engineering, planning and management within the unit.

Potential Risks

- 5.7 In the current world financial situation, countries such as Guyana could face cash flow difficulties which could be a treat to local funding for maintenance activities. To ensure that road maintenance is adequately funded, the Bank should continue to include the RMMS in all future transport infrastructure projects and provide funding for this activity if that becomes necessary.
- 5.8 The first 500m section of Berbice River Bridge approach roads on the eastern bank of river was constructed on very soft soil which was drained and preloaded during construction to accelerate settlement. There is still a risk of continued settlements and WSG should make inspections and correct any differential settlement which could destabilize a vehicle and pose a threat to the traveling public.

- 5.9 Should high staff turnover be a continuous trend, WSG would face problems in implementation progress of donor funded programs since the new staff members would take some time to learn the procedures of these institutions.

B. Institutional Capacity

- 5.10 The Institutional Capacity of the MPW&C has improved significantly with the formation of the WSG. The capacity of WSG itself could be improved with the introduction of a strategic training program to improve the technical and management ability of the current staff which comprises of a number of young professionals. Such a program would also contribute to the retention of staff.

Sustainability Classification SU:

[] Highly Probable (HP) [X] Probable (P) [] Low Probability (LP) [] Improbable (I)

VI. MONITORING AND EVALUATION

A. Information on Results

- 6.1 There data required to assess the impact of the road safety program are not stored in a manner which is easy to collate. The responsibility for data collection lies with the GPF, which is an institutionally weak entity which uses manual methods of record keeping. Attempts to institute a data computerized data collection system for the GPF failed when the contract award was rejected because it was considered too costly. To assemble the data required for the evaluation of this program, the staff of WSG visited the different divisions of the GPF and made copies for the accident report sheets which were then tabulated in an Excel spreadsheet for storage and analysis. This process of collecting traffic data is laborious and time consuming.

B. Future Monitoring and Ex-Post Evaluation

- 6.2 An Ex-post economic evaluation was carried out as part of the PCR preparation. Data collection on road safety needs to continue since this an important to element to feed in the preparation of future transport programs.

VII. LESSONS LEARNED

The lessons learnt from the project are as follows.

Project Design

- 7.1 The designs for the works produced by consultants at the project preparation stage should be reviewed thoroughly by the appropriate technical staff in the EA to

ensure the solution presented adopts suitable design criteria, considers local and site conditions, are practical for the existing construction environment and conforms with the country development plans and strategies in order to avoid changes and delays during project execution.

- 7.2 The Bank and GOG need to have firm agreement on the specific scope of the components during the project preparation stage in order to avoid delays during execution. If this is not had the parties should consider leaving these components for subsequent program.

Project Execution

- 7.3 The WSG was established to execute all donor funded programs in the road sector. This model work well since it rationalized the number of personnel needed to execute the programs, created the opportunity for specialization and offered attractive packages to retain staff. WSG has now taken on the role as the technical arm of the Ministry of Transport and Hydraulics thus increasing that ministry's capacity to implement programs of its own as well. The WSG model is useful in ministries which implement a number of donor and local funded program annually.
- 7.4 Qualification criteria set for contractors bidding for civil works have to give consideration to local logistics and general norms in the international construction industry. Stringent criteria would result in reduced competition and high bid prices.
- 7.5 The value engineering process involving the employer, supervisor and the contractor is a useful tool for identifying and mitigating risks, and obtaining value for money through the utilization of combined experiences of the parties in a spirit of partnership.
- 7.6 This project introduced the concept of modular concrete bridge designs into Guyana which, offers flexibility of constructing elements of the structure offsite and then assembling them on location, thus saving time and reducing cost. It was observed in this project that precast structures were constructed in less than half the time of a cast in-situ one. This concept has been well received and is being adopted for projects which have a large number of bridges and drainage structures
- 7.7 Where possible asphalt concrete surfacing over the concrete structures should be eliminated by requiring the finished concrete surface of the structures to be at the same elevation of the existing road surface. This would speed up the completion time for the structures since the experience has been that the asphalt surfacing is usually delayed by the contractor until an economic quantity is ready to be placed.
- 7.8 The loan requirement for the EA to hire an Environmental Specialist resulted in heightened awareness of environmental matters by the Contractor and Supervisors. This resulted in issue such as traffic management and safety, water

management and waste disposal amongst others being addressed in a satisfactory manner.

- 7.9 The use of lump sum contract is appropriate for works which are well defined and does not high risk on the part of the Contractor; if not it will result in high bids. This project was executed as a hybrid with contract in which the uncertain items such as pile lengths were treated as measured works and the defined works such as bridge element were lump sum.

Institutional Strengthening

- 7.10 The Guyana Police Force needs to have a computerized system to store and analyze traffic accident data. Accident data is important to plan and prioritize road safety initiatives and measure the effectiveness of the programs that are implemented. It should be noted that subsequent to this program the Ministry of Home Affairs, using financing from the Citizen Security Program (IDB Funded) is in the process of implementing the Crime Observatory, which is a data collection system for victims of crime and traffic accidents. Once implemented, the Ministry will have solid statistics and online data in real time of all reported accidents with the number of victims, location, time and type of accident.

Main Road Rehabilitation Program Phase II – Bridges Rehabilitation

Program Phase I

LO 999/SF-GY

Exit Workshop Minutes (September 28, 2010)

1. Participative project assessment

The exit workshop took place on September 28, 2010 with participants representing the Works Services Group (current and past staff), Civil Works Contractor and Supervisor and the Bank. The Draft PCR was summarized and presented in Power Point in order to facilitate the exercise and attain the objectives of the Exit Workshop. The presentation included information on the indicators including the planned and achieved outputs and outcomes organized by components.

2. Assessment of Project Results, Outcomes and Lessons Learnt by Component

The participants were engaged in an active discussion group analysis where outputs and outcomes of the possible future impacts initiated by the project and their benefits were discussed. Based on that information gathered during these discussion groups, the necessary actions and measures were recommended. A summary of the main points identified by the participants is as follows.

3. Component 1: Civil Works

The component was successfully completed with a total of 81 structures being constructed; however, it took more time than was anticipated to be completed. There were a number of challenges that were encountered during the execution of the component as well as a number of positive outcomes.

Design of Structures

There were several challenges regarding the technical design of the replacement structures from both an administrative perspective in the handling of the design process and the technical criteria used along with the quality of the end products. The specifics of these challenges are highlighted below.

- At the time of the execution of the design contract in 1997 the GOG was represented by Road Administration Division Project Execution Unit which was at time dedicated to IDB projects. This unit did not have the requisite specialization to guide the design process and this resulted in a product which was not satisfactory when reviewed by GOG experts Bridge Administration Unit which was at the time working on World Bank funded projects.

- The designs proposed by the Design Consultant, Figg Bridge Engineers Inc., did not fully take in to account, land use changes since the construction of the existing structures (some dated back as far as 1930), changes in drainage flow direction and maintenance of proposed culverts given the silty nature of the open channels which flow into them. This was resolved through field visits between the Bank, GOG and Design Consultant.
- Two design criteria used to prioritize structures for replacement, pertained to width of the driving lane and shoulders provided by the existing structures and the use of timber in the construction of the structure. This criterion was used rigidly by the Design Consultants and resulted in some structures that were in good shape being recommended for reconstruction.
- The Design Consultant did most of the work in their home country which resulted in several discrepancies between the proposed design layouts and the features in the field. These design had to be thoroughly field checked and amended to reflect the field conditions.
- The designs proposed for the bridges across the Mahaica (53m long) and Mahaicony (69 m long) Rivers utilized the same bridge deck elements from the shorter 12m span bridges and would have required a number of pile bents being placed in the river channel restricting of the uses of the river for navigation. This proposal conflicted with the country's National Development Strategy which envisaged rivers as a key resource for transport. GOG's technical team visited the Design Consultants head office in the USA to resolve the design issues and the new bridges were eventually designed incorporating long spans and sufficient clearance between the water surface and bridge beams to allow navigation.

The designs also yielded a number of positive outcomes which are presented below.

- The locations of the bridges across the Mahaica and Mahaicony were both moved upriver due to constraints at the existing sites. This benefitted the traveling public by improving safety and reducing the congestion and travel time at the bridge locations. At the Mahaicony bridge site, a Hostel used by Amerindian people traveling for the interior was in the new alignment. A new Hostel was constructed to replace the existing one in consultation with the Amerindian Affairs Ministry and the management and users of the facility. The new facility was completed prior to the demolition of the existing one.
- This situation of having multiple PEU in the Transport Sector was recognized as an obstacle to project design and implementation, and the Bank along with GOG agreed to resolve this situation through the formation of the Works Services Group in 2002, which is a multidisciplinary unity geared towards improving the planning and execution donor funded projects in the sector.
- This project introduced the concept of *modular concrete bridge designs* into Guyana which, offers flexibility of constructing elements of the structure offsite and then assembling them on location, thus saving time and reducing cost. This concept has been well received and is being adopted for projects which have a large number of bridges and drainage structures.

- The scale of the project allowed the use of prestress concrete technology; this was a first in Guyana for such structures.
- The project highlighted the need for specialization in the area of bridge engineering and this specialty was put as a key engineering position in the structure of the Works Services Group when it was created in 2002.

Procurement and Construction of the Structures

The procurement and construction of the structures was an eventful process being the first project of this nature utilizing prestress modular elements and being procured with a hybrid lump sum contract. The challenges and positive outcomes are documented below.

- The pre-qualification criteria set for the prospective Works Contractors required them to have in-house capability for producing the pre-stress element necessary for the structures and for the equipment to be located in Guyana for the production of the elements. This resulted in only two Contractors being pre-qualified to tender for the works. In retrospect, Contractors should have been allowed to purchase the prestressed units from specialized casting yards as in common practice in the construction industry internationally.
- During the tendering, one of the two prequalified firms did not submit its Bid Security and was disqualified leaving only one bid which was significantly above the budget. There was miscommunication on the Bank's Procurement Policies with regards to negotiation of the bid price with the qualified bidder. This resulted in the Executing Agency (EA) negotiating reductions of the bid price with the qualified bidder and later being informed that reducing the price before contract signing not in keeping with Bank's Policies.
- The culverts designed for the project proposed cast in place solutions rather than precast. The Contractor, Dywidag International GmbH, chose to subcontract these structures to local sub-contractors who encountered difficulties managing traffic during the three month construction period (a bridge took five weeks) where only one lane was open to traffic. The Contractor did little to help the sub-contractors in the area of planning and management of the work.
- The designs required an asphaltic overlay over the structures and road construction to connect the new Mahaica and Mahaicony bridges to the main roads. These works required a small quantity of asphaltic concrete and did not warrant the Contractor mobilizing asphalt plant and placing equipment. The Contractor opted to sub-contract these works to road contractors already mobilized in Guyana and this resulted in poor progress of these works due to the sub-contractor being behind on their own contracts. This could have been eliminated by requiring the finished concrete surface of the structures to be at the same elevation of the existing road surface.

The positive outcomes which were noted are as follows.

- The loan requirement for the Execution Agency to hire an Environmental Specialist resulted in heightened awareness of environmental matters by the Contractor and Supervisors. This

resulted in issue such as traffic management and safety, water management and waste disposal amongst others being addressed in a satisfactory manner.

- A Value Engineering exercise was carried out for the first time between the EA and the Contractor which looked at the Contractors proposed methodology, the requirements and risks associated with the contract. One of the main cost factors was associated in traffic control and bypasses; the EA provided the Contractor with steel bridge elements which it had in stock which allowed a reduction in cost and simplification of the traffic management. This along with other trade off allowed the number of structures being rehabilitated under the contract increase to eighty-one from fifty-nine at the time of tendering. No additional design work was required due to the modular nature of the designs.
- Two old railway bridges across the Mahaica and Mahaicony rivers were originally slated for demolition since they were on the alignments intended to be used for the new bridges. Negotiations with the Contractor saw these structures being shifted out of the alignments of the bridges rather than destroying them, and have been since handed over to the Guyana Heritage Society.
- The Contractor elected to construct a few more bridges instead of culverts at his cost since the culverts took twice as long to construct and the contract period was coming to an end and the application of liquidated damages was imminent.
- The works contract used the Lump Sum contract for the first time in Guyana; the contract was hybrid in nature using Lump Sum for the defined works such as the bridge superstructure and measured works for the uncertain items such as driven pile lengths. The administration of the contract had its difficulties due to the inexperience of the EA with the contract form; however, the overall outcome was a positive one.

4. Component 2: Road Safety

The Road Safety component had mixed results; the civil works component was well executed and resulted in the main road network being lined and marked, reflective road signs installed and street lights and sidewalks placed along some sections. The Technical Operation (TC) component was not fully executed and yielded little in the form of outcomes.

The challenges faced in executing the component were as follows.

- The TC component was not fully executed with more than 80 percent of the funds being left unspent at the end of the program. The main reason for this was the failure to get the Cabinets no objection on the various interventions.
- The Bank and the EA agreed to rehabilitate the traffic light in Georgetown which had been in disrepair as posed a safety issue to the traveling public. This intervention was not implemented since the traffic lights fell under the jurisdiction of the Ministry of Home Affairs and that institution did not have a structure in place to ensure the operation and sustainability of the lights.

The positive outcomes were as follows.

- A comprehensive traffic study was conducted under the program for the main road network. The study collected and analyzed accident data for a three year period and identified accident black spot areas to be target under the program. The worse corridors in terms of fatal accidents were also identified and interventions proposed to militate against the high accident rate.
- The signing, marking and street lights program which was initiated under this program has been continued with resources from subsequent Bank and GOG programs.

5. **Component 3: Berbice River Crossing**

The execution of the Berbice River Crossing component suffered the most delays in the program and eventually culminated with a new bridge and approach roads across the Berbice River. The challenges and positive outcomes are document below.

- The GOG was interested in a bridge across the Berbice River and were *not in favor of studying alternatives* as was stated in the loan documents. The GOG opted to *explore the design, build and finance options* with international firms during the initial stages of the program. This was done through public invitation for proposals and preferred offer was identified, however, a contract between the GOG and the firm was not successfully negotiated. The GOG and the Bank eventually agreed in 2003 to study the feasibility of bridging the Berbice River and a bid was launched to procure a constant to undertake the study.
- The feasibility study was submitted in 2004 recommending a floating bridge close to the mouth of the river over fixed structures further upstream and the Bank identified some weaknesses in the study as presented by the Consultant. This lead to a further review by a Consultant hired by the Bank which concluded that the Bridge project would be feasible once the cost associated with the floating bridge fell under the amount of US\$37.3 million. It was agreed that loan resources would be released to fund the approach roads to the bridge once the final bridge cost is known.
- A Special Purpose Company named the Berbice Bridge Company Incorporated (BBCI) was *incorporated to finance, build and operate a floating bridge across the Berbice River Bridge under a 21 year concession agreement*. The firm tendered the bridge works as design and build project and hired a consultant to supervise the construction on their behalf. After the preferred bidder for the works was identified, it took almost six months for financial closure on the contract and this delayed the start of the approach roads and the loan execution.
- The soil conditions along the alignment were *poor and required the adoption engineering techniques to accelerate the consolidation in those soils*. The adverse soil conditions and unusual rainfall affected progress of the works and necessitated changes in construction material in order for the project to be completed on time to match the opening of the bridge.

The completion date of the approach roads was fixed in the Concession agreement and the GOG would have faced penalties if the road was not in a drivable condition on the specified date.

The positive outcomes of the Berbice River Crossing component were as follows.

- Guyana has its first piece of transport infrastructure funded by private resources raised from the financial institutions present in the country.
- The bridge has resulted in a significant reduction in travel time across the river which is now ten minutes as opposed to one to two hours with the old ferry system.
- The engineering design for the approach roads introduced in Guyana the use of wick drains to accelerate the settlement in the soft soil and pile support for semi ridged pavement reinforced with geotextile fabric.
- There were 33 residential properties which were resettled out of the alignment of the bridge approach roads in an amicable manner. The affected persons were compensated at the market value of the property given for a charge of one Guyana Dollar a house lot with adequate roads and drainage and access to potable water and electricity approximately 3 kilometers away. In addition the property owners were allowed to salvage and remove materials from their houses for reuse in the new construction and were assisted with transportation to move their belongings.

6. Component 4: Technical Cooperation for Ministry Of Public Works and Communication

This component was considered successful since it resulted in two main institutional changes in the Ministry; those were the establishing of the Works Services Group (WSG) and the Routine Maintenance Management System (RMMS).

The WSG was formed in January 2002 an executing unit within the MPW&C with the mandate to plan, design and implement all contracts for investment and maintenance of roads and bridges. The unit was established with a complement of management, engineering and support staff to undertake the tasks assigned to that unit.

A RMMS system was established under the WSG to execute continuous routine maintenance on the main road network. The RMMS utilizes multi-year performance based contracts with local contractors to execute the routine maintenance works and these contracts are funded by the Guyana Treasury as counterpart to Bank loans. There were two main challenges to the implementation of RMMS, the first being the introduction of a new form of contract to local contractors who were accustomed to measured works contracts. The RMMS Contractors were now required to identify where works were necessary in accordance with the contract rather than being informed by the contract or Engineer and this took some time for them to become familiar with. The second challenge was regards to the poor condition of the some roads in the network. These road had to be repaired before routine maintenance could be performed, as such, the RMMS contracts catered for a quantity of Back Logged works such as pot hole repair

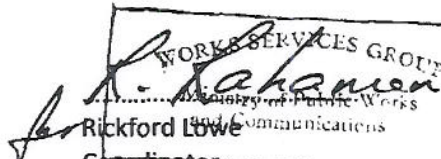
and thin overlays before the routine maintenance commences. This RMMS model worked and the quality of the main roads in the country remain in good driving condition.

7. Sustainability

The sustainability of the interventions is a key issue which has to be paid close attention to, the following areas were identified as impacting sustainability.

- International road signs convention have been adopted and are being placed on the country's main road, however, the highway code has not been amended to adopt the new convention. The Ministry of Home Affairs is the entity with jurisdiction over the road traffic act.
- Road accidents frequently damage the road signs and street lights, claims have been made against the insurance but not all accidents are reported.
- Attention need to be paid to bridge and culvert maintenance as part of the of the RMMS contracts.
- WSG has to focus on retaining and training staff to create specialization in the various facets of engineering, planning and management within the unit.


Christopher Persaud
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Inter-American Development Bank
Project Completion Report –2006 PCR
Borrower Evaluation

Project Name: Main Road Rehabilitation Program Phase II - Bridges Rehabilitation Program Phase I	
Executing Agency(ies): Ministry of Public Works & Communication	
Borrower: Cooperative Republic of Guyana	
Date of Project Approval: November 25, 1997	Date of Contract Effectiveness: March 18, 1998
Date of Borrower Evaluation: September 28, 2010	Expected Date of Exit Workshop: September 28, 2010

Borrower Project Performance Ratings

Probability on Achieving its Development Objective(s):

☒ Highly Probable (HP) ☐ Probable (P) ☐ Low Probability (LP) ☐ Improbable (I)

Project Implementation:

☒ Highly Satisfactory (HS) ☐ Satisfactory (S) ☐ Unsatisfactory (US) ☐ Very Unsatisfactory (VU)

Sustainability of Project Results:

☒ Highly Probable (HP) ☐ Probable(P) ☐ Low Probability (LP) ☐ Improbable (I)

Comments:

The Project has resulted in a reduction in Fatal Accidents, reduced travel time and vehicle operating costs. The project was completed with minimal extension of time, no claims or litigation.

Borrower Performance During Project Preparation

Please rate your own performance during Project Preparation:

☐ Highly Satisfactory (HS) ☒ Satisfactory(S) ☐ Unsatisfactory (US) ☐ Very Unsatisfactory (VU)

Comments:

Initial delays were encountered due to dissatisfaction with designs prepared by the consultants for civil works additional problems were experienced in obtaining approval of the road safety consultant and launching of the routine maintenance management systems.

New Management in 2000 resulted in accelerated progress and highly resolution of policy matters and other obstacles

Borrower Performance During Project Execution

Please rate your own performance during Project Execution:

☒ Highly Satisfactory (HS) ☐ Satisfactory(S) ☐ Unsatisfactory (US) ☐ Very Unsatisfactory (VU)

Comments:

In comparison with previous civil works program financed with support from the IADB, the project was highly successful achieving fully, the intended scope of works. This was the largest civil works contract (at the time) executed on a lump sum basis and was completed with minimal extension of time (for inclement weather), within contract sum, and with no resulting claims or litigation.

Bank Performance During Project Preparation

Please rate the Bank's performance during project preparation. Factors to be considered include the extent to which the Bank facilitated a participatory project design, proposed adequate technical solutions to the problems identified, and responded to the needs of the Borrower (timeliness, selection of instrument type).

☐ Highly Satisfactory (HS) ☒ Satisfactory(S) ☐ Unsatisfactory (US) ☐ Very Unsatisfactory (VU)

Comments:

The Bank, in General, was supportive and efficient except in two areas:

- ✓ The Bank insisted on the execution of the project on a lump sum basis, but could offer no guidance or precedence on contractual conditions, or other similar projects.
- ✓ After receiving initially high bids from civil works contractors, WSG was allowed by the Bank, to enter into negotiations after 3 months, the Bank disallowed the projects.

Bank Performance During Project Supervision

Please rate the Bank's overall performance during project supervision. Factors to be considered include technical assistance (including informal and formal training) to Executing Agency, timeliness of Bank response and the Bank's flexibility to respond to emergency situations during project implementation.

☒ Highly Satisfactory (HS) ☐ Satisfactory(S) ☐ Unsatisfactory (US) ☐ Very Unsatisfactory (VU)

Comments:

The Bank was Highly supportive and advisory, especially in the implementation of sub-components of the program, including traffic safety implementation and the routine maintenance management systems

Additional Suggestions for Improving Bank Performance

Additional comments/suggestions for improving Bank performance in the future.

Relationships and collaboration with the Bank have been highly satisfactory. The Bank and GOG have mutually agreed to eliminate the lump sum component of the civil works contracts which resulted in extremely high bids due to the risk factor.

Guyana: Main Road Program Phase II Bridge Rehabilitation Project— An Ex-Post Economic Evaluation



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January 20, 2010

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I. Introduction

The purpose of this analysis is to carry out an ex-post economic evaluation of the Main Road Rehabilitation Program, Phase II—Bridge Rehabilitation: LO 999/SF-GY. The principal objective of the project was to continue the program by replacing, rebuilding or rehabilitating existing bridges along the main road system. The project also included activities such as increasing road safety, improving the Berbice River crossing, and assistance for upgrading national road planning and maintenance.

The objective was to reduce the overall road transportation cost and increase safety along the major road arteries from Georgetown to Rosignol along the East Coast Demerara, East Bank Demerara and West Coast Berbice highways that serve over 70% of the country's population. Together with the road improvements financed with resources of loan 890/SF-GY the project was expected to provide a rapid link between the capital city, the international airport, and the agricultural centers in the east.¹

A total of 49 bridges and culverts were analyzed of the 81 that were executed. All of the projects that were initially analyzed were included in this exercise, as well as four not previously analyzed. The cost of the 81 projects was \$US21,708,656 in \$US 2004 and \$24,834,703 in \$US2009. The total project cost was slightly higher, but some items were not considered in this analysis as they were small values for structures which were not rehabilitated after initial works.

This report would not have been possible without the cooperation and assistance of the Guyana IDB Representation. In particular, Christopher Persaud was invaluable in developing much of the input data that are used in the analysis, but any errors and omissions remain the responsibility of this consultant.

This report is designed to complement the Project Completion Report for the project. This consultant visited Guyana from November 15th to the 21st.

II. Demand

In order to estimate the demand for the bridges, advantage was taken of existing traffic counts along the two main transportation corridors that contain the bridges that are object of this ex-post evaluation. In order to establish growth rates for the Georgetown-Rosignol stretch along the east coast to the Berbice River and Georgetown-Soesdyke corridors towards the airport, various traffic counts were utilized. For the Georgetown-Rosignol growth rates, two different counts in 2000 and 2008 were used.² The stations were not exactly comparable, but an estimate was made

¹ Loan Proposal, Main Road Rehabilitation Program Phase II—Bridge Rehabilitation. (GY-0026)

² Source: Mahaica Rosignol Design and feasibility Study. Counts taken in July August 2000 and Source: Economic Analysis, Environmental Assessment and Design Studies. Lot 2B Transport Infrastructure Rehabilitation Programme WSP in association with CEMCO. April 2008. Counts taken at Mahaica, Belladrum and Rosignol.

in order to unify the counts. The average growth rate for the three stations was used to estimate an annual growth rate of three percent.

For the Georgetown-Soesdyke road, 1995 and the referenced 2008 traffic counts were used for stations at Diamond and Soesdyke.³ The estimated rate of growth was 5.6% for the area near Diamond and 0.5% for the Soesdyke area. In order to establish the traffic in 2004, the first year of the analysis, the counts recorded in the 2002 study “Top 10 Worst Corridors” were used as there were more stations and it provided a better base. The 2002 initial values were adjusted to 2004 using the established growth rates.

The results for 2004 traffic are summarized below:

2004 Traffic Estimates		
Station	ADT	Annual growth rate
Diamond ⁴	9376	5.6%
Soesdyke ⁵	4151	0.5%
Buxton ⁶	13007	3%
Mahaicony ⁷	4855	3%
Mahaica ⁸	3873	3%

III. The Economics of the Bridges and Culverts

As in the original 1997 study, the analysis that follows is not precise and it should not be so interpreted. If the results are robust as is the case in the majority of the projects, then they point to clear feasibility. If the subprojects are marginally negative, they could fall either way, but probably represent a reasonable investment. This analysis necessarily bases the without project case on the scenarios developed for the original study as this is the best record available of the situation at that time. For the with project case, the scenarios are based on those developed in the field for a sample of the structures.

For the purpose of this analysis, measurable benefits from the rehabilitation of the bridges can be divided into two categories—the widening of the bridges should result in higher speed over the stretches, reducing vehicle operating costs, and passenger and crew time, and secondly, elimination of traffic disruption due to structural failure over the bridge’s lifetime.

³ Source: Ministry of Public Works, Communications and Regional Development; Road Administration Division - Traffic Section.

⁴ For all TG's except TG 85

⁵ For TG85

⁶ This is at MG 48. Use from MG 25 to MG 54. For MG 54 to MG 76, used 50% of this.

⁷ MG 77 to RM 109 to RM 133

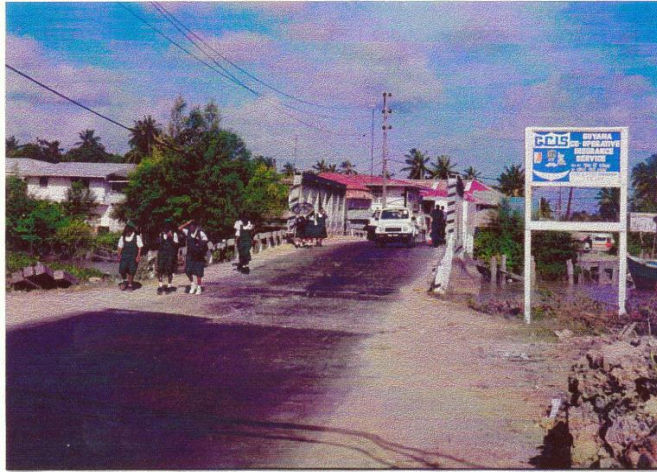
⁸ RM 149 to RM 165



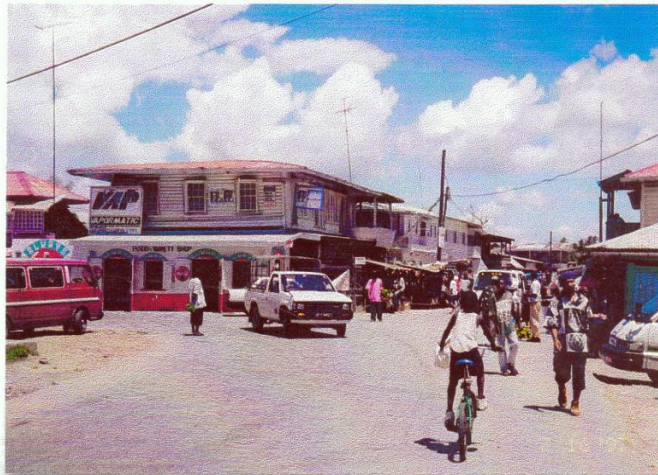
BeeHive MG75: Width Before Project (Above): 6.4m, After 11.27m (Below)⁹



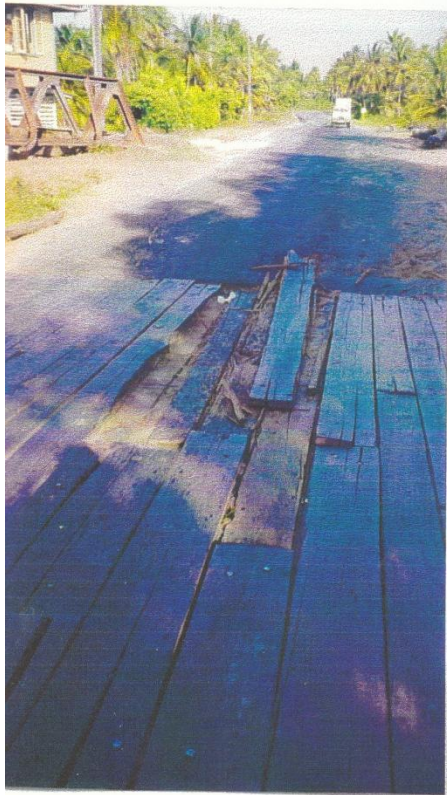
⁹ Here and for the following photos, the without pictures were taken from the 1997 study.



Mahaica Bridge (MG 86) in 1997 before project. Picture below shows market.



Immediately Above: Mahaica (MG 86) Branch Today



Mahaicony Bridge (RM 109)

Width: 5.2 m
 Length: 69.1 m (7 spans)
 1997 Traffic: 2854 vpd
 Timber plank, one way
 traffic, poor structural
 condition.



Mahaicony Bridge 1997



Mahaicony Bridge Today





Top Picture: TG 18 Ramsburg 1997 Before Project
Middle Picture: TG 25 Prospect Today, Bottom Picture: TG 85 Soesdyke Today

A. Benefits from Widening Bridges

1) Bridges and Culverts

Vehicle Operating Costs¹⁰

Narrow Bridges in High Volume Congested Zones¹¹. For bridges less than 6.7 meters wide, where it is necessary for vehicles to slow down, in the more congested areas between Georgetown and Vigilance, and between Georgetown and Golden Grove (TG30) it was assumed that a vehicle traveling 32kmph would have to slow down to 8kmph for 200 meters. From this it was assumed that the average speed over the segment would be 16kmph¹². To illustrate the calculation, MG27, a medium sized bridge between Georgetown and Mahaica at Le Ressouvenir will be used as an example.

Based on vehicle operating costs (voc) for a car, costs/km would decrease from US\$0.60/km to \$0.3710/km with the new bridge, for a difference of \$0.229/km, or \$0.0916 for 400 meters.¹³ With the project, the vehicles would travel the entire 400 m distance at 32 kmph. In 2004 the traffic count was estimated to be 13,007 vehicles per day (vpd), for all vehicle types. This would yield first year savings of US\$169,155 per year or a NPV of over \$1,573,423 with a 3% annual growth for 20 years at a 12% discount rate for the car. To this must be added the voc savings for the other vehicle types. For these high volume areas where there was significant congestion, clearly the projects have high returns to the investment.

Narrow Bridges in Low Traffic Zones¹⁴. This represents voc savings for bridges between Vigilance and Rosignol on the East Coast Demerara/West Coast Berbice Highways and between Golden Grove and Timerhri along the East Bank Demerara. In these cases it is assumed that traffic is flowing at 72kmph and without the project must slow to 32kmph to cross the bridge or culvert. With the project, the traffic would be able to maintain the 72kmph. In the case of MG84, the first year voc savings under this scenario will be less than \$10,000 and the NPV \$88,747 for cars. This difference reflects the dramatic difference in changes in voc between 32 and 16kmph versus 72 and 32 kmph as well as the differences in traffic.

Medium Width Bridges in High and Low Traffic Zones. For bridges between 6.7 meters and 11 meters wide without the project, vehicles slow down less than on narrow bridges, and the benefits would not be as great.

¹⁰ Vehicle Operating Costs were recalculated for all vehicle types and for the different velocities. The costs are given in US\$2009.

¹¹ Congestion is caused by both vehicular and pedestrian traffic in these urbanized areas.

¹² This is slightly lower than the average and is based on the high volume of pedestrian traffic in the area. For the bridges in this category the economic results are robust, and it is not expected to materially affect results.

¹³ The voc estimates are actually based on costs derived from the World Bank HDM model, version 4.0. Costs represent economic values.

¹⁴ Both vehicular and pedestrian traffic are lower in those low population density areas.

2) Mahaica and Mahaicony Steel Truss Bridges

Vehicle Operating Costs

Mahaica Bridge. The vehicle operating costs were calculated over three stretches: 200 meters on each side of the bridge, and the bridge itself. The first segment represents the Georgetown side. Without the project, it was assumed that the speed through the populated area would be 32kmph slowing to 16kmph for an average speed over the segment of 24kmph. The second segment represents the Rosignol side. Without the project, it was assumed that the speed over the bridge would be the same (16kmph) and the highway speed 72kmph for an average speed over the 200m segment of 45kmph. The vehicle operating costs while actually crossing the bridge (a third segment) are based on crossing speed of 16kmph without the project. With the project, it is assumed that the vehicle would maintain at least 72kph.

Mahaicony Bridge. The vehicle operating costs were calculated as the average for both traffic directions: to Rosignol and Georgetown. A vehicle going to Rosignol follows three steps. First, it has to decelerate from 32 kmph within 200 meters before the stop sign. At the stop sign, it may have to wait for an oncoming vehicle. It was assumed that the average speed over that segment would be 16kmph.

A vehicle going to Georgetown follows also three steps. First, it has to decelerate within 200 meters before the bridge, facing two scenarios: It must stop to wait for vehicle in other direction to cross the bridge, or it has to slow down to 16kmph. Under the first scenario it was assumed that, without the project, the average speed over the segment would be 37kmph; with the project, the average speed would be 52kmph. In the second one, the average speeds assumed are 45kmph and 52kmph respectively. The second step is crossing the bridge at either 32kmph with the project or 16kmph without the project. The final step is to accelerate in 200 meters to reach 32kmph. Without the project, it was assumed that the average speed over that segment would be 24kmph. With the project, the traffic would be able to maintain 72kmph.

B. Traffic Disruption Due to Bridge Structural Damage

For many of the structures, in the absence of the project, there would be a serious disruption of traffic in the event of collapse of the structure. It is possible that some scenarios could be developed that take this into consideration. In conversations with Figg Engineering when the project was under analysis, however, they said they were not in a position to make these kinds of predictions nor did they have any idea as to the probability of failure. This is understandable, as they don't have information as to the original design specifications or sufficient depth of information on the existing situation. To gain some insight, a scenario was constructed as follows: there will be damage to the bridge that does not close it but does cause delays of thirty minutes for the first day and five minutes per day for a period for two months. This occurs once for each bridge and for our purposes we will assume that it occurs at the end of five years. The costs of the immediate repair are not included, but the permanent repair (after two months) is taken to be US\$71.89 per square foot. This is based on recent costs of individual bridge construction in Guyana where we assume that there will not be complete rebuilding.

C. Results¹⁵

The table below describes the results.

Description		BENEFITS (NPV)			ECONOMIC COSTS		NET BENEFITS
		Disruption	VOC	Total	US\$ 2009		US\$ 2009
Structure	Name	savings	savings	Benefits	costs	width (mts.)	
ROBUST							
MG 86	Mahaica	235,088	4,180,156	4,415,245	4,180,322	11.27	234,922
MG 76	Greenfield	242,178	861,060	1,103,238	517,229	11.27	586,009
MG 71	Befield/Nooten	182,806	861,060	1,043,866	413,004	11.27	630,862
MG 30	Chat. Margot	363,254	7,477,270	7,840,524	267,604	11.27	7,572,920
MG 58	Paradise	183,626	584,987	768,612	113,157	12.19	655,455
MG 40	Good Hope	365,266	8,062,580	8,427,846	423,712	11.27	8,004,133
TG 14	Providence	196,286	4,817,980	5,014,266	59,616	12.19	4,954,650
TG 34	New Hope	192,285	1,139,974	1,332,259	159,094	12.19	1,173,165
TG 20	Jardin De Prove.	198,786	4,817,980	5,016,767	392,690	11.27	4,624,076
TG 20A	Vreede Ruste	210,789	4,817,980	5,028,769	141,349	N.A	4,887,421
TG 28	Great Diamon.	200,686	4,817,980	5,018,666	438,028	11.27	4,580,638
TG 35	New Hope	195,536	1,139,974	1,335,510	255,978	11.73	1,079,532
MG 27	Le Ressouvenir	373,633	8,062,580	8,436,213	52,228	12.19	8,383,986
TG 32	Good Success	259,039	696,673	955,712	41,720	N.A	913,992
MG 54	Srayspey	372,659	1,846,234	2,218,893	429,966	11.27	1,788,927
MG 24	Better Hope-Vry.	10,753	5,350,647	5,361,399	77,931	15.85	5,283,468
MG 25	Better Hope-Vry.	10,753	5,350,647	5,361,399	144,875	11.73	5,216,525
MG 28	Success	9,823	8,062,580	8,072,403	407,681	11.27	7,664,722
MG 29	Chat.Margot-LBI	13,753	7,477,270	7,491,023	428,375	11.27	7,062,648
MG 33	LBI / BV	3,493	7,477,270	7,480,763	39,683	13.71	7,441,080
MG 34	BV	14,503	7,477,270	7,491,773	66,245	12.19	7,425,528
MG 35	BV-Triumph-LBI	14,503	7,477,270	7,491,773	436,288	11.27	7,055,485
MG 36	Triumph-Mon R.	12,749	8,062,580	8,075,329	411,161	11.27	7,664,168
MG 42	Two Friends	2,083	8,062,580	8,064,662	63,059	11.58	8,001,604
MG 66	Nabaclis	11,156	561,686	572,842	87,708	15.24	485,134
MG 67	Nabaclis	11,074	861,060	872,133	191,062	14.50	681,071
MG 70	Victoria-Belfield	5,038	861,060	866,098	132,696	12.37	733,402
MG 75	Beehive-Greenfi.	18,154	561,686	579,840	350,153	11.27	229,686
TG 16	Ramsburg	4,703	4,817,980	4,822,683	63,979	11.27	4,758,704
TG 18	Ramsburg	5,251	4,817,980	4,823,232	32,248	12.19	4,790,984
TG 19	Jardin De Prove.	9,252	4,817,980	4,827,233	227,368	11.27	4,599,864
TG 21	Vreede Ruste	13,253	4,817,980	4,831,233	202,252	11.73	4,628,981
TG 23	Vreede Ruste	5,251	4,817,980	4,823,232	93,064	12.19	4,730,168
TG 25	Prospect	7,502	4,817,980	4,825,482	483,820	11.27	4,341,662
TG 29	Great Diamond	3,269	4,817,980	4,821,250	59,961	15.24	4,761,289

¹⁵ All are NPV discounted at 12% for twenty year horizons. IRR's were not computed, because the constructions of twenty year flows for the 50 structures would have been arduous and not added a great deal of information. Investment costs are based on actual figures from Bank files.

Description		BENEFITS (NPV)			ECONOMIC COSTS		NET BENEFITS
		Disruption	VOC	Total	US\$ 2009		US\$ 2009
Structure	Name	savings	savings	Benefits	costs	width (mts.)	
MG 43	Lusignan	387,252	0	387,252	304,673	12.19	82,579
RM 130	Profit	128,991	0	128,991	114,552	13.70	14,439
TG 30	Golden Grove	16,754	4,817,980	4,834,734	437,431	11.27	4,397,303
RM 132	Paradise-belle	135,314	528,602	663,916	402,467	11.27	261,449
RM 154	Onverwagt	150,023	422,968	572,990	394,990	11.27	178,000
Newly Analyzed							
MG 64	Golden Grove	0	3,920,486	3,920,486	\$60,645	12.19	3,859,841
TG 33	Craig	185,533	809,896	995,430	450,530	11.27	544,900
TG 44	Friendship	185,533	654,677	840,210	428,279	11.27	411,932
MARGINALLY NEGATIVE							
TG 85	Timerhi	160,344	340,523	500,866	540,297	11.27	-39,431
RM 152	Village No 28	101,373	0	101,373	105,651	12.19	-4,278
NEGATIVE							
RM 109	Mahaicony	237,540	3,499,003	3,736,543	3,985,190	11.27	-248,648
TG 31	Golden Grove	212,625	0	212,625	447,206	11.27	-234,580
MG 18	Ogle	0	593,257	593,257	800,300	12.19	-207,042
RM 165	Bath	103,452	0	103,452	279,989	14.00	-176,537

D. Sensitivity Analysis

The sensitivity analysis is summarized in the following table. In the opening paragraph of section *III, The Economics of the Bridges*, the imprecise nature of the analysis is highlighted. The statement was made that despite this, the robust results point to clearly economically feasible projects. The sensitivity analysis reinforces this assertion. For the base case, 43 of 49 of the bridges demonstrate robust results, and this number does not go below 40 of the 49.

Scenario	NPV Net Benefits (US\$ at 12%)	BRIDGE DISTRIBUTION		
		Robust	Marginally Negative	Negative
Base Case	\$155,551,906	43	2	4
Change in vehicle growth rate ¹⁶	\$118,221,497	42	2	5
No Traffic disruption due to bridge structural	\$150,225,713	40	1	8
VOC savings reduced 25%	\$113,729,969	42	1	6

¹⁶ All roads growth rates equal to 1% annually, except for TG 85 which was 0%..

IV. Bridges and Culverts Conclusion

The following table summarizes the results of the analysis and compares these results with the analysis carried out in 1997.

Category	Projects Analyzed						1997 Ex-ante Results ¹⁷	
	Total Analyzed		Previously Analyzed		Newly Analyzed			
	Nbr.	%	Nbr.	%	New	%	Nbr.	%
Robust	43	84%	40	84%	3	80%	53	76%
Marginally Positive	0	0%	0	0%	0	0%	9	13%
Marginally Negative	2	10%	2	9%	0	0%	4	6%
Negative	4	6%	3	7%	1	20%	4	6%
Total	49		45		4		70	

As can be seen in the above table, 84 % of the projects yielded robustly positive economic returns and only 6 % were negative. Further it should be noted that these program results are very positive despite major increases in the costs of some of the bridges. In particular, Mahaica and Mahaicony increased almost by a factor of five from the original Figg estimates. It should be said, however, that the modifications that were made also significantly facilitated the traffic flow through these critical areas. Even with these increases, Mahaica has an internal rate of return of over 12% and Mahaicony approximately 11%.

In the previous section, the sensitivity analysis demonstrates that despite the possible inaccuracies inherent in the analysis, the program maintains its overall viability and is not sensitive to significant changes in the assumptions. There is no doubt that overall the program was a good investment for Guyana with benefits being enjoyed across a wide spectrum.

The analysis did not take into consideration the apparent increase in safety along the corridor. Statistics are difficult to come by, but at his annual press briefing last year, Minister of Home Affairs Clement Rohee told the media that road fatalities for 2008 had declined dramatically in comparison with the previous year – in fact, by an extraordinary 54.6%. (There were 207 fatalities in 2007 and 113 in 2008, he was reported as saying.).¹⁸

V. Berbice River Crossing

It is early to draw conclusions on the Berbice River Crossing, as it has just opened in late December of last year. Available data however does provide the opportunity to get an idea of the economic (as opposed to financial) return of the Bridge and approach road project. According to the information provided to the Bank, annual revenue was approximately US\$5,155,560 based on the traffic in the most recent three months of this year.¹⁹ Also according to information provided by the BBCI to the Bank in 2006 the fixed price contract for the floating bridge was

¹⁷ Percents do not add to 100% because of rounding.

¹⁸ Stabroek News, November 29th editorial.

¹⁹ For the purpose of this analysis, the revenues were taken as the benefits. This may not strictly be the case, but in the absence of other information, it was adopted.

US\$37,150,000. The approach roads cost was an additional US\$11 million. Costs of operation and maintenance are not available, but from Patricio Millan's December 2004 analysis US\$37,580 were used for annual road maintenance and US\$88,560 for the bridge. In addition, every 10 years major works for the roads will be required that amount to approximately US\$1,000,000, and US\$222,000 every 5 years for the bridge. This yields a NPV at a 12% discount rate of slightly less than minus US\$1,000,000, and a rate of return of 10.2%. It should be understood that this is not a financial analysis, which may or may not yield better results depending on the conditions of the financing.

ANNEX IV: ACCIDENT ANALYSIS

Baseline Accident Data

Corridors		Annual Fatalities					ADT	Kilometer Traveled Annually (million)	Fatalities per Million Km Traveled
From	To	Length (km)	1998	1999	2000	Avg. 1998 - 2000			
Georgetown	Buxton	17.6	11	20	19	16.7	11,300	72.59	0.23
Georgetown	Timehri	39.2	24	25	15	21.3	13,130	187.86	0.11
Buxton	Mahaica Bridge	21.6	7	8	10	8.3	4,600	36.27	0.23
New Amsterdam	Bush Lot No.28	35.2	7	15	16	12.7	5,520	70.92	0.18
Den Amstel	Marias Lodge	35.2	13	11	9	11.0	8,590	110.36	0.10
Den Amstel	Larimakbra	32.8	10	11	8	9.7	4,360	52.20	0.19
Corriverton	Moleson Creek	17.6	5	3	5	4.3	3,930	25.25	0.17
Bush Lot	Corriverton	35.2	5	8	3	5.3	2,460	31.61	0.17
Abary Bridge	Rosignol	36.8	4	4	8	5.3	3,190	42.85	0.12
Mahaica Bridge	Abary Bridge	28	3	4	3	3.3	2,380	24.32	0.14
TOTALS			89	109	96	98.0		654.23	0.15

Results Accidents Data

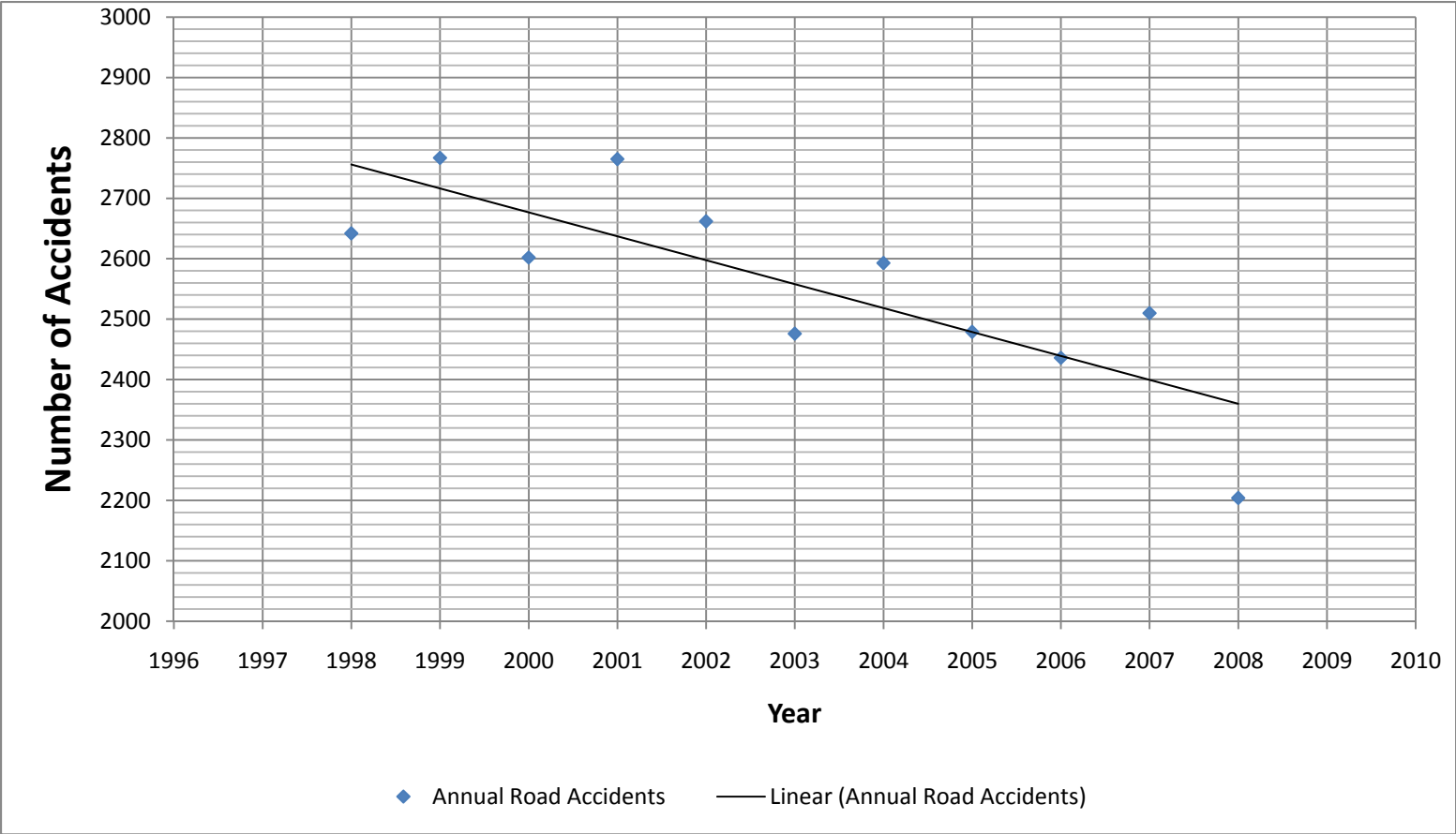
Corridors		Annual Fatalities					ADT	Kilometer Traveled Annually (million)	Fatalities per Million Km Traveled
From	To	Length (km)	2005	2006	2007	Avg. 2005 - 2007			
Georgetown	Buxton	17.6	27	11	27	21.7	13,493	86.68	0.25
Georgetown	Timehri	39.2	32	30	31	31.0	15,678	224.32	0.14
Buxton	Mahaica Bridge	21.6	7	8	3	6.0	5,493	43.30	0.14
New Amsterdam	Bush Lot No.28	35.2	10	12	14	12.0	6,640	85.31	0.14
Den Amstel	Marias Lodge	35.2	14	15	15	14.7	10,257	131.78	0.11
Den Amstel	Larimakbra	32.8	18	9	9	12.0	5,206	62.33	0.19
Corriverton	Moleson Creek	17.6	1	2	5	2.7	4,693	30.15	0.09
Bush Lot	Corriverton	35.2	4	3	6	4.3	2,937	37.74	0.11
Abary Bridge	Rosignol	36.8	9	14	13	12.0	3,907	52.48	0.23
Mahaica Bridge	Abary Bridge	28	3	2	2	2.3	2,703	27.62	0.08
TOTALS			125	106	125	118.7		781.71	0.15

Outcomes

Corridors		Length (km)	% Reduction (Results /Baseline)
From	To		
Georgetown	Buxton	17.6	-9
Georgetown	Timehri	39.2	-22
Buxton	Mahaica Bridge	21.6	40
New Amsterdam	Bush Lot No.28	35.2	21
Den Amstel	Marias Lodge	35.2	-12
Den Amstel	Larimakbra	32.8	-4
Corriverton	Moleson Creek	17.6	48
Bush Lot	Corriverton	35.2	32
Abary Bridge	Rosignol	36.8	-84
Mahaica Bridge	Abary Bridge	28	38
		299.2	-1

* Negative values indicate an increase over the baseline.

Accident Trend in Guyana Roads between 1998 and 2008



Fatalities on Guyana Roads between 2001 and 2010

