The Government of St. Lucia
Ministry of Economic Development, Transport and Civil Aviation
Department of Economic Development, Transport and Civil Aviation

"Destruction of Piaye Bridge following passage of Christmas Eve Trough, December 2013"

Consulting Services For Detailed Designs For The Construction Of The Piaye Bridge

Disaster Vulnerability Reduction Project (DVRP)

ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT

LCC Group Incorporated
Construction, Project Management & Engineering Services

March 2020

ABBREVIATIONS & ACRONYMS

CARPHA	---	Caribbean Public Health Authority
CCO	---	Choiseul Constituency Office
CLDRC	---	Choiseul Local Disaster Response Committee
DCA	---	Development Control Authority
DECDTC		Department of Economic Development, Transport and Civil Aviation
DIPE		Department of Infrastructure, Ports, and Energy
DRC	---	Disaster Response Committee
DSD	---	Department of Sustainable Development
DVRP	---	Disaster Vulnerability Reduction Project
EA	---	Environmental Assessment
ESIA	---	Environmental and Social Impact Assessment
ESMP	---	Environmental and Social Management Plan
GOSL	---	Government of Saint Lucia
IDA	---	International Development Association
LLDRC	---	Laborie Local Disaster Response Committee
LD	---	Labour Department
LUCELEC	---	Saint Lucia Electricity Services Limited
LRTP	---	Land Registry and Titling Project
MAFPPNRC	---	Ministry of Agriculture, Fisheries, Physical Planning, Natural resources and Cooperatives
MIPEL	---	Ministry of Infrastructure, Ports, Energy, and Labour
MHW	---	Ministry of Health and Wellness
MIPST	---	Ministry of Infrastructure, Port Services, and Transport
OP	---	Operational Policies
PAP	---	Project Affected Persons
PCU	---	Project Coordinating Unit
PPS	---	Physical Planning Section
RAP	---	Resettlement Action Plan
SCF		Strategic Climate Fund
SIDS		Small Island Developing States
SLSWMA	---	Saint Lucia Solid Waste Management Authority
TORs	---	Terms of Reference
WASCO	---	Water and Sewerage Company Inc
WB	---	World Bank
WRMA	---	Water Resource Management Unit/ Water Management Authority

Table of Contents

LIST OF TABLES

LIST OF FIGURES

1.0 INTRODUCTION

The island of Saint Lucia is a small developing state (SID) vulnerable to the effects of climate change and the impacts from natural hazards. The country is particularly vulnerable to tropical storms and hurricane, and resultant flooding that often result in significant and recurrent damages to national infrastructure including the road/transportation networks. In December 2013 Saint Lucia experienced an unusual weather related storm, dubbed the Christmas Eve Trough, that resulted in the extensive damage to the parts of the island's road infrastructure including the low lying Paiye Bridge which forms a key part of the main road connection that facilitates the economic and social linkage within Choiseul region along the south western coast between Soufriere, Choiseul and Laborie and the town of Vieux Fort.

The Department of Economic Development, Transport and Civil Aviation under the World Bank funded Disaster Vulnerability Reduction Project (DVRP) is seeking to have detailed designs and associated technical information prepared for the reconstruction of the Piaye Bridge as a climate resilient critical infrastructural link. Building back better will be a key guiding principle.

The World Bank, being known for providing governments with project financing is also keen on protecting the environment and people from potential impacts of projects that they fund. As such they have operated with Safeguard Policies, a mechanism which is used for addressing environmental and social issues in project design, implementation and operation, and providing a framework for consultation with communities and for public disclosure However, on 1st October, 2018, the World Bank launched the Environmental and Social Framework which enables the World Bank and Borrowers to better manage environmental and social risks of projects and to improve development outcomes.

The Environmental and Social Framework sets out the World Bank's commitment to sustainable development, through a Bank Policy and a set of Environmental and Social Standards that are designed to support Borrowers' projects, with the aim of ending extreme poverty and promoting shared prosperity. It also offers broad and systematic coverage of environmental and social risks. It makes important advances in areas such as transparency, non-discrimination, public participation, and accountability - including expanded roles for grievance mechanisms. It brings the World Bank's environmental and social protections into closer harmony with those of other development institutions.

This Framework is supported by ten (10) Environmental and Social Standards which are as follows:

- **Environmental and Social Standard 1 :** Assessment and Management of Environmental and Social Risks and Impacts;
- **Environmental and Social Standard 2 :** Labour and Working Conditions;
- **Environmental and Social Standard 3 :** Resource Efficiency and Pollution Prevention and Management;
- **Environmental and Social Standard 4 :** Community Health and Safety;
- **Environmental and Social Standard 5 :** Land Acquisition, Restrictions on Land Use and Involuntary Resettlement;
- **Environmental and Social Standard 6 :** Biodiversity Conservation and Sustainable Management of Living Natural Resources;
- **Environmental and Social Standard 7 :** Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities;

- **Environmental and Social Standard 8 :** Cultural Heritage;
- **Environmental and Social Standard 9 :** Financial Intermediaries;
- **Environmental and Social Standard 10 :** Stakeholder Engagement and Information Disclosure.

The Environmental and Social Standards are designed to help Borrowers to manage the risks and impacts of a project, and improve their environmental and social performance, through a risk and outcomes based approach.

This **focused Environmental and Social Impact Assessment** (ESIA) is an input into the design process that will lead to the production of final designs and technical information necessary for the bidding of the civil works for the reconstruction of the Piaye Bridge. This ESIA is conducted within the guidelines outlined within the Disaster Vulnerability Reduction Project (DVRP) Environmental Assessment and Environmental Management Framework, and the Social Assessment and Resettlement Policy Framework. This study forms part of the deliverables outlined in the Terms of Reference and Scope of Works provided under the project and presented in Appendix 1 for reference.

This study must be **read in conjunction with all other pertinent studies** that form the final design deliverable such as the topographic surveys, hydrological analysis and hydraulic assessments, geotechnical investigation, and structural analysis and design studies.

An Environmental and Social Management Plan (ESMP) is provided with the final design report to guide the implementation and civil works contractor's efforts. The ESMP attempts to address potential impacts that may have been outlined in the DVRP Environmental Assessment and Environmental Management Framework and Social Assessment and Resettlement Policy Frameworks as well.

1.2 Background

Saint Lucia, like many other Caribbean and small island developing states (SIDS), is particularly vulnerable to the effects/impacts of natural hazards and extreme climate events such as tropical storms, hurricanes, earthquakes, floods, landslides and increasingly intense heavy rainfall. These hazards often result in significant and recurrent damages to national infrastructure including the road/transportation network. Over the past several years, such disasters have not only severely impacted the physical environment, but have also had serious negative impacts on the country's economy and its efforts to achieving sustainable social and economic development.

The Government of Saint Lucia (GOSL) in partnership with the World Bank (WB) has embarked on a Disaster Vulnerability Reduction Project (DVRP) to reduce the island's vulnerability to natural hazards and the adverse impacts of climate change (disasters) in Saint Lucia and to build resilience to adapt to such impacts. Funding has been obtained from the International Development Association (IDA) and the Strategic Climate Fund (SCF) towards the cost of the Disaster Vulnerability Reduction Project. The DVRP is the investment plan consisting of a comprehensive package of infrastructural projects and technical assistance activities designed to strengthen Saint Lucia's resilience to climate related impacts, including reconstruction of critical bridges.

The destruction of the original Piaye Bridge in western Laborie as a result of the 2013 Christmas Eve Trough disrupted the flow of traffic to the south western quadrant of the Island between Soufriere, Choiseul, Laborie, and the town of Vieux Fort. The damage to the Piaye Bridge hampered the efforts of emergency responders to access and service the disaster affected areas. Following this occurrence, and to alleviate the

access problem, a temporary Bailey bridge was erected by the Ministry of Infrastructure in January 2014 to reconnect the south western communities. However, this bridge, which has remained in use as a key link since the Trough, is limited to single lane traffic and by reason of its low lying position, is vulnerable to flooding caused by intense rainfall events.

The Department of Economic Development, Transport and Civil Aviation is the implementing agency of the World Bank funded Disaster Vulnerability Reduction Project (DVRP) and the Department of Infrastructure, Energy and Ports (DIPE) is the technical implementation agency responsible for managing the civil works activities of the project. Under the DVRP, Component 1 – Risk Reduction and Adaption Measures, includes the reconstruction and retrofitting of public infrastructure. This would include the Piaye Bridge. The Department of Economic Development, Transport and Civil Aviation is seeking to have detailed designs and associated technical information prepared under qualified consultancy for the construction of the Piaye Bridge.

The resultant designs must consider the provision of two lanes of traffic, and be a climate resilient structure that can withstand weather related phenomena and the effects of climate change. The designs must also include the construction of a bypass route to facilitate uninterrupted traffic flow during the construction phase. Building back better will be a key guiding principle. This project is encapsulated by the request for **Consulting Services for Detailed Designs of The Construction of the Piaye Bridge Located along the South Western End of Saint Lucia**.

1.3 Objective of the Design Consultancy and the ESIA

The objective of the design consultancy is to prepare detailed designs and associated technical material for the reconstruction of the Piaye Bridge through appropriate studies which also consider the local climate and seismic conditions. These studies would include topographic surveys and mapping, environmental and social assessment, analysis and assessing hydrological conditions, drainage and geotechnical conditions. The proposed bridge design considerations should include the provision of two lane traffic, and the construction of a temporary bypass to facilitate continued access, as well as other ancillary construction activities that may be required to support / enhance the proposed bridge structure.

The ESIA is required, along with an ESMP to identify potential environmental and social impacts and to provide guidance on the mitigative measures that are to be implemented as a component of the Project. The ESIA process is to provide key information that feeds into the design process and assist with the selection of the most appropriate solution to minimize potential negative environmental and social impacts. The findings will also provide inputs to the ESMP. The ESMP will become a component of the contract specifications and will guide the compliance during the construction activities.

1.4 General Methodology

The methodology for this ESIA study was guided by the specifics within the Terms of Reference (TORs) for the **Consulting Services to Prepare the Designs for Consulting Services for Detailed Designs of The Construction of the Piaye Bridge Located along the South Western End of Saint Lucia** provided by the Department of Economic Development, Transport and Civil Aviation under the Disaster Vulnerability Reduction Project. The TORs are provided in Appendix 1 for reference.

In preparing this ESIA, the following activities were undertaken:

- Site visits to the project area as part of a scoping exercise to determine the existing baseline environmental and social conditions.
- A detailed scoping assessment of the bridge crossing site and surrounding area to undertake an inventory and assessment of the existing conditions. This also included a preliminary social survey of the residents or communities that may be impacted by the proposed works.
- Desktop research, literature review and studies. As part of the desktop research, a review was undertaken of available data and maps, available topographic and survey data.
- Meetings with key informants and stakeholders which included community residents, and drivers/ direct users of the bridge to present the project and to solicit responses that will be incorporated into the final ESIA and ESMP. This also included the client and the DVRP;
- Meeting with the affected communities in a public meeting forum to present the project and to solicit responses that will be incorporated into the final ESIA and ESMP;

Site investigations were conducted during the month of February 2020. A list of consultations to date with stakeholders are listed within Appendix 7 of this document.

The study was guided by the relevant World Bank safeguard policies, particularly operational policy requirements under OP 4.01 Environmental Assessment, and by the DVRP Safeguards instruments - Environmental Assessment, Environmental Management Framework, and the Social Assessment, and Resettlement Policy Framework, all of which set out the wider context within which the project was to be assessed and this ESIA undertaken.

2.0 REGULATORY FRAMEWORK

2.1 Regulatory Framework

The following provides a general overview of the agencies with some form of environmental management responsibility that may directly or indirectly affect the project along with their general responsibilities, and guiding legislation. They cover such areas as environmental, land use, water management, domestic, commercial, and hazardous waste management, historical and cultural patrimony, public health, and disaster response. The varied environmental management efforts have generally been fragmented and stymied in many cases by challenges in coordinated efforts, clear or absent empowering legislation or regulations, and financial and technical resources.

Table 1 below summarizes a number of pertinent agencies, their responsibilities, and enabling legislation that relates to this project and its activities directly or indirectly.

Agency	Responsibility	Legislation
Forestry and Fisheries Departments, Ministry of Agriculture, Fisheries, Physical Planning, Natural Resources and Co-operatives	This Ministry has wide ranging management responsibilities relating to the conservation and management. The Forestry Department is responsible for terrestrial ecosystems and resources, flora and fauna in particular legislated reserves on public or private lands such as forest reserve and water catchment areas, water abstraction, and public awareness. Extension and advisory sections are responsible for the dissemination of information and methodologies	Forest Soil and Water Conservation Ordinance 1946 (amended in 1957 and 1983) Sale of Produce Act no 4 of 1945 and amendment of 2001 Banana Plants Protocol of 1958 Fisheries Act 1984

	to farmers as well as undertaking crop damage evaluations. The Fisheries Department has similar responsible for the coastal marine environment and is heavily involved in education of fishers. They also have some responsibilities for some riverine environments.	Wildlife Protection Act 1964
Ministry of Infrastructure, Port Services, and Transport	This Ministry is primarily responsible for the provision and maintenance of major infrastructure (roads and drains) within the state. It also issues licences for the extraction of sand from beach areas. The Ministry is responsible for the provision and management of technical services in the areas of communications, meteorology, transport, electrical safety, roads, hydraulic and building infrastructure, and utilities. The Chief Engineer represents the Ministry on the Development Control Authority and the National Emergency Management Advisory Committee (NEMAC).	Motor Vehicle and road Traffic Act 2003 Beach Protection Ordinance 1963
Ministry of Health and in particular the Public Health / Environmental Health unit of that Ministry	Through its Environmental Health Department, it has the responsibility for reviewing plans, monitoring and enforcing public health and sanitation regulations and practices, and promoting public awareness on matters relating to public health and the environment. These include practices that affect health such as food preparation, sanitation, solid waste management, liquid and solid waste disposal, dust and air pollution, water quality, some occupational health and safety matters.	Public Health Act of 1975 and attendant Regulations to present. No. 10, 11, 12, 13, 14, 15, 16, 18, 20, 21, and 22 of 1978 : Public Health [Nuisances] Regulations. Public Health [Offensive Trades] Regulations: Public Health [Communicable and Notifiable Disease] Regulations: Public Health [Water Quality Control] Regulations: Public Health [Apartment Houses, Guest Houses and Hotels] Regulations: Public Health [Swimming Pools] Regulations: Public Health [Disposal of Offensive Matter] Regulations: Public Health [Sewage and Disposal of Sewage and Liquid Industrial Waste Works] Regulations
Saint Lucia Solid Waste Management Authority	A statutory authority with the responsibility for providing a coordinated and integrated systematic approach to collection, treatment, disposal, and recycling of wastes including hazardous wastes. The Authority is also	The St. Lucia Solid Waste Management Authority Act No 8 of 2004,

	responsible for the management of two sanitary disposal sites, one in the north at Deglos, and the other in the south in Vieux Fort. Vieux Fort has recently been decommissioned.	
Labour Department, Employers Occupational Health and Safety section of the Ministry of Infrastructure, Ports, Energy, and Labour.	This department is responsible for standards of occupational health and safety in places of employment and providing inspection of food handling premises.	The Employees (Occupational Health and Safety) Act No. 10 of 1985, Labour Code (Amendment) Act no 6 of 2011, and Amendments
Physical Planning Department and the Surveys and Mapping Department, Ministry for Agriculture, Fisheries, Physical Planning, Natural Resources and Co-operatives	This Ministry has responsibility through the functions of its various departments/ sections which impact directly on the management of the country's natural resources. The Physical Planning section is the technical arm of the Development Control Authority (DCA). The Physical Planning Ministry is also responsible for the implementation of the Saint Lucia Building Codes and guidelines which are supposed to provide guides for best construction practices. The Ministry also prepares the memorandum to Cabinet for acquisition and various matters. The Surveys and Mapping Department carries out the functions related to surveys, mapping, and lodging of these surveys. The Chief Surveyor is the authorized Officer with responsibility for surveying, valuation, and acquisition.	The Physical Planning and Development Act No 21of 2001 Land Acquisition Act No. 12 of 1945 Amended by Act no.11 of 2000
Development Control Authority	The Board of the Development Control Authority the power to review and decide on development proposals that are brought to it by its technical secretariat, the Physical Section of the Ministry of Physical Development. The relevant Act provides the legislated authority to make provision for the development of land, the assessment of the environmental impacts of development, the grant of permission to develop land and for other powers to regulate the use of land, and for related matters.	The Physical Planning and Development Act No 21 of 2001 (amended 2005) which superseded the 1971 Land Interim Development Control Act. Amendments to the 1971 Land Interim Development Control Act
Pesticides Control Board (in the Ministry of Agriculture)	Pesticides Control Board in the Ministry of Agriculture and is responsible for monitoring the importation and use of various chemical substances.	The Pesticides and Toxic Chemicals Control Act 1975
Saint Lucia National Trust	This statutory body has responsibility for the conservation and management of buildings and objects of historical and architectural value as well as areas of natural and scientific importance. The Trust is responsible for protecting and promoting the patrimony of the country. It manages the Pigeon Island National Landmark, the Praslin Protected Landscape, and the Maria island and Frigate Island Nature reserves.	National Trust Act 1975
Sustainable Development, Energy, Science and Technology Section, Ministry for Education, Innovation,	The Sustainable Development, Energy, Science and Technology is the government body responsible for the following-up of the international commitments signed by Saint Lucia related with environmental issues, including the	

Gender Relations and Sustainable Development	Climate Change Convention (UNFCC). The Sustainable Development, Energy, Science and Technology Section oversees all matters relating to sustainable development within the country and ensure that the various protocols are adhered to. It spearheads the National Environmental Policy (NEP), National environmental Management strategy (NEMS), the national Climate Change Committee (NCCC), and other initiatives related to biodiversity, marine and terrestrial pollution, energy efficiency, sustainable development and environment.	
The Caribbean Environmental Health Institute (CEHI), now called Caribbean Public Health Authority (CARPHA)	The Caribbean Environmental Health Institute, now called Caribbean Public Health Authority (CARPHA), is a regional CARICOM institution and a lead agency in matters related to water quality and water pollution control. It has been involved in testing for and quantifying various inputs into the coastal waters of the island and establishing monitoring and controls especially as part of water quality monitoring programmes. It collaborates with the Ministry of Health performing testing and analysis for that ministry as well as other ministries, agencies, and the private sector who may wish to employ its technical services. This organization is has a well-equipped laboratory to assist its functions. The Ministry of Health relies on the Caribbean Environmental Health Institute (CEHI) to perform many of its analytical functions. CEHI also provides technical assistance and support to water resource management initiatives.	
The National Emergency Management Office (NEMO)	The role of the National Emergency Management Organization [NEMO] is to develop, test and implement adequate measures to protect the population of Saint Lucia from the physical, social, environmental and economic effects of both natural and man- made disasters from Hurricanes, to landslides, to oil spills and fires. Its responsibility is to ensure the efficient functioning of preparedness, prevention, mitigation and response actions. NEMO is responsible for preparing and managing the National Emergency Management Plan. NEMO is the chair of the National emergency Management Advisory Committee which convenes whenever there is a national emergency.	Disaster Management Act No. 30 of 2006 Emergency Powers (Disasters) Act No. 5 of 1995
Saint Lucia National Trust	The Trust is a statutory body established in 1975 and is charged with protecting and promoting natural and cultural heritage and manages sites such as the historical Pigeon Island National Landmark and the Maria Islands Nature Reserve. The Trust has developed the System Plan for Saint Lucia, and is also trying to document and preserve the Architectural Heritage of Saint	The St. Lucia National Trust Act of 1975

	Lucia. While the Trust is a referral agency for the DCA, and also in the vocal manner in which it voices its opinion on matters where it believes the matter of national heritage or preservation has threatened.	
The Archaeological and Historical Society	The Archaeological and Historical Society is an NGO founded in 1954. It is custodian of many of Saint Lucia's archaeological and historical collections and is supposed to serve as a "Preserver of Records". The area of preservation of historical buildings and sites has remained a grey one between the Society and the Trust, and this has caused some conflict at times. The Society also promotes itself as the custodian of underwater archaeological sites as well.	
Water and Sewerage Company Incorporated (WASCO)	WASCO is responsible for the provision of potable water to the country, provision and management of potable water infrastructure, along with sewerage management / waste water services. The company is responsible for the management of the John Compton Dam and a number of intakes around the country. The tariffs set by WASCO are regulated by the NURC. Institutionally, WASCO falls under the Ministry of Agriculture, Fisheries, Physical Planning, Natural Resources and Co-operatives	Water and Sewage Act 2005 with amendment in 2008
National Utilities Regulatory Commission (NURC)	The National Utilities Regulatory Commission (NURC) is a multi-sector independent regulator which succeeded the National Water and Sewerage Commission (NWSC), and is established to regulate utility supply services including, water, sewerage and electricity in Saint Lucia. The primary functions of the NURC are to: regulate the provision of utility services, protect the rights of utility customers and establish, approve, monitor and review rates. WASCO and LUCELEC tariffs are regulated by the NURC	National Utilities Regulatory Commission Act No. 3 of 2016
The Saint Lucia Fire and Emergency Services	Responsible for emergency response during any accident or disaster including chemical spills. Specify fire, and emergency prevention recommendations and measures for residential, commercial, and industrial facilities, as well as mass events. Undertake scheduled inspections of all facilities to ensure compliance with recommended safety measures.	International Fire Prevention and Safety codes.
The St. Lucia Bureau of Standards.	Ensures that national standards are adhered to, and also verifies and calibrates measuring devices. This also applies to building material and relevant operational standards.	The Metrology Act No 17 of 2000 and the Standards Act No 14 of 1990

Table 1 - Agencies with Environmental Management and Related Responsibilities

2.2 World Bank Safeguard Policies

The World Bank funded projects and activities are governed by Operational Policies (OP), which are designed to ensure that the projects are economically, financially, socially and environmentally sound.[1] The Bank has specific safeguard policies, which include Environmental Assessments and policies designed to prevent unintended adverse effects on third parties and the environment. These specific safeguard policies address natural habitats, pest management, cultural property, involuntary resettlement, indigenous peoples, safety of dams, projects on international waterways and projects in disputed areas[2].

The World Bank's environmental assessment policy and recommended processing are used to identify, avoid, and mitigate the potential negative environmental impacts associated with projects and operations funded by the Bank. The environmental policies are described in the Bank's **Operational Policy (OP)/Bank Procedure (BP) 4.01: Environmental Assessment**. This policy is considered to be the umbrella policy for the Bank's environmental 'safeguard policies' which among others include: Natural Habitats (OP 4.04), Forests (OP 4.36), Pest Management (OP 4.09), Physical Cultural Resources (OP 4.11), Involuntary Resettlement (4.12), and Safety of Dams (OP 4.37).

Under OP4.01 the Bank undertakes **environmental screening** of proposed project to determine the appropriate extent and type of EA required. Proposed projects are classified into one of four categories, depending on the type, location, sensitivity, and scale of the project and the nature and magnitude of its potential environmental impacts:

- ***Category A*:** A proposed project is classified as Category A if it is likely to have significant adverse environmental impacts that are sensitive, diverse, or unprecedented. These impacts may affect an area broader than the sites or facilities subject to physical works. EA for a Category A project examines the project's potential negative and positive environmental impacts, compares them with those of feasible alternatives (including the "without project" situation), and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance. For a Category A project, the borrower is responsible for preparing a report, normally an EIA (or a suitably comprehensive regional or sectoral EA) that includes, as necessary, elements of the other instruments referred to above.
- ***Category B*:** A proposed project is classified as Category B if its potential adverse environmental impacts on human populations or environmentally important areas--including wetlands, forests, grasslands, and other natural habitats--are less adverse than those of Category A projects. These impacts are site-specific; few if any of them are irreversible; and in most cases mitigatory measures can be designed more readily than for Category A projects. The scope of EA for a Category B project may vary from project to project, but it is narrower than that of Category A EA. Like Category A EA, it examines the project's potential negative and positive environmental impacts and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance. The findings and results of Category B EA are described in the project documentation (Project Appraisal Document and Project Information Document).
- ***Category C*:** A proposed project is classified as Category C if it is likely to have minimal or no adverse environmental impacts. Beyond screening, no further EA action is required for a Category C project.

[1] Source: http://www.worldbank.org/opmanual

[2]Source:http://web.worldbank.org/WBSITE/EXTERNAL/PROJECTS/EXTPOLICIES/EXTSAFEPOL/0,,contentMDK:20507440~pagePK:64168427~piPK:64168435~theSitePK:584435,00.html

- ***Category FI*: A** proposed project is classified as Category FI if it involves investment of Bank funds through a financial intermediary, in subprojects that may result in adverse environmental impacts.[3]

The World Bank Safeguard Policy OP 4.01 for Environmental Assessment (EA) is triggered, based on the category of project.

A review of the Piaye Bridge crossing, its wider environment, and the options being considered for its rehabilitation suggest that while there would be environmental impacts, these would not be significant and could be managed with the implementation of the appropriate mitigative management and monitoring measures. As a result, **this Piaye Bridge construction project may be classified as a Category B project**. This is consistent with the guidelines in the environmental and social impact assessment (ESIA) in accordance with the Environmental Assessment / Environmental Management Framework (March 2016).

Based on the environmental and social assessment scoping conducted, this project will not involve impacts on any indigenous peoples (SGP OP 4.10), or the relocation of persons, but will involve farmers and land owners and the proposed project activities may lead to the acquisition of lands if determined by the design and the DIPE for construction and maintenance purposes. The policy on involuntary resettlement (SGP OP 4.12) will apply. It must be noted here that the term "resettlement " would refer to the disturbance to the PAP's normal day to day activities, and in this case that would refer to the daily farming activities. The DVRP's Resettlement Framework will also provide guidance for the project interactions with the affected persons.

The World Bank Safeguard Policies deemed pertinent to this pertaining to natural habitats, forests, involuntary resettlement are highlighted below for reference [4] [5]:

- The Banks's Policy on Natural Habitats (Operational Policy 4.04) on seeks to ensure that World Bank-supported infrastructure and other development projects take into account the conservation of biodiversity, as well as the numerous environmental services and products which natural habitats provide to human society. The policy strictly limits the circumstances under which any Bank-supported project can damage natural habitats (land and water areas where most of the native plant and animal species are still present). This policy was triggered as a precaution to ensure that any affected natural habitats are adequately protected.
- The Bank's Forests Policy (Operational Policy 4.36) aims to reduce deforestation, enhance the environmental contribution of forested areas, promote afforestation, reduce poverty, and encourage economic development. The objective of this policy is to assist borrowers to harness the potential of forests to reduce poverty in a sustainable manner, integrate forests effectively into sustainable economic development, and protect the vital local and global environmental services and values of forests. Where forest restoration and plantation development are necessary to meet these objectives, the Bank assists borrowers with forest restoration activities that maintain or enhance biodiversity and ecosystem functionality. The Bank also assists borrowers with the establishment and sustainable management of environmentally appropriate, socially beneficial, and economically viable forest plantations to help meet growing demands for forest goods and services. This policy

[3]Source:http://web.worldbank.org/WBSITE/EXTERNAL/PROJECTS/EXTPOLICIES/EXTOPMANUAL/0,,contentMDK:20064724~menuPK:64701637~pagePK:64709096~piPK:64709108~theSitePK:502184,00.html

[4] Source: http://web.worldbank.org/WBSITE/EXTERNAL/PROJECTS/EXTPOLICIES/EXTSAFEPOL/0,,contentMDK:20543943~menuPK:1286597~pagePK:64168445~piPK:64168309~theSitePK:584435,00.html

[5] Source: https://policies.worldbank.org/sites/ppf3/PPFDocuments/090224b0822f89db.pdf

applies to the projects that have or may have impacts on the health and quality of forests, projects that affect the rights and welfare of people and their level of dependence upon or interaction with forests, and projects that aim to bring about changes in the management, protection, or utilization of natural forests.

- The Banks' Involuntary Resettlement Policy (Operational Policy 4.12) considers the direct economic and social impacts that result from a Bank funded project, and is aimed at the overall objectives of avoiding or minimizing involuntary resettlement and its impacts on affected persons. It encourages inclusion of affected persons within the project process and assisting displaced persons assisted in their efforts to improve their livelihoods and standards of living or at least to restore them, in real terms, to pre-displacement levels or to levels prevailing prior to the beginning of project implementation, whichever is higher. This policy covers direct economic and social impacts that both result from Bank-assisted investment projects, and are caused by (a) the involuntary taking of land resulting in (i) relocation or loss of shelter; (ii) loss of assets or access to assets; or (iii) loss of income sources or means of livelihood, whether or not the affected persons must move to another location; (b) the involuntary restriction of access to legally designated parks and protected areas resulting in adverse impacts on the livelihoods of the displaced persons. The policy outlines the measures to be implemented by the borrowing agency which includes the preparation of a resettlement plan or a resettlement policy framework that included measures to address the situations of the PAPs offering various forms of support to restore their livelihoods and also provided prompt and effective compensation at full replacement cost for losses of assets attributable directly to the project.

These policies are to ensure that adequate steps are taken within a project to ensure protection of the natural habitats as well as minimize impacts on the wider social environment and livelihoods of the project affected persons (PAPs). Identifying potential environmental and social issues early in the project process influences design works and provided the opportunity to address these potential issues in as adequate a manner as possible.

2.2 Statutory Permitting

With respect to the rehabilitation of the culvert and its attendant works, this types of civil project undertaken for disaster vulnerability reduction, the main agencies under consideration are the Development Control Authority (DCA) and the Ministry of Infrastructure The Physical Planning Department of the Ministry for Agriculture, Fisheries, Physical Planning, Natural Resources and Co-operatives is the department that provides planning approvals for development within the country and is the technical arm or executive secretariat of the Development Control Authority (DCA).

The Physical Planning and Development Act (No. 29, 2001) is the act that guides the Development Control Authority (DCA) and the Physical Planning Section. It is one of a number of pieces of legislation that tends to make provision for some form of environmental management and it is under Section 2(2), Section 2(3), Section 22, and in conjunction with the fourth schedule of this law that an EIA for certain activities. Within this piece of legislation lies the authority of the Planning Department to "… make provision for the development of land, the assessment of the environmental impacts of development, the grant of permission to develop land and for other powers to regulate the use of land, and for related matters."
The Department of Physical Planning is guided by this legislation and after soliciting an EIA based on the type of development, will circulate the report to a number of referral agencies which are made up of some of the other agencies and statutory bodies with some responsibility for environmental management and safeguard and who would have assisted in contributing to the Terms of Reference for the study. The study

will be reviewed for its adequacy and the agencies may make additional recommendations if necessary. The final decision on any proposed development application or an EIA is made by the Board of the Development Control Authority (DCA) who may approve the EIA with its recommendations and measures, along with the recommendations and measures of the referral agencies.

The Development Control Authority (DCA) is empowered under the Physical Planning and Development Act No 29 of 2001 to consider and grant approval for all development within the state (Interview DPPS-MPDH, Executive Secretary- DCA). The DCA is made up of a government appointed Board of various professional interest and main technical government offices which also includes the Chief Engineer of the Ministry of Infrastructure or his representative. The applications that are exempted from such consideration are listed in Schedule 3 of the said Act. This also includes "(d) repairs to roads bridges, and harbour installations, (e) repairs to services" (see Appendix 2). Environmental Impact Assessments are requested under Section 22 of the Act and the list of undertakings that require an Environmental Impact Assessment (EIA) as part of the consideration for approval are listed in Schedule 4 of the Act.
The DCA through the Planning Department has the responsibility to monitor approved developments, either singularly, or as part of a monitoring team, in order to evaluate the level of compliance by the developer with the approval granted and the attendant conditions.

The Ministry of Infrastructure has the responsibility for undertaking activities relating to the construction and management of major infrastructural works not only related to transportation, and in the event of disasters, these activities include road and bridge construction and rehabilitation. This ministry does not apply to the DCA for approval as they are of the opinion that all such works are exempted under the Planning Act's third Schedule.[6] DCA is of the opinion that the Ministry of Infrastructure should apply for consideration and approval of the various works such as bridges and roads in order to ensure they meet basic planning and environmental considerations, while the Ministry of Infrastructure does not believe that it has to do so. As such the Ministry of Infrastructure has continued to, as in the past, to undertake all major works as necessary, especially after a disaster in the manner that they consider appropriate. It has also been suggested that since the Chief Engineer sits on the DCA Board, he can so inform the Board of the various works as a matter of courtesy. While the Ministry of Infrastructure may ask for an EIA for works done by a consultant if it so desires, it does not request one for projects done in house within the Ministry. Overall, the DCA and the Ministry of Infrastructure must work closely together with the understanding that their mutual responsibilities lie in the welfare of the nation.

3.0 EXISTING CONDITIONS

The following presents a general view of the existing conditions at and around the Piaye site.

[6] In a 2013 Meeting with then Engineer Laurna Raoul who articulated the Ministry of Infrastructure's position on works that it had to undertake and their belief that there was no need to submit such projects to the DCA. This has been a sore point with some of DCA staff. The Deputy Permanent Secretary of the Ministry of Physical Development Mr. Lewis did indicate at the meeting of 27 June 2013 that this matter was going to be addressed in the near future at both the DCA Board and technical levels. The fact that the chief Engineer of the Ministry of Infrastructure sat on the DCA Board did not prevent the Ministry of Infrastructure from presenting their projects for approval. Hildreth Lewis indicate at the meeting of 27 June 2013 that this matter was going to be addressed in the near future at both the DCA Board and technical levels. The DCA staff felt that the fact that the chief Engineer of the Ministry of Infrastructure sits on the DCA Board does not prevent the Ministry of Infrastructure from presenting their projects for approval. Discussions at that time with DCA Executive Secretary Ms Agustin, and the Deputy Chief Planner Mr. Desir, and Mr. Louis confirmed similar sentiments. The status quo continues up to this date.

3.1 Location of Site

The Piaye Bridge crossing site is located in Piaye, Quarter of Laborie at a low point between the village of Laborie and the Piaye Community along the West Coast Highway from Laborie to Choiseul then on to Soufriere. The Piaye River descends from the Choiseul hinterland all the way from Mount Belvidere, Saltibus through high gorged deep channels and is joined by the Moreau River where it crosses under the Piaye Bridge on its way to the sea at Anse Du Piaye (Refer to Figure 1 below).

Figure 1 Location of Piaye Bridge

3.2 Access

Access to the bridge is along the main primary road network of the island either from Piaye or Sapphire along the Laborie to Soufriere West Coast Highroad via normal vehicular traffic. Access to the river below for any works is off the bridge along the banks via existing dirt track that travels directly from the main road to the sandy banks and water edge. This track is used primarily for sand mining activities, however, it is also used for recreational purposes by persons and as a source of non-potable water in times of drought. The clarity of the water makes it an ideal recreational attraction for persons attracting groups of persons to the area for picnic, bathing, etc.

3.3 Land Use

The site falls within a riverine system that is predominantly surrounded by dry secondary growth and a small subsistence agricultural plot of bananas along the north eastern bank. Going both north and south uphill from the bridge are residential Sapphire and the Piaye developments respectively.

3.4 Climate factors

Saint Lucia has two seasons; a dry season which starts from December and usually ends in May, and a wet season which is from June to November. It is during the wet season that St. Lucia is very vulnerable to hurricanes and other tropical storm occurrences as this is known as the hurricane season. It has been observed that some changes to what was considered clearly defined seasons have been occurring, and this has been attributed to factors of global climate change.

Annual rainfall in Saint Lucia ranges from 250" in the wet central mountainous interior to 60" in the dry coastal locations. This is largely due to the orographic effect as a result of the general topography of the island with a high central mountain range and lower coastal areas.

The island enjoys a relatively pleasant climate with temperatures averaging around 27°C, a maximum temperature is 32° C. with minimum temperature of about 22° C experienced in the mountainous interior during the cool months of November to January. While the island's relative humidity hardly varies, ranging in the high 70% year round, it is highest in the warmer parts of the year. The island is subject to the northeast Trade Winds with winds generally travelling from the east. It has been observed that stronger winds tend to occur during the drier season of the year.

It must be noted that while these conditions had remained relatively consistent, the advent of Global Climate Change is becoming more evident in the changing weather patterns experienced by the island. The project site at Piaye Choiseul will be subject to all of these conditions and the impacts of Climate Change. Climate change factors as they directly affect the project are discussed further in this document.

3.5 Temperature

The baseline temperatures in Saint Lucia are determined by the winds off the surrounding ocean. The mean temperatures vary between 25°C in December through March and 30°C between May to September. Maximum temperatures can reach 32.9°C in the warmer months and may also drop to 21.1°C in January and February; with the mountainous topography imparting a significant variation of 2°C to 5°C relative to the areas of low topography. Piaye, will experience such temperatures.

3.6 Topography

The Piaye Bridge lies within a valley over the Piaye River. The topography to the west and east indicated the nature of the steep sided hills and valleys and river gorges typical throughout the Choiseul region. Figure 2 below depicts the general topography around the site (see figure 2). The Piaye River travels from the higher western forested interior of Mount Belvidere, Choiseul where it is fed by a number of contributor streams. A detail topographic survey of the actual site and the surrounding lands is presently ongoing to

guide the required investigations and detailed design work for the bridge. This is to be presented within the Preliminary Design Report.

Figure 2 - Topographic map of site and surrounding lands

3.7 General Geology

St. Lucia is part of the wider Antillean Arc of islands that are geologically young, not more than 50 million years old and predominantly volcanic in origin. While the active tectonic processes appear to have ceased in the region, there is still some minor activity as evidenced by the dormant volcano in Soufriere with some near-surface hydrothermal hot spots.

St. Lucia is almost entirely volcanic with the oldest rocks, largely of rhyolite, andesite and various basalts, dating from the early 'Early Tertiary' period. The rock formations have been grouped into three wide island

classes – northern series (early Tertiary [Eocene]), central series (middle Tertiary [Miocene/Pliocene]), and southwestern series (Holocene [mid to late Pleistocene]) series[7].

The geology map of Saint Lucia which provides a general geological classification for the island identifies material comprising Belfond Pumice flows and tuffs, categorized as volcanic dacites under the late tertiary southern series as the material located within the bridge site (Refer to Figure 3 below). The site specific geotechnical investigations are presently ongoing to guide designs.

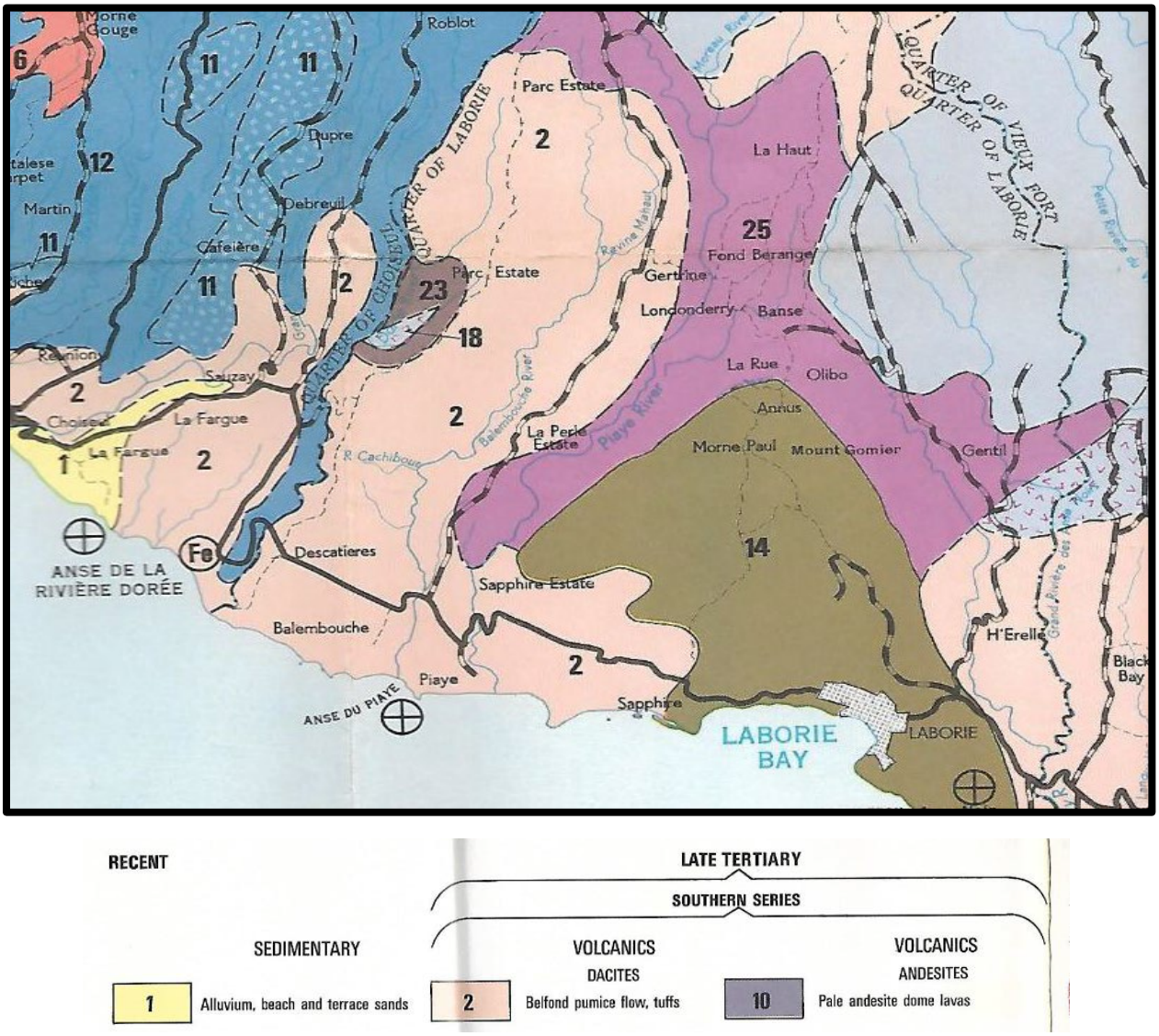


Figure 3 - Extract from the Geologic Map of Saint Lucia

[7] Organization of American States, Saint Lucia Development Atlas. Department of Regional Development, OAS General Secretariat, Washington D.C. USA. 1987

3.8 Hydrology

The Hydrological Analysis and Hydraulic Assessment are presently ongoing and will be a deliverable with the Preliminary Design Report. Data from such agencies as the Water Resource Management Unit/ Water Management Authority (WRMA) will be reflected in these reports.

3.9 Biodiversity

The site on either side of the bridge is surround by secondary vegetation (refer to Figure 4 below). There is a small area of banana cultivation to the east of the bridge. There were no significant or endemic flora or fauna discovered on and around the site during the investigation.

Figure 4 - Existing secondary growth surrounding bride site.

3.10 Existing Services

Infrastructural services exist within close proximity to the site within the surrounding environs. Evidence of electrical poles, water mains, and telecommunications subterrainian installations were observed. There is a 6” diameter ductile iron mains water line fed from Delcer through the Balca community that travels along the bridge to service Saphhire. This water supply line is managed by the Water and Sewerage Company Incorporated (WASCO).

Figure 5 - WASCO water service line along side of bridge

Electrical supply is evident va single and double phase overhead lines managed by the Saint Lucia Electricity Services Limited (LUCELEC). The two telecommunication companies that provide service to the area are LIME and Digicel. However, fibre optic cables were once laid underground in this area prior to the failure of the bridge during the passage of the Christmas Eve trough of 2013. They are presently temporily relocated as overhead lines. The new bridge design will cater for a dedicated utilities corridor where all ammentities will be housed.

3.11 Human Settlement Pattern

The three most affected communites by the Piaye bridge works would be Choiseul, Laborie, and Vieux Fort because of the traffic that traverses the bridge between these three communities on a daily basis. According to the Saint Lucia Population & Housing Census 2010 as seen below in Table 2, Laborie has an estimated household population of 6,701 persons, Choiseul to the west thas 6,098 persons, Soufriere to the north west is estimated as 8,472, and Vieux Fort region has 16,284 persons (Table 1B: Enumerated Household Population and Estimated Household Population by District). While the bridge is within Laborie District, its location places it closer to Choiseul.

The settlement patterns within the affected regions have tended to be clustered following the geographical lay of the land being located along the high ridges and plateaued areas while the main village and urban town being within the flatter coastal areas. As seen below in Table 3, the settlement clusters closest to the bridge site are the Sapphire Community to the north of the bridge with 26 persons within 30 private households, and the Piaye community to the south and west estimated to have 634 persons within 209 households.[8] (Table 16: Estimated Population by Constituency and Settlements). Residences closest to the bridge that may be most directly affected by the works are within Sapphire as material may be brought from Vieuxfort past their community and will aslo experience any noise from construction. Piaye, uphill of the bridge may experience minimal impacts.

[8] StLuciaPreliminaryCensusReport2010.
http://192.147.231.244:9090/stats/images/OtherPublications/StLuciaPreliminaryCensusReport2010.pdf

PRELIMINARY CENSUS 2010 RESULTS

Table 1B: Enumerated Household Population and Estimated Household Population by District

DISTRICTS	Enumerated Household Population 2010	Percent of Total Enumerated Household Population	Estimated Household Population 2010	Percent of Total Estimated Household Population
Total Castries	60,263	39.7%	65,656	39.6%
Castries City	3,661	2.4%	4,173	2.5%
Castries Suburban	16,134	10.6%	17,938	10.8%
Castries Rural	40,468	26.6%	43,545	26.3%
Anse La Raye	6,033	4.0%	6,247	3.8%
Canaries	1,915	1.3%	2,044	1.2%
Soufriere	7,747	5.1%	8,472	5.1%
Choiseul	5,766	3.8%	6,098	3.7%
Laborie	6,507	4.3%	6,701	4.0%
Vieux Fort	14,632	9.6%	16,284	9.8%
Micoud	14,480	9.5%	16,284	9.8%
Dennery	11,874	7.8%	12,599	7.6%
Gros Islet	22,647	14.9%	25,210	15.2%
TOTAL	**151,864**	**100**	**165,595**	**100**

Source: Saint Lucia Population & Housing Census 2010

Table 2 - Saint Lucia Population & Housing Census 2010 Data

LABORIE				
ANNUS - LABORIE	13	30	35	65
AUGIER - VIEUX-FORT	272	370	392	762
BALCA - LABORIE	75	115	106	221
BALEMBOUCHE - LABORIE	29	41	38	79
BANSE - LABORIE	87	145	117	262
BANSE LA GRACE - LABORIE	52	79	75	154
BLACK BAY - VIEUX-FORT	185	261	248	509
CATIN - VIEUX-FORT	70	77	122	199
DABAN - LABORIE	63	95	74	169
DERIERRE BOIS - VIEUX-FORT	37	54	46	100
FOND BERANGE - LABORIE	46	80	59	139
GAYABOIS - LABORIE	24	42	31	73
GENTIL - LABORIE	38	50	57	107
GETRINE - LABORIE	130	180	220	400
GIRAUD - LABORIE	25	36	37	73
GRACE - VIEUX-FORT	65	100	83	183
H'ERELLE - LABORIE	23	39	33	72
KENNEDY HIGHWAY - LABORIE	87	126	134	260
LA HAUT - LABORIE	72	117	113	230
LA PERLE - LABORIE	57	85	74	159
LABORIE	341	482	539	1,021
LONDONDERRY - LABORIE	81	139	116	255
MACDOMEL - LABORIE	20	25	33	58
MAGANIER - VIEUX-FORT	6	8	9	17
MORNE GOMIER - LABORIE	6	6	11	17
MORNE LE BLANC - LABORIE	8	8	11	19
MORNE PAUL - LABORIE	6	7	6	13
MORNE VERT - VIEUX-FORT	16	23	22	45
OLIBO - LABORIE	29	50	45	95
PARC ESTATE - LABORIE	29	54	45	99
PIAYE - LABORIE	209	323	311	634
POMME - VIEUX-FORT	89	125	106	231
SALTIBUS - LABORIE	160	226	243	469
SAPHIRE - LABORIE	30	40	36	76
TETE MORNE - LABORIE	26	49	58	107
VIEUX FORT/LABORIE HIGHWAY - VIEUX-FORT	30	53	48	101
VILLAGE - LABORIE	363	507	545	1,052
WARWICK/DABAN - LABORIE	1	3	1	4
OTHER	21	27	31	58
TOTAL	**2,925**	**4,277**	**4,310**	**8,587**

Table 3 – Estimated Population by Constituency and Settlements

3.12 Vulnerability to Geohazards

Saint Lucia is vulnerable to a number of natural hazards such as hurricanes, earthquakes, volcanic activity, drought, tsunamis, flooding, and landslides. The effects of these phenomena can be exacerbated by the activities of population such as deforestation, indiscriminate garbage disposal, poor building practices, and unplanned settlements in environmentally sensitive areas. With the increased frequency of more intense weather events as a result of climate change, the possibility for disasters to occur increases placing increased strain on the country's ability to respond to these events.

The island has also experienced two period of drought, in 2002, and again between 2009 and 2010, placing tremendous strain on the limited national water supply. It is critical that Saint Lucia increases its capacity to reduce its vulnerability to these geo hazards and in so doing reduce the loss to life and property.

In 2010 Hurricane Tomas, a category 3 event, impacted Saint Lucia creating a major disaster resulting in landslides, infrastructural damage, loss of property, and life. Several major landslides and debris flows occurred along major roadways and settlements, affecting critical national infrastructure having a negative impact on the national economy.

Seismic activity continues to be experienced by the island throughout the year with tremors of varying intensity. According to the University of the West Indies' Seismic Centre, Saint Lucia has an intermediate seismic hazard. The island lies in a transition zone where the rate of seismic activity is climbing. The island's seismic hazard is not as low as neighbouring Saint Vincent's to the south, but it is not as high as Martinique's to the north. There have been swarms of shallow earthquakes in Saint Lucia in the last 100 years. In December of 2018, the island was one of a number of islands in the region who experienced the effects of a magnitude 4 even along with a series of tremors during the following weeks. The impact of all potential geo hazards should be considered in all phases of this project from design to construction, operation, and maintenance.

4.0 NEW BRIDGE DESIGN AND CONSIDERATIONS

4.1 Existing Condition of Piaye Bridge Crossing

The Piaye bridge is located within a valley over the Piaye River and is part of the major infrastructural link btween the south western and southern communities of the island. It was originally placed in the 1970's and has been destroyed twice in the last 30 years, first by the passage of Tropical Storm Debbie in 1994, and recently by the 2013 December Christmas Eve Trough floods. During the passage of the Trough, the bridge, a sinle lane Bailey Bridge, was washed away and access was closed for fifteen (15) days. To relieve the situation and to provide access, a **temporary**, single lane Bailey bridge was installed which became operational on January 6, 2014. The bridge has since remained to date.

This Piaye Bailey Bridge is 24.38m long with a 4.2m road width and accommodates an average of approximately 4,437 vehicles per day according to the DIPE. This traffic data was recently obtained in the month of December, 2019 using automatic counters. The signle lane carriage way of this bridge tends to cause long and time consuming backups on either side especially when there is an accident on or near the bridge. Extreme courtesy and patience must be exercised during normal traffic flow to allow one or another vehicle to pass over the bridge in the event that vehicles arrive at both ends at the same time.

The underside of the present bridge is 3m above the river level. This lowlying nature of the bride make it extremely vulnerable to Climate Change events, blockage by debris from the uplands, and overtopping leading to more damage to the structure. According to DIPE, the bridge is at high risk from rainfall events of 25-year recurrence period or higher. Future weather related events included tropical storms can further cause deterioration to the infrastructure with a possibility of the loss of the bridge.

Figure 6 - Existing Bailey Bridge. Note angled approach of existing road for vehicles to enter the bridge (Looking southward)

Figure 7 - Existing Bailey Bridge. Note angled approach from north to enter the bridge.

4.2 Proposed Design Option

Three design options were considered for the bridge crossing. The bridge option proposed by the design engineers is a composite bridge and will be described below. This design is aimed at increasing resilience, hydraulic capacity and road safety for the motoring public and pedestrians alike. This will be further described below.

4.2.1 General Guidelines and Considerations.

The new design is to incorporate the following key considerations based on consultations with the design enginners.

- To be an additional 1 meter above the level of the exiting bridge to assit in reducing the vulnerability to flood damage from severe storm events. This will also facilitate better road alignment and access to and egress from the bridge.
- Be of a more durable and premanent structure than the present Bailey Bridge to accommodate any increase in traffic volume and weight in light of expansion of surrounding communities and economic development
- Be of 2 lanes to facilitate better traffic flow
- Provide a more stable and slip resistant motorable surface
- Provide safety for the motoring public and pedestrians
- Be a climate resliant structure to resist the various climatic change effects and geohards that he region is subjet to.
- Be guided by the principle of “building back better”.

With respect to the access road from the Sapphire side, there is consideration being given to grading off some of the lands along the northern main corner in order to facilitate a better alignment and approach to the wider and raised bridge structure.

4.2.2 Climate Change Consideration

Climate change as a result of global warming is a phenomenon affecting small island states (SIDS) like Saint Lucia and because of the small spatial area and sensitive environments, the impacts are very noticeable and the impacts significant. According to the 2017 United Nations Conference on Trade and Development (UNCD) report on Climate Change Impacts and Adaptation For Coastal Transport Infrastructure In Caribbean SIDS Saint Lucia Case Study, Saint Lucia is already experiencing some of the effects of climate variability and change through damages from severe weather systems and other extreme events, as well as subtler changes in temperatures and rainfall patterns. Detailed climate modelling projections for Saint Lucia predict:

- An increase in average atmospheric temperature;
- Reduced average annual rainfall;
- Increased Sea Surface Temperatures (SST);
- The potential for an increase in the intensity of tropical storms; and
- The accelerating rate of sea level rise.

According to the UNCD there is evidence to suggest that the climate of Saint Lucia is changing with climate trends reflecting the following:

- Minimum temperatures have increased at a rate of ~0.16 °C per decade, and maximum temperatures at ~0.20 °C per decade.
- The warming trend is expected to continue. The country is projected to be warmer by up to 1 °C by the 2020s, 2 °C by the 2050s and 3 °C by the 2080s.
- The frequency of very hot days and nights will increase, while very cool days and nights will decrease.
- There is no statistically significant trend in historical rainfall which shows considerable inter-annual variability.
- There is a likelihood that the country will be drier (in the mean) by the end of the century. GCMs show a median decrease of up to 22 % for annual rainfall while the RCM suggests a decrease of up to 32 % by the end of the century.
- The proportion of total rainfall that falls in heavy events also decreases in most GCM projections, changing by -26 % to +6 % by the 2090s.
- Climate change will likely shift the dry period earlier in the year and June-July drier.
- Hurricane intensity is likely to increase (as indicated by stronger peak winds and more rainfall) but not necessarily hurricane frequency.
- Caribbean Sea levels are projected to rise by up to 0.5 – 0.6 m by the end of 21st century.
- Sea surface temperatures in St. Lucia are projected to increase by 0.8 °C - 3.0 °C by 2080s.

Saint Lucia experienced the Christmas Eve Trough in December of 2013 after the devastating effects of Hurricane Tomas in 2020, both of which were unusual weather related storms and evidence of climate change factors. The Christmas Eve Trough resulted in extensive damage to both the Cannelles and Volet Culvert Crossings as already noted, separating the north and south of the island on the major East Coast Highway. The intense downpour of rain coupled with blockage by loose debris and soil from the river banks and uplands overwhelmed the design limits of the infrastructure The more recent Hurricane Maria and Irma and Dorian, Category 5 storms speak to the resulting intensity of storms and extensive damage and potential for damage to property and key infrastructure along with the loss of lives from Climate Change factors. The Trough resulted in 171.1 mm of rainfall being dumped within a 24 hour period.

The Piaye Bridge detailed design and the final construction must be cogniscent of these climate change related factors. This must apply throughout the whole life cycle of the project from design, construction, to full operation and routine maintenance procedures (UNCD, 2017, 42). The inclusion of means and methods to ensure aspects of climate resilience and the concept of building back better is fundamental for such an infrastructural project.

4.2.3 Bridge Crossing Design options

The designe engineers are considring three options as bridge crossings. The engineering details of these options will be discussed within the engineering report. The following is just a summary of the considerations. These were also highlighted at the community meeting on the 4th of March 2020.

Three **bridge options** considered are:

1. **Pre stressed concrete slab**

- Too much of a heavy structure
- Requires specialized equipment to prestrss the steel cable members of the slab
- Requires high concrete specifications and management
- High cost associated with construction and laying

2. **Post tensioned concrete slab**
- Too much of a heavy structure
- Requires specialized equipment to post tenstion the steel members of the slab.
- Requires high concrete specifications and management
- High cost associated with construction and placing

3. **Composite Bridge**
- Easier to construct
- No specialized equipment required
- Combination steel beams and concrete slab
- Lower cost associated with construction and placing.

The more favorable option chosen by the design engineers based on ease of construction and financial cost implications was the composite bridge of reinforced concrete and steel beams. This option was also considered acceptable by the community stakeholders at the community meeting.

4.2.4 Composite Bridge Design

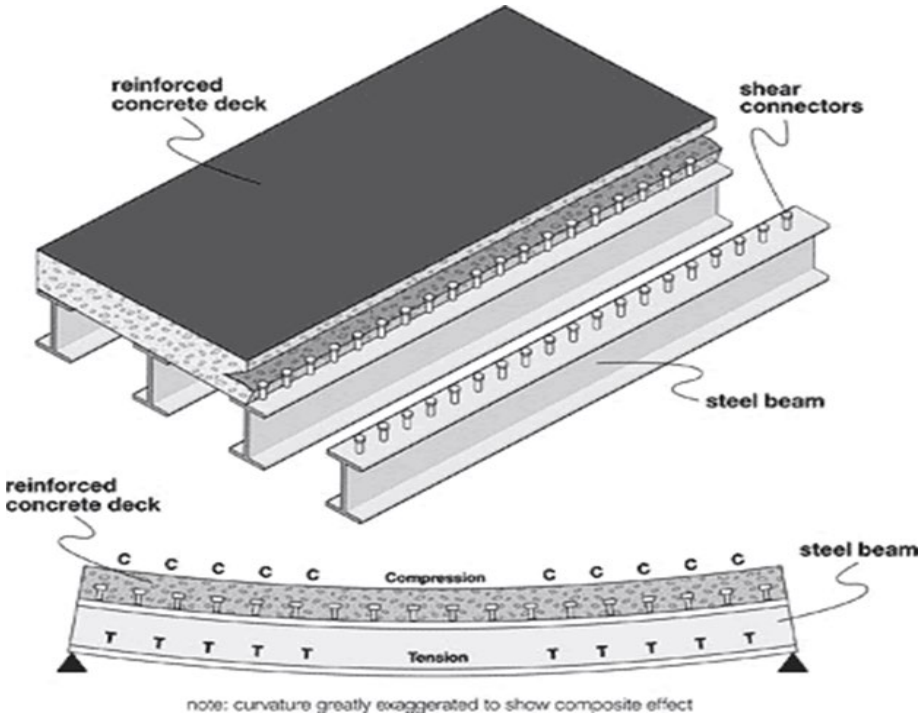
The proposed new bridge is to be **a single carriage way two lane composite single span bridge** design wich combines both reinforeced concrete and steel beams. The two lanes will allow for separate north and southbound traffic. The composite design is more durable from an engineering perspective, with the combination of steel beam longitudinal supports and a reinforced concrete deck with safety railings. The steel structure of the bridge will be fixed to the concrete structure of the deck using 'shear connectors' fixed to the steel beams and then embedded in the concrete so that the steel and concrete act together. This reduces any deflections and increases the strength of the structure.

This new structure will be supported on reinforced concrete abutments and the underside will be a minimum of 4 m above the existing river level. This incresed road level of an additional meter above what presently exists will allow for a greated cross section of the river capcity to one of 24m wide by 4 m high. This design is aimed at increasing resilience to climate change and storms, increasing the hydraulic capacity of the river with its incresed height, and providing improved road safety for the motoring public and pedestrians alike with its ancillary realignment of the approach roads and the provision of sidewalks and railings.

A simple diagramatic representation of a composite bridge is presented below in figure 8 for illustration purporses.

The increased height will also faciliate the easir passage of debris reducing the potential for blockage of the opening and evntual damage of the brige from water build up and pressure. It must be understood that as part of the wider works, the road way approaching and exiting the bride on either side of the river will be better aligned to allow a more direct approach to the intended bridge than what presently exists. This approach will also be riased by 1 m to allow for smother access and exit of the bridge. It is expected that this may involve some road widening and excavation works into existing slopes along the western side of the existing road accessing from the north down to the bridge. This will facilitate better sightline and maneuverability.

The pedestrian sidewalks to be placed with safety rails and the existing services will be placed within one of the sidewalks for security as well as ease of access by the service companies.



Source: http://www.steel-bridges.com/composite-beam-bridge.html

Figure 8 - Illusatration of a Composite Bridge

4.2.5 Diversion Route Options

The diversion route and structure are an important part of the bridge reconstruction process in that it must facilitate the smooth travelling of vehicles from one side of the river to the next with minimal disruption as feasible considering the situation. The design team considered three options which are summarized below and selected one as the most acceptable proposal. These were also highlighted at the community meeting on the 4th of March, 2020. More engineering details would be forthcoming in the engineering report.

Three diversion route options were presented with their pros and cons. These were:

1. Cutting and maintaining a route through the river
- Had previously been done
- Highly susceptibility to river flow
- High water level stops the movement of traffic
- Potential hazard to crossing motoring public

2. Placing containers within the river and placing a concrete slab over the top
- May be moved out of position by increased flow within river
- Requires time to place containers, formwork for slab, casting and curing of slab.

3. Utilizing a Bailey Bridge
- More secure
- High above water level

- Easy to place and remove
- Quick installation

The more favorable construction and cost wise option was the utilization of the Bailey Bridge which was also found to be acceptable by the community stakeholders.

4.3 Description of Proposed Piaye Bridge works

The expected duration of the construction of the new bridge is estimated as **12 months**. All construction activities are to be carefully supervised by engineering professionals to ensure the proper construction and functioning of the proposed bridge.

The works associated with the proposed construction effort may be summarized as follows:

1. A mobilization site with site office, parking, and equipment will be established within the vicinity of the bridge site.

2. An alternative route and temporary bridge will be constructed approximately 15 meters to the east of the existing bridge along an existing bushed route and then over the river to reconnect and follow an existing unpaved access from the river back onto the highway. This will facilitate managed traffic flow reducing traffic interruptions.

3. The existing Baily bridge will be is to be dismantled and completely removed by a crane. The bridge members will be packed and transported to Vieux Fort via long haul trucks.

4. The road way approaching and exiting the bride on wither side of the river will be better aligned to allow a more direct approach to the intended bridge than what presently exists. This may involve some road widening and excavation works into existing slopes along the western side of the existing road accessing from the north down to the bridge.

5. The required reinforced members to accommodate the new bridge will be constructed.
6. The members of the new bridge will be brought in via long haul trucks and assembled, and placed with a crane on the reinforced accommodating members.

7. The height of the bridge is to be increased by another meter over what existed prior, creating a 4 meter rise above the present river water levels to accommodate increased capacity for flows during storm events. This rise would also accommodate the new alignment of the road presenting a higher and smoother approach to and exit off the bridge back onto the road in either direction.

8. All necessary traffic management and safety measures which include public notices, traffic signs, control of vehicular movement by signal staff will be implemented throughout the whole process.

5.0 ENVIRONMENTAL AND SOCIAL IMPACTS

The Piaye Bridge Reconstruction was one of the national projects reviewed under the revised DVRP Environmental Assessment and Environmental Management Framework and Social Assessment and

Resettlement Policy Framework. This project is guided by the prescriptions within these documents and the World Bank Operational Procedures OP 4.01 on Environmental Management. Under OP4.01 this project is classified as a category B project with site specific impacts that, if any, are reversible and mitigative measures can be applied reasonably easily to manage the project's negative and positive impacts. Specific measures may be recommended to prevent, minimize, mitigate, or compensate any adverse impacts and to improve environmental performance.

The bridge reconstruction, irrespective of the final design, is a civil works endeavour and its potential impacts through out its phases from construction to operation must be managed. The activities associated with the various phases will have a number of positive and negative impacts on the immediate and wider environment within the short to long term. Most of the impacts are expected during the construction phase.

The following Table 4 below of the potential impact matrix for the proposed Piaye Bridge works is extracted from the 2016 Table 3 **Impact Matrix of List of Projects initially provided by the PCU** in Section 4 of the 2016 Revised DVRP Environmental Assessment and Environmental Management Framework (pg 40) and offers an identification of the potential environmental impact issues. The assessment identified these issues as being of a moderate to low impact which could be sufficiently managed by an environmental management plan.

	Proposed Activity	Agency	Possibility of Environmental Impact	Environmental Impact Aspect, positive(+) or negative(-)	Level of Environmental Impacts
24	Rehabilitation of Piaye Bridge	MIPST	Yes	1. Potential poor construction management practices (-). 2. Air pollution from dust and fumes from vehicles / machinery (-). 3. Potential removal of natural vegetation and damage to natural habitat in forest areas (-). 4. Noise impact (-).	Moderate to low; environmental management plan sufficient

Source: Extracted from Table 3 ***Impact Matrix of List of Projects initially provided by the PCU*** *in Section 4 of the Revised 2016 Revised DVRP Environmental Assessment and Environmental Management Framework, pg 40.*

Table 4 - Potential Impact Matrix for Piaye Bridge Works

In regards to the potential social impacts, while there appears to be no initial proposal for acquisition, if such is to occur, it will be dealt with under the guidelines of the Social Assessment and Resettlement Policy Framework.

5.1 Environmental Impact Assessment

5.1.2 Environmental Impacts

The following impacts were determined as the potential environmental impacts based largely on the scoping exercise, research, the various consultations, and consideration of the bridge option being proposed. At this point the impacts are general. If any additional project specific impacts are determined after the review of the final bridge design by the DIPE, then these will be considered and appropriate mitigative measures

outlined. The impacts identified in Table 2 above extracted from the Environmental Assessment and Environmental Management Framework also refer. The potential negative environmental impacts may stem from poor construction management practices to a point, but appear manageable.

5.1.3 Loss of Vegetation Cover

The practice of **grubbing and deforesting or removal of vegetation** for exploratory and for construction works can mean the removal of deep rooted vegetation that assist with soil and slope stabilization, and in the case with Piaye, especially along the banks of the Piaye River. The removal of the roots and canopy cover that protects exposed soils, especially those of a more sandy nature as exist along the Piaye River, can lead to land slippage, erosion, and contribute to sedimentation of the river. The increased sedimentation can lead to the loss aquatic communities as well deposition and blockage of the river mouth downstream near the coastline. This has the potential to contribute to increased downstream flood potential. The natural vegetation also plays an important part in maintaining soil moisture content and overall health of the ecosystem along the river. The removal of the vegetative cover also has the potential to lead to the loss of habitat for an endemic flora and fauna as well as a loss of biodiversity who depend on the vegetation for food, shelter, and procreation. Particular care must be exercised to minimize any unnecessary removal of vegetation, particularly of mature trees along the river banks during works.

5.1.4 Loss of Arable Agricultural Lands

The proposed works, in particular the establishment of a bypass route that will run along the north eastern high bank of the river to cross to the other bank, will require the removal of a small plot of bananas that appear to be a subsistence farming effort. This loss of crop is on limited arable land but still represents a direct economic impact on the farmer's livelihoods and will be dealt with further in this report. The expected works is not expected to impact on any large tract of arable lands as the lands are largely sandy with some unconsolidated with secondary growth. There is no extensive agricultural activity practiced along the site.

5.1.5 Biodiversity/ Species Disturbance and Loss

The natural vegetation within lush river systems, particularly fruit trees serve as food sources, habitats for species rearing, and protection. The river itself would serve a similar function for any marine life within it at the site or further downstream and a source of drinking water for the terrestrial animals. During the site visit of the Piaye site and in consultation with residents there appeared to be no abundance of lush vegetation or presence of any particular special terrestrial of marina flora or fauna. The present vegetative cover was of secondary growth.

None the less, it must be noted that the generation of noise from any construction activities can disturb any existing fauna species, temporarily causing disorientation and temporary vacation of what has been a safe and accommodating habitat. This is particularly significant during the nesting and rearing periods of the year and care will need to be exercised in that respect. Similarly, any fumes from any machinery, or the burning of waste material on site will also be disruptive.

5.1.6 Poor Water Quality

There is the potential for the proposed works to negatively impact the existing water quality of the Piaye River through increased sedimentation generated during the excavation, demolition, and general construction works. Any loose or disturbed soil as a result of the construction activities if not appropriately managed may end up in the river and contribute to sedimentation and poor water quality. This would include works involved in site clearing, stripping and stockpiling of the topsoil/organic layer, demolition on the culvert, loose construction material, excavation, backfilling operations to modify to existing slopes and grades to accommodate access and work areas. Materials such as concrete with sand and cement being handled within close proximity and can leach directly into the river. The indiscriminate disposal of construction waste materials which would include cement bags, or other materials such as damaged formwork, can contribute to pollution of the waterway unless properly contained.

The indiscriminate and improperly managed use and disposal of oils, lubricants, or chemicals used in machinery or for any servicing and construction process can contribute to both soil and surface water pollution. During rainfall events chemicals can mix or be carried with runoff and create liquid wastes that impact the marine environment. The management of any wastewater, and in particular human wastes on site is very critical to ensuring a healthy working environment and reduce the risk of faecal contamination of the river. The possible lack of adequate toilet facilities within such an environment is always a concern. Consideration must be given to reducing impacts on the water quality within the river as Piaye residents and other visitors bathe within the river mouth at the coastline. Secondly, the aquatic ecosystem has to be considered as there are signs of thriving aquatic life namely, tilapia *(Oreochromis aureus)* and crayfish. *(Dendrobranchiata)*

Figure 9 - Tilapia (Oreochromis aureus)

Figure 10 - Crayfish. **(Dendrobranchiata)**

Appropriate measures such as monitoring and the implementation of silt traps within the river must be considered.

5.1.7 Increased Noise and Vibration Levels

Increased noise and vibration levels through construction activities such as the movement of heavy construction and supply trucks into and out of the site, and the operation of machinery such as excavators can have negative impacts on the existing terrestrial and marine environments, particularly within this generally quiet, low-lying area. In secluded or heavily vegetated river banks, fauna habitats can be disturbed causing creatures as birds and amphibians to flee their homes and nesting areas.

Similarly, increased noise levels from activities adjacent to or within the communities such as the movement of equipment or large trucks transporting materials, may be deemed as an unnecessary and unwanted nuisance affecting day to day activities. Associated vibrations from the use of heavy equipment such as rollers or excavators can negatively impact surrounding communities by causing nuisances through the shaking of households and household items, and possibly affecting the stability of these structures if they were not properly constructed. Similarly, for biological communities, mating seasons may be affected depending of the time of year that the project activities commence. In the case of Piaye, the location of the

proposed construction within a valley reduces the potential impacts on the residents above in Sapphire and Piaye communities.

It is anticipated that there will be some impact along the route but of a temporary nature, especially for the Sapphire residents. The residences above the site such as Sapphire and lesser so in Piaye may experience some noise impact during the construction process, but the intensity is dependent on the construction activity being undertaken and equipment being used at that time. Noise and vibration levels are expected to be period, temporary, and manageable. However, care must be taken in the judicious usage of any form of heavy noise and vibration generating equipment.

5.1.8 Poor Air Quality

Poor air quality can originate from a number of sources related to the project and can be a potential nuisance to the community and to motorists. While the Piaye project is occurring within a lowlying area, the potential does exist for impacts on the communities that construction vehicles pass through and especially for motorists and their passengers who will be directly affected by the project works.
The vehicles and machinery being utilized for the project can produce noxious fumes such as carbon monoxide, diesel fumes, as well as burnt oil fumes with hydrocarbon and other substances. There is also the increased potential for air pollution to emanate from the operation of older or improperly service vehicles and machinery as well. This can directly affect the health of onsite workers over the short to long term, as well as any adjacent community on a shorter term. The direction of the wind and where it would transport such fumes is also an important consideration.

Dust also arises from cleared land that has been exposed to the sun, is dried, and the wind carries this material to nearby residences as well as on adjacent farm crops. Similarly, uncovered fines such as sands or even cement can be light enough to be blown by the wind either when being transported or being stored on site. This can be a nuisance to the community and to motorists.
The mishandling of particularly noxious chemicals such as solvents or chemical washes, greases, that produce fumes or odours, as well as the burning of solid wastes on the construction site, especially chemical containers, can lead to air pollution and negative resultant health impacts especially for onsite workers.

5.1.9 Potential Worker/Occupational Health and Safety Related Impacts

Safety is a critical concern for all workers on this bridge or any other such project as well as that of motorists and the adjacent communities. Any mishandling of equipment, improper storage and usage of various chemicals and construction materials, high levels of continuous noise and fumes from generators, excavators, haul vehicles as examples, as well as inadequate safety equipment, poor workplace practices, can contribute to both short and long term adverse health effects. These effects of continued exposure to these situations can include various degrees of injury and also accidental death. Serious injury means down time for the workers and the project as it may have to cease operation depending on the severity of the situation. Operating machinery without the proper instruction, personal protective equipment, or safety signage is also a critical issue.

Improper food waste management will tend to increase the potential for vector infestation and possible transference of diseases. The management of wastewater, and in particular human wastes generated by the work force on site is very critical to ensure a healthy working environment and reduce the risk of faecal contamination. Possible contamination by human waste due to lack of adequate toilet facilities is always a concern and more so within the river which leads to its mouth where Piaye residents and visitors bathe.

There is also the risk associated with weather events such as rainfall which provides for wet and slippery conditions increasing the potential for falls as well as accidents with heavy equipment. Soils become saturated and loose contributing to the unsafe working environment. The adjacent river will naturally increase in volume during heavy rainfall or storm events providing for increased potential for loss of parts of the site, materials, and equipment. No work should be occurring during any adverse weather occurrences.

5.1.10 Traffic, Public and Community Safety Impacts

The existing highroad is a key link between Vieux Fort to Soufriere and the communities between accommodating approximately 4,437 vehicles a day according to the DIPE. This amount of vehicles could easily be increased to 5000 vehicles during the tourist season with various tours and increased tourist related traffic. There is always the possibility of **increased construction-related traffic** for such civil works as that involved with the bridge rehabilitation which occurs along a major highway. The potential for vehicular/vehicular and pedestrian/vehicular conflict increases as the scale of construction increases if proper traffic management procedures are not implemented. This can lead to very tempered negative response from the nearby residents, the community, and vehicle operators affected. The matter of safety also becomes a great concern in relation to the speed of the vehicles as well as the alertness of the drivers as they traverse the road and bridge into and out of the site. Combined with this may be **inadequate instruction of project vehicle drivers, lack of warning signs, and on ground manoeuvring directions** during the period of the project construction.

Lack of information within the community **through lack of adequate communication** by the contractor and project proponents on the specific or extra working times can mean the unpreparedness of residents who tend to walk the road at certain times, especially in the later evenings for the presence of construction traffic. This become particularly hazardous if there are children within the vicinity. This can also prove a major threat for motorist along the highway or through any diversion routes if there are **inadequate traffic management measures that include road signage, unbarricade areas, and lack of signal staff** along the roads. Appreciating the amount of traffic that this bridge as part of a main link road accommodates, such factors must be considered in the planning of the proposed bridge works. Road users would need to be vigilant.

Even after the workday, there is always the possibility for curious persons, including children, visiting the site which is also a deep river gorge, and being unsupervised. This increases the risk for personal injury for children as well as adults. All security measures must be put in place.

The **breakdown of a construction vehicle** causing the blockage of the public road before the site passing, possibly hindering access to and from the various communities, especially during the morning rush hour, can escalate tensions. This is especially so if such an event contributes to loss of travel time to work, school, or returning home for persons not only within the immediate Sapphire or Piaye areas, but those having to travel to Soufriere or Vieux Fort. This can also occur with **the spillage of large quantities of construction material**. Similarly, **blockage of any bypass route** would similarly impact road users and the communities. Associated with the movement of vehicles, there is always the additional impacts of dust, fumes, noise, and vibrations as highlighted above.

5.1.11 Impacts on Existing Service

As already indicated earlier, service infrastructure exists on or adjacent to the crossing site. These consist of electricity poles and lines managed by LUCELEC, water mains managed by WASCO, and communications cables managed by the local telecommunications companies of LIME and DIGICEL. There is always the possibility that any of these services can be damaged by construction activities or equipment during works. The impact of such occurrences is the loss of these services to the adjacent communities which results in a major inconvenience. This can contribute to a negative perception of the project for that period if repairs are not completed in a timely manner.

5.2 Post Construction and Operation

After construction, the functioning of the new bridge crossing within the wider national road infrastructural network is expected to have very minimal negative environmental impacts if any. This would be dependent on the prior implementation of the necessary mitigative measures, and proper design, and supervised construction. Routine inspection and maintenance by the Department of Infrastructure would be required to ensure continued proper functioning.

5.3 Social Impact Assessment

The social impact component of the study required meeting with key stakeholders who would be affected by the proposed Piaye Bridge works that would be expected to occur. These involved key stakeholders which included the general public, minibus drivers who ply their route over the bridge in both directions, disaster committee chairpersons, agricultural extension officer for the zone, social transformation officer, and technical staff of the DIPE. This also included the wider Piaye/ Choiseul and Laborie Community who reside in close proximity to the bridge. A description of the community has already been provided earlier in this study. A number of issues and recommendations were captured from these consultations and are reflected below. These were also communicated to the design engineering team.

5.3.1 General Objective

The general objective of this component of the study was to determine the potential social impact that the proposed bridge construction might have on key stake holders within the site area and to ensure that their perceptions, historical knowledge, concerns, and recommendations were captured.

5.3.2 Methodology

The methodology undertaken was direct meeting and interview/ consultation with the stakeholders to inform them of the project and ensure their responses were recorded.

For the community meeting, because of the scope of a wider audience, a communication plan was developed with the office of the Parliamentary Representative who spearheaded the communications with the wider community and facilitated the in-house meeting at the Piaye Community Center which was a central location for all community residents. The Department of Infrastructure, Ports, and Energy (DIPE) of the

Ministry of Infrastructure, Ports, Energy & Labour and the Project Coordinating Unit (PCU) of the Department of Economic Development, Transport and Civil Aviation.

The communication methodology involved the use of the local town crier, community web groups, and digital media, and mouth to mouth. The findings of the consultations are presented below with supporting information in the applicable Appendices.

5.3.3 General Consultation

As part of the social impact exercise a number of consultations were held with a number of institutional and non-institutional stakeholders to assist in determining the various social impacts of the proposed project. These included the representative of the Crown Lands, national emergency organization (NEMO) and local disaster representatives, as well as local persons (refer to Appendix 7). There was a degree of similarity between the views and information provided and theses are reflected below.

1. The width of the present bridge is too narrow and the single lane is unsatisfactory, especially in the event of an accident blocking the bridge for long periods of time from either side as has occurred. Two lanes should be provided instead of one.
2. Bridge needs to be taller or higher above the present water level. Present situation is too low and allow floor water to run over and to damage bridge. Water plus debris hits bridge. Higher means more water can flow underneath.
3. Place open railings that does not block the passage of water int eh event of waters rising as high as the bridge so the bridge will not wash away.
4. Restrict sand mining near foot of bridge to reduce potential for under-mining. Consider livelihoods of persons who sand mine. Perhaps controlled access and extraction should be allowed.
5. During construction place sediment control measures down river of the construction. Lots of sediment presently settles near mouth of the river.
6. Do proper study of the volume and flow of water during various periods' especially flooding/heavy rainfall and use that information to assist in designing bridge.
7. Consider river training methods.
8. Ensure construction activity and final bridge design does not comprise safety of Piaye community at the mouth of the river. This community is at risk during flooding
9. Storms have damaged the bridge twice with the structure having to be replaced, so serious consideration must be provided to effects of storms and climate change.
10. Ensure that any bypass placed during the construction of the bridge is high enough above the river and not affected by rains and rising water so that people can still travel over it.

These issues and recommendations were also consistent with other stakeholders such as the minibus drivers.

5.3.4 Consultation with the Minibus Drivers

During the social Impact assessment exercise one of the key stakeholders identified apart from the wider community, were the minibus drivers who ply their routes that traverse the bridge in both directions (see Appendix 7). These routes were 4E-Vieux Fort/Choiseul/ Soufriere; 4F-Vieux Fort/ Laborie/Choiseul, and

4D- Vieux Fort_ Saltibus. Each route was represented by the president of the minibus association after consultation with their members as follows: 4D- Mr.Peter Dillon Campbell; 4E- Mr.Alexis Holy Train Louisy; and 4D- Mr.Tony Monrose.

Figure 11 - Interviewing Minibus driver and minibus association president for Route 4D (Vieux Fort – Saltibus), Mr.Peter Dillon Campbell, 29th February, 2020

A standardized questionnaire was utilized to consult with the drivers to determine the potential impacts on the project and the composition of this instrument along with eh rationale behind the questions is presented below. A copy of the questionnaire is in Appendix 3 for reference.

	Questions	Rationale
1	Name	
2	Route no & route	To determine the spatial location/ extent of travel
3	Length of time operating route	To determine duration of plying route
4	Do you or your drivers' route cross the Piaye Bridge	To determine if they or their drivers traverse the bridge
5	How many times a day (approximately)	To determine frequency of crossing the bridge
6	Have you or your drivers every experienced any blockage of the bridge	To determine existence of any possible impediment to traffic flow
7	What was determined as the cause of blockage	To determine sources of blockage that prevent movement and loss of time
8	How long was the blockage	Determine duration of nuisance and hence loss of travel time
9	Are there any particular issues that you or your drivers have with the present bridge	To determine issues by direct users
10	Would you like to see a new bridge constructed as a means of addressing the issues with present bridge and if	To determine if new bridge is an accepted option and the recommended actions or measures based on

	"yes", what would you want to see reflected in the new design	perception of what can be improved over old bridge by direct user and guide design engineering team
11	What would you like to see implemented during any construction of the bridge to reduce any negative impact on commuters	To determine recommended actions or measures based on perception by direct user to guide ESMP and appropriate measures
12	What would you like to see done to the bridge after construction to ensure it remains for long term	To determine long term vision of the user for the bridge

Table 5 – Minibus Drivers questionnaire

5.3.4.1 Responses from the Minibus Drivers

The following were the responses from the drivers which were communicated to the design team as input to the design effort. Because of the similarity of responses and recommendations it appeared best not to duplicate, but to provide as single but collective entry for the respective questions in the table below.

	Question	Responses/ Recommendations
1	Name	4D- Mr.Tony Monrose; 4E- Mr.Alexis Holy Train Louisy; and. 4F- Mr.Peter Dillon Campbell;
2	Route no & route	4D- Vieux Fort_ Saltibus; 4E-Vieux Fort/Choiseul/ Soufriere; and 4F-Vieux Fort/ Laborie/Choiseul
3	Length of time operating route	4E- Mr.Alexis Holy Train Louisy= 20 yrs 4D- Mr.Tony Monrose = 15 yrs 4F- Mr.Peter Dillon Campbell= 15yrs
4	Do you or your drivers' route cross the Piaye Bridge	Yes they do
5	How many times a day (approximately)	4D- Vieux Fort_ Saltibus = 8 4E-Vieux Fort/Choiseul/ Soufriere= 12 4F-Vieux Fort/ Laborie/Choiseul=6
6	Have you or your drivers every experienced any blockage of the bridge	Yes
7	What was determined as the cause of blockage	Minor vehicular accidents- Police take hours to arrive
8	How long was the blockage for	1.5 to 2 hours
9	Are there any particular issues that you or your drivers have with the present bridge	• Too narrow- does not allow two vehicles to pass • Single lane- easily blocked and no passing space meaning very long wait for those trying to cross while others are crossing • No means or method for control for traffic flow- who comes first bullies through • Very slippery driving surface- surface very slippery when wet from rainfall and is dangerous to drive on as vehicles slip and slide.
10	Would you like to see a new bridge constructed as a means of addressing	• Yes • Make bridge wider

	the issues with present bridge and if "yes", what would you want to see reflected in the new design	• Make bridge two or more lanes wide • Put in pedestrian walkways on both sides so that people can walk across safely • Make bridge higher above the river to avoid damage from flooding and being washed away • Raise the road higher to meet any new height of bridge so that driving is easier • Straighten road approaching the bridge from the Sapphire side by cutting off the sharp upper corner that exists on the left turn. This is a dangerous blind spot and sometimes long vehicles have difficulty maneuvering that spot. • Construct the bridge out of concrete which is more durable and not subject to rusting • Construct a bridge that can maintain the weight of very heavy vehicles and the increased traffic that might come with future development • Construct a bridge that is climate change resilient • Place brightly painted safety protective rails • Place traffic signage to assist drivers • Put in gabion baskets or protective measures in the river to protect the footing of the new bridge • Have a river desilting program
11	What would you like to see implemented during any construction of the bridge to reduce any negative impact on commuters	• Place a bypass bridge high above the river water but close to present bridge location so that drivers can easily reconnects with the main road. • Have people to direct traffic • Place proper signs to alert drivers of the situation that are approaching • Place proper diversion and warning traffic signs • Work should be done in dry season • Work should be done during the day and not late evening when people are coming home • The construction workers and vehicles must follow all safety procedures • Inform the community when there is going to be work overtime or on holidays
12	What would you like to see done to the bridge after construction to ensure it remains for long term	• Maintain it. Have a proper routine maintenance program • Stop or control the sand mining activities to reduce any potential undermining of the new bridge.

Table 6 – Responses to questionnaire from minibus drivers

5.3.5 Community Meeting

A community meeting was held on Wednesday the 4th of March 2020 at the Piaye Community Centre to allow the wider community to be informed of the proposed works, present the bridge design to them, and solicit their responses. This is very important component of the Social assessment to ensure community input on what will directly affect them, and to have them freely provide their opinions and guidance in regards to what is proposed (Refer to Figure 12 below). The minutes of the meeting are presented in Appendix 4 for reference.

The main responses from the community on the overall proposed new bridge design and associated works are presented below.

5.3.5.1 Community Responses

The following are the main issues and recommendations raised by the attendees at the community meeting.

1. Providing a Bypass route directly through the river is unacceptable as wet conditions damages the disks of minivans and other vehicles

2. Consideration should be given to using the existing Baily bridge in same location as bypass route and shift it as necessary as the various sides of the bridge is completed

3. Only eastern side of the river is being desilted.

4. The bridge surface is very slippery when wet and poses a hazard to drivers as vehicles slide quite a bit

5. Bridge construction may begin in August, but this means that construction will be ongoing in rainy / hurricane season.
6. Local workers need to get priority for works

7. There is need for local economic opportunities for the Piaye are during construction

8. Aesthetic of bridge should reflect local historical character of the region i.e. African

9. Consider using the Daban road and improving its road surface as an alternative, though longer diversion route.

10. Consider using same Baily bridge in same location as bypass route and shift it as necessary as the various sides of the bridge is completed

Figure 12 - Community Meeting attendance on Wednesday 4th March, 2020 : Piaye Community Centre, Piaye

5.3.5.2 Responses to Community Issues Raised

The following were the responses provided by the design engineers and the DIPE to the matters raised by the community.

	Community Matters Raised	Responses from Design Team
1	Bypass route directly through river is unacceptable as wet conditions damages disks of minivan and other vehicles, and also any rainfall could prohibit any movement across the bypass	Understood and accepted
2	Consider using same Baily bridge in same location as bypass route and shift it as necessary as the various sides of the bridge is completed	This cannot happen as the bridge needs to be demobilized to accommodate realignment of the road and approaches. Another bailey bridge is already available in Vieux Fort at the DIPE and this will be used for the diversion route.
3	Consider using the Daban road and improving its road surface as an alternative, though longer diversion route	This is a secondary option as route is very long and will incur an increase in travel time that may not be acceptable to the community
4	Only eastern side of the river is being desilted	The Piaye River was being desilted by the Ministry of Infrastructure but at the mouth of the river where there

		is the sand bank to allow the river to flow naturally. The area of the river at the Piaye Bridge is self cleaning as it allows water to transport any debris present there. If the mouth is not unblocked then the water stagnates with a foul odor, and mosquito breeding can occur.
5	Bridge surface is very slippery when wet and poses a hazard to drivers as vehicles slide quite a bit	The new bridge surface should take care of that issue.
6	Bridge construction may begin in August, but this means that construction will be ongoing in rainy / hurricane season.	There are still aspects of the works that can be done during the rainy season but during the drier part of the beginning of the next year is when the major works will occur and finishings be completed. The weather will be monitored on a daily basis and work will be guided by actual and forecasted conditions. There will be no work during adverse conditions and all safety measures will be taken
7	Local workers need to get priority for works	This is expected and recommended
8	There is need for local economic opportunities for the Piaye are during construction	This is highly encouraged. Opportunities exist for food and refreshment canteens to serve workers. This is recommended.
9	Aesthetic of bridge should reflect local historical character of the region i.e. African	This will be taken into consideration and attempts made to reflect such character in final bridge design.

Table 7 – Questions and answers from community meeting

The value of the community who had firsthand knowledge, especially historical knowledge of the history and dynamics of the Piaye River, the placement, loss, and replacement of the Piaye Bridge, along with the various recommendations clearly highlighted the importance of the incorporation of local knowledge into the design process. The recommendations from the consultations are being provided to the design consultants whose efforts will be guided by them. These comments will also speak to the mitigative responses and the conditions within the ESMP that will guide the contractor's efforts.

As indicated above, during the site visit it was discovered that there was an area to the west or just downstream of the bridge where some banana plants were growing, probably as subsistence farming. This plot is within the area that is to be cleared and used to facilitate the bypass route and temporary bridge crossing back to the main road. Discussion were held with both the local agricultural officer and the social transformation officer and at that time there was difficulty in identifying and locating the farmer.

Post the community meeting, some residents were able to provide some basic information on the farmer and possible location. This was provided to the PCU staff to facilitate the required actions under World Bank procedures of identifying and fairly compensating the individual for lost crops prior to the commencement of any works. There are also private lands accessed from the lower northwestern section of the road approaching the bridge that has the potential to be a staging site for future works. This will be highlighted further in this report.

5.4 Perceived Social Impacts

The following may be considered the main social impacts of the project on the PAPs, community, and also on the client the DIPE.

Social Impacts

Affected Community

- Employment Opportunities
- Short term business opportunities and sales income
- Impact on Livelihoods
- General Community Impacts

DIPE & the Nation

- Increased Resiliency and Vulnerability Reduction of Infrastructure
- Improved Infrastructure
- Institutional and Community Construction Capacity Building

5.4.1 Affected Community

5.4.1.1 Employment and Income Opportunities

As the bride construction project unfolds with an anticipated 12-month construction period, employment opportunities are expected to become available to residents of the adjacent communities. It is anticipated that there would be some temporary income increase for a limited number of households within the community. There would be opportunities associated with the preconstruction phase for heavy equipment operators as site preparations occur, and then a greater **employment opportunities for skilled and unskilled workers** along with **short to medium term employment and economic benefits** for equipment owners and construction material sellers during the construction phase for the duration of the project. Construction material sellers within the community or in proximity would benefit from **short to medium term increased sales** for the period. It is expected that workers in particular would be sourced within the immediate Piaye area and then from further afield within the communities spanning between Vieux Fort to Soufriere.

Additionally, local refreshment and eating establishments within the community will have the **economic opportunity** to provide their services to the workers and so make a short to medium term **increase in income over their present level**. This may be particularly profitable persons who set up food canteens close to the site within Piaye, perhaps even allow the flat downstream bank of the river and is able to serve the workers affordably priced meals and refreshment throughout the workday. Fridays and paydays may be particularly profitable for the community refreshment houses. However, because of the scale of this project which is not large or ongoing for an extended period of time, employment and economic opportunities will be of a short to medium term nature.

5.4.1.2 Impact on Livelihoods

The creation of an access route and preparatory site works will involve the removal of the existing temporary Bailey bridge, and the clearing of adjacent lands to facilitate the placement of a bypass route and

bridge. During the site visit it was discovered that a farmer may be farming a small plot along the riverbank where the bypass might run and that this crop would have to be removed. The land on which this activity as well as the incidences of sand mining that occurs belongs to the Crown (see Figure 13 below).

Figure 13 - Subsistence banana cultivation along north eastern bank of river from bridge.

There was also sand or river aggregate mined from the river banks that is supposed to be sold and used in the local construction industry (refer to figure 14 below). This activity is considered illegal and the Crown, through the Commissioner of Crown Lands is averse to the possibility that persons may be facilitated in accessing to this area through the project activities such as the betterment of the dirt road to facilitate the bypass route. There is the possibility that after the completion of the project and the fact that the dirt road to the river bank has been upgraded as a result of the project, there is the possibility that the sand mining activities will increase on a more frequent and larger scale (consultation with Crown).

The Crown would rather have the existing dirt access cordoned off after the project is completed to curtail such activity. The cordoning off and restriction of the exploitation of the sand banks are not within the scope or purview of this project. This may be a matter where the crow would have to engage local law enforcement and undertake consistent monitoring. No sand miner was able to be located or contacted during this exercise. The matter of ensuring livelihoods is further explored below.

Another impact on the livelihoods of persons not only within the community of Piaye but the wider Saint Lucian public as a whole, is the use of the river for recreational purposes. In rural communities, rivers are considered part of the cultural heritage of the communities as they tend to serve as gathering points where persons would congregate to wash clothes, bathe, etc. and to chat and catch up with community gossip.

As alluded to previously, given the clarity of the water in the river, persons tend to flock to this area for bathing, picnics, etc. (refer to Figure 15 below). With the proposed temporary access road being constructed in the vicinity that is used for the parking of vehicles by persons accessing the recreational spot, there will be limited use of this recreational area.

Figure 14 - Pile of river sand and rocks mined from the river and used sold for use in the local construction industry.

Figure 15 – Piaye River being used for recreational purposes.

5.4.1.3 General Community Impacts

Please refer to section 5.1.10 Public and Community Safety Impacts and impacts on existing services above for a discussion on this impact. At the completion of the project there is the expectation that after all of the incidents of near misses from the Trough to present, there will a sense of ease as the new bridge and road surface will reduce the potential issues and hazards experienced by motorists as a result of blockage, manoeuvring during wet conditions, and possible expectation of the damage to the bridge as a result of flooding or other climate change produced phenomenon.

5.4.1.4 DIPE and the Nation:

5.4.1.4.1 Increased Resiliency and Vulnerability Reduction of Infrastructure

The exiting bridge is vulnerable to any natural hazard as were past bridge crossings evidenced by the impact of the Christmas Eve Trough and the resulting damage to it. Proper design and construction of the new bridge will reduce its vulnerability to Climate Change induced intense hazards, and increase its resiliency. The improved hydraulic conductivity will contribute to the longevity of the structure. This equates to building better for the future and reducing the potential destruction and loss of this critical infrastructural component that connects Vieux Fort in the south to Soufriere in the south west and all the communities in between along the west coast road. This also contributes to improved infrastructural security.

5.4.1.4.2 Improved Infrastructure

The present system experienced significant damage in the past and in conjunction with climate change factors, this has impacted the functional ability of the culvert crossing system and the road surface above. The better constructed and maintained crossing will result in improved road infrastructure.

5.4.1.4.3 Institutional and Community Construction Capacity Building

There is the benefit of capacity building for both DIPE staff and the construction workers involved through out the process. Both parties would gain the respective project supervisory experience for that level of staff, and the practical experience in the construction methodology and delivery of the engineered feature chosen for the crossing. This experience and knowledge gained could be applied to other similar projects within the immediate and long term future.

5.5 Ensuring Security of Livelihoods

The World Bank's Environmental and Social Safeguards (Policy 2.14) require that the livelihoods of PAP (Project affected Persons) must be considered and that projects undertaken do not adversely affect these individuals. Discussions with DIPE and during consultations has made it clear that it is not the intention of this bridge project to intentionally adversely affect the livelihoods of any farmer who might be impacted by the proposed works at Piaye Bridge. This particularly so for the farmer who is cultivating a small plot of bananas long the riverbank just downstream of the project site. This plot sits where the routing of the proposed bypass is to be located. This land also belongs to the Crown.

Clearing that site for investigative and construction activities requires the removal of the existing crops. Compensation will have to be provided to the farmer for the damaged or lost crops and a valuation will have to be undertaken by the zonal agricultural extension officer from the regional office of the Extension and Advisory Division of the Ministry of Agriculture. DIPE and the PCU will need to be presented with an official costing from this officer after their valuation exercise, and compensation completed prior to any works commencing. This will be discussed on site with the farmer when that person is located and in the presence of the agricultural extension officers.

In order to reduce the impacts on farmer's livelihood during the works, it is important that the farmer be informed in advance of the proposed activities in advance so that they or their representative can be present during the works. The agricultural valuation officer must be present to note the existence and extent of the crop, the damage or loss incurred, and to determine in a fair a manner as possible, the monetary amount of the crop loss so that adequate compensation can be provided to the farmer. The agricultural extension and valuation efforts are guided under **the Sale of Produce Act no 4 of 1945 and amendment of 2001 along with the Banana Plants Protocol of 1958**. There should also be a clear record, video or photographic, of the area to be worked and the crops present prior to any works to assist in the assessment. The valuation of the crops is undertaken based on values prescribed in the Ministry of Agriculture's **Crop Valuation Guidelines** which defines monetary value of the crop (fruit and tree) from seedling to production and harvesting stage over time. According to World Bank Policy, an ARAP may be used in this process as it is only one farmer that is affected. However, direct negotiations and settlement can occur between the farmer and the DIPE and PCU.

There is also a recently mutated subdivision of private lands to the lower west of the entrance to the bridge from the north. These lands may provide a suitable staging ground for the project works, but this is being determined further by the design engineers along with other locations. In the vent that these lands are to be used there will need to approach the owners and their representative to facilitate the necessary negotiations if the eventual purpose is not to acquire for any strategic purpose. If it is the DIPE's long term strategy to ensure that lands are acquired for an access for future monitoring and maintenance as well as desilting of the river, then consideration should be given to this process from this early point in the project before construction.

Consultation with any potentially affected parties during which such a proposal is clearly explained and all comments received and further guide any revision or tweaking is critical to understanding and ensuring any success for this approach as proposed. What is important is that this process is well thought out, fair and transparent.

Importantly, if acquisition is the option to be taken, the process and actual acquisition of the route must occur first before any project works commence in order that the project is not jeopardized. Any issues that may have arisen between the famer and DIPE pertaining to the crop or lands that would comprise the route must be fully ventilated and addressed. The acquisition process must be completed in its entirety with all necessary survey, valuation, payments, and legal arrangements between all parties understood and finalized.

In addition to the farmer, it was indicated during this assessment exercise that there was the practice of sand mining occurring along the river banks as a means of livelihood for a number of persons facilitated by the existing unpaved access road of the main road into this area. The material is sold for construction purposes. The number of or who these persons were engaged in this activity or its level of frequency could not be determined, even during post community meeting conversations. The Crown Lands Department identified this an illegal activity which they are discouraging, and this could be the reason for the lack of provision of information. It is envisioned that such activity will continue to occur after the completion of the project and that it is up to the Crown as to how they wish to address this matter in terms of access, monitoring, and control to their satisfaction.

5.6 Land Acquisition Process

5.6.1 Compulsory Acquisition of Key Lands for the Project

DIPE can identify the key lands required to facilitate the crossing project. In this case while this may not be so along the river as the land belongs to the Crown, there may be some cutting of private lands uphill of the bridge to accommodate improved site lines and realigned access to the bridge. Such lands may have to be acquired. The Planning Department which resides under the Ministry of Agriculture, Fisheries, Physical Planning, Natural Resources and Cooperatives is the one who prepares the memorandum to the Cabinet of Ministers providing the request for the acquisition of lands. The process of compulsory acquisition by the Government occurs when there is an overriding national need or that there are many heirs, or owners who may not be fully willing to sell.

The formal compulsory acquisition process for any lands required to accommodate the service access and works on the crossing would have to be guided by **the Land Acquisition Act No.12 of 1945 Amended by Act 11 of 2000**. The Authorized Officer to execute the surveying and acquisition of the required properties is the Chief Surveyor of the Survey and Mapping Department of the Department of Physical Planning in the Ministry of Agriculture.

Generally, the formal compulsory acquisition process would involve the following process:

1. The approach by an agency or department to the relevant Minister or to write directly to the Minister responsible for Physical Planning and make a request along with justification for the acquisition of a particular area of land for a particular use that they want to use it for.
2. The agency's Minister can choose to prepare a memo to the Cabinet of Ministers or the Minister of Physical Planning can do so and submit to the Cabinet.
3. If land in question is being dismembered, when it goes to Cabinet the memo will be for notification of the intent to acquire. This notification must be presented in two consecutive issues of Gazette.
4. After 2nd publication of notification the chief surveyor or the authorized officer will commence the survey. After the survey is done block and parcel numbers will be issued and the survey properly lodged. Land registers will be produced
5. Another memo will be produced for cabinet on the declaration of the accusation. This will be published in another two issues of the Gazette. The property will now belong to the Crown and be designated for use or management by a specific ministry or agency.
6. After that the chief surveyor and the land owners will meet to negotiate the compensation for the acquired property.
7. Once compensation arrangements are successful the agency of interest will now be able to access the property and carry out the project.
8. The full compensation may not necessarily occur before the land is owned by the Crown and the project commences. However, it must be noted that under the World Bank policies compensations must be completed before the project commences or any further disbursement from the world band on the project.
9. The timeline for compulsory acquisitions can vary depending on the length of time of the survey or cabinet response. Sometimes, two to three months can be occupied by the survey and another three to four months can follow with negotiations and agreements before the process can be completed.

DIPE can opt to deal directly with land owners if required and negotiate if the land owner agrees to sell. Compulsory acquisition would occur if land owners do not wish to sell or if there are a number of heirs. DIPE can approach the Ministry of Agriculture which also includes Planning and communicate such plans with both permanent Secretaries. If funding for this process was not a part of the initial proposal to the World Bank and a request was made, once the World Bank has been informed that payment has been made then funds may be provided as reimbursements. If the acquisitions have already been identified as part of the project cost, then that funding will be available for drawing down.

5.6.2 The World Bank Approach to the Land Acquisition

Consultation with the Social Safeguards staff at the PCU indicated clearly that the World Bank is of the opinion that the most complex resettlement issues on any of their projects can be adequately resolved if the particular issues or situations are identified early in the project preparation stages, and addressed early and expeditiously with the affected parties. The World Bank, consistent with Policy, 4.12 Involuntary Resettlement, and the DVRP's Resettlement Policy Framework, tends to favour a more communicative and negotiative approach to the acquisition of any required land rather than compulsory acquisition which suggests a more heavy handed approach. As indicated earlier, while there is no relocation of persons or residences, in this case the term "resettlement " would refer to the disturbance to the PAP's normal day to day activities such as the farming of the plots of land.

Negotiations with any affected landowners and farmer(s) identified by the project and confirmed by the PCU, may be facilitated through the PCU and its Social Safeguards's Section under the DVRP. Institutionally, the PCU resides under the Ministry of Economic Development, Housing, Urban Renewal, Transport, and Civil Aviation. The Chief Economist in this Ministry along with the PCU would take the lead role and with DIPE present. The PCU's Social Safeguards's section must ensure that the World Bank's Social Safeguards are incorporated and complied with in throughout all aspects of the project.

The property owners affected by the project must be identified and compensated for any lands to be acquired for site works and access to the crossing. The farmer(s) whose crops have been damaged or will be damaged, must be identified and have their crops properly assessed by the Ministry of Agriculture, and compensated. **This identification of stakeholders and crop location and conditions must all be done prior to the project commencing on ground**.

It is important that a proper assessment of the damage to crops and land is made and that the correct land owners are not just the farmers are identified. The correct LRTP block and parcels must be identified so that the location of owner's lands and the farmer's plots can be correctly identified.
There must be an element of transparency within this whole process and any disclosure procedures that are implemented must be in keeping with Bank's Policy 4.12 and the PCU's DVRP Resettlement Policy Framework.

The process guided by the Resettlement Framework which the PCU through the Ministry of Economic Development would facilitate is as follow:

The landowners and farmers affected by the project would be identified by DIPE and consultants and confirmed by the PCU. The PCU and DIPE would engage the farmers and property owners (PAPs) to ensure that they clearly understood the project and the intention for which the particular portions of their property is being sought is going to be used for. The crops that would be affected would have to be assessed and valued. After discussions between DIPE and the PCU with the landowners, and, a request would be

forwarded from the PCU to the Permanent Secretary of the Ministry of Economic Development to begin the process of acquisition.

The Permanent Secretary would then write to the Permanent Secretary of the Department of Physical Planning in the Ministry of Agriculture, indicating the rationale for the request and the intent to acquire. The Permanent Secretary of Physical Planning would prepare a memo to the Cabinet of Ministers through the Cabinet Secretary with all supporting documentation to have a Declaration of Intent to Acquire prepared. Once this has been approved by the Cabinet, the declaration is published in two notices of the Gazette. If there are no contentious objections, the Permanent Secretary of Physical Planning directs the Authorized Officer or Chief Surveyor to commence surveys of the properties and determine the cost of the lands to be acquired for compensation. The PCU with its Social Safeguards section would call a meeting with all affected land owners and farmers and would negotiate with them. This negotiation process would be led by the Chief Economist or their representatives of the Economic Development Ministry with PCU and DIPE in attendance. This process is to be guided by the principle of fairness and respect for all parties. Upon acceptance of the compensatory amount by the PAP, a formal contract would be prepared which included the agreed price and also the cost for any lost crops with the assessment from the Ministry of Agriculture. Under the DVRP after acceptance by the PAPs, a formal letter documenting that agreement along with a copy of the compensation agreement is sent to the Accounts Section of the Ministry of Economic Development with a requisition order. Compensation is based on Full Replacement Cost as per the Bank Policy and the DVRP's Resettlement Policy. Unlike the formal process under the Compensation Act which allows for the accumulation of interest on the compensation because of the length of time that can transpire before a PAP receives payment, the World Bank requires that settlement be done immediately upon the formalization of the agreement of compensation between the parties involved.

It must be noted that once information has been obtained on persons who might be affected by the project a **Resettlement Action Plan (RAP)** is prepared by the Social Safeguards Section of the PCU and continually updated as the process continues. The RAP will include the information on the PAPs (land owners and farmers), the full consultation and discussions with the PAPs, the publications in the Gazette, details of the settlement, and any special conditions. The completed plan after compensation is finalized, is sent to the Bank for approval, and after approval, the final document is published for public consumption. Apart from fulfilling due diligence requirements, making the RAP available to the public ensures transparency in the process. In the event that it is less than 200 farmers, an **ARAP or Adjusted Resettlement Plan** is employed.

In the event that any PAP has any issue at any point in the process, there are **Grievance Redress Mechanisms** outlined in the DVRP's Resettlement Framework (section 15) following the Banks's Resettlement Policy to allow any PAP to voice their concerns on any aspect of the project process that affects them, and to receive some form of redress. This process is facilitated by the PCU Social Safeguards officer and would ensure that the grievance is reported and recorded, there is a designated person responsible for responding to it, and that a firm timeline is specified to address the issue. There would also be a monitoring mechanism to ensure the effectiveness of the response and the affected party's satisfaction.

5.7 Recommendations

The following are recommendations based on the attention to ensuring the livelihoods of the affected farmers.

1. Implement the required procedures under the WB and DVRP Resettlement policy to ensure fair resolution of any issues, compensation, and if necessary, acquisition of the required properties to facilitate the project.

2. The PCU social safeguards monitoring officer is to monitor the project from beginning to end

3. The PCU is to ensure that all affected parties are aware of the redress mechanism

4. PCU and DIPE to ensure that the selected contractor is cognitive of the social impacts of the project and the specific measures within the ESMP is to ensure that the contractor's actions do not adversely increase any negative social or environmental impacts.

5. The Crown Lands Department to determine how best they wish to approach the matter of sand mining along the river banks through monitoring, management of access, and enforcement.

6.0 MITIGATIVE MEASURES

6.1 Mitigative Measures

Mitigative measures address the potential impacts of the project works and attempt to reduce or avoid any negative impact on the environment over the short to long term. Any major potential impacts for the culvert crossing project is expected to occur during construction phase when there is continuous activity. While these impacts are not expected to be major, the careful implementation of mitigative measures will allow for the reduction or avoidance of any adverse effects.

A number of general impacts have been identified above and the following in Table 8 is a list of the potential mitigative measures. The measures are presented in a manner that makes them easily incorporated into an ESMP, and with appropriate wording, can become contract clauses for the contractor who will undertake the civil works. This also allows for ease of monitoring by the client and key agencies.

The following Table 8 presents the potential impact areas and the proposed mitigative measures.

	IMPACT AREA	MITIGATIVE MEASURES
1	Traffic impacts	(a) A traffic management plan to be developed and implemented by contractor. (b) An alternative route must be identified and implemented to facilitate continued traffic movement and avoid blockages as a result road and bridge works. (c) The public to be notified of all disturbance to their normal routes. (d) Signposting, warning signs, barriers and traffic diversions must be clearly visible and the public warned of all potential hazards. (e) Provision must be made for the safe passages and crossings for all pedestrians where construction traffic interferes with their normal route. (f) There must be active traffic management by trained and visible staff at the site or along roadways as required to ensure safe and convenient passage for the vehicular and pedestrian public.

		(g) Adjustment of working hours to local traffic patterns, e.g. avoiding major transport activities during rush hours or other pertinent times (h) A communication plan must be developed and implemented to ensure that open and effective communication is fostered with adjacent community and land owners and farmers.
2	Noise	(a) Construction / work activities will occur within specified daylight hours e.g. 8:00 am to 4:00pm. (b) Community / public to be informed in advance of any work activities to occur outside of normal working hours or on weekends. (c) Sites should be hoarded wherever possible. (d) During operations, the engine covers of generators, air compressors and other powered mechanical equipment shall be closed, and equipment placed as far away from residential areas as possible. (e) There will be no excessive idling of construction vehicles at sites. (f) Noise suppression equipment or systems supplied by manufacture will be utilized. (g) Ensure all vehicles and equipment are properly serviced. (h) The contractor must develop and implement a public notification and noise management plan.
3	Land Clearing and removal of vegetation	(a) Any works to be undertaken must be cognizant of the adjacent riverine system (b) There must be no unnecessary clearing of natural vegetation. (c) Avoid the use of herbicides or other chemicals. (d) Consideration must be given to the mating and nesting periods for any critical species identified. (e) There must be minimal impact to flora and fauna as possible. (f) All recognized natural habitats, wetlands and protected areas in the immediate vicinity of the activity must not be damaged or exploited. (g) The contractor must ensure that all staff will be strictly prohibited from hunting, foraging, logging or other damaging activities within the area. (h) A survey and an inventory shall be made of large trees in the vicinity of the construction activity, large trees shall be marked and cordoned off with fencing, their root system protected, and any damage to the trees avoided. (i) There will be no unlicensed borrow pits, quarries or waste dumps on site on in close proximity. (j) Upon completion, all wastes must be immediately removed out of the area. (k) Undertake a replanting program with deep rooted vegetation along the riverbanks
4	Soil Erosion and Slippage	(a) The contractor must ensure that appropriate erosion control measures such as silt fences are installed. (b) Proper site drainage must be implemented (c) Any drain clogged by construction material or sediment must be unclogged as soon as possible to prevent overflow and flooding. (d) The use of retaining structures and planting with deep rooted grasses to retain soil during and after works especially along the riverbanks must be undertaken. (e) The use of bio-engineering methods must be considered as a measure to reduce erosion and land slippage. (f) Keep angle of slopes within limits of soil type.

		(g) Balance cut and fill to limit steepness of slopes. (h) All slopes and excavated areas must be monitored for movement.
5	Poor Air Quality	(a) Construction materials such as sand, cement, or other fines should be kept properly covered. (b) Cement should be kept stored within a shed or container. (c) The sand and fines can be moistened with sprays of water. (d) Unpaved, dusty construction roads should compacted and then wet periodically. (e) Demolition debris shall be kept in controlled area and sprayed with water mist to reduce debris dust. (f) During pneumatic drilling/wall destruction dust shall be suppressed by ongoing water spraying and/or installing dust screen enclosures at site (g) The surrounding environment (sidewalks, roads) shall be kept free of debris to minimize dust. (h) There will be no open burning of construction / waste material at the site. (i) There will be no excessive idling of construction vehicles at sites. (j) The bins of all haulage vehicles transporting aggregate or building materials must be covered on all public roads.
6	Solid and Liquid Waste Management (general)	(a) Contractor to develop and implement a waste management plan. (b) Contractor to abide by all pertinent waste management and public health laws. (c) Waste collection and disposal pathways and sites will be identified for all major waste types expected from demolition and construction activities. (d) Construction and demolition wastes will be stored in appropriate bins. (e) Liquid and chemical wastes will be stored in appropriate containers separated from the general refuse. (f) All waste will be collected and disposed of properly in approved landfills by licensed collectors. (g) The records of waste disposal will be maintained as proof for proper management as designed. (h) Whenever feasible the contractor will reuse and recycle appropriate and viable materials (except asbestos). (i) Construction related liquid wastes must not be allowed to accumulate on or off the site, or to flow over or from the site in an uncontrolled manner or to cause a nuisance or health risk due to its contents.
7	Solid and Liquid Waste Management (hazardous)	(a) Contractor must provide temporary storage on site of all hazardous or toxic substances in safe containers labeled with details of composition, properties and handling information. (b) The containers of hazardous substances shall be placed in leak-proof containers to prevent spillage and leaching into soil or riverine system. (c) The wastes shall be transported by specially licensed carriers and disposed in a licensed facility. (d) Paints with toxic ingredients or solvents or lead-based paints will not be used. (e) Banned chemicals will not be used on any project. (f) Any project activity which involves the purchase or use of significant amounts of pesticides (other than as described in (g) below) will be excluded during the screening process. (g) If termite treatment is to be utilized, appropriate chemical management measures will be implemented to prevent contamination of surrounding

		areas and use only licensed and registered pest control professionals with training and knowledge of proper application methods and techniques.
8	Terrestrial and Riverine Marine Pollution	(a) The contractor must implement all necessary waste management plans and measures. (b) All construction materials, including chemicals, must be properly stored. (c) The contractor will establish appropriate erosion and sediment control measures such as hay bales, sedimentation basins, and / or silt fences and traps to prevent sediment from moving off site and causing excessive turbidity in nearby streams, rivers, wetlands, and coastal waters. (d) A water quality monitoring program must be established by the contractor and testing must be done before construction, and at regular intervals to determine turbidity levels and other quality parameters. (e) See soil erosion and slippage mitigative measures above. (f) Construction vehicles and machinery will be washed only in designated areas where runoff will not pollute natural surface water bodies.
9	Occupational Health and Safety Issues	(a) The contractor must ensure that an Occupational Health and Safety Plan is in place to guide work activities, and provide a safe environment for workers. (b) The contractor must develop and implement an Adverse Weather Response Management plan (c) The contractor must ensure that all workers operate within a safe environment. (d) All relevant Labour and Occupational Health and Safety regulations must be adhered to ensure worker safety. (e) Workers must be provided with necessary equipment as well as protective gear as per their specific tasks such as hard hats, overalls, gloves, goggles, boots, etc. (f) Sanitary facilities must be provided for all workers on site. (g) The contractor must ensure that there are basic medical facilities on site and that there are staff trained in basic first aid. (h) Appropriate posting of information within the site must be done to inform workers of key rules and regulations to follow.
10	Damage to Services	(a) Contractor to liaise with and undertake site inspection with representatives of the service companies to determine the locations of their service lines/ routes on and around the site. (b) Contractor to develop a response plan in conjunction with the service companies to respond to any damage to service infrastructure during works. (c) All removed services must be reinstalled by the service provider's staff or under the supervision of such persons to the specifications of the service provider
11	Community Issues/ grievances_ General	(a) The contractor must develop and implement a communications plan with measures to address and resolve any complaints / issues. (b) Contractor must work with client to ensure open communication and address all issues that may arise.

Table 8 - Impact Areas and Mitigative Measures

6.2 Communications with the Community

Maintaining communication with the project affected communities and with the general public as well, is key to not only fostering a successful project, but also essential in abating or addressing any issues that may arise. While the directly affected persons are the close residents in Sapphire and Piaye, there is also the general motoring public who traverse the bridge and main road between Vieux Fort and Soufriere who are key affected stakeholders as well. The DIPE must prepare and implement a communications plan to inform the motoring public of the intended works, duration, and possible completion date along with any precautionary measures that may need to be implemented. The Piaye bridge and west coast road is a key link between Vieux Fort and that South Western portion of the island.

The contractor should also be required to develop a communications plan for review and approval by the client. This plan must outline the measures to be undertaken to engage and maintain open communication with communities and to address any complaints from the community in a fair and speedy manner towards resolution of the particular issue or issues that may be raised. This plan must also include public meetings with the community prior to, during, and upon completion of the project works in order to ensure that the affected communities are aware of the status of the project and that they may also have the opportunity to express their opinions, concerns, or guidance.

7.0 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

Environmental and social impacts of the proposed project were determined in the wider ESIA. This section of the report describes the link between the predicted impacts, the needed mitigation measures identified during the screening and assessment process, provisions for budgeting the costs of such measures, and the roles of those responsible for ensuring that the mitigation measures are carried out.

7.1 Environmental and Social Impacts

The potential environmental and social impacts determined from the study were identified as the following:

Environmental Impacts

- Loss of Critical Vegetation Cover
- Loss of Arable Agricultural Lands
- Biodiversity/ Species Disturbance and Loss
- Poor Water Quality
- Increased Noise levels
- Poor Air Quality
- Potential Worker/Occupational Health and Safety Related Impacts
- Traffic, Public and Community Safety Impacts
- Damage to existing services

Social Impacts
Affected Community

- Employment Opportunities
- Short term business opportunities and sales income

- Impact on Livelihoods
- General Community Impacts

DIPE & the Nation

- Increased Resiliency and Vulnerability Reduction of Infrastructure
- Improved Infrastructure
- Institutional and Community Construction Capacity Building

The contractor is to be cognitive of these and the ESMP is to ensure that his actions do not adversely increase any negative social or environmental impacts.

7.2 Environmental and Social Management Plan

The mitigative measures are based on best management practice and industry standards and responses from the communities and stakeholders. These are the mitigation measures which are expected of the one contractor who will be undertaking the project works and represents the minimum standard of execution for environmental protection during the execution of such works.

Table 9 below lists the measures, which have been described more fully in Table 8 under Mitigative Measures and need not be repeated here. The generic environmental clauses in Appendix 6 of this report will feed into the specific contract clauses for these types of works. The following Table 6 provides the elements of the standardized ESMP for such works, and also includes monitoring responsibilities and time frames.

Category of Project	Impact Area	Mitigative Measures	Mitigation Responsibility	Monitoring	Frequency
Culvert Crossing Rehabilitation	Traffic Conflict issues	As per mitigative measures (a) to (h)	Contractor	DPIE, PCU, MIPEL, Police as required	Weekly Daily for contractor and staff
	Noise	As per mitigative measures (a) to (h)	Contractor	DPIE, PCU, CARPHA as required	Weekly Daily for contractor and staff
	Land clearing and Deforestation	As per mitigative measures (a) to (k)	Contractor	DPIE, PCU, MAFPPNRC	Weekly Daily for contractor and staff
	Soil Erosion and Slippage	As per mitigative measures (a) to (h)	Contractor	DPIE, PCU, MAFPPNRC	Weekly Daily for contractor and staff
	Poor Air Quality	As per mitigative measures (a) to (j)	Contractor	DPIE, PCU, MHW and CARPHA as required	Weekly Daily for contractor and staff

	Solid and Liquid Waste Management (general)	As per mitigative measures (a) to (i)	contractor	DPIE, PCU, MAFPPNRC ,SLSWMA as required	Weekly Daily for contractor and staff
	Solid and Liquid Waste Management (hazardous)	As per mitigative measures (a) to (g)	contractor	DPIE, PCU MAFPPNRC CARPHA, Fire Service as required	Weekly Daily for contractor and staff
	Terrestrial and Riverine Marine Pollution	As per mitigative measures (a) to (f)	Contractor	DPIE, PCU, MAFPPNRC CARPHA, Fire Service as required	Weekly Daily for contractor and staff
	Occupational Health and Safety Issues	As per mitigative measures (a) to (h)	Contractor	DIPE, PCU, MHW and Labour Dept (LD) as required	Weekly Daily for contractor and staff
	Damage to Existing Services	As per mitigative measures (a) to (b)	Contractor	DIPE, PCU LIME, DIGICEL, WASCO, LUCELEC as required	Weekly Daily for contractor and staff

Table 9 - Standard Minimum Elements of the Environmental and Social Management Plan (ESMP)

While it is not envisioned, but in the event that any specific **statutory approvals** have been sought and granted from any agency, then the generic minimum mitigative measures and monitoring conditions in Table 4 above should be amended to include the conditions and recommendations of that agency or any other statutory agency who was part of any permitting.

As part of the managing the social components of the project the DIPE and the contractor will have to develop and implement **community communications plans**. Maintaining communication with the project affected communities, and in this case with the general public as well, is key to not only fostering a successful project, but also essential in abating or addressing any issues that may arise. While the directly affected persons are the close residents in Sapphire and Piaye, there is also the general motoring public who traverse the high road that are key affected stakeholders as well. The DIPE must prepare and implement a communications plan to inform the motoring public of the intended works, duration, and possible completion date along with any precautionary measures that may need to be implemented.

The contractor must also develop a project specific communications plan for review and approval by the client, DIPE. This plan must outline the measures to be undertaken to engage and maintain open communication with the affected communities. The plan must also include measures to address any complaints from the communities in a fair and speedy manner towards resolution of the particular issue or issues that may be raised. This plan must also include public meetings with the communities prior to, during, and upon completion of the project works in order to ensure that the affected communities are aware of the status of the project and that they may also have the opportunity to express their opinions, concerns, or guidance.

7.3 Environmental Performance Clauses for Works Contracts

Standard environmental related clauses were developed and are to be appended to or incorporated into the work contract. These also form part of the environmental management plan and the mitigative measure presented there. These clauses must be modified to conform with applicable Saint Lucian laws and contract procedures for such works and shall remain in force throughout the contract period.

A number of generic contract clauses are provided in Appendix 6 for reference and listed here:

- Permits and Approvals
- Site Security
- Discovery of Antiquities
- Worker Occupational Health and Safety
- Noise Control
- Use and Management of Hazardous Materials, fuels, solvents and petroleum products
- Use and Management of Pesticides
- Use of Preservatives and Paint Substances
- Site Stabilization and Erosion Control
- Air Quality
- Traffic Management
- Management of Standing Water
- Management of Solid Wastes -trash and construction debris
- Management of Liquid Wastes

It is expected that these generic clauses will be incorporated into all contracts, as applicable. In addition, specific project-related recommendations may also be forthcoming from statutory permitting agencies and these can be reformatted into contract clauses as well. For purposes of cost estimation and budgeting, the contractors should be aware of the existence of the environmental mitigation measures and associated ESMP requirements, and also include cost items for such purposes in their proposals.

7.4 Supervision, Monitoring, and Reporting

A unified and integrated approach must be adopted in reviewing and monitoring the projects from pre-construction to operations in to respond to any issue that may arise. The purpose of the ESMP and its conditions reflected in the construction and operational contract are to ensure accepted good practices are employed and maintained in order to mitigate any adverse environmental impacts.

The person or entity responsible for on-ground implementation, monitoring, and abiding by the contract clauses, recommendations, and mitigative measures will be the contractor. The frequency of monitoring will be a routine part of the contractor's onsite activities. Specific frequencies can also be determined by the requesting agencies to allow them to determine site changes, the environmental conditions, and the adequacy of the mitigative measures, and the overall ability of the contractor to execute the works in the specified and sustainable manner. The main agency will be the DIPE and also the Ministry of Agriculture through its extension officers and when necessary its Fisheries or Forestry officers. Agencies such as the Ministry of Health and wellness (MHW) or the Ministry of Infrastructure, labour Department (LD), or the Caribbean Public Health Authority (CARPHA) may monitor as well as part of their routine or be called in for a specific occurrence. This Saint Lucia Fire Service and the Saint Lucia Police Force can also be called for specific occurrences.

DIPE is the client and implementing agency, with the responsibility to supervise and monitor the project. However, the PCU can also share such responsibility and have the ability to co-opt other technical departments and ministries such as the Department of Sustainable Development (DSD) to assist in executing this duty especially where it came to monitoring and reporting on the technical aspects of the works as necessary, especially where it pertained to the requirements or conditions of the World Bank.

7.5 Key Recommendations

The following key recommendations are made to assist in ensuring the ESMP conditions are implemented to acceptable levels by the contractor.

1. The ESMP must be implemented to manage the environmental and social impacts of the project and allow for the monitoring of the effectiveness of all mitigative and management measures

2. DPIE and MEA must employ an Environmental Monitoring Officer and a Social Monitoring Officer to monitor the implementation of the ESMP actions to ensure the contractor is implementing and abiding by all the requisite environmental and social safety and management plans and procedures.

3. The PCU social safeguards monitoring officer is to monitor the project from beginning to end and ensure the implementation of the required procedures under the WB and DVRP Resettlement policy to ensure fair resolution of any issues, compensation, and acquisition if necessary of any required properties to facilitate the project. The officer through the PCU is also to ensure that the farmer with the small subsistence plot is aware of the redress mechanism and compensated for any crop loss.

4. DIPE and the contractor must engage and work collaboratively with the Ministry of Agriculture as necessary from the preconstruction stage during all land clearing to facilitate the new bridge and the bypass route to ensure that there is no adverse impact on the riverine system or excessive disturbance of existing flora or fauna.

5. DIPE and contractor must develop and implement communications plans not only to provide the general public and the community with project information, but to also effectively maintain and ensure effective communications between all stakeholders.

BIBLIOGRAPHY & REFERENCES

FDL Consult Limited (2015) *Choc Bridge Reconstruction Project-Final Design Report*. *Final Detailed Design Report for Choc Bridge Reconstruction Project*1311-SLU.ADS-Choc Bridge. The Morne, Castries, Saint Lucia (June 2015)

GOSL (2013 rev 2016) *Disaster Vulnerability Reduction Project (DVRP)_Environmental Assessment (EA)& Environmental Management Framework (EMF),* Project Coordination Unit, Department of Planning and National Development, Ministry of Finance, Economic Affairs and Social Security. Castries. December 2013, Revised March 2016 - http://www.finance.gov.lc/resources/download/2033

GOSL (2013 rev 2016) *Disaster Vulnerability Reduction Project (DVRP)_ Social Assessment, and Resettlement Policy Framework.* Project Coordination Unit, Department of Planning and National Development, Ministry of Finance, Economic Affairs and Social Security. Castries. December 2013, Revised March 2016 - http://www.finance.gov.lc/resources/download/2033

GOSL (2001) *The Physical Planning and Development Act (No. 29, 2001).* Castries

GOSL (1945) Land Acquisition Act No.12 of 1945 Amended by Act 11 of 2000.Castries. Saint Lucia

GOSL (1945) Sale of Produce Act no 4 of 1945 and amendment of 2001 along with the Banana Plants Protocol of 1958. Castries Saint Lucia.

Heholt,D (2013) *Disaster Vulnerability Reduction Project (DVRP)_ Social Assessment, and Resettlement Policy Framework.* Project Coordination Unit, Department of Planning and National Development, Ministry of Finance, Economic Affairs and Social Security. Castries. December 2013

Organization of American States (1987) *Saint Lucia Development Atlas*. Department of Regional Development, OAS General Secretariat, Washington D.C. USA. 1987

Ministry of Infrastructure, Port Services & Transport (2015), Volet Culvert Report, Ministry of Infrastructure, Port Services & Transport, Union, Castries, Saint Lucia. March 2015

The Central Statistical Office of Saint Lucia (2011) *StLucia Preliminary Census Report 2010*. Central Statistical Office of Saint Lucia, Finance Administrative Centre, Castries, Saint Lucia. http://192.147.231.244:9090/stats/images/OtherPublications/StLuciaPreliminaryCensusReport2010.pdf

The World Bank. *Environmental and Social Safeguard Policies*. The World Bank, Washington, DC, USA - http://web.worldbank.org/archive/website00530/WEB/OTHER/OPERAT-6.HTM

UNCTAD (2017) ***Climate change impacts on coastal transport infrastructure in the Caribbean: enhancing the adaptive capacity of Small Island Developing States (SIDS), SAINT LUCIA: A case study***. UNDA project 1415O. United Nations Conference on Trade and Development https://sidsport-climateadapt.unctad.org/wp-content/uploads/2018/07/Case-study_Saint-Lucia.pdf

APPENDICES

Appendix 1 - Terms of Reference for the Study

Government of Saint Lucia

Department of Infrastructure, Ports and Energy

Disaster Vulnerability Reduction Project

(DVRP)

TERMS OF REFERENCE

FOR CONSULTING SERVICES

DETAILED DESIGNS OF THE CONSTRUCTION OF THE PIAYE BRIDGE

June 21, 2017
July 3, 2017

TERMS OF REFERENCE

FOR DETAILED DESIGNS OF THE CONSTRUCTION OF THE PIAYE BRIDGE LOCATED ALONG THE SOUTH WESTERN END F SAINT LUCIA

1. Background

The Government of St. Lucia (GOSL) is currently in the process of implementing the Disaster Vulnerability Reduction Project (DVRP) with financial assistance from the the International Development Association and the Climate Investment Fund. The Disaster Vulnerability Reduction Project aims to measurably reduce the Country's vulnerability to natural hazards and climate change impacts, and includes various activities related to institutional strengthening and training as well as the execution of various civil works to improve the resilience, preparedness, and response capacity of Saint Lucia to natural hazards.

The DVRP is being implemented by the Department of Economic Development, Transport and Civil Aviation through the Project Coordination Unit (PCU) while the Department of Infrastructure, Energy and Ports (DIEP), is the technical Implementation Agency responsible for managing the civil works activities.

A component of the DVRP (Component 1 – Risk Reduction and Adaption Measures) includes financing of the reconstruction and retrofitting of public infrastructure including bridges. The GOSL, through the Department of Infrastructure, Ports, and Energy now seeks to reconstruct the Piaye Bridge, which was destroyed during the December 2013, Christmas Eve Trough. Failure of the bridge hampered the efforts of emergency responders' access to affected areas and disrupted the flow of traffic to the south western quadrant of the Island. To alleviate the problem a temporary Bailey bridge was erected in January 2014 to reconnect the south western communities of Laborie, Choiseul and Soufriere to the Town of Vieux Fort. The installed Bailey bridge is limited to single lane traffic and is vulnerable to flooding caused by intense rainfall such as the Christmas Eve Trough.

To this end the Department of Economic Development, Transport and Civil Aviation seeks to engage a Consulting Firm to prepare detailed designs and technical information necessary for the bidding of the works for reconstruction of the Piaye Bridge. Given that the Piaye Bridge serves as a link between the Southwestern communities of Laborie, Choiseul and Soufriere to the Town of Vieux Fort the proposed designs should take into consideration two lane traffic and climate resilience structures that can withstand weather related phenomena and that are resilient to the effects of climate change. The designs shall also include the construction of a bypass to facilitate continuous traffic without interruptions due to construction of the Bridge.

2. Overall Objective

The objective of this consultancy is to engage a firm to prepare detailed designs and works requirements such as detailed construction drawings, accurate bills of quantities, and technical

specifications per international standards under the local climate and seismic conditions for the reconstruction of the Piaye Bridge. Design considerations should also include construction of a bypass to allow access and other ancillary construction activities that may be required to support / enhance the proposed bridges structures.

3. Scope of Services

The Consulting firm shall perform activities described in these Terms of Reference referred to as 'services' as expeditiously and with the highest professional skills and care to ensure the orderly progress of the assignment. During all stages of the services the Consulting Firm shall make all efforts to maintain a full coordination with the Client – Department of Infrastructure, Ports and Energy (DIPE) and stakeholders' so as to ensure a common understanding of the assignment.

The Consulting Firm would be required to undertake the following:

a) Ensure a participatory approach, which includes all stakeholders, in undertaking the assignment.

b) Designate a competent representative of the Firm to provide periodic feedbacks to the Client during the course of the engagement

c) Work with the Community / Liaison Officer for the DVRP as well as with the Community Development Officer to conduct community meetings with stakeholders including residents, users (bus and taxi operators), and concerned citizens. The Social Safeguards Officer for the DVRP should participate in those meetings.

d) Work closely with the Social Safeguards Officer in the PCU in conducting the Social Assessment

e) Work closely by consulting and collaborating with the Civil Works Coordinator in the development of the final designs

PRELIMINARY DESIGNS

a) Undertake an Environmental and Social Impact Assessment (ESIA). The ESIA shall be conducted in accordance with the Environment and Social Assessment Framework for the Project.

b) Develop an Environmental Management Plan (ESMP) – based on the potential impacts identified. The DVRP Environmental Assessment and Environmental Management Framework will serves as a guide to the development of the ESMP.

c) Review of existing topographic and cadastral maps, of the site, surroundings and watershed for the purpose of conducting the relevant hydrological, hydraulic assessment /analysis to inform the designs. Where existing data may be limited undertake necessary topographic, cadastral and other surveys for enhancement and purpose of the assignment

d) Using the existing Social Assessment Framework developed for the DVRP undertake a Social Assessment of the extent of the resultant impact of the works, impact on personal property, livelihoods, damage to crops. Clearly highlight the potential social or economic benefit

e) Use existing topographical, survey maps to determine the social impact on private property, livelihood and displacement of affected persons; where existing data is limited undertake necessary surveys as required

f) Collect relevant data including water elevations, rainfall, traffic count to inform the proposed designs

g) Review previous studies for the development of the engineering options to be presented.

h) Conduct hydrological modelling and analysis of the catchment to inform the drainage assessment.

i) Undertake the hydraulic design of the bridge from the information gathered from the surveys and hydrologic analysis conducted.

j) Surveys undertaken should clearly identify (include areas) of land intake for the purposes of construction that may needed by way of lease or rental as well as any possible permanent acquisitions to facilitate land acquisition and compensation to property owners.

k) Demonstrate the flood inundation patterns for storm return periods up to an Annual Exceedence Probability (AEP 2%), through appropriate water simulation analysis.

l) Undertake scour analysis of the river patterns upstream and downstream.

m) Undertake subsurface soil exploration to determine the soils characteristics engineering strength properties for the purposes of analysis and design of the bridge.

n) At minimum, the following geotechnical investigations should be performed as per site requirement;

    a. Determine the sub-soil condition through pitting (1m x 1m x1m) and Dynamic Cone Penetration (DCP) tests at 2 locations each within 20m of the proposed location for designed infrastructure.

b. Determine the sub-soil condition through 2m deep pitting and DCP test.

c. Determine the engineering strength properties of the sub-soil conditions through geotechnical investigations and laboratory test and/or with empirical correlations from the above test required for design of the bridge and all associated infrastructure.

o) Perform all studies, explorations, tests surveys, laboratory test, analysis and calculations, etc. required to produce full and complete set of working drawings, specifications, bills of quantities, requirement of materials and complete cost estimates for the bridge construction, bypass road and ancillary infrastructural works that maybe required

p) Undertake the necessary traffic count exercise and analysis for loading and design purposes in particular design of the pavement structure. Existing data of the Transport Unit of the Department should be considered

q) Utilize international best practices, standards and codes for soil analyses, geotechnical investigation, hydraulic requirements and bridge design

DESIGN OPTIONS

r) Perform structural analysis to inform the proposed structural designs

s) Use the findings of the Preliminary Design Report and feedback / comments provided by the GOSL to develop two design options for consideration of the Client, The options presented shall take into consideration ancillary infrastructural works, cost for maintenance of the proposed structure, economic and social considerations for the preferred options

t) Include in support of the options detailed calculations and cost estimates, all topographic data used to map the existing river channel together with longitudinal profile and cross sections. Staking out data and other data necessary for the execution of the works by a contractor must also be provided.The options should include bypass alternative with design and cost estimates.

u) Present options and proposed methodologies to stakeholders including the Client, Technical Agencies, commuters, vehicle operators, and public in particular residents of Piaye. Options presented shall take into consideration a two lane bridge to accommodate vehicular and pedestrian traffic, river embankment and river bed protection works and bridge approach works.

FINAL DESIGN REPORT

v) Based on the preferred option accepted by the Client shall prepare the Final Design Report including bidding document (s) for procurement of the works – bridge bypass and other ancillary amenities

w) The Final Design Report should include; complete set of working drawings, technical specifications, detailed bills of quantities, complete set of calculations and analysis used to inform designs, legal requirements for administering the contract, material requirements, and the EMP to be used during construction.

x) Include in support of the Final Design calculations and cost estimates, all topographic data used to map the existing river channel together with longitudinal profile and cross sections. Staking out data and other data necessary for the execution of the works by a contractor must also be provided.The options should include bypass alternative with design and cost estimates.

4. Reporting Requirements and Deliverables

Report #1: Updated Work Plan

Within one week of signing of the Contract a kick-off meeting will be held with the Consultant to allow for discussion, review and acceptance of the Updated Work Plan of the Consultant.

Comments in response by the GOSL, should reach the Consulting Firm no later than five days after receipt of Report 1 (*updated Work Plan)*.

Report #2 – Preliminary Design Report

Within **twelve weeks** of contract signing the consulting firm shall submit the **Report #2 Preliminary Designs which include the findings of surveys, *Hydrological & Hydraulic Modelling and Analyses, Geotechnical Investigations traffic counting exercise and all analyses, environmental and impacts identified*).** Where surveys where undertaken the report should highlight the data gaps that led to new surveys as well as assumptions used.

The Consultant shall present the finding from the Preliminary Design Assessment in the form of a Power Point Presentations. As part of this presentation the Consultant shall clearly present the hydrological & hydraulic modelling and analysis in particular the flood inundation patterns developed as part of the preliminary design assessment.

Comments in response by the GOSL, should reach the Consulting Firm no later than ten days after receipt of Report #2

Report #3 - *Design Options*

Six (6) weeks after acceptance of Report # 2- (***Preliminary Design Report)*** the Consultant shall submit the Report #3 Design Options Report containing the information as described in scope of Services to include justification for the proposed options.

The consultant shall also hold two presentations for a) community meeting and b) technical officers – Client and Technical Agency to present options. The presentations should visual (model) or in power point form

Comments in response by the GOSL, should reach the Consulting Firm no later than ten days after receipt of Report #3

Report #4 - ***Final Designs Report***

Four (4) weeks after acceptance of Report # 3 (***Designs Options)*** the Consultant shall submit the Final Designs containing the information as described in scope of Services. ***The report should also incorporate the actions taken on the comments received on*** Report # 3.

Comments in response by the GOSL, should reach the Consulting Firm no later than ten days after receipt of ***(Final Design Report) to include all previous reports and information gathered as appendices to the Final Report***

- **All CAD drawings shall be produced and submitted in AutoCAD 2010 through 2016 "DWG" file format and PDF finle format. Drawings shall also be submitted on CD and be properly labeled. Submission shall include an index naming and describing each CAD file.**
- All Reports including data collected, drawings ***documents relevant to the Consultant's services, computer programmers, etc. shall become the property of the Government of Saint Lucia.***

5. Duration of Services and Resource Mobilization

The consultancy is estimated at 12 man months to be undertaken over a period of no more than 28 weeks.

Qualified Key personnel for the services shall be available as required to fulfill the services and shall at least comprise the following or be qualified to provide some of the required skills:

KEY EXPERTS	

Team Leader	
Hydrologist	
Hydraulic Engineer	
Geotechnical Engineer	
Surveyor	
Social Specialist	
Environmental Specialist	
Quantity Surveyor	

Apart from the key personnel the Consulting Firm shall have the necessary supporting staff (administrative and technical) and shall ensure that the relevant specialists are available to undertake the assignment.

6. Working Arrangements and Logistics

The consultancy will be executed through the office of the Chief Engineer, Department of Infrastructure, Ports and Energy (DIPE). The Civil Works Coordinator (CWC) will have day to day responsibility for contract administration and supervision of the Consultant and will report to the Chief Engineer and the PC on this project as necessary.

The Client will:

a) Ensure timely review of reports submitted by the consultant and facilitate the provision of feedback within ten days of receipt of reports.

b) Initiate the consultation and co-operation of other agencies required to provide support to the consultant for realization of the relevant aspects of the assignment.

c) Facilitate access to sites for field study.

d) Provide access to relevant existing information, including relevant GIS data, traffic data, survey maps

The Consultant will:

f) Execute the duties and tasks outlined in Section 3 above with due diligence and efficiency and in accordance with the highest standards of professional competence, ethics and integrity.

g) Be responsible for the supervision of its technical experts (key and non-key) involved with implementation of the assignment including providing all office space, software, equipment, materials, accommodation, office requirements and transportation.

h) Submit reports and plans within the stipulated timeframes stated in the Terms of Reference for review by the Client.

i) Be responsible for the provision of software, equipment, materials and transportation required to undertake the consultancy.

j) Execute the services in accordance with the laws, customs and practices in Saint Lucia and use the appropriate international/regional standards for preparation of technical information.

k) Engagement of qualified and experienced technical experts and administrative staff and other resources necessary to undertake the services

7.0 Qualifications Requirements

The shortlisting criteria are:

The Consulting Firm:

1. Must demonstrate at least ten (10) years' experience in successfully undertaking designs of similar magnitude or complexities *(The Consultancy entails the detailed designs for the construction of the Piaye Bridge and shall take into consideration design of a two-lane bridge to accommodate vehicular and pedestrian traffic, river embankment and river bed protection works and bridge approach works. The Consultant shall also take into consideration demolition and salvaging of the existing Bailey bridge and construction of a bridge bypass and other ancillary amenities. The span of the existing bridge is approximately 24.38 metres. It is anticipated that the likely selection of construction material is traditional reinforced concrete, however the consultant is not limited in proposing other construction materials like pre-cast concrete or structural steel as part of the design options);*
2. At least two successfully completed similar assignments undertaken during the past 7 years where the value of the executed physical works was over US$0.75M

WORK TEAM MINIMUM REQUIREMENTS		
POSITIONS	**QUALIFICATIONS**	**SPECIFIC EXPERIENCE**
Lead Consultant	Msc in Civil Engineering (minimum of15 years experience) Or BSc in Civil Engineering (minimum of 20 Years experience)	Advisor, Consultant or management positions in projects for design of infrastructure requiring community participation and administration of contracts At least 15 years' experience in design of highway bridges, road embankments, bridge foundations engineering in fast flooding areas, river-engineering methods and slope stabilization management Experience in consultancy in small island developing states (SIDS) and the Caribbean Region would be an advantage Experience in roads and highways in similar terrains or small Island States Experience of working with multilateral organizations. Fluent in English Language
Hydraulic Engineer	MSc in Hydraulics/Hydrology or BSc in Civil Engineering with fifteen (15) years experience.	Not less than 7 years of work experience as a Hydraulic engineer Worked in similar environments Fluent in the English language.
Geotechnical Engineer	MSc in Geotechnical Engineer or	Not less than 10 years' experience Experience in conducting geotechnical investigations, slope stabilization, design of earth retaining structures, embankment and bio-engineering methods

	BSc in Civil Engineering with fifteen (15) years experience.	
Surveyor	BSc in Surveying, License Land Surveyor	Five Years working experience following certification
Social Specialist	Bachelor's degree in Sociology or Disaster Risk Management or other related field	10 years working experience in communities and urban / rural settings Experience in undertaking social assessments including census Experience working on community participation projects Ability to communicate in the local language – patois
Environmental Specialist	Bachelor's degree in Civil Engineering, Environmental Studies or Disaster Risk Management or other related field	10years working experience in communities and urban / rural settings Experience in undertaking environmental assessments in urban / rural communities Experience working on community participation projects Ability to communicate in the local language – patois
Quantity Surveyor	B. Sc. degree in Quantity Surveying	10 years of professional experience in the field and 5 year experience in the relevant field.

ANNEX I

1. Map showing Location of the Piaye Bridge

2. Aerial view of the Piaye Bridge

Appendix 2 - Schedule 3 of the Physical Planning and Development Act No 29 of 2001- PERMITTED DEVELOPMENT

SCHEDULE 3 **(Section 18)**

PERMITTED DEVELOPMENT

(a) A Garden Huts, other than garages, in approved residential areas and not used for human habitation or for the conduct of any activity of a commercial nature.

(b) Gates, fences, and walls not exceeding 4 feet in height.

(c) Agricultural out buildings not used for human habitation and enclosures and works on agricultural holdings that are requisite for or incidentail to the use of land for the purpose of agriculture not including subdivision of land for agricultural purposes.

(d) Repair to roads, bridges and harbour installations

(e) Repair to services

(f) Internal alterations to buildings not involving changes to the basic structure or façade of the buildings

(g) Subject to any requirements of the regulations prescribing minimum building setback, site coverage, and building height limitations, the enlargements or improvement of an existing single dwelling house provided that the floor of the enlargement or improvement does not exceed 1/3 of the floor area of the existing single dwelling house.

(Amended by Act3 of 2005)

Appendix 3 - Questionnaire

DVRP - Piaye Bridge Construction Project

Piaye, Laborie

Department of Infrastructure, Ports, and Energy
Department of Economic Development, Transport and Civil Aviation

Questionnaire

The purpose of this questionnaire is to assist in soliciting the responses from the mini bus drivers who frequently travel over the Piaye Bridge who are intimately acquainted with the structure and what issues may exist, and recommendations for improvements.

February 2020

Notes for Interviewer:
Introduce the project, and who you are, and why you are carrying out this survey.

	Questions	Responses
1	Name	
2	Route no & route	
3	Length of time operating route	
4	Do you or your drivers' route cross the Piaye Bridge	
5	How many times a day (approximately)	
6	Have you or your drivers every experienced any blockage of the bridge	
7	What was determined as the cause of blockage	
8	How long was the blockage	
9	Are there any particular issues that you or your drivers have with the present bridge	

10	Would you like to see a new bridge constructed as a means of addressing the issues with present bridge and if "yes", what would you want to see reflected in the new design	
11	What would you like to see implemented during any construction of the bridge to reduce any negative impact on commuters	
12	What would you like to see done to the bridge after construction to ensure it remains for long term	

Use additional sheets of paper as necessary

Thank you for your time.

Appendix 4 - Community Meeting (Wednesday 4th March, 2020)

DVRP - Piaye Bridge Reconstruction Project

Piaye Community Centre
Piaye, Laborie
Wednesday 4th March, 2020
6:00pm to 8:00 pm

1.0 Introduction / Overview

The community meeting for the Piaye Bridge reconstruction took place at the Piaye Community Centre on Wednesday 4th March, 2020. There were 30 community residents in attendance. A power point presentation of the existing bridge condition, the proposed new design options which included road realignment, and diversion route details was made by design engineer Lester Arnold of LCC Group Incorporated. The environmental and social component was presented by specialist Daune Heholt. The design is a team effort with other professionals involved as well. The proposed construction period is for 12 months and expected to commence later in the year (August) following selection of a qualified contractor.

The list of attendees is attached.

2.0 Present Situation

- Historically damaged
- Temporary Bailey Bridge placed
- Single lane nature of the bridge
- Accommodates approx. 4400 vehicles daily which can increase to 5000 with tourist
- Present low height of the bridge facilitating easy blockage by debris and flooding
- Not climate change resilient

3.0 Bridge Options

Three **bridge options** were presented along with their pros and cons. These were:

4. **Pre stressed concrete slab**

- Too heavy
- Requires specialized equipment
- Requires high concrete specifications and management

5. **Post tensioned concrete slab**

- Too heavy
- Requires specialized equipment

6. **Composite Bridge**

- Easier to construct
- No specialized equipment required
- Combination steel beams and concrete slab

3.1 More Favorable Option

The more favorable construction and cost wise option was the composite bridge of reinforced concrete and steel beams.

4.0 Diversion Route options

Three **diversion route options** were presented with their pros and cons. These were:

1. **Cutting and maintaining a route through the river**

- Had previously been done
- Highly susceptibility to river flow
- High water level stops the movement of traffic
- Potential hazard to crossing motoring public

2. Placing containers within the river and placing a concrete slab over the top

- May be moved out of position by increased flow within river
- Requires time to place containers, formwork for slab, casting and curing of slab.

3. Utilizing a Bailey Bridge

- More secure
- High above water level
- Easy to place and remove
- Quick installation

4.1 More Favorable Option

The more favorable construction and cost wise option was the utilization of the Bailey Bridge

5.0 Bridge and Diversion Route Details

5.1 Bridge

- Bridge is to be a single carriageway structure with two lanes allowing for separate north and southbound traffic.
- Straighter alignment of approaching road and bridge to facilitate better sightlines and maneuverability
- Part of northern hill at upper corner to be cut back to facilitate better sightline and maneuverability
- Bridged to be raised by 1 meter to facilitate reduce flood hazard, contribute to increased hydraulic capacity (with width from bank to bank), facilitates easier passage for debris, and facilitate improved approach.
- Pedestrian sidewalks to be placed with safety rails
- All services to be placed within sidewalk

5.2 Diversion Route

- Single lane Bailey Bridge to be utilized.
- Patience of drivers and pedestrians required.

6.0 Matters Raised by Community and Response by design team

Matter: Bypass route directly through river is unacceptable as wet conditions damages disks of minivan and other vehicles
Resp: Understood and accepted

Matter: consider using same Baily bridge in same location as bypass route and shift it as necessary as the various sides of the bridge is completed
Resp: This cannot happen as the bridge needs to be demobilized to accommodate realignment of the road and approaches. Another bailey bridge is already available in Vieux Fort at the DIPE and this will be used for the diversion route.

Matter: Only eastern side of the river is being desilted

Resp: The Piaye River was being desilted by the Ministry of Infrastructure but at the mouth of the river where there is the sand bank to allow the river to flow naturally. The area of the river at the Piaye Bridge is self-cleansing as it allows water to transport any debris present there. If the mouth is not unblocked then the water stagnates with a foul odor, and mosquito breeding can occur.

Matter: Bridge surface is very slippery when wet and poses a hazard to drivers as vehicles slide quite a bit
Resp: The new bridge surface should take care of that issue.

Matter: Bridge construction may begin in August, but this means that construction will be ongoing in rainy / hurricane season.
Resp: There are still aspects of the works that can be done during the rainy season but during the drier part of the beginning of the next year is when the major works will occur and finishings be completed. The weather will be monitored on a daily basis and work will be guided by actual and forecasted conditions. There will be no work during adverse conditions and all safety measures will be taken.

Matter: Local workers need to get priority for works
Resp: This is expected and recommended

Matter: There is need for local economic opportunities for the Piaye are during construction
Resp: This is highly encouraged. Opportunities exist for food and refreshment canteens to serve workers. This is recommended.

Matter: Aesthetic of bridge should reflect local historical character of the region i.e. African
Resp: This will be taken into consideration and attempts made to reflect such character in final bridge design

Matter: Consider using the Daban road and improving its road surface as an alternative, though longer diversion route
Resp: This is a secondary option as route is very long and will incur an increase in travel time that may not be acceptable to the community

7.0 Community Overall Response

The community representatives accepted the proposed design option with single carriage way two lane bridge, realignment of approaches and bridge, and bypass routing option using a Baily bridge. They supported the reconstruction effort and design option.

8.0 Way Forward

All of the issues and recommendations made by the community will be considered by the design team and incorporated into the final bridge and road alignment as best as possible. Another meeting will be held at a future date to be determined to present the final design to the community.

Daune Heholt
Environmental and Social Specialist
LCC Group Incorporated

List of Attendees attached below

Registration Sheet

Piaye Bridge Consultation
Disaster Vulnerability Reduction Project
Registration Sheet – March 04, 2020

	NAME	COMPANY	CONTACT INFORMATION (Tel, Fax & Email)
1.	Bryan Charles	Bexon/Saltibus Council	518 321
2.	Peter Phillip	P&W Construction Company	722 7478
3.	Karen Ables	Piaye/Choiseul	717995
4.	Velus Norbert	DIPE	715 2903
5.	Eddie Parade	DIPE	517504
6.	Gerald Butt	Choiseul Council	723-2749
7.	Henry Graham		
8.	Rufina Simon	Piaye Clerk	4874051
9.	Gabriel Timothy Smith	Piaye	287 8876
10.	Melda Florian	Piaye	520 5000
11.	Larry James	Piaye	7206280
12.	Pricilla Henry	Piaye	520 8825
	Cyril Edward	Piaye Community President	484 4000

13.
14. Rudolph Rismay
15. Blaka Siggin
16. Yancey Semas Piaye 5188461
17. Nadia chedery piaye 722 8179
18. Julius Boulogne 712-3800) 7135791
19. Hilda Phillip
20. Ava Volney 5203220
21. Sym Phillip 5842369
22. Kerstelle Medrich 7288672
23. Celia Volney 725-8941
24. Anthony Monrose 5206331
25. Ted Etan 5843344
26. Grata Itan 2841988
27. Arison Hut 7143620
28 Randy Boulogne
29 Dylan Remi 7240588
30 Vera Thomas 730-3088
31 Lucia Edward 712 8497
35. Audrey Springer 5798045

32. K Findley 04.03.29 – Kimberly Findley – Secretary

Hon. Bradly Felix – District Rep

34. Damion Louis – Attaché to District Rep

Appendix 5 – Community Meeting PowerPoint Presentation and Photos

Piaye Bridge Reconstruction Project

LCC Group Incorporated
Construction, Project Management & Engineering Services

DVRP
Disaster Vulnerability Reduction Project

4th March, 2020

Background Information

- The bridge was first built in the 1970's
- Since its initial construction it has been destroyed twice in the last 30 years
- First - with the passage of Tropical Storm Debbie - 1994
- Second – with the passage of the Christmas Eve Trough - 2013
- The bridge was completely washed away with the passage of the Christmas Eve Trough in 2013
- The area was impassable for 15 days due to closure
- The present Bailey Bridge was erected on 6th January, 2014
- The bridge is now being redesigned to be more resilient to Climate Change

Condition of the bridge following the passage of the Christmas Eve Trough - 2013

Present Condition of the bridge following the installation of the Bailey Bridge - 2014

Bridge Options

Option No. 1 – Prestressed Concrete

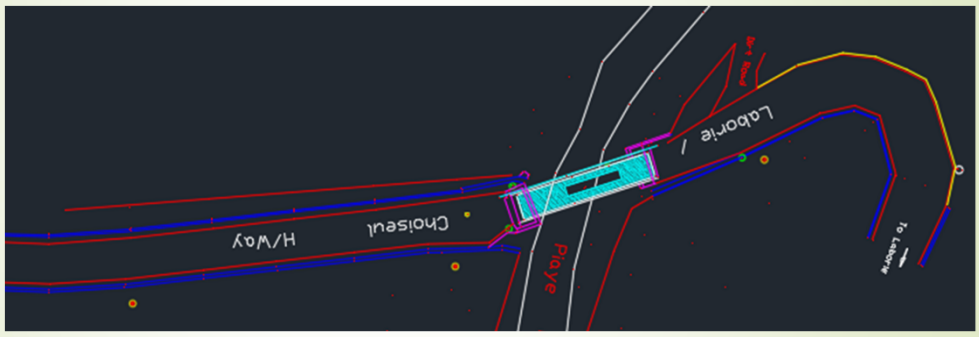
Option No. 2 – Post Tensioned Concrete

Option No. 3 – Composite

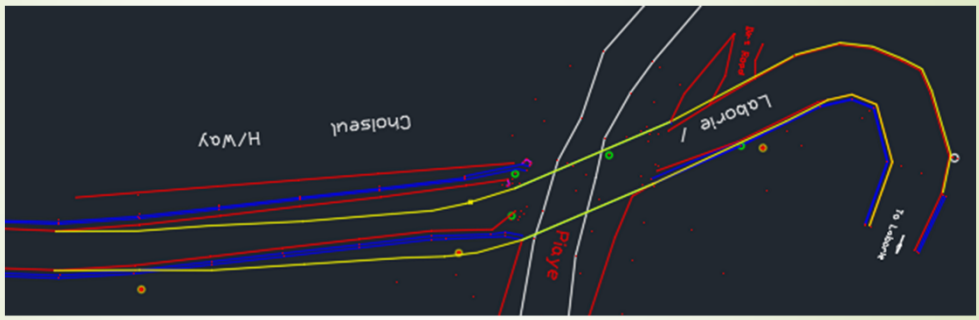
Proposed Bridge Design and Alignment

Option No. 3 – Composite

Present Alignment



Proposed Alignment



The Way Forward and Challenges

The Way Forward

- The bridge when completed will be more resilient to Climate Change
- The bridge will be single carriage way with two lanes
- The bridge will be built with sidewaks
- All utilities will be safeguarded within the new structure
- The cross sectional area of the opening under the bridge will be increased
- The horizontal and vertical alignment of the bridge will be changed
- The southern approached will be enhanced for greater visibility

Challenges

- The bridge is proposed to be built over 12 months
- The construction period will span a hurricane season
- Possibility of construction delays in the event of any tropical event
- Traffic delays dues to road diversion and movement of heavy equipment
- Road diversion will be single lane traffic

Photo 1 – Presentation setup at community meeting

Photo 2 – Early attendees at community meeting (Parliamentary Rep seated to the front)

Photo 3 – Parliamentary Representative, Hon. Bradley Felix delivering welcome remarks

Photo 4 – Environmental and Social Specialist, Daune Heholt delivering his remarks

Photo 5 – Question and answer period after presentation by Team Leader, Lester Arnold

Photo 6 – Audience listening attentively to responses by Team Leader, Lester Arnold

Appendix 6 - Examples of Environmental Contract Clauses

Environmental Contract Clauses Examples

The following are standard environmental related clauses that may be appended to or incorporated into the contracts for the civil works involved with the Volet Culvert Crossing rehabilitation works. These mitigation measures are the core of a generic, standardized ESMP (Environmental and Social Management Plan) for this type of works and typical associated impacts. Best industry practice and responsible environmental management are expected. These clauses are general and are to be modified to conform with applicable Saint Lucian laws and contract procedures for such works and shall remain in force throughout the contract period. The mitigative measures are to address the expected environmental management issues and are based on best management practice and industry standards.

It must noted that specific project related recommendations may also be forthcoming from any statutory permitting agencies such as the DCA or the Ministry of Health, and these can be reformatted in to contract clauses as well. The specific recommendations for mitigative measures in the ESIA should also be included as contract clauses.

These clauses are consistent with those outlined in the DVRP Environmental Assessment and Environmental Management Framework and Social Assessment and Resettlement Policy Framework and (EMF Table 3) standard mitigation measures (EMF Table 6) and special provision for work in Forest Reserve (EMF Annex 10 item 19).

1. Permits and Approvals

The contractor shall be responsible for ensuring that he or she has all relevant legal approvals and permits required to commence works.

2. Site Security

The contractor shall be responsible for maintaining security over the construction site including the protection of stored materials and equipment. In the event of severe weather, the contractor shall secure the construction site and associated equipment in such a manner as to protect the site and adjacent areas from consequential damages. This includes the management of onsite, construction materials, construction and sanitary wastes, additional strengthening of erosion control and soil stabilization systems, and other conditions resulting from contractor activities which may increase the potential for damages.

3. Discovery of Antiquities

If, during the execution of the activities contained in this contract, any material is discovered onsite which may be considered of historical or cultural interest, such as evidence of prior settlements, native or historical activities, evidence of any existence on a site which may be of cultural significance, all work shall stop and the supervising contracting officer shall be notified immediately. The area in which the material was discovered shall be secured, cordoned off, marked, and the evidence preserved for examination by the local archaeological or cultural authority[9]. No item believed to be an artifact must be removed or disturbed by any of the workers. Work may resume, without penalty of prejudice to the contractor upon permission from the contracting officer with any restrictions offered to protect the site.

4. Worker Occupational Health and Safety

[9] The local authority in this case is the Archaeological and Historical Society. The Saint Lucia National Trust would also be involved only after discussion and agreement with the Archaeological and Historical Society.

The contractor shall ensure that all workers operate within a safe environment. Sanitation facilities shall be provided for all site workers. All sanitary wastes generated as a result of project activities shall be managed in a manner approved by the contracting officer and the local authority responsible for public health[10]. The contractor shall ensure that there are basic medical facilities on site and that there are staff trained in basic first aid. Workers must be provided with the necessary protective gear as per their specific tasks such as hard hats, overalls, gloves, goggles, boots, etc. The contractor shall provide the contracting officer with an occupational health and safety plan for approval by the local health authority prior to the commencement of site activities.

The contractor must ensure that all workers operate within a safe environment. All relevant Labour and Occupational Health and Safety regulations must be adhered to ensure worker safety. Sanitary facilities must be provided for all workers on site. Appropriate posting of information within the site must be done to inform workers of key rules and regulations to follow.

5. Noise Control

The contractor shall control noise emissions generated as a result of contracting activities to the extent possible. In the case of site locations where noise disturbance will be a concern, the contractor shall ensure that the equipment is in good working order with manufacturer supplied noise suppression (mufflers etc.) systems functioning and in good repair. Where noise management is a concern, the contractor shall make reasonable efforts to schedule activities during normal working hours (between 8 am and 5 pm). Where noise is likely to pose a risk to the surrounding community either by normal works or working outside of normal working hours or on weekends, the contractor shall inform the contracting officer and shall develop a public notification and noise management plan for approval by the contracting officer.

Specific elements of the noise control activities by the contractor shall include: construction / work activities will occur within specified daylight hours e.g. 8:00 am to 4:00pm; community / public to be informed in advance of any work activities to occur outside of normal working hours or on weekends; sites should be hoarded wherever possible; during operations, the engine covers of generators, air compressors and other powered mechanical equipment shall be closed, and equipment placed as far away from residential areas as possible; there will be no excessive idling of construction vehicles at sites; noise suppression equipment or systems supplied by manufacture will be utilized; ensure all vehicles and equipment are properly serviced; the contractor must develop and implement a public notification and noise management plan.

6. Use and Management of Hazardous Materials, fuels, solvents and petroleum products

The use of any hazardous materials including oils, fuels and petroleum products shall conform to the proper use recommendations of the product. Waste hazardous materials and their containers shall be disposed of in a manner approved by the contracting officer. A site management plan will be developed by the contractor if the operation involves the use of these materials to include estimated quantities to be consumed in the process, storage plans, spill control plans, and waste disposal practices to be followed. This plan and the manner of management are subject to the approval of local authority responsible for safety, and waste management, and the contracting officer[11].

[10] The Ministry of Health , Wellness, Human Services, and Gender Relations, in particular the Environmental Health Department is the agency responsible for public and environmental health matters, and the issuing of the relevant health permits. They also review Occupational Health and Safety plans as part of their project review.

[11] The local Authorities here are the St. Lucia Fire and Emergency Services, The St. Lucia Solid Waste management Authority, and the Ministry of Health.

Elements of the hazardous materials management shall include: contractor must provide temporary storage on site of all hazardous or toxic substances in safe containers labeled with details of composition, properties and handling information; the containers of hazardous substances shall be placed in an leak-proof container to prevent spillage and leaching; the wastes shall be transported by specially licensed carriers and disposed in a licensed facility; paints with toxic ingredients or solvents or lead-based paints will not be used; banned chemicals will not be used on any project.

7. Use and Management of Pesticides

The project will not fund activities that involve the purchase or use of significant quantities of pesticides. For incidental, minor use of pesticides, the use of pesticides shall be approved by the contracting officer and shall conform to the manufacturers' recommendations for use and application. Any person using pesticides shall demonstrate that they have read and understood these requirements and are capable of complying with the usage recommendations to the satisfaction of the contracting officer. All pesticides to be used shall conform to the list of acceptable pesticides that are not banned by the relevant local authority. The contractor and client must ensure that appropriate chemical management measures are implemented to prevent contamination of surrounding areas, and will use only licensed and registered pest control professionals with training and knowledge of proper application methods and techniques if the case requries.

8. Use of Preservatives and Paint Substances

All paints and preservatives which includes paints for marking, shall only be used with the approval of the contracting officer. Information shall be provided to the contracting officer which describes the essential components of the materials to be used so that an informed determination can be made as to the potential for environmental effects and suitability can be made. Storage, use, and disposal of excess paints and preservatives shall be managed in conformance with the manufacturers' recommendations and as approved by the contracting officer. The contractor shall provide the contracting officer with a list of materials and estimated quantities to be used, storage, spill control and waste disposal plans to be observed during the execution of the contract. This plan is subject to the approval of the contracting officer.

9. Use of Explosives

No explosives in any form will be utilized on this project.

10. Site Stabilization and Erosion Control

The Contractor shall implement measures at the site of operations to manage all soil erosion through minimization of excavated area and time of exposure of excavated areas, preservation of existing ground cover to the extent possible, provision of approved ground cover. Where excavations are made, contractor shall implement appropriate stabilizing techniques to prevent cave-in or landslide. Measures shall be approved by the contracting officer.

The contractor must ensure that appropriate erosion control measures such as silt fences are installed. Proper site drainage must be implemented. Any drain clogged by construction material or sediment must be unclogged as soon as possible to prevent overflow and flooding. The use of retaining structures and planting with deep rooted grasses to retain soil during and after works must be considered. The use of bio-engineering methods must be considered as a measure to reduce erosion and land slippage. Keep angle of slopes within limits of soil type. Balance cut and fill to limit steepness of slopes. All slopes and excavated areas must be monitored for movement.

All construction materials, including chemicals, must be properly stored. The contractor will establish appropriate erosion and sediment control measures such as hay bales, sedimentation basins, and / or silt fences and traps to prevent sediment from moving off site and causing excessive turbidity in nearby streams, rivers, wetlands, and coastal waters.

An erosion management plan will be required where the potential exists for significant sediment quantities to accumulate in wetlands, lakes, rivers and nearshore marine systems. This plan shall include a description of the potential threat, mitigation measures to be applied, and consideration for the effects of severe weather and an emergency response plan.

With all work along the river, water quality testing and monitoring must be done before construction, and at regular intervals during the works, and then after the works are completed in order to determine turbidity levels and other quality parameters.
Construction vehicles and machinery must not be washed in or near the river, but only in designated areas outside of the site where runoff will not pollute natural surface water bodies.

11. Air Quality

The following conditions apply to work sites for the control of air quality including dust control:

- Construction materials such as sand, cement, or other fines should be kept properly covered.
- Cement should be kept stored within a shed or container.
- The sand and fines can be moistened with sprays of water.
- Unpaved, dusty construction roads should compacted and then wet periodically.
- During interior demolition debris-chutes shall be used above the first floor.
- Demolition debris shall be kept in controlled area and sprayed with water mist to reduce debris dust.
- During pneumatic drilling/wall destruction dust shall be suppressed by ongoing water spraying and/or installing dust screen enclosures at site
- The surrounding environment (sidewalks, roads) shall be kept free of debris to minimize dust.
- There will be no open burning of construction / waste material at the site.
- There will be no excessive idling of construction vehicles at sites.
- The bins of all haulage vehicles transporting aggregate or building materials must be covered on all public roads.

12. Traffic Management

In the event that contractor / construction activities will result in the disruption of area transportation services, including temporary loss of roadways, blockages due to deliveries and site related activities, the contractor shall provide the contracting officer with a traffic management plan including a description of the anticipated service disruptions, community information plan, and traffic control strategy to be implemented so as to minimize the impact to the surrounding community. This plan shall consider time of day for planned disruptions, and shall include consideration for alternative access routes, access to essential services such as medical, disaster evacuation, and other critical services. The plan shall be approved by relevant local authority.[12] and the contracting officer.

[12] The Transport Division of the Ministry Infrastructure, Ports, Energy, and Labour, with the assistance of the Chief Engineer's Office in that Ministry is the authority responsible for reviewing and approving traffic management plans.

Elements of the traffic management plan to be developed and implemented by contractor shall include: alternative routes to be identified in the instance of extended road works or road blockages; the public to be notified of all disturbance to their normal routes; signposting, warning signs, barriers and traffic diversions must be clearly visible and the public warned of all potential hazards; provision must be made for the safe passages and crossings for all pedestrians where construction traffic interferes with their normal route; there must be active traffic management by trained and visible staff at the site or along roadways as required to ensure safe and convenient passage for the vehicular and pedestrian public; Adjustment of working hours to local traffic patterns, e.g. avoiding major transport activities during rush hours or times of livestock movement .

13. Management of Standing Water

Under no circumstances shall the contractor permit the collection of standing water as a consequence of contractor activities without the approval of the contracting officer and consultation with the relevant local environmental health authority. Recommendations from that local authority on how to manage and treat the standing water must be implemented. The condition of the standing water must be monitored by the contractor to ensure that it does not present itself as a breeding ground for any pests such as mosquitoes.

14. Management of Solid Wastes -trash and construction debris

The contractor shall provide the contracting officer with a solid waste management plan as part of a site waste management plan that conforms to the solid waste management policies and regulations of the relevant St. Lucian authority[13]. Under no circumstances shall the contractor allow construction wastes to accumulate so as to cause a nuisance or health risk due to the propagation of pests and disease vectors. The site waste management plan shall include a description of how wastes will be stored, collected and disposed of in accordance with current law. Additionally the contractor shall provide for the regular removal and disposal of all site wastes and provide the contracting officer with a schedule for such removal.

15. Management of Liquid Wastes

The contractor shall provide the contracting officer with a liquid waste management plan as part of a site waste management plan that conforms to the waste management policies and regulations of the relevant St. Lucian authority[14]. Under no circumstances shall the contractor allow construction related liquid wastes to accumulate on or off the site, or to flow over or from the site in an uncontrolled manner or to cause a nuisance or health risk due to its content. The site waste management plan shall include a description of how these wastes will be stored, collected and disposed of in accordance with current law. Additionally the contractor shall provide for the regular removal and disposal of all site wastes and provide the contracting officer with a schedule for such removal.

Specific elements of the contractor's liquid waste management plan shall include: contractor to abide by all pertinent waste management and public health laws; waste collection and disposal pathways and sites will be identified for all major waste types expected from demolition and construction activities; construction and demolition wastes will be stored in appropriate bins; liquid and chemical wastes will be stored in appropriate containers separated from the general refuse; all waste will be collected and disposed of properly in approved landfills by licensed collectors; the records of waste disposal will be maintained as proof for proper management as designed; whenever feasible the contractor will reuse and recycle appropriate and viable materials (except asbestos); construction related liquid wastes must not be allowed

[13] The St. Lucia Solid Waste Management Authority is the responsible agency. The Environmental Health Department of the Ministry of Health have requested such plans as part of their permitting process as well.
[14] As per 31 above.

to accumulate on or off the site, or to flow over or from the site in an uncontrolled manner or to cause a nuisance or health risk due to its contents.

16. Special conditions – works in Forest Reserves

For any work in a designated Forest Reserve, the following will apply:

- The Forestry Department must be engaged prior to, and during all works within Forest area.
- There must be no unnecessary clearing of natural vegetation.
- Avoid the use of herbicides or other chemicals.
- Any works to be undertaken in a protected forest area must be done under the supervision of a representative of the Forestry Department.
- The contractor must ensure that any work undertaken in the forest reserve must be done by manual means.
- There must be minimal impact to flora and fauna in the forest area.
- All recognized natural habitats, wetlands and protected areas in the immediate vicinity of the activity must not be damaged or exploited.
- The contractor must ensure that all staff will be strictly prohibited from hunting, foraging, logging or other damaging activities.
- A survey and an inventory shall be made of large trees in the vicinity of the construction activity, large trees shall be marked and cordoned off with fencing, their root system protected, and any damage to the trees avoided.
- There will be no unlicensed borrow pits, quarries or waste dumps in protected areas.
- Upon completion, all wastes must be immediately removed out of the forested area.

17. Communications with the Community

The contractor must develop a communications plan for review and approval by the client. This plan must outline the measures to be undertaken to engage and maintain open communication with community. The plan must also include measures to address any complaints from the community in a fair and speedy manner towards resolution of the particular issue or issues that may be raised. This plan must also include public meetings with the community prior to, during, and upon completion of the project works in order to ensure that the affected communities are aware of the status of the project and that they may also have the opportunity to express their opinions, concerns, or guidance.

Appendix 7 - List of Key Consultations

Consultations

Agency	Person Interviewed/ meetings	Date
Engineering Consultants	Engineering & technical staff LCC Group Incorporated	Feb 2020 to present
PCU	Ms.Debroah Hippolyte_ Social Safeguards Officer	Feb 2020 to present
MIPEL/ DIPE	Eng. Amos Hippolyte_Senior Engineer	Feb 2020 to present
LLDRC	Mr.Ulric Alphonse- Chairperson, Laborie Local Disaster Response Committee	Feb 2020
CLDRC	Ms.Feria Theophilia Charles_ Chairperson, Choiseul Local Disaster Response Committee	Feb 2020
NEMO	Maria Medard-Deputy Director	Feb 2020
MAFPPNRC (Agric Extn)	Ms. Yancy Wilson_Extension Officer, Choiseul	Feb 2020
MAFPPNRC (Crown Lands)	Mr. Stanley Auguste_Officer in Charge_ Crown Lands Department	Feb 2020
MESLGE	Ms.Shema Glasgow_Social Transformation Officer_Choiseul	Feb 2020 to present
CCO	Ms. Kimberly Findley_ Secretary_ Choiseul Constituency Office, Choiseul	Feb 2020
Parliamentary Representative	Hon. Minister Bradley FeliX	Feb 2020 to present
Minibus driver/ Assocn	Alexis Holy Train President_Choiseul Minibus Association	Feb 2020
Minibus driver/ Assocn	Tony Monrose_President_ Saltibus Minibus association	Feb 2020
Minibus driver/Assocn	Dillon Campbell President_Soufriere Minibus Association	Feb 2020
WASCO	Ginelle Fontinelle, Control Officer, Control room, Vieux Fort	Mar, 2020

Key

CCO	Constituency Council Office
CLDRC	Choiseul Local Disaster Response Committee
DIPE	Department of Infrastructure, Ports, and Energy
LLDRC	Laborie Local Disaster Response Committee
MAFPPNRC	Ministry of Agriculture, Fisheries, Physical Planning, Natural Resources and Cooperatives
MESLGE	Ministry of Local Government
MIPEL	Ministry of Infrastructure, Ports, Energy, and Labour
PCU	Project Coordinating Unit
NEMO	National Emergency Management Office
WASCO	Water and Sewerage Company Limited