ENVIRONMENTAL MITIGATION REPORT
EMR
RIVER GRISE BANKS CONTAINMENT AND PROTECTION PROJECT

WINNER

WATERSHED INITIATIVE FOR NATIONAL NATURAL RESOURCES

TASK ORDER NO 4 UNDER THE WATER II IQC NO. EPP-I-00-04-00020-00

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***Note**: This report prepared by Michelet Fontaine, Natural Resources Management Specialist - Director Africa, Chemonics International and Christopher Perine, Environmental Specialist - Director Middle East, Chemonics International, is based on the November 30, 2009 Preliminary Report "Environmental and Socio-Economic Assessment: Riviere Grise Banks Reshaping and Protection" prepared by LGL. S.A.*

II. ENVIRONMENTAL MITIGATION REPORT NARRATIVE

1. Background, Rationale and Outputs/Results Expected:

The populations of Haiti are faced with difficult environmental and socio-economic conditions that make them increasingly vulnerable to the many natural disasters (cyclones, droughts, floods, etc.) which frequently strike the country. They must also cope with other types of tragedies which contribute to worsening their already precarious situation. Furthermore, these disasters have major impacts on the national economy as they damaged the already limited productive physical infrastructure.

The metropolitan area of Port-au-Prince is very vulnerable to flash floods and the ensuing damage because of its high population density and the concentration of physical infrastructures in flood-prone areas. In response to recommendations made in an analysis of environmental vulnerabilities in Haiti (Environmental Vulnerability of Haiti [Smucker et al., 2007)]) the watershed of River Grise was identified as a priority area of intervention within the framework of the USAID-funded WINNER Project.

Flood events of the last few years have significantly changed the configuration of River Grise, causing important riverbank erosion and riverbed accretion. The exceptional 2008 floods alone affected about 40 hectares of agricultural or residential with significant human, economic and social impacts, for example they resulted in the loss of 130 houses, 22 hectares of agricultural land, about 3 hectares of river bank vegetation. Faced with the increasing threat and frequency of floods and the exceptional and unplanned urbanization of the target area, river banks protection and containment become a top priority for the protection of human lives, valuable economic and cultural assets, and productive or residential physical infrastructure. It is within this framework that the WINNER project plans to conduct the dredging, containment and protection of the banks of Rivière Grise.

The planned work will contribute to reducing the frequency, magnitude and impacts of flash flood in the target area; however it is expected to cause some negative environmental and social impacts, especially during the construction phase. In the absence of a PEA, this Environmental Mitigation Report provides an overview of the existing conditions in the Rivière Grise and the needs for actions, identifies the proposed actions and their potential impacts, recommends the measures necessary to mitigate these impacts, and proposes a monitoring plan for the mitigation measures.

The successful implementation of the works will contribute to:

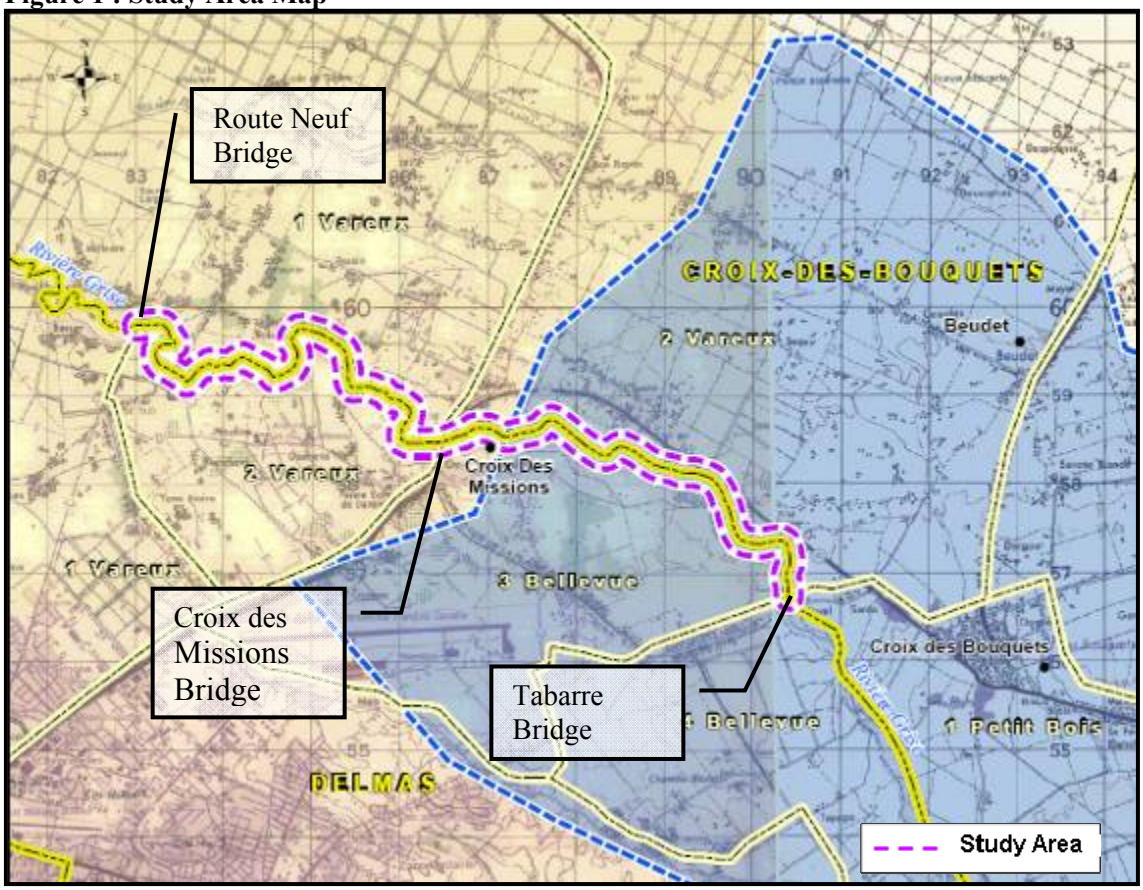
1. Protecting the life of the estimated 12,000 people living in the target area against general river flood;
2. Protecting important productive infrastructure (bridges, agricultural lands), homes, businesses located downstream of the Tabarre bridge against flood risks; and
3. Reducing the frequency and magnitude of river flood.

2. Activity Description:

2.1 Study Area

The study area, located in the Cul-de-Sac Plain, covers a 75-meter wide strip from the banks of Riviere Grise along an approximately 12-km stretch from the Tabarre Bridge (October 15 Boulevard) upstream to the Route Neuf Bridge, downstream (**Figure 1**). The aim of this survey was to collect as much data as possible on the current configuration of the river and carry out a detailed identification of the areas of intervention. In some cases, the study area extended beyond the 75-m strip to include other areas of particular importance, like socio-economic infrastructure and cultural assets.

Figure 1 : Study Area Map



2.2 Areas of intervention and identification of options

The planned river containment and protection works were designed on the basis of an optimal configuration of the water stream calculated for a maximum flow of 1000m3/s. They will focus mostly on river dredging and riverbanks protection with the construction of gabion walls and the stabilization of critical slopes and river bends. The works will be carried out over the 12-km stretch between the Tabarre Bridge and the Route Neuf Bridge, and will aim at protecting riverside populations, productive and basic physical infrastructure, and other economic and cultural assets.

- No bank containment or protection activity will alter current flow patterns; the work will be undertaken only to minimize future changes in flow patterns. Furthermore, the containment works will provide for continuing water exchange between the river and its banks.
- None of the river bends will be eliminated.
- No dredging works will go below the stable river bed. The works will be limited to the removal of sediment, rocks and other materials deposited in the river in recent years.

Six (6) priority areas of intervention have been identified (Figure 2). It should be noted that intervention area # 5 is managed by a project funded by the European Union (PGR-DPC/UE) and is being presented for information purposes only.

In the **first area** of intervention, the plan is to reinforce the right bank with a 500-meter long gabion wall.

In the **second area**, a protective 250-meter gabion wall is also planned.

The **third area** of intervention is different from the previous ones: a bottleneck led to the formation of two bends further upstream with two flow channels separated by an island. The plan is to dredge the river at the level of the bottleneck, and to close with gabion baskets the secondary channels recently created.

Area 4 is directly upstream of the Croix-des-Missions Bridge where heavy sedimentation has caused flooding and bank erosion in recent years. The banks in this section will be protected and the riverbed dredged over about 1.4 kilometer.

Works in the other critical section (**area 5**) in the Damien area directly downstream of the Croix-des-Missions Bridge are implemented by the EU-funded PGR-DPC/UE project. The river forms a bottleneck of about 600 m in length causing significant water surges that lead to increased water levels near the Croix-des-Missions Bridge. In addition, at the bend immediately downstream of the bridge, there is serious bank erosion and collapse. Two types of intervention are planned: protection of the banks at the bend with gabion walls approximately 350 linear meters each, and dredging to remove materials and sediment deposited in the area during the last few years. This work is expected to be enough to lower the water level near the bridge by 50 cm. It will help decrease the backwater effect, thereby reducing general flood water levels in that section.

The same problem exists in **area 6**, where the Route Neuf Bridge causes another bottleneck, causing a rise in flood water levels and banks overflow. The construction of a gabion wall of approximately 200 linear meters on the right bank to protect it against erosion and the opening of the Route Neuf Bridge over 20 meters were proposed. A dredging of the river upstream and downstream the bridge is also planned.

Figure 2: Areas of intervention for riverbank containment and protection

Table 1 lists the main proposed interventions and shows the distances over which they are planned for each of the priority areas of intervention. Minor dredging and containment/protection works will be implemented in between over the entire 12 km stretch.

Table 1 : Length (in meters) of Interventions per Priority Area

Area of Intervention	Gabion Walls (m)	Containment and Dredging (m)	Section concerned by the works (kilometric point (KP))
Area 1	500	0	0+750 à 1+100
Area 2	250	0	1+350 à 1+550
Area 3	Épis	900	3+300 à 4+200
Area 4	0	1400	4+300 à 5+600
Area 5-UE*	700	600	5+700 à 6+650
Area 6	300	500	10+700 à 11+400

* Intervention carried out by the European Union within the framework of the PGR-DPC/UE Project

2.3 Description of Works to be carried out

This study covers the works associated with the dredging of the riverbed and the protection and consolidation of the river banks in the target areas.

The proposed project activities are grouped into a pre-construction phase and a construction phase, as follows:

1. Pre-construction phase:
    - Building site organization
    - Land release or acquisition (if necessary)
    - Delineation of the right-of-way, siting, staking out and planimetry
    - Preparation of the works' right-of-way (if necessary)
2. Construction Phase:
    - Dredging of the river and protection of the banks
    - Manufacture and installation of gabions (gabionage)
    - Waste management and disposal

When the works are completed, maintenance activities will be conducted over the following years to ensure the interventions carried out are sustainable. This will be the responsibility of the Haitian Government to whom the structures and results of the activities carried out within the framework of this project will be handed over at the end of the construction phase. WINNER will work with the relevant GOH authorities and agencies to foster the effective operation and maintenance of the works.

Overall, the main elements of the project for each of the components identified above are presented and described in Table 2.

Table 2 : Identification of the Project's Main Activities

Project Phase	Project Element	Description
Pre-construction	Building site organization	❖ Development of work sites access roads ❖ Mobilization of materials and staff ❖ Identification of materials storage areas and temporary waste storage areas
	Land acquisition*	❖ If necessary for the correction of the river bend
	Siting, staking out and planimetry	❖ Identification of the structures site ❖ Staking out and positioning of the leveling marks
	Preparation of the right-of-way*	❖ Clearing and removal of shrubs in the works right-of-way ❖ Disposal of green waste (land clearing, wood)
Construction	Dredging of the river and protection of the banks	❖ Excavation and reconfiguration of the river bed where it is narrower than the profile calculated ❖ Discharge of fill material (sand and gravel) to rebuild the banks and contain the riverbed ❖ Laying out of cut and fill materials ❖ Water Works
	Gabionage (river bank protection)	❖ Collection of stones and blocks for gabionage ❖ Transportation and storage of gabionage materials ❖ Fabrication and installation of gabion and bank protection structures
	Waste management and disposal	❖ Temporary waste storage and transportation to a disposal site that complies with established standards
	Site restoration	❖ Rehabilitation of works areas used temporarily during construction

* Project element to be determined depending on actual needs.

3. Environmental Baseline:

3.1 Biophysical Environment

3.1.1 Climate

With temperatures ranging between 20 °C and 35 °C, Haiti is generally characterized by two rainy and two dry seasons. The first rainy season is from April to May and the second, also known as the hurricane season, runs from July to November. The dry seasons occur in June and July and from November to March. In the plains, the average annual temperature is 27 °C, while in the mountains it can reach 16 °C.

The average annual precipitation in the Cul-de-Sac Plain is about 1200 to 1400 mm/year; however the rainfall varies with altitude and with the orientation of the massifs in relation to trade winds. The abundance of annual rainfall shows significant variations and can be five times as high from year to year. Rainfall varies from 400 mm to 3600 mm/year depending on winds and topography.

Due to its location, the country is also likely to be affected by extreme weather events such as tropical storms, cyclones or hurricanes. Large quantities of rain may fall within a short period of time and very quickly swell rivers in the country and cause exceptional floods.

3.1.2 Hydrology and Physiography

The Cul-de-sac Plain which spreads east-west is crossed by River Grise, and is bordered by two major mountain ranges: the Trou d'Eau in the North and the Massif de la Selle in the South. The elevation of the Cul-de-sac Plain varies very little to a maximum of 30 meters. The watershed of River Grise contains a set of water streams and springs. The rivers flowing on steep slopes are intermittent, as their bed dries out during the dry season. They drain large loads of water that cascade down the steep slopes of the mountains surrounding the plain. Due to a lack of reliable hydrological data on the study area, we cannot specify the minimum, average and maximum flows of River Grise. The project flood flow was established at 1000 m^3/s, which is the target flow for a 20-year return period.

River banks are prone to severe erosion reflecting the violence of rain events occurring during the rainy season. This severe erosion causes high volumes of sediment to be carried by River Grise up to the river mouth. River Grise is a dynamic system that is constantly reconfigured by runoff water. Following the heavy rains of 2008, the bed of River Grise was heavily altered in the study area, as it moved and expanded in places up to 100 m from to its original position. Figure 3 shows in more detail the impact of the exceptional floods that occurred in 2008 on the River.

3.1.3 Geology and Soils

The island is geologically characterized by limestone very often of karst nature. There are also basalt and consolidated terrigenous sedimentary (sandstone and conglomerates) and non-

consolidated formations (Quaternary alluvial deposits). The massifs are formed with anticlines with many orogenic faults, and generally, the plains are formed by faulted synclines forming graben filled with Tertiary marine deposits which then become continental deposits

The coastal area of the Cul-de-Sac Plain is composed of clay and marl sediments and the lower part contains wetlands and red mangroves. According to the Bureau des Mines (BME) in a 1997 study, River Grise, in terms of resources, could represent approximately 14% of the average daily production of the open-pit quarries. The soils of the region are mainly composed of Quaternary reef limestone and limestone conglomerates. The most represented soils in the plains are recent stratified alluvial soils composed of sand, silt and clay.

River Grise is an important source of loose materials and is intensively exploited for construction sand and gravels (Photos 1 and 2). These deposits consist of a mixture of limestone, silt and pebbles. The loose soils of River Grise, which are often laid on steep slopes, are susceptible to severe erosion during high flood.

1 Photo 1 : Industrial exploitation of the river

1.1 Photo 2 : Exploitation of the river by individuals

3.1.4 Ground and Surface Water Quality

The river crosses the Cul-de-Sac Plain and refills its abundant water table that contributes significantly to the water supply to Port-au-Prince and to water supply for agricultural purposes.

With regard to groundwater, no physicochemical or bacteriological measurements were made during our study to confirm its quality. Based on our observations, the river has a turbid appearance near the surface, which is probably due to fine suspended materials that are moved by the flow. We can also say that the water is contaminated without yet being able to quantify it, given the direct discharge of wastes and dejections in several places along the river. Washing and bathing activities are also regularly observed, with laundry soaps contributing to an injection of phosphate into the river. Several boreholes were installed in the Cul-de-sac Plain for water supply to Port-au-Prince and its surroundings.

	
Photo 3 : Waste in the river	**Photo 4 : Laundry in the river**

1.1.1.1.1

3.1.5 Ambient Air Quality

The quality of ambient air varies according to seasonal activities conducted on the territory and also depending on the area considered. The quality is generally good in rural areas but deteriorates due to agricultural burning and wildfires. In urban areas, air quality is affected by various emission sources commonly found in this environment (uplift of dust due to passing vehicles, exhaust gas, combustion for cooking, etc.).

Thus, several different activities are carried out along the river, which affects air quality in different sectors. Downstream Tabarre Bridge there is a more or less commercial area that hosts several companies, including a manufacture of building materials which generates air suspended particles. Similarly, the access road leading to the site of this company is earth made and the vehicles transporting granular materials raise a significant quantity of dust.

At the Croix-des-Missions market, air quality is mainly impacted by smoke from the continuous burning market waste and traffic exhaust gas.

3.1.6 Noise Environment

The noise environment generally suffers little disturbance in rural areas while it is slightly altered in residential areas. From Tabarre Bridge to Road Nine, the main listed sources of noise during the day include the traffic of large trucks carrying materials and water, and shop and market generators. After the Croix-des-Missions Bridge, there are mostly fields and houses. The characterization of the noise environment has been made based on the types of noise recorded during visits and not based on measurements.

3.1.7 Biological Environment

Biological resources, wildlife and habitats are virtually nonexistent in the study area. Numerous human interventions have contributed to profoundly altering the natural vegetation of the Cul-de-

Sac Plain. Changes made over time, to make the plain suitable for irrigated agriculture, coupled with the heavy urbanization of the region, led to the reduction and possibly even the disappearance of certain species of plants and animals.

Protected Areas

There are no Protected Areas in or near the study area.

Vegetation

Although highly urbanized, the banks of River Grise that are subject to active erosion are colonized by a stand of scrub and wild species from Tabarre Bridge to the Croix-des-Missions, and by some large fruit trees and small banana crops grown by residents. Downstream the bridge Croix-des-Missions, on the left bank, there are agricultural areas on the lands of the Ministry of Agriculture, and on the right bank immediately upstream the Road Nine Bridge, there are sugarcane plantations.

Aquatic Fauna

With regard to fishery resources, there are no data on the use of the river for fishing activities. No commercial fishing activity is mentioned on the river, as these activities are mainly carried out at sea, along the coasts and in the area's two freshwater lakes, i.e. the Trou Caïman and Lake Azuei both of which are located in eastern part of the Cul-de-sac Plain. Nevertheless, subsistence fishing takes place at times in some spots for small freshwater fishes and prawns, especially during the wet seasons. There are no written data on the economic values of these activities.

In the past, the river seems to have been used as a migration corridor by some marine species that spawn in freshwaters, but this is not documented. Everything suggests that the species of fish likely to be found there are species tolerant to disturbance, sedimentation and pollution, and that breeding, rearing and feeding areas are marginal.

Terrestrial Wildlife and Avifauna

We note the occasional presence of some bird nests in trees and on power lines. The other stray animals observed (goats, chickens, cows, ducks ...) are there because of farming activities by local residents.

3.2 Human Environment

3.2.1 The impact of the exceptional 2008 floods on the human environment

Damage caused by the 2008 flood of River Grise led to very significant human, social and economic losses. The comparison of satellite images of July 2009 with those of pre-2008 hurricane season reveals the loss of nearly 40 hectares (ha) of land used primarily for agricultural or residential purposes along the river banks in the study area. Specifically, the floods caused the destruction of about 130 houses and the loss of 22 ha of agricultural land, 5.5 ha of urbanized

land and about 3 ha of river bank vegetation. An area of about 2 hectares used for the industrial exploitation of sand and gravel was also washed away.

Figure 3 shows affected areas in the project area by land use types: loss of farmland mainly between the Croix des Missions Bridge and the Pont Neuf, and residential losses between the Tabarre Bridge and the Croix des Missions Bridge. These resulted into:

- Economic impacts: the monetary value of land and infrastructure destroyed or damaged; and
- Social impacts: many families became poorer and homeless.

There is no accurate economic valuation of these losses, as no comprehensive and detailed assessment of damage is available; however the general estimate below will provide for a better understanding of the area's economic vulnerability to flooding and the erosion of the river banks. It also contributes to explain the importance of the proposed actions.

Data collected in the field and the comparison of the 2008 and 2009 satellite images allowed for an estimate of the economic losses in the study area associated to the 2008 flood:

- Destruction of about 130 houses of a monetary value estimated at U.S. $ 2,860,000 (an average cost of U.S. $ 400 for a m² of buildings and an average building area of 55 m²);
- Loss of 5.5 ha of land in the urbanized area for a monetary value estimated at U.S. $ 1,100,000 (by estimating the average cost of a piece of land in the area at U.S. $ 20/m²)
- Loss of 22 ha of farmland of a monetary value estimated at U.S. $ 4,400,000 (by estimating at U.S. $ 20/m² the cost of a piece of land in the study area. The economic value of the agricultural development of the land has not been calculated due to a lack of data on agricultural production)
- Loss of 5 ha of multiple use land of a monetary value estimated at U.S. $ 1,000,000 (estimating at U.S. $ 20 the cost of a square meter of land in the study area)
- Loss associated with the flooding of lands, buildings and property belonging to the populations (who rarely have insurance on their property).
- Temporary loss of employment income (and of productivity, indirectly) for people directly affected during and after floods (no figures available)
- Loss of business income for companies operating in the formal and informal sectors affected during and after floods (no figures available)

The assessment of the value of affected lands and buildings alone, we come to an economic cost of at least U.S. $ 9,360,000.

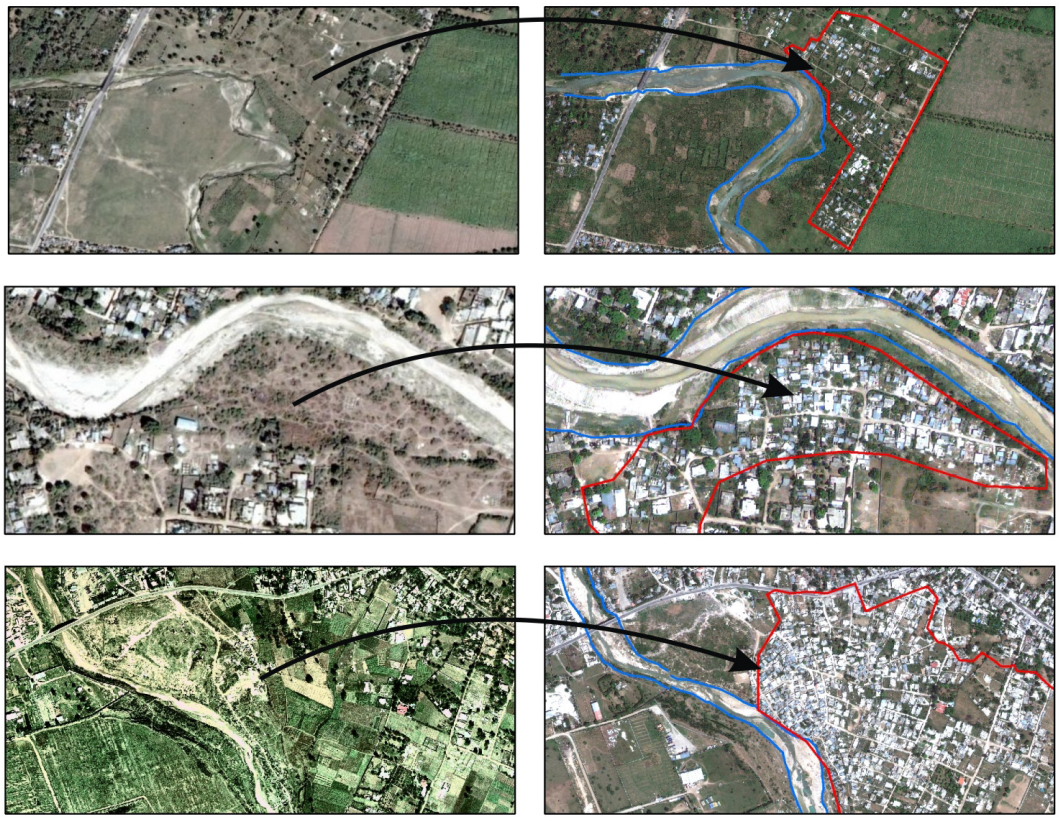
Figure 3 : Areas affected by 2008 floods in 2008

3.2.2 Urbanized areas and Population

The land adjacent to River Grise is mostly privately owned with usually dense and concentrated habitat. In recent decades, people of different socio-economic backgrounds and levels have urbanized the target area. The area along the river banks is characterized by small houses with iron sheet roofs followed by bigger and much bigger concrete houses further away from the river. It is likely that many of the buildings on the banks are unauthorized constructions without official land titles (and thus without insurance on property and possessions), and are occupied by poorer households who are generally more socially vulnerable to flood damage. Many of buildings found along the river are residential, and the rest commercial or industrial.

The problem of accelerated urbanization is also observed in the River Grise flood area. Comparing 2002 and 2009 satellite images, figure 4gives a good overview of the scale of urbanization in the target area.

Figure 4 : Trends in urbanization between 2002 and 2009 for some sectors of the study area



Most of the study area is urbanized (**Figure 5**) and has access to schools, churches, hotels, markets and other basic facilities. The area adjacent to the Croix-des-Missions Bridge has a particularly high concentration of houses, probably due to the proximity of the Croix-des-Missions market.

The study area is adjacent to four communal sections with a population of 188,077 people, according to the 2003 population census (Table 3)

Table 3: Population of the Communal Sections Adjacent to the Study Area, 2003

Communes	Communal Section	Number of Buildings	Number of Households	Number of Residents
Croix-des-Bouquets	1ère Varreux	9 783	7 816	34 955
	2ème Varreux	14 936	12 218	56 288
Delmas	2ème Varreux	9 033	8 621	41 417
	3ème Bellevue	11 301	11 613	55 417
Total		**45 053**	**40 268**	**188 077**

Source : Atlas censitaire de 2003 (2003 Population Census)

Table 4 provides an overview of buildings located on both sides of the River Grise and an estimate of the number of households and residents in the target areas.

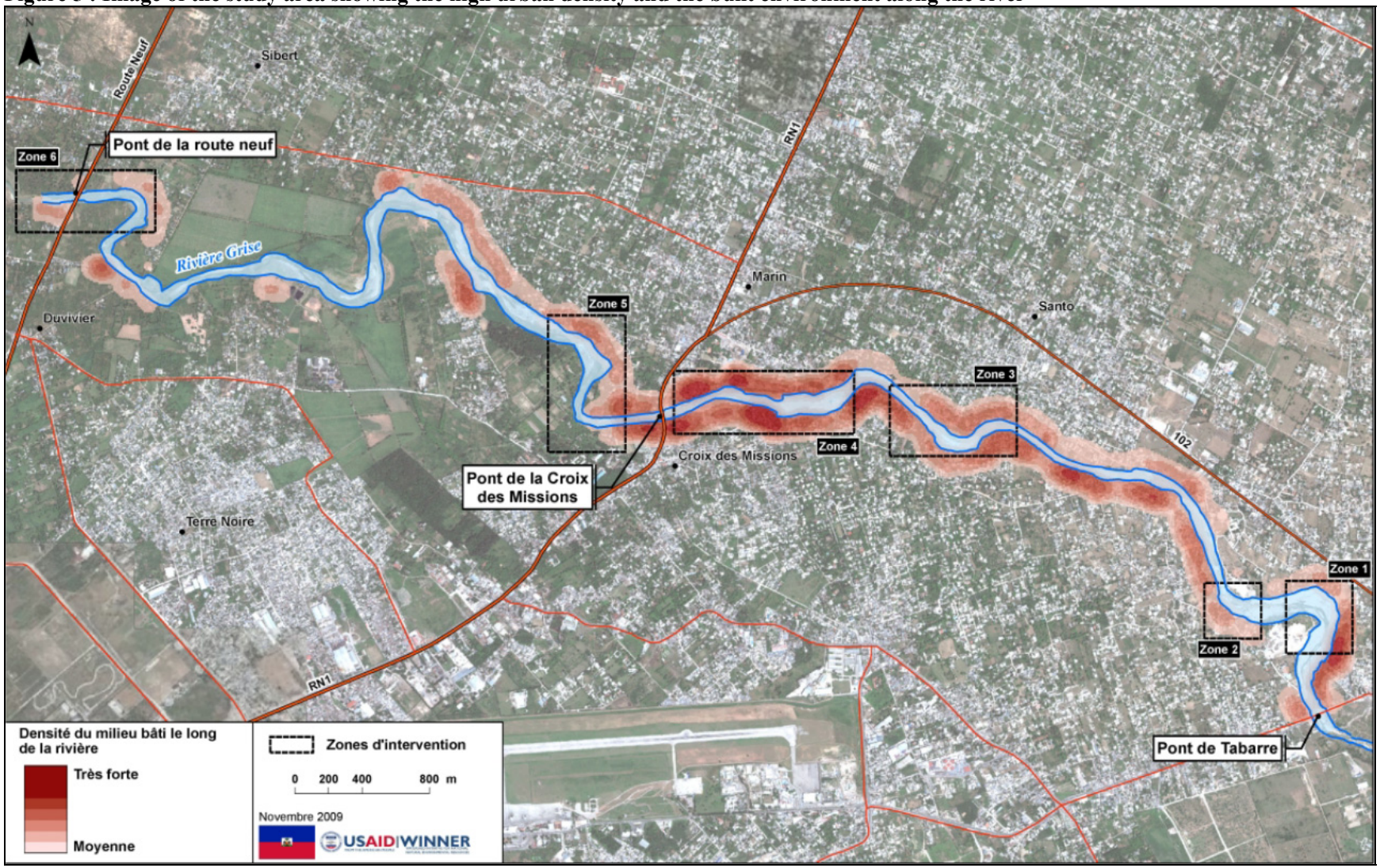
Table 4: Number of Buildings and Estimate of the Population Living along River Grise – July 2009 – Study Area

Distance from the river (top of the bank)	Number of Buildings	Number of Buildings (cumulative)	Estimate of the Number of Households (cumulative)	Estimate of the Number of Residents (cumulative)
0 to 10 meters	103	103	93	436
10 to 25 meters	454	557	501	2 356
25 to 50 meters	731	1 288	1 159	5 448
50 to 75 meters	640	1 928	1 735	8 155
75 to 100 meters	629	2 557	2 301	10 816

Source: Enumeration of buildings from high-resolution Geo-Eye satellite images taken on July 27, 2009. The population was estimated by taking into account data from the census of 2003 where, for the communal sections adjacent to the study area, the following ratios are recorded: 0.9 households per building and 4.7 people per household.

River Grise is crossed by three bridges over the 12 km study area: Tabarre Bridge, the Croix-des-Missions metal bridge and the Road Nine Bridge. The houses located on the banks are serviced by dirt roads with no drainage infrastructure (trenches, sewers, drains, etc.).

Figure 5 : Image of the study area showing the high urban density and the built environment along the river



3.2.3 Socio-economic Situation

The target area is accessible through several main roads: National Road 1 (RN1), Road Nine, National Road 3 (RN3) and the Malpasse Road to the main Border crossing to the Dominica Republic. There are a relatively large number of core social infrastructures in the area, as many schools, medical clinics, and other facilities provide minimal services to the population.

Agriculture, which once dominated economic activities in the area, has seen a dramatic decline in favor of the tertiary sector. The settlement of new populations along River Grise produced a double economic phenomenon: a rapid decline of agricultural land and the growing development of small businesses. Moreover, in some places along River Grise, the presence of small and medium-sized industries such as *Rhum Barbancourt* and *Comme il Faut* was observed.

It should be noted that the mining of the riverbed (extraction of sand, gravel and rocks) represents an important source of income for many households in the target area. There are different types of economic activities in the area:

- Large scale exploitation of materials from the river by large contractors;
- Exploitation of materials from the river on a smaller scale by individuals;
- Presence of construction companies;
- Potable water exploitation and distribution companies;
- Production of plants and flowers;
- Commercial activities of all kinds, including the Croix-des-Missions market;
- Small farming activities downstream the river, in Tabarre Bridge area.

3.2.1 Cultural Heritage and Patrimonial Assets

In the study area there are various buildings or facilities that present some cultural and patrimonial value. These include the Croix-des-Missions iron bridge, the Ministry of Agriculture, the School of Agriculture (in the Damien area), cemeteries and some places of worship including a major place of worship for Jehovah's Witnesses located on the right bank of River Grise downstream Tabarre Bridge. Other cultural or patrimonial sites may be present in the study area but are unlikely to be found in the project's direct area of intervention.

4. Evaluation of Environmental Impact Potential of Activities (Tables 5 & 6):

This section provides a description of the project's potential impacts or anticipated issues during the pre-construction and construction phases, and proposes relevant mitigation or enhancement measures and other actions necessary to ensure the best possible integration of the project into its environment. Tables 5 and 6 at the end of this section summarize the potential impacts and the proposed mitigation measures.

Many of the positive effects or benefits will be felt once the works will have been completed. For the purposes of this evaluation, this period is considered as the operational phase.

4.1 Impacts on the Biophysical Environment

The evaluation of the environmental impacts of the River Grise banks containment and protection project on the biophysical environment focuses on the followings:

- Hydrology and Hydraulics;
- Quality of Surface Water and Groundwater;
- Air Quality; and
- Noise Environment

4.1.1 Hydrology and Hydraulics

During the **construction** period, dredging and containment works will locally affect the natural flow of water in River Grise. To avoid any accumulation of water upstream the intervention sites, water runoff should be maintained in work areas by using, among other things, temporary ditches or channels to allow the waters to flow towards the downstream part of the river.

During the **operation** phase, the area's hydrology system is likely to go through some level of changes. Furthermore, the more controlled flow pattern resulting from this work could cause backfilling leading to coastal flooding. However, the Gonâve Bay being a dynamic sedimentary environment with high concentrations of suspended solids (SS), the anticipated effect of the banks containment and protection works on the hydrodynamic conditions in the delta is expected to be insignificant. In any case, a system will be established for the monitoring of these conditions during the operation phase. If significant backfilling is observed, WINNER will revisit the effectiveness of relevant project mitigation measures and work with the relevant Haitian authorities to determine necessary action.

4.1.2 Surface and Ground Water Quality

During the **pre-construction** and **construction** phases, the main impact on water quality would due to risk of contamination by hydrocarbons and movement of sediments, especially during the riverbed dredging. The river carries no or very limited water in the

target area during the dry season, except in case of an off-season storm event. The work, especially the riverbed dredging, is expected to be completed by the end of the dry season. Thus it is expected very limited movement of sediments toward the mouth of the river. In any case, silt screens and other sediment filtering materials or barriers will be installed in the immediate downstream of the work sites to reduce sediment movement toward the river mouth in case of off-season storm events. Since there will be no disposal of sediment from the river and the excavated materials will be used as fill material for the bank protection activities, no impact is anticipated outside the river itself. For the construction of the gabion walls, the material will be recovered further upstream in the River Grise (near the main basin where rocks are larger in size and from locations that do not exacerbate existing erosion or cause new erosion).

The risk of oil contamination will be greatly reduced since the works will be carried out by qualified and experienced contractors; construction vehicles and equipment will be refueled at a minimum distance of 50 m from the river; emergency response equipment will be available in case of accidental spillage, and the condition of the machines will be checked on a daily basis.

If any contamination is noted or suspected in soils and sediments during excavation works (odors, colors, traces of oil, etc.), the works will be suspended, the extent of the contamination will be determined by a specialist, and the soils will be confined in an appropriate location as directed by the specialist.

Areas of uncontrolled solid waste discharge were identified during a field visit in the riparian zone (photo 3 on page 12). There is a risk that these areas might be contaminated. In any case, these sites will be cleaned with the prompt removal, transportation and disposal of the waste in a designated landfill. During the **operation** phase of the project no significant negative impact is anticipated on water quality. Maintenance activities which will potentially involve the dredging of the river will sometimes disrupt the quality of the river due to the re-suspension of sediments.

4.1.3 Soil Quality

During the **construction** phase the main potential impacts on soils will be associated with the risk of soil erosion and compaction during the dredging, as well as contamination due to accidental spills of hydrocarbons. Several measures are proposed to eliminate or mitigate these negative impacts, particularly by limiting the right-of-way of the construction works to a strict minimum and immediately rehabilitating areas disturbed by the work by reusing the topsoil.

The slopes of the new banks should be shaped to avoid any displacement or subsidence. They should also be stabilized to reduce erosion by using indigenous stabilizing or anti-erosion plants such as mesquite, fast-growing acacia species, vetiver, bamboo or other grass species.

4.1.4 Air Quality

During the **construction** phase, air quality may be affected locally by dust and fine soil particles loosened by the movement of vehicles and heavy equipment in the river and on nearby dirt roads. The anticipated negative impact will be significantly reduced with the use of dust suppressants and the reduction of speed on dirt roads, especially near residence areas. These measures should also include the use of protective tarps on dump trucks transporting bulk materials. Note that travel time with excavated materials will be very limited, as they will be used as back fill materials for the riverbank protection works.

4.1.5 Vegetation and Fauna

The proposed work is expected to have no or very low negative impacts on terrestrial. The clearing of works areas will cause, in some places, a loss or will disturb patches of shrubs and wild grass. This impact will be minimized by demarcating the areas to be cleared and by limiting them to the minimum space required. Wherever possible perennial trees, especially fruit trees will be planted for long-term protection of the bank. Grasses and shrubs with economic values will be planted in other sections. No wildlife and habitats exist in the target area.

4.2 Impacts on the Human Environment

The evaluation of the impacts of the proposed works in the River Grise on the human environment focuses on health and safety, as well as the associated impacts on land use, cultural heritage, employment and the economy. The anticipated negative impact on the human environment will occur mainly during the construction phase, whereas the exploitation of the project's structures will have positive impacts on the environment.

4.2.1 Workers' and neighboring communities' Health and Safety

The **pre-construction** and **construction** works may involve risks to the health and safety of workers and people living nearby works areas. During these periods, the risks will be mainly related to accidents due to movement of trucks and heavy machinery. Thus, good practices and all relevant safety measures should be enforced on the sites. These include the use of personal protective gear (boots, goggles, helmets, etc.), the use of equipment and vehicles in good working condition, etc. A list of the common measures to significantly reduce the risks to worker health and safety is presented in Tables 5 and 6. They also include the implementation, by the contractor, of a workplace health and safety management plan during the construction and compliance to the relevant labor laws.

4.2.2 Human Safety and Protection of Infrastructures

To reduce the risk of accidents in the active work areas, access to non-workers should be very limited and/or controlled. Relevant signs and safety messages should be posted in strategic locations.

4.2.3 Noise Environment

The **pre-construction** and **construction** works will generate noise most of which will be caused by the movement of heavy equipment dredging the riverbed and moving or transporting riverbank protection materials, in addition to the general noise associated with a larger concentration of site workers. These noises could be disturbing early morning and late afternoon for people living in the immediate vicinity of the work sites. Measures such as imposing a speed limit on vehicles and machinery, carrying out works during the day and the use of equipment in good working condition will help limit nuisance. This nuisance is temporary and short-lived with no foreseen residual impacts.

4.2.4 Cultural Heritage and Patrimonial Assets

The main points of patrimonial values in the intervention area are the Croix-des-Missions metal bridge, the Ministry of Agriculture compound with the Faculté d'Agronomie et de Médecine Vétérinaire, the Croix-des-Missions cemetery, a Catholic Church, and a few places of worship. They will all significantly benefit from the proposed interventions. For example, the churches, the cemetery and the Ministry of Agriculture compounds will be protected against regular river floods, while the bridge will be protected. No negative impact is anticipated on the known sites during the **construction** period. Any other accidental discoveries of artifacts or sites of interest will be assessed by the relevant Haitian authorities, should they risk to be affected by the proposed works, and appropriate conservation measures taken under the guidance of the relevant specialist.

4.2.5 Social Acceptability of the Project and Communication

The social acceptability of the project makes it possible to evaluate how the populations, various actors and stakeholders respond to it. Following meetings with the key stakeholders, the proposed works are seen as long overdue, and the protection of their lands, businesses and trade activities against flood. Nevertheless an open and pro-active communication system is needed to ensure continuing understanding and support for project activities by the local population and other stakeholder groups. The communication plan should include, but not limited to, the development and implementation of a complaint management system. The hiring of local workers, as much as possible, will also contribute to increasing project appropriation by the local population.

4.2.6 Socio-economic Benefits and Employment

The proposed River Grise banks containment and protection project will have no foreseen negative socio-economic impacts. The project's expected socio-economic benefits will translate, first in terms of its contribution to the protection of property (lands, houses), investments and the lives of local residents. Secondly, the project will have positive impacts with the number of local people to be employed. During the operation phase, the banks containment and protection works will mainly have positive impacts on the economic activities because they will be protected against flooding and loss of lands.

1. The lack of detailed topographic data for the area to be affected by the proposed works precluded the development of a flood management plan and a comparison of flood scenarios with or without intervention for the target area. However, the various simulations performed for a flood discharge of 1000m³/s, reveal that the proposed works would contribute to reduce flood water levels by 2 to 17% as well as flood frequency. An estimated 2,301 households (about 10,816 people) and small businesses located within 100 meters of the riverbanks are expected to benefit from the works.

2. During the construction phase and especially during the gabionage works, the project will hire an estimated 500 people for a period of 4 months (80% of them will be unskilled labor).

3. The construction companies hired for the implementation of the work and their employees will also benefit from this project's positive socio-economic impacts.

To increase the project's socio-economic benefits for the local population, the followings are recommended:

- Optimization of the use of local resources and services.
- Creation of a monitoring committee responsible for informing the public about employment opportunities and the progress of the project.
- Promotion of labor-intensive works

The proposed works will reduce the availability or access to riverbed materials exploitation which is a substantial source of income in the area. Many of these operators could be hired or mobilized to provide services for the implementation of the works, especially the installation of the gabion baskets. A system should be put in place in order to enforce regulations and laws pertaining to exploitation of riverbed materials, for long-lasting impacts of the works.

Table 5: Biophysical Environment – Summary of Potential Adverse Impacts and Proposed Mitigation Measures

	Component	Ecological Context	Impact Source(s)	Description of Potential Impacts	Proposed Mitigation Measures
BIOPHYSICAL ENVIRONMENT	**Hydrology and Hydraulics**	• The study area is characterized by strong seasonal hydrological fluctuations. During rains, surface runoff waters flow quickly down steep slopes into the Cul-de-Sac Plain and River Grise.	**Construction :** • Dredging of the river • Containment and protection of the river's banks	**Construction :** • Accumulation of water upstream of the work sites if natural flow is not guaranteed. • Disruption of natural flow patterns as a result of containment works	**Construction :** • Maintain natural flow by planning temporary trenches or ditches to make sure the waters flow downstream • Restore surface drainage on work sites once the construction works are completed. • No containment activity will alter current flow patterns; this will be undertaken only to minimize future changes in flow patterns
	Surface Water and Groundwater Quality	• The quality of the River Grise water is poorly documented. • Several indications suggest that the waters are polluted and suffer from the consequences of the strong urban and industrial pollution in Port-au-Prince.	**Pre-construction and construction :** • River dredging • Protection works • Removal of illegally dumped solid wastes and their disposal	**Pre-construction and construction :** • Risk of water quality deterioration due to sediment input and re-suspension. • Risk of water contamination in case of accidental spillage.	**Pre-construction and construction :** • Construction works must be performed by qualified and experienced contractors. • Refuel vehicles and construction equipment in areas designated for that purpose or at a minimum distance of 50 m from the river. • Maintain emergency response equipment on work sites to deal with any spillage • Check equipment on a daily basis in order to identify any oil leaks and make necessary repairs. • If the reuse of waste generated is not possible, place them in a designated landfill. • Assure that any existing solid waste cleared and removed from construction areas is disposed promptly in a designated landfill

	Component	Ecological Context	Impact Source(s)	Description of Potential Impacts	Proposed Mitigation Measures
	Soils	• No data on soil characterization and contamination is available • The study area consists of unconsolidated deposits; much of the land down river is used for agricultural purposes.	**Pre-construction and construction :** • River dredging • Containment/protection works • Traffic of machinery • Accidental spillage of hydrocarbons and other substances	**Pre-construction and construction :** • Risk of bank erosion by runoff waters • Risk of sedimentation from erosion of dredged material • Risk of soil contamination • Risk of soil compaction • Risk of erosion from quarrying of stone and soil from steep slopes or other unstable areas	**Pre-construction and construction :** • Limit the works right-of-way to a minimum • Reuse topsoil to rehabilitate areas disturbed by the works. • Shape the banks in a way that helps avoid any displacement or subsidence. • Stabilize the banks with stabilizing or anti-erosive indigenous plants such as mesquite, fast-growing acacia species, vetiver, bamboo or other herbaceous species • Remove all fill from dredging to prevent any construction phase sedimentation • Source construction materials (e.g. stone and fill) only from stable areas to avoid erosion
	Landscape	• The landscape has been altered extensively by human activity	**Construction** • Earth moving and excavation for construction and sourcing of construction material • River dredging • Containment/protection works	**Construction** • Risk of disruption of natural patterns of surface water and groundwater flow **Operation** • Risk of disruption of natural patterns of surface water and groundwater flow	**Construction** • Re-grade all areas disturbed during construction to restore natural landscape contours • Re-naturalize areas disturbed by the works and not required during the operation phase
	Air Quality	• Air quality varies depending on seasonal activities conducted in the area and depending on the environment.	**Pre-construction and construction :** • Traffic of vehicles and machinery • Transportation of materials • Containment/protection works	**Pre-construction and construction :** • Dust uplift due to the works and the movement of vehicles and heavy machinery • Dust uplift during the transportation and storage of materials • Emission of exhaust gas from trucks	**Pre-construction and construction :** • Use dust suppressants (near sensitive receptors) • Use vehicles and machinery in good working condition • Keep vehicles in good condition. • Respect maximum vehicle loads. • Reduce vehicle and truck speeds • Where applicable, cover temporarily stored or truck-transported materials with a tarp.

	Component	Ecological Context	Impact Source(s)	Description of Potential Impacts	Proposed Mitigation Measures
	Vegetation and Fauna	• Biological resources, wildlife and habitats are virtually nonexistent in the study area. • Numerous human activities have contributed to profoundly altering the natural vegetation and wildlife habitats on the Cul-de-Sac Plain. • There are no protected areas in the project area.	**Pre-construction and construction :** • River dredging • Containment/protection works • Waste management and disposal	**Pre-construction and construction :** • Localized loss of natural terrestrial vegetation.	**Pre-construction and construction :** • Identify areas to be cleared and limit deforestation to the minimum required areas. • Limit deforestation, land clearing and encroachment in riparian areas. • Re-naturalize areas disturbed by the works and not required during the operation phase • Identify all protected areas and other ecologically sensitive areas upstream and downstream of proposed interventions • Save as much vegetation removed for construction and replant it on or around the site at the completion of construction

Table 6: Socio-Economic Environment – Summary of Potential Adverse Impacts and Proposed Mitigation Measures

	Component	Social Context	Impact Source(s)	Description of Potential Impacts	Proposed Mitigation Measures
SOCIO-ECONOMIC ENVIRONMENT	**Compensation of Owners**	• Study area highly urbanized and presence of homes and businesses along the banks. • Agricultural use of lands in the downstream part of the study area	**Pre-construction and construction :** • Acquisition of lands	**Pre-construction and construction :** • Loss of lands • Dissatisfaction among owners and residents	**Pre-construction and construction :** • Prepare a compensation plan including at least the description of the regulatory framework (land issues, compensation, laws and regulations, etc.)
	Workers' Health and Safety	• Study area highly urbanized with a potential for significant labor (workers) • Generally, the usual worker health and safety measures are not broadly implemented in Haiti	**Pre-construction and construction** • Completion of all works • Movement of vehicles and machinery • Fugitive dust emissions	**Pre-construction and construction** • Risk of truck traffic-related accidents facing workers • Risks of respiratory disease facing workers exposed to dust emissions.	**Pre-construction and construction** • Raise workers' awareness of and train them on health and safety measures • Develop appropriate traffic signs • Use of personal protective equipment by workers • Reduce vehicle and truck speeds in traffic • Use equipment and vehicles in good operating condition, • Implement a workplace health and safety management plan • Comply with labor law
	Human Safety and Protection and Sustainability of Infrastructure	• The study area is predominantly an urban area with a high population density. • The existing infrastructure consists mostly of residential buildings.	**Construction** • Movement of vehicles and machinery **Operation** • Operation and Maintenance of Infrastructure	**Pre-construction and construction** • Risk of accidents related to increased heavy truck traffic and at the completion of the works **Operation** • Decreasing efficiency of infrastructure operation, increasing safety hazards for workers and public	• Educate and inform residents on the works to be carried out • Reduce vehicle and truck speeds in traffic • Implement a communication program intended for the public. • Ensure that vehicles and trucks do not impede road traffic by directing traffic and promoting proper movement and delivery of equipment in times of low traffic • Design and implement an O&M training program for relevant government authorities

	Noise Environment	• The ambient noise comes from the traffic of heavy trucks transporting materials and water, business place generators and market activities	**Pre-construction and construction** • Movement of vehicles and machinery • Transportation and discharge of materials	**Pre-construction and construction** • Increased noise in works areas	**Pre-construction and construction** • Limit noisy activities that may harm sensitive receptors during the day • Use equipment in good condition • Maintain equipment noise abatement systems in good condition and in accordance with manufacturing standards. • Ensure that workers wear noise protection equipment where their activities would generate high noise levels.
	Cultural Heritage and Patrimonial Assets	• The known sites of interest in the study area are the Croix-des-Missions iron bridge, built over fifty years ago, the Haiti School of Agriculture and the Ministry of Agriculture, a cemetery and a place of worship • The Cul-de-Sac Plain has, over the years, experienced several types of economic and sociocultural activities that are likely to have left vestiges of historical, cultural and patrimonial value (e.g. installation of sugar cane exploitation activities, etc.).	**Construction** • River dredging • Containment/protection works	**Construction** • Known or unknown risk of damage to or destruction of heritage and cultural sites	**Construction** • Educate workers and machine operators on the procedures to be implemented in case of a discovery of artifacts. • In case of accidental discoveries of artifacts, these should be evaluated by competent Haitian authorities before works continue.
	Socio-economic Benefits and Employment	• In the study area there are various standard formal and informal socio-economic activities (small trade, services). There are also agricultural activities located downstream the river and materials extraction activities near Tabarre Bridge	**Construction** • Construction activities	**Construction** • Temporary work (500 people employed over a period of 4 months) and wage spillovers • Access to river and surrounding areas for customary activities	**Construction** • Promote the use of local resources and services. • Create a monitoring committee responsible for informing the public about employment opportunities and the progress of the project works. • Prioritize labor-intensive work techniques. • Comply with labor and salary legislation. • Whenever possible, use local businesses for the provision of goods and services • Consult with affected communities to assure equal or improved access to river and other resources during construction and operation

5. Environmental Monitoring and Follow-up Program:

The proposed mitigation and enhancement measures will be monitored throughout the life of the project (pre-construction and construction phases). Thus a monitoring program will be established to ensure that the proposed mitigation measures are properly and effectively implemented. Table 7 presents an environmental and social monitoring plan.

An after-works follow-up must be checked for appropriateness to determine whether it can be recommended depending on impacts and proposed mitigation measures

Table 7: Summary of the Environmental and Social Monitoring Plan

Activities requiring mitigation measures	Mitigation Measures	Indicators	Data Collection Frequency	Responsibility
Selection of contractors	- Construction work will be performed by qualified and experienced contractors.	- Percentage of contractors and subcontractors who meet verification criteria for qualifications and records	After awarding each construction contract	Project proponent
All activities (health, safety and communities relations)	- Implement a workplace health and safety management plan	- Number of violations of implemented health and safety plan	Weekly	Project proponent
	- Educate and train workers on health and safety measures - Comply with labor law	- Percentage of employees educated on health and safety measures	Weekly	Contractor
	- Install appropriate traffic signs according to a signage plan - Use of personal protective equipment by workers	- Percentage of signage installed from signage plan Visual inspection - Number of recorded accidents (work accidents, accidental spillages, etc.)	Weekly	Contractor
	- Educate and inform residents about works to be carried out - Develop a communication program intended for the public	- Percentage of residents in affected communities that have received information and updates about construction activities - Number of complaints received from residents about construction activities	Weekly	Contractor/ Project proponent
	- Reduce the speed of vehicles and trucks in traffic - Limit noisy activities that may harm sensitive receptors during the day	Number of recorded incidents when speeds and working hours are not respected	Daily	Contractor
	- Design and implement an O&M training program for government or other relevant authorities who will be responsible for O&M	Percentage of employees/operators who complete training program	Monthly	Project Proponent
	- Consult with affected communities to assure equal or improved access to river and other resources during construction and operation	Number of complaints from residents of affected communities regarding adverse impact on their access to river and associated resources	Weekly	

Activities requiring mitigation measures	Mitigation Measures	Indicators	Data Collection Frequency	Responsibility
Land acquisition	- Implementation of a compensation plan	- Percentage of compensation claims that are paid - Ratio of compensation claims to amounts paid - Number of complaints from residents in affected communities	Weekly	Project proponent
Preparation of the right-of-way	- Limit the works right-of-way to a minimum - Educate workers and machine operators on the procedures to be implemented in case of a discovery of artifacts. - In case of an accidental discovery of artifacts, these should be evaluated by competent Haitian authorities before proceeding with the works.	- Total approximate area of right-of-way in each project location - Percentage of employees educated in proper procedures in case potential artifacts are discovered	Daily Weekly	Contractor Contractor
Riverbed dredging	- Maintain natural flow by planning temporary trenches or ditches to make sure the waters flow downstream - Restore surface drainage on work sites once the construction works are completed. - No bank containment or protection activity will alter current flow patterns; the work will be undertaken only to minimize future changes in flow patterns - Remove from waterways all dredged material to prevent any construction phase sedimentation - Source construction materials (e.g. stone and fill) only from stable areas to avoid erosion - Identify all protected areas and other ecologically sensitive areas upstream and downstream of proposed interventions. - No dredging works will go below the stable river bed. The works will be limited to the removal of sediment, rocks and other materials deposited in the river in recent years	- Surface water turbidity - River flow rates	Monthly	Contractor Contractor

Activities requiring mitigation measures	Mitigation Measures	Indicators	Data Collection Frequency	Responsibility
Banks protection and gabionage	- Shape the banks in a way that helps avoid any displacement or subsidence. - Stabilize the banks with stabilizing or anti-erosive indigenous plants such as mesquite, fast growing acacia species, vetiver, bamboo or other herbaceous species - No bank containment or protection activity will alter current flow patterns. - Containment works will provide for continuing water exchange between the river and its banks.	- Volume of sedimentation entering river channel from river banks - Percentage of river banks with vegetation cover	Monthly	Contractor Contractor
Use of heavy vehicles and machinery	- Refuel vehicles and construction equipment in areas designated for that purpose or at a minimum distance of 50 m from the river. - Maintain emergency response equipment on work sites to deal with any accidental spillage	- Number of recorded incidents of vehicle fuel spilled within 50 m of river (violations of procedure) - Percentage of time operational emergency response equipment is on site	Daily	Contractor
	- Check equipment in order to identify any fluid leaks and make necessary repairs. - Use vehicles and machinery in good working conditions - Maintain equipment noise abatement systems in good condition and in accordance with manufacturing standards.	- Number of recorded incidents of vehicles and machinery leaking fluids - Percentage of time equipment generates noise in excess of manufacturing standards - Number of complaints from residents about noise	Weekly	Contractor
	- Use dust suppressants (near sensitive receptors) - Where applicable, cover temporarily stored or truck-transported materials with a tarp.	- Number of complaints from residents about dust	Weekly	Contractor
	- Ensure that vehicles and trucks do not impede road traffic by directing traffic appropriately and by promoting proper movement and delivery of equipment in times of low traffic.	Number of complaints from residents about construction vehicle traffic	Weekly	Contractor
Recruitment of staff and purchase of goods and services	- Promote the use of local resources and services. - Prioritize labor-intensive work techniques. - Comply with labor and salary legislation. - Whenever possible, use local businesses for the provision of goods and services	- Percentage of total construction and facility operation employment comprised of local residents	Monthly	Contractor

Activities requiring mitigation measures	Mitigation Measures	Indicators	Data Collection Frequency	Responsibility
	- Use local companies to provide goods and services	- Percentage of goods and services provided by local companies in relation to all goods and services purchased	Monthly	Contractor
Waste management	- If the reuse of waste generated is not possible, place them in a designated landfill. - Assure that any existing solid waste cleared from construction areas is stored to eliminate the possibility of surface water and groundwater contamination, and that such waste is removed and disposed at a landfill prior to the completion of construction	- Volume of waste generated per type - Percentage of waste disposed of in a proper landfill facility	Monthly	Contractor
Site restoration	- Reuse topsoil to rehabilitate areas disturbed by the works. - Re-grade all areas disturbed during construction to restore natural landscape contours - Re-naturalize areas on site and surrounding the project site that are disturbed during construction - Save as much vegetation removed for construction and replant it on or around the site at the completion of construction	- Percentage of un-built construction zones re-graded and re-naturalized after construction completed - Percentage of vegetation removed from construction sites that is replanted after construction completed	Monthly	Contractor

ANNEX A: Environmental Screening Form (Table 1)

Name of Activity: WINNER (Watershed Initiative for National Natural Resources)
Type of Activity: River Grise Banks Containment and Protection Project
Grantee/Contractor: Chemonics International
Date: December 31, 2009

		Column A	Column B	Col C	
		Yes	No	If answered yes to Col. A. is it a--?	
				High Risk	Medium-Risk
IMPACT ON NATURAL RESOURCES & COMMUNITIES					
1	Will the project involve construction[1] of any type of structure (building, check dam, walls, etc)?	X			X
2	Will the project involve the construction[2] or repair of roads, bridges or trails?		X		
3	Will the project involve the use, involve plans to use or training in the use of any chemical compounds such as pesticides[3] (including neem), herbicides, paint, varnish, lead-based products, etc?		X		
4	Involve the construction of repair of irrigation systems?		X		
5	Involve the construction or repair of fish ponds?		X		
6	Involve the disposal of used engine oil?	X			X
7	Will the project involve implementation of timber management[4] or extraction of forest products?		X		
8	Are there any potentially sensitive terrestrial or aquatic areas near the project site, including protected areas?	X			X
9	Does the activity impact upon wildlife, forest resources, or wetlands?		X		
10	Will the activities proposed generate airborne gases, liquids, or solids (i.e. discharge pollutants)		X		
11	Will the waste generated during or after the project impact on neighboring surface or ground water?		X		
12	Will the activity result in clearing of forest cover?		X		
13	Will the activity contribute to erosion?		X		
14	Is the activity incompatible with existing land use in the vicinity?		X		
15	Will the activity contribute to displace housing?		X		
16	Will the activity affect unique geologic or physical features?		X		
17	Will the activity contribute to change in the amount of surface water in any body?		X		
18	Will the activity deal with mangroves and coral reefs?		X		
19	Will the activity expose people or property to flooding?		X		
20	Will the activity contribute substantial reduction in the amount of ground water otherwise available for public water supplies?		X		
21	Will the activity create objectionable odors?		X		
22	Will the activity violate air standard?		X		
LOCAL PLANNING PERMITS					
23	Does the activity e.g. infrastructure improvements require local planning permission(s)?	X			
24	Does the activity meet the national building code (e.g. infrastructure improvements)?	X			
25	Is the activity incompatible with existing land use?		X		
ENVIRONMENT & HEALTH					
26	Will the project activities create conditions encouraging an increase of waterborne diseases or populations of disease carrying vectors?		X		
27	For road and bridge rehabilitation/ construction as well as water and sanitation grants, has a maintenance plan been submitted?				
28	Will the activity generate hazards or barriers for pedestrians, motorists or persons with disabilities?	X			X
29	Will the activity increase existing noise levels?	X			X
30	Will the project involve the disposal of syringes, gauzes, gloves and other biohazard medical waste?		X		

[1] Construction projects need to be reviewed for scale, planned use, building code needs and maintenance. Some small construction projects, such as building an entrance sign to a park, may require simple mitigations whereas larger buildings will require more extensive review and monitoring.
[2] New construction of roads and trails will require a full environmental assessment of the planned construction.
[3] The planned involvement of pesticides will trigger the need to develop a Supplemental Initial Environmental Examination that meets USAID pesticide procedures (Pesticide Evaluation Report and Safer Use Action Plan or "PERSUAP") for the project.
[4] Any activities involving harvesting trees or converting forests will require a full environmental assessment of the activity.