The Bahamas Water Supply and Sanitation Systems Upgrade Program (BH-L1061)

Strategic Environmental and Social Assessment
Strategic Environmental and Social Management Plan

PlanEHS

Preliminary Version
July 2024

Document Datasheet

Project Proponent **Water and Sewerage Corporation, Ministry of Works and Urban Development, Government of the Bahamas**	**Project** **Bahamas Water Supply and Sanitation Systems Upgrade Program (BH-L1061)**
During the preparation of the Bahamas Water Supply and Sanitation Systems Upgrade Program (BH-L1061), the Water and Sewerage Corporation commissioned, with resources from the Interamerican Development Bank (IDB), the preparation of a Strategic Environmental and Social Assessment for the Program. The purpose of this SESA is to provide an environmental and social assessment of the activities under the Program, taking into consideration IDB's Social and Environmental Policy Framework.	**Client** Interamerican Development Bank **Contract Date** April 2024

Document History				
1	SESA Preliminary Version (draft)	FS, MV, MK, JG, LL, DR	FS	30/6/24
1	SESA Preliminary Version (draft)	FS, MV, MK, JG, LL, DR	FS	8/7/24
Revision	Description	Authors	Approved	Date

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Executive Summary

Introduction

The general objective of this Strategic Environmental and Social Assessment (SESA) is to evaluate the environmental and social risks and impacts of the "Bahamas Water Supply and Sanitation Systems Upgrade Program (BH-1061)".

The strategic approach for the environmental and social due diligence was used given that the operation is evaluated at the Program level, where the typologies of projects to be financed are known, whereas the specific engineering designs and locations have yet to be defined.

The specific objectives of the SESA are:

1. Conduct the expedited diagnosis of the Environmental and Social Baseline of the Project Intervention Areas, as well as the legal and institutional regulatory framework.
2. Identify and assess the main environmental and social impacts and risks on the physical, biological, and socioeconomic environment, in the Construction, Operation and Closing stages of the Program.
3. Identify the mitigation measures and management procedures to minimize the impacts and risks assessed and outline the contents of the Project's Environmental and Social Management Plan.

Program and Project Description

The Program's main objective is to improve the Water and Sewerage Corporation's (WSC) quality of service, operating efficiency, water supply coverage, and financial performance.

In addition to an Insitutional Strengthening component (component 2), the types of projects included in the Program are the following:

1. Non-Revenue Water reduction and Advanced Metering Infrastructure installation.
2. Potable Water pipeline mains extension in Eleuthera, Abaco and Bimini.
3. Lift Station Refurbishments in New Providence.

Legal and Institutional Framework

Chapter 3 of this SESA outlines the legal, sectoral, and institutional framework of the Projects, taking into account environmental, social, occupational health, and safety areas.

The legal framework is described based on international agreements and national environmental laws.

As this operation is proposed to be financed by a loan operation from the Interamerican Development Bank, this Chapter also describes the Environmental and Social Performance Standards included in IDB's Environmental and Social Policy Framework, which are applicable to the Program.

Environmental and Social Baseline

Chapter 4 of this SESA presents the Environmental and Social Baseline of the Program.

In this section of the Study, the baselines for the physical, biological, and socioeconomic environments are described.

In the cases where information about the Program's activities were available, the corresponding direct areas of influence of each activity were described.

Environmental and Social Impacts and Risks

The Environmental and Social (E&S) Risk and Impact Assessment Process is developed in **Chapter 5**.

To conduct the assessment, the Program's subprojects were categorized into four distinct groups: NRW Reduction Contract, Advanced Metering Infrastructure, Access to Potable Water Supply, and Lift Station Upgrades Projects. Institutional strengthening activities are considered low impact, low risk and this excluded from the analysis.

Different environmental and social methodologies were used for each project typology, with specific mitigation measures outlined for addressing each impact.

NRW Reduction Contract

The NRW Reduction Contract encompasses several activities that do not exhibit any discernable environmental or social impact or risk, except for the water mains replacement due to leaks. These interventions show similar characteristics to the access to potable water supply except for the treatment and disposal of the existing water mains. The identification of environmental and social impacts and risks for this activity was conducted through an impact table which exposed the interactions between the project's actions and environmental and social factors.

During Construction Phase, the primary concern and risk was related to occupational hazards and accidents, gaseous emissions, particulate matter, noise and vibration generation and waste generation. For the Operational phase, similar impacts were found.

Advanced Metering Infrastructure

These projects do not exhibit any discernible environmental or social impact or risk. Nevertheless, to proactively mitigate potential impacts and risks, a set of recommendations were devised.

Access to Potable Water Supply

The identification of environmental and social impacts and risks was conducted through an impact matrix which exposed the interactions between the project's actions and environmental and social factors were analyzed.

In each box of the matrix, an impact rating was presented, according to its sign and magnitude.

A matrix memory describing the evaluation of other impact attributes (scope, duration, probability of occurrence, and accumulation) was presented.

During the Construction Phase, the primary concerns and risks identified were related to occupational hazards and accidents, noise, vibration, and particulate matter generation around sensitive receptors (KBA) whereas for the Operational Phase, similar impacts were found.

Lift Stations Upgrades

The identification of environmental and social impacts and risks was conducted through an impact table which exposed the interactions between the project's actions and environmental and social factors were analyzed.

During the Construction Phase, the primary concerns and risks identified were related to occupational hazards and accidents, particulate matter, noise, vibrations and odor generation, especially around sensitive receptors (schools, hospitals, coastal shore,

ponds), whereas for the Operational Phase, similar impacts were found, mostly related to noise and vibration generation and occupational accidents and lack of knowledge on the new infrastructure installed.

Strategic Environmental and Social Management Plan

The SESMP for the construction stage includes the following Programs:

1. Monitoring and Control of Compliance with Mitigation Measures.
2. Construction Sites Management.
3. Air Quality, Noise and Vibrations Management.
4. Erosion Control.
5. Flora and Fauna Management.
6. Aquatic Habitat Management.
7. Waste Management.
8. Effluent Management.
9. Chemical Substances Management.
10. Occupational and Community Health and Safety.
11. Traffic and Pedestrian Management.
12. Pest and Vector Control.
13. Socio-Environmental Training for Site Personnel.
14. Disaster Management and Emergency Response.
15. Community Information and Participation.
16. Coordination with Service Providers.
17. Environmental Liabilities Program.
18. Chance Find Procedure.
19. Works Closure.

The SESMP for the Construction Phase of the projects will be developed by the Contractor Company.

Chapter 6 outlines the essential requirements for SESMP programs for construction stage and provides general guidelines for programs to be implemented during the operational stage (Operational ESPM).

Conclusions

As usual in works of these characteristics, there are potential impacts and risks, mainly in the construction phase, such as negative impacts due to the risk of occupational accidents during the works, air pollution due to emissions from vehicles and machinery affected by the work, noise and vibrations, risk of soil and water contamination due to accidental spills, risk of soil erosion and sediment runoff, and risk of contamination due to poor management of the solid waste generated.

Additionally, several projects have specific vulnerabilities that need attention. Extreme measures to mitigate pollution must be taken in the South Eleuthera Potable Water Access project due to its location in South Tarpum Bay KBA and from potential historical contamination in Sweetings Village Access to Potable Water Project. Ensuring worker conduct and traffic safety around sensitive areas in certain lift station projects (Princess Margaret Hospital, Schools, residential homes), implementing robust traffic management measures in critical access areas.

These negative impacts of the construction phase are limited in time, occur during the work period, and affect only the direct area of influence of the projects.

The application of adequate mitigation measures is detailed in **Chapters 5** and **Chapter 6** of this study. Along with the application of good construction practices that guarantee compliance with national regulations, and the IDB Environmental and Social Performance Standards, these measures are expected to mitigate all the identified impacts and risks.

In their operational phases, these projects are expected to yield long-term positive impacts on communities by providing enhanced access to potable water and ensuring conservation of water resources due to the reduction of NRW for the Family Islands. This will contribute to an improved quality of life for residents.

Therefore, the operation is considered feasible**, without significant negative socio-environmental risks or impacts that cannot be mitigated**.

Abbreviations

AMI	Advanced Metering Infrastructure
AoI	Area of Influence
BPL	Bahamas Power and Light
Bpvc	Boiler and Pressure Vessel Code (ASME)
CoC	Code of Conduct
DAoI	Direct Area of Influence
DCC	Disaster Consultative Committee (DCC).
DEPP	Department of Environmental Planning and Protection
DMAs	District Metered Areas
EA	Executing Agency
E&S	Environmental and Social
EHSS	Environmental, Health, Safety and Social
ESAP	Environmental and Social Action Plan
ESF	Emergency Support Function
ESPF	IDB's Environmental and Social Policy Framework
ESPS	Environmental and Social Policy Framework
FIA	Family Island Administrators
GHG	Greenhouse Gas
GoTB	Government of The Bahamas
GRM	Grievance Redress Mechanism
IAoI	Indirect Area of Influence
IDB	Interamerican Development Bank
IWA	International Water Association
KBA	Key Biodiversity Area
LMP	Labor Management Procedure
LS	Lift Station
NEMA	National Emergency Management Agency
NRW	Non-Revenue Water
PA	Protected Areas
PEU	Project Execution Unit
PMH	Princess Margaret Hospital
PPE	Personal Protective Equipment
SESA	Strategic Environmental and Social Assessment
SESMP	Strategic Environmental and Social Management Plan
ESMPc	Environmental and Social Management Plan at the Construction Stage (ESMPc)
URCA	Utilities Regulation and Competition Authority
USD	United States Dollars
WSC	Water and Sewerage Corporation
WTP	Wastewater Treatment Plant

1. Introduction

1.1. Background

The general objective of this Strategic Environmental and Social Assessment (SESA) is to **evaluate the environmental and social risks and impacts** of the "Bahamas Water Supply and Sanitation Systems Upgrade Program (BH-1061)", hereinafter "the Program".

The general objective of the Program is to help the **Water and Sewerage Corporation (WSC)** improve quality of service, operating efficiency, water supply coverage, and financial performance.

The specific objectives of the Program are:

i. modernize the legal and regulatory framework for WSC and the Water and Sanitation Sector;
ii. reduce Non-Revenue Water (NRW) in New Providence and the Family Islands using smart water technologies;
iii. reduce operating subsidies provided by the Government of The Bahamas to WSC; and
iv. increase WSC's resilience to Climate Change and Natural Hazards.

The Program, with a total cost of **USD 50 million**, will be executed by the **WSC** and financed by the Inter-American Development Bank (IDB).

As per the Bank's Environmental and Social Policy Framework (ESPF) and based on existing information, the Program has been classified as **category "B."** As such, negative environmental and social impacts are expected to be generated by the Program's works, and those negative impacts are expected to be moderate and of short-term duration. These environmental and social impacts are well known for the types of projects included in the Program, and can be managed through specific mitigation measures and management plans.

This Strategic Environmental and Social Assessment (SESA) was developed as part of the environmental and social due diligence process of the Program. The purpose of the SESA is to predict, identify, assess, and mitigate potential environmental and social risks and impacts that the Program may generate, and to ensure that the projects to be financed under the Program comply with the requirements established in the Environmental and Social Performance Standards (ESPS) contained in IDB's Environmental and Social Policy Framework.

1.2. Objectives

The specific objectives of the SESA are:

4. Conduct the expedited diagnosis of the Environmental and Social Baseline of the Project Intervention Areas, as well as the legal and institutional regulatory framework.
5. Identify and assess the main environmental and social impacts and risks on the physical, biological, and socioeconomic environment, in the Construction, Operation and Closing stages of the Program.
6. Identify the mitigation measures and management procedures to minimize the impacts and risks assessed and outline the contents of the Project's Environmental and Social Management Plan.

1.3. Structure of the Report

This document summarizes the process of environmental and social evaluation of the works of the Program. **Table 1** below presents the outline and organization of the content of this SESA.

Table 1. Contents of the Environmental and Social Assessment (ESA).

Chapter	Content title	Description
1	**Introduction**	This chapter describes the structure of the SESA Report, its contextual framework and objectives.
2	**Program and Projects Description**	This chapter provides an overview of the Program, delineating the various interventions across the different components.
3	**Legal and Institutional Framework**	This chapter describes the legal and institutional framework applicable to the Program, covering the national legislation as well as IDB's Environmental and Social Policy Framework.
4	**Environmental and Social Baseline**	This chapter summarizes the basic information available about the physical, biological, and socioeconomic environment within the Program intervention area.
5	**Environmental and Social Impacts and Risks**	This chapter provides an overview of the methodology employed for assessing the project's impacts on the physical, biological, and socioeconomic environment, along with a detailed presentation of the ensuing analysis results. Additionally, both general and specific mitigation measures are identified with the aim of eliminating, minimizing, or compensating for adverse effects on environmental and social receptors, while simultaneously reinforcing positive impacts.
6	**Strategic Environmental and Social Management Plan**	The Strategic Environmental and Social Management Plan (SESMP) organizes mitigation measures into structured programs for deployment across all project phases. Additionally, it establishes the framework delineating institutional roles and responsibilities for effective implementation.
7	**Conclusions**	This chapter summarizes the conclusions and environmental and social feasibility of the Program.
References		This chapter includes all the references cited in the report and the documentation employed throughout the evaluation process.
Annexes		The technical annexes include specific studies and plans, such as: i) Stakeholder Engagement Plan ii) Labor Management Procedure

2. Description of the Program

This chapter presents a description of the Bahamas Water Supply and Sanitation Systems Upgrade Program, including objectives, components, and costs, as well as a description of the typologies and examples of projects that will be financed under the Program.

2.1. Background and Justification

The Bahamas faces significant **water supply challenges** due to its limited availability of freshwater resources, exacerbated by climate change and population growth.

Water availability is low enough in The Bahamas to be considered scarce by the United Nations criteria[1]. The primary sources of water in The Bahamas are groundwater and rainwater, which are supplemented by desalination, particularly in more populous areas such as New Providence.

The current estimate of available water per head of population ranges from less than one half to more than 107m^3 at different locations, the national average of 7.4m^3 will decrease with increasing demand from population increase and increasing degradation.

The uncontrolled development of land is resulting in land use that will limit the abstraction of water from beneath sites of development due to incompatible land use. The lack of regulation and enforcement of existing regulations on land use, agriculture, pesticides, domestic sewage, landfill sites, solid waste disposal, and the abstraction of water has resulted in the degradation of the resource. To date, the pollution and degradation by natural as well as anthropogenic sources and causes is yet limited to specific sites and limited in magnitude[2].

The Water and Sewerage Corporation (WSC), a central government entity, is responsible for managing these water resources across the islands and providing sanitation services in New Providence and other Family Islands[3].

Despite their efforts, the existing infrastructure is aging and inefficient, leading to high levels of Non-Revenue Water (NRW)—water produced but not billed due to issues like leaks, theft, and meter inaccuracies.

The Family Islands have had an increase in NRW from 41 to 55% in 2022, and New Providence decreased its NRW through a contract-signed in 2012 and renewed in 2023- between MIYA Bahamas and WSC. The contract's aim was to reduce water loss and improve system efficiency through infrastructure modernization, including pipeline replacement and advanced metering[4]. The program was successful, however after implementation, NRW increased for New Providence to 3,85 million imperial gallons in 2022. This is concerning due to the source of water

[1] Ekwue, E. I. (2010). Management of water demand in the Caribbean region: Current practices and future needs. West Ind. J. Eng. 32, 28–35.

[2] Bahamas National Report. ICF Consulting. Integrated Coastal Management Planning. https://www.oas.org/reia/IWCAM/pdf/bahamas/Bahamas%20Report.PDF

[3] https://wsc.com.bs/our-history/

[4] https://www.miya-water.com/en/news/miya-bahamas-and-water-sewerage-corporation-finalize-non-revenue-water-extension/

supplied: most of the water from WSC is obtained via desalination, making the cost of purchasing water account for 49% of WSC operating expenses.

The existing governance framework for the water and sanitation sector lacks provisions for adequate accountability and autonomy of the WSC. This is due to multiple factors, including the absence of sector policies and objectives, clear governance for the WSC, and low tariffs that do not cover the cost of providing services and subsidies to WSC, which are neither efficient nor effective.

The Bahamas lacks a water and sewerage sector policy that clearly states objectives and plans for the sector and the financial means to achieve them. The lack of an independent economic regulatory authority for the sector means there is no mechanism for regularly adjusting tariffs, and there is no independent environmental regulator. WSC acts as both a service provider and a regulatory body, creating a conflict of interest.

Additionally, WSC has limited resources and expertise to effectively conduct regulatory functions. These governance practices limit WSC's autonomy to make necessary decisions to improve service, underscoring the need to clarify and strengthen its governance to enhance operational and financial performance.

Furthermore, the regulatory framework for water extraction from private wells and wastewater discharge is outdated, contributing to over-abstraction and improper sewage discharges, which lead to seawater intrusion and pollution of the freshwater aquifer, posing urgent public health risks.

Despite ongoing projects to improve water infrastructure, many areas, particularly in the Family Islands, still lack access to piped water supplies. The overall estimated level of potable water supply coverage was 63%, according to WSC's Business Plan 2023-2028, 61% for New Providence and 70% estimate for the Family Islands. Residents in these regions often rely on costly and less reliable sources such as bottled water, private rainwater tanks, or private wells, the depths of which determines the quality of water.

The proposed water mains extension project aims to address these gaps by expanding the piped water network, ensuring broader access to a safe and reliable water supply.

In the case of wastewater coverage, New Providence is estimated at 13,5% and 0,7% for the Family Islands, resulting in an overall coverage of 10,8%. This is due to the high capital investments and operating expenses required for collecting and treating wastewater, resulting in tariffs that are not able to cover the costs of operation and maintenance. This leads to aging infrastructure, prone to mechanical failures, leading to frequent service disruptions and overflows that pose environmental hazards. Upgrading and renewing the sewerage infrastructure is essential to ensure the efficient transport of wastewater, reducing the risk of overflows and contamination. Modernizing these facilities will also enhance the overall reliability of the sewage system, contributing to better public health and environmental protection due to less probability of leaks to groundwater sources.

Furthermore, Hurricane Dorian had a severe effect on the water systems in The Bahamas, with estimated damages rising to USD 54 million. It primarily affected water pumping systems, storage tanks, distribution systems, two of its largest wellfields, above-ground infrastructure such as control panels, housings, and power, buildings, underwater mains, and

electrical/mechanical systems. The water and sewerage systems in Marsh Harbour and Treasure Cay experienced particularly severe damage[5].

The Bahamas is projected to experience an increase in the frequency and intensity of tropical cyclones and hurricanes due to climate change (CC), having recorded, apart from Hurricane Dorian, 3 more high intensity events between 2015 and 2019 (Hurricanes Joaquin (Category 4, 2014), Matthew (Category 4, 2016), Irma (Category 5, 2017)) with a cumulative damage of US$4billion, representing 30 to 40% of GDP.

The islands are considered one of the most vulnerable countries in Latin America and the Caribbean to natural hazards, given its location in the Atlantic hurricane belt. Due to its archipelagic nature, the entire landmass of The Bahamas is considered a coastal zone, with approximately 80% within 5ft (1.5m) of mean sea level. Most of the population and economic activity are located near the coast. This underscores the urgency for prioritizing climate change adaptation, resilience, and disaster risk management in the development agenda for The Bahamas. Key sectors likely to be impacted by climate change include agriculture, livestock and fisheries, tourism, health, human settlement, critical infrastructure, and water resources management. CC affects water systems and security in SIDS, contributing to water scarcity and insecurity, further exacerbated by inadequate water governance.

This project is critical for enhancing the resilience and sustainability of the water supply and sanitation systems in The Bahamas. By upgrading infrastructure and extending access to piped water, the initiative will reduce reliance on unsustainable water sources and improve public health outcomes. It also supports national goals for sustainable development and climate resilience, aligning with efforts to provide a robust and dependable water supply system for all residents.

2.2. Objectives

The general objective of this Program is to improve the Water and Sewerage Corporation's (WSC) efficiency, quality of service, sustainability and resilience of potable water supply and wastewater services in The Bahamas.

The specific objectives are to:

i. improve coverage of potable water supply and wastewater services in New Providence and the Family Islands.
ii. improve operational and financial performance by reducing Non-Revenue Water (NRW) in the Family Islands and increasing smart metering in New Providence; and
iii. improve governance through institutional strengthening and supporting the modernization of the policy, legal and regulatory framework for WSC and the water and sanitation sector.

2.3. Components

The Program is structured in **four components**:

[5] https://www.undp.org/sites/g/files/zskgke326/files/migration/jm/JM---SEIA-Bahamas-compressed.pdf

1.1 **Component 1. Non-Revenue Water Reduction and Establishing Advanced Metering Infrastructure (preliminary estimate US$33.000.000).** This component will finance an NRW Reduction Contract to address physical and commercial losses in the Family Islands. The contract's main target will be to reduce NRW in the Family Islands from a baseline of about 1.5 mgd, which is subject to review and confirmation, at an average annual system pressure of 25 psi within a maximum of 5 years, focusing on Abaco, Eleuthera, and Exuma. The activities will include setting up District Metered Areas and Pressure Management Areas (DMAs/PMAs); leak detection and timely repairs; pressure management; mains and service connections replacement, hydraulic modeling, system optimization, GIS updating, SCADA, and the use of data management hardware and software, among others. The NRW contractor will also build the internal capacity of WSC to maintain the target level of NRW. A co-management and shadowing approach will be used to transfer knowledge and know-how to WSC. The component will also finance the procurement, installation and change out of mechanical meters by more efficient Advanced Metering Infrastructure (AMI) in New Providence and the Family Islands, including Abaco, Eleuthera, and Exuma. This will lead to improved meter accuracy and reliability, revenue increase, transparency with customers, and staff efficiency. A digital transformation evaluation and roadmap will be prepared, to define the technological, human capacity, network, connectivity, software, systems, and supervision requirements to effectively implement WSC's digital infrastructure.

1.2 **Component 2. Institutional Strengthening (preliminary estimate US$3.500.000).** This component will finance institutional strengthening activities of the Utilities Regulation and Competition Authority (URCA) as proposed economic regulator of the water and sewerage sector and the Department of Environmental Planning and Protection (DEPP) as proposed environmental regulator of water and sanitation. It will also support the modernization of the policy, legal and regulatory framework for the water and sanitation sector in The Bahamas. Further activities include provision of operating manuals, organizational structures, business plans, skills assessments, and training plans for the proposed regulators. Other activities include providing support to improve the management and conservation of water resources and include considerations of climate resilience planning in line with instruments included in The Bahamas NDC 2022 as well as Integrated Water Resources Management.

1.3 **Component 3. Access to Potable Water Supply (preliminary estimate US$8.000.000).** This component will finance increased coverage to piped, potable water in New Providence and the Family Islands with consideration to resilience to CC and natural hazards. Increasing coverage to piped, potable water will contribute to addressing the critical need for water infrastructure in The Bahamas Country Development Challenges (CDC).

1.4 **Component 4. Wastewater Collection and Treatment (preliminary estimate US$3.000.000)**. This component will finance urgent investments in the sewerage system in New Providence that will improve the quality of wastewater services. These will be prioritized based on impacts to public health, environmental and groundwater pollution, the age and condition of the infrastructure, and any regulatory requirements or compliance obligations. These investments are to replace and upgrade existing lift station pumps and electrical equipment with a view to increasing energy efficiency, procuring spare inventory, and installing remote monitoring technology.

1.5 **Project Administration, Supervision and Other Costs (preliminary estimate US$2.500.000).** This component will finance administrative expenses including support for **Project**

Execution Unit (PEU) assigned staff, external audits, monitoring and evaluation, communication, implementation of an Environmental and Social Management Plan (ESMP).

2.4. Costs, Financing and Timeline

The Program cost is US$50 million and will be financed by a **Specific Investment Loan** of the Interamerican Development Bank.

The disbursement period is set at **5 years** to allow sufficient time to establish a baseline, procure and implement a performance-based co-management NRW contract in the Family Islands.

2.5. Implementation Arrangements

The Commonwealth of The Bahamas will be the Borrower and WSC the Executing Agency for the Project.

The existing Project Executing Unit (PEU) at WSC will be augmented and strengthened to execute this operation. The day-to-day execution activities would be under the responsibility of the PEU which will be headed by a Project Coordinator reporting to the General Manager. At a minimum, the following functions must be covered: Project Coordination, Procurement, Financial, and Environmental and Social.

2.6. Expected Benefits

The Program will benefit approximately 1.830 inhabitants in Eleuthera, Abaco and Bimini, which will receive access to piped water.

The Program also includes a Non-Revenue Water Reduction Contract for the Family Islands of Abaco, Bimini, Eleuthera and Exuma, where the total benefitted population is 35.544 (total population for the 4 family islands).

The program will also benefit all citizens from New Providence with the sewage system upgrades, considering the percentage of population covered at supply system covers 13,5% of the population. New Providence has a population of 296.522, meaning the population that would be benefitted by improvements in the sewage system would be 40.000.

The total number of directly benefitted population from the Program implementation is 75.544.

About 65,000 households (some 180,000 people) in New Providence and the Family Islands are expected to directly benefit with access to, or improved provision of, drinking water services. Underserved communities in New Providence and the Family Islands are expected to benefit from the expansion of access to potable water supply under the project.

WSC will also benefit from institutional strengthening and improving the operational efficiency of the utility (reduction of NRW, energy efficiency, and the installation of smart meters). Indirectly, the entire Bahamian population will benefit due to the strengthening of policy-making capacities and the legal and regulatory framework of the sector and improved governance and operational efficiency of WSC.

Also, the population of The Bahamas will indirectly benefit by having greater resilience to the population's access to drinking water in the face of future water stress scenarios by improving water use efficiency by reducing unaccounted for water losses.

Likewise, the project also contributes to a transition to low-carbon economy by reducing GHG emissions in the collection, treatment, and distribution stages through the reduction of NRW, as it reduces associated energy consumption in water production (currently provided via desalination). Access to Climate Change-resilient potable water services, combined with improvements in service management, generate benefits that have a positive impact on the living conditions and well-being of the population, manifested in improvements in health conditions, as well as financial benefits for WSC.

2.7. Description of Projects

Figure 1 shows the beneficiary islands from the projects to be considered: Eleuthera, Abaco, Bimini, and New Providence.

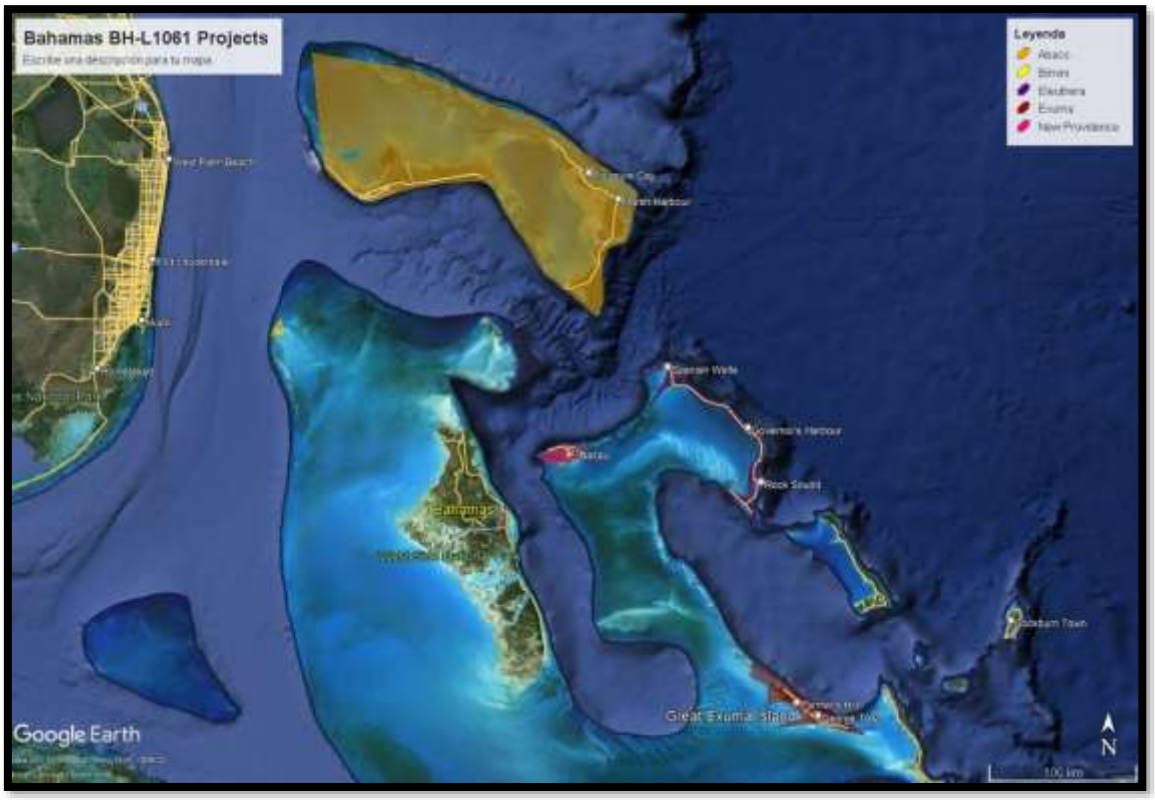


Figure 1. Beneficiary Islands of BH-1061 Program. Source: PlanEHS, 2024.

The NRW project aims to reduce NRW in the Family Islands (Abaco, Bimini, Eleuthera and Exuma) to about 1,5 million imperial gallons per day (MIGD) at an average annual system pressure of 25 psi within a maximum of 5 years.

The NRW contractor will build the internal capacity of the WSC to maintain the target level of NRW and the component will also finance the procurement and installation of advanced metering infrastructure (AMI) for New Providence and the Family Islands. WSC proposes to replace mechanical meters with ultrasonic/electromagnetic smart meters.

The water provision projects are related to closing existing gaps of water services. The existing waterlines have dead ends and areas that are currently not provided. The projects seek to increase the provision of water for the population of New Providence and the Family Islands and avoid stagnant water issues from the existing layout of the systems. Moreover, it was stated by WSC that there have been analyses conducted to groundwater from New Providence aquifers that show contamination of shallow waters, increasing risk of exposure to contamination to the population that currently obtains piped water from private wells.

The sewer infrastructure upgrades are focused on replacing and upgrading existing Lift Station pumps and electrical equipment in New Providence and procuring spare inventory. This includes remote monitoring for adding resiliency.

2.7.1. Component 1. Non-Revenue Water Reduction Contract and Advanced Metering Infrastructure

Component 1 finances a Non-Revenue Water Reduction (NRW) Contract and the purchase and installation of Advanced Metering Infrastructure (AMI) for the Family Islands of Abaco, Eleuthera and Exuma. Below there is a description of each subcomponent.

NRW Reduction Contract

The NRW Reduction Contract seeks to address physical and commercial losses in Abaco, Eleuthera and Exuma.

The contract's main target is to reduce NRW in the Family Islands to about 1.5 million imperial gallons per day (MIGD) at an average annual system pressure of 25 psi within a maximum of 5 years. The NRW contractor will build the internal capacity of the WSC to maintain the target level of NRW. A co-management and shadowing approach will be used to transfer knowledge and know-how to WSC.

The principal components of NRW, as specified in the NRW Water Balance defined by the International Water Association (IWA), include[6]:

- Unbilled authorized consumption (small);
- Apparent losses (also known as commercial losses); and
- Real losses (also known as physical losses or leakage).

The use of IWA Water Balance to quantify the volumes and values of the various NRW components, as well as adoption of approved indicators, are critical first steps in planning NRW Reduction Programs.

In general, NRW increases with the length of distribution pipes, the number of connections, network pressure, the age of the distribution network infrastructure (including pipes, water meters, etc.), the hours per day that the water network is pressurized, soil conditions and many

[6]https://ppp.worldbank.org/public-private-partnership/sites/ppp.worldbank.org/files/2022-03/1_Basics_in_NRW___Water_Balance.pdf

other factors[7]. The main issue, however, is related to a cycle where poor service quality leads to costumer dissatisfaction, which leads to a low willingness to pay, resulting in poor cost-recovery and limited budget which leads to greater irregularities in the water quality and supply service.

To improve NRW the following activities are required:

- systematically and rapidly detect and correct sources of water losses;
- carfully monitor distribution system hardware and operational performance;
- implement both small and large, short-term and long-term renewal projects.

Following the Terms of Reference of the NRW Reduction Performance-Based Contract for New Providence prepared by WSC, the program could include:

- **Baseline/Strategy Development: updated IWA Water Balance and a strategy plan to achieve defined targets**
- **Negotiation Phase: final quantities and price-based baselines and a strategy development phase**
- **Execution Phase: leak detections and repairs, use of District Metered Areas (DMAs)[8], monitoring systems, pipe renewal as necessary, ongoing maintenance and training, reporting**

Advanced Metering Infrastructure (AMI)

The component also finances the procurement and installation of Advanced Metering Infrastructure for New Providence and the Family Islands, including Abaco, Eleuthera, and Exuma.

Advanced Metering Infrastructure (AMI) can be defined as an integrated system of smart meters, communications networks, and data management systems that enables two-way communication between utilities and customers.

AMI has the potential to optimize the operation of distribution assets through enhanced automation, monitoring, security and real-time operation.

Utility operators benefit from remotely reading meters and having the capability to communicate between the metering system and external networks for maintenance and control of the system. This capability will also assist in network planning.

In addition, through the implementation of AMI, utilities may include a time-of-use rate structure in the analysis to assist in achieving maximum benefits by incentivizing customers to

[77] IDB. (2018). Case Study: Performance-Based Contract for NRW Reduction and Control – New Providence, Bahamas.

[8] District Metered Areas (DMAs) are specific geographical zones within a water distribution network where water flow is monitored and controlled separately. The purpose of DMAs is to manage and regulate water distribution more effectively by isolating sections of the network. This allows utilities to detect leaks, measure consumption accurately, and optimize pressure levels within each DMA, thereby improving overall water management and conservation efforts.

shift their energy usage to off-peak times. This has a positive impact on both the demand side and the supply side of the electric grid[9].

The proposed ultrasonic/electromagnetic smart meters will lead to improved meter accuracy and reliability, revenue increases, transparency with costumers and staff efficiency.

The proposed meters are the Diehl Metering Hydrus 2.0 water meters, designed for both residential and bulk applications with a focus on precision and connectivity.

Figure 2. Hydrus 2.0 meters: (a) residential; (b) bulk. Source: Diehl Metering.

Meter options are for residential or bulk purposes:

Residential:

DN15 - DN20: Available in both brass and composite materials, with sizes designed for easy installation.

DN15: Features a 46% reduction in size compared to previous models, enhancing installation efficiency.

Bulk:

DN50 - DN200: Offered in cast iron and stainless steel, with models catering to different temperature ratings (T50 and T90) and high repeatability up to R=1000.

The technology involved utilizes horizontal and vertical cross-shots measurement with ultrasonic waves to adjust for time and temperature differences, ensuring accurate measurements even at low flows and higher temperatures.

The Diehl Metering Hydrus 2.0 water meters feature advanced connectivity options, including Wireless M-Bus, Pulse, L-Bus, and integrated radio configurations with secure data encryption, facilitating versatile and secure data transmission. Emphasizing sustainability, the meters have a low carbon footprint ranging from 9.17 kg CO2 eq to 16.5 kg CO2 eq and comply with environmental regulations such as WEEE directives. Technically, the meters are highly accurate with a dynamic range of R800, can detect very low starting flow rates, maintain low pressure

[9] NEEP. (2017). Advanced Metering Infrastructure: Utility trends and Cost-Benefit Analysis in the NEEP Region.

loss at high flow rates, and offer up to 15 years of battery life, ensuring reliable and efficient performance.

2.7.2. Component 3. Access to Potable Water Supply

Component 3 finances the increased coverage to piped, potable water in the Family Islands through the implementation of 5 water pipeline mains extension projects in Eleuthera, Abaco and Bimini. Below there is a description of each of the projects.

Eleuthera

The island of Eleuthera has existing gaps in potable water provision. The following projects aim to close the gaps by extending water mains and increasing access to potable water for commercial and residential use.

These projects also seek to interconnect the water provision network and, in case of any disruption of the potable water service in a specific area of the island, to be able to provide service from a different water source from the existing Reverse Osmosis Plants.

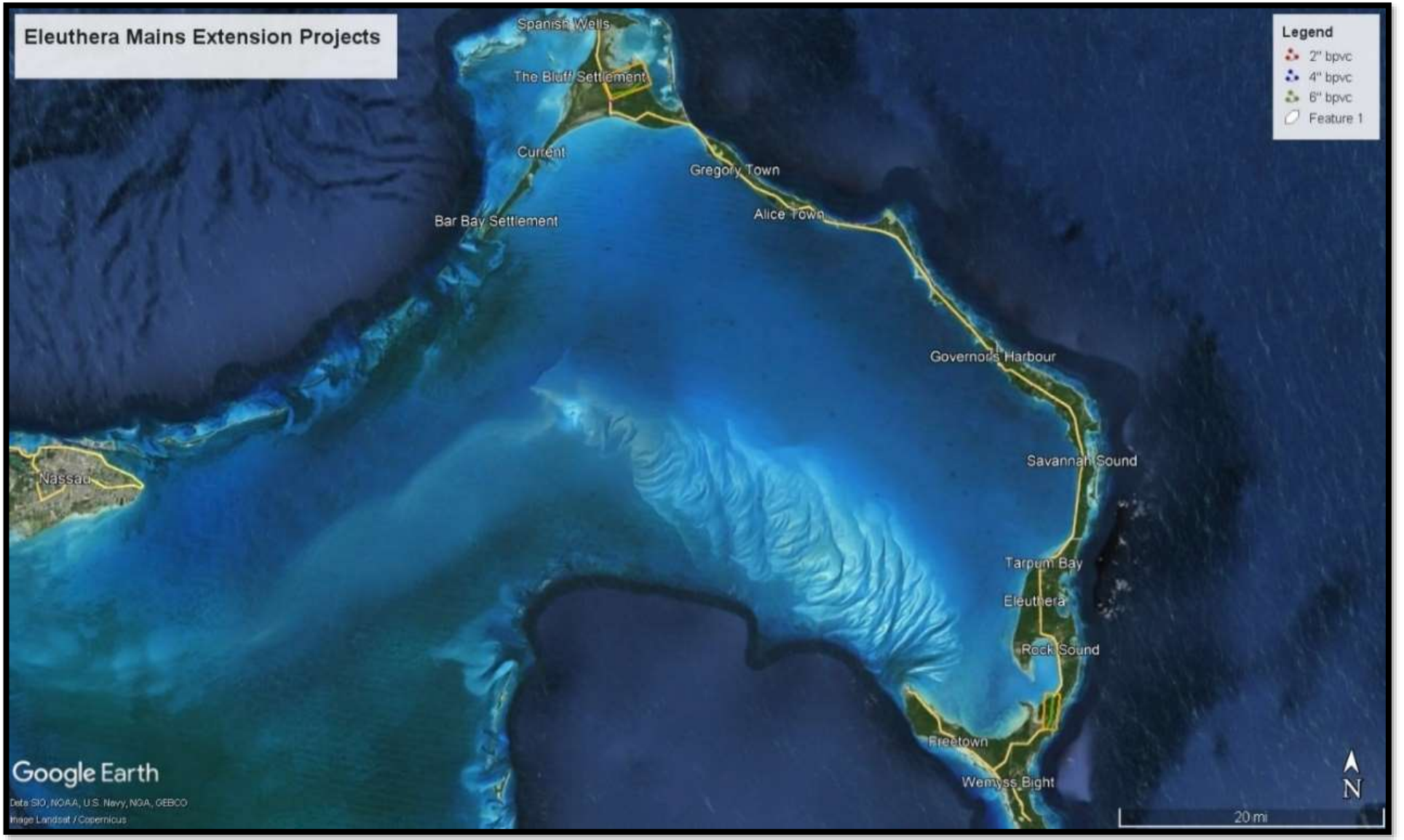


Figure 3. Projects in Eleuthera. Source: PlanEHS (own)

Central Eleuthera Water Main Extension: Savannah Sound to Tarpum

This project is located in Central Eleuthera and consists of the extension of water mains and network of WSC to provide access to potable water to regions that are currently not connected to the water systems and avoid stagnant water. Provision of water in these areas is currently done using shallow private wells that, according to WSC, may be subject to contamination. The project beneficiaries are estimated to be 150 (50 lateral connections).

Figure 4. Location of Water Mains Extension Project. Source: WSC, 2024.

The project encompasses the extension of the existing water main on Queen's Highway, deriving from Savannah Sound to connect to the existing water mains from Tarpum Bay.

Figure 5. Location of Water Mains Extension. Source: PlanEHS, 2024.

The intervention comprises the installation of approx. 6 miles (32.000ft) of 8'' bpvc water mains along Queen's Highway.

The proposed initiative represents and investment of US$ 2.445 million. This investment focuses on the extension of water mains aimed at closing the gaps of water provision to achieve an interconnected water system and increase access to potable water for residents in the family island.

South Eleuthera Water Main Extension Tarpum Plant to Jack's Bay

This project is located on South Eleuthera and entails the extension of water mains and network of the Water and Sewerage Corporation (WSC) to provide access to potable water to regions that are currently not connected to the water systems. Provision of water in these areas is currently done using shallow private wells that, according to Water Sewerage Corporation, may be subject to contamination. The projects beneficiaries are estimated to be 150 (50 lateral connections).

The project encompasses the extension of the existing water mains on Sherman's Highway, deriving from the Tarpum Bay Reverse Osmosis Plant to connect to Jack's Bay and the south water system that connects to the Waterford Reverse Osmosis Plant.

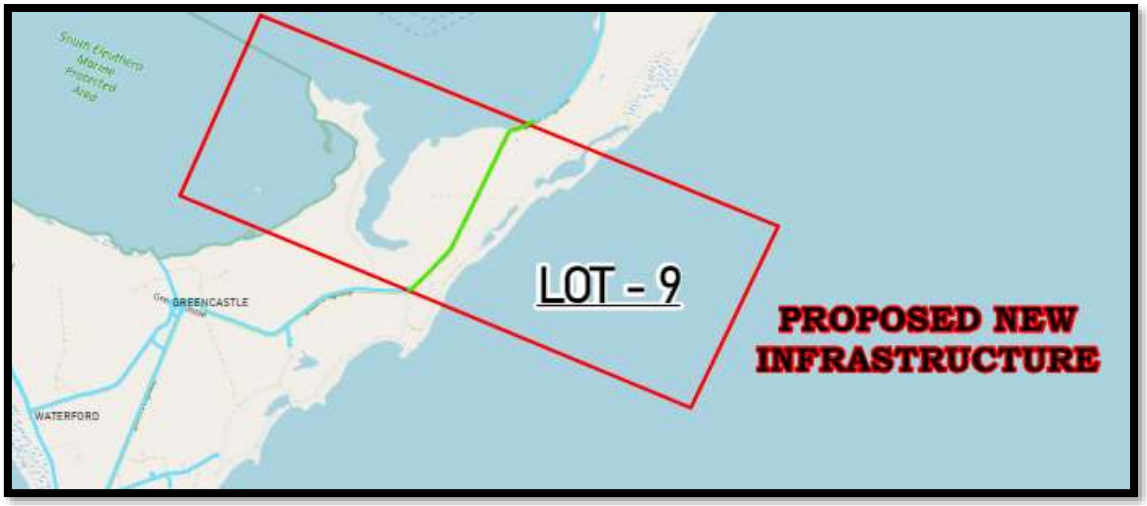


Figure 6. Location of Proposed Project (Red Polygon). Blue lines indicate existing water mains. Source: WSC.

The intervention comprises the installation of 2.8 miles (15000ft) of 6'' bpvc water mains along Sherman's Highway.

The proposed initiative represents and investment of US$ 1.6 million. This investment focuses on the extension of water mains aimed at closing the gaps of water provision to achieve an interconnected water system and increase access to potable water for residents in the family island.

Figure 7. Eleuthera Water Mains Extension Tarpum Plant to Jack's Bay. Source: PlanEHS, 2024.

Abaco

Figure 8. Abaco Island. Source: PlanEHS, 2024.

The island of Abaco, as Eleuthera, has remaining gaps in potable water provision. The following projects aim to close the gaps by extending water mains and increase access to potable water for commercial and residential use. These projects also seek to interconnect the water provision network and, in case of any disruption of the potable water service in a specific area of the island, to be able to provide service from a different water source from the existing Reverse Osmosis Plants.

Sweetings Tract New Water Mains Extension

This project is in Sweetings Village, a residential community in Marsh Harbour. It entails the extension of the water mains deriving from the Marsh Harbour Pumping Station (see violet area in Figure 9) and network to provide access to piped water to the neighborhood, which currently obtains water from private wells. Beneficiaries are estimated to be 1200 (400 lateral installations).

Figure 9. Abaco's Sweetings Tract New Water Mains Project Location. Source: PlanEHS, 2024

The intervention comprises the installation of 25,000 ft of 4" bpvc mains (see blue lines in Figure 9) that begin from the entrance of the residential neighborhood from Great Abaco Highway and 4400 ft of 2" distribution mains (see red lines in Figure 9).

The proposed initiative represents and investment of US$ 2.1 million. This investment focuses on the extension of water mains aimed at closing the gaps of water provision on the existing neighborhood, increasing number of clients of WSC contributing to improving financial sustainability for the company.

Bimini

Figure 10. Bimini Island. Source: PlanEHS, 2024.

The island of Bimini is the westernmost district of the Bahamas, it comprises a chain of islands located 50 miles east of Miami. As Eleuthera and Abaco, has remaining gaps in potable water provision.

The following projects aim to close the gaps by extending water mains and increase access to potable water for commercial and residential use. These projects also seek to interconnect the water provision network and, in case of any disruption of the potable water service in a specific area of the island. Moreover, the water mains extensions also intend to reduce stagnant water from unconnected ends of the existing water mains.

South Bimini Port Royal Water Main Extension

The project is located in Port Royal, a small residential area located in South Bimini, and it entails the extension of water mains and network of WSC to provide access to potable water to regions that are currently not connected to the water systems. Provision of water in these areas is currently done using shallow private wells that, according to WSC, may be subject to contamination. The project beneficiaries are estimated to be 300 (100 lateral connections).

Figure 11. Location of Water Mains extension project. Source: PlanEHS, 2024.

The intervention comprises the installation of 1.89 miles (10.000ft) of 4'' bpvc water mains along unnamed streets of Port Royal's neighborhood.

The proposed initiative represents and investment of US$1.001 million. This investment focuses on the extension of water mains aimed at closing the gaps of water provision to achieve an interconnected water system and increase access to potable water for residents in the family island.

South Bimini Water Main Extension to Airport

The project is located on Airport Road, South Bimini, and it entails the extension of water mains and network of WSC to provide access to potable water to regions that are currently not connected to the water systems. Provision of water in these areas is currently done using shallow private wells that, according to WSC, may be subject to contamination.

The project beneficiaries are estimated to be 30 (10 lateral connections).

Figure 12. Location of interventions on Airport Road, South Bimini, Bahamas. Source: PlanEHS, 2024.

The intervention comprises the installation of 1,76 miles (9.300ft) of 4'' bpvc water mains along Airport Road, in South Bimini, connecting mains from Buccaneer neighborhood to the South Bimini Airport.

The proposed initiative represents and investment of US$841.664. This investment focuses on the extension of water mains aimed at closing the gaps of water provision to achieve an interconnected water system and increase access to potable water for residents in the family island.

2.7.3. Component 4. Lift Station Upgrades in the Wastewater Collection and Treatment in New Providence

Figure 13. LS in New Providence. Source: PlanEHS, 2024.

Component 4 finances the upgrade of existing Lift Station (LS) of the Wastewater systems in New Providence, by procuring electrical equipment, spare inventory, and remote monitoring systems to add resilience.

Below is a detailed description of the lift stations surveyed during the field visit from April 22nd to April 26th as well as a summary of all 19 lift stations included in the component and the equipment to be purchased and replaced in each of them.

Flamingo C Lift Station

This lift station is in the subdivision Flamingo Gardens, a residential neighborhood in South Nassau, located next to subdivision Miller Heights. According to WSC, it collects wastewater from approx. 5000 homes in the surrounding area and it is connected to Flamingo Gardens Wastewater Treatment Plant (WTP).

Figure 14. Location of Flamingo C Lift Station (violet) and Flamingo Gardens WTP (pink). Source: PlanEHS, 2024.

The lift station is composed of:

- 25ft depth by 6-8ft diameter well chamber, which shows significant signs of deterioration on its walls. There is only one pump installed of 20HP.
- There is an overground valve system.
- Power Generator with a storage tank capacity of 120 gallons (8hs autonomy).
- Pump Control Pannel

Figure 15. Flamingo C Lift Station. Source: PlanEHS, 2024

Figure 16. (a) Overground valves; (b) Pump Control Pannel. Source: PlanEHS, 2024.

Figure 17. Well Chamber with significant deterioration. Source: PlanEHS, 2024.

Figure 18. Power Generator. Source: PlanEHS, 2024.

This lift station is one of the oldest in the system, it was installed during the 1980's. It is the last lift station that receives inflow from Silver Gates, Misty Gardens, Pastel Gardens and Flamingo A, B and D lift stations before the Flamingo Gardens WTP.

This lift station has had issues in the past with overflows due to pump failure. Its existing well chamber presents significant deterioration in cement walls, and it has infiltration issues. The pumping system has a lack of capacity that leads to the existing pump working overtime and a failure in the pump leads to a collapse of the entire lift station.

The current system does not include solids separation, leading to issues of pump obstruction and failure. There is no remote monitoring installed, the department in charge of sewage systems performs a daily inspection, however issues with the lift station operation are most times detected once the system is saturated and overflowing into the streets.

The proposed interventions include:

- Pumps will be upgraded to a 2x20HP set to avoid saturation of the system and potential overflows.
- Duplex Panel
- Valves and pipelines will be changed for new cast iron valves (3 8'' valves, two check and one gate) and new PVC lines.
- SCADA system for remote monitoring
- Control Board (Generator), contactors, phase monitors, leakage detectors, floats, alternating relays, control relays, contact kits, breakers, and surge protection.

Elizabeth East Lift Station

This lift station is in subdivision Elizabeth Estates, a residential neighborhood in the southeast of Nassau, New Providence. According to WSC, it collects wastewater from approx. 5000 homes in the surrounding area and it is connected to Fox Hill Wastewater Treatment Plant (WTP), which

only performs a solid separation before deep injection of wastewater into the aquifer (approx. 600ft).

Figure 19. Location of Elizabeth East Lift Station (violet) and Fox Hill WTP (pink). Source: PlanEHS, 2024.

The lift station is composed of:

- 40ft depth by 20ft diameter well chamber, which shows signs of significant deterioration on its walls and pipelines.
- There are two 35HP pumps installed.
- Valve chamber with 3 rusted valves and an 8´´ PVC outlets and a bypass option with bridle configuration.
- Pump Control Pannel.
- Power Generator (3-day autonomy)

Figure 20. Well Chamber, Pump Control Pannel, ventilation, and Power Generator in Elizabeth East LS. Source: PlanEHS, 2024

Figure 21. Valve Chamber. Source: PlanEHS, 2024.

Figure 22. Well Chamber of Elizabeth East LS. Source: PlanEHS, 2024.

This lift station is one of the oldest in the system. It is the last lift station that receives inflow from St. Andrews, Treasure Cove, Twynam 1, 2 and 3, Yamacraw 1, 2, 3 and 4, Star States, Leeward East and Palm Key Lift Stations before flowing into Fox Hill WTP.

This lift station has had several issues in the past with overflows due to pump failure, last one was recorded in January and caused the entire lift stations system to overflow. Its existing well chamber presents significant deterioration in cement walls, and it has infiltration issues.

The pumping system has a lack of capacity that, coupled with infiltration, leads to the existing pumps working overtime. The current system does not include solids separation, leading to issues of pump obstruction and failure. There is no remote monitoring installed, the department in charge of sewage systems performs a daily inspection, however issues with the lift station operation are most times detected once the system is saturated and overflowing into the streets.

The proposed interventions include:

- Pumps will be upgraded to a 3:1 45HP system set to avoid saturation of the system and potential overflows.
- Valves and pipelines will be changed for new cast iron valves (5 8'' valves, three check and two gate) and new PVC lines.
- SCADA system for remote monitoring
- Pumps Control Pannel
- Control Board (Generator), contactors, phase monitors, leakage detectors, floats, alternating relays, control relays, contact kits, breakers and surge protection.

Rawson Square Lift Station

This lift station is located in Downtown Nassau, a central business and cultural hub area, housing government buildings, historic sites, shops and restaurants in New Providence. According to WSC, it collects wastewater from approx. 20000 homes in the surrounding area and it is connected to Malcom Park, which performs deep injection of wastewater into the aquifer.

Figure 23. Location of Rawson Square Lift Station. Source: PlanEHS, 2024.

The lift station is composed of:

- 20ft depth by 20ft diameter well chamber, which shows signs of significant deterioration on its walls and pipelines.
- There are two 20HP pumps installed.
- There is no valve chamber, only a secondary chamber that flows through a 24´´ gravity main towards Malcom Park WTP (no bypass option).
- Pump Control Pannel that has had issues in the past.
- Power Generator (3-day autonomy)

Figure 24. Rawson Square Lift Station. Source: PlanEHS 2024.

Figure 25. Well chamber and secondary chamber (connects to Gravity main). Source: PlanEHS, 2024.

Figure 26. Chlorination station. Source: PlanEHS, 2024.

Figure 27. Power Generator. Source: PlanEHS, 2024.

Figure 28. Well chamber and secondary chamber. Source: PlanEHS, 2024.

This lift station is the oldest in the system, gravity mains date back to 1927. It receives inflow from Vista Marina, Big Pond, Cruise Port Lift Stations and wastewater from Cruise Ships before flowing into Malcom Park Lift Station.

This lift station has had several issues in the past with overflows due to pump failure, last one was recorded in November and caused the entire lift stations system to overflow into the street of the downtown area. Its existing well chamber presents significant deterioration in cement walls, and it has infiltration issues. The gravity main dates back to 1927 and it is made of asbestos cement.

The pumping system has a lack of capacity that, coupled with infiltration, leads to the existing pumps working overtime. The current system does not include solids separation, leading to issues of pump obstruction and failure.

There is no remote monitoring installed, the department in charge of sewage systems performs a daily inspection, however issues with the lift station operation are most times detected once the system is saturated and overflowing into the streets.

The proposed interventions include:

- Addition of a 3 set 8'' valve system with a bypass option (two check and one gate)
- Pumps will be upgraded to a 3:1 35HP system set to avoid saturation of the system and potential overflows
- SCADA system for remote monitoring
- Tryplex Control Panel
- Control Board (Generator), contactors, phase monitors, leakage detectors, floats, alternating relays, control relays, contact kits, breakers and surge protection.

Malcom Park Lift Station

This lift station is located in Downtown Nassau, a central business and cultural hub area, housing government buildings, historic sites, shops and restaurants in New Providence. According to WSC, it collects wastewater from approx. 30000 homes in the surrounding area and it injects wastewater into the aquifer (approx.. 450ft).

Figure 29. Malcom Park Lift Station (and well). Source: PlanEHS, 2024.

The current configuration of the lift station is composed of:

- 3 well chambers: two interconnected which show signs of significant deterioration on its walls, pipelines, they lack closing gates and are exposed to the environment.
- There are two pumps installed, 1x40HP and 1x60HP.
- There is a 3 valves valve chamber with significant deterioration and rust, lacks closing gates and are exposed to the environment.
- Pump Control Pannel that has had issues in the past.
- Power Generator (3-day autonomy)
- Injection Well

The lift station has several structures that are out of order, including a treatment plant (blue building in Figure 30) that during field visit was identified as non-operational due to issues in its construction phase. As it was indicated, during high tide seawater comes in through the building structure, and it needs to pump out water to the well chambers. There are also fuel tanks unused that should be removed from the premises, as well as pipes, valves and other equipment around the area.

Figure 30. Entrance to Malcom Park Lift Station and nonoperational plant (blue building). Source: PlanEHS, 2024.

Figure 31. Malcom Lift Station Layout. Source: PlanEHS, 2024.

The inlet water comes in through the 1º well chamber and, since the connection between the 1º and 2º chamber was closed off during construction of the treatment plant, the two are now connected via a temporary PVC bypass.

From the 2º chamber, the inlet flows naturally towards the 3º well chamber (which also receives water from the blue building) from where it is pumped into the injection well.

Figure 32. (a) 1º well chamber and PVC bypass; (b) 2º well chamber and PVC bypass. Source: PlanEHS

2024.

Figure 33. 3º well chamber and bypass from blue building. Source: PlanEHS, 2024

Figure 34. Injection well (right) and unused fuel tank (left) and screening tank (right). Source: PlanEHS, 2024.

Since the system has no available bypass system, whenever there is pump failure, WSC needs to call a crane service to remove the pump, while shutting off the lift stations that connect to Malcom Park.

The proposed interventions include:

- Pumps will be upgraded to a 3:1 60HP system set to avoid saturation of the system and potential overflows.
- Including SCADA system for remote monitoring, contactors, phase monitors, leakage detectors, floats, alternating relays, control relays, contact kits, breakers and surge protection.

Montague Lift Station

This lift station is located in Downtown Nassau, a central business and cultural hub area, housing government buildings, historic sites, shops and restaurants in New Providence. According to WSC, it collects wastewater from approx. 5000 homes in the surrounding area and it is connected to Malcolm Park.

Figure 35. Location of Montague Lift Station (violet). Source: PlanEHS, 2024

The lift station is composed of:

- 25-30ft depth by 15-15ft well chamber, which shows signs of significant deterioration on its walls and pipelines.
- There are two 20HP pumps installed.
- There is one valve chamber that shows significant deterioration with an exterior temporary gadget connecting the well chamber with the outlet main.
- Pump Control Pannel that has had issues in the past.

This lift station has had several overflow issues in the past. It is located adjacent to a local food vendor and 20 meters from the shoreline. Whenever there is a pump failure, the wastewater is known to flow out into the surrounding parking space and to the beach. There is no coastal sea wall and during storms there are blockage issues from the sand that is flown into the chamber. The well chamber remains opened due to the temporary gadget installed that connects the well chamber to the valve chamber, because of the cast iron pipes being deteriorated.

Figure 36. Location of Montague Lift Station, adjacent to local vendor. Source: PlanEHS, 2024.

Figure 37. Well chamber and temporary gadget connecting to valve chamber. Source: PlanEHS, 2024.

Figure 38. Deterioration on well chamber and valve chamber. Source: PlanEHS, 2024.

The proposed interventions include:

- Pumps will be upgraded to a 2:1 20HP system set to avoid saturation of the system and potential overflows.
- Valves and pipelines will be changed for new cast iron valves (3x8'' valves, three check and two gate) and new PVC lines.
- SCADA system for remote monitoring
- Duplex Control Pannel
- Contactors, phase monitors, leakage detectors, floats, alternating relays, control relays, contact kits, breakers, and surge protection.

Summary of all LS Proposed Equipment Upgrades

Most of the Lift Stations upgrades proposed involve incorporating equipment such as contactors, phase monitors, leakage detectors, floats, alternating relays, control relays, contact kits, breakers, surge protection devices, pumps renewal, and valve upgrades. These upgrades significantly enhance the functionality and reliability of lift stations.

Contactors and relays facilitate precise control over pumps and other critical components, ensuring efficient operation and energy management. Phase monitors and surge protection devices protect against electrical faults, ensuring continuous operation and minimizing downtime due to electrical issues. Leakage detectors and floats monitor water levels and detect leaks, preventing overflow and environmental contamination. Valve upgrades optimize flow control within the station, enhancing operational flexibility and system efficiency.

Overall, these upgrades and additions contribute to improved safety, reduced operational risks, enhanced environmental protection through better leak detection and remote control and monitoring, and increased operational efficiency in managing wastewater within lift stations.

In the table below there is a summary of all lift stations and equipment replacement/incorporation proposed.

Table 2. Summary of proposed works in Lift Stations of New Providence.

N°	Location	Equipment	Costing
1	**Malcolm Park**	60 HP Flygt	120.000
		Contactors, phase monitors, leakage detectors, floats, alternating relays, control relays, contact kits, breakers and surge protection. SCADA monitoring. Control Board (Generator)	36.000
2	**Elizabeth East**	Two 45 HP Flygt	120.000
		Duplex Control Panel	40.000
		Two pump heels, guide rails, brackets	9.600
		Five 8' valves: three check and two gate	35.000
		Contactors, phase monitors, leakage detectors, floats, alternating relays, control relays, contact kits, breakers and surge protection. SCADA monitoring. Control Board (Generator)	46.000
3	**Montague**	Two 20 HP Flygt	80.000
		Duplex panel	30.000
		Heels and guide rails	15.000
		Three 8' valves: two check and one gate	20.000
		Contactors, phase monitors, leakage detectors, floats, alternating relays, control relays, contact kits, breakers and surge protection. SCADA monitoring.	20.000
4	Potters Cay	Two 5HP Flygt	30.000
		Heels, guiderails, and brackets	12.000
		Three 8' valves: two check and one gate	10.000
		Duplex Panel	10.000
		Contactors, phase monitors, leakage detectors, floats, alternating relays, control relays, contact kits, breakers and surge protection. SCADA monitoring.	10.000
5	**Rawson Square**	Two 35HP Flygt	110.000
		Heels, guide rails, Three 8' valves: two check and one gate, and brackets	28.000
		Duplex Panel	40.000
		Contactors, phase monitors, leakage detectors, floats, alternating relays, control relays, contact kits, breakers and surge protection. SCADA monitoring. Control Board (Generator)	36.000
6	Fox Hill	Two 20 HP Flygt	80.000
		Duplex Panel	30.000
		Heels and guide rails	15.000
		Three 8' valves: two check and one gate	20.000

N°	Location	Equipment	Costing
		Contactors, phase monitors, leakage detectors, floats, alternating relays, control relays, contact kits, breakers and surge protection. SCADA monitoring. Control Board (Generator)	36.000
7	Old Cedar	Two 10 HP Flygt	40.000
		Heels, guide rails, three 8' valves: two check and one gate, and brackets	22.000
		Duplex Panel	15.000
		Contactors, phase monitors, leakage detectors, floats, alternating relays, control relays, contact kits, breakers and surge protection. SCADA monitoring.	20.000
		Two 7.5 HP Flygt	36.000
8	Shirlea	Heels, guide rails, three 8' valves: two check and one gate, and brackets	15.000
		Duplex Panel	15.000
		Contactors, phase monitors, leakage detectors, floats, alternating relays, control relays, contact kits, breakers and surge protection. SCADA monitoring.	20.000
9	Yellow Elder Main	Two 45 HP Flygt	120.000
		One Duplex Control Panel	50.000
		Two pump heels (12" discharge), guide rails, three 8' valves: two check and one gate, brackets	52.000
		Contactors, phase monitors, leakage detectors, floats, alternating relays, control relays, contact kits, breakers and surge protection, Control Board (generator). SCADA monitoring.	41.000
10	McNeil	Two 10 HP Flygt	40.000
		Heels, guide rails, three 8' valves: two check and one gate, and brackets	22.000
		Duplex Panel	15.000
		Contactors, phase monitors, leakage detectors, floats, alternating relays, control relays, contact kits, breakers and surge protection. SCADA monitoring.	20.000
		30KW Generator Replacement and Automatic Transfer Switch (ATS). (Existing generator is aged and parts for this unit are obsolete)	51.000
11	PMH	Two 10 HP Flygt	40.000
		Heels, guide rails, three 8' valves: two check and one gate, and brackets	22.000
		Duplex Panel	15.000
		Contactors, phase monitors, leakage detectors, floats, alternating relays, control relays, contact kits, breakers and surge protection. SCADA monitoring.	20.000

N°	Location	Equipment	Costing
		Install 30KW Generator and ATS. (This is a critical Lift Station for Hurricane Preparedness)	51.000
12	Oakes Field	Two 10 HP Flygt	40.000
		Heels, guide rails, three 8' valves: two check and one gate, and brackets	22.000
		Duplex Panel	15.000
		Contactors, phase monitors, leakage detectors, floats, alternating relays, control relays, contact kits, breakers and surge protection. SCADA monitoring.	20.000
13	Big Pond	Two 20 HP Flygt	80.000
		Duplex panel	30.000
		Heels and guide rails	15.000
		Three 8' valves: two check and one gate	20.000
		Contactors, phase monitors, leakage detectors, floats, alternating relays, control relays, contact kits, breakers and surge protection. SCADA monitoring. Control Board (Generator)	36.000
14	St. Albans	Two 5HP Flygt	30.000
		Heels, guiderails, and brackets	12.000
		Three 8' valves: two check and one gate	10.000
		Duplex Panel	10.000
		Contactors, phase monitors, leakage detectors, floats, alternating relays, control relays, contact kits, breakers and surge protection. SCADA monitoring.	10.000
15	Nassau Street	Two 20 HP Flygt	80.000
		Duplex Panel	30.000
		Heels and guide rails	15.000
		Three 8' valves: two check and one gate	20.000
		Contactors, phase monitors, leakage detectors, floats, alternating relays, control relays, contact kits, breakers and surge protection. SCADA monitoring. Control Board (Generator)	36.000
16	**Flamingo C**	Two 20 HP Flygt	80.000
		Duplex Panel	30.000
		Heels and guide rails	15.000
		Three 8' valves: two check and one gate	20.000
		Contactors, phase monitors, leakage detectors, floats, alternating relays, control relays, contact kits, breakers and surge protection. SCADA monitoring. Control Board (Generator)	36.000
17	Yamacraw 2	Two 20 HP Flygt	80.000
		Duplex Panel	40.000
		Three pump heels, guide rails, brackets	9.600

N°	Location	Equipment	Costing
		Five 8' valves: three check and two gate	35.000
		Contactors, phase monitors, leakage detectors, floats, alternating relays, control relays, contact kits, breakers and surge protection. SCADA monitoring. Control Board (Generator)	36.000
18	Pinewood C	Two 20 HP Flygt	80.000
		Duplex Panel	30.000
		Heels and guide rails	15.000
		Three 8' valves: two check and one gate	20.000
		Contactors, phase monitors, leakage detectors, floats, alternating relays, control relays, contact kits, breakers and surge protection. SCADA monitoring. Control Board (Generator)	36.000
19	Sir Lynden 1	Two 10 HP Flygt	40.000
		Heels, guide rails, three 8' valves: two check and one gate, and brackets	22.000
		Duplex Panel	15.000
		Contactors, phase monitors, leakage detectors, floats, alternating relays, control relays, contact kits, breakers and surge protection. SCADA monitoring. Control Board (Generator)	26.000
		GRAND TOTAL	**2.977.200**

Figure 39. Location of all Lift Stations in New Providence, including 19 LS of Component 4. Source: WSC.

3. Legal and Institutional Framework

This chapter outlines the legal, sectoral, and institutional framework of the Bahamas Water Supply and Sanitation Systems Upgrade Program (BH-L1061), considering environmental, social, and occupational health and safety areas.

The **first section** of the chapter describes the **national legal framework** applicable to the Program. As this operation is proposed to be financed by a loan operation from the Interamerican Development Bank, the **second section** describes the **Environmental and Social Performance Standards** included in IDB's Environmental and Social Policy Framework, which are also applicable to the Program.

3.1 National Legal Framework

Due to the extensive number of environmental regulations, tables have been organized and classified thematically. This organization aims to streamline understanding and facilitate future reference. Each table offers a concise analysis of the regulations in question.

3.1.1. Environmental Licensing

According to the Part III – Environmental Plans and Policies of the Environmental Planning and protection Bill (2019), despite the stipulations in any other legal provision, no individual should initiate any project work unless they have received a **certificate of environmental clearance** in line with the specified regulations following the approval of either an Environmental Impact Statement or an Environmental Impact Assessment by the Director.

Alternatively, the project might be one that the regulations specifically exempt from the need for such a certificate. Should anyone embark on a project without procuring the necessary environmental clearance certificate as mandated, they would be committing an offense.

In relation to public consultation mechanisms, the 2020 publication from the IDB titled *"Public Consultations: Step by Step: Regulatory and Legal Frameworks Applicable in the Bahamas"* elucidates that there exists no dedicated legislation concerning infrastructure projects. Nonetheless, the document meticulously outlines best practices for devising a Consultation Plan. Furthermore, the Environmental Planning and Protection Bill Act remains devoid of any specific procedures pertaining to this matter.

Below is a table with a summary of the main regulations related to the environment:

Table 3. Environmental licensing and ESIA regulations

National Regulations	
Environmental Impact Assessment Regulations, 2020	No individual shall commence or proceed with a proposed venture until an Environmental Enablement Certificate has been granted in accordance with the stipulated Regulation. Should an individual embark on a venture without the requisite Environmental Enablement Certificate, the Director of Environmental Planning and Protection; may mandate said

National Regulations	
	individual to halt all associated operations and may execute one or more of the determinations delineated in Rule 11. Any individual intending to implement a proposed venture (hereafter referred to as the "venture proponent") must tender a preliminary assessment request for the proposed venture using the format outlined in Part A of the First Annex, accompanied by the mandated non-refundable fee. The venture proponent shall annex to the aforementioned request the data detailed in Part B of the First Annex. Upon receipt of the request, the Director will scrutinize or delegate the examination of the documentation to ensure precision and comprehensiveness, subsequently deciding if an EIA, PGA, or supplementary inquiries are necessitated. In circumstances where the Director remains unpersuaded regarding the adequacy of the provided data for an informed determination, written correspondence might be dispatched to the venture proponent requesting supplementary data deemed imperative by the Director. Should the project proponent disagree with a decision by the Director, the project proponent may either (a) appeal the decision pursuant to Rule 21, or (b) withdraw the application for the Environmental Enablement Certificate. When the Director deems it necessary to submit an EIA or PGA, the project proponent shall prepare and electronically and manually submit the EIA or PGA to the Director, as outlined in the form of the Second Annex. The Department shall communicate its decision to the project proponent within sixty days from the submission date of the completed EIA or PGA and may mandate supplementary or complementary studies. When the Director is convinced that a proposed project: a) does not necessitate an EIA or PGA, the Director may grant an Environmental Enablement Certificate to the project proponent in the format delineated in the Second Annex, specifying the requisite environmental enablement conditions; b) does require an EIA or PGA, the Director will inform the project proponent about the steps for preparing and submitting an EIA or PGA per the current Regulation. Upon the submission of the EIA or PGA to the Director, the project proponent shall, at the earliest opportunity, provide notice in a widely circulated newspaper published in The Bahamas, indicating: (a) the completion of the consultation process regarding a proposed project as per Rule 9; (b) the preparation of an EIA or EMP

National Regulations	
	concerning the proposed project; (c) the submission of the EIA or EMP to the Department for evaluation; (d) a date, venue, and time for the complimentary inspection of the EIA or EMP. Upon the successful completion of the preliminary review application, the project proponent will undertake a consultation process as detailed in Rule 11, with outcomes documented in the format prescribed by the Director. The Department will notify the general public and concerned parties, with no less than a fortnight's advance, about a consultation process by a project proponent concerning a proposed project. A notification issued pursuant to clause (1) shall (a) specify the project proponent's name and the proposed project's area; (b) state the date and time of the consultation process; (c) mention the venue of the consultation process; (d) provide a project description; (e) invite the general public and concerned parties to submit written feedback. (3) The Department will forward all written feedback received per subsection (2)(e) to the project proponent, allowing the project proponent to address said feedback during the consultation process. The Department of Environmental Planning and Protection will dictate the modality and procedure of a consultation process. Throughout the consultation process, the project proponent must (a) supply detailed information (i) about the proposed project and potential environmental, social, economic, and cultural impacts, including adverse effects defined by the Act; (ii) on any potential impact on properties and communities adjacent to the proposed project; and (iii) on any significant impact of the proposed project on nearby properties and communities. (b) offer a platform to address any public concerns; (c) maintain written records of all raised concerns for inclusion in the EIA or PGA consultation process. The Director shall (a) attend or appoint a representative to partake in the consultation process; (b) ensure that all comments received in line with Rule 8(2) have been addressed by the project proponents. Once the prerequisites for obtaining an Environmental Enablement Certificate (henceforth referred to as the "Certificate") are fulfilled, a Certificate shall be awarded in the format provided in the Third Annex, specifying the conditions of environmental enablement to be met. The Director will inspect or delegate the inspection of activities associated with a project that has been issued an Environmental Enablement Certificate, to ascertain project alignment with the Certificate.

National Regulations	
	Should a project not adhere to the Environmental Enablement Certificate, the Director may: (a) mandate the dismantling, demolition, and removal of any erected structure; (b) command the return to natural topography and conditions of all terrestrial or marine areas linked to proposed projects where construction commenced; (c) stipulate any directive to be adhered to concerning activities. Upon granting the environmental authorization certificate, the Department will continue project supervision, which will encompass, among other things, the appointment of a manager or managers who will: a) oversee the project and ensure compliance with the EIA or PGA, the conditions of the environmental authorization certificate, and the objectives of the Act; b) document project progress and compliance; and c) provide final approval after three years of full-scale operations. The project promoter shall meticulously apply the PGA, including environmental authorization conditions, during the project's construction and operational phases. The Department will supervise the PGA application and environmental authorization conditions throughout the project's construction and operational phases. If the Department determines the project does not adhere to the PGA and Environmental Authorization Conditions, the Department will inform the Project Proponent of the project's identified deficiencies. The project proponent can address the project's deficiencies identified by the Department and request a subsequent project inspection and review by the Department. Any individual, upon receiving a notification under Rule 15, who fails to rectify the identified shortcomings, commits an offense and is liable to a penalty stipulated in Article 60 of the Act. The project proponent shall deposit a bond in line with Article 8 of the 2019 Ministry of Environment Act. All such bonds will be held as collateral, to cover probable costs associated with environmental damages related to the project. The sum to be deposited pursuant to clause (l) will be determined by the Director, not exceeding five percent of the project's value. The environmental compliance bond may be: a) paid in cash, to be deposited into the Environmental Management Fund per Article 8 of the 2019 Ministry of Environment Act; b) secured by an indemnity insurance, assigned to the Department until the activity referred to in the bond concludes or the project is abandoned or closed; or c) guaranteed by a guarantor, via a reputable financial institution.

National Regulations	
	The period of the environmental compliance bond would span from the project's commencement to three years of full operational development. If the bond remains unutilized following substantial completion and three years of full development operations, and the project proponent holds no arrears with the Department, the bond, along with accrued interest if applicable, will be returned to the project proponent. In the event the bond or a portion thereof is utilized during construction, the unused portion of the bond will be returned to the project proponent, and accrued interest shall be retained by the Ministry.
Ministry of the Environment Act, 2019	An Act to establish the Ministry of the Environment to oversee the integrity of the environment of The Bahamas, to establish the environmental stewardship fund and the environmental trust fund, and for related matters.
Environmental Planning and Protection Act, 2019	Act Establishing the Department of Environmental Planning and Protection; Setting Out the Prevention or Control of Pollution, Regulating Activities, and Administering, Conserving, and Sustainably Using the Environment; and for Related Purposes. The Objectives of this Act are the following: a. Ensure the establishment of an integrated environmental management system; b. Protect the Bahamian environment while simultaneously fostering development that upholds ecological integrity and the social and economic well-being of local communities; c. Provide a legal framework for the protection, enhancement, and conservation of the environment, and for the management, use, development, and sustainable enjoyment of the environment by the Bahamian populace, including both present and future generations; d. Provide for the prevention and mitigation of pollution to uphold the environmental quality; e. Facilitate compliance with and execution of obligations arising from regional and international agreements or conventions ratified or acceded to by the Government of The Bahamas; f. Allocate environmental protection and restoration costs equitably, in a manner that encourages responsible environmental use, minimizes environmental damage, and ensures polluters bear an appropriate share of the costs resulting from their activities, products, substances, and services; g. Promote best environmental management practices and minimize environmental damage through strategic planning, public consultation, and effective policies;

National Regulations	
	h. Develop a robust climate change regime implementing adaptation and mitigation technologies to address vulnerabilities; i. Establish a mechanism for the public's effective participation in decision-making and environmental policy formulation; and j. Encourage and foster among all individuals a greater understanding and appreciation of the environment.
Environmental planning and protection (Extension of application) order, 2020	The Environmental planning and protection (Extension of application) order applies throughout The Bahamas, including all islands and cays.

3.1.2. Potable Water, Quality, Supply

Table 4. Water Quality Regulations

International Regulations	
The Convention on Wetlands	The Convention on Wetlands is the intergovernmental treaty that provides the framework for the conservation and wise use of wetlands and their resources.
National Regulations	
Environmental Planning and Protection Act (No. 40 of 2019)	The Director shall maintain within the Environmental Registry data on the sources of water, air and noise pollution, particularly data that identifies the quantity, conditions or concentrations relevant to the identification of each pollutant.
Water and Sewerage Corporation Act	An Act to establish a Water and Sewerage Corporation for the grant and control of water rights, the protection of water resources, regulating the extraction, use and supply of water, the disposal of sewage and for connected purposes.
Licensed Plumbers Rules	When undertaking any work for which a licensed plumber is authorized under the provisions of the Act, one must adhere to the requirements of this Regulation. In any premises intended for human habitation or occupation with a pure water supply, it shall not be connected to any impure water supply, nor shall it intersect through any plumbing fixture with the drainage system. Every building designated for human habitation that has a toilet or other plumbing fixture must have a water supply adequate in volume and pressure to flush said toilet or plumbing fixture. Furthermore, any pipe leading water to such toilet must be of an appropriate size to supply water at a rate necessary for proper flushing without unduly reducing the pressure in any other fixture.
Sewerage Rates Regulations	In determining the sum payable under regulation for sewerage services the building fixture specified in the first column of the Schedule shall be classified under the number of units set out respectively in the second column of the Schedule against each fixture.
Water Supply Rules	The Minister when requested in writing may agree to supply water

International Regulations	
	to a consumer for domestic purposes or any other purpose in accordance with the Water and Sewerage Act. Water will not be supplied through any one metered connection with the supply main to more than two water closets. Where more than two water closets are installed in any new building on one proposed metered water connection or in any part of any new building such part being on one proposed metered water connection, then no water connection will be made until an independent water supply system has been installed to supply all the water closets in such new building or such part of a new building. If a third water closet is installed in a building or part of a building on an existing water connection, then the connection will be cut off unless an independent water supply system is installed to supply all the water closets in the said building or part of a building.
Water Supplies (Out Islands)	This Act makes provision for the water supply in the Out Islands. It mainly concerns the construction and maintenance of water supply systems and the conditions of supply of water to private consumers. The Act prescribes penalties for willful damage or obstruction and defines regulation-making powers of the Minister.
Water Supplies (Out Islands) Rules (Cap. 197)	These Rules concern the public supply of water to consumers at the Out Islands and related matters such as the construction of water supply works, rates, and repairs. The Minister may, on application, agree to supply water for domestic or other purposes in accordance with the provisions of the Water and Sewerage Act and these Rules. The Rules also concern requirements for plumbing and metering, prohibit illegal consumption and waste of water supplied through the public system and prescribe charges for water-related services.
Out Islands Utilities Act	An Act to encourage the construction of water supply and sewerage disposal systems on Out Islands by providing for the refund of customs duties and certain other concessions to the developer of such systems. This Act makes provision with respect to the enhancement of public utilities construction works on the Out Islands such as water supply systems and sewerage systems. A developer who wishes to develop such an utility project may apply to the Minister. The Minister may, through an agreement, license the developer to construct, maintain and operate the utility project at specified conditions. No utility project shall be constructed without the approval of the Minister.
Freeport Bye-laws Act	These Regulations regulate the abstraction of water and public supply of water by authorized suppliers and make further provision to prevent water pollution in the Freeport Area, of groundwater resources. Persons who wish to abstract groundwater (other than an authorized water supplier) shall apply for a license to the Grand Bahama Utility Company Limited, being a licensee of the Port Authority empowered to supply water to the public in the Port Area.

International Regulations	
	The Port Authority may also grant well permits under these Regulations. No well permit shall be issued for the construction or enlargement of any well to any person for a private water supply in any area where a public water supply is available. Suppliers shall obtain a permit from the Port Authority to become an authorized supplier of public water.
South Eleuthera Water Supply Act	An Act to authorize the entering into of an agreement between the Government and the South Eleuthera Power and Light Company Limited for the establishment of a water supply system in the Settlement of Rock Sound and its environments and for matters incidental thereto. This Act authorizes the Governor-general to enter into an agreement with a specified company for the maintenance and extension of water supply systems in a specified part of The Bahamas. The Act also specifies powers of the company in respect of land and prohibits various acts by consumers in respect of water supplied by the company.
Reclamation and Drainage Act	An Act to provide for reclamation and drainage of swampy areas. This Act makes provision for land reclamation and drainage of land ordered by the State. The Act shall apply in parts of the Bahamas that are declared by the Minister to be a reclamation area for purposes of this Act. The Minister may order landowners in a reclamation area to conduct land reclamation works and in case of neglect or refusal in respect of such order the Minister may direct a reclamation officer to carry out the work. The Act grants regulation-making powers for purposes of the Act to the Minister.

3.1.3. Effluent Discharge

Table 5. Effluent discharge regulations

National Regulations	
Environmental Health Services Act	Any individual who, contrary to the provisions of this Act and its regulations, releases or allows the release of any pollutant into the environment is committing an offense. Anyone who (a) discharges a pollutant or contaminating agent into the environment or (b) oversees a source that results in such discharge beyond regulatory limits must immediately notify the Director of such release. No person shall (a) modify or establish any facility or equipment capable of emitting pollutants; (b) change or undertake a production process that results in emissions; or (c) modify a production rate that alters the emission rate or manner, without prior certification approval from the Director endorsing the methods or devices used to control such emissions.

3.1.4. Solid Waste Management

Table 6. Solid Waste Management regulations

National Regulations	
Environmental Health Services (Collection and Disposal of Waste) (Amendment) Regulations, 2013	These Regulations amend the Environmental Health Services (Collection and Disposal of Waste) Regulations, 2004 by repealing and replacing the Schedule. The Schedule, made under regulation 49, determines waste disposal charges for waste brought to a waste management facility. A waste disposal fee shall be assessed and shall be paid by all private collectors for each load of waste.
Environmental Protection (Control of Plastic Pollution) Act, 2019	An act to prohibit single use plastic food ware and non-biodegradable, oxo-biodegradable and biodegradable single use plastic bags; prohibit the release of balloons; regulate the use of compostable single use plastic bags, and for connected matters.
Environmental Health Services (Control of Plastic Pollution) Regulations, 2020	Where an environmental health officer, having inspected premises of a business pursuant to section 10 of the Environmental Protection (Control of Plastic Pollution) Act 2019, has reason to believe that the business has failed to comply with any provision of that Act, the officer may issue a notice of non-compliance.
Environmental Health Services Act	"Solid waste" includes ashes, garbage, refuse, litter, and other discarded solid material resulting from domestic, industrial, commercial, and agricultural operations and from community activities but does not include sewage. The Minister may prescribe regulations to effectuate and fulfill the purpose, intent, and provisions of this Act and, without prejudice to the generality of the foregoing, such regulations may provide for: subject to the provisions of Article 27 of the Constitution, the use, regulation, and control of beaches and coastal areas, both above and below the high-tide line, the removal of solid waste from them, and the cleaning and maintenance of the aforementioned beaches and areas, and generally for preserving the amenities thereof.

3.1.5. Hazardous Waste Management

Table 7. Hazardous Waste Management Regulations

International Regulations	
International Convention for the Prevention of Pollution from Ships (MARPOL), 1973, as modified by the Protocol of 1978 and Protocol of 1997 (Annexes I, II, III, IV, V & VI)	The Convention includes regulations aimed at preventing and minimizing pollution from ships - both accidental pollution and that from routine operations - and currently includes six technical Annexes. Special Areas with strict controls on operational discharges are included in most Annexes.
Stockholm Convention on Persistent Organic Pollutants, 2004	It aims to eliminate or restrict the production and use of persistent organic pollutants (POPs).

National Regulations	
Environmental Health Services Act	The Minister may enact regulations to effectuate and implement the purpose, intent, and provisions of this Act. Without detracting from the generality of the foregoing, such regulations may provide for (o) the control and prevention of radiation, hazards, and the disposal of radioactive or other hazardous waste.

3.1.6. Occupational Health, Hygiene and Safety

Table 8. Occupational Health, Hygiene and Safety regulations

International Regulations	
International Convention for the Safety of Life at Sea (SOLAS), 1974 and the Protocols of 1978 and 1988	The main objective of the SOLAS Convention is to specify minimum standards for the construction, equipment, and operation of ships, compatible with their safety. Flag States are responsible for ensuring that ships under their flag comply with its requirements, and several certificates are prescribed in the Convention as proof that this has been done.

National Regulations	
Environmental Health Services Act	Legislation to advance the conservation and maintenance of the environment in the interest of public health, for proper sanitation concerning food and beverage matters, and more broadly, for the provision and oversight of services, activities, and other matters connected or incidental thereto. The Minister may issue regulations to effectuate and realize the purpose, intent, and provisions of this Act and, without limiting the scope of the foregoing, such regulations might provide for the establishment of standards for the hygienic maintenance and use of public sanitary facilities, restrooms, sinks, laundries, and dry-cleaning establishments.
Health and Safety at Work Act	Law establishing provisions relating to occupational health and safety and other related purposes.
Health and Safety at Work (amendment)	The Health and Safety at Work Act has undergone an amendment targeting section 17. This revision establishes that any individual interfering with an inspector's duties, falsely claiming to be an inspector, altering official documents, or violating any aspect of the Act or its associated regulations is committing an offense. Penalties, upon summary conviction, range from a fine of five thousand dollars for a first-time offense (and additional charges for continuous offenses) to ten thousand dollars for recurrent violations. Legal action for these offenses can only commence with the Attorney-General's direct involvement or endorsement.
Environmental Health (Fees for Services) Regulations, 1989	These Regulations, made under section 17 the Environmental Health Services Act, prescribe fees in respect of the services set out in the Schedule to these Regulations. Any fee or charge incurred in the

National Regulations	
	performance of any service rendered may be recoverable summarily by the Minister and fees and charges shall be paid into the Consolidated Fund. Services include: inspection of cargos of ships and deratization of ships; analysis of drinking water; analysis of treatments involving pesticides; tests analysis of dairy products and food items; and hazardous waste analysis.
Health Rules Chapter 231	These Regulations make provision with respect to a wide variety of matters regarding public health in the Bahamas, including: abatement of nuisances (as defined); the keeping of animals (including birds, goats, pigs, horses and cattle) on premises; waste disposal and littering; discharge of wastewater in public drains; sewerage; digging and construction of wells and cisterns; protection of containers for the storage of water from mosquitoes; handling of food by diseased persons; notification of diseases affecting animals; sanitary conditions for the production, transportation, handling, storage and sale of foods and drugs (including drugs for animals; inspection of food establishments; special matters regarding dairies and the production and sale of (adulterated) milk and milk products; and labelling of dairy products.

3.1.7. Noise

Table 9. Noise regulations

International Regulations	
Environmental, Health, and Safety General Guidelines (IFC, 2007)	Recommended noise level thresholds for residential/institutional/educational areas of 55 weighted decibels [dBA] equivalent sound level (Leq) for daytime and 45 dBA Leq for nighttime.

National Regulations	
Environmental Health Services	The Minister may make regulations to give effect to and carry out the purpose, intent and provisions of this Act and, without prejudice to the generality of the foregoing, such regulations may provide for -the prevention and control of air pollution, including the control of emissions of smoke, gases, dust, dust, particulates, fumes or any combination thereof, offensive odors or excessive noise from factories, vessels, vehicles or any other premises or thing.

3.1.8. Right to Environmental Information

Table 10. Regulations on access to environmental information

National Regulations	
Freedom of Information Act (No. 1 of 2017)	This law seeks to strengthen and make more effective certain fundamental principles underlying the system of constitutional democracy, such as government accountability, transparency, and public participation in national decision-making, by granting the public a general right of access to information. It also establishes an Information Commissioner and provides for mechanisms to give effect to that right.
The Constitution of The Commonwealth of The Bahamas	It guarantees access to information and participation within the framework of the freedoms of expression, peaceful assembly, and association. It also establishes constitutional guarantees if the aforementioned rights are violated.

3.1.9. Labor Legislation

Table 11. Labor Legislation Regulations

International Regulations	
Forced Labor Convention, 1930 (No. 29)	It prohibits the use of forced or compulsory labor in all its forms, considering that the term "forced or compulsory labor" shall mean all work or service which is exacted from any person under the menace of any penalty and for which the said person has not offered himself voluntarily.
Freedom of Association and Protection of the Right to Organize Convention, 1948 (No. 87)	It states workers and employers, without distinction whatsoever, shall have the right to establish and, subject only to the rules of the organization concerned, to join organizations of their own choosing without previous authorization.
Right to Organize and Collective Bargaining Convention, 1949 (No. 98)	It states workers shall enjoy adequate protection against acts of anti-union discrimination in respect of their employment.
C100 - Equal Remuneration Convention, 1951 (No. 100)	It states men and women workers shall be equally remunerated for work of equal value. It refers to rates of remuneration established without discrimination based on sex.
Abolition of Forced Labor Convention, 1957 (No. 105)	It states the obligation to suppress and not to make use of any form of forced or compulsory labor-- (a) as a means of political coercion or education or as a punishment for holding or expressing political views or views ideologically opposed to the established political, social or economic system; (b) as a method of mobilizing and using labor for purposes of economic development; (c) as a means of labor discipline; (d) as a punishment for having participated in strikes; (e) as a means of racial, social, national or religious discrimination.

International Regulations	
Discrimination (Employment and Occupation) Convention, 1958 (No. 111)	It states the obligation to declare and pursue a national policy designed to promote equality of opportunity and treatment in respect of employment and occupation, with a view to eliminating any discrimination in respect thereof. The term discrimination includes (a) any distinction, exclusion or preference made based on race, color, sex, religion, political opinion, national extraction, or social origin, which has the effect of nullifying or impairing equality of opportunity or treatment in employment or occupation.
Minimum Age Convention, 1973 (No. 138)	It states the obligation to pursue a national policy designed to ensure the effective abolition of child labor and to raise progressively the minimum age for admission to employment or work to a level consistent with the fullest physical and mental development of young persons.
Worst Forms of Child Labor Convention, 1999	It states the obligation to take immediate and effective measures to secure the prohibition and elimination of the worst forms of child labor as a matter of urgency. For the purposes of this Convention, the term child shall apply to all persons under the age of 18, and the term the worst forms of child labor comprises: (a) all forms of slavery or practices similar to slavery, such as the sale and trafficking of children, debt bondage and serfdom and forced or compulsory labor, including forced or compulsory recruitment of children for use in armed conflict; (b) the use, procuring or offering of a child for prostitution, for the production of pornography or for pornographic performances; (c) the use, procuring or offering of a child for illicit activities, in particular for the production and trafficking of drugs as defined in the relevant international treaties; (d) work which, by its nature or the circumstances in which it is carried out, is likely to harm the health, safety or morals of children.
Maritime Labor Convention, 2006, as amended (MLC, 2006)	It states the obligation to secure the right of all seafarers to decent employment.

National Regulations	
Apprenticeship Act Chapter 320	An Act to make provision for the regulation of the training of trade apprentices
Employment Act	Act establishing the minimum working hours and paid vacations for workers; the provision of maternity and family leave; severance compensation; provisions concerning notice periods for termination of employment contracts; stipulations related to summary dismissals and wrongful terminations; regulations regarding the employment of children and young people; provisions concerning workers' wages; regulations on fingerprinting and lie detection; and for related purposes.
Health and Safety at Work Act Chapter 321 C	An Act to make provisions relating to health and safety at work and for connected purposes.
Industrial Relations (Validation of Trade Unions) Act	An Act to validate certain Trade Unions deemed not to exist in consequence of failure to comply with transitional requirements of

National Regulations	
Chapter 321D	the Industrial Relations Act upon the repeal by it of the Trade Union and Industrial Conciliation Act.
Industrial Relations Act Chapter 321	An Act to provide for the registration and control of trade unions; for the recognition of trade unions by employers; for the registration of certain Industrial Agreements; for the establishment of an Industrial Tribunal and the regulation of trade disputes; for the repeal of certain parts of the Trade Union and Industrial Conciliation Act; and for other matters connected with or incidental to the aforesaid purposes.
Ionizing Radiations (Worker's Protection) Act Chapter 319	An Act to require notification of undertakings involving exposure to ionizing radiations for the protection of workers involved therein.
Minimum Wages Act Chapter 321B	An Act to make provisions for minimum wages in employments and for connected purposes.
Recruiting of Workers Act Chapter 318	An Act to regulate the recruitment of workers.

3.1.10. Protected Areas

Table 12. Protected Area Regulations

International Regulations	
Convention Concerning the Protection of the World Cultural and Natural Heritage, UNESCO, 1972	It creates the World Heritage Sites, with the primary goals of nature conservation and the preservation of cultural properties. It guides the work of the World Heritage Committee and defines which sites which can be considered for inscription on the World Heritage List. It sets out the duties of each country's governments to identify potential sites and to protect and preserve them. Signatory countries pledge to conserve the World Heritage sites situated on their territory, and report regularly on the state of their conservation.

National Regulations	
The Bahamas National Trust	An Act to incorporate and confer powers upon The Bahamas National Trust for Places of Historic Interest or Natural Beauty. It grants the Trust the power to create regulations to be in effect in the protected areas it establishes.
Conservation and Protection of the Physical Landscape of The Bahamas Act, 1997 (Cap. 260).	This law prohibits any significant excavation, landfill operations, quarrying, or extraction of physical natural resources (such as sand) without the permission of the Director of Physical Planning. The Act also empowers the Director to request an Environmental Impact Assessment (EIA) for any excavation or land reclamation activity. It provides for the protection of rare and historically significant trees and imposes stringent penalties on those who violate this law.

National Regulations	
Bahamas Protected Areas Fund Act, 2014 (No. 28 of 2014)	This Act establishes the Bahamas Protected Areas Fund as a body corporate and defines its functions and powers. It also defines the system of protected areas in The Bahamas and requires the Board of the Fund to establish and maintain a register called the Register of Protected Areas. The system shall include forest reserves, protected forests and conservation forests pursuant to an Order made under the Forestry Act, and areas declared under the Fisheries Resources (Jurisdiction and Conservation) Act, the Bahamas National Trust Act, and the Wild Birds Protection Act. The general purpose of the Fund is to ensure sustainable financing into perpetuity for the management of Protected Areas in The Bahamas, including management activities under the Caribbean Challenge Initiative and the objectives of the Caribbean Biodiversity Fund related to any system of protected areas, programs established for the management of any area required for biodiversity conservation. the protection of any carbon sink under the Forestry Act, 2010, the conservation and protection of water resources, wetlands, or blue holes, degraded or threatened ecosystems, as defined under the United Nations Convention to Combat Desertification and any area which may be designated for the purpose of giving effect to international climate change agreements.
Bahamas Protected Areas Fund (Amendment) Act No. 37 of 2019	This Act makes several amendments in the Bahamas Protected Areas Fund Act. New terms and definitions are inserted to the Section 2 of the Principal Act in Article 2. Paragraph f is inserted to Section 3 regards to biodiversity conservation. Section 8 of the principal Act is repealed and replaced regarding acceptance of conditional contributions as mentioned in Article 7. Article 8 amends Section 9 of the Principal Act regarding the application procedures and principles for a grant from the Fund. Section 11 on the composition of the Board and Section 16 on the powers and duties of the Board are amended in the Principal Act. Section 17 of the principal Act is repealed and replaced regarding the obligation of the Board to provide information to Minister as mentioned in Article 14.

3.1.11. Flora, Fauna, and Native Forest

Table 13. Flora, Fauna, and Native Forest legislation

International agreements	
The Convention on International Trade in Endangered Species of Wild Fauna and Flora	It is an international agreement between governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival.

International agreements	
The Ramsar Convention on Wetlands of International Importance Especially as Waterfowl Habitat, 1971	It provides the framework for the conservation and wise use of wetlands and their resources. The Convention has three main pillars: work towards the wise use of all their wetlands; designate suitable wetlands for the list of wetlands international importance and ensure their effective management; cooperate internationally on transboundary wetlands, shared wetland systems and shared species.
Convention on Biological Diversity, United Nations, 1993	It recognizes the conservation of biodiversity is "a common concern of humankind" and is an integral part of the development process. It recognizes that ecosystems, species and genes must be used for the benefit of humans in a way and at a rate that does not lead to the long-term decline of biological diversity. Some of the many issues dealt with under the convention include: measures the incentives for the conservation and sustainable use of biological diversity; access to and transfer of technology; technical and scientific cooperation; impact assessment; education and public awareness; national reporting on efforts to implement treaty commitments.

National Regulations	
Forestry Act	Law for the conservation and control of forests and related matters.
Forestry Amendment Act	Regulation 36 of the principal Regulations is amended by inserting immediately after the sub-regulation the following new sub-regulation (3A) -- "(3A) The Minister, acting on the advice of the Director of Forestry, may where a hurricane, tornado or any other natural disaster has occurred on any island, islet or cay in The Bahamas which causes serious damage to any forest or non-forest product in any designated forest, forest estate, forest reserve, conservation forest or protected forest, reserve the right to make special provision for the reduction of fees payable as specified in the Second Schedule, for royalties, permits and licenses for the purposes of these regulations". The Second Schedule to the principal regulations is amended by -- (a) inserting immediately after the sixth subheading, the following new subheading -- "REGULATION 36(3) FEES"; and (b) inserting, immediately below the line ending with the words "$84.00 per ton", the following --.

National Regulations	
	"ROYALTIES AND FEES FOR GRAVELY DAMAGED FOREST PRODUCE OR NON-FOREST PRODUCE **Regulation 36(3A)** Saw logs (10 inches/25cms diameter at breast height and greater) $5.00/m3/ton Chip-n-Saw (8-10 inches/20-25cms diameter at breast height) $2.00/m3/ton Pulpwood (8 inches/20cms diameter at breast height) $2.00/m3/ton".
Declaration of protected trees order, 2021	The trees specified in Parts I and II of the Annex are declared protected trees for the purposes of the Act.
Forestry Regulations	The Minister may grant leases to Bahamian governmental and non-governmental bodies for a period not exceeding 99 years for the use of land within a forest reserve, protected forest, and conservation forest for purposes other than the utilization of forest produce under section 17 (1) (a), 17 (1) (b) and 17 (1) (c) of the Act. All applications for leases in respect of Crown land vested in the Minister within forest reserves, protected forests and conservation forests shall be submitted to the Director of Forestry, who shall forward the applications with his recommendations to the Minister.
Wildlife conservation and trade	Law implementing the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), focused on the protection of wild species and the damage caused by unsustainable exploitation.
Accidental Fires Act (Cap. 74)	This Act provides for relief from liability for accidental fires. However, this relief shall not affect the civil liability of any person for any negligent or wilful act or omission or the criminal or contractual liability of any person.
Forestry (Declaration of Protected Trees) Order, 2021	This Order declares protected trees for the management, development, and protection of the forest resources of The Bahamas. The Schedule of this Order lists the trees which are endemic or endangered or threatened in Part I and trees which are of cultural or historical or economic significance in Part II.

3.1.12. Gaseous Emissions Management

Table 14. Gaseous Emissions Management Regulations

International Regulations	
Montreal Protocol on Substances that Deplete the Ozone Layer, 1987	It was designed to stop the production and import of ozone depleting substances and reduce their concentration in the atmosphere to help protect the earth's ozone layer. It regulates the production and consumption of nearly 100 man-made chemicals referred to as ozone depleting substances.

International Regulations	
Kyoto Protocol, 1992	It commits state parties to reduce greenhouse gas emissions, based on the scientific consensus that global warming is occurring and that human-made CO2 emissions are driving it.
The Paris Agreement, 2015	One of the primary goals of the Agreement is to pursue a development trajectory characterized by low greenhouse gas emissions, ensuring that food production remains uncompromised. The Agreement aims to contain the global average temperature increase well below 2°C relative to pre-industrial levels, with continued efforts to further limit this increase to 1.5°C. To achieve this, the signatories intend to peak global greenhouse gas emissions as soon as possible. It is acknowledged that developing nations will require more time to reach this zenith, and once achieved, there will be a swift decline in emissions. Developing nations are expected to augment their mitigation measures. Over time, they are encouraged to adopt comprehensive emission reduction or limitation objectives, considering their distinct national circumstances. Least developed countries and small island developing states have the provision to devise and convey strategies, plans, and actions for low greenhouse gas emission development, reflecting their unique situations.
United Nations Framework Convention on Climate Change (UNFCCC)	The United Nations Framework Convention on Climate Change (UNFCCC) established an international environmental treaty to combat "dangerous human interference with the climate system". All parties should promote and support the development, application, and diffusion, including transfer, of technologies, practices and processes that control, reduce or prevent anthropogenic emissions of greenhouse gases not controlled by the Montreal Protocol in all sectors, including energy, transport, industry, agriculture, forestry and waste management. In addition, they should promote sustainable management and cooperatively support the conservation and enhancement of sinks and reservoirs of all greenhouse gases not controlled by the Montreal Protocol, including biomass, forests and oceans, as well as other terrestrial, coastal and marine ecosystems. Each party should submit to the Conference of the Parties a national inventory, within its capabilities, of anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol, using comparable methodologies to be promoted and approved by the Conference of the Parties.

National Regulations	
Environmental Health Services	The Minister may make regulations to give effect to and carry out the purpose, intent and provisions of this Act and, without prejudice to the generality of the foregoing, such regulations may provide for -the prevention and control of air pollution, including the control of emissions of smoke, gases, dust, dust, particulates, fumes or any

National Regulations	
	combination thereof, offensive odors or excessive noise from factories, vessels, vehicles or any other premises.
Climate Change and Carbon Market Initiatives Act, 2022 (Act No. 15 of 2022).	Gives effect to the Paris Agreement, to aid in the global response to the threat of climate change and to create and implement the initiatives to offset carbon emissions.

3.1.13. Energy

Table 15. Energy Regulations

National Regulations	
Act No. 2 of 1958	BAHAMAS ELECTRICITY CORPORATION (VESTING OF LAND) Act Granting the Bahamas Electricity Corporation a land extension located on the Southern Side of New Providence Island, which constitutes a portion of Clifton Estate, with said land being separated by an existing thirty-foot-wide public roadway.
Act No. 38 of 1961	BAHAMAS ELECTRICITY CORPORATION LOAN. Act authorizing the Bahamas Electricity Corporation to secure a loan through the issuance of bonds, with interest and principal payments guaranteed by the government of the Bahamas and outlining specific terms and conditions applicable to the issuance of such bonds.
Electricity Act, 2015	Its objective is to overhaul the country's energy sector and edict policy targets, among others: 1) security and diversification of power supply and distribution, 2) access to cheap and reliable environmentally sustainable electricity, 3) and the establishment of the Utilities Regulations and Competition Authority (URCA) as the independent regulator of the sector. The Act encourages a higher capacity of renewables electricity generation under several ways. It seeks a reorganization of the electricity sector, so that public suppliers shall increase the proportion of renewables in their generation mix. It also promotes residential renewable energy generation for connection to the grid, and for self-generation. All stages are regulated by Utilities Regulation & Competition Authority (URCA).

3.1.14. Vehicular Traffic

Table 16. Vehicular Traffic Regulations

National Regulations	
Road Traffic Act	An Act to declare, amend and codify the law relating to motor vehicles, and to regulate traffic on highways and of motor vehicles; to establish a Road Traffic Authority; to protect third parties against risks arising from the use of motor vehicles; to amend the law with respect to the licensing of motor vehicles operated for hire or

National Regulations	
	reward, and to regulate public transportation services; and to regulate matters relating to the above matters.
Road traffic (start of licensing throughout the year)	An Act to fix the date of coming into force of the Road Traffic (Amendment) Act 1994.
Road Traffic (vehicle inspection)	The owner of a motor vehicle applying for the registration of such vehicle shall present the vehicle to the Inspector for inspection and shall provide him with the data required in the application for registration of a motor vehicle.
Road Traffic and speed limit (Abaco)	The provisions of these Regulations shall apply to the Districts of Green Turtle Cay, Marsh Harbour and Sandy Point, Abaco, and shall be in addition to any of the provisions of the regulations made under the Road Traffic Law which are applicable to such districts.
Road Traffic and speed limit (Eleuthera)	The speed limit for all motor vehicles shall be fifteen miles per hour within the limits of settlements in the said Districts or along such lengths or parts of any road where it is so indicated by traffic signs.
Road Traffic and speed limit (Exuma)	The speed limit on the main road leading to the George Town Airport from the junction at Lord Rolle Corner shall be forty-five miles per hour for all motor vehicles other than omnibuses having a seating capacity for more than twenty passengers or motor trucks for which the speed limit shall be thirty miles per hour. The speed limit for all motor vehicles shall be twenty miles per hour within the limits of settlements in the aforesaid Island of Exuma or along such lengths or parts of any road where it is so indicated by traffic signs.
Road Traffic and speed limit (New Providence)	The speed limit of all motor vehicles shall be twenty-five miles per hour within the following limits: (a) on Shirley Street and Johnson Road; (b) within the limits bounded on the east from the Harbour to Shirley Street, by the east side of Church Street and from Shirley Street to Wulff Road, by the west side of Mackey Street; on the south by the south sides of Wulff Road and Poinciana Avenue; on the west by the east side of Nassau Street and on the north by the Harbour of Nassau. The speed limit for omnibuses having a seating capacity for more than twenty passengers and for motor trucks shall be thirty miles per hour and the speed limit for all other classes of motor vehicle shall be forty-five miles per hour within the following limits: (a) from the intersection of the Farrington Road and the road running westwardly from Oakes Field along Farrington Road, the Interfield Road and the Windsor Field Road to its intersection with the Western Road near Old Fort; (b) from the intersection of the Coral Harbour Road with the Windsor Field Road along the Coral Harbour Road to Adelaide Road; (c) on Carmichael Road and Adelaide Road; (d) on the Western Road from its junction with

National Regulations	
	Windsor Field Road to the roundabout at Lyford Cay; (e) East/West Highway; (f) on Harold Road; and (g) on Baillou Hill Road South of Soldier Road. The speed limit for all motor vehicles outside the limits specified above shall be thirty miles per hour save that: (a) on that part of West Bay Street — (i) extending eastwards from the intersection of Windsor Field Road and West Bay Street to the westmost limits of the Sandals Royal Bahamian Resort and Spa; and (ii) from The Bahamas Development Bank eastward to Nassau Street, the speed limit shall be thirty-five miles per hour; b) from the western most property line of Sandals Royal Bahamian Resort and Spa extending eastward to The Bahamas Development Bank the speed limit shall be twenty-five miles per hour
Statute Law of the Bahamas Chapter 221	An Act for the registration of hackney carriages and licensing of drivers in The Bahamas.
Statute Law of the Bahamas Derelict Motor Vehicles (Disposal) Chapter 223	An Act to provide for the removal and disposal of abandoned and disused motor vehicles and for other purposes connected therewith.
Statute Law of the Bahamas Garage Licensing Chapter 222	An Act to regulate the operation of garages, the licensing thereof and for other purposes connected therewith.
Cabs Act Chapter 221	An Act for the registration of hackney carriages and licensing of drivers in The Bahamas.
Derelict Motor Vehicles (Disposal) Chapter 223	An Act to provide for the removal and disposal of abandoned and disused motor vehicles and for other purposes connected therewith.
Garage Licensing Act Chapter 222	An Act to regulate the operation of garages, the licensing thereof and for other purposes connected therewith.

3.1.15. Expropriations

Table 17. Expropriations Legislation

National Regulations	
Bahamas Constitution	Article 27. No property of any description shall be compulsorily taken possession of, nor shall any interest in or right over property of any description be compulsorily acquired, except where the following conditions are fulfilled, namely: a. the taking of possession or acquisition is necessary in the interest of defense, public safety, public order, public morals, public health, town and country planning, or the development or utilization of any property in a manner that will promote the public benefit or economic welfare of the community; and

National Regulations	
	b. the necessity for it is such as to give reasonable justification for causing any hardship that it may cause to a person having an interest in or a right to the property; and c. it is provided for in a law applicable to the taking or acquisition, i. for the prompt and adequate compensation in the circumstances, and ii. to secure to any person having an interest in or right to the property the right of access to the Supreme Court, either directly or on appeal from any other authority, for the determination of his interest or right, the legality of the taking or acquisition of the property, interest or right, and the amount of any compensation to which he is entitled, and for the purpose of obtaining the prompt payment of such compensation; and d. any party to a proceeding before the Supreme Court in respect of such claim has by law the same rights of appeal as are generally accorded to parties to civil proceedings in that Court exercising the function of a court of original jurisdiction.
Acquisition of Land	Land to be acquired by the Government for a particular building or construction must comply with the requirements of the Land Acquisition Act (1913) and its regulations (1987). Whenever land is likely to be required in any locality for any public purpose, a notice to that effect must be published in the Gazette, the official publication of the Government. A public notice must also be displayed at a convenient place in the district concerned to indicate what land is needed and where. Following the notice, a 30-day public response period is observed. The Government may acquire, by private purchase agreement or by compulsory expropriation, the selected land. In the event that a structure is moved, compensation is paid to the owner to cover the cost of moving the house to another location plus payment for damages incurred.

3.1.16. Cultural Heritage, Archaeological and Historical Sites

Table 18. Cultural Heritage, Archaeological and Historical Sites Regulations

National Regulations	
Antiquities, Monuments and Museum Act	This law provides for the preservation, conservation, and restoration of historical, paleontological and archeological resources.
The Bahamas National Trust Act Chapter 391	An Act to incorporate and confer powers upon The Bahamas National Trust for Places of Historic Interest or Natural Beauty.

3.2. IDB Environmental and Social Policy Framework

This section presents a summary of the Environmental and Social Performance Standards (ESPS) that are part of the IDB's Environmental and Social Policy Framework (ESPF). As this Program is proposed to be financed with an IDB Loan Operation (BH-L1061), these E&S Performance Standards must be considered during the preparation and implementation of all projects financed under the Program.

After description of the 10 Environmental and Social Performance Standards, **Table 19** details the actions to be implemented in the projects to comply with them.

ESPS 1 – Assessment and Management of Environmental and Social Risks and Impacts

This Standard applies to all investment finance projects and provides the basis for all other Standards by providing guidance on how to assess and manage environmental and social risks and impacts. It defines the importance of having an Environmental and Social Management System (ESMS).

The objectives of this Standard are:

- To identify and evaluate environmental and social risks and impacts of the project.
- To adopt a mitigation hierarchy and a precautionary approach to anticipate and avoid, or where avoidance is not possible, minimize, and, where residual impacts remain, compensate/offset for risks, and impacts to workers, project-affected people, and the environment.
- To promote improved environmental and social performance of Borrowers through the effective use of management systems.
- To ensure that grievances from project affected people and external communications from other stakeholders are responded to and managed appropriately.
- To promote and provide means for adequate engagement with project-affected people and other stakeholders throughout the project cycle on issues that could potentially affect them and to ensure that relevant environmental and social information is disclosed and disseminated.

The Borrower, in coordination with other government agencies and third parties, as appropriate, will conduct a process of environmental and social assessment and establish and maintain an ESMS appropriate to the nature and scale of the project and commensurate with the level of its environmental and social risks and impacts.

The main characteristics of an EMS are:

- Dynamic and continuous process initiated and led by the executing agency.
- It implies a collaboration between the borrower, its workers, the people affected by the project and, when appropriate, other interested parties.
- Uses the “plan, do, check and act” process to manage environmental and social risks and impacts.

The ESMS will incorporate the following elements:

i. Project-specific environmental and social framework.
ii. Identification of risks and impacts.

iii. Management programs.
iv. Organizational capacity and competency.
v. Emergency preparedness and response.
vi. Stakeholder engagement.
vii. Monitoring and review.

ESPS 2 - Labor and Working Conditions

Environmental and Social Performance Standard (ESPS) 2 recognizes that pursuit of economic growth through employment creation and income generation should be accompanied by protection of the fundamental rights of workers.

The objectives of this Standard are:

- To respect and protect the fundamental principles and rights of workers.
- To promote the fair treatment, non-discrimination, and equal opportunity of workers.
- To establish, maintain, and improve the worker-employer relationship.
- To ensure compliance with national employment and labor laws.
- To protect workers, including workers in vulnerable situations such as women, people of diverse sexual orientations and gender identities, persons with disabilities, children (of working age, in accordance with this ESPS) and migrant workers, workers engaged by third parties, and primary supply workers.
- To promote safe and healthy working conditions, and the health of workers.
- To prevent the use of child labor and forced labor (as defined by the ILO).
- To support the principles of freedom of association and collective bargaining of project workers.
- To ensure that accessible and effective means to raise and address workplace concerns are available to workers.

The scope of application of this Performance Standard depends on the type of employment relationship between the borrower and the project worker. Applies to project workers hired directly by the borrower (direct workers), those hired through third parties to perform work related to core project functions for a significant period (contract workers), and those hired by the borrower's primary suppliers (workers in the main supply chain).

The borrower shall adopt and apply labor management policies and procedures appropriate to the nature and size of the project and its workforce. In the application of this Performance Standard, the requirements related to gender equality and stakeholder participation must also be considered, in accordance with NDAS 9 and 10.

ESPS 3 - Resource Efficiency and Pollution Prevention

Environmental and Social Performance Standard (ESPS) 3 recognizes that increased economic activity and urbanization often generate increased levels of pollution to air, water, and land and consume finite resources in a manner that may threaten people and the environment at the local, regional, and global levels. This ESPS outlines a project-level approach to resource management and pollution prevention and control, and avoidance and minimization of GHG emissions. It builds on the mitigation hierarchy, and the

"polluter pays" principle. It recognizes the disproportionate impact of pollution on women, children, the elderly, and the poor and vulnerable. Appropriate mitigation measures, technologies, and practices should be adopted for efficient and effective resource use, pollution prevention and control, and avoidance and minimization of GHG emissions, in line with internationally disseminated technologies and practices.

The objectives of this Standard are:

- To avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities.
- To promote more sustainable use of resources, including energy and water.
- To avoid or minimize project-related emissions of GHG.
- To avoid or minimize generation of waste.
- To minimize and manage the risks and impacts associated with pesticide use.

The borrower must apply technically and financially viable and effective measures to improve its efficiency in the consumption of energy, water and other important resources and inputs. In addition, during the design and operation of the project, the borrower must consider alternatives to avoid or minimize greenhouse gas emissions, and the prevention of contamination of the air, water and soil components.

ESPS 4 - Community Health, Safety, and Security

Environmental and Social Performance Standard (ESPS) 4 recognizes that project activities, equipment, and infrastructure can increase community exposure to risks and impacts, including those caused by natural hazards and climate change. In addition, communities that are already subjected to adverse impacts from natural hazards and climate change may also experience an acceleration and/or intensification of adverse impacts due to project activities.

The objectives of this Standard are:

- To anticipate and avoid adverse impacts on the health and safety of the
- project-affected people during the project life cycle from both routine and non-routine circumstances.
- To ensure that the safeguarding of personnel and property is conducted in accordance with relevant human rights principles and in a manner that avoids or minimizes risks to the project-affected people.
- To anticipate and avoid adverse impacts on the project itself from natural hazards and climate change during the project life cycle.

This ESPS addresses potential risks and impacts to the project-affected people from project activities. It also addresses potential risks and impacts to the project itself that may result from natural hazards and climate change.

Occupational health and safety requirements for workers are included in ESPS 2; environmental standards to avoid or minimize impacts on human health and the environment due to pollution are included in ESPS 3; requirements to address sexual and gender-based violence risks in instances of communal conflict and

influxes of outside workers are included in ESPS 9; and stakeholder consultation and information disclosure requirements are included in ESPS 10.

ESPS 5 - Land Acquisition and Involuntary Resettlement

Environmental and Social Performance Standard (ESPS) 5 addresses impacts of project-related land acquisition, including restrictions on land use and access to assets and natural resources, which may cause physical displacement (relocation, loss of land or shelter), and/or economic displacement (loss of land, assets, or restrictions on land use, assets, and natural resources leading to loss of income sources or other means of livelihood).

Unless properly managed, involuntary resettlement may result in long-term hardship and impoverishment for the project-affected people, as well as environmental damage and adverse socio-economic impacts in areas to which they have been displaced. For these reasons, involuntary resettlement should be avoided. However, where involuntary resettlement is unavoidable, it should be minimized, and appropriate measures to mitigate adverse impacts on displaced persons and host communities should be carefully planned and implemented.

The objectives of this Standard are:

- To avoid, and when avoidance is not possible, minimize displacement by exploring alternative project designs.
- To avoid forced eviction.
- To anticipate and avoid, or where avoidance is not possible, minimize adverse social and economic impacts from land acquisition or restrictions on land use by:

    i. providing compensation for loss of assets at replacement cost and transitional hardships;
    ii. minimizing disruption to their social networks and other intangible assets;
    iii. ensuring that resettlement activities are implemented with appropriate disclosure of information, consultation, and the informed participation of those affected.

- To improve or restore the livelihoods and standards of living of displaced persons.
- To improve living conditions among physically displaced persons through the provision of adequate housing with security of tenure, and safety at resettlement sites.

ESPS 6 - Biodiversity Conservation and Sustainable Management of Living Natural Resources

Environmental and Social Performance Standard (ESPS) 6 recognizes that protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources are fundamental to sustainable development. The requirements set out in this ESPS have been guided by the Convention on Biological Diversity, which defines biodiversity as “the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species, and of ecosystems.”

Ecosystem services are the benefits that people, including businesses, derive from ecosystems. Ecosystem services are organized into four types: (i) provisioning services, which are the products people obtain from ecosystems; (ii) regulating services, which are the benefits people obtain from the regulation of ecosystem processes; (iii) cultural services, which are the nonmaterial benefits people obtain from ecosystems; and (iv) supporting services, which are the natural processes that maintain the other services.

The objectives of this Standard are:

- To protect and conserve terrestrial, freshwater, coastal and marine biodiversity.
- To maintain the ecosystem functions to ensure the benefits from ecosystem services.
- To promote the sustainable management of living natural resources through the adoption of practices that integrate conservation needs and development priorities.

Based on the risks and impacts identification process, the requirements of this ESPS are applied to projects (i) located in modified, natural, and critical habitats; (ii) that potentially impact on or are dependent on ecosystem services over which the Borrower has direct management control or significant influence; or (iii) that include the production of living natural resources (e.g., agriculture, animal husbandry, fisheries, and forestry).

ESPS 7 - Indigenous Peoples

Environmental and Social Performance Standard (ESPS) 7 recognizes that Indigenous Peoples, as distinct social and cultural peoples, are often among the most marginalized and vulnerable segments of the population. In many cases, their economic, social, and legal status limits their capacity to defend their rights to, and interests in, lands and natural and cultural resources, and may restrict their ability to participate in and benefit from development that is accordance with their worldview.

There is no universally accepted definition of “Indigenous Peoples.” Indigenous Peoples may be referred to in different countries by such terms as “original peoples” (*pueblos originarios*), “autochthonous peoples” (*pueblos autóctonos*), residents of indigenous counties (*comarcas*) or reserves (*resguardos*), or any other formally recognized indigenous peoples in Latin America and the Caribbean. In the ESPF, the term “Indigenous Peoples” is used in a generic sense to refer to distinct social and cultural peoples possessing some of the following characteristics in varying degrees:

i. Self-identification as members of a distinct indigenous cultural group and recognition of this identity by others.
ii. Collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories.
iii. Customary cultural, economic, social, or political laws and institutions that are separate from those of the mainstream society or culture.
iv. A distinct language or dialect, often different from the official language or languages of the country or region in which they reside.

The objectives of this Standard are:

- To ensure that the development process fosters full respect for the human rights, collective rights, dignity, aspirations, culture, and natural resource-based livelihoods of Indigenous Peoples.
- To anticipate and avoid adverse impacts of projects on communities of Indigenous Peoples, or when avoidance is not possible, to minimize and/or compensate for such impacts.
- To promote sustainable development benefits and opportunities for Indigenous Peoples in a culturally appropriate manner.
- To establish and maintain an ongoing relationship based on Informed Consultation and Participation (ICP) in a culturally appropriate manner with the Indigenous Peoples affected by a project throughout the project's life cycle.
- To ensure the FPIC of the Project-Affected Communities of Indigenous Peoples when the circumstances described in this ESPS are present.

ESPS 8 - Cultural Heritage

Environmental and Social Performance Standard (ESPS) 8 recognizes the importance of cultural heritage for current and future generations. Consistent with the Convention Concerning the Protection of the World Cultural and Natural Heritage, this ESPS aims to ensure that Borrowers protect cultural heritage during their project activities. In addition, the requirements of this ESPS with respect to a project's use of cultural heritage are based in part on standards set by the Convention on Biological Diversity.

The objectives of this Standard are:

- To protect cultural heritage from the adverse impacts of project activities and support its preservation.
- To promote the equitable sharing of benefits from the use of cultural heritage

For the purposes of this ESPS, cultural heritage refers to (i) tangible forms of cultural heritage, such as tangible moveable or immovable objects, property, sites, structures, or groups of structures, having archaeological, paleontological, historical, cultural, artistic, and religious value; (ii) unique natural features or tangible objects that embody cultural values, such as sacred groves, rocks, lakes, and waterfalls; and (iii) certain instances of intangible forms of culture that are proposed to be used for commercial purposes, such as cultural knowledge, innovations, and practices of communities embodying traditional lifestyles.

ESPS 9 - Gender Equality

This ESPS recognizes, regardless of the cultural or ethnic context, the right to equality among genders as established in applicable international agreements. The pursuit of equality requires actions aimed at equity, which implies providing and distributing benefits and/or resources in a way that narrows existing gaps, recognizing that the existence of these gaps can harm people of all genders.

This ESPS aims at identifying potential gender-based risks and impacts and introducing effective measures to avoid, prevent, or mitigate such risks and impacts, thereby eliminating the possibility of reinforcement of pre-existing inequalities or creating new ones. For purposes of this ESPS, affirmative action specifically

aimed at closing existing gender gaps, meeting specific gender-based needs, or ensuring the participation of people of all genders in consultations will not constitute discrimination or exclusion.

The objectives of this Standard are:

- To anticipate and prevent adverse risks and impacts based on gender, sexual orientation, and gender identity, and when avoidance is not possible, to mitigate and compensate for such impacts.
- To establish actions to prevent or mitigate risks and impacts due to gender throughout the project cycle.
- To achieve inclusion from project-derived benefits of people of all genders, sexual orientations, and gender identities.
- To prevent SGBV, including sexual harassment, exploitation, and abuse, and when incidents of SGBV occur, to respond promptly.
- To promote safe and equitable participation in consultation and stakeholder engagement processes regardless of gender, sexual orientation, and/or gender identity.
- To meet the requirements of applicable national legislation and international commitments relating to gender equality, including actions to mitigate and prevent gender-related impacts.

ESPS 10 - Stakeholder Engagement and Information Disclosure

This ESPS recognizes the importance of open and transparent engagement between the Borrower and stakeholders, especially project-affected people, as a key element that can improve the environmental and social sustainability of projects, enhance project acceptance, and contribute significantly to the project's successful development and implementation. This ESPS is consistent with the objective of implementing the rights of access to environmental information, public participation in the environmental decision-making process, and access to justice in environmental matters.

For this ESPS, "stakeholder" refers to individuals or groups who:

- Are affected or likely to be affected by the project ("project-affected people") and
- May have an interest in the project ("other stakeholders").

The objectives of this Standard are:

- To establish a systematic approach to stakeholder engagement that will help the Borrower identify stakeholders, especially project-affected people, and build and maintain a constructive relationship with them.
- To assess the level of stakeholder interest in and support for the project and to enable stakeholders' views to be considered in project design and environmental and social performance.
- To promote and provide the means for effective and inclusive engagement with project-affected people throughout the project's life cycle on issues that could potentially affect or benefit them from the project.
- To ensure that appropriate information on environmental and social risks.

Summary of Compliance with IDB Environmental and Social Policy Framework

Table 19 below details the actions that will be conducted to ensure compliance with the requirements established in the Environmental and Social Performance Standards (ESPS) during the preparation and execution of the projects to be financed under the Program.

Table 19 - Summary of Compliance with the IDB Environmental and Social Policy Framework

IDB Environmental and Social Performance Standards (ESPS)	Applies
ESPS 1 – Assessment and Management of Environmental and Social Risks and Impacts	**YES/NO**
The operation will be executed by the WSC through its Project Executing Unit (PEU). To meet the requirements of ESPS 1, this Strategic Environmental and Social Assessment (SESA) includes the identification and control of the potential environmental and social impacts and risks of the types of projects to be financed under the Program, and incorporates a Strategic Environmental and Social Management Plan (SESMP) to address these impacts and risks in accordance with the requirements established in the ESPF, and applicable ESPS. Additionally, WSC will develop an Environmental and Social Management System specific to the Program.	**YES**
ESPS 2 - Labor and Working Conditions	**YES/NO**
The works and activities that result in interventions include construction processes, movement of materials and mobilization of personnel, which bring with it risks and impacts associated with labor and working conditions, including the health and safety of workers. A Labor Management Procedure has been included in this SESA/SESMP, with a Code of Conduct and Grievance Redress Mechanism (GRM) for workers. The ESMS of the Program will incorporate requirements for ensuring compliance with ESPS 2 related to worker health and safety and working conditions. The Program may finance the acquisition of solar panels. As such, there is a potential risk of forced or child labor associated with their procurement. To mitigate this risk, guidelines for this procurement have been included in **Annexes 3 and 4.**	**YES**
ESPS 3 - Resource Efficiency and Pollution Prevention	**YES/NO**
The projects will be developed in Abaco, Bimini, Eleuthera, Exuma and New Providence. During the **construction phase**, localized and temporary negative impacts are expected, such as: (i) induction of erosive processes, (ii) alteration of soil characteristics, (iii) increase in particulate matter and noise levels, (iv) increase in road accidents, (v) solid waste, (vi) water contamination by hydrocarbons and other hazardous waste, (vii) discomfort due to the cut off of services and access, (viii) exposure to disabling or fatal accidents due to unsafe acts or conditions. During the **operation phase**, negative impacts can be expected such as exposure to accidents, including disabling or fatal accidents, due to unsafe acts or conditions during maintenance of the new infrastructure and equipment. This SESA identified direct, indirect, and cumulative impacts and risks of environmental contamination and management measures aimed at their proper management were established, using the mitigation hierarchy.	**YES**

IDB Environmental and Social Performance Standards (ESPS)	Applies
ESPS 4 - Community Health, Safety, and Security	**YES/NO**
The impacts and risks on the people affected by the projects in the Program were assessed in this SESA. The use of hazardous materials, exposure to diseases, and presence of foreign workers were analyzed. The corresponding management plans were proposed in the SESMP. During the execution of the works there are risks for the security of the community related to the circulation of vehicles and machinery; exposure to hazardous materials; and presence of security personnel, among others. The overall disaster risk of the Program has been identified as **moderate** because the projects present a moderate level of criticality, and the potential impacts caused by the hazards do not entail emergency situations that would immediately endanger community health or cause irreparable damage to biodiversity. The SESA included a simplified qualitative risk analysis for the works in the Program.	**YES**
ESPS 5 - Land Acquisition and Involuntary Resettlement	**YES/NO**
The operation does not anticipate impacts from the physical displacement of people. Projects involving physical resettlement will not be eligible under the Program. Also, given the scale of the works, no potential impacts on livelihood resulting from the works were identified.	**NO**
ESPS 6 - Biodiversity Conservation and Sustainable Management of Living Natural Resources	**YES/NO**
Eleuthera Water Main Extension from Tarpum Plant to Jack's Bay is in the Key Biodiversity Area (KBA) South Tarpum Bay[10]. There is a single species with a Near Threatened IUCN classification (the bird *Setophaga kirtlandii*), which would trigger IDB's definition of critical habitat. However, given the nature of the works –underground piping being built on the side of an existing highway – and the scale of the works - a 4.6 km linear pipe relative to a 175 km^2 KBA – it is expected that the project does not lead to measurable adverse impacts on those biodiversity values for which the critical habitat was designated, or on the ecological processes supporting those biodiversity values. Management measures aimed at its proper management have been included, using the mitigation hierarchy. The use of exotic invasive species will be forbidden in revegetation activities, which will be designed to achieve a net zero loss of vegetation in intervened areas.	**YES**
ESPS 7 - Indigenous Peoples	**YES/NO**
According to this study, the project activities do not foresee interventions in indigenous community areas, nor do they affect private properties. Nonetheless, mitigation measures are foreseen to prevent conflicts with the community. A grievance redress mechanism is included in the Stakeholder Engagement Plan.	**NO**
ESPS 8 - Cultural Heritage	**YES/NO**

[10] https://www.keybiodiversityareas.org/site/factsheet/19828

IDB Environmental and Social Performance Standards (ESPS)	Applies
According to the information available to date, some of the works are located near historical sites such as Rawson Square Lift Station near the Parliament Square, and two museums, or Montague Lift Station near Fort Montagu. The SESMP includes the requirement of permits for the operation of projects near historical sites, as it is stated in the Antiquities, Monuments and Museums Act an Archaeological Finding Procedures Program in accordance with national regulations and ESPS 8.	**YES**
ESPS 9 - Gender Equality	**YES/NO**
The presence of contractors in the communities during the execution of the projects can increase the risk of sexual and gender violence against women, girls, boys, LGTQI+ people in the community and project workers. To mitigate this possible risk, the SESMP of the projects includes the following measures: (i) adoption by contractors of a Code of Conduct that prohibits acts of sexual harassment, sexual or gender violence, as well as establishing the corresponding measures in in case of non-compliance, (ii) training for workers on respectful relations with the communities, how to avoid gender violence and the Code of Conduct of the Program, (iii) information to the communities regarding the standards of conduct for project personnel , (iv) considerations to be integrated into the project's complaints mechanism to receive, register and address claims related to sexual harassment or gender violence and (v) definition of referral protocols for victims who require it to care services of gender violence or competent authorities.	**YES**
ESPS 10 - Stakeholder Engagement and Information Disclosure	**YES/NO**
This SESA/SESMP includes a Stakeholder Engagement Plan, which includes the mapping of stakeholders, community relations processes, the complaints, and claims response mechanism, as well as what is pertinent to the consultation process. During due diligence, a consultation process will be developed to present to affected and interested groups: the project, the environmental and social impacts, the mitigation measures, and the grievance response mechanism. The consultations must be conducted by the PEU, and their results will be considered in the preparation of the final environmental and social documents of the operation.	YES

4. Environmental and Social Baseline

4.1. Introduction

The main objective of this chapter is to characterize the area where the projects to be financed under the BH-L1061 Program will be developed.

This chapter analyzes general aspects and components of the physical, biological, and socioeconomic environment and specifies the area of influence (AoI) of the specific projects.

4.2. Definition of Area of Influence

This SESA considers both the construction and operations phase of the Project, and focuses on the relevant existing physical, biological, and socioeconomic environments within the direct footprint of the Project, namely the area surrounding the proposed projects on Eleuthera, Abaco, Bimini, and New Providence. As such, both a Direct Area influence (DAoI) and an Indirect Area of Influence (IAoI) are defined for the Project as follows below.

4.2.1. Direct Area of Influence

The Direct Area of Influence (DAoI) for the Project is defined as the footprint where most of the E&S impacts from the Project are expected to occur and/or be experienced most acutely.

The DAoI was defined considering the following zones: i) the spaces occupied by the project components and the accesses that are used and intervened during the construction and operational stage (project footprint); ii) the spaces occupied by the project's auxiliary facilities, such as workshops, temporary material storage areas, among others; and the accesses intervened to reach these facilities; and iii) the area adjacent to the project, where the potential socio-environmental impacts generated during the construction and operation stages are direct.

Within the framework of this Study the area of direct influence is defined as the space within 100 meters from the edge of the work zone

Specific locations to be intervened are listed below:

Eleuthera

- Savannah Sound to Tarpum Bay Mains Extension (Central Eleuthera)
- Tarpum Plant to Jack’s Bay Mains Extension (South Eleuthera)

Abaco

- Sweetings Village (Marsh Harbour, Abaco)

Bimini

- Port Royal Mains Extension (South Bimini)

- Airport Mains Extension (South Bimini)

New Providence

- Malcolm Park LS
- Elizabeth East LS
- Montague LS
- Potters Cay LS
- Rawson Square LS
- Fox Hill LS
- Old Cedar LS
- Shirlea LS
- Yellow Elder Main LS
- McNeil LS
- PMH
- Oakes Field LS
- Big Pond LS
- St. Albans LS
- Nassau Street LS
- Flamingo C LS
- Yamacraw 2 LS
- Pinewood C LS
- Sir Lynden 1 LS

4.2.2. Indirect Area of Influence

The Indirect Area of Influence (IAoI) is the area within which indirect impacts are expected to occur, that is, those impacts that transcend the physical space of the project and its associated infrastructure.

For this SESA, the full extent of each of the subdivisions where the Access to Piped Water Supply Projects is located, that is: Abaco, Bimini and Eleuthera.

For the Lift Station Upgrades Projects, the full extent of the city of Nassau, New Providence is set as the IAoI.

For the NRW Reduction Contract project, the islands of Abaco, Eleuthera and Exuma will be set as the IAoI.

For the AMI infrastructure project, the islands of New Providence, Abaco, Eleuthera and Exuma will be set as the IAoI.

The IAoI results in the islands of: Abaco, Bimini, Eleuthera, Exuma and New Providence.

Generalities of the Indirect Area of Influence

The Abaco Islands lie in the northern Bahamas. It is composed of several small cays and two main islands: Great Abaco and Little Abaco. Administratively, the Abaco Islands constitute seven of the 31 Local

Government Districts of the Bahamas: Grand Cay, North Abaco, Green Turtle Cay, Central Abaco, South Abaco, Moore's Island, and Hope Town. On the Big Island of Abaco is Marsh Harbour, the Abacos' commercial hub and the Bahamas' third largest city, plus the resort area of Treasure Cay. Both have airports.

Bimini is a small island chain within the Bahamas, located about 80 kilometers (50 miles) east of Miami, Florida. Comprising North Bimini, South Bimini, and several smaller cays, Bimini is the westernmost district of the Bahamas. Known as the "Gateway to the Bahamas," Bimini is famous for its deep-sea fishing, rich marine life, and historical significance. The island's clear blue waters attract divers and snorkelers, especially to sites like the Bimini Road, which some believe to be part of the lost city of Atlantis. Bimini has a vibrant local culture, with the main settlements on North Bimini being Alice Town and Bailey Town.

Eleuthera is an elongated island stretching approximately 180 kilometers (110 miles) and lies east of New Providence. Known for its pink sand beaches and dramatic cliffs, Eleuthera is a paradise for beach lovers and adventurers. The island is divided into three main regions: North, Central, and South Eleuthera, each with its unique charm and attractions. Governor's Harbour, the island's capital, is a picturesque town with colonial architecture and vibrant local culture. Eleuthera's Glass Window Bridge offers stunning views where the deep blue Atlantic Ocean meets the calm turquoise waters of the Caribbean Sea. The island is also famous for its pineapple plantations and annual Pineapple Festival.

Exuma, part of the Out Islands of the Bahamas[11], comprises over 365 cays and islands, with Great Exuma and Little Exuma as its principal landmasses. Located centrally within the archipelago, Exuma is esteemed for its pristine beaches and diverse marine ecosystems, making it a paramount destination for ecotourism and marine conservation efforts. The region's tranquil ambiance and rich biodiversity, including vibrant coral reefs and secluded coastlines, attract enthusiasts of snorkeling, diving, and marine biology research. With George Town as its administrative hub, Exuma offers a harmonious blend of natural beauty and sustainable tourism practices, catering to discerning travelers seeking serene environments and immersive ecological experiences.

New Providence is the most populous island in the Bahamas, home to the capital city, Nassau. This island serves as the political, economic, and cultural hub of the country, housing a significant portion of the nation's population. New Providence is renowned for its vibrant tourism industry, featuring a blend of historic sites, luxury resorts, and bustling marketplaces. The island offers numerous attractions, including the iconic Atlantis Paradise Island Resort, the historic Queen's Staircase, and Cable Beach. Nassau's Lynden Pindling International Airport is the main gateway for international visitors.

[11] The Out Islands are more sparsely inhabited and less economically developed than New Providence and Grand Bahama. The most populous of the Out Islands are Abaco, Andros, and Eleuthera; the Out Islands tend to be less populous as one moves southward.

4.3. Indirect Area of Influence Baseline (IAoI)

4.3.1. Physical Environment Baseline of the IAoI

Climate

According to the Climate Change Knowledge Portal of the World Bank, the Bahamas, situated on the cusp of the tropical and subtropical zones, features -tropical marine climate, moderated by the Gulf Stream's warm waters and with wet and dry winter incursions of modified polar air from the North American continent. The trade wind flow is generated by the quasi-permanent Bermuda Azores anticyclone, which is a large area of high atmospheric pressure, covering part of the subtropical north Atlantic Ocean, they are relatively dry and yield fair-weather systems.

Year-round, the islands sustain warm, humid conditions, though with more pronounced seasonal variations than their Southern Caribbean counterparts. Distinct variations exist between the islands, with the northwestern islands receiving twice the rainfall and bearing temperatures up to 5° cooler than the southeastern islands. Daily temperatures hover between 17°C and 32°C on average (see Figure 11). Since 1960, there has been an increase of around 0.5°C in mean temperatures, at an average rate of 0.11°C per decade. The mean daily maximum temperature for July has risen at a rate of 2°C per century, and more recently at a rate of 2.6°C per century. Seasonal variations in the rate of temperature increase are apparent, with the warmest seasons seeing the most rapid rates. The analysis of extreme or maximum temperatures of Figure 12 shows a 6,5 °C reveals a temperature difference of 8°C between winter (DJF) and summer months (JJA) in Abaco.

There is also an island-wide variation, with northeastern islands warming more rapidly than their southwestern counterparts. From 1973-2008, there have been significant increases in the frequency of ‘hot’ days and nights and decreases in ‘cold’ days and nights.

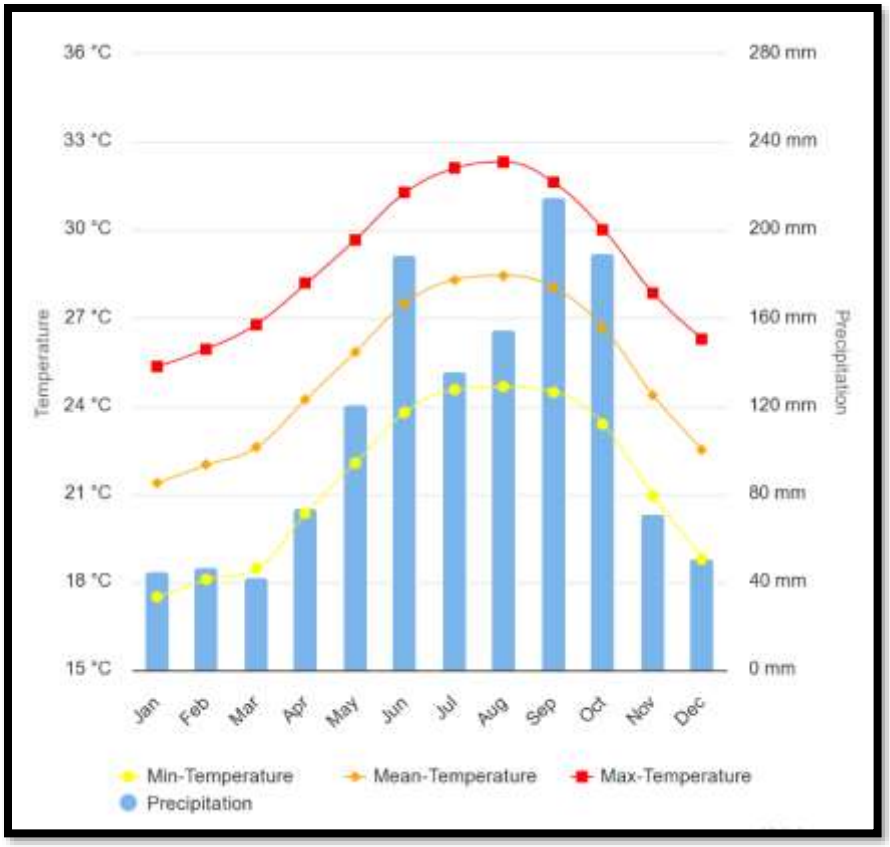
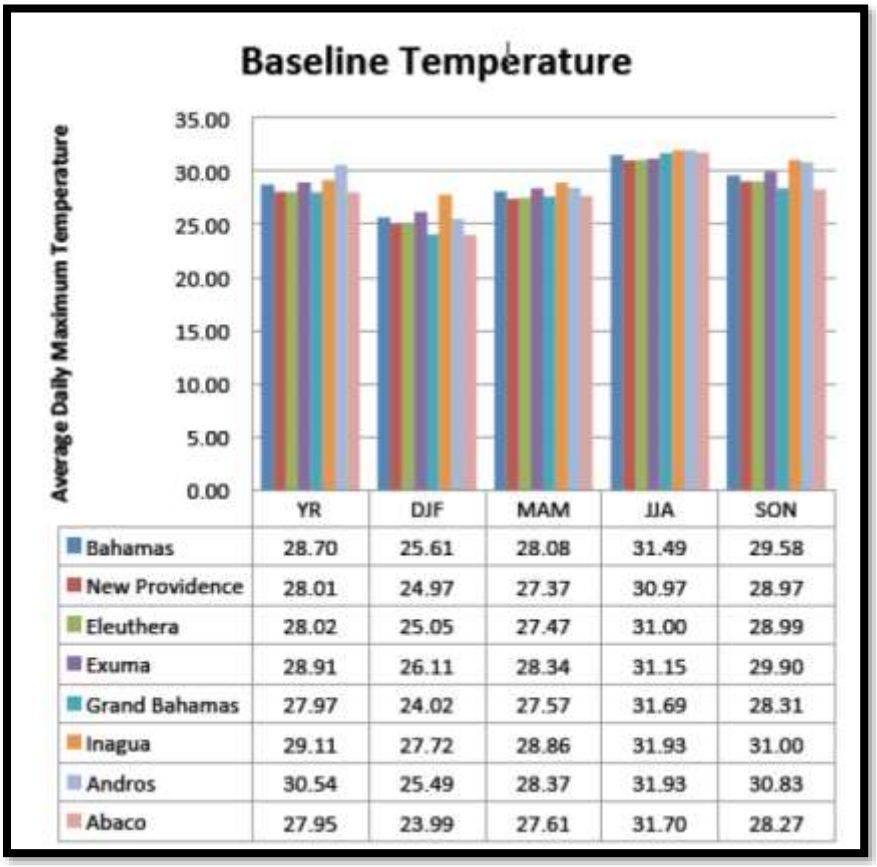


Figure 40. Monthly Climatology of Min-Temperature, Mean-Temperature, Max- Temperature & Precipitation in Bahamas. Period. 1991-2020. Source: Climate Knowledge Portal, https://climateknowledgeportal.worldbank.org/country/bahamas/climate-data-historical

Temperature



	YR	DJF	MAM	JJA	SON
Bahamas	28.70	25.61	28.08	31.49	29.58
New Providence	28.01	24.97	27.37	30.97	28.97
Eleuthera	28.02	25.05	27.47	31.00	28.99
Exuma	28.91	26.11	28.34	31.15	29.90
Grand Bahamas	27.97	24.02	27.57	31.69	28.31
Inagua	29.11	27.72	28.86	31.93	31.00
Andros	30.54	25.49	28.37	31.93	30.83
Abaco	27.95	23.99	27.61	31.70	28.27

Figure 41. Average Daily Maximum Temperatures for The Bahamas. Period 1960-2006. Source: UNFCCC, https://unfccc.int/sites/default/files/resource/bhsnc2.pdf

Using the 21-GCM ensemble, under the A1FI high scenario by 2050[12], the projected temperature increase for the entire Bahamas ranges from 1.91°C to 2.11°C, the daily maximum temperature is the highest in the northernmost island of Grand Bahama and in the southernmost island of Inagua. In the central part of The Bahamas, the daily maximum temperature increases of 1.93°C to 1.97°C is expected. Projected rate of warming is most rapid in the summer from June-August and September-November. Substantial increases in the frequency of "hot" days and nights and decreases in frequency of cold days and nights are projected to occur, with the most rapid changes occurring in the June-August period.

[12] A1FI scenario, from the IPCC's Special Report on Emissions Scenarios (SRES), is part of a set of socio-economic pathways that explore different futures based on varying levels of economic growth, population dynamics, and technological development. The A1FI scenario specifically focuses on a fossil-fuel-intensive future. While A1FI and RCP 8.5 originate from different frameworks and were developed at different times, they share similar characteristics as high-emission scenarios, providing critical inputs for understanding the potential severe impacts of future climate change.

Precipitation

Rainfall is unevenly distributed across The Bahamas: north and central receive annually some 50 to 60 inches (1270 to 1524 mm), while in the southeast Bahamas, it decreases to some 36 inches (914mm). Moving across the archipelago, the average annual rainfall varies from about 60 inches (1524mm) per year at Abaco in the northwest to less than half this amount at Inagua in the southeast.

There is a distinct dry season (November to April) and a pronounced wet season (May to October). The seasonal effects of tropical cyclones have a pronounced effect on annual rainfalls across The Bahamas. Additionally, winter storms flowing off the North American continent also impact rainfall during the normally dry period. However, this effect rarely extends into the central and southern Bahamas.

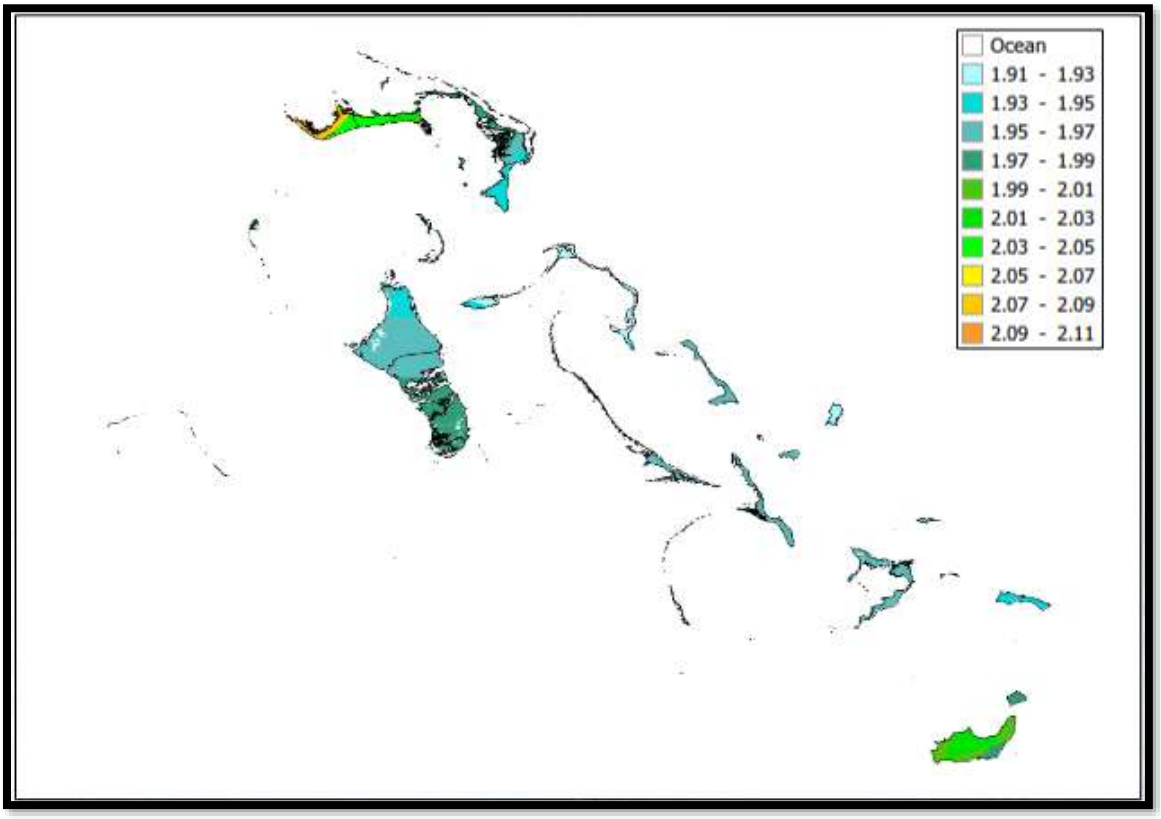


Figure 42. Daily Maximum Temperature for The Bahamas under A1FI for 2050. Source: UNFCC, https://unfccc.int/sites/default/files/resource/bhsnc2.pdf

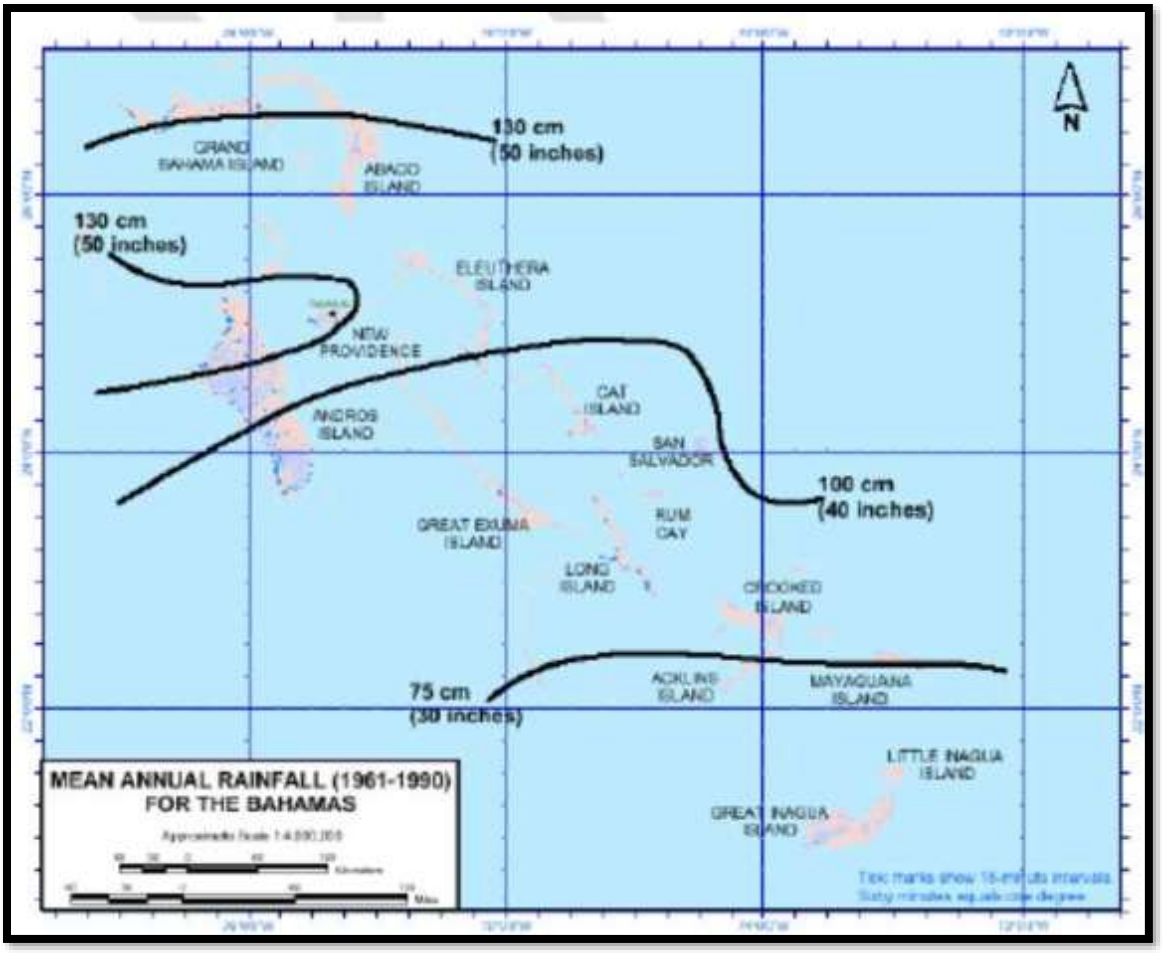


Figure 43. Mean annual rainfall for The Bahamas. Source: First Biennial Update Report of the Commonwealth of The Bahamas to the UNFCCC, December 2022.

Rainfall projections indicate decreases in rainfall for The Bahamas, due to decreases in rainfall during the March-May and June-August periods. The decreases in the months from March to August however are partly offset by overall increases in rainfall in the September-November period. The risk of drought increases along a southeastern gradient since the more southern islands already experience only half of the rainfall that falls in the more northern islands. 70 Additionally, since the weather of The Bahamas is influenced by ENSO events, the likelihood of drought is increased if El Nino episodes become more frequent and/or intense[13].

Droughts and dry periods

Droughts in the Caribbean are attributed to declines in rainfall, particularly in the wet season, and have become exacerbated in recent decades by high evapotranspiration rates associated with increasing temperatures. Both temperature and evapotranspiration are projected to further increase in the future.

[13] The Commonwealth of The Bahamas. 2022. First Biennial Update Report (BUR1). United Nations Framework Convention on Climate Change (UNFCCC)

Often the declines in rainfall leading to significant drought impacts are associated with El Niño phenomenon and with cooler than normal sea surface temperatures in the Tropical North Atlantic Ocean and the Caribbean Sea[14].

Hurricanes and other extreme events

One of the most significant natural hazards to the country are tropical storms (including hurricanes). From 1852 to 2022, 356 hurricanes passed within 60 nautical miles of The Bahamas[15]. The country has a history of suffering major impacts from destructive storms and hurricanes, such as Maria and Irma Hurricanes in 2017 and Hurricane Dorian in 2019 that have caused significant losses of life, evacuation of affected islands and damage to infrastructure and the economy in billions of dollars. Hurricane Dorian alone is estimated to have caused over US$ 3 billion in damages, 71 deaths and 282 people missing.

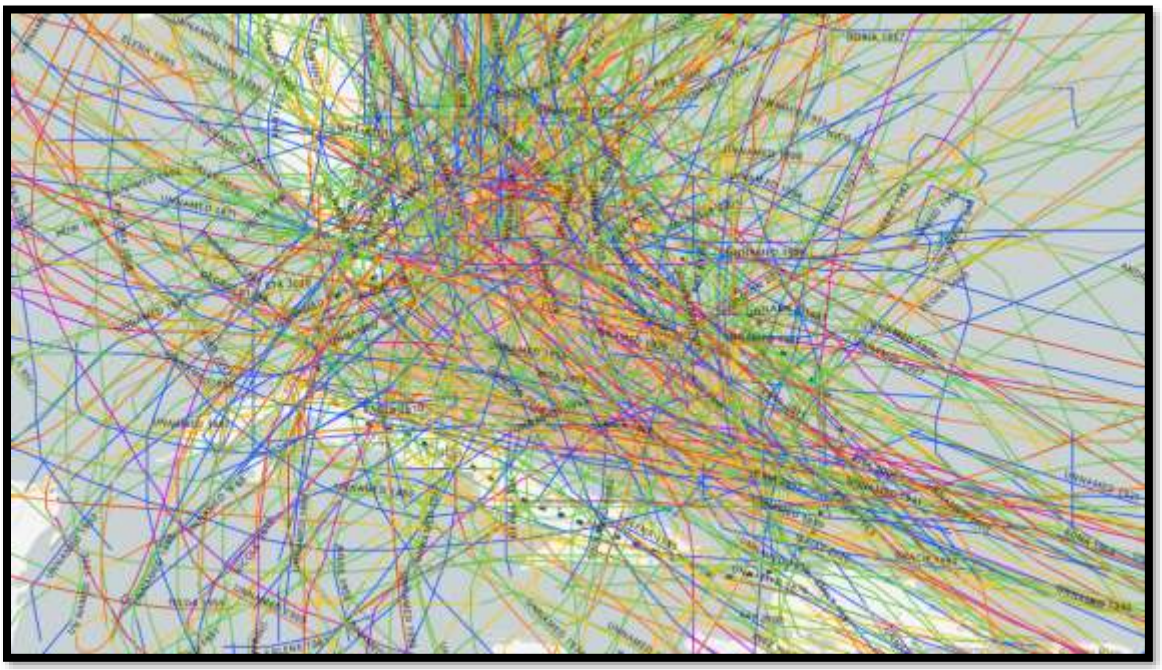


Figure 44. Historical Hurricanes from 1852 to 2022 that have passed The Bahamas. Source: NOAA.

[14] WSP. 2023. Water Supply Improvements Project Climate Risk and Vulnerability Assessment.

[15] NOAA. Historical Hurricane Tracks. https://coast.noaa.gov/hurricanes/#map=4.68/24.16/-76.58&search=eyJzZWFyY2hTdHJpbmciOiJCYWhhbWFzIiwic2VhcmNoVHlwZSI6Imdlb2NvZGVkIiwib3NtSUQiOiI1NDc0NjkiLCJjYXRlZ29yaWVzIjpbIkg1IiwiSDQiLCJIMyIsIkgyIiwiSDEiLCJUUyIsIlREIiwiRVQiXSwieWVhcnMiOltdLCJtb250aHMiOltdLCJlbnNvIjpbXSwicHJlc3N1cmUiOnsicmFuZ2UiOlswLDEwMzBdLCJpbmNsdWRlVW5rbm93blByZXNzdXJlIjp0cnVlfSwiYnVmZmVyIjo2MCwiYnVmZmVyVW5pdCI6WyJOYXV0aWNhbCBNaWxlcyJdLCJzb3J0U2VsZWN0aW9uIjp7InZhbHVlIjoieWVhcnNfbmV3ZXN0IiwibGFiZWwiOiJZZWFyIChOZXdlc3QpIn0sImFwcGx5VG9BT0kiOnRydWUsImlzU3Rvcm1MYWJlbHNWaXNpYmxlIjp0cnVlfQ==

The Bahamas is projected to experience an increase in the frequency and intensity of tropical cyclones and hurricanes as a result of CC, underscoring the urgency for the prioritization of CC adaptation, increasing resilience and disaster risk management in the development agenda for The Bahamas[16].

There are other natural phenomena that have lower probability of affecting the country, such as floods and storm surge, and these can also result in significant local damage.

Storm surge or sea swells from extratropical cyclones during the winter season often cause flooding in The Bahamas due to its low relief. Storm surge also results in beach and coastal erosion[17]. The dense tourism and residential development along the coast is highly vulnerable, which could have serious economic and social implications for residents and for the tourism sector.

The advanced Rapid Imaging and Analysis (ARIA) team at NASA, in collaboration with the Earth Observatory of Singapore, used synthetic aperture radar data from the European Union's Copernicus Sentinel-1 satellites to produce a flood map of The Bahamas (map area covers 109 miles by 106 miles, stretching over Abacos and Bimini Islands, in reference to this study's IAoI). The light blue color indicates areas that were likely flooded when the data were acquired, the map shows flooding in and around Marsh Harbour in the Abaco Islands. As it can be seen from the maps below, both Bimini and Abaco Islands are subject to flooding. Moreover, the sites where the proposed projects are situated have floodable areas.

[16] IPCC. (2023). Summary for Policymakers. In: Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, Geneva, Switzerland, pp. 1-34, doi: 10.59327/IPCC/AR6-9789291691647.001

[17] The Commonwealth of The Bahamas. 2022. First Biennial Update Report (BUR1). United Nations Framework Convention on Climate Change (UNFCCC).

Figure 45. Abaco Island Flood Map. Source: ARIA, NASA, 2019.

Figure 46. Sweetings Village Project Site and floodable areas. Source: ARIA, NASA, 2019.

Figure 47. Bimini Flood Map. Source: ARIA, NASA, 2019.

Figure 48. Bimini Airport Road Project and floodable areas. Source: ARIA, NASA, 2019.

Figure 49. Bimini Port Royal site and floodable areas. Source: ARIA, NASA, 2019.

Regarding Exuma, as per an analysis conducted by the World Bank[18], the island is exposed to significant flood risks attributable to its geographical and climatic conditions. Historical data, alongside probabilistic modeling of synthetic events, demonstrates a notable increase in flood intensity at return periods (RP) of 50 years, leading to considerable potential damage. Specifically, the analysis indicates that the population affected by floods in Exuma rises significantly from 268 at an RP of 5 years to 4,349 at an RP of 100 years.

Sea Level Rise

Sea level rise is a natural hazard to which The Bahamas are extremely vulnerable to. The effects of sea level rise include salinization of groundwater, flooding, and soil erosion. Moreover, it also affects biodiversity, economic activities and human health.

Integrated sea-level rise projections and flood risk analysis indicate that floods reaching at least 0,5 m above high tide line at shore will become common events throughout most of the Caribbean within half a century (2050), and more likely sooner. Floods above 1 m may become common by the end of the century (2100), and permanent sea-level rise exceeding this threshold is possible. Recent research suggests that Antarctic ice sheets may be less stable than previously anticipated. In this case, scenarios of unabated climate pollution led to sea-level projections exceeding 1,5 m by 2100 across the Caribbean. Swift and sharp cuts in climate pollution, however, could reduce these projections by roughly 1 m. In the much longer run, contemporary carbon emissions leading to 4 °C warming could lock in more than 8 m of

[18] https://riskmonitor.iadb.org/en/node/149

sea-level rise unfolding across centuries. Limiting warming to 2 °C could limit sea-level increases to roughly 4m and projections translate 1,5°C warming to about 3m[19].

Based on analysis using Coastal DEM and population data, The Bahamas confronts the greatest proportional threat of the Caribbean region, 32% of land, 25% of population and 13% of Internet access points are below 0,5m.

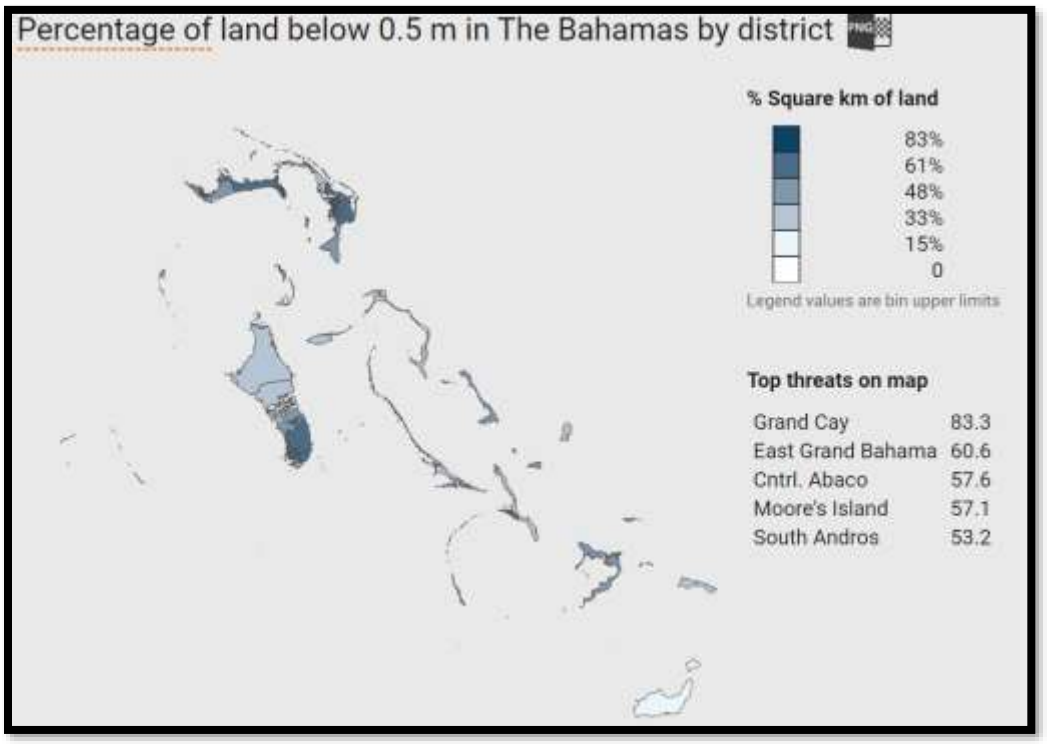


Figure 50. Percentage of land below 0,5m in The Bahamas. Source: Risk Finder, Climate Central, 2024.

[19] Strauss, B. (2018). Sea-Level Rise Threats in the Caribbean. Data, tools and analysis for a more resilient future. Inter-American Development Bank. https://sealevel.climatecentral.org/uploads/ssrf/Sea-level-rise-threats-in-the-Caribbean.pdf

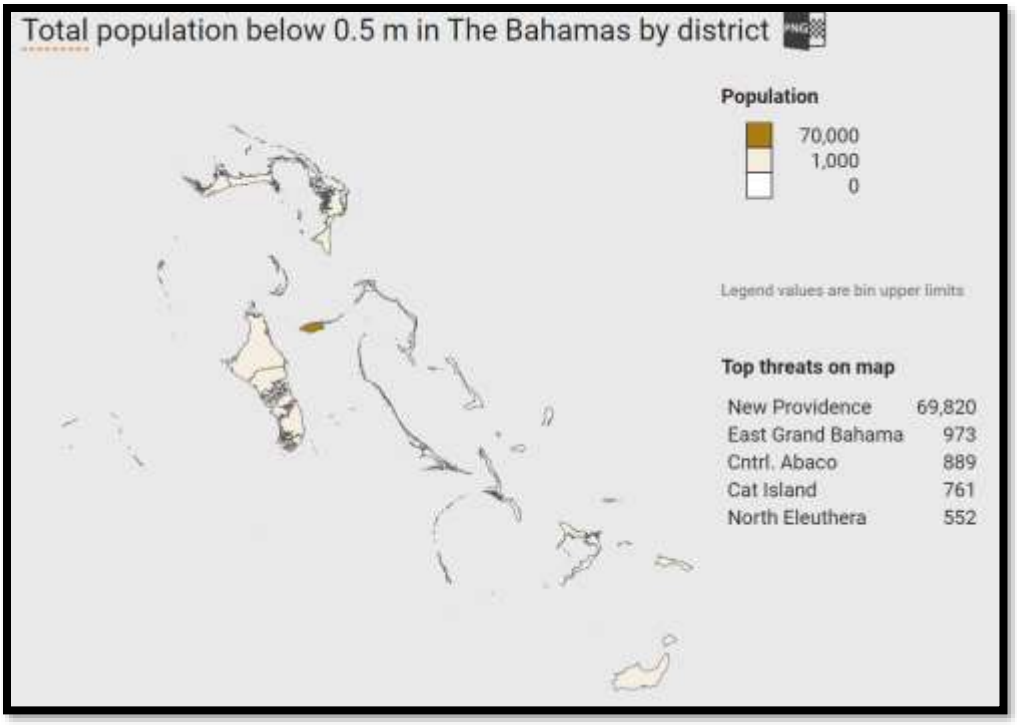


Figure 51. Total Population below 0,5m in The Bahamas District. Source: Risk Finder, Climate Central, 2024.

About 77.000 people (24,8%) in the Bahamas live on land below 0,5m, projected sea-level rise for midcentury. 889 people (10,7%) in Central Abaco, 84 (4,8%) people for Central Eleuthera, 382 people (14,6%) in South Eleuthera, 72 people (5%) in Bimini Islands, 301 people (4,34%) in Exuma, and 69.820 people (32,4%) for New Providence, the most densely populated area.

In terms of elevation, total land below 0,5m in The Bahamas is estimated in 32% of the land (4.043km2), 57,6% (399 km2) in Central Abaco, 5,9% (4km2) in Central Eleuthera, 26,1% (55km2) in South Eleuthera, 11,8% (4km2) in Bimini, 43,2% (108 km2) in Exuma, and 43,2% (108 km2) in New Providence.

This data shows that in terms of amount of land to be impacted by a 0,5m sea level rise, Central Abaco is the area to be the most impacted, with almost 57,6% of its land below the level analyzed, followed by Exuma and New Providence with 43.2% and South Eleuthera with 26.1%. In terms of population to be impacted by a 0.5m sea level rise, New Providence has the highest number of people and percentage of population affected, with 69.820 people, representing 32,4% of its total population.

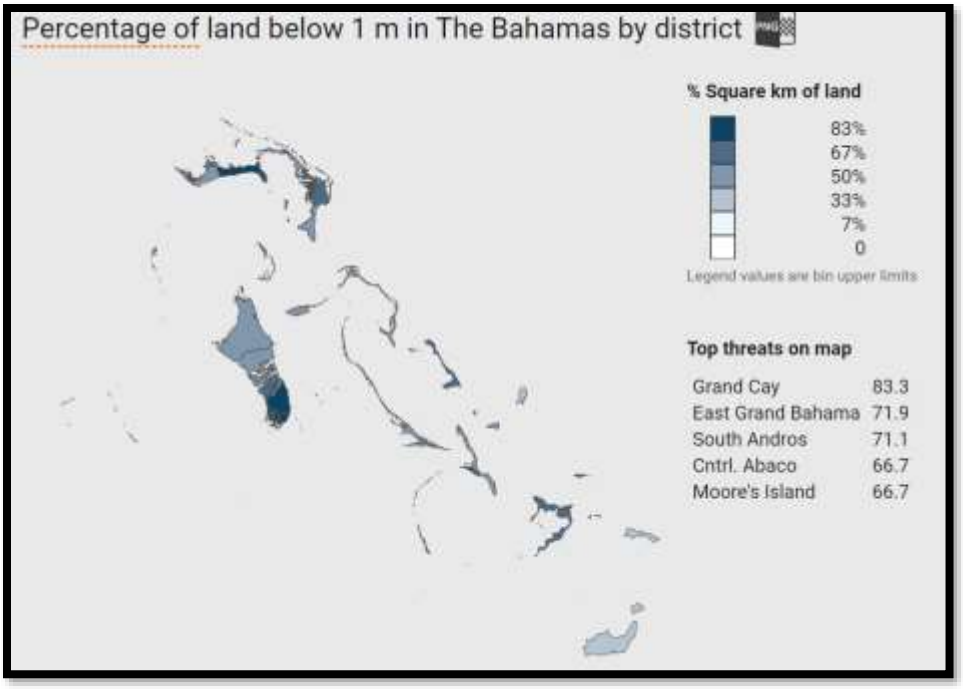


Figure 52. Percentage of land below 1m in The Bahamas. Source: Risk Finder, Climate Central, 2024.

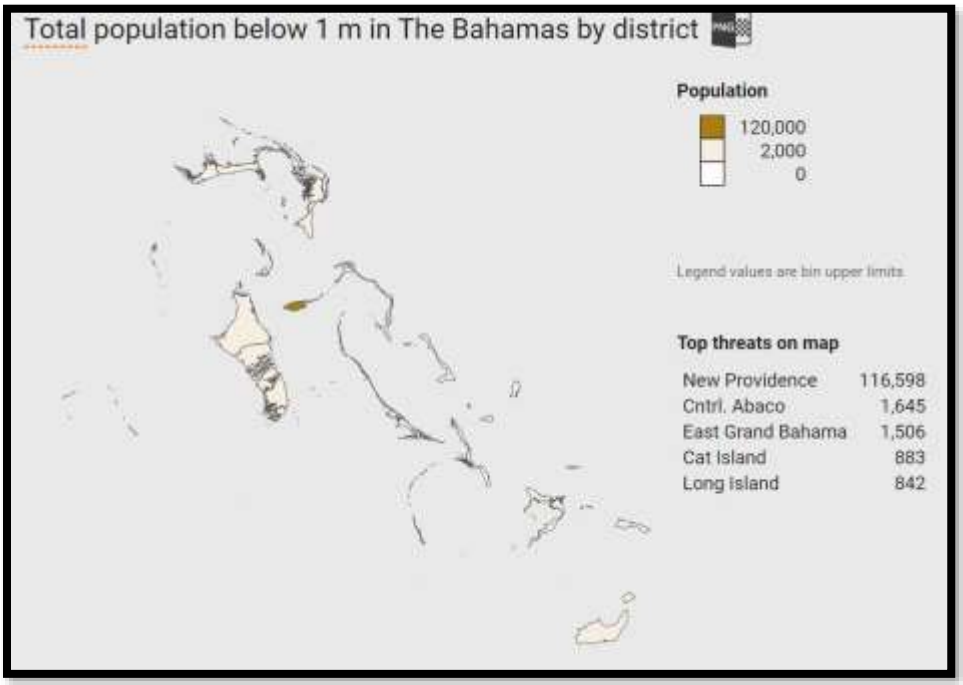


Figure 53. Total land below 1m in The Bahamas. Source: Risk Finder, Climate Central, 2024.

About 130.000 people (41,4%) in The Bahamas live on land below 1m, projected sea-level rise for end of the century. 1.600 people (11,7%) in Central Abaco, 120 people (6,9%) for Central Eleuthera, 575 people (22%) in South Eleuthera, 134 people (9,3%) in Bimini Islands, 535 people (7,72%) in Exuma, and 116.598 people (54,1%) for New Providence, the most densely populated area.

In terms of elevation, total land below 1m in The Bahamas is estimated in 46,1% (5.771km2), 66,7% (462 km2) in Central Abaco, 7,4% (5km2) in Central Eleuthera, 35,1% (74km2) in South Eleuthera, 17,6% (6km2) in Bimini, 52% (151 km2) in Exuma and 36,1% (79km2) in New Providence.

This data shows that in terms of the amount of land to be impacted by a 1m sea level rise, Central Abaco is the area to be the most impacted, with almost 66.7% of its land below the level analyzed, followed by Exuma with 52%, New Providence with 36.1%, and South Eleuthera with 35.1%. In terms of population to be impacted by a 1m sea level rise, New Providence has the highest number of people and percentage of population affected, with 116,598 people, representing 54.1% of its total population.

Topography

With a total area of 5.380mi2 (13.934 km2), the islands of The Bahamas-an archipelago of over 700 low-lying islands plus more than 200 cays and rocks- are typically flat with elevations of less than 32ft (10m), the highest point in The Bahamas is 206ft (63m) above sea level at Mount Alvernia on Cat Island. A higher coastal ridge may occur, usually located along the exposed side of most islands. Islands of the southeast and central Bahamas are of higher elevation than in the northern Bahamas. The islands are usually long and narrow, oriented from northwest to southeast with central ridges extending to a maximum height of 200ft (60m).

The Bahamas' modern topography displays two distinct regions: the shallow-water banks and the deep-water troughs. The shallow areas consist of flat-topped, steep-sided carbonate platforms that have been sites of carbonate deposition since at least Cretaceous times. These platforms have sedimentary rock thicknesses ranging from 5.4 km to 10 km. The Great Bahama Bank, in which Bimini, Eleuthera, Exuma and New Providence are located, is the largest shallow-water bank and stretches over 400 km from north to south and 250 km from west to east. Great Abaco Island instead, lies on the Little Bahama Bank, north of the Great Bahama Bank which is separated from it by a deep channel[20].

[20] Hearty, P.J. (2008). Integrated Late Quaternary chronostratigraphy for San Salvador Island, Bahamas: Patterns and trends of morphological change in the land snail Cerion. Palaeogrography, Palaeoclimatology, Palaeoecology. 267, 41-58.
doi:10.1016/j.palaeo.2008.06.003

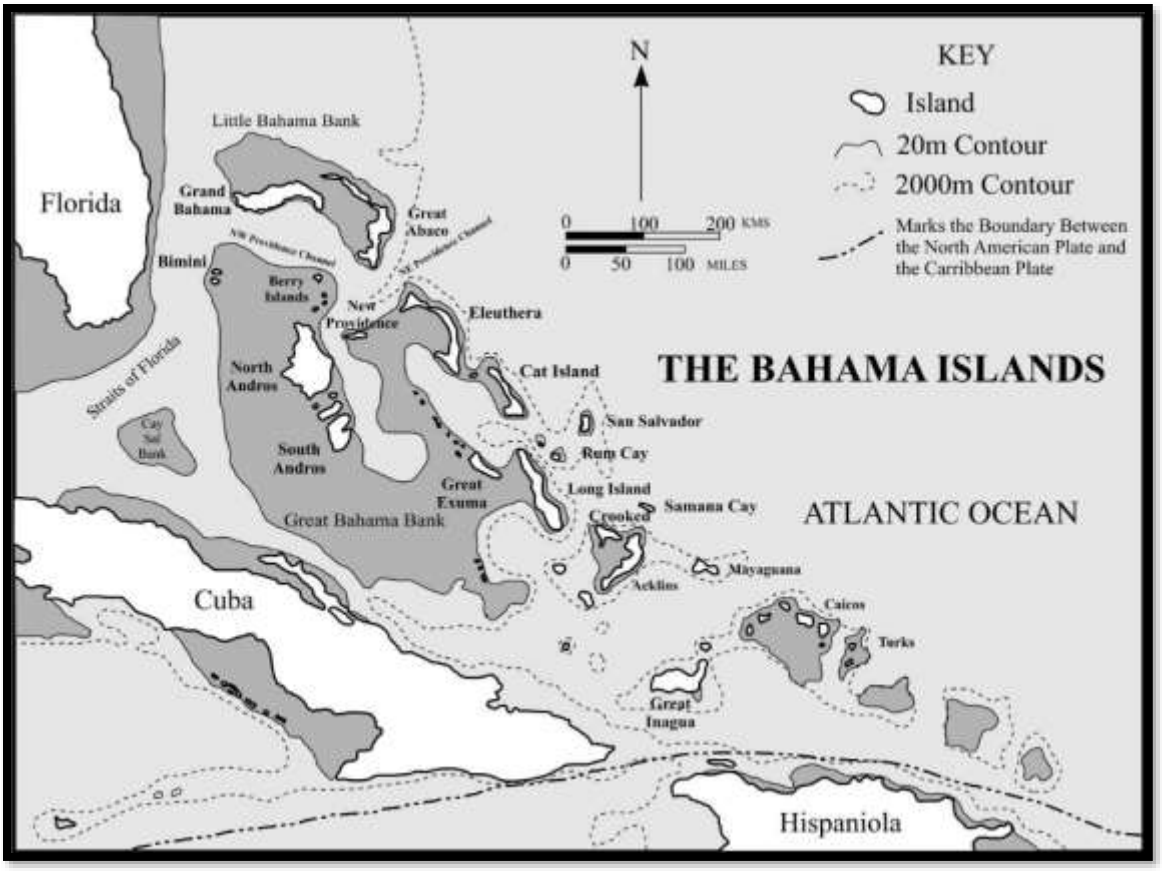


Figure 54. Map of The Bahamas islands and rocks distributed across Great and Little Bahama Banks. Source: Mylroie, J. (2012).

The topography of Abaco Island is predominantly flat, defined by eolianite (dune) ridges that frequently exceed elevations of 24 m and form most of the relief on the island. High cliffs lining the eastern shore of Abaco Island are commonly a result of erosion of these eolianite deposits. The high ridge that forms the eastern flank of Abaco Island peaks at approximately 34 m east of the site, with the ridge generally maintaining an 18 m elevation. East of the ridge, the topography gradually descends to sea level.

Bimini comprises two small subtropical islands, North and South Bimini, located in the Northwest corner of the archipelago. The islands are on the western edge of the Great Bahamas Bank, facing the Florida Strait and surrounded by shallow waters of only 20 to 30ft depth. The islands are surrounded by marine biotopes such as coral reefs, seagrass beds, mangrove forests, sand flats and banks[21].

[21] Trave, C. (2014). Bimini Islands: a characterization of the two major nursery areas; status and perspectives. Trave and Sheaves, SpringerPlus. 3:270. https://www.srpinerplus.com/content/3/1/270

Eleuthera lies on the northeastern margin of the Great Bahamas Bank, fully exposed to the enormous potential energy of the Atlantic Ocean. The northern part of the island is rocky, narrow (0,25-2km) and high (often over 40m)[22].

New Providence Island, principal island of The Bahamas, is mostly flat, with swamps and several shallow lakes and gentle elevations. The island is composed of aeolianite ridges, like those found on other Bahamian islands, generally lower in elevation compared to Abaco, around 15m above sea level. It is surrounded by shallow waters, ranging from 10 to 20ft in depth[23].

The Exuma Cays comprise about 40 main islands and many smaller islets and rocks extending 200 km along the eastern edge of the Great Bahama Bank. They are bordered by Exuma Sound to the east, a semi enclosed deep basin (>1000 m) 250 km long and 50–90 km wide, and by the Great Bahama Bank (mean depth of 3 m) to the west[24].

Geology

The geological history of the Bahama Islands is steeped in antiquity, with the carbonate platform known as the Bahamas dating back to the Cretaceous Period at least 135 million years ago[25]. This platform, referred to as the Bahamian Platform, possesses a foundation primarily composed of fossil coral, although much of the rock manifests as oolitic limestone derived from the disintegration of coral reefs and seashells[26].

Investigations into the platform suggest that it embodies a layer exceeding 5 km of carbonate sediment, specifically limestone, which has accumulated since the pre-Triassic era. Along with this sedimentation, the subsidence of the bank has allowed for the nearly continuous accumulation of carbonates throughout the majority of the Bahamas' geological history[27].

The surface geology of the Bahamas, shaped predominantly by Pleistocene and more recent deposits, showcases an array of geological features. The exposed limestone, marking the upper boundary of the Lucayan Formation with an average thickness of 40 m, primarily exhibits a packs tone texture, though mudstone to grains tone textures is also observed. This formation, dating back to the late Pliocene-Pleistocene, primarily consists of reef limestone and its weathered products. While the islands'

[22] Hearty, P.J. (1998). The geology of Eleuthera Island, Bahamas: a Rosetta Stone of Quaternary stratigraphy and sea-level history. Quaternary Science Reviews 17, 333–355.

[23] Hearty, P.J. (1997). The Stratigraphy and Surficial Geology of New Providence and Surrounding Islands, Bahamas. Journal of Coastal Research. 13, 798-812. http://www.jstor.org/stable/4298673

[24] Chiappone, M., & Sullivan Sealey, K. M. (2000). Marine reserve design criteria and measures of success: Lessons learned from the Exuma Cays Land and Sea Park, Bahamas. Bulletin of Marine Science, 66(3), 691–705.

[25] Dice, D.W. (2003). Geochemistry of the Pleistocene aquifer, Northeastern Andros Island, Bahamas.

[26] U.S. Army Corps of Engineers. (2004). Water Resources Assessment of the Bahamas.

[27] Sealey, N.E. (1994). Bahamian Landscapes: An Introduction to the physical geography of the Bahamas.

topography is largely subdued, with elevations seldom exceeding 9 meters above sea level, exceptions include islands like Abaco and New Providence, where dune ridges surpass 31 meters[28].

In addition to this, the upper units of the platform comprise Pleistocene and Holocene limestones, which include aeolian calcarenites, beach rock, and fossil coral reef rock. Lithified aeolian dune ridges contribute to the islands' topography, with shallow brackish to hypersaline lakes nestled between the depressions. The shorelines exhibit sandy beaches, often containing Holocene beach rock, situated between headlands formed of older, eroded aeolianites crystalline rock.

Abaco Island, located on Little Bahama Bank, exhibits typical carbonate island karst features such as karren, blue holes, pit caves, banana holes and flank margin caves. Landforms that resemble tropical cone karst and pseudokarst tafoni caves are also present. Its geology consists of mid to Late Quaternary carbonate deposits, less than a million years old. The island's soil is primarily calcareous, supplemented by aluminous lateritic soils formed under humid conditions, with frequent wet-dry cycles due to the porosity of the underlying carbonates and sporadic rainfall[29].

Bimini islands, consisting of North and South, lie on the western edge of the Great Bahamas Bank, close to deep oceanic channels, having high deposits on the channel facing shorelines and low platform sides. The islands predominantly feature Pleistocene and Holocene limestone formations, including aeolian calcarenites and beach rock, indicative of their formation from ancient coral reefs and sedimentary deposition. The geology of Bimini includes the presence of carbonate sediments typical of the Bahamian platform, contributing to its low-relief topography with elevations generally not exceeding 9m above sea level[30].

Eleuthera, situated northeastern margin of the Great Bahamas Bank, has a mid to Late Quaternary carbonate deposit geological structure, with significant exposure to Pleistocene limestone formations, often exceeding 40m in elevation in the northern rocky regions. The island's rugged northern coast contrasts with its southern counterpart, which is generally lower and sandier, featuring limestone outcrops and occasional karst formations. These geological features contribute to Eleuthera's diverse landscape and ecological diversity[31].

New Providence Island is approximately 21 miles long by 7 miles at its widest north-south extent. It contains several ridges, and the highest point is 125 ft (38m) high on the Gladstone Ridge, which extends from east to west. South of the ridges, the island is uniformly flat until it grades into sea level about a mile from the southern shoreline. New Providence contains many of the landscapes that are found on islands the Bahamian archipelago, namely ridges, flat rock land, cliff shorelines and mangrove wetlands. The

[28] Kalimantan Environmental Services (KES). (2008). Environmental Impact Assessment Report. BEC Expansion, New Power Plant, Wilson City, Abaco, Bahamas. KES No. 127-08-001.

[29] Walker, L.N. (2008). The Caves of Abaco Island, Bahamas: keys to geologic timelines.

[30] Kindler, P. (1997). Geology of The Bahamas: Architecture of Bahamian Islands. Chapter 3B. Elsevier Science B.V.

[31] Kindler, P. (1997). Geology of The Bahamas: Architecture of Bahamian Islands. Chapter 3B. Elsevier Science B.V.

northern third of New Providence Island is comprised of typical fossil dune ridges, with an offshore tier comprising a string of cays including Paradise Island, and an outer tier including Salt Cay and Rose Island[32].

According to Hearty and Backstrom[33], the Exuma Cays' geology is predominantly composed of bioclastic and oolitic limestone, with high stand deposits capped by red-stained micritic limestone, calcrete, or karst surfaces. Stratigraphic analysis reveals at least seven distinct units, indicating three broad eustatic intervals: the Pliocene-early Pleistocene, the Mid-Pleistocene Transition, and the mid-late Pleistocene. These geological records, established through physical stratigraphy, geomorphology, paleomagnetism, and amino acid racemization, provide insights into the depositional processes and sea-level history of the region.

Hydrology

The hydrology of the Bahamas is intrinsically connected to its physical geology, as there are no true rivers in the archipelago, making rainfall the primary means of recharge for freshwater resources. Groundwater resources include fresh, brackish, saline, and hypersaline waters found both at near and deep subsurface and in lakes and ponds that intercept the surface.

The Bahamian islands are uniquely layered with limestone, causing precipitation to sink as diffuse input into the limestone. Fresh or brackish groundwater exists in a lens that floats on the saline marine water permeating the islands from below, referred to as Ghyben-Hertzberg lenses[34]. These freshwater resources occur as three-dimensional lens-shaped bodies overlying brackish and saline water[35]. Over 90% of these freshwater lenses are within five feet of the surface[36]. This means there is generally no place on the islands that groundwater cannot be met in holes that penetrate 10ft (3m) below sea level.

There are two types of aquifers in the country. The first type are Holocene sands aquifers (unconsolidated, loose sands), which, despite their high porosity and low yield, are crucial freshwater sources on windward islands. The second type is the Lucayan Limestone aquifers, primarily the 'Pleistocene Age' formations, which comprise the main freshwater aquifer on most Bahamians islands and occur approximately 3 to 130 ft below ground level. Freshwater is absent in older deposits beyond 150 feet below ground level[37].

[32] WSP. 2023. Water Supply Improvements Project Climate Risk and Vulnerability Assessment.

[33] Hearty, P. J., & Backstrom, J. T. (2021). Surficial and shallow subsurface geology of the northern and central Exuma Cays, The Bahamas.

[34] Curran, A.H. (1995). Terrestrial and Shallow Marine Geology of the Bahamas and Bermuda. Series: Special papers. The Geological Society of America, Inc., Boulder, CO.

[35] SEV Consulting group. (2020). Environmental Impact Assessment for Central Bank of The Bahamas Demolition Project, New Providence.

[36] ERM. (2021). Environmental and Social Assessment (ESA) and Environmental and Social Management Plan (ESMP). Support for the Health System Strengthening of The Bahamas for Health Risks Programme BH-L1953.

[37] Whitaker, F. F., Smart, P. L. (2004). Hydrogeology of the Bahamian Archipelago. Geology and Hydrogeology of Carbonate Islands, 183–216. doi:10.1016/s0070-4571(04)80026-8

Thirteen islands contribute to a total reserve of 700 million m3 of water that is scattered throughout the country[38].

The typical normal water table elevations are estimated at 3 to 5 ft (0,9 to 1,5 m) below ground level. Seasonal high-water table elevations can range from 1 to 3 ft (0,3 to 0,9 m) below ground level. During certain storm periods, the water table elevation can be above ground for a period ("perennial wetland areas") but dissipates following the storm period[39].

According to the Water Resources Assessment of The Bahamas developed by the US Army Corps of Engineers in 2004, the surface and groundwater systems on Abaco Island in the Bahamas present diverse hydrological features influenced by the island's flat, rocky terrain and its seasonal rainfall pattern, with an average annual precipitation of about 1,010 mm, largely occurring from May through October. Surface water bodies, including blue holes, man-made lakes, and ponds, make up less than 2% of the island's landscape. The blue holes, although substantial in depth, cannot serve as primary freshwater sources. Man-made ponds, originated from limestone extraction for road construction in the mid-1970s, also lack the capacity to be primary water sources.

Groundwater resources are mainly constituted by the Lucayan Limestone aquifer lenses, with four large freshwater lenses identified: Normans Castle, Marsh Harbour – Lake City, Lake City – Crossing Rocks, and Crossing Rocks – Hole in the Wall[40]. These lenses vary in thickness, with the water table located between 0.6 and 6 meters below the surface. They provide substantial quantities of water, with the area between Marsh Harbour and Lake City being notably well developed.

Additional smaller lenses and coastal Holocene Sand aquifers also exist but provide very small to meager quantities of water, with the water quality ranging from saline to brackish. Approximately 60% of Abaco Island is unsuitable for groundwater development.

The major sources of pollutants are inundation by sea water due to hurricanes and other sever weather phenomena, exacerbated by the extremely permeable and porous limestone rock, intrusion of sea water due to excessive abstraction and anthropogenic sources such as domestic sewage, landfill leachates from solid waste, tourism, agriculture, residential and light industries. Pollutants impacting the lens include sea water, sewage, solid waste effluents, pesticides, fertilizers, fuels and oils and heavy metals.

Due to climate change, The Bahamas will face several challenges with respect to is water security, these include[41]:

- Declining freshwater availability: with declining average precipitation in the wet season, increasing temperatures throughout the year (thus increasing evaporation and

[38] FAO. (2015). AQUASTAT Country Profile - Bahamas.

[39] The Commonwealth of The Bahamas. 2022. First Biennial Update Report (BUR1). United Nations Framework Convention on Climate Change (UNFCCC).

[40] The Bahamas National Report. 2012. Integrating Management of Watersheds and Coastal Areas in Small Island Developing States (SIDS) of the Caribbean.

[41] The Commonwealth of The Bahamas. 2022. Dirst Biennial Update Report (BUR1). United Nations Framework Convention on Climate Change (UNFCCC).

evapotranspiration) and a potentially longer and drier dry (winter) season, the frequency of droughts is expected to increase, and the availability of freshwater is likely to decline. These challenges will be particularly pronounced for the southernmost islands, which already have more limited freshwater supplies due to the tendency for precipitation to decline from north to south in the archipelago.

- Increasing contamination of freshwater: Increasingly intense precipitation events and tropical storms, coupled with sea level rise, are expected to increase the frequency and intensity of floods in The Bahamas. This is expected to increase turbidity and the rate at which pollutants contaminate the islands' groundwater lenses which (due to their shallow nature) are highly vulnerable to anthropogenic pollution. Further exacerbating this dynamic is the fact that increasingly intense extreme weather events may damage wastewater treatment and collection systems, flood septic tanks and thereby also increase the risk of contaminated groundwater. Previous flooding in The Bahamas resulted in contamination of the soil and groundwater with seawater, sewage, petroleum and agricultural pesticides –occurrences that could become more pronounced as climate change progresses. Furthermore, The Bahamas is already grappling with sea level rise that is causing saline intrusion of aquifers. These challenges could become increasingly difficult to manage as sea levels continue to rise over the coming decades.

- Negative Impacts on critical water infrastructure: More intense hurricanes and other extreme weather, as well as heavier precipitation events, are expected to inflict significant damage on water storage, treatment, and distribution infrastructure in The Bahamas. This may disrupt efforts to reliably distribute water to end-users throughout the country. This may also increase leakage rates precisely as the country is grappling with declining freshwater availability. The Government is currently working to reduce non-revenue water (NRW) rates in recognition of the fact that this constitutes an effective way to address looming water supply shortages.

Below there are two tables that details freshwater availability for the islands in the IAoI of the present study and the overall freshwater resources in The Bahamas.

Table 20. Renewable freshwater resources in The Bahamas. Source: FAO, 2015.

Renewable freshwater resources		
Precipitation (long-term average)	1292	mm/year
	17930	million m3/year
Internal renewable water resources (long-term average)	700	million m^3/year
Total renewable water resources	700	million m^3/year
Dependency ratio	0	%
Total renewable water resources per inhabitant	1857	m^3/year

Table 21. Renewable freshwater resources per island in the IAoI. Source: USACE, 2004.

Renewable freshwater resources	million m3/year
Abaco	131.7
Bimini and the Berry Islands	0.28
Eleuthera, Harbour Island & Spanish Wells	13.54
Exuma and Cays	4.83
New Providence	16.03

In terms of water use, total municipal withdrawal is estimated at 31 million m3 in 2013. Tourism needs a large quantity of water. The primary source of drinking water is fresh groundwater. Desalination is increasing in usage, and will most likely continue to increase, as fresh groundwater availability continues to decline, and water demands grow. Rainwater catchment is rarely used, supplying possibly 3 percent or less of the water[42].

Oceanography

The Bahamas archipelago represents the largest tropical shallow water region in the Western Atlantic. Its position between two major warm ocean currents results in seasonal variability, influencing the biological communities that inhabit its ocean and coastal areas[43].

The islands are subject to two main currents: the Gulf Stream, moving from the Caribbean Sea and the Gulf of Mexico between Florida and the Bahamas, and the Antilles Current, flowing onto the archipelago from across the Atlantic Ocean. These currents influence temperature across the islands, affecting marine habitats' biological components. Variability in sea surface water temperatures affects coral growth and species diversity, while tidal range, salinity, and turbidity also play roles in shaping marine and coastal ecosystems.

[42] FAO. (2015). AQUASTAT Country Profile - Bahamas.

[43] Sealey, N.E. (1994). Bahamian Landscapes: An Introduction to the physical geography of the Bahamas.

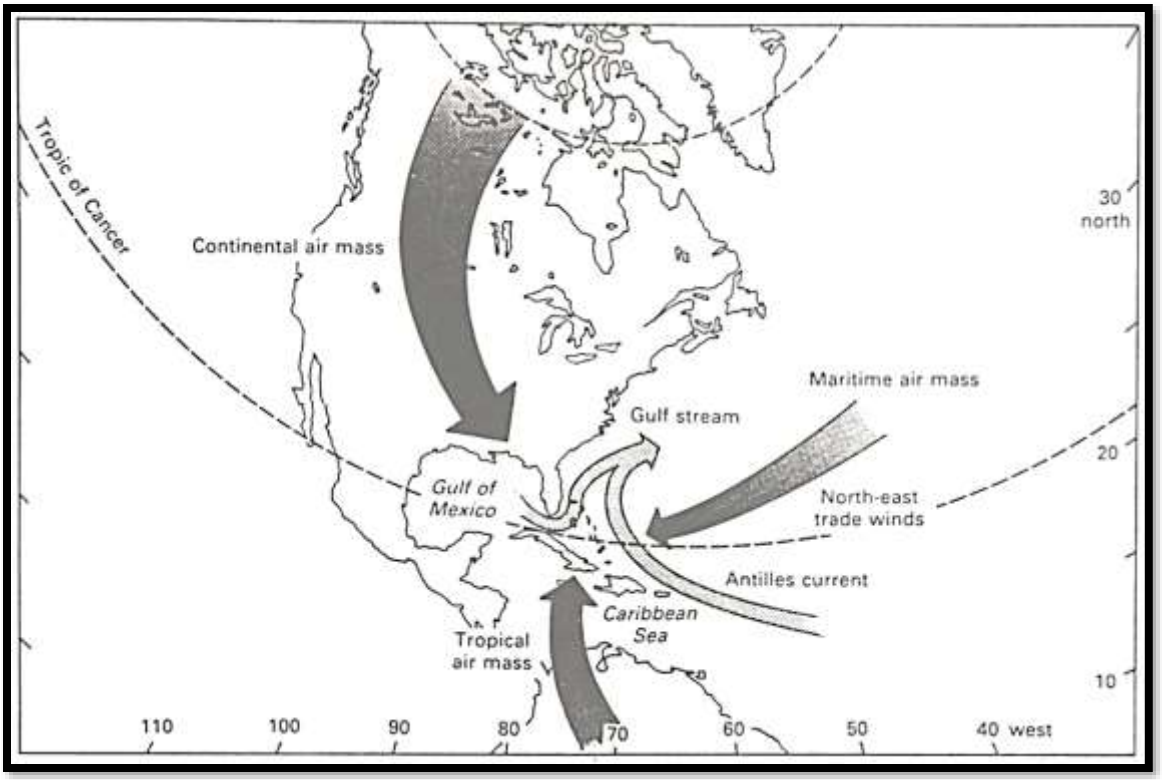


Figure 55. Air masses (winds) and ocean currents affecting The Bahamas. Source: Sealey, 1994.

In terms of marine and coastal habitats, the Bahamas' banks offer a marine sediment of pure calcium carbonate in forms of aragonite, and a lesser amount of calcite from coralline algae and foraminifera. Habitats within the Bahamas Archipelago vary, with interior platforms generally more turbid due to tidal circulation and more variable in temperature and salinity compared to the clear, warm coastal waters. As a result, reef development is inhibited in these interior platforms.

The preservation of these diverse oceanographic conditions and marine habitats is of utmost importance given the integral role they play in the Bahamian economy and local ecosystems[44].

Natural Hazards, Vulnerability, and Islands Risk

The Risk and Vulnerability Assessment (RVA) conducted by the Pacific Disaster Center as part of the The Bahamas National Disaster Preparedness Baseline Assessment performed a Multi-Hazard Risk Assessment for The Bahamas[45].

The results indicate the country is subject to Hurricanes (100% exposure), Storm Surges (48% exposure), Flooding (24% exposure), Wildfires (12% exposure), Landslides (1,3% exposure) and Sea-Level Rise (1%).

[44] Buchan, K. C. 2000. The Bahamas.

[45] PDC. (2021). The Bahamas National Disaster Preparedness Baseline Assessment.

As it was stated above, tropical cyclones are the most significant natural hazards to which Bahamas is exposed due to their frequency, intensity, and the fact that the country is an archipelago comprised of over 700 small islands located in the "Hurricane Belt" of the Atlantic Ocean. Risks associated with tropical cyclones include storm surge, high winds, and heavy rainfall. Just for 2024, The National Oceanic and Atmospheric Administration (NOAA) projects 8 to 13 hurricanes, with 4 to 7 of those being major hurricanes[46]. There is an estimated US$ 40,9 billion of potential economic exposure to hurricane winds category 1 or higher and the entirety of the population exposed.

Flooding is the second most important natural hazard for the country, related to the fact that 80% of the land surface is only a meter or less above mean sea level and topography is generally of low relief and flat terrain. There is an estimated US$ 7,9 billion of potential economic exposure and 92.786 people exposed to flooding. Out of the critical infrastructure exposed, there are 10 airports, 13 seaports, 43 health centers and 50 schools identified[47].

Wildfires are also identified by PDC as natural hazards of significance for the country, exacerbated by the extreme heat and dry conditions stemming from Climate Change. The month of May 2024 has seen wildfires break in New Providence, Grand Bahamas, Abaco and Andros, with flames scorching coppice and pine forests[48]. In Bahamas there have been 109 VIIRS fire alerts reported so far in 2024 considering high confidence alerts only. This total is high compared to the total for previous years going back to 2012. The most fires recorded in a year was 2013, with 149[49]. There is an estimated US$ 5,6 billion of potential economic exposure and 47.711 people exposed to wildfires.

Landslides are identified by PDC as natural hazards of significance for the country and, while the topography of the islands means that they face limited landslide risk, the calcareous and fragile nature of

[46] https://www.bahamas.gov.bs/wps/portal/public/gov/government/news/disaster%20risk%20management%20authority%20streamlines%20response%20agencies%20for%20greater%20effectiveness%20this%20year%2C%20very%20active%20hurricane%20season%20predicted/!ut/p/b1/vZPJkqM4FEW_JT_AiZjxEsyMmAcDG4LBYLAB22AwfH3hjl5kVUR1brpKWiniSFc67wmJkRCJu3Sqq3Ss-y69vtcxleBA0lmWYHRGpFig-LiIkxqLSza6AdFXQCIBtQEWZC1axkwCfLf_iISyn8B80OeDNQfwQQcKYLyJoPeN6bmKo2HpEb-wrl8kOPry6mV-LutZfpLOcqWOufZMoZ-Uuj-ctSDkw2uoCCnxOFggpoVb20Pbla6BEV2MVaibDGJzbxpWexy47pipi5kfNKHd-O3eGK1HVaFfhsuuffAsTZRulaZqtBOCBa8rKL0WYVcJE6iseYrg9Z73zjlnGfsWrf5JjTQ2SGK5bBw9XSc4KVqxUM5aVmOc3M8W2pVHnHII0PA98cTdoxntBywraqmj9ok_atfV_vj41yf4zWC_9akicZ21n3PefoJPkkBJco9i--1tGI3SSLD6zOvtmrcGTcTQ8Qav2X4lqrVQm5h_tEGqApXD5Yna5dSsU0WtmJzAzt3T6oiRLu3qdsPoyAt3w218Pdz-lb4u8I5pqa3KIT6JovokavsEQTIzcmXes4ykyNyq88LvI2kWOT7l4d2V3Cqwz4MjvKZUUKSl9A1xdqaAsIO8PHba1JukMGYHuy-t01lvJB6qllqTm1OJ0OvqlGZDecjJbGoOXPM8T8OhKNiCebRcHHhtIxh1D0ynN2QRa5-wTMakTztwlk8o7TP5Qnb92PHDPeifYfOgmGGYx25KgtMu3DElwctnLh-rrR5HJP5Z-S8drmHfAO8v8A_wHzWNNoD-coIXAKCggHVc1AYMTSMeEgIicZvlpqyX1WlWB-oPQzF40QIAVQ2-dA1PmL29aozCAlio6Wu0eNBFDc9G9X2oF6Ljc9dd41PvLvsl0MS8_RZ4QCnNJ4Er4X86UCJNZnNEexZLYpsC6m8Hkn8qUDJ1-_BW6nFvpbgssxTETQH924H_fw0NuW9PyK31J0hOrrJLv0z24wfYqyeZ/dl4/d5/L2dBISEvZ0FBIS9nQSEh/

[47] PDC. (2021). The Bahamas National Disaster Preparedness Baseline Assessment.

[48] https://climatetrackercaribbean.org/caribbean/the-bahamas-burns/

[49] Global Forest Watch. (2024). https://www.globalforestwatch.org/dashboards/country/BHS/?category=fires

the soils means that they are vulnerable to soil loss caused by rain and wind action[50]. Landslides in the Bahamas are limited to small rock falls and rockslides along some of the low sea cliffs and are in response to wave action attacking the base of the slope[51]. The only other significant ground-failure phenomenon is the formation of sinkholes, which is a fairly common occurrence and has been observed during site visits. There is only an estimated US$ 670 million of potential economic exposure and 5.175 people exposed to landslides.

Lastly, sea level rise is also identified as a natural hazard of significance for the country, considering 80% of the land lies less than 1,5m above sea level. Moreover, Integrated sea-level rise projections and flood risk analysis indicate that floods reaching at least 0,5 m above high tide line at shore will become common events throughout most of the Caribbean within half a century (2050), and more likely sooner. The Bahamas confronts the greatest proportional threat of the Caribbean region since 32% of land, 25% of population and 13% of Internet access points are below 0,5m.

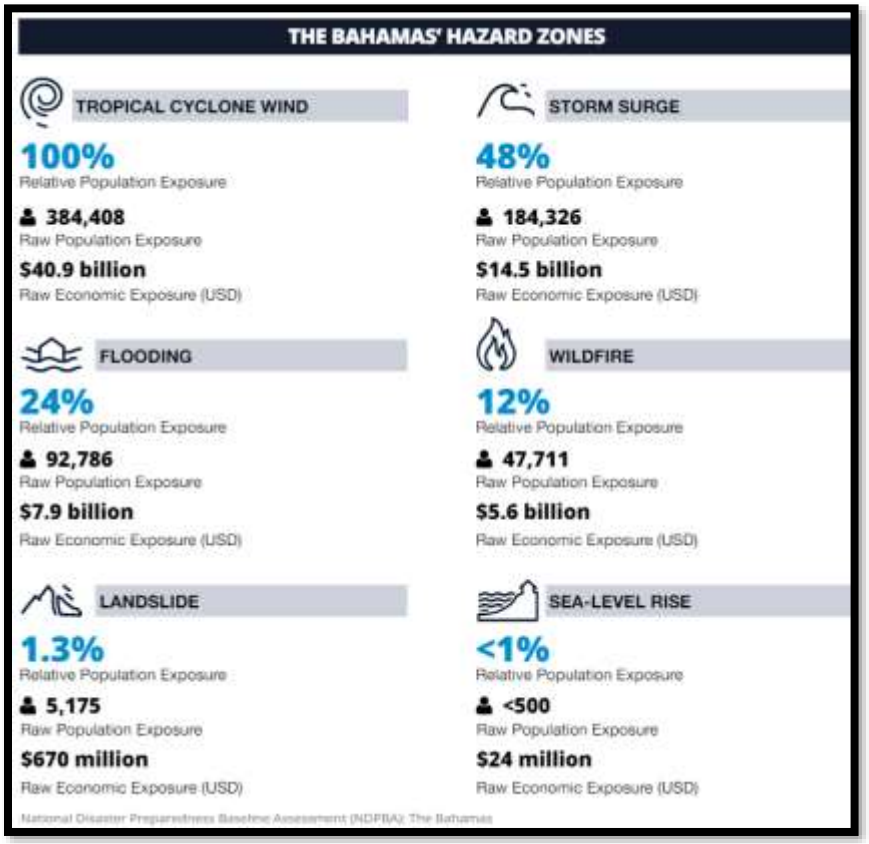


Figure 56. Results for Bahamas Hazard Zones. Source: Pacific Disaster Center, 2021.

The Multi-Hazard Risk combines hazard exposure, susceptibility to impact and the relative ability to absorb negative disaster impacts to provide a collective measure of how each province may be affected

[50] Climate Change Knowledge Portal. (2024.). https://climateknowledgeportal.worldbank.org/country/bahamas/vulnerability

[51] DeGraff, J.V., Bryce, R., Jibson, R.W., Mora, S., and Rogers, C.T. (1989). Landslides: Their extent and significance in the Caribbean. In E.E. Brabb

by hazard and disaster over time. It was calculated by averaging multi-hazard exposure, vulnerability, and coping capacity (Island Capacity and Logistics Capacity) for each island of The Bahamas.

In terms of the Multi-Hazard Exposure Index, it analyzes maximum potential population exposure, maximum potential economic exposure and critical infrastructure exposure for each island of The Bahamas.

Results show Abaco is at very high exposure, Eleuthera and New Providence at high exposure and, Bimini and Exuma at very low exposure.

Figure 57. Multi-Hazard Exposure Index per island. Source: PDC, 2021.

In terms of Vulnerability, defined as the increase susceptibility of communities and systems to the damaging effects of hazards, the subcomponents analyzed were: Population Pressure, Gender Inequality, Household Composition, Housing and Transportation, Economic Constrains, Clean Water Access Vulnerability and Environmental Stress.

The results of the analysis per island show that Eleuthera is at high vulnerability, Abaco and Exuma moderate vulnerability, and Bimini and New Providence low vulnerability.

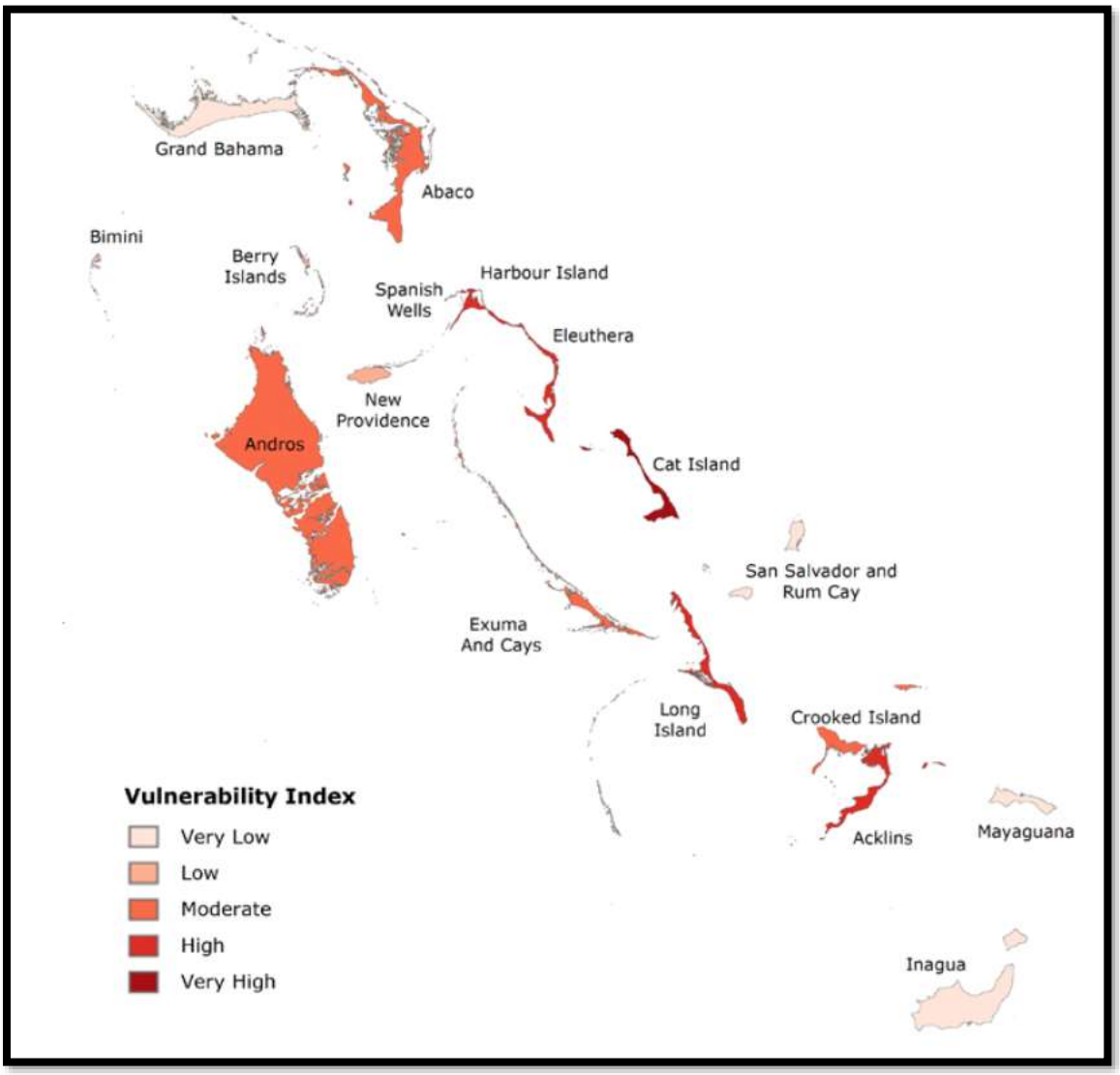


Figure 58. Vulnerability Index per island. Source: PDC, 2021.

In terms of Island Capacity, representing the societal and institutional resources that islands can leverage and mobilize to prepare for and bear disaster impacts, the subcomponents analyzed were: Economic Capacity, Governance, Environmental Capacity, Communications Capacity, Healthcare Capacities, Energy Capacities, Emergency Services Capacity and Transportation Capacity.

Results show New Providence and Exuma have a high island capacity, Abaco shows a moderate capacity and Bimini and Eleuthera a low capacity.

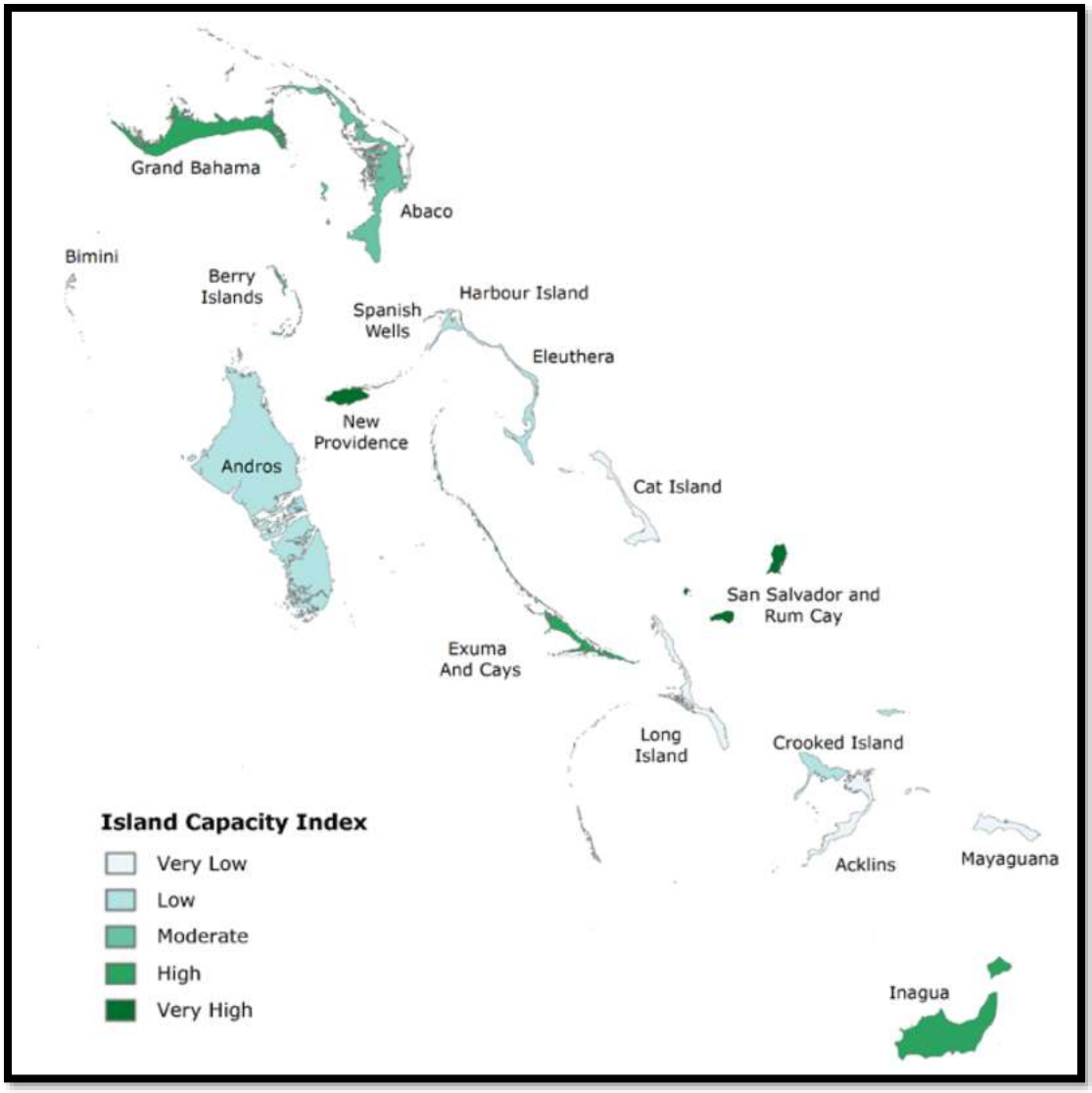


Figure 59. Island Capacity Index. Source: PDC, 2021.

Lastly, the Multi-Hazard Risk analysis results, combining multi-hazard exposure, vulnerability and Island and Logistics Capacity, show that Eleuthera is at high risk of natural disasters, Abaco is at moderate and New Providence, Exuma is at low risk, and Bimini are at very low risk.

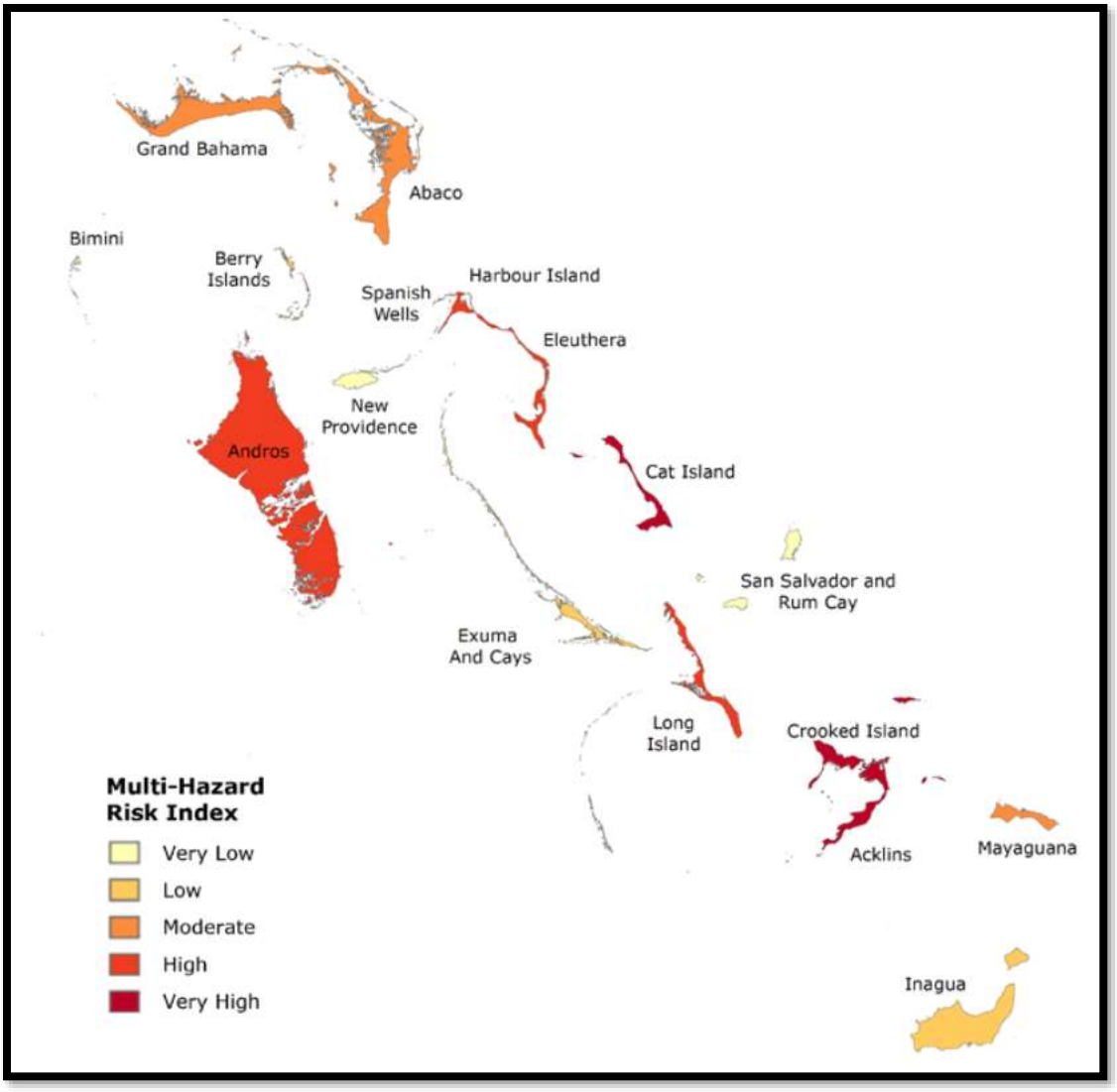


Figure 60. Multi-Hazard Risk Index per island. Source: PDC, 2021.

Climate Change

The Bahamas is particularly vulnerable to climate change due to its low-lying geography, making it susceptible to sea-level rise, increased hurricane intensity, and coastal erosion. According to the Bahamas' Nationally Determined Contribution (NDC), these impacts threaten vital sectors such as tourism, fisheries, and infrastructure. The NDC emphasizes the need for adaptation strategies, including the development of coastal defenses and sustainable land-use practices to mitigate these risks[52].

[52] The Commonwealth of The Bahamas. 2022. First Biennial Update Report (BUR1). United Nations Framework Convention on Climate Change (UNFCCC).

The IPCC Sixth Assessment Report highlights that small island states like The Bahamas face existential threats from climate change. The report underscores the increased frequency of extreme weather events and their catastrophic impacts on economies and ecosystems. For The Bahamas, this translates to more frequent and severe hurricanes, leading to extensive damage to homes, businesses, and critical infrastructure, and exacerbating challenges related to freshwater availability due to saltwater intrusion into aquifers[53].

4.3.2. Biological Environment Baseline of the Indirect Area of Influence

Flora

The Bahamas is a subtropical, dry island archipelago with pronounced warm/wet and cool/dry seasons. The island's relatively flat topography and uniform geology result in a limited variety of plant communities compared to other Caribbean Islands. Most of the terrestrial plant community is Dry Broadleaf Evergreen Formations (DBEF) and Pine Woodlands (PW). Coastal terrestrial systems, while widespread throughout the archipelago, occupy a smaller footprint than the more extensive DBEF and PW communities.

Within The Bahamas archipelago a mosaic of natural systems exists, representative of the tropical Americas: coral reefs, mangroves, sea-grass meadows, lagoons, and beaches. The coral reefs are rich with fish and marine life. Biologically, The Bahamas can be described as an oligotrophic system because its waters and land are low in nutrients. This tightly associated group of organisms recycle and reuse organic material to produce forests, wetlands, and reefs from near-desert conditions[54].

The classification system used to categorize plant communities in the Bahamas is based on Areces-Mallea et al, 1999[55]. This system splits most communities into different formations and alliances, but not associations. According to this classification, the vegetation types in the Bahamas can be categorized into several distinct communities:

Mangrove Forests: These are primarily found along coastal areas and are dominated by species such as *Rhizophora mangle* (red mangrove), *Avicennia germinans* (black mangrove), and *Laguncularia racemosa* (white mangrove). These forests play a crucial role in coastal protection and provide habitats for various marine and bird species.

[53] IPCC. (2023). Summary for Policymakers. In: Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, Geneva, Switzerland, pp. 1-34, doi: 10.59327/IPCC/AR6-9789291691647.001

[54] BEST (The Bahamas Environment, Science and Technology Commission). (2022). The Bahamas Environmental Handbook. Ministry of Agriculture and Fisheries, Nassau, Bahamas. ISBN: 976-8170-41-7.

[55] Areces-Mallea, A. E., Weakley, A. S., Li, X., Sayre, R. G., Parrish, J. D., Tipton, C. V., & Boucher, T. (1999). A guide to Caribbean vegetation types: Preliminary classification system and descriptions (N. Panagopoulos, Ed.). The Nature Conservancy.

Seagrass Beds: Dominated by species such as *Thalassia testudinum* (turtle grass) and *Halodule wrightii*, seagrass beds are vital for maintaining the health of marine ecosystems. They provide feeding grounds for marine life and contribute to sediment stabilization.

Coppice Forests: These are dry evergreen forests found on higher grounds, often characterized by species like *Bucida spinosa* and *Metopium toxiferum*. These forests are adapted to dry conditions and play a significant role in the biodiversity of the Bahamas.

Rocky Shores and Sandy Plains: Vegetation in these areas includes herbaceous plants and shrubs that can tolerate harsh coastal conditions. Species such as *Ipomoea pes-caprae* and *Sesuvium portulacastrum* are common in these regions.

Tidal Flats and Salt Ponds: These areas support unique plant communities adapted to saline conditions, including halophytes like *Rhizophora mangle* and *Laguncularia racemosa*. These ecosystems are crucial for bird habitats and nutrient cycling.

Pine Forests: These forests are dominated by *Pinus caribaea var. bahamensis*. They are fire-adapted ecosystems and are essential for the local timber industry and biodiversity conservation.

On **Abaco** Island, the dominant vegetation type is pine rockland vegetation[56]. The upper canopy is composed of Bahamian pine, while the understory consists of tropical hardwoods, including poisonwood, chicken toe (*Tabebuia bahamensis*), cassada wood *(Bumelia salicifolia*), and saw palmetto (*Serenoa repens*). Open and flat savannas are dominated by sawgrass (*Cladium jamaicensis*), with occasional stands of silver palm (*Cocothrinax argentata*) and brier tree (*Bucida spinosa*) scattered throughout. The transitional communities between pine rocklands and savannas are the freshwater swamps, where the water table is close to the surface. Vegetation in these areas includes buttonwood mangrove, myrsine (*Myrsine floridana*), bush iva (*Iva cheranthifolia*), and other shrubs. Pinelands are maintained by frequent low-intensity ground fires that can occur throughout the year[57]. These fires can be triggered by lightning strikes during winter and summer or by human activities. Some fires are intentionally set for pig hunting, while others may escape from agricultural or domestic sources. Bahamian pine is well adapted to frequent low-intensity fires, thanks to its thick bark, needle clusters, and high open canopies[58]. Pinelands with a bracken fern (*Pteridium aquilinum*) dominated understory are believed to experience a higher fire frequency than other stands[59].

Bimini Islands, comprising North and South, are characterized by a variety of habitats including coral reefs, seagrass beds, mangrove forests, and sand flats. Trave and Sheaves (2014)[60] mentioned that these

[56] Correll, D. S. & Correll, H. B. (1982). *Flora of the Bahama Archipielago*.

[57] E. Kjellmark. (1995). The effects of late Holocene climate change and human disturbance on the vegetation and fire history of Andros Island, Bahamas.

[58] Miller, A. C. (2007). Fire history of Caribbean pine (Pinus caribaea var. bahamensis (Griseb.) W.H. Barrett & Golfari) forests on Abaco Island, The Bahamas. M.S. Research Paper. University of Tennessee, Knoxville.

[59] R. Myers y C. Bergh. (2004). Fire management assessment of the Caribbean pine forest ecosystems on Andros Islands, Bahamas.

[60] Trave, C., & Sheaves, M. (2014). Bimini Islands: A characterization of the two major nursery areas; status and perspectives.

interconnected environments support a high level of biodiversity and play a crucial role in maintaining the ecological balance of the region. The flora of Bimini includes various species of seagrasses, mangroves, and algae, which contribute to the health and productivity of these marine ecosystems.

Southern Bimini, in particular, showcases an assemblage of flora that is essential to the ecological integrity of the area. The mangrove forests here, dominated by *Rhizophora mangle (red mangrove)*, are critical for coastal protection and provide a habitat for numerous species. These mangroves help to stabilize the shoreline, trap sediments, and offer nursery grounds for juvenile fish and invertebrates.

In addition to mangroves, Southern Bimini is home to extensive seagrass meadows, primarily composed of *Thalassia testudinum* (turtle grass) and *Halodule wrightii* (shoal grass). These seagrasses are vital for the marine ecosystem as they offer food and shelter to a variety of marine organisms, including commercially important fish species. The seagrass meadows also play a significant role in maintaining water quality and preventing erosion by stabilizing the seabed.

Eleuthera showcases a diverse range of vegetation types influenced by both natural and anthropogenic factors. The island's flora is primarily composed of broadleaved trees and shrubs, creating dense areas of dry forest and scrubland. Among the prevalent species are *Acacia choriophylla*, *Bursera simaruba*, *Coccoloba sp., Lysiloma latisiliquum, Metopium toxiferum, Reynosia septentionalis, Erithalis fruticosa, Eugenia sp., Chiococca sp., Smilax auriculata*, and *Lantana involucrata*[61].

According to Currie (2005), historically, Eleuthera experienced extensive agricultural activity, which has significantly shaped its current landscape. The decline in farming has led to a mosaic of broadleaf habitats of varying ages, from recently disturbed abandoned plantations to mature tall coppice. The structure of these habitats varies markedly, with mature vegetation typically featuring taller canopies and less ground cover compared to younger, more recently disturbed areas. For instance, mature coppice habitats are characterized by canopy heights of up to 11.9 meters and a dense shrub layer, whereas abandoned plantations have shorter vegetation and higher ground cover percentages.

The vegetation of **New Providence** is diverse and characterized by several distinct ecosystems. One of the primary vegetative areas is the pineyards, which are composed of Caribbean pine (*Pinus caribaea var. bahamensis*). These pineyards are vital for the island's ecology, providing habitat for numerous endemic species[62].

In addition to the pineyards, New Providence features extensive mangrove ecosystems. The Bonefish Pond National Park, for example, is a significant conservation area that protects mangrove habitats, which are crucial for coastal protection and biodiversity.

Another important vegetative zone is the coppice forest. These forests are found in urban environments and are protected within areas like the Primeval Forest National Park and the Retreat Garden. The

[61] Currie, D., Wunderle, J. M., Ewert, D., & Davis, A. O. (2005). Winter avian distribution and relative abundance in six terrestrial habitats on southern Eleuthera, The Bahamas.

[62] One Earth. (n.d.). Bahamian Pineyards. Retrieved from https://www.oneearth.org/ecoregions/bahamian-pineyards/

Primeval Forest National Park, in particular, preserves a unique urban coppice forest along with significant geological formations, demonstrating the island's natural history and ecological diversity.

As reported by CaMPAM[63], **Exuma** encompasses diverse terrestrial habitats including coppice and coastal strand environments. The flora includes unique and region-specific plant species such as spider lilies and black torch flowers.

Fauna

The fauna of the Bahamas can be classified mainly into terrestrial herpetofauna, mammals, birds and marine fauna.

The native herpetofauna of The Bahamas is derived primarily from Cuba and Hispaniola, and numbers 46 species comprised of three frogs (including one endemic),25 lizards (13 endemic), 11 snakes (7 endemic), two freshwater turtles, and five sea turtles. Of the native terrestrial species, 85% are either not assessed or data deficient to affirm IUCN listing, thus stressing the need for more research in The Bahamas[64].

Many mammalian species that occur on The Bahamas are bats, which account for 10 species. As these islands become increasingly developed, human disturbance of bat roosting and foraging habitat poses a threat to terrestrial mammal diversity[65].

Based on Birdlife International's official records, the data for The Bahamas pertains to a total of 245 bird species, with 9 of them being classified as globally threatened.

The bird species in the islands can be categorized into various groups. There are 135 land birds and 37 seabirds, making up a significant portion of the total bird diversity. Additionally, there are 201 migratory birds, indicating the importance of this region as a migratory corridor. Furthermore, 95 waterbirds are present, highlighting the significance of aquatic habitats within the area.

Based on the IUCN Red List assessment, 2 bird species have been classified as extinct (*Riccordia bracei* and *Riccordia elegans*), and none are currently extinct in the wild. However, 9 species are categorized as globally threatened (see **Figure 61**), indicating the urgency of conservation efforts for their survival. The percentage of threatened bird species is relatively low at 4% when compared globally (155th position).

[63] CaMPAM Network and Forum. https://campam.gcfi.org/

[64] C. R. Knapp, J. B. Iverson, S. D. Buckner y S. V. Cant. (2011). Conservation of amphibians and reptiles in The Bahamas.

[65] K. A. Speer, J. Soto-Centeno, N. A. Albury, Z. Quicksall, M. Marte y D. L. Reed. (2015). Bats of the Bahamas: Natural history and conservation.

Scientific name	English name	Family	Global IUCN Red List Category
Chaetura pelagica	Chimney Swift	Apodidae (Swifts)	VU
Hydrobates leucorhous	Leach's Storm-petrel	Hydrobatidae (Northern Storm-petrels)	VU
Pterodroma caribbaea	Jamaican Petrel	Procellariidae (Petrels, Shearwaters)	CR (PE)
Rissa tridactyla	Black-legged Kittiwake	Laridae (Gulls, Terns, Skimmers)	VU
Tyrannus cubensis	Giant Kingbird	Tyrannidae (Tyrant-flycatchers)	EN
Tachycineta cyaneoviridis	Bahama Swallow	Hirundinidae (Swallows and martins)	EN
Sitta insularis	Bahama Nuthatch	Sittidae (Nuthatches)	CR
Icterus northropi	Bahama Oriole	Icteridae (New World blackbirds)	EN
Setophaga flavescens	Bahama Warbler	Parulidae (New World warblers)	EN

Figure 61. Globally Threatened species in The Bahamas[66]

The majority of the bird species (221) are currently considered as Least Concern, implying a relatively stable population and lower conservation concern.

Regarding marine fauna, the Andros Barrier Reef in the Bahamas is the world's 3rd largest barrier reef, and the 3rd largest living organism on the planet, measuring 190 miles long. The reefs are populated with eels, clownfish, angelfish, barracudas, Nassau grouper, nurse sharks and porcupine fish. Other marine life in The Bahamas waters are sponges, conch, lobster, hogfish, snapper, bonefish, and many other fish. Several marine mammal's species observed along the coastline include humpback whales (*Megaptera novaeangliae*), blue whales (*Balaenoptera musculus*, IUCN Endangered), Atlantic spotted dolphins (*Stenella frontalis*), and Cuvier's beaked whale *(Ziphius cavirost*). The Bahamas support at least two species of sea turtles of which include the Green Turtle (*Chelona mydas*) and the Hawksbill (*Eretmochelys imbricata*, IUCN Critically Endangered) (ERM, 2021).

According to Patterson (2014), **Abaco** Island hosts a diverse range of fauna that thrive across its varied habitats. The terrestrial fauna of Abaco includes several endemic and native species, migratory and resident avifauna, herpetofauna, and bats (a single group of native land mammals)

Lee (1996)[67] states that 31% of the birds identified during a winter survey in Abaco National Park were migratory. Migratory bird species seen wintering in Abaco include the endangered Kirtland's Warbler, which nests in Michigan[68] as well as Piping Plovers originating from a threatened population in the north-eastern United States[69].

[66] Source: Birdlife, 2023.

[67] Lee, D. (1996). Winter Avifauna of the Abaco National Park (Part 1). Bahamas Journal of Science, 3(3), 8-15.

[68] Donner, D.M., Ribic, C.A., and Probst, J.R. (2009). Male Kirtland's Warblers' patch-level response to landscape structure during periods of varying population size and habitat amounts. Forest Ecology and Management.

[69] Pover, T. (2012, April-May-June). Partnering for Piping Plovers: A Conservation Success Story. Endangered Species Bulletin.

Based on information from the Bimini Biological Field Station Foundation (BBFSF)[70], **Bimini** hosts a diverse array of terrestrial species. The Bimini Boa (*Epicrates striatus fosteri*), an endemic snake, thrives in the island's unique habitats such as mangroves and hardwood hammocks. Several lizard species, including the Brown Anole (*Anolis sagrei*) and the Curlytail Lizard (*Leiocephalus carinatus*), are also prevalent. Bird species such as the Bananaquit (*Coereba flaveola*) and the Antillean Nighthawk (*Chordeiles gundlachii*) can be commonly observed around forested areas and open spaces.

The island of **Eleuthera** boasts a diverse and rich avian population across its various habitats. According to Currie et al. (2005), the island's six terrestrial habitats, ranging from recently disturbed abandoned plantations to mature tall coppice, host a wide variety of bird species. Permanent residents like the Thick-billed Vireo, Greater Antillean Bullfinch, Bahama Mockingbird, Black-faced Grassquit, and Bananaquit are particularly abundant in mature vegetation. Winter residents such as the Gray Catbird, Prairie Warbler, and Palm Warbler also frequent these habitats, with their abundance often correlating with the maturity and structural complexity of the vegetation. Notably, the island supports endemic species like the Bahama Woodstar and Bahama Yellowthroat, which, along with several migratory species, reflect the ecological importance of Eleuthera's habitats.

New Providence hosts a diverse array of wildlife across its various national parks. At Bonefish Pond National Park, visitors can spot bonefish and a variety of wetland birds. Harrold and Wilson Ponds National Park is notable for its herons, egrets, ibises, and cormorants, making it an Important Bird Area. Primeval Forest National Park offers sightings of various bird species and unique forest fauna. The Retreat Garden is renowned for its exotic palms and attracts migratory warblers, adding to the rich birdwatching opportunities on the island. Due to this variety of avian fauna, these species can often be found throughout the island.

Based on CaMPAM's[71] findings, Exuma is home to the hutia (*Geocapromys ingrahami*), the only native land mammal in the Bahamas. Other terrestrial animals include the mini boa constrictor and land crabs. The avian population features species such as the white-tailed tropicbird, green heron, and osprey. Marine fauna includes green turtles, southern rays, spiny lobsters, queen conchs, and various corals, with the invasive lionfish also present.

None of the fauna identified in the information collected from Abaco, Bimini, Eleuthera, Exuma and New Providence corresponds with the globally threatened species listed in The Bahamas IUCN Red List assessment. However, this does not imply that these species, particularly birds, are not present in the area of interest.

[70] Bimini Biological Field Station Foundation (BBFSF) is a nonprofit organization located on the island of South Bimini, Bahamas. https://www.biminisharklab.com/

[71] CaMPAM Network and Forum. https://campam.gcfi.org/

Protected areas and KBAs

Abaco

Abaco is home to a diverse array of protected areas encompassing various ecosystems, including terrestrial, marine, and mixed environments. The island boasts 23 designated protected zones, each serving a vital role in preserving the unique flora, fauna, and habitats of the region**.**

Despite the extensive network of protected areas in Abaco, none of these lies within the immediate vicinity of the proposed project area. The closest protected site is the Abaco Marls National Reserve, located approximately 3 kilometres west of the project site (**Figure 62**).

The **Abaco Marls National Reserve**, located on the western side of Abaco, spans an extensive area of 192,500 acres of mangrove flats[72]. This vital wetland habitat plays a crucial role as a nursery for commercially and ecologically important species such as Queen conch, groupers, and turtles. The reserve is heavily utilized by local bone fishing guides and serves as an essential habitat for various species.

The primary objective of the reserve is to protect this critical environment while allowing for cultural and recreational activities, such as fishing, under strict regulations to ensure sustainability.

[72] https://rollingharbour.com/tag/abaco-marls-national-reserve/

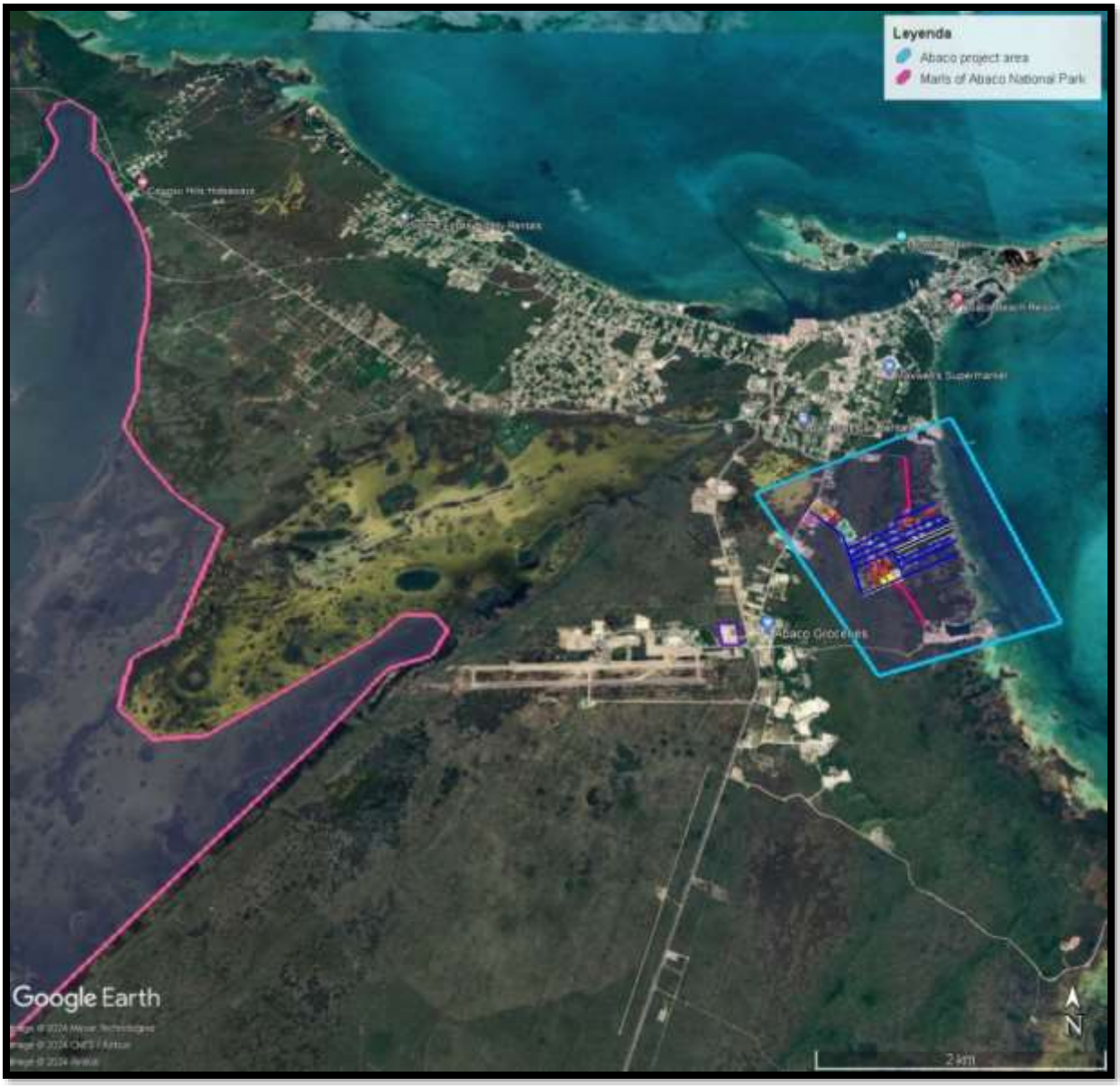


Figure 62 - Abaco project area and Marls of Abaco National Park. Source: PlanEHS, 2024.

Bimini

An extensive review of Bimini's environmental data indicates that there are no designated protected areas or Key Biodiversity Areas (KBAs) identified within within or near the project areas.

Eleuthera

Within the southern section of the project area, corresponding to the Eleuthera Water Main Extension from Tarpum Plant to Jack's Bay, the Key Biodiversity Area (KBA) South Tarpum Bay[73] has been identified.

[73] Key Biodiversity Areas Partnership (2024) Key Biodiversity Areas factsheet: South Tarpum Bay.

South Tarpum Bay, has been confirmed as a Key Biodiversity Area (KBA) of global importance[74]. The KBA has an area of 175 km^2. There is a single species with a Near Threatened IUCN classification (the bird *Setophaga kirtlandii*), which would trigger IDB's definition of critical habitat.

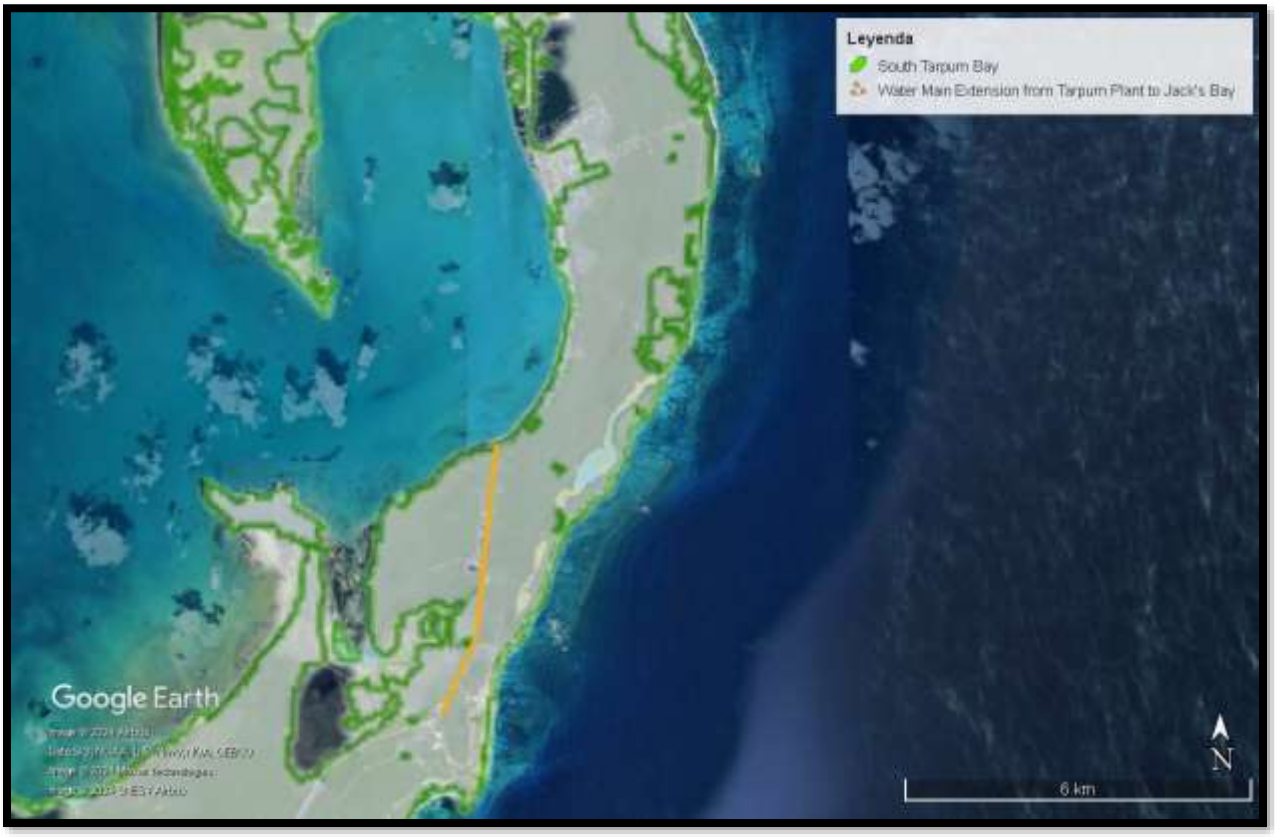


Figure 63 – Eleuthera project area and South Tarpum Bay. Source: PlanEHS, 2024.

In addition to these species, South Tarpum Bay is home to other avian species that, while not triggering the KBA criteria, contribute to its ecological value. Among these are the White-crowned Pigeon (*Patagioenas leucocephala*) and Bahama Woodstar (*Calliphlox evelynae*), both assessed in 2006 and classified as Near Threatened (NT) and Least Concern (LC), respectively.

Exuma

Exuma is home to three major protected areas shown in the following map:

[74] https://www.keybiodiversityareas.org/site/factsheet/19828

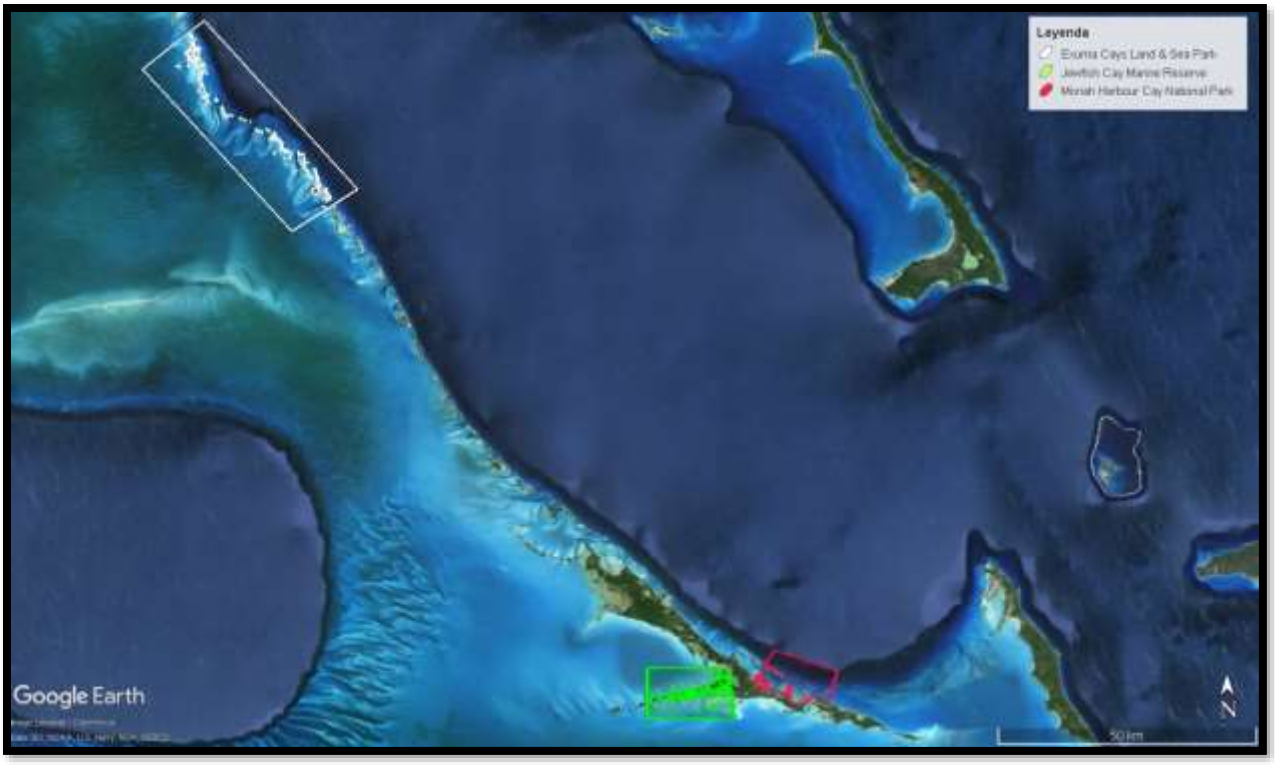


Figure 64 - Exuma Protected Areas. Source: PlanEHS, 2024.

According to The Nature Conservancy[75], The Exuma Cays Land and Sea Park, encompassing over 100,000 acres of ocean, islands, blue holes, coral reefs, and estuaries, is the world's first land and sea park and the oldest national park in The Bahamas. This designation has allowed populations of commercially important species such as queen conch, Nassau grouper, and spiny lobster to flourish. The park's waters, provide a habitat for sea turtles and the land serves as a refuge for the hutia, rare iguana species, and marine birds such as terns and white-tailed tropicbirds.

The Jewfish Cay Marine Reserve spans a marine area of 121 km² and a total area of 126 km²[76]. The reserve's primary objectives are to enhance fish stocks, protect ecosystems and species, provide recreational opportunities, and safeguard cultural heritage.

The reserve enforces strict protection measures, prohibiting any removal of marine life or fishing activities to preserve biodiversity and maintain ecological balance. Activities such as the removal of historic artifacts are prohibited, while anchoring, discharge, diving, entry, and speed are allowed under regulated conditions.

The Moriah Harbour Cay National Park, established in 2002 and managed by the Bahamas National Trust (BNT), covers significant marine and coastal areas between Great Exuma and Exuma Sound. The park's

[75] https://www.nature.org/

[76] ProtectedSeas. (2023). Exuma (Jewfish Cay) Marine Reserve. ProtectedSeas Navigator.

western boundary begins just west of Crab Cay, extending approximately 3.5 nautical miles into Exuma Sound, while the eastern boundary extends three nautical miles to sea from Forbes Hill Beach, east of Pigeon Cay. The land and seascapes protected within the National Park include pristine beaches, sand dunes, blue holes, coral reefs, mangrove creeks, coppice forests and seagrass meadows, home to populations of endangered corals, sea turtles, conch, lobster, grouper, birds, and sharks.

In addition to the three national parks mentioned, there are several small Wild Bird Reserves in the Exuma region. These reserves, managed by the Ministry of Environment and Housing, provide critical habitats for various bird species. Notable reserves include Betty Cay, Rock off Hog Cay, Guana Cay, Harvey Cay, Big Galliot Cay, Goat Cay, Channel Cays & Flat Cay, Little Darby Island, and Big Darby Island.

New Providence

An extensive review of New Providence's environmental data indicates that there are no designated protected areas or Key Biodiversity Areas (KBAs) identified within or near the project areas.

4.3.3. Socioeconomic Environment Baseline of the Indirect Area of Influence

Population and Growth

The following table is based on official data from the 2010 and 2022 Bahamian censuses. It is important to mention that the results for 2022 are preliminary, so they may vary from the results. The data were used anyway to make an estimated analysis of growth in the intercensal period.

Table 22 - Total population by Sex in The Bahamas, Abaco, Bimini, Eleuthera, Exuma and New Providence in the 2010-2022 period.[77]

Island	Population 2010			Population 2022 (preliminary results)		
	Male	Female	Total	Male	Female	Total
All Bahamas	170.257	181.204	351.461	192.544	206.770	399.314
Abaco	8.902	8.322	17.224	7.998	8.589	16.587
Bimini	1.063	925	1.988	1.166	1.252	2.417
Eleuthera	4.058	4.144	8.202	4.459	4.788	9.247
Exuma	3.468	3.460	6.928	3.517	3.776	7.293
New Providence	117.909	128.420	246.329	142.979	153.543	296.522

During the intercensal period from 2010 to 2022, the population of The Bahamas experienced significant changes, as shown in **Table 22**. The total population increased from 351,461 to 399,314, representing a percentage change of approximately 13.62%. This growth resulted in an average annual growth rate of around 1.13%.

For males in The Bahamas, the population grew from 170.257 to 192.544, resulting in a percentage change of approximately 13%. The average annual growth rate for males during this period is approximately

[77] Source: Self-compiled using information from the 2010 and 2022 censuses.

1.08%. For females in The Bahamas, the population increased from 181.204 to 206.770, with a percentage change of approximately 14.11%. The average annual growth rate for females is approximately 1.18%.

On the individual islands, Abaco, Bimini, Eleuthera and New Providence, the population dynamics by gender were as follows:

For Abaco, the total population decreased from 17,224 to 16,587, resulting in a percentage change of approximately -3.70%. The average annual growth rate for Great Abaco during this period is approximately -0.35%. Specifically, the male population in Great Abaco changed from 8902 to 7998, resulting in a percentage change of approximately -10.13%, while the female population decreased from 8322 to 8589, representing a percentage change of approximately 3.21%.

For Bimini, the total population increased from 1.988 to 2.417, resulting in a percentage change of approximately 21,6%. The average annual growth rate for Bimini during this period is approx. 1,8%. Specifically, the male population in Bimini changed from 1.063 to 1.166 (9% increase) while the female population changed from 925 to 1.252 (26% increase).

For Eleuthera, the total population increased from 8.202 to 9.247, resulting in a percentage change of approx. 13%. The average annual growth rate is approx. 1%. Specifically, the male population in Eleuthera changed from 4.058 to 4.459 (10% increase) while the female population changed from 4.144 to 4.788 (16% increase).

For Exuma, the total population increased from 6,928 to 7,293, resulting in a percentage change of approximately 5.3%. The average annual growth rate is approximately 0.4%. Specifically, the male population in Exuma changed from 3,468 to 3,517 (1.4% increase) while the female population changed from 3,460 to 3,776 (9.1% increase).

For New Providence, the total population increased from 246.329 to 296.522, resulting in a percentage change of approx. 20%. The average annual growth rate is approx. 1,7%. Specifically, the male population in New Providence changed from 117.909 to 142.979 (21% increase) while the female population changes from 128.420 to 142.979 (20% increase).

Infrastructure and Services

Household size

Household size is a key indicator for examining social issues such as poverty and health, especially as it relates to the risk of exposure to communicable diseases. The following table provides insights into the population and household statistics for The Bahamas in general, as well as for the specific islands of Abaco, Bimini, Eleuthera, Exuma and New Providence according to the census results:

Table 23 – Average household size by island in The Bahamas, Abaco, Bimini, Eleuthera and New Providence in the 2010-2022 period[78]

Island	2010			2022 (preliminary results)		
	Population	Households	Average household size	Population	Households	Average household size
All Bahamas	351.461	102.862	3,42	399.314	118.221	3,38
Abaco	17.224	5.197	3,31	16.587	6.192	2,68
Bimini	1.988	751	2,65	2.417	1.130	2,14
Eleuthera	8.202	2.718	3	9.247	3.668	2,52
Exuma	6.928	2.028	3,42	7.293	2.348	3,11
New Providence	246.329	70.222	3,5	296.522	79.660	3,72

For The Bahamas as a whole, the number of households rose from 102,862 to 118,221, indicating an increase of around 14.93%. There was a slight decrease in the average household size, which declined from 3.42 in 2010 to 3.38 in 2022.

Focusing on Abaco, there was also an increase in the number of households, from 5,197 to 6,192, indicating a 19.15% growth. The average household size decreased significantly from 3.31 in 2010 to 2.68 in 2022.

In the case of Bimini, there was an increase in the number of households, from 751 to 1.130, a 50% growth. The average household size decreased significantly from 2,65 to 2,14, showing a 19% reduction.

Eleuthera showed a 35% increase in households, from 2.718 to 3.668. In terms of household size, it also shows a significant decrease from 3 to 2,52, a 16% reduction.

Focusing on Exuma, there was also an increase in the number of households, from 2,028 to 2,348, indicating a 15.8% growth. The average household size decreased significantly from 3.42 in 2010 to 3.11 in 2022, showing a 9.1% reduction.

Lastly, New Providence showed a 13,4% increase in households from 70.222 to 79.660. In terms of household size, it is the only island that exhibits an increase of 6%, from 3,5 to 3,72.

Accessing Healthcare and Emergency Medical Services

The Government of The Bahamas has the National Health Insurance Authority (NHIA), established under the National Health Insurance Act. Since 2017, it has been offering healthcare to the country's inhabitants.

[78] Source: Self-compiled using information from the 2010 and 2022 censuses.

According to the NHIA's official website[79], Bahamian citizens and residents can enroll online, by phone or in person and must have a valid NIB smart card. Enrollees become NHI beneficiaries by selecting their preferred primary care provider and receive services at no cost at the point of care.

Based on 2010 census data, approximately 47.2% of the total Bahamian population has health insurance. Out of the islands analyzed, New Providence showed the highest percentage of population with health insurance, 49,5%, then Exuma with 42%, Eleuthera with 40,8%, Abaco with 38,5% and lastly Bimini with only 23% of its population accessing health insurance.

In The Bahamas there are only three public hospitals, two in Nassau (Princess Margaret Hospital, located adjacent to **PMH Lift Station** and Sandilands Rehabilitation Centre) and the other one in Freeport, Grand Bahama (The Rand Memorial Hospital)[80]. The medical centers in the rest of the islands are community clinics: Abaco Island (9), Bimini (2), Eleuthera (14)[81].

Access to electricity

The World Bank's official website[82] states that electricity access in The Bahamas is universal, reaching 100% of the population.

Access to water

Approximately 83% of the country's water systems are owned, operated and managed by WSC, while the remaining 17% fall under private companies such as Gran Bahama Utility Company (GBUC) for Gran Bahama and Paradise Island Utilities for Paradise Island (New Providence). Moreover, New Providence Water Development Company (NPWDCO) provides water to some areas of New Providence where it has private subdivisions.

WSC's potable water and wastewater collection and treatment coverages are low compared to other utilities in the Caribbean. According to WSC Corporate Business Plan 2023-2028, in 2022 the overall estimated level of potable water supply coverage was 63%. The water supply coverage for New Providence was 61% which is lower than the 70% estimate for the Family Islands.3 Wastewater coverage

[79] https://www.nhibahamas.gov.bs/

[80] The Commonwealth of The Bahamas. 2022. First Biennial Update Report (BUR1). United Nations Framework Convention on Climate Change (UNFCCC).

[81] https://www.bahamas.gov.bs/wps/portal/public/Health/Medical%20Facilities/!ut/p/b1/vZTZbqMwFIafpQ9AMWvCJQQChLBjthsEgRC24CQUEp5-6GikGVVqejPt8ZWl7_jT-W0Zj_EQj8_pWJXpUPXntH3fx2xCAVnneXqtywxggQqtPW-tFNK06AWIFgB8Ujx42q-Rf_o_A2jwlT_AQyWahc1NnSTJSVB8ONic2hDb-_ayZSRpkwxOsevSLG3STBFW1BGlQUzrrCEbUEMBIC6SdcVYAwsH3775walKnLjhwDUKjcMRYbD0uAndhrft2CmqcZRcFSiq52C83vqbuL8kwyycGAvBurQhYYsBaa-ch5EC_4r6s2WfMakSaVGSeIby01GZMXvtCxzffjH7Es6Xs8dPkff0fgPPrufpCSSDG0rfFXi0YKt_MM8HQCUA77iEDWgIcA8PAZ249QOpczM7NZhIo5ZIFwAC1BDotRcYsLnrg0zoEmeC2te8LFY9OAG3jmZjEK3cd6DA823o3fKPQpP0uEW4IVgNMsA1v10oM-Z6CWLlWTxDApkmflpI_WiksmV-_4QfHg3z34U7PK6y7nU6dK_glVmKZWmWpQBBMIDB_TpiOXH5KETVOZ5cWJuintlVr6sbT4L7vjTmQEPHCRmZu7acVN9LM0W6x5XYXugCyQ9jyKI0RgGlF_6DUyIzioDcDheln3K4FYpTdCdMu2nLghZvQLiuLAVS--w4ZvItOOko9KYhHzsEk4mO74iBhjYWa7UMKw5Fan4CqVhPutYo4z1M0x2237GXvLowmzLznXsSbdMpcrBSq1ru8dbl_UgpdnKLhUKgyYxmJr1sXnDUQTjuWUeZiPXfNb38Apq9VHo!/dl4/d5/L2dBISEvZ0FBIS9nQSEh/

[82] https://data.worldbank.org/indicator/EG.ELC.ACCS.ZS?locations=BS

was estimated to be around 13.5% for New Providence and 0.7% for Family Islands resulting in an overall coverage of 10.8%.

90% of the potable water in New Providence is produced by reverse osmosis plants that treat brackish groundwater and reinject the rejects via deep injection wells, as seen in the Reverse Osmosis Plant in the DaoI. In terms of access to piped water, it is estimated that Abaco has 85,1% of its households with piped water connections, Bimini 97,1%, Eleuthera 92,2%, Exuma 93,6 and New Providence 92,4%[83].

A factor that negatively affects access to quality potable water is the level of NRW. The larger the physical losses the more water needs to be produced from the expensive Reverse Osmosis Plants. Lowering NRW improves operating efficiency, contributes to improved financial performance as well as improved resilience and quality of service, since recovered water can be distributed to new customers or production can be decreased. In New Providence, NRW decreased from 2011 to 2019 before increasing to 3.85 million imperial gallons in 2022. In the Family Islands, NRW increased from 1.66 million imperial gallons (equivalent to 41 percent) in 2019 to 2.67 million imperial gallons (equivalent to 55 percent) in 2022. It is commonly accepted that a well performing utility should have an NRW below 30%[84]. From information provided verbally by WSC during site visits, there is no existing infrastructure in the Family Islands that enables to remotely detect leaks in the potable water systems, as well as control water consumed by clients, the meters installed must be checked on site.

Transportation

New Providence, home to the capital of the Bahamas, Nassau, has a well developed transportation infrastructure. The island's main thoroughfare, Bay Street, runs parallel to the northern coast, connecting downtown Nassau to east and west ends of the island. Public transportation is serviced by minibuses, also called "jitneys", which operate on fixed routes throughout Nassau and nearby areas[85]. Additionally, taxis are readily available. The island possesses the Lynden Pindling International Airport, largest airport in The Bahamas and a major hub for international and domestic flights. New Providence also boasts several major docks, including Prince George Wharf, which accommodates large cruise ships, Potter's Cay Dock, serving as a central hub for inter-island ferry services and local mail boats.

Abaco can be reached by boat at Green Turtle Cay, Marsh Harbour, Spanish Cay, Treasure Cay, and Walker's Cay, and there are regular ferry services to cays and towns, including Green Turtle Cay, Elbow Cay, Man-o-War Cay and Great Guana Cay (Bahama Beach Club, 2020). Marsh Harbour International Airport and Treasure Cay Airport offer commercial flights. With regard to road infrastructure, there are 120 miles of highway on the Abaco, the main road is Great Abaco Highway that runs through the island connecting northern and southern points. Taxis, bicycles, scooter and car rentals are available for transportation around the island[86]. They are found mostly at the airports (Leonard M. Thompson International Airport, Treasure Cay International Airport and Sandy Point International Airport as well as Moores Island, Walkers Cay and Spanish Cay Airport) and ferry docks in Marsh Harbour (Marsh Harbour

[83] PDC. (2021). The Bahamas National Disaster Preparedness Baseline Assessment.

[84] Janson N.(2021). Caribbean Water Study, Iner American Development Bank.

[85] https://www.roadtraffic.gov.bs/wp-content/uploads/2016/04/RT-Dept.Official-Bus-Routes.pdf

[86] https://www.bahamabeachclub.com/guest-guide/local-transportation

and Boat Harbour Maina) and Treasure Cay[8788]. In some areas of the Abaco, golf carts are the most widely used forms of transportation.

Bimini, the westernmost district of The Bahamas, is composed of North and South Bimini islands. Transportation on the islands is mainly via golf carts, bicycles, and small cars due to their compact size. The Queen's Highway is the primary road running along the length of North Bimini. South Bimini Airport serves the islands, providing connections to Nassau and South Florida. Bimini Cruise Port, Alice Town Dock and Brown's Marina are key docking facilities, handling local and visiting boats, including fishing charters and yachts as well as the ferry service that allows to travel around the three islands that comprise Bimini (North, South and East Bimini)[89].

As for Eleuthera, it is known for its long, narrow shape, served by the Queen's Highway, which runs the length of the island, connecting major settlements. Public transportation is limited, but taxis and rental cars are widely used by residents and visitors. Eleuthera has three airports: North Eleuthera Airport, Governor's Harbour Airport, and Rock Sound Airport, facilitating domestic and international travel. The island also features multiple docks, such as Governor's Harbour Dock, Three Island Dock and Hatchet Bay, supporting both local fishing activities and inter-island ferry services[90].

According to the Pacific Disaster Center[91], Exuma has a transportation capacity score of 0.587, ranking it 6th out of the 17 assessed islands. The road density in Exuma is 2.43 miles per square mile (1.51 kilometers per square kilometer). Despite this relatively high road density, transportation vulnerability remains a concern. The island ranks 5th out of 17 in housing and transportation vulnerability with a score of 0.501. Key factors contributing to this vulnerability include 30% of housing being crowded, 28% of the population lacking access to a private vehicle, and 26.4% of housing built before 1980.

Education

Education is available to all segments of the Bahamian population and is compulsory to children aged 5 to 16. There are 167 public schools in the country, 56 are situated in New Providence while 111 are in the Family Islands, total enrolment for K-12 is more than 50.000[92] [93].

The Bahamian education system is structured in a 6-3-3 format. The first cycle is primary education, which lasts for six years and is designed to cater to students aged five to eleven. Secondary education is divided

[87] https://www.bahamabeachclub.com/guest-guide/local-transportation

[88] Link

[89] https://www.roadtraffic.gov.bs/resources/

[90] https://www.eleutheraparadise.com/transportation.html

[91] Pacific Disaster Center. (2021). National Disaster Preparedness Baseline Assessment: The Bahamas Island Risk Profiles. Pacific Disaster Center.

[92] The Commonwealth of The Bahamas. 2022. First Biennial Update Report (BUR1). United Nations Framework Convention on Climate Change (UNFCCC)

[93] Ministry of Education, The Commonwealth of The Bahamas. (2019). A Handbook for Teachers in Bahamian Public Schools.

into two equal parts of three years' duration; junior high is designed to accommodate students from age 11 to 14 while it is expected that students aged 14 to 17 attend senior high. Although not yet mandatory, education at the preschool and post-secondary levels is rapidly expanding[94].

Figure 65. Education System in The Bahamas. Source: Ministry of Education, 2019.

Each New Providence and Grand Bahama school district comprises preschools, primary schools, junior high schools, senior high schools, special education programmes and intervention programmes. Family Island school districts comprise primary schools with an attached pre-primary class, in some instances, central secondary schools and, again in some instances, All-Age Schools[95].

SCHOOLS 2018-2019

ISLAND/CAY	* Pre-Primary	Primary	All-Age	Junior High	Secondary	Senior High	Special Schools	Total
Abaco and Cays	0	11	1	0	2	0	0	14
Acklins	0	3	0	0	1	0	0	4
Andros	3	13	0	0	4	0	0	20
Berry Islands	0	0	1	0	0	0	0	1
Bimini	0	1	0	0	1	0	0	2
Cat Island	0	4	0	0	2	0	0	6
Crooked Island	0	1	0	0	1	0	0	2
Eleuthera	0	11	2	0	3	0	1	17
Exuma and Cays	0	8	3	0	1	0	1	13
Grand Bahama	1	10	1	3	0	3	3	21
Inagua	0	0	1	0	0	0	0	1
Long Island	0	4	0	0	2	0	0	6
Mayaguana	0	1	0	0	1	0	0	2
New Providence	8	24	0	7	1	7	8	55
Rum Cay	0	0	1	0	0	0	0	1
San Salvador	0	1	0	0	1	0	0	2
Total	*12	92	10	10	20	10	13	167

* The twelve (12) pre-schools listed in the table above are "standalone" pre-schools. There are approximately fifty-eight other "attached pre-schools" (pre-schools attached to primary schools).

Figure 66. Number of Schools in The Bahamas per Island. Source: Ministry of Education, 2019.

[94] Ministry of Education, The Commonwealth of The Bahamas. (2019). A Handbook for Teachers in Bahamian Public Schools.

[95] Ministry of Education, The Commonwealth of The Bahamas. (2019). A Handbook for Teachers in Bahamian Public Schools.

New Providence has 8 pre-primary schools (stand-alone), 24 primary schools, 7 junior high schools, 1 secondary high school, 7 senior high schools and 8 special schools, with a total of 55 primary and secondary education establishments.

In the case of Abaco, there are 11 primary schools, 1 all age school and 2 secondary schools, bringing a total of 14 schools in the Family Island. The aftermath of Hurricane Dorian brought about significant upheaval in the educational sector. Substantial damages were endured by the majority of schools in these areas, leading to the displacement of a vast number of students and incurring millions of dollars in repair costs. Abaco experienced the impact on 23 private and public educational facilities, directly affecting 3,512 students and 211 teachers[96].

Despite the efforts to restore normalcy, numerous challenges have surfaced in Abaco, impeding children from returning to their regular school routines. Key obstacles identified include the sheer destruction of schools (57%), the prohibitive distance to the operational schools (35%), ongoing school closures (17%), and a minor percentage (4%) facing challenges due to the requirement of specific documents they don't possess[97].

As for the rest of the Family Islands in this study, Bimini has only 1 primary and 1 secondary school, Eleuthera hast 11 primary schools, 2 all-age schools and 3 secondary schools; and Exuma . In addition to a special school, there is a total of 17 schools.

In the case of Exuma, there are 8 primary schools, 3 all-age, 1 secondary and 1 special school, resulting in a total of 13 schools.

Economy

According to the Advance Estimates of Gross Domestic Product (GDP) developed by The National Accounts Section of the Bahamas National Statistical Institute, in 2023, the Bahamian economy saw a considerable increase by 9,2% in nominal terms and by 2,6% in real terms as business activity experienced modest gains. When compared to 2022, the majority of industries showed marginal growth, while tourism related industries experiences sizable growth. In 2023, the total value of goods and services produced in The Bahamian economy was estimated at 14,3 billion in nominal prices and 12,8 billion in real prices[98].

Data from 2022 shows that, from a 11.671 nominal GDP (12.073 real GDP), a disaggregation of the Family Islands' share shows the following contributions to the 2022 GDP performance: Abaco, $364 million (2.81 percent); Eleuthera, $312 million (2.4 percent); Exuma, $272 million (2.1 percent); Bimini and the Berry Islands, $185 million (1.4 percent). As for New Providence, its contributions to the GDP were of $9.869 billion, which was 76.5% of the total GDP.

[96] Ministry of Education, sf. The Bahamas Post Hurricane Dorian Reconstruction.

[97] CERF, United Nations, 2019. Great/Little Abaco Islands Situational Report.

[98] Bahamas National Statistical Institute. (2024). Advance Estimated for Gross Domestic Product 2023.

Economic Activity

The Bahamas has a predominantly market economy that is heavily dependent on tourism and international financial services. Despite the concentration of the population in urban centers (especially Nassau and Freeport) that are devoted to tourism, the traditional pattern of small farming and fishing prevails in some villages, notably in the southeastern islands.

Tourism accounts for approximately 50% of GDP and directly or indirectly employs half of the archipelago's labor force. Financial services constitute the second-most important sector of the Bahamian economy, accounting for about 15% of GDP. Manufacturing and agriculture combined contribute less than 7% of GDP and show little growth, despite government incentives aimed at those sectors (ERM, 2021).

The Bahamas has 14,000 ha of agricultural area (FAO, 2016). FAO reported in 2013, that 4,000 inhabitants were economically active in agriculture (equivalent to 2% of the total economically active population, with zero women and 100% men). In 2012, the GDP was US$ 8,149 million and agriculture accounted for 2% of GDP. Although agriculture and fisheries account for a small percentage of the GDP of the Bahamas, they produce 3% of all jobs and are important for the diversification of the economy (IDB, 2018).

The fisheries sector plays an important role in the economy in terms of foreign currency earnings, food supply and employment. In 2017, exports of fish and fishery products amounted to USD 87.7 million (FAO, 2019). In the same year, imports were valued at USD 18.4 million. Per capita fish consumption (27.7 kg in 2013) is largely above world average (FAO, 2019). The Bahamas produced 11,400 tons from capture fisheries in 2017, with Caribbean spiny lobster and queen conch accounting about for 68 and 29% of total catches, respectively. Other important fishery resources include snappers, Nassau grouper and various mackerel species. Conch and finfishes are mostly consumed locally in restaurants, hotels and homes. However, significant exports of these also take place. Spiny lobster is the most important species in terms of weight and in value with over 90% being exported (FAO, 2019).

The Bahamian fishing sector in 2015 contributed 1.2% of GDP (USD 96 million). In 2017, four people were reported as employed in aquaculture and 9,000 in occasional fishing. There were a reported 934 vessels, most of which were small-undecked boats under six meters length overall (LOA) (FAO, 2019).

Poverty and Vulnerability

Poverty levels in 2013 were higher among Family Islanders (one in six), among youth (20 to 29-year-olds accounted for nearly one-quarter of the poor), and among Haitian migrants, whose poverty levels were three times those of the national level. Haitian nationals have been migrating to and settling in The Bahamas for hundreds of years. However, the presence of Haitians in The Bahamas has been an ever-increasing cause for concern for some of the Bahamian population. The relatively high numbers of Haitian migrants on some Bahamian islands have raised fears that The Bahamas is being overwhelmed by this group; in some districts Haitian nationals account for more than 20% of the population. A stigma has become attached to being a Haitian migrant in The Bahamas as they are associated with illegal status, poor education, and poverty. Language is also a barrier, which prevents Haitian migrants from fully participating in society and makes them distinct from the general population. Furthermore, children born to migrants in The Bahamas may face the prospect of being stateless (ERM, 2021).

After Hurricane Dorian, thousands of Haitians were displaced, and especially vulnerable population such as illegal immigrants, faced significant challenges when looking for shelters or keeping a job as they lack work permits or "satisfactory living conditions".

The Bahamas' Human Development Index (HDI) for 2019 was 0.814, which put the country in the high human development category, positioning it at 58 out of 189 countries and territories (UNDP, 2020).

The Gender Inequality Index (GII), which reflects the gender-based inequalities based on reproductive health, empowerment, and economic activity, for The Bahamas is 0.341, ranking it 77 out of the 162 countries in the 2019 index (UNDP, 2020). In The Bahamas, 21.8% of parliamentary seats are held by women, and 88% of adult women have reached at least a secondary level of education compared to 91% of their male counterparts. For every 100,000 live births, 70 women die from pregnancy-related causes; and the adolescent birth rate is 30 births per 1,000 women of ages 15-19. Female participation in the labor market is 68.1% compared to 81.6% for men (UNDP, 2020).

The NDPBA Island profile of the PDC from 2021 shows the following estimates for population in poverty from the islands: Eleuthera ranks first with almost half of its population below the poverty line (49,9%), followed by Abaco (43,1%), Exuma (37,4%) and Bimini (33,7%). New Providence has the lowest percentage of poverty out of all the islands considered in this study, with 28,6%[99].

Indigenous People and Communities

The original inhabitants of the Bahamas were indigenous Taino (Arawak) who are also known as Lucayan. They originated from both Hispaniola (today Dominican Republic) and Cuba and migrated by canoe into the Bahamas, settling the entire archipelago by the 12th century of the Current Era. However, the Lucayan societies in the Bahamas were practically destroyed by slavery, exile, diseases, warlike confrontations and migration[100]. As a result, there are no reported indigenous communities in the project area.

As reported by the official website of the United Nations High Commissioner for Refugees (UNHR)[101], today in the Bahamas there are minority groups such as Haitians. There are no official figures, but it is estimated that Haitians represent between 10% and 25% of the population, or between 30,000 and 78,000 people. According to 2000 census figures, the total population of the Bahamas was 306,000.

A significant number of expatriates from the United States and Europe have moved to the Bahamas. They live mainly on the islands of Abaco, Harbour and Long Island, as well as Spanish Wells, and in the Montagu Bay district of New Providence, near the capital, Nassau.

Archaeological, Historical and Cultural Heritage

The Antiquities, Monuments, and Museum Act of 1998 (AMMA) is the main legislation governing cultural heritage in the Bahamas. It defines legally protected monuments and establishes legal requirements for

[99] PDC. (2021). NDPBA, The Bahamas Island Risk Profiles. Subnational Assessment Results.

[100] United Nations High Commissioner for Refugees (UNHR), 2023. Website: https://www.refworld.org/docid/4954ce0b30.html.

[101] https://www.refworld.org/

Projects funded by the Project, such as reporting antiquity discoveries to the government, protecting artifacts, and obtaining licenses to excavate, carry on building or other work, plant or fell trees or deposit earth or refuse on, in or near a monument[102]. The Antiquities, Monuments, and Museum Corporation (AMMC) is the primary regulator responsible for protecting and preserving the historic cultural resources of the Bahamas through various initiatives, including archaeological investigations and historic preservation.

The results of the cultural heritage baseline study demonstrate there are a wide variety of cultural heritage resources found in The Bahamas. Archaeological resources associated with the Pre-Columbian occupation of the islands by Lucayan Tainos, historic terrestrial sites, and historic shipwrecks have been found across the archipelago.

Built heritage resources on The Bahamas date to the Historic Period. Examples of historic built heritage resources in The Bahamas include Colonial Period residential, governmental, and commercial buildings in major towns and cities, as well as a number of coastal fortresses such ad Fort Montagu in New Providence, close to one of the project sites (Montagu Lift Station)[103].

Fort Montagu sits on the site of an earlier structure dating to c.1725 -1728. The present fort was built between 1741-42 by Peter Henry Bruce, a military engineer, during the governorship of John Tinker (1735-58). It was built of locally cut limestone and named after the Duke of Montagu[104].

In addition, three museums are located within the AMMC administration, two of which are located about 400 m from the Rawson square project area: Pompey Museum and Balcony House. According to AMMC[105], this museum dates to the 1760s. Initially a market for various commodities, including enslaved people, it later served the telegraph, telephone, and electricity departments. In 1992, it became a museum named after Pompey, a slave who led a revolt in Great Exuma. The museum features notable exhibitions on Bahamian slavery, including "Struggle For Freedom in The Bahamas," sponsored by Templeton World Charity Foundation. In 2018, artist Jolyon Smith added a mural depicting significant eras in Bahamian history.

Balcony House is a restored house museum, opened to the public by the Central Bank in 1994. Owned by American heiress Josephine Bryce from the 1930s to the 1980s, it was furnished with antique pieces and styled by interior designer Annie Ralston. Architecturally significant, the timber-built house features a front balcony with wooden knee brackets and a mahogany staircase salvaged from a ship. Dating back to around 1788, it represents the Loyalist period and was home to Stephen Dillet, one of the first people of color elected in The Bahamas. It is considered the oldest residential building in Nassau.

No properties are registered in the Bahamas on the World Heritage List on UNESCO's official website.

[102] Statute Law of The Bahamas. (1998). Antiquities, Monuments and Museum Act.

[103] ERM. (2021). Environmental and Social Assessment. Support for the Health System Strengthening of The Bahamas for Health Risks Programme BH-L1053.

[104] https://ammcbahamas.org/forts/fort-montague/

[105] https://ammcbahamas.org/museums/pompey-museum/

Figure 67. Fort Montagu, a Historical Building located near a proposed project site (Montagu Lift Station). Source: ERM, 2021.

Figure 68 - Pompey Museum near a proposed project site (Rawson Square). Source: AMMC website

Figure 69 – Balcony House near a proposed project site (Rawson Square). Source: AMMC website

Figure 70. Parliament Square, Historical Buildings located in front of a proposed project site (Rawson Square Lift Station). Source: PlanEHS, 2024.

According to the above, there may be tangible or intangible cultural heritage in the project's areas, mostly related to build heritage. As it is stated above, no person is allowed to excavate or deposit earth materials in or near a monument unless a permit is granted by the Minister. This will have to be considered for

those projects near historical sites, such as Rawson Square Lift Station (located in Rawson Square and 50ft from Parliament Square) or Montagu Lift Station (located 770ft from Fort Montagu).

4.4. Direct Area of Influence Baseline (DAoI)

Below is a brief description of the Direct Area of Influence of each project, accompanied by corresponding photographs displaying these areas. The Direct Area of Influence data was collected during the field survey of April 22nd to 26th.

4.4.1. Central Eleuthera Water Main Extension Savannah Sound to Tarpum Main Mains Extension

The project area is located on Central Eleuthera, on a 32,000 ft stretch of Queen's Highway, an asphalt road 20-25ft wide that is the main road that runs through the island. The area where the main extension will be performed is characterized by a low-density residential area, there are approx. 50 connections expected.

There are mostly residential homes, Mission Bay Cottage rental property and the entrance to Camp Bahamas Ministries, a Christian Camp located on the east coast of the island, accessed by an unpaved road from Queen's Highway. There are no noticeable farming areas during the site visit, although in some satellite images there can be seem some lots resembling farming areas.

Figure 71. Location of Central Eleuthera water mains extension. Source: PlanEHS, 2024.

Figure 72. Queen's Highway Middle Tension lines on left side of road and Australian Pine Tree. Source: PlanEHS, 2024.

There are middle tension electricity lines located on the left side of Queen's Highway, outside the right of way and the shoreline on the right. There were no visible interferences on the road.

The area is characterized by extensive vegetation located on vacant land along both sides of the road, including native species as were identified by the WSC and the invasive Australian pine tree, Casuarina equisetifolia.

This specie has invaded most islands on the Bahamas, it tends to acidify soils and eliminate grass covers, making soil subject to erosion. The tree's superficial root system renders it vulnerable during hurricane season, as the intense winds have the potential to uproot it from the soil. There was also visible trash on the sides of the road.

Figure 73. Isolated residential homes along Queen's Highway. Source: PlanEHS, 2024.

Figure 74. Shoreline close to Queen's Highway, vegetation including Australian pine tree and visible trash. Source: PlanEHS, 2024.

Queen’s Highway is adjacent to the shore and, in 3,2 miles stretch the road is located less than 30 ft. from the beach. WSC comments that, in cases where the beach is near, the water mains are connected on the opposing side. There is no seawall, the shore has approx. 75ft of sandy beach shore.

Figure 75. Queen's Highway proximity to shore, no seawall structure. Source: PlanEHS, 2024.

4.4.2. South Eleuthera Water Main Extension Tarpum Plant to Jack's Bay

The project area is located on South Eleuthera, on a 15,000 ft stretch of Queen's Highway, an asphalt road 20-25ft wide that is the main road that runs through the island. The area where the main extension will be performed is characterized by a low-density residential area, there are approx. 50 connections expected. There are mostly residential homes and some businesses, Beyond the Rock restaurant, Oscar Symonette Ranch, the Tarpum Bay Reverse Osmosis Plant located at the right side of Queen's Highway and a resort located on the south end of the mains extension projected. WSC stated there are no farming activities on the south of the island and there were no visible farming areas.

Figure 76. South Eleuthera Water Mains Extension. Source: PlanEHS 2024.

Figure 77. Queen's Highway, road where mains extension is projected. Source: PlanEHS 2024.

Figure 78. Oscar Symonettes Ranch, one of the commercial activities on the area. Source: PlanEHS 2024.

Figure 79. Residential houses along Queen's Highway. Source: PlanEHS.

Figure 80. Residential houses in construction along Queen's Highway. Source: PlanEHS

There are middle tension electricity lines located on the left side of Queen's Highway and street lighting located on the right, located outside the right of way. There were no visible interferences on the road.

The area is characterized by extensive vegetation located on vacant land along the sides of the road, including native species as were identified by the WSC and the invasive Australian pine tree, Casuarina equisetifolia.

One of the findings during the visit was the Rock Sound Public Dump, located 6,000ft from the start of the mains extension projected on the left side of the road. Soil is bare, there were piles of waste along the 111ft2 dumpsite. WSC commented that it has no environmental permits, and it is a usual practice amongst the family islands.

Figure 81. Rock Sound Public Dump. Source: PlanEHS 2024.

Figure 82. Rock Sound Public Dump, bare soil and waste. Source: PlanEHS 2024.

Figure 83. Rock Sound Public Dump, waste. Source: PlanEHS 2024.

4.4.3. Abaco's Sweetings Tract New Water Mains Extension

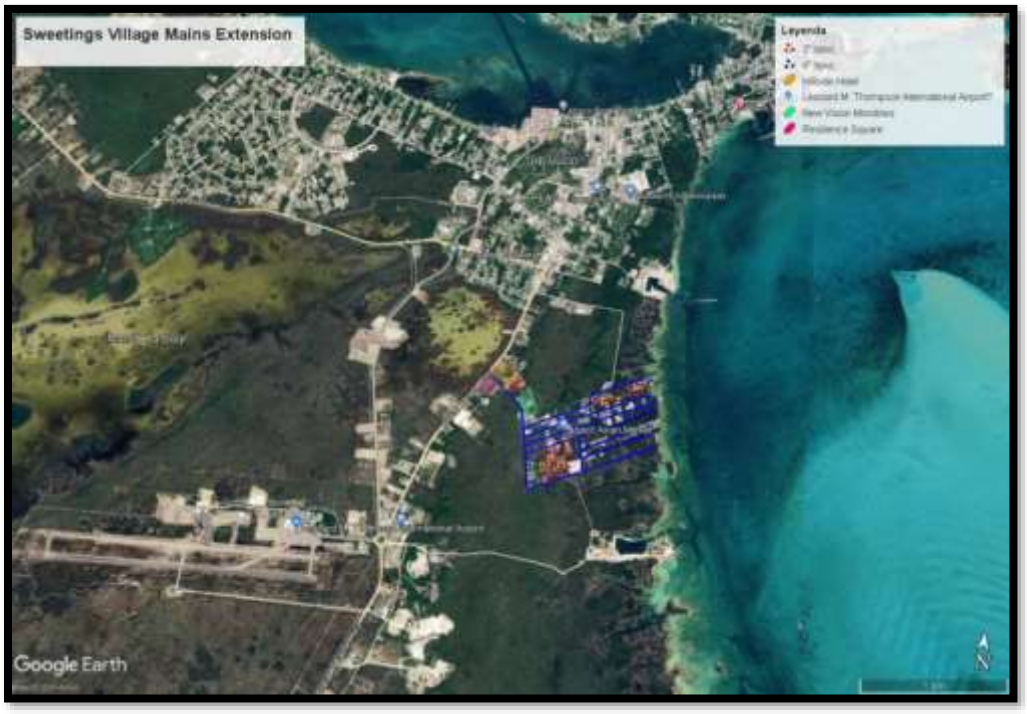


Figure 84. Location of Sweetings Village. Source: PlanEHS, 2024.

The project area is in Sweeting's Village, a high-middle income residential neighborhood east of Marsh Harbour, the commercial town of Abaco Island, 0.88 miles east of the Leonard M. Thompson International Airport. WSC comments that the Village used to be a privatized development that was later sold to the government. There are mostly residential homes in the Village, New Vision Ministries, an Asian Market and Lady with the Rose Taxi service.

The water mains extension begins in the crossroads of Great Abaco Highway and John Sweeting Drive, the access road to the neighborhood. 100ft to the right to the main entrance, Resilience Square can be found, an area comprised of an Integrated Medical Centre, a COVID-19 Testing Centre, an Easy Dental Care, and other local businesses. On the right side, there is the Abaco Hillside Hotel.

Great Abaco Highway is a 20-25ft wide asphalt highway, the main highway on the island. There are middle tension lines on the left side of the road, opposite Sweetings Tract and it possesses signs of deterioration with potholes and dents on the pavement on the crossroad with John Sweetings Drive.

Figure 85. Great Abaco Highway, access to Sweetings Tract, Resilience Square and Middle Tension Line. Source: PlanEHS 2024.

Figure 86. Abaco Hillside Hotel. Source: PlanEHS, 2024.

Figure 87. Integrated Medical Centre located adjacent to John Sweetings Drive. Source: PlanEHS, 2024.

Figure 88. Entrance to Sweetings Tract, Great Abaco Highway and John Sweetings Drive. Source: PlanEHS, 2024.

John Sweetings Drive is a 20ft wide, white tar paved road and the main access to Sweetings Village neighborhood, there are low tension lines and optic fiber connections located on the left side of the road, close to the pavement. The area where the main extension is projected is characterized by a low-density residential area, there are approx. 50 connections expected in the area, although it is commented by WSC there are up to 400 lots in total on the village, there are empty lots around the neighborhood, especially on the southeast.

Figure 89. Empty lots on Sweetings Village. Source: PlanEHS, 2024.

There is a New Vision Ministries building 900ft from the entrance to the neighborhood, equipped with a Community Park and Outdoor exercise area.

Figure 90. Development of the neighborhood, houses in construction. Source: PlanEHS, 2024.

Figure 91. New Vision Ministries on John Sweetings Drive. Source: PlanEHS, 2024.

Figure 92. New Vision Community Park and Outdoor Exercise area. Source: PlanEHS, 2024.

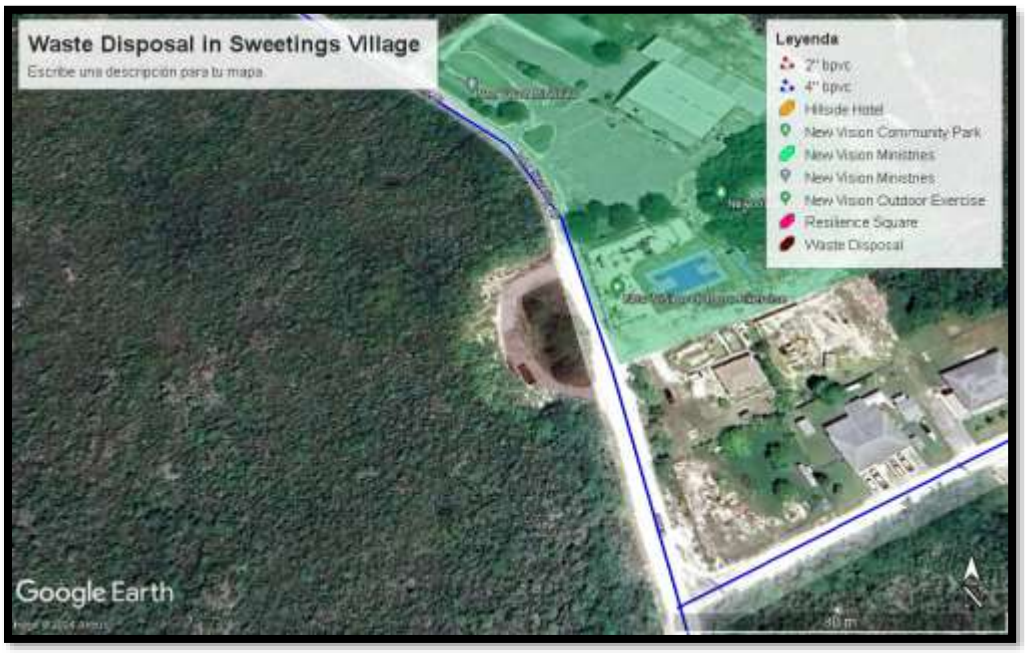


Figure 93. Waste Disposal in Sweetings Village. Source: PlanEHS, 2024

In front of the Ministry, there is an area used to disposed waste. It is adjacent to John Sweetings Drive, and it is the only access to the site. Works on John Sweetings Drive might interfere with waste pick up and

disposal on the neighborhood. There is a waste container, corresponding to Abaco Waste and noticeable waste around the bare soil in the area.

Figure 94. Waste Disposal in Sweetings Drive. Source: PlanEHS, 2024.

Figure 95. Waste on bare soil. Source: PlanEHS, 2024.

Figure 96. Abaco Waste Container. Source: PlanEHS, 2024.

Most of the residential homes in the area were equipped with their own extraction wells (usually 60ft depth), located usually in the front of the properties. In conversation with WSC, it was stated that the main issue with attracting clients from this area is the pressurized systems they possess have up to 40 psi, while WSC only ensures 15 psi. WSC have also stated that there have been water monitoring of underground wells and, at least in New Providence, there is significant water contamination on shallow wells. Water for the region is supplied by Marsh Harbour Pumping Station, adjacent to the airport.

Figure 97. Private Wells from residential homes. Source: PlanEHS, 2024.

Figure 98. Private Wells and Power Generators. Source: PlanEHS, 2024.

In terms of interferences, WSC mentions most houses possess their own septic tanks, but they are usually installed in the back of the lots, not posing an issue in terms of the works to be performed on the streets.

There are overhead electricity lines on all roads of the village, located on either side of the street, on the right of way. In some properties, there are structures such as fences on the right of way, close to the electricity poles.

Figure 99. Overhead electricity poles in Sweetings Village. Source: PlanEHS, 2024.

WSC stated the location of the mains extension to be installed could be on either side of the right of way and, if any interferences, it could be installed in the middle of the road. This decision will be done during the design phase.

There are native species in the growing vegetation on vacated lots of the neighborhood, such as Mahogany trees (Swietenia mahagoni), Gum Elemi (Bursera simaruba) and Strongbark tree. Since there are no specifications as to where the water mains extensions will lay, the removal of these trees is not certain.

Figure 100. Native Trees on Sweetings Village's vacant lots and vegetations: (a) Mahogany; (b) Gum Elemi; (c) Strongbark Tree (Cocoloba diversifolia). Source: PlanEHS, 2024.

Most streets in the neighborhood are 20ft wide and have a white tar paving, which shows deterioration, with visible potholes. However, in the southwest area of the village, there are some roads that have yet to be cleared and paved.

Figure 101. Residential houses and deterioration on paved roads.

Figure 102. Uncleared and unpaved roads in Sweetings Village (yellow), car graveyard (red) and access roads (pink). Source: PlanEHS, 2024.

Figure 103. Uncleared and unpaved roads. Source: PlanEHS, 2024.

Figure 104. Uncleared and unpaved roads. Source: PlanEHS, 2024.

On one of the lots located on the unpaved roads there was an area with at least 8 cars that were abandoned on bare soil (marked in red in **Figure 102**). There is waste accumulation and broken glass from the abandoned cars.

Figure 105. Abandoned Cars in lot of Sweetings Village. Source: PlanEHS, 2024.

There are three visible entrances to the neighborhood, from satellite images. The main entrance through John Sweeting Drive, an entrance located north of the neighborhood and an entrance to the south. The entrance to the north it is accessed only through a private house, it is not accessible (pink). The entrance in the south is a path that has not been paved or cleared (pink).

Figure 106. Alternative access roads: (a) north, not accessible; (b) south, unpaved and uncleared. Source: PlanEHS, 2024.

There are two visible mangrove swamps, located at the lots closest to shore on S. Venie Lowe Drive and the unnamed street parallel and after Milton K Sweeting Drive.

Figure 107. Mangrove swamp close to shore on lot adjacent to S Venie Lowe Drive. Source: PlanEHS, 2024.

Figure 108. Mangrove swamp on unnamed street close to shore. Source: PlanEHS, 2024.

WSC local representative states that the area is not prone to flooding and, during the last hurricane, only the portion close to the shore was flooded, since the terrains were elevated prior to development. The shoreline is not protected by any coastal wall infrastructure, there was one residential home that had a deteriorated wooden balustrade. There are some mangroves visible in certain areas and there is generally waste accumulation.

Figure 109. Coastal Area with no seawall and deteriorated wooden balustrade. Source: PlanEHS, 2024.

Figure 110. Waste at the Coastal Area. Source: PlanEHS, 2024.

4.4.4. Wastewater Collection and Treatment in New Providence

Flamingo C Lift Station

Figure 111. Flamingo C Lift Station location on Flamingo Gardens Park. Source: PlanEHS, 2024.

This lift station is in the subdivision Flamingo Gardens, a low-density residential neighborhood in South Nassau, located next to subdivision Millar Heights. Flamingo C is located on a 7.2-acre park, Flamingo Gardens Park.

The lift station is located approx. 100 ft from the nearest house across Bahamas Boulevard, the 25 ft wide asphalt road with middle tension lines on the left side opposite the park that accesses the projected intervention site.

Figure 112. Bahamas Boulevard, access road to Flamingo C Lift Station. Source: PlanEHS, 2024.

Figure 113. Surrounding houses to Flamingo C Lift Station on Bahamas Boulevard. Source: PlanEHS, 2024.

The lift station is also adjacent to Bangladesh Crescent Road, a 20ft asphalt road with middle and low-tension lines on the side of the park. 330ft south of Flamingo C, opposite Bangladesh Crescent Road, there is a “Family Life Center” from the Ministry of Social Services and Urban Development. Next to the Ministry, Gerald Cash Primary School borders all the south side of Flamingo Gardens Park.

Figure 114. Ministry of Social Services & Urban Development 330ft from lift station. Source: PlanEHS, 2024.

Figure 115. (a) Gerald Cash Primary School, adjacent to Lift Station on Flamingo Gardens Park; (b) Bangladesh Crescent Road. Source: PlanEHS, 2024.

The park consists of 2 playground areas, an artificial pond, recently constructed according to WSC, and basketball courts on the south side, 50ft away from the lift station. WSC confirms that the area is subject to flooding in heavy rainfall events and hurricane season, especially the months of July, august and September.

Figure 116. Flamingo Gardens Park: (a) playground; (b) Artificial Pond; (c) playground; (d) basketball court and Flamingo C Lift Station. Source: PlanEHS, 2024.

Flamingo C Lift Station receives the wastewater collected by Silver Gates, Misty Gardens, Past Gardens and Flamingo A, B and D lift stations, a total estimation of 5000 homes are connected to this system. The wastewater collected is then pumped to Flamingo Gardens WTP, mentioned by WSC for only having an injection well and no treatment of the water.

In terms of conditions of the lift station, the system involves a well chamber that shows deterioration on its walls and has only one pump working. WSC mentions that there have been issues with leaks in heavy rainfall events. There is an unused pipeline next to the lift station that was removed and replaced from the system because of issues with leaks as well from the old iron cast installation. There is no valve chamber, in turn the valve systems are overground, they have been treated with corrosion resistant coating. There is also a power generator with 8hs autonomy and a control panel for the pumps. The lift station does not include a screen for solid material removal, which causes some issues with pump clogging and consequent pump failure. There is also no alleviator system, and it is mentioned by WSC that in case of saturation, the overflow spills over Bahamas Boulevard. In these situations, WSC does disinfection of the area.

While the works take place, WSC will follow procedures in place for when there is pump failure and a saturation of the system. They will bypass this well chamber and redirect the wastewater to Flamingo D.

The waste generated from the interventions will be taken to the Public Dump Site, managed by New Providence Ecology Park, where there is a Processing and Recycling of Construction and Demolition Debris process.

Figure 117. Flamingo C Lift Station: (a) Overground valve system; (b) replaced pipeline; (c) power generator; (d) deteriorated well chamber. Source: PlanEHS, 2024.

Elizabeth East Lift Station

Figure 118. Location of Elizabeth East Lift Station. Source: PlanEHS, 2024.

This lift station is located in subdivision Elizabeth Estates, a low-density residential neighborhood in the southeast of Nassau, New Providence. The lift station is accessed by Saint Vincent Road, a 20ft wide asphalt road with low tension lines located on the side of the lift station.

Figure 119. Access to Elizabeth East Lift Station via unnamed road with low tension lines. Source: PlanEHS; 2024.

The lift station is 15ft away from a residential home to the right and 15ft from Elizabeth Estates Public Park.

Figure 120. Adjacent residential home of Elizabeth East Lift Station view from unpaved path that leads to Trinidad Way. Source: PlanEHS, 2024.

Figure 121. Elizabeth Estates Public Park, adjacent to Elizabeth East Lift Station. Source: PlanEHS, 2024.

WS mentions that, during construction, materials would be brought into the site via an unpaved path that connects to Trinidad Way, bordered by two residential homes.

Figure 122. Unpaved path that connects Elizabeth East Lift Station to Trinidad Way. Source: PlanEHS, 2024.

This lift station receives inflow of wastewater from St Andrews, Treasure Cove, Twynam 1, 2 and 3, Yamacraw 1, 2, 3 and 4, Star Estates, Leeward East and Palm Key Lift Stations, which amounts to approx. 5000 homes. The lift station pumps wastewater to Fox Hill WTP, which only screens sludge from the wastewater and injects it through deep well injection.

This is one of the most problematic lift stations in the system, according to WSC. It has had many issues in the past with pump failures due to the overworking of the pumps because of leaks, especially during the hurricane season. WSC representatives mention the area is subject to flooding and, when that occurs, the pumping systems fail. The last occurrence happened in January, WSC received a call from the surrounding houses due to an overflow of the lift station.

In terms of conditions of the lift station, there is severe deterioration of the well chamber, there is noticeable cracks, and it exhibits the rebar framework. Valves show extreme rusting and leaks into the chamber.

Figure 123. Elizabeth East Lift Station conditions: (a) rusted valves in valve chamber; (b) severe deterioration on well chamber. Source: PlanEHS, 2024.

The waste generated from the interventions will be taken to the Public Dump Site, managed by New Providence Ecology Park, where there is a Processing and Recycling of Construction and Demolition Debris process.

Rawson Square Lift Station

Figure 124. Location of Rawson Square Lift Station. Source: PlanEHS, 2024.

This lift station is in Rawson Square, a park in Downtown Nassau. The site is a central business and cultural hub area, housing government buildings, historic sites, shops and restaurants in New Providence. The area is accessed by Bay Street, a 20ft wide asphalt road with overhead lighting, sewage system and underground electricity, dependent on BPL.

Figure 125. Bay Street with overhead lighting and sewer system and view of Rawson Square Lift Station (green fenced). Source: PlanEHS, 2024.

It is a highly dense area, located 40ft. from the Parliament Square, colonial-influenced pink historical buildings that include the House of Assembly, the Senate Building and the Supreme Court of The Bahamas

The lift station is also adjacent to local shops and businesses (130ft), a parking lot (30ft) and the Nassau Bahamas Cruise Terminal and Visitor Center (250ft). In conversation with WSC they mention this is a historical site and they need permits to do the proposed interventions.

Moreover, during the works, it is most likely that Bay Street will be partially closed, and they will have to pump out wastewater from the utility holes in the vicinity in order to prevent saturation of other lift stations and prevent interruption of the service.

Figure 126. Parlament Square in front of Rawson Square Lift Station. Source: PlanEHS, 2024.

Figure 127. Parking lot adjacent to Rawson Square Lift Station. Source: PlanEHS, 2024.

Figure 128. Surrounding buildings from Rawson Square Lift Station. Source: PlanEHS, 2024.

Figure 129. Bahamas Cruise Terminal, 130 ft from Rawson Square Lift Station. PlanEHS, 2024.

The lift station receives wastewater from Vista Marina, Big Pond, and Cruise Port Lift Stations, as well as wastewater from the cruise ships, giving a total estimate of 20,000 homes connected. The wastewater accumulated is directed to Malcolm Park Lift Station and then it is injected underground via a Deep Injection Well.

The area is reclaimed land, when there is a high tide, the road tends to flood, drainage culverts are also in need of rehabilitation according to WSC.

Rawson Square Lift Station is fenced and surrounded by bushes. It is comprised of two well chambers receiving the inflow of wastewater, 2 operating pumps, a power generator, and a chlorination dosing machine to prevent foul odors. The lift station has no valves, valve chamber nor a screen for solids separation and it shows significant deterioration on its well chambers. The lift stations gravity main dates to 1927 and it is made of asbestos cement.

Figure 130. Rawson Square Lift Station: (a) power generator and Chlorination Dosing Machine; (b) well chambers. Source: PlanEHS, 2024.

The waste generated from the interventions will be taken to the Public Dump Site, managed by New Providence Ecology Park, where there is a Processing and Recycling of Construction and Demolition Debris process.

Malcolm Park Lift Station

This lift station is located 1 mile from Rawson Square Lift Station, on East Bay Street (same street as Rawson Square Lift Station) in Downtown Nassau. It is a middle-density mixed commercial and residential area, according to WSC this is still considered historical site. It is 330ft from the entrance to Paradise Island, a renowned resort island located north on reclaimed land.

The lift station is located next to Malcolm Park (less than 10ft) and there are some businesses and residential houses on the opposite side of E Bay St.

Figure 131. East Bay Street, only access to Malcolm Park Lift Station. Source: PlanEHS, 2024.

Figure 132. Malcolm Park, adjacent to Malcolm Park Lift Station. Source: PlanEHS, 2024.

Figure 133. Residential home and businesses in front of Malcolm Park Lift Station. Source: PlanEHS, 2024.

East Bay Street possesses overhead lighting and underground electricity by BPL. The area tends to flood due to it being reclaimed land. Moreover, in conversation with WSC, there is an existing issue with a building structure in the site, which was meant for wastewater treatment but never operational, that leads to seawater flooding in the lift station. To temporarily solve this issue, the building is connected by a pipeline and pumps water into the wells of the lift station.

Figure 134. Entrance to Malcolm Park Lift Station, view of the non-operational building and access to Paradise Island on the back. Source: PlanEHS, 2024.

This is the most problematic lift station out of all the existing ones, with frequent pump blockage and failure events, every 3 months. Moreover, it is in the central downtown area, close to Paradise Island and historical and touristic sites.

As it was described in the project description section, there are several issues with its operation, mainly from interventions performed once the wastewater infrastructure on the new building was installed, such as the closing off the entrance well chambers. Since the building was never operational, WSC comments they had to resort to the use of the old system, which brought upon the need of including several bypasses to the system.

There are abandoned infrastructures and equipment on site, such as the wastewater treatment building, pumps, pipelines, and fuel tanks unused that should be removed from the premises. Moreover, it possesses poor health and safety conditions, such as the lack of railing or cover for the existing well chambers.

The site is adjacent to the sea, the seawall shows severe deterioration. There is also an outlet on the outside of the seawall, not mentioned by WSC during the visit or as part of the systems in place.

Figure 135. Unused fuel tanks that need to be removed from the premises. Source: PlanEHS, 2024.

Figure 136. Severe deterioration on seawall and unused equipment. Source: PlanEHS, 2024.

Figure 137. Severe deterioration of seawall and outlet to the sea from the Lift Station. Source: PlanEHS, 2024.

The waste generated from the interventions will be taken to the Public Dump Site, managed by New Providence Ecology Park, where there is a Processing and Recycling of Construction and Demolition Debris process.

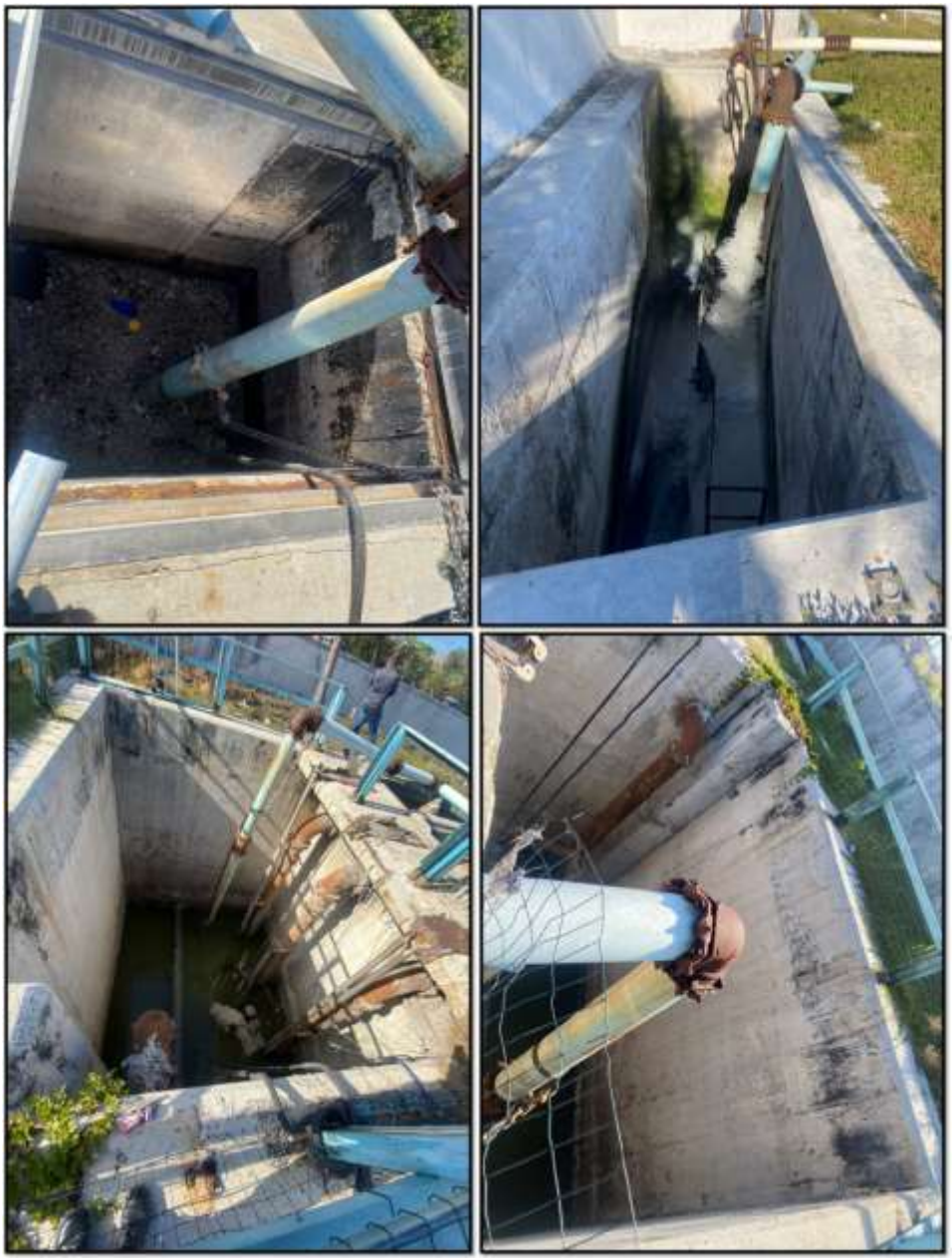


Figure 138. Uncovered well chambers in Malcolm Park Lift Station. Source: PlanEHS, 2024.

Montague Lift Station

Figure 139. Location of Montague Lift Station. Source: PlanEHS, 2024.

This lift station is located in Downtown Nassau, a central business and cultural hub area, housing historic sites, embassy buildings, resorts, shops and restaurants. It is 1 mile away from Malcolm Park Lift Station, adjacent to East Bay Street, its access road with overhead lighting and underground electricity.

The site is less than 80 ft from the beach, and it has a food vendor next to the lift station. It receives wastewater from around 5000, including resorts and hotels nearby.

Figure 140. East Bay Street, access to the lift station and resorts located in front of Lift Station. Source: PlanEHS, 2024.

Figure 141. Location of Lift Station, food vendor adjacent and beach. Source: PlanEHS, 2024.

The site suffers from flooding and, as it was stated by WSC, there is constant sand being blown into the lift station and causing blockage. Moreover, the lift station has suffered a collapse of the cast iron piping, during the visit there was a temporary bypass needed for the lift station to be operational. The entire system needs replacement, both the well and valve chambers as well as an increase in horsepower for the pumping system.

There is some surrounding vegetation, purposely in place by WSC to minimize odor generation. It will be removed during the proposed interventions and replaced once the operations are done.

The waste generated from the interventions will be taken to the Public Dump Site, managed by New Providence Ecology Park, where there is a Processing and Recycling of Construction and Demolition Debris process.

Figure 142. Temporary bypass needed for operation. Source: PlanEHS, 2024.

4.4.5. Other Visited Sites

During site visits held from April 22nd to April 26th there were visits to potable water and wastewater treatment plants, described below.

Reverse Osmosis Plant North Eleuthera

Figure 143. Reverse Osmosis Plant Location. Source: PlanEHS, 2024.

The potable water plant that treats the water supplied to the north of Eleuthera is located adjacent to Queen's Highway. The area is characterized by a low-density residential area, with isolated farming activities, some businesses, the North Eleuthera Airport (located approx. the middle of the main extension) and the Three Island Dock.

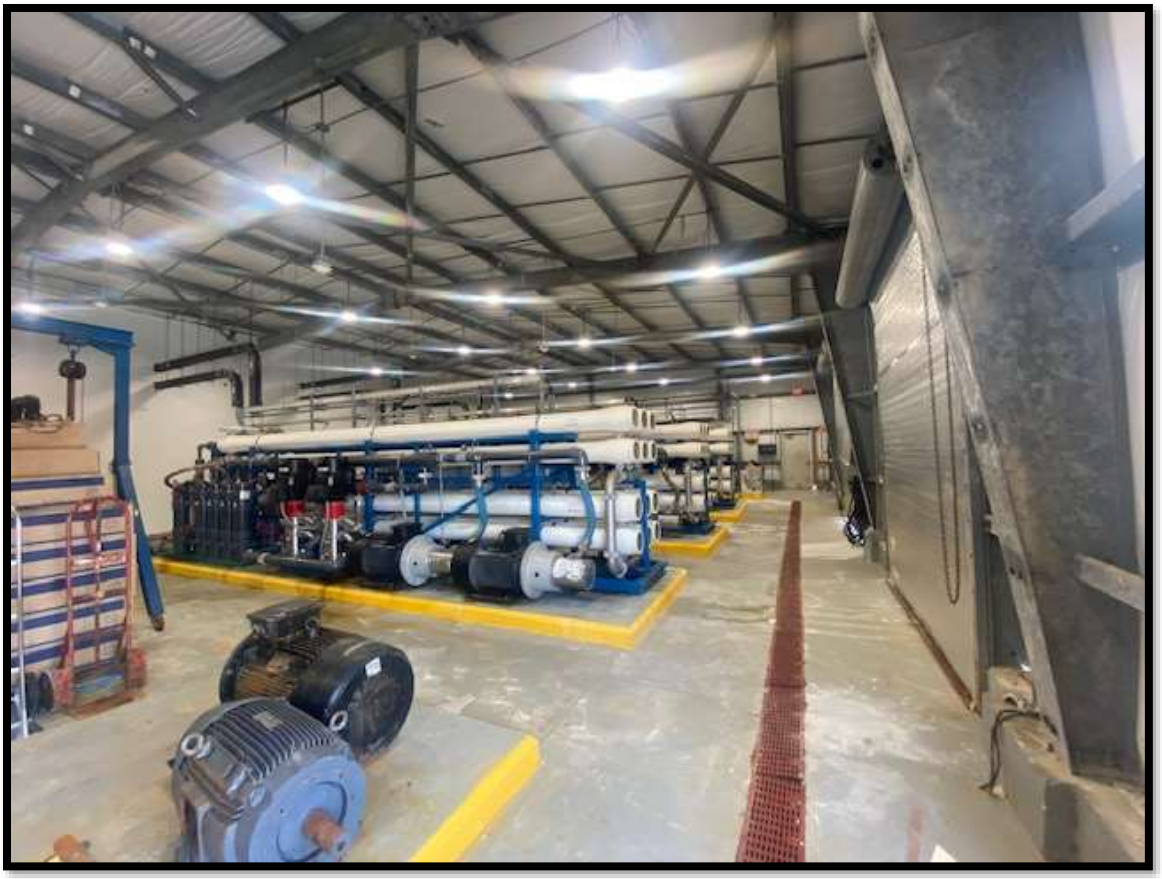


Figure 144. Reverse Osmosis Plant with RO membranes. Source: PlanEHS, 2024.

The plant is a reverse osmosis plant that has a capacity of 650.000 gallons/day, it treats groundwater taken from the field wells located next to the plant by Reverse Osmosis Membranes and has a recovery rate of 32%. Out of 75 historical wells, 300ft deep, 36 are active and only 6 are operational.

During site visit, RO membranes saturated with ferric compounds were observed. WSC stated that they have issues with excessive fouling of the membranes and overall “rusty” water, caused by the change in water sources from underground wells (hard water) to reverse osmosis (desalination) plants. This problem has hampered WSC efforts to improve its corporate image, and hindered project activities such as the public relation efforts to win-back customers.

Figure 145. RO membranes saturated with ferric minerals. Source: PlanEHS, 20924.

Feed water is treated with a sulfuric acid solution to adjust the pH of the water before entering the potabilization process, to avoid scaling of the RO membranes. The solution was located under direct sunlight and on wooden pallets, no spill collection basins were seen.

Figure 146. Sulfuric Acid Solution to treat feed water. Source: PlanEHS, 2024.

The potabilization process also includes filtration prior to the RO process and a latter chlorination with sodium hypochlorite.

Figure 147. Potabilization Process: (a) Filtration prior to RO membranes; (b) Chlorination after RO process. Source: PlanEHS, 2024.

Water is accumulated in tanks that range from 250.000 gallons, as the collapsible tank seen in **Figure 148**, to 1.000.000gallons, such as the newly finished tank also seen in **Figure 148**.

Figure 148. Treated water accumulation tanks: (a) New 1.000.000-gallon tank; (b) Collapsible tank. Source: PlanEHS, 2024.

There was unused equipment and obsolete elements in the plant, such as old, damaged tanks from hurricane activity, as well as certain irregularities surrounding chemicals use and storage. It was stated by WSC that the operation of the plant is responsibility of the contractors.

The reject from the plant is reinjected at 600ft depth via a deep injection well.

Figure 149. Unused Damaged tank. Source: PlanEHS, 2024.

During site visit, there were noticeable sinkholes surrounding the area of the RO plant. WSC comments that, due to the high content of limestone bedrock, it is frequent to observe sinkholes in the area.

Figure 150. Sinkholes around RO Plant. Source: PlanEHS, 2024.

Marsh Harbour Pumping Station (Abaco)

Figure 151. Location of Marsh Harbour Pumping Station. Source: PlanEHS, 2024.

Marsh Harbour Pumping Station is situated next to Leonard M. Thompson International Airport, accessible via Great Abaco Highway and 0.9 miles from Sweetings Village, in Marsh Harbour, Abaco Island.

Figure 152. Pumping Station, Storage Building, Generator Building and Solar Plant. Source: PlanEHS, 2024.

Figure 153. 540 solar panels generating 221KW at Marsh Harbour Pumping Station. Source: PlanEHS, 2024.

Figure 154. Pumping System at Marsh Harbour Pumping Station. Source: PlanEHS, 2024.

Figure 155. Operational Well. Source: PlanEHS, 2024.

Figure 156. Existing (and damaged) storage tanks at Marsh Harbour Pumping Station. Source: PlanEHS, 2024.

Marsh Harbour is a pumping station for piped potable water, it extracts water from 5 wells that are in service, however the entire Marsh Harbour wellfield is comprised of 17 wells and a 3-pump extracting system.

Thanks to a US$1,2 million agreement between the Water and Sewerage Corporation (WSC), The Goodness Tour, Water Mission, and The United Nations Children's Fund (UNICEF), Marsh Harbour Pumping Station was part of a solarization project to transform 11 water systems in Abaco, the mainland and the cays that have suffered damage because of Hurricane Dorian[106] .

The newly furbished pumping station possesses 540 solar panels that generate 221 kW of power, this feeds the plant day and night, thanks to the battery systems also in place, although the plant is still connected to BPL power grid.

The contract also included a 1.5 million imperial gallon storage tank to replace 2 existing tanks that have been extensively damaged by Hurricane Dorian.

Figure 157. New 1.5 million imperial gallon storage tank. Source: PlanEHS, 2024.

[106] Link

Coral Vista Wastewater Treatment Plant (New Providence)

Figure 158. Location of Coral Vista WTP. Source: PlanEHS, 2024.

Coral Vista Wastewater Treatment Plant is in subdivision Coral Harbour, a low-density residential neighborhood in southwest Nassau, New Providence. The area is residential, there are some isolated businesses, mostly related to food stores and bakeries, located at least 500ft from the project site. The entrance to the neighborhood is in the conjunction of Coral Harbour Road and Carmichael Road.

Figure 159. Gated fence entering Coral Vista Wastewater Treatment Plant. Source: PlanEHS, 2024.

The wastewater treatment plant processes 50,000 gallons per day and is composed of several key components. It begins with an aeration tank where wastewater undergoes biological treatment through the introduction of air, supporting the aerobic digestion of organic matter. Prior to entering the aeration tank, a screening or grit removal system ensures that large solids and grit are filtered out from the feed wastewater to prevent damage to downstream equipment.

Figure 160. Aeration tank with grid for solid removal (right). Source: PlanEHS, 2024.

After aeration, the wastewater flows into a clarifier tank where suspended solids settle out, clarifying the water. To ensure the treated water is safe for discharge, a sodium hypochlorite solution is added for disinfection, effectively eliminating harmful microorganisms. The settled solids from the clarifier are then processed in a digester, where anaerobic or aerobic digestion further breaks down organic materials, reducing the volume of sludge produced. The remaining sludge is removed and transported to New Providence Ecology Park (formerly Harold Road Landfill), while the treated wastewater is injected back into the aquifer via a deep injection well.

Figure 161. View of Aeration, Clarifier and Digestion Tanks. Source: PlanEHS, 2024.

Figure 162. Injection well for treated wastewater. Source: PlanEHS, 2024.

5. Environmental and Social Impacts and Risks

This chapter focuses on the identification and assessment of potential environmental and social impacts and risks that could be derived from the construction and operation of the projects to be financed under the Bahamas Water Supply and Sanitation Systems Upgrade Program.

The analysis of the Program was conducted with consideration for the inherent characteristics of the distinct types of projects to be financed under each component. The Program's activities were thus categorized into **four distinct groups**: (i) Non-Revenue Water Program Activities; (ii) Institutional Strengthening; (iii) Potable Water Mains Extensions; and (iv) Lift Station Upgrades Projects (see **Table 24**).

Table 24. Projects classification under the BH-L1061 Program

Type of Project	Subprojects	Program Component
Non-Revenue Water Program and Advanced Metering Infrastructure	Non-Revenue Water Reduction Contract: leak detections and repairs, use of District Metered Areas (DMAs), monitoring systems**, pipe renewal as necessary**, ongoing maintenance and training, reporting	**Component 1**
	Installation of advanced metering infrastructure (AMI) for New Providence and Family Islands.	
Institutional Strengthening	Capacity development activities for WSC.	**Component 2**
Access to Potable Water Supply	Central Eleuthera Water Mains Extension Savannah Sound to Tarpum.	**Component 3**
	South Eleuthera Water Main Extension Tarpum Plant to Jack's Bay.	
	Sweetings Tract New Water Mains Extension.	
	South Bimini Port Royal Water Main Extension.	
	South Bimini Water Main Extension to Airport.	
Lift Station Upgrades in New Providence	Malcolm Park	**Component 4**
	Elizabeth East	
	Montague	
	Potters Cay	
	Rawson Square	
	Fox Hill	
	Old Cedar	
	Shirlea	
	Yellow Elder Main	
	McNeil	
	PMH	
	Oakes Field	
	Big Pond	
	St. Albans	
	Nassau Street	
	Flamingo C	

Type of Project	Subprojects	Program Component
	Yamacraw 2	
	Pinewood C	
	Sir Lynden 1	

Activities under **Component 2** (Institutional Strengthening) are not expected to cause environmental risks and impacts, given that no infrastructure or installation of equipment is included within the scope. The environmental and social impacts and potential risks of each of the three remaining typologies were evaluated, and the results are outlined in the following sections.

5.1. Non-Revenue Water Reduction Program and Advanced Metering Infrastructure

The projects featured in this component are:

- Non-Revenue Water Reduction Contract

This project has not exhibited any discernible environmental or social impact or risk, except for the replacement of existing water mains from leak detections detected in the Non-Revenue Water Reduction Contract.

The impacts and risks associated with this type of project are like those found in the potable water mains extension section. Main differences reside in the existing pipeline to be replaced, whether it will be removed from site or if the new pipeline will be installed adjacent to the existing one.

Since the contract is yet to be designed, there are no certainties regarding the pipeline's final disposal. If the existing pipeline is not removed, the project is of the same characteristics as the mains extension projects. However, if the pipeline is removed, then a separate activity in the Construction Phase needs to be assessed (the removal and disposal of said pipeline).

This activity can be evaluated as follows:

Phase & Activity	Impacted component of the environment	Impact	Mitigation Measure Proposed
Construction Phase Activity: Existing Pipeline removal)	**Physical**	• Gaseous emissions and particulate matter generation from combustion equipment.	• Proper O&M of equipment. • Proper training in the use of equipment.
		• Noise and vibrations during removal.	
		• Water or soil contamination risks from accidental spills or poor waste management.	• Proper O&M of equipment to avoid accidental spills or waste. • Correct waste management and implementation of a Waste Management Program. • Washing of tools and machinery on site will be prohibited.

Phase & Activity	Impacted component of the environment	Impact	Mitigation Measure Proposed
		• Soil erosion and compaction.	• Correct planning of activities and designation of disturbance area boundaries, managing runoff and restricting vehicle use to predefined roads and tracks. • Revegetating bare soil with native species according to Fauna and Flaura Management Program.
		• Alteration of fauna from noise and workers movement.	
	Biological	• Potential risks to flora and fauna from accidental spills or poor waste management.	• Correct planning of activities (considering breeding seasons). • Correct waste management and implementation of Waste Management Program. • Proper O&M of equipment. • Consultation actions on protected areas and biodiversity aspects with KBA regulating agencies
		• Assimilable household, hazardous and construction solid waste generation.	
	Socio-Economic	• Increased accident risk both occupational and from traffic conditions.	• Using of proper personal protective equipment. • Training in the use of equipment. • Training in First Aid and provision of First Aid Kits.
		• Risk of economic and physical displacement resulting from the installation of metering infrastructure	• Conduct specific analysis of potential economic and physical displacement once the final engineering designs and locations for the metering infrastructure are defined.
		• Piped Water Service interruption	• Correct planning of activities. •Active Stakeholder Engagement and implementation of the Stakeholder Engagement Plan.
		• Risks of Impact on potential cultural, historical, and archeological heritage on site.	• Implement Chance Find Procedure Program • Permit for works near or in monument areas, when necessary, according to national legislation
		• Visual alteration of landscape.	• Correct planning of activities. • Correct waste management.

Given the existing NRW Reduction Contract from New Providence, a series of recommendations has been devised from the Completion of the Project[107]:

- Detailed **quantitative analysis of the problem** (Non-Revenue Water for every Family Island) and **Comprehensive NRW reduction strategies** should be elaborated prior to the implementation of the contract and should be actively supported over a substantial period to assure successful results.

- Key elements of the NRW Reduction strategy are proactive leak detection, rapid repairs, use of adequate materials, pressure management, selective replacement of network elements, disconnection of inactive service lines, large customer metering and asset maintenance. All these strategies should be included in the NRW Reduction Contract.

- Hydraulic monitoring, system optimization, GIS updating, SCADA and the use of data management hardware and software is also recommended to improve the overall systems sustainability and reliability.

- Any partial results in water quality improvements must be adequately reported and communicated to all relevant stakeholders and customers. This should be done through directly, systematically, and methodically supported by specialized and experiences technical assistance and with sufficient allocation of resources.

- Tariff and institutional restructuring studies should be developed ahead of or in parallel of the loan operation, providing adequate framework for financial sustainability of the new investments.

- The use of performance-based contracts significantly contributed to positive outcomes under the NRW Reduction Contract in New Providence, the use of this type of contract should be consider to better guarantee well-coordinated and timely execution, especially considering the existing experience with said contract of WSC.

- Advanced Metering Infrastructure

This project entails the purchase of new electromagnetic meters and their installation, replacing existing ones. This project does not involve physical interventions and does not exhibit any discernible environmental and social impact and risk, nevertheless, WSC must submit the contractor's information and installation procedure to IDB prior to conducting the installation works. In other to proactively mitigate potential impacts and risks, a series of recommendations has been devised, which are delineated below[108]:

- Ensure that the new meters are designed to be energy-efficient and made from environmentally friendly materials to minimize resource consumption and waste generation during production and installation.

[107] IDB. (2017). WSC Support Program – New Providence Water Supply and Sanitation Systems Upgrade (BH-L1028; Loan 2624/OC-BH). Project Completion Report (PCR).

[108] NEEP. (2017). Advanced Metering Infrastructure: Utility trends and Cost-Benefit Analysis in the NEEP Region.

- Develop a comprehensive Waste Management Program for the disposal of old meters, focusing on recycling and safe disposal to prevent environmental contamination.

- Minimize emissions from transportation and installation activities by optimizing logistics and using fuel-efficient vehicles.

- Utilize the advanced features of AMI to detect leaks and reduce water wastage, thereby promoting overall water conservation.

- Engage with local community to inform about the benefits of AMI, address any concerns related to health, cost and privacy issues and coordinate the replacement of the meters to reduce water supply affectations and implement a Grievance Redress Mechanism.

- Implement Socio-Environmental Training Program to protect workers and residents during the installation process and provide comprehensive training for operation and maintenance of the new meters to reduce risk of operational failure (Capacity Building Program for WSC).

- Ensure robust data privacy measures are in place to protect consumer information collected through AMI systems.

5.2. Access to Potable Water Supply

The following subsections describe the general process for assessing environmental and social impacts and risks for piped water mains extensions in the following Family Islands: Abaco, Bimini and Eleuthera. However, there are limitations to the study, given that the project is in the development stage.

The following assessment process will consider typical activities associated with piped water mains installation projects to identify and evaluate the environmental impacts and risks.

5.2.1. Assessment Process

Impact and Risk Assessment Process

The steps involved in the impact and risk assessment are:

1 **Impacts Identification:** determine what could happen in the different environment components, because of the project and its associated activities and facilities.

2 **Impact Assessment**: evaluate the significance of the predicted impacts and risks, considering their magnitude and occurrence probability, and the sensitivity, value and importance of the factor or component of the impacted environment.

3 **Mitigation / Improvement**: identify appropriate measures to mitigate negative impacts and enhance positive impacts.

4 **Residual Impact Assessment**: evaluate the significance of impacts assuming the effective implementation of mitigation and improvement measures.

Analyzed Phases for Piped Water Mains Extensions Projects

For the identification of environmental and social impacts and risks, the analysis time horizon was divided into three phases:

- **Construction**
- **Operation and Maintenance**
- **Decommissioning or abandonment**

The project involves infrastructure that is considered to have a long service life (piped water infrastructure). It is assumed that this infrastructure will be permanently incorporated into the service provider assets. Therefore, the decommissioning or abandonment stage **was not considered for the impact assessment**.

Piped Water Mains Extension Activities

This section includes the description of the activities of the piped water mains extension projects in the Family Islands.

Project Activities in the Construction Phase

There are several activities in the construction phase that must be considered from the socio-environmental perspective. Activities identified for the project included:

Work Preparation

A. Transport, movement and stockpiling of materials, equipment, machinery. Mobilization of the workforce.
B. Installation and operation of the construction sites and work fronts, installation of fencing and perimeter barriers.
C. Site clearing and trenching in the roadway area, removal of vegetation.

Main Work

D. Trenching, bed preparation and earthmoving.
E. Pipe Installation, hydraulic testing, trench backfilling.

Work Demobilization

F. Demobilization of construction sites and workers. Removal of surplus materials. Closure of the construction site.

Project Activities in the Operational Phase

G. Operation of the potable water network.
H. Maintenance of the potable water network.

Physical, Biological and Socioeconomic Environment Components Summary

The components of the physical, biological, and socioeconomic environment likely to be affected by the Infrastructure Projects include:

Physical Environment

1. Air. Gaseous emissions and particulate matter.
2. Air. Noise and vibrations.
3. Waters. Water table and groundwater. Surface water courses. Sea water.
4. Soil.

Biological Environment

5. Flora (including marine flora)
6. Fauna (including marine fauna)

Socioeconomic Environment

7. Infrastructure and services. Road network and traffic.
8. Infrastructure and services. Mains services (water, sewage, energy, gas).
9. Infrastructure and services. Waste Management. Municipal solid waste.
10. Infrastructure and services. Waste Management. Special and hazardous waste.
11. Infrastructure and services. Waste Management. Construction waste
12. Occupational Health and Safety. Risk of occupational and road accidents. Health impact.
13. Socio-Economic development. Labor employment. Commercial and service activities.
14. Cultural and Archaeological Heritage.
15. Land Use and Activities in the Area. Residential Use.
16. Landscape and Public Space. Visual impact. Landscape perception.

Impact Identification and Assessment for Infrastructure Projects

For the impact identification, the **interactions between the project actions** (identified above) and **the environmental components** (physical, biological, and socioeconomic environment) were analyzed.

As a representative graphic synthesis of this process a **matrix** was constructed, which reproduces in a simplified way the conditions of the studied system and allows to visualize with simple symbology the representative interactions. The matrix is a double-entry table in which the columns correspond to actions owned or induced by the project with environmental or social implications, while the rows are the physical, biological, and socioeconomic environment components likely to be affected.

The intersections between Project actions and the environmental components considered, allow us to visualize interaction relationships where differentials were evaluated between the "without project" situation and the "under project" situation, that is, impacts and risks.

The impact assessment to complete the matrix was conducted through: (i) interviews with sector experts and project team staff; (ii) expedited field survey; (iii) literature review – including checklists and impact evaluations for similar projects; and (iv) the consultant's experience.

Details of the impact assessment can be found in the matrix report.

Impact attributes

In each matrix cell, the impact is rated according to the attributes detailed below:

1. **Impact Sign**: refers to the nature of the impact (whether it is a positive or negative impact)
2. **Impact Magnitude (scale)**: qualitatively, it will be indicated if it is an impact of high, medium, or low significance (see **Table 25**).
3. **Impact Scope**: indicates whether it is a restricted impact (effect restricted to the Operational Area - OA), specific (effect located within the Direct Area of Influence - DAoI), or major (if it impacts neighboring areas, outside the Indirect Area of Influence - IAoI).
4. **Impact Duration (persistence)**: it is determined whether it is a transitory or permanent impact.
5. **Impact probability: it** is a measure of the probability of the impact occurrence.
6. **Accumulation:** for the most significant impacts identified, the cumulative impacts of the execution and operation of the works with respect to existing or potential projects will be analyzed.

Regarding the **magnitude of the impact**, the definitions in the following Table as a basis for their determination.

Table 25. Keys to determine the impacts magnitude.

Impact Magnitude	Physical and Biological environment	Socio-economic environment
High	It is defined as one that affects the environment or a subcomponent thereof, either in its entirety, or in a high percentage, altering its characteristics in a forceful way, so that it can be presumed that the impact will make it impossible to use it in the current conditions of this environment, in the modality and abundance in which it is currently used.	It is defined as one of long duration (persisting over several generations), or one that affects a definable group of people to such an extent as to cause a significant change in the quality of life or in culturally established and socially valued positive or appropriate patterns of an activity that will not return to pre-project levels for at least several generations.
Medium	It is defined as that which affects the environment or a subcomponent of it, partially, in a non-majority fraction, altering its characteristics in an evident manner, but in such a way that it can be presumed that the impact will not significantly impede the use of the resource in the current conditions of this environment, in the modality and abundance in which it is currently used.	It is defined as one that affects a definable group of people in a significant magnitude, enough to cause an alteration in the quality of life or in culturally established and socially valued as positive or adequate patterns of an activity.
Low	It is defined as that which affects the environment or a subcomponent of it, partially, in a clear minority fraction, not significantly altering its characteristics, in	It is defined as one of short duration or one that affects a reduced group of people in a localized area but does not imply an evident alteration in the quality of life or in culturally

Impact Magnitude	Physical and Biological environment	Socio-economic environment
	such a way that it can be presumed that the impact will not make it impossible to use this environment in the current conditions, in the modality and abundance in which it is currently used.	established and socially valued as positive or adequate patterns of an activity.

Mitigation measures identification

Once the impacts have been identified and assessed, mitigation measures are identified to avoid, reduce, correct, or compensate for them.

Mitigation Hierarchy

All negative impacts identified in the impacts and risks analysis of this Study require preventive, mitigatory, corrective or compensatory measures, which must be incorporated to minimize environmental impact and ensure the sustainable performance of the project.

Within the mitigation hierarchy, preventive (pre-impact, avoid impact at source) and mitigatory measures (minimize impact, reduce impact at source, or on the receiving body) are preferred over measures involving treatment (post-impact), such as restoration and compensation.

Residual Impact Determination

Once mitigation measures are identified, the next step in the assessment process is to assign a residual impact value. This step is a new impact assessment, considering the effective implementation of the mitigation measures identified.

5.2.2. Environmental and Social Impact Matrix for Infrastructure Projects

As a first approach to the analysis, a matrix was prepared to identify environmental and social impacts and risks. The matrix contains the sign and magnitude of the impact. The matrix is presented in **Figure 163**.

Matrix for the Identification of Environmental and Social Impacts and Risks

The Bahamas Water and Sanitation Systems Upgrade Program Component 3: Access to Potable Water Supply

ENVIRONMENTAL COMPONENTS LIKELY TO BE AFFECTED BY THE PROJECT				PROJECT ACTIVITIES WITH ENVIRONMENTAL AND SOCIAL IMPACT	PHASE: CONSTRUCTION PHASE – WORK PREPARATION			PHASE: CONSTRUCTION PHASE – MAIN WORK		PHASE: CONSTRUCTION PHASE – WORK DEMOBILIZATION	PHASE: OPERATIONAL PHASE – OPERATION AND MAINTENANCE	
					Transport, movement and stockpiling of materials, equipment, machinery. Mobilization of the workforce.	Installation and operation of the construction sites and work fronts, installation of fencing and perimeter barriers.	Site clearing and trenching in the roadway area, removal of vegetation.	Trenching, bed preparation and earthmoving.	Pipe Installation, hydraulic testing, trench backfilling.	Demobilization of construction sites and workers. Removal of surplus materials. Closure of the construction site.	Operation of the potable water network	Maintenance of the potable water network
					A	B		C	D	K		L y M
PHYSICAL AND BIOLOGICAL MEDIA	AIR	Gaseous emissions and particulate matter		1								
		Noise and vibrations		2								
	WATER	Water table and groundwater. Surface water. Sea water.		3								
	SOIL	Soil		4								
	BIOTA	Flora and Fauna		5								
SOCIO-ECONOMIC MEDIA	INFRASTRUCTURE AND SERVICES	Road network and traffic		6								
		Main utilities (water, energy)		7								
		WASTE MANAGEMENT	Solid waste	8								
			Hazardous or Special Waste	9								
			Surplus from works, C&D	10								
			Excavation Surplus	11								
	OCCUPATIONAL AND COMMUNITY HEALTH AND SAFETY	Risk of accidents (occupational, road, community accidents)		12								
	SOCIO-ECONOMIC DEVELOPMENT	Labor Employment, Commercial and Service Activities		13								
	CULTURAL HERITAGE	Cultural, Archaeological and Paleontolofical Heritage		14								
	LANDSCAPE	Visual Impact. Landscape Perception		15								

Sign and Magnitude of the Impact

Negative	High	
	Medium	
	Low	
Positive	High	
	Medium	
	Low	
Neutral	Neutral	

Figure 163 - Project Environmental and Social Impacts and Risks Matrix (Piped Water Mains Extension in Family Islands).

5.2.3. Matrix Report for Access to Potable Water Supply

The following report explains the criteria used in the weighting of the impacts shown graphically in the Impacts and Risks Matrix. It also expands on the valuation of the other attributes identified for the impacts (scope, duration, frequency, and duration). Finally, it identifies mitigation measures to be applied, determining the residual impact resulting from effectively applying these measures.

Impacts - Construction Phase

Air. Gaseous Emissions, Particulate Matter and Greenhouse Gases

Impact Assessment

Impact Description	Air quality impacts of gaseous emissions and particulate matter		
Impact Nature	Negative	Positive	Neutral
Magnitude	Low	Medium	High
Scope	Restricted (OA)	Punctual (DAoI)	Local (IAoI)
Duration	Transitory	Permanent	
Probability	Low	Medium	High
Accumulation	Non-cumulative	Cumulative	

Impact Discussion

The actions of the construction phase, including worker camps installation, material storage, movement of machinery and vehicles affected by the work, cleaning of the land, excavations, movement of soils, civil works for infrastructure upgrades and new infrastructure construction, are characterized by the emission of particulate matter and gaseous emissions of combustion engines, which can cause air pollution.

On one of the sites visited, some abandoned cars were seen located in a lot adjacent to the proposed intervention site (Sweetings Village). The presence of this potential historical contamination must be addressed accordingly, to ensure the cleanliness of the site and avoid any risk of occupational and community exposure due to the dispersion of contaminated soil. It is recommended to implement an Environmental Liabilities Program, as a good practice measure. Moreover, there must be mitigation measures pertaining the reduction of dust generation in this area, avoiding possible contaminated soil dispersion during work preparation and main works to be implemented.

These impacts are valued as negative, of medium magnitude, of punctual scope (direct influence area) and of a transitory nature (they only occur during the construction phase).

Mitigation Measures

- All materials that could give off dust will be transported in vehicles covered with tarpaulins, with sufficient humidity to minimize their dispersion.
- During the on-site stockpiling period, materials that could generate dust will be periodically wetted. The quantities in stockpiles will be minimized, whenever operationally feasible.
- Periodic watering of roads without asphalt layer to be used on site will be implemented (twice a day).

- Limiting the speed of construction vehicles on access roads without asphalt surface (depending on the case, between 20 and 40 km/h).
- When extracting earth during excavation and soil movement, dust emissions will be mitigated by spraying the material.
- Maintenance of construction machinery in good condition (technical verification).
- It is recommended to implement an Environmental Liabilities Program pertaining the potential historical contamination site located in Sweetings Village, Abaco.

Residual Impact

Considering water is a limited resource in the islands, the use of water for wetting materials will be limited. The associated residual impact remains of low magnitude.

Noise and vibration

Impact Assessment

Impact Description	Impacts by noise and vibration generation		
Impact Nature	Negative	Positive	Neutral
Magnitude	Low	Medium	High
Scope	Restricted (OA)	Punctual (DAoI)	Local (IAoI)
Duration	Transitory	Permanent	
Probability	Low	Medium	High
Accumulation	Non-cumulative	Cumulative	

Impact Discussion

The transportation of materials and workers, and the operation of construction machinery, the operation of groundwater depression pumps (if required), are activities that generate noise and vibrations (noise pollution).

No impacts are expected outside the direct area of influence. These are temporary exposures. Given that there are mixed residential environments at the project sites, including homes, hotels, cabins, and commercial premises, the impacts are assessed as medium magnitude, with specific reach and transient duration.

Mitigation Measures

- Implement an **Information and Community Participation Program** in the SESMP, which provides information to neighbors about the works duration and scheduling.
- In the vicinity of population settlements, high noise generation activities will be scheduled with the community in order to avoid impacts at sensitive hours.
- Maintain construction machinery and equipment in good condition.
- Implement IFC Guidelines noise guidance levels – 55 dBA during the day, and 45 dBA at night for equivalent continuous noise levels in residential, institutional, and educational settings; and/or compliance with specific legislation at national and local level.

Residual Impact

Effective implementation of detailed mitigation measures is expected to result in low negative residual impact.

Water table and groundwater. Surface water. Sea Water.

Impact Assessment

Impact Description	Impacts on groundwater and surface water resources		
Impact Nature	Negative	Positive	Neutral
Magnitude	Low	Medium	High
Scope	Restricted (OA)	Punctual (DAoI)	Local (IAoI)
Duration	Transitory	Permanent	
Probability	Low	Medium	High
Accumulation	Non-cumulative	Cumulative	

Impact Discussion

In terms of water quality, construction activities can have a negative impact on the water table due to the risk of accidental spills (hydrocarbons, oils or other chemical substances used on site), or due to poor effluent management during construction work (for example, sanitary effluents, effluents from hydraulic tests, or *mixer* washing). Permeability of the substrate is high and the aquifers on the island are located at shallow depths, especially the existing domestic private wells connections, so they could be negatively impacted during construction.

Given the proximity of some of the project sites to the shoreline, there is an elevated risk of adverse impacts on coastal water quality due to potential accidents and spills involving hazardous substances. Such incidents could lead to contamination, affecting marine ecosystems and biodiversity.

Some of the sites are near natural wetlands (see Sweetings Village DAoI) which could also be affected by potential accidents and spills involving hazardous substances or construction debris.

One of the sites (Sweetings Village, Abaco) showed abandoned cars that were left on bare soil, 30ft from the proposed water mains extension. This could be a potential historical contamination, given it is a source of contamination of groundwater, the main water source for the neighborhood (Sweetings Village). It is recommended to implement an Environmental Liability Program to address this site. The proposed project would, however, decrease the risk of adverse health effects and exposure to the potential historical contamination, given the water source for the community of Sweetings Village would be switched to WSC main water supply system from desalination plants.

These identified impacts are negative, transitory (they only occur during the work implementation), and of medium magnitude.

Mitigation Measures

- Establish an **Effluent Management Program** on the **SESMP**.
- Establish an **Aquatic Habitat Management Program** on the **SESMP**
- Establish a **Chemical Substance Management Program** in the **SESMP**, including storage within a containment area, protocols for fueling and oil changes with spill protection.

- Provide sanitation systems for personnel from the beginning of the project implementation (portable toilets, toilets with connection to the sewer, etc.).
- Identify and effectively manage non-domestic effluents.
- Implement a drainage system on-site to control runoff volumes and extreme measures in project sites located near coastal shores and wetlands.

Residual Impact

The magnitude of residual impacts remains low.

Soil

Impact Assessment

Impact Description	Impacts on soil resources from conversion, erosion, sediment runoff, and/or pollution		
Impact Nature	Negative	Positive	Neutral
Magnitude	Low	Medium	High
Scope	Restricted (OA)	Punctual (DAoI)	Local (IAoI)
Duration	Transitory	Permanent	
Probability	Low	Medium	High
Accumulation	Non-cumulative	Cumulative	

Impact Discussion

The stockpiling and handling of construction materials, and the operation of machinery and equipment in all work activities, can give rise to the risk of soil contamination by oil and hydrocarbon spills, or by poor management of sewage effluents or solid construction waste.

The removal of vegetation and tree cover, soil movement, drilling and excavations, demolition and breakage of road, and post-excavation filling always mean a negative impact on the composition of the soil, which can lead to erosion, compaction, alteration of the edaphic sequence, etc. The stockpiling of soil during excavations can lead to sediment runoff to nearby water streams and water courses. This effect can also be exacerbated during flooding events or tropical storms.

At one of the sites visited, there were some abandoned cars located in a lot adjacent to the proposed intervention site (Sweetings Village). The presence of this possible historical contamination must be addressed accordingly. It is recommended to implement an Environmental Liabilities Program to ensure the cleanliness of the site and avoid any risk of occupational and community exposure due to the dispersion of possibly contaminated soils.

In addition, soils movement can cause the dispersion of rodents and other vectors to surrounding areas.

These identified impacts are negative, of low magnitude, of a transitory nature (they only occur during the work implementation phase) and localized (they affect only the direct influence area of the project).

Mitigation Measures

- Establish a **Chemical Management Program in the SESMP**, including storage within the containment area, fuel refill and oil change protocols with spill protection.
- Establish a **Contingency Plan**, which includes spill preparedness and actions (anti-spill kits, training, etc.).
- Establish protection measures to avoid sediment runoff, including limiting the extent of open trenches to minimize stockpiling volumes; close out trenches as works schedule permits in anticipation of strong storms / tropical storms; cover soil stockpiles with tarpaulin sheets, etc.
- Establish an **Effluent Management Program** at the **SESMP**.
- Provide sanitation systems for personnel from the beginning of the project implementation (portable toilets, toilets with connection to the sewer, etc.).
- Avoid the washing of tools and machinery (for example, concrete mixers) in the operational area of the project.
- Establish a **Pest and Vector Control Program** in the **SESMP**.
- Establish a **Chemical Substance Management Program** in the **SESMP**, including storage within a containment area, protocols for fueling and oil changes with spill protection.
- Establish an **Erosion Control Program** in the **SESMP**
- Establish responsible party of the historical contamination found in one of the sites, ensuring its correct remediation and corrective measures applied.

Residual Impact

The residual impact remains low.

Flora and Fauna

Impact Assessment

Impact Description	Impacts on Flora and Fauna due to construction activities		
Impact Nature	Negative	Positive	Neutral
Magnitude	Low	Medium	High
Scope	Restricted (OA)	Punctual (DAoI)	Local (IAoI)
Duration	Transitory	Permanent	
Probability	Low	Medium	High
Accumulation	Non-cumulative	Cumulative	

Impact Discussion

The tasks related to site clearing, installation of the work zone and work fronts, storage of materials in preparation for construction, and trenching excavations will involve the removal of vegetation cover. The areas are in roadway zones, since there are no technical specifications of the current project, there is no clear estimation as to trees requiring removal. Site visits identified certain trees that are considered protected trees that could require removing due to proximity to the road. The removal of protected trees is regulated by the Conservation and Protection of the Physical Landscape of The Bahamas Act and it requires permitting for harvesting of protected trees.

In terms of fauna, the most significant impacts will be caused by the movement of personnel, machinery, and the noise and vibrations associated with various construction activities, which will result in the temporary displacement of the fauna present in the area.

One of the project sites is located within a KBA (Eleuthera Water Mains Extension from Tarpum Plant to Jack's Bay), of significance importance due to the avian species that are in the IUCN Red List as Near Threatened (NT). However, given the nature of the works –underground piping being built on the side of an existing highway – and the scale of the works - a 4.6 km linear underground pipe relative to a 175 km^2 KBA – it is expected that the project does not lead to measurable adverse impacts on those biodiversity values for which the critical habitat was designated, or on the ecological processes supporting those biodiversity values. Extreme mitigation measures must be taken to ensure the reduction of impacts to these areas.

One of the project sites (Abaco's Sweetings Village Water Mains Extensions) is 30ft away from several abandoned cars located in a lot adjacent to the proposed site interventions (Sweetings Village). The presence of this potential historical contamination could negatively affect the fauna of the site, especially if redispersed by activities during Work Preparation and the Main Works to be implemented. It is recommended to implement an Environmental Liabilities Program pertaining to mitigate this impact.

These identified impacts are considered negative, of low magnitude and of a permanent nature and affecting the direct influence area of the project.

Mitigation Measures

- Establish a **Vegetation and Fauna Management Program** in the constructive SESMP, with specific guidelines aimed at preventing impacts on flora and fauna. Likewise, the Program will explain the mitigating and compensatory measures for the removal of trees and protected trees, communication actions to neighbors, and the prohibition of introducing invasive species.
- Implement a formal communication strategy with the authorities responsible for KBA regulation to guarantee compliance with the established guidelines.
- Consider breeding seasons for the planning of activities.
- Allow the removal of vegetation cover only in designated areas necessary for the works associated with the project. Harvesting of protected trees should be avoided and taken into consideration as a factor when establishing designated areas for the works.
- Respect the edaphic sequence in soil movements: after cleaning, the upper floor (stored separately) will be used for leveling and reprofiling.
- Land used for temporary construction facilities (e.g., campground) must be restored to its original condition.
- Establish strict speed limits within and around the construction zone, coupled with awareness campaigns to protect the fauna.
- Compensatory measures for removed specimens in a ratio of 3:1.
- Train employees on native wildlife and how to proceed in encounters with species.
- Prohibition of hunting in the project area.
- It is recommended to implement an Environmental Liabilities Program

Residual Impact

Effective implementation of detailed mitigation measures is expected to result in low negative residual impact.

Road and Traffic Impacts

Impact Assessment

Impact Description	Competitive impacts on the use of the road network		
Impact Nature	Negative	Positive	Neutral
Magnitude	Low	Medium	High
Scope	Restricted (OA)	Punctual (DAoI)	Local (IAoI)
Duration	Transitory	Permanent	
Probability	Low	Medium	High
Accumulation	Non-cumulative	Cumulative	

Impact Discussion

Throughout the entirety of the construction phase, impacts will be generated due to increased traffic and competition for the use of the road network (due to the transportation of materials, equipment, personnel, and machinery for project works) and due to the reduction of effective roadway areas (due to the presence of work installation zones, construction site fencing, trenching, and parked or operating machinery).

Moreover, the project is expected to generate potential disturbances for residents living along the affected roads. These disturbances may include temporary inconvenience, disruption of daily activities, and potential grievances due to noise, dust, restricted access, and construction-related activities. It is crucial to engage with the local community proactively to address their concerns and mitigate adverse impacts through effective communication and management strategies.

The road sections where the networks extensions will take place are located on Main Highways (Sherman's Highway in Eleuthera projects, Airport Road in Bimini) for some of the projects on the program, which are the main circulation axis for the islands and where several commercial activities can be found, including Airports, restaurants, and hotels. They usually have a single carriageway of 20.25ft wide and dual lanes, which could cause inconvenience to the community and tourism circulation, leading to delays and specific congestion at the work progress front. Therefore, the impact is considered negative, localized in the Influence Area, of medium magnitude, and of a transient nature (occurring only during the construction period).

Mitigation Measures

- Implement an **Information and Community Participation Program** in the SESMP, which provides information to neighbors about the works duration, scheduling and mitigation measures of risks and impacts produced by the works.
- Establish a **Road Safety and Traffic Management Program** in the SESMP.

Residual Impact

The residual impact is expected to result in low negative impact.

Main Utilities (water, energy)

Impact Assessment

Impact Description	Competitive impacts on the use of the road network		
Impact Nature	Negative	Positive	Neutral
Magnitude	Low	Medium	High
Scope	Restricted (OA)	Punctual (DAoI)	Local (IAoI)
Duration	Transitory	Permanent	
Probability	Low	Medium	High
Accumulation	Non-cumulative	Cumulative	

Impact Discussion

Throughout the entire construction phase, activities such as transportation of materials and machinery through narrow access roads, site clearing, excavations, earthworks, and pipeline laying, among others, could cause interference with pre-existing service networks located in the intervention area, electricity. This impact is negative, localized in the Influence Area, of medium magnitude, and of a transient nature (occurring only during the construction). It also exhibits cumulative characteristics: the incremental effect of this impact on services may be enhanced by concurrent activities associated with the Project.

Mitigation Measures

- Establish a **Coordination Program** with service providers in the SESMP to manage the impacts.

Residual Impact

The residual impact remains low.

Waste Management

Impact Assessment

Impact Description	Contamination by improper disposal of solid waste		
Impact Nature	Negative	Positive	Neutral
Magnitude	Low	Medium	High
Scope	Restricted (OA)	Punctual (DAoI)	Local (IAoI)
Duration	Transitory	Permanent	
Probability	Low	Medium	High
Accumulation	Non-cumulative	Cumulative	

Impact Discussion

The operation of the camp and the construction front involve the generation of solid waste assimilable to domestic.

In all construction activities, surplus construction, demolition waste (iron cuttings, cables, remains of plastic pipes, wood, aggregates from pavement breaks, etc.) and green waste (resulting from weeding, land cleaning, etc.) may also be expected.

During site visits, there was noticeable amounts of waste surrounding some of the areas of intervention that will have to be removed.

Due to the characteristics of the activities to be conducted in the works of the project, it is not expected that special or hazardous waste will be generated, except for smaller quantities resulting from the maintenance of machinery and vehicles affected by the work (lubricating oils, etc.). These special waste streams must be disposed of in accordance with current regulations, using authorized transporters and operators, and in compliance with the local specific regulations. One of the sites possesses abandoned cars in a vacant lot 30ft from the project site (Sweetings Village), which could potentially be considered a historical contamination. It is recommended to implement an Environmental Liability Program, in which the responsible party of the sites is identified, and appropriate measures taken to reduce risk and remediate the site.

Surplus excavation soils (if any) must be properly disposed of (e.g., used as backfill at other approved sites – quarries).

Improper waste management on site can cause contamination, and risk of proliferation of rodents and other vectors.

The risk of contamination due to poor solid waste management on site is considered a low negative impact, of medium probability and of a transitory nature (occurring during the work execution phase).

Mitigation Measures

- Establish a **Waste Management Program** in the SESMP, which defines the guidelines for proper management of all waste streams to be generated on site – including surplus excavations, in accordance with current legislation and good practices.
- Establish a **Socio-Environmental Training Program for Construction Personnel**, which includes training in the correct management of construction waste.
- Establish a **Monitoring and Control Program** that includes a protocol for analyzing soil contamination from excavations.
- Establish a **Pest and Vector Control Program** in the SESMP.
- It is recommended to implement an **Environmental Liability Program** to address the potential historical contamination found in one of the project sites.
- Removal of existing waste surrounding project areas

Residual Impact

The residual impact of solid waste management is expected to remain low.

Occupational and Community Safety

Impact Assessment

Impact Description	Risk of accidents (occupational - road)		
Impact Nature	Negative	Positive	Neutral
Magnitude	Low	Medium	High
Scope	Restricted (OA)	Punctual (DAoI)	Local (IAoI)
Duration	Transitory	Permanent	
Probability	Low	Medium	High
Accumulation	Non-cumulative	Cumulative	

Impact Discussion

The execution of these tasks carries inherent risks, primarily of an occupational nature. These risks are attributed to the high-risk nature of various construction activities, encompassing excavations (with the potential for cave-ins and entrapment, especially with the characteristics of calcareous soils and the probability of sinkholes), electrical work, accidents involving heavy machinery, potential for hearing impairment due to noise-producing equipment, welding, and hot work operations, as well as ergonomic hazards.

One of the project sites (Abaco's Sweetings Village Water Mains Extensions) is 30ft away from several abandoned cars located in a lot adjacent to the proposed site interventions (Sweetings Village). The presence of this potential historical contamination could negatively affect the occupational and community health from exposure to contaminated soils and dust, especially during work preparation activities. It is recommended to implement an Environmental Liabilities Program pertaining to mitigate this impact.

Furthermore, there is a recognized risk of forced or child labor associated with the procurement of solar panels.

This impact is classified as negative, of high magnitude for main work instances (drenching) and low magnitude for work preparation and demobilization activities, and of a transitory nature (occurring during the work execution phase).

Mitigation Measures

- Implement an **Occupational Health and Safety Program** within the SESMP that aligns with current national and local regulations and incorporates elements from globally recognized occupational health and safety management systems (ISO 45001:2018).
- Develop a **Socio-Environmental Training Program** for on-site personnel in the SESMP, encompassing comprehensive training on personal protective equipment (PPE), work-related risks, contingency planning, safe handling of chemical substances, and related subjects.
- Establish a **Road Safety and Traffic Management Program** within the SESMP, aimed at proactively preventing road accidents involving personnel and construction vehicles through measures such as safe driving practices and proper signage at work sites and detours.
- Create a **Works Installation and Camp Set-up Program** in the SESMP, ensuring the installation of fencing, access control, and appropriate signage at camp sites, work areas, ditches, and other relevant locations.

- Develop a **Contingency Plan** within the SESMP to ensure a swift and effective response to medical emergencies.
- The implementation of an **Environmental Liabilities Program** is recommended.

Residual Impact

As a result of the effective implementation of the proposed mitigation measures, the residual impact associated with occupational safety is reduced to low magnitude.

Economic development

Impact Assessment

Impact Description	Impacts on employment, business, and services		
Impact Nature	Negative	Positive	Neutral
Magnitude	Low	Medium	High
Scope	Restricted (OA)	Punctual (DAoI)	Local (IAoI)
Duration	Transitory	Permanent	
Probability	Low	Medium	High
Accumulation	Non-cumulative	Cumulative	

Impact Discussion

The activities foreseen in the construction phase will require labor – skilled and unskilled – and acquisition of construction materials and services. This will have a positive impact on employment generation, and on the dynamization of the activity of trade in goods and services. In particular, the items that will benefit include those related to the sale of construction inputs and materials, equipment, vehicles, machinery, spare parts and accessories, mechanical services, fuel, logistics, and food, among others.

These impacts are considered positive of low magnitude, of a transitory nature, and geographically distributed in the indirect influence area of the project, except for work demobilization period, where the impact is low negative due to the completion of the tasks.

These positive impacts could be reduced by the risk of economic displacement for business owners in the affected areas, or access to livelihoods for informal workers, derived from disruptions caused by the construction works.

Mitigation Measures

- Once final engineering designs are completed, update the assessment on potential economic displacement to be caused by the construction works, and define appropriate mitigation measures, including plans for prevention of business disruption, or livelihood restoration plans.
- Establish a **Grievance Redress Mechanism** for the Project.

Residual Impact

The residual impact of the area revitalization by the action of the Project implementation remains in positive low.

Cultural and Archaeological Heritage

Impact Assessment

Impact Description	Negative impacts on cultural and archaeological heritage		
Impact Nature	Negative	Positive	Neutral
Magnitude	Low	Medium	High
Scope	Restricted (OA)	Punctual (DAoI)	Local (IAoI)
Duration	Transitory		Permanent
Probability	Low	Medium	High
Accumulation	Non-cumulative		Cumulative

Impact Discussion

According to the information in the Environmental and Social Baseline, there is no probability of finding evidence of cultural or historical heritage on the operational area of the projects. However, the possibility of chance finds must be addressed. The activities of soil movement could entail a risk of impact on the cultural, historical, and archaeological heritage of the area, due to the degradation or loss that could result from improper management of archaeological assets that are in the intervened area.

This risk is assessed as negative, of low magnitude, irreversible (permanent).

Mitigation Measures

- Implement a **Procedure of Fortuitous Discoveries** in the SESMP, which ensures the correct management of findings that could have archaeological value.

Residual Impact

The residual risk of negative impacts on the archaeological heritage remains low.

Landscape and Public Space

Impact Assessment

Impact Description	Visual and landscape impact		
Impact Nature	Negative	Positive	Neutral
Magnitude	Low	Medium	High
Scope	Restricted (OA)	Punctual (DAoI)	Local (IAoI)
Duration	Transitory		Permanent
Probability	Low	Medium	High
Accumulation	Non-cumulative		Cumulative

Impact Discussion

The activities of the construction phase and presence of camps, fences, construction machinery, excavation, etc. have a negative effect on the perception of the landscape (visual alteration).

This impact is valued as low negative, and transitory.

Mitigation Measures

- Ensure the necessary means are in place so that, concerning work organization and especially in the construction site and storage areas, there are no potential impacts on the aesthetic quality of the landscape (for example, continuously removing construction waste and debris).
- Install systems for the disposal and containment of construction waste, adequately protecting them to prevent dispersal by wind, thus avoiding environmental impact and landscape alteration.
- Implementation of visual barriers.

Residual Impact

The residual impact is considered low.

Impacts - Operational Phase

Air. Gaseous Emissions, Particulate Matter and Greenhouse Gases

Impact Assessment

Impact Description	GHG reductions		
Impact Nature	Negative	Positive	Neutral
Magnitude	Low	Medium	High
Scope	Restricted (OA)	Punctual (DAoI)	Local (IAoI)
Duration	Transitory	Permanent	
Probability	Low	Medium	High
Accumulation	Non-cumulative	Cumulative	

Impact Discussion

The operational phase of the Project includes the operation and maintenance of the infrastructure. Activities conducted during infrastructure maintenance, which may involve excavations for repairs due to leaks or losses, will impact the immediate urban area adjacent to it and must be appropriately mitigated.

This impact is assessed as low negative, of a transient nature, and localized within the project's Area of Influence.

Mitigation Measures

- When extracting earth during excavation and soil movement, dust emissions will be mitigated by spraying the material.
- Maintenance of construction machinery in good condition (technical verification).

Residual Impact

Considering water is a limited resource in the islands, the use of water for wetting materials will be limited. The associated residual impact remains of low magnitude.

Water table and groundwater. Surface water. Sea Water.

Impact Assessment

Impact Description	Impacts on groundwater and surface water resources from operation and maintenance		
Impact Nature	Negative	Positive	Neutral
Magnitude	Low	Medium	High
Scope	Restricted (OA)	Punctual (DAoI)	Local (IAoI)
Duration	Transitory	Permanent	
Probability	Low	Medium	High
Accumulation	Non-cumulative	Cumulative	

Impact Discussion

In terms of water quality, maintenance activities of the infrastructure can have a negative impact on the water table due to the risk of accidental spills (hydrocarbons, oils or other chemical substances used on site). Permeability of the substrate is high and the aquifers on the island are located at shallow depths, especially the existing domestic private wells connections, so they could be negatively impacted during construction. Some of the sites are near natural wetlands (see Sweetings Village DAoI) which could also be affected by potential accidents and spills involving hazardous substances.

In terms of water quantity, the incorporation of additional clients into the piped water system is anticipated to augment water extraction demands and consumption levels on the family islands during operational phase. This adverse health effect, however, is coupled with the beneficial outcomes of Component 1's Non-Revenue Water contract, which aims to decrease water losses, thereby increasing the net volume of piped water produced. An assessment is required to determine the cumulative impacts, which is whether the increased piped water demand on the family islands can be accommodated within the targets set by the Non-Revenue Water Reduction Contracts for water loss.

These identified impacts are negative, transitory (they only occur during the operation and maintenance works), and of low magnitude.

Mitigation Measures

- Establish a **Socio-Environmental Training Program** for personnel in the operational SESMP, which includes training in the use of PPE, risks during maintenance tasks, contingency plan, etc.
- Assess the increased potable water demand on the family islands and whether it can be accommodated by the Potable Water Systems for each of the Islands, taking in consideration the Non-Revenue Water Reduction Contract expected targets.

Residual Impact

The magnitude of residual impacts remains low.

Waste Management

Impact Assessment

Impact Description	Domestic waste generation		
Impact Nature	Negative	Positive	Neutral
Magnitude	Low	Medium	High
Scope	Restricted (OA)	Punctual (DAoI)	Local (IAoI)
Duration	Transitory		Permanent
Probability	Low	Medium	High
Accumulation	Non-cumulative		Cumulative

Impact Discussion

The project's operational phase will result in a waste stream stemming from pipeline maintenance tasks (solid waste from cleaning, unclogging, and other activities). Additionally, waste will be generated from the maintenance and repair of electromechanical equipment, such as oils, greases, dirty rags, etc. Improper management of these waste streams can pose hazardous risks if not managed and disposed of according to current regulations.

The generation of these types of waste is considered a low negative impact of a permanent nature.

Mitigation Measures

- Establish a **Waste Management Program** in the SESMP, which defines the guidelines for proper management of municipal solid waste streams.

Residual Impact

The assessment of the magnitude of the residual impact remains negative low.

Occupational and Community Safety

Impact Assessment

Impact description	Risk of accidents in maintenance tasks		
Impact Nature	Negative	Positive	Neutral
Magnitude	Low	Medium	High
Scope	Restricted (OA)	Punctual (DAoI)	Local (IAoI)
Duration	Transitory		Permanent
Probability	Low	Medium	High
Accumulation	Non-cumulative		Cumulative

Impact Discussion

It can be anticipated that network maintenance activities involve a risk and probability of accidents, both occupational (due to the maintenance tasks themselves) and traffic-related (due to the circulation of vehicles and machinery assigned to these tasks).

During the execution of these tasks, accidents or risks to the community can also occur, affecting residents, neighbors, and pedestrians who need to navigate through these road areas, particularly if there are deficiencies in signage, reduced road widths, and machinery or materials obstructing passage in the area.

Based on this, the impact is classified as negative, punctual to the direct area of influence, of medium magnitude, and permanent.

Mitigation Measures

- Reinforce signage and occupational health and safety measures in the intervened facilities.
- Establish an **Occupational Health and Safety Program** in the SESMP for the operational phase, which complies with the requirements of current national and local regulations and is nourished by elements of internationally recognized occupational health and safety management systems (ISO 45001: 2018).
- Establish a **Contingency Plan** in the operational SESMP, which ensures the response to medical emergencies.
- Establish a **Socio-Environmental Training Program** for Personnel in the operational SESMP, which includes training in the use of PPE, risks during maintenance tasks, contingency plan, etc.
- Establish a **Road Safety and Traffic Management Program** in the operational SESMP aimed at preventing road accidents involving construction personnel or vehicles, through measures such as sage driving practices, proper site signage, detours, etc.

Residual Impact

As a result of the proper implementation of the proposed mitigation measures, the residual impact associated with occupational safety is considered of low magnitude.

5.2.4. Environmental and Social Residual Impacts Matrix

After applying the mitigation measures identified for Project's environmental and social impacts and risks, the matrix of residual environmental and social impacts is obtained, shown in **Figure 164**.

Matrix for the Identification of Environmental and Social Impacts and Risks

The Bahamas Water and Sanitation Systems Upgrade Program Component 3: Access to Potable Water Supply

ENVIRONMENTAL COMPONENTS LIKELY TO BE AFFECTED BY THE PROJECT				PROJECT ACTIVITIES WITH ENVIRONMENTAL AND SOCIAL IMPACT	PHASE: CONSTRUCTION PHASE – WORK PREPARATION: Transport, movement and stockpiling of materials, equipment, machinery. Mobilization of the workforce.	PHASE: CONSTRUCTION PHASE – WORK PREPARATION: Installation and operation of the construction sites and work fronts, installation of fencing and perimeter barriers.	PHASE: CONSTRUCTION PHASE – WORK PREPARATION: Site clearing and trenching in the roadway area, removal of vegetation.	PHASE: CONSTRUCTION PHASE – MAIN WORK: Trenching, bed preparation and earthmoving.	PHASE: CONSTRUCTION PHASE – MAIN WORK: Pipe installation, hydraulic testing, trench backfilling.	PHASE: CONSTRUCTION PHASE – WORK DEMOBILIZATION: Demobilization of construction sites and workers. Removal of surplus materials. Closure of the construction site.	PHASE: OPERATIONAL PHASE – OPERATION AND MAINTENANCE: Operation of the potable water network	PHASE: OPERATIONAL PHASE – OPERATION AND MAINTENANCE: Maintenance of the potable water network
					A	B	C	D	E	K		L y M
PHYSICAL AND BIOLOGICAL MEDIA	AIR	Gaseous emissions and particulate matter		1								
		Noise and vibrations		2								
	WATER	Water table and groundwater. Surface water. Sea water.		3								
	SOIL	Soil		4								
	BIOTA	Flora and Fauna		5								
SOCIO-ECONOMIC MEDIA	INFRASTRUCTURE AND SERVICES	Road network and traffic		6								
		Main utilities (water, energy)		7								
		WASTE MANAGEMENT	Solid waste	8								
			Hazardous or Special Waste	9								
			Surplus from works, C&D	10								
			Excavation Surplus	11								
	OCCUPATIONAL AND COMMUNITY HEALTH AND SAFETY	Risk of accidents (occupational, road, community accidents)		12								
	SOCIO-ECONOMIC DEVELOPMENT	Labor Employment, Commercial and Service Activities		13								
	CULTURAL HERITAGE	Cultural, Archaeological and Paleontolofical Heritage		14								
	LANDSCAPE	Visual Impact. Landscape Perception		15								

Sign and Magnitude of the Impact

Negative	High	
	Medium	
	Low	
Positive	High	
	Medium	
	Low	
Neutral	Neutral	

Figure 164 – Access to Potable Water Supply. Residual Environmental and Social Impacts and Risks Matrix.

5.2.5. Assessment Process

The steps involved in the impact and risk assessment of Lift Station Upgrades are:

1 **Impacts Identification:** determine what could happen in the different environment components, as a consequence of the project and its associated activities and facilities.
2 **Mitigation / Improvement**: identify appropriate measures to mitigate negative impacts and enhance positive impacts.

5.3. Lift Stations Upgrades

The activities proposed in this component are comprised of acquisition, removal of old equipment and installation of new equipment for the following 19 lift stations.

Table 26. List of Lift Stations and equipment to be upgraded.

N°	Location	Equipment
1	Malcolm Park	60 HP Flygt
		Contactors, phase monitors, leakage detectors, floats, alternating relays, control relays, contact kits, breakers and surge protection. SCADA monitoring. Control Board (Generator)
2	Elizabeth East	Two 45 HP Flygt
		Duplex Control Panel
		Two pump heels, guide rails, brackets
		Five 8' valves: three check and two gate
		Contactors, phase monitors, leakage detectors, floats, alternating relays, control relays, contact kits, breakers and surge protection. SCADA monitoring. Control Board (Generator)
3	Montague	Two 20 HP Flygt
		Duplex panel
		Heels and guide rails
		Three 8' valves: two check and one gate
		Contactors, phase monitors, leakage detectors, floats, alternating relays, control relays, contact kits, breakers and surge protection. SCADA monitoring.
4	Potters Cay	Two 5HP Flygt
		Heels, guiderails, and brackets
		Three 8' valves: two check and one gate
		Duplex Panel
		Contactors, phase monitors, leakage detectors, floats, alternating relays, control relays, contact kits, breakers and surge protection. SCADA monitoring.
5	Rawson Square	Two 35HP Flygt

N°	Location	Equipment
		Heels, guide rails, Three 8' valves: two check and one gate, and brackets
		Duplex Panel
		Contactors, phase monitors, leakage detectors, floats, alternating relays, control relays, contact kits, breakers and surge protection. SCADA monitoring. Control Board (Generator)
6	Fox Hill	Two 20 HP Flygt
		Duplex Panel
		Heels and guide rails
		Three 8' valves: two check and one gate
		Contactors, phase monitors, leakage detectors, floats, alternating relays, control relays, contact kits, breakers and surge protection. SCADA monitoring. Control Board (Generator)
7	Old Cedar	Two 10 HP Flygt
		Heels, guide rails, three 8' valves: two check and one gate, and brackets
		Duplex Panel
		Contactors, phase monitors, leakage detectors, floats, alternating relays, control relays, contact kits, breakers and surge protection. SCADA monitoring.
		Two 7.5 HP Flygt
8	Shirlea	Heels, guide rails, three 8' valves: two check and one gate, and brackets
		Duplex Panel
		Contactors, phase monitors, leakage detectors, floats, alternating relays, control relays, contact kits, breakers and surge protection. SCADA monitoring.
9	Yellow Elder Main	Two 45 HP Flygt
		One Duplex Control Panel
		Two pump heels (12" discharge), guide rails, three 8' valves: two check and one gate, brackets
		Contactors, phase monitors, leakage detectors, floats, alternating relays, control relays, contact kits, breakers and surge protection, Control Board (generator). SCADA monitoring.
10	McNeil	Two 10 HP Flygt
		Heels, guide rails, three 8' valves: two check and one gate, and brackets
		Duplex Panel
		Contactors, phase monitors, leakage detectors, floats, alternating relays, control relays, contact kits, breakers and surge protection. SCADA monitoring.
		30KW Generator Replacement and Automatic Transfer Switch (ATS). (Existing generator is aged and parts for this unit are obsolete)
11	PMH	Two 10 HP Flygt

N°	Location	Equipment
		Heels, guide rails, three 8' valves: two check and one gate, and brackets
		Duplex Panel
		Contactors, phase monitors, leakage detectors, floats, alternating relays, control relays, contact kits, breakers and surge protection. SCADA monitoring.
		Install 30KW Generator and ATS. (This is a critical Lift Station for Hurricane Preparedness)
12	Oakes Field	Two 10 HP Flygt
		Heels, guide rails, three 8' valves: two check and one gate, and brackets
		Duplex Panel
		Contactors, phase monitors, leakage detectors, floats, alternating relays, control relays, contact kits, breakers and surge protection. SCADA monitoring.
13	Big Pond	Two 20 HP Flygt
		Duplex panel
		Heels and guide rails
		Three 8' valves: two check and one gate
		Contactors, phase monitors, leakage detectors, floats, alternating relays, control relays, contact kits, breakers and surge protection. SCADA monitoring. Control Board (Generator)
14	St. Albans	Two 5HP Flygt
		Heels, guiderails, and brackets
		Three 8' valves: two check and one gate
		Duplex Panel
		Contactors, phase monitors, leakage detectors, floats, alternating relays, control relays, contact kits, breakers and surge protection. SCADA monitoring.
15	Nassau Street	Two 20 HP Flygt
		Duplex Panel
		Heels and guide rails
		Three 8' valves: two check and one gate
		Contactors, phase monitors, leakage detectors, floats, alternating relays, control relays, contact kits, breakers and surge protection. SCADA monitoring. Control Board (Generator)
16	Flamingo C	Two 20 HP Flygt
		Duplex Panel
		Heels and guide rails
		Three 8' valves: two check and one gate

N°	Location	Equipment
		Contactors, phase monitors, leakage detectors, floats, alternating relays, control relays, contact kits, breakers and surge protection. SCADA monitoring. Control Board (Generator)
17	Yamacraw 2	Two 20 HP Flygt
		Duplex Panel
		Three pump heels, guide rails, brackets
		Five 8' valves: three check and two gate
		Contactors, phase monitors, leakage detectors, floats, alternating relays, control relays, contact kits, breakers and surge protection. SCADA monitoring. Control Board (Generator)
18	Pinewood C	Two 20 HP Flygt
		Duplex Panel
		Heels and guide rails
		Three 8' valves: two check and one gate
		Contactors, phase monitors, leakage detectors, floats, alternating relays, control relays, contact kits, breakers and surge protection. SCADA monitoring. Control Board (Generator)
19	Sir Lynden 1	Two 10 HP Flygt
		Heels, guide rails, three 8' valves: two check and one gate, and brackets
		Duplex Panel
		Contactors, phase monitors, leakage detectors, floats, alternating relays, control relays, contact kits, breakers and surge protection. SCADA monitoring. Control Board (Generator)

5.3.1. Analyzed Phases

To identify environmental and social impacts and risks associated with the Lift Stations Upgrades. the time horizon has been analyzed considering the distinct phases of the projects.
For the identification of environmental and social impacts and risks, the analysis time horizon was divided into three phases:

- **Construction**
- **Operation and Maintenance**
- **Decommissioning or abandonment**

The project involves infrastructure that is considered to have a long service life (Lift stations). It is assumed that this infrastructure will be permanently incorporated into the service provider assets. Therefore, the **decommissioning or abandonment stage was not considered for the impact assessment**.

5.3.2. Physical, Biological and Socioeconomic Environment Components Summary

The components of the physical, biological, and socioeconomic environment likely to be affected by the project include:

- **Physical Environment:** air (gaseous emissions and particulate matter, noise, and vibrations) water (water table and groundwater, surface water courses, sea water) and soil.
- **Biological Environment:** flora and fauna (including marine biodiversity).
- **Socioeconomic Environment:** infrastructure and services, waste management (solid waste, hazardous waste), occupational and community health and safety, (socio-economic development, tourism, labor employment, cultural and archaeological heritage, landscape).

5.3.3. Impact Identification and Assessment

For the impact identification, the **interactions between the project phases** and **the environmental components** (physical, biological, and socioeconomic environment) were analyzed.

As a representative synthesis of this process a simplified table was prepared.

The impact assessment to complete the tables was conducted through: (i) interviews with sector experts and project team staff; (ii) expedited field survey; (iii) literature review – including checklists and impact evaluations for similar projects; and (iv) the consultant's experience.

Mitigation measures identification

Once the impacts have been identified and assessed, mitigation measures are identified to avoid, reduce, correct, or compensate for them. Preventive (pre-impact, avoid impact at source) and mitigatory measures (minimize impact, reduce impact at source, or on the receiving body) are preferred over measures involving treatment (post-impact), such as restoration and compensation.

5.3.4. Environmental and Social Impacts Assessment

These projects will involve minor works, including the removal of old equipment from the lift stations (mainly pumps and valves) and the installation of upgraded equipment, such as leakage detectors and SCADA monitoring systems. During the installation process, WSC mentioned during site visits that the lift stations will be emptied using an external pump, crane and external tanks, and the inflow will be bypassed to prevent any saturation and overflow of the system during the works. This is of particular importance since some of the lift stations are located adjacent to residential homes in subdivisions, schools, and hospitals/health centers, are considered sensitive receptors (Elizabeth East LS, Pinewood C LS, St Albans LS, Shirlea LS and Sir Lynden LS; Flamingo C LS, McNeil LS, Yellow Elder Main LS and Yamacraw LS; PMH LS and Fox Hill LS, respectively).

For some lift stations located in downtown areas (e.g., Malcolm Park, Rawson Square, Nassau Street LS and PMH LS), there may be a need for partial street closures to facilitate the emptying of the lift stations and surrounding utility holes. It should be noted that some equipment used during this process, such as generators and pumps, may emit gases and particulate matter.

Some lift stations are located near ponds, wetlands, or coastal shore (Big Pond LS, Potters Cay LS, Montagu LS, Malcolm Park LS and Nassau Street LS), extreme measures must be taken to ensure no accidental spills of hazardous substances or overflows of wastewater will impact said environments.

Malcolm Park LS exhibited certain conditions in the layout that could increase risk of occupational accidents, such as the lack of railing in one of the open well chambers and old unused equipment.

Lastly, the works to be conducted will result in waste generation of old, aging equipment that needs to be disposed of accordingly to its hazardous substances presence and volumes. The overall environmental and social impacts and risks associated with these activities are presented in the following table.

Table 27. Environmental and social impacts and risks of the Lift Stations Upgrades Projects.

Phase	Identified Impacts		
	Physical Media	**Biological Media**	**Socio-Economic Media**
Installation	• Noise, vibrations, and odors (some project sites are located near schools-Flamingo C LS- or hospitals-PMH LS). • Gaseous emissions and particulate matter generation from combustion equipment. • Water (several lift stations are adjacent small wetlands, coastal shore and ponds) and soil contamination risks from accidental spills, overflow of lift stations and poor waste management of removed equipment.	• Alteration of fauna from noise and workers movement. •Potential risks to flora (several lift stations are adjacent small wetlands, coastal shores, and ponds) and fauna from accidental spills of wastewater or poor waste management of removed equipment.	• Assimilable household and hazardous solid waste generation. • Increased accident risk both occupational and from traffic conditions from partial street closure. • Risks of Impact on potential cultural, historical, and archeological heritage on site. • Risks of sewage service interruptions. • Visual alteration of landscape, especially in project sites located on touristic areas (downtown area).
Operation and Maintenance	• Noise and vibrations from maintenance activities. • Water or soil contamination risks from accidental spills, lift station overflow or poor waste management from maintenance activities.	• Potential risks to fauna and flora from poor waste management or other bad practices.	• Assimilable household and hazardous waste generation from maintenance activity. • Risk of occupational accidents and equipment failure due to insufficient training on new equipment.

To mitigate the risks and negative impacts previously identified, a set of mitigation measures is outlined in the Table below. The measures exposed for the installation phase will be integrated into the bidding documents to ensure contractor compliance.

Table 28. Mitigation measures for the Lift Station Upgrades Project.

Phase	Impacted component of the environment	Impact	Mitigation Measure Proposed
Installation	Physical Media	• Gaseous emissions and particulate matter generation from combustion equipment.	• Air Quality, Noise and Vibrations Management Program
		• Noise, vibrations, and odors (some project sites are located near schools-Flamingo C LS- or hospitals-PMH LS).	
		• Water (several lift stations are adjacent small wetlands, coastal shore and ponds) and soil contamination risks from accidental spills, overflow of lift stations and poor waste management of removed equipment.	• Effluent Management Program. • Establish a Waste Management Program for removed equipment. • Washing of tools and machinery on site will be prohibited.
	Biological Media	• Alteration of fauna from noise and workers movement.	• Correct planning of activities (considering breeding seasons). •Establish a Waste Management Program for the removed equipment. • Flora and Fauna Management Program and Aquatic Habitat Management. • Consultation actions on protected areas and biodiversity aspects
		•Potential risks to flora (several lift stations are adjacent small wetlands, coastal shores and ponds) and fauna from accidental spills of wastewater or poor waste management of removed equipment.	
	Socio-Economic Media	• Assimilable household, hazardous, and solid waste generation.	• Establish a Waste Management Program for removed equipment.
		• Increased accident risk both occupational and from traffic conditions and partial street closure.	• Occupational and Community Health and Safety Program • Installation of railings in Malcolm Park well chambers, removal, and disposal of old equipment • Traffic and Pedestrian Management Program. • Grievance Redress Mechanism

Phase	Impacted component of the environment	Impact	Mitigation Measure Proposed
			• Socio-Environmental Training for Site Personnel Program
		• Risks of Impact on potential cultural, historical, and archeological heritage on site.	• Follow national legislation on works near or in declared monuments (for lift stations located near historical sites) and obtain required permits.
		• Risk of sewage service interruptions	• Correct planning of activities • Community Information and Participation Program to involve stakeholders in the area, notify timeline of works and possible service interruptions
		• Visual alteration of landscape, especially in project sites located on touristic areas (downtown area).	• Correct planning of activities. • Establish a Waste Management Program for removed equipment.
Maintenance	**Physical Media**	• Noise from maintenance activities.	• Proper O&M of equipment.
		• Water or soil contamination risks from accidental spills or poor waste management.	• Waste Management Program
	Biological Media	•Potential risks to fauna and flora from poor waste management or other bad practices.	• Correct waste management. • Occupational Health and Safety Program.
	Socio-Economic Media	• Assimilable household and hazardous waste generation from maintenance activity and tourists' presence.	• Correct waste management • Grievance Redress Mechanism
		• Risk of occupational accidents from increased traffic and partial closure of streets and equipment failure due to insufficient training on new equipment.	• Road Safety and Traffic Management Program • Comprehensive Capacity Building Program for WSC personnel on operation and maintenance of new equipment.

The Lift Station Upgrades projects involve the replacement of outdated equipment with new installations like leakage detectors and SCADA monitoring systems. During installation, potential impacts include noise, vibrations, and odors near sensitive areas such as schools and hospitals, as well as gaseous emissions from equipment operation. Risks of water and soil contamination from accidental spills and poor waste management also exist, particularly in environmentally sensitive locations like wetlands and coastal areas. There may also be a risk of sewage service interruptions if any accidents occur during installation. Waste generation from removed equipment adds to these concerns. During operational phase, risk of occupational accidents and equipment failure due to insufficient training on new equipment was identified.

To mitigate these impacts, proposed measures include proper operation and maintenance (O&M) practices, establishing comprehensive waste management programs, and conducting activities outside sensitive breeding seasons to minimize disruption to fauna. Training programs for equipment use and environmental conservation practices are recommended to enhance operational safety and reduce environmental risks. Additionally, consultation with stakeholders and adherence to national regulations on cultural heritage and antiquities are crucial steps to mitigate socio-economic impacts and ensure project compliance.

5.4 Disaster and Climate Change Risks Assessment

The purpose of this section is to assess, in a simplified and qualitative manner, the hazards that the project may encounter and generate, particularly those associated with natural hazards that could impact the project structurally and/or operationally. Additionally, the evaluation considers the project's potential impact on the community, assets, and environment due to failures within its components. Furthermore, the assessment aims to identify existing hazards to communities and the environment, related to natural hazards, which the project might exacerbate.

As a result of this evaluation, each project intervention is assigned a risk rating (high, medium, or low). For the hazards identified, corresponding mitigation measures are established to address and reduce these risks to acceptable levels.

5.4.1. Legal Framework

The primary regulation relevant to risk management for the Program is:

Disaster Risk Management Act (2022): The Disaster Management Plan of 2022 for the Bahamas outlines a comprehensive approach to disaster risk management, aiming to mitigate socio-economic and environmental impacts, including those exacerbated by climate change. It promotes the active involvement of all societal sectors and stakeholders in planning, financing, and executing disaster response and recovery efforts. Key provisions include the establishment of critical infrastructure such as the National Disaster Emergency Operations Centre, early warning systems, and humanitarian assistance standards. The Act also defines the roles and responsibilities of the Disaster Risk Management Authority, a body responsible for disaster risk management in The Bahamas that merges the former National Emergency Management Agency and Disaster Reconstruction Authority, local administrators for Family Islands, public institutions, and the Minister of Finance across all phases of disaster management—from alert to rehabilitation and recovery—and establishes funds for disaster response, risk reduction, and

preparedness activities. The act defines the instruments of Disaster Management Risk Policy, the National Disaster Risk Management Plan, and the National Disaster Emergency Plan, to be prepared by the authority, as well as requiring every local administrator to prepare, after consultation with the Disaster Risk Management Consultative Committee a Local Disaster Risk Management Plan and a Local Disaster Emergency Plan. Additionally, it outlines procedures for international assistance, ensuring a coordinated and inclusive approach to disaster resilience and mitigation in the Bahamas.

ESPS 4, 'Community Health and Safety,'. In compliance with this standard, all projects involving infrastructure works financed with Program funds must undergo a Disaster Risk Analysis using the IDB Methodology.

5.4.2. Reference Methodology

The methodology employed for this evaluation is delineated in the IDB document “Disaster and Climate Change Risk Assessment Methodology for IDB Projects” (IDB, 2019). This methodology is structured around three core pillars:

- **Identification of Hazards and Vulnerabilities:** This involves pinpointing the natural hazards that may impact a project, as well as assessing the physical, social, and economic characteristics that could render it vulnerable to these hazards.
- **Risk Assessment:** This entails estimating the likelihood of adverse events occurring and evaluating the potential consequences for the project.
- **Risk Management:** This includes implementing measures to reduce the risk from disasters and climate change, such as prevention, mitigation, and preparedness strategies.

The IDB methodology is designed to be flexible, allowing it to be tailored to the specific needs of each project. It encompasses various phases and steps, with efforts and resources allocated according to the identified risk levels. The steps outlined in the IDB methodology are illustrated in the accompanying figure.

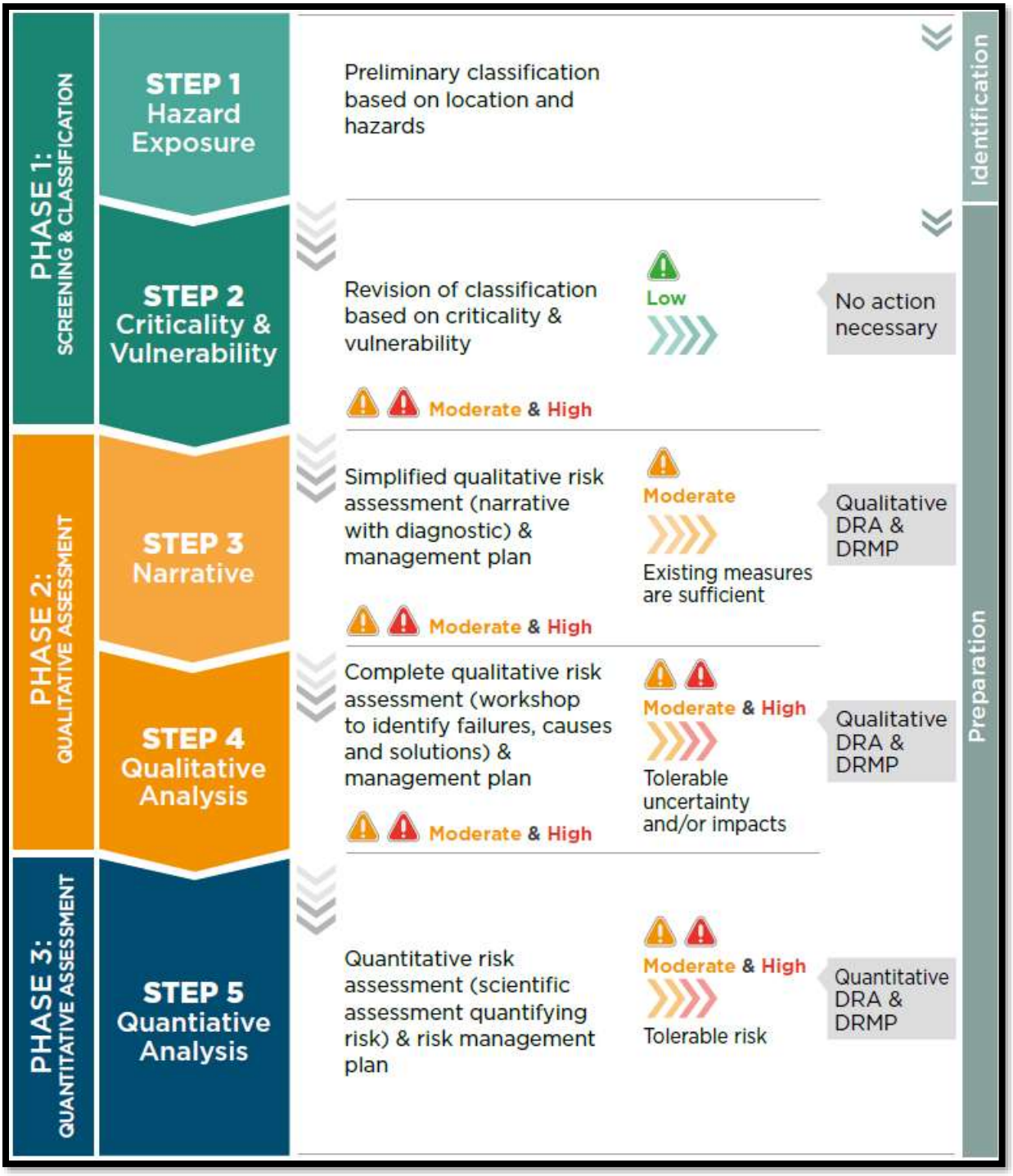


Figure 165. Disaster and Climate Change Risk Assessment Methodology (IDB, 2019).

5.4.3. Procedure

In accordance with the IDB Methodology, the process is developed through the following steps:

Step 1: Exposure to Threats

Current and future threats are identified, and the level of exposure of the project to each threat is determined.

Step 2: Criticality and Vulnerability

The level of vulnerability and criticality is assessed by considering the potential for losses and damages that could result from project activities in the event of failure, in relation to the existing physical, environmental, and socioeconomic conditions.

Step 3: Narrative

A simplified and qualitative analysis of the project risk is conducted, considering the previous steps and available information about the project design and the environment.

Based on this analysis, mitigation measures for the identified risks are proposed and structured within the Disaster Risk Management Plan (DRMP).

The activities undertaken as part of the risk assessment and the findings of this procedure are detailed below.

5.4.4. Hazard Exposure

Table 29 summarizes the identified natural hazards to which projects under the Program could be exposed. Section 4.3 provides a comprehensive description of these hazards.

Table 29 – Relevant hazards for the project

Hazard	Cause	Potential Impacts
Hurricanes and strong winds	Atlantic hurricane.	Potential damage to water and wastewater infrastructures.
Flooding	Low land relief and storm surges.	Damage to physical infrastructure due to the effect of water.
Wildfires	Dry season, exacerbated high temperatures and reduced rainfall from CC.	Damage to physical infrastructure and soil loss
Landslides	Small rock falls, rockslides by low sea cliffs and sinkholes caused by limestone bedrock.	Damage to physical infrastructure and soil loss

Hazard	Cause	Potential Impacts
Storm Surges	Wind and storms.	Soil loss affecting land stability; diversion of natural drainage of rainwater; alteration of topography.
Coastal erosion and Sea Level Rise	Storms, sea activity and limestone bedrock.	Receding shorelines; threats to coastal infrastructure; habitat loss.

5.4.5. Project Criticality and Vulnerability

Criticality pertains to the level of significance that a structure or system holds within a broader context, as determined by the scope and nature of the services or functionalities it provides. On the other hand, vulnerability denotes the inherent traits that dictate the proneness of a structure or system to damage.

This phase of the analysis aims to enhance the comprehension of the criticality and vulnerability levels of the project. It complements the preceding assessment to derive a comprehensive classification of disaster and climate change risks, with a specific focus on the project's operations rather than solely on the threats. The primary goal is to delve into the project's features to ascertain its vulnerability to natural threats, the criticality of service interruptions or cancellations, and the benefits it bestows. This approach, crafted from a bottom-up perspective, endeavors to evaluate at the project level the projected response and vulnerability of the infrastructure to potential damages.

In this analysis, categorizing the level of criticality is contingent solely upon the attributes of the specific point under review, without factoring in the impact of the threatening agents (which are addressed in the previous phase).

The IDB Methodology advocates assessing criticality and vulnerability across three key dimensions, namely: 1) the potential adverse repercussions of infrastructure failure on the services provided by the projects, 2) the potential negative effects of these failures on the environment and/or the populace, and 3) the vulnerability of each infrastructure based on its complexity and scale.

In alignment with these dimensions, the IDB Methodology lays out guiding criteria to streamline the analysis process. These criteria are elucidated through diagrams illustrating the interplay of the three dimensions, tailored for specific types of projects (typically those involved in offering essential services).

In the case of this program, particular it is relevant to consider the **Criticality Table for drainage infrastructure, water supply, and wastewater management** (Figure 166), which delineates the criteria for assessing the criticality across three dimensions: impact on service functionality (dimension 1), impact on the population (dimension 2), and physical attributes (dimension 3).

This table serves as a benchmark for evaluating the infrastructure included in the project. The criteria for assessing the three dimensions were customized to accommodate the distinct characteristics of the various interventions. The overall degree of criticality for each project is determined by selecting the highest category obtained among the three dimensions.

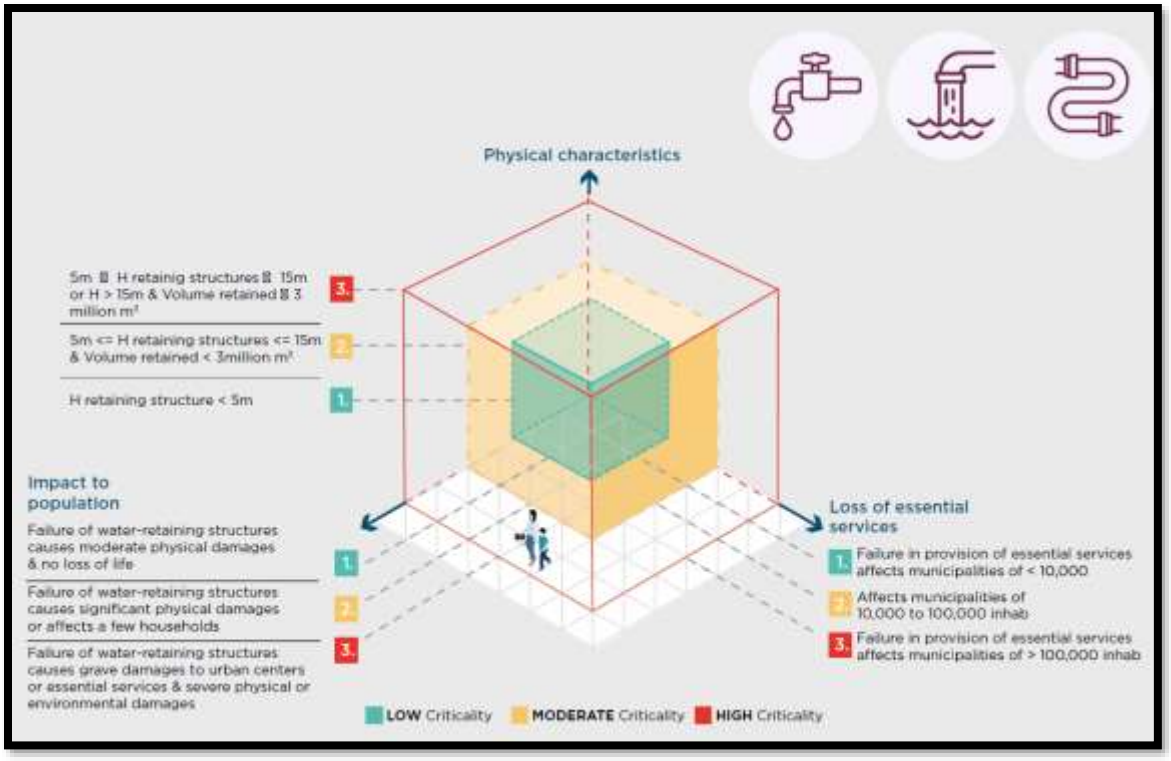


Figure 166. Criticality and Vulnerability Table for Drainage and Water and Wastewater Infrastructure (IDB, 2019).

Adjustments to the evaluation criteria were made based on **Figure 166** to better align with the specific characteristics of the works included in the Program. Below, the criteria taken into consideration for evaluating the criticality within each dimension are presented.

Thresholds for Dimension 1: Impact on Service Functionality

In water and wastewater projects, the criticality of the system depends on its ability to maintain essential water distribution and wastewater collection and transportation in the event of system failures. To represent this, an indicator measuring the extent of service disruption has been chosen. The following table presents the defined quantitative ranges for this indicator.

Criteria	Low	Moderate	High
Impacts on Service Functionality	Service disruption affects the collection of wastewater or distribution of water to a population of fewer than 10,000 inhabitants.	Service disruption affects the collection of wastewater or distribution of water to a population ranging between 10,000 and 100,000 inhabitants.	Service disruption affects the collection of wastewater or distribution of water to a population exceeding 100,000 inhabitants.

Thresholds for Dimension 2: Impacts on Population and Environment

This dimension evaluates the environmental characteristics of the project site in terms of its susceptibility to potential installation failures. The qualitative range defined for the key indicator is outlined in the following table.

Criteria	Low	Moderate	High
Impacts on the Population or the Environment	Equipment failures do not impact the population or the environment	Equipment failures may have a limited impact on the population or the environment	Equipment failures can significantly affect the population and the environment

Thresholds for Dimension 3: Physical Characteristics

Due to its non-representative nature in assessing sanitation works, alternative aspects have been considered to evaluate the physical characteristics.

The evaluation criteria for this analysis encompass the infrastructure's complexity concerning electrical equipment presence and the intricacy of operation and maintenance tasks associated with the infrastructure. The table below outlines the qualitative ranges defined for the indicator.

Criteria	Low	Moderate	High
Physical Characteristics	Minimal or no electrical equipment present, reflecting low complexity; O&M tasks are straightforward and infrequent.	Installations of medium complexity; the presence of electrical equipment necessitates periodic O&M tasks.	Installations requires highly complex electrical equipment with a variety of functions; daily O&M tasks are required, demanding skilled personnel for execution.

Criticality assessment

Based on the criteria outlined above, the summary of the criticality assessment results for each project type is provided below.

Table 30. Summary of the criticality assessment.

Project type	Dimension 1 Impact on Service Functionality	Dimension 2 Impacts on Population and Environment	Dimension 3 Physical Characteristics	Classification
NRW reduction	**Low** Installations failures may reduce	**Low** Installations failures do not impact the	**Moderate**	**Moderate**

Project type	Dimension 1 Impact on Service Functionality	Dimension 2 Impacts on Population and Environment	Dimension 3 Physical Characteristics	Classification
	efficiency, but do not cause the interruption of the service	population or the environment	The installations require periodic O&M tasks	
Advanced Metering Infrastructure	**Low** Equipment failures do not impact the delivery of the service.	**Low** Equipment failures do not impact the population or the environment	**Moderate** The equipment requires periodic O&M tasks	**Moderate**
Pipelines for Potable Water Supply	**Low** Service disruption of projects affects a population <10,000 inhabitants in all cases	**Low** Installations failures do not impact the population or the environment	**Moderate** The installation requires periodic O&M tasks	**Moderate**
Wastewater Utilities (LSs) in new providence (19 lift stations)	**Moderate** The disruption in service affects the collection of wastewaters for a population ranging from 10,000 to 100,000 inhabitants in all cases	**Moderate** Equipment failures of projects may have a limited impact on the population or the environment in all cases	**Moderate** The installation requires periodic O&M tasks	**Moderate**

5.4.6. Risk Narrative

Following the IDB Methodology, a qualitative risk assessment for projects of moderate to high criticality is necessary. This assessment, the third step in the Methodology, involves summarizing the level of risk in a narrative format.

These narratives rely on data gathered from previous steps regarding threats, vulnerability, and criticality.

Based on the findings from this step, appropriate measures to address identified risks are proposed. These measures are outlined in the Disaster Risk Management Plan detailed in the SESMP. The aim is to reduce potential impacts and ensure the safety and resilience of Project interventions against disaster risks and climate change.

Upon analyzing the narratives, it was determined that **all interventions carry a moderate level of risk**.

The full narratives can be found below.

NRW reduction

The installations assessed in this section are primarily pipelines slated for the repair or replacement of specific sections, as well as the equipment involved in leak detection and repairs. Criticality was assessed as moderate based on evaluations of dimension 3, given that they involve a certain level of complexity and require periodic monitoring and O&M tasks.

The primary threats to these installations are floods and strong winds, which may damage exposed appurtenances of pipelines such as fire hydrants, valves, and stream crossings. These elements may be impacted by debris or washed away by fast-flowing floodwaters. These hazards may also interrupt or hinder leak detection and repair activities. However, it is important to note that the interventions included in this project are implemented within existing installations and do not alter the current level of risk associated with these installations.

These risks do not pose direct and significant threats to the community's life. There are no anticipated emergency situations that would immediately endanger community health or cause irreparable damage to biodiversity and natural environments. Thus, **the overall risk to the system is rated as moderate**.

To manage these identified risks, mitigation measures have been included in the Disaster and Climate Change Risk Management Plan. These measures will be implemented unless deemed inappropriate due to technical reasons or replaced or discarded following an appropriate analysis of alternatives.

Advanced Metering Infrastructure

Criticality was assessed as moderate based on evaluations of dimension 3, give than the metering infrastructure involve certain level of complexity and require periodic monitoring and O&M tasks.

The primary threats to these installations are floods and strong winds, which may damage exposed equipment, which may be impacted by debris or washed away by fast-flowing floodwaters.

These risks do not pose direct and significant threats to the community's life. There are no anticipated emergency situations that would immediately endanger community health or cause irreparable damage to biodiversity and natural environments. Thus, **the overall risk to the system is rated as moderate**.

To manage these identified risks, mitigation measures have been included in the Disaster and Climate Change Risk Management Plan. These measures will be implemented unless deemed inappropriate due to technical reasons or replaced or discarded following an appropriate analysis of alternatives.

Pipelines for Water Supply

Criticality was assessed as moderate based on evaluations of dimension 3, give than water pipelines involve require periodic monitoring and O&M tasks.

The primary threats to these installations are floods and strong winds, which may damage exposed appurtenances of piping such as fire hydrants, valves, and stream crossings. These elements may be impacted by debris or washed away by fast-flowing floodwaters.

These risks do not pose direct and significant threats to the community's life. There are no anticipated emergency situations that would immediately endanger community health or cause irreparable damage to biodiversity and natural environments. Thus, **the overall risk to the system is rated as moderate.**

To manage these identified risks, mitigation measures have been included in the Disaster and Climate Change Risk Management Plan. These measures will be implemented unless deemed inappropriate due to technical reasons or replaced or discarded following an appropriate analysis of alternatives.

Wastewater Utilities (LSs) in New Providence (19 lift stations)

This narrative assesses the risk for the 19 lift stations considered in the program. As these facilities are similar in nature and complexity, exposed to the same hazards, and share the same criticality assessment, they are evaluated collectively in this narrative.

The criticality of these projects was evaluated as **moderate** due to the following characteristics:

- Each lift station pumps wastewater for a population ranging from 10,000 to 100,000 inhabitants (dimension 1).
- The facilities are located in medium-density urban areas, with limited risks of impact on the population or natural habitats (dimension 2).
- The facilities involve medium complexity, including electromechanical equipment that requires periodic O&M tasks (dimension 3).

The primary threats to these installations are floods and strong winds, which may lead to the following impacts:

- Damage to exposed equipment caused by debris impact.
- Damage to pumping equipment due to the submergence of electromechanical components, potentially posing an electrical hazard to on-site personnel.
- Discharge of raw effluent into the environment due to failures in the pumping systems, resulting in disturbances to surrounding ecosystems and populations.

These risks do not pose direct and significant threats to the community's life. There are no anticipated emergency situations that would immediately endanger community health or cause irreparable damage to biodiversity and natural environments. Thus, **the overall risk to the system is rated as moderate**.

It is important to note that these interventions are implemented within existing installations and do not alter the current level of risk associated with these installations. It is unknown whether the existing facilities have protections against the current threats. Nonetheless, to manage these identified risks, mitigation measures have been included in the Disaster and Climate Change Risk Management Plan. These measures will be implemented unless deemed inappropriate due to technical reasons or replaced or discarded following an appropriate analysis of alternatives.

5.4.7. Disaster Risk Management Plan

This Disaster and Climate Change Risk Management Plan aims to propose and systematize mitigation measures for the risks identified in the Disaster Risk Assessment section, with the goal of minimizing their potential damages or impacts throughout the various phases of the project.

The following table provide a portfolio of measures for each type of intervention, including those to be considered during the engineering design, construction, and operation and maintenance (O&M) stages.

Table 31 – Disaster Risk Mitigation Measures for the Program

Measures	Description	Design	Construction	O&M	Type of Project	Type of Measures (Structural / Not Structural)	Responsible for Execution
Measures against Flooding	Install floodwater pumping systems and/or channels/drain systems to collect and divert floodwater away from lift stations	X			Lift Station Upgrades	Structural	Design Team, Contractor, Inspection
	Install physical barriers to protect equipment against floods (protection walls)	X			Lift Station Upgrades	Structural	Design Team, Contractor, Inspection
	Waterproof electrical components and circuits	X			Lift Station Upgrades	Structural	Design Team, Contractor, Inspection
	Anchor and tether facilities that can float; provide anchors and ties to pipelines, tanks, and other floating facilities such as mobile offices, storage buildings, and equipment to prevent them from being swept away. Anchoring systems such as thrust blocks and concrete at joints of pipelines to prevent buoyance issues and enhance stability.		X	X	Lift Station Upgrades	Structural	Design Team, Contractor, Inspection
					NRW Reduction Contract and Access to Piped Water Supply		O&M responsible organization
	Consideration of areas at higher risk of surface flooding for the installation of washouts, valves and hydrants in areas of lowest risk of surface flooding	X			Access to Piped Water Supply	Structural	Design Team, Contractor, Inspection

Measures	Description	Design	Construction	O&M	Type of Project	Type of Measures (Structural / Not Structural)	Responsible for Execution
	Increase depth of pipe installation (3ft; 4ft for vulnerable areas)	X			NRW Reduction Contract and Access to Piped Water Supply	Structural	Design Team, Contractor, Inspection
	Regular inspections of sewer systems to ensure no rainwater enters the system.			X	Lift Station Upgrades	Not Structural	WSC Local Government O&M responsible organization
Measures for Coastal Protection	Protect and enhance relief forms that function as natural mitigation measures with native species (wetlands, coastal vegetation such as mangrove trees).			X	All projects	Structural	WSC
						NbS	Local Government O&M responsible organization
Measures against Fires	During the construction phase, use fire-resistant construction materials such as metal roofs, fire-retardant coatings, and non-flammable construction materials, especially in wildfire-prone areas.		X		All projects	Not Structural	Design Team, Contractor, Inspection
	During the construction phase, establish safety zones, keep work areas clear of flammable materials, and have easily accessible and properly functioning firefighting equipment.		X		All projects	Not Structural	Design Team, Contractor, Inspection
		X				Structural	

Measures	Description	Design	Construction	O&M	Type of Project	Type of Measures (Structural / Not Structural)	Responsible for Execution
	Use non-combustible materials such as steel, concrete, masonry, etc. Where possible				Lift Station Upgrades		Design Team, Contractor, Inspection
	Protect electrical components with fire-resistant coating: exposed components and conduits on poles with metallic conduits and other fire-resistant materials.	X			Lift Station Upgrades	Structural	Design Team, Contractor, Inspection
	Treat fences and walls with a fire-retardant layer.	X			Lift Station Upgrades	Structural	Design Team, Contractor, Inspection
Measures against Hurricanes, Storm Surges, and strong winds	During the construction phase, ensure construction materials and temporary structures are properly secured to withstand strong winds during severe storms. This may include using additional anchors and reinforced fastening systems.		X		All projects	Not Structural	Design Team, Contractor, Inspection
	Pipework sitting and orientation needs to be considered at the design phase and evaluate the proximity to trees (uprooted mains), infrastructure foundations and other hazards that could lead to exposed pipelines and breakages derived from it	X			Access to Piped Water Supply	Not Structural	Design Team, Contractor, Inspection
	Consider the use of PEX for pipelines due to its durability and resistance to breakages	X			NRW Reduction Contract and Access to Piped Water Supply	Structural	Design Team, Contractor, Inspection
	Anchor equipment to withstand wind loads generated by hurricane-force winds without excessive movement.	X	X	X	Lift Station Upgrades	Structural	Design Team, Contractor, Inspection

Measures	Description	Design	Construction	O&M	Type of Project	Type of Measures (Structural / Not Structural)	Responsible for Execution
							O&M responsible organization
Measures against Landslides	Thoroughly study the soil conditions and the susceptibility of the project area so as to avoid areas susceptible to landslides/sinkhole formation.	X			Access to Piped Water Supply	Not Structural	Design Team
Measures against Corrosion	Surface waterproofing systems, coatings, and protection barriers (stainless steel, galvanized reinforcements, corrosion inhibitors).	X		X	All projects	Structural	Design Team, Contractor, Inspection O&M responsible organization
Redundancy of Electrical Systems	Redundancy in the electrical system to maintain operation if power supply network goes offline (power generators).	X		X	Lift Station Upgrades	Structural	Design Team, Contractor, Inspection O&M responsible organization
Operation bypass	Have a way to bypass normal pumping station operations when necessary (contractors capable of providing emergency pumping services, acquiring portable pumps to restore pumping station operation after flood events).	X		X	Lift Station Upgrades	Structural Not Structural	Design Team, Contractor, Inspection O&M responsible organization
Early Warning Systems	Systems based on monitoring hydrometeorological variables to establish alerts for threatening agents and establish response protocols involving different stakeholders.			X	All projects	Not Structural	WSC Local Government O&M responsible organization

Measures	Description	Design	Construction	O&M	Type of Project	Type of Measures (Structural / Not Structural)	Responsible for Execution
Regular Maintenance and Inspection	Frequent maintenance and inspection of structures with special attention to anchors and safety measures against natural hazards.			X	All projects	Not Structural	WSC Local Government O&M responsible organization

5.5. Summary of Environmental and Social Impact Assessment

Below is a summary of the environmental and social impact assessment conducted for all types of subprojects in the Program, including major findings in the baseline assessment and major impacts and risks with their corresponding Mitigation Measures.

Table 32. Summary of Environmental and Social Impact Assessment.

Type of Project	Subprojects	Benefitted Population of Project Sites	Major Findings in Baseline Assessment	Major Impacts Associated with the project typology	Mitigation Measures Proposed
Non-Revenue Water Program and Advanced Metering Infrastructure	Non-Revenue Water Reduction Contract: leak detections and repairs, use of District Metered Areas (DMAs), monitoring systems**,** pipe renewal as necessary, ongoing maintenance and training, reporting	Population of Bimini, Abaco, Eleuthera and Exuma: 35.544	Family Islands: Water Scarcity, groundwater main source for the islands. Possible Shallow Groundwater Contamination due to permeable limestone soils. 55% NRW	Gaseous Emissions, Particulate Matter, Noise and Vibrations. Water and Soil contamination from accidental spills. Waste Generation (replaced equipment/water mains during leak detection). Occupational and community accident risk	Complete SESMP (for leak detections and repairs, including water mains replacements)
	Installation of advanced metering infrastructure (AMI) for New Providence and Family Islands	Population of Bimini, Abaco, Eleuthera y Exuma: 35.544	Outdated infrastructure lacks remote monitoring capabilities	Waste Generation and lack of capacity of Family Island WSC personnel on AMI systems	Targeted SESMP (Programs 1, 7, 9, 12 and 14)

Type of Project	Subprojects	Benefitted Population of Project Sites	Major Findings in Baseline Assessment	Major Impacts Associated with the project typology	Mitigation Measures Proposed
Access to Potable Water Supply	Central Eleuthera Water Mains Extension Savannah Sound to Tarpum	150	Low-density residential areas with certain businesses. Overhead electricity lines on the side of roads. Native Species (some are Protected Trees) on side of roads. One Project site is located on KBA (South Tarpum Bay), and one has a potential historical contamination site (abandoned cars in Sweetings Village, Abaco). One project site 30ft away from coastal shore	Gaseous Emissions, Particulate Matter, Noise and Vibrations. Water and Soil contamination from accidental spills. Waste Generation. Occupational and community accident risk (especially from potential historical contamination at a site). Flora and Fauna disturbance (protected trees and avian species protected under KBA at a site). Increased water demand.	Complete SESMP
	South Eleuthera Water Main Extension Tarpum Plant to Jack's Bay	150			
	Sweetings Tract New Water Mains Extension	1200			
	South Bimini Port Royal Water Main Extension	300			
	South Bimini Water Main Extension to Airport	30			
Lift Station Upgrades in	Malcolm Park	Population of all of New Providence	Aging infrastructure.	Gaseous Emissions, Particulate Matter,	

Type of Project	Subprojects	Benefitted Population of Project Sites	Major Findings in Baseline Assessment	Major Impacts Associated with the project typology	Mitigation Measures Proposed
New Providence	Elizabeth East Montague Potters Cay Rawson Square Fox Hill Old Cedar Shirlea Yellow Elder Main McNeil PMH Oakes Field Big Pond St. Albans Nassau Street Flamingo C Yamacraw 2 Pinewood C Sir Lynden 1	connected to sewer systems: 40.000[109]	Leaks and overflows frequent. Sensitive receptors close to Lift Stations in the project (Hospitals, Schools, Residential houses). Ponds, wetlands and coastal shore close to Lift Stations in the project. Historical Sites close to Lift Stations in the project.	Noise, Vibrations and Odors (especially in areas with sensitive receptors such as schools, hospitals, and health centers). Water and Soil contamination from accidental spills and overflows (especially in areas close to ponds, wetlands, and coastal shore). Waste Generation. Occupational and community accident risk (especially at downtown areas). Lack of Capacity of WSC on SCADA Monitoring	Targeted SESMP (Programs 1, 2, 3, 5, 6, 7, 8, 7, 9, 10, 11, 12, 13, 14 and 18)

[109] Calculated based on the estimated 13,5% of the New Providence population connected to sewage system and 2022 census results of 296.522 population.

6. Strategic Environmental and Social Management Plan

The Strategic Environmental and Social Management Plan (SESMP) is a tool that guides the environmental and social implementation of the projects to be financed under the Program, providing procedures for environmental and social management.

This Plan will guide the Executing Agency (WSC) in the environmental and social management of the Program, by outlining necessary environmental and social mitigation measures during the implementation stages of each project.

Considering the different typologies of projects, and according to the mitigation measures described in Chapter 5, the mitigation requirements for each project category have been structured as illustrated in Table 33 below.

Table 33. Organization of Mitigation Measures According to Program Projects.

Type of Project	Subprojects	Program Component
Non-Revenue Water Program and Advanced Metering Infrastructure	Non-Revenue Water Reduction Contract: leak detections and repairs, use of District Metered Areas (DMAs), monitoring systems**, pipe renewal as necessary**, ongoing maintenance and training, reporting	Targeted SESMP and Mitigation measures
	Installation of advanced metering infrastructure (AMI) for New Providence and Family Islands	Mitigation measures to be included as part of the bidding documents for Contractor
Access to Potable Water Supply	Central Eleuthera Water Mains Extension Savannah Sound to Tarpum	Complete SESMP
	South Eleuthera Water Main Extension Tarpum Plant to Jack's Bay	
	Sweetings Tract New Water Mains Extension	
	South Bimini Port Royal Water Main Extension	
	South Bimini Water Main Extension to Airport	
Lift Station Upgrades in New Providence	Malcolm Park	Targeted SESMP
	Elizabeth East	
	Montague	
	Potters Cay	
	Rawson Square	
	Fox Hill	
	Old Cedar	

Type of Project	Subprojects	Program Component
	Shirlea	
	Yellow Elder Main	
	McNeil	
	PMH	
	Oakes Field	
	Big Pond	
	St. Albans	
	Nassau Street	
	Flamingo C	
	Yamacraw 2	
	Pinewood C	
	Sir Lynden 1	

The following sections in this chapter set forth the guidelines for ESMP for **NRW Reduction Contract, Lift Station Upgrades** and **Access to Piped Water Supply Projects**.

For the **Advanced Metering Infrastructure Project**, the mitigation measures outlined in Chapter 5 will be integrated into the bidding documents to ensure contractor compliance.

6.1 Roles and Responsibilities

6.1.1. Design

During the design phase of the interventions, WSC, as the Executing Agency (EA) of the Program will develop the executive project (engineering design) of each project to be financed under the Program.

WSC will prepare the bidding documents for the works, and the environmental and social specialist from WSC will incorporate the necessary environmental, social, and occupational health and safety clauses and requirements, both general and specific to the projects, which arise from this SESA and SESMP, and including the needs for reporting and monitoring. These aspects will be included in the Environmental and Social Technical Specifications.

For NRW Reduction Contract, Lift Station Upgrades and Access to Piped Water Supply Projects, WSC will prepare the SESMP as part of the bidding documentation. The bidding documents must outline the minimum content of the Environmental and Social Management Plan at the Construction Stage (ESMPc) for each project.

The proposals received during the bidding process for the works must contain a budget that includes the cost of implementation and compliance with the environmental, social, and occupational health and safety mitigation measures required by the project, to guarantee compliance with the IDB ESPF and applicable national and local regulations.

6.1.2. Construction Phase

Prior to the start of the works, WSC will conduct the due diligence with the applicable environmental authority (Department of Environmental Planning and Protection-DEPP) to obtain certificate of environmental clearance for the works.

During the Construction Phase (or Installation Phase), the Contractor Company will be responsible for preparing and implementing the Environmental and Social Management Plan (ESMPc) of each project, as well as obtaining the environmental and occupational health and safety qualifications and insurances required according to the national and local regulatory framework.

The Contractor will also need to obtain others applicable permits, which could include tree cutting permits for protected trees according to the Protected Trees Act, easements, excavation permits, construction permits, public road occupancy permits, waste disposal permits, permits for works near or in monuments, etc.

Before the start of the works, the Contractor must submit to the EA, for its approval, a Construction Environmental and Social Management Program (ESMPc).

The ESMPc of each project will contain, as a minimum, the programs described in Section 6.1.5 of this SESA.

Once the ESMPc is approved, the Contractor Company will be responsible for its compliance, using the necessary means to implement the Programs that are formulated within its framework. The Contractor Company must have an environmental and social representative and a person responsible for hygiene and safety, who will be responsible for conducting the implementation of the ESMPc. Likewise, the contractor must comply with and make the operators and subcontractors comply with all the provisions contained in said Plan, national and local environmental legislation, appropriate construction codes and best practices and the IDB Environmental and Social Policy Framework, during all stages of the execution of the works.

The Contractor Company will prepare monthly reports to the EA, detailing the actions and results of the ESMPc implementation.

The inspection, control, and monitoring activities of the ESMPc will be conducted by WSC. WSC may conduct inspection visits, prepare reports for internal use for the Project, and determine and impose corrective measures based on the stipulations of the bidding documents.

The environmental authority may also conduct control audits of the work.

At the finalization of the works, the Contractor must submit a Final Environmental and Social Report, which includes the information corresponding to the implementation of ESMPc, including records of implementation of plans and programs, and a report on compliance with all environmental and social indicators considered at various stages of the project cycle.

6.1.3. Operation and Maintenance

During the operational stage, EA will be responsible for the operation and maintenance of the infrastructure built under the Program, in accordance with its current environmental policies and environmental and social management systems, including the ESMP for the operational and maintenance stage of each work.

6.1.4. Role of IDB

The IDB will oversee and supervise the implementation of the environmental and social management system for all projects under the Program. This includes the review and approval of the semi-annual environmental and social compliance reports submitted by WSC, as well as conducting environmental and social supervision missions. This is expected to last throughout project implementation.

Table 34 summarizes the environmental and social management responsibilities of the entities involved in the different phases of the projects.

Table 34 - Roles and Responsibilities for E&S Management of the Projects

Project Cycle Phase	Activity	Responsible Party	Monitoring	Supervision
Design	Grievance Redress Mechanism (for the duration of the Program)	WSC	-	IDB
	Executive Project / Engineering Design	WSC (may use external consultants)	-	IDB
	Environmental and Social Assessment	WSC (may use external consultants)	-	IDB
	Public Consultation / Public Information Campaigns	WSC	-	IDB
	Preparation of E&S Technical Specifications for Bidding Documents	WSC	-	IDB
	Environmental Permits	WSC	-	DEPP
Construction	ESMPc: Preparation and Implementation	Contractors	WSC	IDB
	Environmental and Social compliance during construction	Contractors	WSC	IDB
	E&S Progress Reports	Contractors to WSC (monthly)	WSC	
	E&S Progress Reports	WSC to IDB (half-annually)	-	IDB
	Final E&S Report	Contractors	WSC	-
	Final E&S Report	WSC	-	IDB
Operation	Operation and maintenance of the water and sewage infrastructure	WSC	-	IDB (for a period of 3 years after commissioning)

6.2 Environmental and Social Management Plans

Mitigation measures were grouped into two different ESMPs, each one targeting different phases of the project:

- **Construction/installation ESMP**: aimed at mitigating the impacts and risks of construction activities.
- **Operational ESMP:** aimed at mitigating the negative impacts and risks of the operational stage.

6.1.5. Construction Environmental and Social Management Plan

This ESMP presents the minimum environmental and social guidelines that must be implemented during the construction activities of the project's infrastructure.

The extent of the construction-phase ESMP will depend on the project typology. Table 35 below presents the requirements of subprograms to include on each ESMP, depending on the project’s typology.

Table 35. ESMP requirement for each project typology.

Program Number	ESPM Programs	NRW Reduction Contract	AMI	Access to Piped Water Supply	Lift Stations Upgrades
1	Monitoring and Control of Compliance with Mitigation Measures	X	X	X	X
2	Construction Sites Management	X		X	X
3	Air Quality, Noise and Vibrations Management	X		X	X
4	Erosion Control	X		X	
5	Flora and Fauna Management	X		X	X
6	Aquatic Habitat Management	X		X	X
7	Waste Management	X	X	X	X
8	Effluent Management	X		X	X
9	Chemical Substances Management	X		X	
10	Occupational and Community Health and Safety	X	X	X	X
11	Traffic and Pedestrian Management	X		X	X
12	Pest and Vector Control	X		X	X
13	Socio-Environmental Training for Site Personnel	X	X	X	X
14	Disaster Management and Emergency Response	X		X	X
15	Community Information and Participation	X	X	X	X
16	Coordination with Service Providers	X		X	
17	Environmental Liabilities Program	X		X	
18	Chance Find Procedure	X		X	
19	Works Closure	X		X	X

Based on these guidelines, the Contractor Company must prepare the final version of the construction ESMP. The full set of subprograms to include in the ESMP is presented in Table 36.

Table 36. SESMP Programs for the Construction/Installation Phase.

Program Number	Program
1	Monitoring and Control of Compliance with Mitigation Measures
2	Construction Sites Management
3	Air Quality, Noise and Vibrations Management
4	Erosion Control
5	Flora and Fauna Management
6	Aquatic Habitat Management
7	Waste Management
8	Effluent Management
9	Chemical Substances Management
10	Occupational and Community Health and Safety
11	Traffic and Pedestrian Management
12	Pest and Vector Control
13	Socio-Environmental Training for Site Personnel
14	Disaster Management and Emergency Response
15	Community Information and Participation
16	Coordination with Service Providers
17	Environmental Liabilities Program
18	Chance Find Procedure
19	Works Closure

Below, the guidelines for each of the Construction SESMP programs are presented.

Program 1: Monitoring and Control of Compliance with Mitigation Measures

Program 1: Monitoring and Control of Compliance with Mitigation Measures	
Socio-environmental effects to be prevented or corrected:	Deviations in implementation of mitigation measures
Management Measures	
To ensure effective oversight of compliance with the identified mitigation measures, the contractor will establish and maintain a comprehensive "compliance monitoring system." This system will serve as a means to oversee the implementation of each mitigation measure during the construction stage. The compliance monitoring system will include, but is not limited to, the following elements: • Actions to be Implemented: A detailed description of specific actions and steps to be taken to execute each mitigation measure. • Necessary Material Resources: An inventory of the materials, equipment, and resources required to conduct mitigation measures effectively. • Responsible Staff: Identification of personnel responsible for execution and supervision of each mitigation measure, including their roles and responsibilities. • Indicators of Compliance: Establishment of clear and measurable indicators that will be used to assess the degree of compliance with each mitigation measure. • Goals and Frequency of Monitoring: Defined objectives for achieving compliance, along with the frequency and methodology for monitoring progress towards these goals. This structured compliance monitoring system will ensure that the construction project adheres to the established mitigation measures and operates in a manner that minimizes potential environmental or regulatory impacts.	
Monitoring and Compliance	
Indicators • Number of ESHS Non-Conformities (environmental, social and safety and hygiene) identified during the inspections. • Number of ESHS Non-Conformities closed on time.	
Responsible for the measure implementation	Contractor (Works Director)
Responsible for the control of the measure	WSC / Works Supervision

Program 2: Construction Sites Management

<table>
<tr><th colspan="2">Program 2: Construction Sites Management</th></tr>
<tr><td>Socio-environmental effects to be prevented or corrected:</td><td>Minimize the environmental and social impacts of the preparatory activities of the works</td></tr>
<tr><th colspan="2">Management Measures</th></tr>
<tr><td colspan="2">The work sites must ensure the minimal impact on the environment and incorporate the following considerations:
• Establishment of a materials storage and collection area.
• Implementation of an efficient waste collection and storage system.
• Supply of sufficient water resources for sanitary and operational needs.
• Installation of appropriate signage for safety and guidance.
• Availability of a well-equipped first aid kit.
• When deemed necessary, provision of an electric generator with a waterproof base.
Among the specific recommendations, the following guidelines have been established:
• Provision of Adequate Communication Equipment: All work sites shall be equipped with reliable communication tools, such as radios, to facilitate prompt request for assistance during emergencies.
• Fire Safety Measures: Work sites must be equipped with fire extinguishers or other appropriate fire suppression systems.
• Emergency Response Training: Personnel shall undergo comprehensive training in emergency response procedures, first aid, and proper hygiene practices.
• Site Cleanup: Upon completion of construction activities at each work site, all residual materials must be promptly removed, ensuring a clean and organized environment.
• The drainage of excess water, soil movement, and stockpile management shall prioritize the preservation of natural drainage patterns and land runoff levels to prevent erosion and its associated environmental impacts.</td></tr>
<tr><th colspan="2">Monitoring and Compliance</th></tr>
<tr><td colspan="2">Indicators
• The ratio of work sites where management measures have been applied to the total number of active work sites.</td></tr>
<tr><td>Responsible for the measure implementation</td><td>Contractor (Works Director)</td></tr>
<tr><td>Responsible for the control of the measure</td><td>WSC / Works Supervision</td></tr>
</table>

Program 3: Air Quality, Noise and Vibrations Management

Program 3: Air Quality, Noise and Vibrations Management	
Socio-environmental effects to be prevented or corrected:	Impacts of air quality, dust and noise near community or urban areas.
Management measures	
Emissions Control Measures: • Ensure all construction equipment is maintained in accordance with manufacturer's specifications. • Implement dust suppression measures as necessary in unpaved areas. • Prohibit incineration of non-vegetative wastes (e.g., refuse) at construction sites. • Reduce unnecessary idling of construction equipment and delivery trucks when they are not in active use. • Maintain cleanliness, especially of tires, on work vehicles to prevent tracking of dirt both within and outside the construction site. • Covering of work vehicles transporting friable materials to prevent dispersion of materials beyond the site. • Minimize drop heights of materials during construction operations. • Establish and enact a comprehensive grievance procedure in the event of receiving complaints related to dust and/or exhaust emissions. **Noise Control measures:** • Ensure maintenance of all construction equipment in accordance with manufacturer's specifications to minimize noise emissions. • Strategic Work Scheduling: Plan construction, modification, and rehabilitation activities to take place during daylight hours when heightened noise levels are more acceptable to the surrounding community. • Develop and implement a comprehensive Construction Communications Plan to proactively notify neighboring receptors, such as residents, commercial establishments, religious institutions, and hotels, about upcoming construction activities. • Consider Acoustic Enclosures: Evaluate the necessity of installing acoustic enclosures where applicable to mitigate noise generated by construction activities. • Discourage unnecessary idling of construction equipment and trucks to minimize noise emissions and environmental impact.	
Monitoring and Compliance	
Indicators • Absence of grievances voiced by neighboring commercial establishments and/or the local community. **Monitoring** Regular daily site inspections shall be conducted, encompassing the following critical aspects: • Visual assessment for dust migration in order to detect any instances of dust transgressing site perimeters. • Visual assessment of areas with a heightened propensity for dust emissions, such as haul roads, stockpiles, and operational zones. • Equipment and machinery service records.	
Responsible for the measure implementation	Contractor (Works Director)
Responsible for the control of the measure	WSC / Works Supervision

Program 4: Erosion Control

Program 4: Erosion Control	
Socio-environmental effects to be prevented or corrected:	Effects of erosion and sedimentation on the environment. Soil disturbance, degradation, and erosion.
Management measures	
Erosion control measures • The minimization of disturbance area will be a paramount objective, and clear demarcation will be established to delineate the boundaries of this zone. • All activities will strictly occur within the designated work zone, ensuring that the work scope is confined to this specific area. • Vehicle movements will be confined to predefined roads and tracks, thereby mitigating potential off-road impacts. • Management of runoff water, and soil displacement and accumulations will be conducted with a primary focus on preserving their natural flow patterns and adhering to the natural runoff levels of the terrain. • Monitoring and periodic inspections will be conducted to assess the effectiveness of sediment controls, particularly after significant rainfall events exceeding 10mm in a 24-hour period.	
Monitoring and Compliance	
Indicators • Absence of Substantial Sediment Deposition: There should be no noticeable accumulation of sediment beyond the designated works area. **Monitoring** • Daily inspections of the work site will be conducted. • Sediment controls will be assessed during site inspections and following significant rainfall events (defined as more than 10mm of rainfall within 24 hours, leading to site runoff). The assessment will also encompass the removal of any accumulated sediments as needed.	
Responsible for the measure implementation	Contractor (Works Director)
Responsible for the control of the measure	WSC / Works Supervision

Program 5: Flora and Fauna Management

Program 5: Flora and Fauna Management	
Socio-environmental effects to be prevented or corrected:	Impacts on vegetation cover and wildlife

Management measures

Flora management measures

- Assess the net area of natural vegetation loss and perform a Pre Clearance-Survey to identify and flag protected trees and any other notable tree prior to defining construction sites so as to avoid removal of protected trees.
- Make every effort to minimize natural vegetation loss, especially of protected trees.
- In the case of a necessary, unavoidable removal of a protected tree, legal permits must be obtained from the Director of Forestry prior to harvesting the protected trees.
- The Contractor must implement a revegetation scheme for zero net loss of vegetation, subject to the EA approval. A 3:1 compensation ratio for tree removal is required.
- Determine the revegetated area four months after planting, considering surviving vegetation.
- Remove vegetal cover just before construction commences.
- Minimize time on construction sites to limit disturbance to the natural habitat.
- Store the topsoil separately for ground leveling, respecting the edaphic sequence.
- Strictly prohibit the introduction of invasive species in revegetation activities.

Fauna

- Ensure all personnel receive proper training in identification and safeguarding of native flora and fauna, as well as protocols for dealing with potentially hazardous animals.
- Implement strategies to deter wildlife from areas earmarked for vegetation clearance, focusing on species with greater mobility such as medium to large mammals, birds, and large lizards. Encourage their relocation to adjacent areas without the need for capture. For less mobile species, promote rescue and relocation to nearby suitable habitats. Any bird nests encountered within the proposed clearing areas will be avoided.
- Recommend the adoption of reduced vehicle speeds within the project area.
- Plan activities to minimize the presence of workers in natural environments. Whenever feasible, restrict use of machinery or opt for equipment with reduced noise emissions.
- Enforce a strict prohibition on hunting within the project area.

Environmental management actions for the interventions in South Tarpum Bay KBA

Specifically for the interventions in Westside National Park, and in addition to the prior measures, additional management and mitigation measures have to be implemented to avoid or minimize conflicts and reinforce habitat restoration and sustainable use of natural resources. These management measures include:

- Avoid critical zoning areas, in particular, strict conservation areas and buffer zones.
- Prior to start of the interventions, acquire all necessary permits required for construction activities.
- Engage in consultations with relevant environmental agencies and institutions prior to the start of the interventions.
- Anticipate potential conflicts between different area users or stakeholders and outline proactive measures to avoid them.
- Detail how regulations and guidelines will be enforced, including consequences for violations.

Monitoring and Compliance

Indicators

- Reduction in vegetation cover surface.
- Number of protected trees removed/Number of total protected trees on the intervention areas.

Program 5: Flora and Fauna Management	
• Persistence of revegetated cover surface four months after planting.	
Responsible for the measure implementation	Contractor (Works Director)
Responsible for the control of the measure	WSC / Works Supervision

Program 6: Aquatic Habitat Management

Program 6: Aquatic Habitat Management	
Socio-environmental effects to be prevented or corrected:	Impacts on aquatic habitat
Management measures	
Aquatic Habitat Management Measures • Implementation of Erosion and Sediment Control Management Plan: Develop and execute a comprehensive Erosion and Sediment Control Management Plan in conjunction with a Spill Prevention, Control, and Countermeasures Plan. This should encompass sediment control procedures during in-water activities to minimize the discharge of fine sediments into adjacent water bodies. • Runoff and Drainage Management: Take measures to prevent or minimize runoff from construction sites and associated drainage systems. • Covering Exposed Slopes and Dredged Material: Ensure the covering of exposed slopes and dredged materials to mitigate potential runoff and sediment discharge. • Demarcation of Work Areas: Utilize fencing to delineate work areas, thereby minimizing disruption and the removal of natural vegetation. • Strategic Equipment Access: Plan equipment access locations with a focus on minimizing impacts on riparian areas, prioritizing stable structures over steep banks. • Stockpile Management: Minimize the temporary stockpiling of materials and place stockpiles outside of active floodplain areas. Implement erosion control measures such as silt fences and straw wattles to prevent runoff from stockpiles entering nearby waterways. • Prohibition of Creosote-Treated Pilings: Prohibit the use of creosote-treated pilings in any construction or development activities. • Avoidance of Shoreline modifications. • Prescribed Sand Extraction: Limit sand extraction activities to designated and authorized areas only.	
Monitoring and Compliance	
Monthly inspection report to EHS Team.	
Responsible for the measure implementation	Contractor (Works Director)
Responsible for the control of the measure	WSC / Works Supervision

Program 7: Waste Management

Program 7: Waste Management	
Socio-environmental effects to be prevented or corrected:	Pollution due to improper handling of waste generated on site.

Management measures

Waste generated during the construction phase comprises two distinct categories: common household waste, characterized by low hazard, and specialized waste, considered potentially dangerous.

The first category encompasses materials such as packaging waste, plastics, pipe cuttings, wood, cardboard, food scraps, wires, bags containing lime and cement, cables, bricks, and similar non-hazardous items.

The second category comprises hazardous materials such as rags, contaminated wood, filters, gloves, or other solid objects tainted with oils, hydrocarbons, traces of solvents, varnishes, paints, as well as waste stemming from coating and welding electrodes. Additionally, it includes used oils and containers or packaging with residues of the aforementioned substances.

Waste Management Measures

- Contractors will be responsible for the proper management and final disposal of the waste generated by their activities.
- Personnel training and waste management: all personnel must be adequately trained to distinguish between the two distinct categories of waste and to rigorously maintain their segregation throughout the entirety of the project's development. This includes the proper handling and management of waste.
- Waste storage and categorization: all waste materials must be segregated based on their inherent properties, such as reusability, recyclability, or categorization as household or special waste. This segregation should occur under controlled conditions to preserve their inherent characteristics and prevent any unintended dispersion.
- Waste disposal prohibitions: no form of waste generated during the construction phase, whether it is of household or special nature, solid or liquid, may be incinerated, buried, or discharged into water bodies or the soil. Strict adherence to these prohibitions is mandatory.
- Prevention of unattended waste: under no circumstances shall unattended waste be left unattended at construction sites, where it may be accessible to both wildlife and individuals.
- Waste documentation: a comprehensive record of the waste generated at each construction site must be diligently maintained, documenting the type, volume, and detailed characterization of the waste produced.
- Effluent management: whenever feasible, the practice of washing tools and machinery on the construction site should be avoided. In cases where this is unavoidable, a designated location must be provided for the temporary containment of effluents. These effluents must be removed from the project area at the conclusion of each phase of work.

Low Hazard Waste Management Measures

- When the recycling of assimilable household waste is both technically and economically viable, it will be conducted.
- Should recyclable materials prove valuable to the residents of the locality, they shall be made available to those who express a need for them, following consultations and mutual agreement with the local populace.
- Waste materials that remain unutilized within the Project Area must be securely stored and promptly removed upon the successful conclusion of each phase of the project.

Special Waste Management Measures

- Special waste must be securely stored in appropriate containers, in compliance with the nature of the substances, and managed as hazardous waste, in accordance with prevailing legal regulations.

Program 7: Waste Management	
• In the event of accidental spills, the Environmental Agency (EA) will be immediately informed, and necessary measures for the containment and elimination of the spilled hydrocarbon or chemical product will be conducted. Immediate absorption using suitable materials (such as absorbent cloths or clay) shall be applied. Any contaminated soil or vegetation shall be treated as special waste. • Any generation of pathological waste resulting from personal accidents requiring first aid care must be carefully separated, stored, and treated in strict adherence to prevailing legislation. • Hazardous waste generated as a result of construction activities should be diligently managed, adhering to current legislation. These materials must be securely stored within designated facilities, ensuring their proper preservation. After competition of the works, prompt removal and transportation of special waste to an appropriate facility for treatment and final disposal must be conducted. • Transportation and disposal of special waste must exclusively be conducted by licensed and authorized operators. Under no circumstances will the ultimate disposal of special waste be conducted at open dumps or landfills designated for household waste.	
Monitoring and Compliance	
Indicators • Hazardous waste managed according to standards / hazardous waste generated by the project. • Properly managed dry waste and construction surplus / total dry waste and construction surplus generated by the project. **Monitoring** • Training in supervising hazard waste registration forms for key personnel. • Records of the removal of hazardous waste for its ultimate disposal. • Reviewing hazardous waste removal records for compliance. • Verifying accreditation certificates for hazardous waste disposal.	
Responsible for the measure implementation	Contractor (Works Director)
Responsible for the control of the measure	WSC / Works Supervision

Program 8: Effluent Management

Program 8: Effluent Management	
Socio-environmental effects to be prevented or corrected:	Pollution due to inadequate management of effluents generated by work activities.
Management Measures	
Effluent Management Measures • The management of water drainage, soil movements, and stockpiles will prioritize adherence to the natural flow patterns and runoff levels of the land. • In areas susceptible to potential spills or leakage of pollutants, impermeable flooring, and a surrounding channel, connected to an autonomous drainage system, will be installed to direct rainwater toward treatment facilities. • To minimize wastewater production, where feasible, dry toilets or urine-diverting dry toilets equipped with on-site treatment options (such as alternating pits or compost chambers) will be deployed at construction sites. Adequate facilities will be strategically placed in both the camp and work areas and subject to oversight by the environmental inspection manager to prevent adverse impacts on water resources. • In cases where dry toilets are not viable, a sufficient number of portable toilets or equivalent facilities must be installed. Effluents from these facilities will be removed and sanitized daily by authorized operators or service providers. • Efforts will be made to avoid on-site tool and machinery washing. When such washing is unavoidable, a designated area for temporary effluent storage will be established, with removal of these effluents from the project area at the conclusion of each work period.	
Monitoring and compliance	
Indicators • Effluent types managed according to standards / Total effluent types generated by the project. **Monitoring** • Record sheet documenting the withdrawal and inspection of portable toilets by the contractor.	
Responsible for the measure implementation	Contractor (Works Director)
Responsible for the control of the measure	WSC / Works Supervision

Program 9: Chemical Substances Management

Program 9: Chemical Substances Management	
Socio-environmental effects to be prevented or corrected:	Pollution due to inadequate management of chemical substances used by work activities.

Management Measures

If the contractor refuels heavy machinery in the vicinity of the worksite, tanker trucks must be used, and the following procedures must be considered during refueling:

- Park the vehicle in a way that does not cause interference, allowing for a quick exit.
- Ensure the presence of fire extinguishers near the refueling site (within a distance of no more than 3 meters).
- Verify that there are no sources that could cause a fire in the surrounding area.
- Check the coupling of the hoses.
- Use spill containment trays.
- In case of a spill or fire, follow the procedures outlined in the Contingency Plan.
- Immediately report any spills or product contamination to the environmental inspector.

There should be a report and authorization form for fuel refilling.

Polyethylene material should be placed over the area where any corrective maintenance on heavy machinery (greasing and checking oil levels) will be conducted. In this case, the delegated Site Supervision must be notified of the day, place, and reasons for the maintenance.

The person responsible for the site must report and clean up any fuel, oil, and toxic substance spills. If there are accidental spills on the ground, they must be immediately removed, and the Site Supervision must be notified. If the spill exceeds approximately 5 liters, the affected soil must be removed and treated as special waste. Small spilled volumes can be collected with synthetic absorbent materials, rags, sawdust, or sand. The final cleaning of the site can be done with water and detergent.

The minimum daily storage allowed in the work area must be agreed upon with the competent authority. Tanks containing fuels or lubricants should be stored away from any building, ideally at a distance greater than 6 meters. The storage of fuels or lubricants should be in metal containers with spring-closed lids or in plastic tanks. They should be properly labeled with the substance they contain and have warning signs of “flammable” and “no smoking.”

When concrete is mixed on site, the application of chemicals that require handling measures is sometimes needed. An inventory of the chemical products should be made before starting work, classifying them according to the type and degree of physical and health risks associated with their use.

All flammable substances must be properly protected, safeguarded, and stored under safe conditions and restricted according to their use and level of hazard. All chemical products should be labeled to provide essential information about their classification, the hazards they pose, and the safety precautions that should be observed by workers.

Persons handling chemical products should ensure that when chemical products are transferred to other containers, their identification and all industrial safety and occupational health precautions are maintained, in accordance with the relevant Plan.

It will be mandatory to have safety data sheets for the chemical products at the site and to inform employees about them during induction training. These sheets should contain essential detailed information about their identification, supplier, classification, hazards, precautionary measures, and emergency procedures. A registry of these sheets should be created and made accessible to all interested workers and their representatives.

Program 9: Chemical Substances Management	
Implement procedures for the safe decontamination of equipment that has contained chemicals, using methods that neutralize chemical residues before their removal or recycling. Conduct training on the safe handling of chemical substances, emergency procedures, and proper use of PPE.	
Monitoring and compliance	
Indicators • Percentage of compliance in inspections conducted on facilities and chemical substance management procedures. **Monitoring** • Registration forms for training of key personnel in chemical substance management. • Registration forms for chemical substances stored on-site. • Report and authorization forms for fuel refilling.	
Responsible for the measure implementation	Contractor (Works Director)
Responsible for the control of the measure	WSC / Works Supervision

Program 10: Occupational and Community Health and Safety

Program 10: Occupational and Community Health and Safety	
Socio-environmental effects to be prevented or corrected:	Accidents and incidents that affect occupational and community health and safety

Management measures

The contractor shall regularly ensure compliance with relevant standards and regulations, including international best practices (such as the International Finance Corporation guidelines). This will involve retaining a team of professional advisors.

All personnel are required to receive training on equipment operation, machinery use, and vehicle operation in accordance with prevailing regulations within protected areas.

Clear and permanent identification of all available elements must be conducted, alongside the use of signage and instructional materials for educational purposes.

The contractor must supply Personal Protective Equipment (PPE) and provide comprehensive induction training to workers, covering PPE types, proper usage, characteristics, and limitations.

Occupational Health and Safety Subprogram

A comprehensive assessment of risk factors associated with each job role, including an enumeration of the workforce exposed to these risks, must be conducted. The following measures are recommended to enhance workplace safety:

- Conduct **Daily 5-Minute Safety Talks** before commencing work. Topics should be tailored to the specific risks associated with ongoing activities.
- Develop and implement **Safe Work Procedures** for the safe execution of activities. Emphasize adherence to established safety protocols.
- Regularly **inspect and ensure the proper functioning of equipment, machinery**, and essential safety apparatus such as fire extinguishers.
- Apply **Safety Data Sheets** for hazardous products, ensuring that relevant information is readily accessible to workers.
- Provide necessary **Personal Protective Equipment** (PPE) to all workers on the construction site in accordance with the specific requirements of their tasks.
- **demarcate work** areas and storage zones using appropriate signaling in order to promote awareness and help prevent accidents.
- Develop a comprehensive **Contingency Plan** and ensure that all workers are proficiently trained in its implementation to address unforeseen circumstances.
- Conduct proper **Waste Management** by exercising control over the collection, treatment, and disposal of residues and waste, while adhering to basic sanitation standards.
- Verify that personnel operating equipment possess the necessary **licenses and certifications**.
- **Training in Environmental, Health, Hygiene, and Occupational Safety.**

The following activities are classified as high-risk within the occupational context, and demand a diligent commitment to safety protocols, continuous training, and strict adherence to established guidelines to mitigate potential hazards and ensure the well-being of personnel involved:

- Work at Heights and on Scaffolding
- Hot Work (Welding)
- Machinery Maintenance
- Electrical Work

Community Health and Safety Subprogram

This subprogram is designed to address potential risks and impacts on the health and safety of communities affected by the project. The Contractor is required to conduct a comprehensive evaluation of the project's

Program 10: Occupational and Community Health and Safety

potential effects on the health and safety of the affected communities, with specific attention to individuals facing vulnerability due to their unique circumstances, such as children. Subsequently, the Contractor is expected to propose mitigation measures in strict adherence to the mitigation hierarchy. The assessment will encompass the following key aspects:

- Thorough evaluation of the impact on **traffic and road safety**, with the aim of minimizing any adverse effects on the community.
- Implementation of clear and effective **signaling** and delineation measures at work sites to enhance safety and minimize potential hazards.
- Rigorous management and safety protocols for handling **hazardous materials** to prevent any harm to the health and safety of the affected communities.
- Examination of the project's **impact on natural habitats** and the potential risks and adverse effects on the health and safety of the affected communities.
- Development and implementation of a comprehensive **emergency preparedness and response plan**, ensuring swift and effective actions in the event of unforeseen circumstances.

The Contractor is expected to integrate these measures into the project's execution, reflecting a commitment to responsible and conscientious project management.

Labor Management Procedure Subprogram

The contractor is required to formulate a comprehensive Labor Management Procedure (LMP) designed to articulate a structured framework governing the actions and responsibilities of both the employer and the workforce. This protocol is applicable to individuals employed directly by the contractor and extends to personnel engaged through third-party entities (sub-contractors).

The primary objective of the LMP is to establish and maintain employment relationships grounded in the principles of equal opportunities and equitable treatment. The employment of child or forced labor is strictly prohibited. The contractor, along with its subcontractors, is expressly prohibited from engaging individuals below the minimum age of employment as prescribed by relevant legal statutes, with a minimum threshold of no less than 15 years of age.

The LMP will include the creation of a **grievance redress mechanism**. This mechanism is designed to provide a channel through which workers, and where applicable, their affiliated organizations, can voice concerns related to the workplace. Additionally, it serves as a platform for the lodging of complaints pertaining to instances of

Program 10: Occupational and Community Health and Safety

sexual and gender-based violence. The contractor is tasked with ensuring the effectiveness and accessibility of this grievance redress mechanism to facilitate a transparent and responsive resolution process.

Protection of Community Critical Infrastructure

For all works under the Program, and in particular for the component of lift station upgrades, the following measures will be implemented to protect sensitive receptors in the area of works (such as hospitals, schools or residents).

- **Identification and Mapping:** Clearly identify and map all sensitive receptors in the project area, including hospitals, schools, and residences.
- **Communication and Notification:**
  - Inform affected communities and institutions about the project timeline, potential impacts, and planned mitigation measures.
  - Provide regular updates through community meetings, flyers, and digital platforms.
- **Noise and Vibration Control:**
  - When applicable, implement noise barriers and schedule noisy activities during less sensitive times (e.g., avoiding school hours and hospital visiting hours).
  - Use low-vibration equipment and techniques to minimize disturbances.
- **Dust and Air Quality Management:**
  - Employ dust suppression measures such as water spraying and covering of materials.
- **Traffic and Access Management:**
  - Develop traffic management plans to ensure safe and uninterrupted access to sensitive receptors.
  - Coordinate with local authorities to manage traffic flow and minimize congestion.
- **Emergency Response Planning:**
  - Establish emergency response protocols.
  - Ensure clear access routes for emergency vehicles at all times.

Protection Measures for Historical Sites

For all works under the Program, and in particular for the component of lift station upgrades, the following measures will be implemented to protect historical sites.

- **Identification and Documentation:** Conduct thorough surveys to document all historical sites within the project area.
- **Physical Protection Measures:**
  - Install protective barriers around historical sites to prevent accidental damage during construction.
  - Restrict construction activities within a defined buffer zone around each site.
- **Monitoring and Reporting:**
  - Regularly monitor the condition of historical sites throughout the construction process.
  - Document any changes or damages and report them to relevant authorities.
- **Stakeholder Engagement:**
  - Involve local heritage organizations and community groups in the planning and monitoring process.
  - Provide opportunities for stakeholders to give input on protection measures.
- **Training and Awareness:**
  - Train construction personnel on the importance of preserving historical sites and the specific measures in place.
  - Raise awareness among workers about the cultural significance of these sites.

Monitoring and Compliance

Program 10: Occupational and Community Health and Safety	
Indicators • Frequency rate (number of accidents x 200,000/person-hours worked in the period). • Severity Index (number of serious accidents x 200,000/ person-hours worked in the period). • Fatal Accident Incidence Rate (Number of fatal accidents x 200,000/Number of exposed workers). • Number of personnel using PPE according to the risk of the activity / Total number of personnel. • Number of workers with Medical and Labor Insurance / Total number of workers in the project **Monitoring** • Work accident registration forms. • PPE delivery record forms. • Record sheets for training in the use of PPE. • Certification forms for the use of specific machinery. • Safety procedures for critical activities. • Risk analysis and checklists for critical activities.	
Responsible for the measure implementation	Contractor (Works Director)
Responsible for the control of the measure	WSC / Works Supervision

Program 11: Traffic and Pedestrian Management

Program 11: Traffic and Pedestrian Management	
Socio-environmental effects to be prevented or corrected:	Accidents and incidents that affect occupational and community health and safety
Management measures	
The Master Contractors will prepare the Traffic and Pedestrian Management Program. Consultation with key stakeholders will be conducted prior to Program finalization. The Contractors will ensure implementation of this Program. The Traffic and Pedestrian Management Program shall: • Identify the sensitive location (religious facility, educational facility, heath facility, commercial areas) along the site access roads. • Identify the road condition, traffic congestion areas and peak traffic load period. • Identify the traffic hotspots like road junctions, market areas, school areas. • Provision of traffic marshal (signal person) in identified traffic sensitive locations. • Identify any major road repairing requirement along the site access road. • Prepare the Traffic and Pedestrian Management Program based on local sensitivity (religious gathering, school timing, market timing and peak traffic timings); • Implement procedure to follow road safety requirements by the drivers & helpers. • Implement procedure to check fit certificates of the vehicles to minimize the emission of air and noise. • Monitor road conditions to identify any damage of road or structures and remedy immediately to reduce the potential for significant impacts to the local communities. Contractors will provide instructions to drivers to maintain the speed as per Traffic and Pedestrian Management Program. Contractors will provide induction/training to all drivers for safe driving. Contractors will require drivers to follow all legal and project related safety requirements applicable in respect of road safety.	
Monitoring and Compliance	
Indicators • Number of work fronts marked with signs in accordance with the approved Traffic and Pedestrian Management Program /Number of work fronts that require signage in accordance with Traffic and Pedestrian Management Program. • Number of road accidents. **Monitoring** • Weekly inspection program • Monthly inspection report • Road safety accident records	
Responsible for the measure implementation	Contractor (Works Director)
Responsible for the control of the measure	WSC / Works Supervision

Program 12: Pest and Vector Control

Program 12: Pest and Vector Control	
Socio-environmental effects to be prevented or corrected:	Spread of pests and vectors
Management Measures	
To safeguard public health, it is strongly advised that the Contractor engages the services of a certified and proficient company with the following responsibilities: • Pest Control: before the removal of green waste and soil movement, the contracted company should conduct thorough pest disinfection. This involves the use of pest control methods such as cultural practices, biological or chemical as the last resort to eliminate pests effectively. • Municipal coordination: the contracted company must collaborate with municipal or local authorities to prevent the unlawful deposition of municipal solid waste on neighboring properties or nearby, adjacent streets. This coordination helps maintain a clean and sanitary environment. • Product protocols: to ensure safety, it is recommended to request and monitor the protocols for the products used in pest control. This includes assessing supply chain and potential side effects and residual impacts, ensuring that only approved and safe products (non-toxic) are utilized. • Waste management: the company responsible for pest disinfection must manage the waste generated during their operations. They should promptly remove containers used for pest control, and evidence of proper disposal should be provided. • Food handling and fire prevention: to prevent the attraction of rodents and snakes, no food remnants should be left exposed, and open fires should be avoided. Both hot food and ash can be an attractant for these species, posing risks to public health.	
Monitoring and compliance	
Indicators • Completed pest and vector disinfection/control applications to the total planned applications in the Program. **Monitoring** • Verification of disinfection certificates in alignment with the predetermined disinfection schedule, including projected fumigation dates, specified products for use, outlined safety protocols, Contingency Plan, etc. • Validation of bait withdrawal and proper final disposal confirmation.	
Periodicity of Supervision of the degree of Compliance and Effectiveness of the Measure	Monthly
Responsible for the measure implementation	**Contractor (Works Director)**
Responsible for the control of the measure	WSC / Works Supervision

Program 13: Socio-Environmental Training for Construction Personnel

Program 13: Socio-Environmental Training for Construction Personnel	
Socio-environmental effects to be prevented or corrected:	Lack of knowledge regarding the personnel's role in preserving, protecting, and conserving the environment, as well as ensuring occupational safety in the performance of their duties

Management measures

Socio-Environmental Training

To conduct the training process, informative sessions will be conducted prior to the commencement of work. Subsequently, ongoing exchange and training meetings will be organized, tailoring content to meet the specific requirements of diverse projects with environmental implications. Additionally, drills addressing emergency response protocols will be conducted.

The planning and execution of these training sessions will be conducted under the oversight of safety, hygiene, and environmental professionals employed by the contractor. The training program encompasses a comprehensive agenda, including, but not limited to, the following topics:

- Basic induction in environmental protection.
- Evaluation and control of risks with a focus on personnel safety.
- Management of environmental contingencies such as spills and fires.
- Fire prevention and control measures.
- Comprehensive waste management procedures.
- Protection and management of plant species in the immediate environment.
- Safe handling of chemical substances.
- Familiarization with the company's Code of Conduct and addressing gender-related issues.
- The implementation of this program will ensure a thorough understanding of essential environmental and safety protocols, contributing to the effective management of potential risks and emergencies.

Code of Conduct

The Contractor is required to develop and implement a comprehensive Code of Conduct for Site Personnel, as exemplified in Annex 2, Appendix A. This code shall be incorporated into employment contracts for both the Contractor and Subcontractors, adhering to the guidelines outlined in the LMP, and the contractors will conduct a training of workers on the code of conduct. To mitigate the risk of gender, social, political, cultural, or racial conflicts, and to maintain order, the Contractor must take necessary measures and precautions. This includes preventing tumult or disorder among construction personnel, employees hired by them, or Subcontractors, while ensuring the preservation of order, protection of inhabitants, and the security of public and private property within the project's area of influence.

The Code expressly prohibits harassment, violence, exploitation, and racism. Its application is mandatory for all individuals involved in the project, both during and outside of working hours.

Non-compliance or infringement of the established rules of conduct will result in sanctions, fines, or dismissals, depending on the severity of the violation. All construction personnel, irrespective of their hierarchical level, are required to participate in training sessions and discussions related to the Code.

Furthermore, the Contractor is obligated to conduct a minimum of two activities addressing non-discrimination and gender equity for all personnel affected by the project. These activities will focus on: 1) the prevention of sexual exploitation of children and adolescents, including labor and criminal consequences; and 2) fostering positive relationships between men and women in the workplace.

Program 13: Socio-Environmental Training for Construction Personnel

Prior to these activities, the Contractor must submit an Action Plan for approval by the Construction Management. This plan should outline the responsible parties for implementation, the methodology, and the schedule. Upon completion, a comprehensive evaluation report must be submitted.

Additionally, the Contractor is required to establish, within an agreed-upon timeframe with Construction Management, a protocol addressing sexual harassment constitutes sexual exploitation and abuse (SEA) in the workplace.

In order to create a common understanding of what constitutes SEA, and sexual harassment, the following definitions are provided:

Sexual Exploitation and Abuse (SEA)

Is defined as any actual or attempted abuse of a position of vulnerability, differential power, or trust, for sexual purposes, including, but not limited to, profiting monetarily, socially or politically from the sexual exploitation of another.

Sexual Abuse: "The actual or threatened physical intrusion of a sexual nature, whether by force or under unequal or coercive conditions."

Sexual Harassment:

Unwelcome sexual advances, request for sexual favors, and other verbal or physical conduct of sexual nature.

Sexual Harassment versus SEA:

SEA occurs against a beneficiary or member of the community. Sexual harassment occurs between personnel/staff of an organization or company and involves any unwelcome sexual advance or unwanted verbal or physical conduct of a sexual nature. The distinction between the two is important so that agency policies and staff trainings can include specific instruction on the procedures to report each.

Consent is the choice behind a person's voluntary decision to do something. Consent for any sexual activity must be freely given, ok to withdraw, made with as much knowledge as possible, and specific to the situation. If agreement is obtained using threats, lies, coercion, or exploitation of power imbalance, it is not consent. Under this Code of Conduct consent cannot be given by anyone under the age of 18, regardless of the age of majority or age of consent locally. Mistaken belief regarding the age of the child is not a defense.

There is no consent when agreement is obtained through:

- the use of threats, force or other forms of coercion, abduction, fraud, manipulation, deception, or misrepresentation
- the use of a threat to withhold a benefit to which the person is already entitled, or
- a promise is made to the person to provide a benefit.

While all forms of violence against a community resident or a co-worker are forbidden, this code of conduct is particularly concerned with the prevention and reporting of sexual exploitation and abuse (SEA) and sexual harassment which constitute gross misconduct, is grounds for termination or other consequences related to employment and employment status:

Examples of sexual exploitation and abuse include, but are not limited to:

- A project worker tells women in the community that he can get them jobs related to the work site (cooking and cleaning) in exchange for sex.
- A worker that is connecting electricity input to households says that he can connect women headed households to the grid in exchange for sex.
- A project worker gets drunk after being paid and rapes a local woman.
- A project worker denies passage of a woman through the site that he is working on unless she performs a sexual favor.
- A manager tells a woman applying for a job that he will only hire her if she has sex with him.

Program 13: Socio-Environmental Training for Construction Personnel

- A worker begins a friendship with a 17-year-old girl who walks to and from school on the road where project related work is taking place. He gives her moto rides to school. He tells her that he loves her. They have sex.

Examples of sexual harassment in a work context include, but are not limited to:

- Male staff comment on female staffs' appearances (both positive and negative) and sexual desirability.
- When a female staff member complains about comments male staff are making about her appearance, they say she is "asking for it" because of how she dresses.
- A male manager touches a female staff members' buttocks when he passes her at work.
- A male staff member tells a female staff member he will get her a raise if she sends him naked photographs of herself.

Appendix A in Annex 2 provides an Individual Commitment Model against SEA to be signed by workers.

Prevention of Gender-Based Violence

Trainings on prevention of gender-based violence will be conducted on a monthly basis to ensure continuous awareness and reinforcement of the guidelines among construction personnel. Additionally, refresher sessions will be scheduled as needed, especially in response to any incidents or policy updates.
The contents of the training will include the protocol to address sexual and gender-based violence, namely:

- **Immediate Response:**
  - Ensure the victim's safety and provide a safe space.
  - Offer immediate medical and psychological assistance.
  - Respect the victim's confidentiality and autonomy.
- **Reporting and Documentation:**
  - Detailed procedures for reporting incidents internally.
  - Documentation requirements while maintaining confidentiality.
  - Steps for cooperating with law enforcement and legal entities.
- **Support and Assistance:**
  - Provide access to health care and psychological services.
  - Connect victims with local support organizations and legal aid.
  - Continuous follow-up to ensure the victim's well-being and support during recovery.
- **Preventive Measures:**
  - Regular training and awareness programs.
  - Implementing a zero-tolerance policy for GBV within the contractor firm.
  - Encouraging a culture of respect and equality at the workplace.

Monitoring and Compliance

Indicators

- Percentage of personnel trained in accordance with the Training Program.
- Percentage of training sessions given out of the total training sessions required according to the Training Program.

Responsible for the measure implementation	Contractor (Works Director)
Responsible for the control of the measure	WSC / Works Supervision

Program 14: Disaster Management and Emergency Response

Program 14: Disaster Management and Emergency Response	
Socio-environmental effects to be prevented or corrected:	Human, economic, and environmental losses associated with an emergency situation and protect areas of social, economic, and environmental interest located in the area of influence of the project.

Management measures

Contingency Prevention and Control Strategies

Contractor Responsibilities:

- Strict compliance with general and specific regulations, rules, procedures, and instructions pertaining to health, hygiene, and occupational safety.
- Identification and mitigation of all potential risks leading to workplace accidents or occupational illnesses.
- Identification and rectification of unsafe conditions within work areas.
- Enforcement of standards and procedures outlined in environmental management plans.
- Development of programs aimed at enhancing working conditions and implementing procedures to ensure greater safety during project execution.
- Implementation of training and awareness campaigns for workers focused on Occupational Health practices.
- Periodic communication of specific job risks to each worker, along with information about environmental risks and preventive measures.
- Ensuring that the design, engineering, construction, operation, and maintenance of equipment align with safety norms and procedures endorsed by Construction Supervision.
- Establishment of periodic and preventive maintenance programs for machinery, equipment, and facilities.
- Facilitation of inspections and investigations related to occupational health conditions conducted by competent authorities.
- Provision of necessary and suitable personal protective equipment based on the level of risk, adhering to Industrial Safety recommendations.
- Development of an emergency response plan in collaboration with the Disaster Risk Management Authority (DRM).
- Ensuring availability of essential resources and materials for effective response to emergencies.

Employee Responsibilities:

- Execute tasks with utmost care, ensuring operations adhere to safety standards, environmental regulations, and the guidelines outlined in the management plan programs.
- Vigilantly monitor machinery and equipment to promptly identify and report any risks or dangers to superiors. Address human, physical, mechanical, or environmental issues that arise during work.
- Refrain from operating unauthorized machines or allowing unauthorized personnel to manage equipment under their responsibility.
- Avoid the introduction of alcoholic or intoxicating substances in the workplace and avoid working under their influence.
- Workers operating machinery with moving parts must avoid wearing loose clothing, jewelry, or accessories. If they have long hair, secure it with a cap or hairnet.
- Safely utilize and maintain company-provided work items, safety devices, and personal protective equipment. Maintain cleanliness and order in workplaces and services.
- Actively participate in company-approved programs for preventing occupational accidents, illnesses, and community health issues.

Program 14: Disaster Management and Emergency Response	
• Promptly report any procedures or operations that violate safety regulations and pose a threat to individuals, colleagues, or company assets. • Vehicle drivers must adhere to internal traffic regulations and those of protected areas during work execution. • Propose activities that promote occupational health within the workplace. • Implement actions specified in emergency protocols and strategies. **Fire Prevention and Control:** The Contractor is responsible for preventing and controlling fires in the workplace. In case of a fire, the following actions will be taken: • Utilize the nearest fire extinguishers to prevent the fire from spreading. • Request external support when necessary and initiate control procedures with available resources as a first response. • Establish means for maintaining constant communication, such as radios or telephones. • Evacuate individuals from the work front and the camp until the emergency is under control. • Identify and evaluate the emergency, determining the point of occurrence, cause, magnitude, consequences, actions to follow, and necessary support for control. **Actions in Case of Floods:** • In the event of flash flooding, immediately move to higher ground. • Stay vigilant for sudden flooding in streams, drainage channels, and other areas. • Avoid driving through flooded areas. • Once the emergency is controlled, the emergency coordinator will prepare a comprehensive final report.	
Monitoring and Compliance	
Indicators • Number of environmental and health accidents managed in accordance with the defined procedure / Total number of environmental and health accidents that occurred in the project.	
Responsible for the measure implementation	Contractor (Works Director)
Responsible for the control of the measure	WSC / Works Supervision

Program 15: Community Information and Participation

Program 15: Community Information and Participation	
Socio-environmental effects to be prevented or corrected:	Misinformation of the public regarding the progress and tasks of the project.
Management measures	
Contractor Responsibilities: • **Project Reporting:** Maintain timely and updated records on the project's implementation and progress. Promptly address queries, observations, complaints, and claims from the Works Inspection, proactively identifying and implementing solutions to identified problems. • **Communication Channels:** Provide the public with a transparent and accessible means of communication. Establish a complaints book for public access. Make available a 24-hour contact telephone number, an email address, and a web interface for the community to submit their claims, complaints, and suggestions. Ensure that all submitted comments are promptly analyzed and receive a swift response. • **Community Information and Participation:** Implement the Community Information and Participation Program consistently throughout the project's lifecycle. Give special attention to ensuring clear, transparent, and timely communication with all individuals benefiting from the program. • **Community Engagement:** Establish a mode of engagement with the community affected by the project's development. Inform the community about the project's schedule and progress to foster transparency. • **Access to Information:** Facilitate equal access to information, with a commitment to promoting gender equity among all interested social sectors. These responsibilities underscore the contractor's commitment to effective communication, community engagement, and transparency throughout the project.	
Monitoring and Compliance	
Indicators • Percentage of complaints managed properly during the month according to the defined mechanism over the total number of complaints generated. • Percentage of public consultations conducted over the total number of public consultations required.	
Responsible for the measure implementation	Contractor (Works Director)
Responsible for the control of the measure	WSC / Works Supervision

Program 16: Coordination with Service Providers

Program 16: Coordination with Service Providers	
Socio-environmental effects to be prevented or corrected:	Disruption of services due to breakages during construction activities.
Management Measures	
The Contractor will establish coordination with utility service providers to address the interferences that the execution of the Work will cause with existing infrastructure. To comply with this, and with the agreement of the Site Inspection, they will plan and propose the most appropriate solution and reach consensus with the respective company responsible for executing it, minimizing inconvenience to users. Additionally, actions will be scheduled so that the Contractor promptly resolves any unforeseen interference that may jeopardize service provision. From the start of the project, the Contractor will manage the appropriate permits, coordinating with the technical teams of the service providers. The Contractor shall inventory existing public utility networks in accordance with the contract specifications and plans to identify and locate lines that may be affected. Each utility company shall appoint a coordinator to attend project oversight committees, ensuring cordial management of all expansion, repair, or replacement work within the project intervention area. If removal or relocation of structures is required, the Contractor shall first locate the axes of different public utility lines within the intervention area, as indicated by the project design plans and information provided by the utility companies. Simultaneously, approval of the plans by the respective utility companies shall be obtained.	
Monitoring and Compliance	
Indicators • Number of network service interruptions caused by construction activities with interferences / Number of network service interruptions caused by construction activities with interferences coordinated with network service providers.	
Responsible for the measure implementation	Contractor (Works Director)
Responsible for the control of the measure	WSC / Works Supervision

Program 17: Environmental Liabilities Program

Program 17: Environmental Liabilities Program	
Socio-environmental effects to be prevented or corrected:	Impact on Air, water and soil. Impact on Fauna and Flaura Impact on Occupational and Community Safety
Management Measures	
This program will be implemented at the start of the construction phase to ensure that the construction site is free of environmental and social liabilities. This program is of application in the Sweetings Village water supply project (where abandoned cars were identified in the Direct Area of Influence, which might lead to soil and groundwater contamination) and any other intervention area where environmental liabilities are identified. For liability management, the implementation of management measures is divided into three stages: **Stage 1** Stage 1 consists of a preliminary assessment on the site and/or the project intervention area. The entire site should be visually surveyed, documented with photographic records, to detect the presence of potential environmental liabilities. If liabilities are detected, they should be pre-classified (domestic-like solid waste, hydrocarbon residues, aggregates, hazardous waste such as car batteries, wastewater infiltrations, among others) and the degree of magnitude or severity should be qualitatively determined (low, medium, or high). Regarding social liabilities, the following will be identified: (i) informal occupations on the construction sites; and (ii) complaints and claims regarding the functioning of the infrastructures to be intervened. **Stage 2** If special waste (hydrocarbon residues, unidentified chemical substances, or others) is detected during the initial site analysis, laboratory characterization of soils, groundwater, and surface waters (as applicable) will be conducted to determine the presence of contaminants and their concentrations. **Stage 3** Based on the results of stages 1 and 2, the identified environmental liabilities will be removed or remediated. For the cleanup of different solid wastes and hazardous wastes, the guidelines of the Waste Management Program of this SESMP will be followed. All workers involved in remediation tasks must work under the guidelines of the Occupational and Community Health and Safety Program of this SESMP. Regarding social liabilities, the contractor's social specialist, together with the Environmental and Social team of the Executing Agency, will define an Action Plan, which must receive the Bank's No Objection."	
Monitoring and Compliance	
Indicators • Environmental Liabilities Remediated/Environmental Liabilities Identified	
Responsible for the measure implementation	Contractor (Works Director)
Responsible for the control of the measure	WSC / Works Supervision

Program 18: Chance Find Procedure

Program 18: Chance Find Procedure	
Socio-environmental effects to be prevented or corrected:	Destruction of historical, cultural, archaeological, and paleontological heritage.
Management measures	
This program will be systematically implemented throughout the duration of the project, with the following key provisions: • **Continuous Monitoring:** A permanent monitoring initiative will be conducted across the entire area directly impacted by the project to identify any archaeological elements. • **Immediate Action on Discovery:** Should any property of potential archaeological significance be discovered, the construction team is obligated to promptly cease activities that may impact the identified area. Adequate surveillance measures will be implemented to prevent unauthorized access and looting. • **Alternative Worksite Consideration:** If necessary, the project team will explore alternative locations for project activities to mitigate any potential impact on archaeological finds. • **Notification of Competent Authority:** The relevant national authority will be promptly notified, and the project will adhere to their instructions for further action in response to the archaeological discoveries. • **Salvage Operations:** In the event of cultural remains emerging during activities such as ditching, earth removal, or excavations, salvage operations will be promptly initiated. Recognized archaeologists, under supervision, will conduct these operations with the utmost consideration for preserving the contextual integrity of the archaeological remains. Work will resume only upon the archaeologist's determination of an appropriate timeframe and location. • **Comprehensive Reporting:** Upon completion of the project, a comprehensive final report will be prepared. This report will detail the quantity and nature of the recovered materials and will be submitted to the competent authority. • **Consultation with Competent Authority:** The competent authority will be consulted regarding the proper procedures for delivering archaeological materials as part of the project's commitment to compliance and transparency.	
Monitoring and Compliance	
Indicators • Number of archaeological and cultural resources found in the project and managed according to the defined procedures / Number of archaeological and cultural resources found in the project.	
Responsible for the measure implementation	Contractor (Works Director)
Responsible for the control of the measure	WSC / Works Supervision

Program 19: Works Closure

Program 19: Works Closure	
Socio-environmental effects to be prevented or corrected:	Impacts on the environment once the work is finished.
Management measures	
Mitigation measures • All installations utilized in the execution of the project will undergo systematic removal. • An exhaustive examination of environmental and social liabilities will be conducted, and identified issues will be promptly addressed and remedied. • Disposal of waste and solid materials must adhere to the guidelines set by environmental and social supervision, ensuring their transfer to approved sites. • Areas where vegetation has been cleared must undergo revegetation using the same species originally present. • Surplus reusable or recyclable materials are eligible for donation, while the delivery of materials constituting environmental liabilities is strictly prohibited. • The incineration of waste during the dismantling process is expressly forbidden. • Dismantled sites are obligated to be left in impeccable condition, seamlessly integrated into the surrounding environment.	
Monitoring and Compliance	
Indicators • Absence of claims by the authorities, the surrounding population, and the community in general. **Monitoring** • Photographic record before and after work.	
Responsible for the measure implementation	Contractor (Works Director)
Responsible for the control of the measure	WSC / Works Supervision

6.1.6. Operational Strategic Environmental and Social Management Plan

This Strategic Environmental and Social Management Plan (SESMP) outlines the mitigation measures designed to address potential adverse impacts and risks during the **operational and maintenance phase** of the projects' implementation.

The Essential Social and Environmental Management Plan (ESMP) for each project must include, at a minimum, the programs outlined in **Table 37**. **Table 38** outlines the critical requirements and prerequisites for these programs.

Throughout the operational phase, the WSC will assume responsibility for the operation and maintenance of the infrastructure, equipment, and machinery, following the prescribed guidelines provided herein.

Table 37. Operational SESMP requirement for each project.

ESPM Programs	NRW Reduction Contract	AMI	Access to Piped Water Supply	Lift Station Upgrades
Waste Management Program	X	X	X	X
Occupational Health and Safety Program	X	X	X	X
Grievance Redress Mechanism	X	N/A	X	X
Capacity Building Program for WSC Personnel	X	X	X	X
Contingency Plan	X	N/A	X	X
Socio-Environmental Training Program	X	X	X	X
Road Safety and Traffic Management Program	X	N/A	X	X

Table 38 - Operational Strategic Environmental and Social Management Plan.

Plan / Program	Impact to avoid	Minimum Mitigation Measures	Responsible Party	Indicators and Compliance, Records	Supervision
Waste Management Program	Contamination due to inadequate management of assimilable household, and hazardous waste.	Development and implementation of a Waste Management Program	WSC	Environmental Audit of the Site	DEPP
Occupational Health and Safety Program	Occupational risks due to the operation and maintenance of infrastructure	Compliance with current national regulations. Adopt international best practices	WSC	Frequency Index (number of accidents x 200,000/person-hours worked in the period). Severity Index (number of serious accidents x 200,000/	Competent authority

Plan / Program	Impact to avoid	Minimum Mitigation Measures	Responsible Party	Indicators and Compliance, Records	Supervision
				person-hours worked in the period). Fatal Accident Incidence Rate (Number of fatal accidents x 200,000/Number of exposed workers).	
Grievance Redress Mechanism	Impacts on local community and workers of the work for the non-attention to the claims and complaints.	There must be an efficient tool for receiving, registering, monitoring, and resolving claims.	WSC	Registration of claims and complaints	Competent authority
Capacity Building Program for WSC Personnel	Lack of knowledge on new equipment and systems to be in place.	Minimum training: - Introduction to SCADA Systems and AMI - Operation of SCADA, DMAs and AMI - SCADA and AMI Data Management and Reporting	WSC	Percentage of operators trained according to Training Program Training Registration Sheets	Competent authority
Contingency Plan	Poor management of environmental/occupational contingencies	**Strategic Plan** Define the structure and organization for emergency response, the roles and responsibilities of the people in charge of executing the plan, the necessary resources, and the preventive and operational strategies to be applied in each of the possible scenarios, defined from the evaluation of	WSC	Number of environmental and safety accidents managed according to the defined procedure / Total number of environmental and health accidents occurring in the project.	Competent authority

Plan / Program	Impact to avoid	Minimum Mitigation Measures	Responsible Party	Indicators and Compliance, Records	Supervision
		the risks associated with construction. **Action Plan** Establish the procedures to be followed in case of emergency.			
Socio-Environmental Training Program	Lack of knowledge regarding the personnel's role in preserving, protecting, and conserving the environment, as well as ensuring occupational safety in the performance of their duties	Training on waste management, contingency plans, use of PPE, spill prevention and management, effective sludge handling, fire safety protocols, and environmental regulations and compliance.	WSC	Percentage of personnel trained in accordance with the Training Program.	Competent authority
Road Safety and Traffic Management Program	Accidents and incidents that affect occupational and community health and safety	Identify sensitive locations, implement road safety requirements, implement procedures of marking work fronts	WSC	Number of road accidents Number of work fronts with signs/Number of work fronts that require signs	Competent authority

6.1.7. Budget for Implementation of the SESMP

Table 39 includes the estimated costs, schedules, and responsible entities for the implementations of the SESMPs.

Table 39. Costs, Schedules, and Responsible Entities for the implementations of the SESMPs.

Measure	Description	Estimated cost	Schedule	Responsible
Implementation of Mitigation Measures and Programs of Construction SESMP	Preparation of the ESMP at the construction level and implementation during the construction of the project; socio-environmental monitoring of the works.	**1.5% of the total cost of the Project**	From the beginning of the works, until their finalization	Contractor
Implementation of Mitigation Measures of Operational SESMP	Incorporation of mitigation measures for the operational stage within the project activities	[incorporated in WSC operational budget]	Throughout the lifecycle of the infrastructure	WSC

The cost for the implementation of the ESMP mitigation measures and programs is indicative and does not constitute a prescriptive element of contractual obligation. The implementation of the SESMP is monitored exclusively in terms of its performance (results), and not based on the inputs used (resources expended by the contractor).

7. Conclusions

7.1. Conclusions

This Strategic Environmental and Social Assessment (SESA) evaluated the environmental and social impacts and risks of the typologies of projects included within the Bahamas Water Supply and Sanitation Systems Upgrade Program (BH-L1061).

The analysis of impacts and risks focused on the interactions between project activities and the components of the physical, biological, and socioeconomic environment likely to be affected.

The **NRW Reduction Contract** included in the Program is not expected to result in substantial risks or adverse impacts, except for the water mains replacement activities that might take place during leak detections and repairs. For these activities, main impacts associated with the activities would be gaseous emissions and particulate matter from dust generation during soil excavation and movement activities, water and soil contamination risks from accidental spills, poor waste management of the removed pipelines and increased accident risk both occupational and from traffic conditions.

The study also suggests the preparation of an NRW baseline assessment for each of the Family Islands prior to the execution of the contract to establish the targets, including quantifying physical and commercial losses, condition and efficiency of pipelines, valves, pumps and storage facilities, accuracy of meters and billing processes, establishment of performance indicators and identification of operational and financial risks associated with the execution of the program.

The **Advanced Metering Infrastructure** (AMI) project, which entails the replacement of old meters for new advanced meters, is not expected to exhibit any discernible environmental and social impacts and risks due to the lack of physical interventions and construction activities. Nonetheless, certain measures are recommended to implement the projects, such as the establishment of a Waste Management Program for the final disposal of the old meters equipment, capacity building for WSC personnel on AMI systems, their operation and maintenance to avoid any operational failure risks.

The **Potable Water Supply** projects involve, as usual in this type of infrastructure, impacts and risks associated with the construction phase such as occupational accidents, gaseous emissions and particulate matter (dust generation) during soil excavation and movement activities, water and soil contamination risks from accidental spills, poor waste management and increased accident risk both occupational and from traffic conditions. In particular, one of the proposed project sites is located on a KBA, and specific mitigation measures must be implemented in the Flora and Fauna Management Program to avoid risk of impact on avian species included in IUCN Red List.

Some project sites have presence of protected trees under national legislation. Since no technical specifications are yet prepared for said projects, these protected species must be taken into consideration in the design phase of the project to avoid negative impacts on them. Given the presence of a possible historical contamination site in the Direct Area of Influence of one of the project sites, it an Environmental Liabilities Program is recommended, to reduce both occupational

and community risk of exposure to contamination. Moreover, these projects entail the addition of approx. 1830 clients to the WSC piped water systems. There needs to be an assessment to determine whether the increased piped water demand on the family islands from the projects can be accommodated within the targets set by the Non-Revenue Water Reduction Contracts.

Lastly, a water quality assessment of both groundwater reserves and potable piped water of each of the Family Islands is recommended to assess the risk of exposure to contamination from shallow groundwater supply (for people not connected to the current network and who possess private wells) and public awareness campaigns should be implemented to reduce risk of exposure to said contaminants and ensure household incorporation into WSC network.

The **Lift Stations Upgrades** projects involve minor works, the removal of old equipment from the lift stations and the installation of upgraded equipment, such as leakage detectors and SCADA monitoring systems. The main impacts associated with the construction phase were the generation of noise, vibrations and odors, gaseous emissions, water and soil contamination from accidental spills or overflow of lift stations, especially in lift stations close to sensitive receptors such as schools and hospitals, potential risks to flora and fauna, especially in lift stations adjacent to coastal shores, wetlands or natural ponds, from accidental spills or poor waste management, risk of impact on cultural heritage-historical buildings and sites- and increased accident risk both occupational and from traffic conditions due to partial street closures in some of the project sites interventions.

In this regard, the application of adequate mitigation measures detailed in Chapter 5 and 6 of this study, along with the application of good construction practices that guarantee compliance with national regulations, and the IDB Environmental and Social Performance Standards, are expected to mitigate these risks.

The negative impacts and risks of the projects are considered mitigable and acceptable. The positive impacts associated with the projects to implement have a long-lasting effect, especially considering the water scarcity of the country and the potential contamination of shallow groundwater, used by communities via private wells as main source of water. The implementation of the project will increase the provision of potable water for beneficiaries in the Family Islands, improving their overall health and reducing risks of exposure to contamination.

Moreover, the implementation of the NRW Reduction Contract will enhance the conservation of the only water resource available for the Islands, fostering economic development, and advancing the capacity and development of WSC, the Utilities Regulation and Competition Authority (URCA) as proposed economic regulator of the water and sewerage sector and the Department of Environmental Planning and Protection (DEPP) as proposed environmental regulator of water and sanitation.

Therefore, **the operation is considered feasible, without significant negative socio-environmental risks or impacts that cannot be mitigated.**

7.2. Environmental and Social Action Plan (ESAP)

This section includes special considerations for the preparation and execution of the works to be implemented in the projects of this program.

These considerations will serve as input for the Environmental and Social Action Plan (ESAP) to be prepared by the IDB, which aims to address gaps identified during the Program preparation, to prevent and minimize potential impacts resulting from project execution.

7.2.1. Non-Revenue Water Reduction Program and Advanced Metering Infrastructure

Table 40. Environmental and Social Action Plan for the Non-Revenue Water Reduction Program and Advanced Metering Infrastructure Project.

Topic		Considerations
1	**NRW Baseline Assessment for Family Islands**	A NRW baseline assessment needs to be conducted for each of the family islands in the NRW Reduction Contract to establish the contract targets, including quantifying physical and commercial losses, condition and efficiency of pipelines, valves, pumps and storage facilities, accuracy of meters and billing processes, establish performance indicators and identify operational and financial risks associated with inefficient water management. This will result in a Strategy for NRW Reduction for each of the Family Islands, including infrastructure upgrades, leak detection programs and operational improvements, as well as communication and stakeholder engagement strategies to incorporate future clients into WSC water systems.
2	**Potable Water Supply Availability Assessment**	An assessment is required to determine whether the increased potable water demand on the family islands from the projects can be accommodated in the context of water resources availability.
3	**Removed Equipment**	Considering all existing meters will be removed and replaced by AMI, there needs to be a specific Waste Management Program to dispose the meters, including possibility of recycling of materials.

7.2.2. Access to Potable Water Supply

Table 41. Environmental and Social Action Plan for the Piped Water Mains Extension in Family Islands Projects.

Tema		Considerations
1	**Potential Historical Contamination in Sweetings Village (Abaco) project site**	Considering the abandoned cars identified in Sweetings Village, located 30ft from the project's location and on bare soil, this potential historical contamination could impact the health and safety of the community and labor force, soil water and air quality and fauna during the construction phase due to redispersion of potentially contaminated soil. It is recommended to include an Environmental Liabilities Program and conduct soil sampling, analysis of contaminants and ensure the cleanliness of the site.

7.2.3. Lift Stations Upgrades

Table 42. Environmental and Social Action Plan for the Lift Stations Upgrades Projects.

Tema		Considerations
1	**Protected Areas and Historical Sites**	Considering some of the Project sites are located near historical landmarks sites (Rawson Square Lift Station near Parliament Square) considered monuments by current national legislation, extreme mitigation measures must be taken to reduce the impact on sensitive areas. In addition, permits will be required to conduct works on or near a monument. The need for such permission must be evaluated with the responsible authorities and included in the licenses and permits required for the program.
2	**Removed Equipment**	Considering most of the equipment will be replaced, there needs to be a definition on what specific disposal will be given to the machinery/parts to be removed, in line with company's asset management.
3	**Proposed Interventions at Lift Stations**	At the time of this study, the information available consists of general locations and not precise geographic locations. When the defined locations are available, it will be necessary to evaluate the possible impacts and associated socio-environmental risks of each of the pumping stations.

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Annex 1. Stakeholder Engagement Plan

Introduction

This Stakeholder Engagement Plan was developed to describe the socialization process of the Bahamas Water Supply and Sanitation Systems Upgrade Program (BH-L1061) Program.

This Plan sets out the general principles of participation and a collaborative strategy to identify stakeholders and plan a participatory process in line with Environmental and Social Performance Standard 10: "Stakeholder Engagement and Information Disclosure" along with ESPS 1 "Assessment and Management of Environmental and Social Risks and Impacts" and ESPS 9 "Gender Equality".

Stakeholder engagement is an inclusive, continuous, and iterative process that takes place throughout the project lifecycle (preparation, implementation, and closure). The process must be properly designed and conducted, sustained by the establishment of solid, constructive, and responsive relationships that are important for the satisfactory management of the environmental and social risks and impacts of the Program/Project.

The nature, scope and frequency of stakeholder engagement is commensurate with the nature and scale of each project, its development and implementation schedule, and its potential risks and impacts. WSC as the Executing Agency will be responsible for defining and evaluating the necessary instances of participation and dissemination of the works.

The entire participation process must be properly documented. WSC shall take steps to maintain confidentiality where required and where necessary to protect personal data.

It is in this context, the following Stakeholder Engagement Plant is proposed, which presents the minimum guidelines and criteria to conduct the consultation process.

Objective

The objective of the consultation process is to present to the affected population and other interested parties the description of the Project, its potential environmental and social impacts and the mitigation measures planned to ensure adequate environmental and social management during the execution of the works, and their subsequent operation.

This instance of participation aims to respond to the doubts and concerns that may arise, and to collect suggestions which will be evaluated to determine the possibility of incorporating them into the design of the Project, when appropriate.

Institutional Arrangements for Plan Implementation

WSC as the Executing Agency is responsible for leading and implementing the Stakeholder Engagement Plan.

Consultation Process

The programming and dissemination of the consultation should be conducted in such a way as to ensure the participation of stakeholders. Every effort will have to be made to involve groups likely to be affected by the activities of the project, and those groups that have been identified as stakeholders, regardless of whether they do not belong to the affected population.

It is important to recognize the reduced accessibility to these consultation spaces by populations with greater vulnerabilities such as women, original communities, in situations of immobility, in street situations, LGBTIQ + populations (lesbian, gay, bisexual, trans, intersex, queer), among others. With this, it must be ensured that the call is made considering the obstacles that these populations may face for participation.

The consultation process shall consider at least the following elements:

- **Stakeholder Mapping**
- **Documents to disclose and availability of information**
- **Dissemination of the consultation process through the WSC website, social media, and other means**
- **Development of content and documentation to be socialized**
- **Public consultation procedure**
- **Report of the public consultation process**

Below is a brief description of the requirements to be considered at each stage of the consultation process.

Stakeholder Mapping

Stakeholder mapping consists of identifying the directly affected population and organizations relevant to the consultation.

From a preliminary identification, it emerges that, at a minimum, the stakeholders presented **Table 43** should be included in the process.

It is important to note that the proposed stakeholder mapping is preliminary, and that the final selection of the stakeholders can be adjusted by WSC. Therefore, any other stakeholders that the authorities consider appropriate to invite to contribute to guaranteeing a broad, representative, and meaningful participatory process may then join.

Table 43 - Stakeholder Mapping

Type of Stakeholder	Stakeholder	Relationship with the Program/Project	Stakeholder Interest in the Project (high / medium / low)	Stakeholder Influence on Project (high / medium / low)
Institutional Stakeholders	**WSC**	Executing Agency	High	High
	Department of Environmental Health Services (Family Islands Subdivisional Offices)	Interested party	Low	Low
	Department of Environmental Planning and Protection	Interested party	Low	Medium
	Stakeholders related to other infrastructure and services in the project areas (e.g., Bahamas Power and Light Company, cable and internet companies, etc.)	Affected party	Medium	Low
Civil Society Stakeholders	**Population living in the direct area of influence of the projects**	Affected party	High	Medium
	Businesses and informal workers in the direct area of influence of the projects	Affected party	High	Medium
	Representatives from institutions in the direct area of influence of the projects (e.g., schools, health centers, etc.)	Affected party	Medium	Medium
	Civil Society Organizations (in particular, those working in environmental and social issues)	Interested Party	Medium	Low
Community	**Population of the communities reached by the Project and community in general** (indirect area of influence)	Interested Party	Medium	Low

Documents to Disclose and Availability of Information

Below are the documents to be socialized, which must be published on WSC's website and other means, and available to the public for at least 14 days prior to the consultation events.

- Strategic Environmental and Social Assessment, including the Strategic Environmental and Social Management Plan (first draft, Fit for Disclosure)
- Summary information on the Project (description of objectives, works, etc.)

Once the information is available on the website, the consultation process will be disseminated to interested parties.

Public Consultation Events

The consultation process will be conducted during the week of July 29 – August 2. It will consist of a single **consultation event**, conducted in **hybrid format** (in person and streaming), in Nassau, New Providence. The final date and venue, as well as the streaming platform to be used, will be defined by WSC.

This consultation event will be complemented with **community information campaigns**, to be conducted prior to the start of the works, on each work location, once the engineering design details of the projects are known.

WSC will be responsible for the invitations to the consultation event. The invitation to the event will be made **directly** to the interested parties identified in the stakeholder mapping, 14 days in advance of the event date.

To ensure maximum stakeholder participation, the event will also be disclosed to the general public starting 14 days prior to the event date, through **publication in relevant information media**, such as **radio**, **local TV** and / or **digital media**, important **newspapers**, and on the **institutional website and social network profiles of WSC**. Also, personal email submissions and brochure handouts can be used, to ensure adequate dissemination of the process.

Proposed content of the invitation

The following information shall be detailed in the invitation to the consultation event:

- Project Proponent: WSC
- Project/Program
- Website with the publication of the documentation (SESA/SESMP) and as a space for sending queries or concerns about the Project.
- Procedure of the consultation process
- Duration of the consultation process
- Topics to be addressed, including: Program and main works to be conducted, benefits associated with the operation of the Project, Parties involved and institutional responsibilities, Outline of the applicable regulatory framework and relevant standards, Main environmental and social impacts identified, main environmental and social management measures, and grievance redress mechanism.

- Documentation available.

Development of the Public Consultation Process

Disclosure of Documents

WSC must publish the SESA/SESMP for a minimum of 14 days prior to the event.

The consultation process announcement should explain the objective of the consultation, clarifying that, although it is not in itself legally binding, the questions and proposals arising from the persons participating will be analyzed and answered and, where relevant, the proposed amendments will be incorporated.

Then the context in which the consultation takes place will be explained, and the **description of the Project** will be made, including its **objectives**, **main characteristics** and **alternatives** considered.

The presentation then follows with the **environmental and social impacts and risks identified,** both in the construction and operation stages, as well as the **mitigation measures** designed for an adequate environmental and social management of the Project.

The **Grievance Redress Mechanism** and the available channels for filing complaints or consultations on the Project will also be disclosed.

The explanation should be clear, and the language used should allow the community to understand the main aspects of the project and its impacts.

After the presentation, adequate time will be allowed for **questions and suggestions from participants**, including both in-person as well as virtual attendees.

WSC shall disclose the estimated date and how the consultation report will be published so that all stakeholders can read it and make their observations, if any.

The development of the event, including questions from participants, replies given, and commitments made, will be properly documented to include in the consultation report [see next Section].

Proposed Structure of the Consultation Report

A report will be prepared containing the main concerns raised (both during the consultation process and any prior or subsequent requests that may be received), indicating how they were addressed at the time or, where appropriate, what responses were subsequently prepared and how they were communicated to stakeholders and the public.

Although, as mentioned, the consultation is not legally binding, the proposals received should be evaluated and the explanation of their relevance or not included in the report. If these are relevant, the consultation report will result in proposals for changes to the Project and/or the ESMP, specifically recommendations for: (i) project design; (i) mitigation measures and (iii) mechanism for dealing with complaints and grievances.

The consultation report will also include the invitation process, the links to the web pages where the project has been published and the corresponding environmental and social documentation, the description of the call mechanism used, the list of participants, photos or screenshots of the process, informative banners, publications made in local media, and other dissemination materials used.

The following is a **minimum content outline / proposed structure of the Consultation Report**:

1. **Participation strategy**: Description of how the consultation process was developed (prior coordination with authorities, key stakeholders, methodology, selection of topics to be addressed, etc.).
2. **Stakeholder mapping** (groups, institutions or people who were invited) and selection criteria of the invited stakeholders, Invitation mechanism.
3. **Dissemination**: Invitations issued and publications of the event on institutional websites and media.
4. **Website** used for disclosure of information.
5. **Analysis of the people who participated** compared to the guests.
6. **Gender-disaggregated data** of participants.
7. **Materials disclosed** during the consultation process.
8. **Questions and answers** (suggestions, claims or questions made by the different stakeholders during the process, and how they were addressed).
9. Indication of how the suggestions and/or complaints received were incorporated/or will be incorporated into the design of the project. Any formal agreement reached with the persons consulted.
10. **The main conclusions** on positive or negative perception of the project by the participants, including the agreements.
11. Feedback collected from the consultations and included in the final version of the ESIA and ESGP.
12. ANNEX. Copy of the presentations made (it must be ensured that the impacts and mitigation measures of the specific project have been presented).
13. ANNEX. Sample copy of invitation letters sent.
14. ANNEX. Copy of the RSVPs of the invitation letters.
15. ANNEX. List of invited people.
16. ANNEX. List of participants: interested persons/affected persons, governmental, institutional, and general population participants.
17. ANNEX. Photographs of the activity / screenshots of online event.

The consultation report must be published on the institutional website of EA, as communicated to the persons participating in the consultation meeting.

Grievance Redress Mechanism

The Program and its projects will have a feedback / claims management system that includes their entry / reception, analysis, monitoring, and resolution.

GRM Guidelines

In general, the Mechanism will follow the following guidelines:

- **Proportional:** The Mechanism will proportionally consider the level of risk and possible negative impacts on the affected areas.
- **Culturally appropriate:** The Mechanism will be designed to consider the local customs of the area.
- **Accessible:** The Mechanism will be designed in a clear and simple way so that it is understandable to all people. There will be no cost related to it.
- **Anonymous:** The complainant may remain anonymous, as long as it does not interfere with the possible resolution of the complaint or problem. The GRM need to ensure that complaints can be raised anonymously. Anonymity is distinguished from confidentiality in that it is an anonymous complaint, the personal data (name, address) of the complainant are not recorded.
- **Confidential:** The Program will respect the confidentiality of the complaint. Information and details about a confidential report will only be shared internally, and only when it is necessary to report or coordinate with the authorities.
- **Transparent:** The process and operation of the Mechanism will be transparent, predictable, and readily available for use by the population.

Management of the GRM

The procedure begins with the presentation of the consultation, claim, complaint and / or suggestions (orally or written) by any person linked to the actions of the Program. The process ends with the closure and agreement in the resolution of both parties. The process will be documented by means of a record (in a physical and digitized file).

Complaints received by WSC must be addressed and classified.

Complaints received at the level of individual projects to be financed by the Program (via the contractors of each work, or departmental or municipal agencies) must be redirected to WSC for management and follow-up.

Scope

The GRM applies and may be used by any person (general population) who expresses any type of claim, complaint or query related to the activities planned by the projects to be financed by the Program.

Dissemination of the Grievance Redress Mechanism

For the registration of claims, a specific email address will be set up, as well as complaints mailboxes at project sites.

Information on these means of receiving complaints must be disseminated through the different dissemination channels used by the Program, among which are:

1. **Signs at Worksites:** Each project will include the contact details of the executing agency for receiving complaints (telephone, email, and website)
2. **Formal and informal meetings** in places close to the works of the projects, for the dissemination and communication of activities related to environmental preservation and conservation defined in the project, as well as to disseminate the means to address concerns and claims. In these meetings, EA's contact details for receiving complaints (telephone, email and/or website) will be disseminated.
3. **Social networks of WSC** (WhatsApp, Instagram, Facebook, Twitter, etc.).
4. **Others** (to be agreed with the community)

The specific dissemination mechanisms should be detailed based on the information collected on the specific communities to be impacted by the benefits of the Program.

Receipt and Registration of Claims

The following mechanisms and channels will be available for the reception of concerns:

- Letters submitted to WSC *[address to be defined by WSC]*
- By phone *[number to be defined by WSC]*
- Institutional email *[to be defined by WSC]*
- Complaints entered by WSC's usual means of contact: online form on webpage and hotline (242-302-5500)
- Work sites of the contractor companies, which will have available a telephone line and / or email available to address concerns.

In the case of complaints related to Gender-Based Violence, in addition to the anonymous and confidential nature of the complaints, the GRM needs to ensure that the complainants can access health and psychological services.

Claims Evaluation

In the case of a claim related to the works, it will be considered and responded to by the Contractor company or WSC.

If the claim or complaint is rejected, the complainant will be informed of the decision and the reasons for it. To this end, relevant and understandable information will be provided in accordance with the sociocultural characteristics of the claimant.

Complaints received will be categorized according to the following:

- **NOT ADMISSIBLE:** Complaints or claims that do not meet one or more of these requirements:
    - It is not directly related to the work, its contractors, and the actions of the project.
    - Its nature exceeds the scope of GRM.
    - There is no real cause of the action.
    - There are other formal mechanisms and institutions for filing complaints according to the nature of the complaint.
    - Related to labor issues must be addressed to the corresponding instances of the construction company.
- **LOW IMPORTANCE**: This category corresponds to complaints that do not require resolution, but only require information or a certain clarification that must be provided to the complainant. This category includes complaints that have been previously evaluated and received a definitive response from the Program.
- **MEDIUM IMPORTANCE:** Complaints and claims related to health, the environment, transportation, and contractors and subcontractors.
- **HIGH IMPORTANCE:** Includes complaints related to the safety of personnel, as well as those related to the health and safety of construction workers.

Within a period not exceeding **ten working days**, the social manager of the contractor or the unit in which the complaint is registered will have to evaluate the documentation presented by the claimant.

Where possible, if additional information is required for the proper evaluation of the complaint, EA will contact the complainant within a maximum of ten working days, to obtain the necessary information. Once the complaint is completed and reviewed, project staff will proceed to register the complaint.

The file should include, along with the complaint, a summary and the name of the person who received and processed it. Registration information will be updated periodically to reflect the status of the case until the complaint has been finalized.

Grievance Closure and Monitoring Mechanism

The resolution of claims will be conducted through two instances:

1. **Internal**. The management of reception of claims and resolution of conflicts is the responsibility of WSC and will be referred to the competent agency in the subject according to the complaint / claim.
2. **Mediation**. Cases of claims and conflicts not resolved in the first instance will be dealt with under the mediation mechanism. The person in charge of this instance must have sufficient authority to mediate for the resolution of claims and conflicts, and sufficient independence to project credibility in the parties.

Conflict Resolution

If there is no agreement between WSC and a complainant, either because of a rejected concern or because there is no agreement on the solution to be implemented, the means to reach a joint agreement between the parties must be arbitrated. This may include, among others: promoting the participation of technical third parties, inviting dialogue tables, mediations, conciliations, etc.

WSC shall ensure that claims handling and dispute resolution are conducted in an appropriate and comprehensive manner.

In the event that the complaint cannot be managed within the scope of the work, the interested party may present his claim through the regular Justice procedures.

The IDB's Independent Consultation and Investigation Mechanism (ICIM), available on its website https://www.iadb.org/mici/, is also available.

Deadlines for Response to Claims

All complaints must be registered, and the proposed solution must be communicated to the interested party within the following deadlines: **low importance** complaints will be dealt with within a maximum period of **30** calendar days, **medium-importance** complaints will be dealt with within **15** calendar days, and **high importance** complaints will be dealt with within a maximum period of **7** calendar days. The deadlines set can be adjusted by WSC.

In all cases, a complaint response report will be drawn up and signed by the person who filed the complaint in accordance with the attention of the complaint. WSC will systematize the complaint records and the minutes of attention of these.

The information provided will be relevant and understandable according to the sociocultural characteristics of the person who consults.

Likewise, it will oversee supervising the process, detecting deviations, and ensuring its solution.

Monitoring and Documentation

WSC will be responsible for maintaining an up-to-date database with all documentation and information related to complaints submitted. It will also be responsible for following up on the complaint processing process, in coordination with the areas involved, and for facilitating the complainant's participation in the process.

A follow-up form will be completed for each case. Once an agreement is reached, follow-up will be followed up to confirm that the relevant resolution measures are being implemented.

The complaint registry must demonstrate that all these actions and processes were conducted in accordance with this document.

It will include:

- Date on which the complaint was registered;
- Person responsible for the complaint;
- Information on the remedies proposed/communicated by the complainant (if applicable);
- Date on which the complaint was closed; and
- The date of the response was sent to the complainant.

In the Semiannual Compliance Reports, WSC will report to the IDB on the status and follow-up of the management of complaints and grievances received in the framework of the execution of the Program's projects.

Monitoring

Any complaint closed with conformity by the complainant must be monitored for a reasonable period in order to verify that the reasons for the complaint or claim were effectively resolved. The estimated period for this purpose is 6 (six) months from the response and / or solution to the claim.

Implementation Timeline

The GRM will be available throughout the execution of the Program.

IDB Program Grievance Mechanism

In addition to the Grievance Redress Mechanism (GRM) of the Program implemented by EA, the IDB, on the Project page, will present a public access mechanism with which complaints and claims that have not been resolved with the mechanism of each project can be managed.

IDB's Independent Consultation and Investigation Mechanism

The IDB also has an Independent Consultation and Investigation Mechanism (MICI, more info at https://www.iadb.org/en/mici/mici-independent-consultation-and-investigation-mechanism), which can also be accessed to process complaints that could not be resolved at the previous two levels of grievance mechanisms.

MICI is a grievance office independent of the project teams, which facilitates dispute resolution processes to resolve concerns raised. In addition, it conducts independent investigations to determine whether the IDB Group has met its standards and improve the Group's practices.

Keep in mind that the handling of a complaint must start at the local level to be eligible at the next level. All grievance mechanisms will be available throughout the duration of the Program.

Annex 2. Labor Management Procedure (LMP)

Introduction

The purpose of this Labor Management Procedure (LMP) is to establish the scope and application of ESPS 2 "Labor and Working Conditions" for the BH-L1061 Program.

The Labor Management Procedure will be managed as part of the Strategic Environmental and Social Management Plan (SESMP). The requirements included in the LMP will be systematically integrated into the legal requirements of the Program, the tender documents and the contracts of the contracting companies and suppliers.

The LMP is a dynamic document and should therefore be revised and updated as necessary during the life cycle of the Program.

The LMP presents the guidelines, guidelines and minimum contents for the labor management and working conditions of the works of the Program to be fulfilled by the main contractor, the companies involved and the executing agency. The responsibility for ensuring compliance with this procedure shall be the responsibility of EA.

The LMP is governed by the principles of equality, opportunity and fair treatment ensuring that no employment decisions will be made based on personal characteristics outside the requirements inherent to the job, refraining from discrimination in any aspect of the employment relationship, such as recruitment and hiring, remuneration (wages and benefits), working conditions and terms of employment, access to training, job assignment, promotion, dismissal or retirement and disciplinary practices. Measures shall be taken to prevent and address violence, harassment, intimidation, or exploitation, especially regarding women, persons of diverse sexual orientations and gender identities, persons with disabilities, and migrant workers. Under no conditions shall child or forced labor be permitted.

A safe and healthy work environment shall be ensured, considering the risks inherent in the Program and specific hazards for women, persons of diverse sexual orientations and gender identities, persons with disabilities, children (of working age, in accordance with this Performance Standard), and migrant workers. Measures shall also be taken to prevent accidents, injuries and illnesses that may arise from, be associated with, or occur during work, minimizing, to a reasonable extent practicable, the causes of hazard factors.

Scope of the Labor Management Procedure (LMP)

Environmental and Social Performance Standard 2 "Labor and Working Conditions" of the IDB's Environmental and Social Policy Framework pursues the following objectives:

- Respect and protect the fundamental principles and rights of workers.
- Promote fair treatment, non-discrimination, and equal opportunities for workers.
- Establish, maintain, and improve relations between workers and the employer.

- Ensure compliance with national legislation on employment and labor.
- Protect workers, including those in vulnerable situations, such as women, persons of diverse sexual orientations and gender identities, persons with disabilities, children (of working age, in accordance with this Performance Standard) and migrant workers, workers hired by third parties and workers in the main supply chain.
- Promote safe and healthy working conditions and promote workers' health and prevent the use of child labor and forced labor (as defined by the ILO).[110]

This standard applies to:

- **Direct workers:** are persons employed or hired directly by the borrower to work specifically in relation to the Program. The direct worker is employed or hired by the borrower, is paid directly by the borrower, and is subject to the borrower's instructions and day-to-day control.
- **Contract workers:** Persons engaged through third parties to perform work related to core functions of the Program for a considerable period of time where that third party exercises continuous control over the work, working conditions and treatment of the worker in relation to the project[111]
- **Main supply chain workers**: Workers in the main supply chain, provides goods and materials to the project, where the supplier exercises control over this worker for the work, working conditions and treatment of the worker[112]

Where public employees are working in connection with the Project on either full-time or part-time basis, they will be subject to the terms and conditions of their existing public sector employment agreement or arrangement, unless their employment or hiring has been effectively legally transferred to the Project.[113]

Requirements relating to gender equality and stakeholder participation (including a grievance mechanism) should also be considered in the implementation of this Performance Standard in accordance with ESPS 9 and 10. In no case and under no circumstances shall child and forced labor be permitted.

[110] International Labor Organization.

[111] The core functions of the project are those corresponding to the construction, production and service processes that are essential for a specific activity, without which it could not continue.

[112]Primary or primary suppliers are those that continuously supply goods or materials essential to the core functions of the project.

[113] ESPS 2 is not intended to interfere with the relationship between the borrower when it comes to a government agency and its public administration officials, who are typically employed under specific terms and conditions that may reflect mandatory legal requirements.

Description of the Project's Workforce.

Identification and characterization of workers involved in the project:

Depending on the activities foreseen in the project, it is estimated that the organization of the workforce involved will be as follows:

1. **Direct workers:** In accordance with the organizational structure foreseen for this Program, it is considered that the direct hiring of personnel under the modality of contracting services will be coordinated by WSC and are mostly linked to the hiring of personnel to carry out the supervision and technical inspections (environmental and social) of works.

2. **Project workers: It** is expected that the largest number of staff will be employed under this category. The contracting companies will conduct the construction works foreseen for each project.

3. **Workers in the main supply chain:** Personnel employed by the companies supplying inputs and infrastructure linked to the works foreseen by the Program. The Program must conduct due diligence to ensure that inputs produced under conditions of forced labor are not procured and that the working conditions of suppliers comply with current regulations with their personnel.

Table 44. Summary Table of Type of Workers Linked to the Project

Type of Worker	Characteristics
Direct Workers	Individual Consultants directly hired by the Program
Contract workers	Workers hired by the contracting firms hired by the project. It is expected by the type of works that the largest number of people involved in the Program be incorporated under this modality of contracting.
Primary Supplier Workers	The number of workers to be hired under this modality and the specific characteristics will be information provided by the contractor awarded the work.

Assessment of possible occupational hazards

Depending on the activities to be conducted by the staff in the project, the main risks for each of the most relevant jobs must be identified.

The existing risks involve adopting measures for the prevention of accidents and incidents with the development of safe working methods, with a correct choice and training of personnel to perform such work, in addition to using the appropriate tools and personal protection elements (PPE).

The following table provides a summary of the main activities, with the possible risks identified and those responsible.

Table 45. Example of activities and risks identified in the project.

Activity Group	Activity	Location	Risks identified	Responsible
Management and Administrati	• Planning, design, execution and implementation, evaluation, and monitoring of Projects	Office: WSC	No specific and significant risks are identified. Risks related to occupational health and safety in internal environments (ergonomic risks, accidents, stress, mental load, psychophysical factors)	WSC
Training and Awareness for people hired by the contractor	• Train, inform and raise awareness especially among construction personnel both orally and in writing about the expected environmental and social problems, the implementation and control of environmental and social protection measures and the specific and relevant aspects applicable to the execution of projects in accordance with current environmental and social regulations and regulations. • Conduct gender-sensitive training and code of conduct for all contracted personnel, including the management staff of the contractor company. • Have updated the technical file of the personnel with the training conducted and the elements of security and personal protection delivered	Workshops / offices	No specific and considerable risks are identified if the facilities of the workshops comply with current regulations. Possible risks linked to occupational health and safety in internal environments (accidents, stress, mental load, psychophysical factors).	Contractor (Environmental and Social Manager)

Activity Group	Activity	Location	Risks identified	Responsible
Civil works of infrastructure and equipment	Conducting interventions for improvement of water and sewage systems	[Project Locations]	Specific risks are identified that can be avoided with the corresponding security measures and protocols. **In workshops and place of work:** • Risks of gender-based violence • Occupational and community accident risks **In the recruitment processes**: • Risk of exclusion of vulnerable groups • Exclusion of local labor and discrimination • Influx of labor from outside the place. **In the execution of the planned works:** **Occupational hazards:** • Accidents and falls of different levels • Falling objects • Road accidents (circulation of trucks and machinery) • Temporary hearing loss due to operation of equipment and machinery. **Ergonomic risks:** • Forced posture; Repetitive motion; Cargo handling; Application of forces: Overexertion	Contractor Company

Activity Group	Activity	Location	Risks identified	Responsible
Construction supervision	Supervise the strategic environmental and social management plan, occupational safety and health; monitor environmental, social, health and safety risks, their impacts and actions taken (including in the field, if necessary).	Office / Field activities at the site of implementation of the works	**In Office:** No specific and considerable risks are identified. Possible risks linked to occupational health and safety in internal environments (accidents, stress, mental load, psychophysical factors). **In the field:** Risks linked to accidents in the work area. They can be minimized if PPE is properly used.	WSC / Construction Inspection

Description of prevention and mitigation measures to address possible risks in the workplace

Based on the identification of the main risks by activity group, the priority measures to prevent and minimize the risks identified are detailed below, by way of example:

Prevention and mitigation measures in the workshops:

- Implement hygiene, safety and health standards and conditions.
- Install workshops of size according to the number of people employed and as required by Laws and Decrees.
- Training and awareness on health and safety, non-discrimination, and prevention of gender-based violence, prevention of child exploitation, forced labor, prevention of discrimination and / or violence against people from indigenous communities or vulnerable groups in compliance with the code of conduct.

Prevention and mitigation measures in staff recruitment processes:

- The contractor will seek to approach its recruitment process with a gender perspective, seeking to make equal opportunities for men and women effective.
- Personnel with criminal records related to sexual crimes, sexual harassment, prostitution, and trafficking in persons will not be hired in order to protect the integrity of the population linked to the work.
- The contractor will try to prioritize the local skilled and unskilled local labor, especially of the beneficiary parties of the works and surrounding localities.
- Nondiscrimination requires that the contractor/ WSC not make employment-related decisions based on personal characteristics, such as gender, race, ethnic, social and indigenous origin, religion, political opinion, nationality, disability and sexual orientation that are not related to job requirements. They cannot affect equality of opportunity or treatment in employment.
- The contractor shall develop and implement the **code of conduct** and provide training for its knowledge and understanding. See Appendix A for the proposed content of the code of conduct. This Code is aimed at ensuring respectful and harmonious ties in the workplace in which the Program and its projects are developed in such a way as to ensure a work environment free of discrimination and/or violence based on gender, gender identity, sexual orientation, cultural identity, religion, ethnic or national origin, trade union membership, disability or any other discrimination typified in current legislation.

Prevention and mitigation measures in the execution of civil works of infrastructure and equipment of the project:

- Review the environment in which the tasks will be developed. If power poles, hazardous materials tanks or other items are present in adjacent areas, they could catch fire or fall on workers in the event of evacuation.
- Provision of personal protection elements (PPE) and tools and machinery in perfect working order.
- Training and advisory programs for the people employed by the contractor on the inherent risks of their tasks and the mitigation measures, actions and good practices to be implemented to ensure the health, safety and hygiene of the employees, the population, and the protection of the environment.

- Code of conduct.
- Evaluate the state of gas, electricity, and water facilities near the intervention area.
- Examine the distribution of workspaces verifying that there are no elements that could interfere with a rapid evacuation.
- Identify safe areas.
- Determine accessibility to fire protection equipment, emergency lights, first aid equipment, etc. (they should always be in place of easy access).
- Define the resources available to avoid and respond to an emergency.
- Make an inventory of those security elements that the organization has (fire extinguishers, first aid kit, etc.).
- In the case of works conducted in the vicinity of routes, traffic management measures, signaling and communication program to the community must be extreme.

Protocols and procedures to address cases of gender-based violence during the life cycle of the project.

The Contractor will establish reporting procedures, protocol for responses to unacceptable conduct and internal accountability measures in situations of gender-based violence within the framework of the operation.

In terms of prevention, in addition to urging the development of actions aimed at dismantling all types of situations of inequality, discrimination and exclusion in the workplace, actions can be implemented to raise awareness and train on gender issues. The training program will be defined according to the demands of the different work teams.

To address cases of gender violence, immediate and confidential contact should be made with local authorities who are experts in the field if the victim gives clear and enthusiastic consent to do so, to ensure adequate treatment of the victim of violence, providing specific advice and accompaniment. The identity of the complainant should be kept confidential in order to protect against retaliation, stigmatization, revictimization or other consequences that frequently can happen.

Grievance Redress Mechanism (GRM) for Project Labor Management

The Program has a Grievance Redress Mechanism (GRM), and at the same time the LMP has a simultaneous mechanism that aims to arbitrate the means and mechanisms to facilitate the reception of concerns exclusively (queries, claims, complaints, suggestions) of workers linked to the Projects of the Program, and respond to them to solve them, and to anticipate potential conflicts.

Likewise, workers may appeal directly to the courts, applying the general system in force in the country.

Principles of the GRM for the Labor Management Procedure

Each project will have a feedback/claims management system that includes input/reception, analysis, monitoring, resolution and return to the people who are working linked to the projects.

The principles that the system will observe are the same as those that govern the general GRM of the Program:

- The interaction/claims management system will have mechanisms in accordance with the local context and the sociocultural characteristics of the people involved in each project, with special consideration and respect for the most vulnerable groups (young people, women, people with disabilities, migrants, among others).
- The complaint procedures, the process that will follow, the deadline and the resolution mechanisms will be widely disseminated for your knowledge by the interested parties, that is, by direct workers, contractors, and primary suppliers.
- In all cases, a record will be kept of the reception, analysis and resolution of claims and conflicts.

GRM Guidelines

In general, the mechanism will follow the following guidelines:

- **Proportional:** The Mechanism will proportionally consider the level of risk and possible negative impacts on the affected areas.
- **Culturally appropriate:** The Mechanism will be designed to consider the local customs of the area.
- **Accessible:** The Mechanism will be designed in a clear and simple way so that it is understandable to all people. There will be no cost related to it.
- **Anonymous:** The complainant may remain anonymous, as long as it does not interfere with the possible solution to the complaint or problem. Anonymity is distinguished from confidentiality in that it is an anonymous complaint, the personal data (name, address) of the complainant are not recorded.
- **Confidential:** The Program will respect the confidentiality of the complainant. Information and details about a confidential report will only be shared internally, and only when it is necessary to report or coordinate with the authorities.
- **Transparent:** The process and operation of the Mechanism will be transparent, predictable, and readily available for use by the population.

Management of the specific GRM for the Labor Management of the projects of the Program

The procedure begins with the presentation of the consultation, claim, complaint and / or suggestions (orally or written) by any worker linked to the works. The process ends with the closure and agreement in the resolution of both parties (the claimant and the contractor). The process will be documented by means of a record (in a physical and/or digitized file).

Complaints received by all means of receipt enabled during the implementation of the Project must be attended and classified.

The claims received via the contractors of each work, or agencies of the municipal authority (if applicable) must be redirected to WSC for management.

Reception and registration of claims for the labor management of the projects of the Program

- Office of contractors (specific modality for operators and employees)
- Suggestion box / complaints book available in the workshops (Specific for operators and employees).
- WSC (via telephone, mail, or other way enabled to make the claim) specific for direct employees, contractors, and workers in the main supply chain).
- Offices of the municipalities involved.
- Others (to be defined during the life of the Program).

Claims Evaluation

All claims that enter through the various channels must be registered and managed considering the criterion of proportionality (level of risk and possible negative impacts).

In the case of a claim related to employees of the contractor, it will be considered and responded to by the Contractor company with supervision of WSC.

WSC must also resolve all complaints and queries related to the works of the projects of the Program that occur in the labor field of its offices and dependencies.

After receiving a claim, it must be evaluated by WSC in terms of severity, safety implications, complexity, and impact, among others, to take immediate action as appropriate. Complaints must be answered in a timely manner according to the urgency of the order.

If the claim or complaint is rejected, the worker will be informed of the decision and the reasons for it. To this end, pertinent, relevant, and understandable information will be provided according to the sociocultural characteristics of the workers.

When possible, if additional information is required for the correct evaluation of the complaint, the WSC team will contact the worker to obtain the necessary information.

The file must include, together with the complaint, a summary of the procedures and steps taken. Registration information will be updated periodically to reflect the status of the case until the complaint has been finalized.

Conflict resolution

In all cases WSC must ensure that the attention of claims and the resolution of conflicts are conducted in an adequate and timely manner, and that all workers linked to the projects of the Program have a satisfactory management of their claim.

Responding to Complaints

Low-importance claims will be dealt with within a maximum of 30 calendar days, medium-importance claims will be dealt with within 15 calendar days and high-importance claims will be dealt with within a maximum of 7 calendar days. The established deadlines can be adjusted by WSC.

Monitoring and documentation

WSC will be responsible for maintaining an up-to-date database with all documentation and information related to complaints that are submitted as part of labor management. This team is also responsible for following up on the complaint processing process, in coordination with the areas involved, and for facilitating the participation of the worker in the process.

The complaint registry must demonstrate that all of these actions and processes were conducted in accordance with this document.

It will include:

- Date on which the complaint was registered;
- Person responsible for the complaint;
- Information on the corrective measures proposed/communicated by the complainant (if applicable);
- Date on which the complaint was closed; and
- The date of the reply was sent to the complainant.

Deadlines

All complaints must be registered, and the proposed solution must be communicated to the interested party within a stipulated period. The deadlines set can be adjusted.

Monitoring

Any complaint closed with compliance by the complainant must be monitored for a reasonable period in order to verify that the reasons for the complaint or claim were effectively resolved. The estimated period for this purpose is 6 (six) months from the response and / or solution to the claim.

As initially indicated, this document is dynamic in nature, therefore the specific procedures for the implementation of the Grievance Mechanism for Labor Management will be strengthened with the implementation of each project.

Appendix A - Code of Conduct - Model and Suggested Content

Model Standard Code of Conduct for Workers

Introduction

The company is committed to ensuring a work environment which minimizes any negative impacts on the local environment, communities, and its workers. The company also strongly commits to creating and maintaining an environment in which Sexual Exploitation and Abuse (SEA) and Sexual Harassment (SH) have no place, and where they will not be tolerated by any employee, sub-contractor, supplier, associate, or representative of the company. The purpose of this *Code of Conduct* is to:

1. Create a common understanding of what constitutes Sexual exploitation and abuse, and sexual harassment.
2. Create a shared commitment to standard behaviors and guidelines for company employees to prevent, report, and respond to SEA and SH.
3. Create understanding that breach of this code of conduct will result in disciplinary action.

Definitions

Sexual Exploitation and Abuse (SEA)[114]

Is defined as any actual or attempted abuse of a position of vulnerability, differential power, or trust, for sexual purposes, including, but not limited to, profiting monetarily, socially or politically from the sexual exploitation of another[115].

- Sexual Abuse: "The actual or threatened physical intrusion of a sexual nature, whether by force or under unequal or coercive conditions."

Sexual Harassment: [116]

Unwelcome sexual advances, request for sexual favors, and other verbal or physical conduct of sexual nature.

Sexual Harassment versus SEA[117]

SEA occurs against a beneficiary or member of the community. Sexual harassment occurs between personnel/staff of an organization or company and involves any unwelcome sexual advance or unwanted verbal or physical conduct of a sexual nature. The distinction between the two is important so that agency policies and staff trainings can include specific instruction on the procedures to report each.

Consent is the choice behind a person's voluntary decision to do something. Consent for any sexual activity must be freely given, ok to withdraw, made with as much knowledge as possible, and specific to the situation. If agreement is obtained using threats, lies, coercion, or exploitation of power imbalance, it is not consent. **Under this Code of Conduct[118] consent cannot be given by anyone under the age of 18**,

[114] As defined in the UN Secretary's bulletin – Special Measures for protection from sexual exploitation and abuse October 9, 2003, ST/SGB/2003/13

[115] In the context of World Bank Financed operations exploitation occurs when access to, or benefit from a World Bank Financed good or service is used to extract sexual gain.

[116] Inter-Agency Standing Committee Protection against Sexual Exploitation and Abuse (PSEA): Inter-agency cooperation in community-based complaint mechanism. Global standard Operating Procedures. May 2016

[117] Ibid

[118] In accordance with the United Nations Convention on the Rights of the Child.

regardless of the age of majority or age of consent locally. Mistaken belief regarding the age of the child is not a defense.

There is no consent when agreement is obtained through:

• the use of threats, force or other forms of coercion, abduction, fraud, manipulation, deception, or misrepresentation

• the use of a threat to withhold a benefit to which the person is already entitled, or

• a promise is made to the person to provide a benefit.

While all forms of violence against a community resident or a co-worker are forbidden, this code of conduct is particularly concerned with the prevention and reporting of sexual exploitation and abuse (SEA) and sexual harassment which constitute gross misconduct, is grounds for termination or other consequences related to employment and employment status:

(1) **Examples of sexual exploitation and abuse** include, but are not limited to:

- A project worker tells women in the community that he can get them jobs related to the work site (cooking and cleaning) in exchange for sex.
- A worker that is connecting electricity input to households says that he can connect women headed households to the grid in exchange for sex.
- A project worker gets drunk after being paid and rapes a local woman.
- A project worker denies passage of a woman through the site that he is working on unless she performs a sexual favor.
- A manager tells a woman applying for a job that he will only hire her if she has sex with him.
- A worker begins a friendship with a 17-year-old girl who walks to and from school on the road where project related work is taking place. He gives her moto rides to school. He tells her that he loves her. They have sex.

(2) **Examples of sexual harassment in a work context** include, but are not limited to:

- Male staff comment on female staffs' appearances (both positive and negative) and sexual desirability.
- When a female staff member complains about comments male staff are making about her appearance, they say she is "asking for it" because of how she dresses.
- A male manager touches a female staff members' buttocks when he passes her at work.
- A male staff member tells a female staff member he will get her a raise if she sends him naked photographs of herself.

Individual signed commitment:

I, _____, acknowledge that sexual exploitation and abuse (SEA) and sexual harassment, are prohibited. As an *(employee/contractor)* of *(contracted agency / sub-contracted agency)* in (*country)*, I acknowledge that SEA and SH activities on the work site, the work site surroundings, at workers' camps, or the surrounding community constitute a violation of this *Code of Conduct*. I understand SEA and SH activities are grounds for sanctions, penalties or potential termination of employment. Prosecution of those who commit SEA and SH may be pursued if appropriate.

I agree that while working on the project I will:

- Treat all persons, including children (persons under the age of 18), with respect regardless of sex, race, color, language, religion, political or other opinion, national, ethnic or social origin, gender identity, sexual orientation, property, disability, birth or other status.
- Commit to creating an environment which prevents SEA and SH and promotes this code of conduct. In particular, I will seek to support the systems which maintain this environment.
- **Not** participate in SEA and SH as defined by this *Code of Conduct* and as defined under *(country)* law (*and other local law, where applicable).*
- **Not** use language or behavior towards women, children or men that is inappropriate, harassing, abusive, sexually provocative, demeaning or culturally inappropriate.
- **Not** participate in sexual contact or activity with anyone below the age of 18. Mistaken belief regarding the age of a child is not a defense. Consent from the child is also not a defense. I will not participate in actions intended to build a relationship with a minor that will lead to sexual activity.
- **Not** solicit**/**engage in sexual favors in exchange for anything as described above.
- Unless there is the full consent by all parties involved, recognizing that a child is unable to give consent and a child is anyone under the age of 18, I will not have sexual interactions with members of the surrounding communities. This includes relationships involving the withholding or promise of actual provision of benefit (monetary or non-monetary) to community members in exchange for sex—such sexual activity is considered "non-consensual" under this Code.

I commit to:

- Adhere to the provisions of this code of conduct both on and off the project site.
- Attend and actively partake in training courses related to preventing SEA and SH as requested by my employer.

If I am aware of or suspect SEA and SH, at the project site or surrounding community, I understand that I am encouraged to report it to the Grievance Reporting Mechanism (GRM) or to my manager. The safety, consent, and consequences for the person who has suffered the abuse will be part of my consideration when reporting. I understand that I will be expected to maintain confidentiality on any matters related to the incident to protect the privacy and security of all those involved.

Sanctions: I understand that if I breach this Individual Code of Conduct, my employer will take disciplinary action which could include:

- Informal warning or formal warning
- Additional training.
- Loss of salary.
- Suspension of employment (with or without payment of salary)
- Termination of employment.
- Report to the police or other authorities as warranted.

I understand that it is my responsibility to adhere to this code of conduct. That I will avoid actions or behaviors that could be construed as SEA and SH. Any such actions will be a breach this Individual Code of Conduct. I acknowledge that I have read the Individual Code of Conduct, do agree to comply with the standards contained in this document, and understand my roles and

responsibilities to prevent and potentially report SEA and SH issues. I understand that any action inconsistent with this Individual Code of Conduct or failure to act mandated by this Individual Code of Conduct may result in disciplinary action and may affect my ongoing employment.

Signature: _____

Printed Name: _____

Title: _____

Date: _____

Annex 3. Guidelines for the Procurement of Solar Panels

There have been instances of solar panels being produced under conditions of forced labor and child labor in certain regions of the world.

In this context, selecting solar panel suppliers with a history of good performance – in particular, in this and other key sustainability areas, should be a priority during project implementation.

WSC must conduct a due diligence process to ensure that solar panels produced under conditions of forced labor are not procured through the Program, and that the working conditions of suppliers comply with current regulations with their personnel.

Table 46 presents guidelines to orient the evaluation of solar panel suppliers.

Table 46. Labor Evaluation of Solar Panel Suppliers.

Thematic	Key questions	How to verify
Traceability protocol	Does the solar panel supplier have a traceability protocol?	Existing traceability protocol
Policy Supplier Social Responsibility	Does the supplier have a corporate social responsibility policy? If so, can you share it?	Presentation and analysis of the supplier's environmental and social responsibility policy or other similar document (Human Resources Procedures/Policies), and environmental and social responsibility monitoring reports.
	Does the policy address areas covered by International Labour Organization (ILO) labour code standards? Do you communicate your policy to your suppliers?	
	Does the supplier's policy have procedures in place to identify cases of forced labor, address them, and report them to authorities?	
Origin	Can you show where the product is made and where the inputs come from? For example, can you explain where the module, cells, platelets, and polysilicon come from? Are they developed in places where independent audits are allowed?	Documents of origin of parts and supplies of solar panels. Commercial licenses of suppliers.
Independent supplier audit reports	Can you provide the latest independent audit reports on the traceability of your solar panel supplier? Who conducted the audit? Was it done by a qualified and independent third party? Are audits announced or unannounced? How often are audits performed?	Presentation and analysis of the latest audits on traceability.
Historical	Are there past or current legal cases against your provider regarding employment issues? Are there any past or current complaints of conditions that may amount to forced labor that have been reported?	Articles from the press or associations for the defense of workers. Information contained in public records, for example, company records and public documents relating to violations of applicable labor laws, including reports from labor inspections and other law enforcement agencies.

Annex 4. Affidavit Model for the Procurement of Solar Panels

AFFIDAVIT MODEL

Business name: …….

In my capacity as owner/representative/proxy of the firm ……. ……., manifest as an Affidavit that I am not aware of the existence of forced labor in the production of the solar panels that we provide…… …….. .

……

Signature, explanation and type and identification number

of the Owner/Representative/Attorney

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