STRATEGIC ENVIRONMENTAL ASSESSMENT FOR GOVERNMENT CAMPUS

DELIVERABLE 3 DRAFT STRATEGIC ENVIRONMENTAL ASSESSMENT FOR GOVERNMENT CAMPUS

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Abbreviations and Acronyms

ANSI	American National Standards Institute
AWS	Automatic Weather Stations
BOD	biochemical oxygen demand
BPO	Business Process Outsourcing
CBD	Central Business District
CCF	Climate Change Factors
CCF	Climate Change Factors
CN	Curve Number
CO	Carbon Monoxide
COD	Chemical Oxygen Demand
CSG	Climate Studies Group
DAFOR	Dominant, Abundant, Frequent, Occasional and Rare
dBA	A-Weighted Decibels
DCP	District Cooling Plant
ED	Enumeration Districts
EIA	Environmental Impact Assessment
ELR)	Environmental lapse rates
ENSO	El Niño Southern Oscillation
EQO	Environmental Quality Objectives
EQOs	Environmental Quality Objectives
ESL	Environmental Solutions Limited
FDI	Foreign Direct Investment
FOG	fats, oil and grease
GDP	Gross Domestic Product
GIS	Geographic Information Systems
GoJ	Government of Jamaica
HEC-HMS	Hydrologic Engineering Center-Hydrologic Modeling System
HEC-RAS	Hydrologic Engineering Center-River Analysis System
HOP	Houses of Parliament
HRWMU	Hope River Watershed Management Unit
IDF	Intensity Duration Frequency
IEC	International Electrotechnical Commission
IMF	International Monetary Fund

IPCC	Intergovernmental Panel on Climate Change
ISO	International Organization for Standardization
IUCN	International Union for Conservation of Nature
IUSS	International Union of Soil Science
JNHT	Jamaica National Heritage Trust
km	Kilometer
KMA	Kingston Metropolitan Area
KSA	Kingston and St. Andrew
LC	Least Concern
LED	Light-Emitting Diode
LICJ	Land Information Council of Jamaica
MDA	Ministries, Departments and Agencies
mm	Millimeters
NE	Not Evaluated
NHC	National Heroes Circle
NHP	National Heroes Park
NMIA	Norman Manley International Airport
NO2	Nitrogen Dioxide
NRCA	Natural Resources Conservation Authority Act
NWA	National Water Authority
ODPEM	Office of Disaster Preparedness and Emergency Management
PDVESA	Petróleos de Venezuela South America
PM10	Respirable Particulates
PPP	Public-Private Partnerships
PR	Probability Ratio
PVC	Polyvinyl Chloride
QA	Quality Assurance
QC	Quality Control
RP	Return Period
RP	Return Periods
RTK	Real-Time Kinematic
SCHIP	Southern Coastal Highway Improvement Project
SCS	Soil Conservation Service
SDA	Seven Day Adventist

SEA	Strategic Environmental Assessment
SEZ	Special Economic Zones
SO2	Sulphur Dioxide
STATIN	Statistical Institute of Jamaica
TOR	Terms of Reference
TWA	Time Weighted Average
TWA	Time Weighted Average
UDC	Urban Development Corporation
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Carbons
WHO	World Health Organization
WRA	Water Resource Authority

Executive Summary

The Government Campus Project, spearheaded by the Government of Jamaica, aims to modernize and centralize key government services and infrastructure around the National Heroes Circle in Kingston. This initiative will establish a contemporary Government Campus with a Houses of Parliament (HOP) building located in the northern section of the National Heroes Park (NHP). The project area will also house Government Ministries, Departments, and Agencies (MDAs) while fostering sustainable urban development through revitalization efforts in Downtown Kingston, through rehabilitation of housing stock, development of mixed-use enterprises and maintenance of the park as a significant green space.

The project seeks to:

- Consolidate government operations to improve efficiency and reduce rental costs.
- Revitalize the NHP and its surroundings with mixed-use residential, commercial, and recreational spaces.
- Enhance the urban landscape with pedestrian-friendly designs, green spaces, and upgraded infrastructure.

The Urban Development Corporation's (UDC) Master Plan underpins this ambitious vision, emphasizing sustainability, cultural heritage preservation, and economic growth. It incorporates energy-efficient infrastructure, integrated water resource management, and climate-resilient urban planning.

Environmental Solutions Limited (ESL) was contracted to conduct a Strategic Environmental Assessment (SEA) to evaluate the environmental, social, and economic impacts of the project. This assessment will guide the planning and implementation phases, ensuring minimal adverse impacts and adherence to local and international standards. The SEA highlights key aspects including:

- Baseline environmental studies on air and water quality, noise levels, and biodiversity.
- Assessment of physical, social, and economic environments through the use of community surveys and economic impact evaluations.
- Recommendations of mitigation measures, design improvements, and potential monitoring frameworks.

In addition to desktop reviews for aspects of the project, the methodological approach for the SEA made use of the stratified random sampling technique, which facilitated the administering of questionnaire surveys to a sample population that was 1% of the total number of residents of each community within the project's 2 kilometer (km) sphere of influence. Along with surveys, key informant interviews were also conducted with personnel in the health, emergency response and education sectors to explore complex topics related to the project.

The potential impacts of the Government Campus Project span physical infrastructure, social dynamics, and environmental quality. Positive impacts of the project include but are not limited to job creation, urban regeneration and enhanced public amenities. On the other hand, the negative

impacts anticipated are temporary disruptions during construction and potential gentrification efforts. These negative impacts may be addressed through proposed mitigation strategies, including:

- Comprehensive stakeholder engagement.
- Relocation and rehabilitation assistance for affected residents.
- Sustainable design standards to minimize ecological footprint.

The development of the Government Campus will adopt a phased approach, leveraging public-private partnerships to ensure efficient resource allocation. The project will have long-term benefits including improved public services delivery, economic revitalization, and positioning of Downtown Kingston as a global model for sustainable urban planning. Its aesthetic value will result in elevating the hopes and aspirations of urban dwellers and ignite the dreams for renewal and revitalization of other cities in Jamaica and wider Caribbean.

1 Introduction

1.1 Contextual Background

The Government of Jamaica has been using Gordon House since 1960 as the official meeting place of the Jamaican Government (Jamaica National Heritage Trust (JNHT) 2011). Over the past 60 years the facility has become inadequate, as it has outlived its usefulness. With increasing economic and social development occurring across Jamaica, the needs of the Jamaican Government continue to grow. Therefore, a modern Parliament Building and a more centralized Government system for effective operations is required. This has been recognized by past and present government administrations.

National Heroes Park (NHP) and its environs is seen as an ideal location for the consolidation of Government services, which is expected to reduce rental costs and spur regeneration in the general area. In 2016, the Prime Minister of Jamaica, Honorable Andrew Holness, under the King George VI Memorial Park Act of July 1956, mandated the planning for the creation of the Government Campus and Parliament Building at Hero's Circle and the National Heroes Park.

1.2 Purpose

This project aims to create a Government Campus with buildings to house Ministries, Departments and Agencies (MDAs) in one consolidated space around the National Heroes Circle (NHC). The Master Plan for this development includes mixed residential and commercial spaces to replace the dilapidated buildings, has already been completed. Key highlights of this Master Plan include:

1. Architectural designs, engineering drawings, Environmental Impact Assessment (EIA) and permitting were completed for the new HOP Building in National Heroes Park in 2021. Construction was expected to begin in 2022.
2. Redevelopment and the upgrade of the NHP to a public recreational green space is a key feature.

The Government Campus Project is also expected to: -

1. Create additional development of new and repurposed residential, commercial, and recreational zones around the NHC, within the boundaries of the Government Campus Area and the surrounding communities.
2. Implement improved and enhanced citywide public transportation and utilities system, which will serve the project area and the wider community. This includes the upgrade and replacement of existing infrastructure.
3. Drive the general re-development of this section of Downtown Kingston.

The NHC and the surrounding environs has been identified as the ideal area for the Government Campus Development as the area is centrally located with the required space for government MDAs. Several of these MDAs are already located around this area, including the Accountant General's Department, Ministry of Education, Youth and Information and Ministry of Finance and Public Service

(Figure 1-1). Additionally, The Ministry of Labor and Social Security is located just south of the Government Campus area. With the construction of the HOP at NHC, this will also allow for increased centralization of government services and business.

Figure 1-1: Satellite Imagery of the Project Area

1.3 The Consultant's Mandate

In acknowledging the need for a more modern and centralized space to house Government buildings to enhance efficiency, Environmental Solutions Limited (ESL) was contracted by the Urban Development Corporation to conduct a Strategic Environmental Assessment (SEA) for the proposed Government Campus.

The SEA serves as the systematic, on-going process for evaluating, at the earliest appropriate stage of publicly accountable decision-making, the environmental quality, and consequences, of alternative visions and development intentions incorporated in policy, planning or programme initiatives, ensuring full integration of relevant biophysical, economic, social, and political considerations (Partidário, 1999).The purpose of the SEA is to inform Phases 1 and 2 of the Government Campus Project to identify and address the ramifications of the activities planning, design and implementation on the existing business and residential communities (Figure 1-2).

Figure 1-2: Phases of Government Campus Development

This SEA will offer a strategic approach to the environmental attributes and liabilities of the development area, and the resultant data will inform future Environmental Impact Assessments within the proximate project area below (Figure 1-3). The issues raised in the SEA will also guide decisions related to construction and the operations of the facilities. Further, the SEA will quantify the assigned financial and economic values of the adaptation and mitigation measures, recommendations, and a gap analysis of the proposed development. A comprehensive monitoring programme and recommended project alternatives will also be included in the final report.

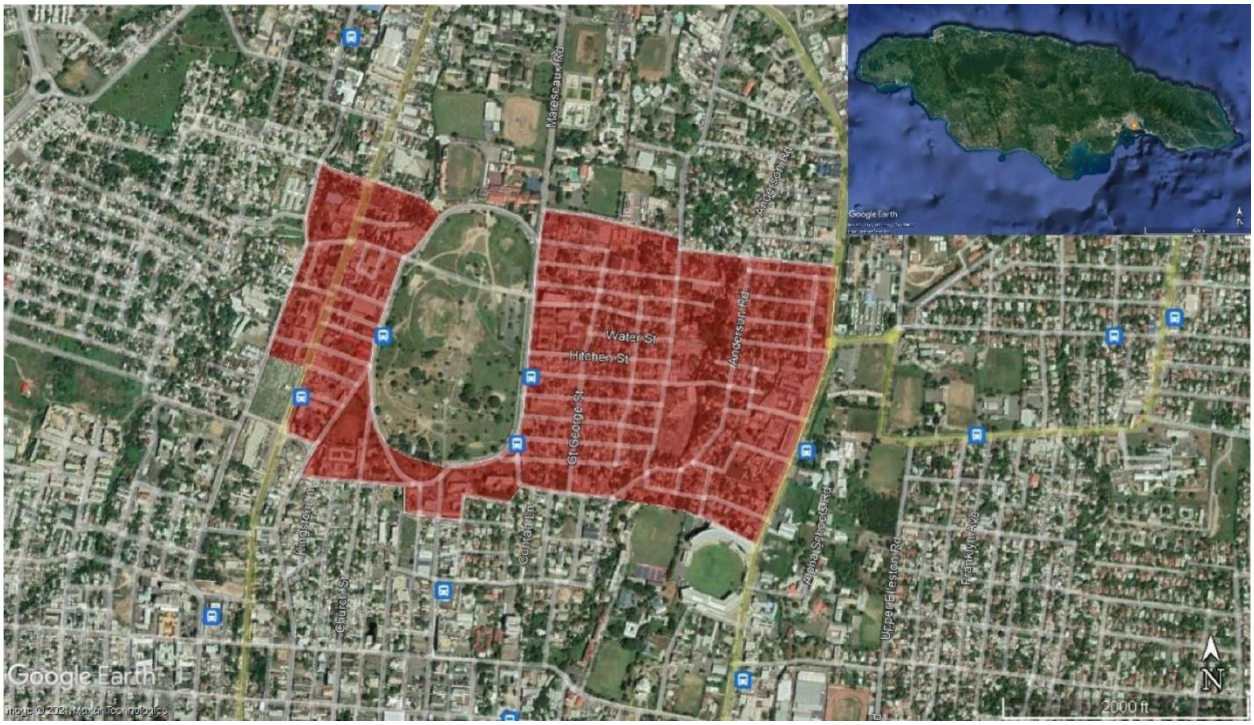


Figure 1-3: Government Campus Project Boundaries

1.4 The Master Plan

The National Heroes District Master Plan, spearheaded by the Urban Development Corporation (UDC), envisions a transformative redevelopment of Downtown Kingston, Jamaica. Anchored by NHP, the plan outlines a centralized Government Campus alongside residential, commercial, and public spaces. This ambitious project aims to enhance operational efficiency, reduce government costs, promote sustainable urban development, and restore Kingston's cultural and historical vibrancy while serving as a catalyst for private sector investment.

Vision and Design Principles

The plan is guided by a vision of integrating modern development with Jamaica's cultural heritage. It focuses on creating a government identity and defining a mixed-use district that promotes walkability, accessibility, and community interaction. Design principles prioritize sustainability through energy-efficient infrastructure, climate-responsive building standards, and integrated green spaces. Universal accessibility for individuals of varying abilities is central to the plan, ensuring inclusivity and functionality for all. Pedestrian-friendly layouts with vibrant public spaces are integral, fostering social and economic activity throughout the district.

Urban Design Framework

The urban design framework reconfigures the street and block network to create efficient traffic circulation and enhance connectivity. The plan emphasizes a mix of government, residential, and commercial uses to activate the district during and beyond work hours (Figure 1-4). Modernized blocks feature multiple courtyards, plazas, and open spaces for diverse uses. Building heights are strategically designed to transition from taller structures near the park to lower heights toward

surrounding neighborhoods. King Street is reimagined as a central parade route linking the NHP to the waterfront, emphasizing its historical importance.

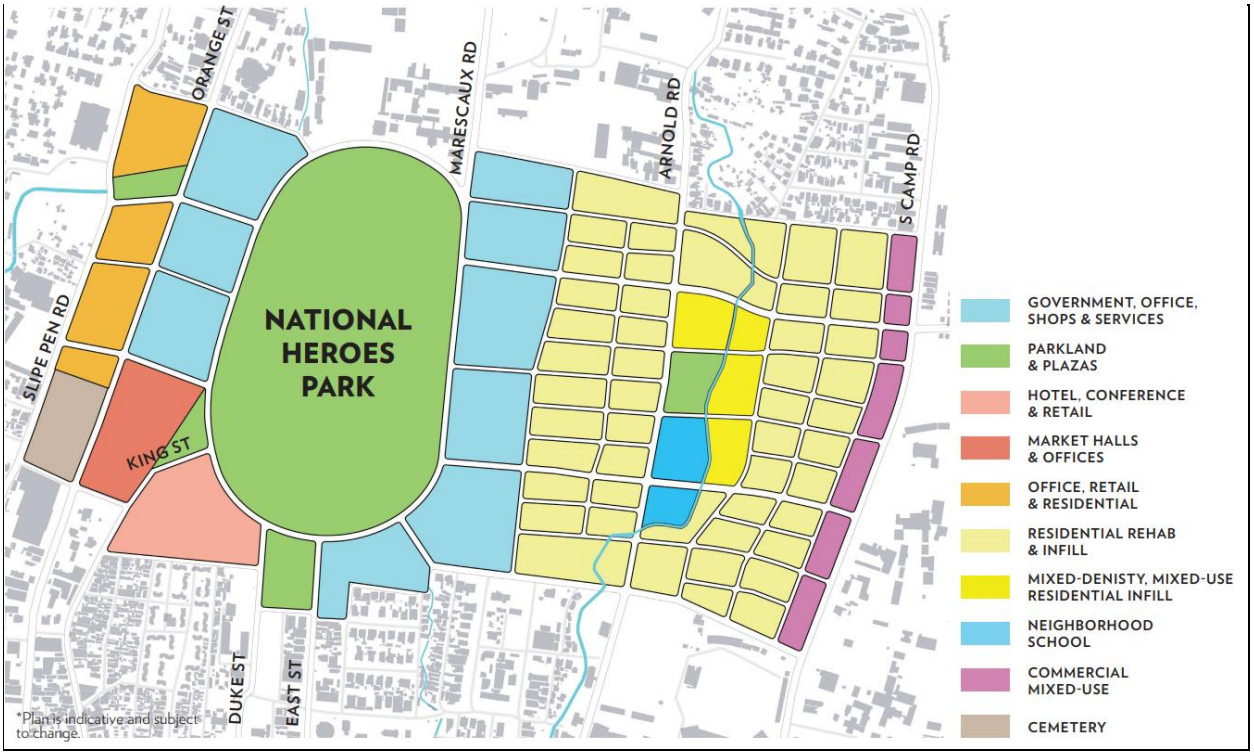


Figure 1-4: Overall District Land Use

Infrastructure and Sustainability

The Master Plan includes a robust infrastructure strategy addressing energy, water, and waste management. Renewable energy initiatives such as rooftop solar panels and district cooling systems are proposed to reduce carbon footprints. Water reclamation systems will recycle greywater and rainwater for non-potable uses, while stormwater infrastructure will mitigate flooding based on climate projections. Solid waste strategies include waste diversion targets and potential development of automated collection systems. The overall design aims to position Kingston as a global example of sustainable urban planning.

Allman Town Framework

The adjacent Allman Town neighborhood, rich in historical and cultural significance, is earmarked for targeted regeneration. Plans include housing renewal, adaptive reuse of heritage structures, and mixed-use infill development to improve community living standards. The framework proposes enhanced parks, schools, and community services, alongside stream restoration and stormwater management to address environmental challenges (Figure 1-5). The plan aims to preserve the neighborhood's essence while fostering economic opportunities and uplifting its residents.

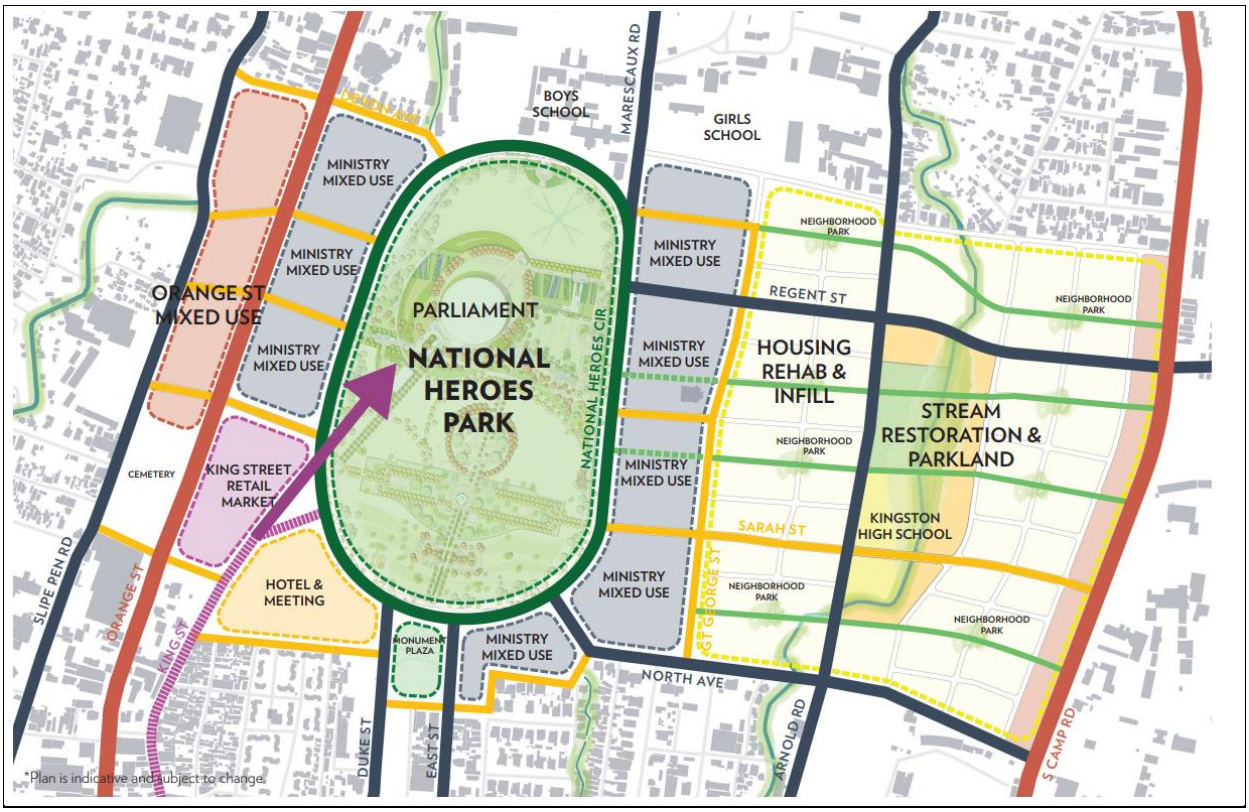


Figure 1-5: District Framework Plan

Phasing and Implementation

The development will follow a phased approach to ensure scalability, flexibility, and effective resource management. The Government of Jamaica (GoJ) will leverage Public-Private Partnerships (PPPs) to finance and execute infrastructure and public amenities, combining public funds with private sector investments. This strategy enables sustainable growth and maximizes the economic potential of the project.

Public Realm and Character

The NHP will serve as the centerpiece of the district, providing a space for national and community events, monuments, and recreational activities. The plan includes pedestrian-oriented streetscapes, shaded walkways, and small-scale shops to enhance the experience of residents and visitors. Public spaces are designed to reflect Jamaica's rich cultural and historical heritage while-supporting diverse activities such as parades, markets, and celebrations (Figure 1-6).

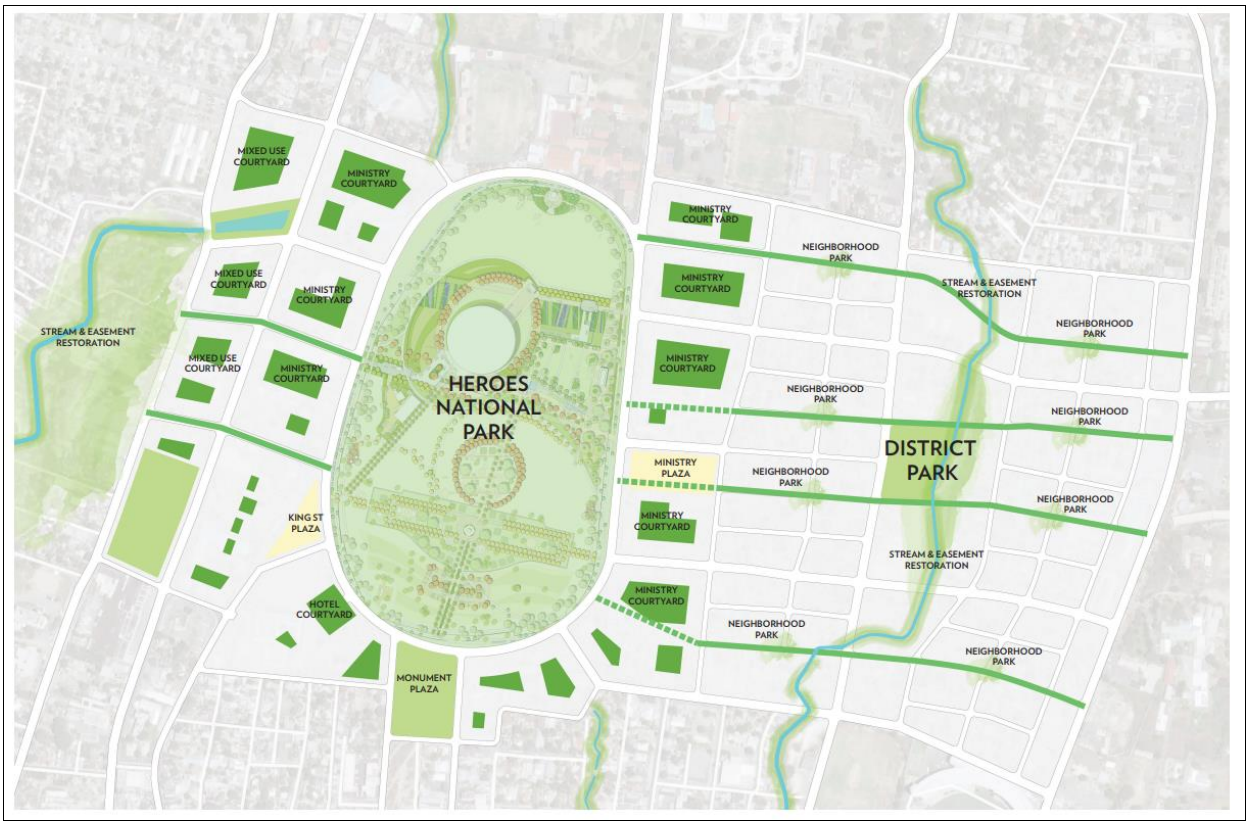


Figure 1-6: Public Realm Character

The National Heroes District Master Plan embodies a comprehensive and future-focused approach to urban renewal. By integrating sustainable practices, preserving cultural identity, and fostering economic growth, the plan aspires to transform Downtown Kingston into a modern, vibrant, and inclusive urban hub that serves Jamaica's present and future generations.

2 Legal and Regulatory Considerations

This section presents the legislation and regulations pertinent to the proposed government campus development. A list of key legislation and their relevance to the development is presented below.

National legislation- natural environment

NAME	MAIN FUNCTIONS
King George VI Memorial Park Act (1956)	This Act makes reference to the development and improvement of land designated as the King George VI Memorial Park (previously the Kingston Racecourse) in Kingston and St. Andrew, the power of which stands with the Kingston and St. Andrew Corporation. Under the Act, the park, commonly referred to as National Heroes Circle may be used as a public garden, pleasure park, and recreation area for the benefit of the inhabitants of the Corporate Area or be used for the construction of Parliament buildings and such administrative and other buildings, along with the burial of the remains of distinguished persons and is subject to approval by the Minister of Local Government.
Flood Water Control Act (1958)	This Act makes provisions for the construction, improvement and maintenance of works to control floodwater, as well as any other matters connected therewith.
Watershed Protection Act (1963)	This Act provides for the protection of watersheds and areas adjoining watersheds and by that means to promote the conservation of water resource
National Heritage Site (1999) under the Jamaica National Heritage Trust Act (1985)	An act to repeal and replace the Jamaica National Trust Act which includes changing the name of the Jamaica National Trust, and to make new provisions for governing its operations as well as to provide for matters incidental thereto or connected therewith. The Trust, in functioning under the Jamaica National Heritage Act, is responsible for promoting the preservation of national monuments and anything designated as protected national heritage for the benefit of Jamaica. It also carries out related development that is deemed necessary for the preservation of any national monuments or anything designated as protected national heritage. Additionally, the Trust records any precious objects or works of art to be preserved and to identify and

	record any species of botanical or animal life to be protected. The site is of historical and cultural importance. As such, the project is required to preserve as much as possible and to have a Chance Find Procedure/ Watching Brief
Natural Resources Conservation Authority Act (NRCA) (1991)	The primary legislation that influences the development of the project is the Natural Resources Conservation Authority (NRCA) Act (1991) and its regulations. The NRCA Act provides for the management, conservation and protection of natural resources and is the chief environmental act for Jamaica. The NRCA Act also provides the guidelines for the creation of an environmental impact assessment in Jamaica.
The Natural Resources Conservation Authority (Air Quality) Regulations (2002)	The Regulations state that no person shall emit or cause to be emitted from any air pollutant source at a new facility, any visible air pollutants the opacity or pollutant amount of which exceeds the standards. Every owner of a facility with one or more air pollutant source or activity shall employ such control measures and operating procedures as are necessary to minimize fugitive emissions into the atmosphere, and such owner shall use available practical methods which are technologically feasible and economical, and which reduce, prevent or control fugitive emissions to facilitate the achievement of the maximum practical degree of air purity. The project must ensure that contractors employ emission control measures to minimize fugitive emissions during construction.
Water Resources Act (1996)	The Water Resources Act established the Water Resources Authority (WRA). This Authority is mandated to regulate, allocate, conserve and manage the water resources of the island.
National Solid Waste Management Act (2001)	This Act provides for the regulation and management of solid wastes. Solid waste management will be essential in the construction phase and will require the removal and proper disposal of vegetative matter, soil and construction rubble. The NSWMA should be contacted regarding an approved disposal site

Natural Resources Conservation (Wastewater and Sludge) Regulations (2013)	These Regulations are designed to prevent pollution of the environment (land, surface and marine water) from manufacturers, developers, operators of various (trade and sewage) treatment facilities and other relevant sectors, etc.
Disaster Risk Management Act (2014)	Given Jamaica's susceptibility to natural hazards and more recently, the outbreak of the coronavirus disease 2019 (COVID-19), the Government Campus Development should be taken with the same cognizance of changes mandated by the Act for business continuity purposes and the safety of all employees.
Natural Resources Conservation (Permit and License) (Amendment) Regulations (2015)	These regulations were developed in 2013. They require the application for the grant of a permit to undertake an enterprise, construction or development of a prescribed description or category in a prescribed area as set out in Form 1 in the First Schedule.
Natural Resources Conservation (Permits and Licenses) (Amendment) Regulations (2015)	This is subsequent to the Natural Resources Conservation Authority Act (NRCA) (1991) and authorizes the NRCA to issue, suspend and revoke permits and licences if facilities are not in compliance with the environmental standards and conditions of approval stipulated.
Building Act (2016)	The Act identifies the Bureau of Standards as the body responsible for making recommendations to the Minister with respect to the National Building Code, determining the extent to which the International Building Codes apply to Jamaica and recommending accreditation standards relating to building work, building material or products, construction methods, design, building components and building systems connected with building work.
Land Acquisition Act (1947)	Section 3 of the Land Acquisition Act (1947) empowers any officer authorized by the Minister to enter and survey land in any locality that may be needed for any public purpose. This may also involve: (1) Digging or boring into the sub-soil; (2) Cutting down and clearing away any standing crop, fence, bush or woodland; (3) Carrying out other acts necessary to ascertain that the land is suitable for the required purpose.
Land Development and Utilization Act (1966)	provides the regulatory framework for effective land management, aligning urban revitalization with environmental sustainability and socioeconomic priorities. The Act's provisions help

	ensure that the development incorporates mixed-use spaces, green areas, and resilient infrastructure while preserving the cultural and historical significance of the National Heroes Park and surrounding areas. Additionally, the Act supports mitigation of potential negative impacts, such as displacement and gentrification, by promoting equitable land use and sustainable planning practices. It aligns with the project's goals of integrating stakeholder engagement, rehabilitation assistance for affected residents, and sustainable design standards.
Main Road Act (1932)	This Act ensures that road infrastructure development complies with national standards, facilitating efficient transportation networks and urban connectivity. It provides legal provisions for land acquisition, boundary delineation, and encroachment management, which are essential for planning and implementing road-related aspects of the project. Additionally, the Act supports sustainable practices by enabling proper drainage, addressing environmental impacts, and ensuring road safety through clear regulations.
Municipalities Act (2003)	This Act provides the legislative framework for establishing, governing, and managing municipalities, ensuring local authorities have the powers to regulate land use, infrastructure development, and public services. It emphasizes the role of Municipal Councils in shaping urban development, including zoning regulations, the upkeep of public spaces, and the management of traffic and thoroughfares. These provisions are critical for projects that involve creating mixed-use spaces, enhancing public amenities, and integrating pedestrian-friendly infrastructure, as outlined in the Government Campus Project.
Registration of Titles Act (1989)	This Act ensures clarity and security of land titles, reducing disputes over property ownership and enabling efficient acquisition and development of land for large-scale projects. For initiatives like the Government Campus, which involves creating a centralized hub of government services and modern infrastructure, the Act supports transparent processes for registering titles, verifying ownership, and addressing encumbrances.

	Furthermore, the Act facilitates the integration of public and private sector investments by streamlining land transactions and protecting stakeholders' rights. Its provisions ensure that all land brought under the project complies with legal requirements, safeguarding both public interest and private investments.
Town and Country Planning Act (1958)	This Act provides the legislative framework for systematic land use planning and development control, ensuring that urban initiatives align with national and local plans. It emphasizes sustainable urban growth through land use zoning, infrastructure planning, and environmental preservation, which are essential for projects aiming to modernize and centralize government services. Additionally, the Act fosters balanced development by promoting mixed-use spaces, green areas, and pedestrian-friendly designs, ensuring urban revitalization aligns with environmental and cultural heritage preservation.
Clean Air Act (1964)	The Clean Air Act is designed to control air pollution by regulating the amount of any noxious or offensive gas, which is permitted to escape or is discharged from any affected premises into the air. The Clean Air Act is administered by the Ministry of Health.
Noise Abatement Act (1997)	The Noise Abatement Act in Jamaica regulates loud sounds, including those from construction, to protect citizens from disturbances. The act applies to amplified sound and other specified equipment. The act also provides guidelines such as: • Noise levels: Construction noise levels must not exceed 70 decibels (dB) at the site boundary. • Work hours: Construction work hours may be limited to certain times of day, such as 7 AM–6 PM Monday through Friday, and 8 AM–6 PM on Saturday. • Work on holidays: Construction work may be prohibited on Sundays and public holidays. • Permission: Permission may be required to work outside of the permitted hours.
Pesticides (Amendment) Act (1996)	This Act gives the Authority the responsibility of controlling the importation, manufacture, packaging, sale, use and disposal of pesticides. Section 11 states that the Authority is required to

	keep a register or record of all relevant information such as registered pesticides, restricted pesticides, pest control operators and persons licensed to import or manufacture pesticides.
Public Health Act (1976)	The Public Health Regulations 1976 aim at controlling, reducing, removing, or preventing air, soil, and water pollution in all possible forms. The excavation and construction work and use of heavy machinery and equipment may result in the temporary generation of fugitive dust. Proper care and standard best practices for the construction industry should be applied to minimize public health risks.

3 General Approach and Methodology

The Consultants developed the approach and methodology according to international best practice in conducting SEAs as well as Jamaica's draft Policy on Conducting SEAs (2003). As part of the general approach, a multidisciplinary team of experienced scientists and environmental professionals assembled to conduct the required resource assessment, generation and analysis of baseline data, determination of potential impacts, and recommendations for mitigation measures and development guidelines.

The team utilized the Charette-style approach to data gathering, analysis, and presentation, whereby team members conducted the reconnaissance investigations together to determine critical elements for analysis and the issues to be highlighted for review of the corridor design and planning process. Team meetings were used to discuss the progress of investigations and analyses and to facilitate integration of data toward an understanding of the systems at work in both the natural and built environment.

Baseline data for the study area was generated using a combination of research approaches:

- Field investigations
- Surveys
- Analysis of maps, plans, aerial photos
- Review of reports and background documents
- Structured interviews
- Laboratory analyses

An integrated team approach was applied with engineers, architect-planners, geotechnical and other project professionals to facilitate ongoing information sharing as the project design progresses. Excellent results have been demonstrated where this approach has been applied to other large infrastructure and visionary projects in Jamaica and overseas.

The least constraining methodology was applied whereby parameters of the construction and operational phases of the development were considered in light of environmental risks. Appropriate mitigation measures will be recommended to minimize impacts. Environmental Quality Objectives (EQOs) for the development will be determined through integrated professional assessments and will be used to guide recommendations for the client on design and implementation.

3.1 Project Inception

The project inception phase was a beneficial exercise that all team members participated in. All members of the project team participated in a charrette-style meeting, which was followed by a site reconnaissance exercise that included a tour of the project area. Ad hoc field consultations that provide a helpful overview of the project region were also included in these observations.

3.2 Assessing the Existing Environment/Baseline Study

Following the project inception exercise, the consultants conducted a detailed literature review and various field assessments to examine the existing characteristics of the physical, environmental and socio-economic environment. These assessments are intended to document the baseline conditions within the project boundary. Extensive study through an Environmental Impact Assessment Report for the Jamaica Houses of Parliament, was reviewed in relation to the baseline study for this SEA.

Additionally, all relevant existing legislation, regulations and standards have been reviewed and considered regarding the proposed redevelopment of NHC. In consideration of national and local legislature and standards including but not limited to those which govern the environmental quality, safety and health, protection of sensitive areas, siting and land use control and land acquisition. There was a review of relevant aspects covered under these regulations. The approach used is detailed in the section below.

3.2.1 Physical Environment

This section describes the purpose and methodology of the air quality, water quality and noise analysis within a 1km sphere of influence.

Air Quality and Noise

The objective of the air quality assessment and noise survey was to capture information about the existing conditions of this area. The locations for the air quality assessment and noise level sampling stations were selected to represent the use of the land in the project sphere. Sites likely to be impacted by changes in air quality, for example, those areas with high human populations were considered as these sites are some of the most sensitive receptors.

3.2.1.1.1 Methodology

The air quality assessment was conducted over a 24-hour period between May 14 - 15, 2024, and three-minute-long noise surveys were conducted over two separate days. The concentration of respirable particulates (PM10) for air quality and noise levels in dBA was assessed. An analysis of the Volatile Organic Carbons (VOCs), NO_2 and SO_2 present in the area was also assessed. A summary of the field investigations is outlined in Table 3-1 below and the air quality assessment and noise survey locations are presented in Figure 3-1. In Figure 3-1 below, sampling stations indicated by a green marker were assessed for respirable particulates, select gaseous atmospheric pollutants and surveyed for noise levels, whereas the sampling station indicated by a yellow marker was assessed for respirable particulates only and surveyed for noise levels.

Table 3-1: Summary of the Investigations for Air and Noise Quality

Attributes	Parameters	Data Points	Sampling Period	Assessment Timeframe
Air Quality	Respirable Particulates (PM_{10})	Eleven (11) Sampling Stations	May 14 – 15, 2024	24-Hours
	Volatile Organic Carbon	Ten (10) Sampling Locations	May 14 – 15, 2024	
	NO_2 and SO_2	Ten (10) Sampling Locations	May 14 – 15, 2024	
Noise Levels (Ambient)	Noise Levels in dBA	Eleven (11) Sampling Stations	May 13 & 14, 2024	3 Minute Assessments done over a 2-day Period

Particulate matter was measured using calibrated air pumps (with flow rates at 5L/min), attached to pre-weighed Polyvinyl Chloride (PVC) filters. After the 24-hour sampling period, the pumps were collected, and the filters returned to the laboratory where they were stabilized and weighed to determine a Time Weighted Average (TWA) value for the particulates.

Nitrogen oxides, sulfur oxides and volatile organic compounds were measured using passive samplers. The samplers were generally placed at respiratory height for a 24 ± 4-hour period. After the 24-hour sampling period, the samples were collected, placed in their respective canisters and returned to the laboratory for analysis. It must be noted that these monitors, as a limitation of the sampling exercise, may have been impacted by relative humidity.

The results at the end of the sampling period were compared to the Ambient Air Quality Standards Regulations for Jamaica and/ or any other applicable standard.

Noise measurements were taken using a calibrated Quest SoundPro SE/DL series sound level meter, which conforms to the IEC 616721-1-2002 Class 2, Sound Level Meter Type 2, ANSI S1.4 – 1983 (R2001) Octave Band &1/3 Octave Band Filter Class 1, IEC 61260:2001 Octave Band & 1/3 Octave Band Filter Class 1, ANSI S1-11-2004 and ANSI S1.43 -1997 (R2002) Type 2 standards. The average high and low noise level readings were taken twice over a 3-minute interval and recorded in decibels (dBA). Wind direction and any unusual local noise sources were documented at each sampling location. In addition, before and after the survey, the instrument was checked with a calibrator, which is pre-calibrated at the factory.

The results at the end of the sampling period were compared with the applicable Jamaica National Noise Standard.

3.2.1.1.2 Quality Assurance and Quality Control

For the air quality assessment and noise survey, all equipment was calibrated prior to use and where applicable, field blanks were used for quality control purposes. Monitoring devices were placed away from any known sources to prevent bias in the data collected.

Detailed observations were made at all sampling stations and were georeferenced for traceability and future monitoring requirements. Section 4.2.6 presents the results and observations of the assessments completed.

Figure 3-1: Air Quality and Noise Sampling Locations

Water Quality

3.2.1.1.3 Methodology

Field investigations were conducted to capture information about the existing environmental conditions over the sampling period as it pertains to water quality. Investigations were conducted between May 14 and 15, 2024. A summary of the assessment is outlined in Table 3-2.

Table 3-2: Summary of Investigations for the Water Quality Assessment (WQA)

Attributes	Parameters	Data Points	Date
Water Quality (Freshwater)	Physical, Chemical and Microbiological	Seven (7) Sampling Stations – Full assessment	One sampling period between May 14 & 15, 2024

The Terms of Reference (TOR) indicated that the water quality of any existing wells, surface of coastal waters in the vicinity of the development area should be analyzed. Based on the project site, there were no (identified) surface water sources except for water that may be present in the gully system during anomalous events or seasons of high rainfall. Given the inputs and lack of water within the gullies during the assessment, water was not collected from these concretized systems. However, there were several wells within a 1km sphere of influence. The proposed sites for water quality analysis are depicted in Figure 3-2. However, not all sites were sampled due to the accessibility of the wells during the sampling exercise. Nonetheless, water samples were collected upstream, within and downstream of the proposed project area. Figure 3-3 depicts the sampling areas where water quality samples were collected.

Sites were selected to obtain information about the current quality of the water that may be impacted by the proposed development, as well as to highlight any impact(s) that existing practices have on the water quality in the area.

Water quality results were compared to the Draft Jamaica National Ambient Water Quality Standards for Freshwaters.

3.2.1.1.4 Quality Assurance and Control

A quality assurance (QA) and quality control (QC) plan involving all aspects of the project was instituted. The programme consisted of the care and calibration of field equipment, as well as the preservation of samples. The sampling programme included grab sampling with the sample types and locations properly identified. Samples were indexed by their location and the time of sampling. Ambient conditions and sample description at the time of collection were also noted.

All samples were kept between 0 – 6°C and transported to either the ISO/IEC 17025 accredited Quality or Environmental Health Laboratory at Environmental Solutions bearing in mind the analysis hold time for each test. Any sub-contracted laboratory used was assessed prior to submitting the samples for analysis. Additional quality control procedures included the analysis of blanks, reference standards and duplicates as well as the utilization of verified standard analytical

methods, field blank and field duplicate samples. In all cases, appropriate chain-of-custody records will be prepared and maintained for all analytical samples. All containers were properly labelled, individually packaged, stored, and transported in a cooler maintained at the appropriate temperature.

Figure 3-2: Proposed Water Quality Sampling Points

Figure 3-3: Water Quality Locations where Samples were Collected (May 2024)

3.2.1.1.5 Water Quality Assessment

As shown in Figure 3-3, seven (7) water samples were collected within the project's sphere of influence upstream, within and downstream of the proposed development location. The major objectives of the water quality assessment were to: -

- Assess land use practices and their impacts on the existing environment
- Determine the nature and extent of existing land use impacts
- Make recommendations for the monitoring and management of water resources based on the proposed activities where applicable

Parameters assessed include: -

1. pH (pH units)
2. Dissolved Oxygen (mg O_2/L)
3. Conductivity (mS/cm)
4. Salinity (ppt)
5. Total Dissolved Solids (mg/L)
6. Temperature (°C)
7. Biochemical Oxygen Demand (mg O_2/L)
8. Total Suspended Solids (mg/L)
9. Turbidity (NTU)
10. Nitrate (mg NO_3^-/ L)
11. Orthophosphates (mg PO_4^{3-}/L)
12. Chloride (mg Cl^-/L)
13. Sulphate (mg SO_4^{2-}/L)
14. Fats, Oil & Grease
15. Total Alkalinity (mg$CaCO_3$/L)
16. Total Hardness (mg$CaCO_3$/L)
17. Total Coliform (MPN/100ml)
18. Faecal Coliform (MPN/100ml)
19. *E. coli* (MPN/100ml)
20. Potassium (µg K/L)
21. Magnesium (µg Mg/L)
22. Calcium (µg Ca/L)
23. Manganese (µg Mn/L)
24. Sodium (µg Na/L)
25. Zinc (µg Zn/ L)
26. Copper (µg Cu/L)
27. Arsenic (µg As/L)
28. Cadmium (µg Cd/L)
29. Mercury (µg Hg/L)
30. Chromium (µg Cr/L)
31. Lead (µg Pb/L)
32. Iron (µg Fe/L)
33. Pesticide Screen (µg/L)

Topography, Geology and Soil

Maps and satellite imagery were used to analyze the topography, geology and drainage networks in the general project area. This was supplemented by the customary literature review process.

Land Use and Zoning

Data acquired from the National Spatial Data Management Branch of the Land Information Council of Jamaica (LICJ) was used to determine the land use and zoning practices surrounding the project area.

Climate

Data for Jamaica and the parish of Kingston and St. Andrew was compiled to present an overview of the typical climatic parameters in the project area. Precipitation, relative humidity, ambient temperatures, wind speed and direction will be assessed based on data from the Meteorological Office of Jamaica. Climate change projections as they relate to rainfall characteristics will be examined from various reports such as the State of the Jamaican Climate, 2019 (CSG, 2021).

Hydrology

3.2.1.1.6 Data Review

A review of existing data and literature was carried out on available resources in and around the study area. This involves obtaining all the available background information (for e.g. existing maps, photographs and reports) related to the environmental conditions of the site and its surroundings, namely the physical (natural and manmade), social and economic features. The relevant base data for the project area and its surroundings was collected and collated in order to inform the design decision process.

Key Activities	Objective
A review of existing historical events	Generate an understanding of the existing flood conditions that have been reported and recorded over the years. This provides an initial understanding of possible areas of concern as well as possible triggers/causes.
Raw daily and hourly rainfall data from the Meteorological Office of Jamaica.	The raw rainfall data was collected and organized in terms of annual extremes. Probability distribution fitting (GEV best fit) was then performed to determine the associated return periods for different levels of precipitation.
Topographic maps from the Survey Department from the National Works Agency. Topographic Maps from other consultants (Supplemented by JAXA Topographic Data and CEAC Topographical Surveys)	Guide our slope and elevation analysis and provide channel and roadway dimensions, such as spans, depths and inverts. This will inform the performance of existing infrastructure as well as identify design constraints for proposed infrastructure. In addition, it allows for the determination of contributing basins and their affected channels and crossings.
Collection of available GIS resources Soil Data Satellite Imagery Residential and Commercial Infrastructure Data:	Soil data and satellite imagery was utilized to determine the existing land use as well as hydrologic soil group for determination of run-off performance. While residential and commercial infrastructure data provides baseline for possible assets at risk.

3.2.1.1.7 Topographical Surveys

An aerial survey in conjunction with traditional RTK survey methods were done to quickly and accurately gain topographic data from the project area. The undertaken surveys were conducted with the following parameters:

a. Ground control and survey data set to local JAD-2001 Benchmark within reasonable proximity to the project site.
b. Aerial Lidar surveys to 5 cm horizontal and vertical accuracy (flight height at 60 -150m);
c. Generation of an Orth mosaic and Digital surface in GIS format.
d. Generation of contours from resampling and blended with available topographic survey(s).

Analysis of topographic data will include but not be limited to the following:

a. Building a digital terrain model of the area.

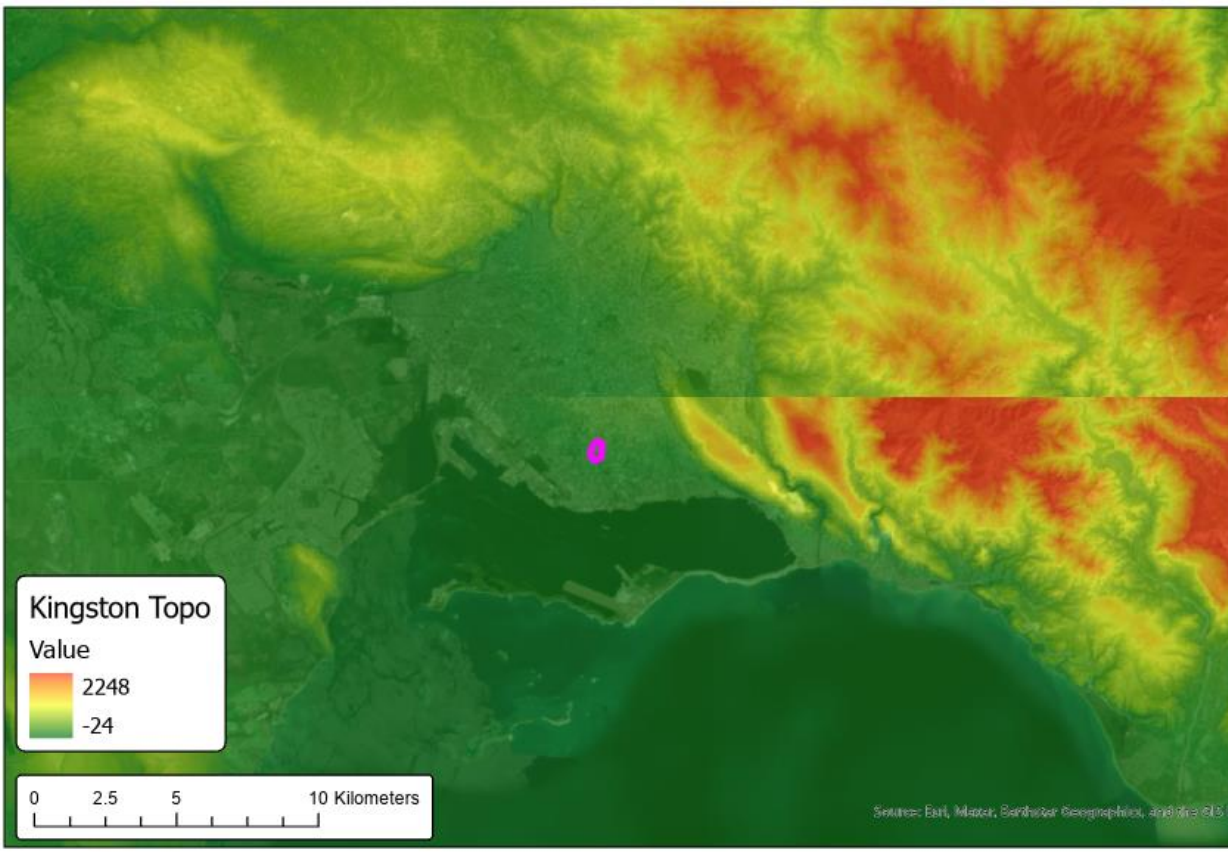


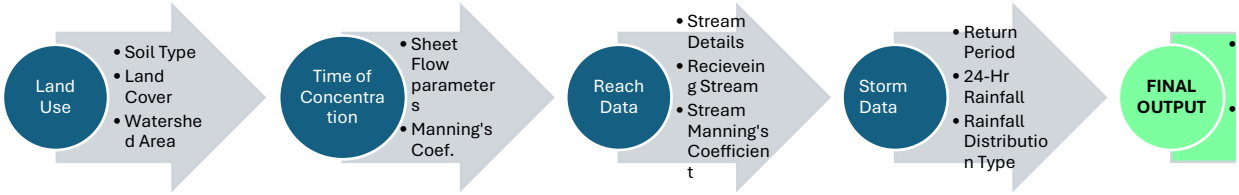
Figure 3-4: Lidar Survey Data captured for Kingston and St. Andrew.

The project area is characterized by a slight gradient of about 2% towards the coast in south. This gentle slope facilitates ease of movement and construction activities within the site. The 2% gradient can contribute positively to surface water drainage, helping to prevent water stagnation or pooling during periods of rainfall. However, careful planning is still required to manage runoff and ensure proper water flow, especially if the area is subject to significant rainfall events.

3.2.1.1.8 Hydrological and Hydraulic Study

The Soil Conservation Service (SCS) method was used to estimate the runoff hydrograph. This method requires the assignment of curve number (CN) for sub-catchments based on soil types and land use, the determination of catchment geometrics such as slope, flow lengths and areas and the calculation flow times of concentration within sub catchments. For 24-hour events the peak runoffs are generally calculated using the Type III rainfall distribution. See the model input parameters utilized in the hydrologic assessment as well as process flow chart:

Parameter	Description
Watershed Area	Area contributing flow to outlet
Reach Data	This details the parameters for the reaches in the assessment area. This includes length, Manning's Coefficient, slope, channel width, and side slopes.
Design 24-Hour Rainfall (Storm Data)	The 24-Hr Rainfall and their corresponding return period for the assessment area. Rainfall Distribution Type is also selected.
Runoff Curve Number	Roughness factor dependent on Land Use and Soil Type
Mannings's Coefficient	Roughness value for watershed area
Elevations	Upper and lower elevations of watercourse and watershed area.



3.2.1.1.9 Model Input

The HEC-HMS hydrological modelling system was utilized. The input parameters of this model comprised of 2 main components: (i) the basin model and (ii) the meteorological data. The basin model requires the identification and understanding of the existing drainage scheme and its routing, as well the classification of surface land usages. While the meteorological model allows for the application of precipitation events expected to affect the area.

3.2.1.1.10 Identification of Drainage Scheme

It was key to identify the size of contributing catchments as well as the general routing of these catchments to the downstream end. To achieve this, a combination of desktop studies and surveys was performed to collect terrain data.

1. Lidar topographical surveys were done around the proposed Government Campus, and some contributing drains to capture accurate and dense surface data. (CEAC Surveys)
2. Field surveys will be performed to identify and geotag existing drains to determine their flow directions and associated inlet, and outlet drains. (JAXA Topographic Geo Tiff, NWA Surveys)
3. Client provided and previously collected survey data will be collated to be used as a supplement to the lidar and traditional surveys in areas where they were not available.

This data was then processed using GIS to determine areas of natural flow accumulation, man-made routing and catchment sizes. In addition, they were also used to determine the size and material properties of the relevant drains and crossings. The identified drainage scheme was used as the basis for the layout of the hydrological model. See Figure 3-5 for the map showing the relevant catchment areas and drains.

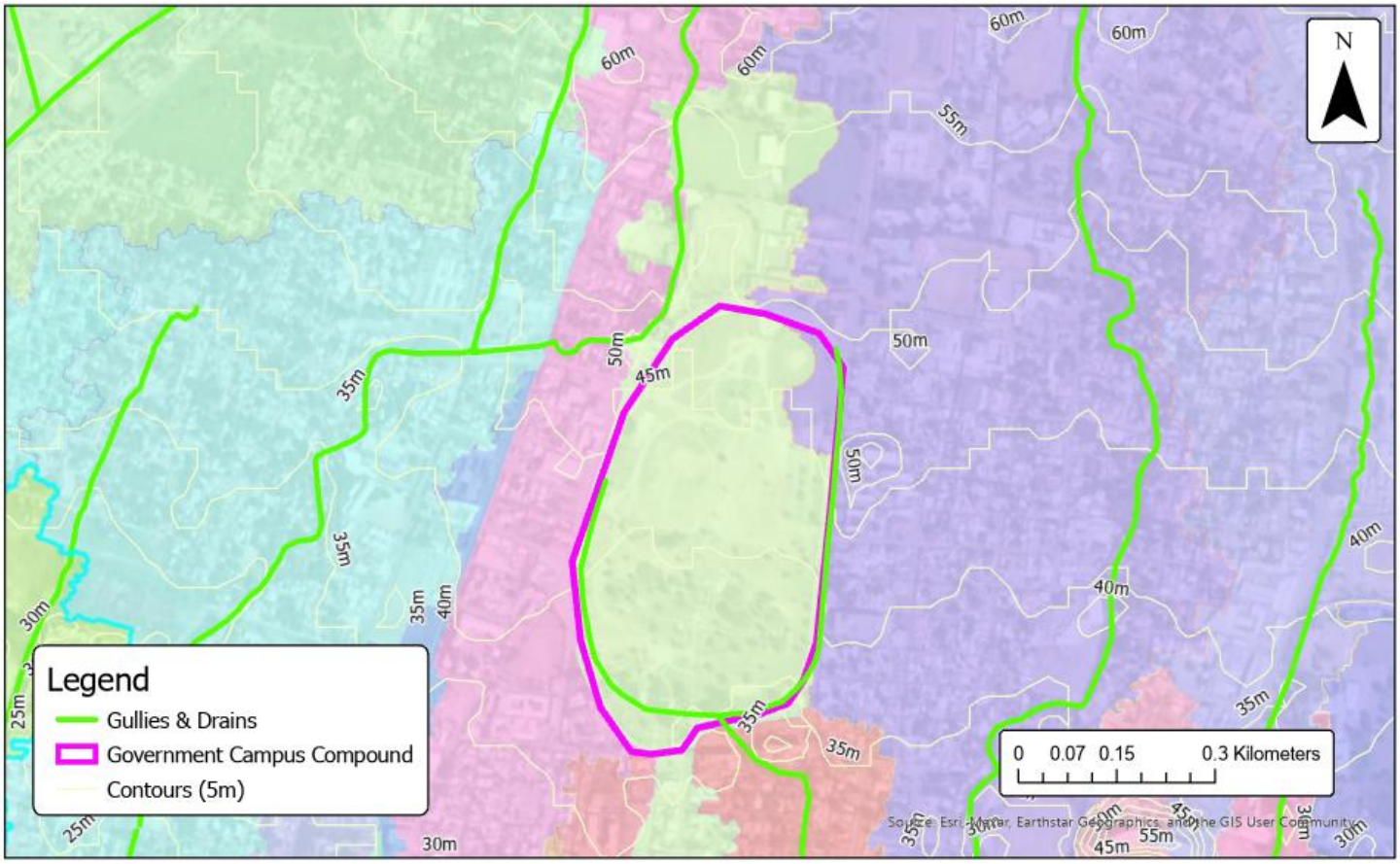


Figure 3-5: Contributing catchment areas around project area.

3.2.1.1.11 Land Use

The land use of the catchment was used as a basis for defining the various flow characteristics associated with having varying terrain within the model. This was especially necessary for usage in the SCS method wherein it allows for the determination of the CN Number when correlated to hydrologic soils groups. A percentage of surface permeability was also determined. To determine the land cover, image classification was performed on satellite imagery.

3.2.1.1.12 Rainfall (Precipitation) Analysis: Rain Gauges, Climate Change Projections

Depth of rainfall for various return periods was provided by the National Meteorological Service of Jamaica for the gauges across the island. Both Synthetic mass-curves (SCS type 3) and IDF curves were formulated and used for this study. The overall approach to defining the metrological conditions was as follows:

- Evaluate the existing Meteorological Service data.
- Define the present climate 24-hour rainfall depths for the 2-year, 25-year, 50-year and 100-year RP using extremal analysis
- Develop rainfall hyetograph for temporal distribution of rainfall in model.
- The determination of max rainfall depths within 60-minute, 2-hour, 6-hour, 12-hour and 24-hour durations for each year of available data.

3.2.1.1.13 Flood Plain Modelling

Ther project area is historically and evidently known to be susceptible to flooding following an intense or prolonged rainfall event. Flooding originates from the overtopping of banks of the natural waterways as well as drains being overwhelmed or blocked. Outputs from the hydrologic model will be used to route the flows through calibrated hydraulic models of the respective gullies, and major drains to prepare flood hazard maps. A distributed overland flow method will be utilized to generate the maps based on hydraulic model developed and calibrated with historical data and anecdotal information for the 10-year through 100-year flood events.

The outputs from the hydrologic model will be used in a hydraulic model to route the flows and to prepare flood hazard maps (minimum 1:2500 scale) for the current and future climate 10 to 100-year flood events. These floodplain models will be calibrated using anecdotal data also to be collected as specified. HEC-RAS 2D modelling software was used to generate flood maps. The United States army corps of engineers created this software to perform one and two-dimensional hydraulic calculations for a complete network of natural and constructed channels. Due to the complex nature of the hydrodynamics within the project area, a 2-D model was used to generate flood depth and determine its impact on the surrounding infrastructure and land. To fully understand its extent, it was necessary to analyze the project area using a general approach, considering the dynamic nature of the environment and the existing drainage features.

3.2.1.1.14 ODPEM Flood Prone Communities and Hazard Mapping

GIS Databases containing historic ODPEM Flood Prone Communities were examined in order to determine their proximity and thus overall impact on the project area, or otherwise. An online database created by the Mona GIS which identifies flood reports/advisories and their sources and then locates them spatially was one of the desktop studies utilized for preliminary understanding of the project area. Several locations were identified by this GIS resource around the area of interest.

3.2.1.1.15 Natural Hazards

Assessment of natural hazard risks (flooding, hurricanes, seismicity, climate change and extreme weather events) was done through a review of relevant literature pertaining to climate, soils, geology and drainage; site assessment; and anecdotal reports on historical events from residents in the surrounding communities. Other issues such as groundwater pollution incidents were reviewed within a 5 km radius of the development. Aerial photographic interpretation and literature review were also conducted. The existing setting will also present the existing issues related to natural hazards and geotechnical stability.

3.2.2 Biological Environment

The assessment involved walkthroughs while evaluating the vegetation, with all fauna encounters documented. The consultants also employed specialized surveys to gather information on avifaunal species and interviewed residents encountered during visits to gain additional insights into the presence of other fauna and flora such as butterflies, amphibians, and reptiles. Plant identification has relied on morphological characteristics such as leaf arrangement, branching structure, and fruit and flower morphology, supplemented by reference to Adams' (1972): Flowering Plants of Jamaica. Each observed species has been assigned a DAFOR ranking based on its abundance relative to the entire site.

3.2.3 Social Environment

In assessing the social environment of the Government Campus Project, several approaches, sampling techniques and data collection methods were used to prioritize resource efficiency and acquisition of the relevant information. This chapter outlines the methodologies by which this study was governed.

3.2.3.1 Population Demographics

The 2011 Population Census data, acquired from the Statistical Institute of Jamaica (STATIN) was primarily used for the determination of the survey population. The census data was categorized into enumeration districts (EDs) from which the total population of each community could be determined. The survey was administered to residents of the following communities:

- Jones Town
- Downtown
- East Downtown
- Fletchers Land
- Franklyn Town
- Trench Town
- Vineyard Town
- Allman Town
- Arnett Gardens
- Denham Town
- Campbell Town
- Cross Roads
- Passmore Town
- Cross Roads
- Kingston Gardens.

3.2.4 Sample Size and Sample Techniques

Computations allowed for a target sample size of 1% of the total number of residents in each ED. A group of data collectors was trained and tasked with deploying the survey instrument in the different communities, ensuring that the stratified random sampling method used surveyed an individual from each household. This was done to increase the validity of the responses as being representative of community perceptions and sources of primary information.

3.2.4.1 Data Collection

3.2.4.1.1 Survey Instrument

A questionnaire survey was used to assess the social environment within which the proposed Government Campus on individuals and communities that are located within the project's 2km sphere of influence. Specifically, the survey aimed to evaluate the population demographics of communities, income, household size, willingness to relocate, access to utilities, health, awareness and perception of the Government Campus Project. The survey mostly consisted of closed-ended questions, however there were a series of open-ended sub-questions which were asked to capture deeper insights provided by respondents. Survey data collection commenced on **July 19, 2024** and culminated on **August 13, 2024**, spanning 3 weeks and 2 days. The Appendix includes a copy of the survey instrument that was designed and deployed via KoboToolbox.

3.2.4.1.2 Key Informant Interviews

Along with the surveys, key informant interviews were conducted with personnel in the health and emergency response (policing and fire response) sectors. Interviews with personnel from the Ministry of Education were also carried out to gather in-depth, firsthand information on the impacts of the project on educational facilities within the project area, especially the relocation of the Kingston High School. These interviews were semi-structured which allowed for the use of open-ended questions that facilitated the exploration of complex topics.

3.2.5 Economic Environment

The implementation of the Government Campus Project represents a significant investment in the country's governance and infrastructure development. The aims of the assessment were to qualitatively describe and assess the project's economic impacts (direct, indirect and induced), including its contribution to job creation, local economic activity, and broader economic benefits.

The economic assessment qualitatively described the potential changes in, *inter alia*, business growth opportunities, employment creation, and revenue generation before, during and after the Government Campus Project implementation. The assessment revealed that the economic impact of the pre-construction and construction phases are more temporary in duration, and are expected to have a temporary or transient effect. On the other hand, the operational phase of Government Campus is to take place over a long-term horizon; hence, the impacts during this phase are of a sustainable nature. By analysing these various economic dimensions, this assessment aimed to provide a framework for understanding how the Government Campus Project could influence the local and national economy.

3.2.6 Archaeological Environment

For an archaeological and heritage assessment of the study area, two methods were employed, namely archival/desk research and a driving and walking survey. Archival research was utilized to garner information on the history of the study area and structures and features of historical significance.

This data collection method involved the analysis of newspaper articles, books, booklets and maps which addressed the historical to present-day usage of the study area. Additional information was extracted from Peter Espeut's forthcoming publication, "Encyclopedia of Jamaican Place Names". The JNHT and the Institute of Jamaica were also consulted.

A site evaluation exercise was completed via the use of a driving and walking survey. The purpose of the walking survey was to substantiate the information identified through the secondary research by locating any structural features and/or artefacts which were still visible from the road. The entire project site was driven through and a selection of representative buildings photographed.

3.3 Impact Analysis and Determination of Development Guidelines

The main goal of the Impacts and Risk Assessment was to identify the environmental and social impacts associated with the Government Campus Project at and around the sites of interest, focusing on both positive and negative impacts and risks as well as bio-physical, chemical, social, economic and cultural components of the environment including, but not limited to:

- Effects on Government Ministries and Services
- Effects on existing residents and community structure within surrounding communities
- Effects on commercial activities and livelihoods
- Effects on human and environmental health and well-being

Table 3-3: Defining the nature of the potential impacts

Term	Definition
Positive Impact (Benefit)	An impact that is considered to represent an improvement on the baseline or introduces a positive change.
Negative Impact	An impact that is considered to represent an adverse change from the baseline or introduces a new undesirable factor.
Direct Impact	Impacts that result from a direct interaction between a planned project activity and the receiving environment/receptors (*e.g.* between occupation of a site and serviced communities).
Indirect Impact	Impacts that result from other activities that are encouraged to happen as a consequence of the Project (*e.g.* in-migration for employment placing a demand on resources).
Cumulative Impact	Impacts that act together with other impacts (including those from concurrent or planned future third-party activities) to affect the same resources and/or receptors as the Project.

Table 3-4: Impact Rating Table

Criteria Used for Impact Rating	
Extent	• On-site – Limited to within the site boundaries • Local – impacts that affect an area in a radius of 2km around the sites. • Regional – impacts that affect regionally important resources or are experienced at traditional authority or district scale. • National – impacts that affect nationally important resources or affect an area that is nationally important/ or have macro-economic consequences. • Transboundary/International – impacts that extend beyond country borders or affect internationally important resources.

Criteria Used for Impact Rating	
Duration	• Temporary – impacts are predicted to be short duration and intermittent/occasional. • Short-term – impacts that are predicted to last only for the duration of the construction period. • Long-term – impacts that will continue for the life of the Project but cease when the Project stops operating. • Permanent – impacts that cause a permanent change in the affected receptor or resource (*e.g.* removal or destruction of ecological habitat) that endures substantially beyond the Project lifetime.
Likelihood	• Unlikely – The impact is unlikely to occur. • Likely – The impact is likely to occur under most conditions. • Definite – The impact will occur.

Magnitude	• Magnitude can be considered in terms of the sensitivity of the receptor:
	  ○ Negligible – the impact is not detectable.
	  ○ Low – the impact affects the environment in such a way that natural functions and processes are not affected.
	  ○ Moderate – where the affected environment is altered but natural functions and processes continue, albeit in a modified way.
	  ○ High – where natural functions or processes are altered to the extent that it will temporarily or permanently cease.

Table 3-5: Impact Significance or Severity Criteria

Significance Criteria	
Negligible Significance	An impact of negligible significance is where a resource or receptor will not be affected in any way by a particular activity, or the predicted effect is deemed to be imperceptible or indistinguishable from natural background levels.
Low Significance	An impact of low significance is one where an effect will be experienced, but the impact magnitude is sufficiently small and well within accepted standards, and/or the receptor is of low sensitivity/value.

Significance Criteria	
Moderate Significance	An impact of moderate significance is one within accepted limits and standards. The emphasis for moderate impacts is on demonstrating that the impact has been reduced to a level that is as low as reasonably practicable (ALARP). This does not necessarily mean that "moderate" impacts have to be reduced to "minor" impacts, but that moderate impacts are being managed effectively and efficiently.
High Significance	An impact of high significance is one where an accepted limit or standard may be exceeded, or large magnitude impacts occur to highly valued/sensitive resource/receptors. A goal of the ESIA process is to get to a position where the Project does not have any major residual negative impacts, certainly not ones that would endure into the long term or extend over a large area. However, for some aspects there may be major residual impacts after all practicable mitigation options have been exhausted (i.e. ALARP has been applied). An example might be the visual impact of a development. It is then the function of regulators and stakeholders to weigh such negative factors against the positive factors, such as employment, in coming to a decision on the Project.

3.4 Study Limitations

The compiled dataset that contains the results of the surveys has evidence of missing data. This is largely due to human error during the data collection process, as well as respondents making use of their right to withhold information on certain aspects of their lives.

4 The Existing Environment

This section presents the summary of the results of the assessment of the existing physical, ecological, socioeconomic, and archaeological environment, respectively. These results were elaborated in the Baseline Report which preceded this SEA, which was Deliverable 2 under this project.

4.1 The Study Area

The area which comprises this study includes the greater NHC and the surrounding environs which has been identified as the area designated for the Government Campus Development. This is described in the Master Plan, as centrally located given the space required for government ministries, departments, and agencies, which will allow for increased centralization of government services and business. (Figure 11: Satellite Imagery of the Project Area. The area currently consists of residential and commercial dwellings, with intense human activities.

4.2 Physical Environment

4.2.1 Topography, Hydro-stratigraphy, Geology and Soil

The project area is located in the south-central section of Kingston & St. Andrew sitting atop the Liguanea Plain. The area is generally flat with elevations not exceeding 50 meters above sea level. In the absence of vegetation and green spaces, the project area is surrounded by community built-up areas inclusive of the neighborhood communities of Jones Town to the west and Allman Town to the east, as well as the notable commercial community of Cross Roads to the north. Additionally, there are a number of road networks that border the project area which facilitate ease of accessibility such as South Camp Road, Slipe Pen Road and Devon Avenue. Furthermore, the project area encompasses the National Heroes Park, which is an area of cultural significance hosting numerous monuments and burial sites of many prominent Jamaican figures on 52 hectares of land, making it the largest open space in Kingston. Although the area is relatively close to the island's south coast (radius ~ 2 km), it is not affected by waves or tidal driven coastal processes. Figure 4-1 illustrates the sites on the topographic map.

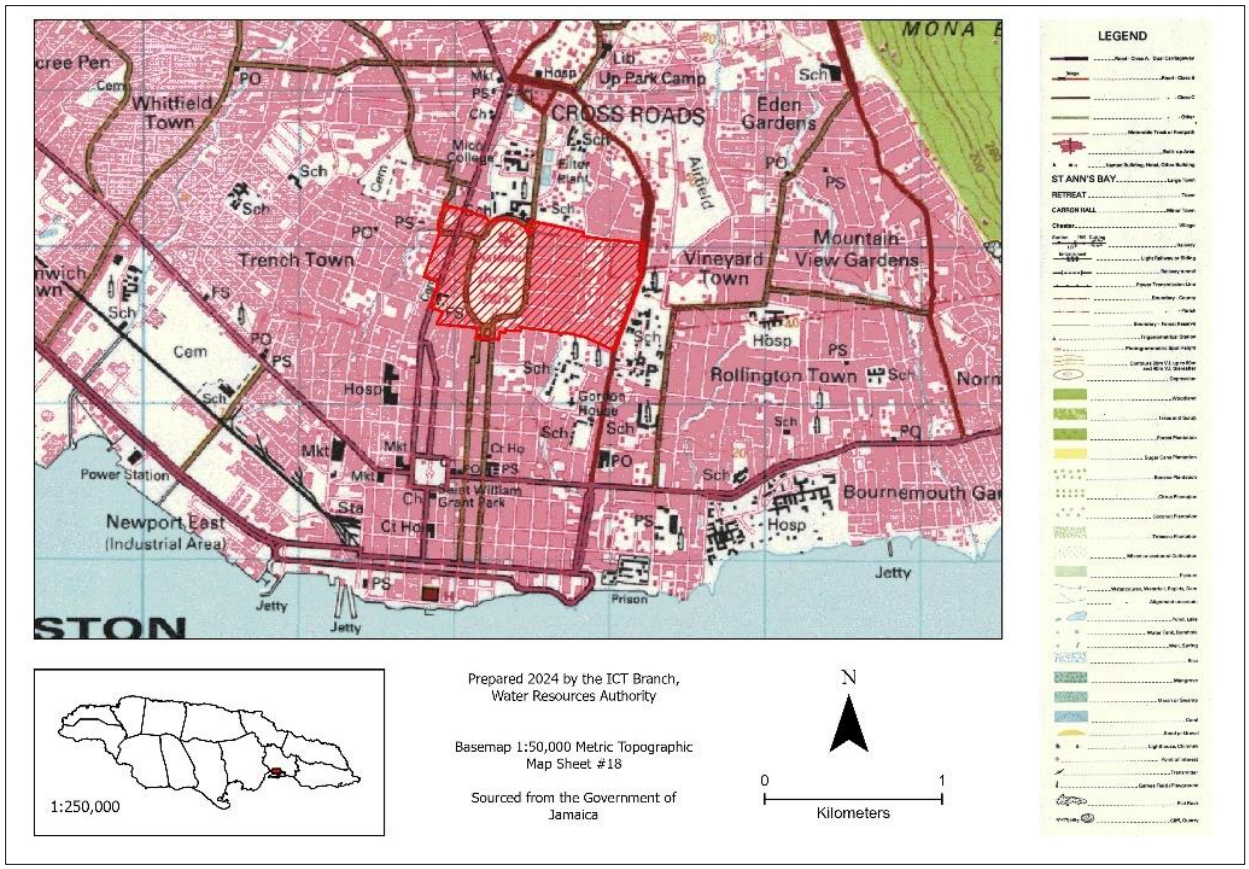


Figure 4-1: Topographic Map showing the Project Area

There are three (3) gullies within the project area, namely the Mico Gully, Admiral Town Gully and Barnes Gully that could pose challenges to the site and surrounding developments if there are structural failures or overflows (Figure 4-2). These gullies are responsible for transporting excess runoff from communities north of the project site. Additionally, within close proximity surrounding the project site are several pumping wells with a few abandoned and non-pumping wells. Notably, there is an unclassified well located within the site boundary.

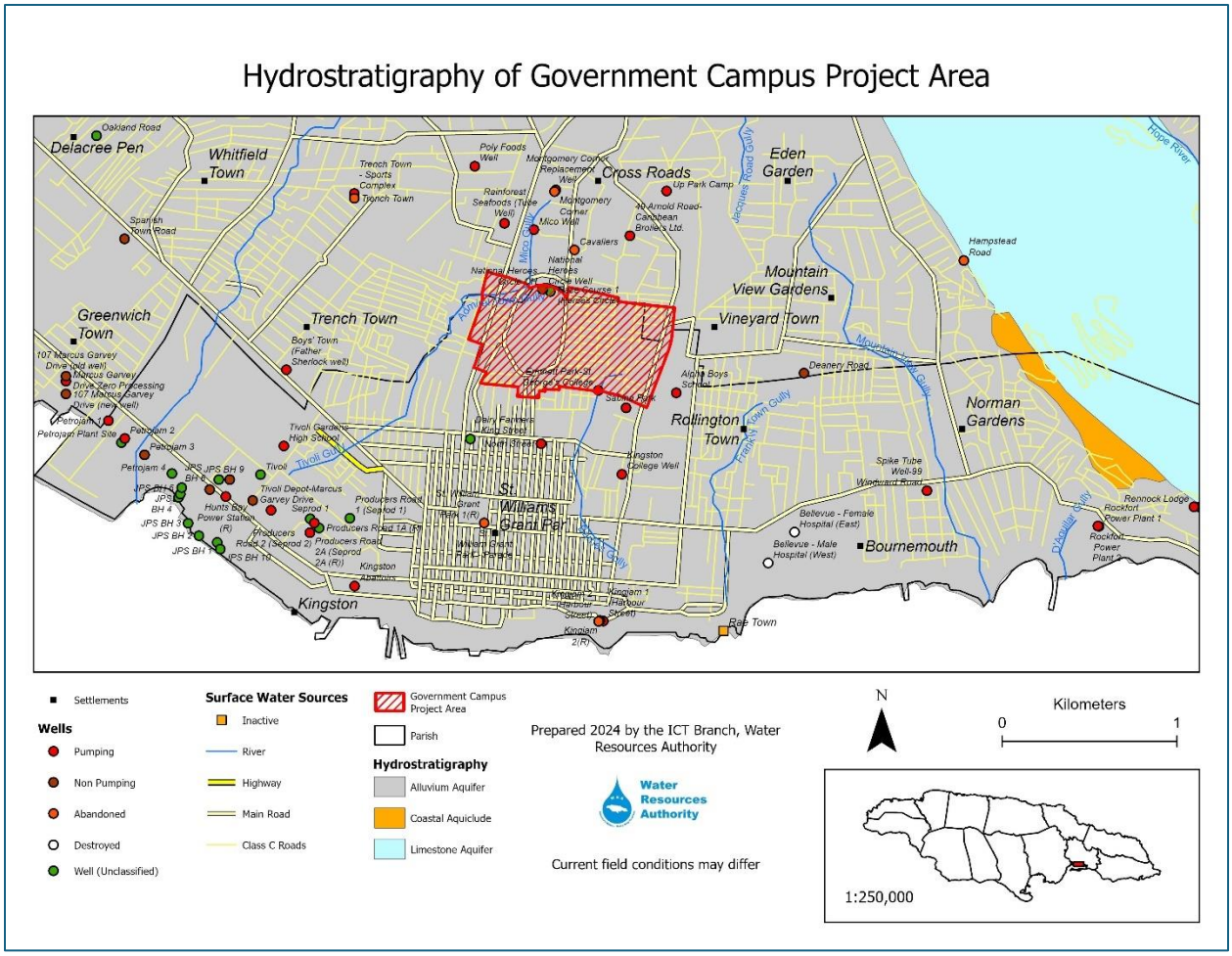


Figure 4-2: Hydrostratigraphy Map showing the Project Area

The project area's geology is primarily comprised of alluvium (Figure 4-3), which is the loose unconsolidated material that has been deposited by a river or stream on its floodplain, delta or fan at the base of a mountain slope (Miller and Juilleret 2020). As previously mentioned, the project area is situated on the Liguanea Plain, which in actuality is an alluvial fan that was formed due to the fluvial processes of the Hope River (Wiggins-Grandison, Kebeasy, and Husebye 2003). The geological composition of this alluvial fan consists of poorly sorted layers of sand, gravel and clay.

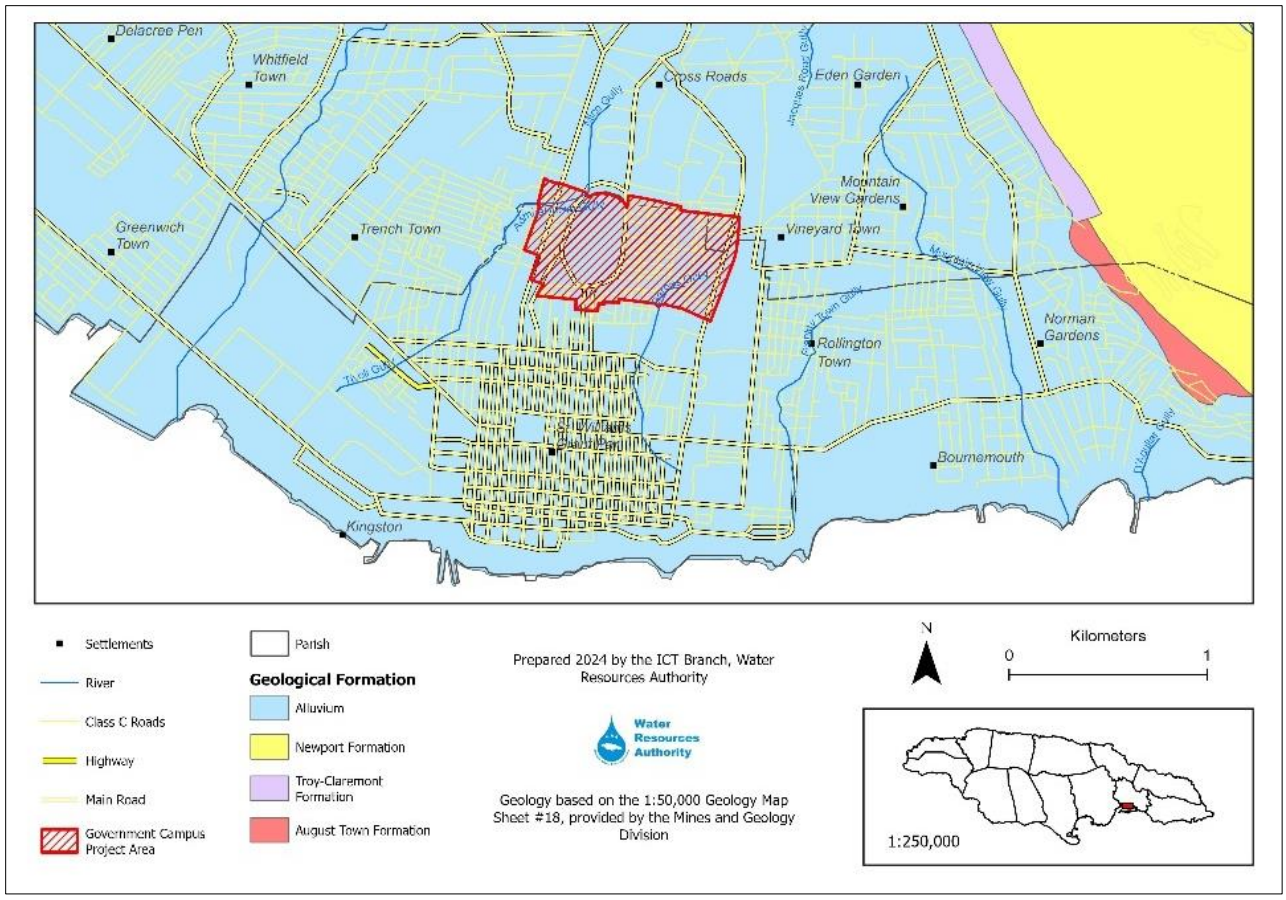


Figure 4-3: Geology Map of the Project Area

This geological composition of the alluvial fan is evident in the makeup of the project area as there is an overlying soil matrix of gravelly clay loam (Figure 4-3 and Figure 4-4). According to the classification of soil particle sizes by the International Union of Soil Science (IUSS), clay particle sizes are less than 0.002 millimeters (mm) whereas any particle larger than 2.0 mm are classified as gravel (Mohan and Prasadini 2019). Loam soils are combination soils, containing a mixture of clay, silt and sand in varying concentrations which influences their characterization.

Clay soils have a high concentration of fine mineral particles that are tightly packed together. This structural composition influences the soil's behaviour when exposed to moisture. Once exposed to moisture, clay soil absorbs water and exhibits high moisture retention rates, often causing the soil to expand and become waterlogged as the particles become packed tightly together. The presence of gravel sized particles in the soil matrix may increase the porosity of the soil, however depending on the exact size of the particles within the project area they may affect the stability of the soil. On the other hand, when exposed to drying conditions clay soils shrink as the particles lose their ability to hold water. The behaviour of clay soils in the presence or absence of moisture may lead to structural issues such as cracks in the infrastructure constructed above the soil layer.

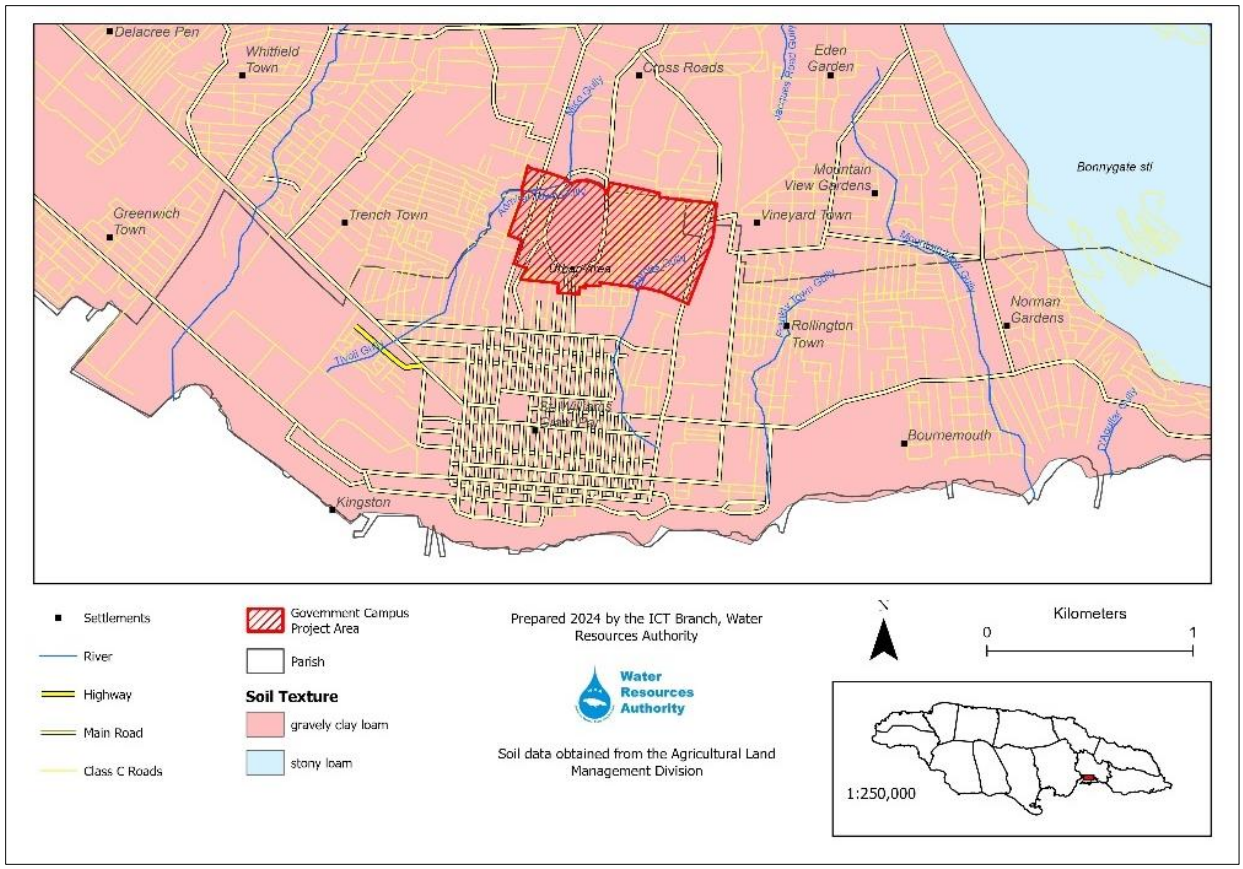


Figure 4-4: Soil Map for the Project Area

4.2.2 Land Use and Zoning

Data from the National Spatial Data Management Branch of the Land Information Council of Jamaica (LICJ) shows that the majority of the Kingston and St. Andrew (KSA) region, particularly the southern half of the region is primarily used for urban/industrial purposes (see Figure 4-5). The Development Order for the KSA region proposes that the heavily urbanized area be used as a multi-purpose zone – for commercial, residential, recreational and statutory purposes.

The Government Campus Project area encompasses a region that is zoned mainly as a residential area; residential areas are mainly located in the eastern section of the project area, east of the NHC. The NHC itself is zoned as an area of recreational purpose and dominates the west-central region of the project area. Furthermore, as there are several offices of key governmental ministries surrounding the NHC, this area is also zoned for the purposes of governmental and statutory undertakings. With the presence of educational institutions in the project area, namely the Kingston High School in the southwestern section of the project area and the Allman Town Primary School to the north, educational activity is accounted for in the parish's development order. With the project area encompassing different activities, it stands a risk that the proposed development may alter the land use patterns and may require a revision of the area's zonation.

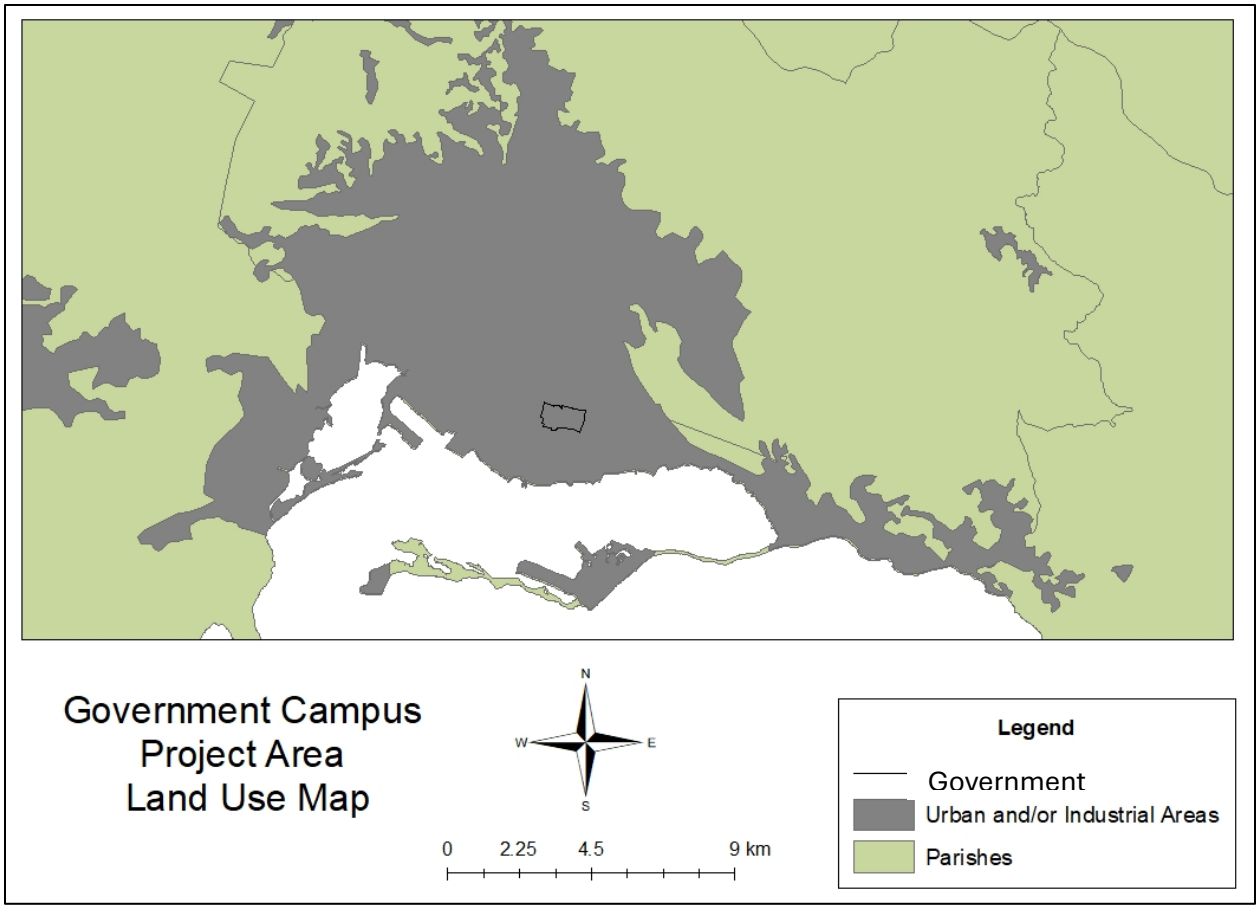


Figure 4-5: Land Use Map for the Project Area

Satellite Imagery from 2002 and 2024 shows that the changes that have taken place in the area have been limited to mainly development in residential areas. East of the project area underwent the greatest extent of development with the expansion of the residential areas (Figure 4-6).

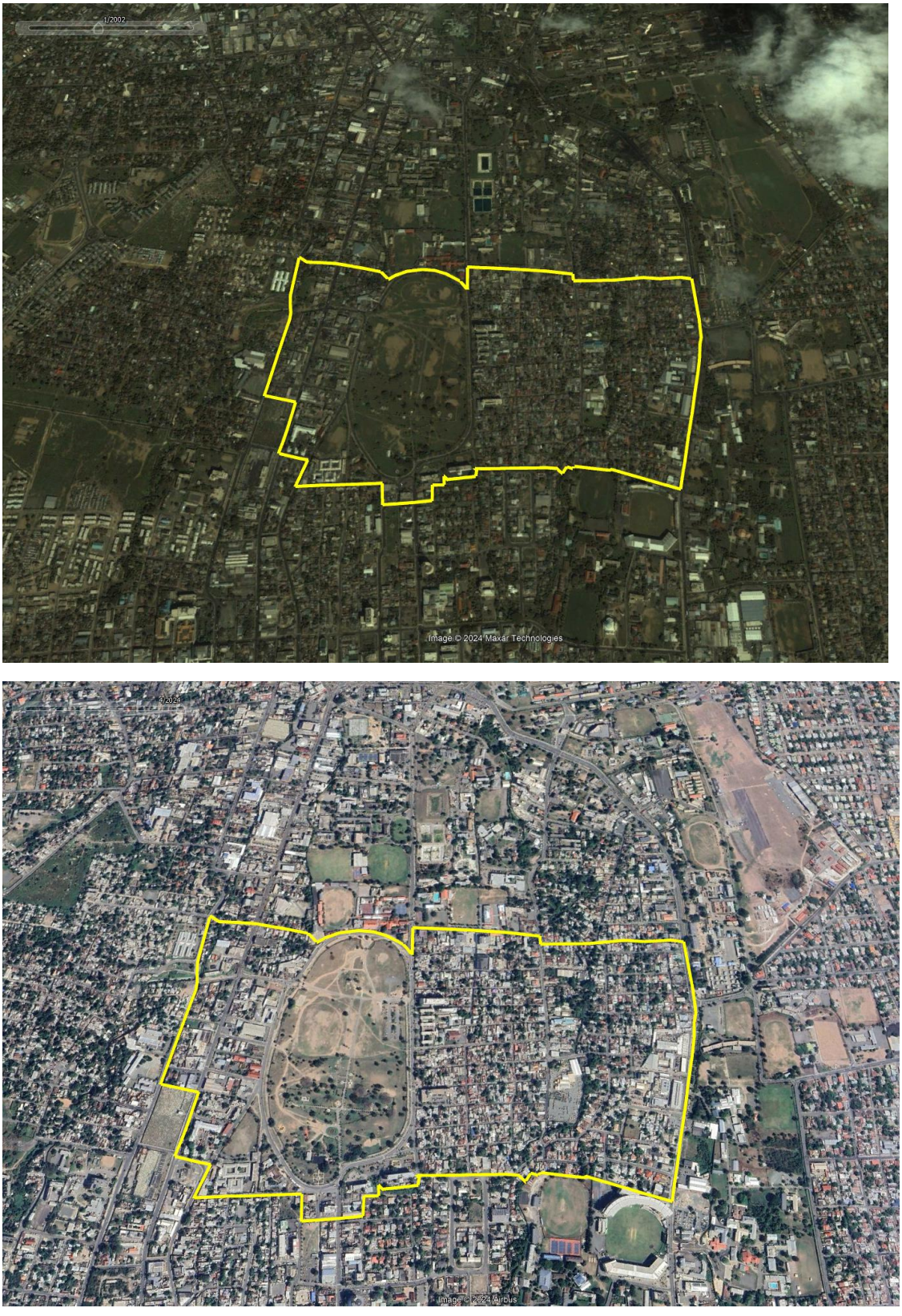


Figure 4-6: Satellite Images of the Project Area 2002 (top) and 2024 (bottom)

4.2.3 Climate

4.2.3.1 Temperature

Jamaica experiences a Tropical Marine climate that is driven by the influence of the North East Trade Winds and the warm waters of the surrounding Caribbean Sea. The island experiences relatively small variations in temperature with the most significant differences occurring due to localized effects such as altitude, distance from the sea and proximity to the island's hilly interior. Temperature observations recorded at the Norman Manley International Airport (NMIA), which is relatively close to the project area (straight line distance ~ 5 km), revealed that average minimum temperatures can be as low as 23℃ during the months of January – February (see Figure 4-7).

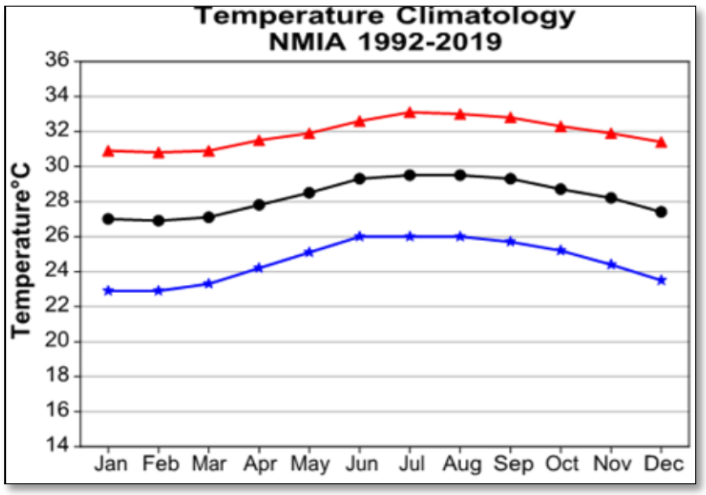


Figure 4-7: Temperature Climatology Recorded at the Norman Manley International Airport (NMIA). Maximum temperatures -red, minimum temperatures -blue and average temperatures -black

However, during the summer months (i.e. June – August) the average maximum temperatures can increase to up to 33℃. Considering that Kingston is generally flat, there is no great change in altitude that would give rise to the effect of environmental lapse rates (ELR) – changes in temperature experienced with increasing altitude. Furthermore, the absence of widespread vegetation such as forests and trees in the largely urban area of Kingston enhances the urban heat island effect in which warmer temperatures are experienced as opposed to surrounding areas. Climate change is expected to cause increasing temperatures for the island, further exacerbating this heat island effect. The 2019 State of the Jamaican Climate Report outlines that Jamaica has been on a warming trend that is consistent with global rates and is expected to remain on this trajectory through to the end of the century. General Climate Models have indicated that average temperatures are projected to increase by 0.65℃ - 0.84℃ by the 2030s, 0.86 ℃-1.10℃ by the 2050s and by 0.82℃-3.09℃ by 2081- 2100. It is also projected that at the NMIA, the average monthly maximum temperature is projected to increase by 0.18℃-1.3℃ by early mid-century. These projections in essence, suggest that Jamaica will be much warmer in the coming years, with urban centers such as Kingston experiencing heightened temperatures due to the enhanced greenhouse effect and its exacerbating effects on climate change in urban areas.

4.2.3.2 Rainfall

Jamaica has a bimodal rainfall pattern that is experienced across all parishes and is characterized by two wet seasons, the first of which is termed the early rainfall season (April – June) and the late rainfall season (September – November) (Figure 4-8). These rainfall seasons are separated by the midsummer drought that typically takes place in July, which is then followed by a longer dry period from December – March each year. The highest rainfall peaks are recorded in the months of May and October, while the lowest values are experienced in February and March.

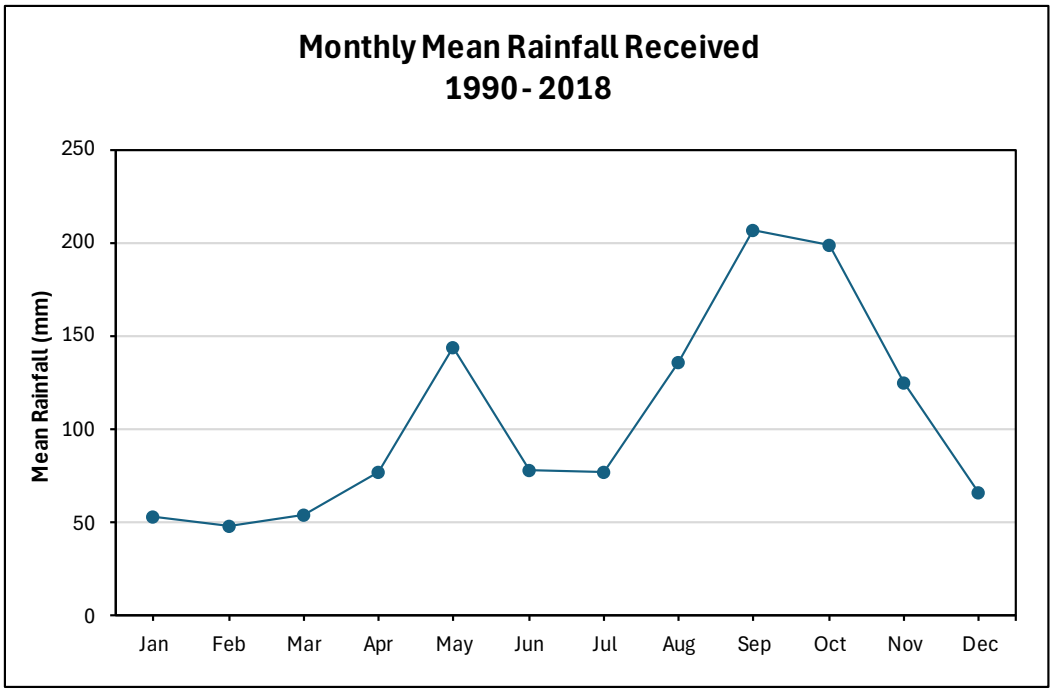


Figure 4-8: Monthly Mean Rainfall Received in Kingston and St. Andrew (1990-2018)

With the onset of climate change, General Climate Models have projected that by the 2030s, the island will be drier by up to 4% in the 2030s, 9% in the 2050s and up to 21% by the end of the century which is attributed to changes in the late rainfall season. This therefore means that the project area will begin experiencing an increase in drying conditions, which is also expected to be influenced by the El Niño Southern Oscillation (ENSO). Climate change is projected to increase the frequency of ENSO events which plays a role in the presence (or lack thereof) of rainfall events within the island. During an El Niño year (occurs every 3-5 years; 1 year duration), the island experiences drier and hotter conditions especially during the late wet season.

4.2.3.3 Current State

Temperature and rainfall data acquired from the Meteorological Service of Jamaica for the period 2020-2023 has shown decreasing rainfall trends and increasing temperatures (Figure 4-8: Monthly Mean Rainfall Received in Kingston and St. Andrew (1990-2018)). The graph depicted in Figure 4-9: Temperature and Rainfall Climatology for the Project Area Recorded at the MICO UC Automatic Environmental Solutions Limited

Weather Station (Retrieved from the Meteorological Service of Jamaica), differs slightly from that shown in Figure 4-7 and Figure 4-8 with respect to historical temperature and rainfall trends. The month of January remains the coolest month with temperatures beginning a steady climb to reach a peak in July, before decreasing as the winter months approach. However, the rainfall data does not display the typical monthly biannual peaks that take place throughout the year in the early and late rainfall seasons. The highest rainfall values were recorded in November, with January having the second highest values. Typically, an early peak would be observed in May and the later peak in October; however, these months were found to have the lowest rainfall values. These changes could possibly be linked with the occurrences of weather events that brought dry and wet conditions.

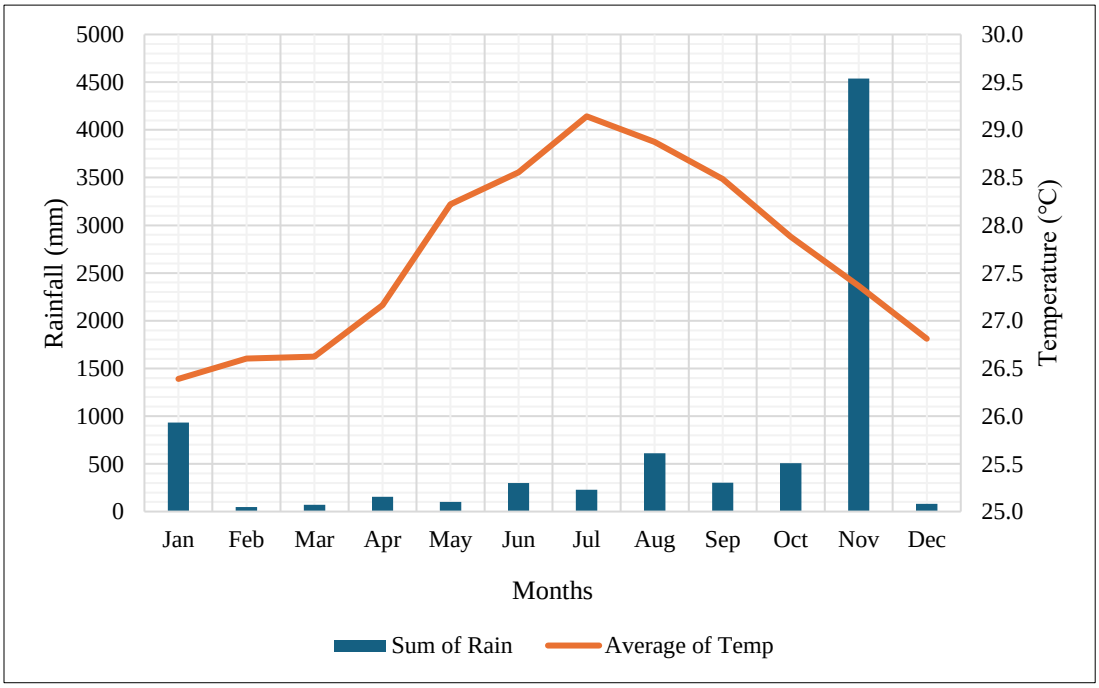


Figure 4-9: Temperature and Rainfall Climatology for the Project Area Recorded at the MICO UC Automatic Weather Station (Retrieved from the Meteorological Service of Jamaica)

4.2.4 Hydrology

The hydrological regime of the main catchments and the project area was investigated to determine the runoff flow rate and velocities to aide in determining the adequacy of the existing drainage system and to assist in developing solutions at the identified areas within the project area. The land use of the catchment was used as a basis for defining the various flow characteristics associated with having varying terrain within the model. The existing land use contributes to increased impervious surfaces, which can impact natural drainage patterns and exacerbate flood risks.

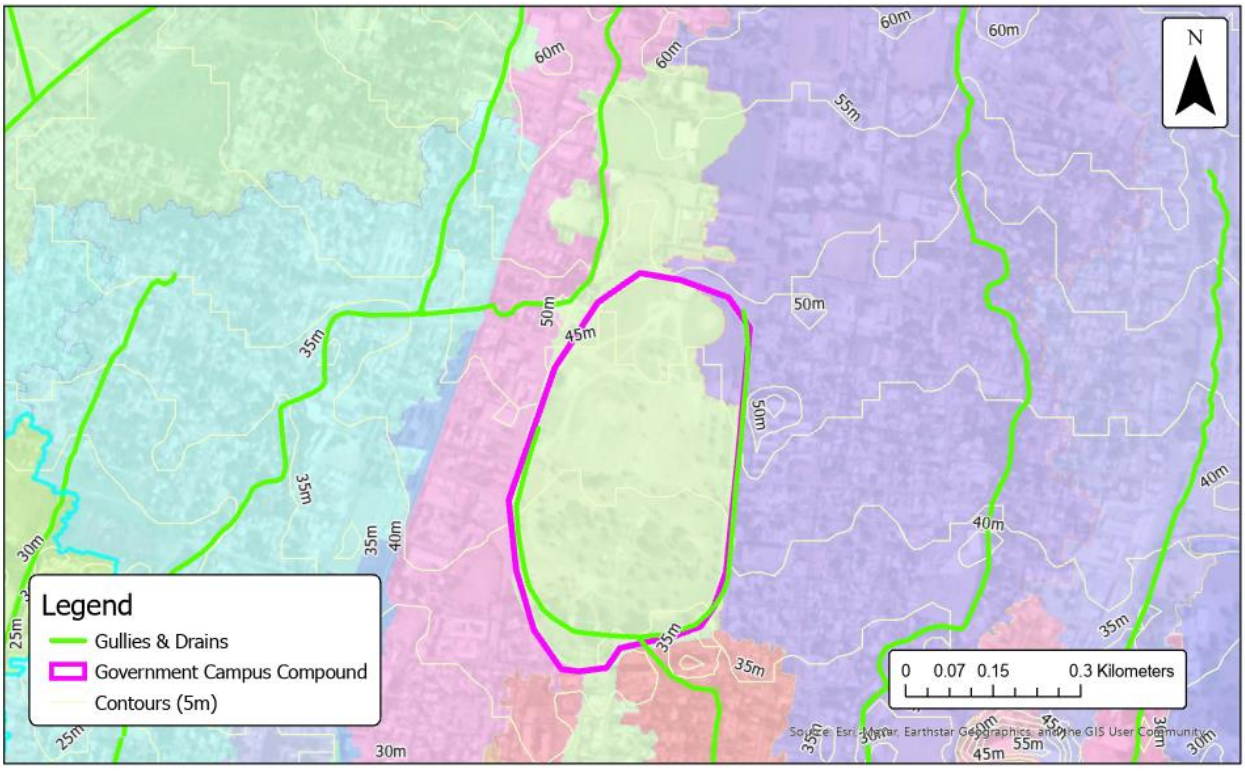


Figure 4-10: Contributing catchment areas around project area.

4.2.4.1 Existing Infrastructure

The existing stormwater management system for the proposed government campus area controls and redirects accumulated water through a network of drop inlets and underground drainage. These inlets capture stormwater from various points around the compound, ensuring that surface water does not pool or cause flooding. The collected water is then channeled into a larger drainage system that encircles the compound, ultimately discharging into Barnes Gully, which directs the flow toward the southern coastline.

This assessment was supported by the Mona GIS Hazard Map which corroborates that the site is not prone to flooding or significant water-related hazards.

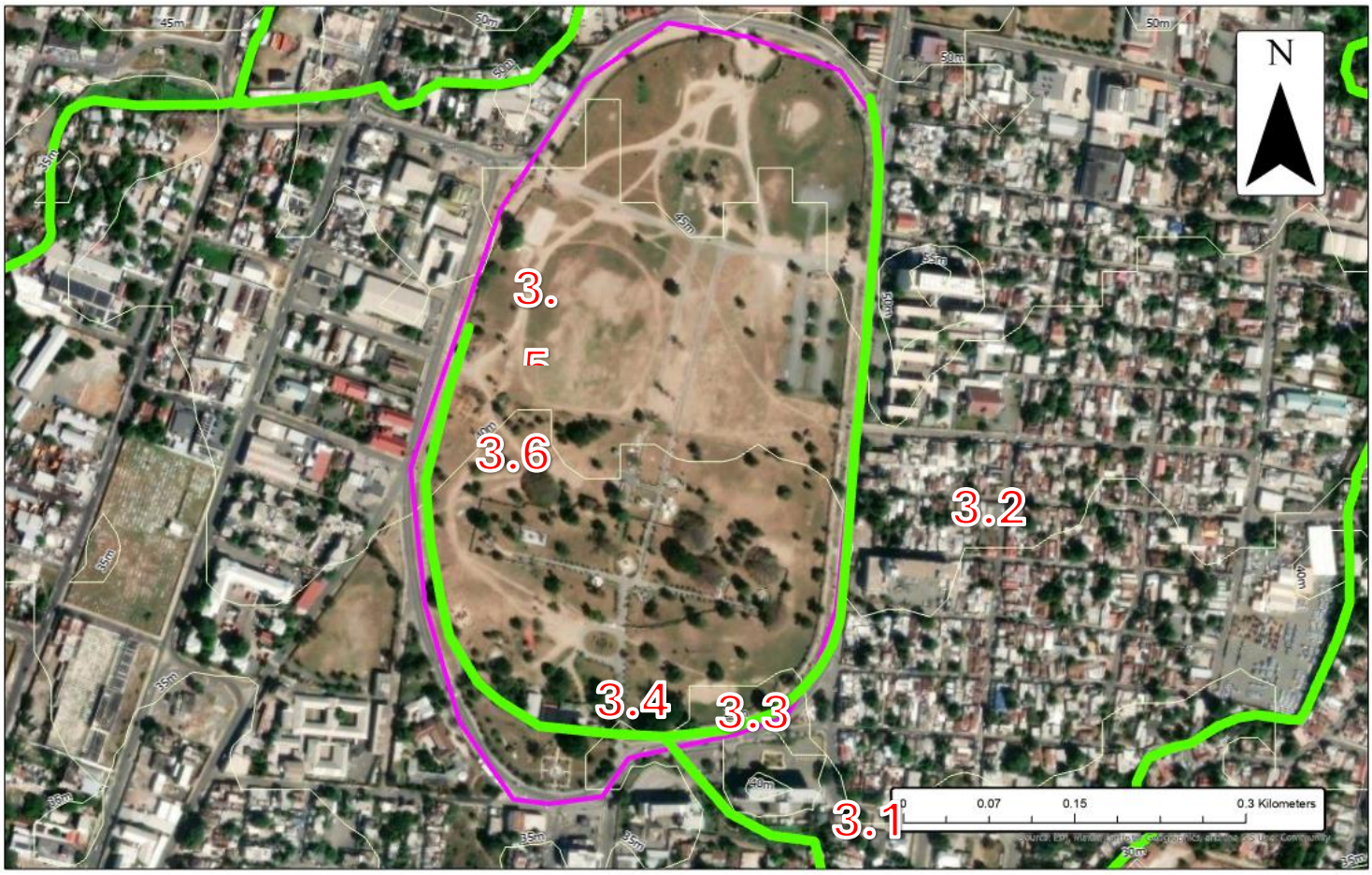


Figure 4-11: Map of major drainage features in the project area

Figure 4-12: Photo of Barnes Gully

Figure 4-13: Inlet leading to underground drainage system

Figure 4-14: Inlet leading to underground drainage system

Figure 4-15: Existing Heroes Circle internal drain (uncovered)

Figure 4-16: Kerb Drain along perimeter of compound

Figure 4-17: Existing Heroes Circle internal drain (covered)

Table 4-1: Channel Analysis Summary

Drain	Description	Capacity	Condition
Compound Perimeter Drain	Approx. 0.45m x 0.45m, ~2% slope (at observed area) Concrete Drain	0.95 m^3/s	Poor Condition in some sections, with damaged concrete covering, and blockage on the exterior sections.
Barnes Gully	Approx. 2m x 1.2m, ~3% slope (at observed area) Concrete Drain with Low Flow Channel	16.8 m^3/s	Good Condition, with no blockage observed.

4.2.4.2 Rainfall (Precipitation) Analysis: Rain Gauges and Climate Change Projections

Depth of rainfall for various return periods was provided by the National Meteorological Service of Jamaica for the gauges across the island. The rainfall intensity for various return periods was generated from 24-hr rainfall data provided by the National Meteorological Service of Jamaica for the rain gauges within the project area and processed. The rainfall gauges selected for the purpose of the project were the Cavaliers and Half Way Tree due to their close proximity to the study area. Via a request to Meteorological service of Jamaica additional raw daily precipitation values between the years of 2013-2023, were provided.

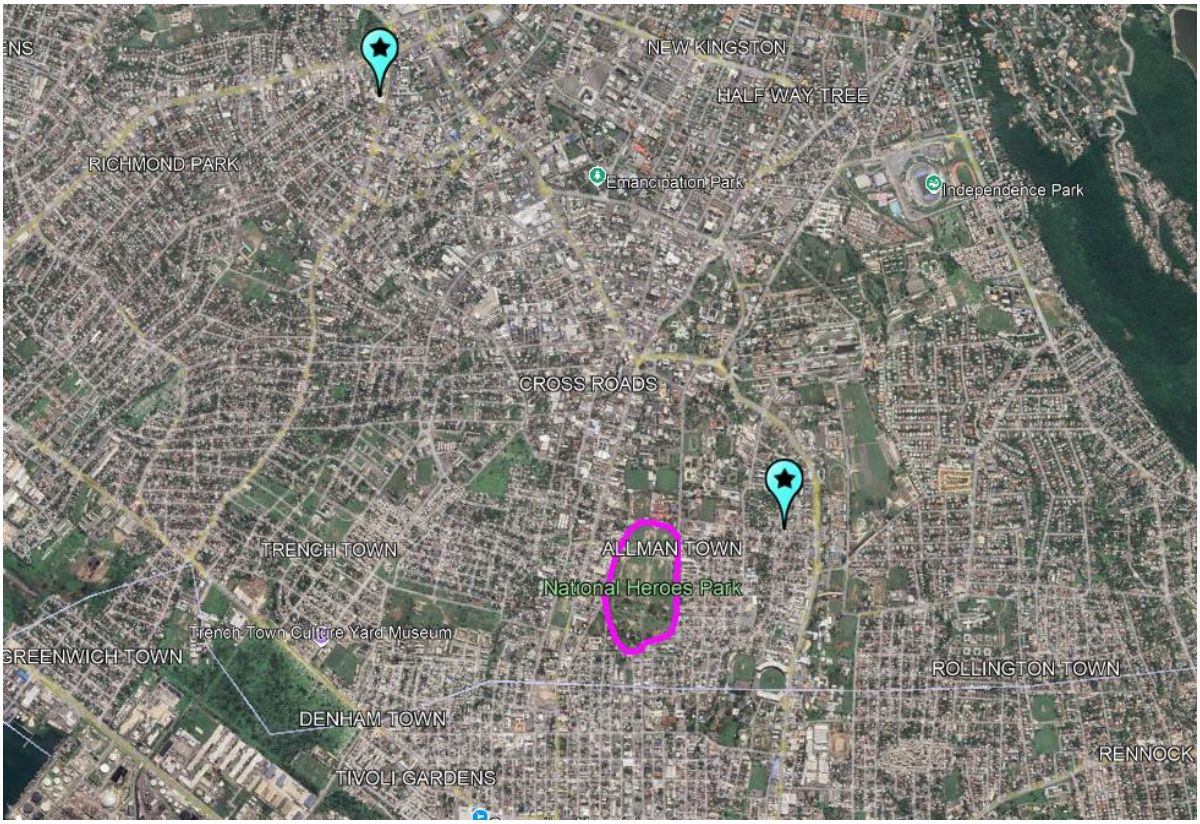


Figure 4-18: Map of Project Area showing Rainfall Gauges

Table 4-2: Rainfall Intensities for the Rain Gauges near project area

Return period (years)	Cavaliers (mm)	Half Way Tree (mm)
2-Year	181	97
5-Year	266	146
10-Year	346	183
25-Year	469	230
50-Year	572	266
100-Year	682	301

Future climate extreme rainfall was estimated based on the findings and recommendations of IPCC (2018)**Invalid source specified.**. This estimation is based on the probability ratio of heavy precipitation as a function of global warming and event probability (Figure 4-19). Climate change factors for the 2-yr, 25-yr, 50-yr and 100-yr were determined to be 1.2 to 1.45 for the 2°C above pre-industrial levels. Climate Change Factors (CCF) were applied to the present climate 24-hour rainfall depth extremes to determine the estimated future climate rainfall extremes as depicted in present climate (IPCC 2018) and estimated future climate 24-hour rainfall depths at 2°C.

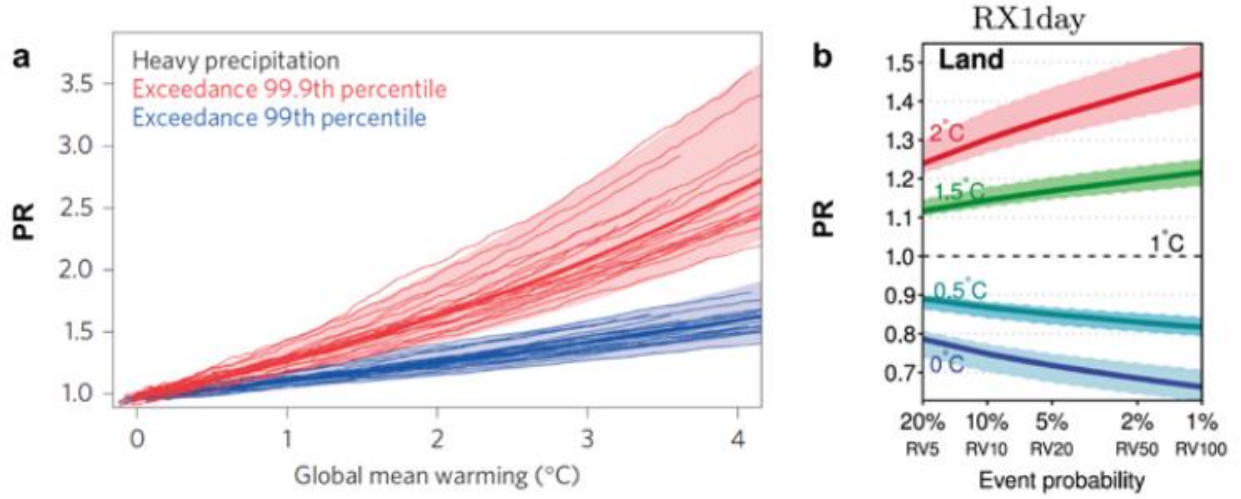


Figure 3.10 | Probability ratio (PR) of exceeding (heavy precipitation) thresholds. (a) PR of exceeding the 99th (blue) and 99.9th (red) percentile of pre-industrial daily precipitation at a given warming level, averaged across land (from Fischer and Knutti, 2015). (b) PR for precipitation extremes (RX1day) for different event probabilities (with RV indicating return values) in the current climate (1°C of global warming). Shading shows the interquartile (25–75%) range (from Kharin et al., 2018).

Figure 4-19: Probability Ratio (PR) of Exceeding (Heavy Precipitation) Thresholds

Table 4-3: Rainfall Intensity Return Periods for Cavaliers and Half Way Tree

Return period (years)	Cavaliers (mm) Present	Cavaliers (mm) Future	Half Way Tree (mm) Present	Half Way Tree (mm) Future
2-Year	181	182.82	97	98.82
5-Year	266	270.00	146	150.00
10-Year	346	353.69	183	190.69
25-Year	469	487.52	230	248.52
50-Year	572	607.71	266	301.71
100-Year	682	750.97	301	369.97

4.2.4.3 Rainfall Hyetograph

A hyetograph is the distribution of rainfall intensity over time. For example, in the 24-hour rainfall distributions developed by the Soil Conservation Service, rainfall intensity progressively increases until it reaches a maximum then gradually decreases. The Type III rainfall distribution curve was used for this assessment as it most accurately reflects the 24-hour rainfall distribution experienced by the island. Rainfall Hyetographs were generated using the present and future climate conditions extreme rainfall and used to model the respective return periods.

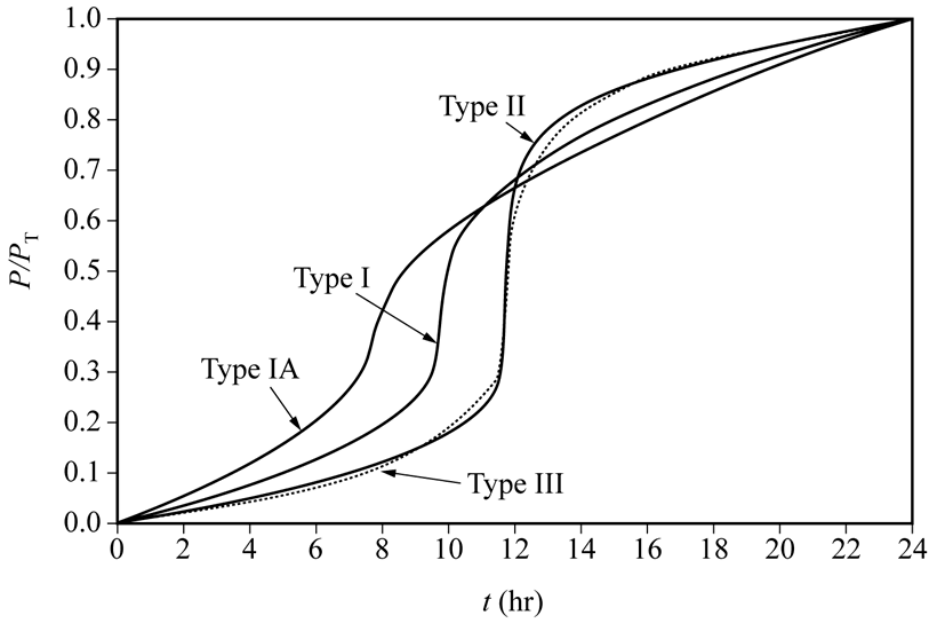


Figure 4-20 Typical cumulative distribution curve for varying types of 24-hour rainfall distribution.

4.2.4.4 IDF Curves

The 24-hour rainfall data was then redistributed based on the NWA drainage guidelines tables for precipitation and duration relationships. This redistribution was used to formulate a series of IDF curves for the varying return periods.

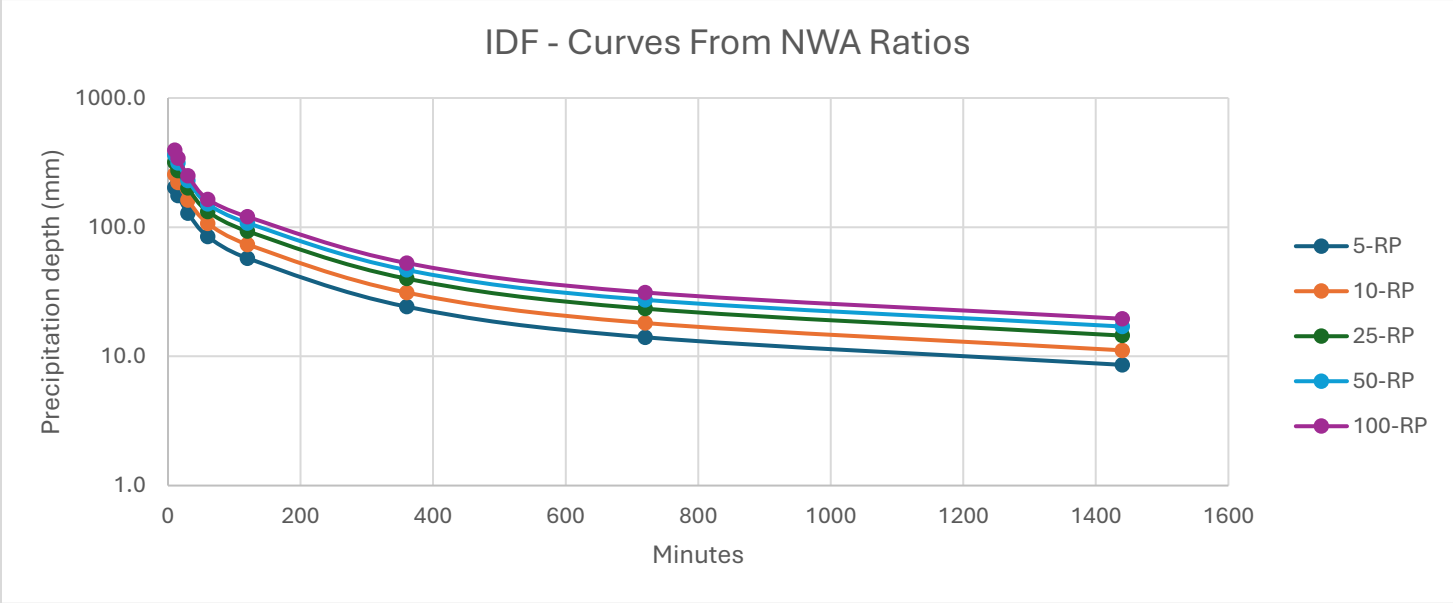


Figure 4-21: IDF Curves from NWA Ratios

4.2.4.5 Flood Plain Modelling

A range of scenarios was investigated to determine the sensitivities to: climate state, land use and return period. These are summarized below:

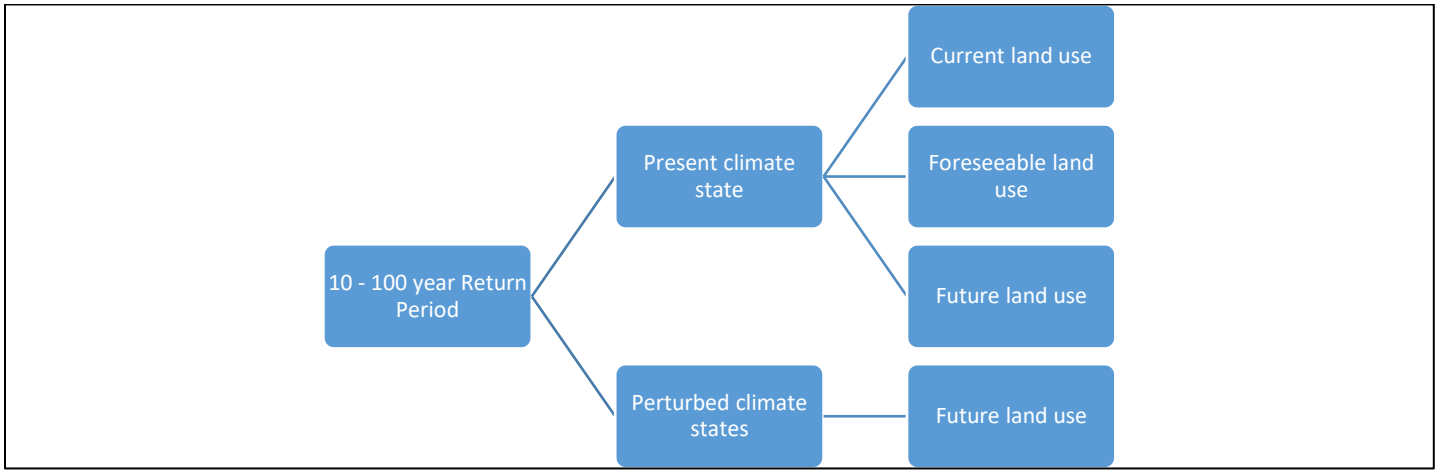


Figure 4-22. Scenarios for hydrological runoff modelling.

After land use projections, the hydraulic models were used to inform the approach and make recommendations to the existing drainage system(s) to explore cost effective options. Several strategies were explored including:

- Rehabilitation
- Maintenance
- New drainage works:
  - Soft solutions will be explored, including detention ponds and earth swales
  - Hard solutions will also be engineering were required: bridges, check dams, drains and lining.

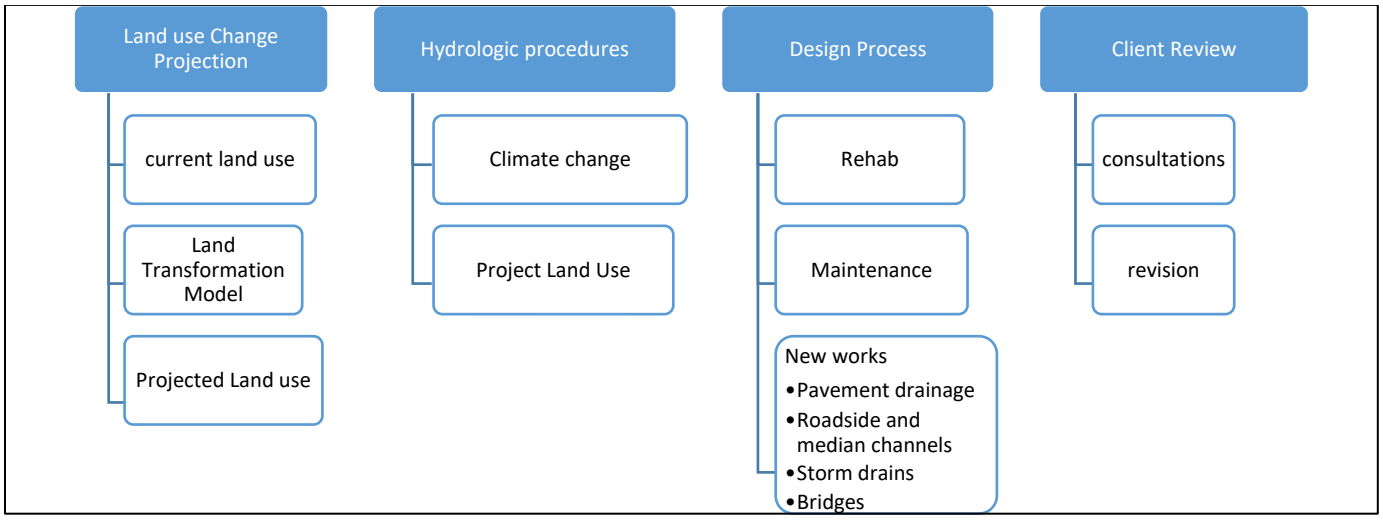


Figure 4-23 Methodical approach to land use changes

A design flood hydrograph or the instantaneous peak discharge was derived for each catchment and for each design cross section. Three variations of the hydrograph was explored including:

Climate resilence was built into the management measures by consider the change in meteorological events or in the change in the hydrological response of the basin due to anthropogenic influences due to the growth of population and higher standards of living/intensified land development. These factors can lead to:

1. increased volumes and peak flows of surface runoff; and
2. increased sediment transport.

The outputs of the floodplain models were assessed to determine the sites vulnerability to flooding due to a spectrum of rainfall events, with return periods (RP) ranging from 2 years to 100 years. This analysis is crucial in determining the potential flood risks for the project area under varying storm conditions, ensuring that any potential issues can be addressed preemptively. The 2-Yr, 10-Yr, and 100-Yr scenarios were highlighted as they represent the most important critical events to in understanding the performance of the project area. It must be noted that the depths observed were largely as a result of imperfections surface model, as pooling is highly unlikely due to the topography of the project area.

4.2.4.5.1 2 – Yr RP

The 2 – Yr RP event was selected as it represents the relatively common occurrence of heavy rainfall, especially during the hurricane season. The flood map indicates instances of minor pooling on the existing compound, with observed depths of ~0.35m to the south of the compound. See Figure 4-24 for Flood Plain Map of project area for this Return Period.

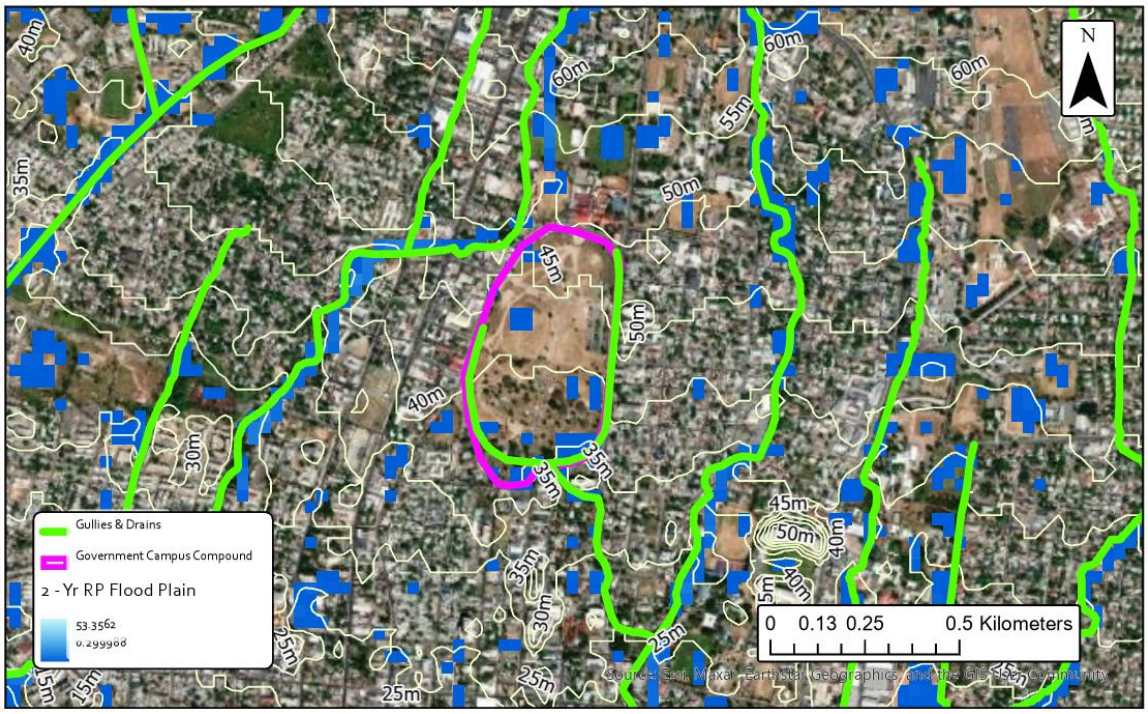


Figure 4-24: 2 - Yr RP Flood Plain Map

4.2.4.5.2 10 – Yr RP

The 10 – Yr RP event was selected as it represents the requirements outlined by the NWA in their Drainage Guideline Document[1]. The flood map indicates instances of minor pooling on the existing compound, with observed depths of ~0.5m to the south of the compound as with the 2-Yr RP. See Figure 4-25 for Flood Plain Map of project area for this Return Period.

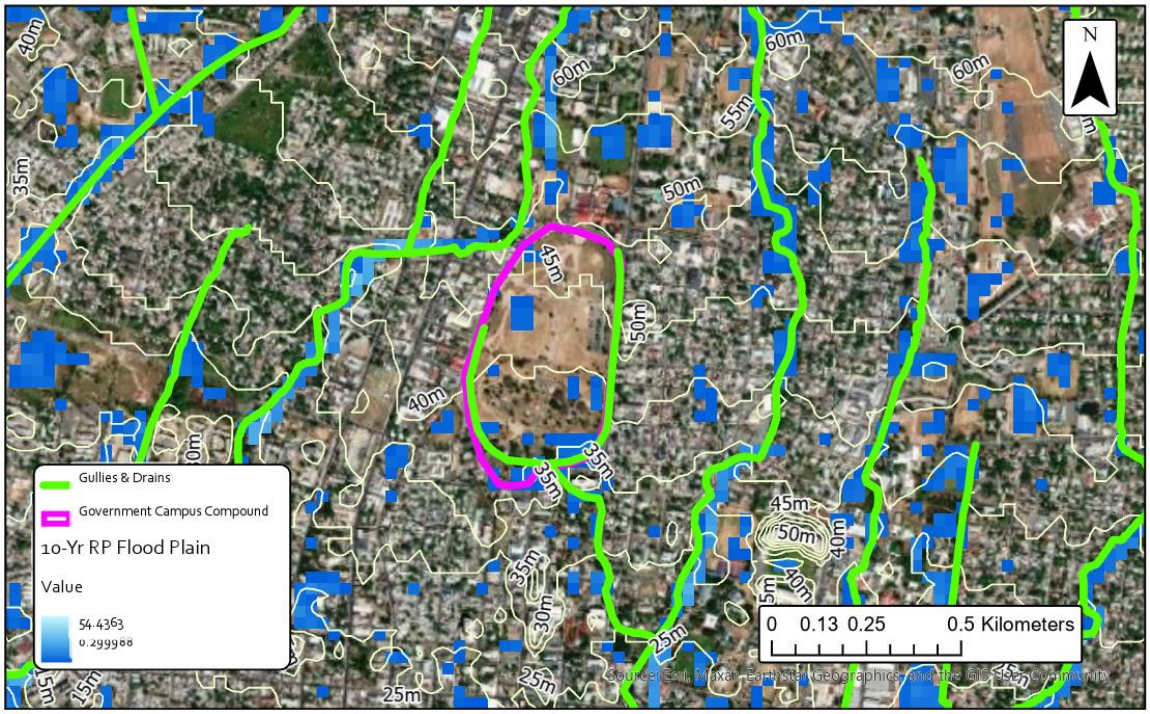


Figure 4-25: 10 - Yr RP Flood Plain Map

4.2.4.5.3 100 – Yr RP

The 100 – Yr RP event was selected as it represents an extreme storm/hurricane scenario. The flood map still indicates instances of minor pooling on the existing compound, with observed depths of ~0.6m to the south of the compound as with the previous scenarios. See Figure 4-26 for Flood Plain Map of project area for this Return Period.

[1] National Works Agency. (2015). Guidelines for Preparing Hydrological and Hydraulic Design Reports for Drainage Systems of Proposed Developments (Final version).

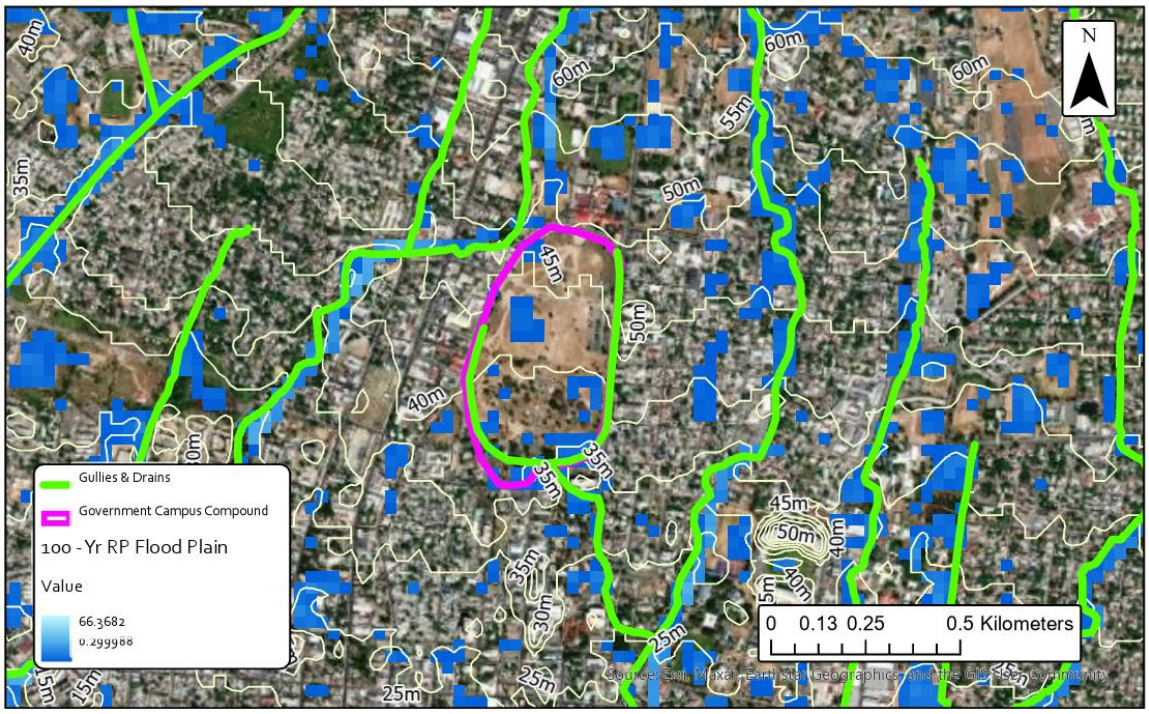


Figure 4-26: 100 - Yr RP Flood Plain Map

The scenarios were selected to represent both common and extreme weather events, particularly during hurricane season. The analysis identified minor pooling on the southern side of the compound across all scenarios, with depths ranging from approximately 0.35m for the 2-Year RP, 0.5m for the 10-Year RP, and 0.6m for the 100-Year RP.

The observed flooding pattern suggests that these flood depths are largely due to imperfections in the surface model rather than actual topographical conditions, as significant pooling is unlikely given the natural elevation of the project area.

4.2.4.6 Hydraulic Performance

4.2.4.6.1 Pre-Development

The pre-development analysis of the hydraulic performance assessed the peak runoff rates for storm events with return periods of 2, 10, and 100 years. This baseline data is crucial for understanding the natural flow of stormwater before any modifications to the site. For the 2-Year Return Period (RP), the peak runoff was measured at 6.24 m^3/s, indicating typical runoff levels for frequent storms. The 10-Year RP, which corresponds to more intense but still relatively common storms, produced a peak runoff of 14.67 m^3/s. For the 100-Year RP, representing extreme storm events, the peak runoff reached 33.94 m^3/s. These values provide the foundation for comparing pre- and post-development hydraulic performance. See Table 4-4 and Figure 4-27 for a summary of the preconstruction peak flows from the project area.

Table 4-4: Summary of Pre-Development Peak Flows from Project Area

Return Period (Year)	Peak Runoff (m^3/s)
2 - Yr	6.24 m^3/s
10 - Yr	14.67 m^3/s
100 - Yr	33.94 m^3/s

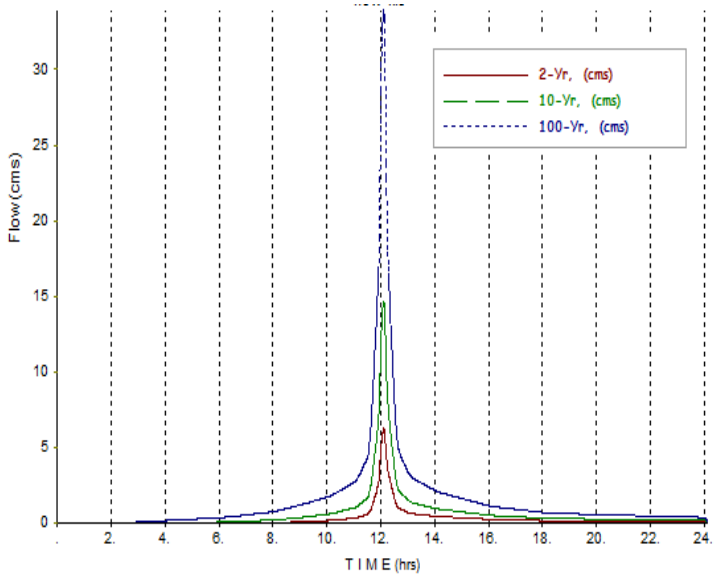


Figure 4-27: Flow Hydrograph for Pre-Development peak flows

4.2.4.6.2 Post Development

Post-development hydraulic analysis showed a slight increase in peak runoff rates across all storm events, reflecting the impact of changes to the landscape and drainage infrastructure. For the 2-Year Return Period, the peak runoff increased to 6.66 m^3/s, showing a modest rise in runoff due to the new development and an increase in impervious areas. The 10-Year RP yielded a peak runoff of 15.08 m^3/s, a slight increase from the predevelopment scenario, but within manageable limits for stormwater management systems. Similarly, for the 100-Year RP, the peak runoff rose to 34.24 m^3/s. See Table 4-5 and Figure 4-28 for a summary of the predevelopment peak flows from the project area.

Table 4-5: Summary of Pre-Development Peak Flows from Project Area

Return Period (Year)	Peak Runoff (m^3/s)
2 - Yr	6.66 m^3/s
10 - Yr	15.08 m^3/s
100 - Yr	34.24 m^3/s

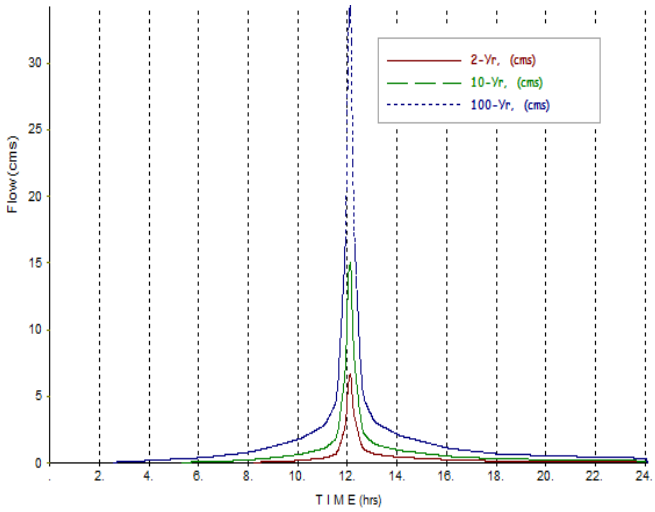


Figure 4-28: Flow Hydrograph for Pre-Development peak flows

4.2.4.6.3 Results

The results comparison between pre- and post-development peak runoff rates shows a minor increase in peak runoff after development across all return periods. For the 2-Year Return Period, peak runoff increased by 7%, from 6.24 m^3/s predevelopment to 6.66 m^3/s post-development. For the 10-Year RP, the increase was 3%, rising from 14.67 m^3/s to 15.08 m^3/s. The 100-Year RP showed the smallest change, with a 1% increase, from 33.94 m^3/s pre-development to 34.24 m^3/s post-development.

For the 2-Year Return Period, the inundation depth rose by 2%, from 0.35 m to 0.36 m. The 10-Year Return Period experienced a 2% increase, with depths rising from 0.50 m to 0.51 m. The 100-Year Return Period saw the smallest change, maintaining a depth of 0.60 m both pre- and post-development, reflecting only a 1% increase. This can be observed in Table 4-6.

Table 4-6: Comparison of Pre and Post Development Peak Runoff

Return Period (Year)	Pre-Development Peak Runoff (m^3/s)	Post Development Peak Runoff (m^3/s)	% Increase
2 - Yr	6.24	6.66	7%
10 - Yr	14.67	15.08	3%
100 - Yr	33.94	34.24	1%

Table 4-7: Depth of Inundation

Return Period (Year)	Pre-Development Inundation (m)	Post Development Inundation (m)	% Increase
2 - Yr	0.35	0.36	2%
10 - Yr	0.5	0.51	2%
100 - Yr	0.6	0.60	1%

4.2.5 Natural and Man-Made Hazards

4.2.5.1 Storms / Hurricanes

Jamaica's hurricane season is based on that of the wider North Atlantic which begins on June 1st and ends on November 30th each year, coinciding with the island's rainfall season. Although catastrophic hurricanes may occur at any point throughout the season, historical observations have highlighted that the North Atlantic experiences seasonal hurricane peaks from mid-August to late October, during which tropical storms are more likely to develop into hurricanes of varying categories (Figure 4-29).

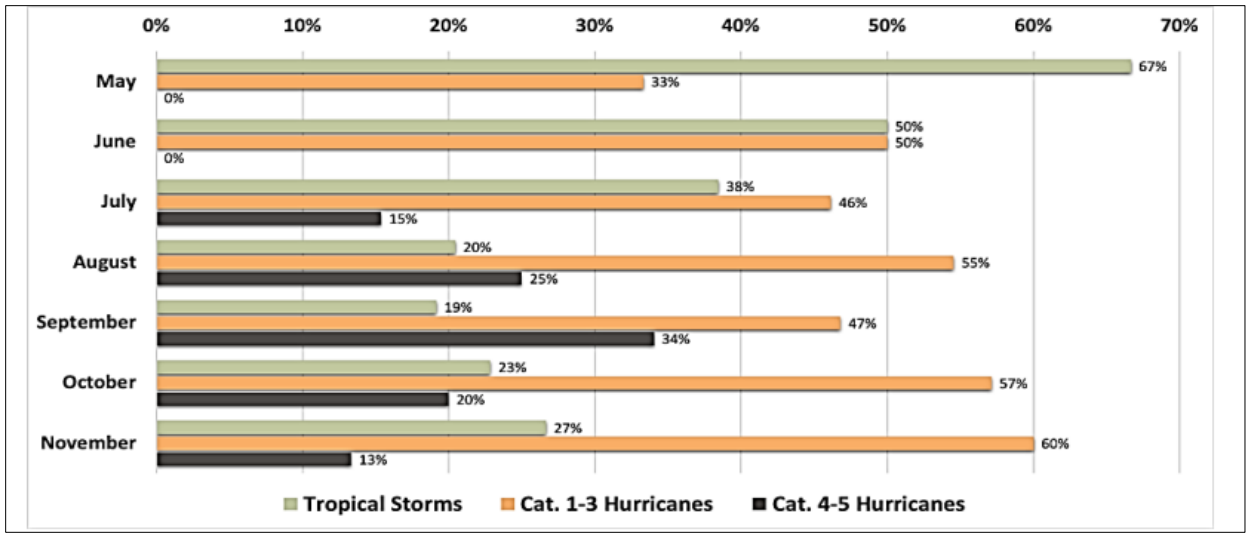


Figure 4-29: Percentage of Tropical Storms and Hurricanes that have passed within 200-km of Jamaica (1851-2019)

Furthermore, spatial analysis and satellite imagery have revealed the historical paths of storms and hurricanes that have passed within 200 km of the island, showing that the most travelled path is from the southeast to the northwest. This indicates that majority of storms or hurricanes experienced by the island approach from the south of the island, thus making the south coast susceptible to strong winds, heavy rainfall and storm surge, as well as other impacts associated with storm or hurricane activity (see Figure 4-30). Considering that the project area is located relatively close to the island's south coast, it is highly likely that storm or hurricane events could have potentially severe consequences for developments within the area causing damage to service and building infrastructures.

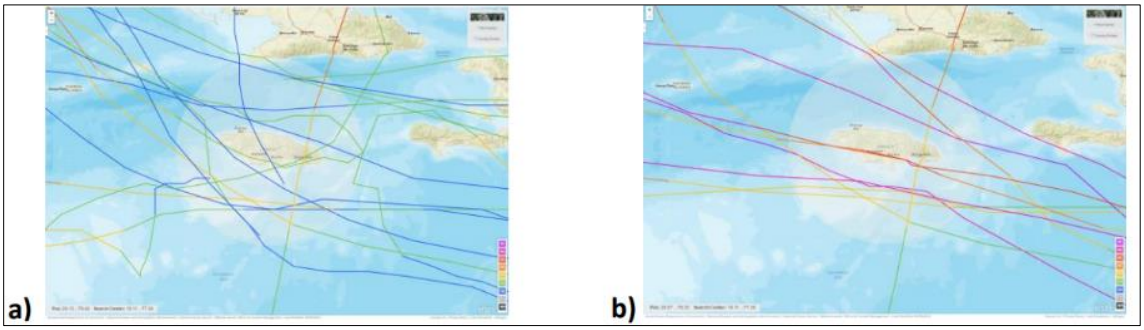


Figure 4-30: Historical Paths of Tropical Storms (a) and Hurricanes (b) passing within 200 km of Jamaica between 1950 and 2015

4.2.5.2 Flooding

Rainfall is a causative factor that increases the probability of flooding, through its role in soil saturation, increasing river discharge and encouraging surface runoff (Ganjirad and Delavar 2023; Yu et al. 2023). Flood events mirror that of Jamaica's rainfall climatology by exhibiting a bimodal pattern, with similar peaks in the early and late rainfall season. The State of the Jamaican Climate

Report (2019) explains that the month of May accounts for 27% of the island's flooding event occurrences, while 39% is recorded in October (see Figure 4-31).

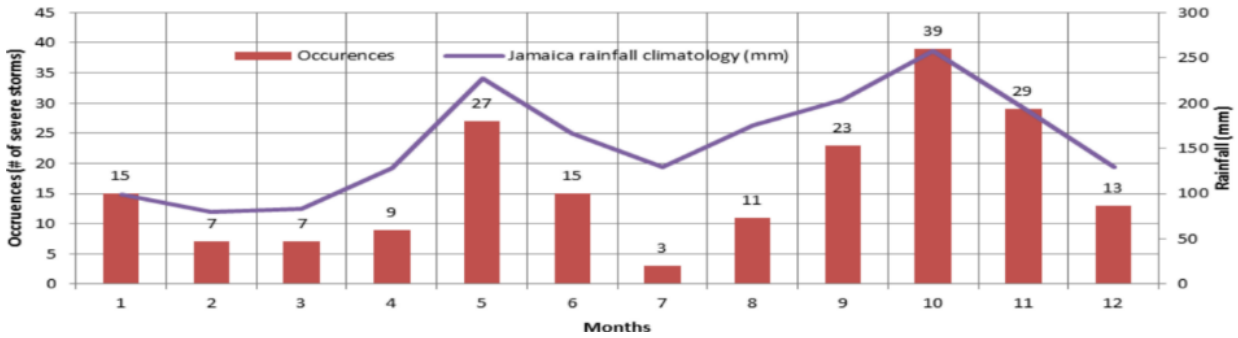


Figure 4-31: Severe Flood Climatology for Jamaica from 1850-2010 for 198 events (Source: State of the Jamaican Climate 2019)

Although Jamaica has not experienced direct flooding due to hurricanes or storms making landfall since Hurricane Sandy in 2012, several systems have passed within at least 200 miles (~321 km) of the island, supplying heavy and intense rainfall, which have sparked flooding in several communities (Figure 4-32). The graph depicted shows the increases to the total daily rainfall climatology in the years 2016 and 2017 versus the local average. These systems brought rainfall which was either just shy of 100mm or exceeded this value between 24 to 48 hours.

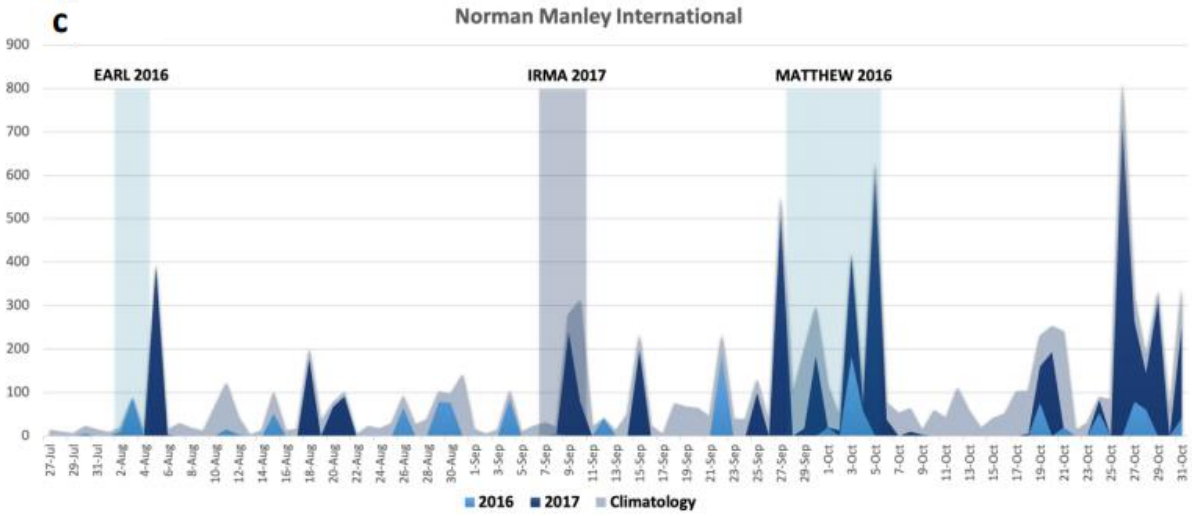


Figure 4-32: Total Daily Rainfall (mm) Observed with the Passage and Duration of Select Hurricanes Compared to Daily Rainfall Climatology from 1981-2010 (Source: State of the Jamaican Climate 2019).

It is also important to note that aside from bringing heavy and intense rainfall to Jamaica, hurricane or storm activity can also influence flooding by causing storm surges along the island's coast. A storm surge refers to a storm generated rise in seawater during a storm or hurricane as a result of the strong winds pushing the water towards the shore (The Meteorological Office 2019). Additionally, storm or hurricane force winds generate large waves on top of the surge which often leads to coastal flooding, causing catastrophic damage to coastal infrastructure and livelihoods. This may have

potential impacts on the project area, as storms and hurricanes tend to approach the southeastern sections of the island. Depending on the category of the system, it may be able to generate winds strong enough to cause surges that stretch up to several miles inland, bringing large volumes of water and encouraging flooding within the project area based on its proximity to the coast (radius ~2km).

In addition to rainfall, flooding events are also heavily influenced by topography such as elevation, slope, drainage patterns and vegetative cover. The project area is on relatively flat land with an elevation not exceeding 50 meters above sea level and due to its urbanized nature, lacks large-scale vegetation areas, increasing its susceptibility to flooding hazards. Furthermore, the project area is near three major gullies, which are essentially storm drains that collect and transport surface runoff to Kingston Harbour. These gullies are the Barnes Gully, as well as the Mico and Admiral Town gullies which connect to the Tivoli Gully as they approach the coast. During periods of heavy rainfall, surface runoff can transport solid waste pollutants into gullies that later obstruct the flow of water. These blockages can result in gully overflows which may spark flooding in surrounding areas.

4.2.5.3 Earthquake Risks

The most active earthquake zone in Jamaica is found within the Blue Mountain Block in Eastern Jamaica, which is comprised of many strike-slip faults where the Plantain Garden fault collides with the Yallahs, Blue Mountain, Wagwater and Silver Hill faults. (Figure 4-33). The red dots on the map indicate the high concentration of tectonic activity within the eastern and southeastern sections of the island.

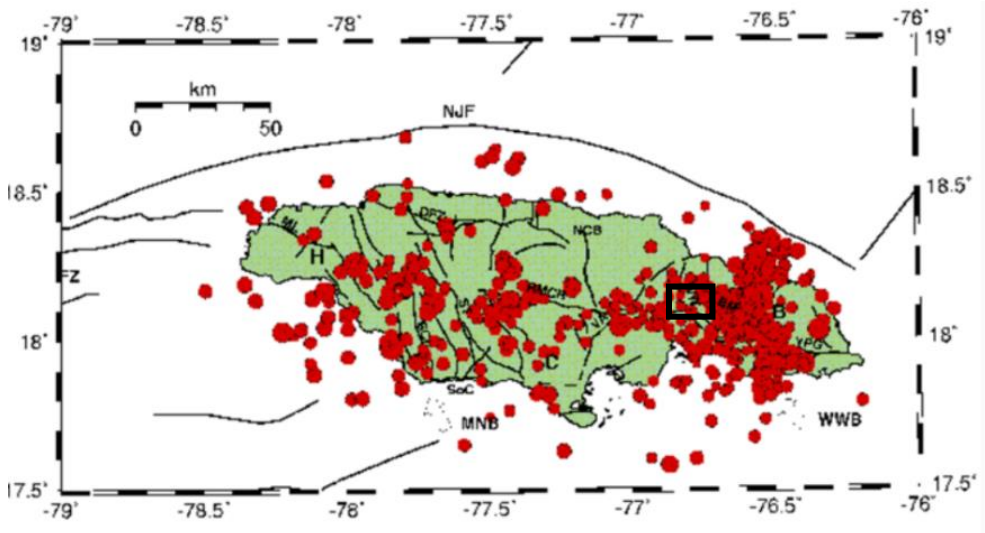


Figure 4-33: Fault Lines and Seismic Activity in Jamaica from 1997-2007 (Source: Earthquake Unit 2023). B-Blue Mountain Block, YPG-Yallahs-Plantain Garden, WW-Wagwater.

The majority and most recent earthquakes are concentrated in this area, encompassing the parishes of St. Thomas, Portland and St. Andrew (Figure 4-34). Considering the location of the project area (highlighted within the black box), based on the historical data provided, it can be expected that if seismic activity were to occur the likely magnitudes expected ranges between 1.2-2.9. However, the

increasing magnitudes experienced outside of the project area, along with the relatively proximity to the Blue Mountain Block suggests that in the event of strong seismic activity, high magnitudes can be expected within the project area. This is supported by a vulnerability assessment on the 100-year return period of magnitude VIII earthquakes originating within the Blue Mountain Block (Figure 4-35). In the event of an earthquake of this magnitude, the project site is expected to experience shaking at a magnitude of VIII on the Modified Mercalli Intensity Scale, which would result in severe damage to life and property including the destruction of communities close to the epicentre with damages even radiating across hundreds of kilometers.

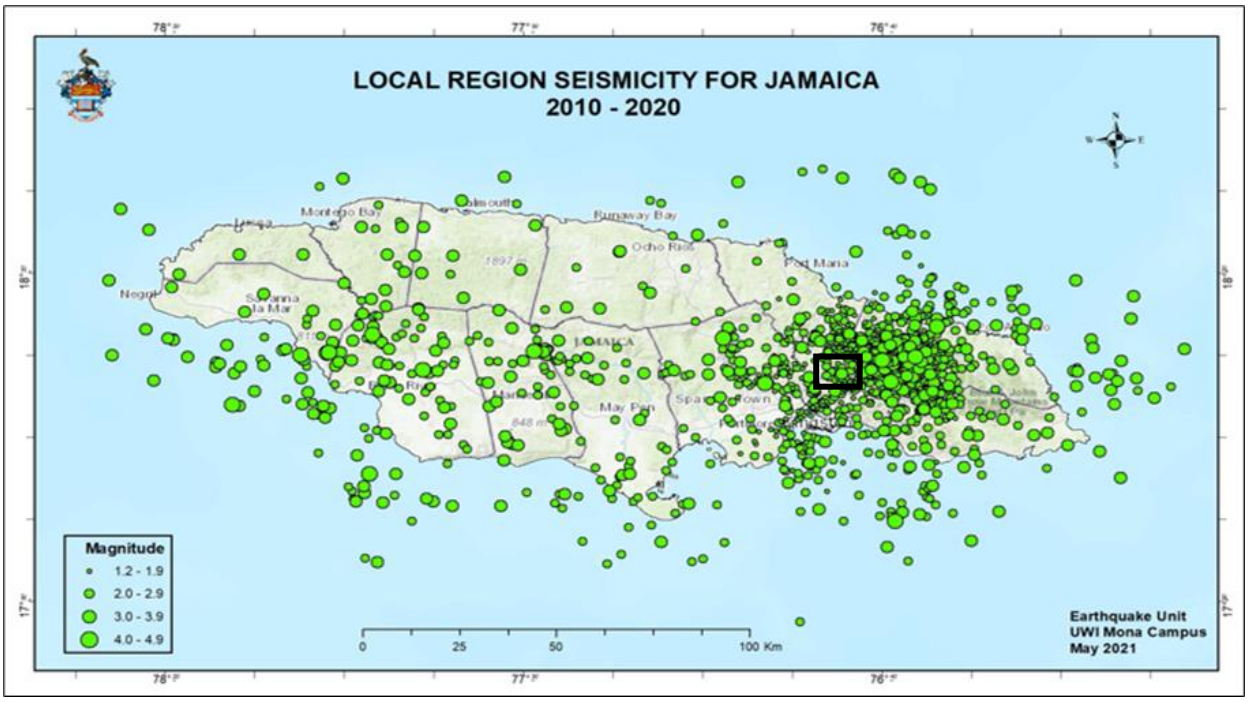


Figure 4-34: Seismic Activity 1998-2010 (Source: Earthquake Unit 2021). Project site is indicated within the black box with magnitudes ranging from 1.2-2.9, as well as higher magnitudes of 3.0-4.9 surrounding the project area.

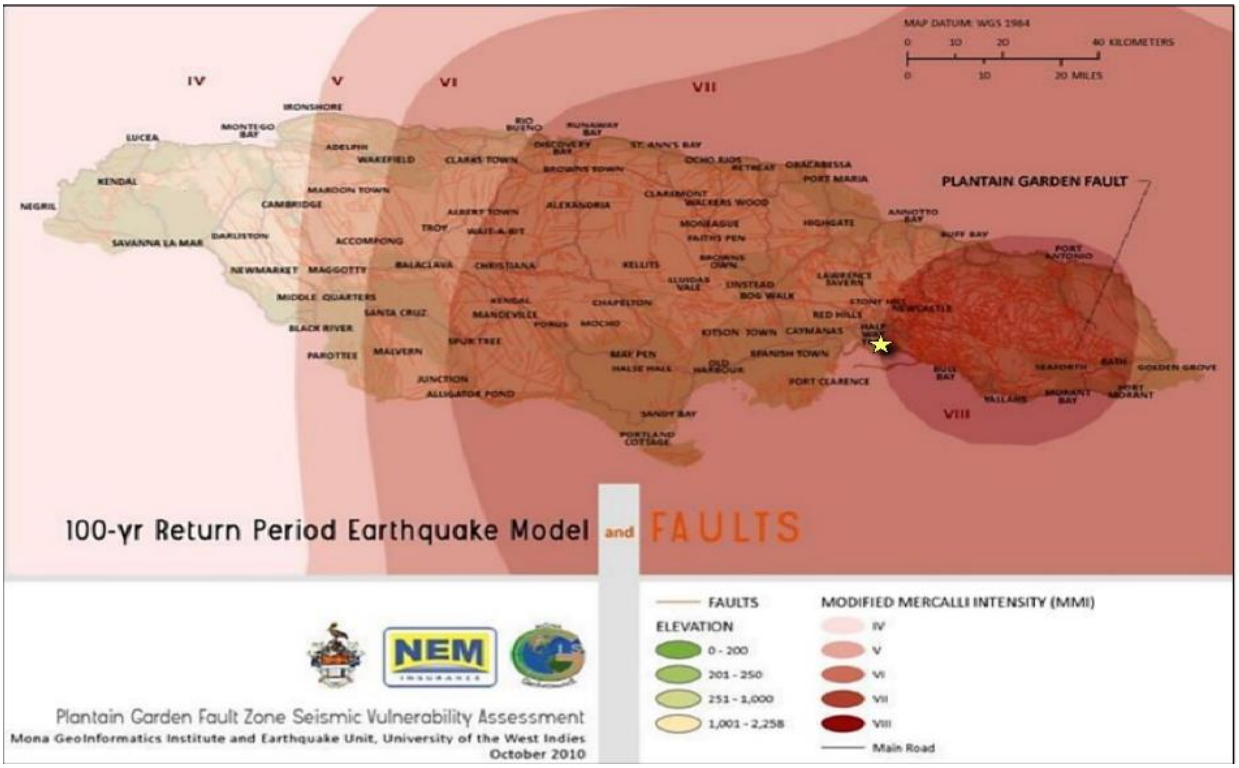


Figure 4-35: Modelled Intensity for 100-Year Return Period for Earthquakes of Magnitude 8 Originating from within the Blue Mountain Block (Mona Geoinformatics Institute and Earthquake Unit, 2010). Project site is indicated by the yellow star.

Additionally, recent studies by Wright et al. (2019) have illustrated the presence of a tectonically complex offshore region located within Kingston harbor that contains active strike-slip fault systems. This region is an extension of the onshore Bull Bay strike-slip fault, which is associated with the Plantain Garden Fault Zone (Figure 4-36). It is believed that this offshore extension into the Kingston harbor facilitates strain that originates within the Plantain Garden Fault Zone, suggesting that this system has the potential to generate earthquakes of large magnitudes which are greater than or equal to 5.8 (5.8 ≥). The discovery of this fault system indicates that the prior development of structures within Kingston face catastrophic seismic risk, especially those close to the Kingston Harbor inclusive of the project area. Further seismic research will need to be carried out to assess and verify the extremity of this system, however this development is within reach of facing severe damages in the event that there is materialization of seismic risks considering its location within the most seismically active region in the island.

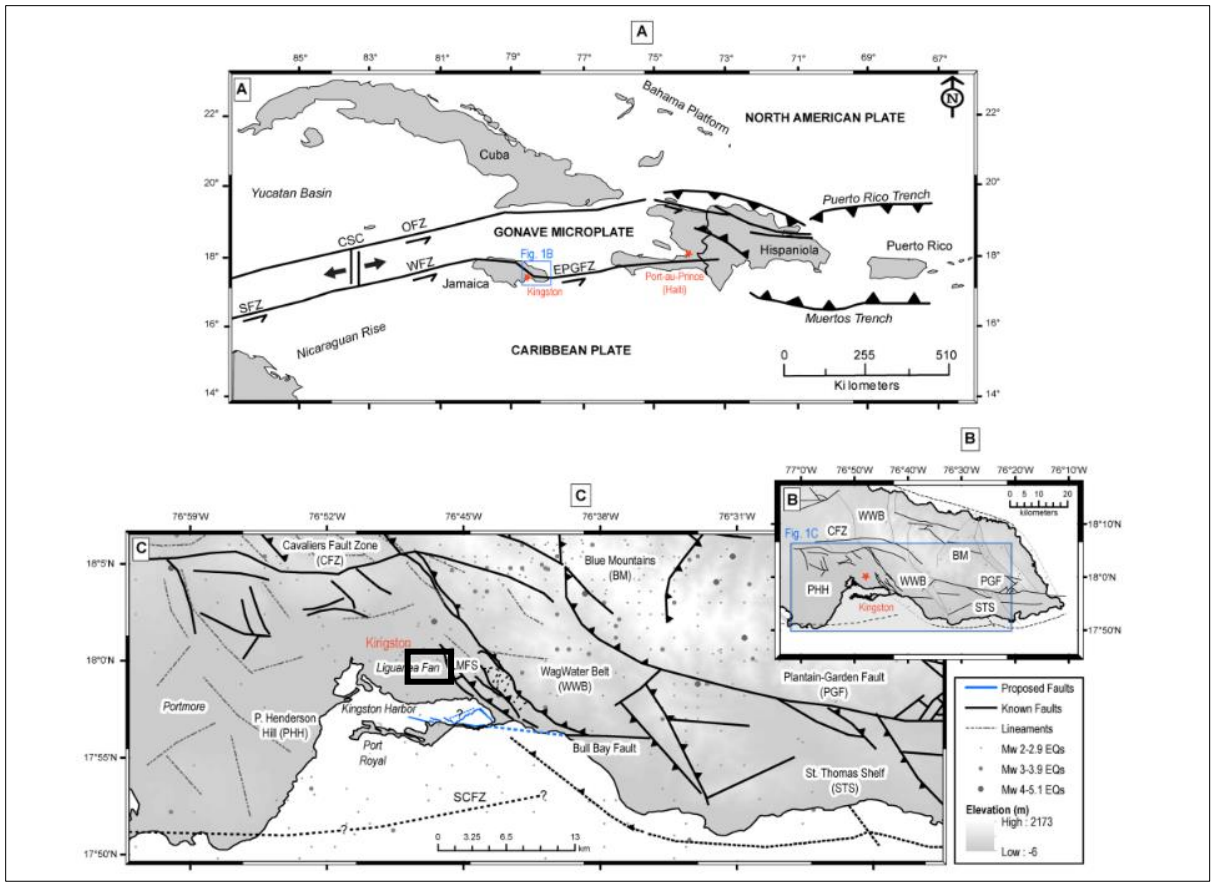


Figure 4-36: Extent of Fault System in Southeastern Jamaica and the Proposed Extension of the Bull Bay Fault System into the Kingston Harbor (Source: Wright et al 2019) Project area is located within the black box.

4.2.5.4 Fires

Fires are another dangerous and life-threatening hazard that must be taken into consideration when assessing the project site. The site is within a highly urbanized area and is surrounded by a large concentration of built-up areas (Figure 4-5Figure 4-6). It is highly likely that many of these infrastructures will contain electrical appliances, and to a smaller extent flammable liquids. Fire hazards usually begin as a result of electrical problems due to worn-out wiring, accidental or improper use of equipment, as well as due to accidents during food preparation activities using stoves or other open fire methods of cooking. According to the Jamaica Fire Brigade (JFB), the parishes of Kingston and St. Andrew recorded the highest loss of lives due to fire incidences in 2023, with a total of 9 persons having lost their lives (Salmon 2024). Considering that the project area is surrounded by built-up areas of varying uses, it is highly recommended that fire detection systems and safety plans are in place, as well as electrical systems are maintained. It is also recommended that, if possible, fire-resistant building materials are used in the construction of facilities.

4.2.6 Noise, Air, and Water Quality

4.2.6.1 Air Quality

As mentioned in section 0, eleven sampling stations were assessed for respirable particulates and select gaseous atmospheric pollutants (see Figure 4-37). The simplified descriptions of the sampling locations are presented in Table 4-8: Simplified Descriptions of the Air Quality Sampling Locations below whereas the full descriptions of the sampling locations are presented in Table 12-1.

Figure 4-37: Air Quality and Noise Sampling Locations

Table 4-8: Simplified Descriptions of the Air Quality Sampling Locations

Sample Location	GPS Coordinates	Description
AQ1 (Holy Trinity Chapel)	17°58'33.6"N, 76°47'02.4"W	This sampling location was located south of the south-eastern boundary of the proposed project. The pump was placed atop the **Holy Trinity Chapel** lower-level roof. 
AQ2 (Central Masjid)	17°59'3.60"N, 76°46'48.40"W	This sampling location was located at the north-eastern boundary of the proposed project. The pump was placed atop the roof of the **Central Masjid**. 
AQ3	17°58'41.40"N,	This sampling location was located south of the south-eastern boundary of the proposed project.

Sample Location	GPS Coordinates	Description
(Sabina Park)	76°46'59.40"W	The pump was placed atop an old open grandstand area at the **Sabina Park**. 
AQ4 (Heroes Circle SDA Church)	17°59'01.3"N, 76°47'25.4"W	This sampling location was located close to the mid-western boundary of the proposed project. The pump was placed in an empty parking lot of the **Heroes Circle SDA Church.** 

Sample Location	GPS Coordinates	Description
AQ6 (Missionaries of the Poor)	17°58'34.7"N, 76°47'15.2"W	This sampling location was located south of the central-southern boundary of the proposed project area. The pump was placed on the second-floor balcony of an area with dormitories at **Missionaries of the Poor**. 
AQ8 (National Public Health Laboratory Roof)	17°58'50.64"N, 76°47'39.92"W	This sampling location was located west of the south-western boundary of the proposed project. The pump was placed atop the roof of the **National Public Health Laboratory**. 

Sample Location	GPS Coordinates	Description
AQ9 (Allman Town Police Station)	17°58'50.30"N, 76°47'8.63"W	This sampling location was located in south-central area of the proposed project. The pump was placed at the **Allman Police Station** nearby a generator. 
AQ10 (Cross Roads SDA Church)	17°59'19.4"N, 76°47'31.8"W	This sampling location was located north of the north-western boundary of the proposed project. The pump was placed atop a recently constructed decking at the **Cross Roads SDA Church.** 

Sample Location	GPS Coordinates	Description
AQ12 (Wolmer's Boys' School)	17°59'10.2"N, 76°47'17.3"W	This sampling location was located north of the Heroes Circle National Park (located in the centre of the proposed development area). The pump was placed in the secure flagpole area at the **Wolmer's Boys School**. 
AQ13 (Arnold Road SDA Church)	17°59'19.1"N, 76°46'55.1"W	This sampling location was located north of the mid-northern boundary of the proposed project. The pump was placed in the partially vegetated area, free of any encumbrances to air flow, at the **Arnold Road SDA Church**. 
AQ15 (Heroes Circle Park)	17°58'54.5"N, 76°47'23.1"W	This sampling location was located near both the eastern and western central boundary areas of the proposed project.

Sample Location	GPS Coordinates	Description
		The pump was placed in the shrine area of the **Heroes Circle Park**. 
For all sampling points, the environmental conditions were sunny with scattered clouds and light to moderate SE winds.		

Based on information obtained from the Meteorological Station of Jamaica, the closest Automatic Weather Stations (AWS) are located at Mico University (within the project sphere of influence), and the Jamaica Agricultural Commodities Regulatory Authority (JACRA) located approximately 3 km south-west of the proposed project location.

Information obtained from the MICO AWS for the period September 25, 2022, to December 7, 2023, indicated that the prevalent winds (91% of all winds) originate from an NNE direction. Based on the Beaufort Wind Scale, approximately 50% of these NNE winds can be characterised as calm winds as they fall between a wind speed of 0 and 3 knots.

For the JACRA AWS, approximately 68% of winds (i.e., winds originating from any direction) are calm winds with the prevalent wind direction originating from a N or NE direction (see Figure 4-38).

Figure 4-38: JACRA AWS Wind Rose Diagram (January 1, 2022 - January 1, 2024

Based on the results of the assessment presented in Table 4-9, all sites were compliant with the PM_{10} Ambient Air Quality Standards Regulations for Jamaica of 150 μgm^{-3}; values ranged from a low of 24.7 at assessment point AQ15 (**Heroes Circle Park**) to a high of 65.1 μgm^{-3} at assessment point AQ10 (**Cross Roads SDA Church**). Given the results and observations made in the field, sources of particulate matter originate from both human and natural activities. Natural sources of particulate matter observed at the assessment locations include wind-blown dust while anthropogenic (human) sources of particulate matter include several residences may include burning and vehicular movement and emissions.

These observations highlight the susceptibility of the area to increased impacts from anthropogenic activities such as land clearance, as well as fine earth material transportation and stockpiling. As such, the area may be adversely impacted by the additional anthropogenic activities arising from the pre-construction and construction phases if sound mitigative measures are not strictly adhered to.

Based on the information obtained from the Met Service, it is likely that the predominant winds are NE winds. This would suggest that communities located south-west of the proposed development would most likely be impacted especially during its pre-construction and construction phase.

Table 4-9: Concentrations of Respirable Particulates and Select Gaseous Atmospheric Pollutants

Sample Location	PM_{10} Concentration (μgm^{-3})	TVOC (μgm^{-3})	NO_2 (ppm)	SO_2 (ppm)	CO (ppm)
AQ1	46.9	105	<0.042	<0.034	2.9
AQ2	52.2	153	<0.042	<0.034	5.7
AQ3	38.5	145	<0.043	<0.035	1.6
AQ4	42.8				
AQ6	24.7	114	<0.042	<0.035	3.1
AQ8	60.8	158	<0.043	<0.035	2.8
AQ9	52.0	143	<0.043	<0.035	2.7
AQ10	65.1	444	<0.044	<0.036	2.9
AQ12	34.2	146	<0.043	<0.035	3.0
AQ13	34.7	133	<0.044	<0.036	8.5
AQ15	27.0	215	<0.043	<0.035	3.4

Based on the activities in an area, there are several gaseous air pollutants that can exist in the atmosphere such as carbon monoxide (CO), sulphur dioxide (SO_2), nitrogen dioxide (NO_2) and volatile organic carbons (VOCs). Depending on the level in which these gases exist in nature, they can have impacts on both environmental and human health. The results obtained for select gaseous atmospheric pollutants are presented in Table 4-9 above.

Nitrogen dioxide and sulfur dioxide were undetected at all locations and as such will not be discussed further.

CO and TVOC were detected across all locations. The TVOC concentrations ranged from a low of 105 μgm^{-3} at location AQ1 (**Holy Trinity Chapel**) to a high of 444 μgm^{-3} at AQ10 (**Cross Roads SDA Church**). Sources of VOCs include vehicle exhaust, burning wood/ garbage and can react with other gaseous atmospheric pollutants such as nitrogen oxides to form tropospheric ozone. Most locations were close to busy roadways which could explain the levels of TVOC detected across each sampling location. TVOCs, depending on their levels, can result affect the respiratory system in humans.

Acceptable levels of TVOCs in the air are typically regarded as less than 500 μgm^{-3}.[2] All sites assessed during the sampling assessment were lower than this value. However, with increased traffic in the construction and operational phases, these levels may increase.

Based on the USEPA, within an hour, the average carbon monoxide reading within the ambient air should not exceed 35 ppm. [3] Carbon monoxide readings during the sampling period were averaged over a 5-minute period. Although the sampling period was not as long as the period noted in the standard, typically, shorter timeframes have higher exposure levels. Nonetheless, all samples collected were lower than the value specified as the average exposure level over an hour. However, the greatest sources of carbon monoxide in ambient air include emissions from vehicles were incomplete combustion takes place. [4]

4.2.6.2 Noise

Noise levels were surveyed at the same sites as the air quality samples (see Figure 4-37 above). Measurements were taken at these locations to determine the existing environmental conditions with respect to noise in the project area. The sources of noise and the readings obtained at each site are presented in Table 4-10.

Table 4-10: Sources of and Average Noise Levels obtained for Each Site

Sample Location	Noise Level (dBA)			Sources of Noise		Time Period of Assessment	
	Day 1	Day 2	Avg	Day 1	Day 2	Day 1	Day 2
AQ1 (Holy Trinity Chapel)	58.1	50.1	54.1	Helicopter, trucks, children, birds	Birds chirping, doors opening and closing, distant vehicle movement,	Morning	Morning
AQ2 (Central Masjid)	64.2	67.1	65.7	Birds, children in background, vehicles in background	Vehicles traversing on main road, chatter, dogs barking, bikes, children in	Morning	Morning

[2] https://scied.ucar.edu/learning-zone/air-quality/volatile-organic-compounds#:~:text=Gasoline%20and%20natural%20gas%20are,ozone%2C%20another%20harmful%20air%20pollutant.
[3] https://www.epa.gov/criteria-air-pollutants/naaqs-table
[4] https://www.epa.gov/co-pollution/basic-information-about-carbon-monoxide-co-outdoor-air-pollution#:~:text=The%20greatest%20sources%20of%20CO,machinery%20that%20burn%20fossil%20fuels.

Sample Location	Noise Level (dBA)			Sources of Noise		Time Period of Assessment	
	Day 1	Day 2	Avg	Day 1	Day 2	Day 1	Day 2
					background, sirens		
AQ3 (Sabina Park)	72.6	54.6	63.6	Heavy winds, children in distance	Car horns, beeping of machinery, school children, distant chatter, music over intercom	Morning	Morning
AQ4 (Heroes Circle SDA Church)	67.5	70.2	68.9	Traffic, birds, car throttling, rustling trees	Rustling of trees, bikes, chatter, constant vehicle movement with intermittent horns	Afternoon	Morning
AQ6 (Missionaries of the Poor)	79.3	65.7	72.5	Vehicular passage, heavy winds	Children, dog barking, vehicular movement, rustling winds, bikes	Afternoon	Morning
AQ8 (National Public Health Laboratory Roof)	80.8	82.7	81.8	Heavy winds, chatter, vehicles, machinery	Generators, vehicular movement with intermittent horn blowing, heavy winds moving through small spaces, chatter in distance, sirens in distance	Afternoon	Morning
AQ9 (Allman Town Police Station)	60.3	61.6	61.0	Music in background, light winds, cars, chatter, phone ringing in distance	Car throttling, police intercom, intermittent vehicle passage, generator in	Afternoon	Morning

Sample Location	Noise Level (dBA)			Sources of Noise		Time Period of Assessment	
	Day 1	Day 2	Avg	Day 1	Day 2	Day 1	Day 2
					distance, chatter, bikes		
AQ10 (Cross Roads SDA Church)	59.4	62.7	61.1	Peacock, rustling trees, vehicles and sirens in distance, chatter	Music in background, birds, sirens, vehicles movement, rustling of trees, bikes	Afternoon	Morning
AQ12 (Wolmer's Boys' School)	73.2	79.1	76.2	Cars, chatter, heavy winds	Flag hitting against metal pole, heavy winds, frequent vehicle movement, bikes, car horns, machinery chipping in and out	Afternoon	Morning
AQ13 (Arnold Road SDA Church)	55.1	57.5	56.3	Vehicular movement, light rustling of leaves, construction activities in background	Rustling of trees, birds chirping, chatter, vehicle movement with intermittent horns	Morning	Morning
AQ15 (Heroes Circle Park)	67.6	72.7	70.2	Gardening activity, rustling of trees, chatter, frequent vehicle passage, birds	Chatter, car throttling, vehicle movement, horns, birds, light rustling of trees	Afternoon	Morning
*Values in red indicate those average noise values that would have exceeded the Ambient Noise Standard of 55 dBA.							

The average noise levels ranged from a low of 54.1 dBA (site AQ1 – Holy Trinity Chapel) to a high of 81.8 dBA (site AQ8 – National Public Health Laboratory Roof). All average noise levels with the exception of that obtained for site AQ4 (Heroes Circle SDA Church) exceeded the Ambient Noise Standard of 55dBA for residential areas. Given the proximity of each of the sites assessed to Environmental Solutions Limited

residential communities, clinics, hospitals, schools etc., noise pollution is especially important to consider and is the rationale for assessing the sites compared against the residential noise standard.

Across all sites, major influences of noise include vehicular traffic (inclusive of bikes and car horns), as well as winds especially in areas of a higher elevation. Other human activities such as the playing of music, chatter, and playing were also seen as consistent noise contributing themes across the sites.

As such, it is imperative that a maintenance and transportation schedule be developed during the pre-construction and construction phases to ensure that: -

- Trucks and other machinery being operated are maintained to prevent additional noise arising from poorly maintained vehicles.
- Operations are done within specified time frames to prevent unwanted noise in neighbouring communities, especially during the nighttime.

Noise barriers should be instituted as a mitigation measure to reduce unwanted noise from construction activities.

During the operational phase, unwanted noise can arise from additional traffic in the area; as such, speed bumps or other mechanisms to reduce the speed in which communities or other sensitive areas such as schools, hospitals and clinics are driven through or near to can be instituted to reduce noise arising from vehicles. Signs indicating where noise should be reduced should also be considered.

4.2.6.3 Water Quality

As mentioned in section 00, seven sampling stations were assessed for their water quality (). The descriptions and GPS coordinates of each water quality sampling point are presented in

Figure 4-39: Water Quality Sampling Locations

Table 4-11 below.

Figure 4-39: Water Quality Sampling Locations

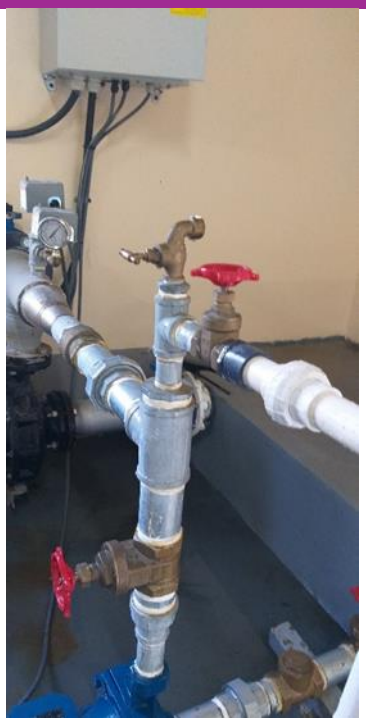
Table 4-11: Description and GPS Coordinates of the Water Samples Collected

Sample Location	GPS Coordinates	Description
WQ2	17°59'8.93"N, 76°47'17.22"W	This sample was collected from a plastic "standpipe" encased in a concrete structure with a rubber flexible fitting attached to its end. This sampling point was located **south of the Wolmer's Boy School**. The direct area surrounding the sampling location was dry, sparsely vegetated and littered with debris. The sample collected was colourless and clear.  Environmental Conditions: Sunny, scattered clouds with very light winds
WQ3	17°58'37.37"N, 76°47'2.49"W	The sample was collected from a metal pipe connected to a combination of plastic and metal tubing. This pipe was located in a well-maintained garden partially enclosed by walkways and buildings at the **St. George's College**. The area directly surrounding the sampling area had exposed dirt and leaf litter was also observed, however, the area was free from human debris.

Sample Location	GPS Coordinates	Description
		The sample collected was colourless and clear.  Environmental Conditions: Cool, sunny, slightly cloudy
WQ4	17°58'34.57"N, 76°47'15.81"W	This sample was collected from a metal standpipe under a large tree in a garden area at the **Missionaries of the Poor**. The area the sample was taken from was free from manmade debris but had natural debris littering the ground. The sample collected was colorless and clear.

Sample Location	GPS Coordinates	Description
		 Environmental Conditions: Sunny with clear skies and light winds.
WQ6	17°58'40.94"N, 76°46'59.41"W	This sample was collected from a plastic piping structure running along the length of a concrete wall at **Sabina Park**. A metal pipe was attached to this outlet prior to sample collection. The area around the sampling area was free from debris. Parking areas and pallet storage areas were located to the north and west of the sampling area. The sample collected was colourless and clear.

Sample Location	GPS Coordinates	Description
		 Environmental Conditions: Sunny with scattered clouds and light winds
WQ9	17°59'21.34"N, 76°46'57.64"W	This sample was collected from a metal pipe in an area overgrown with vegetation near to a truck unloading area at **Caribbean Broilers** (Arnold Road). The sampling point was free from man-made debris. The sample collected was colourless and clear. Environmental Conditions: Sunny, moderate winds, clear skies
WQ12	17°59'21.70"N, 76°47'19.85"W	This sample was collected from a metal pipe inside a pump house at the **Mico University College**. The area surrounding the sample collection area was clean and free from debris. The area was concretised and sloped slightly to allow water to drain outdoors. Machinery and other metal fittings were located nearby collection area. The sample collected was colourless and clear.

Sample Location	GPS Coordinates	Description
		 Outdoor Environmental Conditions: Cool, sunny, clear skies
WQ13	17°59'24.09"N, 76°47'24.51"W	This sample was collected from a metal pipe removed from a plastic tap outlet at **Rainforest Seafoods** (Slipe Pen location). The area around the pipe was free from debris. A rubber water hose, cars in a parking lot and pallets were located to the immediate west of the sampling location The sample collected was colourless and clear.

Sample Location	GPS Coordinates	Description
		 Environmental Conditions: Scattered clouds, sunny with light winds

According to the Water Resources Authority (WRA), the proposed project area is located in the Hope River Watershed Management Unit (HRWMU) within the Kingston Hydrologic Basin. The Kingston Hydrologic Basin includes the Kingston and St. Andrew parishes which have been defined as Jamaica's largest and most densely populated urban centre.[5] Based on information presented in the Water Quality Atlas – 2019 published by the WRA, the Kingston Hydrologic Basin is drained by a network of rivers flowing over mountains in the eastern sections of the basin and by a system of concretised gullies towards the southern coast. [5]

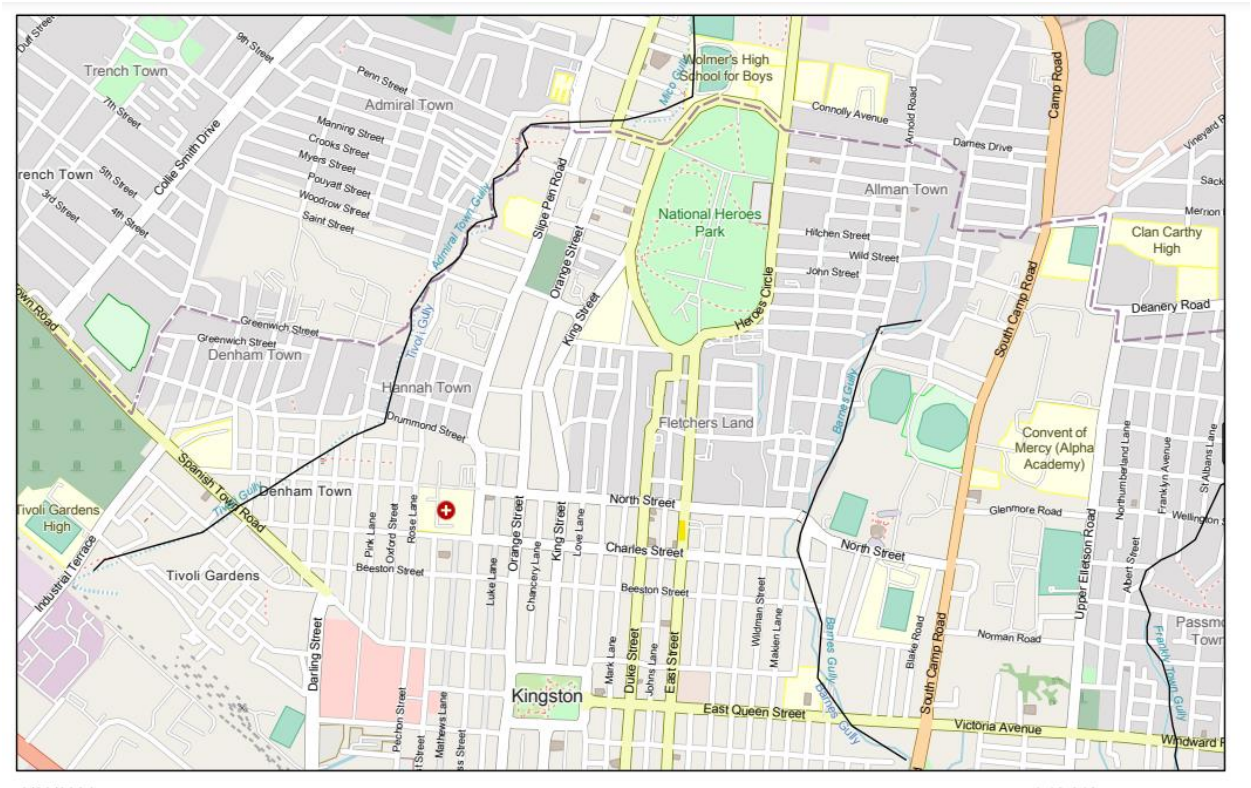


Figure 4-40: OpenStreetMap Showing Gullies within the Project Sphere of Influence[6]

The proposed development is located within an alluvium aquifer and contains several wells within and around the proposed development area and is drained possibly by the Barnes Gully to the east and the Tivoli Gully to the west. Investigations conducted by the WRA indicate that these groundwater samples have showed possible signs of both contamination and pollution. Majority of samples collected nearby and within the proposed development (e.g., sampling points A1, A2, A6, A9, A19 and A25 as shown in Figure 4-41 below), have showed elevated levels of nitrates possibly due to inadequately treated sewage, as well as elevated levels of sodium, chloride, sulfate and total dissolved solids when compared to the Draft Jamaica National Ambient Water Quality Standard –

[5] https://www.wra.gov.jm/wp-content/uploads/2020/06/WRA-Water-Quality-Atlas-2019.pdf

[6] https://www.arcgis.com/home/webmap/viewer.html?webmap=645025797e0947c68388adcd8c455995&extent=-78.9494,17.2273,-75.5765,18.9166

Freshwater, 2009. [7] Based on the WRA's Water Information System, where information was available, all wells were noted as being active with the exception of the Cavaliers well (point A6).

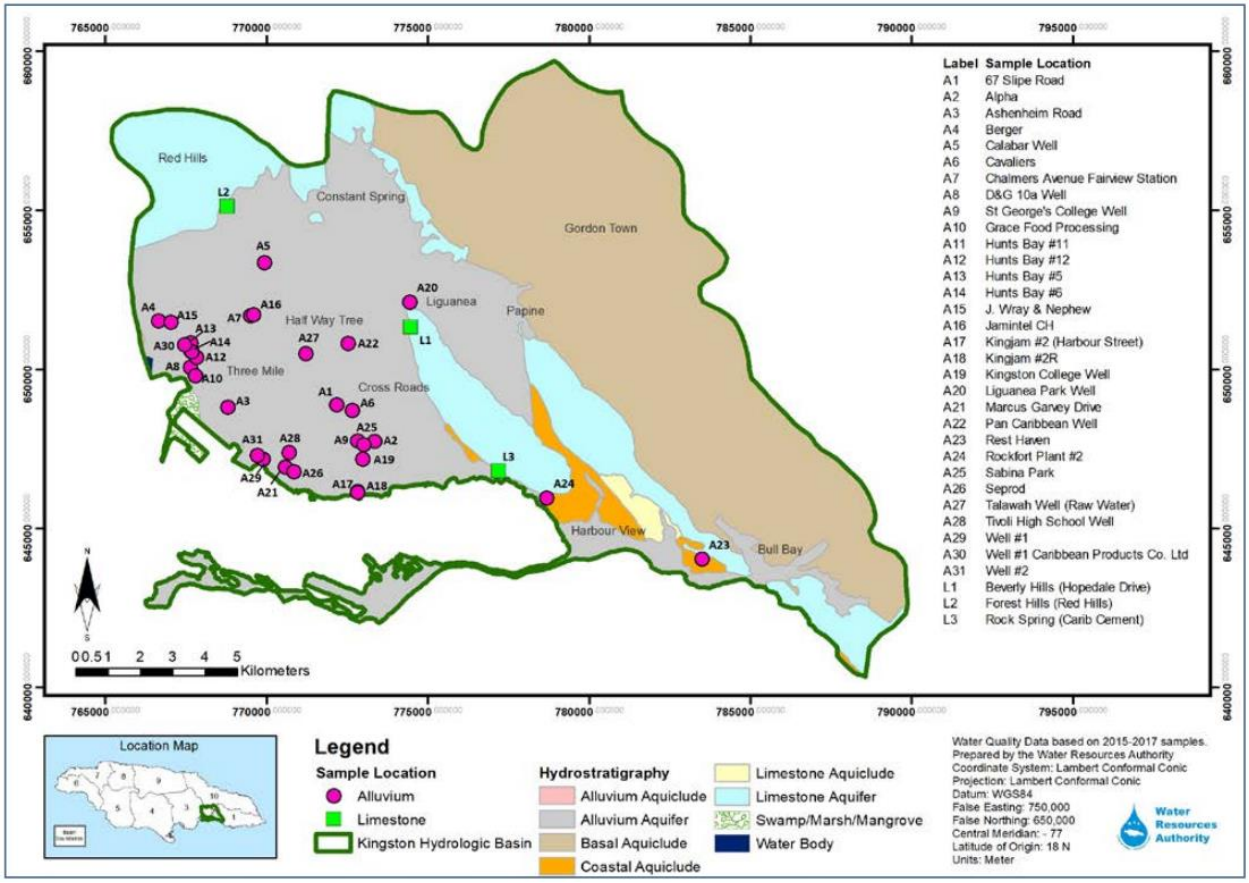


Figure 4-41: WRA Groundwater Sampling Points within the Kingston Hydrologic Basin[8]

The evaluation of water quality physically, chemically, and microbiologically against pre-established guidelines, standards and observations taken in the field can be used to indicate whether there is an impact, anthropogenically or otherwise, on the water samples of concern. Table 4-12 indicates the results for the water quality samples collected within the project area. Values highlighted in red indicate where values are non-compliant with the cited standard. All water samples collected, regardless of sample collection point, were noted as being untreated water samples, i.e., groundwater samples without any further treatment.

[7] https://www.wra.gov.jm/wp-content/uploads/2020/06/WRA-Water-Quality-Atlas-2019.pdf
[8] https://www.wra.gov.jm/wp-content/uploads/2020/06/WRA-Water-Quality-Atlas-2019.pdf

Table 4-12: Water Quality Results

Parameter (Units)	WQ2	WQ3	WQ4	WQ6	WQ9	WQ12	WQ13	NRCA Ambient Water Standard - Freshwater
pH (pH units)	6.96	7.15	7.28	7.09	6.99	7.14	6.82	7.00-8.40
Dissolved Oxygen (mg O_2/L)	2.84	3.96	3.94	3.91	2.96	5.13	4.24	-
Conductivity (mS/cm)	1.310	1.193	1.018	1.123	1.037	0.865	0.905	150.0-600
Salinity (ppt)	0.61	0.54	0.45	0.50	0.48	0.39	0.41	-
Total Dissolved Solids (mg/L)	795	717	604	661	638	523	546	120.0-300
In situ Temperature (°C)	28.7	29.2	30.1	30.0	28.0	28.8	29.1	-
Turbidity (NTU)	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	-
Nitrate (mg NO_3^-/L)	95.0	50.6	46.6	52.8	54.1	46.4	47.5	0.1-7.5
Orthophosphate	0.24	0.28	0.28	0.26	0.22	0.24	0.22	0.01 - 0.8

Parameter (Units)	WQ2	WQ3	WQ4	WQ6	WQ9	WQ12	WQ13	NRCA Ambient Water Standard - Freshwater
(mg PO_4^{3-}/L)								
Chloride (mg Cl^-/L)	51.2	46.4	34.2	35.2	37.6	35.1	31.6	5.0-20.0
Sulphate (mgSO_4^{2-}/L)	51	67	47	58	40	22	26	3.0-10.0
Faecal Coliform (MPN/100ml)	<1.8	<1.8	2.0	31	<1.8	<1.8	<1.8	-
Total Coliform (MPN/100ml)	<1.8	4.5	13	920	<1.8	<1.8	<1.8	-
E.Coli (MPN/100ml)	<1.8	<1.8	2.0	23	<1.8	<1.8	<1.8	-
Total Suspended Solids (mg/L)	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	-
Total Hardness (mg $CaCO_3$/L)	353.6	194.2	221.0	214.5	328.2	273.7	290.6	127.0-381.0
Total Alkalinity (mg $CaCO_3$/L)	338.3	324.2	275.5	299.5	288.5	252.3	254.1	-

Parameter (Units)	WQ2	WQ3	WQ4	WQ6	WQ9	WQ12	WQ13	NRCA Ambient Water Standard - Freshwater
Chemical Oxygen Demand (mg O_2/L)	<3	<3	<3	<3	5	<3	<3	-
Biochemical Oxygen Demand (mg O_2/L)	1.5	1.1	1.6	1.1	0.7	1.3	1.6	0.8-1.7
Fats, Oil & Grease (mg/L)	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	-
Potassium (µg K/L)	2531	2078	1905	1967	2291	1849	1906	740 - 5000
Calcium (µg Ca/L)	95060	58277	64298	73569	90615	79842	87434	40000 - 101000
Magnesium (µg Mg/L)	18918	16716	14647	17466	18470	16685	18089	3600 - 27000
Sodium (µg Na/L)	82141	99718	68605	69687	39419	27037	27190	4500 - 12000
Zinc (µg Zn/L)	<11.8	<11.8	<11.8	52.2	<11.8	183	<11.8	-
Copper	<5.3	<5.3	<5.3	<5.3	<5.3	<5.3	<5.3	-

Parameter (Units)	WQ2	WQ3	WQ4	WQ6	WQ9	WQ12	WQ13	NRCA Ambient Water Standard - Freshwater
(µg Cu/L)								
Cadmium (µg Cd/L)	<12.2	<12.2	<12.2	<12.2	<12.2	<12.2	<12.2	-
Chromium (µg Cr/L)	<43.1	<43.1	<43.1	<43.1	<43.1	<43.1	<43.1	-
Iron (µg Fe/L)	<12.9	<12.9	<12.9	<12.9	<12.9	<12.9	<12.9	-
Lead (µg Pb/L)	<4.2	<4.2	<4.2	<4.2	<4.2	<4.2	<4.2	
Arsenic (µg As/L)	<9.9	<9.9	<9.9	<9.9	<9.9	<9.9	<9.9	
Mercury (µg Hg/L)	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
Pesticide Screen (ppb)	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	-

4.2.6.3.1 General Water Quality

Based on the results obtained from the samples collected during the time of the assessment, all water samples collected were fairly neutral. The pH across the samples collected ranged from 6.82 – 7.28 pH units with an average pH value of 7.06 pH units. Most samples collected had fairly low dissolved oxygen concentrations, however, could be characterised as having a low oxygen demand as demonstrated by the values obtained for the parameters: chemical oxygen demand (COD), biochemical oxygen demand (BOD) and fats, oil and grease (FOG).

All samples collected could be described as having a high-water clarity given that both turbidity and total suspended solids were undetected in all samples, however, all samples exceeded the total dissolved solids (TDS) and conductivity concentrations as stipulated in the Draft Jamaica National Ambient Water Quality Standard – Freshwater. Despite exceeding this standard value, majority of the samples collected, could be described as being freshwaters; samples WQ2, WQ3 and WQ6 could be described as oligohaline, or marginally brackish samples given the salinities exceeding 0.5 ppt but remaining below 5 ppt [9]. The elevated TDS levels could be due to the levels of nitrates, sulfate, chloride and sodium observed in the samples collected.

Majority of the samples assessed were typically free from or had minute levels of coliforms, with the exception of the samples taken from WQ6. The samples also had low or undetected levels of tested heavy metals and pesticides.

4.2.6.3.2 Impacts on Water Quality

4.2.6.3.2.1 Heavy Metals

All heavy metals analysed (cadmium, chromium, iron, copper, zinc, arsenic, lead and mercury), with the exception of zinc obtained at sampling stations WQ6 and WQ12, were not detected in the water samples analysed (see Table 4-12). The non-detection of these heavy metals suggests that the groundwater in the project's sphere of influence is not being impacted by industrial activities.

The concentrations of zinc in groundwater do not generally exceed 40 ppb, however, can be influenced by the material of pipes and other fittings [10]. This could be a possible explanation for the levels of zinc detected at this location. Nonetheless, the levels obtained are well below the secondary maximum contaminant level of 5000 ppb specified by the USEPA that can be present in drinking waters indicating that the levels obtained do not pose a risk to human health.

4.2.6.3.2.2 Organic Demand

All water samples tested were compliant with the Draft NRCA Ambient Water Guideline – Freshwater, 2009 for BOD, i.e., all water quality sampling points had BODs of less than 1.7 mg O_2/L. The COD and FOG levels were largely undetected or relatively low in the samples collected

[9] https://www.dcr.virginia.gov/natural-heritage/natural-communities/ncea2#:~:text=Oligohaline%20conditions%20are%20defined%20as,occurs%20from%20Maine%20to%20Georgia.

[10] https://cdn.who.int/media/docs/default-source/wash-documents/wash-chemicals/zinc.pdf?sfvrsn=9529d066_4#:~:text=In%20natural%20surface%20waters%2C%20the,piping%20and%20fittings%20(2).

suggesting that the water samples were relatively free from substances that could result in the depletion of oxygen in the groundwater samples.

Although the dissolved oxygen was low in these samples collected, this could be due to a number of factors such as the temperature of the sample, the expected low turbulence of the sample and the depth at which the samples are collected from. Subsurface samples typically have low turbulence and photosynthetic activities given the lack of light that can penetrate the water body. Additionally, the water samples collected had temperatures between 28.7 and 30.1°C reducing the amount of dissolved oxygen that can be held in the water samples. However, these factors are most likely due to the nature of the samples and sampling activity and do not indicate an anthropogenic impact on the water samples themselves.

4.2.6.3.2.3 Nutrients, Minerals and Other Metals

The nitrate concentration across the samples collected ranged from 46.1 mg NO_3^-/L to 95.0 mg NO_3^-/L exceeding the upper limit specified in the Draft Jamaica National Ambient Water Quality Standard – Freshwater of 7.5 mg NO_3^-/L. Additionally four of the seven samples collected had nitrate concentrations that exceeded the World Health Organization's guideline value of 50 mg NO_3^-/L. Although most of the locations sampled from indicate that the raw groundwater sampled is only used for irrigation purposes, i.e., groundwater is either treated or water is obtained from the NWC for potability purposes, the levels of nitrate within the groundwater poses a health risk to human health if not used appropriately. High levels of nitrate are associated with the body's ability to carry oxygen in a condition known as methemoglobinemia. [11] Nitrate in groundwater can be a product of surface activities rising to the possibility of other contaminants also being present in the groundwater system such as those from agricultural activities. However, no pesticides were detected within the samples collected and the orthophosphate concentrations across the samples tested were fairly low and within the range (0.01 – 0.8 mg PO_4^{3-}/L) specified in the Draft Jamaica National Ambient Water Quality Standard – Freshwater. The trend results obtained for these samples are similar to that observed by the WRA where majority of samples collected in the general vicinity of the assessment area showed early deterioration (exceeded the Draft Jamaica National Ambient Water Quality Standard – Freshwater) or poor water quality (exceeded the WHO drinking water guideline) for the nitrate parameter.

Similarly, the parameters sodium, chloride and sulfate also exceeded the Draft Jamaica National Ambient Water Quality Standard – Freshwater, however, all were lower than the values specified by the WHO drinking water guideline. This trend was also similar to the data obtained by the WRA.

The data suggests that the water may be contaminated by anthropogenic activities that can result in elevated levels of these parameters such as sewage. During the operational phase of the project, if groundwater is to be used, use should be limited to irrigation or treated adequately before use as a potable water source.

11 https://agsci.oregonstate.edu/system/files/extcrs137feb2012_nitrate_hi_res_30jan2012.pdf

4.2.6.3.2.4 Microbial Parameters

The samples collected exhibited low or non-detectable levels of coliforms with the exception of the sample collected at WQ6. Although the reason for the difference in coliform levels as compared to the other samples is unclear, it underscores the importance of limiting the use of the water samples for potability purposes unless adequate treatment is applied to these water samples.

4.3 Biological Environment

The observations from the site reconnaissance indicate a predominantly urbanized environment, characterized by limited vegetation and animal populations. The trees observed consist mainly of fruit-bearing varieties including cashew (*Anacardium sp*.), mango (*Mangifera sp*.), and Otaheite apple (*Syzygium malaccense*), alongside various ornamental species deliberately cultivated for aesthetic and landscaping purposes Figure 4-42. Various grasses and shrubs of low ecological significance were also observed within the gully network throughout the project area Figure 4-43.

Figure 4-42 Fruit Tree Dominance in the Surrounding Communities

Figure 4-43 Gully Network and Adjacent Vegetation in the Project Vicinity

Among the observed animals were predominantly feral cats and dogs, along with occasional sightings of butterflies and birds, typical of urban settings. Other domestic animals such as goats and pigs have been observed and/or reported within the study site; however, none was observed during this site reconnaissance. The species list can be found in the Appendices.

Despite the general disturbance within the project area, critical ecosystem services such as pollination, habitat provision, and nutrient cycling are still provided Figure 4-44. Additionally, the area retains cultural significance, offering recreational as well as historical value.

Figure 4-44 Multifaceted Contributions of the Community Center Tree: Supporting Nutrient Cycling and Cultural

The observations made during this reconnaissance are consistent with findings from the 2020 Environmental Impact Assessment for the Jamaica Houses of Parliament, suggesting similar ecological conditions within this urbanized environment.

The EIA documented that the project site, despite not being an ecologically sensitive area, underwent an environmental assessment considering its impact on surrounding flora and fauna. The ecosystem is significantly disturbed due to historical vegetation clearing and landscaping for park and monument use. The adjacent area is heavily developed and urbanized.

Terrestrial ecology is dominated by landscaped species and opportunistic plants, with grasslands accounting for over 90% of vegetation cover. Thirteen plant species were recorded, none of which are of special conservation concern or endemic to the area as seen in the

Terrestrial fauna observations were limited to birds, butterflies, and feral dogs, all common and widespread species typically found in disturbed environments. No rare or endemic species were observed. All observed bird species are categorized as "Least Concern" by the International Union for Conservation of Nature (IUCN), indicating they are not currently threatened as seen in the

In essence, the project site exhibits a significantly altered ecosystem due to past human activities. The limited biodiversity and presence of common, non-threatened species reflect the impact of urbanization on the local environment.

Both the site reconnaissance and the Environmental Impact Assessment (EIA) for the Jamaica Houses of Parliament found the proposed project area to be heavily disturbed. Based on these findings, no significant adverse environmental impacts on the flora and fauna are anticipated during the construction and operational phases of this project.

4.4 Social Environment

This section describes and discusses the social environment of the National Heroes Park and its surrounding communities, with a focus on the population demographics, issues and challenges. The results highlighted were obtained from social surveys carried out by Environmental Solutions Limited and the Mona School of Business and Management (2024) as well as from the most recent available date from the Statistical Institute of Jamaica. Further details on the social environment can be found in the Social Impact Assessment Report prepared by Mona School of Business and Management. The Government Campus Project seeks to create a centralized location for governance while facilitating the growth of safe, resilient, inclusive and sustainable urban spaces in alignment with United Nations Sustainable Development Goal 11.

4.4.1 Population Demographics

Using a 2km sphere of influence, the population of the project area spans the following 14 communities with a total population of 59,947 residents (as illustrated in Table 4-13), with 29,067 being males – males accounted for approximately 48.4% of the population.

Table 4-13: Community Population (STATIN 2011)

Communities	Total Population
Jones Town	9881
Vineyard Town	8406
Cross Roads	2129
Arnette Gardens	6391
Trench Town	3582
Fletchers Land	5643
Town (Downtown)	2562
Allman Town	1366
Campbell Town	3344
Denham Town	2673
East Downtown	9723
Frankyn Town	2814
Kingston Gardens	107
Passmore Town	1326
	Total: 59,947

Based on the most recent publication from the Statistical Institute of Jamaica (STATIN) of the national population and housing census (2011) these communities share the common characteristic of having a population size constituting heavily of persons younger than 45 years. A youthful population in each community implies that the general project area features high birth rates with low life expectancies – on average, ~7% of the total population of the high priority communities are over the age of 65, while 38% are under the age of 20. Franklyn Town had the highest proportion of the elderly (> 65 years) (~14%) while East Downtown and Allman Town had the highest proportion of youth (< 20 years) (~39%).

It is possible that the high birth rates and low life expectancy observed in these communities could be as a result of the amalgamation of social issues. These probable issues include:

- High crime rates
- Political divide
- Poor access to healthcare services (contraception)
- Lack of education (health and family planning)
- Emigration

4.4.2 Housing Infrastructure

4.4.2.1 Housing Material and Quality

Concrete and blocks are the most dominant materials used to construct housing units in the communities surrounding the NHP, with board being the second most popular type of construction material. There were also notable variations in the quality of the housing stock across communities. In the Cross Roads community, the majority of houses are in good condition, while in Hannah Town most of the houses are in poor condition. Housing units found in Fletchers Land and Allman Town are best described as in fair condition. It is interesting to note that although Hannah Town had the highest percentage of concrete and black dwellings, it also had the lowest structure quality. There was no data readily available on either housing material or quality of houses was available for Jones Town. However, from field observations, the Consultants are of the view that the housing stock in the project zone of influence is mainly of good construction (Figure 4-45).

Figure 4-45: Sample of Housing Infrastructure within the Project Area

4.4.2.2 Land Tenure

With respect to land tenure, ownership is dominant in all five communities. Renting was the second most popular land tenure type in Allman Town, Cross Roads, Jones Town and Fletchers Land. Notably, residence on captured land was the second highest land tenure type in Hannah Town. The captured land tenure category was also relatively high in Jones Town, Cross Roads and Allman Town.

4.4.3 Summary of Communities and Utility Access

The assessment of the socio-economic environment of the project area and its communities took into consideration the project area's sphere of influence. Their socio-economic standing was analysed using some key indicators such as their access to basic services such as electricity, water and healthcare. Access to these services represents the challenges faced by their peculiar geographical and demographic positioning. (SDC Community Demographic Data, 2022). The sections below detail communities and their socio-economic considerations in relation to data collected through a survey.

These key communities included: Allman Town, Fletchers Land, Jones Town, Cross Roads, Denham Town, Arnett Gardens, Passmore Town, Vineyard Town, Trench Town, Campbell Town and Franklyn Town. A summary of the of each area, based on the socioeconomic survey completed under this project, is presented in Sections 3.4.1.1 to 3.4.12 below. Appendix 1 presents the tabulated results.

4.4.3.1 Allman Town

The demographic composition of the Allman Town residents surveyed consisted of majority (72%) female respondents. Most (47%) of residents reported that someone within their household suffer from illnesses including hypertension (60%), diabetes (30%) and asthma (15%). All residents surveyed have access to electricity, with the majority (91%) reporting that they have internet access

by way of an Indoor Service Providers (ISPs) (95%). It is noteworthy to mention that although the majority (79%) of residents reported having indoor plumbing services, 21% of the respondents lack access to indoor plumbing with another 26% stating that their restroom facilities are located outdoors.

4.4.3.2 Fletchers Land

The demographic composition of the Fletchers Land residents surveyed consisted of majority (59%) female respondents. The majority (58%) of respondents reported that no one in their household suffers from any illnesses, while 28% attested having someone in their household that suffers from an of illness such as diabetes (17%) or hypertension (6%). Illnesses such as asthma, cancer, heart disease and thyroid issues each accounted for 2% of the responses. Most of the residents surveyed stated that they have access to electricity (98%) and internet connectivity (92%). Internet access is mainly received from ISPs (77%) and mobile data plans (39%), with a smaller percentage of the residents receiving internet access from public wi-fi networks (12%). Although the greater percentage of respondents (64%) benefit from indoor plumbing services, 36% stated that they do not have access to adequate indoor plumbing which has resulted in the use of outdoor restroom facilities by 57% of the respondents.

4.4.3.3 Jones Town

The demographic composition of the Jones Town residents surveyed consisted of slightly more male (54%) than female (46%) respondents. Most (35%) of respondents indicated that illnesses are present within their household, with diabetes (56%) and hypertension (54%) being the most common. It is also noteworthy to mention that other illnesses reported by residents included stroke (8%), heart disease (26%) and cancer (10%). The majority of the residents surveyed have access to electricity (93%), as well as 80% reported that they have access to internet with connections mostly being provided by ISPs (50%) and mobile data plans (45%) and to a smaller extent by access to public wi-fi networks (20%). Despite the even split in responses regarding indoor plumbing, the majority (60%) of residents surveyed stated that they use outdoor restroom facilities.

4.4.3.4 Cross Roads

The demographic composition of the Cross Roads residents surveyed consisted of more male (52%) than female respondents (48%). The majority (62%) of respondents state that there are no illnesses within their household, however 17% of respondents stated that they do suffer from illnesses. Within this 17%, diabetes and kidney disease accounted for 80% and 20% of the responses respectively. The majority of residents have access to electricity (83%), indoor plumbing (79%) and all participants stated that they have access to the internet. Internet connectivity is largely received from mobile data plans (76%), as well as ISPs (41%) and to a smaller extent public wi-fi networks (7%). With regards to restroom facilities, 72% of respondents stated that their facilities are located indoors, while 28% stated that their restroom facilities are located outdoors.

4.4.3.5 Denham Town

The demographic composition of the Denham Town residents surveyed consisted of 57% females and 43% males. The majority (63%) of residents stated that there are no illnesses within their household, however a small percentage (23%) do suffer from illnesses. Within this 23%, the most

prominent two illnesses experienced are diabetes and hypertension which accounts for 71% and 43% of the responses respectively. All residents surveyed have access to electricity, however 40% of residents do not have access to indoor plumbing and another 30% stating that their restroom facilities are located outdoors. The vast majority (97%) of respondents have internet access which is made possible largely through connections provided by ISPs (62%) and mobile data plans (55%).

4.4.3.6 Arnett Gardens

The Arnett Gardens residents surveyed were comprised of 57% female and 43% male respondents. The majority (57%) of respondents are unsure of their health status as it relates to illnesses, however the results show that 36% indicated the presence of illnesses within their households. Within this 36%, diabetes is the most prominent illness experienced by 60% of the respondents' households. Other illnesses reported included cancer (20%), heart disease (13%), stroke and hypertension which each accounted for 6% of the responses. The majority (98%) of residents stated that they have access to electricity and indoor plumbing services (95%), which facilitates access to indoor bathroom facilities (98%). Most (95%) of the respondents surveyed have access to the internet with the majority receiving connections form ISPs (83%).

4.4.3.7 Passmore Town

The Passmore Town residents surveyed consisted of 57% female and 43% male respondents. Most of the respondents stated that there are no illnesses experienced within their households (43%), with another 36% who indicated that they are unsure of the health status within their household. For the 3 persons (21%) who stated that persons within their household experience illnesses, the results show that hypertension is the most common illness. In relation to utility access, all residents surveyed have access to electricity, indoor plumbing services that facilitates the use of indoor restrooms and internet access.

4.4.3.8 Vineyard Town

The demographic composition of the Vineyard Town residents surveyed comprised of 55% female and 45% male participants. The majority (67%) of respondents stated that there are no illnesses experienced within their household, however the results showed that 24% of the responses suggested that illnesses are experienced within households represented by a few survey participants. Within this percentage, hypertension and diabetes are the most common illnesses which accounted for 67% and 58% of the responses respectively. In relation to utility access, all participants have access to electricity, the majority (92%) have access to indoor plumbing and 94% have access to indoor restroom facilities. The vast majority (90%) of residents indicated that they have access to the internet, and within this percentage ISPs are largely credited for providing connectivity accounting for 91% of responses.

4.4.3.9 Trench Town

The Trench Town residents surveyed consisted of 58% females and 42% males. Most (40%) respondents stated that there are no illnesses experienced within their household and another 40% stated that they are unsure of the health status as it relates to illnesses. A total of 10 (18%) participants stated that illnesses are present within their household, and within this number diabetes is the most common illness experienced accounting for 80% of the responses. The other

illnesses reported were stroke and cancer which each accounted for 20% of the responses. The vast majority of respondents have access to electricity (95%), 89% have access to indoor plumbing and 88% have access to indoor restroom facilities. A total of 44 (77%) respondents mentioned they have internet access, and within this number the majority (68%) receive their connections from ISPs and 27% are connected via mobile data plans.

4.4.3.10 Campbell Town

The demographic composition of the Campbell Town residents surveyed consisted of 49% females and 51% males. The majority (58%) of respondents reported that there are no illnesses experienced within their household, however 35% of respondents represented households have persons who suffer from illnesses. Within this percentage, hypertension is the main illness experienced as it accounted for 89% of the responses. With regards to utility access, the majority of respondents have access to electricity (96%), indoor plumbing (85%), indoor restroom facilities (77%) and internet access (96%) which is mainly provided by ISPs (96%).

4.4.3.11 Kingston Gardens

The Kingston Gardens residents surveyed consisted of 75% males and 25% female. Half (50%) of the respondents surveyed stated that illnesses are experienced within their household, while 25% of the responses accounted for households without illnesses and those with an unsure health status. All participants stated that they have access to electricity, internet and indoor plumbing, however 25% of participants stated that their restroom facilities are located outdoors. Participants mainly receive internet connectivity from ISPs as stated by 75% of respondents.

4.4.3.12 Franklyn Town

The demographic composition of the Franklyn Town residents surveyed consisted of 52% females and 48% males. Most (45%) respondents were unsure of the health status within their household, however, 37% indicated that illnesses are experienced within their household. From this percentage, diabetes and hypertension were the most reported illnesses which accounted for 50% and 55% of the responses respectively. The vast majority of participants stated that they have access to utilities such as electricity (97%) and internet connectivity (93%) which is primarily provided by ISPs (80%). Additionally, the majority of households represented by survey participants benefit from indoor plumbing (95%) and indoor restroom facilities (95%), however 5% of respondents stated that their household lacks indoor plumbing and as a result rely on outdoor restroom facilities.

In analyzing the above, there exists an overall majority of females within the area of interest. Most households benefit from indoor plumbing which suggests that to a certain degree they have better access to modern plumbing, which influences their capacity to have clean water for domestic use and direct lines for sewage. However, there remains a considerable percentage of households without access to indoor plumbing facilities that make them heavily reliant on the use of outdoor restroom facilities. This is a cause for concern as it heightens the risk for diseases and contamination due to latrine seepages or the direct exposure of human waste in surrounding spaces, especially in densely populated urban space.

Although the results acquired from the survey did not suggest the presence of any diseases due to poor sanitation and contamination, discussions with public health professionals at the Windward

Road Health Centre within the project area indicated that the lack of access to indoor plumbing services for the relevant households could potentially contribute to the spread or outbreak of communicable diseases due to the use of communal spaces for water access such as standpipes. The data from the Windward Road Health Centre also indicated that the most common illnesses reported are diabetes and hypertension, suggesting that there is a substantial risk for cardiovascular diseases among the individuals within the area of interest. As such, access to reliable and efficient health care services is of utmost importance. Considering the urban nature of these communities, the vast majority of households have access to electricity which in turn allows them to benefit from internet access provided by indoor service providers.

4.4.4 Social Services

4.4.4.1 Healthcare

The boundary of the projected Government Campus, which includes areas with direct impact and the sphere of influence and is serviced by three health centres and three public hospitals. These are healthcare facilities which fall under the Ministry of Health and Wellness Southeast Regional Authority. All healthcare facilities in the Kingston and St. Andrew Authority operate under similar regulations and therefore, a referral structure exists whereby health centres and hospitals are in sync to provide services to their clients.

The availability of local health services to Jamaican citizens is free, with the establishment of two major policy interventions by the Government of Jamaica, the Jamaica National Health Fund (NHF), in 2003 and the abolition of user fees at public facilities in 2008. This has been described as an effort to improve universal access to healthcare, as a basic service delivery marker provided by the GOJ. Further, to ensure the most vulnerable in society is able to access healthcare, despite any lack of affordability.

There were interviews conducted with the Head Nurses at health centres which serve communities impacted by the Government Campus Project. These facilities include the Glen Vincent Health Centre, Comprehensive Health Centre and Windward Road Health Centre. Of the three health centres where data was collected, two are type 5 clinics, and one is paediatric and maternal healthcare. A type 5 clinic, according to the MOHW, is a facility that offers maternal, child health, family planning, dental and curative services, as well as pharmacy and specialist on a daily basis and is the headquarters for the health district. The other facility is a type 2 clinic which offers maternal, child health, family planning, dental and curative services, three days per week.

Despite the varying services offered, these clinics displayed excellent knowledge of their patient care statistics, with an average of the cases per day, communicable and non-communicable disease identification, nutrition levels and other environmental conditions and considerations. This data is summarized in the table below:

Table 4-14: Summary of Health Facilities

Health Facility	Average Number of Patients Per Day	Common Communicable Diseases	Common Non-Communic	Nutrition Status	Environmental Threats

			able Diseases		
Comprehensive Clinic	100	STDs & STIs	Diabetes & Hypertension	Average Nutrition Levels	Sanitation Issues relating to the Use of Pit Latrines, Violence and Housing Stock Decline
Glen Vincent	45-50	Gastroenteritis	Asthma & Other Respiratory Illnesses	Over Nutrition with Cases of Obesity	Floods, Riverton Fires and Climate Change (Heat & Dust)
Winward Road	8-40	Tuberculosis	Diabetes & Hypertension	Generally Low Nutrition Levels with a Lack of Balanced Diets	Improper Garbage Disposal, Floods from Poor Drainage and Violence

The combined geographical scope for the facilities serves the communities within the communities impacted by the project and the sphere of influence. However, for varying reasons mentioned, each facility highlighted the most common communities from where they receive the largest influx of patients. Of note, the reasons for low uptake by some communities are influenced by violence and turf wars. The consensus is that, despite the desire of some community members to attend the clinics, violence has caused them not to be able to enter or cross-over into certain communities. Presented below are the most common communities where patients visit per facility, the age ranges and most common services rendered.

Table 4-15: Health Facilities and Services

Health Facility	Communities	Age Range	Services
Comprehensive Clinic	Jones Town, Arnett Gardens, Allman Town and Fletchers Land	0-18 Years Represents the Key Demographic; Care is Provided to All Ages	Antenatal and Postnatal Care, STI Control & Prevention, Child & Adolescent Health, Mental Health, General Health Clinic, Dental Care and Pharmacy Services (NHF)
Glen Vincent Health Centre	Allman Town, Swallowfield and Kencot	0-11 Years; Adult Women	Vaccination, Family Planning, Prenatal & Postnatal Care, Growth Development, Women's Clinic, Child Guidance and Pharmacy Services (NHF)
Winward Road Health Centre	Winward Road, Fleet Street, McIntyre Villa,	0-99 Years	Child Health, Antenatal & Postnatal Care, Mental Health, General

Health Facility	Communities	Age Range	Services
	Southside (Downtown) and Tel Aviv		Clinic and Pharmacy Services (NHF)

The health practitioners provided feedback on barriers and challenges in their service delivery endeavours. All facilities noted that violence is an impediment to service delivery, as communities are challenged by limited movement as sporadic violent events are common. Of note, the Comprehensive Health Centre has had issues with violent crime on the premises, while the Winward Road Health Centre noted a recent drive by shooting on the road where the clinic is located. This is seen as a deterrent to the attendance for follow up appointments, as patients become fearful to leave their communities to be exposed to other community members at the clinics. This facility also noted that those who would like to attend also face financial constraints due to the sparse layout of the communities served.

Also noted were the long wait times, inflexible patient working hours and missed appointments, other common barriers for potential patients. For the Glen Vincent Clinic, it was noted that patients often visit for services not offered at the clinic such as dental and lab services. Although referred to other clinics, this is a barrier as should there be an expansion of services, this will fulfil the needs of the immediate community. The issue of understaffing and the migration of nurses was overwhelming at all facilities. It was expressed that adequate nursing staff persists and this challenges the ability to deliver services in an optimal way.

Despite the gaps in service delivery the clinics continue to operate using the prescribed systems for health care service delivery and management, as stipulated by the MOHW SERHA. Patients that are critical or have health concerns that are outside of the management scope of the clinics are referred to Bustamante Children's Hospital, Victoria Jubilee Hospital and Kingston Public Hospital. In turn, these larger facilities may refer the patients back to the health centres for further treatment or follow ups or revise the escalation, if deemed to be manageable by the facilities. The hospitals and clinics appear to work closely on their referral system, where there are protocols in place for the efficient care of patients.

Within the facilities, there are tracking mechanisms in place to track appointments, track dropouts and track and log referrals. These mechanisms allow for the clinics to be able to track non-compliance particularly vaccination rates.

The education and literacy levels among the community members was identified as a challenge especially where drop-out rates are concerned. The Windward Road Health Centre noted that their high levels of tuberculosis (TB) are due to the failure of their patients to complete their treatment once diagnosed, as well as low rates of immunization. In some cases, the high HIV prevalence accounts for this spike in TB numbers, as this causes some to be immunocompromised. To help to combat these challenges, there are non-medical programmes that take place within communities and at clinics. Below is a table that provides a list of these programmes offered by each of the health facilities.

Table 4-16: Programmes for Health Facilities

Health Facility	Environmental Health Workshops	Health Education and Promotion	Home Visits	School Visits	In-Clinic Disease Prevention Education	Risk Assessment
Comprehensive Clinic		X	X		X	X
Glen Vincent Health Centre		X	X	X	X	
Windward Road Health Centre	X	X	X		X	

Collectively, the health practitioners expressed that, in the present dispensation the health care centres are adequate for the population and geographical areas they serve. However, if there is a large expansion in the population due to the development of the Heroes Circle, they believe that there may be a need to upgrade their facilities to better serve. The combined issues of violence and other environmental challenges should be addressed as redevelopment takes place.

4.4.4.2 Fire Services (York Town Fire Station)

The St. Andrew Jamaica Fire Brigade (JFB) Divisional Commanding Office is located at the York Town Fire Station with one divisional commander in charge of the parish. This station commands the entire Kingston Metropolitan area and has the overarching responsibility for communities and stations therein. Despite this overarching responsibility, the York Town Fire Station has specific scope to respond to the communities of Admiral Town, Hannah Town, Jones Town, Fletchers Land, Allman Town and Campbell Town. In the case of other stations that may lack the resources to respond to fire and disaster incidents, this is the command centre with the responsibility to do so. Of note is the awareness of the commanding officer and team, for the proposed relocation of the commanding office and station, contained in the Master Plan for this project. There is a high level of knowledge and engagement which has taken place with this team in relation to this project.

The challenges that face the JFB in this division include the construct and layout of the communities, as this limited the ability to respond to fires and other disasters. The limited space to navigate the roadways are due to the removal of stormwater drains, residents building too far out into the roadway and old dilapidated buildings expanding into the roadways. The increased fire risk for the communities is also due to these dilapidated buildings and low electrical wires also pose a fire risk as they are considered fire hazards. Therefore, there is a need for housing renewal within these communities, as the continued deterioration of infrastructure poses a heightened risk for future fire disasters.

As a part of risk mitigation measures the JFB has as a part of its standard procedures, public education within schools, churches, communities and among other key stakeholders. While this is being done in this division, there is more to be done especially to ensure fire incidents decline from what it has been over the last few years. It is noted that incidents have spiked in recent years, particularly during the summer months, as children are unsupervised, and house fires become more common.

The JFB commander recommends heightened public education, during and after this project is implemented, to ensure an understanding of relatable issues especially in new living circumstances. A key recommendation in the housing redevelopment aspect, is the layout to consider space for extended platforms and space to rotate for firefighting and rescue. Additionally, to serve communities with new demands, the JFB will need to be better equipped with state-of-the-art equipment to serve new building structures, especially when considering multi-storey buildings. Finally, it is noted that elevators in buildings adds another layer of risk to housing developments, as there are electrical and maintenance issues that may arise, as well as human induced operational hazards. Any new housing solutions should be built to consider fire protection materials, equipped with extinguishers, smoke alarms and the use of fire-resistant material in the construction phase.

4.4.4.3 Security and Safety

The Kingston Central Police Division is one of 19 police geographical divisions in the Jamaica Constabulary Force. (JCF) The division headquarters is located at 50 East Queens Street in Downtown Kingston currently headed by a Divisional Commander (Superintendent Berrisford Williams). The communities within this project boundary and sphere of influence fall within the geographical map of this JCF division. The area command for this division is within the east of South Camp Road and within the West of Slipe Road. In terms of the safety concerns within the communities, the division's team shared that their responses vary between crime prevention, mitigation and response; community intervention and outreach programmes.

Within the past three years, communities have been plagued with sporadic acts of violence with ongoing gang concerns and turf wars between communities, closely located. Despite the increase in shooting incidents, the police maintain a 24-hour police presence, to continue to combat crime. The police have had to rely on local trust and intelligence to combat crime, with an aggressive campaign to dismantle gangs which is an ongoing endeavour. This relationship building also expands to their thrust in relation to apprehending alleged criminals for crimes perpetrated.

To build trust within the communities, outreach programmes have been implemented throughout the division. These activities include community engagement through face-to-face meetings, proximity policing strategies, widely publicised stakeholder meetings and engagement through the local Police Youth Clubs. The police stations within the division also have as their mandate to encourage and attend neighbourhood watch meetings and initiatives, working closely with schools and churches. The objective for these kinds of engagements is to educate residents on the role of the police, build relationships and trust and to promote peace within the communities. Additionally, sporting activities such as a football competition was launched to promote the spirit of community and peace and harmony. Despite being marred by a recent stabbing incident at one of the matches, the police division leadership is of the fervent belief, that sporting activities help to garner and promote peace and mutual respect between communities. Residents, stakeholders and the public are invited to weekly station lectures at the divisional commanding office to share information and provide feedback.

In admitting a short coming in the community engagement strategy, the police divisional team expressed a need to improve on one-on-one communication with the community members to ensure that anonymous cases are dealt with appropriately. Where their strength currently lies, is in observation mechanisms within the space to aid in intelligence gathering. It is commended, that this

can be used to engender trust and protection during the construction and possible relocation in the implementation of this project. Further, the JCF team recommends that, security mobilisation from the level of the state, be employed during the construction phase, as this will be mutually beneficial.

The layout of the communities remains a concern for policing, as this facilitates crime and is a barrier to crime and incident response. As a densely populated set of communities, the closeness of dwellings, the two-story layout of houses and the narrow roadways present a challenge for police to traverse communities. This challenge often results in delays in response and sometimes leads to an inability to adequately respond to the problems which repeatedly present themselves. As criminals and gangs become more organised, the police have found that the multistorey and densely populated- one entrance dwellings (also known as tenement yards) harbour get away plans and plots to disappear once a chase ensues.

Other challenges being experienced by the police has to do with the internet connectivity at their command centre which has impaired their ability to communicate smoothly with the other stations and mobile units within the division. This is a matter that is being worked on to improve on the broad communication of the division, as this affects the operations at varying levels. However, from an operational perspective, it is believed that this development will provide an opportunity to decentralise their operations, particularly with the relocation of the parliament building and the moving of ministerial offices to one location. This is positive for the police, as they believe it will reduce manpower load and redirect the human resources to the on-the-ground crime fighting activities. The police team has been engaged in and displays a high level of involvement and knowledge of the project and its stakeholders.

4.4.4.4 Solid Waste Management

The National Solid Waste Management Authority (NSWMA) organizes its waste collection targets into zones, with each of the identified communities in this assessment being a constituent of a zone that is recipient to waste collection devices. The primary disposal site that serves the KSA region is the Riverton City Disposal Site.

Despite the NSWMA's organized collection schedule, waste collection and disposal in most of the target communities could be improved upon. Solid waste can be observed in the various gullies and minor waterways that populate the project area. Residents in Jones Town in particular have expressed concerns over this improper waste disposal practice that tends to lead to downstream flooding.

4.4.4.5 Road Networks

A consequence arising from the pre automobile settlement patterns established in the Rim Communities has been that their roads are narrow, mostly incapable of carrying two-way traffic, and do not function as an efficient system of carriageway for their members. The networks have been built based on the traditional grid pattern, of interconnected roadways. In most communities these would be better described as lanes.

In all communities they are generally oriented north south and east west. The roads are maintained by the Kingston and St Andrew Municipality. In very recent times, road maintenance has been

undertaken in sections of Jones Town Hannah Town and Fletchers Land, and some sections of Cross Roads. Greater Allman Town is has not yet benefitted from this road improvement program.

The nature and pattern of the roadways is indicative of the urban decay that is a persistent threat to the living conditions in these communities. Zoning is absent and signed boundary demarcations between settlements within the Communities is absent. There are no parking zones which appear to be dictated by the narrowness of the streets and roads, and bear little relationship to convenience of access by motorists, to places of business, schools, churches or homes. Consideration should perhaps be given to pedestrianizing some roads in the interest of commuter safety but also if visitors are to be encouraged to Draft Report – Environmental Impact Assessment – Jamaica Houses of Parliament Environmental Solutions Ltd. 89 participate in the Community's hope that the Project could allow exposure to their various cultural offerings. There is particularly this need for safer commuting access in most of Greater Allman Town, Jones Town and Fletchers Land.

It is noteworthy that although public transportation is available within moderate walking distances and by taxis, no minibuses, much less Government operated buses, route through major parts of these communities

4.4.5 Public Opinion on the Project

During a three-week period in July 2024, a data collection exercise was conducted in fifteen communities within the project boundary and 2 KM wide to the sphere of influence. Using data from the EDs within these communities, 629 interviews were conducted. The project was positively viewed by respondents, 72% of the respondents agreeing with the Government Campus being a good development. To this extent, some 25% of respondents do not believe that the project is beneficial to their community or the general development of Kingston. Of note, is an average awareness about the project, where only 52% of the residents were aware of the project, while 46% expressed that they were unaware up until the point of these interviews.

The survey results show the major concern for the residents of proposed relocation.

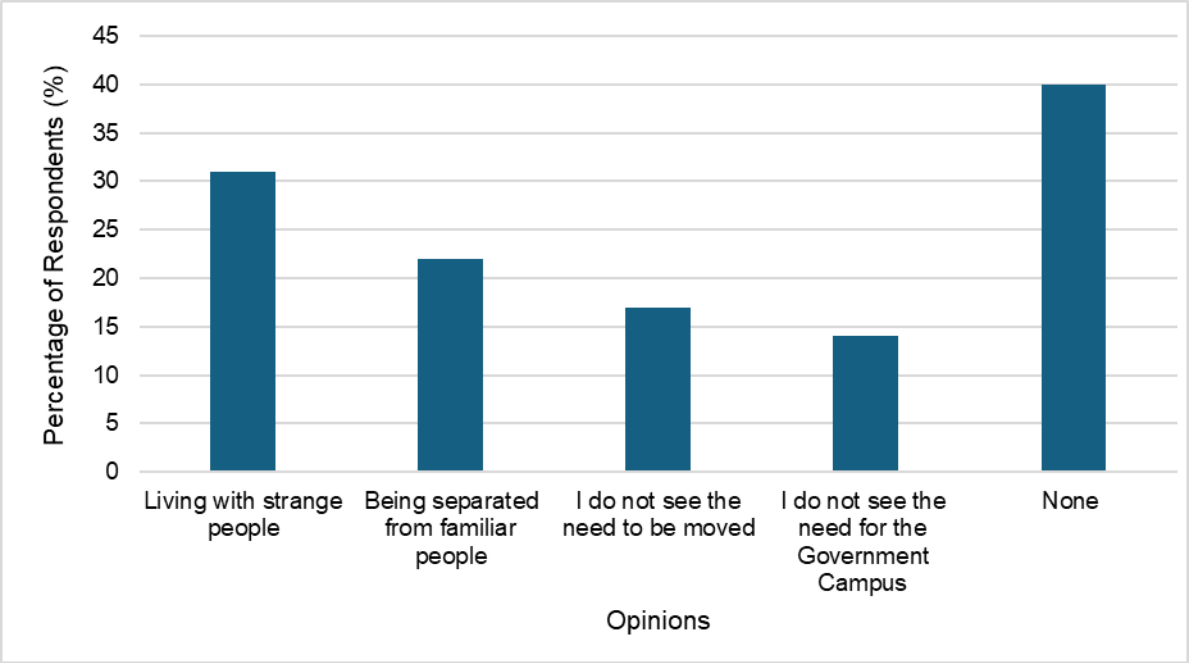


Figure 4-46: Public Opinions on Relocation

Despite not being comprehensively briefed on this project, 71% of the respondents expressed that they would be willing to move from where they currently reside, if relocation is an option for them. For this to happen, they want to move into a housing facility or home with improved amenities. In this regard, 82% believe that the Government of Jamaica should provide better amenities for their housing for communities, once relocation is an option. There are variations in the responses, however, more than half of the respondents do not feel the need to have a say in this development project despite their generally positive response for the project. Below details more specific views on the project, as expressed through the data:

- Crime – Residents expressed their beliefs in the possibility that this new development could spark an increase in crime rates within the surrounding communities because of the influx of opportunistic migrants.
- Electoral Boundaries – The possible changes to enumeration districts due to the influx of new residents and the changes to the settlement patterns
- Urbanization – There are concerns regarding the reduction of green spaces due to the construction of buildings and supporting infrastructure.
- Distrust – Residents expressed their distrust in the government and/or government officials regarding the use of public funds.
- Expenses – There are fears surrounding the potential increases in utility costs and decreases in housing stock.
- Education – Residents are fearful of the disruptions to the existing educational environment (i.e. the proposed relocation of Kingston High School).
- Roads & Traffic – The likely changes to the direction of traffic flows may lead to confusion and require a period of adjustment. However, there were identifiable benefits mentioned by residents such as access to better roads and community landscaping.

4.4.6 Overview of Survey Communities

The survey targeted residents who belong to the adult population, with 18-24 being the youngest age cohort surveyed. The age group with the highest concentration of residents was the 18-24 group which accounted for 16% of the results. Approximately 70% of survey participants are formally or informally engaged in the active workforce. Over 75% of residents surveyed attested to living in their respective communities for more than 10 years, with the majority of households accommodating 3-4 people (35%). There are children in more than 50% of the households surveyed, with the majority attending school in their respective communities. Electricity and internet utilities are accessible to the vast majority of residents. Most households have access to indoor plumbing which suggests that to a certain degree they have access to modern plumbing, which influences their capacity to have clean water for domestic use and direct access for sewage. However, there remains a considerable percentage of households without access to indoor plumbing facilities (27%), making them heavily reliant on the use of outdoor bathroom and toilet facilities.

4.4.7 Key Findings from Social Surveys

1. Social Inequities
   The social inequities identified within the context of the Government Campus Project are largely tied to the disparities in housing conditions and access to key services and resources. Many of the residents in the communities surveyed live in inadequate housing, with poor structural integrity and limited amenities. There also exists a variety of tenure arrangements, i.e. ownership, renting and informal occupation which further complicates proposed relocation and compensation efforts. The aged infrastructure is a major contributor.

2. Threats to Social Cohesion
   Relocation of residents is an expected outcome of the Government Campus Project, and this has the potential to disrupt longstanding social ties and cultural networks which contribute to community resilience. Within the communities surveyed, there is a reliance on informal support systems for child and elder care, as well as for mutual aid. Community relocation can erode these social networks, leaving many individuals without essential support which may further lead to the marginalization of vulnerable groups and limit the opportunities for meaningful engagement among residents.

3. Community Trust
   The Government Campus Project faces significant challenges to building and maintaining community trust. These threats are rooted in perceptions of inadequate transparency, limited engagement and the distresses caused by the residents' uncertainties of the project. Many residents believe that the planning and decision-making process for the project lacks openness, resulting in speculation and skepticisms. Residents also expressed feelings of exclusion from meaningful discussions which will directly affect their lives. The lack of clarity about the project's direction in relation to livelihoods and housing, coupled with previous grievances with government projects, suggests a level of distrust across community members. This is exacerbated by the uncertainty of the timelines for development which causes anxiety.

4. Relocation Readiness
   Over 50% of residents surveyed expressed their willingness to relocate, however the preference lies in relocation to another community. Notably, improving residents' access to amenities is also likely to aid in relocation efforts as over 70% of residents surveyed expressed their willingness to relocate into a home with better access to amenities. Despite the overall willingness to relocate by the majority of those surveyed, there are concerns about the adequacy of relocation plans and loss of social networks. On the other hand, businesses located within the study area are more reluctant to relocate, reflecting their apprehensions about the sustainability of new locations and loss of their clientele.

4.4.8 Social Benefits from Government Campus

Despite the negative social drawbacks of the project, there are several anticipated benefits which span the following themes:

1. Access to Improved Housing and Infrastructure (Water, Roads, Indoor Plumbing and Electricity)
2. Increased Access to Transportation
3. Increased Employment Opportunities (Formal and Entrepreneurial)
4. Improved Educational Facilities
5. Increased Capacity Building
6. Aesthetic Appeal
    a. Significant Improvements to the Aesthetics of the Project Area
    b. Demolition of Dilapidated Buildings, Unsafe Structures and Removal of Zinc Fences
7. Improved Safety and Security
    a. Police and Military Presence
8. Accessibility to Government Institutions
9. Improved Solid Waste Collection and Sanitation
10. Increased Property Values
11. Improved Environmental Quality
12. Improved Well-Being

4.5 Economic Environment

4.5.1 Overview of Jamaica's Economic Landscape

Jamaica's economy is an open emerging market economy, with key sectors including tourism, agriculture, mining, and services. The nation has made strides in recent years to improve its fiscal position, lower debt, and foster economic growth. However, challenges remain in the form of low human capital development, low productivity, high public debt, and economic vulnerabilities tied to external shocks and climate change. The Jamaican government has prioritized economic stability, debt reduction, and growth-oriented reforms under its national development framework, Vision 2030, which aims to make Jamaica *"the place of choice"* has been setback due to the global financial shock of 2008, the Covid19 pandemic, and the need to implement very strict agreements with the IMF.

Key Economic Indicators

- Gross Domestic Product (GDP) Growth: Over the last decade, Jamaica's GDP growth has been moderate, averaging between 1.5% and 2.0% annually. Growth in recent years has been driven by tourism, financial services, and construction. However, the economy remains vulnerable to external shocks, such as the COVID-19 pandemic, which led to a contraction of 10% in 2020. Growth in 2023 was estimated at 1.8%, with tourism rebounding strongly and construction activity increasing.
- Unemployment Rate: Jamaica's unemployment rate stood at around 6.2% in 2024, a significant improvement from earlier periods of high unemployment. Key drivers of employment growth have been the tourism, construction, and Business Process Outsourcing (BPO) sectors. However, underemployment and informal employment remain issues, particularly among the youth.
- Inflation: Inflation has been relatively stable, staying within the Bank of Jamaica's target range of 4%–6%. However, global supply chain disruptions and rising oil prices have led to periods of higher inflation, notably in 2022–2023. The inflation rate in 2024 is projected to average around 5.5%, driven by food and energy prices.
- Public Debt: Jamaica has made commendable strides in reducing its debt-to-GDP ratio, which peaked at 147% in 2013 but has since fallen to 75% in 2024. This reduction was achieved through a combination of fiscal consolidation, economic reforms, a debt buy-back arrangement with Petróleos de Venezuela South America (PDVESA), and debt restructuring under the International Monetary Fund's (IMF) Extended Fund Facility. Debt management remains a priority, as the high level of debt servicing limits the fiscal space for new investments in infrastructure and social services.
- Foreign Direct Investment (FDI): FDI has remained strong, particularly in sectors such as tourism, mining, and infrastructure. In 2023, FDI inflows totaled approximately $850 million, with significant investments in hotels, energy, and transportation infrastructure. However, further diversification is needed to attract FDI into other sectors such as technology and manufacturing.
- Remittances: Remittances from Jamaicans abroad contribute significantly to the economy, accounting for about 20% of GDP in recent years. These funds are critical in supporting domestic consumption and alleviating poverty, especially during economic downturns. Remittances have been particularly resilient during the COVID-19 pandemic, with inflows remaining steady despite global challenges. It is to be noted that the rate of growth of remittances has slowed during 2024 and is likely to continue in this mode for some time.
- Balance of Trade: Jamaica's trade deficit has narrowed in recent years, thanks to a robust tourism recovery and rising export revenues from mining and agriculture. However, the country remains a net importer of goods, particularly oil and food. In 2023, the trade deficit stood at $4 billion, a slight improvement over previous years as exports of bauxite, alumina, and agricultural products recovered.

Performance in Key Sectors

- Tourism: The tourism sector is the largest contributor to GDP, accounting for over 30% of total economic output. Despite the devastating impact of COVID-19 on international travel, the sector has rebounded strongly, with tourist arrivals increasing by over 45% in 2023 compared to 2020. Investments in new hotels, resorts, and tourist attractions have driven

growth. However, the sector remains highly vulnerable to external shocks, including pandemics and natural disasters. Indeed, the arrivals numbers have slowed for the second half 2024 due in part to a US government travel advisory relating crime and health care.

- Agriculture: Agriculture employs about 15% of the labor force and contributes roughly 7% of GDP. Key exports include sugar, coffee, bananas, and yams. While agricultural production has grown, the sector faces challenges such as climate change, low productivity, and the need for modern farming techniques. The government has prioritized initiatives to improve agricultural resilience and expand agro-processing to increase value-added exports.
- Mining and Quarrying: The bauxite and alumina industries are still significant contributors to exports and employment. Jamaica remains one of the world's leading producers of bauxite, and the mining sector contributes about 5% of GDP. However, declining global demand, high energy costs, and competition from other producers pose risks to the sector's long-term viability. Investments in green mining technologies are needed to reduce environmental impact and improve sustainability.
- Services and Financial Sector: The financial services sector is a significant part of the economy. Jamaica has a robust banking system, supported by financial reforms and increasing financial inclusion. The rise of digital financial services, including mobile banking and fintech, has been a key development in recent years. The BPO industry has also expanded rapidly, making Jamaica a leading regional hub for outsourced business services.

Relevant Planned Strategies to Drive Investment and Growth

The Jamaican government has implemented several strategies to stimulate economic growth, attract investment, and enhance long-term resilience. These strategies align with the Vision 2030 framework and the government's goal of achieving higher levels of growth and sustainable development.

- Infrastructure Development
  Investment in infrastructure is a key priority, with the government planning several large-scale projects in transportation, energy, and public buildings. These projects aim to improve Jamaica's logistics and trade capabilities while creating jobs. The new Southern Coastal Highway Improvement Project (SCHIP) and the planned Kingston Logistics Park are expected to boost connectivity and position Jamaica as a logistics hub for the Caribbean. The Government Campus Project is expected to be a major element of this investment drive.

- Fiscal Responsibility and Debt Reduction
  The government's fiscal policies continue to focus on maintaining a primary surplus and reducing public debt. Jamaica's success in reducing its debt burden has been supported by strong fiscal reforms, including public sector wage freezes, pension reforms, and tax system modernization. The Fiscal Responsibility Framework mandates stringent oversight of government spending and borrowing, ensuring fiscal discipline.

- Green Economy and Climate Resilience

Jamaica is committed to transitioning to a green economy, with a focus on renewable energy, sustainable tourism, and climate-resilient infrastructure. The government has set an extremely challenging target of achieving 50% renewable energy generation by 2030, supported by investments in solar and wind energy. In addition, climate resilience projects, including flood defenses and agricultural adaptation programs, are being implemented to mitigate the impact of natural disasters.

4.5.2 Describing and Assessing the Economic Impacts

The economic assessment considers three (3) different types of economic impact, namely direct, indirect and induced by the Government Campus Project.

These levels of impact are defined as follows:

A **direct impact** occurs when the project creates jobs and procures goods and services resulting in increased employment, business sales, and household income.

An **indirect impact** occurs when the suppliers of goods and services to the proposed project experience a larger market and the potential to expand. Indirect impacts result in an increase in job creation, GDP and household income.

An **induced impact** represents further shifts in spending on food, clothing, shelter and other consumer goods and services due to increased income in the directly and indirectly affected businesses. This leads to further business growth throughout the local economy.

Direct Impacts

- Employment Generation
- Investment in Infrastructure
- Government Revenues

Indirect Impacts

- Stimulus for Citizens and Local Businesses
- Government Revenues
- Regional Development

Induced Impacts

- Increase in Property Values
- Community Development

The major economic challenges identified are linked to challenges encountered at the macroeconomic level. These are inclusive of:

- High Public Debt: Despite notable progress, high public debt remains a major challenge, limiting the government's ability to invest in critical infrastructure and social programs. Jamaica continues to prioritize fiscal discipline, but debt servicing consumes a significant portion of the budget. The government's fiscal surplus targets and ongoing economic reforms under the IMF-supported program aim to further reduce the debt-to-GDP ratio.

- Low Productivity: Productivity levels in Jamaica, particularly in agriculture and manufacturing, remain low. Structural challenges such as inadequate infrastructure, limited access to finance, and a mismatch between education and labour market needs are key barriers to higher productivity. The government is focusing on education, skills training, and technology adoption to improve productivity.

- Vulnerability to External Shocks: Jamaica's reliance on tourism, remittances, and imports makes it vulnerable to global economic conditions. Natural disasters, such as hurricanes, also pose a constant threat, causing significant economic and social disruptions. The government has prioritized disaster risk management and climate resilience to reduce the impact of such shocks.

The main risks associated with the project to be considered are:

- Funding and Financing: Identifying funding sources, fiscal space and managing public expectations regarding expenditure during the life of the project will be a crucial determinant for successful project implementation for all phases. The Government Campus Project will require multi-annual and phased budgetary support. Such a requirement indicates a sustained and committed allocation mechanism and fiscal commitment on the part of the Government of Jamaica to ensure the project and its envisioned components are fully completed to ensure the anticipated objectives of the project is achieved.

- Community Engagement: The UDC, as Project Managers, will have to ensure that local communities are involved in the planning process to mitigate any negative impacts and enhance community support for this multi-annual and phased project. There should also be moderation in the expectation regarding the likelihood for such this project to single-handedly transform the surrounding communities; particularly with respect to long-standing issues of crime and public safety.

- Capacity for Inter-Government Co-ordination: The Government Campus Project, envisions major infrastructural development and upgrades; for which certain MDAs and/or private companies have exclusive responsibility or mandates to oversee and/or maintain. In order to deliver all components and phases of the project it will be important for the Project Management Entity to achieve strong inter-governmental coordination in order to streamline the required decision-making processes, reduce bureaucratic delays, and enhance accountability for achieving the project objectives on time and within budget.

4.5.3 Key Considerations Going Forward

4.5.3.1 Outlook for the Jamaican Economy (2024 – 2034)

Jamaica's economic outlook over the next decade is generally positive but moderate, underpinned by government efforts to maintain fiscal discipline, reduce debt, and implement strategic reforms aligned with the Vision 2030 development framework. Economic growth is expected to average between 2% and 3% annually, driven by the recovery of key sectors such as tourism, mining, agriculture, and services, particularly BPOs. As the government continues to diversify the economy,

Jamaica's reliance on tourism and BPO will gradually decrease, with a growing emphasis on renewable energy, logistics, and technology.

Public investments in infrastructure development, including the Southern Coastal Highway and Kingston Logistics Park, will enhance trade connectivity and position Jamaica as a regional logistics hub. The government's Special Economic Zones (SEZs) and PPPs will help attract FDIs, especially in manufacturing, agro-processing, and green energy projects, boosting long-term growth.

Debt management remains a critical priority. Jamaica's debt-to-GDP ratio is expected to fall to around 60% by 2030, as fiscal reforms and prudent budgeting reduce debt-servicing costs. This will create fiscal space for further investments in education, healthcare, and social protection programs, helping to reduce poverty and inequality.

Challenges such as low productivity, climate vulnerability, and exposure to external shocks, including global economic downturns and natural disasters, remain. However, Jamaica's commitment to climate resilience, through renewable energy targets and disaster risk management, will help mitigate these risks.

The outlook for inflation is stable, projected to remain within the 4%–6% target range, while unemployment could fall below 5%, supported by skills training programs and growing sectors like BPO and construction. Overall, Jamaica is well-positioned for moderate, sustainable growth, with a stronger, more diversified economy by 2034.

Economic Value Proposition for Government Campus

The Government Campus Project must demonstrate a clear balance between its upfront costs and long-term economic, social, and political benefits, and should align with Jamaica's Long-Term Vision 2030 development plan, particularly in governance, economic growth, and social development. It should also fit within other urban policy, programmes and plans for the area

It is vital that there be public support for the project. This can best be built via engagement with key stakeholders - parliamentarians, local communities, and business leaders - to ensure broad-based.

It is also crucial that there be a comprehensive risk analysis and contingency planning to mitigate potential issues such as cost overruns, construction delays, disruption to communities, and environmental concerns. The building should meet modern standards for sustainability, reducing future operational costs and positioning Jamaica as a leader in green governance infrastructure.

4.6 Archaeological Environment

4.6.1 History of the Area

4.6.1.1 The Taínos

The remnant of a boat constructed in the style used by the indigenous people recovered from former National Water Commission land on Water Lane is the earliest evidence of occupation of the area that came to be known as Kingston and St. Andrew. It is known that the Tainos occupied the Jamaica from the 900s, so the identification of this cultural item, known to be used by them, indicates that this area was in use from this early time. Additionally, they occupied Long Mountain, overlooking the

Liguanea Plains, and this site may have extended from Mona/August Town to the Warika Hills as cultural items associated with them have been collected in both of these locations.

The Spanish

Some 600 years later, in the early 1500s, the Spanish occupied Jamaica and established a ranch he Liguanea Plains was the site of a huge ranch established by the Spanish. The Liguanea Plains extended from the foothills in the north to the harbor in the south comprising wetlands of mangroves and swamps and generally regarded as an unhealthy place to live.

4.6.1.2 The English

After the English took Jamaica in 1655, these plains slowly grew to prominence becoming a part of the parishes of Kingston and St. Andrew. Then, with the loss of Port Royal to the 1692 earthquake as a major entrepôt, Kingston was destined to take its place.

The town of Kingston rose to prominence quickly, fast becoming a full-fledged parish what with many of the surviving inhabitants of Port Royal moved across the harbor. However, the area underwent several catastrophes including earthquakes, fires and hurricanes over the centuries. However, subsequent rebuilding demonstrated not only the resilience of the people of the town but also their wealth. This determination to succeed combined with the financial ability to see it through allowed for new and more modern structures to replace the older and historic structures. As a consequence, the old historic fabric of timber frame buildings, of brick and stone buildings were replaced by nog buildings, and then later by concrete block and steel strictures. The area has very few historic buildings standing.

4.6.1.3 Government Campus Site

The boundary of the projected Government Campus comprises in great part Allman Town and Fletcher's Land. These two properties were incorporated into the city of Kingston in 1867 when the city boundary was changed. They both date back to a much earlier period, however. This early period indicates that the building stock would comprise structures of Georgian and Victorian styles. The Georgian structures were defined by brick, Spanish nog or stone structures with hip roofs, sash windows, flanked by serpentine jealousies and trimmed with fretwork decorations. The Victorian period comprised sash bay windows, timber frame with nog walls. Many of these early structures have been demolished however, in favour of more modern style structures of the mid- to late -1900s into the early 2000s and to date comprising block and steel walls with concrete render, iron grill bars of various styles, pivot windows of numerous types. Buildings are our heritage and mark the work of our ancestors.

The Fletchers Land/Allman Town/Manchester Square/Racecourse area comprises a major part of the area earmarked for the Government Campus. This was an area of pens occupied by livestock, mainly hogs – best known as Colonel Samuel Barry's Hogs Crawle. Then, circa 1700, this property was sold to Beeston who owned much of the land in the area. The property of 200 acres were taken by the council and paid for without Beeston's permission. This land which was later returned to him became a part of the parishes of Kingston and St. Andrew. Allman Town was formerly known as Allman Pen and, and during the Spanish period, as previously noted, was a part of a huge ranch encompassing the Liguanea Plains with tens of thousands of heads of cattle. This ranch later was

divided in many sections, a part of which was Cavaliers Pen owned by Colonel Barry. This Cavaliers Pen great house was converted to a boarding school for Wolmer's and later demolished in favour of classrooms for the school. A further division of Cavaliers Pen saw the advent of Allman Pen, later to become Allman Town. This town was the site of one of the largest residential developments of its time in 1843. Further, it had the distinction of having national hero Marcus Garvey as one of its representatives in local government. It boasts many churches of different denominations. On Hector Street was the headquarters of the Women's Liberal Club with members including well -known Jamaican icons, such as Amy Bailey, Mary Morris Knibb, and Edith Dalton James. On Prince of Wales Street was Ivy Perry's Restaurant popular haunt of Prime Ministers and Members of Parliament in the 1960s and 1970s. Campbell Pen became a part of Allman Town after the 1907 earthquake. Fletchers Land, formerly known as Fletcher's Town, was incorporated into the city of Kingston in 1867. It was home to the Female Freemasons Lodge, which building is still standing. Ten years later, in 1877, Kingston had gas lights and later in 1884 a telephone service. In the 1920s Fletchers land was extended by lands formerly devoted to the Mary Villa College. In 1974, after fire razed an area right next to the Fire Brigade Station, Beverly Gardens was built.

4.6.1.4 The Streets

Table 4-17: Government Campus Streets With/Without Historic Buildings

STREET NAMES	HERITAGE BUILDINGS	
	PRESENCE	ABSENCE
ADAMS LANE		✓
ALTON VILLA ROAD		
ANDERSON ROAD (N/S)		✓
ANOTHER ROAD ABOVE THIS ONE PARALLEL TO TORRINGTON ROAD		✓
ARNOLD ROAD (n/s)	✓	
ARUNDEL STREET		✓
BOLIVER PLACE		✓
CAMPBELL STREET (N/S)		✓
CONNOLLY AVENUE	✓	
CONRAD LANE		✓
DAMES DRIVE	✓	
DEVON	✓	
EAST AVENUE		✓

STREET NAMES	HERITAGE BUILDINGS	
	PRESENCE	ABSENCE
EVE LANE		✓
GEFFRARD PLACE		✓
GOODWIN PARK STREET		✓
GRACE STREET		✓
GREAT GEORGE STREET (N/S)		
HANNA STREET		✓
HART STREET		✓
HITCHEN STREET		✓
HOPE STREET		✓
JOHN STREET		✓
LAIDLAW STREET		✓
LIVERPOOL STREET		✓
LORD ELGIN STREET		✓
MAURESCAUX ROAD		✓
MELBOURNE ROAD (E/W)		✓
MELBOURNE ROAD (N/S)		✓
MOORE STREET		✓
NEW CROSS STREET	✓	
NORTH AVENUE (NORTH/SOUTH)		✓
ORANGE LANE		✓
ORANGE STREET	✓	
PRINCE ALBERT STREET		✓
PRINCE OF WALES STREET		✓
REGENT STREET	✓	
ROAD ABOVE TORRINGTON ROAD		✓
ROBERT STREET		✓

STREET NAMES	HERITAGE BUILDINGS	
	PRESENCE	ABSENCE
ROSEDALE AVENUE		✓
ROSEMOUNT AVENUE		✓
SARAH STREET		✓
SEAFORTH STREET		✓
SLIPE PEN ROAD		✓
SLIPE ROAD		✓
STABLE LANE		✓
STANTON STREET		✓
STEPHEN STREET		✓
TORRINGTON AVENUE		✓
TORRINGTON ROAD		✓
TORRINGTON STREET (N/S)		✓
WATER STREET (N/S)		✓
WILD STREET		✓
WOODFORD STREET		✓
	7	47
N/S - NORTH SOUTH		
E.W EAST WEST		

4.7 Urban Planning and Development

4.7.1 Historical Urban Landscape of the National Heroes Park

The landscape of the NHP and surrounding communities have largely been shaped by a combination of the country's pre-colonial and colonial history. The area has a blend of elements that reflect memorial architecture and symbolic landscaping, while also functioning as a civic space. Evidence of a boat found on Water Lane which is believed to be from the time of the Taínos, suggests the settlement of indigenous people within the space. The Taínos are known for their practice of coastal habitation as they relied on the sea for fishing and trade. Despite their conflict with the Taínos, the Spanish continued this trend through their establishment of settlements along Jamaica's coastal plains. These settlements later saw the development of harbors and ports which served as major

points of trade. This was expanded upon by the British following their colonization of the island to create central hubs for trade, sugar refining and the export of goods to Europe which subsequently boosted the rapid coastal development that took place on the island's coast especially with population increases.

The site for the project is within the confines of one such central hub that later became known as Downtown Kingston. Downtown Kingston is Jamaica's first central business district (CBD) and hub of commercial activities in the island consisting of a number of communities and neighborhoods such as Allman Town and Jones Town, the urban form was constructed as a grid system radiating from a circle identified as the NHC (see Figure 4-47).

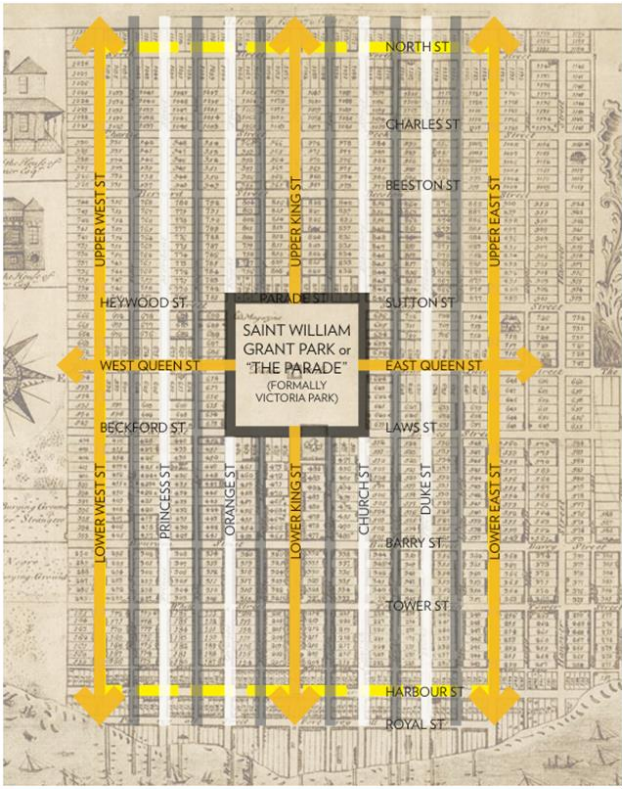
There is a blend of elements that reflect memorial architecture and symbolic landscaping which evokes respect, reflection and national pride. The key features of the historical urban landscape unique to the NHP and surrounding environs include:

1. Road Networks and Street Names
   The essence of the road layout is similar to that shown in the historic town plan which is found in the project's Master Plan. As the area became more developed, there was addition of newer streets, however many of the older streets retained their names including Church Street, King Street, Duke Street, Hannah, Hitchen and Stephen Streets. The functions of these streets remain the same with regards to channeling and connecting vehicular, as well as pedestrian traffic throughout the city for various reasons.

2. Landscaping and Architectural Elements
   Prior to becoming the National Heroes' Park, the location was the site of the Kingston Racecourse. It was the most popular venue for horse racing in the island for roughly 100 years. The location also functioned in the capacity as a multi-purpose complex used for events related to cricket, cycling and even traveling circuses. To the west of the racecourse was Torrington House, which was a prominent building used for housing several government offices, businesses and commercial entities. Due to the nature of its use, over time it became one of the central locations for professionals working in commerce and governance. Today, the property that is now occupied by buildings with different functions inclusive of the Good Samaritan Inn, which was developed by the East Jamaica Conference (EJC) of Seventh-day Adventists along with other entities to assist the needy and homeless with care, food, clothing, shelter and health services. Additionally, to the immediate north of the racecourse was the Quebec Lodge which primarily functioned as a guesthouse that catered to local and international visitors. The property was a place of luxury renowned for its association with the elite and upper classes, for a variety of reasons including hosting dignitaries, travelers and private social events. It was one of the premier locations in Kingston for hospitality of the highest standards. The property for the Quebec Lodge was acquired and now occupied by the Wolmer's Boys' and Girls' Schools. Equally as important is the York Park Fire Station which was built in the early 20th century and is one of Jamaica's oldest and important part of the city's fire service. Built in the colonial era, it has unique architectural characteristics and typical red brick construction of that era. While the York Park Fire station is a key symbol in Jamaica's firefighting legacy the building has been poorly maintained, which is a not an uncommon sight in the area. Just outside the project area is the Sabina Park, which is one of

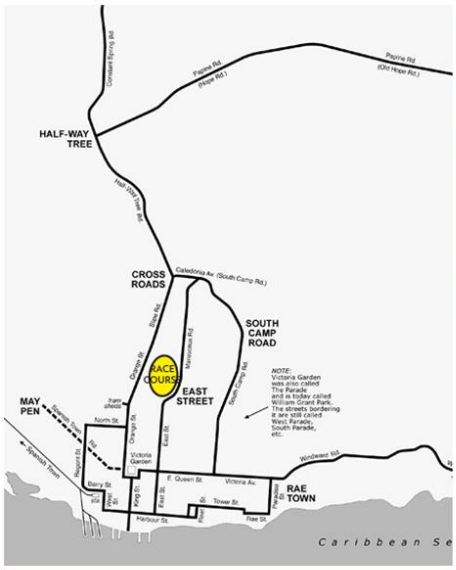
the largest cricket stadiums in the English-speaking Caribbean, as well as the Orange Street Jewish Cemetery which is the largest Jewish cemetery in the island. The St. Mathew's Anglican Church on Hitchen Street which is over a hundred and forty years old continues to serve nearby residents, in addition to those within the corporate area.

3. Integration with the Urban Environment
   Kingston morphed into Jamaica's hub for several industries ranging from trade and commerce to local, corporate and international governance. This gradually changed Kingston's classification and characterization as an urban center, marked by its increases in population density and advanced infrastructure in comparison to more rural and inland areas. Eventually, the concentration of businesses and services led to the need for spaces for housing and to host even more commercial complexes. Considering the rapid rate of urbanization which commenced prior to and following Jamaica's independence, the function, image and even design of many of the buildings, as well as streets went through several enhancements and rehabilitation to reflect the urbanized Kingston seen today.

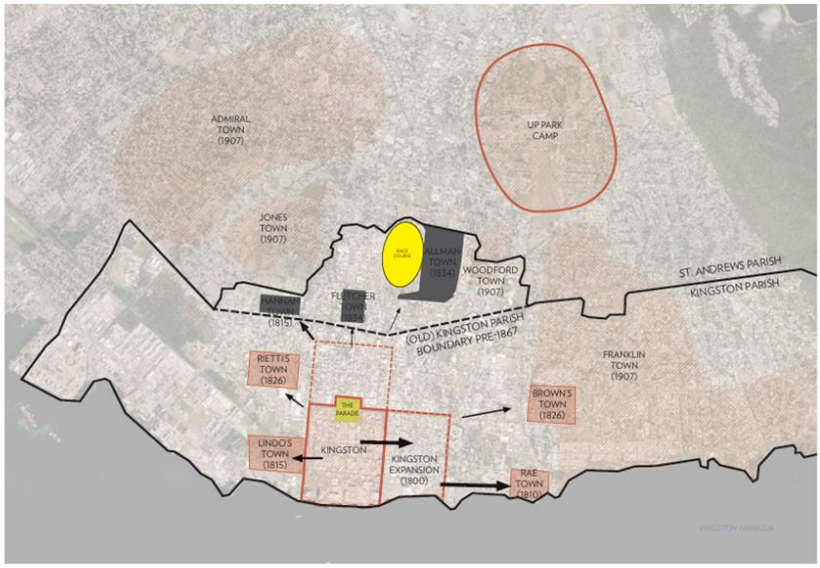


Historical Town Plan with Grid Layout

Kingston Race Course and Street Network



Kingston Tram Line Map with Layout of Race Course and Communities and Major Streets



Road Network and Settlement Expansion in relation to Race Course

Figure 4-47: Changes in the Kingston Area to become Main Industrial Hub

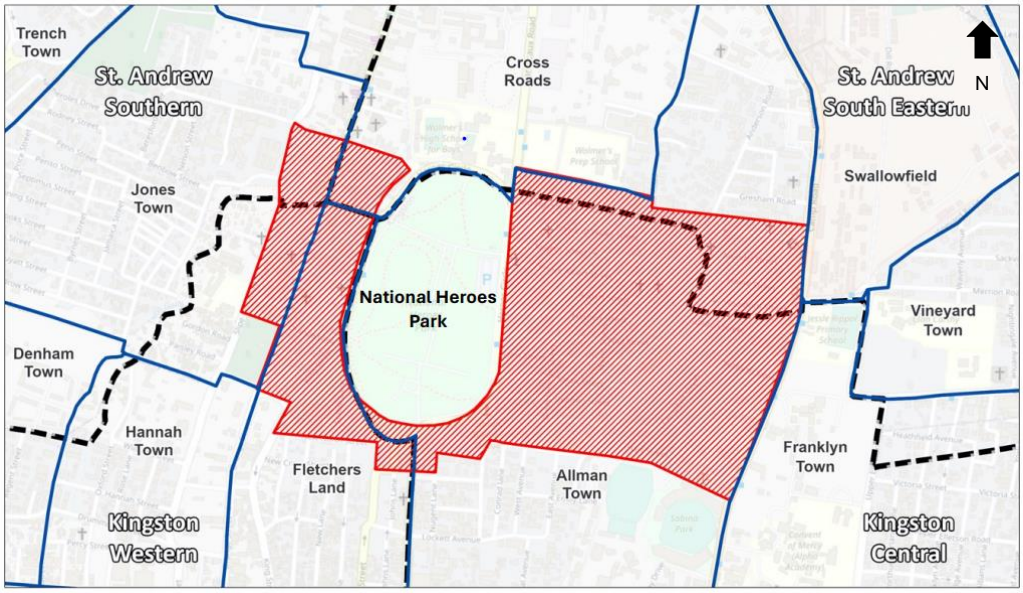


Figure 4-48: Modern Layout of Kingston

4.7.2 Changing Urban Environments

As Kingston began to take the shape of Jamaica's premier urban center and capital city, it attracted settlers of various ethnicities which was reflected in the social demographic of communities and neighborhoods that surround the project site, especially Allman Town. Ethnicities ranged from Chinese, Jews, Syrian and persons of Middle Eastern origin. With population increases as a result of an influx of immigrants and rural-urban migrants, Kingston underwent rapid urbanization which eventually led to urban sprawl. Urban sprawl is the uncontrolled or unplanned expansion of a city's built-up area into surrounding rural, or otherwise undeveloped land. Kingston's urban sprawl primarily occurred due to the resultant demands for housing, infrastructure and services as the city's population grew at rapid rates. Residential and commercial areas began spreading northwards into the parish of St. Andrew, even beyond the Half-Way-Tree area into Mona and across the Liguanea Plains.

Urban migration driven by the search for employment opportunities and an overall better life, led to the outward migration of downtown residents west and northwards which triggered the deterioration of the area as buildings were left without proper upkeep, overgrown lots, the growth of tenement yards, and ultimately the downward spiral of Downtown's built environment. These issues were compounded by the depreciation of land value and high population density which gave rise to a host of social challenges including crime and violence. Urban planning and zoning at the municipal level did not address the decay but focused on the growth of new suburban areas and the development of new centers of commercial development such as the development of New Kingston, Halfway Tree and Manor Park. This materialized through the infrastructure development in these areas, namely with regards to the road connectivity, electricity and water supply.

Despite the new developments made, there exist several challenges which shape the urban image in Kingston. These include:

1. Urban Blight
   Urban blight refers to the decline of certain areas of a city, often characterized by physical deterioration and social challenges, due to a variety of issues including abandonment, poor maintenance or neglect. With the outward migration of Kingston's early residents into the suburbs, urban decay became rampant throughout the city, especially within the confines of the project site due to a variety of economic, environmental and social factors. The issue of urban decay throughout the areas surrounding the NHP, was largely driven by high crime rates which affected the safety and security of residents and businesses, as well as highlighting the socioeconomic disparities which existed between the initial residents, visitors and migrants.

   To date, the park's surrounding communities exhibit several characteristics including the rise in informal settlements and squatter communities as a result of income disparities, and the lack of affordable, well-maintained housing. Additionally, the issue of property and housing stock depreciation due to the high crime rates which causes realtors and developers to focus their attention on creating new residential and commercial infrastructure in the periphery, further boosting migration and investments in these suburban areas as these developments reflect the ideal image for potential homeowners, business owners, and investors who are fleeing safety and security risks.

2. Social Inequities
   Consequently, social inequities emerged due to the cascading effects of urban blight. The early residents of Downtown Kingston belonged to the upper and elite classes of society. With their northerly retreat further into the Liguanea Plain, much of the maintenance of residential infrastructure was left to the incoming migrants, many of whom were a part of the working and lower economic earners of society. This led to significant disparities in housing conditions and later tenure arrangements. Furthermore, this retreat of the upper classes, gradually stimulated the movement of most commercial, governance and social services away from the Downtown Kingston area to other nodes such as New Kingston and Half Way Tree, Liguanea and Manor Park. Revitalisation attempts in downtown Kingston was pursued much later.

3. Outdated Wastewater/Sewage Infrastructure
   Urban blight is also reflected in the city's wastewater and sewage infrastructure, much of which is outdated and overburdened, resulting in its contribution to the city's role in the risks of environmental degradation, contamination and flooding. Several areas of Downtown Kingston that surround the NHP suffer from sewage overflows, which is intensified by rainfall events leading to flood and public health risks due to the spread of contaminating pathogens that can cause a range of illnesses from mild gastrointestinal issues to life threatening respiratory diseases.

4. Traffic Congestion

Several roads within the Government Campus Project boundary require upgrades and expansion to alleviate bottlenecks through widening and improving the efficiency of intersections. Additionally, improvements are needed as it relates to traffic control measures with regards to the synchronization of traffic signals to ease traffic flow and reduce congestion at critical points. These factors should be considered as the Government Campus Project aims to promote the construction of mixed-use infrastructure that incorporates residential, commercial and recreational areas which is anticipated to reduce the need for long commutes by increasing the accessibility to services and employment opportunities. Improved traffic flow will also support policing and security.

Figure 4-49: Sample of Narrow Road Networks within the Sphere of Influence

5. Loss of Green Spaces

Prior to Kingston's urban sprawl infringing on the northern lands of the Liguanea Plain, the area was once surrounded by a more pronounced rural buffer zone that consisted of agricultural lands, forests and open green spaces some of which housed smaller settlements. These areas were less dense, preserved the natural landscape of the Liguanea Plain and supported biodiversity. Notably, these spaces would have served as a mitigation measure for the urban heat island effect which is experienced in Kingston today. Although the Hope Gardens remains a significant public park, the property and its environs have undergone several transformations to accommodate infrastructure for a zoo, restaurants and souvenir shops. The park is now surrounded by several educational institutions, residential and commercial buildings, that are supported by a dual carriageway that transports high volumes of vehicular traffic.

4.7.3 Government Campus from an Urban Perspective

The concept of a Government Campus is based on the creation of a catalytic anchor that can attract private sector investment back into the historic heart of Jamaica's capital city. Though ambitious, it is a well needed initiative that has the potential to expand the city's urban renewal programme. The development's centerpiece will be a newly constructed HOP building that will host the Jamaican legislature. The HOP building and the renovations that will be made to the NHP, are expected to anchor a new urban district and reflect the image of Jamaica's rich heritage and address future needs, while maintaining its significance as one of the city's most significant green spaces. The aesthetic appeal is impressive and would elevate national pride and value to the communities and neighborhoods.

The project's Master Plan includes a variety of layouts with spaces and features to facilitate government functions and public activities. The aspiration is that the park will become a living canvas that can be further programmed in coordination with new buildings constructed around the park to add to the richness and variety to the visitor and resident experience. The overarching concept of the project as stated earlier in this report is to:

1. Create a Government Campus to house ministries, departments and agencies around Heroes Circle.
2. Create new Residential and Commercial zones around the Government Campus to serve current and future populations.
3. Implement city wide enhancements for public transit and utilities to service the district concurrently with the construction of the new Houses of Parliament.
4. The NHP will be renovated to increase opportunities for public recreation, national and local events, and additional spaces for honorific monuments and memorials.

The National Heroes District will be the face of Jamaica that nurtures the heart and soul of its people. The Government Ministries located in modern, highly efficient offices that are designed to streamline public interaction, increase workflow efficiencies and provide a healthy working environment that promotes connectivity, productivity and well-being for visitors and employees. The district will set new standards for modern development in Kingston through demonstrating best practices in design, construction, operation and maintenance of public infrastructure. Furthermore, it will highlight the guidelines for the creation of high-performance buildings with low carbon footprints which

characterize resilience. This is expected to catalyze renewed interest and reinvestment in the Downtown Kingston and draw people into the historic core of the city through the achievement of the following objectives:

1. Creation of Government Identity
2. Define Mixed Use District Character
3. Connect and Integrate Adjacent Areas
4. Promote Walkability, Access and Comfort
5. Create a Multi-scale Public Space Network
6. Provide Universal Accessibility for People of Varied Abilities
7. Integrate Natural Site and Water Features
8. Develop Phased Approach for Implementation

The Government Campus Project is expected to incorporate a variety of sustainability principles that will align with urban environmental targets:

- Development of site wide energy reduction targets and strategies.
- Incorporate decentralized energy generation and distribution via an intelligent micro-grid.
- Pursue renewable energy technologies such as: roof mounted and building integrated photovoltaic system, small scale wind turbines and district cooling plant (DCP) providing thermal storage and chilled water to the district

The area has historical significance like Allman Town, which is one of the oldest settlements in Kingston, and, as such, has a rich and diverse history represented by both its people and buildings. The intent of the National Heroes' District Master Plan as it pertains to Allman Town is focused on preservation, adaptive reuse, renovation and strategic infill to meet the community development needs of the area. The intent is not to destroy the essence of the neighborhood, but rather to build value in the area by investing in its people, housing stock, streets, schools, parks and other essential needs.

Currently the project area is generally blighted with ad hoc improvements and hence the vision as cast in the Master Plan seeks to create a holistic redevelopment /urban renewal which includes:

1. Improved Infrastructure initiatives that will seek to upgrade roads, utilities, public transportation, and other infrastructure set to improve the functionality and appearance of the area. This would be important to facilitate traffic movement for the public as well as for safety and security. The improvement of sanitation is greatly needed in the neighborhoods. This enhanced infrastructure is expected to increase accessibility for residents, businesses, and visitors.

2. Economic Development initiatives to revitalize the area attracting businesses, developers, and investors, creating job opportunities and boosting the local economy - redevelopment often increases property values, benefiting homeowners and encouraging further investment. However, this has to be managed in order to ensure equity for displaced people and to ensure access and affordability to new housing stock by current owners. Otherwise economic development initiatives will facilitate:

- Business Development: Retail, restaurants, and small businesses thrive in revitalized areas, providing local jobs and services.
- Job Creation: Construction and redevelopment efforts provide immediate employment opportunities.
- Entrepreneurial Support: Programs for small business owners can be integrated into the renewal process, fostering local entrepreneurship.

3. Enhanced Quality of Life
    - Better Amenities: New parks, recreational facilities, community centers, and public spaces to improve residents' quality of life. The concern for more green spaces which are properly maintained in the city will boost wellbeing for residents and workers in the new facilities.
    - Safer Communities: Improved lighting, better road design, and increased economic activity is expected to lead to lower crime rates. This particular concern by the security forces and residents will enable better policing and crime fighting.
4. Environmental Benefits
   Within the context of environmental benefits, the project is expected to incorporate aspects of:
    - Sustainable Development: Redevelopment will incorporate eco-friendly building practices and green spaces, reducing the environmental footprint of urban areas.
    - Remediation: Cleanup of polluted or abandoned sites (brownfields) will improve environmental health.
5. Social Revitalization
   Social revitalization efforts are expected to improve cohesion and housing opportunities for the residents through a variety of means including:
    - Community Cohesion: New social hubs and public spaces foster stronger community ties and interaction. Care should be taken to ensure communities are treated equitably to ameliorate disruptions in lives and livelihoods.
    - Housing Opportunities: Mixed-use and affordable housing developments provide diverse living options, helping combat homelessness or housing shortages. The character of new housing should consider social norms and affordability to avoid exclusion of the existing population.
6. Cultural and Historical Preservation
    - Restoration of Heritage: This renewal project will include the preservation of historic buildings and landmarks, maintaining the area’s cultural identity where possible. Much has been destroyed or significantly modified.
    - Cultural Development: As the area is revitalized opportunities exist for the creation of hubs for art, culture, and tourism.

7. Long-Term Economic Stability
    - Tax Revenue Growth: New businesses and higher property values could generate increased tax revenue, supporting public services.
    - Job Creation: Construction, retail, and service-sector jobs will emerge during and after the redevelopment process.
8. Concerns about High Crime
    - Environmental Design for Safety: Improved lighting, open spaces, and better building layouts (like clear sightlines) will deter crime.
    - Increased Activity: The revitalized area is intended to attract businesses, residents, and visitors, creating a bustling environment where criminal activity is less likely to occur.
    - Community Policing Integration: Incorporation of spaces for community policing should foster trust and safety.
9. Upgraded Housing
    - Affordable Housing Initiatives: It is intended that this renewal project will include mixed-income developments to ensure a range of affordable and market-rate housing options.
    - Elimination of Substandard Housing: Dilapidated housing will be replaced with modern, energy-efficient units, improving living conditions.
    - Tenant Protections: To prevent displacement, renewal plans will include programs to help current residents transition to new or improved housing within or outside the area.
10. New and Revitalized Government Buildings
    - Modernization: New construction as well as upgraded government buildings will improve functionality, efficiency, and aesthetics.
    - Shared Spaces: Government services with community resources, such as libraries, clinics, or recreation centers can make way for improved social relations.
    - Catalyst for Growth: Well-maintained government buildings signal investment and stability, encouraging private development nearby.
11. Enhancing Community Identity
    - Community Involvement: Inclusive planning processes engage residents, ensuring their voices shape the redevelopment vision.
12. Improved Public Spaces
    - Parks and Recreation: Adding or upgrading green spaces improves the area's livability and offers recreational opportunities.
    - Public Transit Integration: Better transportation options improve accessibility, linking residents to jobs and services across the city.

13. Reducing Social Disparities

    - Social Services Accessibility: Centralized government and community resources can provide support for low-income families, mental health care, and job training.
    - Education Investments: Schools in the area can benefit from community support generated by urban renewal.

To achieve the sustainable urban development goals outlined for the Government Campus Project in its entirety, careful planning to balance redevelopment with community rights, political interests and governance will be required. Stakeholder management will be a significant aspect of the project to ensure mutual benefit across all sectors and levels. This visionary project has the potential to reduce crime, improve living conditions, and create a thriving, inclusive neighborhood along with an uplifted visual centerpiece which signifies the nation's dignity and a place which epitomizes efficiency and excellence.

To ensure maximum benefit, effective planning and community involvement to ensure that equity is vital will consider the following:

- Policies such as rent control, property tax freezes, and affordable housing quotas to protect existing residents.
- Community engagement through regular public meetings and consultations to ensure that redevelopment aligns with residents' needs and aspirations and the plan.
- Focus on sustainability by taking into consideration long term environmental social and economic impacts, making for a resilient community coexisting with others in its sphere of influence.

5 Potential Impacts and Development Guidelines

5.1 Main Impacts Identified

The main impacts identified after the completion of several site assessments and survey include:

5.1.1 Government Ministries and Services

One of the main targets of this project is the localization of Government ministries, departments and services. This is expected to improve and streamline efficiency by facilitating increased productivity and making it easier for cross-collaboration. Furthermore, once operational, the Government Campus will improve the image of the city, uplift the mood of their environs, give added value and a sense of place to this historic site, and continue to provide opportunities for the country's citizens to partake of their democratic rights.

5.1.2 Housing Rehabilitation and Infill

The residents of communities surrounding the project area will be rehabilitated in new housing infrastructures with upgraded utility access such as indoor plumbing. However, during the construction and rehabilitation activities, residents may encounter a variety of challenges including but not limited to utility disruptions and changes to traffic flow. It is therefore recommended that effort should be placed into communicating with those who may be affected via advertising platforms (radio and television stations, social media). Additionally, once operational the rehabilitated housing stock should benefit from the regular scheduling of routine maintenance activities to maintain the image of the area.

5.1.3 Commercial Mix-use Spaces

There are multiple land-use types in the areas surrounding the Government Campus site with commercial land use dominating in communities such as Cross Roads. In other surrounding communities, commercial land use plays a considerable role to their economy via shops, stalls and wholesales. The location of the site in a commercial zone provides access to major roadways that provide transit routes for vehicular and pedestrian traffic. It is therefore anticipated that once fully operational, the Government Campus will have positive impacts on existing and potential economic activities. This is based on the assumption that both will enhance park design and management features will allow adequate provision for controlled commercialization that will attract a variety of business ventures while facilitating medium and small enterprises, local micro-entrepreneurship.

5.1.4 Kingston High School Relocation

The Kingston High School's relocation according to the project's Master Plan will be one of the major social changes. This is expected to provide numerous benefits such as updated infrastructure and academic opportunities including spaces that facilitate a variety of subject areas including science labs. It is therefore recommended that prior to the school's relocation a thorough assessment of the current infrastructure, resources and needs is completed. This is to facilitate the added benefit of improving the educational facility once relocated and rehabilitated into the newly designed government campus space.

5.1.5 Traffic Changes

The flow of vehicular and pedestrian traffic within the project's sphere of influence will be adjusted to accommodate construction activities, as well as to ensure the safety of both workers and the public. These may be inclusive of lane (or road) closures and restrictions, detours, temporary traffic signage and reduced speed limits. These changes are likely to cause an increase in traffic congestion, causing bottlenecks and gridlock in neighboring roads not initially affected by construction activities. Furthermore, adjustments to traffic flow will be necessary to accommodate the movement of heavy-duty equipment such as construction vehicles and machinery that may need to enter and exit the site frequently to transport, load or unload equipment. Additionally, it is also expected that following the completion of construction activities and the Government Campus site is in full operation that there will be permanent changes to the flow of traffic within the area.

5.1.6 Development of Green Spaces

The project aligns with local environmental targets to maintain the park's significance as a green space. It is therefore recommended that the space remains a significant green space within the Kingston Metropolitan Area (KMA), contributing to the quality of urban life, and thus adding vitality to local urbanity by meeting the needs for physical, intellectual, emotional and social stimuli for the healthy development of both young and old.

5.1.7 Physical Infrastructural Upgrades- Potable Water, Electricity and Storm Water

5.1.7.1 Potable Water

Considerations will have to be given to pre-existing pipe networks that supply potable water for use to residents, schools and businesses etc. in surrounding communities, to reduce the severity of impacts during periods of disruption which are likely to occur during the construction phases. It is therefore recommended that effort should be placed into communicating with those who may be affected via advertising platforms (radio and television stations, social media).

5.1.7.2 Electricity

Considerations will have to be given to pre-existing electrical networks that supply electricity for use to residents, schools and businesses etc. in surrounding communities, to reduce the severity of impacts during periods of disruption which are likely to occur during the construction phases. It is therefore recommended that effort should be placed into communicating with those who may be affected via advertising platforms (radio and television stations, social media).

5.1.7.3 Storm Water

The design drainage system for the compound should be enough to carry beyond the 10-Yr peak flows, without exceeding the capacity of the infrastructure. Ongoing maintenance of the drainage system, including clearing debris from drop inlets and underground drains, will be essential to ensure optimal performance during storm events. While the risk of flooding is minimal, it is advisable to monitor the low-lying areas around the southern boundary of the project area, particularly during high-intensity storms, and implement minor flood mitigation measures as necessary.

5.2 Summary Potential Impacts and Development Guidelines

5.2.1 Summary Potential Impacts and Development Guidelines during Pre-Construction Activities

Table 5-1 below summarizes the main and existing areas of concern (disaggregated by proposed investment project); potential impacts during the preconstruction, construction, and operational phases of the various and combined project activities; as well as recommended mitigative actions/development guidelines for consideration.

Table 5-1: Potential Negative Impacts and Development Guidelines during Pre-Construction Activities

Risks	Probability Of Impact	Potential Impacts	Direction Of Impact	Permanence	Magnitude Of Impact	Impact Duration	Proposed Development Guidelines
Dust generation from site clearance activities and improper storage/ transportation of material with fine particles	Likely	Increased fugitive particulate matter which may result in adverse health impacts on employees, residents, and properties in surrounding areas	Negative	Reversible	Moderate	Short Term	Phase land clearance activities and install dust screens around the site
Emissions from increased vehicle movement and	Likely	Reduction of air quality due to emissions (exhaust) released from vehicles such as sulfur dioxide, particulate	Negative	Reversible	Moderate	Short Term	Develop and implement a Vehicle Maintenance and Traffic Plan

Risks	Probability Of Impact	Potential Impacts	Direction Of Impact	Permanence	Magnitude Of Impact	Impact Duration	Proposed Development Guidelines
construction machinery		matter, nitrogen dioxide, carbon monoxide, hazardous air pollutants etc. which can have adverse impacts on employees, residents and properties in surrounding areas.					
Noise pollution from site clearing, heavy construction equipment operation, truck traffic etc.	Likely	Prolonged exposure to noise levels above recommended limits without appropriate PPEs can results in adverse health impacts	Negative	Reversible	Moderate	Short Term	Erect noise barriers as needed Implement soft start procedures, where possible, when using construction equipment Construct noise generating

Risks	Probability Of Impact	Potential Impacts	Direction Of Impact	Permanence	Magnitude Of Impact	Impact Duration	Proposed Development Guidelines
							activities during regular working hours to minimize noise nuisance at nighttime. Position stationary noise sources away from sensitive noise receptors and other sources of noise in the area where necessary Staff should be equipped with proper PPEs and trained on the appropriate use of these PPEs.

Risks	Probability Of Impact	Potential Impacts	Direction Of Impact	Permanence	Magnitude Of Impact	Impact Duration	Proposed Development Guidelines
							Ensure Safety Management and Monitoring Plan is developed.
Land clearing activities may result in the removal of trees, buildings and artifacts of historical significance	Likely	Removal of surrounding trees which offer shading and cooling benefits, which may cause the area to experience higher temperatures. Historical buildings found within the project area may be altered or demolished based on the requirements for specific areas within the project boundary.	Negative	Irreversible	High	Long Term	Consult the relevant environmental and heritage organizations such as the JNHT, NEPA and JET to determine the best course of action for the mutual benefit of all stakeholders. A watching brief should be in place where buildings are earmarked for demotion and building excavation works

Risks	Probability Of Impact	Potential Impacts	Direction Of Impact	Permanence	Magnitude Of Impact	Impact Duration	Proposed Development Guidelines
		Given English occupation of the area from the late 1690s and the subsequent continuous development of the area. it likely that Archaeological excavations may reveal artefacts from the historic period of the 17th, 18th and 19th centuries.					scheduled for new structures. A team of archaeologists should be prepared to conduct salvage archelogy to record the archaeology of the area.
Disruption of school activities	Likely	Activities in schools surrounding the site may be affected due to noise and the deteriorating air quality	Negative	Reversible	Moderate	Short Term	The necessary steps must be taken to ensure that disruptions to school activities such as classes and

Risks	Probability Of Impact	Potential Impacts	Direction Of Impact	Permanence	Magnitude Of Impact	Impact Duration	Proposed Development Guidelines
							events are kept to a minimum.
Community engagement and participation	Likely	Community engagement and participation in the early stages of development, which can aid in defining the best course of action to the benefit of community members, investors and other stakeholders.	Positive	Reversible	Moderate	Long Term	Create surveys to understand the needs and preferences of community members. Host focus groups and townhalls to converse with community members as a means to acquire direct feedback.

5.2.2 Summary Potential Impacts and Development Guidelines during Construction Activities

Table 5-2 elaborates on the potential impacts and development guidelines associated with the operations of the various project investments proposed for the Government Campus Project area.

Table 5-2: Potential Negative Impacts and Development Guidelines during Construction Activities

Risks	Probability Of Impact	Potential Impacts	Direction Of Impact	Permanence	Magnitude Of Impact	Impact Duration	Proposed Development Guidelines
Improper disposal of waste material	Likely	Improper disposal of waste materials generated during construction activities can cause blockage to nearby gullies, which can be problematic during periods of heavy rainfall.	Negative	Reversible	Moderate	Short Term	Implement appropriate waste management techniques, especially those related to electrical and chemical waste. Categorize and establish a designated storage area for waste away from gullies.
Dust generation from construction activities and improper storage/ transportation	Likely	Increased fugitive particulate matter which may result in adverse health impacts on employees, residents, and	Negative	Reversible	Moderate	Short Term	Install dust screens around the site Ensure stockpiles are appropriately covered during storage

Risks	Probability Of Impact	Potential Impacts	Direction Of Impact	Permanence	Magnitude Of Impact	Impact Duration	Proposed Development Guidelines
of material with fine particles		properties in surrounding areas					Ensure fine earth material are covered during transportation Wet site when necessary to reduce fugitive dust
Emissions from increased vehicle movement and construction machinery	Likely	Reduction of air quality due to emissions (exhaust) released from vehicles such as sulphur dioxide, particulate matter, nitrogen dioxide, carbon monoxide, hazardous air pollutants etc. which can have adverse impacts on employees, residents and properties in surrounding areas.	Negative	Reversible	Moderate	Short Term	Develop and implement a Vehicle Maintenance and Traffic Plan

Risks	Probability Of Impact	Potential Impacts	Direction Of Impact	Permanence	Magnitude Of Impact	Impact Duration	Proposed Development Guidelines
Noise pollution from site clearing, heavy construction equipment operation, close truck traffic etc.	Likely	Prolonged exposure to noise levels above recommended limits without appropriate PPEs can results in adverse health impacts	Negative	Reversible	Moderate	Short Term	Erect noise barriers as needed Implement soft start procedures, where possible, when using construction equipment Construct noise generating activities during regular working hours to minimize noise nuisance at nighttime. Position stationary noise sources away from sensitive noise receptors and other sources of noise in the area where necessary

Risks	Probability Of Impact	Potential Impacts	Direction Of Impact	Permanence	Magnitude Of Impact	Impact Duration	Proposed Development Guidelines
							Staff should be equipped with proper PPEs and trained on the appropriate use of these PPEs. Ensure a Safety Management and Monitoring Plan is developed.
Pollution of water from improperly treated sewage/ wastewater	Likely	Contamination of water sources with pathogens from improperly treated sewage	Negative	Reversible	High	Long Term	Provide proper lavatory access to workers. An Environmental Management and Monitoring Plan should be developed and implemented to have a Sewage/Wastewater Management Plan.
Damage to historical buildings and	Likely	Historical and housing buildings may be altered or	Negative	Irreversible	High	Long Term	Consult the relevant heritage organizations such as the JNHT, as

Risks	Probability Of Impact	Potential Impacts	Direction Of Impact	Permanence	Magnitude Of Impact	Impact Duration	Proposed Development Guidelines
housing infrastructure		destroyed to accommodate construction					well as the relevant regulations to determine the best course of action for the mutual benefit of all stakeholders
Disruption of school activities	Likely	Activities in schools surrounding the site may be affected due to noise and the deteriorating air quality	Negative	Reversible	Moderate	Short Term	The necessary steps must be taken to ensure that disruptions to school activities such as classes and events are kept to a minimum.
Disruptions to utility services	Likely	Disruptions to water supply and electricity is likely to occur during the construction activities	Negative	Reversible	Moderate	Short Term	It is recommended that effort should be placed into communicating with those who may be affected via advertising platforms (radio and television stations, social media).

Risks	Probability Of Impact	Potential Impacts	Direction Of Impact	Permanence	Magnitude Of Impact	Impact Duration	Proposed Development Guidelines
Flora and fauna can be displaced or removed during the construction phase	Likely	Loss of flora and fauna during construction phase Habitat fragmentation	Negative	Reversible	Low	Short Term	Construction activities should be scheduled outside of peak bird activity periods whenever possible. Identified bird nests should be carefully relocated to undisturbed areas within the property. Vegetation clearing, material storage, and all construction-related activities must be confined within the designated construction area. Areas containing priority plant species must be designated as "no-go zones" and

Risks	Probability Of Impact	Potential Impacts	Direction Of Impact	Permanence	Magnitude Of Impact	Impact Duration	Proposed Development Guidelines
							strictly off-limits to construction activities. Construction work should be prioritized during the dry season to minimize impacts on sensitive species and habitats.
Employment Opportunities and community engagement	Likely	Construction activities can provide employment opportunities to members of the surrounding communities through direct labour on-site or indirectly through vending in surrounding areas. Community leadership and support is another	Positive	Reversible	Moderate	Long Term	Provide opportunities and encourage community participation. Media such as radio stations and social media platforms could be used to spread information for hiring notices.

Risks	Probability Of Impact	Potential Impacts	Direction Of Impact	Permanence	Magnitude Of Impact	Impact Duration	Proposed Development Guidelines
		benefit of this project as residents are engaged and considered in all aspects of the project life cycle for the mutual benefit of all stakeholders.					
Construction of new building assets	Likely	Construction activities will produce new building assets that are more modern and attractive to various consumers. This has the potential to attract investors and create benefits in other sectors such as tourism.	Positive	Irreversible	Moderate	Long Term	Ensure that the necessary infrastructure and construction codes, acts, zoning and other regulations pertinent to the project are followed. Implementation of a Public Infrastructure Management and Development Plan

Risks	Probability Of Impact	Potential Impacts	Direction Of Impact	Permanence	Magnitude Of Impact	Impact Duration	Proposed Development Guidelines
Relocation of the Kingston High School	Likely	The Kingston High School's location within areas slated for construction according to the project's master plan will require the need for its relocation. This is expected to provide numerous benefits such as updated infrastructure and academic opportunities including spaces that facilitate a variety of subject areas such as science labs.	Positive	Irreversible	High	Permanent	Careful planning and consideration of various factors that could serve to improv such as the accessibility, educational needs of the students, technology and infrastructure resource requirements.

5.2.3 Summary Potential Impacts and Development Guidelines during Operations

Table 5-3 elaborates on the potential impacts and development guidelines associated with the operations of the various project investments proposed for the Government Campus Development.

Table 5-3: Potential Negative Impacts and Development Guidelines during Operations

Risks	Probability Of Impact	Potential Impacts	Direction Of Impact	Permanence	Magnitude Of Impact	Impact Duration	Proposed Development Guidelines
Damage to heritage assets	Moderate	Area comprises of heritage building assets which may be subject to intentional or inadvertent destruction.	Negative	Irreversible	Moderate	Long-term	Close collaboration between project operators and the JNHT will be required. Training of asset managers and workers, for artefact recovery and sensitization as well as for restrictions on tampering with historical assets may be necessary. Proper warning and restrictions signs need to be erected in strategic

Risks	Probability Of Impact	Potential Impacts	Direction Of Impact	Permanence	Magnitude Of Impact	Impact Duration	Proposed Development Guidelines
							locations near historical buildings Presence of monitors as part of a monitoring system Restoration of historical structures must be guided by the JNHT and the UNESCO guidelines to ensure that rehabilitated heritage assets maintain the standard for the area to achieve the internationally recognized UNESCO Heritage Site status.

Risks	Probability Of Impact	Potential Impacts	Direction Of Impact	Permanence	Magnitude Of Impact	Impact Duration	Proposed Development Guidelines
							Appropriate visitor limitations Proper warning and restrictions signs need to be erected in strategic locations near these key heritage assets. Use of licensed tour guides who are friendly and informed. Have licensed tour guides so visitors do not accidentally deface heritage assets. Designated path that is followed

Risks	Probability Of Impact	Potential Impacts	Direction Of Impact	Permanence	Magnitude Of Impact	Impact Duration	Proposed Development Guidelines
							Availability of trash receptacles Disposal of trash Regular sanitization of relevant areas. A proposed Management Plan for each building/attraction, may not necessarily be the best approach to manage the heritage assets. These assets are interconnected and can be seen in the land use and land zoning history of the city. The management of the heritage assets

Risks	Probability Of Impact	Potential Impacts	Direction Of Impact	Permanence	Magnitude Of Impact	Impact Duration	Proposed Development Guidelines
							should be guided by their social and spatial association, albeit, in their historic context.
Land pollution from improper disposal of solid waste	Moderate	Inconsistent solid waste management services	Negative	Reversible	Moderate	Short-term	Appropriate receptables should be available on-site for proper solid waste disposal, especially in areas with high vehicular and pedestrian traffic. Commercial entities can engage a collection company to cover shortfall of the public NSWMA collection system.

Risks	Probability Of Impact	Potential Impacts	Direction Of Impact	Permanence	Magnitude Of Impact	Impact Duration	Proposed Development Guidelines
Increased vehicular traffic	Likely	Reduction of air quality due to emissions (exhaust) released from vehicles such as sulphur dioxide, particulate matter, nitrogen dioxide, carbon monoxide, etc., which can have adverse impacts on employees, residents and properties in surrounding areas. Possible increase in ambient noise levels	Negative	Reversible	Moderate	Long Term	Develop and implement traffic management plan where speeds throughout the campus are managed. Establish quiet zones where horns and loud music cannot be played.
Pollution of water from improperly treated sewage/ wastewater	Likely	Contamination of water sources with pathogens from improperly treated sewage	Negative	Reversible depending on extent of pollution	High	Long Term	Ensure site has proper infrastructure for sewage management or disposal; sewage

Risks	Probability Of Impact	Potential Impacts	Direction Of Impact	Permanence	Magnitude Of Impact	Impact Duration	Proposed Development Guidelines
							produced should be monitored regularly to ensure compliance with regulatory requirements
Government efficiency	Likely	The concentration of government ministries and offices serves to improve and streamline efficiency, as well as provide a localized point from which the necessary services and functions can be carried out.	Positive	Irreversible	High	Long Term	Historically, the National Heroes' Park was a prominent green space within the Kingston Metropolitan Area. It is therefore recommended that this prominence is maintained after construction activities through replanting of trees, grass etc.
Commercial mixed-used spaces	Likely	The establishment of commercial spaces is likely to attract investment from diverse portfolios, which	Positive	Irreversible	High	Long Term	Implementing and scheduling routine maintenance activities.

Risks	Probability Of Impact	Potential Impacts	Direction Of Impact	Permanence	Magnitude Of Impact	Impact Duration	Proposed Development Guidelines
		has the potential to maximize the land use while stimulating the area's economy					
Designated multi-purpose green spaces	Likely	The urban nature of the Kingston Metropolitan Area is characterized by its lack of trees and open green spaces. The project will promote the planting of trees and shrubs to create green spaces, which may also function as recreational areas such as parks.	Positive	Irreversible	High	Long Term	Implementing and scheduling routine maintenance activities.
Housing rehabilitation of community members	Likely	The residents of communities surrounding the project area will be rehabilitated in new housing	Positive	Irreversible	High	Permanent	Implementing and scheduling routine maintenance activities.

Risks	Probability Of Impact	Potential Impacts	Direction Of Impact	Permanence	Magnitude Of Impact	Impact Duration	Proposed Development Guidelines
		infrastructures with upgraded utility access such as indoor plumbing.					
Relocation of the Kingston High School	Likely	The Kingston High School will benefit from updated infrastructure and academic opportunities including spaces that facilitate a variety of subject areas such as science labs.	Positive	Irreversible	High	Permanent	Implementing scheduled improvement and maintenance monitoring to prevent infrastructure deterioration.
Flooding and flood vulnerabilities	Unlikely	The results of flood modelling indicated that there is a low flood risk in the project area, and storm water is effectively managed by the surrounding drainage system.	Positive	Reversible	High	Short Term	Ongoing maintenance of the drainage system, including clearing debris from drop inlets and underground drains, will be essential to ensure optimal performance during

Risks	Probability Of Impact	Potential Impacts	Direction Of Impact	Permanence	Magnitude Of Impact	Impact Duration	Proposed Development Guidelines
							storm events. While the risk of flooding is minimal, it is advisable to monitor the low-lying areas around the southern boundary of the project area, particularly during high-intensity storms, and implement minor flood mitigation measures as necessary.

6 Cumulative Impacts

6.1 Houses of Parliament Construction

The new HOP building will be located in the NHP. The space is expected to improve the image of the city, uplift the mood of their environs, give added value and a sense of place to this historic site, while providing opportunities for the country's citizens to actively engage in their democratic rights. The construction of the HOP building will provide direct employment for residents of surrounding communities on-site, as well as indirectly through vending opportunities. It is noted that prior to construction, capacity building and training for people in the area will be necessary to fully empower them to be part of the labour force. Construction activities are also expected to bring improvements to the area's water and sewage system networks to ensure that these systems will function efficiently and at much higher capacities despite the projected increase in the number of residents (or occupants) of the space. The movement of heavy-duty construction machinery and vehicles are likely to be an added source of carbon emissions, noise and contribute to traffic congestion. Dust and other fine particles will likely be generated from construction activities, especially during tree removal and land clearing. However, this will drastically subside over time as construction activities come to a close and the space is filled with new trees and designated green spaces. It is also anticipated that after construction is completed, the HOP building can serve as a tourist attraction, such as in the cases of the Houses of Parliament (Palace of Westminster) in London and Parliament Hill in Ottawa, where tourists are able to visit the historical and architectural landmarks to learn about Jamaican politics, governance and democracy through guided tours.

6.2 Development of Mixed-Use Enterprises

Mixed-use enterprises often combine commercial, residential and at times recreational spaces in a single development or area. The incorporation of mixed-use enterprises within the project area will offer several benefits to communities, businesses and individuals. The combination of residential and commercial spaces will drive more people to local businesses, increasing sales and helping small businesses thrive. Furthermore, these spaces will be occupied by varied tenants, which can reduce the financial risk for property owners by spreading revenue sources and creating economic diversity for the area. Jobs can be provided across various sectors, including retail, services, construction, and management. With residential, commercial, and recreational spaces in close proximity, residents can rely less on cars, reducing traffic congestion and pollution. For residents, these enterprises will improve convenience and quality of life through the live, work and play model in which they can benefit from having workplaces, entertainment, dining, and essential services nearby. These developments will help to revitalize the underutilized and vacant urban spaces in Downtown Kingston, making them more vibrant and economically productive, increase property values in surrounding areas and improving the overall real estate market.

6.3 Housing Rehabilitation and Resettlement

The housing rehabilitation and resettlement programme that will accompany the Government Campus Project will provide a range of benefits that will improve the quality of life and living conditions for individuals, communities and by extension the image of the Downtown Kingston area. In addition to increasing property values, the rehabilitation and resettlement of residents will ensure that homes are structurally sound and safe, reducing risks such as building collapses or fire hazards. Residents will have better access to essential services such as indoor plumbing to facilitate potable water supply and sewage services. The rehabilitation and resettlement aspect of the Government Campus Project will focus on improving the social fabric of Downtown Kingston and making the existing urban areas more livable, rather than expanding into undeveloped areas, which can help preserve natural habitats and reduce urban sprawl. Through rehabilitation and resettlement, disparities in housing access may also be addressed to foster more inclusive and equitable communities that promote social inclusion across different socio-economic classes.

6.4 School Relocation

An unavoidable outcome of the Government Campus Project is the relocation of the Kingston High School. Although this may pose significant challenges, there are many benefits to students, teachers and even the broader community that can be expected. The relocation of the Kingston High School can provide access to newer, more spacious and well-designed buildings, that offer modern amenities such as science labs, sporting facilities and dedicated classrooms for specialized subjects. Additionally, the accessibility of the school compound can be enhanced for students with disabilities, through the designation of spaces for ramps and elevators among others. The new location of the school could also be closer to the new public transportation points, making it easier for commuting students and staff. The school relocation efforts can also morph into an opportunity to incorporate more green and sustainable building practices through the implementation of energy efficient systems and the use of sustainable materials, resulting in an environmentally friendly institution with a reduced carbon footprint.

6.5 Public Park

Despite the construction and renovation activities that will take place at the NHP, the area will remain a significant public park and open space of cultural and heritage significant. While preserving the NHP as a historical site with monuments and plaques, the space will offer psychosocial benefits to residents and visitors. In addition to providing space for physical wellness, the renovated park will also provide a space for persons to spend time in nature for stress and anxiety relief, leisure and recreation. The green space will provide an oasis for wildlife and support for biodiversity in the urban space, such as birds.

6.6 Changes to Traffic Flow

During the construction activities, it is expected that traffic flow will be subjected to several changes due to the need to accommodate transportation of equipment by heavy-duty vehicles, while minimizing disruption to the surrounding area. As such, one or more lanes or roads may be closed temporarily to provide space for construction activities, leading to reduced vehicular capacity. Lane and road closures impact traffic flow significantly and often result in the establishment of detour

routes to redirect traffic. The temporary changes to road configurations during these activities may also pose challenges for emergency vehicle access, making it difficult to provide timely care and assistance. It is therefore important to make the necessary accommodation to ensure that emergency response is not severely affected by the Government Campus Project.

6.7 Air, Noise and Water Impacts

The groundwater in the proposed project area has deteriorated over the years by possible sewage contamination as evidenced in the results obtained from the sampling exercise conducted, as well as historic data obtained from the WRA. Improper management of sewage in the area can possibly result in a further deterioration of these water sources and increase the pathogenic and nutrient loads. Furthermore, with the increase in concrete structures and paved surfaces, the amount of surface run-off will increase. If this is not adequately addressed, there may be more run-off which may impact the marine environs and increase the amount of flooding experienced in the area. It is also anticipated that there will be a significant increase in the traffic in the area which will increase both air and noise pollution. Given the use of the area and its current practices (church, schools, health centers etc.), proper traffic management and infrastructure will need to be considered given the possible increase in air pollutants and respirable particulates from vehicular emissions, increased wear and tear of man-made structures and noise.

7 Environmental Quality Objectives

Environmental Quality Objectives have been identified for the proposed development to highlight the following aspects:

7.1 Integration of Archaeological and Cultural Heritage Features

The National Heroes District development integrates Jamaica's rich cultural and historical heritage by preserving and celebrating key archaeological and architectural features within the area. Allman Town and Fletcher's Land, both historical settlements incorporated into Kingston in the 19th century, are integral to the district's cultural landscape. The project emphasizes adaptive reuse and preservation of significant Georgian and Victorian structures. These include buildings with iconic architectural elements such as sash windows, fretwork decorations, and hip roofs that showcase Jamaica's colonial history.

To enhance public engagement, the master plan proposes interpretive signage, heritage trails, and cultural exhibitions highlighting the area's historical significance. Sites of cultural value, such as the Women's Liberal Club headquarters and Ivy Perry's Restaurant. Notably, the Female Freemasons Lodge Building that is presently in frail condition and occupied by a resident whose mother was a freemason who attended meetings in the very same structure exhibits Georgian styled architecture that could be restored or commemorated as part of the district's revitalization (Figure 7-1). These efforts aim to create a vibrant and educational environment that honors Jamaica's legacy while fostering tourism and community pride.

Figure 7-1: Female Freemason's Lodge Building in Fletcher's Land on New North Street

7.2 Conservation of Endangered/Protected/Endemic Species

Conservation efforts within the National Heroes District focus on preserving urban biodiversity by protecting rare and ecologically significant species. The development will incorporate native and drought-tolerant plants in landscaping to support pollinators and other wildlife. Any identified endemic or protected species will be prioritized for conservation through habitat preservation and enhancement initiatives.

Green spaces, including parks and gardens, will serve as urban refuges for fauna such as birds and butterflies, ensuring the continuation of critical ecosystem services like pollination and nutrient cycling. Public education campaigns will raise awareness about the importance of conserving urban biodiversity as part of the district's sustainable development goals.

7.3 Aesthetic Appeal

The National Heroes District will balance modern infrastructure with aesthetic considerations to create an inviting urban space. The master plan includes green roofs, tree-lined streets, and landscaped public areas to enhance visual appeal and promote environmental well-being. Monumental structures, such as the new Parliament building and commemorative installations, will reflect national pride and historical significance.

Architectural guidelines prioritize designs that blend contemporary styles with traditional Jamaican elements, creating a cohesive yet distinctive identity for the district. Public art installations, recreational spaces, and well-maintained pedestrian pathways will ensure the area remains vibrant and engaging for residents and visitors alike.

7.4 Stormwater run-off and Watershed Management

Effective stormwater management is a core component of the National Heroes District Master Plan to mitigate flooding hazards and support climate resilience. The project area's flat terrain and proximity to gullies like Barnes Gully and Tivoli Gully necessitate robust drainage solutions. Proposed strategies include green infrastructure elements such as bioswales, permeable pavements, and rain gardens to reduce surface runoff and enhance water infiltration.

Rainwater harvesting systems will be incorporated into building designs, and detention basins will be constructed to regulate water flow during peak rainfall events. These measures, supported by regular maintenance and desilting of gullies, aim to prevent blockages, reduce urban flooding, and protect coastal water quality. Additionally, community education programs will promote sustainable stormwater practices among residents.

7.5 Pollution Prevention

Pollution prevention strategies in the project focus on addressing water, air, and noise pollution to enhance environmental quality. For water pollution, the plan emphasizes upgrading sewage systems to prevent contamination of groundwater and coastal waters. Solid waste management practices, including adequate trash receptacles and regular waste collection, will be implemented to prevent littering and gully blockages.

To combat air pollution, dust suppression techniques and emission controls for construction equipment will be enforced. Preserving green spaces and introducing vegetative buffers will further mitigate air quality impacts. Noise pollution reduction measures include the use of noise barriers, maintenance of equipment to prevent excessive noise, and restrictions on construction activities during nighttime hours. Collectively, these actions aim to create a healthier urban environment.

7.6 Integrated Water Resource Management

The use of potable water in conjunction with the treatment of wastewater and irrigation systems is proposed to encourage recycling and reuse where possible. Rainwater harvesting and storage is also strongly recommended where viable. Storage facilities are similarly recommended, especially for the planned apartment buildings. Additionally, new building designs and construction should incorporate water conservation devices that foster sustainable use of the scarce resource.

7.7 Energy Efficiency

Energy efficiency is a cornerstone of the National Heroes District's sustainable design. The master plan promotes the use of renewable energy sources, including solar panels and small-scale wind turbines, to reduce reliance on fossil fuels. Building designs will incorporate energy-efficient systems such as Light-Emitting Diode (LED) lighting, occupancy sensors, and advanced insulation materials to lower energy consumption.

District-wide initiatives, such as a centralized cooling system and an intelligent micro-grid, will further enhance energy efficiency. These efforts aim to position the district as a model of low-carbon urban development, aligning with global sustainability standards.

7.8 Climate Change Considerations

The district's development integrates climate adaptation measures to address rising temperatures, changing precipitation patterns, and the urban heat island effect. Urban greening initiatives, such as green roofs and tree planting, will provide shade and mitigate heat. Buildings will be designed to maximize natural ventilation and minimize heat absorption through reflective materials.

To address water scarcity driven by climate change, rainwater harvesting and efficient irrigation systems will be implemented. These strategies, along with public education campaigns on climate resilience, ensure that the district remains adaptable to future climate conditions while fostering a sustainable and livable urban environment.

8 Analysis of Alternatives

Based on the information from the project masterplan, the information below is a list of potential impacts of the project on the project area and vice versa:

Air and Noise Pollution:

- Elevated levels of particulate matter (PM_{10}) and gaseous pollutants (e.g., CO and VOCs) during construction and operation phases due to vehicular emissions, land clearance, and stockpiling.
- Noise levels at most sites exceed Jamaica's Ambient Noise Standard for residential areas, with significant contributions from traffic, construction, and human activity.

Water Pollution:

- Existing groundwater samples show high nitrate, sodium, chloride, and sulfate levels, which may be exacerbated by construction activities and improper waste management.
- Risk of further contamination from untreated sewage and surface runoff entering the drainage network.

Flooding and Drainage Issues:

- Poor drainage infrastructure increases the risk of gully overflows during heavy rainfall, potentially leading to localized flooding and pollution.
- The project area requires improved stormwater management due to its flat topography and proximity to major gullies (e.g., Barnes Gully and Tivoli Gully).

Biodiversity and Green Space Loss:

- Limited vegetation in the area is at risk of being further reduced, exacerbating the urban heat island effect and diminishing critical ecosystem services like pollination and nutrient cycling.

Socioeconomic Impacts:

- Potential displacement of residents and disruptions to communities during construction.
- Noise, air pollution, and increased traffic could negatively affect nearby sensitive receptors, such as schools, hospitals, and residential areas.

Cultural and Historical Resource Risks:

- Potential damage to culturally significant sites, such as NHP and nearby heritage buildings.

The alternatives listed below consider all the potential negative impacts of the project and identifies how alternatives to the enlisted criteria will mitigate the negative impacts of the project or maximize on the positive impacts. This serves as an analysis of the potential benefits of taking alternative methods into consideration for the carrying out of the project.

8.1 No Action Alternative

If the project does not proceed, the existing challenges within the project area will persist. Issues such as inadequate stormwater management, deteriorating infrastructure, and poor air and water quality would remain unaddressed. However, the area's green spaces and cultural heritage sites would remain undisturbed, and nearby communities would avoid potential disruptions and displacements during construction.

On the downside, the area would miss opportunities for sustainable development, economic revitalization, and improved public services. The lack of centralized government facilities would perpetuate inefficiencies in service delivery and hinder the regeneration of this section of Downtown Kingston.

Impacts:

- Impact on Livelihood:

Project: Jobs associated with the construction and operation of the Government Campus would not be created, resulting in lost employment opportunities for local contractors and service providers.

Project Area: Residents would continue to rely on existing, often inadequate, economic opportunities. The potential for commercial and economic revitalization in the area would remain unrealized.

- Environmental Impacts:

Project: Environmental degradation associated with construction and operation would not occur.

Project Area: Existing environmental challenges, such as poor air quality, inadequate drainage, and contamination of water sources, would persist without intervention.

- Socioeconomic Impacts:

Project: Delays in centralizing government services would result in continued inefficiencies and higher operating costs for government departments.

Project Area: The area would miss opportunities for infrastructural upgrades, improved public services, and community amenities. Residents would not benefit from potential increases in property values and enhanced quality of life.

8.2 Alternative Location

Relocating the project to a different area could mitigate specific environmental and social impacts, such as the risk of flooding and displacement of residents. A site with better drainage infrastructure and fewer sensitive receptors, such as schools and hospitals, would be more suitable.

However, moving the project would forfeit the symbolic and functional value of centralizing government operations in a location with historical and cultural significance. Additionally, finding a new site with adequate space and accessibility could increase costs and delay project timelines.

Impacts

- Impact on Livelihood:

Project: Relocating the project may shift economic opportunities, benefitting new local communities at the expense of those in the current project area.

Project Area: Loss of potential job creation and investment in the current area. However, other areas may gain access to employment and economic growth associated with the project.

- Environmental Impacts:

Project: Depending on the new location, environmental impacts could be mitigated if the alternative site has less risk of flooding, contamination, or biodiversity loss.

Project Area: Relocation would spare the current area from construction-related impacts but also prevent environmental restoration efforts tied to the project, such as improved drainage and green space development.

- Socioeconomic Impacts:

Project: Increased costs and delays associated with securing and preparing a new site could affect project feasibility.

Project Area: The relocation would remove the chance for urban regeneration, improved infrastructure, and community benefits, leaving the current area in its existing state of decline.

8.3 Alternative Scale of the Project

Scaling down the project could reduce its environmental footprint by lowering emissions, minimizing water and noise pollution, and requiring less green space alteration. It would also decrease community displacement and infrastructure strain.

Conversely, a smaller scale might limit the project's ability to centralize government operations and provide adequate public amenities. Scaling up the project would maximize its benefits but exacerbate challenges like pollution, flooding risks, and infrastructure demands.

Impacts

- Impact on Livelihood:

Project: A smaller project would create fewer jobs during construction and operation, while a larger project would generate more economic opportunities.

Project Area: A smaller scale could limit local employment opportunities, while a larger scale might strain local infrastructure but create more long-term economic growth.

- Environmental Impacts:

Project: A smaller project would reduce air, water, and noise pollution, as well as land disturbance. Conversely, a larger scale would amplify these impacts.

Project Area: A smaller scale might leave some environmental issues unaddressed, while a larger scale could exacerbate risks such as flooding and heat island effects.

- Socioeconomic Impacts:

Project: A smaller scale might reduce the effectiveness of centralizing government services, while a larger scale could enhance operational efficiency but increase costs.

Project Area: A larger project could significantly improve infrastructure and public services but might cause greater disruption to residents and require extensive community engagement.

8.4 Alternative Processes or Equipment

Adopting sustainable construction practices and equipment could significantly reduce the project's environmental impacts. For instance, using low-emission machinery and prefabricated construction methods would minimize air and noise pollution. Implementing advanced stormwater management solutions, such as permeable pavements and bioswales, could address flooding risks.

Alternative equipment, such as quieter machinery and vehicles, could mitigate noise impacts, while improved waste management processes would prevent water and soil contamination. Although these alternatives may increase initial costs, they would provide long-term environmental and community benefits.

Impacts

- Impact on Livelihood:

Project: The adoption of sustainable technologies and practices could require specialized skills, potentially creating opportunities for training and employment in green construction.

Project Area: Improved air and noise quality could enhance the living conditions and productivity of residents.

- Environmental Impacts:

Project: Using low-emission machinery and sustainable materials would reduce construction-related pollution. Improved stormwater management systems could minimize flooding risks and water contamination.

Project Area: Enhanced environmental outcomes, such as better air quality and reduced noise pollution, would benefit the health and well-being of residents.

- Socioeconomic Impacts:

Project: While alternative processes may increase initial costs, they could improve the long-term sustainability and reputation of the project.

Project Area: Cleaner construction and operation processes would minimize disruptions to local communities, improving their quality of life and fostering better public perception of the project.

8.5 Alternative Site Layout

A revised site layout could consider constructing a single high-rise building or multiple high-rises for housing ministries, agencies, and departments. This approach could minimize land use, preserving more green space and reducing the project's overall footprint. Grouping ministries based on their operations and objectives would enhance operational efficiency and reduce inter-ministry travel, cutting down emissions from vehicular traffic.

However, high-rise construction may introduce new challenges, such as greater shading effects, altered wind flow patterns, and increased energy demands for vertical transportation systems. The architectural design would need to address these impacts while ensuring alignment with urban aesthetics and zoning regulations. Additionally, maintaining accessible public spaces, particularly around National Heroes Park, should remain a priority in any revised site layout.

Impacts

- Impact on Livelihood:

Project: A consolidated design, such as a single high-rise building, would optimize construction efficiency, potentially reducing the duration of job opportunities. However, ongoing maintenance could provide sustainable employment for specialized workers.

Project Area: Concentrating functions in one high-rise could reduce land use, preserving space for ancillary developments, recreational areas, or housing, which could support additional local businesses and jobs.

- Environmental Impacts:

Project: A single high-rise design could reduce the physical footprint of the development, minimizing vegetation loss and ecosystem disruption. It may also enable more centralized stormwater management solutions.

Project Area: Preserving more green spaces within the site could mitigate the urban heat island effect and improve local air quality. However, a tall structure might affect local wind patterns and shade neighboring areas.

- Socioeconomic Impacts:

Project: Centralizing services in a single building could improve operational efficiency and reduce long-term costs. Grouping ministries by focus in multiple buildings might foster inter-agency collaboration.

Project Area: The potential aesthetic impact of a high-rise on the historical and cultural character of the area should be considered. Smaller, distributed buildings could blend better with the existing urban landscape.

8.6 Alternative Operating Conditions

Phased project implementation could be explored, leveraging the local labor force incrementally and ensuring sustainable resource use. Limiting construction activities to specific time frames,

particularly during off-peak hours, would mitigate noise pollution impacts on nearby residential and educational institutions.

Operational hours for construction could also be adjusted to reduce traffic congestion and vehicular emissions in the project area. Incorporating renewable energy systems and energy-efficient appliances in the building's operational phase could further reduce environmental impacts and align the project with Jamaica's sustainable development goals.

Impacts

- Impact on Livelihood:

Project: A phased construction approach could allow for longer employment periods, ensuring steady job creation over time. Adjusting operational hours to include shifts may create flexible work opportunities for residents.

Project Area: Prioritizing local labor for construction and operations would directly benefit the community, fostering economic empowerment.

- Environmental Impacts:

Project: Staggered operations or phased construction could reduce peak environmental disturbances, such as noise and air pollution. Adjusting construction schedules to avoid high-pollution times (e.g., midday heat) could minimize environmental impact.

Project Area: Reduced environmental stress could benefit the surrounding communities, especially in managing noise and dust levels during critical times.

- Socioeconomic Impacts:

Project: Operating conditions, such as prioritizing sustainable construction timelines and maintenance schedules, could enhance project longevity and cost efficiency.

Project Area: Utilizing local resources and labor would strengthen community ties to the project and foster long-term public support.

8.7 Alternative Ways of Dealing with Potential Impacts

The baseline study and master plan suggest several mitigation strategies to address environmental and social impacts, including improved stormwater management, green space integration, and noise barriers. These could be enhanced further by adopting:

Green Infrastructure: Installing bioswales, green roofs, and permeable pavements to manage stormwater runoff while reducing urban heat island effects.

Enhanced Community Engagement: Expanding outreach to residents for continuous feedback and integrating their input into the project's development phases.

Upgraded Pollution Controls: Using advanced air filtration systems to manage dust and emissions during construction, complemented by stringent monitoring programs.

Incorporating innovative practices and technology into construction and operational phases would minimize negative impacts while maximizing the project's social and environmental benefits.

Impacts

- Impact on Livelihood:

Project: Enhanced mitigation measures, such as advanced air and water treatment technologies, could create skilled employment opportunities during installation and operation.

Project Area: Improved air quality and reduced noise levels would positively impact residents' productivity and well-being, supporting better livelihoods.

- Environmental Impacts:

Project: Employing state-of-the-art pollution control technologies, such as particulate filters or permeable pavements, would significantly reduce environmental impacts. Incorporating bioswales and reed beds could enhance stormwater management and water quality.

Project Area: Strengthened mitigation measures would preserve local ecosystems, improve biodiversity, and enhance climate resilience.

- Socioeconomic Impacts:

Project: Integrating more sustainable practices may increase upfront costs but would yield long-term savings through enhanced efficiency and reduced regulatory compliance risks.

Project Area: Mitigation measures, such as fire-resistant building materials and effective waste management systems, would improve safety and living standards, aligning with broader urban resilience goals.

9 Other Requirements

In addition to the legislative and regulatory framework that will need to be adhered to, the Consultants further recommend advanced preparation to ensure that the developers are aware of the potential planning and environmental requirements that may arise during the proposed phases of the project. This section provides:

- a list of Government Agencies that should be contacted early.
- an indicative list of post permit requirements likely; and
- an indicative list of permits and licenses that may be required.

9.1 List of GOJ (and Other) Agencies Recommended for Early Dialogue

The GOJ agencies and companies recommended for initial contact by the project developers/ UDC includes regulatory agencies, implementing agencies, emergency services as well as non-governmental organizations (NGOs). Early dialogue with these agencies should significantly assist in mutual information sharing, early determination of agency requirements and foster good relations.

Table 9-1 List of GOJ (and Other) Agencies Recommended for Early Dialogue

Abbreviation	Agency	Portfolio
EHU	Environmental Health Unit	Public and environmental health aspects and regulations
JCF	Jamaica Constabulary Force	Security
JPSCo	Jamaica Public Service Company	Provision of Electricity
JNHT	Jamaica National Heritage Trust	Preservation of archaeological and cultural heritage. Establishment of Watching Brief during site preparation and construction. Excavation of artefacts/relics. Assistance in development of heritage aspects and interpretive signages.
NEPA	National Environment and Planning Agency	Environmental permitting, town planning, land development, monitoring requirements
NSWMA	National Solid Waste Management Agency	Approval of quantities for disposal and designation of disposal site. Collection regimes.
NWA	National Works Agency	Submission of drainage plan for approval
NWC	National Water Commission	Supply of potable water

NGO's	Non-governmental Organizations	These include environmental NGO's fishers, =and community groups. Provision of labour, public sentiment, and community acceptance.
ODPEM	Office of Disaster Preparedness and Emergency Management	National response in the event of a disaster. Liaisons and preparers of Hazard Management Plan if required

9.2 Indicative List of Post Permit Requirements

Based on the Consultant's experience the list provided below has been generated as an indicative list of the types of post permit requirements the developer may be required to obtain. It should be noted that any permit or license issued in respect of any component of the project must be adhered to, and any post permit requirements must be submitted to the responsibly agency within the stipulated time frame. Failure to do so will result in the developer being in breach of the permit conditions which could result in the implementation of a Stop Order on the development, or further legal action.

Table 9-2 Indicative List of Post Permit Requirements

Environmental Monitoring Programme
Fortnightly or monthly Environmental Monitoring Reports
Environmental and Social Management Plan
Stakeholder Engagement Plan
Mitigation Plan
Hazard Management Plan
Emergency Responses and Evacuation Plan
Wildlife Management Plan
Landscape Management Plan
Drainage Plan

9.3 Indicative List of Environmental Approvals, Permit and/or Licenses

Several approvals, permits ands or licenses would be required with respect to the proposed Project, and regular communication with the agencies outlined below will assist in early determination of the requirement for these. The following table is an indicative list of some of the approvals, permits and/or licenses that may be required, and the corresponding responsible agency:

Table 9-3 Indicative List of Environmental Approvals, Permit and/or Licenses

Agency	Approval, Permit and/or License
Ministry of Security	Immigration and Customs Facilities
Ministry of Justice	Beach Licenses (for foreshore modification, dredging and coastal works, recreational use)
NEPA	License to Construct Sewage Treatment Facility
NEPA	License to Discharge Treated (Sewage or Trade) Effluent
NEPA	License for Storage of Petroleum Products
NEPA	Mangrove Modification/ Reclamation Permit
Parish Council	Subdivision Approval

9.4 A Recommended Development Protocol for the Government of Jamaica

The National Heroes District holds significant cultural, historical, and social value for Jamaica, making its redevelopment an opportunity to preserve heritage while addressing modern needs. To ensure successful development that aligns with stakeholder expectations, the following steps are recommended.

Infrastructural Upgrades

Critical infrastructural improvements must prioritize water supply, sewage systems, solid waste management, and pest control to address existing urban challenges. These issues have been identified as urgent by residents during consultations, reflecting widespread concerns about public health and environmental quality.

Community and Cultural Integration

Key cultural sites within the district, such as the Women's Liberal Club headquarters and Ivy Perry's Restaurant, should be preserved or commemorated. Adaptive reuse of historic buildings and the creation of cultural trails can ensure that the heritage of Allman Town and Fletcher's Land remains a focal point of redevelopment. Public spaces should incorporate elements reflecting Jamaica's history, including monuments, murals, and interpretive signage.

Economic Opportunities for Residents

The redevelopment plan must include mechanisms to involve residents in economic opportunities arising from the project. Initiatives such as the creation of market hubs, food kiosks, and local art installations can generate employment and entrepreneurship opportunities. These hubs could prioritize leases for residents, fostering community ownership and early participation in economic gains.

Recreational and Public Amenities

Open spaces and parks should be upgraded with amenities such as playgrounds, walking trails, and green spaces to enhance the area's livability. These features can serve both residents and visitors, creating a balanced environment that caters to recreational and cultural needs.

Phased Development and Communication

A phased approach is essential for minimizing disruption and maintaining transparency. Early wins, such as beautification projects or small-scale infrastructure upgrades, can demonstrate progress and build trust with residents. Clear timelines and regular updates—via both in-person and virtual engagements—are critical for maintaining community confidence and participation.

Sustainability and Resilience

The development must integrate sustainable practices, such as green infrastructure, renewable energy, and water-efficient systems, to future-proof the district against climate change impacts. This approach will not only enhance the project's environmental credentials but also align with national and international sustainability goals.

By addressing these elements, the redevelopment of the National Heroes District can successfully balance modernization with heritage preservation, fostering a sustainable and inclusive urban environment for current and future generations.

10 Conclusion

The proposed Government Campus Project represents a transformative milestone for Jamaica's governance and urban landscape. By centralizing Government Ministries, Departments and Agencies and providing a designated space for the House of Parliament, the project will revitalize Downtown Kingston, while addressing longstanding infrastructural inefficiencies, foster economic growth and cultural preservation. The Strategic Environmental Assessment provided insights int a robust framework for mitigating potential impacts, ensuring that the project aligns with sustainability principles and community needs.

The social survey designed and deployed in the target communities within a 2 km sphere of influence of the project site highlighted that overall residents are willing to relocate if housing is provided, preferably to another area. Additionally, residents value and are in agreement with the Government Campus Project for their communities. The main impacts of the projects identified are the streamlining of government ministries and services, housing rehabilitation, development of commercial mixed-use spaces, green spaces and the upgrades made to physical utility infrastructure. Several cumulative impacts are expected as a result of both positive and negative influences, such as changes to traffic flow and relocation of educational facilities. Furthermore, construction activities are expected to contribute significantly to the deterioration of air and noise quality in the surrounding communities. The potentially negative impacts that have been identified can be mitigated and with a reduction in the residual negatives and the enhancement in the positive impacts identified the overall project can be a positive one for the project area and for the country.

As construction progresses, continuous monitoring and adaptive management will be essential to uphold environmental quality and social equity. Upon completion, the Government Campus will stand as a testament to Jamaica's commitment to modernity, sustainability, and inclusivity, benefitting both present and future generations.

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12 Appendices

12.1 Air Quality Sampling Locations Detailed Descriptions

Table 12-1: Detailed Air Quality Sampling Location Descriptions

Sample Location	GPS Coordinates	Description
AQ1	17°58'33.6"N, 76°47'02.4"W	This sampling location was located south of the south-eastern boundary of the proposed project. The pump was placed atop the **Holy Trinity Chapel** lower-level roof which was approximately 10 -15 ft above ground level. The area is which the pump was placed was free from debris and there were no encumbrances to prevent air flow. The sampling area was located approximately 120 feet west of a busy main road and north of the Holy Trinity Church. The ground below the sampling area was a mixture of paved and well-maintained vegetated areas comprising of an assortment of grasses and flowering trees and plants.
AQ2	17°59'3.60"N, 76°46'48.40"W	This sampling location was located at the north-eastern boundary of the proposed project. The pump was placed atop the roof of the **Central Masjid**. The area is which the pump was placed was free relatively free from debris. The roof area was protected enclosed by green mesh fitting that did not hinder the movement of air. The sampling area was located approximately 20 feet west and south of a road frequently traversed. Approximately 200 ft east of the sampling location (at ground level), some burning was observed.
AQ3	17°58'41.40"N, 76°46'59.40"W	This sampling location was located south of the south-eastern boundary of the proposed project. The pump was placed atop an old open grandstand area at the **Sabina Park**. The area is which the pump was placed was free from debris and there were no encumbrances to prevent air flow. The sampling area was located approximately 50 feet

Sample Location	GPS Coordinates	Description
		north of a parking lot and west of a well-maintained cricket pitch.
AQ4	17°59'01.3"N, 76°47'25.4"W	This sampling location was located close to the mid-western boundary of the proposed project. The pump was placed in an empty parking lot of the **Heroes Circle SDA Church** approximately 40 feet from a busy main road. The sampling area was free from any hindrances to air flow. The general area that the pump was placed in was free from debris however a pile of old construction material was seen to the northeast of the pump set up area
AQ6	17°58'34.7"N, 76°47'15.2"W	This sampling location was located south of central-southern boundary of the proposed project area. The pump was placed on the second-floor balcony of an area with dormitories at **Missionaries of the Poor**. The area was approximately 25 feet above ground level and was free from debris. However, the area below the sampling area had some unpaved areas with exposed dirt and was vegetated with both small and large flowering trees and plants. The sampling area was located to the immediate west of a large parking lot and approximately 150 ft west of a busy main road. Activities such as persons cleaning fish tanks on lower levels was observed during the set-up of the pump.
AQ8	17°58'50.64"N, 76°47'39.92"W	This sampling location was located west of the south-western boundary of the proposed project. The pump was placed atop the roof of the **National Public Health Laboratory**. The roof area was largely free from debris; however, pigeons were observed roosting nearby the pump set up area. Machinery such as extractors or fresh air intakes were observed on this roof; some amount of insulating material was observed also. There was smoke seen to the west of the sampling location.

Sample Location	GPS Coordinates	Description
AQ9	17°58'50.30"N, 76°47'8.63"W	This sampling location was located in south-central area of the proposed project. The pump was placed at the **Allman Police Station** nearby a generator. The sampling point was located approximately 10 feet west and 20 feet south of a roadway frequently traversed. An unpaved walkway was observed nearby the pump set up area. The area was unencumbered and allowed the free movement of air flow.
AQ10	17°59'19.4"N, 76°47'31.8"W	This sampling location was located north of the north-western boundary of the proposed project. The pump was placed atop a recently constructed decking at the **Cross Roads SDA Church** approximately 15 - 20 ft above ground level. The area is which the pump was placed was generally free from debris and there were no encumbrances to prevent air flow. A large mango tree was observed near to the sampling location and construction material was seen on the ground level. Areas on the ground near to the sampling location were unpaved.
AQ12	17°59'10.2"N, 76°47'17.3"W	This sampling location was located north of the Heroes Circle National Park (located in the centre of the proposed development area). The pump was placed in the secure flagpole area at the **Wolmer's Boys School**. The area is which the pump was placed was free from debris and there were no encumbrances to prevent air flow. The sampling area was located approximately 30 feet north of a busy main road and west of a well-maintained garden area.
AQ13	17°59'19.1"N, 76°46'55.1"W	This sampling location was located north of the mid-northern boundary of the proposed project. The pump was placed in the partially vegetated area, free of any encumbrances to air flow, at the **Arnold Road SDA**

Sample Location	GPS Coordinates	Description
		Church. The sampling area was located approximately 170ft east and 50 feet north of roadways frequently traversed. The pump was set up approximately 8 feet south of the church driveway (asphalted). There were areas of burning observed in the general church yard. Large fruit and flowering trees were observed on property.
AQ15	17°58'54.5"N, 76°47'23.1"W	This sampling location was located near both the eastern and western central boundary areas of the proposed project. The pump was placed in the shrine area of the **Heroes Circle Park** which was free of any encumbrances to air flow. The areas immediately surrounding the pump area were paved, however, a mixture of unpaved and grassed areas also encapsulated the pump set up area. The closest busy roadway to the pump set up area was located approximately 300 ft to the west of the pump set up area.
For all sampling points, the environmental conditions were sunny with scattered clouds and light to moderate SE winds.		

12.2 Appendix 2 Species Lists

Flora observed and/or reported in project area

Class	Scientific Name	Common Name	Range	IUCN Status	DAFOR Ranking
Magnoliopsida	*Anacardium sp.*	Cashew	Native to tropical Americas; cultivated in urban areas	Not Evaluated (NE)	Occasional
Magnoliopsida	*Mangifera sp.*	Mango	Native to South Asia; widely cultivated in tropical regions	Least Concern (LC)	Occasional

Magnoliopsida	*Syzygium malaccense*	Otaheite Apple	Native to Southeast Asia; introduced to tropical regions	Least Concern (LC)	Rare
Various (e.g., Magnoliopsida, others)	Various species	Ornamental Trees and Plants	Deliberately cultivated; urban areas worldwide	Varies by species	Frequent
Monocotyledon	Unspecified species	Grasses	Global distribution, urban and disturbed areas	Not Evaluated (NE)	Abundant
Magnoliopsida or others	Unspecified species	Shrubs	Global distribution, urban and disturbed areas	Not Evaluated (NE)	Frequent

Fauna observed and/or reported in project area

Class	Scientific Name	Common Name	Range	IUCN Status	DAFOR Ranking
Mammalia	*Felis catus*	Feral Cat	Global, associated with urban areas	Not Evaluated (NE)	Frequent
Mammalia	*Canis lupus familiaris*	Feral Dog	Global, associated with urban areas	Not Evaluated (NE)	Frequent
Insecta	Various species	Butterflies	Global, typical of urban and natural habitats	Varies by species	Occasional
Aves	Various species	Birds	Global, typical of urban and natural habitats	Varies by species	Occasional
Mammalia	*Capra aegagrus /hircus*	Goat	Domestic and feral populations worldwide	Least Concern (LC)	Reported but not observed

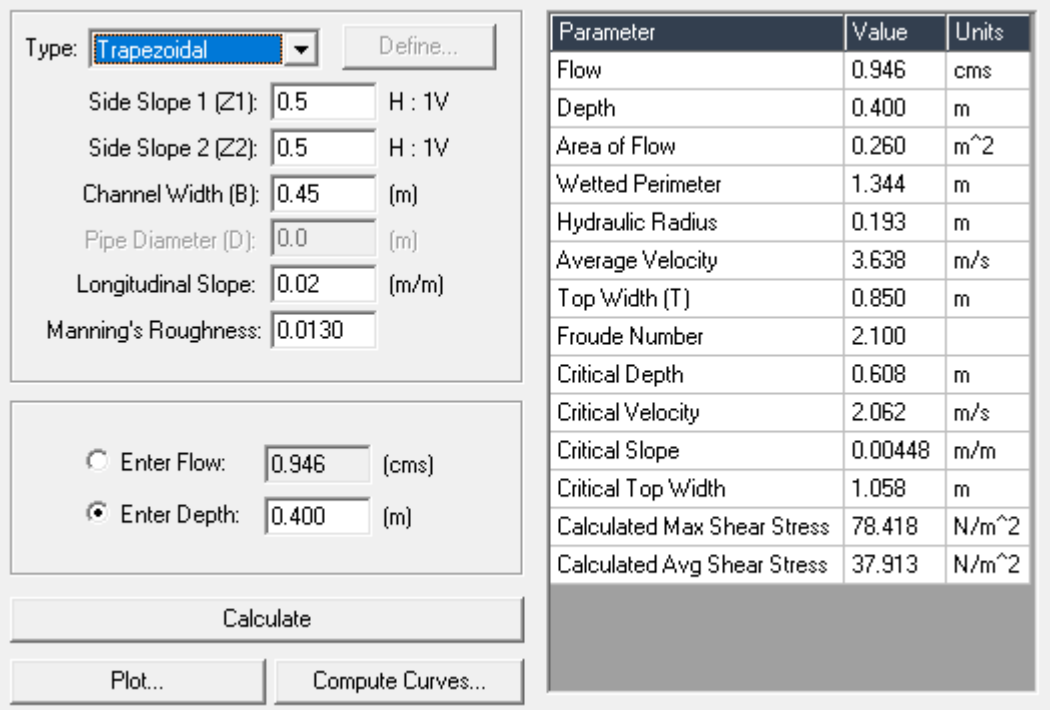
Mammalia	*Sus scrofa domestica*	Pig	Domestic and feral populations worldwide	Not Evaluated (NE)	Reported but not observed

Herpetofauna observed and/or reported in project area

Class	Scientific Name	Common Name	Range	IUCN Status	DAFOR Ranking
Amphibia	*Rhinella marina*	Cane toad	Introduced	LC	R
Amphibia	*Eleutherodactylus johnstonei*	Lesser Antillean Frog	Invasive	LC	O
Amphibia	*Osteopilus septentrionalis*	Cuban Tree Frog	Introduced/Invasive	LC	O
Reptilia	*Anolis garmani*	Jamaican Giant Anole	Endemic	LC	R
Reptilia	*Anolis lineatopus*	Jamaican Brown Anole	Endemic	LC	F
Reptilia	*Aristelliger praesignis*	Jamaican Croaking Gecko	Native	LC	R

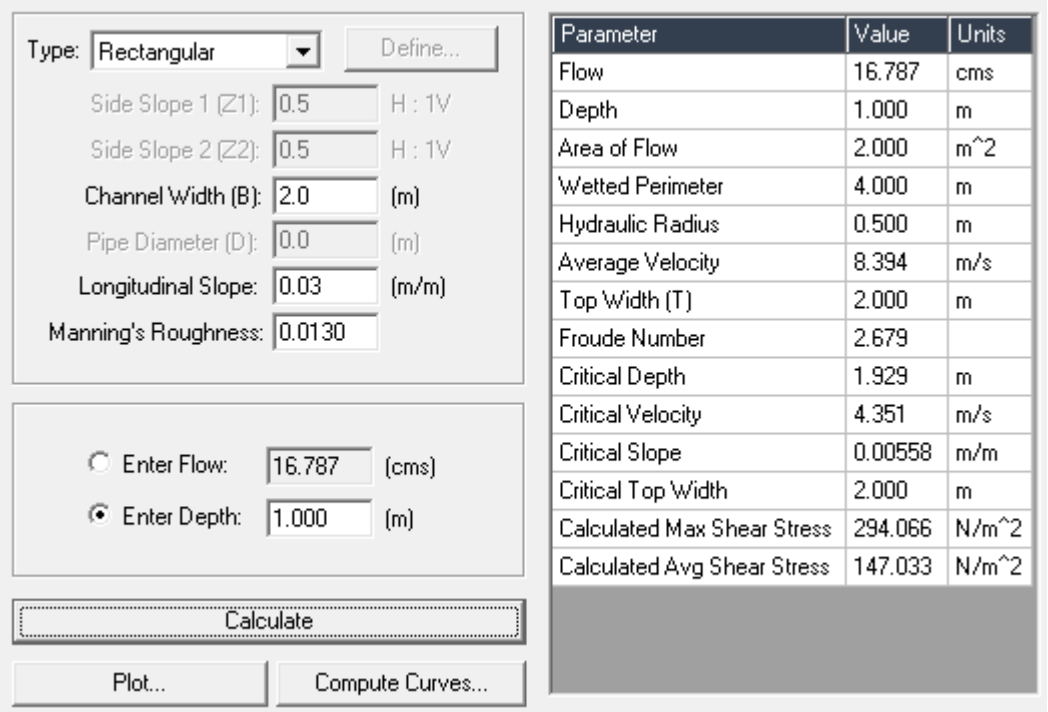
12.3 Appendix 3 Hydrological Channel Analysis

12.3.1 Perimeter Drain



Parameter	Value	Units
Flow	0.946	cms
Depth	0.400	m
Area of Flow	0.260	m^2
Wetted Perimeter	1.344	m
Hydraulic Radius	0.193	m
Average Velocity	3.638	m/s
Top Width (T)	0.850	m
Froude Number	2.100	
Critical Depth	0.608	m
Critical Velocity	2.062	m/s
Critical Slope	0.00448	m/m
Critical Top Width	1.058	m
Calculated Max Shear Stress	78.418	N/m^2
Calculated Avg Shear Stress	37.913	N/m^2

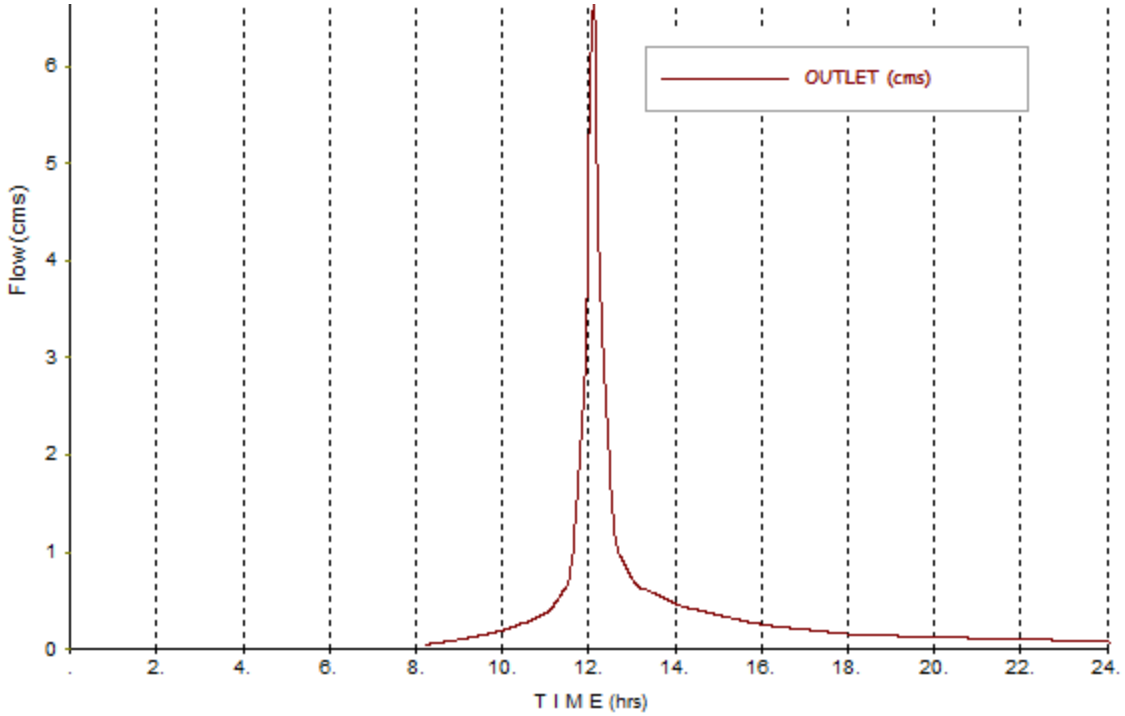
12.3.2 Barnes Gully



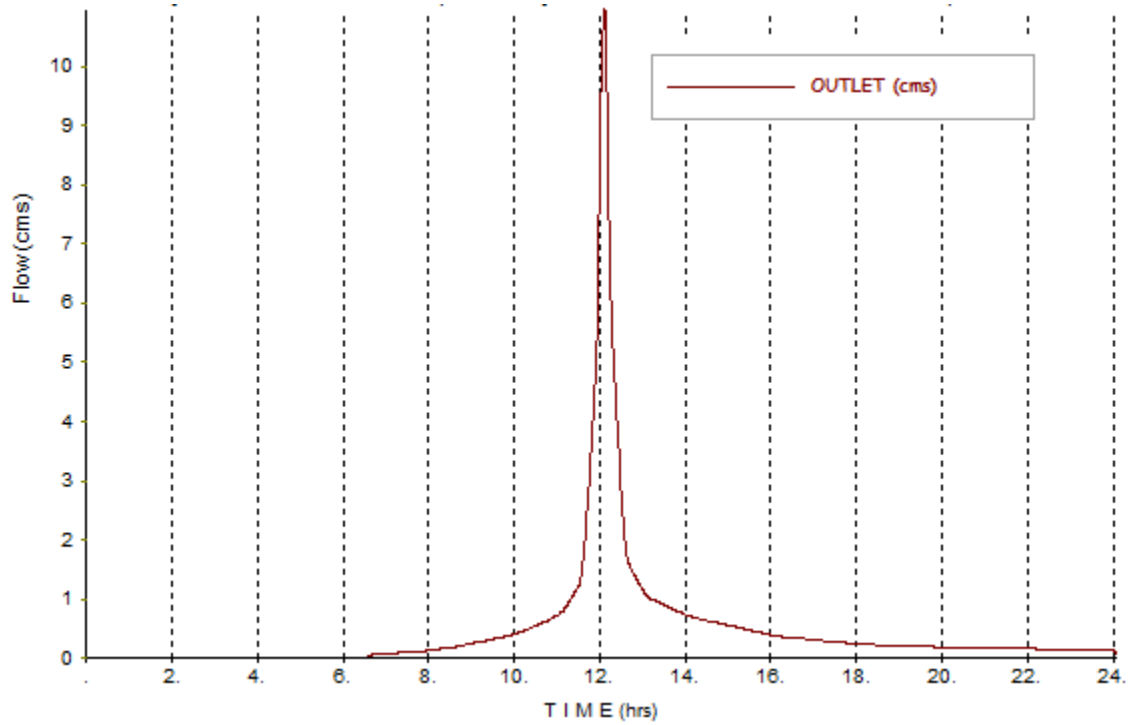
Parameter	Value	Units
Flow	16.787	cms
Depth	1.000	m
Area of Flow	2.000	m^2
Wetted Perimeter	4.000	m
Hydraulic Radius	0.500	m
Average Velocity	8.394	m/s
Top Width (T)	2.000	m
Froude Number	2.679	
Critical Depth	1.929	m
Critical Velocity	4.351	m/s
Critical Slope	0.00558	m/m
Critical Top Width	2.000	m
Calculated Max Shear Stress	294.066	N/m^2
Calculated Avg Shear Stress	147.033	N/m^2

12.4 Appendix 4 Peak Flow Hydrographs (Future Climate)

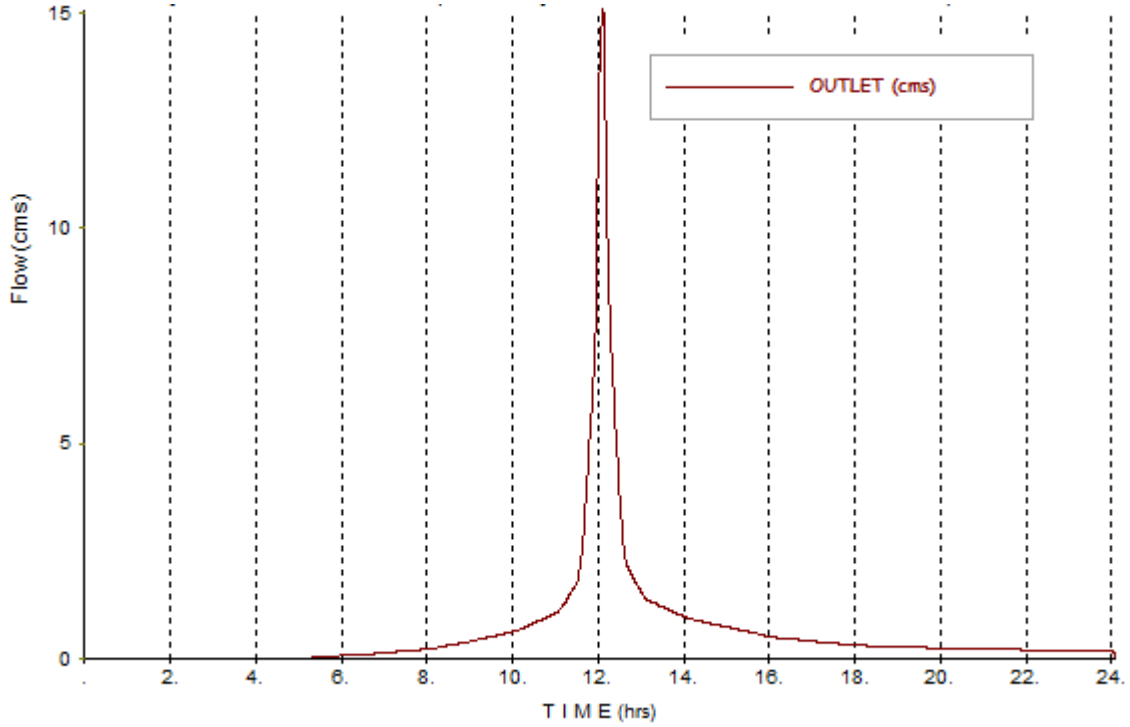
12.4.1 2-Yr RP



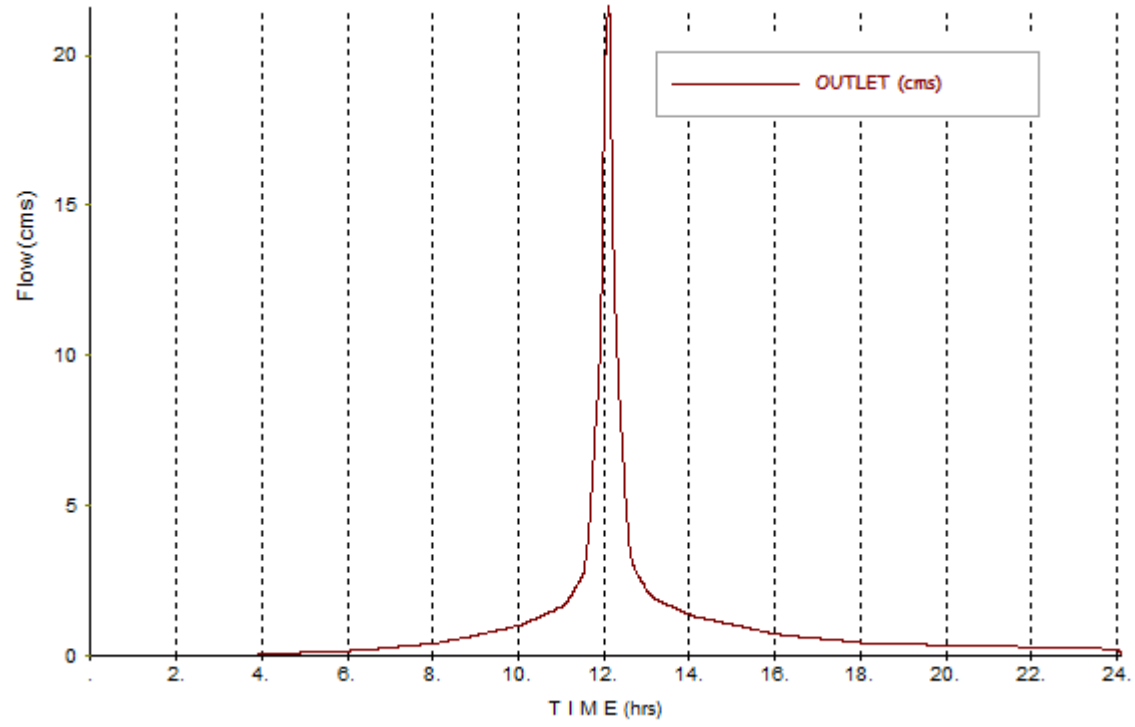
12.4.2 5-Yr RP



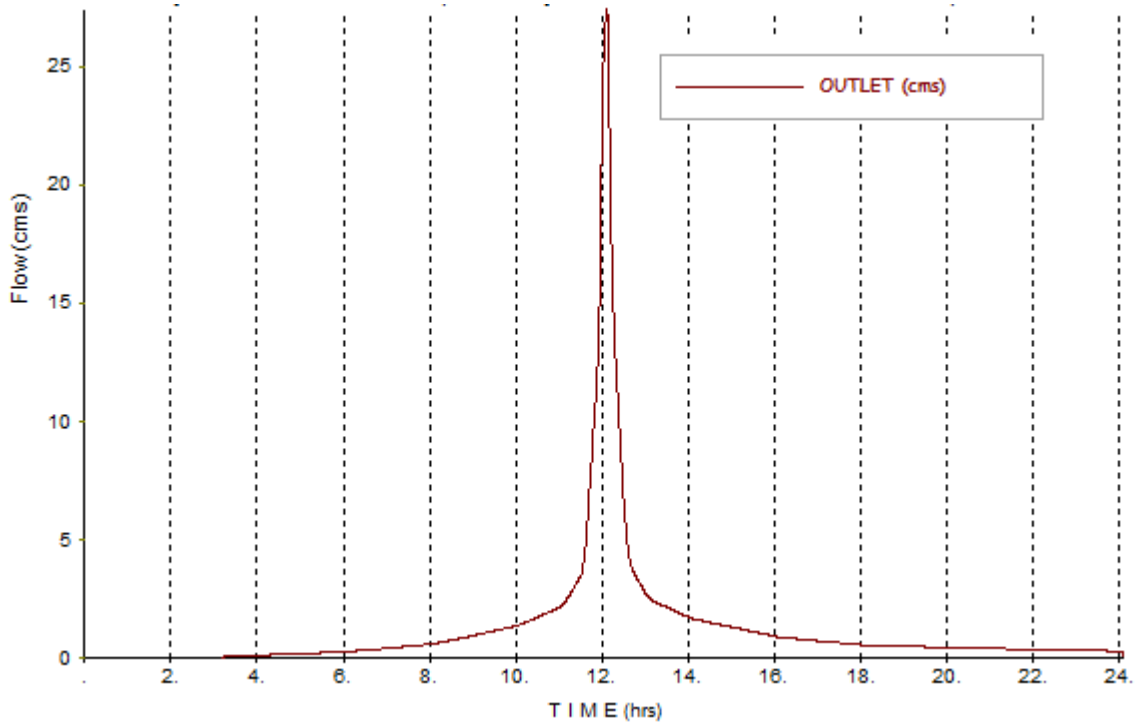
12.4.3 10-Yr RP



12.4.4 25-Yr RP



12.4.5 50-Yr RP



12.4.6 100-Yr RP