Cooperative Republic of Guyana

Flood Risk Management Project – Additional Financing – P147250

Environmental and Social Assessment Framework

Ministry of Agriculture –
Agriculture Sector
Development Unit

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Acronyms

ASDU	Agriculture Sector Development Unit
CAP	Conservancy Adaptation Project
CITES	Convention for International Trade for Endangered Species
CSQAP	Construction Supervision Quality Assurance Plan
EA	Environmental Assessment
EDWC	East Demerara Water Conservancy
EIA	Environmental Impact Assessment
EPA	Environmental Protection Agency
EPP	Emergency Preparedness Plan
ESMF	Environmental and Social Management Framework
FRM	Flood Risk Management
GDP	Gross Domestic Product
GFC	Guyana Forestry Commission
GNBS	Guyana National Bureau of Standards
GoG	Government of Guyana
GSDS	Green State Development Strategy
IDA	International Development Association
ITCZ	Inter Tropical Convergence Zone
IUCN	International Union for the Conservation of Nature
LCDS	Low Carbon Development Strategy
MoA	Ministry of Agriculture
NDIA	National Drainage and Irrigation Authority
NDS	National Development Strategy
NEAP	National Environmental Action Plan
O&M	Operation and Maintenance
PDO	Project Development Objective
RPF	Resettlement Policy Framework
SDR	Special Drawings Right
SOP	Standard Operating Procedures
UNCBD	United Nations Convention on Biological Diversity

1. INTRODUCTION

1.1 Project Background

Guyana has a land area of 215,000 square kilometres (83,000 square miles) and a low population density, with ninety percent of its 760,000 inhabitants living on the narrow coastal plain, which represents ten percent of the country's area. This is an area of reclaimed lands, much of which lies below sea level, protected by a seawall complex. This area is crucial to the economy of the country, supporting the majority of the population including the nation's capital, Georgetown, and a large part of Guyana's agrarian economy which accounts for approximately 27 percent of the nation's Gross Domestic Product (GDP). As a flood prone region, reducing risk against natural disasters is important to allow this region's economy to continue to encourage shared prosperity through its role as an engine for economic growth, job creation and poverty reduction in Guyana.

The low-lying coastal plains along the Atlantic Ocean are highly populated and generally lie below sea level. They are bordered to the south by the East Demerara Water Conservancy (EDWC) and to the north by a seawall complex along the Atlantic Ocean. Drainage in the coastal area is undertaken by a network of drainage and irrigation canals which are in need of upgrading and expansion.

The EDWC system is separate from this drainage system. It stores water inland and drains directly to nearby rivers and the Atlantic Ocean to avoid flooding in the coastal area. It includes a reservoir fronted on three sides by an earthen dam with six main drainage relief canals. Three of these canals drain into the Demerara River to the west (Kofi, Land of Canaan and Cunha canals), two drain into the Mahaica River to the east (Lama and Maduni relief structures) and a new canal drains north directly into the Atlantic Ocean (Hope-Dochfour canal).

1.2 Project Location: The Country of Guyana

Guyana is a low-lying country situated in the Northern part of South America, bordering the North Atlantic Ocean, and with Suriname, Venezuela and Brazil as neighbours. It is the third smallest country in South America after Suriname and Uruguay, and with a population of less than a million (mainly of East Indian, African, mixed, and Amerindian descent), it has one of the lowest population densities in the world. Guyana is also the third poorest country in Latin America and the Caribbean, after Haiti and Nicaragua, has one of the highest rates of skilled migration in the world, and is the greatest recipient of remittances (relative to GDP) in the region. It is well endowed with natural resources including bauxite and gold, fertile agricultural lands, and large tropical forests. Ninety percent of the inhabitants live on the narrow coastal plain, which represents 10 percent of the country's area and lies largely below sea level. With 77.2% percent of the country (152,050 km2) covered by forests, Guyana has one of the world's highest forest cover per capita ratios.

Guyana is a center of biodiversity and is initiating a series of efforts to prepare itself to provide environmental services on a global scale, which include using the forest as a carbon sink that can generate a new revenue stream for the country. Much of the country's indigenous population (9.2 percent) lives in forests on which they depend for their economic, social and cultural subsistence. These Amerindian communities hold formal land titles for over 2.4 million hectares. The annual deforestation rate is estimated at 0.1-0.3 percent, which is relatively slow, compared to most tropical countries, and about 90 percent of Guyana's forest is still intact. At present, the main pressures on forests are considered to be forest clearing for mining, the conversion of forest to agriculture, and the opening of infrastructure, especially roads. The main factors that have protected Guyana's forests so far are considered to be the very low population density away from the coastal plains, and the lack of physical accessibility to the forest hinterland.

Guyana is committed to addressing the various challenges that constrain its growth by:

- Protecting the environment and managing natural resources with simultaneous sustainable social and economic development.
- Managing the sea level rise and changes in rainfall patterns through disaster mitigation.
- Improving infrastructure to promote growth and private sector development.
- Improving the quality of education.
- Improving the quality of health services which is hampered by the emigration of skilled health personnel.
- Deepening governance and modernizing the state, while building on progress already made.
- Preventing crime and enhancing citizen's security

1.3 Original Project's Objectives and Status

The Government of Guyana (GoG) through the Ministry of Agriculture (MoA) is currently implementing the Flood Risk Management Project. The Project Development Objective (PDO) is to reduce the risk of flooding in the low-lying areas of the East Demerara. The US$11.89 million IDA Credit was approved in 2014 and, as of May 2019, the available amount of US$10.6 million is fully committed. The discrepancy between the approved credit and the available one is due to exchange shortfalls. The project was designed to address several priority interventions identified by the GoG through the Conservancy Adaptation Project (CAP) study and it consists of three components: 1) Priority works for flood risk reduction, 2) Institutional strengthening for flood risk reduction, and 3) Project management and implementation support. The status of the specific components is as follows:

Component 1: Priority Works for Flood Risk Reduction (US$10.3 million)

Upgrading critical parts of the EDWC dams. The rehabilitation of 4 km out of the 67 km of the EDWC dam has been on-going since August 2016. Within the Conservancy, the rehabilitation of small existing irrigation structures is currently on hold because of lack of available resources.

Investments in the East Coast Demerara Drainage System. The priority flood risk reduction investments in the East Coast Demerara Drainage system have been successfully completed in 2018, in particular the construction of three pump stations at Buxton, Hope/Enmore, and Lusignan. Overall, the pump stations cover an area of 7,800 ha and serve more than 47,000 people directly in Region 4, thereby reducing their exposure to recurrent floods.

Component 2: Institutional Strengthening for Flood Risk Reduction (US$0.4 million)

Dam Safety Improvement. The 'Construction Supervision and Quality Assurance Plan', the 'Instrumentation Plan', and the 'Operations Maintenance and Surveillance Plan' have been completed and are currently in use to guide and supervise project works. The installation and improvement of instruments to monitor and record the dam behaviour and the purchase of instrumentation to expand the hydro-meteorological data in the EDWC to include upstream watershed data - part of the Installation Plan - have been completed.

Communications. The Project Implementation Unit (PIU) – the Agriculture Sector Development Unit (ASDU) – is preparing a video to support the MoA on its on-going efforts in the disaster risk management and the drainage and irrigation sectors, highlighting the works carried out under the FRM and its impact on the population (before and after approach). Other communications activities are on hold. The revised Emergency Preparedness Plan (EPP), the flood modelling and capacity building activities, and the communication and outreach activities are currently on hold for lack of resources available.

Component 3: Project Management and Implementation Support (US$1.2 million)

The operational costs have been efficiently optimized by sharing resources with other projects implemented by the World Bank in Guyana. In particular, the PIU is also implementing the Cunha Canal Rehabilitation Project, a US$3 million recipient-executed grant financed by Guyana's REDD+ Investment Fund (GRIF) with the World Bank implementing the fiduciary arrangements.

Overall the Flood Risk Management Project is progressing well, as most of the activities have been completed and some of the project objectives, as measured by framework indicators, have been achieved in a timely fashion. The project funds are fully committed and an extension of one-year (closing date moved from January 31, 2019 to January 31, 2020) has recently been granted to complete the EDWC contract that experienced delays. However, few activities are on hold due to the lack of financial resources available since the exchange rate reduced the amount of available IDA credit by about 10 percent. In particular, activities on hold include: the update of the EPP, the flood modelling and capacity building activities, the rehabilitation of small existing irrigation structures, and the communication and outreach activities. As such, Additional Financing (AF) of US$4.5 million for the Flood Risk Management Project is being considered.

1.4 Rationale for Additional Financing

As noted above, completing the project as originally planned would require AF because of exchange losses between the Special Drawings Right (SDR) and US dollars. Since the project was effective, the available project credit amount of US$11.89 million in 2014 has been reduced to around US$10.6 million in 2019, due to exchange losses. This is a loss of around US$1.2 million, or 10 percent of the budget. Currently, 100 percent of the remaining budget has been committed, therefore this shortfall will impact project activities, and some outputs will not be completed, including: completing the works on the EDWC dam, updating the EPP, the flood modeling and capacity building activities, the rehabilitation of small existing irrigation structures, and the communication and outreach activities. The funds will be utilised as follows:

- About US$0.9 million of the AF will be used to finance the completion of the rehabilitation works of the EDWC dam (completion of one activity of Component 1). The works on the dam suffered from exchange losses and delays, thus requiring extra time and funds to be completed maintaining the high quality of the work carried out so far.

- About US$2.9 million of the AF will finance flood risk reduction works in the Liliendaal area (scaling up of Component 1). The Liliendaal area has severe flood problems during intense rainfall events and it was identified in the CAP study as one of the coastal lowlands' priority areas for intervention. The CAP study identified various complementary potential interventions in this area to reduce the risk to flooding. These include: removing bottlenecks in the drainage system, adding more retention capacity and also adding extra pump capacity to the existing pump station at Liliendaal to allow drainage of water off the land east of Sheriff Street and its environs, which include the University of Guyana and the Cyril Potter College of Education compounds. Recent field visits and preliminary assessments revealed that the existing pump station cannot drain its maximum capacity since one of the two pumps needs substantial repair. Following the CAP study recommendations, the additional resources will be targeted to no-regret measures based on a drainage system assessment of the Liliendaal area. The scaling up is in alignment with the overall project purpose and scope.

- About US$0.1 million of the AF will be used to update the Emergency Preparedness Plan (EPP) (Component 2). The plan details roles, responsibilities, and actions to be taken in case of dam failure and needs to be updated to reflect the ongoing rehabilitation and the other

interventions carried out in the course of the FRM.

- About US$0.6 million of the Additional Financing will contribute to project management and implementation support (Component 3). This component will finance the provision of support for the ASDU in the Ministry of Agriculture to strengthen and develop their institutional capacity to conduct project management and evaluation, including reporting and auditing activities.

- The parent project closing date will also have to be aligned with the AF proposed closing date. A preliminary time estimation to implement the additional financing is about 30 months. Adding a six months contingency time, the proposed timeline for the additional financing is therefore 36 months, or three years, hence from the proposed Board date of November 2019 to November 2022.

1.5 Description of Additional Financing

The overall approach, objectives and scope of the AF to the Flood Risk Management Project will not differ substantially from those of the parent project. The proposed additional IDA credit of US$4.5 million will allow the completion of most activities originally planned under the Flood Risk Management Project and currently not fully completed or on hold due to the budget loss caused by the exchange rate shortfall. Furthermore, it will allow the scaling up of component 1. The anticipated costs per component are detailed in the table below.

Table 1: Anticipated Cost by Component

Component	Parent Project Amount[1] [US$M]	Additional Financing Amount [US$M]	Total (Parent + AF) Amount [US$M]
Component 1: Priority Works for Flood Risk Reduction	9.1	3.8	12.9
Component 2: Institutional Strengthening for Flood Risk Reduction	0.4	0.1	0.5
Component 3: Project Management and Implementation Support	1.2	0.6	1.8
Total	**10.7**	**4.5**	**15.2**

1.6 Proposed Changes

There will be no changes to the PDO. The PDO of the FRM project is to reduce the risk of flooding in the low-lying areas of the East Demerara. The will be also no changes to the project components, but one activity will be scaled-up. The project components of the AF will stay the same as those of the FRM project; the only difference will be the scaling up of one activity under component 1. Therefore, the AF design will be as follows:

Component 1: Priority Works for Flood Risk Reduction

Sub-component 1.1 – Upgrading Critical Parts of the EDWC Dams. Reconstruction of 4 km of the North-Eastern Dam of the EDWC is well advanced but still on going. Delays in delivering this subcomponent, due to: i) a 6-month delay in awarding the supervision contract, ii) having to fill an unanticipated seepage drain; and iii) slow drying of stockpiled materials, were the key issues warranting the extension of the project as well as the AF. Works are moving slower than anticipated,

[1] Amount available in US$ with current exchange SDR/US$ as of May 15, 2019

compaction being the main issue. This sub-component also suffered from the loss of budget due to exchange shortfalls. The AF budget will allow the completion of the activities of this sub-component, without modifying its initial design or scope.

Sub-component 1.2 – Investments in the East Coast Demerara Drainage System. The rehabilitation of three pump stations as per the original FRM plan was completed in time and within the allocated budget. The MoA is proposing to use the additional financing to also scale up one activity of this sub-component, in alignment with the overall project purpose and scope. Specifically, the MoA proposes the rehabilitation of a pump station at Liliendaal. Improvement to the Liliendaal drainage system was identified as a priority area for intervention by the CAP, in order to allow efficient drainage of water off the land east of Sheriff Street and its environs, which include the University of Guyana and the Cyril Potter College of Education compounds. The Liliendaal drainage system serves a total area of 9.6 km^2, which is mainly urbanized. The existing pumping capacity of 8.5 m^3/sec and equivalent unit area drainage rate of 76 mm/day would be a good drainage rate for agricultural land but is not sufficient for urban areas considering the expected rainfall depths. Furthermore, one of the two existing pumps is not working and requires substantial repairs. Following the recommendation of the CAP, the AF will allow a more detailed exploration of a design-effective rehabilitation of the Liliendaal pump station to include repair of the non-functional pump station as well as adding extra pump capacity and/or modifications to the drainage system such as increased culvert widths with the focus on improving efficiency of the drainage system within the available resources.

Sub-component 1.3 – Construction Supervision and Quality Assurance. The 'Construction Supervision and Quality Assurance Plan' was completed and used to guide and supervise construction of the North-Eastern dam of the EDWC and the new pumps under the FRM. The plan will be used to guide the construction of the additional pump at Liliendaal under the AF.

Component 2: Institutional Strengthening for Flood Risk Reduction

Sub-component 2.1 – Dam Safety Improvement. While the 'Construction Supervision and Quality Assurance Plan', the 'Operation, Maintenance and Surveillance' manual and plan, and the 'Instrumentation plan for Surveillance and Forecasting' were developed and implemented under the FRM, the EPP could not be updated for shortage of funds. Therefore, the plan, aimed at specifying roles of responsible parties and procedures to respond in the case of dam failure (from the perspective of both dam operations and response of downstream communities), will be completed under the AF.

Sub-component 2.2 – Support to Flood Modelling. This FRM sub-component has been on hold because of shortage of funds and will still be on hold as not enough funds could be secured to carry out the proposed activities at this stage.

Sub-component 2.3 – Communications. Several communications activities that were to be carried out under the FRM are currently on hold for lack of funds and, therefore, will be completed under the AF. These include: (i) public meetings in the project areas; (ii) coordination meetings with development partners; and (iii) production of information materials on the project. Additional communications activities will be developed and carried out to specifically address the scaled-up component of the AF (e.g. public meetings and community engagement at the Liliendaal pump station site).

Component 3: Project Management and Implementation Support.

This component of the FRM was designed to finance the provision of support for the ASDU in the MoA to strengthen and develop their institutional capacity to conduct project management and evaluation, including reporting and auditing activities. As was the case under the parent project, the AF will continue supporting: (i) the hiring of specialized staff; (ii) consultants to collect socio-economic data for monitoring and evaluation; (iii) consultant services for supervision of contracts; (iv) consultants for

preparation of technical and financial project reporting, and mid-term and ex-post evaluation of project activities; (v) project audits; (vi) contracting of environmental and social safeguard consultants to develop, implement and supervise relevant plans and provide guidance on mitigation measures, as needed; (vii) trainings on areas such as procurement, safeguards, monitoring and evaluation, and financial management to strengthen the ASDU in their role as PIU; (viii) operating costs for the ASDU; and (ix) computers and equipment for the ASDU.

Changes to the Project Results Framework. The Project Results Framework will be modified to reflect the scaling up of Component 1, as well as the additional resources and timeframe of the AF.

Change in Closing Date. A preliminary time estimation to implement the AF is about 30 months. Adding a six months contingency time, the proposed timeline for the additional financing is therefore 36 months, or three years, hence from the proposed Board date of December 2019 until December 2022. It is also proposed to align the closing date of the Parent project (currently January 2020) with the proposed Additional financing closing date.

Changes in Disbursement Arrangements. There will be no changes in disbursement arrangements between the FRM and the AF. The disbursement projection for the AF has been updated.

Changes in Procurement Procedures: The FRM procurement procedures are to align with the updated AF procurement procedures.

Changes in Safeguards Categories and Policy Triggered. There are no changes in safeguards categories and policy triggered between the FRM and the AF.

1.7 Project Locations

The activities to be undertaken through the additional financing are located in two areas: (i) the East Demerara Water Conservancy; and (ii) the Liliendaal area along the East Coast of Demerara.

The East Demerara Water Conservancy: The EDWC stores water inland and drains directly to nearby rivers and the Atlantic Ocean to avoid flooding in the coastal area. It includes a reservoir fronted on three sides by an earthen dam with six main outlets to drainage relief canals. Three of these outlets lead to canals that drain into the Demerara River to the west (Kofi, Land of Canaan and Cunha canals), two drain into the Mahaica River to the east (Lama and Maduni relief structures) and a new canal drains north directly into the Atlantic Ocean (Hope-Dochfour canal).

Liliendaal*:* The areas in Region 4 outside of the EDWC that drain to the Atlantic Ocean and the Demerara River are populated and generally lie below sea level. They are bordered to the south by the EDWC and to the north by a seawall complex along the Atlantic Ocean and to the east and west by the Mahaica and Demerara Rivers respectively. Drainage in the coastal area is undertaken by a network of drainage and irrigation canals which are delineated by their drainage areas. It also in this area that the drainage channels from the EDWC are located. The Liliendaal Pump Station is located within this area. Improvement to the Liliendaal drainage system was identified as a priority area for intervention by the CAP, in order to allow efficient drainage of water off the land east of Sheriff Street and its environs, which include the University of Guyana and the Cyril Potter College of Education compounds. The Liliendaal drainage system serves a total area of 9.6 km^2, which is mainly urbanized.

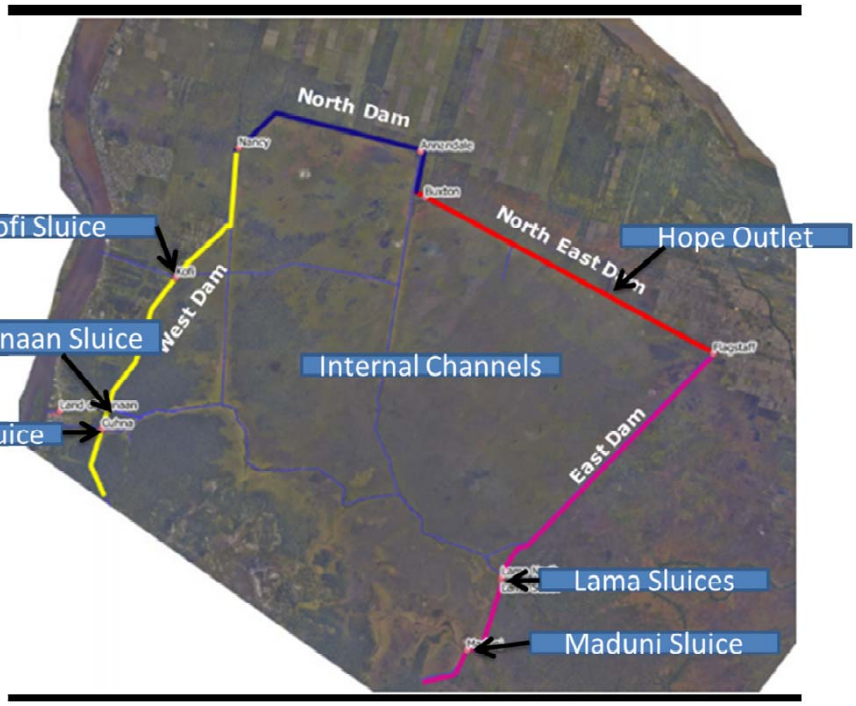


Figure 1: EDWC including the Northeast Dam where works are being undertaken

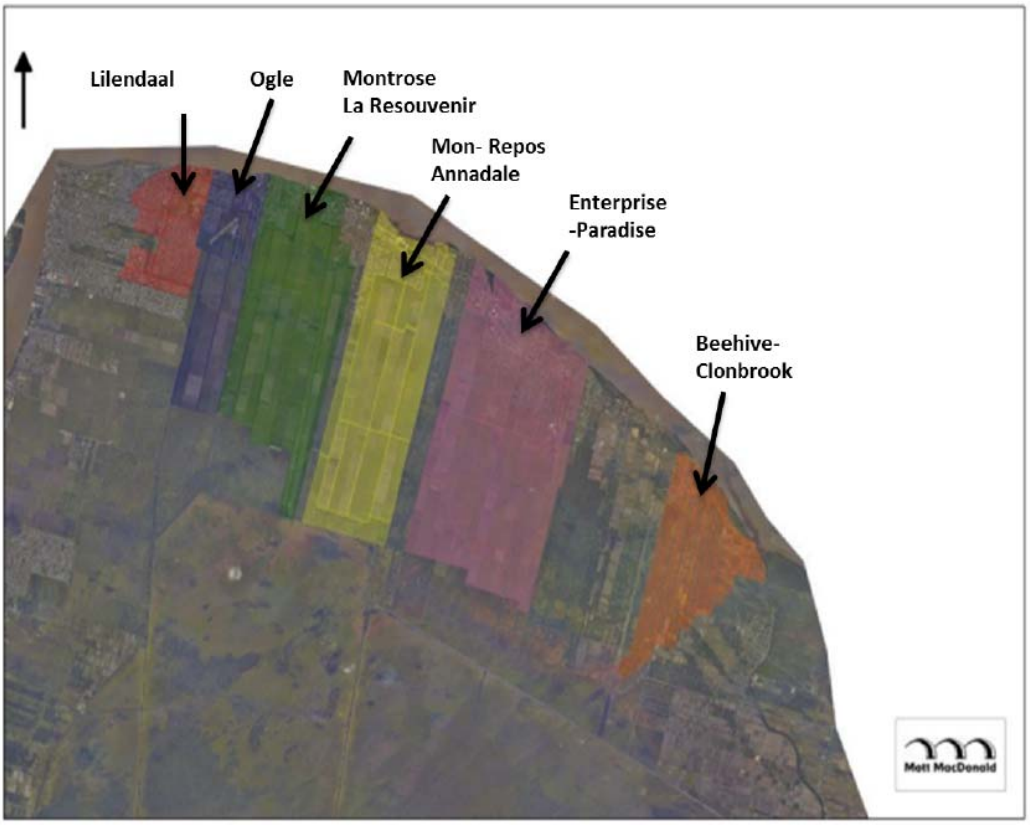


Figure 2: Coastal drainage systems showing the Liliendaal Catchment Area

2. SCOPE OF ESMF

The safeguards instruments prepared for the parent project were the following:

(i) Environmental and Social Assessment Framework; and
(ii) Resettlement Policy Framework.

Given that at the time the sub-projects were not yet defined with the exception of the first year's investments, it was required that an Environmental and Social Management Framework (ESMF) be prepared for the project to cover the succeeding years' works. The ESMF was informed by an Environmental and Social Management Assessment conducted for the project in 2014. The specific objectives of the ESMF were: (i) to assess the potential environmental and social impacts of the Project, whether positive or negative, and propose mitigation measures which will effectively address the impacts; (ii) to inform the project preparation process of the potential impacts of different alternatives, and relevant mitigation measures; and (iii) to establish clear directives and methodologies for the environmental and social screening of subprojects to be financed under the proposed Project. The Environmental and Social Assessment Framework is designed to provide procedures and processes for assessment and implementation of these investments as the designs are finalized and financing is identified. This is anticipated to be implemented over a period of years.

This ESMF has been revised and updated to address the Additional Financing and focuses on the physical aspects of the Additional Financing. However, there are no changes neither modifications on the type of physical intervention and works that are being conducted within the EDWC under the Additional Financing. These works, during 2014, were assessed and impacts determined and the necessary management plans were then prepared and implemented. The environmental risks are not deemed significant since the Additional Financing will finance works to rehabilitate existing structures rather than building new ones in new sites. The social risk is also moderate as the project will not have negative impacts on people and no resettlements are foreseen for implementing the works that are considered in this AF.

3. LEGISLATIVE FRAMEWORK

3.1 The World Bank Safeguards Policies

During project preparation, five environmental and social Safeguards Policies have been applied to the Disaster Risk Management Project. These policies were triggered to ensure that project funds are engaged in a manner consistent with Bank institutional policies with respect to social and environmental protection and management.

OP/BP 4.01 – Environmental Assessment (EA)

This policy is triggered if a project is likely to have potential (adverse) environmental risks and impacts in its area of influence. OP 4.01 covers impacts on the natural environment (air, water and land); human health and safety; physical cultural resources; and transboundary and global environment concerns. This project has been classified as Category B and thus an environmental assessment was required during preparation of the project. According to the Policy, a 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 mitigation 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*"

OP/BP 4.04 – Natural Habitats

This safeguard seeks to support the protection and rehabilitation of natural habitats associated with Bank-financed projects. The Natural Habitats Policy is triggered by any project (including any subproject under a sector investment or financial intermediary loan) with the potential to cause significant conversion (loss) or degradation of natural habitats, whether directly (through construction) or indirectly (through human activities induced by the project).

Natural habitats are land and water areas where most of the original native plant and animal species are still present. Natural habitats comprise many types of terrestrial, freshwater, coastal, and marine ecosystems. They include areas lightly modified by human activities, but retaining their ecological functions and most native species.

The Natural Habitats Policy distinguishes between critical and other natural habitats. Critical natural habitats are those natural habitats which are either (i) legally protected, (ii) officially proposed for protection, or (iii) unprotected but of known high conservation value (see OP 4.04, Annex A, Para. 1.(b) for official Bank definition). Bank-supported projects must avoid significant conversion or degradation of any critical natural habitats. The environmental assessment process (OP 4.01) should identify any critical natural habitats within a proposed project's area of influence. For other (non-critical) natural habitats, the Natural Habitats Policy requires avoiding or minimizing damage to natural habitats to the extent feasible (see OP 4.04, Para. 5). If significant conversion or degradation of a non-critical natural habitat is needed to achieve a project's key objectives, the project must include mitigation measures acceptable to the Bank.

The EDWC including the savannah swamp lands areas are highly disturbed environs with significant amounts of habitat loss/stress already experienced as a result of human interactions/encroachment. As a consequence, the existing biological realm of the area is predominated by species that adapt well to changing environments. It is therefore expected that there will be a rapid recovery of habitats and associated biodiversity owing to species adaptability to the habitat stresses that will ensue from proposed project works. The species affected directly by the works are important for embankment stability and act as a 'prevention mechanism' against soil erosion. They also provide a habitat for many faunal species serving as roosting and breeding sites for birds, insects and other fauna. Appropriate mitigation to minimize and negate impacts associated with the proposed works will be implemented.

The project areas along the canal systems are largely converted habitat including a combination of urban areas and agricultural areas. Vegetation along the canal system includes secondary growth vegetation dominated by common weeds, shrubs and trees and aquatic vegetation within the Canal system are sparse and consist of common species. Like in the EDWC project areas there are species important for embankment stability and provide useful habitat and mitigation measures will be implement to maintain these uses.

There are no endangered species noted at the site and none of the species identified were listed on the IUCN species listings or restricted by the CITIES listings. Habitat loss will be the major impact on faunal diversity. In its present condition, existing habitats are severely stressed by human activity. As such, it is crucial that habitat destruction is minimized and that proposed works are done in a manner that allows natural regeneration/resuscitation of habitats and/or to ensure that re-vegetation is done along embankments and contiguous area after works are completed.

Particular attention is applied to critical habitats where impacts may result in ecological modifications that affect core survival requirements for resident species particularly where endangered, species are involved. All construction sites will be rehabilitated and re-vegetated with native shrubs and trees. None of the proposed works would result in significant degradation or conversion of natural habitats. This safeguard is triggered based on the possibility that activities may affect natural habitats and the related management measures to ensure rehabilitation of these areas.

OP/BP 4.11 – Physical Cultural Resources.

This policy is intended to avoid or mitigate adverse impacts on physical cultural resources from development projects financed by the World Bank. Physical cultural resources are defined (under this policy) as movable or immovable objects, sites, structures, groups of structures, natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. Physical cultural resources may be located in urban or rural settings, and may be above ground, underground, or underwater. Their cultural interest may be at the local, provincial or national level, or within the international community. The assessment and mitigation is done through the Environmental Assessment Process. As no cultural property are at this stage anticipated to be affected by the works, the policy the project as a precautionary measure in case cultural resources are encountered as part of the environmental assessment process or during construction.

OP/BP 4.10 – Involuntary Resettlement

This policy is intended to avoid the long-term hardship, impoverishment, and environmental damage that may be caused by involuntary resettlement. The policy does this through: (a) avoiding involuntary resettlement where feasible, or minimized, exploring all viable alternative project designs; (b) where feasible conceiving and executing involuntary resettlement programs as sustainable development programs, providing sufficient investment resources to enable the persons displaced by the project to share in project benefits and (c) assist displaced persons in their efforts to improve their livelihoods

and standards of living or at least to restore them. The policy covers not only physical relocation, but any loss of land or other assets resulting in:(i) relocation or loss of shelter;(ii) loss of assets or access to assets; and (iii) loss of income sources or means of livelihood, whether or not the affected people must move to another location.

The policy also applies to the involuntary restriction of access to legally designated parks and protected areas resulting in adverse impacts on the livelihoods of the displaced persons.

Given that potential sub-projects may require relocation or compensation of Project Affected Persons, this policy is triggered and a Resettlement Policy Framework (RPF) was prepared as a separate document to guide the process of avoiding or compensating for any resettlement impacts identified.

OP/BP 4.10 – Indigenous Peoples

The Indigenous Peoples safeguard aims to ensure that Bank sponsored projects protect and include the rights and perspectives of potentially affected indigenous groups. Such groups possess specific and often unique social and cultural characteristics that need to be considered and incorporated in the design and execution of Bank sponsored activities. It is not expected the project works will impact Amerindian groups and therefore the safeguard is no longer triggered. The majority of the Amerindian Population in Guyana reside in Regions 1, 7, 8 and 9 which is out of the project area, and the nearest population is outside the project area and will not be impacted by the works.

3.2 Guyana National Laws and Regulations.

The Flood Risk Management Project implementation will need to comply with the Guyana national legal framework. Table 1 shows the main national environmental regulatory framework of Guyana applicable to this project.

Project activities area are also potentially subject to the application of international treaties and agreements in which Guyana is signatory. These treaties pursue the conservation of biological diversity, wetlands and marine ecosystems and promote adequate management of pesticides, climate change, among other topics (see Table 1).

Table 2. Guyana Environmental Legal Framework

National Regulatory Framework
Environmental Protection Act, 1996
Environmental Protection (Air Quality) Regulations, 2000
Environmental Protection (Noise Management) Regulations, 2000
Environmental Protection (Water Quality) Regulations, 2000
Environmental Protection (Hazardous Waste Management) Regulations, 2000
Environmental Protection (Litter Enforcement) Regulations, 2013
Forests Act, 2009
Pesticides and Toxic Chemicals Control Act, 2000
Pesticides and Toxic Chemicals (Amendment) Regulations, 2007
Pesticides and Toxic Chemicals Control (Amendment) Act, 2007
Pesticides and Toxic Chemicals Regulation, 2004
Occupational Health and Safety Act
Food & Drug Act, 1971
National Trust Act, 1972
Drainage and Irrigation Act, 2004

International Treaties
United Nations Framework on Climate Change (UNFCCC)
Kyoto Protocol (and its successor)
United Nations Convention on Biological Diversity (UNCBD)
Cartagena Protocol on Biosafety
Nagoya-Kuala Lumpur Supplementary Protocol on Liability and Redress
Nagoya Protocol on Access and Benefit Sharing
International Plant Protection Convention
United Nations Convention to Combat Desertification (UNCCD)
United Nations Law of the Sea Convention
International Convention for the Prevention of Pollution from Ships (MARPOL 73/78)
Cartagena Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region
Protocols to the Cartagena Convention
Ramsar Convention on Wetlands
Convention on the International Trade of Endangered Species of Wild Flora and Fauna (CITES)
Convention for the Control of Transboundary Movements of Hazardous Wastes
Stockholm Convention on Persistent Organic Pollutants
Rotterdam Convention on Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade
Treaty of Amazonian Cooperation
Convention Concerning the Protection of the World Cultural and Natural Heritage
UNESCO Convention of the Protection of the Underwater Cultural Heritage

The following information summarizes some of the environmental regulations of Guyana included in Table 1. However, it is recommended for project personnel in charge of the environmental and social supervision of this Project and for future contractors responsible to comply with this ESMF, to consult directly with the Environmental Protection Agency (EPA) personnel about country regulations, procedures and permits and/or visit their website (http://www.epaguyana.org).

The Environmental Protection Act, 1996 (As amended by the Environmental Protection Act, 2005)

The Environmental Protection Act, 1996, and the Environmental Protection Amendment Act 2005, establishes the basic institutional and regulatory framework within which all activities that may significantly impact on the natural, social, and cultural environments are assessed. The Act also provides that the EPA will be the central coordinating agency for environmental management in the relevant sectors in Guyana. For example, the EPA also has Memoranda of Understanding with the Guyana Geology and Mines Commission (GGMC) and the Guyana Forestry Commission (GFC).

Section 68 of the Act provides for the elaboration of regulations to articulate specific areas of environmental management, and of relevance are the Regulations on hazardous waste management, water quality, air quality, noise management and environmental authorization which were established under the Environmental Protection Act in 2000. These pollution management regulations were developed to regulate and control the activities of developmental projects during construction and operation. Standards establishing the permissible parameters under these regulations are being developed[2]. In addition, the Regulations on litter enforcement were also developed under the Act to address the issue of littering.

[2] For example the Interim Guidelines for Noise Emission into the Environment, 2009

In Sec. 4 (1) (a), of the Act, the EPA is given the mandate to *"take such steps as are necessary for the effective management of the natural environment so as to ensure conservation, protection and sustainable use of its natural resource*s". In addition the Agency is given the overall responsibility to:

- Take necessary steps for effective management of the natural environment to ensure conservation, protection and sustainable use of its natural resources;
- Ensure that any developmental activity, which may cause an adverse effect on the natural environment, is assessed before such activity is commenced;
- Coordinate and maintain a programme for the conservation of biological diversity and its sustainable use; and
- Coordinate the establishment of national parks and protected areas system and a wildlife protection management programme.

In fulfilling the above listed functions, the EPA is required to ensure projects such as those which falls under the Flood Risk Management Project are authorized and are in compliance with the environmental requirements.

Environmental Protection (Air Quality) Regulations 2000

These Regulations were formulated to protect the air quality and provide the necessary infrastructure for controlling the amount of contaminants by stipulating specific allowable levels of emissions that are released into the atmosphere at any given time. Parameters are specified for several contaminants including smoke, solid particles and carbon monoxide.

Environmental Protection (Water Quality) Regulations 2000

These Regulations were developed to manage the discharge of waste matter into inland and coastal water bodies. They provide for minimizing the contamination of potential and existing water supply sources.

Environmental Protection (Noise Management) Regulations 2000

These regulations are concerned with the control and management of noise emission in Guyana. In practice, the EPA (Guyana) combines the Regulation with the Guyana National Bureau of Standards (GNBS) Noise Standard into the atmosphere, since the Regulation is silent on measurements and parameters for ambient noise emission etc.

Environmental Protection (Hazardous Waste Management) Regulations, 2000

These Regulations cover the management of waste[3] including chemical waste and cover industrial, commercial and any other activity that produces waste. Some of the key activities which are covered under the Regulations are generation, treatment and disposal[4] of hazardous waste. The Regulation is read and construed as being in addition to, and not in contravention of the Pesticides and Toxic

[3] Hazardous waste is any "waste or combination of wastes which, because of its quantity, concentration or physical, chemical or infectious characteristics, may pose a substantial hazard to human health, and belong to any category contained in Schedules I, unless they do not contain any of the characteristics contained in Schedule II and includes waste that is hazardous industrial waste, acute hazardous waste chemical, hazardous waste chemical, severely toxic waste, flammable waste, corrosive waste, reactive waste, radioactive waste, clinical waste, leachate toxic waste or polychlorinated biphenyl waste.

[4] Under the Regulations, disposal is defined as "the discharge, deposit, injection, dumping or placing of any hazardous waste
into or on any land so that it may enter the environment, be emitted into the air or discharged into any waters, including groundwater"

Chemicals Control Act 2000 (No. 13 of 2000). Based on the definition all chemical wastes including persistent organic pollutants (POPs) are covered under these Regulations for the purposes of management.
Permits are required for the generation of waste which is monitored throughout the production, storage, transport and release phases. The waste streams on which focus is centered for control are as follows:

(a) Clinical Wastes from medical care in hospitals, medical centers and clinics;
(b) Wastes from the production and preparation of pharmaceutical products;
(c) Wastes from the production, formulation and use of biocides and phytopharmaceuticals;
(d) Waste pharmaceuticals, drugs and medicines; and
(e) Wastes from the manufacture, formulation and use of wood preserving chemicals.

The Environmental Protection (Authorizations) Regulations, 2000

These Regulations are concerned with the guidelines for granting authorization for projects that can have medium to high environmental impacts in Guyana. Guidelines and procedures are specified in its contents and a fee structure in its schedule.

Environmental Protection (Litter Enforcement) Regulations, 2013

These Regulations provide for the enforcement against litter offences. It is an offence under these regulations to (a) place litter in a public place; (b) permit or cause another person to litter a public place or; (c) have litter on private premises that pose a health risk. Under the Litter Prevention Regulations, the contractor will have to ensure that solid waste generated is managed and disposed of in an acceptable manner.

Forests Act, 2009

The Forestry Act 2009 sets a regime for the sustainable management of the state forests, by providing State forests through concessions for forest activities, including the conservation of biological diversity and environmental services provided by the forest. Mangrove forests are also protected by the Act. The second part of the Act provides for the issuance of five types of state forest authorizations: concessions, exploratory permits, use permits, community forest management agreements and afforestation agreements. This section also addresses compliance with occupational health. The Act prohibits acts that could cause forest fires in State Forest areas and allows the GFC to declare certain areas to be fire protection areas. The Act places emphasis on value added activities by addressing issues of quality control through legally binding codes of practice which can be subject to amendments from time to time. Issues of under-pricing, unlawful exportation of forest produce, trade of timber in contravention to the GFC's guidelines, and procedures for ownership of concession areas and change thereof, are also outlined in the Act.

Chemical Use and Pesticides: There are a number of legal instruments governing chemical use including pesticides. As maintenance and clearing under the project will be done manually or mechanically no pesticides will be procured or used as a result of the project. The legislation is included here for completeness sake.

Pesticides and Toxic Chemicals Control Act, 2000

The management of chemicals in Guyana is governed by the Pesticides and Toxic Chemicals Control Act 2000 (No.13 of 2000). This Act provides for the establishment of the Pesticides and Toxic Chemicals Control Board, which comprise representatives from the Ministry of Agriculture, Ministry of Health, Environmental Protection Agency and other representatives from the private sector and non-governmental organization.

A Secretariat has been established for the management of pesticides and toxic chemicals with the administrative head being the Registrar of Pesticides and Toxic Chemicals. All chemicals used in Guyana must be registered by the Board. The decision to register or not is done based on registration submission to the Board. The relevant documentation are examined along with international guidance and previous decisions emanating from international agencies such as the Food and Agricultural Organization of the United Nations (FAO), United Nations Environmental Programme (UNEP), *Stockholm Convention on Persistent Organic Pollutants (POPs)*[5]*, the Rotterdam Convention on the Prior Informed Consent for Certain Hazardous Chemicals in International Trade*[6], European Union and United States of America Environmental Protection Agency (US EPA).

Pesticides and Toxic Chemicals (Amendment) Act 2007 (No. 13 of 2007)

This Amendment provides for the regulating of exports and accession to international Agreements governing pesticides and toxic chemicals[7] management by providing for the adoption of Agreements containing legally binding instruments.

Pesticides and Toxic Chemicals Regulations 2004 (No. 8 of 2004)

These Regulations were established under Section 32 of the Act and provide the instruments and requirements for the implementation of the Act in the following areas:

(a) Pesticide and Toxic Chemical Registration and Classification Procedure;
(b) Pesticide labelling;
(c) Certification of Pesticide Applicators;
(d) Pesticide Manufacturing and Distribution Certificate; (e) Experimental Pesticides and Toxic Chemicals Studies;
(f) Transportation, Storage, Disposal and Recall of Pesticides and Toxic Chemicals;
(g) Ministerial Emergency Registration and Exemptions;
(h) Pesticide Residues; and
(i) Pesticide Worker Protection.

Pesticides are classified as Prohibited, Restricted or General Use. A prohibited pesticide is not allowed for use and is classified based on toxicity, use pattern under local conditions and the respective decisions of the following international agencies:

(a) United Nations Food and Agricultural Organization (FAO);
(b) Rotterdam Convention;
(c) Stockholm Convention;
(d) United Nations Environmental Programme; and
(e) World Health Organization.

A restricted pesticide is permitted for use only on certain stated crops.

Pesticides and Toxic Chemicals (Amendment) Regulation 2007 (No. 8 of 2007)

This Amendment provides the instruments for regulating exports of pesticides and toxic chemicals. It covers prohibited, restricted and registered products along with information on monthly import of any chemical into Guyana, vending premises, legislations, reports, and news pertaining to current and

[5] See http://chm.pops.int/default.aspx and http://www.pops.int/documents/convtext/convtext_en.pdf
[6] See http://www.pic.int/home.php?type=s&id=77 and http://www.pic.int/home.php?type=t&id=49
[7] The Stockholm and Rotterdam Conventions. The Basel Convention is addressed by the Environmental Protection (Hazardous Wastes Management) Regulations, 2000

ongoing developments. Other methods of dissemination of information include the publication of a Quarterly Newsletter, and the use of the print and television Media for public and general notices.

Occupational Safety and Health Act 1997 (No. 32 of 1997)

The provisions for registration and regulation of industrial establishments and for occupational safety and health of persons at work are enshrined in the Occupational Safety and Health Act 1997. The Act covers hazardous chemicals at workplaces which can endanger the health of workers, and allows for the limited or restricted use of such chemicals. It also covers the introduction of new chemicals in the workplace. Implementation of this Act is the responsibility of the Occupational Safety and Health Department of the Ministry of Labour.

Food and Drug Act, 1971

This Act regulates food, drugs, cosmetics, and therapeutic devices, and is concerned with the institution of standards for food and drugs, the regulation of the sale of food or drugs that are considered unfit or harmful for consumption and the prohibition of marketing food and drugs in a manner misleading to the public.

National Trust Act, (No. 7 of 1972)

The Act provides for the preservation of monuments, sites, places and objects of historic interest or national significance. The main body vested with this responsibility is the Office of the National Trust of Guyana which was established in 1972. The Act states that " when it appears to the National Trust that in the public interest that any monument (defined as: "any building structure, object or other work of man or of nature whether above or below the surface of the land or the floor of the sea within the territorial waters of Guyana and any site cave or excavation") should be preserved on account of the historic, architectural or archaeological attaching to it or its national importance, the National Trust may declare the monument to be a national monument." At present there are nine gazetted National Monuments.

Drainage and Irrigation Act, 2004

The Act provides for the establishment of the National Drainage and Irrigation Authority (NDIA) for ensuring the water resources are located, evaluated, conserved and utilised through appropriate water management strategies and water use planning. In addition, the Act provides for drainage and irrigation systems to be operated in a sustainable manner and allows for increased participation from farmers (through water users associations, local government organs or private entities) in the planning, operation and management of drainage and irrigation systems.

3.3 Guyana National Policies and Environmental Strategies

Green State Development Strategy: Vision 2040

The Green State Development Strategy: Vision 2040 (GSDS) is Guyana's overarching national development framework that outlines the economic and social development imperatives for Guyana over the next 20 years. The GSDS' main goal, as the roadmap for Guyana to achieve the Sustainable Development Goals by the 2030s, is to improve standards of living, ensure social equity and reduce environmental risks. The Strategy outlines the principles of the green agenda for 2040 as "*an inclusive and prosperous Guyana that provides a good quality of life for all its citizens based on sound education and social protection, low-carbon and resilient development, providing new economic opportunities, justice and political empowerment*."

The GSDS prioritises 8 development objectives as follows:

- Development Objective A: Sound Fiscal and Monetary Policy
  By 2040, implementation of systems to transparently manage oil wealth in order to secure a stable future source of public revenue. Oil revenues will be channelled into productive public investments to deliver sustainable development benefits for the whole of society and into the future.

- Development Objective B: Sustainable Management of Natural Resources
  By 2040, preservation of natural capital through institutionalised and prudent management of natural resources (land, forests, minerals and water) for the purposes of meeting Sustainable Development Goal #15 (land use and biodiversity). In addition, Guyana maintains and safeguards its food security, traditional livelihoods and knowledge through effective conservation of biodiversity, ecosystem services and heritage.

- Development Objective C: Green and Inclusive Economic Diversification
  By 2040, high levels of productivity and sustainability through the adoption of advanced technology and implementation of best practices. In addition, there will be efforts to compete successfully in regional and international markets due to effective fiscal policies. These systems will be supported by strong and effective institutions which ensure compliance with regulations, reduce bureaucracy and support the transition to the 'formal' sector.

- Development Objective D: Transition to Renewable Energy
  By 2040, transition to near-100% renewable and clean energy sources for electricity generation sourced from the country's natural capital and in accordance with its international agreements and commitments. Energy efficiency technologies and practices in existing and new buildings will be deployed and by 2030 improvement in energy efficiency will be doubled. Changes will also be made in the transport sector as there will be a shift to the use of higher efficiency vehicular fleets and/or more diversified fuels.

- Development Objective E: Resilient Infrastructure, Green Towns and Urban Public Spaces
  By 2040, infrastructure developed to provide high quality connections in transport and across Guyana, lowering transit times, transport and business costs, and environmental impacts, while improving the reliability of national connectivity services. The poorest in society, will be provided with a sufficient supply of safe and affordable housing, open green space and access to quality services (electricity, water and sanitation facilities), in line with minimum international health standards. In addition, low-carbon and sustainable lifestyles will be supported through the provision of convenient and low-cost alternatives to private transport as well as improving access to non-motorized transport.

- Development Objective F: Trade, Investment and International Cooperation
  By 2040, national standards and foreign policy will be put in place to facilitate greater competitiveness and clear access to markets for exporters, while also attracting foreign direct investment.

- Development Objective G: Healthy, Educated and Socially Cohesive Population
  By 2040, equal and universal access to quality healthcare and education. This includes a right to good standards of living, health, education and well-being regardless of economic status or ethnicity. In addition, a priority will be to eliminate persistent disparities in health and education outcomes between coastal and hinterland regions.

- Development Objective H: Good Governance, Transparency and Knowledge Management

> By 2040 governance and institutions will include stronger checks and balances among the branches of government. Public sector institutions will be managed by a modern, professional and competent staff that function under executive management and appropriate parliamentary oversight while operating with a new ethic of accountability, openness and client orientation with the public and the business community. In addition, a modern knowledge management system will be developed where Information Communication Technology (ICT) systems are the backbone of efficient public service delivery, support a more informed and active citizenry, and drive innovations in all sectors.

Implementing the Strategy involves phasing-in activities sequentially in order to prioritise investment and drive outcomes, appreciating the interdependency of strategic actions, along with the required and available capacity, skills and technology.

Low Carbon Development Strategy

As a direct mitigation response to global climate change, the GoG launched a National Low Carbon Development Strategy[8]. This strategy responses to an international agreement (REDD-plus) between Norway and Guyana: ¨On November 9th, 2009, the Governments of Guyana and Norway signed a Memorandum of Understanding which set out how the two countries will "work together to provide the world with a relevant, replicable model for how REDD-plus can align the development objectives of forest countries with the world's need to combat climate change."[9] Norway committed to providing financial support of up to US$250 million by 2015 for results achieved by Guyana in limiting emissions from deforestation and forest degradation.¨

The strategy seeks to provide insights on how to stimulate the creation of a low- deforestation, low-carbon, climate-resilient economy. The Guyana LCDS identifies five strategic imperatives for Guyana to undertake in order to generate economic growth, while simultaneously eliminating approximately 30 percent of non-forestry emissions through the use of clean energy. These strategic goals are:

- Invest in strategic low carbon economic infrastructure, such as: hydropower development; improved access to unused, non-forested land; and improved fiber optic bandwidth to facilitate the development of low-carbon business activities.

- Nurture investment in high-potential low-carbon sectors, such as fruits and vegetables, aquaculture, and sustainable forestry and wood processing.

- Invest in other low-carbon business development opportunities such as business process outsourcing and ecotourism.

- Expand access to services and new economic opportunity for indigenous peoples through improved social services (including health and education), low-carbon energy sources, clean water and employment which do not threaten the forest.

- Improve opportunities to Guyana society, including improving and expanding job prospects, promoting private sector entrepreneurship, and improving social services with a particular focus on health and education.

The strategy at this moment is a draft for national discussion by stakeholders. Upon completion, the LCDS will be a major policy driver, as it seeks to balance ecological sustainability through the management and protection of forests with meeting economic and social needs of the Guyanese nation.

[8] The Low Carbon Development Strategy of Guyana: http://www.lcds.gov.gy/
[9] http://www.lcds.gov.gy/images/stories/Documents/Low%20Carbon%20Development%20Strategy%20-%20May%202010.pdf

National Environmental Action Plan

The National Environmental Action Plan (NEAP) of 2001-2005, follows directly the NEAP of 1994, which summarizes the national environment policy and focuses on coastal zone management, natural resources management including land resources, biodiversity, wildlife, forestry and ecotourism, waste management and pollution control, and mining. NEAP is best described as a Guyana's expressed national commitment to sustainable development in the pursuit of national social and economic goals; and provides a framework for integrating cross-sectorial environmental concerns into the wider context of Guyana's economic and social development programs (NEAP, 2001-2005).

The main goals of the NEAP are identified as:

- prevention or control of pollution in order to maintain the integrity of the land and the natural purity of the air and water resources;
- general preservation and conservation of ecological integrity and, in particular, the protection of natural habitats and fragile ecosystems; and
- ensuring sustainability through best practice of the management and use of natural resources for national development.

Further, the NEAP states that to fulfil these objectives, the Government of Guyana will:

- Institute punitive measures to deter possible violations of environmental norms;
- Ensure that, where environmental damage occurs, remedial action will be taken with the cost being covered by those responsible for causing the damage;
- Rehabilitate damaged ecosystems where possible and reverse any degradation of the environment;
- Ensure prior environmental assessments of proposed activities that may significantly affect the environment;
- Ensure that conservation is treated as an integral part of the planning and implementation of development activities;
- Raise the consciousness of the population on the environmental implications of economic and social activities through comprehensive education and public awareness programmes; and
- Involve the population, including indigenous peoples, women and youth, in the management of the environment and natural resources.

National Land Use Plan

The National Land Use Plan (2013) aims to streamline land use planning and to create conditions necessary to achieve sustainable, socially desirable and environmentally compatible land uses of State lands. The National Land Use Plan states that, within the Coastal Plain, the main land uses are agriculture (mainly sugar and rice), livestock rearing, aquaculture and built-up areas comprising housing, commerce and industry and that there are appreciable areas of abandoned or unused agricultural land and large areas of undeveloped land in the backlands. It recognises that the main issues concerning land use in the coastal plain centre around the need for improved land administration, improved planning and co-ordination, the issue of unused land with increasing land pressure, rehabilitation of the drainage and irrigation system, improved access to markets and the use of reserved land. The supply of water, drainage and irrigation are a prerequisite for agriculture on the coastal plain.

Revised National Forest Policy Statement and National Forest Plan

This National Forest Policy Statement is an associated appendage of the Guyana National Forest Plan. The document has the overall goal of conserving, protecting and utilizing State Forests ensuring its social, economic and environmental attributes and benefits are sustained and enhanced for the benefit of current and future generations of Guyanese whilst fulfilling Guyana's commitments to international agreements and conventions. The four specific objectives in the achievement of the goal are:

- Deriving development benefits from the forest the focuses on forest extraction, value-adding and non-traditional services (Economics);
- Conserving, protecting and sustaining the forest the focuses on forest health, remediation and improvement (Conservation);
- Governing the forest to ensure current and future benefits that focuses on strengthening institutional coordination and promoting stakeholder engagement and participation in the sector (Governance);
- Building human and institutional capacity for management of activities in the forest the focuses on forestry research, training of the workforce, and public education and awareness (Capacity).

Guyana's National Forest Policy covers the period 2018 to 2028, and will be reviewed in 2023 at the halfway stage.

National Mangrove Management Action Plan

National Mangrove Management Action Plan (2001) was developed to guide the work of stakeholders involved in the utilization and protection of mangrove resources. Basically, this Plan: (i) proposes specific actions, including review of policy and legislation, as well as zonation of mangrove forest to ensure protection; (ii) identifies main facilitators of the process; and (iii) outlines indicators and establishes time-lines. The ultimate objective of this plan is to foster a more coordinated approach in planning, policy formation, institutional cooperation and implementation of actions. Additionally, this Management and Action Plan laid the basis for the development of a mangrove management plan in Guyana.

The Guyana Forest Commission (GFC) also has in place a number of measures to ensure the conservation and management of Guyana's flora and fauna. These include a Forest Management Plan (1999), a Code of Practice for Timber Harvesting (2002), a Sectorial Environmental Assessment for the forestry sector, and National Standards for Forest Certification.

Integrated Coastal Zone Management Plan

The Integrated Coastal Zone Management Plan (ICZM, 2001) identifies, among other factors, sea level and floods as social, economic and ecological stresses that impact on the coastal zone. The Plan basically addresses issues related to policy development, analysis and planning, inter-agency coordination, public education and awareness building and education, environmental control and compliance, monitoring and measurement and information management-all of which are necessary to reduce the risks posed by climate change. One of the constraints in the implementation of the ICZM is the limited institutional capacity in terms of human, technical and physical capital to implement the specific actions to address issues affecting the coastal zone, including solid waste management, air, land and water pollution, and environmental health of its inhabitants.

National Biodiversity Strategy and Action Plan (2012 – 2020)

The National Biodiversity Strategy and Action Plan (NBSAP) (2012 – 2020) is the national plan to protect, conserve, use sustainably and share equitably the benefits arising from the country's

biodiversity. The NBSAP outlines the national priorities and the strategic objectives as well as provides guidance and support actions for sustainable utilization and conservation of biodiversity. The document is inclusive allowing, all social partners to be involved in the country's biodiversity vision and its commitments to the UNCBD Strategic Plan for Biodiversity (2011-2020) and selected Aichi 2011-2020 targets.

National Policy on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization.

The Environmental Protection Act, 1996 gives the EPA the mandate to coordinate and maintain a program for the conservation and sustainable use of biological diversity. Since ratifying the UNCBD and enacting the EPA Act, the Government of Guyana and the EPA have been committed to developing national strategies plans and programmes for the conservation and sustainable use of biodiversity, and to implementing legislative, administrative and policy measures in furtherance of the provisions of the UNCBD.

In implementing its mandate, the EPA has paid particular to those aspects of the UNCBD that are of immediate national importance. One such aspect is covered by Articles 15 of the UNCBD which make provisions for Access to Genetic Resources and Benefit-Sharing.

Water

In Guyana water resources governance is done under the Water and Sewerage Act 2002, which also require a national water policy to be prepared and a National Water Council established for the development and coordination of water resources management, as well as on supporting analyses for water use, threats, alternative sources and/or solutions. The National Water Council is to develop and/or review the national water policy and to oversee its management and coordination. The goal of the Policy is to provide a framework to maximize the contribution of the water sector to sustainable economic, social and environmental development in an efficient and equitable manner. The GSDS has recommended the amending of the Water and Sewerage Act 2002 to improve integrated water resources governance and management. The priority is to amend the Act so that the National Water Council becomes an inter-agency body with oversight of integrated water policy and inter-agency coordination between agencies of the Ministry of Agriculture (e.g. Hydrometeorological Department, the National Drainage and Irrigation Authority) and Guyana Water, Inc. As top priority, the draft Integrated Water Management Plan should be revisited and updated so that national water policy is relevant and clear. The GSDS also indicated that integrated water resources management should be prioritised along with science-based research and analysis.

In 2014 the Government of Guyana prepared a National Wastewater Management Strategy which provides an analysis of the key issues and challenges facing wastewater management in urban and rural settings, reviewed existing practices and recommended priority strategic actions to address the issues.

Agriculture

In 1996, the government drafted a new fisheries policy, which seeks to promote the conservation of fishery resources. A Fisheries Management Plan (FMP) has since been developed to promote the conservation and sustainable development of the fisheries resources of Guyana. Additionally, this Plan has provided information on fisheries policy, guiding principles, goals and the legal and institutional framework for fisheries management and development, including aquaculture. There also exists a Draft Management Plan, 2002, (for Arapaima in North Rupununi) that was developed with the communities of the North Rupununi and the North Rupununi District Development Board (NRDDB). This Plan represents the first attempt to have local Amerindian communities managing an inland

fishery plan in Guyana. The Ministry of Agriculture is presently revising the National Agriculture Strategy for Guyana for the period 2013 – 2020.

Moreover, the NDS (2001-2010) articulates a number of policy objectives aimed at transforming the sector to increase its productivity, output, production and competitiveness. Three of those objectives are vital to the sustainable utilization and management of fishery resources: (i) providing adequate support services and infrastructure to facilitate development of the sector; (ii) designing and implementing systems for information generation as they relate to market intelligence and research and development; and (iii) increasing the relevance of agricultural training and education.

The GSDS highlights increased agricultural productivity through sustainable agricultural practices as a pillar of Guyana's development. Sustainable farming practices including the utilization of crop-specific resource efficient technologies will be promoted. Research and development in agriculture will be enhanced through accessible financial resources and improved capacity to translate research to results. Agricultural diversification will be built on improved economies of scale, increased access to finance and improved land tenurship. Finally, infrastructure to increase connectivity and transportation capacity will be developed.

Guidelines for Noise Emission into the Environment, 2009

Developed to assist the Environmental Protection Agency in the enforcement of the Environmental Protection (Noise Management) Regulation 2000 and to reduce the level of noise emanating from commercial, residential, institutional, educational, industrial, construction, transportation and recreational activities.

Interim Guidelines for Industrial Effluent Discharge into the Environment, 2002

The Interim Guidelines for Industrial Effluent Discharge into the Environment specifies the discharge limits for various parameters and different types of operations and activities. A revised Standard was prepared in 2015 but is still a work in progress.

3.4 Environmental Permits and Requirements

The Environmental Protection Agency of Guyana (EPA) was created through the Environmental Protection Act, No 11 of 1996. The EPA web site indicates: "The Act mandates the Agency to oversee the effective management, conservation, protection and improvement of the environment. It also requires that the Agency takes the necessary measures to ensure the prevention and control of pollution, assessment of the impact of economic development on the environment and the sustainable use of natural resources." The EPA falls under the direct supervision of the Department of Environment within the Ministry of the Presidency.

EPA is responsible to evaluate project development in the country and to classify each project according to the potential environmental and social impact. EPA is also responsible to undertake proper supervision and monitoring of the project environmental and social outcomes.

EPA is responsible to supervise compliance of several of the environmental regulations set up in the country such as the Environmental Protection Regulations (2000), which aims to control and prevent noise, air, water, hazardous waste and soil contamination. These regulations as well as others indicated in the Section of Guyana Legal Framework should be carefully reviewed by the Project Implementing Unit (PIU), the ES and future contractors of this project. The main environmental regulations applicable to the civil works planned by this project are:

- Environmental Protection Act, 2000, 2005

- Environmental Protection (Air Quality) Regulations, 2000
- Environmental Protection (Noise Management) Regulations, 2000
- Environmental Protection (Water Quality) Regulations, 2000
- Environmental Protection (Hazardous Waste Management) Regulations, 2000
- Litter Enforcement Regulations, 2013

The environmental permitting process in Guyana varies depending on the type of project, its dimension and potential environmental impacts or whether it is new or existing. For new development projects there are two processes: (i) Environmental Impact Assessment (EIA) not required and (ii) EIA required. The process to obtain an environmental authorisation can take from 2 to 6 months if an EIA is not required. If an EIA is required the process is longer.

4. DESCRIPTION OF THE EXISTING ENVIRONMENT

4.1. Project Area

Guyana's Region 4, an area of 1,843 square kilometres (711 square miles), includes Georgetown and is home to the majority of Guyana's population. It is bounded to the north by the Atlantic Ocean, to the west by the Demerara River and to the east by the Mahaica River and Region 5.

The East Demerara Water Conservancy (EDWC), a large, shallow water storage system with a catchment area of 571 square kilometres (220 square miles), provides agricultural lands and urban areas with irrigation and drinking water. It is drained by a system of canals, sluices and pumps. This system, combined with a dense network of drainage and irrigation canals in the lowland areas along the East coast and Demerara River, provides flood control that is crucial for the protection of property, life and economy in the country.

Liliendaal is located in the Greater Georgetown area. Drainage is undertaken by a network of drainage canals which are delineated by their drainage areas. The drainage canals eventually leads to the Lileindaal Pump Station. The drainage system drains water off the land east of Sheriff Street and its environs, which include the University of Guyana and the Cyril Potter College of Education compounds. The Liliendaal drainage system serves a total area of 9.6 km^2, which is mainly urbanized. According to the 2002 Census, the population of drainage area served by the Liliendaal pump is approximately 25,700 but there are interconnections in the drainage system between Liliendaal and Georgetown metropolitan area, meaning that the direct beneficiaries are likely much greater. The current pump station at Liliendaal occupies a fraction of the large land parcel and is segregated between the sea and a main road. Moreover, the land where the pumping station has been built is fenced and rehabilitation works are envisaged to be executed on the same area.

4.2. Climate

Rainfall

Guyana experiences a wet tropical climate with warm temperatures and abundant rainfall. The coast of Guyana generally experiences two wet and two dry seasons due to the annual meridional migration of the Inter Tropical Convergence Zone (ITCZ). According to Guyana Hydro-meteorological Service at the Ministry of Agriculture, the mean annual rainfall recorded in Georgetown, during the period of 2008 to 2018, varied from 1900 mm to 3450 mm (Figure 3). Georgetown receives on average 2435 mm of precipitation annually. During the period from 2008 to 2018, the total annual rainfall on Georgetown (Figure 5) fluctuated but there were no significant changes.

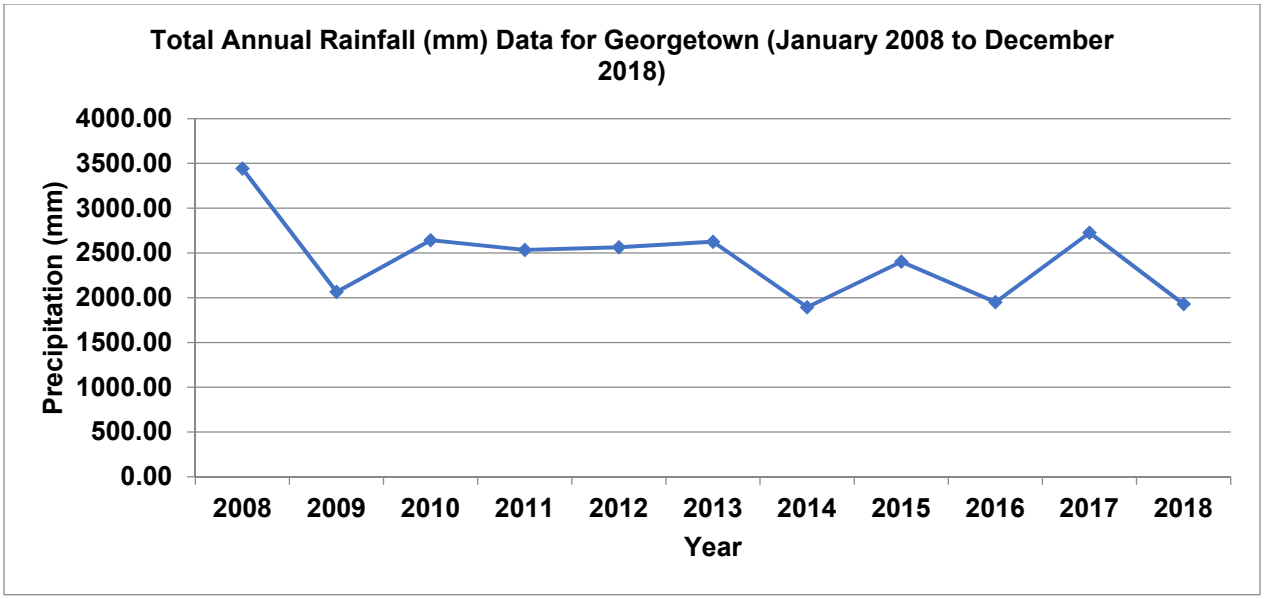


Figure 3: Annual average rainfall during the period 2008-2018. Source: Ministry of Agriculture

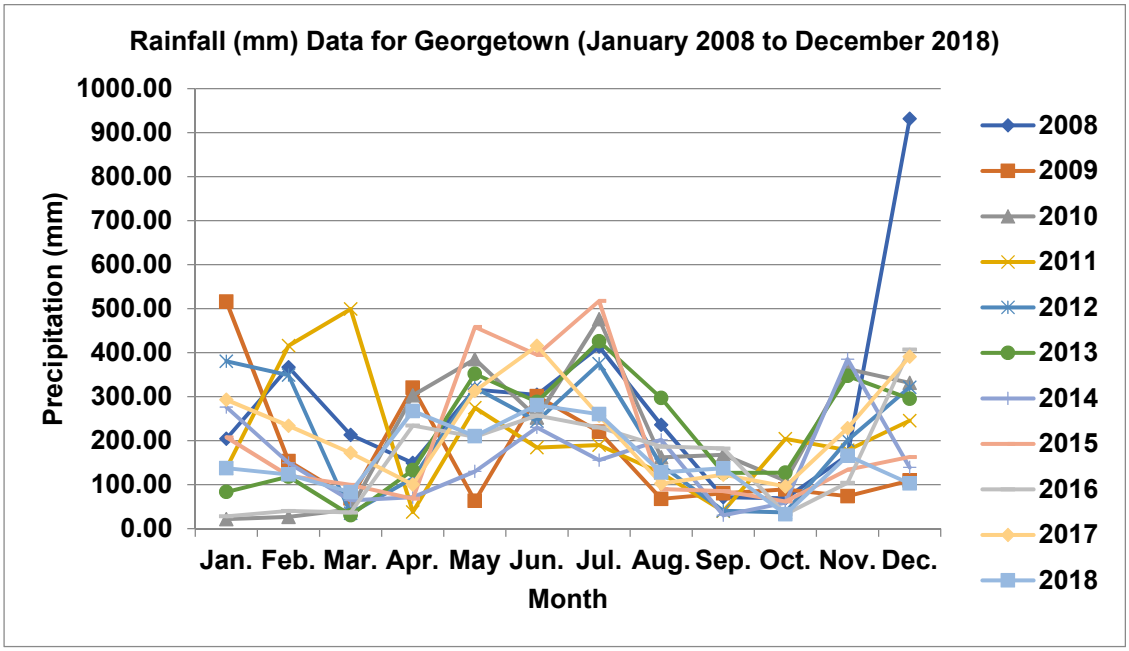


Figure 4: Monthly rainfall at Georgetown, during the period 2008-2018. Source: Ministry of Agriculture

Georgetown usually experiences heavy rainfall between April and July each year (Figure 4). While this is due to the northward movement of the ITCZ, the southward migration of the ITCZ brings the second wet season to Georgetown between November and January. Generally, the wettest months are June and December and the driest February, March and September.

Temperature

The average temperature in Georgetown, Guyana is 27.0 °C (81 °F). The warmest average maximum temperature is 31 °C (88 °F) in September and October. The average minimum temperature is 24 °C (75 °F) in January, February, March, June, July, August and December. During the period 2000 to 2009, the annual mean maximum and minimum temperatures in Georgetown have remained relatively constant (Figure 7). The annual maximum and minimum temperatures averaged 30.5 and 24.1°C, respectively.

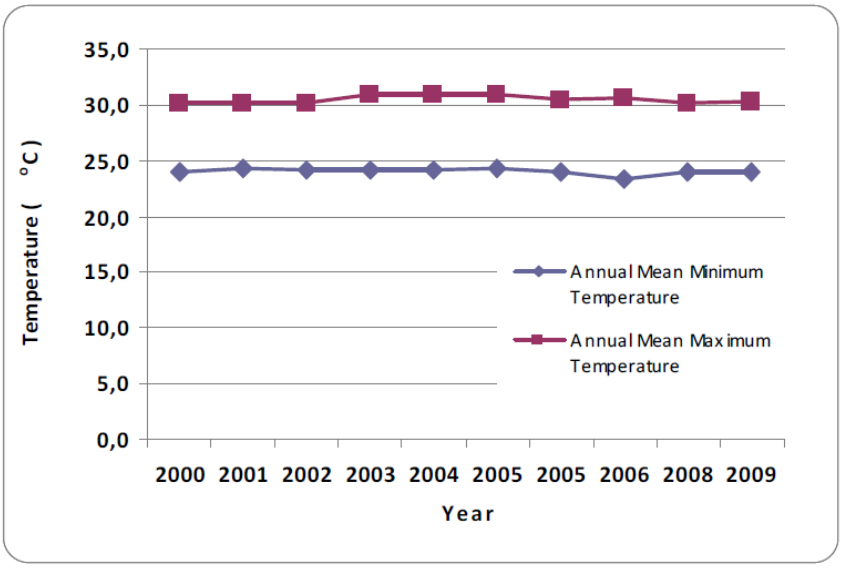


Figure 5: Annual Mean Minimum and Maximum Temperatures for Georgetown (2000-2009). Source: Ministry of Agriculture

Humidity

Georgetown usually experiences high humidity. During the period of 2000-2009, the relative humidity recorded has been over 70% as shown in Table 2. The annual morning and afternoon relative humidity average 80% and 72%, respectively.

Table 3. Relative Humidity in Georgetown (2000-2009)

Year/Time	Annual Mean Relative Humidity (%)	
	8:00 hrs	14:00 hrs
2000	80.0	71.0
2001	77.0	69.0
2002	77.0	71.0
2003	79.0	70.0
2004	81.0	71.0
2005	83.0	74.0
2005	81.0	75.0
2006	82.0	74.0
2008	81.0	72.0
2009	79.0	71.0

4.3 Ground water

The project area is part of a large coastal aquifer system. This groundwater system occupies an area of about 20,000 square kilometers, extending about 250 kilometers along the Atlantic coast and 40 to 150 kilometers inland, comprises three aquifers: the “Upper Sands”, the “A Sand” and the “B sand”. Overlying layers of clays confine the lower two aquifers, therein protecting them from contamination from external sources.

The “Upper Sands” aquifer, which is the shallowest of the three aquifers, is 30 to 60 meters deep varies in thickness from 15 to 120 meters. This aquifer is no longer used as a source of potable water because of its high iron content (>5 mg/l) and salinity (up to 1200 mg/l). The “A sand” aquifer is 150 to 220 meters deep and 12 to 27 meters thick. The “B sand” aquifer is encountered at depths of 350 and 800 meters. Most of the potable water is obtained from the two deep aquifers. Guyana Water Incorporated uses these as water sources with some treatment necessary.

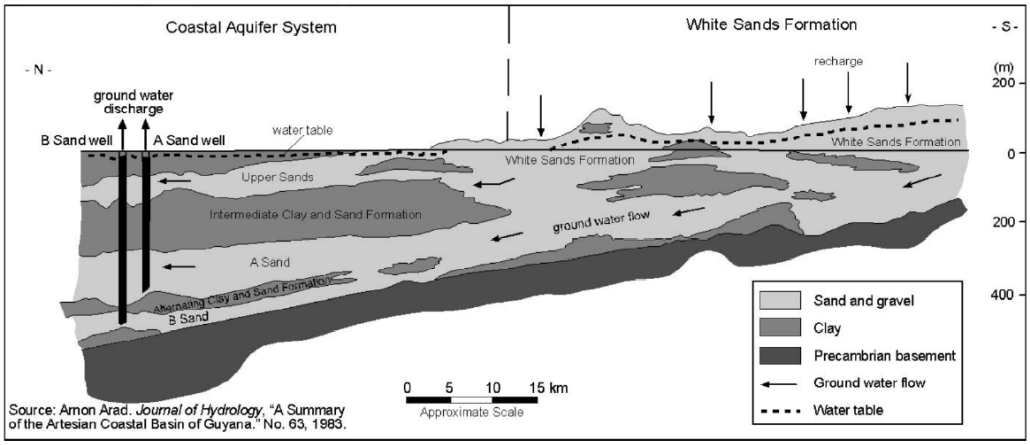


Figure 6: The Coastal Aquifer System

4.4 Soils and Geomorphology

A combination of the following types of clays and organics is found in the area.

Mara Clay: Poorly drained soil developed from relatively old marine sediments. It occurs in depressions and is characterized by a shallow peat deposit over thick grey clay underlain by greenish grey clay subsoil.

Brickery Clay: Poorly drained soil developed in river alluvium. The alluvium may have been deposited over fluviomarine sediments. It is characterized by a thin dark grey surface over grey clay subsoil mottled with brownish yellow, yellow red and brown. The substratum is soft green grey clay, which may contain numerous bits of partially decomposed organic matter. The soil is strongly acid, slowly permeable and has a moderate level of fertility.

Tuschen Clay: Poorly drained soil developed in river alluvium. It is characterized by a thin dark grey clay surface over a grey to greenish clay subsoil with mottles of brownish yellow, yellowish red and brown. The soil is strongly acid, slowly permeable and has a moderate level of fertility.

Lama Muck: Poorly drained organic soil occurring in depression areas. The soil consists of well decomposed muck underlain by dark reddish brown peat. The substratum is greenish grey soft clay.

The topography of coastal area is typically low–lying and flat. The soils of the area are a combination of Demerara clays, white sand, with an increasing proportion of amount of Lama Muck pegasse near and in the East Demerara Water Conservancy.

4.5 Surface Water Quality

East Demerara Water Conservancy: The EDWC water is dark brown as it is a mixture of peat like organic acids and clay with low transparency. Beyond the presence of organics and clays the water is relatively clean and is used with some treatment as a water source for the Guyana water Company.

Lowlands canal system: The water in the canal systems is brackish near the coast and fresh upland. The canals are subject to contamination through agricultural runoff and, in the populated areas, solid waste and sewage. Sugar refining and distilleries discharge their wastewater in the project area but through a separate set of canals. The canal systems that drain the conservancy are dark brown when the sluice gates of the conservancy are open due to the peat organics found in the EDWC.

4.6 Air Quality

The East Demerara Water Conservancy has few sources of air pollution, among them boats and equipment and nearby agricultural burning. The air quality in the coastal lowlands is overall not of poor quality but air pollution can be important depending on the site. Among the potential sources of air pollution that could affect a project site are traffic in areas near roads, distilleries, sugar refining and food processing industries and garbage burning.

4.7 Noise

East Demerara Water Conservancy: Background levels of noise in the project areas are affected only by boats and ongoing activities of the EDWC (including channel maintenance, dam re-enforcement).

Coastal lowlands: The noise levels are very site specific and vary depending on the built environment in the area which can range from roads, to agricultural fields, to residences and industrial operations.

4.8 Biological Resources

East Demerara Water Conservancy: Although the East Demerara Conservancy dam is a man-made structure, the water resources in the EDWC are protected, functionally providing a managed habitat for species such as caiman, giant otters, anteaters, boas and bats. Numerous species of birds also nest in or migrate through the Conservancy, including Muscovy Ducks, Blue-winged Teal, Pied-billed Grebes, Cormorants, Stripe- backed Bitterns, Egrets, Vultures, Snail Kites, and Great Kiskadees.

The areas of potential works within the EDWC include savannah swamp lands areas which are highly disturbed environs with significant amounts of habitat loss. As a consequence, the existing biological realm of the area is predominated by species that adapts well to changing environments. It is therefore expected that with basic management measures there will be a rapid recovery of habitats and associated biodiversity owing to species adaptability to the habitat stresses that will ensue from proposed project works. The vegetation in the area comprises of secondary ‘disturbed’ vegetation, primarily of common weeds, shrubs, herbaceous plants and trees including domesticated crops. These species along the channel embankments are important for embankment stability and act as a ‘prevention mechanism’ against soil erosion. They also provide a habitat for many faunal species serving as roosting and breeding sites for birds, insects and other fauna.

Coastal Lowlands: The project areas along the canal systems are largely converted habitat including a combination of urban areas and agricultural areas. The canal system hosts perch, catfish, hassar,

houri, patwa, lukanani, sunfish, freshwater prawn, large snails and caiman. The area also hosts a variety of birds including kites, egrets, doves, swallows, mockingbirds and other common coastal birds. Small reptiles and amphibians (toads, frogs, geckos and lizards) are also common in this area as well as domesticated animals such as cows, sheep, goats,

Vegetation along the canal system includes secondary growth vegetation dominated by common weeds, shrubs and trees including Carrion crow bush, Congo Pump, Bamboo trees, Moko Moko, Clammy Cheery, Whitey and Etae. Aquatic vegetation within the Canal system is sparse, and consisted typically of water lilies, moss and dew grass.

Like in the EDWC project areas these species are important for embankment stability and act as a 'prevention mechanism' against soil erosion. They also provide a habitat for many faunal species serving as roosting and breeding sites for birds, insects and other fauna.

4.9 Socio-economic Context

East Demerara Water Conservancy: This area is protected and access is only provided to workers who are allowed to undertake subsistence fishing in the conservancy area.

Coastal Lowlands: Much of Guyana's population in Region 4. The urban areas are dominated by the capital and its peri-urban areas. The percentage of the population living below the poverty line is 32% and in urban Georgetown, 28.9% live below the poverty line (UNDP, 1996). The primary economic activities are businesses, government posts and agriculture and fisheries. The main types of agriculture are rice and sugar. There is one Amerindian community, St. Cuthbert's mission, located upstream of the Lama and Maduni Sluices along the Mahaica River. St. Cuthbert's is primarily a logging community. Other sources of income are employment within the mining sector and subsistence farming. This community is distant from the project areas, no works will be undertaken near this community and no impacts are expected.

4.10 Agriculture

There are no agricultural activities in the East Demerara Water Conservancy, however some grazing and farming are undertaken in the lands adjacent to the Dam. Sugar and rice are the predominant agricultural products in the in the Coastal lowlands. Bora, pepper, watermelon, eddoes and coconuts are also cultivated at a subsistence and commercial level in the region. Many of these crops are dependent on the irrigation provided by the canal systems.

5. ANALYSIS OF PROJECT IMPACTS

The project is designed to improve the ability of the EDWC and lowlands drainage systems to reduce flooding in the project area. At the time of assessment, decisions on which works would be implemented were not finalized as well as many of the project designs. The potential magnitude or significance of impacts which depends on the works undertaken as well as technical design, decisions regarding technical equipment and management arrangements, which have not yet been taken. Notwithstanding, this section provides a means of scoping the types of impacts expected in order to develop a process for sub-project screening and environmental and social assessment that is appropriate to the types and scale of the impacts and that can be implemented as part of the project implementation phase. Listed below are the anticipated types of impacts and their significance for the potential works contemplated under the project, the reconstruction of the dam, widening and improving connectivity of internal channels; safety upgrading of the water control structures; expansion, upgrading and installation of pump stations; upgrading and new embankments, channels and culverts; and sluice upgrading and channel widening for EDWC drainage to the East Demerara River. The analysis benefited significantly from previous Environmental Assessments under taken for similar works and/or in the project area (see reference list). The impacts are predominantly low to moderate, are not considered unusual and common practices mitigation measures are available to address them.

5.1 Potential impacts of the reconstruction of the EDWC dam

The works include the reinforcement and reconstruction of the EDWC dam which was constructed more than 200 years ago and has many areas of marginal stability. The works will the construction of a new portion of dam adjacent and contingent with the existing dam, widening it, making it higher and reinforcing it with stronger materials and construction techniques that are consistent with international standards with qualified supervision of the works.

The project is being implemented on a 4,000 m section of the dam and works entail a series of land clearing and grubbing (removal of vegetation), dewatering, infilling of existing seepage drain, removal of 0.075 m of pegasse, construction of upstream and downstream berm, and earthen dam, and excavation of seepage drain. Works are being executed by a Contractor. There are currently a total of eight long boom excavators on site; four of which are used for sourcing silty clay and two (2) used for land clearing and grubbing, removal of pegasse and placement of silty clay. Four pontoons are also used for transporting silty clay from the borrow site to the embankment. There is a sheep-foot roller, which is used for compacting and a mini-excavator (back hoe) for minor works.

All construction activities are based on the requirements outlined in the Construction Supervision Quality Assurance Plan (CSQAP), and are done in accordance with the Environmental and Social Management Plan prepared for the project. Completed works have been estimated to be in excess of 65% thus far. The following are the main activities:

- preparation of the existing dam embankment;
- preparation of area identified for berm construction;
- preparation of identified borrow site;
- removal and transport of silty clay from borrow site to new dam construction site;
- performance of field and laboratory tests on extracted silty clay; and
- construction of the earthen dam embankment and berm.

Table 4. Potential Impacts from Reconstruction of the EDWC Dam

Issue	Impact	Significance
Land/Soil		
Land take due to expansion of dam	The expansion of the dam may require temporary or permanent land-take in some areas. All of the land is expected to be land currently owned by the government.	Low-moderate
Land clearing during construction	Removal of vegetation, where necessary, to construct new embankment and other works may cause erosion.	Low-moderate
Operation of heavy machinery during construction	The compaction of soil from heavy machinery can result in creation of ponding areas and can make regeneration of vegetation difficult.	Low
Disposal of materials (sediments and vegetation)	The activities will remove grass, shrubs and small trees as well as soil debris that will need to be stored, discarded or used in a way that avoids erosion and rehabilitation of the construction area.	Low
Management of fuel and lubricants during construction	Fuel will be transported to the project site for refueling of equipment which will need to be handled properly to avoid leaks and spills. The equipment will produce engine oil and lubricants that will need to be managed and disposed properly to avoid land and soil contamination.	Low
Vegetative removal to maintain embankments during operation	Periodic habitat disturbance.	Low-moderate
Emissions to Water		
Excavation of construction soil, materials and debris	Collection of construction materials from the EDWC will result in temporary and localized increase in suspended sediments.	Low-moderate
Management of fuel and lubricants during construction and maintenance	Fuel will be transported to the project site for refueling of equipment which wil need to be handled properly to avoid leaks	Low

Issue	Impact	Significance
	and spills. The equipment will produce engine oil and lubricants that will need to be managed and disposed properly to avoid water contamination.	
Stockpile management during construction	From material stockpiles and excavated materials resulting in an increase in sediment loading in the EDWC.	Low
Waste disposal during construction	Small amounts of waste will be produced by workers and need to be managed and disposed properly to avoid contamination of water.	Low
Emissions to Air		
Operation of heavy machinery during construction	Noise and fumes from the operation of machinery and other equipment.	Low
Operation of heavy machinery during construction	Dust from the operation of machinery and other equipment.	Low
Biological Environment		
Construction activity impact on flora	Habitat loss, destruction, fragmentation due to land clearing as a result of construction activities.	Low-moderate
Construction activity impact on fauna	Habitat loss, destruction, fragmentation due to land clearing as a result of construction activities.	Low-moderate
Socio-economic environment		
Worker safety and health during construction and maintenance activities during operation	Occupational health and accidents from operating heavy machinery and other construction activities.	Low
Dislocation of activities as a result of construction	The expansion of the dam may encroach into lands that are largely marshland with no productive use except low intensity grazing in some localities.	Low
Irrigation and drainage canals	Construction of the dam may temporarily interfere with irrigation during construction activities and drainage dependent on canals in the construction area.	Low
Flooding during construction	Potential breaches of the EDWC Dam	Low

Issue	Impact	Significance
Employment during construction	Overall short-term increase in employment.	Low
Vegetative clearing during operation	Periodic habitat disturbance	Low
Flooding during operation	Breaches along the embankment	Low
Periodic de-silting of the canal near dam to remove sediments and weeds	Risks of accidents to workers and exposure to noise from the operation of heavy-duty machines	Low

Potential Impacts on Land/Soil

Clearing of land is necessary to facilitate rehabilitation/construction of new embankment and other related activities. The impacts are expected to be low to moderate and have management measures that can reduce or eliminate the impact.

The environmental impacts that potentially result from the aforementioned activities are:

- Loss of land due to direct land take;
- Clearing of vegetation and soil disturbance to facilitate the excavation works, embankment construction and other structures can cause some level of erosion;
- Compaction of soil from the constant movement of heavy machinery within the project area and the wider surroundings;
- Fuel and/or oil spill from the operation of heavy-duty machines can cause soil contamination;
- Improper disposal of excavated material; and
- Improper disposal of vegetation from land clearing activities.

The embankment will be expanded and the land utilized will be unavailable to other uses. Generally this land is currently marshland with some areas near East Dam used for cattle grazing during the dry season.

The removal of existing vegetative cover and soil disturbance hastens the erosion process by exposing soils to the elements. The works are likely to affect this vegetation and soil cover which has value for erosion control. Efforts to re-vegetate the area can reduce this impact.

The use and movement of heavy duty machines and equipment over exposed soil can result in soil compaction; this can eventually lead to ponding during periods of heavy rainfall. Compaction also makes regeneration of vegetation difficult. Construction management measures can be put in place to minimize this impact.

Management and storage of fuel, lubricants and used oil on site can contaminate land. Leakage from equipment, refuelling and servicing of machines in the field can result in fuel/oil spills. Workers negligence and inadequate storage facilities can contribute to these spills which can contaminate the soil. Management plans for fuel storage, transport, management, machinery maintenance and spill management can help mitigate and prevent these spills.

Excavated materials and vegetation will need to be removed from the area and disposed or otherwise reused to avoid the use of the land in the project area for disposal.

Potential Impacts on Water

The surface water quality can become contaminated or affected from potential threats due to construction and maintenance activities.

- Water contamination from sediments eroded from excavation, construction soil, materials and debris;
- Water contamination from fuel/oil spills;
- Improper solid waste disposal by workers such as food wrappers, boxes etc.

The reconstruction of the dam will involve the sourcing of some of the materials from the excavation of the soil from the EDWC. This will suspend sediments and increase turbidity temporarily. As the conservancy is already a low transparency, high suspended solids water body this impact is expected to be temporary and localized.

Materials eroded from the embankment and stored construction materials and waste debris stockpiles can end up in existing waterways resulting in sedimentation. Measures exist to manage this impact including locating the stockpiles away from EDWC water bodies, draining them to designated areas and limiting the time period for storage.

Management and storage of fuel, lubricants and used oil on site can contaminate land. Leakage from equipment, refuelling and servicing of machines in the field can result in fuel/oil spills. Workers negligence and inadequate storage facilities can contribute to these spills which can contaminate the soil. Similar management measures as described for land impacts can reduce the risk associated with this impact.

Solid waste can often end up in water bodies as a result of direct dumping which can lead to contamination and blockage. During the construction phase, care can be taken by all workers to dispose of any solid waste material generated.

Potential Impacts on Air

During the construction and operation phase there are several activities which can affect the air quality in the project area. However, the level of impact will be low, localized and short-term. These impacts are more likely to affect workers; the project site is not located in close proximity to any housing development. The following impacts can potentially arise as a result of the project.

- Noise from the operation of machinery.
- Fumes from the operation of machinery used during the de-silting process, re-routing of the canal, rehabilitation of the sluice and construction of the bridge; and
- Dust from moving of earth, equipment and stockpiles.

Construction and maintenance activities will generate significant levels of noise. The operation of heavy duty machines and equipment may generate noise levels above hazardous thresholds. However, there are no immediate communities in close proximity to the canal that will be affected by the increased noise level. Measures can be put in place to reduce the noise level from construction activities for workers and other persons on-site. Equipment and machinery will be fitted with mufflers to reduce the noise.

The operation of the machines and equipment will also generate fumes which may have some minor effect on the air quality in the surrounding area. However, the level of impact will be localized, short-term and insignificant, to the point of negligible.

Dust will be generated from earth movement activities and the movement of equipment over dry areas. Construction material stockpiles such as sand can become airborne and contribute to a dust nuisance. Construction activities such as demolition and removal of existing structures can increase dust nuisance. The use of cement products increase dust levels in the immediate area, transportation of material to site can however impact the wider public. Since the project site is located away from housing development, the potential for dust nuisance is not great. However, measures (mainly wetting the site frequently, covering or soaking stockpiles), can be implemented to reduce this impact.

Potential Impacts on the Biological Environment

The potential impacts on the flora in the project are:

- Direct loss of vegetation due to removal to facilitate construction and maintenance during operation.
- Damage to flora during construction and operational work as a result of machinery working in close proximity.

Vegetation removal is essential to facilitate construction of a new embankment and various other aspects of project and, therefore, unavoidable. The areas of potential works within the EDWC include are savannah swamp lands areas are highly disturbed environs with significant amounts of habitat loss. No rare, threatened or endangered species were found within the area. The vegetation in the area comprises of secondary 'disturbed' vegetation, primarily of common weeds, shrubs, herbaceous plants and trees including domesticated crops. These species along the channel embankments are important for embankment stability and act as a 'prevention mechanism' against soil erosion. They also provide a habitat for many faunal species serving as roosting and breeding sites for birds, insects and other fauna. As such this impact is deemed minor and re-vegetation of many affected areas can minimize the loss and ensure rapid recovery.

The potential impacts on the fauna in the project environment are:

- Habitat loss, destruction, fragmentation due to land clearing as a result of construction activities.
- Migration of faunal species due to the presence of humans and machinery.

The EDWC in general functionally provides a managed habitat for species such as caiman, giant otters, anteaters, boas and bats. Numerous species of birds also nest in or migrate through the Conservancy, including Muscovy Ducks, Blue-winged Teal, Pied-billed Grebes, Cormorants, Stripe-backed Bitterns, Egrets, Vultures, Snail Kites, and Great Kiskadees.

However the faunal diversity in the area affected by the works near the dam is sparse and most species are domestic animals. Although a small portion of land area will be taken up by the project and some vegetation will be removed, there is available habitat within the project environment to support these animals. Therefore, the impact of habitat disruption on the biological environment will be localized and insignificant especially given that this area has been highly disturbed. Re-vegetation can be undertaken in some areas to minimize impact.

Aquatic species in the EDWC are limited to common species that are suited for the low transparency, swamp/marshland that exists in the conservancy. While there will be some temporary increase in sediments due to works, the temporary and localize nature of the impact combined with the size of the conservancy water habitat, indicates the works are not expected to have a significant impact on these species.

Potential Impacts to the Socio-Economic Environment

The potential impacts of construction and operation activities of the upgrading of the EDWC dam on socio-economic environment of the project are related to:

- Displacement and relocation of farming and grazing activities.
- The construction may temporarily affect irrigation channels result in some level of disruption.
- The construction may temporarily affect the drainage regime of the EDWC.'
- Construction could contribute to the risk of flooding from the EDWC.
- Safety risks for workers during construction and operation phases.

The proposed dam alignment is anticipated to impacts on arable farming and the project area is expected to lie entirely within Government of Guyana owned land. On the east dam there may be some small loss of grazing land, however as this will only affect a small percentage of the large and very sparsely grazed area available it is not considered significant.

Irrigation structures exist on the dam and may be temporary affected. Work can be programmed so as not to disturb irrigation supply during critical periods during the crop cycle. Where disruption to irrigation supply is unavoidable, supplementary supply will be diverted to feed irrigation canals.

Work to the relief structures will be programmed so as to avoid disruption to the drainage regime of the EDWC. Any works which affect the operation of the relief structures can be programmed to take place during the dry season, and measures can be taken to avoid cases where more than one relief structure be rendered inoperable.

Construction activities are likely to have a positive impact on employment within the wider area. Construction will be done utilizing contractors for different aspect of the project.

Potential Impact on Flooding

Construction activities are designed to reduce the likelihood of breaches of the embankment but because of the activity there is concern that if not managed well can exacerbate breaches or interfere with drainage capacity. Using proper construction supervision is a key mitigation measures. Works to the relief structures can also be scheduled for the dry season with limits on the number of structures that can be rendered inoperable. Additionally, the existing dam will remain intact until works on the new dam are complete. Additionally, in order to prevent this occurrence, maintenance activities can be conducted as necessary including routine inspection to dams and structures; maintenance of channels and embankments.

5.2 Potential Impacts of Liliendaal Pump Station Improvement

The Liliendaal drainage system and pump capacity will be improved. However, the exact interventions are not defined as yet. As part of the project preparation and using the AF resources, an additional, more focused analysis will be carried out to define the works for the Liliendaal area, including the engineering design. These will include a system-wide analysis of the Liliendaal drainage basin including a cost-effective solution for the rehabilitation of the Liliendaal pump station in order to improve the efficiency of the drainage system. The overall expected impact of the proposed project intervention for Liliendaal is a reduction in flood depth and a reduction of flood occurrence in the Liliendaal system area. These potential works will likely involve the expansion of existing pump capacity through installation of a new pump. In addition to the installation of the pump the ancillary works (buildings, and piping) may also be part of the works. Below are the potential impacts of the works identified at this scoping stage.

Table 5. Potential Impacts of Installation and Upgrading of Pump Stations (expansion, upgrading and installation of new stations)

Issue	Impact	Significance
Land/Soil		
Vegetation clearing during construction and operation	The activities will result in the removal of grass and small trees and some soil that will need to be stored, discarded or used	Low
Management of fuel and lubricants during construction.	Fuel will be transported to the project site for refuelling of equipment which will need to be handled properly to avoid leaks and spills. The equipment will produce engine oil and lubricants that will need to be managed and disposed properly to avoid land and soil contamination.	Low
Temporary or permanent land acquisition as a result of construction	In some cases land will need to be acquired temporarily or permanently.	Low
Emissions to Water		
Management of fuel and lubricants during construction	Fuel will be transported to the project site for refuelling of equipment which will need to be handled properly to avoid leaks and spills. The equipment will produce engine oil and lubricants that will need to be managed and disposed properly to avoid water contamination.	Low
Waste disposal during construction	Small amounts of waste will be produced by workers and need to be managed and disposed properly to avoid contamination of water.	Low
Emissions to Air		
Operation of machinery during construction.	Noise and fumes from operation of construction machinery.	Low
Construction material stockpiles	Dust generation from stockpiling of construction materials.	Low- moderate
Operation of pumps during operation.	Noise and fumes from the operation of the pumps.	Low-moderate
Biological Environment		
Construction activity impact on flora	Habitat loss, fragmentation as a result of construction activities	Low
Construction activity impact on fauna	Habitat loss, fragmentation as a result of construction activities.	Low

Issue	Impact	Significance
Socio-economic environment		
Worker safety and health during construction and maintenance activities during operation	Occupational health and accidents from operating heavy machinery, traffic accidents and other construction activities.	Low
Community safety and health during construction	The public can be exposed to risks associated with construction activities, which if not properly managed can result in accidents.	Low-moderate
Relocation due to temporary or permanent land acquisition	These lands are a combination of agricultural, residential, commercial and industrial	Low
Traffic disruption during construction	Where pump stations are proximate to roads, disruption in traffic due to the construction activities may occur.	Moderate

Potential Impacts on Land/Soil

Clearing of vegetation and use of machinery that produce fuel and oil waste are necessary as part of the installation of the pumps. In addition, some small parcels of land may need to be acquired temporarily or permanently. The impacts are expected to be low and have management measures that can reduce or eliminate the impact.

The environmental impacts that potentially result from the aforementioned activities are:

- Loss of land due to direct land take;
- Clearance of vegetation;
- Fuel and/or oil spill from the operation of heavy-duty machines can cause soil contamination;
- Improper disposal of vegetation from land clearing activities.

The installation of new and upgraded pump stations may require land and the land utilized will be unavailable to other uses. Generally the current land use in the area varies including residential, agricultural, commercial and industrial uses.

The removal of existing vegetative cover will be necessary to install the pump stations. The impacts are expected to be low. In areas where it is possible re-vegetation can be undertaken to reduce this impact.

Excavated materials and vegetation will need to be removed from the area and disposed or otherwise reused to avoid the use of the land in the project area for disposal.

Management and storage of fuel, lubricants, used oil and oily waste on site can contaminate land. Leakage from equipment, refueling and servicing of machines in the field can result in fuel/oil spills. Workers negligence and inadequate storage facilities can contribute to these spills which can contaminate the soil. Management plans for fuel storage, transport, management, machinery maintenance and spill management can help mitigate and prevent these spills.

Potential Impacts on Water

The surface water quality can become contaminated or affected from potential threats as those listed below due to construction and maintenance activities.

- Water contamination from fuel/oil spills; and
- Improper solid waste disposal by workers such as food wrappers, boxes etc.

Improper storage and handling of fuel and lubricants, waste oil and oily waste can also result in water contamination. The spilled material can flow or be transported along with runoff the nearby canal system and into the ocean. Standard measures can be implemented to help minimize this.

Solid waste can often end up in water bodies as a result of direct dumping which can lead to contamination and blockage. During the construction phase, care can be taken by all workers to dispose of any solid waste material generated.

Potential Impacts on Air

During the construction and operation phase there are several activities which can affect the air quality in the project area. However, the level of impact will be localized, short-term and insignificant. These impacts are more likely to affect workers; the project site is not located in close proximity to any housing development. The following impacts can potentially arise as a result of the project.

- Noise from the operation of machinery.
- Fumes from the operation of machinery used during the de-silting process, re-routing of the canal, rehabilitation of the sluice and construction of the bridge; and
- Dust from material stockpiles and construction activities.

Construction and maintenance activities will generate significant levels of noise. The operation of machines and equipment may generate noise levels that may affect workers. Measures can be put in place to reduce the noise level from construction activities for workers and other persons on-site. Equipment and machinery will be fitted with mufflers to reduce the noise.

The operation of the machines and equipment will also generate fumes which may have some minor effect on the air quality in the surrounding area. However, the level of impact will be localized, short-term and insignificant, to the point of negligible.

Material stockpiles and construction activities can generate some amount of dust, especially during dry and windy conditions. However, this impact is expected to be short term and localised. Measures can be implemented to reduce dust such as covering stockpiles, soaking of access traversed, and reducing the height of material stockpiles.

The pumps will be operated during times of rain and flood events. They will emit noise that may affect local areas. Siting, maintenance and other design measures can reduce these impacts.

Potential Impacts on the Biological Environment

The potential impacts on the flora in the project are:

- Direct loss of vegetation due to removal to facilitate construction and maintenance during operation.
- Damage to flora during construction and operational work as a result of machinery working in close proximity.

The works will be undertaken along the drainage canals in the coastal area. A small amount of vegetation removal will be undertaken in some areas to upgrade the structures. The overall area is small. The project area along the canals is covered predominantly by secondary vegetation and indicates a highly human disturbed area. No rare, threatened or endangered species were found within the area. The area of immediate influence consists of shrub-like vegetation, aquatic species and tree type vegetation can be found. Most of the vegetation which will be lost is the type which is common within and around the project area and can also be found throughout the coastal area of Guyana. This impact is deemed minor and re-vegetation of many affected areas can minimize the loss.

The potential impacts on the fauna in the project environment are:

- Habitat loss, destruction, fragmentation due to land clearing as a result of construction activities.

The diversity in the area affected by the works is sparse and most species observed are domestic animals. Although a small portion of land area will be taken up by the project and some vegetation will be removed, there is available habitat within the project environment to support these animals. Therefore, the impact of habitat disruption on the biological environment will be localized and insignificant especially given that this area has been highly disturbed. Re- vegetation can be undertaken in some areas to minimize impact.

Potential Impacts to the Socio-Economic Environment

The potential impacts on the socio-economic environment of the project are:

- Safety and health risks for workers during construction and operation phases;
- Safety risks to the public during construction and operation phases;
- Relocation due to land acquisition; and
- Traffic disruption;

Safety measures for workers and the public can be put in place to mitigate this impact.

In some cases land acquisition might be necessary displacing agricultural, commercial, industrial or residential activities. A resettlement action plan will be developed in accordance with the Resettlement Framework of the project. Necessary compensation would need to be developed.

As pump stations can be located near roads in urban areas, there may be temporary disruption of traffic during construction. Alternative measures will be implemented to ensure traffic flow, safety, and access are maintained.

5.3 Potential Impacts of Upgrading and Construction of new embankments, channels and culverts for the Liliendaal drainage system

As was previously indicated the exact interventions to the Liliendaal drainage system is not yet defined. As part of the project preparation and using the AF resources, an additional, more focused analysis will be carried out to define the works for the Liliendaal area, including the engineering design. These will include a system-wide analysis of the Liliendaal drainage basin including a cost-effective solution for the rehabilitation of the Liliendaal pump station in order to improve the efficiency of the drainage system. The overall expected impact of the proposed project intervention for Liliendaal is a reduction in flood depth and a reduction of flood occurrence in the Liliendaal system area. As such, some improvement of the drainage system to take the water to the pump station will be done. These works may involve widening of some channels through excavation, construction and rehabilitation of culverts

under roads and other structures; and reinforcement of eroding embankments with rip-rap or other similar structure. Below are the potential impacts of the works identified at this scoping stage.

Table 6. Potential impacts of upgrading and new embankments, channels and culverts for East Coast Demerara Drainage System

Issue	Impact	Significance
Land/Soil		
Vegetation clearing during construction and operation.	The activities will result in the removal of grass and small trees and some soil that will need to be stored, discarded or used	Low
Management of fuel and lubricants during construction.	The equipment will produce engine oil and lubricants that will need to be managed and disposed properly to avoid land and soil contamination.	Low
Temporary or permanent land acquisition as a result of construction	In some cases land will need to be acquired temporarily or permanently.	Low
Emissions to Water		
Management of fuel and lubricants during construction	The equipment will produce engine oil and lubricants that will need to be managed and disposed properly to avoid water contamination.	Low
Waste disposal during construction	Small amounts of waste will be produced by workers and need to be managed and disposed properly to avoid contamination of water.	Low
Excavation of canals	Temporary and localized increase in suspended solids.	Low-moderate
Emissions to Air		
Operation of machinery during construction.	Noise and fumes from operation of construction machinery.	Low
Biological Environment		
Construction activity impact on flora	Habitat loss, fragmentation as a result of construction activities.	Low
Construction activity impact on fauna	Habitat loss, fragmentation as a result of construction activities.	Low
Socio-economic environment		
Worker safety and health during construction and maintenance activities during operation.	Occupational health and accidents from operating heavy machinery, traffic accidents and other construction activities.	Low
Relocation due to temporary or permanent land acquisition.	These lands are a combination of agricultural, residential, commercial and industrial.	Low

Issue	Impact	Significance
Traffic disruption during construction	Where works are proximate to roads, disruption in traffic due to the construction activities may occur.	Low-moderate

Potential Impacts on Land/Soil

Clearing of vegetation and use of machinery that produce fuel and oil waste is necessary as part of the culvert construction and canal widening. Some temporary or permanent land acquisition may also be necessary. The impacts are expected to be low and have management measures that can reduce or eliminate the impact.

The environmental impacts that potentially result from the aforementioned activities are:

- Loss of land due to direct land take;
- Clearance of vegetation;
- Fuel and/or oil spill from the operation of machinery can cause soil contamination;
- Improper disposal of vegetation from land clearing activities.

For canal widening in particular, it may require additional land that will be unavailable for other uses. The land in the project area in general includes agricultural, commercial, residential or industrial land.

The removal of existing vegetative cover is necessary for the channel widening and to a lesser extent for the other works. It also will be part of the maintenance activities. The impacts are expected to be low. In areas where it is possible re-vegetation can be undertaken to reduce this impact.

Management and Storage of fuel and lubricants on site can contaminate land. Leakage from equipment, refuelling and servicing of machines in the field can result in fuel/oil spills. Workers negligence and inadequate storage facilities can contribute to these spills which can contaminate the soil. Management plans for fuel storage, transport, management, machinery maintenance and spill management can help mitigate and prevent these spills.

During construction and to a lesser extent maintenance excavated materials and vegetation will need to be removed from the area and disposed or otherwise reused to avoid the use of the land in the project area for disposal.

Potential Impacts on Water

The surface water quality can become contaminated or affected from potential threats as those listed below due to construction and maintenance activities.

- Suspension of sediments during excavation of canals;
- Water contamination from fuel/oil spills; and
- Improper solid waste disposal by workers such as food wrappers, boxes etc.

The upgrading and widening of the canals will involve some excavation. This will suspend sediments and increase turbidity temporarily. As the canal system is already a high suspended solids water body this impact is expected to be temporary and localized.

Improper storage and handling of fuel and oil can also result in water contamination. The spilled material can flow or be transported along with runoff the nearby canal system and into the ocean. Standard measures can be implemented to help minimize this.

Solid waste can often end up in water bodies as a result of direct dumping which can lead to contamination and blockage. During the construction phase, care can be taken by all workers to dispose of any solid waste material generated.

Potential Impacts on Air

During the construction there will be some noise and air emissions that could affect workers and can be managed through protective equipment and proper maintenance of equipment. The pumps themselves which will be operated during rain and flood periods will produce noise and emissions also. Proper design and maintenance of the equipment is necessary to minimize these impacts.

Dust will be generated from earth movement activities and the movement of equipment over dry areas. Construction material stockpiles such as sand can become airborne and contribute to a dust nuisance. Construction activities such as demolition and removal of existing structures can increase dust nuisance. The use of cement products increase dust levels in the immediate area, transportation of material to site can however impact the wider public. Measures (mainly wetting the site frequently, covering or soaking stockpiles), can be implemented to reduce this impact.

Potential Impacts on the Biological Environment

The potential impacts on the flora in the project are:

- Direct loss of vegetation due to removal to facilitate construction and maintenance during operation.
- Damage to flora during construction and operational work as a result of machinery working in close proximity.

Vegetation removal will be undertaken as part of the channel widening and to a lesser extent other activities. The project area near the canals covered predominantly by secondary vegetation and indicates a highly human disturbed area. No rare, threatened or endangered species were found within the area. It contains shrub-like vegetation, aquatic species and trees. Most of the vegetation which will be lost is the type which is common within and around the project area. This impact is deemed low and re-vegetation of many affected areas can minimize the loss.

The potential impacts on the fauna in the project environment are:

- Habitat loss, destruction, fragmentation due to land clearing as a result of construction activities.

As the area of lost habitat is very small the impact is expected to be minor. The faunal diversity in the area is sparse and most species observed during the field exercise were domestic animals. As the lost habitat around the canals has value to reduce erosion and to provide refuge for birds, reptiles and other species, re-vegetation can be undertaken in some areas to minimize impact.

Aquatic species are limited to common species that are easily adaptable to changing environments (perch, catfish, hassar, houri, patwa, lukanani, sunfish, freshwater prawn, large snails and caiman) and suited to highly disturbed, poor water quality found in the canals. While there will be some temporary increase in sediments due to the works, the already high sediment environment in the canals and the temporary nature of the work make the impact on these species minimal

Potential Impacts to the Socio-Economic Environment

The potential impacts on the socio-economic environment of the project are:

- Safety risks for workers during construction and operation phases.
- Relocation due to land acquisition;
- Traffic disruption;

Safety measure for workers can be put in place to mitigate the risks to workers.

In some cases land acquisition might be necessary displacing agricultural, commercial, industrial or residential activities. Necessary compensation would need to be developed.

As the works can be located near roads in urban areas, there may be temporary disruption of traffic during construction. Measures to limit this impact will need to be implemented to minimize this impact.

6. MITIGATION MEASURES

For each of the subprojects, screening will be undertaken based on an analysis of impacts and on that basis an Environmental Management Plan (EMP) that will include mitigation measures specific to the subproject. Below is a description of the types of mitigations measures that would be considered based on the impacts expected. This can be used as a basis for understanding the scope of impacts of the project overall and as a starting point in developing environmental management plans for specific subprojects.

6.1 Introduction

The Environmental Management Plan is to be prepared by the Contractor for the sub project and should establish the framework within which the Contractor will manage the construction activities to minimize adverse environmental and social impacts. The Plan will describe the way in which the main environmental impacts of the project can be managed, and prescribes appropriate mitigation measures to be adopted during the rehabilitation and construction activities as well as the operational life of the project. The impacts are based on an environmental impact screening and analysis.

The objectives of the EMP will be to: Set out measures and strategies to address the environmental issues related to the rehabilitation and construction as well as operational activities of the project. Formulate a monitoring plan to ensure that the activities are executed in accordance with these environmental requirements and to establish the impacts of the project with a view to implementing any necessary further action to minimize negative impacts.

6.2 Environmental Management Organization

To accomplish a successful environmental management program the Contractor, the client and the EPA must establish an effective organization and reporting procedure. This will be formalized in the EMP. As a minimum, it is essential that:

- During the pre-construction meeting, the environmental management measures will be discussed with the successful Contractor. This meeting will include representatives from the Ministry of Agriculture (ASDU), NDIA, engineering and environmental personnel of the Supervising Consultants and engineering and environmental personnel of the Contractor.
- All necessary permits, licences and approvals will be obtained and copies will be on site prior to the start of construction. Furthermore, all work will be undertaken in a manner consistent with the conditions of all permits, licences and approvals.
- The environmental management measures should be included in the Contractor EMP and form the framework for the contract/bidding documents so as to ensure that the EMP is prepared and implemented by the Contractor.
- The Contractor shall, at the outset of construction, prepare a waste management strategy providing a plan of action for the reuse, recycling and disposal of all types of waste material generated during construction as well as during the post- construction period (demolition of construction related facilities). The objective of the strategy will be to minimise disposal through maximisation of reuse and recycling opportunities.
- The Contractor shall, at the outset of construction, prepare a health and safety plan which should address all risks posed by project activities to workers and the public.
- The Contractor shall, at the outset of construction, prepare an emergency response plan which will encompass the objective and direction provided in the spill contingency plan, this plan shall comprise procedures for notification and reporting of spills, establishment of an emergency response team.

6.3 Mitigation Measures

General

In the following sections we have identified mitigation measures which can form the minimum standard of what should appear in the Contractors EMP. These mitigation measures were identified to prevent, minimise and manage the adverse environmental impacts. These measures are outlined below.

The Contractor should:

- dispose of sewage, refuse and hazardous wastes in a manner approved by all authorities with jurisdiction;
- conduct all operations in such a manner that there are no unauthorised discharges of any sort (liquid or solid) into waterways;
- undertake work in compliance with the plans approved by ASDU/NDIA/EPA, and shall not undertake work not on the approved plans;
- ensure that habitat areas that are not within the work site are protected from disturbance;
- ensure that appropriate spill kits are available;
- when night work is authorised by the Consulting Engineer, provide adequate lighting where work is being executed at night and shall provide and install any additional lighting as required by the Consultant in order to gain access or to supervise the works and carry out testing or examination of material;
- ensure that access is provided to all properties adjacent to the site for the duration of the contract; and
- acquaint himself with the position of all existing services such as sewers, surface water drains, cables for electricity and telephone and lighting poles, water mains and the likes before commencing excavation or other work likely to affect the utilities.

Erosion and Compaction

The following measures can be implemented to reduce the impact of erosion and sedimentation activities:

- Minimise removal of vegetation to areas where it is absolutely necessary.
- Encourage natural re-vegetation in areas where possible to prevent soil exposure.
- Monitor areas of exposed soil during periods of heavy rainfall.
- Slopes should be constructed at the recommended angle to prevent collapse.
- Use appropriate machines for all earth works.
- Designate routes for heavy duty equipment to prevent compaction of soil.
- If ponding is observed due to compaction, it may be necessary to scarify the topsoil.
- Consider the weather pattern before initiating major earthworks. Earthworks should be avoided during periods of heavy rainfall.
- The area around the inlet and outlet of the culvert under the bridge will have to be stabilised as soon as possible to minimise erosion around the culvert.
- Construction activities on the EDWC embankment should be done in a manner as to not affect the integrity of this structure.
- Cofferdams and other appropriate measures should be used to prevent water from entering working areas so as to prevent breaches from occurring.

During operation, routine maintenance activities will be conducted as necessary. Maintenance requirements should include:

- Routine inspection to dams and structures
- Routine cleaning of channels
- Routine cleaning of embankments
- Raising low spots on the embankments
- Maintenance of structures
- Repairs to slips

Habitat and Wildlife

The following measures can be implemented to minimize impact on disturbance to habitat and wildlife:

- Minimise removal of vegetation to areas where it is absolutely necessary.
- Encourage natural re-vegetation using native plants in areas.
- Schedule activities to avoid disturbance of resources during critical periods of the day (e.g., night) or year (e.g., periods of courtship, breeding, nesting, lambing or calving).
- Instruct employees, sub-contractors and site visitors to avoid harassment and disturbance of wildlife.
- If studies identify nesting grounds or other important habitats, establish buffer zones to avoid disturbance.
- Avoid the spread of invasive, non-native plants by keeping vehicles and equipment clean.
- Report observations of potential wildlife problems, including wildlife mortality, to the appropriate wildlife agency.

Fisheries and Watercourses

In order to protect fish, fish habitat, water courses and the quality of water used for domestic and irrigation purposes, the following should be implemented. The Contractor shall:

- minimise and contain suspended sediment within the immediate zone of construction;
- undertake appropriate containment measures during concrete pours to ensure that uncured concrete or concrete leachate does not enter any watercourse or drainage;
- ensure that water intakes or drainage channels for domestic and irrigation purposes are protected from damage at all times;
- avoid disruption of sluices and impact to hydraulics, drainage shall be controlled and monitored during construction to maintain proper water levels through adequate structural support systems. Water bodies should be free of obstruction and normal flow of water maintained;
- all waste storage stockpiles or stockpiled material shall not be placed within 10m of any watercourse and shall have a toe berm construction around; and
- significant volumes of dewatering effluent (greater than 3 litres/second) shall be discharged into a “filter bag” that’s designed to retain or filter sediment while gradually releasing water.

Dewatering

The discharge of dewatering effluent can result in scouring and erosion at point of discharge as well as sediment loading to watercourses and drains. The Contractor shall keep the whole works free from water and provide all dams, cofferdams, pumping, piling and temporary drains necessary for this purpose.

Significant volumes of dewatering effluent greater than 50 gallons per minute shall be discharged into a filter bag that is a geotextile bag to retain or filter out sediments.

Noise

As identified in the impact section, noise will be a significant environmental impact that requires mitigation. The EPA, in collaboration with GNBS, has developed Guidelines for Noise Emission into the Environment. The Standard specifies noise limits for construction activities both for daytime and during the night. The daytime limit (06:00hr – 18:00hr) is 90dB while the limit in the night is 75dB. Given the proximity of residents to the activities locations noise is not anticipated to be a significant problem. However, to comply with the National Standard and reduce this impact the following are measures should be implemented:

- Provide hearing protection to workers exposed to high noise levels such as those involved in demolition.
- Provide earplugs for employees who operate heavy duty machines.
- Employees working in high noise levels areas should be mandated to wear earmuffs or earplugs as required.
- Ensure that machinery and equipment are working efficiently and have installed the required muffler devices.
- Night works should be avoided and must be authorised by the Consultants.
- Equipment which produces continuous noise such as generators should be sited away from residents.

Dust

Dust, though localised, is a potential impact that would require some level of mitigation. The following measures should be implemented to reduce the impact of dust on the environment:

- Personnel working in dusty environments should be required to use respirators.
- During dry periods it may be necessary to soak routes traversed by vehicles and equipment. Dry areas should be soaked as necessary, depending on the weather condition.
- Materials should be transported to site as needed thus resulting in small stockpiles. All trucks transporting construction materials should be covered.
- If necessary, the stockpile would also be soaked with water periodically.
- The burning of construction waste and cleared vegetation should be prohibited to avoid smoke nuisance.

Fuel, Lubricants and Used Oil

Fuel, lubricants and used oil are classified as hazardous materials and require special consideration in terms of transportation, storage and handling. The following measures should be implemented to ensure the risks of contamination of soil or water from spillages are minimised:

- Since the construction activities would be temporary and fuel storage will be moved as activities progress, it would not be feasible to construct proper facility for fuel storage. As such, it is recommended that fuel be transported to the site as needed or in small quantities.
- Fuel which will require storage should be sited a safe distance from waterways, site offices and work areas and should be elevated to detect any leaks.
- Care should be taken to prevent spillage and leakage of fuel during off loading and refuelling. This should be done by trained personnel. When refuelling is completed, all nozzles, hoses and other materials should be stored in a proper manner to avoid spills.
- Drip pans can be placed under the fuel/vehicle coupling when vehicle tanks are being filled. This should prevent the possible contamination from leakage of fuel.
- Regular maintenance of machinery should be done to avoid leakages.

- Spill kits should be made available in the event of spillages.
- Workers, mechanics and other staff should be trained on the proper use of these kits.
- Adequate signage should be installed in fuel storage areas such as 'No Smoking' and 'Flammable Materials'.
- Fuel storage tanks/containers should be monitored for leaks.
- Fire containment measures such as extinguishers or sand buckets should be place in fuel storage/refueling areas.
- The on-site fuelling area should be deemed a 'no smoking' zone and all staff required to turn off cell phones when in that general vicinity.
- During servicing all used oil should be properly collected and removed from site. There should be no storage of used oil onsite.

Waste Management

Several types of waste can be generated from the various activities that would require different methods of disposal. Domestic and construction waste will be disposed of at the Lusignan Dumpsite. The waste is to be properly collected, stored and transported. There should be no significant accumulation of construction waste onsite. Adequate and approved toilet facilities are to be provided for workers.

Grading and Topsoil Protection

The following measures can be implemented to manage soil and ensure topsoil protection:

- Excavated material not to be reused shall be stored at temporary sites
- Excess materials shall be placed in piles from which it may be replaced into its original position.
- Stockpiles shall not be placed within 10 m of any water body.
- Topsoil and subsoil shall be stripped and stockpiled separately to avoid mixing.
- In areas where soils are not to be removed, the grassed vegetative layer shall be maintained, where possible, to protect soils from compaction and erosion
- Topsoil shall be spread to a uniform depth of 5cm on designated areas. Areas where topsoil is to be placed shall be fine graded to a uniform surface. It shall be free of all vegetation and other debris, and free of stones, which would not be covered by the depth of topsoil of 5cm.
- Where excess topsoil is generated, that is not required for restoration of the construction area, this excess topsoil should be donated to the Local Government Authorities, as represented by the Neighbourhood Democratic Council for their use and distribution to local landowners.

Traffic Disruption

The following measures can be implemented to reduce this impact and prevent accidents:

- Make suitable provision, including the use of a bypass to accommodate all vehicular and pedestrian traffic safely and with a minimum of inconvenience through or around the work area.
- Construction in phases to allow for the free flow of traffic.
- Use of precast materials to reduce the construction period.
- Locate material stockpiles and waste debris piles away from road way so as to prevent encumbrances.
- Traffic control devices such as signs, barriers, fences, lights should be provided and installed.
- Placement of advance warning signs on road before approaching sites. Cones placed to demarcate construction and lane closure zone.

- Use of flag persons should be provided during all periods of activities which may affect normal traffic flow.
- Consider the use of the Guyana Police Force to assist in controlling traffic. Cordoning off work zones.
- Providing lighting for the construction zone at night.
- Informing road users through the media of possible traffic disruption and the importance of exercising caution in order to minimize accidents.

Temporary or Permanent Land Acquisition as a Result of Construction

In the event that a sub-project entails land acquisition, and has involuntary taking of land resulting in the loss of assets, the following will be undertaken: (i) affected parties will be informed about their options and rights pertaining to resettlement; (ii) consulted on, offered choices among, and provided with technically and economically feasible resettlement alternatives; and (iii) provided prompt and effective compensation at full replacement cost for losses of assets attributable directly to the project. A detailed process for undertaking these tasks is outlined in the Resettlement Policy Framework for the project.

Health and Safety

Under the specifications the Contractor will be required to undertaken measures for ensuring the safety of all stakeholders in the vicinity of the construction site. This should comply with all guidelines outlined in the Occupational Health and Safety Act, as well as the recommendations listed below. Consideration should be given to the following measures to manage health and safety:

- Designation of a person on staff with responsibilities for Occupational Health and Safety.
- Risk assessment with mitigation measures as discussed below.
- Protocol for training and toolbox talks for all site personnel.
- Protocol for talking through risk assessment with site personnel, and having all site personnel sign risk assessment to agree to follow mitigation measures
- Reporting procedures for near misses, accidents and dangerous actions.
- Commitment to ensure all PPE, first aid equipment, and safety and emergency response equipment are provided in accordance with the risk assessment.
- Ensure emergency response procedures are developed and communicated.
- Procedures for site inductions to be given to site visitors.
- Adequately secure/cordon construction zone and erect the necessary warning signs.

“Chance finds” of Physical Cultural Resources.

If the Contractor discovers archaeological sites, historical sites, remains and objects, including graveyards and/or individual graves during excavation or construction, the Contractor shall:

- Stop the construction activities in the area of the chance find;
- Delineate the discovered site or area;
- Secure the site to prevent any damage or loss of removable objects. In cases of removable antiquities or sensitive remains, a night guard shall be arranged until the responsible local authorities or the National Trust of Guyana;
- Notify the Supervisory Project Environmental Officer and Project Engineer who in turn will notify the responsible local authorities and the National Trust of Guyana immediately (within 24 hours or less);

Responsible local authorities and the National Trust of Guyana would then be in charge of protecting and preserving the site before deciding on subsequent appropriate procedures. This would require a preliminary evaluation of the findings to be performed by the archaeologists of the National Trust of Guyana. The significance and importance of the findings should be assessed according to the various criteria relevant to cultural heritage, namely the aesthetic, historic, scientific or research, social and economic values.

Decisions on how to handle the finding shall be taken by the responsible authorities and the National Trust of Guyana. This could include changes in the layout (such as when finding irremovable remains of cultural or archaeological importance) conservation, preservation, restoration and salvage.

Implementation for the authority decision concerning the management of the finding shall be communicated in writing by relevant local authorities.

Construction work may resume only after permission is given from the responsible local authorities or the National Trust of Guyana concerning safeguard of the heritage.

6.4 Specific Management Plans

The Contractor's EMP should elaborate Specific Management Plans for the more involved mitigation measures. Annex 1 provides guidelines and sample plans for: (i) erosion and sediment control; (ii) waste management; (iii) fuel and lubricant management; (iv) a closure plan and (v) health and safety plan. These can be adapted to the context of the individual subproject.

6.5 Dam Safety Plans

The Proposed works on the dam are based on technical studies of the EDWC dams covering the safety status, performance history and operation and maintenance procedures. Necessary remedial work and safety-related measures were identified in order to upgrade the safety status of the dam, including immediate priority works on the northeast dam for which the Project will be providing financing.

Evaluation of dam safety status, performance history and operation and maintenance procedures: The study conducted geotechnical investigations and provided a comprehensive evaluation of the structural integrity of the EDWC dams, their performance history and operation and maintenance procedures. It also assessed the condition of the relief structures and irrigation offtakes associated with the dams. The existing EDWC dams are over 130 years old. The performance history of the dam highlights the fact that it operates above safe operating levels almost every year and has had many minor slope failures, which have generally been repaired without substantial consequences. For most of the dams, the study supports the historical evidence which suggests that under design operation conditions the stability of certain dam sections become marginal, as evidenced by the historical incidence of localized instability. The operation and maintenance procedures were evaluated and found to be not formalized; leading to the development of an operations manual that included formal monitoring and inspection practices.

Necessary remedial work and safety-related measures: The results of the study show that the northeast dam is the most fragile dam and in need of rehabilitation. Its foundation is comprised of pegasse (peat), and the dam itself is made of very soft clays with a high pegasse content. The north dam, and the northeast dam have also been found to have marginal stability. The west dam on the east bank of the Demerara River is built on and constructed of better clays, however the side slopes are steep, the crest is narrow and the vegetation is overgrown. It therefore does not meet international standards, but it is still considered stable. The water control and offtake structures were found to need some work on the reconstruction of the downstream revetments and upgrading of the support

infrastructure to allow for a safe operating environment for the workers. In order to meet an acceptable standard of safety, a set of works and measures were recommended. These included: (i) immediate term works to rehabilitate the weak sections of the northeast and north dams; (ii) safety improvements to existing water control structures and offtakes; and (iii) medium term works to rehabilitate the east and west dams to upgrade them to international standards.

Construction methodology and program: The study also detailed the approach to the remedial works identified above including the necessary equipment, materials sourcing, labor, phasing of works, costs and schedule. It also includes the necessary technical specifications and constructing procedures to ensure quality of the work, the safety of the structures and safety during construction. These can be used in the bidding documents and as a basis for supervision of the works.

Operations and Maintenance: The study developed a manual for operation and maintenance of the EDWC system. It included operational procedures for flood management operation; water supply operation; maintenance of the waterways, dam, control structures, and monitoring. It covered the organizational structure, staffing, technical expertise and training as well as the necessary equipment and facilities. It also addresses the current and additional resources needed to implement these procedures.

In order to further reduce the risk of failure of the dam as the works are being undertaken and into the future, in parallel with these measures the following plans will be developed or updated and operationalized in order to improve the quality of the rehabilitation works; monitoring and surveillance of the dam behaviour; improve operation of the maintenance procedures; and preparedness of downstream communities in case of a failure.

1. *Plan for construction supervision and quality assurance.* This plan covers the organization, staffing levels, procedures, equipment, and qualifications for supervision of the construction of the remedial work on the dam. The current procedures for construction supervision were reviewed and the organizational approach was adjusted to improve staffing, to include the use of a consulting firm with expertise in dam construction for supervision and to improve accountability and eliminate potential conflicts of interest in the contractual arrangements. To raise the standard of the approach for construction, supervision and quality assurance, the agreed approach will be included as part of the plan for construction, supervision and quality management that will form the specifications for bidding of the construction and the supervision of the dam works and will be completed before construction starts.

2. *Operation, Maintenance and Surveillance (OMS) Plan.* This Plan addresses the procedures and practices for the EDWC dams and affiliated structures - the operation, maintenance, monitoring and inspection required to ensure safe and sustainable operations. This plan will cover organizational structure, staffing, technical expertise, and training required; equipment and facilities needed to operate and maintain the dams; operation and management (O&M) procedures including standing operating procedures (SOP); and arrangements for funding O&M, including dams maintenance and safety inspections. An OMS Plan was prepared by an international consultant based on the existing O&M practices and dam improvement design. The existing OMS will be refined and updated before bidding of the works.

3. *Instrumentation Plan.* The dam improvement design already prepared by the international consultants includes basic dam monitoring instruments. This will be elaborated as a plan before bidding of the works and included as part of the construction technical specifications. These instruments will be procured and installed as part of the construction contract to monitor and record the behaviours of the entire EDWC dams. In addition, any essential hydrological meteorological stations required for dam and affiliated structures operations and flood emergency management, will be procured and installed under the project.

4. *Emergency Preparedness Plan (EPP).* This is required to improve the preparedness and resilience of the communities and assets in the influence zone, and reduce the related damages and losses in the cases of extraordinary floods in the catchment of EDWC and in the event of EDWC dam failure. The plan should specify the roles of responsible parties when dam failure is considered imminent, or when expected operational flow release threatens downstream life, property, or economic operations that depend on EDWC flow levels. It includes the following items: clear statements on the responsibility for dam operations decision making and for the related emergency communications; maps outlining inundation levels for various emergency conditions; flood warning system characteristics; and procedures for evacuating threatened areas and mobilizing emergency forces and equipment. This plan will be developed during Project implementation.

7. SUBPROJECT SCREENING AND EA PREPARATION PROCESS

7.1 Subprojects Eligible for Financing

The Additional Financing will fund the current works ongoing at the EDWC and improve the drainage capacity at Liliendaal.

7.2 Screening Procedures

National Regulatory Requirements

The EDWC Dam reconstruction project is already permitted by the EPA. The works to be done at Liliendaal will require a Construction Permit from the EPA, as was required for the other pump stations already constructed. ASDU will consult and submit the required application form to the EPA in order to initiate the screening process and facilitate the permitting process. However, in the case that EPA requests an Environmental Impact Assessment (EIA) or any other type of assessment for the proposed civil works or for any other activity related to this Project, ASDU will include the national requirements in their preparation of the EIA.

World Bank Requirements
The potential subprojects are governed by the World Bank Operational Policies OP 4.01 – Environmental Assessment and depending on the subproject may also be governed by OP 4.04 – Natural Habitats, OP 4.11 – Physical Cultural Resources and OP 4.10 – Involuntary Resettlement, and possibly OP 4.10 – Indigenous Peoples (in the event that any sub-projects would be located in an area in which Indigenous Peoples are present).

The main difference between World Bank OP 4.01 Environmental Assessment and the national legislation is that an EIA/EMP, or in some cases a very detailed EMP, is required for a larger set of subproject types including many that would only require an environmental permit (and no EIA) under the National Regulations. The EMP also includes analysis and as necessary mitigation measures for OP 4.11, OP 4.12 and OP 4.12 if they apply to the subproject.

ASDU will undertake screening of each subproject to assess the potential impacts and mitigation measures in order to identify the level of analysis, key issues to analyse and to ensure application and compliance with any World Bank policies triggered. In undertaking this screening, the attached checklist (Annex 4) can be used.

7.3 EMP Preparation

In addition to the issuance of the environmental authorisation by the EPA, ASDU will require the Contractor to prepare an ESMP to respond adequately to the requirements of this framework. The World Bank will undertake review of the implementation of the framework including the quality of the EMP as part of the regular supervision.

7.4 Implementation

The EMP once accepted by ASDU and the environmental authorisation will be enforced and the Contractor will be obligated to comply. ASDU and the contracted construction supervisor will monitor the implementation of the provisions related to the EMP.

7.5 Costs of Mitigation Plans

The Environmental and Social Management Plan will be included as part of the costs borne by the contractor and the supervision will be funded under the works supervision contract.

7.6 Monitoring and Reporting

ASDU will have the main responsibility for monitoring the application and use of this ESMF. Reports related to the implementation of the EMPs will be produced from the supervision of the work. ASDU will develop consolidated bi annual monitoring reports for all the works and include this in the regular project documentation. Copies of the bi-annual monitoring reports will also be sent to the World Bank. The Bank will also review these reports during the periodic supervision missions.

Specific Roles and Responsibilities

ASDU has the overall responsibility for ensuring the environmental, health and safety safeguards are implemented and requirements met. ASDU should have in place an Environmental and a Social Specialist to oversee the environmental, social, health and safety aspects of the works to ensure that the World Bank Environmental Safeguard Policies are adhered to with where applicable and that the contractors comply with the requirements of the Construction Permits and implement the Environmental Management Plans.

The Supervisory Consultants is responsible for ensuring that the Contractor comply with the requirements of the Construction Permit and implement the Environmental Management Plans.

The Contractor has the responsibility to ensure that the requirements of the Construction Permit issued by the EPA are complied with, as well as to ensure that the approved Environmental Management Plans are implemented.

Project Site Meetings

The Environmental and Social Specialists should be involved in regular project meetings with the Supervisor's Representative, and the Contractors Representative. The purpose of such regular meetings should be to outline the schedule of upcoming construction and proposed activities, and to review the activities of the previous week. In the event that the Specialists or Supervisor's Representative deem the compliance regarding environmental requirements to be inadequate at any time during the Project, the frequency of the weekly or biweekly regular meetings should be increased accordingly until the they are satisfied with the implemented changes.

Environmental Monitoring of Construction Activities

<u>Reporting Criteria and Frequency</u>
To facilitate efficient communications, the Contractor's on-site Environmental Officer/Monitor should report and communicate with the EPA and other agencies. The Environmental Officer/Monitor should keep written records and photographic records where applicable, of all mitigation activities, compensation works, and construction task assessments and communications regulatory personnel. Weekly summary reports should be submitted to the Supervisor's Representative and should include:

- Number and type of work assessments
- Quality of construction work and work techniques or mitigation recommendations
- Follow-up on previous recommendations
- Outstanding environmental works
- Proactive measures taken to protect the environment

- Other environmental issues
- Communications with environmental agencies
- Areas of work scheduled for upcoming week
- Proposed changes to design

If a special event occurs, the Environmental Officer/Monitor should immediately report the event to the Supervisor's Representative. Subsequent reporting should include event details, quality assurance and prevention plans. If an event results in a spill, the spill response plan should be activated. The Environmental Officer/Monitor should provide:

Weekly reports detailing

- Number and type of work assessments
- Recommendations and follow-ups
- Unanticipated activities
- Proposed design changes Summary of meeting issues
- Other environmental issues

Monthly Reports detailing:

- Environmental construction works to date
- Outstanding environmental construction works
- Planned environmental construction works
- Quality of work and work technique or mitigation recommendations
- Environmental assessment work projection for the upcoming month
- Proactive measures taken to protect the environment
- Communications with environmental agencies
- Other environmental issues

The Environmental Officer/Monitor should also maintain a daily diary containing details of events, assessments undertaken, communications, and other relevant items. The diary should be delivered to the Supervisor's Representative at the end of each construction season, or at the year's end. Example forms for regular environmental inspection reporting have been included in Annex 5.

Construction Activity to be Assessed

All aspects and phases of construction are to be assessed including planning, scheduling, methodology, and mitigation. Daily planning, scheduling and construction techniques should be discussed and assessed by the Environmental Officer/Monitor.

Assessments

The Environmental Officer/Monitor should record assessments in written format and photographically where applicable. Individual records should be maintained for each environmental section and for each springs/wells compensation sites. Specific activities are to have individual assessment records on file, including any recommendations for follow-up.

Copies of assessment records should be forwarded, as completed, to the Supervisor's Representative, highlighting outstanding works, substandard works requiring improvement, and construction technique recommendations. The Supervisor's Representative should provide a written response, within 2 days detailing the schedule to accommodate substandard or outstanding works. Recommendations should be discussed at the next weekly meeting.

Compliant /Non-compliant Criteria

A non-compliant activity is any activity that does not comply with the requirements of the Environmental Management and Monitoring Plan, the Special Specifications for the Project, permits, approvals and authorizations, and environmental regulations and acts, regardless of due diligence and mitigation activities. If a non-compliant activity is detected or reported, the activity creating the non-compliance should cease, and efforts should be undertaken to rectify the non- compliance. The Environmental Officer/Monitor should assess all non-compliance activities and assist the Contractor in returning the activity back into compliance.

The Contractor, in consultation with the Environmental Officer/Monitor, should prepare a prevention plan designed to prevent reoccurrence of non-compliant activities. The Environmental Officer/Monitor should conduct follow-up assessments on all previously non-compliant activities to assure changes have been made to ensure environmental protection. Follow-up assessments should be submitted to the Supervisor's Representative and the Contracting Authority.

Stop Work Authorization

Persons with Stop Work Authorization are the primarily Supervisor's Representative and subsequently the Environmental Officer/Monitor. Stop Work Authorizations are to be used only after all other efforts, such as dialogue with the Contractor and assessment reports, have been employed in an attempt to return a noncompliant or potentially non-compliant activity back into compliance. Although both parties are authorized to issue Stop Work Orders for a particular adverse activity, whenever possible, the Environmental Officer/Monitor should request the Supervisor's Representative to undertake this Management. If the Supervisor's Representative is not available, or is unresponsive to this request, the Environmental Officer/Monitor should issue the Stop Work Order. Stop Work Orders should be in writing. Stop Work Orders for environmental protection, or any issued by the Environmental Officer/Monitor must immediately be communicated with the Contracting Authority.

General Environmental Monitor Activities and Deliverables

The activities of the environmental monitoring services should be comprised of routine activity assessments, potential environmental protection activities, unanticipated activity assessments, meetings and reporting, resource assistance and environmental protection. Routine activity assessments, potential environmental protection activities, meetings and reporting are based on scheduled construction activities. Unanticipated activity assessments are those construction activities that are not planned or scheduled and include activities such as spills and uncontrolled environmental releases, weather influenced activities, field changes, etc.

The Environmental Officer/Monitor services should also act as an environmental protection resource for the Contractor, participating in training, modifying construction techniques, providing recommendations, and assisting in preventative planning toward environmental protection. The Environmental Officer/Monitor should be expected to participate in weekly Contractor meetings to discuss project schedule, changes, recommendations, works in environmentally sensitive areas,

Pre-Construction/Construction Phase

A pre-construction report should be prepared by the Consultant before the commencement of construction. This assessment should take the form of a small audit to detail characteristics of the environment in the construction and related areas. This should include a photo log and sketches of area. This report can be used to monitor construction impact on the environment.

The following items should be monitored during the construction phase.

- General Site Condition: Routine assessment of general site conditions, visual inspection of construction staging area to ensure that EMP is being implemented.
- Fuel and Hazardous Material Storage Areas: Routine assessments of fuel and hazardous material storage and general housekeeping practices are to be undertaken on an informal base throughout construction.
- Noise and Dust: Monitoring of noise and dust nuisances and measures implemented to mitigate those nuisances.
- Waste Management Assessment/Monitoring of waste collection and disposal practices and general housekeeping on site.
- Public Complaints: Assessment of public complaints and follow up
- Watercourse Crossings Equipment crossings of the drains (channels) are to be monitored for best management practices such as bank erosion reduction, sedimentation,
- Flag Riparian Zones: The Environmental Officer/Monitor is responsible to flag all riparian zones simultaneous to the construction contractor project layout, prior to clearing and grubbing operations
- Drainage: All channels, drains and River are to be monitored as and when required, to assure clearing and grubbing activities, and erosion control measures, are undertaken in accordance with the environmental management plan.
- Sediment Control Monitoring Sediment control should be monitored to ensure water quality protection during all phases of construction.
- Flora and Fauna: The effect of construction on vegetation clearance and also impact on water bodies and aquatic environment should be assessed.

Post Construction Phase Assessment
Construction site and staging area shall be cleared, all structures dismantled and restored to its original stage as far as practicable as possible. Within one month of completion of construction the Environmental Inspector shall prepare the post construction report and shall be forwarded to the Client and Contractor.

The following items should be inspected and monitored.

- Site clean up. All waste materials should be removed and all existing structures that are not part of the works removed.
- Grading and slope stabilization done.
- Erosion control measures in place, sedimentation identified and recovered.
- Re-vegetation around construction sites to avoid erosion.
- Utilities disconnected.

Monitoring Plan

Monitoring is an integral part of effective implementation of the Environmental Management Plan. The Consultant environmental Inspector should visit all construction area on a daily basis to ensure that mitigation action area implemented. The main environmental issues to be monitored are water quality, erosion and sedimentation. At each construction site it is important to carry out water quality test (pH and Turbidity), these tests should be done prior to construction to establish benchmark data, during construction to assess the impacts and after the completion of construction.

Services not provided by the General Environmental Monitor

Environmental monitoring service is not responsible to undertake environmental mitigation activities that are normally performed by the Contractor. Such activities include, but not limited to:

- Sediment control structure implementation, inspections and maintenance
- Mitigation activities required due to weather
- Returning non-compliance activities back into compliance
- Spill control and clean up

Environmental Protection Agency

The EPA main role is to ensure that the project is implemented and the project is in compliance with environmental laws, standards and regulations. The EPA will receive annual and closure reports from the Contractors during construction and post construction. The EPA is also responsible for periodic monitoring of the project.

7.7 Grievance Procedures

A grievance redress mechanism for the project will be established for addressing legitimate concerns of affected individuals and groups who may consider themselves deprived of appropriate treatment under the project or otherwise affected. The mechanism will be developed by the ASDU and will include:

(i) a recording and reporting system, including grievances filed both verbally and in writing,
(ii) designated staff with responsibility at various levels of governments, and;
(iii) a timeframe to address the filed grievances.

This mechanism will be detailed in the sub-project safeguards documents. The functioning of the grievance redress mechanism will be regularly monitored and evaluated by the ASDU during project implementation. The mechanism is outlined in Table 9 below.

Table 7: Grievance Redress Mechanism

Grievance Redress Procedures	
Access Point	• The Minister of Agriculture holds weekly meetings with farmers each Wednesday. These meetings can also be opened to include the public at large but specifically communities living around the project area or affected by the project. • The Project Coordinator in the ASDU will also be accessible via telephone, email, and in-person and will be responsible for intake of any grievances. • This access point will be advertised through the Ministry's website or a signboard or other means. • The Permanent Secretary of the MoA shall be responsible for leading responses to grievances related to this project.
Grievance Log[10]	• Grievances can be made verbally to the Minister and/or the designated representative of the Minister. In this case, the grievance shall be accurately documented and verified as a true account by a third party. • Grievances can be made in person, telephone calls or by writing addressed to the Project Coordinator in the ASDU

[10] This log should constitute a data base containing the origin of the grievances and associated issues, number of complaints received, resolved, and gone to mediation. This document should be publicly accessible via the MoA website.

Grievance Redress Procedures	
	and copied to the NDIA, defined as a relevant authority in the Drainage and Irrigation Act, 2004. • All grievances must be signed and dated by the aggrieved person. • All grievance records shall be copied to the relevant authority as defined in the Drainage and Irrigation Act, 2004.
Assessment and Timeframe	• The ASDU should acknowledge within 5 working days, receipt of the complaint and should include notification of the period necessary to address the grievance to the aggrieved person. • If the aggrieved person does not receive a response within the agreed time or is not satisfied with the outcome, he/she can refer the matter to the NDIA Board for redress. • The NDIA Board should acknowledge within 10 working days, receipt of the letter of appeal and should include notification of the period necessary to address the appeal. • If the aggrieved person does not receive a response within the agreed time, or is not satisfied with the outcome he/she can refer the matter to the responsible Minister for redress. • If the aggrieved person is not satisfied with the outcome he/she can refer the matter to the Court of Law for redress. • The grievances should be categorized by type (environmental, compensation, resettlement etc). The first assessment of the grievance should be conducted by a Grievance Committee comprising of the Permanent Secretary, the ASDU Project Coordinator, technocrats from the NDIA and the lawyer based in the Ministry of Agriculture. • Where agreement is not reached at the level of the Grievance Committee, the steps outline above should be followed.
Resolution and Follow- up	• An Implementation Plan will be developed for resolution of grievances. Data should be shared with the World Bank (raw grievance and/or monthly reports). On the spot resolution should be encouraged. However, the process and results should be documented.

7.8 Training and Capacity Building

ASDU will be staffed by qualified engineers and an environmental and social specilaists that can supervise the environmental and social aspects of the works. The project will include training on the ESMF and its implementation, including the reporting requirements to these engineers. Contractors will be given training on the requirements of individual EMPs by ASDU.

In addition, all employees directly and indirectly involved in the construction of the proposed culverts shall be trained. This training program should aim to train and familiarize workers with the Environmental Management plan, the implementation of the plan and application of the mitigation measures. Workers should receive basic health and safety training to ensure that accident levels and mishaps on the construction site are kept top the minimal level. The traffic management plan should be discussed in detail with the designated traffic office and other employees responsible for traffic management, to ensure that effective traffic control mechanisms are in place and a free flow of traffic is maintained at all times. Safety of road users and construction employees is an important issue that

need special consideration and training in traffic management will assist in implementing the Traffic management Plan. All construction workers should be familiar with the construction impact and preventative measure identified in this EMP as it related to waste management, general construction, water management, erosion and sedimentation control, dust and noise pollution, flora and fauna protection

REFERENCES

Conservancy Adaptation Project: Pre-investment Studies, EDWC Dam Safety and Feasibility Analysis, Environmental Assessment for Construction Activities, Mott MacDonald for the Ministry of Agriculture, Government of Guyana, June 2013.

Environmental and Social Assessment Report, Cunha Canal Rehabilitation Project, EMC for the Ministry of Agriculture, February 2010.

Environmental Assessment and Environmental Management Plan, University of Guyana Science and Technology Support Project, December 2011.

Arnon, Arad, Journal of Hydrology, “A Summary of The Artesian Coastal Basin of Guyana”, No. 63 1983.

Environmental, Health and Safety Guidelines, The World Bank, Group, 2007.

ANNEXES

The following annexes are presented as they appeared in the original 2014 ESMF prepared for the project. These have been revised and updated for the works and activities as they have been described in Section 1.3, that are the basis for this updated version of the ESMF of the project Guyana Flood Risk Management Project.

Annex 1 – Guidelines and sample management plans
Annex 2 – Environmental Permitting Process
Annex 3 – Terms of Reference Environmental Impact Assessment
Annex 4 – Screening checklist
Annex 5 – Example Forms
Annex 6 - Presentation of DRM Project Environmental and Social Assessment Framework and Resettlement Policy Framework *(to be added after the consultation planned on July 25, 2019)*

Annex 1: Guidelines and Sample Management Plans

Erosion and Sediment Control Plan

Purpose and Scope
This Plan describes environmental protection measures to prevent erosion and sedimentation. Protection measures to control sediment and runoff and specific sediment and drainage control plans for all areas of disturbance are contained herein.

Sediment Control and Water Quality
Works will be planned, scheduled and performed in such a manner that the quality of water flowing from the site is at all times acceptable. Conditions will be maintained to protect the aquatic environment of watercourses not only during construction, but also during periods of suspended construction activity. Permanent and temporary soil erosion control features will be constructed at the earliest practicable time, and will be inspected daily during adverse weather conditions or when construction operations are proceeding in Environmentally Sensitive Areas. Control measures will be capable of continuous operation during working and non-working hours, and are subject to approval by the Supervisors' Representative. During periods of inclement weather, operations will cease, or construction methods will be modified or relocated to an alternative site within the project area to avoid siltation of watercourses.

The Environmental Officer/Monitor will conduct regular water quality monitoring for changes in turbidity as a result of construction as part of the quality assurance program. The installation of culverts will be conducted in the dry whenever possible to reduce the risk of sedimentation to local watercourses. During preparation of stream diversions, culvert installations and other dewatering where drainage could readily reach a watercourse, all effluent and silt-laden water will be discharged to a sediment control pond, or alternate sediment control method for removal of sediment prior to its release into that watercourse. This requirement also applies to the control of discharge resulting from curing areas of recent concrete pours for bridges or drainage structure headwalls. The direct discharge via seepage of untreated, silt-laden water or other deleterious substance into any watercourse is prohibited. During construction it is often impossible to protect all newly exposed soils from erosion; therefore it is important to also apply sediment control measures at the same time as the erosion controls. Sediment control typically focuses on managing water run-off from erosion prone areas. Water carrying sediment must be directed away from entering waters that provide domestic and irrigation needs and contain aquatic organisms or the water must be treated before it is released into such waters. Steps to control sediment include:

- Control and collect runoff from erosion prone areas
- Minimise runoff velocities and erosive energy;
- Maximise the length of flow paths for precipitation or surface runoff to minimize energy of flow or employ structures such as check dams and ditch blocks.
- Discharge sediment-laden waters to re-vegetated areas where sediment can be filtered out before the water reaches any watercourses.
- Retain sediments on site with sediment control structures.
- Use correctly installed silt fences and other barriers;
- Provide bed-load clean-outs at culverts and ditches;
- Construct sediment traps in areas where ditch water must be intercepted to ensure sediment is not transported into watercourses;
- Construct sediment traps of sufficient size to handle the anticipated runoff.
- Regularly monitor erosion and sediment control measures to ensure that they are working effectively;
- Additional checks are required after rain events;

- Maintenance of sediment control devices includes the removal of accumulated sediments to maintain collection capacity;
- Have extra geo-textile (silt fencing), and /or gravel on hand to repair or install new sediment control structures as required.

Erosion Control
Once land clearing and construction have begun, erosion control is the first step in effective management of sediment. While erosion is a natural process that shapes the landscape, construction can accelerate the process and cause significant volumes of material to be transported and potentially adversely impact aquatic resources. Therefore, sites at risk of shallow slope movement will be identified and appropriate control measures applied to minimize the potential of slope movement. Effective and proactive erosion control is more effective than sediment interception and trapping.

The following steps to effectively control erosion shall be adhered to:

- Schedule construction activities at sensitive sites for times when the risk is minimal.
- Inlet and outlets of drainage culverts will be stabilized as per construction drawings as soon as the culvert is installed to minimise erosion around the culvert.
- Where possible construction activities in areas of high erosion potential will be planned for the driest season of the year.
- Equipment movement in erosion prone areas during periods of heavy precipitation will be restricted.
- Retain as much existing vegetation as possible.
- Construction drawings will identify areas of clearing and grubbing and designed to minimise the loss of vegetation;
- Clearing of vegetation will be minimised at equipment storage and marshalling areas and at borrow and other material storage areas avoid exposing sensitive soils;
- The RoW clearing and grubbing boundaries will be flagged to ensure areas are not unnecessarily cleared.
- Re-vegetate/protect cleared areas and bare soils
- Protect temporary fills, stockpiles or exposed soils adjacent to drains, streams and canals with slope blankets or covers. Plastic sheeting, geotextiles and other manufactured products can be used as covers. Angular rocks may be suitable in protecting sensitive soils. All stockpile shall have a toe berm and should not be located within 10m of the watercourse.
- Use mulches and other organic stabilizers to minimise erosion until re-vegetation can be re-established
- Divert runoff away from cleared areas
- Minimise the flow of water onto cleared areas;
- Isolate cleared areas;
- Retain natural drainage patterns wherever possible;
- Establish permanent erosion control as soon as possible

The most important aspect of erosion control is to apply permanent stabilisation and re-vegetation as soon as possible. As soon as areas are graded to final slope lines and levels, and construction traffic no longer needs to access an area, permanent erosion control measures will be put in place.

Waste Management Plan

Purpose and Scope
This plan will ensure that waste generated during construction is handled in a way that protects the environment and complies with applicable regulations. The following are some of the materials that can be expected to generate during construction:

- Vegetation strippings
- Concrete forms Dimension lumber
- Packing materials
- Containers for various construction materials (e.g. asphalt, concrete and steel)
- Pallets
- Plastics
- Waste oil, filters, lubricants and hydraulic fluids
- Concrete
- Food
- Sewage

The plan addresses open burning, refuse disposal, recycling, reuse, sewage disposal, and camp (yard) waste disposal practices.

Waste Management Practices

All organic and inorganic materials will be placed and/or disposed of so as not to directly or indirectly impact any watercourse or groundwater. The placement and disposal of all such products and materials will be done in an environmentally acceptable manner. Suitable landfill sites should be identified and approved by the NDC for disposing of construction waste. Any waste material that is inadvertently disposed in or adjacent to watercourses or other designated environmentally sensitive areas will be removed immediately in a manner that minimises adverse impacts, and the original drainage pattern will be restored. All wastes which are not designated, as combustible waste to be burned on-site, will be recycled, disposed of in an approved landfill, or shipped to an approved disposal facility.

Construction debris will not be allowed to accumulate on the construction site but will be collected promptly and regularly removed from the site. Waste materials will be placed and stored in suitable containers. Storage areas and containers will be maintained in a sanitary condition and covered to prevent spreading of wastes by water, wind or animals.

Solids, sludges and other pollutants generated as a result of construction or removed during the course of treatment or control of wastewaters will be disposed of in a manner that prevents their direct or indirect discharge to any watercourse or ground waters.

Open burning
Open burning of wood debris generated by land clearing will be conducted in accordance with the Standard and Special Specifications. Open burning must be planned so that it does not adversely affect local residents during their daily lives. Burning methods will be employed that will prevent heat or smoke damage to all vegetation that has been designated for preservation. The use of waste oil and/or tires as fire accelerators is not permitted. Burning pits will not be located within 50 m of any watercourse, wetland or other Environmentally Sensitive Area, or in areas where ditches are to be constructed.

In situations where the material generated as a result of clearing and/or grubbing may not be burned onsite, the disposal method must be approved by the Supervisor's Representative or the Environmental Officer/ Monitor.

Strippings
All waste and surplus material will be disposed in designated and approved areas. Not less than fifteen days prior to disposing of any waste or surplus material, the Environmental Officer/Monitor will be provided the locations, nature of the material being disposed, and stabilization technique.

Excavated material will be properly drained, spread and trimmed to a stable slope not exceeding 1.5 to 1, in a manner which minimises disturbance of watercourses and vegetated areas. All waste sites will be re-vegetated immediately after creation of the waste disposal site, or else suitable temporary erosion control measures, such as tarps or plastic will be used until re- vegetation is undertaken.

Waste Oils and Special Wastes
Waste oils, special wastes, and refuse generated during the servicing of equipment (e.g., air and oil filters, hydraulic fluids, petroleum products) will be stored, transported and disposed of in accordance with regulations and the contract Specifications, and will not be disposed of by dilution, burial or incineration. Where possible, waste oil, lubricants and other waste materials generated during the servicing of equipment and machinery will be recycled. The dumping of oil or other deleterious materials on the ground or in a watercourse is strictly prohibited. Refuse generated during the servicing of equipment will be removed from the site and disposed of in an approved facility.

Concrete Wastes
Fresh concrete or cement will be isolated from any designated watercourse for 48 hours after placement. Containers or trucks carrying cement or fresh concrete will be washed at a site approved by the Supervisor's Representative. Concrete waste, including wastewaters from batching or cleaning, will only be disposed of at approved and designated disposal sites. All cement-contaminated wastewater from cleaning or mixing is to be considered toxic, and must be prevented from entering any watercourse for at least 48 hours to allow the water to reach neutral pH.

Food Waste
All food wastes will be collected and stored in containers and either incinerated daily or regularly transported to the nearest operating landfill.

Fuel and Lubricants Management (Spill Contingency and Response Plan)

Purpose and Scope

This document describes spill contingency measures and response plan for this Project. The plan is designed to reduce impacts to the environment in the event of a spill through ensuring materials are available and established procedures are followed.

The purpose of the spill contingency plan is to provide a course of action, which will be implemented to allow a prompt and orderly response to spills that may occur during construction. A spill of any liquid, solid or gaseous substance, which could impair the usefulness of the land, water or air where it is released will be responded to by the procedures outlined in the contingency plan. The main objectives of the Spill Contingency Plan are:

- To reduce the risk of harmful exposure to individuals and the surrounding environment;
- To clearly outline the action to take if a spill will occur; and,
- To ensure that project staff is aware of the correct response required.

"Spill" consists of unauthorised release or discharge into the environment of a substance in an amount equal to or greater than the specified amount, or the uncontrolled release of any deleterious substance to the environment. All spills will require immediate action as necessary, with priorities for:

- Protecting lives and preventing injuries;
- Protecting the environment; and,
- Protecting property.

This plan is intended to provide guidance in the event of a spill. The areas of responsibility of the various personnel who will be directly involved are outlined to provide clear direction of what each person will be doing at the time of an emergency. The Environmental Officer/ Monitor in consultation with the Supervising Consultant will review this plan regularly. The review date will be recorded and kept on file.

Reporting of Spills
All spills major or minor must be reported. Workers are to report all spills to their supervisor or Environmental Officer/Monitor who will in turn report to the Supervising Consultant.

Minor Spills
Minor spills are those that can be easily and safely handled by those people in the area, and generally by the person(s) initiating the spill. These spills are generally within confined areas, are small in nature, have minimal health and safety risks, and have no chance of migrating into the environment.

Major Spills
These would be spills of greater potential than minor spills and have potential health and safety risks. When in doubt, treat the spill as major. The Supervising Consultant must be contacted with the following information:

- The person's name and telephone number;
- The name and telephone number of the person who caused the spill;
- The location and time of the spill;
- The type and quantity of the substance spilled;
- The cause and effect of the spill;
- Details of action taken or proposed to stop, contain and minimize the effects of the spill;
- A description of the spill location and of the area surrounding the spill;
- Details of further action contemplated or required.

Spill Response Equipment
Spill response equipment will be provided and located in a designated spill response storage facility. Any operations adjacent to a watercourse will have a spill kit present. Any used spill abatement and clean-up materials will be promptly replaced.

Appropriate Spill Response Measures

Solid Material Spill in a Dry Area
- Clean up and recover material with protective gear.
- Detoxify the area.
- Store/transport recovered material and review the mode of disposal.

Liquid Material Spill in a Dry Area
- Contain spill using earthen berms.
- Clean up and recover material with protective gear. Material recovery may utilize pumps or absorbents as appropriate for type of spill
- Detoxify area.
- Store/transport recovered material and review the mode of disposal.

Solid Material Spill in an Area Wet from Rain
- Cover material with plastic.
- Isolate any drainage from the spill area, if possible, using earthen berms.
- Notify downstream users if appropriate.

- Clean up and recover material using protective gear.
- Store/transport recovered material and review the mode of disposal.

Liquid Material Spill in an Area Wet from Rain

- Contain the spill using earth berms.
- Isolate drainage, if possible, using earth berms
- Notify downstream water users, if appropriate.
- Clean up and recover material using protective gear. Material recovery may utilize pumps or absorbents as appropriate for the type of spill.
- Detoxify the area.
- Store/transport recovered material and review the mode of disposal.

Solid or Liquid spill in a Drainage Ditch

- Contain the spill by placing an earth berm across the ditch as far downstream of the spill as possible;
- Isolate drainage, if possible using berm.
- Store/transport recovered material and review the mode of disposal

Spills of Specific Materials on Construction Projects
The following response actions are outlined for specific spills that, however unlikely, could occur during road construction.

Petrol/Gasoline

Petrol/gasoline may be stored on-site for use in light vehicles. A list of the hazards associated with petrol/gasoline, spill response, fire response and recovery methods are listed below. Varsol spills will be treated as petrol/gasoline spills. Petrol/gasoline is:

- Highly flammable;
- Explosive when in a vapour form;
- Easily ignited by flame or spark; lighter than water (floats on water); Toxic to humans by ingestion and by aspiration; and
- Toxic to fish and other aquatic organisms

The initial response to petrol/gasoline spill will be:

- Stop the flow at the source if possible;
- Eliminate all possible sources of ignition (e.g., extinguish cigarettes, shut off motors);
- Evacuate danger area
- Carefully consider the hazards and merits of trying to contain the spill. Contain only if it is safe to do so and obvious benefit of containment is apparent (e.g., contain if flowing towards a water course). Otherwise leave gasoline to spread and evaporate.
- Notify the Environmental Officer/Monitor/ or the Supervisor's Representative.

In the event of a fire, the response will be:

- Use CO2, dry chemical, foam or water spray (fog);
- Use jet streams to wash away burning gasoline;
- Divert the gasoline to an open area and let it burn off under control;
- Use water to cool tank surfaces;
- Be aware of re-ignition if the fire is put out before all the gasoline is consumed. Petrol/gasoline can be recovered in the following manner:

- Unburned gasoline can be soaked up by sand and peat moss or by commercial sorbents;
- If necessary, contaminated soil will be excavated;
- Gasoline entering the ground can be recovered by digging sumps or trenches and pumping from below the water table

Petrol/ gasoline can be disposed of in the following manner: Evaporation or incineration under controlled circumstances.

Other Fuels and Petroleum Products

Fuel and petroleum products spills will be contained using local earth materials and/or sandbags. Spill clean-up equipment specifically designed for petroleum products are to be located at camp (will one be established) and in the Maintenance Shop. Spills or leaks of all light and medium oils, including fuel oil at storage facilities, will be responded to by the following these steps:

- Identify the source of the leak or spill
- Stop flow if possible
- Eliminate open flame ignition processes
- Contain the spill
- Notify the Supervising Consultant
- Initiate Spill Response Plan
- In the event of a tank rupture, the containment berm is designed to contain the full capacity of the tank. This will allow the oil to be contained and pumped out of the area into salvage tanks. Contaminated soil from the site will be excavated and transported to a treatment facility or treated onsite by air sparging.
- Spilled diesel fuel can be recovered by commercial sorbents or by sand, straw or peat moss. If necessary, contaminated soil will be excavated. Digging sumps or trenches and pumping from below the water table can recover Diesel fuel saturated soil.

Fuel spills on land will be responded to by the following procedures:

- Construct a earth berm down slope of the running or seeping fluid;
- Plastic tarps may be placed at the base of the berm to allow the fuel to pool on the plastic for easy capture with absorbent pads;
- Pads may be squeezed into empty drums and re-used;
- Larger pools can be pumped back into drums;
- Special care will be taken to prevent the fuel from entering a body of water where it will; have greater negative impact;
- Contaminated soil and vegetation may have to be removed and disposed of.

Fire response methods for diesel fuel include:

- CO2, dry chemical, foam, or water spray;
- Water to cool tank surfaces;
- Diversion of the diesel to an open area and let it burn off under control;
- Awareness of re-ignition if the fire is put before all the diesel fuel is consumed.

Fuel spills on water must be contained immediately to restrict the extent of the floating fuel. The methods, which may be used to contain fuel oil, include:

- Booms deployed to contain the spill area;
- Absorbent pads used to capture small spills on water;

- A skimmer to recover oil contained by the boom and then pump the recovered fuel into empty fuel drums; and
- Culverts (CMP's or plastic) to permit water flow while capturing and collecting fuel. The culvert can be surrounded with absorbent material to capture any fuel on the water surface.

Concrete and/or Concrete Wastewater
During any concrete pour within 15 metres of, or in work areas below, the high water level of any watercourse, carbon dioxide cylinders will be ready for use in the event of concrete or concrete-leachate discharges into the watercourse. The carbon dioxide will be used to neutralise any concrete leachate that is inadvertently discharged into the watercourse.

Acid Spills
Spills of acid will be contained using sandbags and neutralization can be accomplished using either soda ash or lime. Both the sandbags and lime will be stored at the maintenance yard. Following neutralisation, the area must be carefully flushed with water. Note: Prior to using water in any clean up, consult the guidelines for the specific chemical, as appropriate use of water may be severely hazardous. Any water used for flushing a spill will be contained, recovered and disposed of in an approved manner.

Closure Plan

Upon completion of construction, the Contractor shall demolish wholly or in part, remove and dispose of all buildings, structures, pipe culverts, fences, barriers and other obstruction that is not to remain on site to an approved landfill site.

- The Contractor shall arrange for disconnecting water supply and electricity supply.
- He shall remove all temporary drains, backfill trenches, fill in any pits created.
- The site and all staging area shall be restored as far as practicable to its original state and be left in a neat and tidy condition.
- The Contractor is responsible for producing a waste management plan of which the dismantling of construction site will have to be outlined in terms of disposal of materials.

Health and Safety Plan

Under the specifications the Contractor will be required to propose a Health and Safety Plan which will outline their strategy for ensuring the safety of all stakeholders in the vicinity of the construction site. This should comply with all guidelines outlined in the Occupational Health and Safety Act, as well as the recommendations listed below. Consideration should be given to the following measures to manage health and safety during the construction phase in the Health and Safety Plan.

- Designation of a person on staff with responsibilities for Occupational Health and Safety.
- Risk assessment with mitigation measures as discussed below.
- Protocol for training and toolbox talks for all site personnel.
- Protocol for talking through risk assessment with site personnel, and having all site personnel sign risk assessment to agree to follow mitigation measures.
- Reporting procedures for near misses, accidents and dangerous actions.
- Commitment to ensure all PPE, first aid equipment, and safety equipment are provided in accordance with the risk assessment.
- Procedures for site inductions to be given to site visitors.

Health and Safety Risk Assessment and Identification of Mitigation Measures

Key to the development of the Health and Safety Plan is the production of a comprehensive risk assessment. In determining the mitigations for risks identified, the Contractor should consider that risk control measures should preferably be collective rather than personal. In descending order of effectiveness, the hierarchy of risk control involves:

I. Changes that eliminate a hazard
II. Substitution of less hazardous methodology
III. Enclosure – isolation, barriers, guarding or segregation, all of which are designed to separate people from the hazard
IV. Reduced exposure – changes that reduce the time individuals are exposed to a risk, or the number of people exposed
V. Safe systems of work, together with suitable training and supervision
VI. Written procedures, and the provision of information, instruction, warnings, signs and/or labels
VII. Use of personal protective equipment (PPE)

In preparation of the risk assessment the Contractor must consider measures to ensure the safety of all persons within the vicinity of the works. Examples of risks and mitigations to be considered are listed below:

- Provision and maintenance of construction sites that are lighted, safe and without risks to health.
- Provision of signage and fencing to stop access to work site by members of the general public.
- The execution of suitable arrangements for ensuring safety and absence of risks to health in connection with the use, handling, storage, transport and disposal of articles and substances
- Provision and maintenance of access to all places on site is in a condition that is safe and without risk of injury.
- Provision of protective clothing and safety gear (hard hats, hearing protection, goggles and other devices for activities).
- Provision of First Aids Kits.
- Arrangements for transfer to nearby hospital to deal with emergencies.
- Provision and maintenance of adequate sanitation, refuse collection and waste disposal. Provision of continuous supply of fresh water on site.
- Designation of a safety officer of one of the Contractors senior staff who will have specific experience and knowledge of safety regulations on similar projects.

Health and Safety Training for Workers

All employees will undergo Health and Safety Training prior to commencement of constructions. Training sessions will also be ongoing throughout the construction phase to ensure full compliance with the approved Health and Safety Plan. The risk assessment will be discussed with all staff to ensure prescribed procedures and recommendations are clear.

Key points to be covered in training of all site workers

- Obligations on employee as regards adherence to risk assessment and hazard reporting
- Risks posed by Site Conditions and Climate
- Behaviour on site
- Communication with the Public.
- Emergency Response (Fire, Health, Spills)
- Spill Response Mechanism
- Waste Management.
- Traffic Safety and Management
- Working hours and breaks

Discussion of use and importance of the following safety equipment will be identified and demonstrated.

- High visibility clothing
- Hard hats
- Steel toe-capped boots
- Goggles
- Gloves
- Dust masks
- Fire Extinguishers.

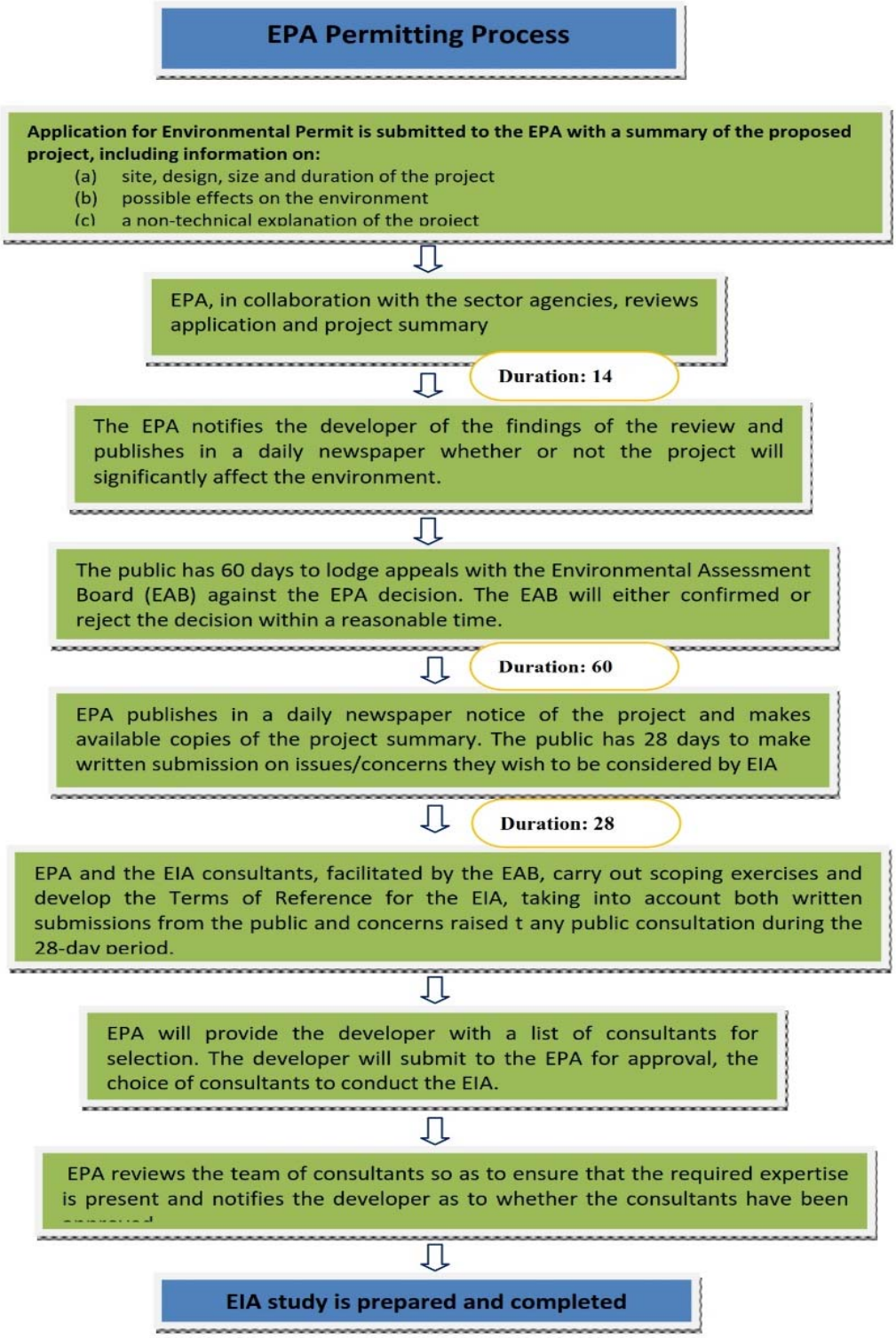
Key points to be covered in training of machinery operatives

- Qualifications and licences required for all operatives of heavy machinery
- Safe systems of work to protect operatives, site workers, public and property
- Use of banksmen at all times
- Ground conditions at work sit
- Areas to be avoided
- Methods of working to ensure safety in poor ground conditions
- Working hours and breaks
- Carriage of passengers
- Use of seat belts
- Use of PPE
- Use of fire extinguishers and spill kits
- Smoking
- No operative to operate heavy machinery while under the influence of alcohol
- No operative to operate heavy machinery while excessively tired
- Use of mobile phones while operating machinery
- Maintenance of equipment

Site Inductions
All persons who have not undergone training as described above must be given a site induction before entering the work site. Key points to be addressed in this induction include:

- Talking through and signing off on relevant parts of the risk assessment,
- Particular hazards relevant to visitor
- Behaviour on site
- Wearing of PPE
- Location of First Aid and Safety Equipment
- Introduction to nominated safety officer
- Entry and exit routes

Annex 2: Environmental Permitting Process



Annex 3: Terms of Reference

TERMS OF REFERENCE
ENVIRONMENTAL IMPACT ASSESSMENT Government of Guyana
DISASTER RISK MANAGEMENT PROJECT

[PUT TITLE OF SUBPROJECT HERE]

1. Introduction

The Government of Guyana is preparing the engineering design and project implementation plan for the [INSERT PROJECT DESCRIPTION HERE]. The objective of the project is [PUT OBJECTIVE HERE]

The purpose of this study is to provide an Environmental/Social assessment of the proposed works in compliance with the requirements of the Government of Guyana and World Bank Safeguards. This project is being implemented under the Disaster Risk Management Project which is being funded by World Bank and executed by the Ministry of Agriculture.

2. Construction Works Description

Under the construction project, the GoG is considering the [INSERT DETAILED DESCRIPTION OF WORKS]

3. Specific Requirements: Environmental/Social Assessment

The preparation of the environmental/social assessment is governed by the Guyana EPA requirements and those of the World Bank Safeguards Policies as outlined in the Environmental and Social Assessment Framework (ESMF) for the Disaster Risk Management Project. This EIA to be prepared under this contract shall provide an analysis of the potential impacts associated with the works. The assessment shall consider the physical, biological, and socio-economic impacts of the works and, in general, the positive and negative impacts associated with rehabilitating the historical canal alignment.

Specifically, the consultant shall:
Review proposed designs and construction plans Review the baseline situation in the project area.
Assess social issues
Meet with relevant parties to discuss perceived impacts of the works plan including Local Community.
Identify short-term reversible and non-reversible environmental impacts associated with construction and operation of the rehabilitated canal.
Provide a mitigation plan for anticipated social and environmental impacts relating to the project.

The consultant shall produce an Environmental/Social Assessment report detailing the findings of the study which shall be based on the following outline and at a minimum include:

1. Executive Summary (English) of not more than 2 pages
2. Description of the works and alternatives considered
3. Legal framework including environmental, land use, water management and other related laws and regulations
4. Description of the Existing Environment
   Physical
   Biological
   Socioeconomic
5. Analysis of Impacts including selection of the preferred options
   Physical
   Biological
   Socioeconomic
6. Mitigation Analysis of the preferred option
7. Mitigation and EMP

8. Record of Consultations
9. Technical Annexes This assessment shall be written in a concise manner in terms that can be readily understood by non-technical personnel and shall be organized to clearly present the positive and negative impacts of works identified. Technical supporting information shall be included in the technical annex of the report.

4. Public Consultation

During the development of this assessment, the contractor shall conduct meetings with the affected population, relevant government and non-government entities. A record of these meetings shall be summarized in the assessment and a written record of these meetings shall be contained in the annex section of the assessment report.

5. Public Comment

This report shall be delivered to the GoG for review. Additionally, the report shall be made available for public comment for not less than 30 days. At the conclusion of the public comment period, comments shall be reviewed and incorporated in the final environmental assessment document.

6. Relocation Plan

In the event that works require involuntary relocation, a relocation plan shall be developed pertaining to the affected sites. This plan shall be produced consistent with the Guyana national legal framework and shall conform to World Bank requirements for involuntary relocation and the ESMF for the Disaster Risk Management Project.

4. Deliverables

Draft EMP for consultation and review:

Final EMP incorporating feedback from consultations and review

5. Period of performance

[insert relevant dates]

Annex 4: Screening Checklist

	Questions to be considered in Scoping	Yes/No?	**Which Characteristics of the Project Environment could be affected and how?**	**Is the effect likely to be significant? Why?**
1. Will construction or operation Project involve actions which will impact land or soil?				
1.1	Temporary or permanent land take.			
1.2	Clearance of existing land vegetation and/or soil			
1.3	Use of heavy machinery that may cause ponding or compaction.			
1.4	Use of land for storage or disposal of construction materials, vegetation or waste.			
1.5	Use of fuel and lubricants that may be spilled.			
1.6	Any other actions with impacts			
2. Will construction or operation of the Project cause emissions to water?				
2.1	Excavation of construction materials or debris.			
2.2	Use of fuel and lubricants that may be spilled.			
2.3	Storage or disposal of construction materials, vegetation or waste that may runoff.			
2.4	Any other activities that may cause emissions?			
3. Will construction or operation of the Project cause emissions to air?				
3.1	Operation of vehicles or machinery that would cause noise.			
3.2	Operation of vehicles and machinery that would emit fumes.			
3.3	Any other activities that may cause impacts?			
4. Will construction or operation of the Project impact biological habitats or species?				
4.1	Clearing of vegetation that serves as wildlife habitat.			
4.2	Land take that currently contains habitat.			
4.3	Activities that change in water quality that may affect aquatic species			
4.4	Noise or activity that would affect nesting or breeding activities.			
4.5	Any other activities that may cause impacts?			
5. Will construction or operation of the Project cause socio-economic impacts?				
5.1	Temporary dislocation of land, assets or economic activities.			
5.2	Activities that present a health and safety risk to employees.			

	Questions to be considered in Scoping	Yes/No?	**Which Characteristics of the Project Environment could be affected and how?**	**Is the effect likely to be significant? Why?**
5.3	Activities that may interfere with irrigation and drainage.			
5.4	Activities that may increase the risk of flooding due to failure of infrastructure.			
5.5	Any other activities that may cause impacts?			

Annex 5. Example Forms

Daily Environmental Inspection Summary - Construction

National Drainage and Irrigation Authority.

Ministry of Agriculture.

DAILY ENVIRONMENTAL INSPECTION SUMMARY-CONSTRUCTION

SUBPROJECT:

Location:

Inspection Date:

DAY OF:

Issue	Yes	No	N/A	Comments
General				
Sand Bags, silt fencing and absorbent material readily available for emergency.				
Erosion and sediment control measures in place				
Dust control measures in place.				
All workers outfitted with necessary PPE.				
First Aid Kits on site				
Spill kits on site				
All warning signs in place.				
Waste and Spills Management				
Garbage scrap material and waste collected in suitable receptacles				
No servicing or refilling with 30 m of watercourse				
Spill containment material available on site				
Vegetation material gathered for removal				
Waste construction stockpile not older than 30 days.				
Erosion and Sediment Control				
Stockpiles do not interfere with surface drainage				
Stockpiles protected from wind and water erosion				
Silt fencing/trenching/berming in place				
Stockpiles not located within 10m of watercourses.				
Water Management				
Watercourse flow maintained				
No equipment, waste material or construction material stored within 10 m of watercourse				
Site dewatering pump outlets to vegetated area and not within 10 m of watercourse.				
Other Observation/Comments				
Issues Raised				
Environmental Inspector's Signature			Date:	

Weekly Environmental Inspection Summary – Construction

National Drainage and Irrigation Authority. **Ministry of Agriculture.** **DAILY ENVIRONMENTAL INSPECTION SUMMARY-CONSTRUCTION** **SUBPROJECT:** **Location:** **Inspection Date:** **WEEK OF:**
Summary of Works completed:
Contractor:
Consultant:
Summary of Construction Activities and Site Conditions during the Week.
Environmental Management · Onsite Traffic/Traffic Management · Waste Management/Housekeeping
Safety Equipment/Spill Kits
Dust and Noise
Fuel Spills
Sediment and Erosion Control
Dredging and Disposal
Public Complaints
Health, Safety and First Aid Accidents/Near Misses/Lost Time Licenses – Permits
Outstanding Corrective Actions (attach extra sheets if necessary) Location:
Action Item and Status:
Issues Raised:
Environmental Inspector's Signature: Date:

Monthly Environmental Inspection Summary – Construction

National Drainage and Irrigation Authority. **Ministry of Agriculture.** **MONTHLY ENVIRONMENTAL INSPECTION SUMMARY-CONSTRUCTION** **SUBPROJECT:** **Location:** **Inspection Date:** **MONTH OF:**
Summary of Works completed:
Contractor:
Consultant:
Summary of Construction Activities and Site Conditions during the Week .
Environmental Management · Onsite Traffic/Traffic Management · Waste Management/Housekeeping
Safety Equipment/Spill Kits
Dust and Noise
Fuel Spills
Sediment and Erosion Control
Dredging and Disposal
Public Complaints
Health, Safety and First Aid · Accidents/Near Misses/Lost Time Licenses – Permits
Outstanding Corrective Actions (attach extra sheets if necessary) Location:

Action Item and Status:	
Issues Raised:	
Environmental Inspector's Signature:	Date:

Quarterly Environmental Inspection Summary – Construction

National Drainage and Irrigation Authority. **Ministry of Agriculture.** **QUARTERLY ENVIRONMENTAL INSPECTION SUMMARY-CONSTRUCTION** **SUBPROJECT:** **Location:** **MONTH/YEAR:**
Summary of Construction Activities/ Progress:
Contractor:
Consultant:
Summary of Environmental Mitigation.
Public Complaints
Outstanding Corrective Actions (attach extra sheets if necessary) Location:
Issues Raised:
Environmental Inspector's Signature: Date:

Corrective Action Report

National Drainage and Irrigation Authority. **Ministry of Agriculture.** **CORRECTIVE ACTION REPORT** **SUBPROJECT:** **Location:** **Inspection Date:**
Nature of Non-Compliance (attach inspectors report):
Description of Corrective Action Taken (attach photo):
Environmental Inspector's Signature: Date:

Post Environmental Inspection Summary - Construction

National Drainage and Irrigation Authority.

Ministry of Agriculture.

POST ENVIRONMENTAL INSPECTION SUMMARY-CONSTRUCTION

SUBPROJECT:

Location:

Inspection Date:

Issue	Yes	No	N/A	Comments
General				
Sand Bags, silt fencing and absorbent material readily available for emergency.				
Erosion and sediment control measures in place				
Dust control measures in place.				
All workers outfitted with necessary PPE.				
First Aid Kits on site				
Spill kits on site				
All warning signs in place.				
Waste and Spills Management				
Garbage scrap material and waste collected in suitable receptacles				
No servicing or refilling with 30 m of watercourse				
Spill containment material available on site				
Vegetation material gathered for Removal				
Waste construction stockpile not older than 30 days.				
Erosion and Sediment Control				
Stockpiles do not interfere with surface drainage				
Stockpiles protected from wind and water erosion				
Silt fencing/trenching/berming in Place				
Stockpiles not located within 10m of watercourses.				
Water Management				
Watercourse flow maintained				
No equipment, waste material or construction material stored within 10 m of watercourse				
Site dewatering pump outlets to vegetated area and not within 10 m of watercourse.				
Other Observation/Comments				
Issues Raised				
Environmental Inspector's Signature:			Date:	