DRAFT FINAL ENVIRONMENTAL AND SOCIAL ASSESSMENT REPORT AND MANAGEMENT PLAN

ENVIRONMENTAL AND SOCIAL ANALYSIS OF THE MODERNISATION OF THE AGRICULTURE SECTOR PROGRAMME JA–L1083

Report Version:	Table of Contents
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PROPRIETARY RESTRICTION NOTICE

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The views expressed herein are those of the authors and do not necessarily reflect the views of the IDB.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

List of Abbreviations and Acronyms

ACP	Agricultural Competitiveness Programme
AEC	Agricultural Export Complex
AEZ	Agro-Export Zones
Agro-Invest	Agro-Investment Corporation
AEC	Agricultural Export Complex
AIC	Agro Investment Corporation
AMC	Agricultural Marketing Corporation
BOD	Biochemical Oxygen Demand
COD	Chemical Oxygen Demand
CSGM	Climate Studies Group, Mona
DSIA	Donald Sangster International Airport
EHS	Environment, Health and Safety
EHU	Environmental Health Unit
EIA	Environmental Impact Assessment
EMP	Environmental Management Plans
EPAC	Ebony Park Agricultural Cooperative
EPAP	Ebony Park Agro Park
ESA	Environmental and Social Assessment
ESL	Environmental Solutions Limited
ESMP	Environmental and Social Management Plan
FAO	Food and Agriculture Organization
FC	Faecal coliform
GAP	Good Agricultural Practices
GDP	Gross domestic product
GoJ	Government of Jamaica
HACCP	Hazard Analysis and Critical Control Points
IDB	Inter-American Development Bank
JPSCo	Jamaica Public Service Company
KPI	Key Performance Indicators

MASP	Modernisation of the Agriculture Sector Programme
MDL	Method detection limit
MGI	Mona GeoInformatics
MICAF	Ministry of Industry, Commerce, Agriculture and Fisheries
MPDC	Manchester Parish Development Committee
Msl	Mean Sea Level
NEPA	National Environment and Planning Agency
NFDH	New Forest/Duff House
NMIA	Norman Manley International Airport
NIC	National Irrigation Commission
NRCA	Natural Resources Conservation Authority
NSWMA	National Solid Waste Management Authority
NWC	National Water Commission
ODPEM	Office of Disaster Preparedness and Emergency Management
OFWMU	On-Farm Water Management Unit
OP	Operational Policy
PCA	Pesticide Control Authority
PEU	Programme Executing Unit
PIF	Productivity Innovation Fund
PIOJ	Planning Institute of Jamaica
P&L	Permits and Licences
PPP	Public-private partnerships
SDC	Social Development Commission
SPAP	Spring Plain Agro Park
SRC	Scientific Research Council
STATIN	Statistical Institute of Jamaica
TA	Technical assistance
TOR	Terms of Reference
UWI	University of the West Indies
WMU	Watershed Management Units

WRA	Water Resources Authority
WWT	Wastewater Treatment
WUA	Water User Association
WUG	Water User Group
YAP	Yallahs Agro Park

1 Introduction

1.1 Purpose

This document presents a Draft Environmental and Social Assessment (ESA) of the *Modernisation of the Agriculture Sector Programme (MASP) JA-L1083* being funded under an agreement between the Government of Jamaica (GOJ) and the Inter-American Development Bank (IDB). The assessment has been conducted in accordance with the IDB's *Environment and Safeguards Compliance Policy and Guidelines* to identify and assess potential environmental and social impacts of the development and implementation of the MASP, and is submitted in support of the project preparation phase of the IDB's undertaking. Based on the ESA, an Environmental and Social Management Framework/Plan (ESMP) has been prepared for the mitigation and management of the identified potential impacts and risks during the life of the programme.

The ESA and ESMP have been prepared by Environmental Solutions Limited (ESL) under a consultancy agreement with the IDB. This report is organised into 3 main sections: Section 1 – Environmental and Social Assessment; Section 2 – Environmental and Social Management Plan; and Section 3 – Consultation Plan and Grievance Mechanism.

1.2 Contextual Background

The agricultural sector is an important contributor to Jamaica's economic development and is recognised as a priority in the Government's mid-term economic and social development plans. The sector accounts for 7.5 percent of Jamaica's gross domestic product (GDP), and employs approximately 17 percent of the labour force. Agri-food products represent 20 percent of total merchandise export earnings, and 16 percent of the total merchandise import bill. With a high import bill and the need to become more competitive, resilient and sustainable for both the local and export markets, it is essential to displace high value imports particularly through technology transfer and infrastructure improvements (World Bank, 2018; Ministry of Agriculture and Fisheries, 2015). In addition, small farmers tend to be at a comparative disadvantage on the local and international markets, and there have been several initiatives toward greater inclusion.

The Ministry of Industry, Commerce, Agriculture and Fisheries (MICAF) has had challenges over the years in the development of this small-scale agricultural sector. This sector is considered to be underexploited with several challenges preventing farmers from being competitive on the local and international markets. Optimal agricultural production and sale face a number of key barriers: high costs of some production inputs; relative cost and productivity of labour; praedial larceny; limited use and investment in modern technology; poor business practices; limited infrastructure; vulnerabilities to pests and diseases; and limited or no coordination among farmers. To improve small-scale farmer competitiveness in larger local and international markets, production practices and outputs need to meet market requirements; quality and cost are key factors. To better achieve this, MICAF has recognised the need to create synergies among small-holders, provide development support and connect agricultural producers to a wider market of consumers (World Bank, 2018).

Over the years, several programmes have been implemented to assist the small-scale agricultural sector to become more competitive. One such programme was the IDB investment loan of USD$15M in 2010 – the Agricultural Competitiveness Programme JA–L1012 (ACP), aimed at increasing farmers' access to markets. The ACP was rescoped in 2013, at the request of the Government of Jamaica (GoJ), to continue the development of small-scale agriculture in Jamaica, with greater focus on increasing agricultural competitiveness and the modernisation of the sector. The new scope was entitled Modernisation of the Agriculture Sector Programme (MASP), JA–L1083.

SECTION 1

ENVIRONMENTAL AND SOCIAL ASSESSMENT

2 Modernisation of the Agriculture Sector Programme (MASP)

2.1 Overview

The MASP is intended to provide support for various growth-enhancing reforms and development programmes designed to increase agricultural productivity and market linkages by offering improved services in the following areas:

(i) animal and plant health services;
(ii) food safety services;
(iii) agricultural extension; and
(iv) the promotion of public-private partnerships (PPP) in the agricultural sector.

To achieve the above objectives, the following two components have been identified:

Component 1. Agricultural health and food safety

This component will finance activities related to:

(i) strengthening animal health: improvement of disease surveillance and control, traceability systems, animal quarantine facilities, formulation of protocols and operational regulations, staff training, equipment, and inputs for the veterinary laboratories;
(ii) strengthening plant health: improvement of pest surveillance and control, traceability systems, plant quarantine facilities, enhancement of integrated border controls, formulation of protocols and operational regulations, staff training, equipment, and inputs for the plant health laboratories;
(iii) improving food safety: assessment of the food safety policy and the related legal framework, analysis of the institutional arrangements of the agricultural health and food safety system, improvement of the surveillance, inspection and monitoring systems, enhancement of the monitoring system for agricultural inputs, strengthening of good agricultural practices and certification procedures, formulation of protocols and operational regulations, staff training, equipment and inputs for the relevant laboratories.

Component 2: Public agricultural infrastructure for public-private partnerships

This component will finance activities related to:

(i) the development of a national, comprehensive policy and operational strategy for the conception and management of PPP in the agricultural sector and, specifically, of Agro Parks;
(ii) the financing of key public infrastructure to complement PPP that will be identified through competitive processes including rigorous technical evaluations as well as socio-economic and environmental analyses;
(iii) the provision of specific agronomic and business training to producers' organisations located in the existing Agro Parks;
(iv) the provision of demand-based agricultural public services and information to facilitate market integration and synergies.

The following Component 2 activities have been identified to date. Further details of these are presented in Appendix I.

- 2.1: Development of a comprehensive framework for agricultural PPPs;
- 2.2: Market-driven agricultural PPPs to improve productivity and farm-to-market linkages;
- 2.3: Public infrastructure and services to support market-driven agricultural PPPs;
- 2.4: Development of a pilot Productivity Innovation Fund;
- 2.5: Systems and tools to strengthen management and data collection in agro-economic zones.

2.2 The Development of Agro Parks

In 2008, the Government of Jamaica (GOJ) and the Inter-American Development Bank (IDB) allocated a sum of $219 million to execute the National Irrigation Development Project, which was designed to drill wells and develop irrigation distribution networks in specific locations, namely, Colbeck, St. Catherine; New Forest, Manchester; Duff House, St. Elizabeth; and Yallahs in St. Thomas. In addition, Water User Groups (WUGs) and Water User Associations (WUAs) were to be legally registered and members engaged in training for irrigation management, farm management and marketing techniques (JIS, 2007). This project was not able to complete all the works intended and subsequently in 2010, the Ministry of Agriculture and Fisheries launched the Agro Parks Programme. Funding (J$427M) was obtained from the European Union/Sugar Transformation Unit Programme, and also the Inter-American Development Bank which provided funding (J$620M) for the Agriculture Competitiveness Programme (ACP) implemented to set up Agro Parks across Jamaica.

Stakeholder consultations with MICAF indicated that the development of Agro Parks is a major avenue to improving the competitiveness of the small-scale agricultural sector.

The Ministry of Agriculture and Fisheries published a Ministry Paper (48) in 2014 on the Agro Park Development Programme. The document defines an Agro Park as "*an area of intensive, contiguous, parcel of land for agricultural production, which seeks to integrate all facets of the agricultural value chain from pre-production to production, post harvesting and marketing*". All these activities are being executed by the Agro Investment Corporation (AIC) within the framework of a tripartite partnership involving the Government, the farmers/investors, and the marketing entities. The AIC operates under the legal framework provided by the AIC Act, 2009 which is elaborated in Section 8.2.

The following are features that should be present in the Agro Parks:

1. The requisite infrastructure and facilities;
2. An environment that supports integrated, sustainable agricultural production, processing and logistics;
3. Processes that are integrated along a value chain in a deliberate way;
4. Partnerships involving Government, farmers/investors and marketing organisations.

Agro Parks are being strategically implemented across Jamaica to facilitate the following:

- Promotion of public-private partnership investments;
- Promotion of efficiency in resource allocation and utilisation – thus reduction in costs;
- Improvement in economies of scale – e.g., in the procurement of goods and services;
- Improvement in market access;

- Promotion and encouragement of sustainability;
- Creation of long-term and seasonal employment;
- Creation of focal points for agricultural development.

Nine (9) Agro Parks were targeted for implementation, but only 6 are currently in operation and functioning as an Agro Park as outlined in Table 2.1 below. Four of these Agro Parks were selected for environmental and social assessment as recommended by MICAF. These are highlighted in Table 2.1.

Table 2.1: Land Availability and Distribution in Agro Parks (AIC, 2014)

	Agro Park	Parish	Acres Available	Acres Leased	Acres in Production
1	Plantain Garden River (PGR)	St. Thomas	290	290	43.73
2	Yallahs	St. Thomas	252	All Private	22.5
3	Amity Hall	St. Catherine	2,100	1,400	208.8
4	Ebony Park	Clarendon	1400	683	374
5	Spring Plain	Clarendon	1,149	638	19.8
6	New Forest/Duff House	Manchester, St. Elizabeth	779	All Private	105
7	Hill Run	St. Catherine	300	Private	238 - But not Functioning as an Agro Park
8	Meylersfield	Westmoreland	90	All Private	0* Not in operation
9	Small Ruminant Abattoir Cluster	Westmoreland	Acreages to be determined	All Private	0* Not in Operation
	Total		**6,360**	**2,756**	**1,011.83**

In order to develop an Agro Park, AIC travels to different areas across Jamaica and holds meetings with the community members and farmers. The AIC sensitises the community on what the Agro Park is about and how they can benefit. The benefits of the Agro Park are as follows:

a. Access to Land – via lease agreements.
b. Access to Irrigation Water – NIC provides water at a rate between J$5 and $15 per cubic metres.
c. GlobalGap Certification – this in encouraged and under various projects farmers who are willing have been certified.
d. Technical Support – provided to farmers through training provided.
e. Market Access – access to a wider local, regional, and international markets.

It is anticipated that since the Agro Park is developed to have clustering of farmers on a contiguous piece of land. This would allow for the sale of large quantities of produce needed to fulfill the needs to large markets. Further, there are even greater benefits to large strict markets if neighbouring famers all employ good agricultural practices and are GlobalGap Certified.

Once the community have bought into the vision, the AIC seeks to establish an Agro Park in that area.

2.2.1 Access to Land in the Agro Parks

In order to access lands within the Agro Park, the following are key documents required from applicants:

1. Business Plan
2. Implementation Plan
3. Completed Application Form
4. Proof of identification
5. Tax Registration Number

Once the applicant provides all the necessary documentation to the AIC, the AIC's Lease Committee meets to review and evaluation the proposal for each applicant. A minimum of 5 acres of land has to be planned for lease in the Business Plan to be considered. Once the Lease Committee is satisfied with the application, a Lease Contract is prepared and signed by both parties and witnessed, which then binds both parties to the terms and conditions within the contract. One of the terms within the contract requires that land leased ought to be put into production, if significant time has elapsed, the AIC takes back their land. The conditions require farmers to have a minimum of 70% of the leased land to be under production.

New Entrants currently pay J$10,000 per acre for land, which was recently raised. Older farmers with existing lease contracts that have not yet ended currently pay J$5,000 until their contract expires.

For those Agro Parks with private land-owners, they each have their individual leases to farmers, which is different from the AIC arrangement. There is no MOU arrangement between private land-owners and AIC just an agreement that they desire to be in the Agro Park.

Youth unemployment is a common challenge in several communities across Jamaica, as such land has been earmarked in the Agro Parks for the youth. Both men and women have equal opportunities to own land in the Agro Parks.

2.2.2 Support for Agro Parks

The Agro Parks are supported by the AIC through the Government of Jamaica's Consolidated Fund. This is used to pay staff and allows for the management of the existing Agro Parks. This is inadequate sustain the full suite of staff needed, as such some Agro Parks do not have Managers resulting in other personnel such as Cluster Coordinators and Technology Transfer Officers doubling on the execution of roles and responsibilities.

In addition to this Fund, the AIC receives revenue from the leasing of land, rental of space for processing at the various Packaging Facilities and the rental of equipment such as tractors for ploughing. However, there is limited equipment for rental and not enough available lands under irrigation for rental.

This consolidation fund and current revenue streams are therefore inadequate to allow the AIC to fully undertake its mandate and as such project proposals are written on a regular basis to receive external

funds to make up for the shortfall. For example, there is currently a CDB funded project developing Essex Valley[1], Amity Hall, and the Old Victoria Banana Estate in Clarendon as Agro Parks[2].

The past IDB funded Agricultural Competitiveness Project (ACP) is also another funded project that facilitated the provision of irrigation water and other infrastructure in the Yallahs, Spring Plain and New Forest/Duff House Agro Parks.

There are plans under other funded projects to develop more Agro Parks such as Holland in St. Elizabeth.

2.3 Quarantine Facilities for Exporting Goods

MICAF is also seeking to develop an appropriate quarantine facility to facilitate the export of agricultural goods. Plans include improvements to the following:

1. Agricultural Export Complex – Plant Quarantine at the Norman Manley International Airport (NMIA)
2. Agricultural Export Complex – Plant Quarantine at the Donald Sangster International Airport (DSIA)
3. The Agricultural Marketing Corporation (AMC) Complex on Spanish Town Road run by the Agro Investment Corporation (AIC).

All three facilities have been identified for further development under MASP as a quarantine facility with the appropriate amenities that can facilitate the post-harvest processing and packing of Global GAP-certified and Hazard Analysis and Critical Control Points (HACCP) certified produce for export. These facilities were also environmentally and socially assessed under this consultancy.

3 Methodology

The Consultants developed the approach and methodology according to the IDB Safeguard Policies and Guidelines (OP 703) and the Terms of Reference provided by the IDB. As part of the general approach, a multidisciplinary team of experienced scientists and environmental professionals was assembled to conduct the institutional review, environmental assessment, social assessment, stakeholder consultations, determination of potential impacts, recommendations for mitigation measures, and development of an environmental and social management plan.

The team utilised the Charette-style approach to data gathering, analysis, and presentation, whereby team members conducted the field investigations together to determine critical elements for analysis and the issues to be highlighted. Team meetings were used as a means to discuss the progress of work and to facilitate integration of data toward achieving the project objectives outlined above.

The following (Sections 3.1 to 3.7) are the specific tasks to be completed in order to achieve the project objectives.

1 Essex Valley Agriculture Development Project (EVAD)

2 Southern Plains Agricultural Development Project (SPAD)

3.1 Project Initiation/Kick-off

The project began with an initial client meeting on July 4, 2019 to discuss the project work plan and schedule and any anticipated changes. Discussions were also held regarding data collection being essential for timely submission of the deliverables due under this consultancy.

3.2 Data Collection and Review

The Consultants conducted desktop research to collect and review existing data as well as review relevant documentation provided by the client and executing agency related to this project. Existing data collected for review are referenced in this ESA Report.

3.3 Field Visits

Field investigations were conducted at the locations identified for assessment as follows:

- Yallahs Agro Park – July 26, 2019;
- Spring Plain/Ebony Park Agro Park – July 30, 2019;
- New Forest/Duff House Agro Park – July 30, 2019;
- Agricultural Marketing Corporation (AMC) Complex – August 12, 2019;
- AEC Plant Quarantine NMIA – September 16, 2019;
- AEC Plant Quarantine DSIA – September 26, 2019.

These sites were selected based on their level of compliance to international best practices as identified by information received from MICAF. The sites were screened for physical, ecological and social issues that could impact operations.

Potential, social and environment risks were flagged along with lessons learned from previous activities; relevant areas directly and indirectly affected by the operation; and the identification of the socioeconomic and cultural profile of the main stakeholders and potential beneficiaries. Information was disaggregated by gender where applicable and available.

3.4 Stakeholder Consultations

A Stakeholder Mapping Exercise was conducted, and stakeholder groupings were identified and classified based on their role and potential influence on the project as illustrated in Figure 3.1.

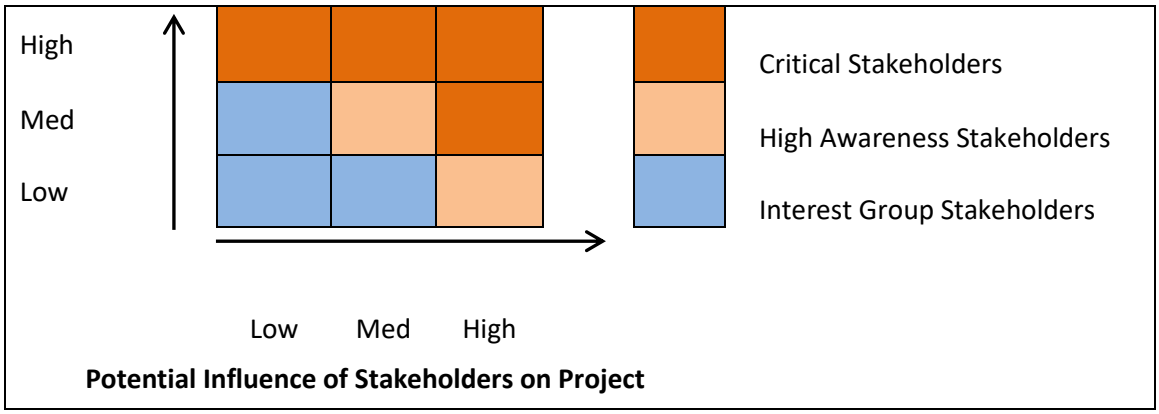

Figure 3.1: Stakeholder Mapping

The stakeholders identified were grouped as follows:

- Stakeholders to be affected, directly or indirectly, by aspects and the effects of project implementation
- Stakeholders who participate in the project implementation
- Stakeholders being able to influence project implementation.

The method of engagement was outlined for the various stakeholder groups, in order to meet the varying needs identified. Figure 3.1 below shows the various levels of stakeholders and the engagement approaches that were utilised during this aspect of the project.

Table 3.1: Stakeholder Levels of Engagement and Approaches

Level	Role or responsibility	Communication	Nature of Relationship	Engagement Approaches
Monitor	Monitor stakeholders' views	One-way: stakeholder to company	Long term	• Media and Internet tracking • Second-hand reports from other stakeholders possibly via targeted interviews
Inform	Inform or educate stakeholders	One-way: company to stakeholder, no invitation to reply	Short- or long-term relationship with stakeholders	• Bulletins, letters, brochures, reports, and websites • Speeches, conference and public presentations • Open house and facility tours • Road shows and public displays • Press releases, press conferences, media advertising, lobbying
Transact	Work together in a contractual relationship where one partner directs the objectives and provides funding	Limited two-way: setting and monitoring performance according to terms of contract	Relationship terms set by contractual agreement	• Public-Private Partnerships and Private Finance Initiatives • Grant-making, cause-related marketing
Consult	Gain information and feedback from stakeholders to inform decisions made internally	Limited two-way: company asks questions and the stakeholders answer	Short- or long-term involvement	• Surveys, focus groups, workplace assessments, one-to-one meetings • Public meetings and workshops • Standing stakeholder advisory forums • Online feedback and discussions
Involve	Work directly with stakeholders to ensure that their concerns are fully understood and considered in decision making	• Two-way, or multi-way between company and stakeholders • Learning takes place on both sides • Stakeholders and company take action individually	May be one-off or longer-term engagement	• Multistakeholder forums • Advisory panels • Consensus building processes • Participatory decision-making processes

Level	Role or responsibility	Communication	Nature of Relationship	Engagement Approaches
Collaborate	Partner with or convene a network of stakeholders to develop mutually agreed solutions and joint plan of action	• Two-way, or multi-way between company and stakeholders • Learning, negotiations, and decision making on both sides • Stakeholders work together to take action.	Long-term	• Joint projects, voluntary two-party or multistakeholder • Initiatives, partnerships
Empower	Delegate decision-making on a particular issue to stakeholders	• New organisational forms of accountability • Stakeholders have formal role in governance of an organisation or decisions delegated out to stakeholders	Long-term	Integration of stakeholders into governance structure (e.g.' as members, shareholders or on particular committees, etc.)

The results of the stakeholder mapping exercise were used to inform a Consultation Plan, prepared and put forward to the Borrower and IDB as a suggested consultation methodology for going forward.

3.5 Policy Legislative and Institutional Review

Key policies and legislation were reviewed to identify and make reference to those that may apply under the implementation of the MASP.

The capacity of the Executing Agency, MICAF, to manage environmental, social, cultural, institutional, health and safety, and labour issues was evaluated with a view to recommending a technical and/or institutional strengthening programme that may be needed. This was informed by desk research and key stakeholder interviews.

3.6 ESA Report Preparation

The ESA and ESMP were prepared using the information gathered in 3.1 to 3.5 above and reported as guided by the terms of reference.

3.7 Limitations

This project did not collect raw/primary data and so was heavily reliant on available existing data. Some data, such as air quality and noise baselines, are not available for the area and therefore could not have been discussed. Additionally, more accurate estimates for population data were not available from the Statistical Institute of Jamaica (STATIN) within the short time frame and as such, the Social Development Commission's (SDC) community profiles available for communities within or bordering the Agro Parks were used as reasonable substitutes in assessing the social setting.

The Community Profile of Albion, a community located to the south of the Yallahs Agro Park was used to inform the social setting. The Milk River Development Area Profile which incorporates Spring Plain was used to provide the social setting for the Spring Plain and Ebony Park Agro Parks. The community of Bull Savannah immediately neighbours Duff House with New Forest to the west, and its Community Profile was used to inform the social setting for the Duff House/New Forest Agro Park. Parish totals from the 2011 Census data were also used where data was deemed useful and applicable.

Of note is the fact that whereas the Terms of Reference (TOR) refer to an ESA of MASP which includes several components, this document covers only a limited aspect of the overall programme. It is intended that this assessment will guide the further development of other aspects of the programme.

4 Yallahs Agro Park (YAP)

4.1 Location

The Yallahs Agro Park is located in the Yallahs River floodplain within the Yallahs River Watershed Management Unit in the parish of St. Thomas. Many of the farms are located along the sandy river banks. Extensive quarrying was noted on the south western bank. The Agro Park includes the communities of West Albion, Spring Garden, Norris, Heartease, Poor Man's Corner and Phillipsfield (Figure 4.1).

Figure 4.1: Yallahs Agro Park in St. Thomas

4.2 Farmers in YAP

The ACP project completed the Yallahs Irrigation Scheme and the establishment of the Water Users Association which was named the *Yallahs Irrigation Specially Authorised Society*. This Friendly Society operates the Yallahs Agro Park. The ACP Project funded the training and GlobalG.A.P. certification of

farmers within the area and constructed for them a GlobalGAP-certified Packaging Facility. There are currently seven certified GlobalG.A.P. farmers in the Yallahs Agro Park, five males and two females (See Appendix III, AIC, 2019).

All the lands in this Agro Park are privately owned and farmers reside on their farm plot. Each farmer owns an average of a ½ to 1 acre of land. This Agro Park largely has under production, tree crops such as mangoes, ackees and bananas; however, other crops are produced, such as onions, peppers, melons, gungo peas, carrots, cucumbers, bell peppers and okras. All the farmers are equipped with metered irrigation water from the Yallahs Irrigation Scheme, which provides water from three well sources. The supply is reported to be good and consistent with most farmers practising sprinkler irrigation. A few farmers have invested in and practise drip irrigation (Figure 4.2).

Figure 4.2: Farms in the Yallahs Agro Park using Sprinkler and Drip Irrigation

Farmers largely do their own marketing of goods on the local market. However, the certified farmers have been assisted with market linkages to export mangoes and peppers.

4.3 Infrastructure

The road network in Yallahs was recently upgraded under the ACP Bridging Project (2015–present). River shingles were used to upgrade the roads on the flat, with the exception of a small hillside community called Red Hills that was asphalted to minimise the risk of erosion (Figure 4.3). Major earth drains were

also cleared and a few culverts were constructed to reduce the risk of flooding and damage to the newly upgraded road network. This Bridging project will also fund additional training and the recertification of the GlobalG.A.P. certified farmers in the YAP.

Figure 4.3: Road and Irrigation Infrastructure constructed in the Yallahs Agro Park

Hydrological studies were done on water availability prior to pumping which indicated no issues with respect to water availability and demand during both the rainy and dry seasons. Further, the Water Resources Authority (WRA) assesses well levels to ensure pumping, over time does not result in water levels below the recommended level thus preventing saltwater intrusion.

4.4 *The Yallahs Agro Park Packaging Facility*

The Agro Park has been equipped with a grading and packaging/processing facility constructed in the Heartease community under the 2010–2015 ACP Project (Figure 4.4). The facility was constructed using containers and was observed to be adequately labelled although underutilised as evidenced by the dust, wasp nests and rusting metal work (Figure 4.5). Farmers within the west Albion area of the park complained that the facility was too far away from their farms and it is not feasible for them to utilise it. The facility is equipped with appropriate gender-segregated restrooms and a common lunch area. An enclosed room in the middle of the facility has been designated for the storage of pesticides and other chemicals used by the farmers.

Figure 4.4 Yallahs Agro Park Packaging Facility

The Packaging Facility is located ~230 metres east-north-east of the Heartease pumping well, but is supplied with water via a trucking system. The facility was designed to be self-sufficient and was handed over to the Agro Investment Corporation (AIC) and the Yallahs Irrigation Specially Authorised Society for use and maintenance. It was equipped with a solar panel and associated batteries for electricity and large water storage tanks, which can be filled by the Friendly Society users as needed.

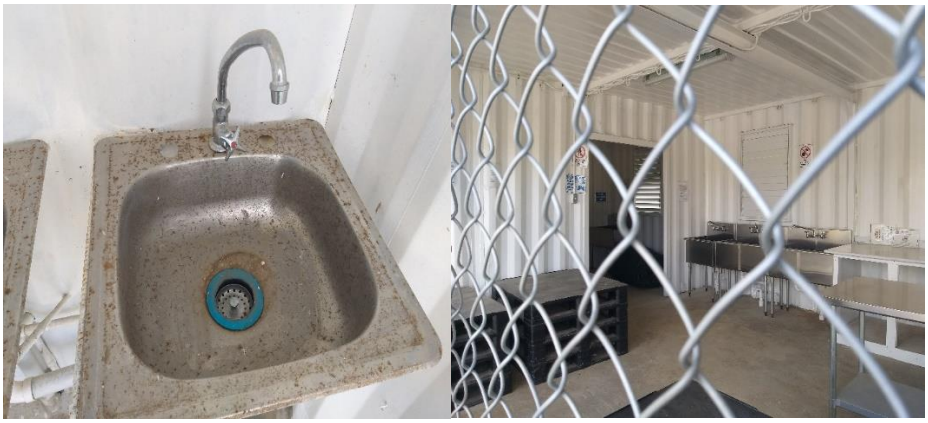

Figure 4.5 Rusting Metal Works at Yallahs Agro Park Packaging Facility

A wastewater treatment (WWT) system comprising a septic tank, reed bed and soakaway pit has been constructed; no tertiary treatment (disinfection) was identified. Each packing facility at all the Agro Parks has a similar wastewater treatment system. It was stated that the relevant permits were obtained from the National Environment and Planning Agency (NEPA) although no related signs were observed.

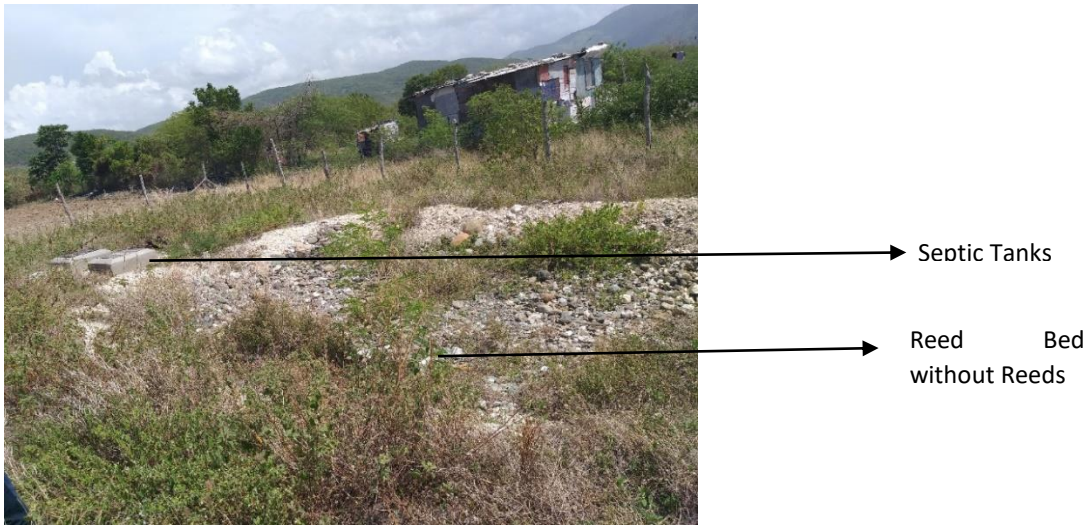

Figure 4.6: WWT System at Yallahs Agro Park showing Septic Tanks and Reed Bed

Figure 4.7: WWT System at Yallahs Agro Park showing Reed Bed and Soakaway Pit

4.5 Existing Environmental and Social Setting

4.5.1 Physical Setting

4.5.1.1 Geology

The YAP is located on the Yallahs River flood plain, therefore, the underlying rocks are recently deposited alluvium. The older geology around the YAP appears to be largely faulted. The oldest rocks exposed appear to be olistrotromes of coarse-grained breccias (Donovan & Pickerill, 2008) of the Middle Eocene Font Hill Formation of the Yellow Limestone Group (Mitchell, 2016). These are fault-bounded against blocks of the Gibraltar-Bonny Gate Formation and Montpelier Formation of the White Limestone Group and younger rocks of the Coastal Group (Figure 4.8).

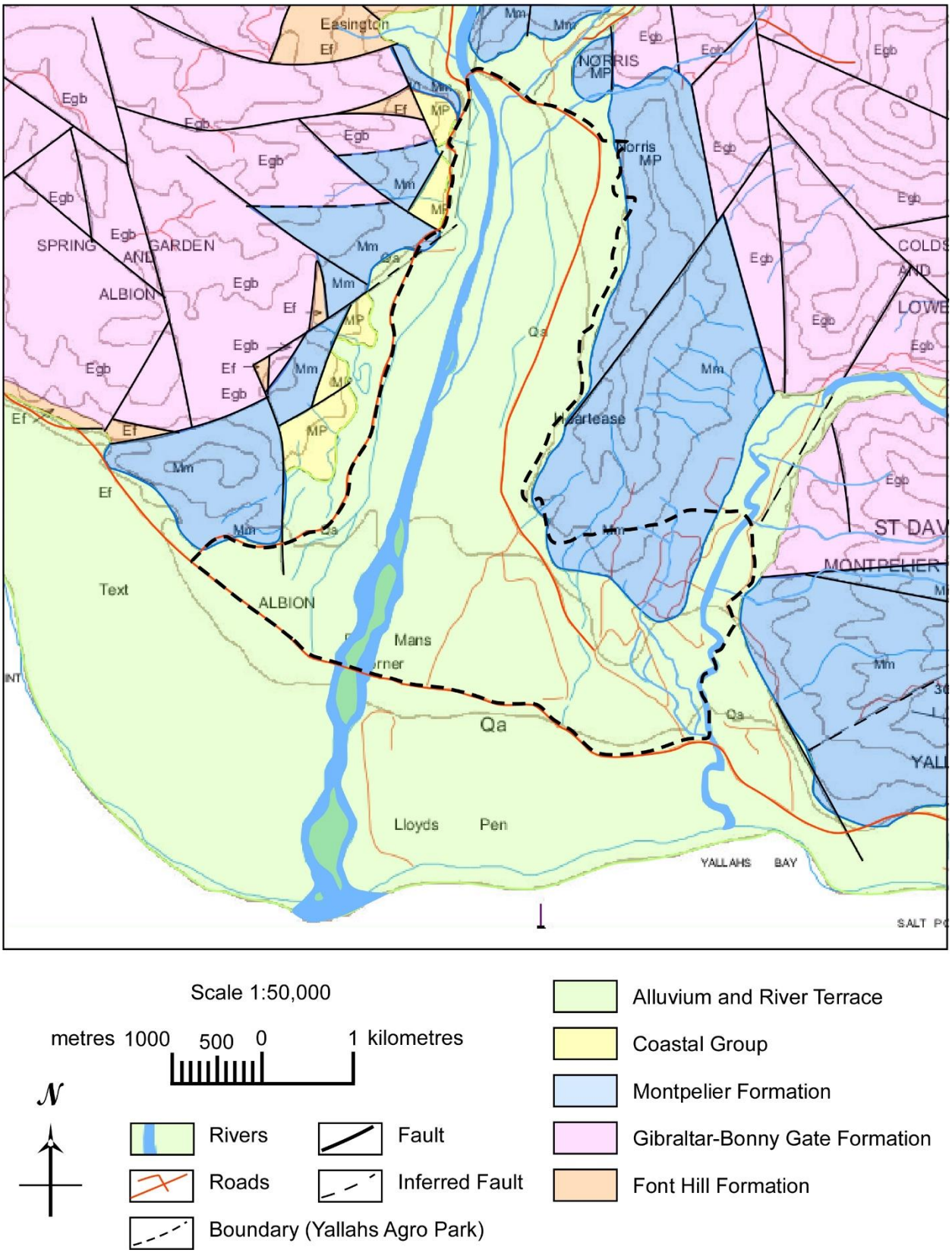

Figure 4.8: Geology Map around the Yallahs Agro Park (modified from: Mines and Geology Division)

4.5.1.2 Topography, Hydrology and Drainage

The topography at the YAP is generally flat with a low gradient merging into the Yallahs fan Delta to the south (Figure 4.9). Elevation ranges from 20 to 80 mean sea level msl, as the Park sits within the wider Yallahs flood plain. The hills to the west of the Agro Park rise to a high of 380 mean sea level and on the east, to a height of 250 mean sea level.

The Yallahs River running north-south through the Park is part of the Yallahs River Watershed Management Unit and the Blue Mountains South Hydrological Basin, and is the main drainage feature of YAP. Several smaller tributaries are also present. Water wells drilled to the alluvium aquifer are located in the area, and water is used mainly for irrigation purposes.

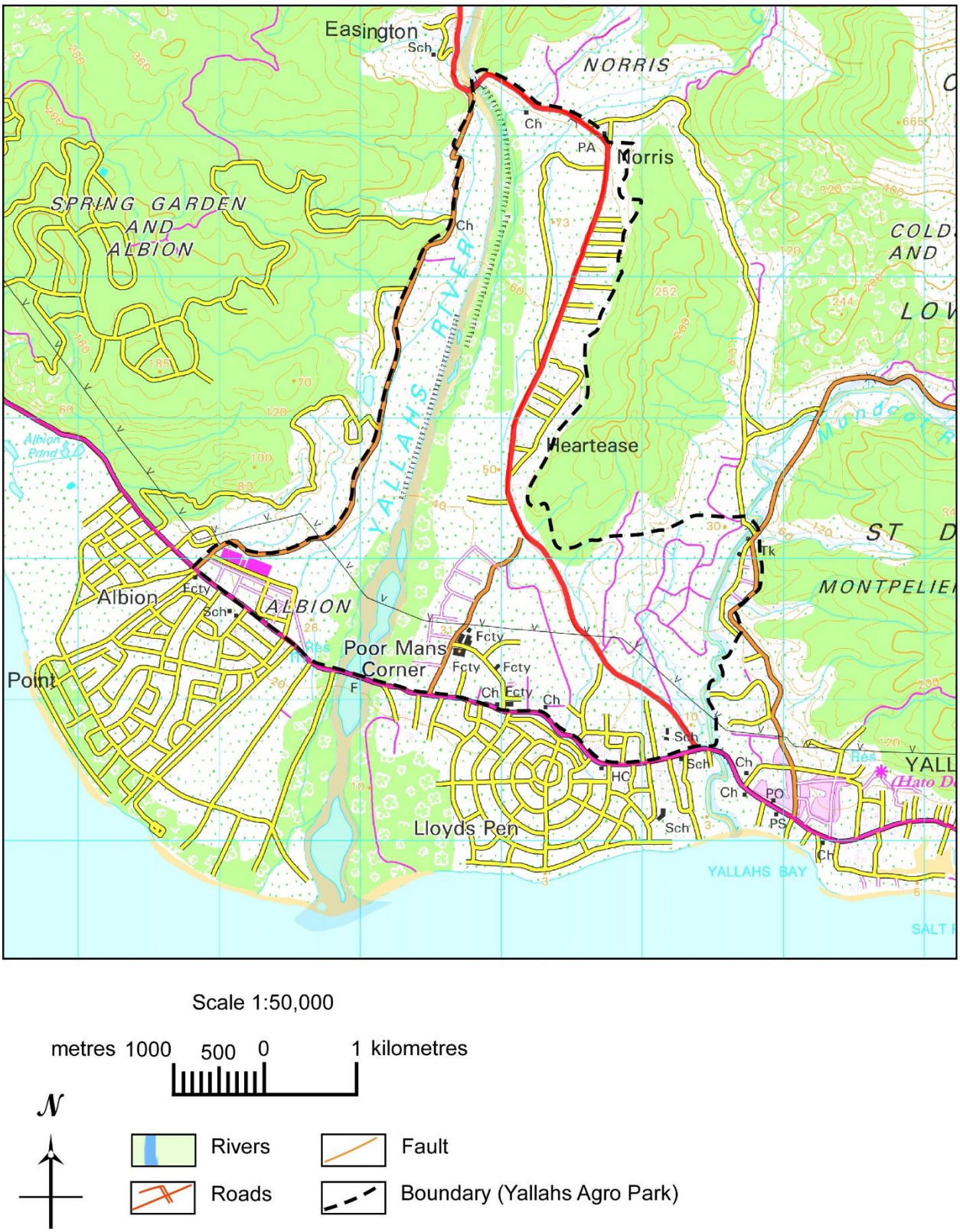

Figure 4.9: Contour Map showing location of the Yallahs Agro Park (Black Broken Line). Excerpt from the Jamaica 1:50,000 (Metric Edition), Sheet 18 (National Land Agency, 2010)).

4.5.1.3 Climate and Climate Change Projections

The climate surrounding the Yallahs Agro Park is consistent with that experienced throughout St. Thomas. Average mean monthly temperatures range between 24.2°C and 26.8°C with average annual temperatures of 25.7 °C. Typically, precipitation is the lowest in March, with an average of 41 mm, and the highest in October, averaging 279 mm. This period of rain is usually accompanied by a short dry season in the earlier months of the year. Between the driest and wettest months, the difference in precipitation is 238 mm and throughout the year, temperatures vary by 2.7 °C (CSGM, 2017). St. Thomas, and by extension Yallahs, is one of the few areas across Jamaica which experiences very strong annual mean wind speeds (1.48-8.69m/s) (CGSM, 2017).

Table 4.1: Mean monthly Temperature (°C) and Rainfall (millimetres) received in Yallahs, St. Thomas (Source: Climate-Data.org, 1982–2012)

	January	February	March	April	May	June	July	August	September	October	November	December
Avg. Temperature (°C)	24.2	24.3	24.6	25.4	26	26.7	26.9	26.9	26.8	26.2	25.6	24.9
Min. Temperature (°C)	20.6	20.6	20.9	21.8	22.8	23.6	23.4	23.2	23.4	22.9	22.2	21.4
Max. Temperature (°C)	27.8	28	28.3	29	29.3	29.8	30.5	30.7	30.3	29.6	29.1	28.4
Avg. Temperature (°F)	75.6	75.7	76.3	77.7	78.8	80.1	80.4	80.4	80.2	79.2	78.1	76.8
Min. Temperature (°F)	69.1	69.1	69.6	71.2	73.0	74.5	74.1	73.8	74.1	73.2	72.0	70.5
Max. Temperature (°F)	82.0	82.4	82.9	84.2	84.7	85.6	86.9	87.3	86.5	85.3	84.4	83.1
Precipitation / Rainfall (mm)	58	52	41	66	155	160	91	137	192	279	161	84

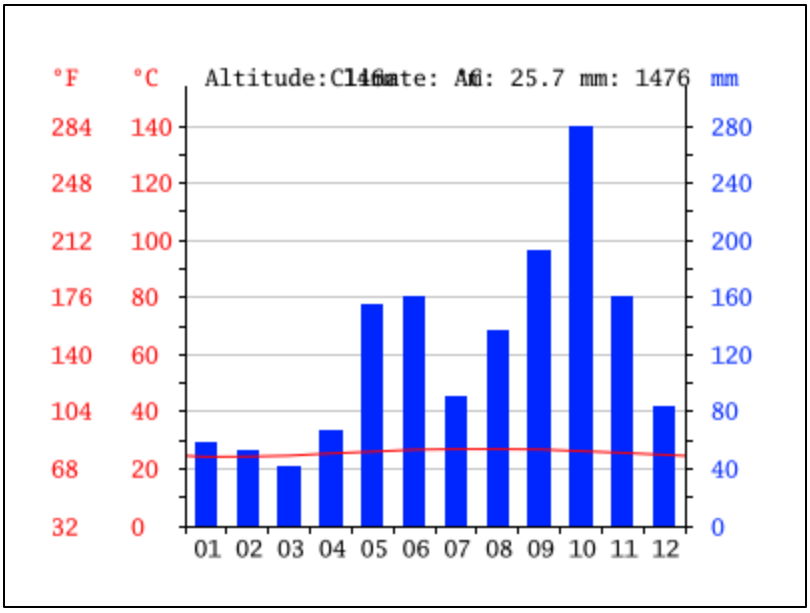

Figure 4.10: Mean Monthly Rainfall (mm) and Temperature (°C) experienced across Yallahs, St. Thomas (Source: Climate-Data.org, 1982–2012)

Irrespective of the model used or scenario examined, Jamaica continues the warming trend seen in the historical data through to the end of the century (CSGM, 2017). Projected changes in mean temperature for the eastern end of the island where St. Thomas is located show consistent increases.

Table 4.2: Projected Changes in Mean Temperature in the East of Jamaica (Source: CSGM, 2017)

Table 33: East (Zone 2)				
	2020's	**2030's**	**2050's**	**2080's**
NDJ	1.26 – 1.32	1.94 – 2.06	2.61 – 2.77	3.13 – 3.34
FMA	1.22 – 1.27	1.86 – 1.95	2.57 - 2.70	3.20 – 3.38
MJJ	1.14 – 1.21	1.87 – 2.02	2.65 – 2.86	3.27 – 3.55
ASO	1.28 – 1.38	2.00 – 2.21	2.76 – 3.04	3.30 – 3.64
ANNUAL	1.22 – 1.30	1.92 – 2.06	2.65 – 2.85	3.22 – 3.48

A drying trend is projected from as early as the mid-2020s with 0 to 2% less rainfall in the annual mean (CSGM, 2017). The 2030s will be up to 4% drier, the 2050s up to 10% drier, while by the end of the century, the country as a whole may be up to 21% drier as discerned from the most severe model results. Change in rainfall during the late rainfall season is the primary driver of the drying trend noted. By the mid-2030s, late season rainfall would have decreased by 1–3%, while by the end of the century the mean decrease is likely to be 2–20% (ibid). Dry season rainfall generally shows small increases or no change.

4.5.1.4 Natural Hazards

4.5.1.4.1 Drought

Drought within the Yallahs Valley has not been associated with the short dry periods experienced throughout the year. Instead, the installation of pipelines from the Yallahs River to channel water to the Mona Reservoir in St. Andrew has resulted in a significant reduction in the water available to farmers on

the Yallahs floodplain. Since the pipelines have been in place, farmers have reported not being able to flood their lands to maintain its moisture and this has led to an increase in the number and severity of bush fires which affect crops and housing (Edwards, 2013).

4.5.1.4.2 Flooding

Areas along the Yallahs River, and the southern region of the YAP are prone to flooding particularly after heavy rains. The 100-year return period floodplain of the Yallahs River illustrated in Figure 4.11 is known to affect areas near the Poor Man's Corner and Albion communities (NWA, 2017). Subsequent landslides along the steep valley sides which border the Agro Park are also associated with heavy rains.

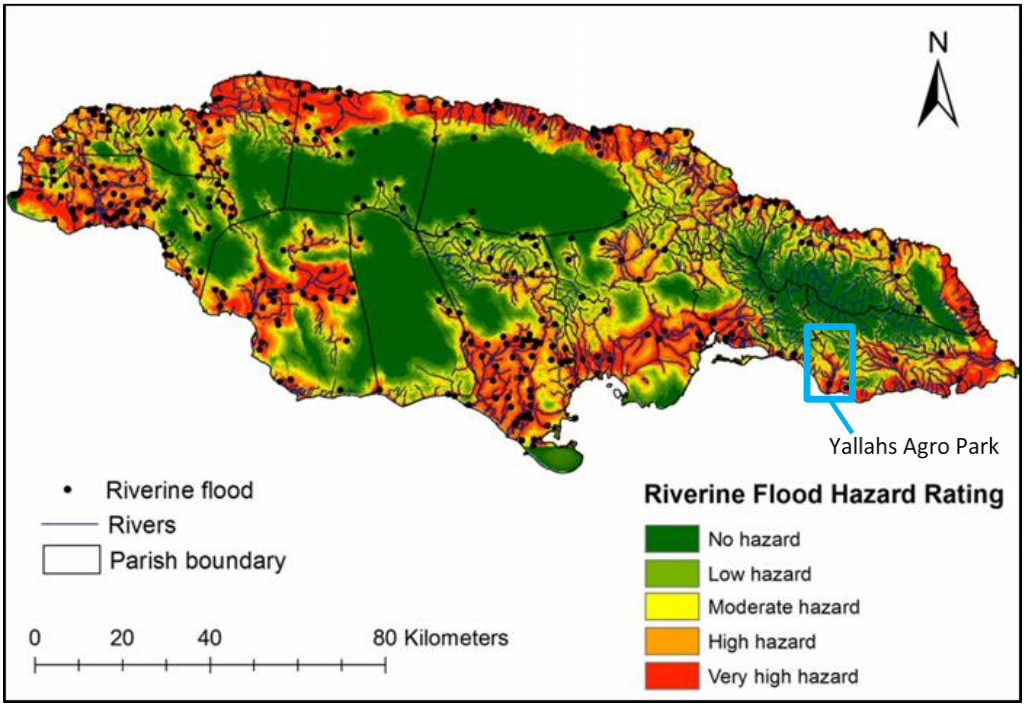

Figure 4.11: Riverine Flood Hazard Ratings across Jamaica with Yallahs Agro Park highlighted in blue. Map indicates high to very high flood risk along the Yallahs River (Source: Nandi et al., 2016)

4.5.1.4.3 Tropical Cyclones

The Yallahs Agro Park has been impacted by Tropical Storm Nicole and Hurricanes Dennis, Emily, and Gustav in recent years. These and other major storms have resulted in flash flooding and landslides which destroyed the fording (Dennis and Gustav) and Yallahs main road (Nicole). These form the major transport infrastructure link between Kingston and eastern Jamaica. The loss of these transport networks resulted in delayed earnings as some farmers were unable to transport goods to be sold.

Table 4.3: Recent Hurricanes and Tropical Storms which have impacted agriculture and livelihoods in St. Thomas

Hurricane	Year
Hurricane Dennis	2005
Hurricane Emily	2005
Tropical Storm Nicole	2008
Tropical Storm Gustav	2008

Hurricane	Year
Hurricane Sandy	2012

4.5.1.5 Earthquakes, Liquefaction and Landslides

YAP is situated in the most active earthquake zones in Jamaica, along the Wagwater Belt (Figure 4.12). A major fault, the Plantain Garden Fault Zone, is less than 20 km north of the Agro Park site (Figure 4.13). The Wagwater Belt fault zone trends NW–SE and the Plantain Garden Faults trend E–W.

Earthquake modelling for Jamaica has identified that a strong earthquake (based on earthquake history) of magnitude VIII on the Modified Mercalli Scale could occur along the Plantain Garden Fault. Since this location is just several kilometers north of the Yallahs Agro Park, the area is expected to experience the same magnitude earthquake (VIII) (Figure 4.12). The location of the Agro Park is also on alluvium deposits, therefore the area could experience liquefaction.

Landslides may also occur on the hills to the east and west of the site and these may be earthquake-induced or rainfall-induced. Large and small landslides may block roads and access to nearby communities as well as affect both the eastern and western sections of the Agro Park.

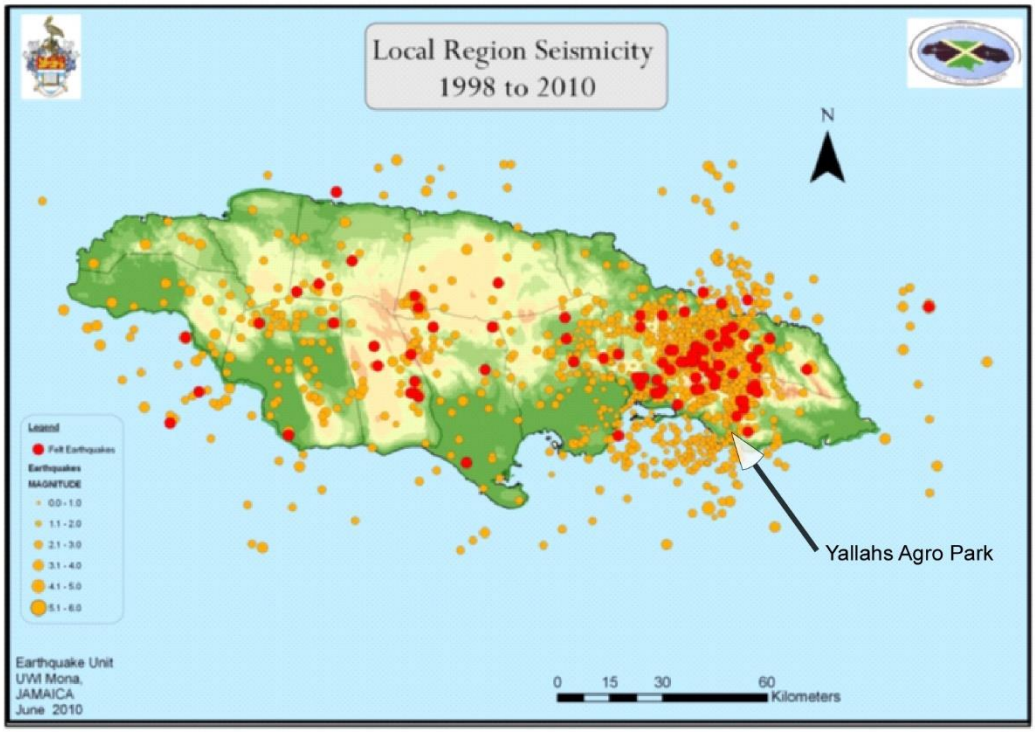

Figure 4.12: Map showing local regional Seismicity for Jamaica from 1998 to 2010 and the Location of the Yallahs Agro Park (Brown, n.d.)

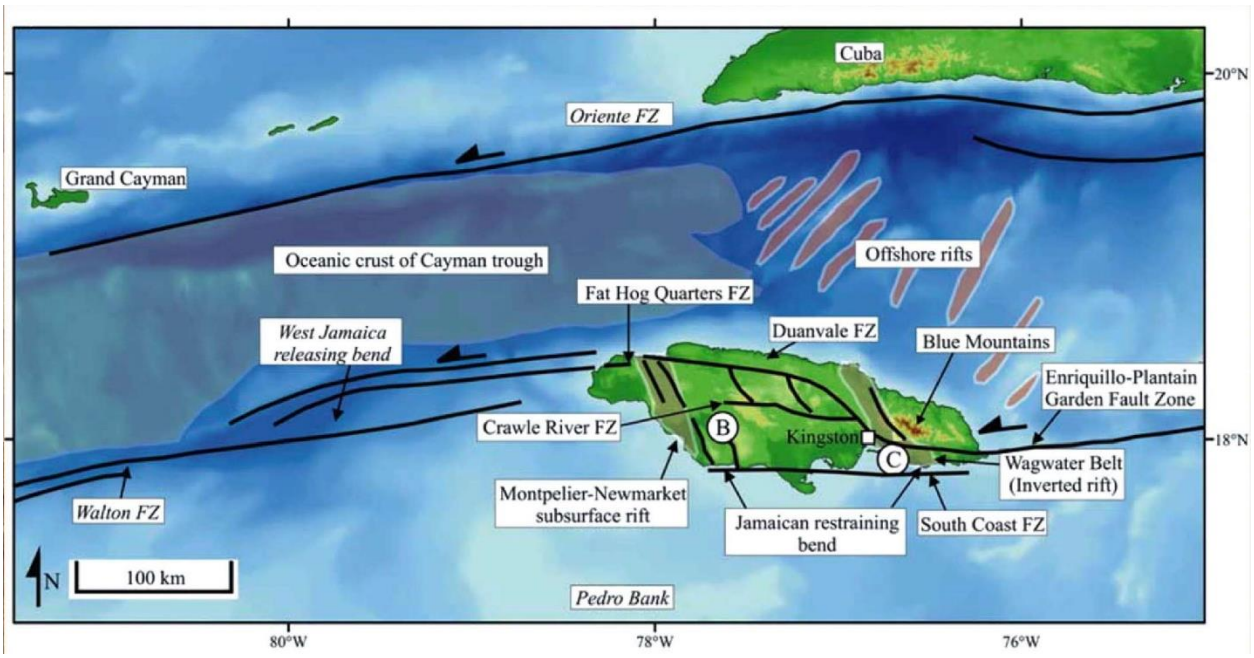

Figure 4.13: Fault Model Map of Jamaica showing the Enriquillo-Plantain Garden Fault Zone (Mann, DeMets, & Wiggins-Grandison, 2007)

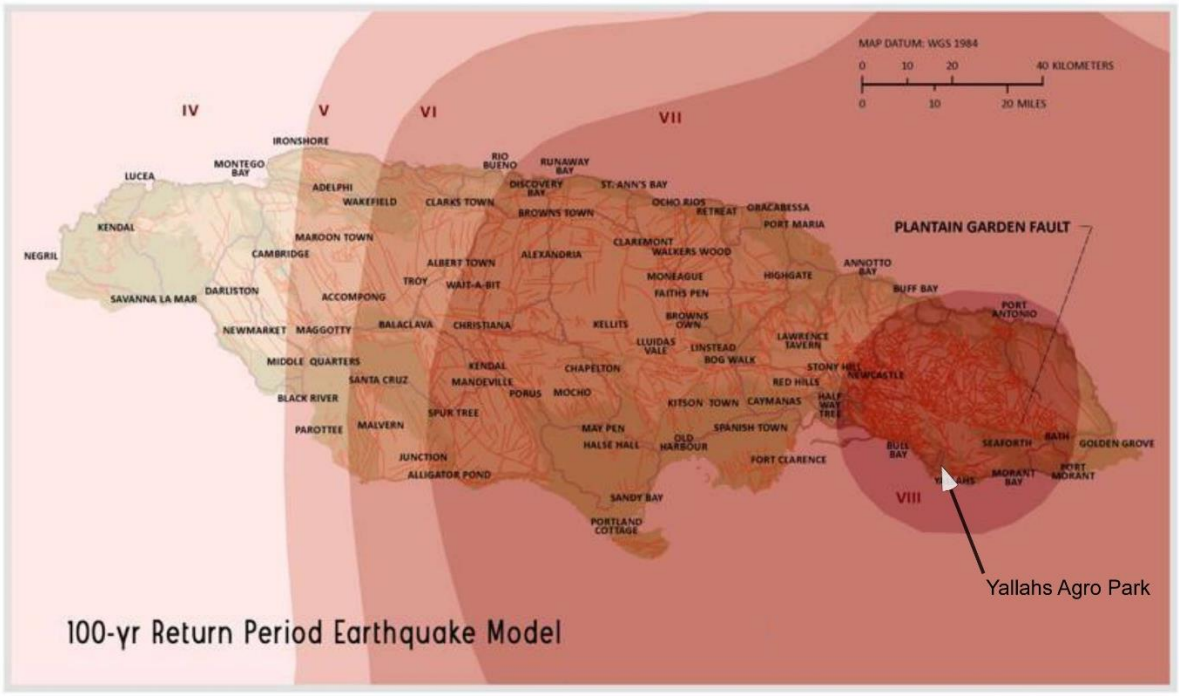

Figure 4.14: Map showing modelled Earthquake Intensity on a Modified Mercalli Intensity Scale for a the Plantain Garden Fault and the Location of the Yallahs Agro Park (MGI & Earthquake Unit, UWI, 2010)

4.5.1.6 Water Supply

There are three (3) wells and pumping stations within the Yallahs Agro Park; these are located in the Norris, Heartease, and Phillipsfield communities. All three wells are drilled into alluvium aquifers and are used to supply water to the Yallahs Agro Park farmers east of the Yallahs River using pressurised pipes. Farmers on the eastern bank of the Yallahs River indicate that they are not supplied with water from the National Irrigation Commission (NIC), but instead retrieve water from a spring located outside of the watershed. In one case, a farmer receives wash water from the quarry located upstream the farm.

The NIC supplies water based on demand and as such, the consistent changes in the water pressure flowing through the lines can potentially impact operating costs and damage the distribution network. The irrigation system sees its highest throughput during the peak season for production, which is September to February each year.

The Heartease Pumping Station has a maximum pumping capacity of 1,350 imperial gallons per minute. The well at this pumping station is approximately 300 feet deep and comprises mainly fine gravel and coarse sand with some boulders and silt. The water that is pumped from the Heartease well is filtered prior to distribution to remove excess sediment. The trapped sediments are sporadically removed, then periodically flushed.

The Norris Pumping Station has a maximum pumping capacity of 850 imperial gallons per minute. This well is located in a low-lying area approximately 100 meters from a currently dry tributary of the Yallahs River – the Collier River. Observations indicated that the pumping station sits on a flood-prone site.

4.5.1.7 Water Quality

Water quality analyses were done under the ACP project for which 9 sampling locations were established as illustrated in Figure 4.15. Water samples were analysed for the following 22 parameters:

1. Faecal Coliform
2. Nitrates
3. Orthophosphates
4. Total Suspended Solids
5. Chloride
6. Pesticides
7. Copper
8. Zinc
9. Boron
10. Manganese
11. Iron
12. Magnesium
13. Sodium
14. Calcium
15. Salinity
16. Dissolved Oxygen
17. pH
18. Conductivity
19. Potassium
20. Biochemical Oxygen Demand
21. Oil & Grease
22. Chemical Oxygen Demand

Based on the data obtained over three (3) consecutive months of sampling and analysis, Chemical Oxygen Demand (COD) remained below the method detection limit (MDL) and there was absence of pesticides at all 9 sites. Chloride and conductivity were the only test parameters that had values that were above the NRCA Ambient (Fresh) Water Guidelines of 20ppm and 600µS/cm respectively at least once for the Yallahs Agro Park. Salinity trends remained consistent over the sampling period although samples taken from the western bank had the highest values. On average, the entire surface water system within the Agro Park can be described as a freshwater system with mean salinity value at 0.27ppt (<0.5ppt) (ESL, 2018).

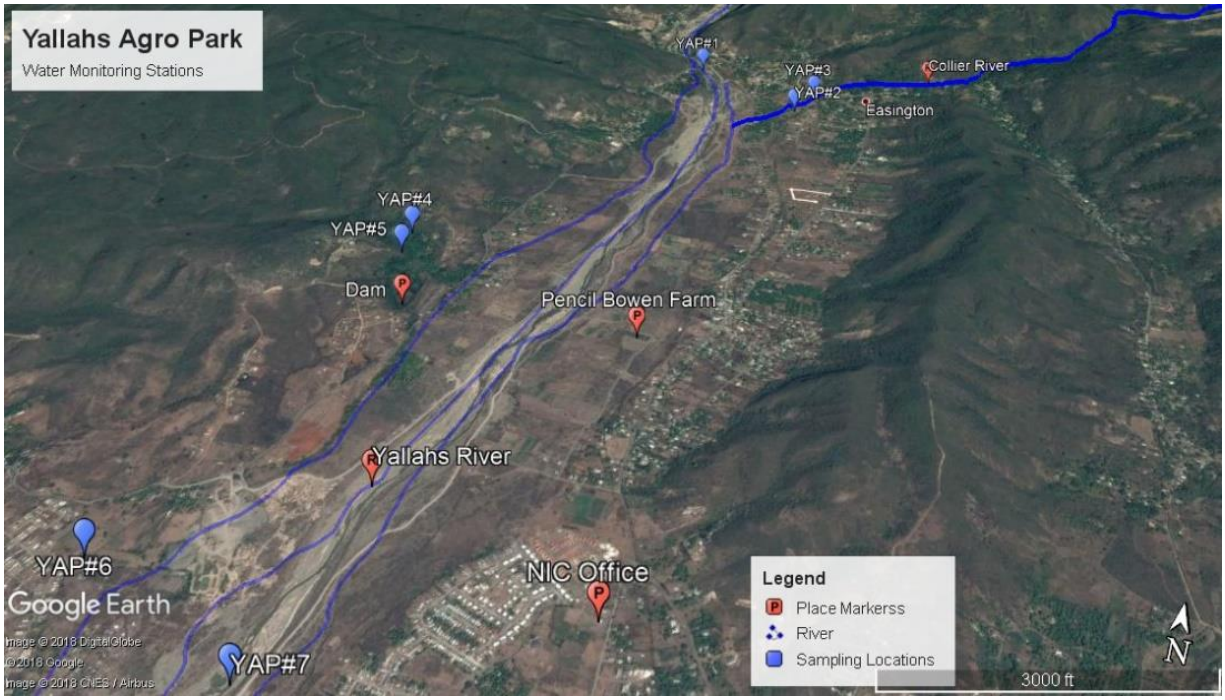

Figure 4.15: Google Earth Image of Sampling Locations at the Yallahs Agro Park, January – March 2018

4.5.2 Ecological Setting

Natural vegetation within the Yallahs Agro Park has been cleared to accommodate residential development and farming activities. However, west of the park, there are dry limestone forests and sections of the Port Royal Mountains while to the east of the Yallahs River lies the Queensbury Ridge and Yallahs Hill (Figure 4.16). Vegetation along the hillsides and throughout the forests include lowland semi-deciduous and other disturbed evergreen wooded trees, while the flat areas are occupied by mixed herbaceous/shrubland, subsistence plantations of sugar and banana, pockets of other cultivated cash crops and grasslands (Evelyn and Camirand, 2003; FAO, 2008). In these areas, deforestation and soil erosion, including landslides, are a growing problem. This is mainly because agriculture and other activities are not regulated, and conservation is not ensured leading to agricultural encroachment. As such, rehabilitation of the watersheds has become a high priority to ensure preservation of natural vegetation to maintain biodiversity (FAO, 2008).

Figure 4.16: Dry Limestone Forest on Hillsides bordering the Yallahs Agro Park

The growth of secondary vegetation was observed in the river channel along with some reed grasses where standing water existed. Based on the diversion of water from the Yallahs River to Kingston and the sandy porous nature of the soil, the river channel is largely dry in the flood plain. Heavy flooding is associated with rainfall events.

Figure 4.17: Vegetation in the Yallahs River Channel

4.5.3 Social Setting

YAP includes major communities: Easington and Norris to the north; Heartease and Phillipsfield to the east; Spring Bank to the west; and Albion and Poor Man's Corner to the south, with the latter two being west and east of the Yallahs River respectively (Figure 4.1).The STATIN best fit enumeration district (ED) data was not available within the short time frame for the project and so estimates of population and infrastructure have been gleaned from the Albion Community Profile prepared by the Social Development Commission (SDC).

4.5.3.1 Demography

The area was reported to have a population of 2,592 with approximately 720 households. The overall population comprises almost equal males and females. Of note, however, is significantly more aging females (65 years and over) and more male youths (0–24), while 47.5% of the total population falls within the working age group (25– 64).

Male-headed households are 52.8% with only 38.6% being headed by persons without any academic qualifications and 22.9% led by unemployed individuals (SDC, 2009). All the land within the Yallahs Agro Park is owned by the farmers who also live on the land they cultivate.

Table 4.4: Age-Sex Distribution of the Albion Community in the Yallahs Agro Park. (Source: SDC, 2009)

Age Cohort	Male	Female	Average
0-14	16.2	13.1	14.65
15 - 24	10.8	8.5	9.65
25 - 29	3.9	3.9	3.9
30 - 64	19.1	20.6	19.85
65+	1.2	2.7	1.95
TOTAL	51.2	48.8	50

4.5.3.2 Housing

Sixty-seven percent (67%) of the houses are made from blocks, 18% from wood, and 9% from concrete. Sixty-one percent (61%) of the residents, mainly farmers, own the land on which they live, while 12.5% live on family-owned land. In these communities, 76.4% of the residents owned the houses in which they live.

Figure 4.18: Sample Housing Stock in Yallahs Agro Park

The site visit gave an indication that the various residential communities are growing as several new houses were observed to be under construction. Figure 4.18 shows a sample of the housing stock.

4.5.3.3 Social Infrastructure

Private water is piped into the dwellings of 59.7% of the residents and 15.3% receive public water piped into their dwellings. It was also noted that 95.4% of residents use electricity for lighting (SDC, 2009).

All residents have access to telephone services: 66.7% have cellular phones; 31.9% have both land lines and cellular phones; and 1.4% have land lines only (SDC, 2009).

Garbage is collected by the National Solid Waste Management Authority (NSWMA) for 83.3% of households, while 30.3% households burn their garbage (ibid).

Approximately 50% of households use sewer/water not linked to a main sewer and only 26.4% use sewer/water linked to a main sewer. Few households (6%) share toilet facilities (ibid).

4.5.3.4 Existing Social Issues

The main community issues faced include poor road conditions for lower class roads leading off the Yallahs Main Road, high levels of youth (15–24 yrs) unemployment, high levels of high school

dropouts, high levels of adult (25 years and over) unemployment, and there was also evidence of poor parenting (ibid).

5 Spring Plain and Ebony Park Agro Parks

5.1 Location

The Spring Plain Agro Park (SPAP) lies in the Milk River Watershed Management Unit in the parish of Clarendon. The Agro Park is located on flat land, and more specifically, the floodplain of the Milk River (Figure 5.2). The Milk River is a second order non-perennial river, which separates the two adjacent parks. West of the river is the Spring Plain Agro Park and to the east, the Ebony Park Agro Park (EPAP). Although registered as two separate entities, they are both managed by the same Agro Park Manager.

The lands in the Spring Plain and Ebony Park Agro Parks are owned by the Government of Jamaica and leased to farmers for cultivation. The main crops produced include pumpkins, sweet potatoes, melons, capsicums (peppers/ chillies), onions, cassava and sugar cane (Figure 5.1).

Figure 5.1: Farms in the Spring Plain Agro Park

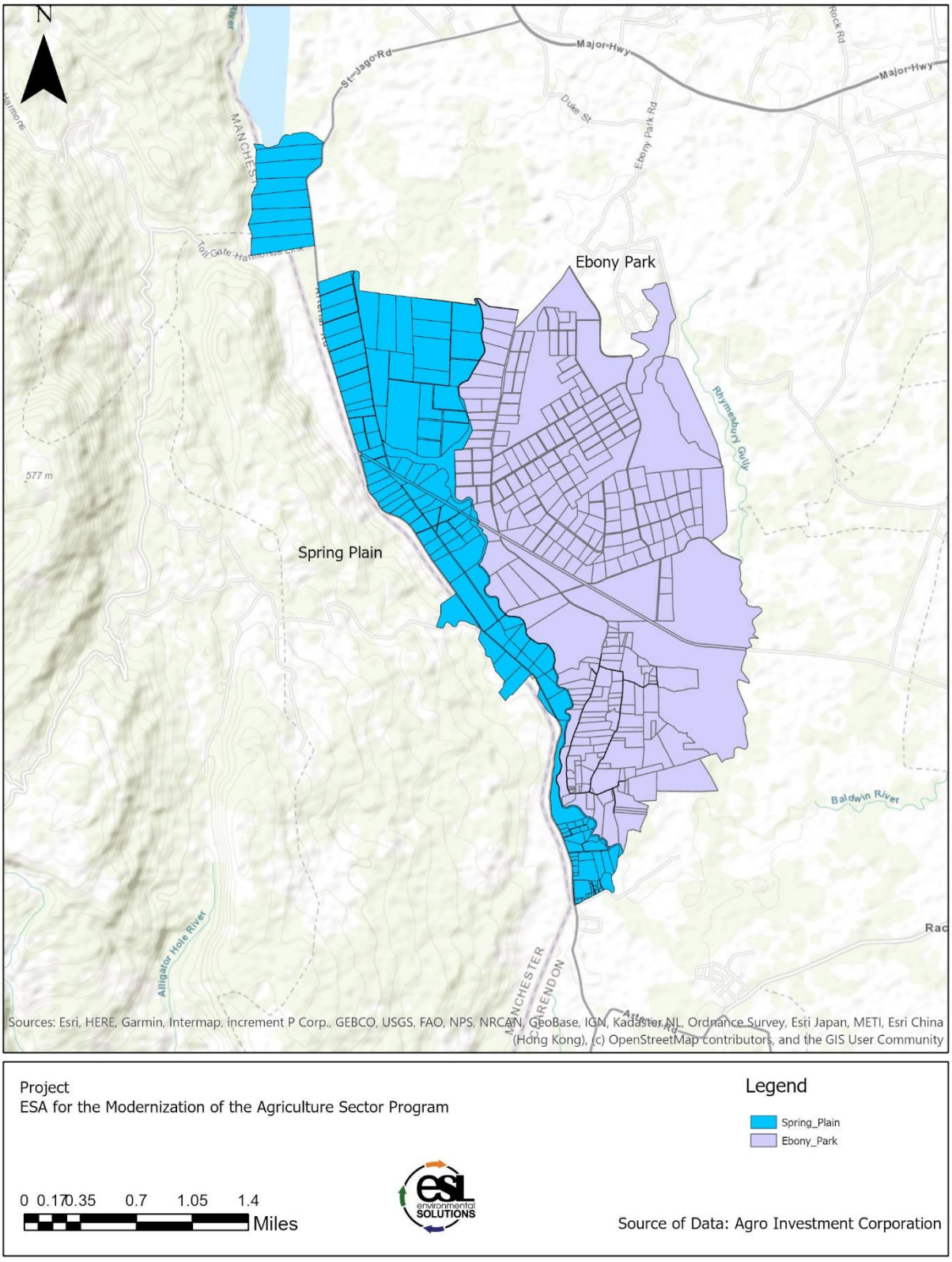

Figure 5.2: Spring Plain and Ebony Park Agro Parks in Clarendon

5.2 Farmers in the Agro Park

The farmed lot sizes in the SPAP range from 5 acres to 200 acres with a total of 25 lessee farmers. The farmed lot sizes in EPAP are much smaller than in the SPAP, as lots are 5 acres and less per farmer and there are 78 lessees.

Under the previous ACP project, the Spring Plain Farmers Association was established. On record, there are 19 members, 16% of whom are women. Stakeholder consultations reveal that the group is not very active and as a result, attempts were made to join with the more vibrant Ebony Park Agricultural Cooperative that was also established, but this move was unsuccessful. The latter Cooperative has 21 members, and 10% are women.

Approximately 62 daily labourers support these farmers. They live in the surrounding communities of Spring Plain, Milk River, Carf Wheel and Gravel Hill District. Despite the limited number of female farm owners or lessees, many women were observed in the fields during the site visits. It is possible that the percentages of female labour involvement are much higher than those relating to farm ownership.

Under the previous ACP project, MICAF incorporated an initiative to encourage youth to become involved in agriculture by dedicating over 100 acres of land for young farmers. A few young persons acquired lots to farm, but several challenges prevented a greater uptake. In the same period, the Red Stripe Jamaica Brewery in Kingston launched their Project Grow, which focuses on the production cassava as a locally grown substitute for previously imported starch in their malt, beer and stout beverages (Red Stripe, 2019). Stakeholder consultations indicated that the rural sociologist from the ACP project made recommendations for the involvement of Red Stripe on the SPAP and as such, 100 acres of land were leased to Red Stripe for the production of cassava. Embedded in Project Grow is the generation of employment through training and certification of young Jamaicans in good agricultural practices. The workers on the Red Stripe lands are over 50% youths.

Farmers report that praedial larceny was one of the main challenges in these two Agro Parks. Additionally, during periods of heavy rainfall, flooding occurs resulting in significant losses.

Anecdotal evidence suggests that high temperatures in the area have limited the range of crops. The heat has also impacted the labourers in the field and acts as a deterrent for some persons to work under the conditions. There are issues with securing equipment for land preparation and mechanical harvesters are not used on farms. No cooling mechanism is available on farms or in the nearby Produce Handing Facility.

Some farmers in the Spring Plain and Ebony Park Agro Parks do their own marketing. Others have, with the assistance of the AIC, maximised on strategic market linkages with a number of local entities: Carliston Bammies, Progressive Supermarkets, Lee's Food Fair, Magnolia, Rainforest, and the RIU chain of hotels. Similar linkages have also been established with food chains in the United States (US) and the United Kingdom (UK).

5.3 Infrastructure

The main road to the SPAP is paved. The area benefitted from the road improvements under a previous project by the Tourism Enhancement Fund (TEF) to upgrade the Milk River Bath attraction located south of the Agro Park. To access some of the interior lots and the EPAP, dirt farm roads, in fair condition, were present (Figure 5.4).

Even though the Milk River and its tributaries run through the park, the source of irrigation water is via pumping wells.

Hydrological studies were done on water availability prior to pumping which indicated no issues with respect to water availability and demand during both the rainy and dry seasons. Further, the Water Resources Authority (WRA) assesses well levels to ensure pumping, over time does not result in water levels below the recommended level thus preventing saltwater intrusion.

5.4 Spring Plain and Ebony Park Produce Handling Facilities

Both Spring Plain and Ebony Park have Produce Handling Facilities that are of a similar construction to the facility at the Yallahs Agro Park. The facilities are located on either side of the Milk River ~2200m apart, with Ebony Park's Facility being north east of the Spring Plain Facility (Figure 5.3).

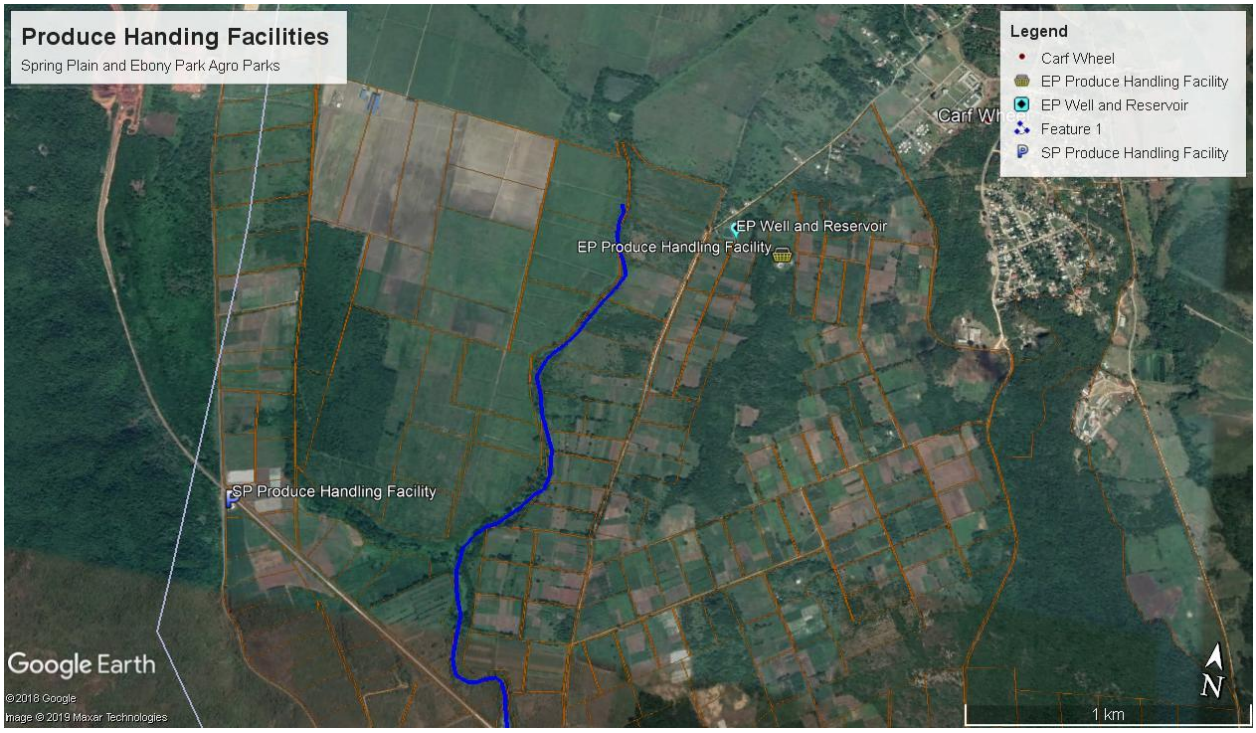

Figure 5.3 Location of Spring Plain and Ebony Park Packaging Facilities

Figure 5.4 Spring Plain Produce Handling Facility

Figure 5.5: Inside the Spring Plain Agro Park Produce Handling Facility

Like the Yallahs Agro Park Packaging Facility, the wastewater treatment system includes a septic tank, reed bed, and soakaway pit; no tertiary treatment was identified. It was stated that the relevant permits were obtained from NEPA, but no signs were observed.

Figure 5.6: Septic Tank at SPAP (left); Reed Bed at SPAP (right)

5.5 Existing Environmental and Social Setting

5.5.1 Physical Setting

5.5.1.1 Geology

The Geology at the Spring Plain Agro Park consists mainly of the Mid Miocene to Oligocene Newport Formation overlain by younger Upper Miocene to recently deposited alluvium (Figure 5.7). The New Port Formation is characterised by white or pale-coloured wackestones and mudstones with some subsidiary packstones (Mitchell, 2016). The alluvium was deposited from the larger Rio Minho River and the smaller Milk River.

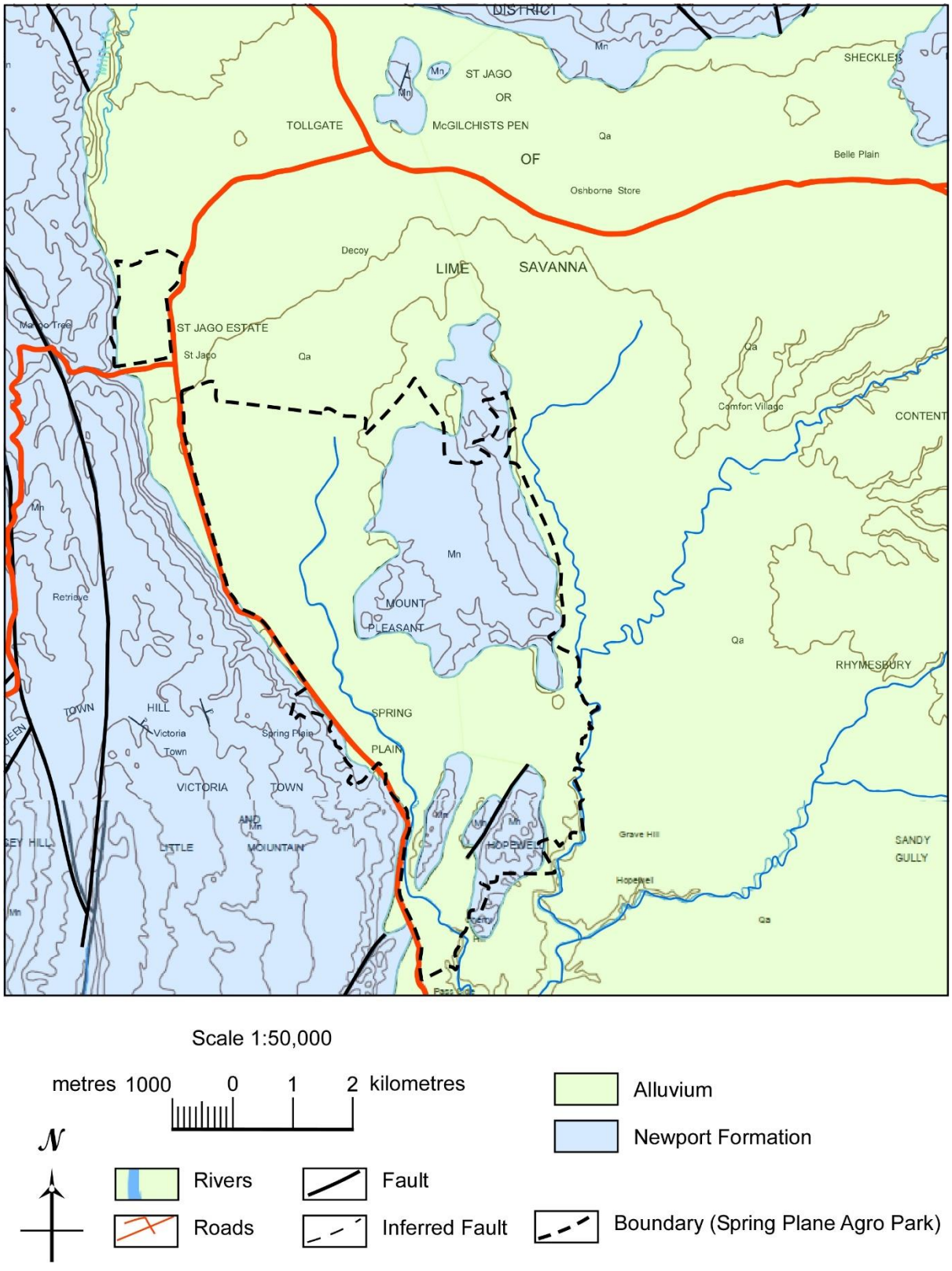

Figure 5.7: Geological Map around the Spring Plain Agro Park (Modified from: Mines and Geology Division)

5.5.1.2 Topography, Hydrology & Drainage

The topography at the Spring Plain Agro Park is generally flat ranging from a low of 28 msl to 50 msl with a gentle gradient from the south to the north. The plains are bounded by the Mocho Mountains

to the north, Mount Oliphant to the west and south-west, and to the south-east, by Mount Pleasant (Figure 5.8).

Spring Plains falls within the Milk River Watershed Management Unit, and is also part of the Rio Minho Hydrological Basin. There are several water wells in the area which were drilled to the underlying limestone aquifer. The main use for the water from these wells was irrigation, however, it is unsure how many of these wells are still in operation. The main drainage feature in the area is the Milk River (Figure 5.8).

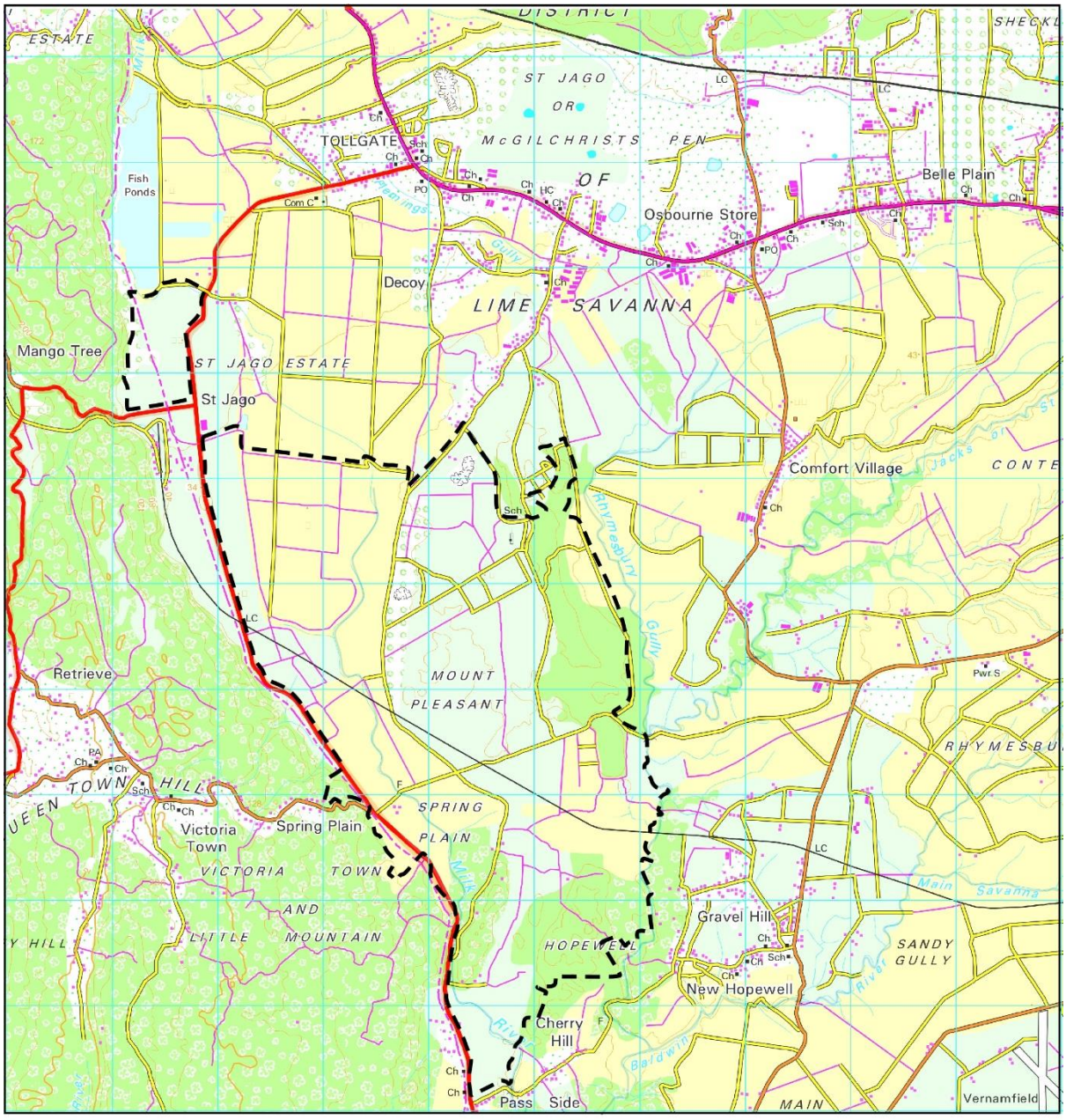

Figure 5.8: Topographic Map showing location of the Spring Plain Agro Park (Black Broken Line). Excerpt from the Jamaica 1:50,000 (Metric Edition), Sheet 16 (National Land Agency, 2010).

5.5.1.3 Climate and Climate Change Projections

The climate surrounding the Spring Plain Agro Park is consistent with that experienced throughout south western Clarendon. Average mean monthly temperatures range between 24.3°C and 26.9°C with average annual temperatures of 25.8 °C. With an average of 27.2 °C, August is considered the warmest month.

Typically, the driest month is January, with an average rainfall of 40 mm, and the wettest, October, averaging 242 mm, however, rainfall is, at times, sporadic. Summers are usually rainier compared to other periods of the year with an average 1,273 mm of precipitation falling annually. Between the driest and wettest months, the difference in precipitation is 202 mm and throughout the year, temperatures vary by 2.9°C (Climate data, 2012; CSGM, 2017).

Figure 5.10 provides graphic illustration that the SPAP and EPAP are located in one of the driest areas in Jamaica.

Table 5.1: Table showing Mean Monthly Temperature (°C) and Rainfall (millimetres) received by Milk River near Spring Plain Agro Park (Source: Source: Climate-Data.org, 1982–2012)

	January	February	March	April	May	June	July	August	September	October	November	December
Avg. Temperature (°C)	24.3	24.5	24.9	25.5	26.2	26.8	26.9	27.2	26.9	26.3	25.8	24.9
Min. Temperature (°C)	20.7	20.7	21.1	21.8	22.9	23.6	23.3	23.4	23.3	22.8	22.3	21.4
Max. Temperature (°C)	28	28.3	28.7	29.3	29.6	30	30.6	31	30.6	29.9	29.4	28.5
Avg. Temperature (°F)	75.7	76.1	76.8	77.9	79.2	80.2	80.4	81.0	80.4	79.3	78.4	76.8
Min. Temperature (°F)	69.3	69.3	70.0	71.2	73.2	74.5	73.9	74.1	73.9	73.0	72.1	70.5
Max. Temperature (°F)	82.4	82.9	83.7	84.7	85.3	86.0	87.1	87.8	87.1	85.8	84.9	83.3
Precipitation / Rainfall (mm)	40	48	53	86	143	95	78	139	171	242	112	66

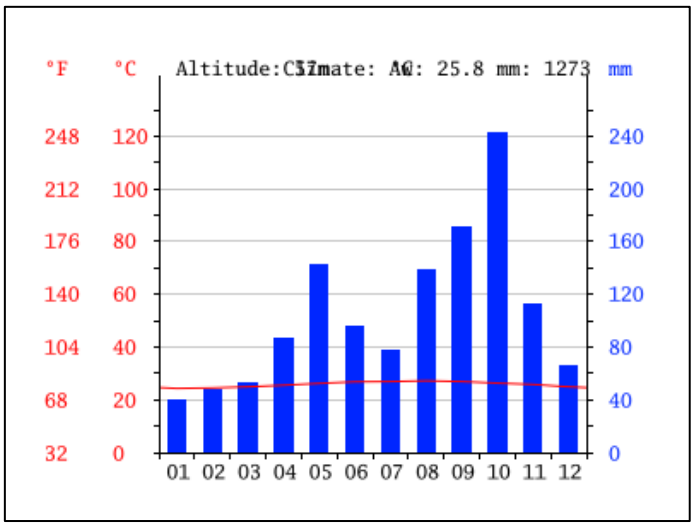

Figure 5.9: Mean Monthly Rainfall (mm) and Temperature (°C) experienced at Milk River near the Spring Plain Agro Park (Source: Climate-Data.org, 1982–2012)

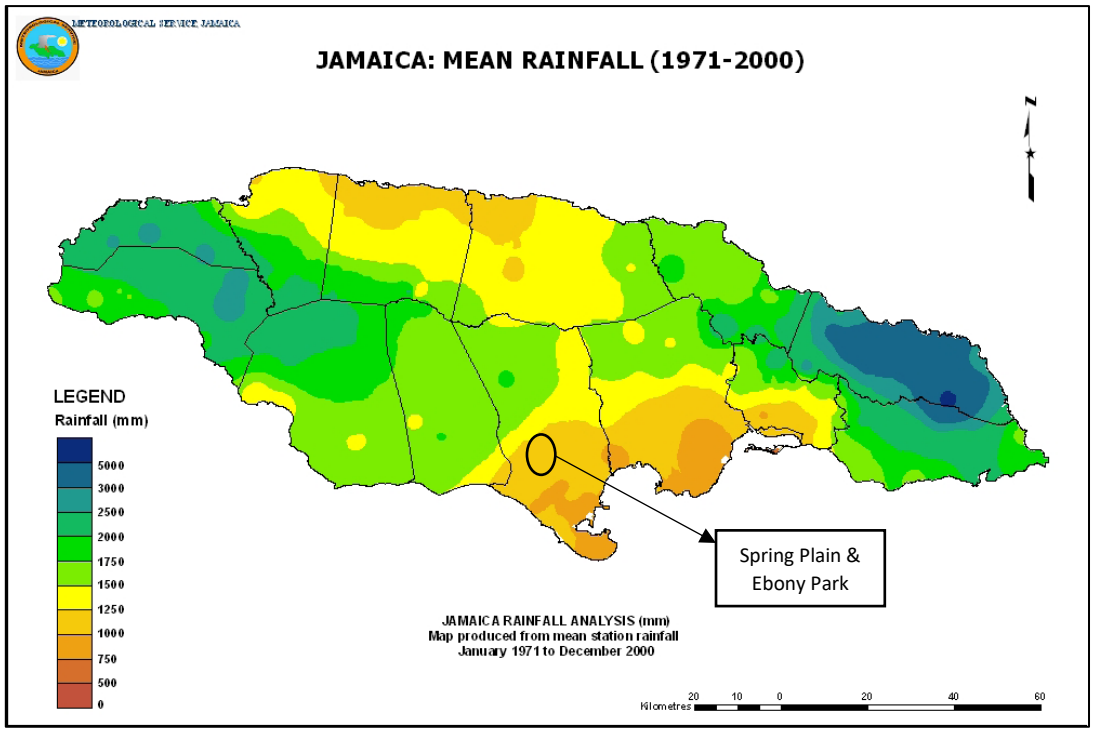

Figure 5.10: Distribution of Mean Annual Rainfall for Jamaica (in millimetres). Averaging Period is 1971–2000 (Source: Meteorological Service of Jamaica)

As indicated in Section 4.5.1.3 above, global and regional climate change projections for temperature suggest a continued increase in temperatures. Projected absolute changes in mean temperature by season and for annual averages (°C) for the 2020s, 2030s, 2050s and 2080s relative to the 1961–1990 baseline are presented in Figure 4.6.

Table 5.2: Temperature Projections for the Rainfall Zone within which the Spring Plain and Ebony Park Agro Parks fall

Table 31: Coasts (Zone 4)				
	2020's	2030's	2050's	2080's
NDJ	1.17 – 1.40	1.20 – 2.18	1.63 – 2.89	2.21 – 3.54
FMA	1.19 – 1.27	1.35 – 2.02	1.93 – 2.83	2.62 – 3.49
MJJ	1.14 – 1.22	1.67 – 2.49	2.47 – 3.32	3.20 – 3.95
ASO	1.22 – 1.37	1.71 – 2.63	2.42 – 3.17	3.04 – 3.81
ANNUAL	1.18 – 1.31	1.48 – 2.83	2.11 – 2.98	2.76 – 3.62

5.5.1.4 Natural Hazards

5.5.1.4.1 Drought

Drought conditions are brought about by reduced rainfall in drier months. Drought conditions have impacted farmers in this Agro Park significantly because the lack of water has increased the number of crops lost (Samuels, 2014).

5.5.1.4.2 Flooding

Heavy rains in the area often lead to flooding within the Spring Plain Agro Park. This is typical of the Milk River floodplain. Additionally, most roads along the Milk River do not have adequate drainage in place to allow for discharge of flood waters, resulting in flooding of major roadways and bank slips,

and also erosion. Flood-prone areas in the region of the river spread to both sides of the river as the water levels increase (PIOJ, 2017). More often than not, these occurrences set back production by at least three months or result in the loss of cash crops which could not be harvested due to waterlogged soils. Additionally, farmers also experience damage and loss of irrigation infrastructure (pipes, sprinklers, stakes, and tubing), farm tools, and equipment as well as losses related to delayed earnings (PIOJ, 2017).

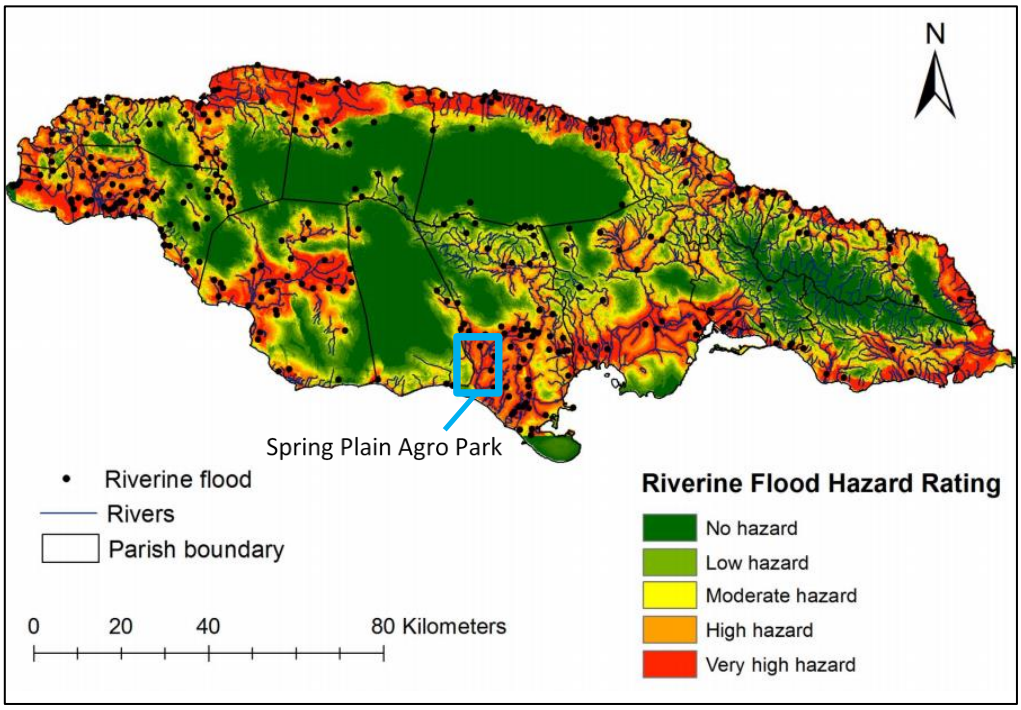

Figure 5.11: Riverine Flood Hazard Ratings across Jamaica with Spring Plain Agro Park highlighted in blue. Map indicates high to very high Flood Risk along the Milk River (Source: Nandi et al., 2016)

5.5.1.4.3 Tropical Cyclones

Tropical Storm Nicole and Hurricanes Dennis and Wilma are some of the more recent and notable storms and hurricanes which have caused flooding in Clarendon and affected crops in Spring Plain (Table 5.3).

Table 5.3: Hurricanes and Tropical Storm which have impacted Agriculture and Livelihoods in Clarendon

Hurricane	Year
Hurricane Ivan	2004
Hurricane Dennis	2005
Hurricane Wilma	2005
Hurricane Dean	2007
Tropical Storm Nicole	2008

5.5.1.4.4 Earthquakes, Liquefaction and Landslides

The Geological Map (Figure 5.7) around the Spring Plain Agro Park shows small faults in the general area. However, major faults are present to the west of the Agro Park. These faults trend NW–SE, E–W and NE–SW. The NW–SE faults (Spur Tree Fault) are typical across the rift zones across Jamaica and

these may be associated with the Montpelier-Newmarket Subsurface Rift. Minor earthquakes have been recorded along these faults in the past.

The Agro Park is located about 90 km from the most active seismic zone in Jamaica, The Plantain Garden Fault in the Blue Mountain Block, modelling for a 100-year return period earthquake event shows that the area will experience earthquake intensities up to VII on the Modified Mercalli Scale (Figure 5.12). The area can experience liquefaction as the geology at the Agro Park is mostly alluvium.

Landslides may also occur on the hills to the west and these may be earthquake-induced or rainfall-induced. Large landslides may block roads and access to nearby communities as well as affect the western sections of the Agro Park.

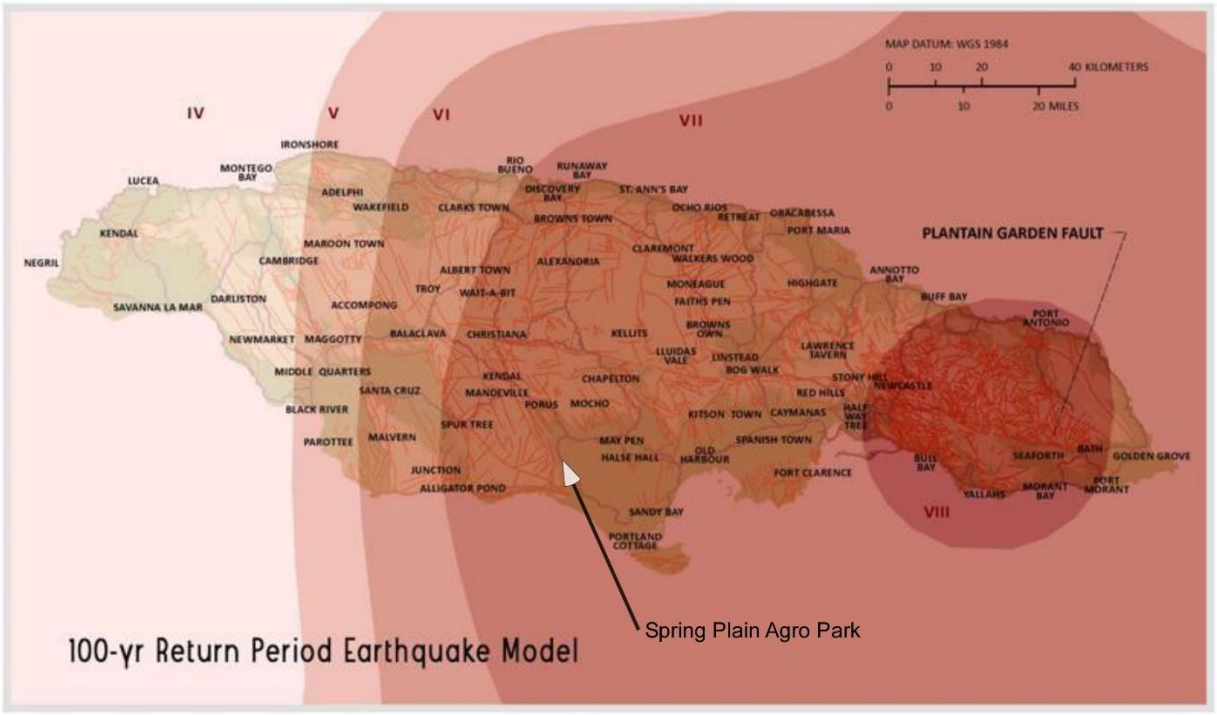

Figure 5.12: Map showing modelled Earthquake Intensity on a Modified Mercalli Intensity Scale for the Plantain Garden Fault and the Location of the Spring Plain Agro Park (MGI & Earthquake Unit, UWI, 2010)

5.5.1.5 Water Supply

Five operational pumping stations are located in these Agro Parks; however, only four are currently used for irrigation. The pumping stations at Jungle West (capacity 318m^3/hr) and Spring Plain (capacity 862m^3/hr) are the newest pumping stations, the St. Jago (capacity 1050 m^3/hr) and Armon's (386m^3/hr) wells are located across from each other. The Armon's well is not used to provide irrigation water to the Agro Parks and as such, is not represented in this report. The Ebony Park well with a maximum flow rate of 380m^3/hr has a unique set-up when compared to the other four pumping stations.

Groundwater at Ebony is pumped into a reservoir. The water is then pumped from the reservoir to a sump, then through a system of filters and into the pressured distribution lines to the farmers. Fish are placed in the reservoir to prevent the breeding of mosquitoes. Solar panels are also located at the Ebony Park pumping station to reduce overhead expenses by offsetting the cost of electricity supplied by the Jamaica Public Service Company (JPSCo).

Similar to the Yallahs Agro Park, water is supplied to farmers using pressurised pipes with crops being irrigated by either the drip lines or sprinklers based on demand. The water level in the wells are monitored approximately every six (6) months by the Water Resources Authority (WRA) with routine testing of the wells being conducted twice per year. The NIC also has the requisite permits from the WRA for the abstraction of water using these wells.

Water quality was monitored at the sampling locations illustrated in Figure 5.13.

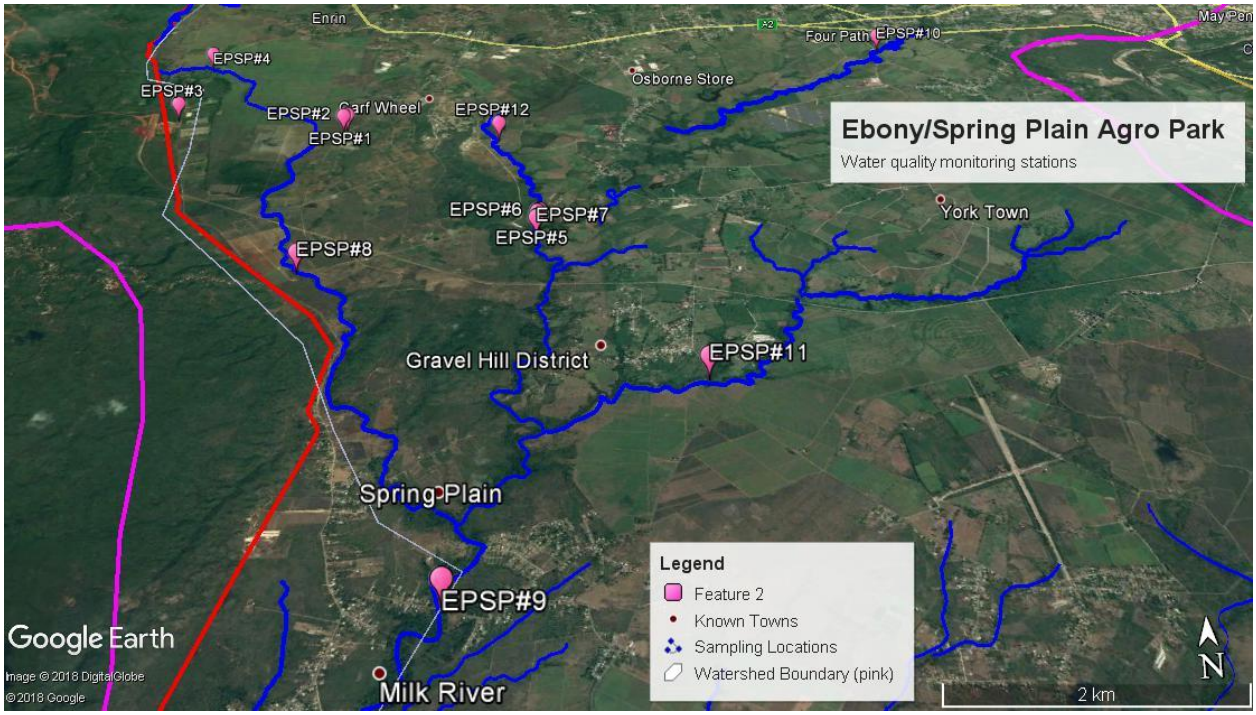

Figure 5.13: Established Water Quality Monitoring Stations in the Ebony/Spring Plain Agro Parks, January – March, 2018

Based on the data obtained from the monitoring of water quality, Chemical Oxygen Demand (COD) was undetected for all sites and there was also absence of pesticides at all sites. Biochemical Oxygen Demand (BOD), Chloride, and conductivity were above the NRCA Ambient (Fresh) Water Guidelines (ESL, 2018).

Of all the sites monitored, Main Savannah (EPAP #11) consistently had the highest salinity, chloride and conductivity values (Figure 5.14).

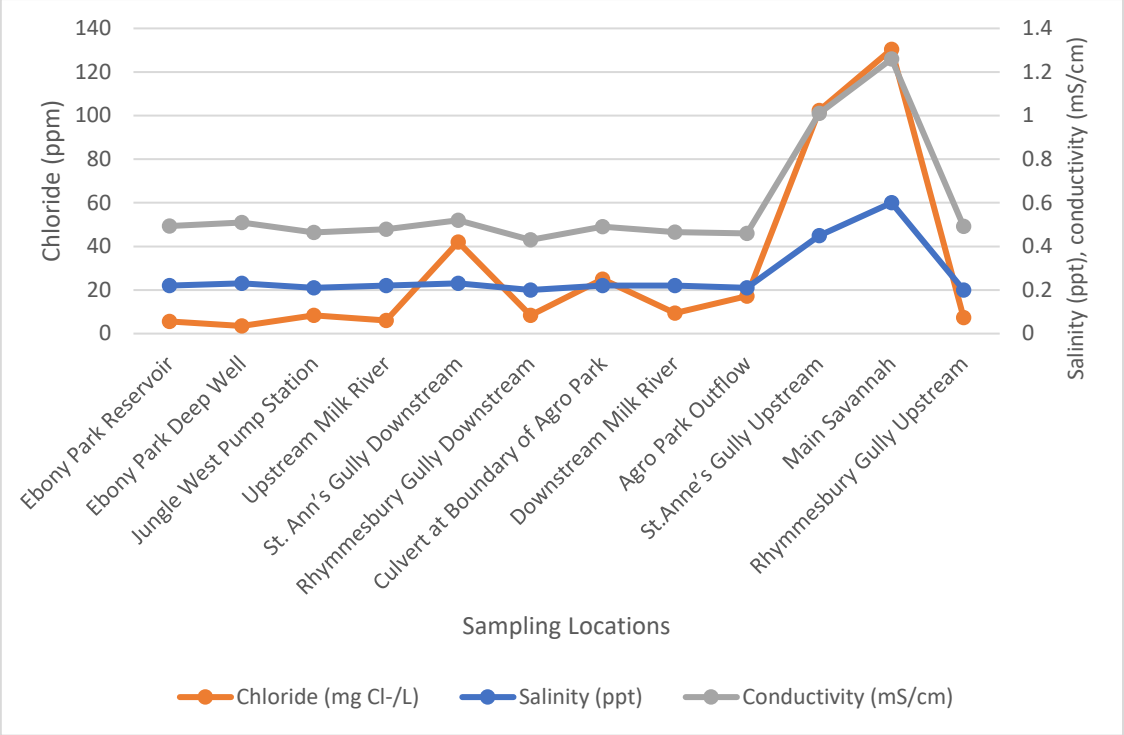

Figure 5.14: Variation in Salinity, Chloride and Conductivity within the Ebony/Spring Plain Agro Park Water Samples collected March 13, 2018 (ESL, 2018)

Major rock salt ion (Mg^{2+}, Ca^{2+}, K^{+}, Na^{+}) concentrations except for potassium were significantly higher for water samples collected at Main Savannah samples. The concentration of Mg^{2+}, Ca^{2+}, Na^{+} may be due to saline intrusion or dissolution of the underlying limestone rocks (Mitchell, 2013; ESL, 2017).

Potassium values varied at the Rhymesbury Gully sites (EPAP #6 – Upstream and EPSP#12 – Downstream) indicating possible impact from the agricultural activities. This water body flows through the area of the Agro Park that has the highest proportion of the active farms (the flow of water is contiguous to the Ebony Heart Academy).

Faecal coliform (FC) levels were highest for all surface water samples when compared to groundwater sources. The FC levels in the Ebony Park Reservoir fluctuated over the monitoring period, but this organism was detected in all the samples collected during the monitoring period indicating that this water source is impacted by faecal matter and may pose a significant health risk. Samples testing positive for FC are non-compliant with potable water standards. The Ebony Park Reservoir needs to be protected from the elements to ensure continued protection against public health threats as this is used for irrigation purposes within the Agro Park. Also, treatment of this water source may become necessary based on specific crop and market requirements.

The other major concern noted for this Agro Park is at that the upstream samples for Rhymesbury and St. Anne's Gully had consistently higher phosphate levels than the ones downstream indicating the presence of a source for this nutrient likely from sewage, surface runoff from agricultural lands and so on. The lower phosphate levels in the samples downstream may be due to assimilation of this nutrient by the biota living in the gullies and/or dilution due to incoming flows from other water inputs. It should be noted, however, that during the dry season the concentration of these phosphates may not fluctuate much along the length of the gullies.

5.5.2 Ecological Setting

Natural vegetation within the Spring Plain Agro Park has been disturbed to accommodate agriculture and the development of residential communities with the exception of some areas of non-arable land toward the east of the Ebony Park Agro Park (Figure 5.15).

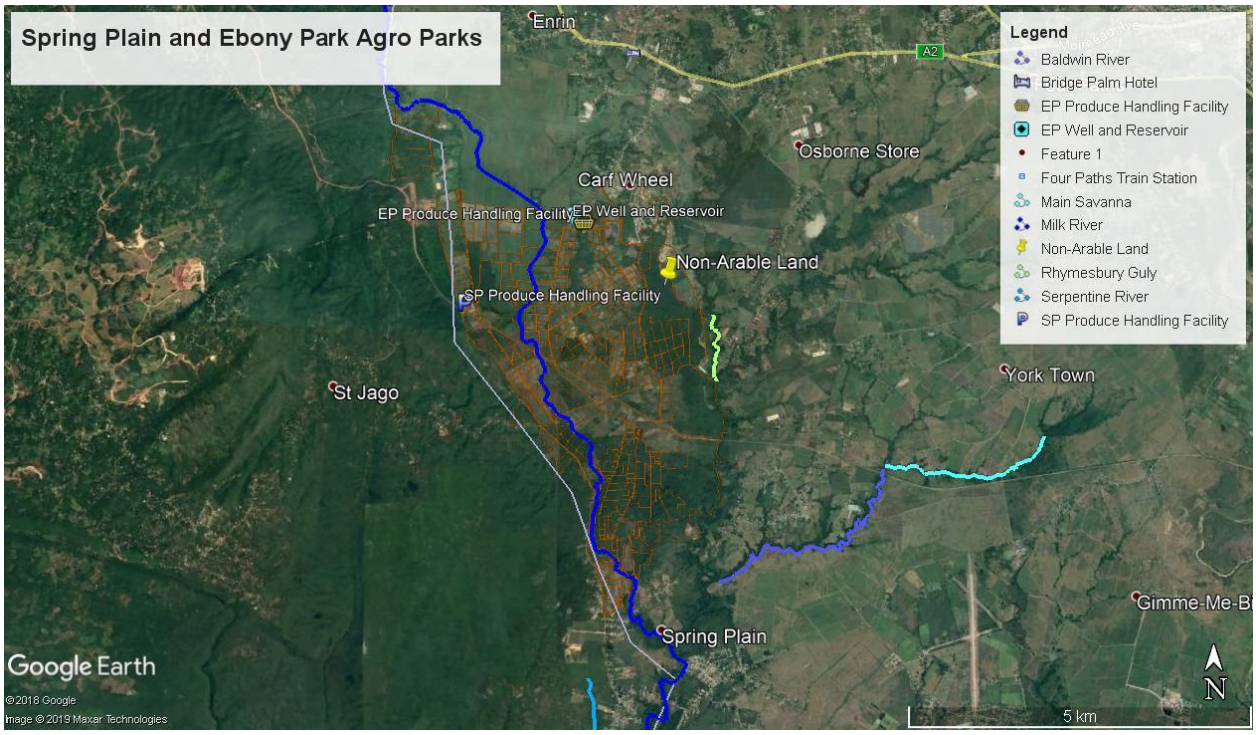

Figure 5.15: Spring Plain and Ebony Park Agro Parks

Immediately west of the Spring Plain Agro Park lies an extensive mountain range in Manchester, while eastward is distinctly different with the extensive flat lands of the Vere Plains. Surrounding the park are semi deciduous forests and mixed planted/cultivated woody and herbaceous crops (Figure 5.16). The Agro Parks are cultivated with various crops as already listed in Section 5.1 above, some sugarcane and pasture lands for cows and goats. Annual abstraction of the river can reach 400 million cubic metres, which is primarily used in agriculture, and domestic water supply.

Figure 5.16: Semi Deciduous Forest West of the Spring Plain Agro Park

The only freshwater habitat within the Park is the Milk River along with several small streams and natural ponds. There are also some irrigation canals in the area. The rivers and streams have dense vegetation typical of a riparian environment, including large trees on sections of their banks. This vegetation is important for protecting the integrity of the banks, reducing soil erosion, and capturing sediments. The rivers include complex habitats that support a variety of fish and invertebrates. They also function as possible migration routes for various species, including pond turtles. Wildlife abundances are relatively low in much of the Park, possibly due to the high levels of long-term disturbance and land-use changes caused by human activity. Birds are numerous, but the species encountered were common, widespread and typical of disturbed habitats.

5.5.3 Social Setting

The Spring Plain Agro Park is located in the Spring Plain District, one of 12 districts located within the Milk River Community/Development Area. This community is located in Clarendon and along the border of Clarendon and Manchester.

5.5.3.1 Demography

The estimated population size for the area is 3,931 with approximately 936 households. Fifty-nine percent (59%) of the households are headed by males, with only 26% headed by persons without any academic qualifications, but 56% are led by unemployed individuals. Farmers and labourers reside in the surrounding community. The population in the Milk River Community/Development Area is predominantly male (56%). As outlined in Table 5.4, the majority of the population falls within the age ranges of under 15, and 30–64 years, with 27% between the ages of 15–29 and 8% in the group of 65 and over (Social Development Commission, 2018).

Table 5.4: Age-Sex Percent Distribution of the Communities surrounding the Spring Plain Agro Park (Source: Social Development Commission, 2018)

Age Cohort	Male	Female	Average
0-14	14	14	14
15 - 24	14	7	10.5
25 - 29	6	5	5.5
30 - 64	19	14	16.5
65+	3	4	3.5
TOTAL	56	44	50

5.5.3.2 Housing Stock

Spring Plain is located within the south-central rural area of Jamaica. Seventy-five percent (75%) of the houses were constructed from concrete and block and 10% from wood. Fifty-six percent (56%) of the community members own the land on which they live.

5.5.3.3 Social Infrastructure

Forty-four percent (44%) of the residents receive public water piped into their yards, while 35% receive public water piped into their respective dwellings (SDC, 2009). This is because although some residents may purchase water from the National Water Commission (NWC) or private trucking companies, other residents utilise water from rivers and streams, private catchments, and public standpipes.

Eighty-two percent (82%) of the residents use electricity for lighting. Telephone services are utilised by all residents, and of these, 87% utilise cellular phones only (ibid).

Solid waste is collected by the National Solid Waste Management Authority (NSWMA) for 68% of households, but in some cases, residents still use non-environmentally friendly garbage disposal methods such as burning and dumping (ibid).

Electricity and cooking gas are accessible to all communities associated with the Agro Park, but some residents continue to use traditional fuels such as kerosene and charcoal.

Potable water supply from the NWC is described as poor and unreliable, which has led to dependence in many areas on latrines (56%) and shared toilet facilities (13%) which do not link to official sewage collection systems (ibid).

5.5.3.4 Existing Social Issues and Livelihoods

Main community issues include high levels of adult (25 years and over) unemployment, high levels of youth (14–24 years) unemployment, poor roads, poor parenting skills, high levels of high school drop-outs and limited access to training and employment (ibid). Local communities depend on a number of land use practices, like agriculture, in the Milk River Watershed to support their livelihoods. Small- and large-scale farms raise livestock and also produce crops, as described in Section 5.1 above, for both local sale and export.

6 New Forest/Duff House Agro Park

6.1 Location

The New Forest/Duff House (NFDH) Agro Park is located on the border of Manchester and St. Elizabeth *en route* to Little Ochi, a coastal town and fishing beach south of Gutters at the base of the Spur Tree Hills. This Agro Park lies in both the Black River and Alligator Hole Watershed Management Units.

The 680 acres of land in this Agro Park is privately owned. Most farmers live on the land that they plant, while others reside in close proximity. Approximately 80% of this Agro Park is cultivated with the main crops being escallion, thyme, sweet peppers, squashes, callaloo, cauliflowers, cucumbers, melons, broccoli and tomatoes. There is one farmer using greenhouse technology in the area. The farmers in this area prefer to invest in 6- to 12-week crops as the return on expenditure is much faster.

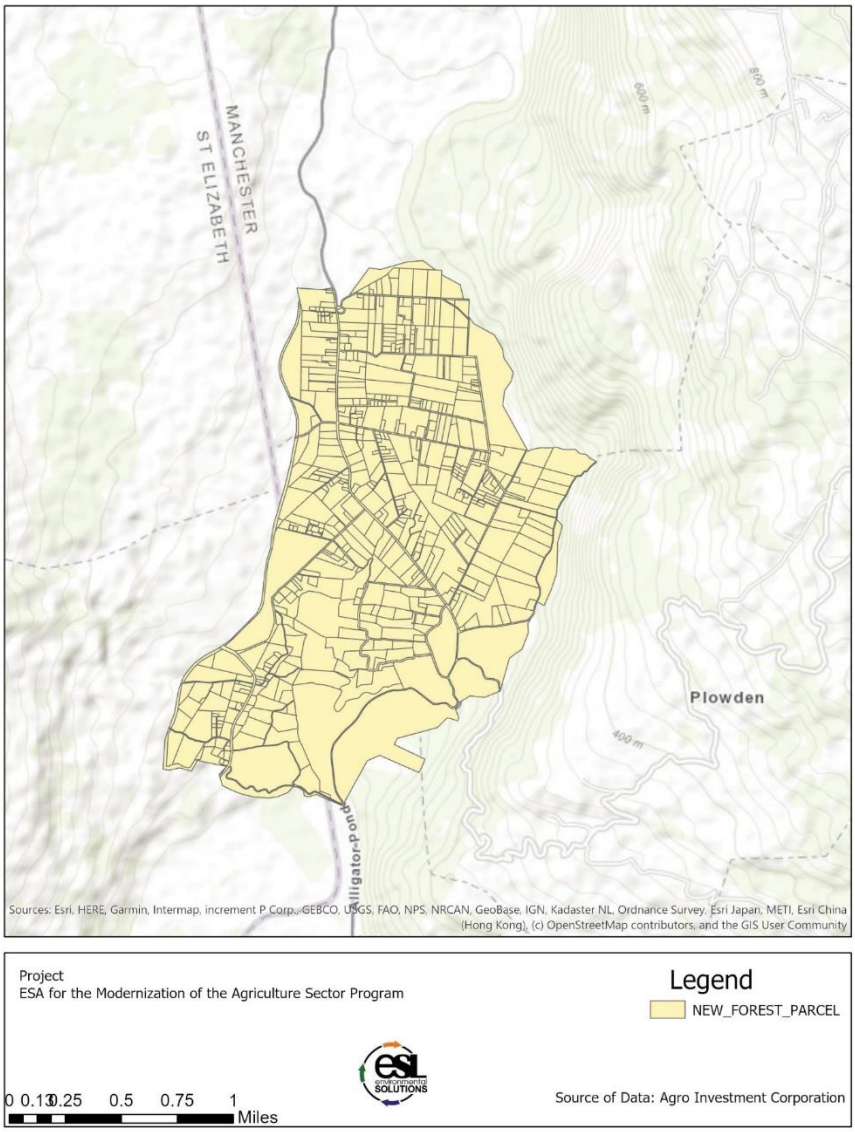

Figure 6.1: New Forest/ Duff House Agro Park

6.2 Farmers in the Agro Park

The farmers are registered and represented in the New Forest/Duff House Water Users Association. There are nine members listed on their register, 33% of whom are women. Seven of the farmers in this group are GlobalGAP-certified and of these, 43% are women.

Farmers use mostly drip irrigation systems, with a few (approximately 10%) in the area using sprinklers. Grass mulching is prevalent and common to all farms as illustrated in Figure 6.2 below. The farmers in the area are very receptive to training and reports have shown that they have consistently increased yields through the application of the knowledge gained during training sessions.

Figure 6.2: Irrigated Farms in New Forest/Duff House using Grass Mulching

In the past, farmers received credit from financial institutions and reports were that some persons did not repay their loans due to disagreement with the bank's terms. At times, there are water scheduling for farmers, which has resulted in farmers having to fill containers at particular times. It was reported that during peak hours, the voltage from the existing transformers within the area cannot accommodate meeting domestic demand and the demand to pump water from wells for irrigation purposes.

6.3 Infrastructure

The roads within the Agro Park are mostly paved and in very good condition; only a few roads toward the east, close to mountain range, are in poor condition.

The wells in the Agro Park are over 400 feet deep. Irrigation water is supplied by pumping and is metered to each farmer. Hydrological studies were done on water availability prior to pumping which indicated no issues with respect to water availability and demand during both the rainy and dry seasons. Further, the Water Resources Authority (WRA) assesses well levels to ensure pumping, over time does not result in water levels below the recommended level thus preventing saltwater intrusion.

Anecdotal evidence suggests that an Agro Park is being set up in the Comma Pen area via Caribbean Development Bank (CDB) funding and 6 wells are being done following hydrological assessments. Reports were that there were unusual issues with water supply from existing wells in New Forest/Duff House.

6.4 Complete Packaging House in the NFDH Agro Park

The New Forest Agro Park and the Duff House Agro Park each has separate produce handling facilities. However, the vision for the area is that there will be need for greater processing of goods for the export market and so a complete Grading Processing and Packaging Facility was constructed to serve the two locations (Figure 6.3). Farmers are required to submit a business plan before they can use this comprehensive facility.

Figure 6.3 Complete Packaging House in the NFDH Agro Park

A wastewater treatment system is constructed and comprises a septic tank, reed bed and soakaway pit; no tertiary treatment was identified. All the packing facilities at each Agro Park have a similar wastewater treatment system, though the one located in NFDH seems to be the most adequately constructed (Figure 6.4 and Figure 6.5). It was stated that the relevant permits were obtained from NEPA, though no signs were observed.

Figure 6.4: Septic Tank at NFDH Packaging Facility

Figure 6.5: Reed Bed (without reeds) at NFDH Packing Facility

Like the other Agro Parks, there was no visible waste stream from the wastewater treatment plants. This is due largely to the very low uptake in usage of the packaging facilities.

6.5 Existing Environmental and Social Setting

6.5.1 Physical Setting

6.5.1.1 Geology

The geology at the New Forest/Duff House Agro Park is similar to the geology at the Spring Plain Agro Park. It consists of the same Mid Miocene to Oligocene Newport Formation. The younger alluvium (Upper Miocene to Recent) occurs just south of the New Forest/Duff House Agro Park site (Figure 6.6). These lands lie primarily on shallow water limestone deposits, with bauxite as the topsoil.

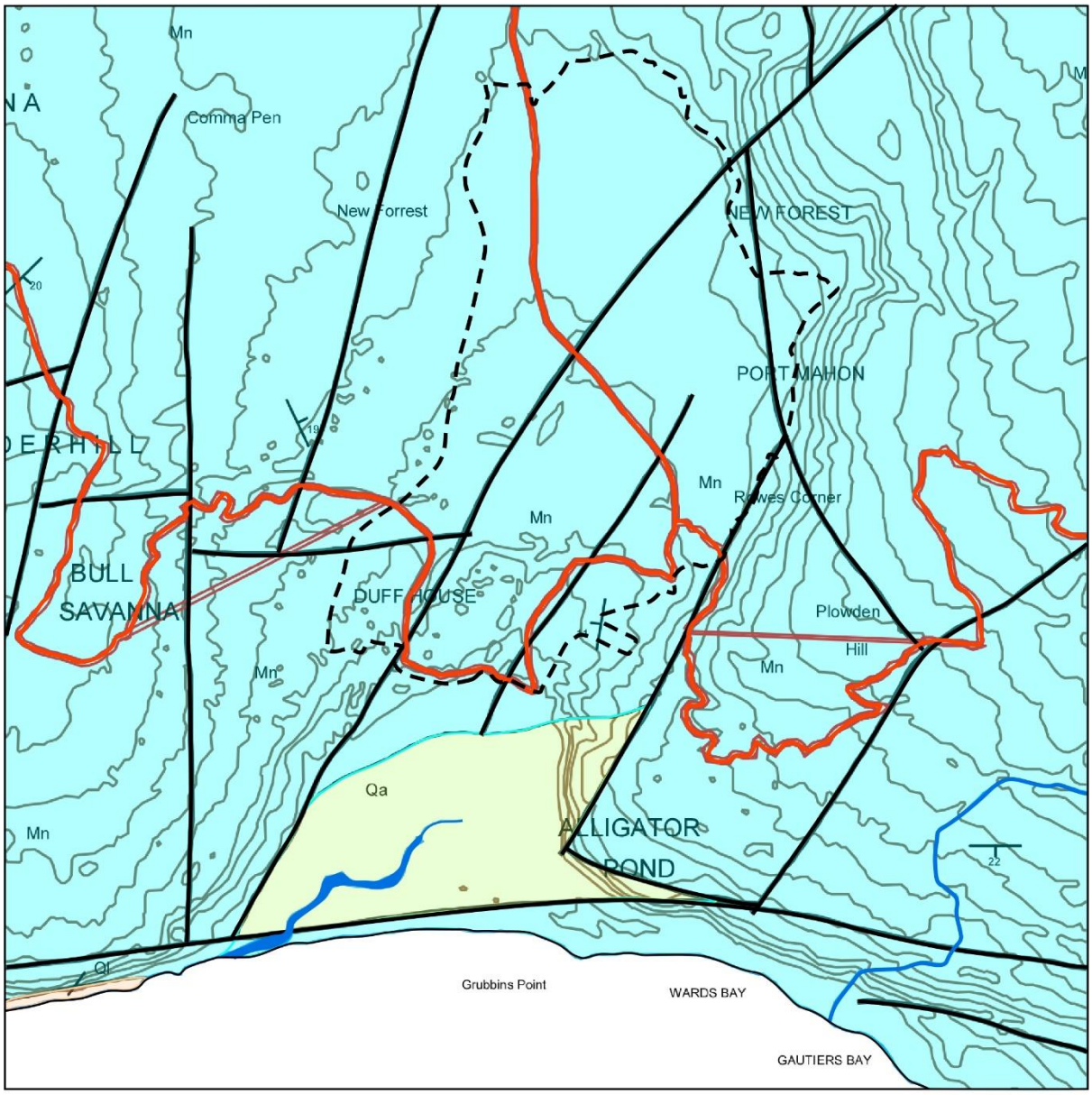

Figure 6.6: Geological Map around the New Forest/Duff House Agro Park (Modified from: Mines and Geology Division)

6.5.1.2 Topography, Hydrology & Drainage

The topography at the New Forest/Duff House Agro Park is generally between 100m and 155m above sea level with a gentle gradient to the south (Figure 6.7).

New Forest/ Duff House falls within the Bull Savanna Sub-Watershed Management Unit and is part of the Black River Watershed Management Unit which falls within the Black River Hydrological Basin. In the area, there are several water wells which are drilled into the underlying limestone aquifer. Water from these wells is used mainly for irrigation. The main drainage feature in the area is the Alligator Pond River which is south of the Agro Park site.

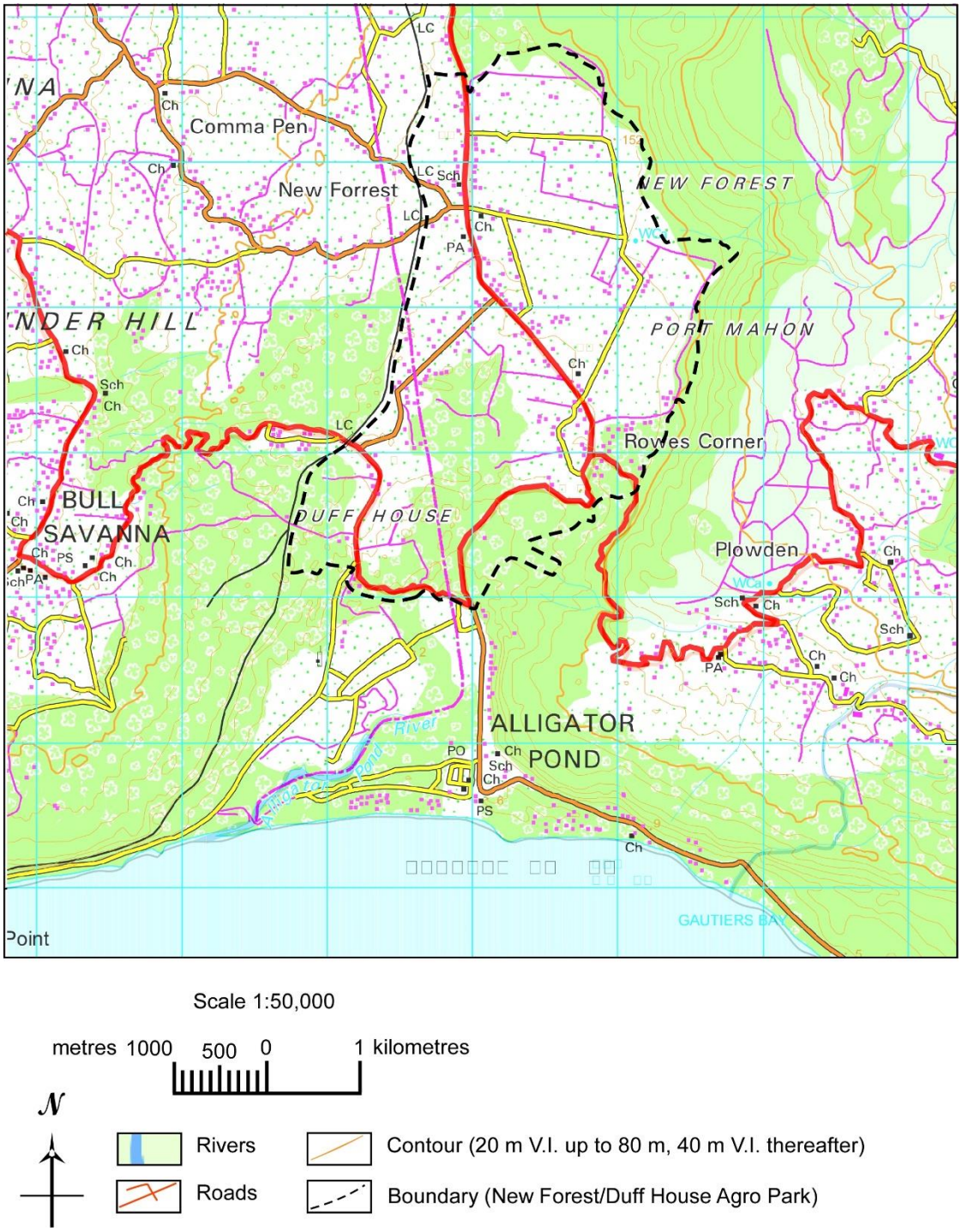

Figure 6.7: Topographic Map showing Location of the New Forest/Duff House Agro Park (Black Broken Line). Extract from the Jamaica 1:50,000 (Metric Edition), Sheet 18 (National Land Agency, 2010).

6.5.1.3 Climate and Climate Change Projections

The climate surrounding the New Forest/Duff House Agro Park is consistent with that experienced throughout southeastern St. Elizabeth. Average mean monthly temperatures range between 24.9°C and 27.6°C with average annual temperatures of 26.4°C. With an average of 27.6 °C, August is considered the warmest month. Typically, the driest month is January, with an average of 32 mm, and the wettest, October, averaging 217 mm. Summers are usually rainier compared to other periods of the year with an average 1,161 mm of precipitation falling annually. Between the driest and wettest months, the difference in precipitation is 185 mm and throughout the year, temperatures vary by 2.7°C (Climate data, 2012; State of the Jamaican Climate, 2015).

Table 6.1: Table showing mean monthly Temperature (°C) and Rainfall (millimetres) received by Alligator Pond near New Forest/Duff House Agro Park (Source: Climate-Data.org, 1982–2012)

	January	February	March	April	May	June	July	August	September	October	November	December
Avg. Temperature (°C)	24.9	24.9	25.3	26	26.8	27.2	27.5	27.6	27.4	26.9	26.3	25.6
Min. Temperature (°C)	21.4	21.2	21.6	22.4	23.5	24.1	23.9	23.9	23.9	23.4	22.8	22.1
Max. Temperature (°C)	28.5	28.7	29.1	29.7	30.1	30.4	31.1	31.4	31	30.4	29.9	29.1
Avg. Temperature (°F)	76.8	76.8	77.5	78.8	80.2	81.0	81.5	81.7	81.3	80.4	79.3	78.1
Min. Temperature (°F)	70.5	70.2	70.9	72.3	74.3	75.4	75.0	75.0	75.0	74.1	73.0	71.8
Max. Temperature (°F)	83.3	83.7	84.4	85.5	86.2	86.7	88.0	88.5	87.8	86.7	85.8	84.4
Precipitation / Rainfall (mm)	32	45	44	82	117	79	68	125	155	217	109	88

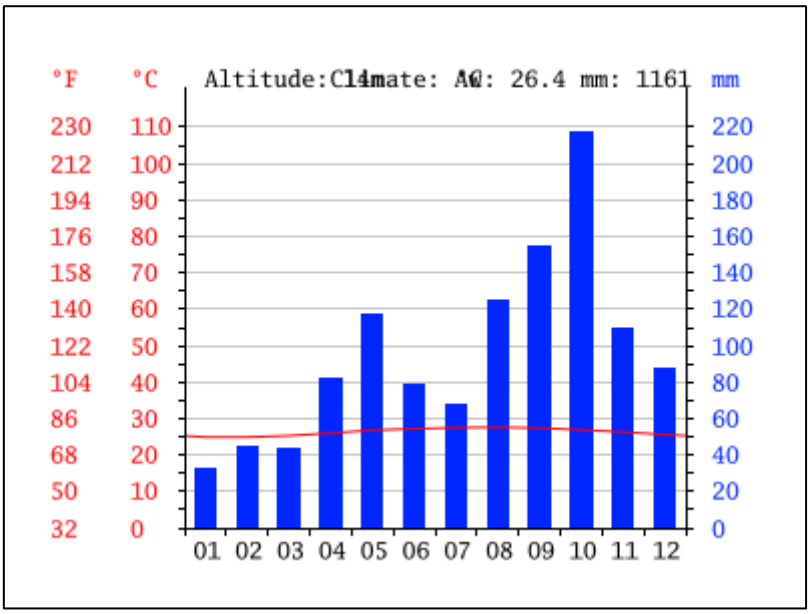

Figure 6.8: Mean monthly Rainfall (mm) and Temperature (°C) experienced in Alligator Pond near New Forest/Duff House Agro Park (Source: Climate-Data.org, 1982–2012)

As indicated in Sections 4.5.1.3 above, irrespective of the model used or scenario examined, Jamaica continues the warming trend seen in the historical data through to the end of the century (CSGM,

2017). Projected changes in mean temperature for the western end of the island where New Forest and Duff House are located show consistent increases.

Table 6.2: Projected Absolute Changes in Mean Temperature by Season for Western Jamaica (CSGM, 2019)

Table 30: West (Zone 3)				
	2020's	**2030's**	**2050's**	**2080's**
NDJ	1.23 – 1.41	2.06 – 2.22	2.59 – 2.85	3.10 – 3.58
FMA	0.99 – 1.28	1.96 – 2.10	2.47 – 2.86	3.04 – 3.63
MJJ	1.14 – 1.25	1.98 – 2.24	2.77 – 3.08	3.27 – 3.76
ASO	1.29 – 1.38	2.14 – 2.40	2.88 – 3.10	3.53 – 3.80
ANNUAL	1.23 – 1.32	2.04 – 2.79	2.77 – 2.96	3.40 – 3.69

Extreme events, inclusive of droughts, sporadic high intensity rainfall events, and high intensity tropical cyclones, are projected to increase with climate change. The frequency of these extreme events has implications for freshwater availability. With a rise in the occurrence of extreme events, freshwater may be less available, or it may be contaminated (CSGM, 2017).

6.5.1.4 Natural Hazards

6.5.1.4.1 Drought

The New Forest/Duff House Agro Park suffers from massive droughts at drier periods throughout the year, crippling farmers who struggle to find water for crops. Stemming from this are periodic bush fires. January to August is the drought period. Strong winds also contribute to drought in the area. This limits farmers to escallion, the only crop likely to survive in any weather, although too much rain affects the crop. During droughts they use domestic water for farming and this is costly (PIOJ, 2017).

6.5.1.4.2 Hurricanes

In the past, the impacts of hurricanes like Charley, Emily, Ivan and Tropical Storm Nicole have caused flooding, loss of livestock and crops, and left the area marooned.

Table 6.3: Tropical Cyclones which have impacted agriculture and livelihoods in St. Elizabeth

Tropical Cyclones	Year
Hurricane Ivan	2004
Hurricane Charley	2004
Hurricane Emily	2005
Tropical Storm Nicole	2008

6.5.1.4.3 Flooding

Unlike the other Agro Parks, there are no rivers running through the New Forest/Duff House Agro Park. However, with extreme rainfall events, flooding has impacted the livelihood of farmers and community members in the surrounding areas.

6.5.1.5 Earthquakes, Liquefaction and Landslides

The New Forest/Duff House Agro Park is located in an area with both major and minor faults (Figure 4.13 and Figure 6.6). The major faults trend NW–SE, E–W and NE–SW. The NW–SE faults (Spur Tree Fault) are typical across the rift zones throughout Jamaica and these may be associated with the Montpelier-Newmarket Subsurface Rift. Minor earthquakes have been recorded along these faults in the past.

Although the Agro Park is located over 100 km from the most active seismic zone in Jamaica, the Plantain Garden Fault in the Blue Mountain Block, modelling for a 100-year return period earthquake event shows that the area will experience earthquake intensities between VI and VII on the Modified Mercalli Scale (Figure 6.9). The area is not prone to liquefaction due to the geology.

The steep hills to the east may be prone to earthquake-induced landslides which may block roads and access to nearby communities. Large landslides may also affect the eastern sections of the Agro Park.

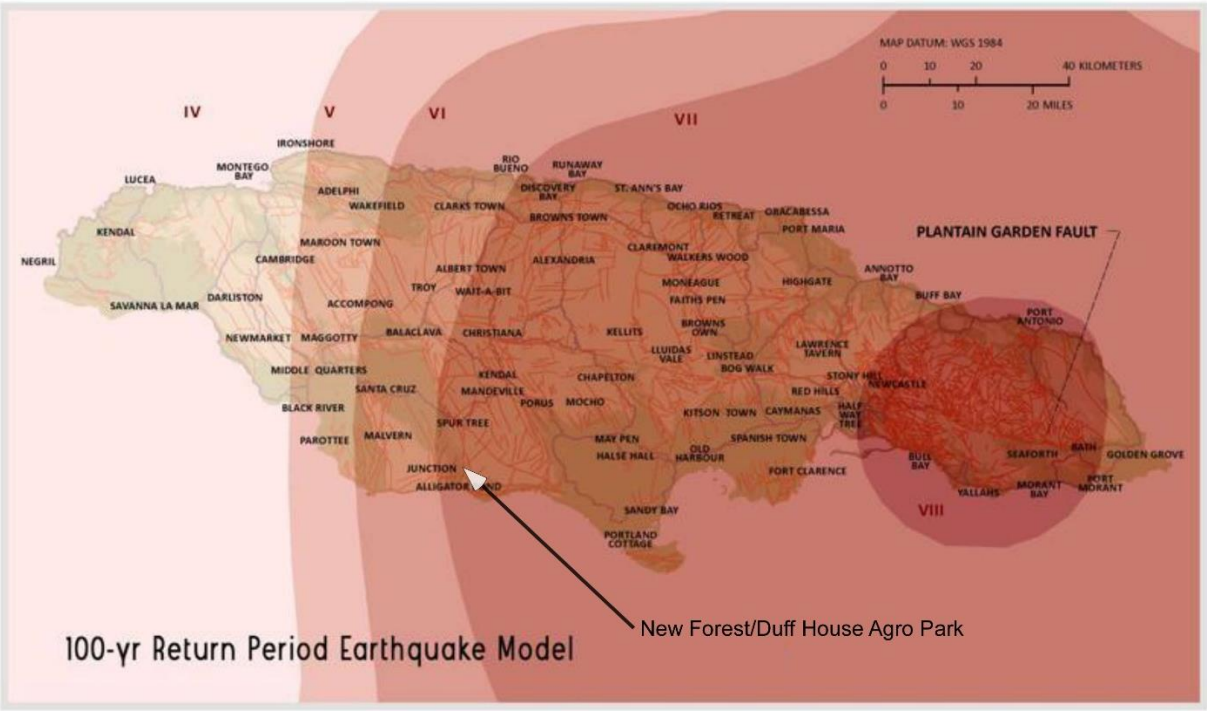

Figure 6.9: Map showing modelled Earthquake Intensity on a Modified Mercalli Intensity Scale for the Plantain Garden Fault and the Location of the New Forest/Duff House Agro Park (MGI & Earthquake Unit, UWI, 2010).

6.5.1.6 Water Supply

Currently, four (4) of the six (6) wells in this Agro Park are operational. The Lane Well requires a pump, and the Rowe's Corner well has been abandoned due to saline intrusion. Water is supplied to farmers in the parks using pressurised pipes. Crops are irrigated using either the drip or spray method and as with the previously discussed parks, water is supplied to the farmers based on their demand.

The water levels in the well are monitored approximately every six (6) months by the WRA with routine testing of the wells done twice per year and the results submitted to the WRA. The NIC also has the requisite permits from the WRA for the operation of the wells and the extraction of water from them.

Chloride and conductivity had values being above the NRCA Ambient (Fresh) Water Guidelines at least once during the 3-month monitoring period in 2018. Also, as in the case of SPAP and YAP, COD and pesticides as well as BOD were undetected in all water samples collected.

One of the major concerns for water quality in this Agro Park was saline intrusion, particularly for the western side of the Agro Park (New Forest Pumping Station, Line 8, Line 41 and Line 44) where rock salt ion concentrations were significantly greater than on the eastern side (Figure 6.10) and the water was determined to be brackish (ESL, 2018).

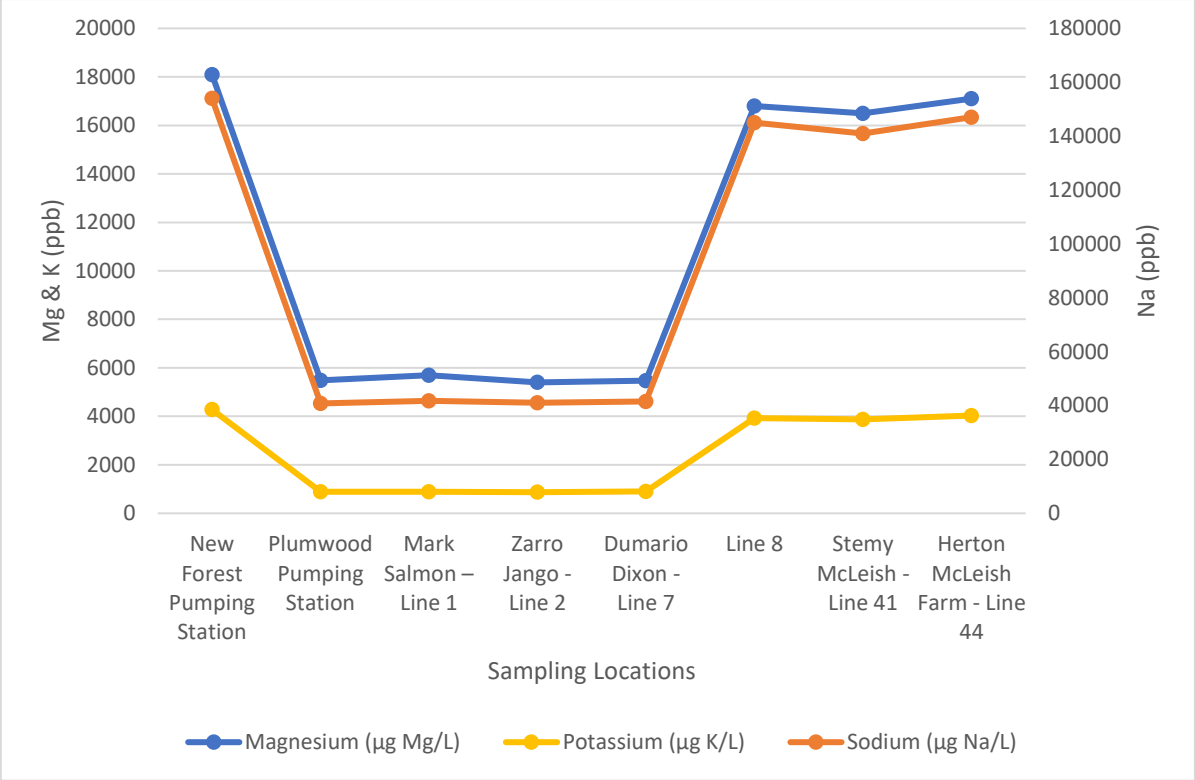

Figure 6.10: Variation in major Rock Salt Ion Concentration in the NFDH Agro Park, March 14, 2018

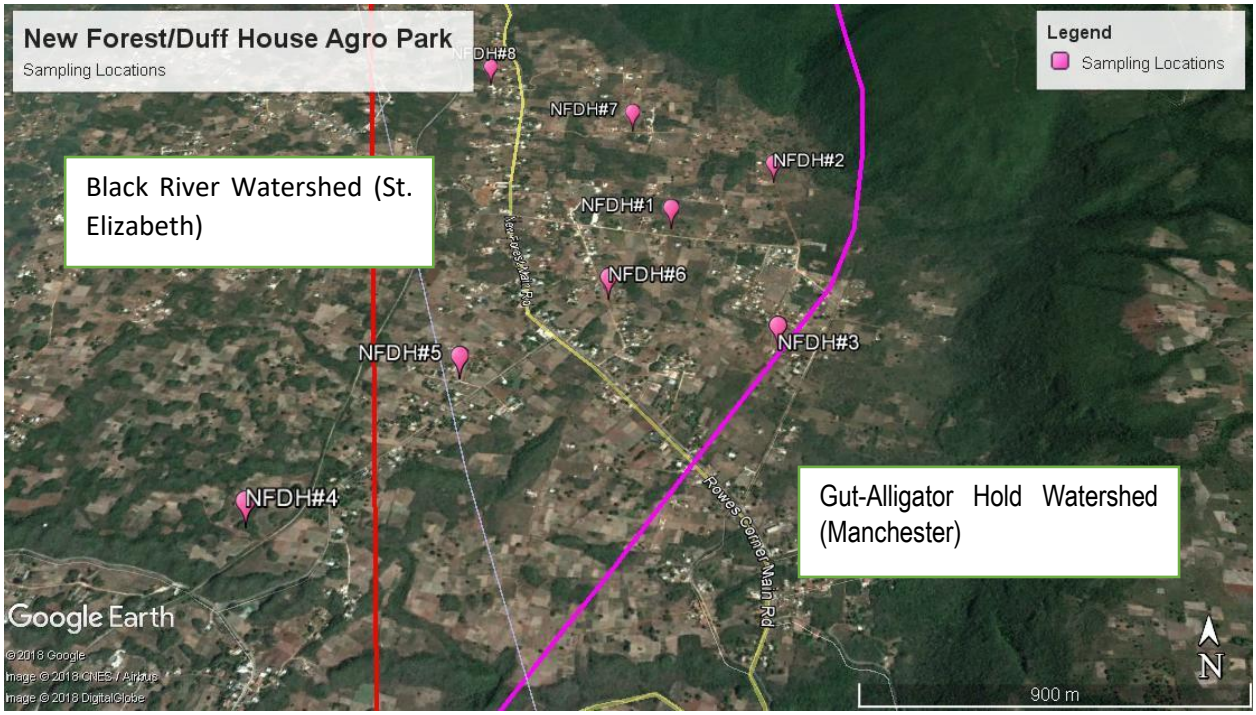

Figure 6.11: Location of NFDH Agro Park showing Water Quality Monitoring Stations in the NFDH-AP January 18, 2018

6.5.2 Ecological Setting

The New Forest/Duff House Agro Park is between 100–200m above sea level and is bounded on the east by the Spur Tree Fault System along the base of the Manchester Plateau and the flatter more undulating land of St. Elizabeth, sloping south from Lititz, ending at Alligator Pond in the south. Most of the area that makes up the New Forest/Duff House Agro Park is intensive or extensive farmland or

brush/scrub (Figure 6.12). It also includes some of the forested western slopes of the mountains that make up part of a forest ring (Figure 6.13). The slopes consist of lowland semi-deciduous forests and based on site assessments, these areas are largely intact. In the New Forest/Duff House Agro Park farming area, the soil is very healthy (Figure 6.13 and Figure 6.14. Crops include melons, escallion, thyme, sweet peppers, cucumbers, cabbage, tomatoes and cauliflower, the most popular being escallion and thyme. The New Forest/Duff House Agro Park consists of very few pockets of natural forests with low ecological impact. There is no nearby surface water as it is located in an area where there are no aquicludes or aquitards (MPDC, 2003).

Figure 6.12: Slope consisting of Shrubland adjacent Farmland in Duff House

Figure 6.13: Semi-deciduous Forests on Mountain Range surrounding Farmland in New Forest

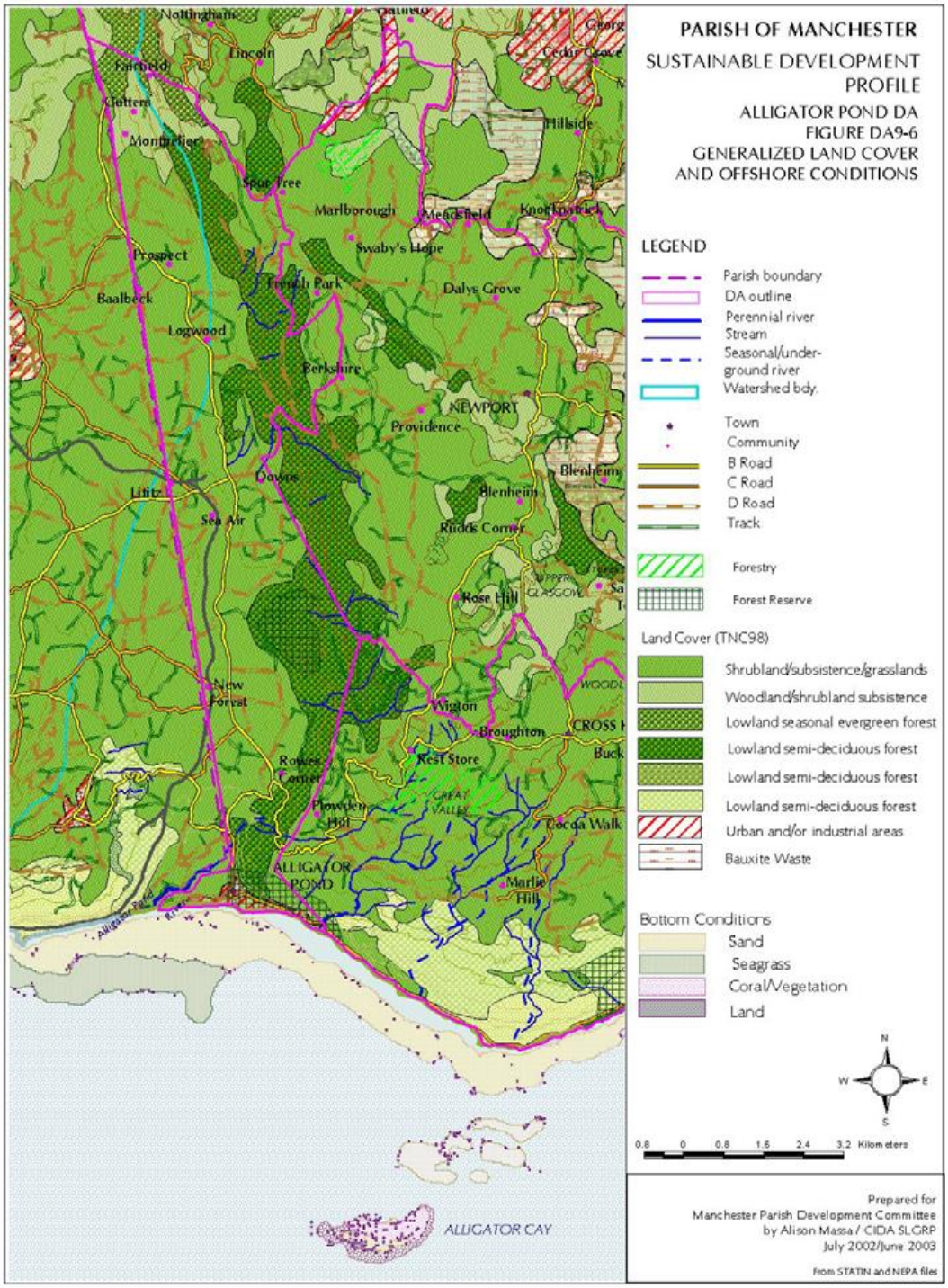

Figure 6.14: Sustainable Development Profile for the Alligator Pond Development Area

6.5.3 Social Setting

The New Forest/Duff House Agro Park is situated along the border of St. Elizabeth and Manchester.

6.5.3.1 Demography

The estimated population size for the area is 2,851 with approximately 731 households arranged in nucleated developments around the New Forest/Duff House Agro Park. Sixty-six percent (66%) of the households are headed by males with a staggering 62.4% headed by persons without any academic qualifications, nevertheless, only 17% are led by unemployed individuals (SDC, 2009). Like the Yallahs Agro Park, all of the farmed land within the New Forest/Duff House Agro Park is privately owned.

In 1982, the St. Elizabeth parish population was a very young one, with 66% of the population being ≤24 years of age and 3% being ≥65 years. By 1991, 58% of the population was ≤24 years, while the ≥65 age group had increased to 5% of the population. The number of females declined by 1991 to 85 females for every 100 males (STATIN, 2011). In recent years, as illustrated in Table 6.4, the ratio of men to women in each age group has narrowed (SDC, 2009).

Table 6.4: Age-Sex Percent Distribution of the Communities surrounding the New Forest/Duff House Agro Park (Source: SDC, 2009)

Age Cohort	Male	Female	Average
0-14	13.6	11.8	12.7
15 - 24	7.9	9.6	8.75
25 - 29	11.4	10.7	11.05
30 - 64	8.6	11.3	9.95
65+	8	7.4	7.7
TOTAL	49.5	50.8	50.15

6.5.3.2 Housing

Up until 2001, the parish of St. Elizabeth had over 90% of housing units detached and roughly 90% of the dwellings had zinc roofs. The remainder had concrete or wooden roofs. Forty percent (40%) had concrete floors, 30% had wooden floors, and the remainder had a combination. Fifty percent (50%) of units had walls constructed from concrete, 35% from wood and the remainder from zinc (STATIN, 2011).

Currently, the community's profile indicates that 97% of the dwellings were constructed from concrete and blocks. Eighty-seven percent (87%) of the residents own the land on which they live, 2% live on rented land, and 11% live on land which they neither own nor rent (SDC, 2009).

Figure 6.15: Sample of Housing Stock in New Forest/Duff House

The site assessment gave evidence of a growing community as several houses were being constructed. Figure 6.15 shows a sample of the housing stock with surrounding farms.

6.5.3.3 Social Infrastructure

Sixty-eight percent (68%) of residents have private catchments and purchase water and 96% of residents use electricity for lighting. Telephone services are utilised by all residents, with 21% utilising both landlines and cellular phones (SDC, 2009).

Solid waste is collected by NSWMA from 55% of households. Water linked to a main sewer system and soakaway is utilised by 40% of households. Fifteen percent (15%) of dwellings had access to piped water via drums and tanks in their yards, while the rest used a public standpipe. However, pipes tend to run dry in periods of drought (STATIN, 2011; SDC, 2009).

6.5.3.4 Existing Social Issues

Major community challenges experienced by persons in surrounding areas include poor roads, low water pressure or no water supply, poor representation by elected political leaders, low skill levels, high levels of adult unemployment. Prospective citizens expressed concern about the rates of high school dropouts and teen pregnancy, which they see as causes of unemployment (SDC, 2009).

7 Quarantine Facilities that Support Export

7.1 Agricultural Marketing Corporation (AMC) Complex

7.1.1 Site and Situation

The Agro Investment Corporation's (AIC) processing plant is located at 188 Spanish Town Road, Kingston. The facility was built in 1961 and sits on nine (9) acres of land. The yard of the facility is paved or filled with gravel and the buildings on site are concrete with zinc roofs (Figure 7.1).

Figure 7.1: Agro Investment Corporation's AMC Complex

Figure 7.2: Deteriorated Building on the AMC Complex

The physically appearance of the building (peeling paint, flaking walls, leaks, mould growth, joints pulling apart and numerous cracks) suggests lack of maintenance (Figure 7.2 The facility has twenty-eight (28) packing houses or warehouses of which seven (7) are currently in use. The facility currently has forty-two (42) employees and the activities of the tenants currently using the facilities are linked to the following products and/or production-related tasks:

- Agro Processing Units (5);
- Herbs and Teas (1);
- Dry food storage (1).

Electricity and water are currently supplied to the facility by the Jamaica Public Service Company (JPSCo) and National Water Commission (NWC) respectively. The facility currently stores eight thousand (8,000) gallons of potable water in 1,000 gallons plastic tanks as seen in Figure 7.3 below. In cases where the NWC supply is not reliable, the tanks are filled by a private contractor, DT Construction Limited. The operators of the facility do not have any evidence of the source for the trucked water they receive from this contractor.

Solid waste is collected in skips which are removed from the complex on an average of twice weekly (Tuesdays and Thursdays) by the National Solid Waste Authority (NSWA).

Figure 7.3: Potable Water Storage Tanks and Distributing System (left); Skip for Solid Waste (right); Drain for Trade Effluent (right)

Sewage is handled by the National Water Commission (NWC). Sections of the facility (close to the dry goods storage area) are sporadically flooded with sewage. When this occurs, the NWC is contacted to rectify the issue. All trade effluent from the facility is collected in concrete drains which lead to a soakaway on the property (Figure 7.3).

The operators of the facility are in the process of procuring a consultant to assist with the development of an Emergency Response Plan. Several labelled assembly points were noted on the property. However, the fire department visited the facility in 2018 and conducted training with some staff members. The existing system for fire suppression lacks maintenance and is in disrepair (Figure 7.4).

Figure 7.4: Missing Fire Hose

There are several bait stations for rodents on the property (Figure 7.5). These are checked once monthly by the contractor Hypro Pest Control Limited.

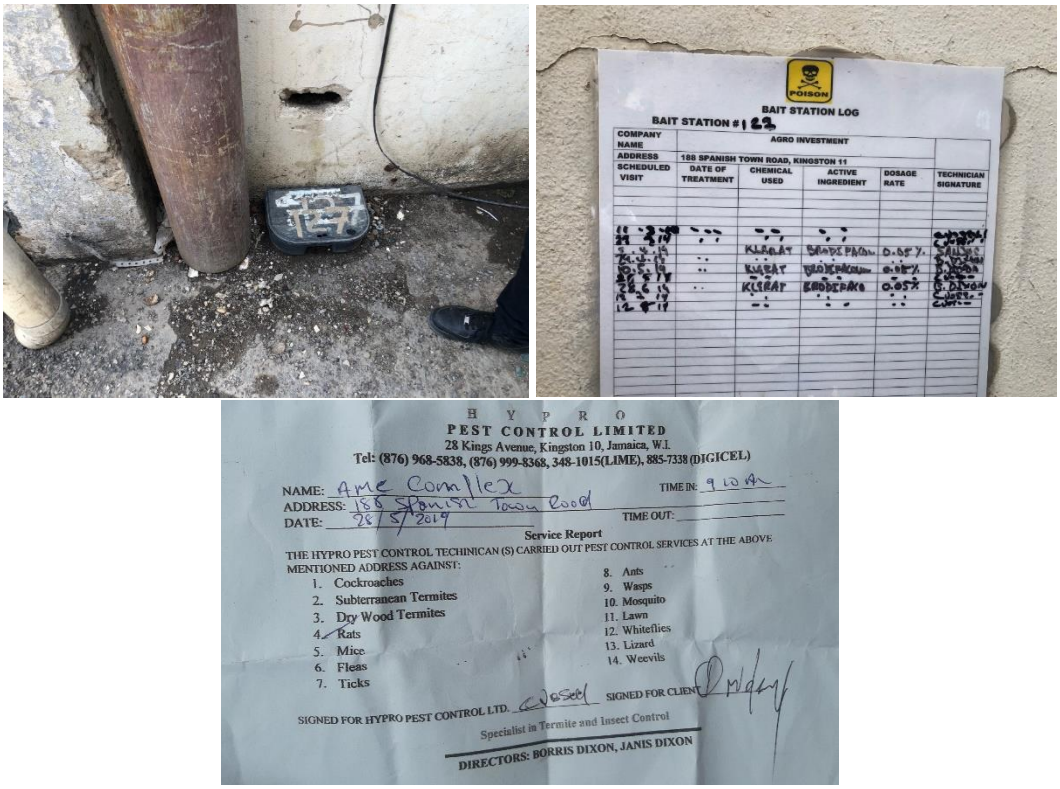

Figure 7.5: Bait Station on Property (left); Log for bait Station (right); Evidence of Contractor's Visit (bottom)

Pigeons living in the roof are a serious concern for the operators of the facility (Figure 7.6). Several attempts have been made to remove these birds, but without success.

Figure 7.6: Pigeon Droppings inside the Packing House

The Ministry of Industry, Commerce, Agriculture and Fisheries (MICAF) is currently in dialogue with the Life Science Department of the University of the West Indies for a permanent solution to the pigeon problem. The facility is audited by the Public Health Department sporadically or when they are called in by the Client.

7.1.2 Description of Operations

The AMC complex offers space to agro-processors for the cleaning, packaging and storage of their products. The facility is located approximately one-kilometre north of the Kingston Freeport Terminal

and Kingston Wharves. There are 22 customers at the AMC Complex as of April 30, 2019. Produce processed at the facility (some seasonal) includes the following:

- Dasheen
- Yams
- Sweet Potatoes
- Mangoes
- Peppers
- Papyas
- Guineps
- Naseberries.

Figure 7.7: Tenants using the AMC Complex

The list of tenants of the AMC complex is presented in Appendix IV. Tenants of the complex are provided with metered water and electricity. However, each tenant is responsible for sourcing their own water when the NWC's supply is off. All approved tenants are responsible for retrofitting their rented space to suit their needs; this includes installing meshed screens, wash sinks and pest management. Tenants are audited on a regular basis by teams from the Food Storage and Prevention of Infestation Division of MICAF to ensure pest management practices are conforming to regulatory standards. This includes ensuring that only approved chemicals are used for pest control. The reports from these audits are not shared with the operators of the facility.

The facility also has six (6) cold storage areas (chillers), but none are currently in operation due to maintenance and other issues. Tenants are therefore required to use cold storage via renting refrigerated containers.

Solid waste storage and removal are provided by AIC.

7.2 Agricultural Export Complex – Norman Manley International Airport Plant Quarantine Branch MICAF

7.2.1 Site and Situation

The Agricultural Export Complex (AEC) is located at the Normal Manley International Airport (NMIA). It is one of two such facilities, the other is located at the Donald Sangster International Airport in Montego Bay. The AEC acts as a one stop facility for exporters of agricultural produce and as such houses all the relevant agencies (such as Customs, Airlines Cargo, United States Department of Agriculture (USDA), inspectorate, etc.) necessary to facilitate the exporting process in a timely and efficient manner. Activities at the AEC includes the following:

- Inspection and Certificate of agricultural produce for export
- Fumigation of agricultural produce especially Yam, Pepper and Thyme for export
- Cold and ambient condition storage
- Preclearance of agricultural produce for the US market

The AEC is located on Normal Manley International Airport Limited (NMIAL) property and operates under the conditions outlined in its concessionaire's agreement with NMIAL. The complex is located at the eastern end of the NMIAL property and is entered from the Port Royal Main Road.

Figure 7-8: Map Showing the Location of the Agricultural Export Complex - NMIA

7.2.1.1 Assessment of the Overall Structure

The facility is a concrete structure consisting of a main building (office, accounts bathrooms etc.), two fumigation rooms, cold room and warehouses for the storage of produce. The zinc roof of the main building was being replaced during the assessment.

Figure 7-9: Repair of Roof

Inside the main building moisture intrusion (flaking paint, water stained ceiling tiles etc) was evident everywhere.

Figure 7-10: Signs of Moisture Intrusion inside Building

Cracks in the concrete were also observed in several sections of the building (*Figure 7-10*).

Figure 7-11: Cracks in Concrete of building (left); Old defunct AC system (right)

The office spaces are primarily cooled by wall mounted split air conditioning (AC) systems. Old defunct AC systems were also observed in some areas.

These systems should be removed as soon as possible as they will become breathing ground for microorganisms such as yeast and mould.

Numerous unseated and missing ceiling tiles were observed in the building.

Figure 7-12: Unseated and Missing Ceiling Tiles

Ceiling tiles should be properly seated, and all missing ones should be replaced as they prevent dirt, debris and microorganism from the ceiling plenum from entering the space occupied by people. Air exchange inside the building is only facilitated when a door and/or a window to the outdoor is opened.

7.2.1.2 Utilities - Power and Water Supply

Electricity and water are currently supplied to the facility by the Jamaica Public Service (JPS) and National Water Commission (NWC) respectively. The facility currently stores five thousand (5,000) gallons of potable water in 1000 gallons plastic tanks as seen in the *Figure 7-14* below. In cases where the NWC supply is not available the facility is able to operate for approximately ten (10) days using the storage tanks.

Figure 7-13: Potable Water Storage Tanks

The water in the storage tanks constantly circulate as long as the NWC supply is active, however, once this supply is off, circulation stops. The storage tanks are not cleaned on a scheduled basis.

The facility also has a diesel-powered generator which is used when there is a power outage or fluctuation in the power supply.

Figure 7-14: Standby Generator

The exhaust from the generator depending on the direction of the prevailing wind can be towards the main office building which has open windows.

7.2.1.3 Waste Management

Solid waste is collected in drums which are removed from the complex on an average three times weekly by a contractor engaged by NMIAL. The disposal of solid waste is done at a National Solid Waste Management (NSWA) approved site.

Figure 7-15: Drum for solid waste (left); Incinerator (right)

Sewage and trade effluent generated by the facility is transported (via pumps and pipes) and treated at the NMIA wastewater treatment plant which is a National Environment and Planning Agency (NEPA) approved facility.

An incinerator was observed on the facility. It was indicated that this was used in the past to destroy ceased produce that were illegally imported or infested, but it is no longer functioning. Currently, such material is either burn in a small fire made on the compound or sent to the incinerator at the Veterinary Division to be destroyed.

7.2.1.4 On-site Drainage

The facility is unlikely to be flooded due to its elevated location and good drainage system. All drains are concreted and free of debris.

Stormwater is not allowed to collect in the front parking lot due to concrete drain placed at the lowest point. The drain collects and transport stormwater away from property to earthen drains nearby.

Figure 7-16: On-site Drainage

Despite the drainage system water was observed ponding in some areas due to an old and corroding water cooler and leaking AC condensate pipe.

Water ponding from leak in AC drainpipe

Water ponding from old and rusting water cooler. Buckets are placed under to unit to assist with containing the leak

Figure 7-17: Ponding Water on AEC

A water-based fire suppression system was observed in the warehouses and fumigation rooms. A fire station is also located on the airport property. The Airport Fire Service does a regular check of the compound's facilities to ensure it adheres to their requirements. Labelled assembly points were noted on the property.

Numerous bait stations were observed on the property. The bait stations are checked monthly by Target Pest Management company.

Figure 7-18: Bait Station on Property

The facility grounds and buildings are also sprayed quarterly for pests. AEC is audited every two years by MICAF, monthly by the Public Health Department of the Ministry of Health and Wellness (MOHW) and more frequently by the Security and Safety team of NMIAL. The reports from these audits are submitted to AEC for review and action.

7.2.2 Description of Operations

AEC facilitates the inspection and certification of agricultural produce. On average an estimated one hundred (100) persons access and use the facility. Due to its location and function, security is a critical component of the AEC operations. As such, multiple check points, cameras and guards are on the property to ensure full compliance with the relevant security protocols.

Before an exporter can access the services of the packaging facility, the exporter users must first be approved by the Plant Quarantine Division of MICAF. The procedures governing the requirements of a packaging facility and how to get said facility approved can be found on the website www.micaf.gov.jm/content/plant-quarantine-produce-inspection. The Plant Quarantine Division of MICAF also offers training to all exporters on the operations of the facility and the requirements for export.

Once the facility is approved, the exporter then proceeds to make an appointment between 24-72 hours prior to the export date to have his produce inspected, fumigate (if necessary), and passed by customs prior to shipment. Payment for the inspection is done at the main building and the exporter proceed to the inspection process. The appointment system was implemented to streamline the operations of the facility (ensuring enough manpower and space is available to accommodate the exporter) so as to prevent delays since shipment (via both air and sea) is a time sensitive issue.

The inspection process takes place along the corridors of the warehouse in metal bins with cleanable surfaces.

Figure 7-19: Inspection bins

After each inspection the surfaces of the inspection bins are cleaned with a bleach solution.

If the produce does not meet the required standard, the goods has failed the inspection and must be removed from the property as soon as possible by the exporter. These good sometimes enters the domestic market. Produce such as pepper, thyme and yam along with produce to be shipped by sea must be fumigated. Fumigation is done in two rooms equipped with extractors. The flooring inside one of fumigation room is damaged.

Figure 7-20: Fumigation Rooms

Figure 7-21: Exhaust Stack for Fumigation Rooms

Fumigation is done using Bromomethane (an ozone depleting chemical). Bromomethane is used due to its broad-spectrum application, toxicity to pests and relatively short life span. After fumigation and once the levels of Bromomethane have sufficiently decreased the produce is removed to a venting room to allow for the residual levels of the chemicals to deplete. Persons walking towards the main building may be exposed to the Bromomethane being removed from the venting room. It should be noted that the fumigation rooms are not located in a restricted area and normal operations of the facility runs concurrent during the fumigation process. Both internal and external customers can therefore be vulnerable to any leaks or accidents from the fumigation gas.

The status of the current fumigation rooms is a serious concern to the manager of the facility. The rooms are concreted and exposed to direct sunlight. The temperatures within the rooms can be very high especially on very sunny days. The integrity of the produce being exposed to these high temperatures is therefore a serious concern since temperature can affect microbial and enzymatic activities and hence increase the rate of spoilage.

Once the produced is approved for shipment it is stored primarily under ambient conditions (sometimes in the yard exposed to sunlight and other ambient conditions) until it is collected by the cargo handler and taken to the plane.

Figure 7-22: Certified Goods Waiting to be Shipped

Currently, the facility only has space for one cargo handler, Ajas Limited. This cargo handler handles shipment for several airlines such as Cayman Airways, Jet Blue, Air Canada, British Airways and Caribbean Airlines.

Figure 7-23: Cargo Handler, AJAS Warehouse

Produced shipped by Amerijet and Flight Connections must to transported to their respective warehouses after inspection and certification for shipment.

Certificated produce being transported from AEC to respective cargo handler or aircraft.

Figure 7-24:Certified Produce being transported from AEC facility.

Produce processed at the facility (some seasonal) includes the following:

1. Yam
2. Pepper
3. Thyme
4. Breadfruit
5. Pumpkin
6. Callaloo
7. Avocados

The facility has cold storage; however, it is primarily used to house air shipments which have been certified from the previous day and is due for export the following morning.

7.2.2.1 Testing

Currently exporters are not required to provide evidence that their produce are tested for pesticide residue, microbial content and/or heavy metals prior to shipment or release to the local markets. It is

taken for granted that the exporters follow the Country of Import requirements[3]. It should be noted however that the importing countries can test and has tested produce imported into their countries for pesticide residue. Those imports which have failed the test are returned to Jamaica.

Consultations with the complex Manager indicated that testing requirements locally are not mandatory because of the lack of government facilities to conduct such testing and lengthy turnaround times to receive the results.

7.2.2.2 Labour and Staffing

The entire compound has an approximate 53 staff members on site on any given day. 21 of these persons are employed directly to the Ministry of Industry Commence Agriculture and Fisheries (MICAF). A brief summary of the staffing is presented in the table below, which shows a balanced ratio of males to females.

Table 7-1: Staffing at the NMIA Plant Quarantine Compound

STAFFING AT NMIA PLANT QUARANTINE COMPOUND	
MICAF STAFF	
1. Fumigation staff	1 fumigator and 3 assistants (All Male)
2. Cleaners and Daily Workers	1 Male, 2 Females
3. Accounting and Administration	1 Male Accountant; 1 Female Cashier, 1 Female Administrative Assistant
4. Plant Quarantine Inspectorate – M, M, M,	3 Male Inspectors, 2 Male Managers, 2 Female officers, 3 Female Inspectors, 1 Female Entomologist
TOTAL MICAF STAFF	**11 Males + 10 Female = 21 Persons**
OTHER AGENCIES ON THE COMPOUND	
5. On-site Security Outsourced	1 Female; 2 Males
6. United States Department of Agriculture	1 Female; 1 Male
7. Jamaica Customs	2 Females
8. AJAS and Airline Personnel	5 Females; 10 Males
9. AJAS and Airline Security Personnel	7 Females; 3 Males
TOTAL FROM OTHER AGENCIES	**16 Females; 16 Males**

The facility has never gone through any period of retrenchment but instead has expanded over the years. Despite the expansions, it was noted that with the planned expansion addition personnel would be required.

The property and surroundings are free from information informal settlements, not seen as a potential issue in the future.

7.2.2.2.1 Restroom facilities

A total of 11 restrooms are located on the compound, 5 for females and 6 for males. With the exception of 1 of the male restrooms, each is equipped with 3 stalls and 3 sinks.

Restroom facilities to support staff and visitors are more than adequate and in fairly good condition. Minor adjustments are needed as a leaking pipe, was observed in one restroom.

3 Some of Country of Import requirements are found on the website www.micaf.gov.jm/content/plant-quarantine-produce-inspection

7.2.3 Plans for Expansions

The Plant Quarantine would like to expand operations as several measures elaborated below were identified as needs to facilitate the growth in agricultural produce export and reduction to the risk of damaged produce as well as the risk to occupational health and safety impacts of staff and visitors.

1) Establishment of a Hot Water Treatment Area to address the fruit fly issue that impacts Mango export to Europe. Since 2015, Europe has been closed to Jamaica because of this issue;
2) Additional Space to Accommodate other Airline Handlers, such as Amerijet and Flight Connections;
3) Renovation of Fumigation Chambers to allow for temperature controlled environmental and greater safety;
4) Location of in-door, temperature-controlled goods inspection area to reduce risk to damaged produce from heat;
5) Increased capacity for goods inspection area;
6) Covering of Holding Area for produce approved and stacked for transporting to airline;
7) Reestablishment of an incinerator to destroy ceased produce that were illegally imported or infested.

The facility can accommodate an expansion and in the last lease agreement with NMIAL instead of the usual 2.5 acres, an additional 2.5 acres of adjacent lands was acquired to support this expansion. A total of 5 acres is under the lease agreement of which only 50% is in use. These are unused lands are all adjacent the airport runway and there are no issues related informal settlements as there is nothing on the property recently acquired and no houses are located in this zone.

7.3 Agricultural Export Complex – Donald Sangster International Airport Plant Quarantine Branch MICAF

7.3.1 Site and Situation

The second Agricultural Export Complex (AEC) is located at the Donald Sangster International Airport (SIA), Montego Bay, St. James. This facility is the Regional Plant Quarantine Facility for Western Jamaica and services the parishes of Westmoreland, Hanover, St. James, Trelawny and sections of St. Ann and St. Mary. Similar to the NMIA facility, the AEC facility at SIA acts as a one stop facility for exporters of agricultural produce and currently handles over 70% of Jamaica air exports. In 2018, the facility had a through put of approximately seven (7) million kilogram or eight hundred thousand (800,000) boxes of products, of which 80% was agricultural produce.

The facility which AEC operates from is owned by MBJ Airports Limited and as such AEC also operates under the conditions outlined in its concessionaire's agreement with this entity. The complex is located at the western end of the Airport property and south of the ramp and runway. Similar to the NMIA facility, the AEC facility at SIA does not pay rent to MBJ Airports Limited, instead they pay a utility fee.

AEC shares the building with AJAS Aviation Services Limited and Goddard Catering Group (GCG).

Figure 7-25: Map Showing the Location of the Agricultural Export Complex - SIA

7.3.1.1 Assessment of the Overall Structure

The facility is a concrete structure with Zinc roof consisting of a main building (office, accounts, kitchen bathrooms etc.) and a warehouse. The grounds of the facility are paved and graded to allow for efficient drainage.

Figure 7-26: AEC Facility at SIA

The main building of AEC was recently expanded and renovated in 2014. Some of the office spaces have windows which can be opened to the outdoors. The offices are primarily cooled by wall mouthed

split air conditioning units and the bathrooms are equipped with relative clean functional extractors, which vents to the outdoor.

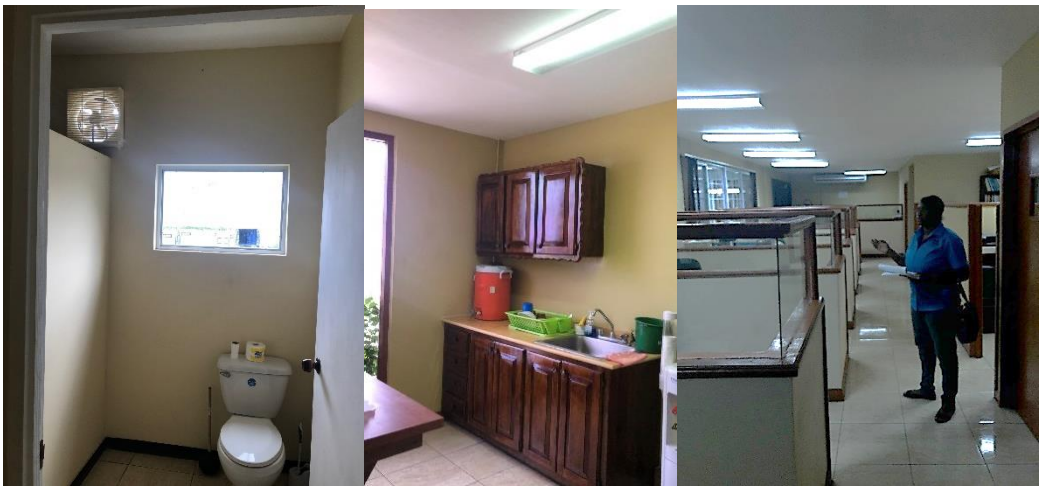

Figure 7-3: Spaces inside the Main Building

The space was relatively clutter free with no obvious signs of leaks. Cobwebs and surface dust were observed throughout the building. It was communicated to the team that the Entomologist may from time to time prepare slides or specimen for examination within the office area at her workstation. This is a risky practice since the office area is not a well ventilated nor does it have a ventilation system and as such the emitted volatile organic compounds (VOCs) can cause irritation or have more harmful impacts on persons exposed to them.

The fumigation facility, laboratory, cool and cold storages are located on separate secured complex East of the AEC main office. The fumigation facility has two buildings apart from the guard house and bathrooms at the entrance of the facility. One of the buildings is a concreted structure with a slab roof which houses the cool rooms, freezer and venting room. The second building is also concreted with a Zinc roof. This building houses an unfinished laboratory, a gas delivery room and a fumigation station.

Figure 7-4: Sign to Fumigation Facility

7.3.1.2 Utilities - Power and Water Supply

Electricity and water are currently supplied to the facility main building by the Jamaica Public Service (JPS) and National Water Commission (NWC) via MBJ Airports Limited. In cases where the national utility company's supplies are down, MBJ Airports Limited will supply the main building with water and electricity from its emergency or back up supplies.

AEC engages JPS directly for electricity for the fumigation facility. In cases where there is a disruption in the power supply, the fumigation facility has a backup generator. Water is supplied to the fumigation compound by NWC via MBJ Airports Limited.

Figure 7-27: Backup Generator for Fumigation Facility

The facility also stores two thousand (2,000) gallons of potable water in 1000-gallon plastic tanks for emergency use. One of the tanks is stored on the roof of the man building while the other is stored by the fumigation facility (Figure 7-28 below).

Figure 7-28: Potable Water Storage Tanks

The water in the storage tanks constantly circulate if the NWC supply is active, however, once this supply is off, circulation stops. The storage tanks are not cleaned on a scheduled basis.

7.3.1.3 Waste Management

Solid waste is collected in a centrally located skip which is removed from the complex daily by MBJ Airports Ltd.

Sewage and trade effluent generated by the facility is transported to and treated at the Airport's Sewage Treatment Plant which is a National Environment and Planning Agency (NEPA) approved facility. This service is facilitated by MBJ Airports Ltd.

This AEC facility does not have an incinerator of its own and currently uses MBJ Airports Ltd.'s incinerator to destroy goods and contraband deemed for this treatment. The AEC facility at SIA wants an incinerator of its own as currently the agreement in place does not meet Phytosanitary Standards and also adversely impacts the efficiency of their operations.

7.3.1.4 On-site Drainage

The yard of the facility was flooded recently due to poorly maintained drains, which runs along the eastern and southern boundaries of the property. The issue was rectified by MBJ Airports Ltd. who cleaned and widened the earthen drain which seemed effective in preventing a reoccurrence of this issue.

Figure 7-29: Drainage along Eastern and Southern Property Boundaries

Fire extinguishers were observed in the buildings, one of which was not properly secured.

A fire station is also located on the airport property.

Figure 7-30: Unsecured Fire Extinguisher

The Airport Fire Service does a regular check of the compound's facilities to ensure it adheres to their requirements. Labelled assembly points were noted on the property of the Airport which are used by the AEC staff.

Numerous bait stations were observed on the property. Some of the bait stations were damaged

Figure 7-31: Damaged Bait Station on Property

The bait stations are checked every two weeks by Target Pest Management Company. The facility grounds and buildings are also sprayed quarterly for pests as well as on an as-needed basis identified during the two weekly checks.

AEC is audited every two years by MICAF, monthly by the Public Health Department of the Ministry of Health and Wellness (MOHW) and more frequently by the Security and Safety team of MBJ, the United States Department of Agricultural (USDA), Transportation Security Administration (US) and the Jamaica Civil Aviation Authority (JCAA) . The reports from these audits are submitted to AEC for review and action.

7.3.2 Description of Operations

AEC facilitates the inspection and certification of agricultural produce. Staff members of AJAS Aviation Services MICAF Plant Quarantine and Airline and Security Personnel are the only persons with access to the Warehouse facility. Due to its location and function, security is a critical component of the AEC operations. As such, a camera system and guards are on the property to ensure full compliance with the relevant security protocols. Security guards on the compound are provided by the airport security (MBJ), private security (MICAF) and from the respective airlines.

The Manager of the facility indicated that there have been breaches in protocol with respect to the contractor used for the compound's security. The security contractors are employed through MICAF and the request is made for personnel certified by the Jamaica Civil Aviation Authority (JCAA) to work on the airport, they have received uncertified personnel which had to be sent back. It's therefore

important for the Manager to monitor the contractors used to provide this service to prevent a breach of its concessionaire's agreement, by ensuring persons sent to work at AEC are certified by JCAA.

The procedures which govern the facility are generally the same as the NMIA facility with the exceptions outlined below.

All goods for processing at the facility first enter the warehouse via an X-Ray machine.

Figure 7-32 Goods passing through X-Ray machine

A sample of the goods is then sent for inspection within the same place. If fumigation is required, the goods are transported to the fumigation facility.

As mentioned above in Section 7.3.1.1, the fumigation facility is separate from the Main Building where inspection is done. Persons entering the fumigation facility must first pass through a security check point. Once fumigation is being done, access is restricted close to the fumigation station.

Figure 7-33: Signs by Fumigation Station

Fumigation is done under thick tarpaulins located in a well-ventilated area. The spraying chambers are of two sizes (a large expandable chamber and a smaller one) to allow for better control of the volume of gas used.

Figure 7-34: Fumigation Chambers

Once fumigation is completed, the fumigator enters the space in protected gears equipped with an active monitor to measure the levels of Bromomethane. The Bromomethane is injected under the tarpaulin from a room at the rear of the building. The cylinder with the gas is not secured to a stationary object.

Figure 7-35: Gas Delivery Room (left) Unsecured gas cylinder (right)

The empty gas cylinders are normally removed from the room and temporary stored in a secure area before being transported to the Kingston where they are shipped back to the supplier.

Figure 7-36: Empty Gas Cylinder Storage Area (left); Venting room (right)

After fumigation and once the levels of Bromomethane have sufficiently decreased, the produce is removed to a venting room to allow for the residual levels of the chemicals to deplete.

After fumigation the goods continue with the inspection and certification process.

AEC also processes live and frozen foods at SIA. The inspection of live animals is very time sensitive and environmental conditions such as high temperatures will affect the mortality of the organisms. The inspection warehouse only has fans to assist with the cooling of the space and the roof of the warehouse is Zinc. The temperature within this space especially on sunny days is very high which can significantly affect quality of goods being inspected.

The facility's cold storage is primarily used to hold air shipments which have been certified from the previous day and is due for export the following morning.

AJAS is the only cargo handler on the facility with AEC that handles agricultural produce.

A very wide range of produce are processed for export at the facility some of these include the following:

- Yam
- Pepper
- Thyme
- Breadfruit
- Pumpkin
- Turmeric
- Callaloo
- Avocados
- Dasheen

7.3.2.1 Testing

Currently, exporters are not required to provide evidence that their produce are tested for pesticide residue, microbial content and/or heavy metal prior to shipment or release to the local markets. It is taken for granted that the exporters follow the Country of Import requirements (some of which are also found on the website: www.micaf.gov.jm/content/plant-quarantine-produce-inspection). It should be noted however that the importing countries can test and has tested produce imported into their countries for pesticide residue. Those imports which have failed the test are returned to Jamaica.

Consultations with the Manager of the complex indicated that the testing requirements locally are not mandatory because of the lack of government facilities to conduct such testing and lengthy turnaround times to receive the results.

7.3.2.2 Labour and Staffing

The AEC at SIA has 17 members of staff who are employed directly by MICAF and 2 USDA Officers. A brief summary of the staffing is presented in the table below, which shows a balanced ratio of males to females.

Table 7-2: Staffing at AEC-SIA

STAFFING AT SIA PLANT QUARANTINE COMPOUND	
MICAF STAFF	
1. Complex Manager	1 male
2. Administrator	1 female
3. Cashier	1 female
4. Forklift Operators/ Fumigator Assistants	3 males
5. Plant Quarantine/ Produce Inspectors	2 males; 5 females
6. Fumigator	1 male
7. Entomologist	1 female
8. Office Attendants	2 females
USDA STAFF	
9. USDA Officers	1 male; 1 female
TOTAL MICAF AND USDA STAFF	**8 Males + 11 Females = 19 Persons**

The following are other entities who share the compound whose staffing were not examined under the scope of this project.

- On-site Security Outsourced
- Jamaica Customs Personnel
- AJAS and Airline Personnel
- AJAS and Airline Security Personnel
- SIA Airport Security
- Goddard Catering Personnel

This AEC facility has never gone through any period of retrenchment but instead has grown significantly since the facility was opened in the 1990s.

All good for export go through the AJAS warehouse and all goods for exporting are inspecting and processing in the same space. The space is small for the level of traffic that occurs on a daily basis in the facility. Whilst there is an appointment system, everyone usually gets the same time (See Appendix V). There are only seven Plant Quarantine Inspectors one of which is always based in Ocho Rios. Another is based at the Sea Port and another at the Cruise Ship Pier. This leaves four Inspectors to handle all the goods passing through the facility, which is woefully inadequate. Consultations revealed that on heavy days Inspectors are removed from their posts at the Cruise Ship Pier and the Sea Port to assist in the Inspection of goods and the Entomologist doubles up on her role to act as an Inspector so as to prevent the goods from missing the scheduled flights.

7.3.2.2.1 Restroom Facilities

There are two main staff restrooms, one male and one female. Each restroom has two staffs and are in good conditions. There is also a single male and a single female restroom located on the fumigation facility, both of which are in good condition.

The complex is supported by public restrooms adjacent the AJAS warehouse, one male and one female. Each has three stalls each and are in good condition.

These restroom facilities were considered adequate to support the workers and visitors on the compound.

7.3.3 Plans for Expansion

Discussions have been held with MBJ Airports Limited and land has been earmarked and agreed upon.

The property and surroundings are free from informal settlements and this is not seen as a potential issue in the future.

8 Relevant Policy, Legislation and Regulations and Key Institutions

In Jamaica, there are fifty-two (52) statutes that have direct or indirect jurisdiction over matters of the environment. These range from public health to physical planning and land use with many instances of overlapping responsibilities among Ministries. The enactment of the Natural Resources Conservation Authority Act of 1991 (NRCA Act) began the process of rationalisation and prioritisation of these statutes. This Act binds the Crown as well as the people; therefore, enforcement can be applied to public sector entities as well as to private citizens.

The following legislation, policies and plans were deemed most relevant to the development and operation of Agro Parks in Jamaica. The aim of these developments is to facilitate import substitution, enhance the agricultural supply chain, deepen industrial linkages, and increase food security in alignment with the goals and outcomes set forth in Jamaica's National Development Plan – Vision 2030.

8.1 Policies and Plans

Table 8.1 presents several policies and plans relevant to the Sector Programme.

Table 8.1: Relevant Policies and Plans

Policy/Plan	Relevance to the Project
National Development Plan – Vision 2030	Jamaica's long-term National Development Plan which aims to put the country in a position to achieve developed country status by 2030 It is based on a comprehensive vision – "Jamaica, the place of choice to live, work, raise families, and do business" – • Outcome # 12 – Internationally Competitive Industry Structures • Outcome # 13 – Sustainable Management and Use of Environmental and Natural Resources • Outcome # 15 – Sustainable Urban and Rural Development • Agricultural Sector Plan
National Land Policy, 1996	The goals and objectives of this Policy are to ensure the sustainable, productive, and equitable development, use and management of the country's natural resources.
National Food Safety Policy, 2013	To advance the national food safety and security systems in Jamaica based on the implementation of national and international standards aimed at safeguarding human, animal, plant and environmental health and the facilitation of trade through the application of science-based principles
National Plant Health Policy, 2011	To establish a coordinated, sustainable and international compliant plant health system that enhances Jamaica's plant health status, thus fostering consumer, plant and environmental health and food security
National Seed Policy and Action Plan, 2016 – 2025	To establish a sustainable seed system that ensures a consistent and reliable supply of clean, affordable and accessible seed in support of agricultural production, productivity, food security and biodiversity
Agricultural Land Utilisation Policy	This policy has been developed in response to the national imperative to guide proper administration and management of land for sustainable use that will foster agricultural growth, encourage opportunities for investment and income generation, satisfy the demand for lands for agricultural production, regenerate livelihoods for farming communities, and promote overall economic development of the country. *The Policy was approved by way of Cabinet Decision No. 25/11 dated 13 June 2011 pending adjustments that are now being addressed.*

8.2 Legislation and Regulations

Table 8.2 outlines several legislations and regulations relevant to the Modernisation of the Agriculture Sector Programme.

Table 8.2 Relevant Legislation and Regulations

Legislation and Regulations	Relevance to Project
Agro Investment Corporation Act (AIC) Act 2009	This Act establishes the Agro Investment Corporation as the body responsible for agricultural development across Jamaica. AIC is mandated to stimulate, facilitate and undertake the development of agriculture in Jamaica.

Legislation and Regulations	Relevance to Project
	This responsibility of the development of the Agro Parks is therefore part of their responsibility since this is a key avenue currently being used by the Government of Jamaica through MICAF to develop agriculture.
The Natural Resources Conservation Authority Act, 1991	Responsible for environmental management; governs all pollution activities within Jamaica; and the EIA regulatory framework (where this is applicable) is governed by the NRCA Act NRCA's powers and responsibilities include, among others: • Establishing and enforcing pollution control and waste management standards and regulations; • Monitoring and enforcing environmental laws and regulations, especially those included in the NRCA, Beach Control, Watershed Protection, and Wildlife Protection Acts.
The Natural Resources Conservation (Permits and Licences) (Amendment) Regulations, 2015	These regulations, developed in 2013 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.
The Natural Resources Conservation (Wastewater and Sludge) Regulations, 2013	Jamaica has prepared and enacted regulations governing the quality of the effluent discharged from facilities to public sewers and surface water systems. The regulation requires that the facility meet the outlined trade effluent and sewage quality standards set by the NRCA. The requisite permits and licences are required for the installation and operation of sewage treatment facilities and wastewater treatment systems.
The National Solid Waste Management Act, 2001	This Act provides for the regulation and management of solid waste. It establishes the National Solid Waste Management Authority (NSWMA) for matters connected therewith or incidental thereto.
The Disaster Risk Management Act, 2015	The Disaster Preparedness and Emergency Act established the Office of Disaster Preparedness and Emergency Management (ODPEM) which is responsible for carrying out the provisions of the Act.
The Wildlife Protection Act, 1945 (Amendment 2001)	Section 6 of the Wild Life Protection Act (1945) states that "No person shall hunt any protected animal or protected bird. Every person who contravenes the provisions of subsection (1) shall be guilty of an offence against this Act"."
The Forest Act, 1996	This Act addresses the sustainable management of forests on lands in the possession of the Crown and vests management responsibility in the Conservator of Forests.
The Town and Country Planning Act, 1958	This Act regulates land-based developments and also establishes area-specific standards for land use, density and zoning. Section 5 of the Town and Country Planning Act authorises the Town and Country Planning Authority to prepare, after consultation with

Legislation and Regulations	Relevance to Project
	any local authority, the provisional development orders required for any land in the urban or rural areas, to control the development of land in the prescribed area. Relevant Development Orders for: • St. Thomas • Clarendon • St. Elizabeth • Manchester
The 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.
The Watersheds Protection Act, 1963	This Act provides for the protection of watersheds, to include areas adjoining watersheds, and the conservation of water resources for Jamaica.
The Public Health Act, 1976	This Act establishes the Central Health Committee with the local bodies being resident under the Parish Council of the respective parishes. The Public Health (air, soil and water pollution) Regulations (1976) aim at controlling, reducing, removing or preventing air, soil and water pollution in all possible forms.
The Food Storage and Prevention of Infestation Act, 1958 (Amendment 1973)	This Act makes provision for the storage of food and for the prevention of loss of food by infestation, and for related purposes. The development of the AMC Complex as a main quarantine facility for produce export must supersede the requirements of this Act.
The Pesticides Act, 1975 and Regulations, 1996, 1999, and 2004	The Act and its Regulations control the registration, importation, storage, retailing and manufacturing of pesticide formulations. The Act also establishes the Pesticides Control Authority which has responsibility for registering pesticides; licensing persons to import or manufacture registered pesticides; authorising persons to sell restricted pesticides; registering premises in which a restricted pesticide may be sold; and licensing pest control.
The Plants Quarantine Act, 1994 and Regulations, 1999, and 2005)	This Act and its Regulations make provision for the effective control of the importation of plants, plant products and articles which pose a threat of introduction to Jamaica, any injurious plant pest, as well as the course of action to be taken when these are discovered within the island. The Act contains two regulations, namely, the Plants (Importation) Control (Amendment) Regulations, 2005, and the Citrus Plant (Certification) Regulation (1999).
The Protection of Plant Genetic Resources for Food and Agriculture Act, 2013	This Act facilitates Jamaica's compliance with its obligations under the International Treaty on Plant Genetic Resources for Food and Agriculture (PGRFA). The Act permits for access to any listed plant genetic resource for utilisation or conservation for the purpose of research, breeding, or training for food and agriculture.
The Agriculture Produce Act, 1926	An Act to consolidate and amend the laws relating to agricultural produce

8.2.1 Summary – Relevance to Development and Operation of Agro Parks and a Quarantine Facility for Goods Export

The Table below presents a summary of the relevant legislation and regulations within the context of the development and operation of Agro Parks and a quarantine facility for goods exported from Jamaica, based on the information outlined in the previous section. The categories presented are not exhaustive, however, represent core commonalities across Agro Parks.

Table 8.3 Relevant Legislation and Regulations for the Development and Operation of Agro Parks and a Quarantine Facility for Goods exported from Jamaica

LEGISLATION AND REGULATIONS	Land Purchase/ Lease	Land Zoning/ Development	Building Construction	Well Construction	Vegetation Clearance	Farming/ Food Storage/ Packaging	Irrigation	Wastewater Management	Solid Waste Management	Seed Importation	Hazardous Chemical Storage	Worker Health and Safety
Natural Resources Conservation Authority Act, 1991				■	■			■	■		■	
The Natural Resources Conservation (Permits and Licences) (Amendment) Regulations, 2015				■				■	■		■	
The Natural Resources Conservation (Wastewater and Sludge) Regulations, 2013								■				
The National Solid Waste Management Act, 2001			■						■		■	
The Disaster Risk Management Act, 2015												■
The Wildlife Protection Act, 1945			■		■							

LEGISLATION AND REGULATIONS	Land Purchase/ Lease	Land Zoning/ Development	Building Construction	Well Construction	Vegetation Clearance	Farming/ Food Storage/ Packaging	Irrigation	Wastewater Management	Solid Waste Management	Seed Importation	Hazardous Chemical Storage	Worker Health and Safety
The Forest Act, 1996												
The Town and Country Planning Act, 1958												
The Water Resources Act, 1996												
The Watersheds Protection Act, 1963												
The Public Health Act, (976												
The Food Storage and Prevention of Infestation Act, 1958 Amendment (1973)												
The Pesticides Act, 1975 and Regulations, 1996, 1999, and 2004												
The Plants Quarantine Act, 1994 and Regulations, 1999 and 2005												
The Protection of Plant Genetic Resources for Food and Agriculture Act, 2013												

LEGISLATION AND REGULATIONS	**Land Purchase/ Lease**	**Land Zoning/ Development**	**Building Construction**	**Well Construction**	**Vegetation Clearance**	**Farming/ Food Storage/ Packaging**	**Irrigation**	**Wastewater Management**	**Solid Waste Management**	**Seed Importation**	**Hazardous Chemical Storage**	**Worker Health and Safety**
The Agriculture Produce Act, 1926												

8.3 International Treaties and Protocols

- **International Treaty on Plant Genetic Resources for Food and Agriculture** – The objectives of this Treaty are the conservation and sustainable use of plant genetic resources for food and agriculture and the fair and equitable sharing of the benefits arising out of their use, in harmony with the Convention on Biological Diversity, for sustainable agriculture and food security.
- **Convention on Biological Diversity** – The Convention on Biological Diversity (CBD), adopted in 1992, is the foremost international convention obliging its contracting parties to take action on invasive alien species.
- **Cartagena Protocol on Biodiversity** – The Cartagena Protocol on Biosafety to the Convention on Biological Diversity is an international treaty governing the movements, from one country to another, of living modified organisms (LMOs) resulting from modern biotechnology.
- **The 2030 Agenda** – The 2030 Agenda is a Global Pact unanimously agreed to by the 193 Member States of the United Nations to take bold and transformative steps to shift the world on to a sustainable and resilient path, while leaving no one behind. The 17 Sustainable Development Goals (SDGs) and 169 targets of this Agenda, which is the successor to the Millennium Development Goals (MDGs), build on existing global agreements.
- **Global Good Agricultural Practices** – Good agricultural practices are "practices that address environmental, economic and social sustainability for on-farm processes, and result in safe and quality food and non-food agricultural products". Good agricultural practices (GAP), codes, standards, and regulations are guidelines which have been developed in recent years by the food industry, producers' organizations, governments and NGOs, aiming to codify agricultural practices at the farm level for a range of commodities.

8.4 Relevant IDB Safeguards and Operational Policies (OP)

8.4.1 OP–703 Environmental and Safeguards Compliance

This Policy consists of a set of directives that will guide the Bank's work towards environmental sustainability through mainstreaming environmental considerations into social and economic development objectives. It commits the Bank to safeguard the environmental quality of all operations and to introduce socially and environmentally responsible practices in its own facilities.

The Policy has two sets of directives

- Environmental Mainstreaming
- Safeguarding Directives

Projects are classified in categories (A, B and C); this Project is classified as Category "B", meaning that operations are likely to cause mostly local and short-term negative environmental and associated social impacts and for which effective mitigation measures are readily available. Section B.6 of the Policy requires that as part of the overall preparation design process, an environmental and social analysis should be undertaken, according to and focusing on specific issues identified in the screening process. Another important stipulation/requirement of the Bank, and espoused by Section B.6, is the need to conduct consultations with the affected parties and stakeholders and to take their views into consideration. Category B projects require at least one round of public consultation.

Sections B.10 and B.11 state that Bank-financed operations should avoid adverse impacts to the environment and human health and safety, particularly as it relates to hazardous substances and pollution

prevention. Relevant measures should be undertaken as may be appropriate to prevent and reduce impacts. Several of Jamaica's laws and policies address the issues relevant to this policy, namely, the Natural Resources Conservation Authority Act, 1991.

Table 8.4 outlines the other relevant IDB operational policies and the Jamaican legislation/ policies that address these policies.

Table 8.4 Summary of the IDB's Operation Policies and the relevant Jamaican Legislation/Policies

IDB Operation Policy	**Summary**	**Jamaican Legislation/Policy**
OP-761– Gender Equality in Development	This policy seeks to strengthen the Bank's response to the goals and commitments of its member countries in Latin America and the Caribbean to promote gender equality and the empowerment of women. In order to achieve this objective, the Policy on Gender Equality integrates a gender perspective that seeks equal conditions and opportunities for women and men to attain their social, economic, political, and cultural potential.	National Policy for Gender Equality in Jamaica, 2011 The Vision 2030 Jamaica National Development Plan
OP-102– Access to Information	Through the implementation of this policy the Bank seeks to demonstrate its transparent use of public funds, and by deepening its engagement with stakeholders, to improve the quality of its operations, knowledge and capacity building activities. It supports the conduct of public consultations to ensure that public access to pertinent project information is not withheld from the stakeholders.	The Access to Information Act, 2002 *No legislation exists for stakeholder consultations. It is only a requirement under the EIA process of the National Environment and Planning Agency.*
OP- 704– Disaster Risk Management	This policy provides two lines of action addressing: (i) the prevention and mitigation of disasters that occur as a result of natural hazards, through programming and proactive project work at regional, national and local levels; and (ii) post-disaster response to the impacts of natural hazard events, and physical damage (such as structural collapse and explosions) resulting from technological accidents or other types of disasters resulting from human activity.	Disaster Risk Management Act, 2015

IDB Operation Policy	Summary	Jamaican Legislation/Policy
*IDB – Agriculture and Natural Resources Management Sector Framework Document	The main challenges in the region and problems that the bank wishes to address in the sector include: • Agricultural productivity lagging behind its potential • Natural resource utilisation facing sustainability challenges due to weaknesses in governance and the incorrect use of management tools • Agriculture and natural resources are highly vulnerable, in particular to the impact of climate change, natural disasters, and yield and price volatility • Agricultural growth not benefitting rural populations equally in Latin America and the Caribbean	Protection of Plant Genetic Resources for Food and Agriculture Act, 2013 The Agriculture Produce Act, 1926 Draft Agricultural Land Utilization Policy *Dated Agriculture Produce Act.* Draft *Agricultural Land Utilization Policy to be made operational through the development of an Action Plan*

**Not an Operational Policy, but very relevant to developing and implementing MASP*

8.4.1.1 Gaps

One gap that exists between the Jamaican legislation/policies and the IDB Operational Policies relates to stakeholder consultation. Stakeholder consultation is a requirement in the EIA process for the National Environment and Planning Agency (NEPA). However, outside of this, there are no other specific requirements for consultations when a project is being undertaken. Nonetheless, stakeholder consultations are considered a key success factor for development projects and have therefore been utilised for this consultancy as further elaborated in the sections below.

Another is the dated Agriculture Produce Act (1926) and the need for the newly developed Agricultural Land Utilization Policy to be made operational through the development of an Action Plan.

8.5 Key Institutions

8.5.1 Ministry of Industry, Commerce, Agriculture and Fisheries (MICAF)

The Ministry of Industry, Commerce, Agriculture and Fisheries (MICAF) has been charged with the responsibility of driving the integration of the production of primary agricultural produce along all the stages of the supply chain through to value added and facilitating full commercialisation of outputs of the agriculture, manufacturing, and service sectors. The agencies that fall under MICAF are:

- Department of Co-operatives and Friendly Societies (DCFS)
- Micro Investment Development Agency Limited (MIDA)
- Jamaica Promotions Corporation (JAMPRO)
- Jamaica National Agency for Accreditation (JANAAC)
- Jamaica Intellectual Property Office (JIPO)
- Jamaica Business Development Corporation (JBDC)
- Fair Trading Commission (FTC)

- Consumer Affairs Commission (CAC)
- Companies Office of Jamaica
- Bureau of Standards Jamaica (BSJ)
- Anti-Dumping and Subsidies Commission (ADSC)
- Cannabis Licensing Authority (CLA)
- Food Storage and Prevention of Infestation Division (FSPID)
- Hazardous Substances Regulatory Authority (HSRA)
- Jamaica 4-H Clubs
- Jamaica Agricultural Society (JAS)
- Jamaica Dairy Development Board (JDDB)
- National Compliance and Regulatory Authority (NCRA)
- National Export-Import Bank of Jamaica (EXIM)
- Office of the Government Trustee
- Rural Agricultural Development Authority (RADA)
- Sugar Company of Jamaica Holdings Limited (SCJH)
- Sugar Industry Authority (SIA)
- The Banana Board
- Trade Board Limited

The Ministry has a stated vision that by 2030, Jamaica will have an innovative, inclusive, sustainable and internationally competitive agricultural industry. To achieve this, some of the Ministry's expected outcomes include:

- Increased contribution of local agricultural industry to the country's GDP
- A high standard of quality on agricultural products and services
- Reduced improper usage of agricultural lands in Jamaica
- Reduction in praedial larceny, theft from agriculture and other agriculture-related issues.

Within MICAF, the Technical Services Directorate responsible for directing and coordinating technical activities has a mission to transform and modernise the agricultural sector. The Directorate makes recommendations for the adoption of policies, strategies, goals and plans that promote research and development programmes; agricultural health and food safety, trade facilitation, as well as conservation of biodiversity are central to the Directorate's activities.

8.5.1.1 Agro Investment Corporation

Agro-Investment Corporation (Agro-Invest or AIC) is an agricultural investment facilitation entity arising from the closure of Agricultural Support Services Productive Projects (ASSP) and the need for a revitalisation of the Agricultural Development Corporation (ADC). On June 1, 2009, a name change from The Agricultural Development Corporation Act to the Agro-Investment Corporation Act was passed, and this led to the creation of Agro-Invest. The entity is the agri-business facilitation arm of the Government of Jamaica's Ministry of Industry, Commerce, Agriculture and Fisheries responsible for stimulating, facilitating and developing agriculture. It focuses on agricultural investment promotion and facilitation, project development, and market development.

The products they offer range from Agro Park and agricultural land leases to processing facilities, cold storage, warehousing and logistical support to new and existing agro-producers. One of the functions of

Agro-Invest is to identify possibilities for the development and expansion of agri-business industries and sub-sectors. They have since identified a need for further strategic development of the following industries: hot pepper, honey, pineapple (and other fruits), castor bean, breadfruit, mango, papaya, West Indian Sea Island Cotton, cassava, sweet potato, small ruminants (sheep & goats) and cattle.

To date, the Agro-Invest has created several market linkages for farmers on the various Agro Parks. These are listed in Table 8.5 below.

Table 8.5: Creation of Market Linkages

No.	Contract	Crop(s)
1.	Ashman Producers	Pepper
2.	Tijule	Pepper, Cassava, Escallion and Sorrel
3.	Spur Tree	Pepper
4.	Grace	Pepper
5.	Sankard	Pumpkin
6.	Carleston	Cassava
7.	Red Stripe	Cassava
8.	Imagination Farms	Sorrel
9.	Shoppers Fair	Pumpkin and Pepper
10.	Trout Hall	Dasheen
11	J&F Import and Export	Dasheen

8.5.1.2 National Irrigation Commission

The National Irrigation Commission (NIC) is the executive agency within the Ministry of Industry, Commerce, Agriculture and Fisheries (MICAF) responsible for managing, operating, maintaining and expanding existing (and future) irrigation schemes and systems established by the Government of Jamaica or the private sector. A key function of the NIC is to manage its water resources as efficiently and effectively as possible, especially as droughts are becoming more common and prolonged. Furthermore, Vision 2030 Jamaica requires agriculture and other key sectors to develop capacity in hazard risk reduction and adaptation to climate change (Outcome 14). One response of the NIC has been to strengthen On-Farm Water Management Units (OFWMUs) at 10 irrigation schemes (Figure 8.1). The OFWMUs are designed to plan, direct and implement on-farm water management and drainage techniques and optimise scarce water resources through the introduction of new water saving techniques, technologies and training. Drip and sprinkler irrigation, the introduction of drought-resistant crops, mulching of soils to retain moisture, catchment ponds and the application of fertigation are examples of these new techniques and technologies that have been established through the OFWMUs.

Table 8.6: Infrastructure managed by NIC (Source: State of the Jamaican Climate, 2012)

Name of Irrigation Scheme	Pump Stations	Wells	Canals	Pipes (km.)
Rio Cobre	18	22	26	31.01
St. Dorothy	8	7	28	-
Yallahs	3	3	-	15.21
Mid Clarendon	32	32	153	36.10
Duff House/New Forest	2	4	-	26.00
Hounslow	5	5	-	41.40
Beacon Little Park	3	3	-	27.83
Seven Rivers	-	-	-	2.96
Colbeck	1	1	-	5.13
Braco	1	-	-	8.60
Total	**73**	**77**	**207**	**194.24**

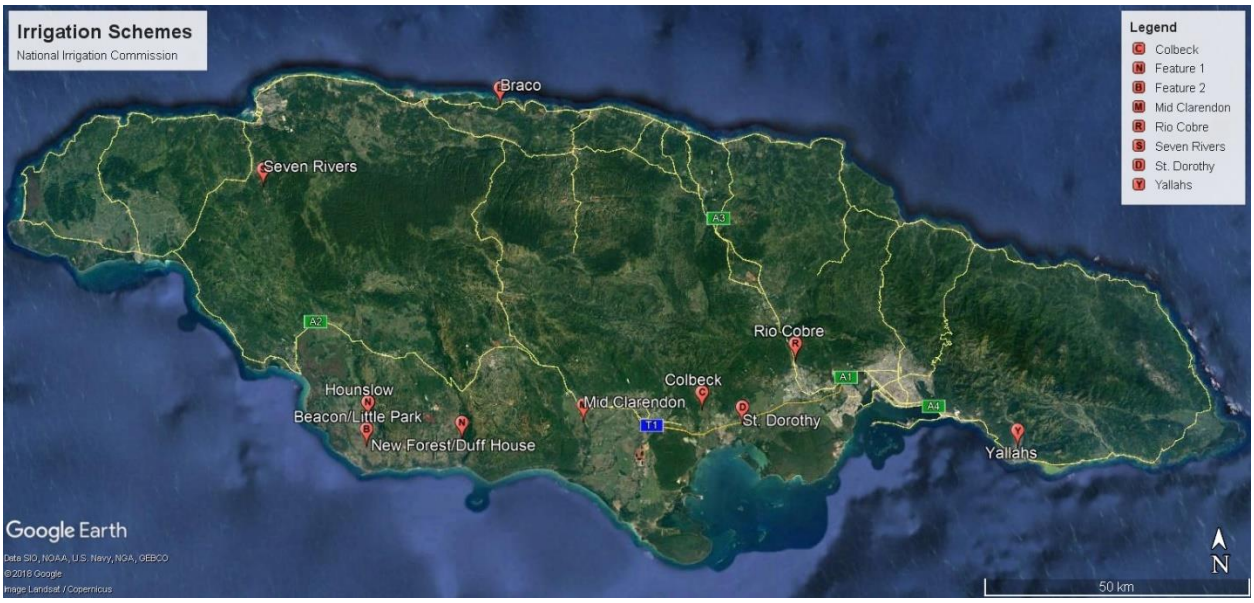

Figure 8.1: Location of NIC's Irrigation Schemes

8.5.1.3 Capacity Challenges

Stakeholder consultants revealed that despite the hand-over of the Agro Parks to the AIC for long-term management, funding has been a major challenge. Once a programme is complete the activities within the Agro Parks are significantly reduced. For example, during a funded programme, there is a schedule for training at regular intervals. The programme is able to fund training on good agricultural practices in relation to pest, disease, crop production and management via the setting up of tents on the Agro Parks for farmer field school training and tapping into resources from the Scientific Research Council (SRC), the UWI, the HEART Academy Ebony Park and Fersan, a private sector company.

Once the programme ends, training is only held upon request and the requests are very few. A major challenge is that while the AIC pays Agro Park Managers, farmers rely on the RADA extension officers for

training and they are overstretched. Currently, there is 1 extension office to 2,500 farmers and this is a major limiting factor.

In addition, any improvement required in the Agro Park cannot be addressed as funds are unavailable. It was noted that land is leased for J$10,000 per acre within the Agro Parks, but this is not a significant sum of money to maintain operations. For example, machinery and cold storage have been identified as needs for the Agro Parks, but these remain unaddressed.

8.5.2 Water Resources Authority

The Water Resources Authority (WRA), established by the Water Resources Act (1995), is the statutory body of the Government of Jamaica (GoJ) responsible for regulating the abstraction and use of Jamaica's water resources. Their stated mission is . . . "*To ensure sustainability of Jamaica's water resources through continual assessment and proper management, promotion of conservation and protection, and optimal development of these resources. To ensure rational and equitable allocation of the nation's water resources and to reduce conflicts among water users"*.

The Act stipulates the functions of the WRA including, *inter alia,* all licencing for the abstraction of surface and underground water; environmental monitoring and impact assessments; and water resource inventory, forecasting and planning (including for domestic, irrigation, industrial and tourism sectors). The Agency's main activities comprise hydrological data collection and analysis; and monitoring the quantity and quality of Jamaica's fresh water supply from 10 main hydrological basins, within which there are 26 Watershed Management Units (WMUs). The Agency currently operates within the portfolio of the Ministry of Economic Growth and Job Creation (MEGJC). Any drilling of wells and extraction of water from wells need to be authorised by the WRA.

8.5.3 National Environment and Planning Agency

The NEPA is the main government agency with the primary responsibility of managing the environment. Their mission *is . . . "To promote sustainable development by ensuring protection of the environment and orderly development in Jamaica through highly motivated staff performing at the highest standard"*. It was founded to carry out the technical (functional) and administrative mandate of three statutory bodies: *"the Natural Resources & Conservation, Authority (NRCA), the Town & Country Planning Authority (TCPA), and the Land Development & Utilisation Commission (LDUC)"*. Hence, NEPA's role and responsibilities cover the following areas:

- Conservation and Protection (Natural Resources Management);
- Environmental Management;
- Spatial Planning;
- Compliance and Enforcement;
- Applications Management;
- Public Education;
- Policy and Research;
- Legal Services and Standards Management (NEPA, 2014).

The Agency is responsible for managing all aspects of the Permits and Licences Regulations (P&L). P&L is the mechanism to ensure that all Jamaican facilities (developments), within the prescribed categories, meet required standards, including Environmental Impact Assessment (EIA) where appropriate, in order to minimise negative environmental effects. The NEPA's roles include receiving and screening permit applications for environmental issues (including natural hazards), determining if an EIA will be required and, if it is, managing the process including consultation with government and other stakeholders. Section

9 of the NRCA Act requires the Authority to consult "any agency or department of Government exercising functions in connection with the environment".

The NEPA operates under the following Acts:

- Executive Agencies Act
- The Natural Resources Conservation Authority Act, 1991
- The Town and Country Planning Act, 1958
- The Land Development and Utilization Act, 1966
- The Beach Control Act, 1956
- The Watersheds Protection Act, 1963
- The Wild Life Protection Act, 1945
- Endangered Species (Protection, Conservation and Regulation of Trade) Act, 2000.

9 Potential Programme Impacts and Recommended Mitigation Measures

This section presents the overall impact assessment and recommended mitigation measures to guide the development and implementation of the MASP. Given the commonalities among the Agro Parks, the impacts and mitigation measures associated with the Agro Parks and the AMC complex within the context of MASP are presented in a single table – Table 9.1 – so as to focus on key issues and minimise repetition.

Table 9.1:Impacts, Proposed Mitigation Measures, Management Plans and Responsible Party for the Activities of the Modernisation of the Agriculture Sector Programme

RISKS	POTENTIAL IMPACTS	PROPOSED MITIGATION MEASURES	MANAGEMENT PLANS REQUIRED	MONITORING FREQUENCY	RESPONSIBLE PARTY
Physical					
Soil degradation and siltation of waterways	Loss of productive soil Reduced capacity of drainage ways	Reforestation of degraded slopes • Installation of check dams and other siltation control measures	Environmental and Social Management Plan Erosion Control and Forest Restoration Plan	Quarterly and immediately following flood events	MICAF for establishing Drainage Works Agro Park Manager for monitoring and implementing management plan
Flooding	Loss of crops and farm equipment Damage and disruption of farm and supporting infrastructure Disruption of social infrastructure	Effect mechanisms to minimise the lateral spread of floodwaters and reduce the time it takes for flood waters to recede Place berms/gabion baskets alongside river banks in floodways Retain existing riparian vegetation and replace as feasible Design on-site stormwater drainage systems to handle in excess of 25-year return period	Environmental and Social Management Plan Early Warning System for flood risk	Rainy season Monitor weather forecast at national and regional levels	MICAF for establishing Drainage and Flood Control/Management Works

RISKS	POTENTIAL IMPACTS	PROPOSED MITIGATION MEASURES	MANAGEMENT PLANS REQUIRED	MONITORING FREQUENCY	RESPONSIBLE PARTY
Agricultural Runoff	Contamination of surface and groundwater with nutrients and potassium from fertilizer as well as pesticides	Periodic monitoring of water quality along with visual inspection of any receiving water bodies Implementing of pesticide and fertiliser management protocols (This is especially critical in the rainy season when surface runoff is a lot more likely.)	Environmental and Social Management Plan (Water Quality)	Monthly and/or as stipulated in Environmental Permit	Agro Park Manager NEPA, WRA Agro Park Manager and Agro Investment Corporation
Improperly treated wastewater	Contamination of groundwater and surface water Public Health Issues	Ensure sewage treatment systems are designed to fit purpose and meet the requirements of the regulatory agency Ensure conveyor systems for sewage and trade effluent are intact and there are no leakages	Environmental and Social Management Plan (Waste Management)	Twice monthly or as stipulated by environmental permit	Agro Park Manager
Over-extraction of groundwater from wells	Saline intrusion	Monitor groundwater level and quality periodically	Environmental and Social Management Plan (Water Quality)	Monthly or as stipulated by abstraction licence	Agro Park Manager, WRA

RISKS	POTENTIAL IMPACTS	PROPOSED MITIGATION MEASURES	MANAGEMENT PLANS REQUIRED	MONITORING FREQUENCY	RESPONSIBLE PARTY
Environmental and public health issues related to hearing or respiratory illnesses of farm workers and nearby residents	With the introduction of heavy machinery into the daily operations of the Agro Parks, noise and particulate matter levels may increase above favourable levels and result in environmental and public health issues.	Conduct baseline studies to establish monitoring guidelines and conduct an on-site assessment during operations to confirm long-term needs for monitoring particulate matter and noise	Not currently applicable, but may be required as the Agro Park is developed based on case by case evaluation	Depends on outcome of evaluation or NEPA permit	If required Site/Park Manager or Environmental Officer, NEPA
Hazardous Spills	The mechanisation of any of the facilities may require the storage of petroleum products to support the activity. Should this be done negative environmental impacts, e.g., soil contamination, spills into nearby waterways, could result.	Develop and implement Hazardous Material Storage and Handling (inclusive of disposal) Protocols	Environmental and Social Management Plan (Waste Management)	Weekly (more frequently depending on activities)	Agro Park Manger and Maintenance Manager
Ecological					
Disturbance of Natural Ecological Balance (Nutrient Cycling, Pollination, etc.)	The removal of natural vegetation cover for agriculture or other uses can compromise the ecological function of the area. Reduction in biodiversity can disrupt ecological processes like nutrient cycling and pollination. This reduces habitat foraging areas and	Currently, within the Agro Parks, non-arable land, neighbouring hillsides and a few other undeveloped lands still serve to maintain the biodiversity and provide ecological services in the immediate areas. It is recommended that all hillsides, all non-arable land	Not Applicable	Not Applicable	MICAF to Use Mitigation Measure as a Guide in developing MASP

RISKS	POTENTIAL IMPACTS	PROPOSED MITIGATION MEASURES	MANAGEMENT PLANS REQUIRED	MONITORING FREQUENCY	RESPONSIBLE PARTY
	natural pest and nutrient balance resulting in the need for farmers to use pesticides and fertilizers to make up for the imbalance.	and some of the other areas under natural vegetation should remain in their natural state to maintain the biodiversity and ecological balance, namely, pollination, a corridor for diverse fauna inclusive of natural predators for pests and nutrient balance. This will be of significant ecological benefit to the existing neighbouring farms and will truly establish the Agro Parks as Agro-Ecological Zones[4].			
Social					
Losses due to variable unpredictable extreme weather, – temperature, rainfall, humidity	Loss of crops and associated income due to extreme events – drought, floods, wind	Pay keen attention to Tropical Cyclone of Flash Flood warning advisories Reap crops where possible upon the warning of an impending Tropical Cyclone event Research and apply drought-tolerant crops	Environmental and Social Management Plan Disaster Risk Management Plan	Before Tropical Cyclone of Flash Flood	Farmers to implement on-farms measures Independent Consultant under MASP

4 An Agro-ecological Zone is a land resource mapping unit, defined in terms of climate, landform and soils, and/or land cover, and having a specific range of potentials and constraints for land use.

RISKS	POTENTIAL IMPACTS	PROPOSED MITIGATION MEASURES	MANAGEMENT PLANS REQUIRED	MONITORING FREQUENCY	RESPONSIBLE PARTY
		Lobby for agricultural/crop insurance			
	Extreme temperatures can lead to growth in agricultural pest populations, e.g., increase in the population of Beet Army Pest Worm, an agricultural pest which thrives in harsh conditions wreaking havoc on escallion and onion crops.	Training of farmers in pest management measures	Farm Management Plan (Pest Management)	Frequency to be determined with Agronomist of MASP Programme	Third party or MICAF Farmers to implement on-farm measures
Water shortages due to heightened evapotranspiration and reduced or compromised rainfall, and polluted sources	Compromised agricultural output Inability to meet market/customer demand Loss of income	Training of farmers to use mulching mechanisms to retain soil water and minimise water consumption Utilisation of more drip irrigation measures as opposed to sprinkler mechanisms to minimise evaporation, wastage and leaching of nutrients	Farm Management Plan (Water management and Sanitation)	Frequency to be determined with Agronomist of MASP Programme	Third party or MICAF Farmers to implement on-farm measures

RISKS	POTENTIAL IMPACTS	PROPOSED MITIGATION MEASURES	MANAGEMENT PLANS REQUIRED	MONITORING FREQUENCY	RESPONSIBLE PARTY
		Citrus and root crops highly sensitive to changes in temperature and precipitation and planting of drought-tolerant crops in areas where drought is a chronic problem			
Environmental and public health issues related to hearing or respiratory illnesses of farm workers and nearby residents	With the introduction of heavy machinery into the daily operations of the Agro Parks, noise and particulate matter levels may increase above favourable levels and result in environmental and public health issues.	Conduct baseline studies to establish monitoring guidelines and conduct an on-site assessment during operations to confirm long-term needs for monitoring particulate matter and noise	Not currently applicable, but as the Agro Park is developed may be required based on case by case evaluation	Depends on outcome of evaluation or NEPA permit	If required Site/Park Manager or Environmental Officer, NEPA
Health and Safety issues during renovation	The users of the AMC Complex will likely be negatively impacted by renovation activities if the area is not properly marked with signs and barriers to prevent access incidents. If workers are not properly trained and equipped with the correct equipment, injuries could occur.	The contractor must have a health and safety policy that is known and understood by all workers. It must also be visible to the workers on site. Renovation areas should be clearly demarcated with safety signs and barriers to prevent possible incidents. Workers should be properly equipped with health and safety equipment and trained	Environmental and Social Management Plan (Health and Safety Management Plan)	Daily Inspections	Implementing Agency (MICAF) Contractor AIC AMC Complex Property Manager

RISKS	POTENTIAL IMPACTS	PROPOSED MITIGATION MEASURES	MANAGEMENT PLANS REQUIRED	MONITORING FREQUENCY	RESPONSIBLE PARTY
		in the proper use of construction equipment. All workers must be trained in the proper use of all health and safety equipment. All workers must be trained in the proper handling and management/disposal of all types of waste. The Contractor's Environment, Health and Safety (EHS) Manager shall maintain a register of all EHS-related incidents that have occurred as a result of the activities associated with the contract. EHS incidents that should be recorded, including fires, accidents, spills of hazardous materials that contaminate soil or water resources, stop-order notices issued by NEPA, the Municipal Corporation or any other relevant agency, and non-compliance with this			

RISKS	POTENTIAL IMPACTS	PROPOSED MITIGATION MEASURES	MANAGEMENT PLANS REQUIRED	MONITORING FREQUENCY	RESPONSIBLE PARTY
		Environmental Management Plan (EMP). Each EHS-related incident will be investigated by the Contractors' EHS officer and an incident report forwarded to the contractor. An incident report will be presented within five working days. The EHS incident reports will include, as a minimum, a description of the incident, actions taken to contain any damage to the environment, personnel, or the public, and the corrective actions to repair/remediate any damage. All construction equipment and machinery shall be maintained in a good state of repair throughout the construction period. Equipment maintenance will be carried out on an impermeable surface.			

RISKS	POTENTIAL IMPACTS	PROPOSED MITIGATION MEASURES	MANAGEMENT PLANS REQUIRED	MONITORING FREQUENCY	RESPONSIBLE PARTY
		Leakage from equipment will be prevented by regular inspection and repair. Areas under renovation should be clearly demarcated. Emergency medical supplies must be available and easily accessible in the case of an incident. In the event that the onsite medical supplies are not adequate, the incident needs to be escalated to the hospital. In the event that a worker is exposed to hazardous material, he/she should immediately be taken for medical attention.			
Improperly Trained Staff	Environmental, public health and food safety issues	Ensure all Agro Park users are trained by qualified personnel and that training is documented Evaluation of training records by external auditors	Environmental and Social Management Plan Farm Management Plan (Train the Trainers and Food	Annual audits	Agro Park Manager, Third Party

RISKS	POTENTIAL IMPACTS	PROPOSED MITIGATION MEASURES	MANAGEMENT PLANS REQUIRED	MONITORING FREQUENCY	RESPONSIBLE PARTY
			Safety should be key elements)		
Poor solid waste disposal	Solid waste generated from the operations are expected to be mostly organic in nature, if left on the site over an extended period (especially without adequate containment mechanisms), the leachates can contaminate groundwater in the area.	Proper facilities for storage (ensure inaccessibility by pests; location should prevent leaks and facilitate easy cleaning) Removal should be timely and documented.	Environmental and Social Management Plan	Weekly (more frequently based on use of facilities)	Agro Park Manager and/ or Facilities Manager
Poor air quality during renovation or construction activities associated with the AECs	The construction works associated with the AECs may result in increased dust and exhaust emissions which may impact on local air quality. This could have negative health impacts on the workers on the compound and the surrounding airport users.	Continuous monitoring will be necessary. The parameters to be monitored during construction include PM_{10}. Frequent wetting and other methods of dust suppression is recommended where digging is taking place. Roads that are used for transportation of materials should be watered to avoid dust emissions. Trucks transporting sand or other construction material	Environmental Health and Safety Management Plan Grievance Mechanism	Every two weeks in the first month of construction, once per month thereafter.	Implementing Agency Contractor

RISKS	POTENTIAL IMPACTS	PROPOSED MITIGATION MEASURES	MANAGEMENT PLANS REQUIRED	MONITORING FREQUENCY	RESPONSIBLE PARTY
		shall be covered to avoid dust emissions. All airport users that may be affected directly along the route should be given written notice of the works to be carried out and the timeframe for the potential disruption (Grievance mechanism).			
Noise pollution during renovation or construction activities associated with the AECs	The construction works for the AECs may result in incremental noise disturbance to surrounding areas and worker safety	Workers must be properly protected from noise above 90dBA using the appropriate protective gear (according to US OSHA Permissible Noise Exposure Limits). The National Institute for Occupational Safety and Health (NIOSH) recommended exposure limit for occupational noise is 85dBA for an 8 Hour shift. The area is considered an industrial area and as such noise should not exceed 75dBA from 7am to 10pm and 70dBA from 10pm to 7am.	Environmental Health and Safety Management Plan Grievance Mechanism	Every two weeks in the first month of construction, once per month thereafter.	Implementing Agency Contractor

RISKS	POTENTIAL IMPACTS	PROPOSED MITIGATION MEASURES	MANAGEMENT PLANS REQUIRED	MONITORING FREQUENCY	RESPONSIBLE PARTY
		Utilise noise mitigation measures (including the construction of bunds, metal sheet walls) in order to limit noise levels at sensitive receptors. Ensure that equipment to be used meets industry best standard in relation to noise attenuation. Ensure that construction works are only undertaken in defined working hours (weekdays 8h00 – 17h00 and weekends 8h00 – 13h00). In the event that noisy activities are undertaken outside of the specified working hours, all noise receptors will be informed of such activities in advance. Assess and manage all noise complaints.			

RISKS	POTENTIAL IMPACTS	PROPOSED MITIGATION MEASURES	MANAGEMENT PLANS REQUIRED	MONITORING FREQUENCY	RESPONSIBLE PARTY
		Undertake noise monitoring at locations with persistent noise complaints. Vehicle speeds should be limited to 20km/h on unpaved surfaces;			
Vulnerable groups such as females and youths remain unemployed	The vulnerable population, in particular females and youths, can miss out on gainful employment if targeted initiatives are not tied to MASP implementation.	Develop gender and youth targeted empowerment initiatives for agriculture	Gender Equality Action Plan	Monthly	Sociologist/Consultant MICAF to implement under MASP

10 Recommended Activities for MASP

Based on the results of the environmental and social assessment conducted, several recommended activities are being made to be included as activities in the Modernisation of the Agriculture Sector Programme being developed. These are presented in Section 10.1 to 10.9 which follows.

10.1 Improve Existing Agro Park Infrastructure

There are six fully functioning Agro Parks in Jamaica: Plantain Garden River, Amity Hall, New Forest/ Duff House, Spring Plain, Ebony Park and Yallahs. Whilst there are some infrastructure in place, there are a number of gaps and recommended improvements outlined below in Section 10.1.1 to 10.1.4.

10.1.1 Irrigation Network

All the Agro Parks have lands not yet under production because there is no irrigation infrastructure. Of the six existing Agro Parks, the Plantain Garden River urgently needs irrigation infrastructure as there are farmers who have leased lands in the area, that do not have access to irrigation water. It is therefore recommended that the irrigation network be expanded to cover all the arable lands in the Agro Parks. When considering the expanded irrigation network, it is recommended that the necessary checks are made with the JPS to ensure the existing transformers can accommodate the voltage needs bot during peak and off-peak hours. Also, the necessary hydrological studies and permitting need to be done to determine suitable water sources, water availability for the planned and future irrigation water demand.

10.1.2 Roads

The road network is not in good condition for some of the existing Agro Parks. Many have dirt tracks and farmers have difficulty accessing and transporting goods from their farms during the rainy season because of the mud. Road improvements are recommended for the following Agro Parks: Plantain Garden River, Ebony Park, Spring Plain and Amity Hall.

10.1.3 Drainage

Drainage in all the existing Agro Parks need to be reviewed and appropriate design solutions need to be put forward to address flooding issues in each location. In particular, it is recommended that drainage improvements are specifically addressed both along the roads as well as on-farm drains need to be constructed at Plantain garden River, Spring Plain, Ebony Park and Amity Hall Agro Parks.

Drainage improvement is important to mitigate the flooding hazards and with climate change is needed as an adaptation measure.

10.1.4 Capital

Section 2.2.2 above speaks to the inadequate revenue stream to sustain the function of the AIC. There is a significant shortage of equipment available for rental, such as tractors, trucks for transporting goods, ploughs, arrows, etc. There is consistently a need for project funding to pay for staff such as Agro Park Managers, to conduct training of farmers, as well as to expand the irrigation network so that more lands are available for lease. It is recommended that a sustainable financial model for the AIC be developed under MASP so that key members of staff and core functions can be covered sustainably. Additionally, it is recommended that investment be made under MASP so that the AIC can secure a greater fleet of equipment available for rent to farmers.

10.1.5 Non-Operational Agro-Parks

There are three non-functioning Agro Parks: Hill Run in St. Catherine, Meylersfield and the Small Ruminant Abattoir Cluster both in Westmoreland. It was intended that these Agro Parks be developed for animal

husbandry, but they have never been operational. It is recommended that priority be made under MASP to improve the existing six Agro Parks to make them functional as ideal Agro Economic Zones, rather than to create several new Agro Parks that lack the resources to function as an Agro Economic Zone.

10.2 GIS Mapping of Ago Park and its Assets

Currently, not all the Agro Parks are mapped electronically in terms of boundaries and assets such as the irrigation network, road network and location of Packaging facilities. Further, to properly develop the Agro Park as an Ago Ecological Zone[5], non-arable lands and steep hillsides in each Agro Parks should be mapped and earmarked to remain untouched to preserve to maintain the biodiversity and ecological balance, namely, pollination, a corridor for diverse fauna inclusive of natural predators for pests and nutrient balance.

10.3 Develop and Execute Strategic Marketing Approach

It is recommended that a strategic market approach be developed and executed under MAPS for the sale of goods from the Agro Parks. Greater linkages need to be made get the private sector buyers and investors.

Currently, it was not difficult to market goods during the drought for those Agro Parks equipped with an irrigation network. However, there is competition during the rainy season. With better market linkages made locally, regionally and internationally produce from the Agro Parks can be secured year-round at profitable prices.

10.4 Improve Disposal of Pesticides

Farmers buy their pesticides from various farm stores who are regulated by the Pesticide Control Authority (PCA). The PCA has a list of approved chemicals that retailers are allowed to import. Currently, there is no means to dispose of left-over pesticides from containers and as such it is recommended that charcoal pits be created for each Agro Park to facilitate the safe disposal pesticides. In addition, rather than just dispose of pesticide containers via the NSWMA trucks, there is some collaboration between PCA and NSWMA regarding a more environmentally friendly means to dispose of pesticide containers.

10.5 Training and GlobalGAP Certification

It is recommended that MASP seeks to increase the number of GlobalGap certified farmers within the existing Agro Parks. There is a great marketing benefit to having all the farmers within the Agro Parks certified for any market. Additionally, certified farmers will not bet at risk to have their crops and produce negatively impacted by other farmers not employing good agricultural practices especially with respect to pesticide use.

10.6 Improve Agricultural Export Complexes

10.6.1 Improve the AMC Complex – Spanish Town Road

Renovation of the main building is recommended to address several issues explained in Section 7.1 above. The building is not currently used to its full capacity but also does not encourage users. The facilities are in very poor condition and not suited to GlobalGAP certified farmers without the necessary renovation works include the installation of proper cold storage.

5 An Agro-ecological Zone is a land resource mapping unit, defined in terms of climate, landform and soils, and/or land cover, and having a specific range of potentials and constraints for land use (FAO).

10.6.2 Improve Plant Quarantine Produce Facility – Norman Manley International Airport

10.6.2.1 Expand and Improve Efficiency

With the continuous expansion of Agro Parks to farm produce that meet international standards, this will require improvements to be made at the Plant Quarantine Produce Facility at NMIA to accommodate greater volumes being exported as well as reduce the risk of damage to produce and other occupations health and safety risks. Some recommendations are outlined below:

1) Establish a Hot Water Treatment Area to address the fruit fly issue that impacts Mango export to Europe;
2) Create additional space to accommodate other airline handlers, such as Amerijet and Flight Connections;
3) Renovate fumigation chambers to allow for temperature controlled environmental and greater safety;
4) Set up an in-door, temperature-controlled goods inspection area to reduce risk to damaged produce from heat;
5) Increase the capacity for the goods inspection area;
6) Additional staff compliment of Inspectors to compliment the expansion;
7) Cover the holding area for produce approved and stacked for transporting to airline;
8) Re-establish an incinerator to destroy ceased produce that were illegally imported or infested.

10.6.2.2 Produce Testing

It is recommended that testing of the produce should be mandatory and be done by a certified or accredited facility for at least pesticide residue. Currently, Jamaica has two labs which focusses on pesticide residue testing on food, soil and in water. Both labs operate using a quality management system. One is currently ISO/IEC 17025:2005 accredited and the other is in the process of receiving accreditation.

The testing of the produce by a qualified lab will reduce the risk of the produce being rejected by the importing country. The local population can also be protected from being sold produce that is not deemed safe for consumption. As such it is also recommended that produce not deemed safe for consumption be discarded rather than returned to the customer, who will likely sell same locally in an attempt to recover costs.

10.6.3 Improve Plant Quarantine Produce Facility – Donald Sangster International Airport

It was communicated to the team that the Entomologist may from time to time prepare slides or specimen for examination within the office area at her workstation. It is recommended that this practice be discontinued as soon as possible as the office area is not a well ventilated nor does it have a ventilation system and as such the emitted volatile organic compounds (VOCs) cause irritation or have more harmful impacts on persons exposed to them.

The above recommendations listed above in Section 10.6.2.1 for the Plant Quarantine Produce Facility at NMIA is also recommended for that at SIA. However, it is recommended that even before the expansion, the staffing situation needs to be addressed especially since it leaves the borders exposed without an Inspector at the Sea Port and Cruise Ship Port during these periods.

11 Conclusion

In conclusion, based on the findings of the environmental and social assessment, it is the professional opinion of the Consultants that the project is not likely to result in significant negative environmental

impacts. Where there are potential direct negative impacts, these are mostly short term and reversible and can be mitigated. Once mitigated, the potentially negative physical and ecological impacts highlighted above are significantly minimised.

On the other hand, the project is expected to result in significant positive social impacts as training and employment of persons within the agricultural sector continues; this is especially positive as the gender equality and youth employment and empowerment are continually fostered through specific initiatives.

SECTION 2

ENVRIONMENTAL AND SOCIAL MANAGEMENT PLAN

12 Environmental and Social Management Plan

This Section presents the Environmental and Social Management Plan (ESMP), which follows on the identification of the potential environmental and social impacts and proposed mitigation actions (Section 10) for the MASP. Specific Environmental Management Plans (EMPs) have been developed to be utilised by Contractors Agro Park Managers, or Quarantine Complex Managers commissioned for the implementation of MASP and will form the basis of site-specific management plans that will need to be prepared before the programme is implemented.

The following plans are anticipated for the identified environmental aspects and risks to the project:

1. Environmental and Social Management Plan (ESMP)
    a. Air Quality Management
    b. Noise Management
    c. Water Quality Management
    d. Waste Management
    e. Health and Safety
2. Farm Management Plan
    a. Pest Management
    b. Water Management and Sanitation
    c. Train the Trainers
    d. Food Safety
3. Disaster Risk Management Plan
4. Erosion Control and Forest Restoration Plan
5. Early Warning System for Flood Risk
6. Gender Equality Action Plan

Under this project, ESL has developed the ESMP outlined below. It is recommended that the other plans be developed prior to implementation of MASP.

12.1 Water Quality Management Plan

Monitoring of water quality for all abstraction wells and downstream surface water sources should be implemented to ensure water resources are not negatively impacted by the Agro Park activities. The parameters to be monitored should consider ambient water quality guidelines in addition to others for environmental health protection. The sampling protocol used should meet, at a minimum, the Ministry of Health and Wellness' (MoHW) Environmental Health Laboratory Sampling and Field Measurements Protocol.

12.1.1 Monitoring Standard

Parameters suggested in Table 12.1 for the monitoring programme are based on the guidelines for ambient freshwater quality stipulated by NEPA along with others required for public health protection. The Table is further elaborated in Appendix VI providing the relevance of each parameter identified.

Table 12.1: Suggested Water Quality Monitoring Parameters

PARAMETERS (UNITS)	NRCA AMBIENT WATER QUALITY STANDARD
Faecal Coliform (MPN/100ml)	–
Nitrate as Nitrogen (mg NO_3^-/L)	0.1 – 7.5

PARAMETERS (UNITS)	NRCA AMBIENT WATER QUALITY STANDARD
Phosphate (mg PO_4^{3-}/L)	–
Total Suspended Solids (mg/L)	0.01 – 0.8
Chloride (mg Cl^-/L)	5.0 – 20.0-
Salinity (ppt)	–
Alkalinity (mg $CaCO_3$/L)	–
pH (pH units)	7.00 – 8.40
Conductivity (mS/cm)	0.15 – 0.6
Biochemical Oxygen Demand (mg O_2/L)	0.8 – 1.7
Dissolved Oxygen (mg O_2/L)	–
Chemical Oxygen Demand (mg O_2/L)	–
Pesticide Screen	–
Copper (µg Cu/L)	–
Zinc (µg Zn/L)	–
Boron (µg B/L)	–
Manganese (µg Mn/L)	–
Iron (µg Fe/ L)	–
Magnesium (µg Mg/L)	3600 – 27000
Sodium (µg Na/L)	4500 – 12000
Calcium (µg Ca/L)	40000 – 101000
Potassium (µg K/L)	740 – 5000
Hardness (mg $CaCO_3$/L)	127.0 – 381.0

12.1.2 Monitoring Equipment, Stations and Frequency

Water quality monitoring for protection of environmental health will be according to the stipulations of the environmental licence issued by NEPA. Monitoring of well water will be stipulated by the WRA in the relevant abstraction licences.

Once effluent is being discharged from the wastewater treatment systems, monitoring of these effluents will also become necessary. If sewage is mixed with the wastewater from the washing of produce, then the final effluent should be chlorinated prior to discharge.

12.1.3 Management and Mitigation Measures

Once parameters are determined to be non-compliant with the regulatory stipulations or process requirements, corrective actions should be taken to bring the parameters back into compliance. Investigations into the cause(s) of the non-compliance should be done as soon as possible once results are obtained to ensure swift and adequate corrective measures are implemented.

12.1.4 Key Performance Indicators

Performance indicators will be used to assess the effectiveness of the implemented water monitoring programmes. The assessment will be done in the form of planned or impromptu audits conducted by the Agro Park manager and team. The assessments will be used as performance indicators will cover the following areas:

1. The performance of communication mechanisms when non-compliant data are obtained. This will be accomplished through the review of records and data from monitoring exercises;
2. Water quality reports;
3. Corrective action reports when non-compliant results are obtained. The effectiveness of implemented corrective actions should also be assessed.

12.1.5 Roles and Responsibilities

All samples collected during the monitoring exercise should be analysed using verified/validated analytical methods at an Environmental Health Unit (EHU) approved laboratory. The AIC and Agro Park managers should keep track of the stipulations in any NEPA and WRA permits and contract the appropriate services as necessary.

12.1.6 Data Analysis and Reporting

The Certificate of Analysis (CoA) obtained from the EHU-approved laboratory should contain at least the following information:

1. Sample identification/information and description
2. Sample collection date and time
3. Sample submitting information (temperature and condition of sample, time and date of submission)
4. Analysis date
5. Test results with units of measurement
6. Test methods
7. Notes regarding anomalous tests results
8. Applicable standard
9. Quality assurance (QA)/ Quality control (QC) documentation
10. Signature of authorised persons.

The data obtained from the certificate of analysis will be analysed, taking into consideration regulatory requirements and operational standards as well public/environmental health and safety. These reports will be prepared by the environmental specialists (internal or external) and submitted to the Agro Park Manager who will then review and take necessary actions and report to the relevant regulatory agencies according in the reporting frequency in their licence.

The schematic of the reporting structure will therefore be as follows:

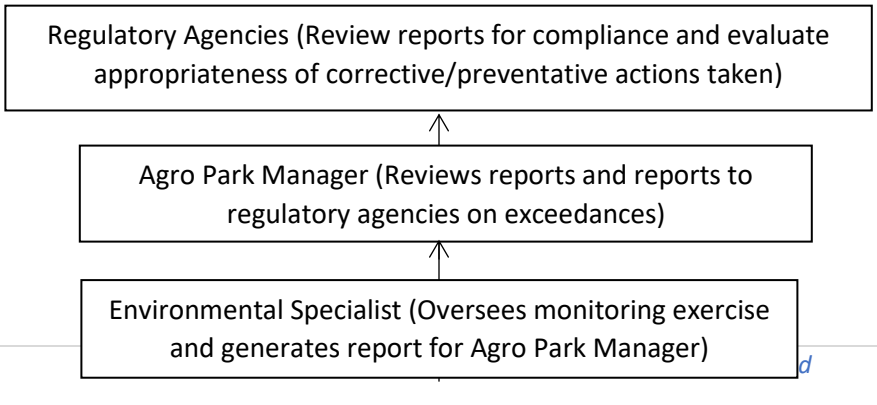

Figure 12.1: Water Quality Reporting Structure

12.2 Waste Management Plan

The administration and oversight of solid waste management is primarily to be carried out by the Property or Agro Park Manager. Below are the definitions used in the management of solid waste:

Solid (Non-Hazardous) Waste

The International Finance Corporation's (IFC) General Environment, Health and Safety (EHS) Guidelines define solid (non-hazardous) waste as generally any garbage refuse including domestic trash; inert construction/demolition materials; refuse such as scrap metal; and empty containers. Solid waste that is likely to be generated in this project will primarily be organic agricultural waste.

Hazardous Material/Waste

The International Finance Corporation's (IFC) General Environment, Health and Safety (EHS) Guidelines define hazardous waste as substances that possess at least one of four characteristics: ignitability, corrosivity, reactivity, or toxicity – or appear on special lists.

The International Finance Corporation's (IFC) General Environment, Health and Safety (EHS) Guidelines define hazardous material as materials that represent a risk to human health, property, or the environment due to their physical or chemical characteristics. They can be classified according to the hazard as explosives; compressed gases, including toxic or flammable gases; flammable liquids; flammable solids; oxidising substances; toxic materials; radioactive material; and corrosive substances. Hazardous material will primarily be pesticides and fertilizers as well as cleaning agents used in the various processing and packaging facilities.

12.2.1 Monitoring Frequency

At most locations, waste collection is conducted on a weekly basis and so monitoring of waste should be done weekly to ensure that all measures are being implemented and followed.

12.2.2 Management and Mitigation Measures

So as to reduce the possible negative impacts of improper waste disposal and management, the Property or Agro Park Manager will ensure that during operations, every effort is made to adhere to the following mitigation measures:

- Potential hazardous material should be identified and stored in designated locations, ideally not in the same space as processing or packaging of produce;
- All non-hazardous waste generated should be disposed of using approved methods. Waste should only be collected by the NSWMA or a contractor approved by NSWMA and transported to an approved disposal facility;
- Burning or burying of any kind of waste is prohibited;
- Any hazardous material, such as waste oil, asbestos-containing material and contaminated soil, should be disposed of via approved contractors in locations approved by NEPA. A special permit for removal and transportation is a requirement of NEPA;

- A schedule for collection of waste and disposal must be developed and must be adhered to throughout the duration of the project;
- Recycling of compost can be done, where feasible;
- In the event of leaks/spills, they should be cleaned up immediately, NEPA/ODPEM consulted, and the waste disposed of at an approved dump site;
- Portable toilets, if used, must only be transported by approved contractors. NEPA permits may be required;
- Hazardous material should not be stored on site, but in packaging facilities located within the Agro Park or offsite;
- Hazardous materials shall be stored in properly bunded areas to contain any leaks, and drip trays shall be in place under all fuel bowsers;
- Workers handling hazardous waste (e.g., pesticides) should be properly equipped with personal, protective equipment (PPE), that is, masks, gloves, hard hats, hard boots, etc.;
- Appropriate spill kits must be available in areas of proximity to watercourses and drains;
- All wastewater that is contaminated with hazardous substances shall be collected in a container, allowed to evaporate, and the sludge disposed of as hazardous waste;
- All personnel shall be trained and educated during induction on the safe handling of hazardous substances;
- Sufficient weather and scavenger-proof bins (with lids to prevent the escape of litter) shall be provided and be accessible at all points where waste is generated;
- The project area should be kept clean and free of litter and no litter from the site shall be allowed to disperse to surrounding areas;
- All personnel shall be instructed to dispose of all wastes in a proper manner;
- During any renovation activities, all construction materials should be suitably stored and protected so that they do not become damaged and unusable.

12.2.3 Key Performance Indicators

The following Key Performance Indicators (KPIs) have been selected in order to evaluate the effectiveness of the solid waste management system.

Table 12.2: Key Performance Indicators

No.	Key Performance Indicator	How will it be monitored and measured	Responsibility
1	No construction waste deposited in the main or farm roadways or in nearby rivers or gullies	Location of a temporary storage site away from road, gully and walkway for construction waste	Agro Park or Property Manager of Contractor for renovation activities Results to be presented to the Implementing Agency
2	No leakages or spills	Monitor possible spills	Agro Park or Property Manager or Contractor for renovation activities

No.	Key Performance Indicator	How will it be monitored and measured	Responsibility
		Inspection of the site by the Agro Park or Property Manager	Results to be presented to the Implementing Agency
3	Limited sediment-laden run-off during heavy rain	Monitor nearby/downstream wells and water bodies during operation for significant sediment deposits	Agro Park or Property Manager Results to be presented to the Implementing Agency
4	Reuse of organic waste where possible as compost	Less organic waste being delivered to the disposal site	Farmers Results to be presented to the Agro Park or Property Manager who reports to the Implementing Agency
5	Approved Contractors for renovation activities	Inspection of licences and documentation	Contractor Results to be presented to the Implementing Agency

KPIs will be reviewed occasionally to determine areas for improvement. Specific KPIs will need to be developed for the Solid Waste Management aspect of Component 1.

12.3 Health and Safety Management

This section relates to both the health and safety workers as well as that of other users of the AMC complex.

12.3.1 Monitoring Frequency

Monitoring will be carried out daily by the renovation contractor to minimise possible incidents.

12.3.2 Management and Mitigation Measures

So as to reduce the possible negative impacts of workers and users of the facility, the contractor will make every effort to ensure that there is adherence, during renovation, to the following mitigation measures:

- The contractor must have a health and safety policy that is known and understood by all workers. It must also be visible to the workers on site;
- Construction areas should be clearly demarcated with safety signs and barriers to prevent possible incidents;
- Workers should be properly equipped with health and safety equipment and trained in the proper use of construction equipment;
- All workers must be trained in the proper use of all health and safety equipment;
- All workers must be trained in the proper handling and management/disposal of all types of waste;
- The Contractor's EHS Officer shall maintain a register of all EHS-related incidents that have occurred as a result of the activities associated with the contract. EHS incidents that should be recorded include fires, accidents, spills of hazardous materials that contaminate soil or water

resources, stop-order notices issued by NEPA, the Municipal Corporation or any other relevant agency, and non- compliance with this EMP;

- Each EHS-related incident will be investigated by the Contractor's EHS Officer and an incident report forwarded to the Contractor. An incident report will be presented within five working days following the incident;
- EHS incident reports will include as a minimum, a description of the incident; actions taken to contain any damage to the environment, personnel or the public; and the corrective actions to repair/remediate any damage;
- All renovation construction equipment and machinery shall be maintained in a good state of repair throughout the renovation period;
- Equipment maintenance will be carried out on an impermeable surface;
- Leakage from equipment will be prevented by regular inspection and repair;
- Areas under renovation should be clearly demarcated;
- Emergency medical supplies must be available and easily accessible in the case of an incident;
- In the event that the onsite medical supplies are not adequate, the incident needs to be escalated to the hospital;
- In the event that a worker is exposed to hazardous material, they should immediately be taken for medical attention.

12.3.3 Key Performance Indicators

The following KPIs have been selected in order to evaluate the effectiveness of the health and safety management system.

Table 12.3: Key Performance Indicators

No.	Key Performance Indicator	How will it be monitored and measured	Responsibility
1	Health and Safety Policy	Review and inspection of documentation	Contractor Results to be presented to the Implementing Agency
2	Health and Safety Signs	Inspection of the site	Contractor Results to be presented to the Implementing Agency
3	Training log and schedule	Review and inspection of documentation	Contractor Results to be presented to the Implementing Agency
4	Register of all EHS related incidents	Review and inspection of documentation	Contractor Results to be presented to the Implementing Agency
5	Equipment maintenance log and schedule	Review and inspection of documentation	Contractor

No.	Key Performance Indicator	How will it be monitored and measured	Responsibility
			Results to be presented to the Implementing Agency
6	Emergency Kit	Inspection of site office	Contractor Results to be presented to the Implementing Agency

12.3.4 Roles and Responsibilities

It is the responsibility of the Contractor to ensure the following:

- The health and safety management policy is clearly understood by all workers;
- All mitigation measures are carried out;
- Monitoring reports are prepared.

It is the responsibility of the workers to ensure that they understand the health and safety requirements and that they adhere to them.

The Implementing Agency is responsible for monitoring the Contractor to ensure that monitoring is being undertaken and mitigation measures are being enforced.

12.3.5 Data Analysis and Reporting

If there are any violations, this will be reported immediately to the AIC and AMC Complex Property Manager to allow for management strategies to be changed according to the results.

12.4 Air Quality Management

12.4.1 Monitoring Standards

Through monitoring of the ambient air quality, the Contractor will ensure that they comply with all emission limits in the NEPA standards. NEPA has a 24-hour standard for Particulate Matter PM10 (<10 µm) which is 150 µg/m3.

Description	Standard			
	Average Timing	NRCA (NEPA) (Max Concentration in μgm^{-3})	Average Timing	IFC (μgm^{-3})
PM_{10}	Annual 24 hours	50 150	1-year 24-hour	70 (Interim target-1) 50 (Interim target-2) 30 (Interim target-3) 20 (guideline) 150 (Interim target-1) 100 (Interim target-2) 75 (Interim target-3) 50 (guideline)

12.4.2 Monitoring Equipment and Stations

Particulate Matter

Samples for particulate matter should be collected using calibrated pumps. The pumps should be placed at the approximate respiratory height of the individual(s) for a 24-hour period. The data obtained from the analyses of the filter should be expressed as the exposure levels of particulate matter (PM_{10}) using a Time Weighted Average (TWA). The results at the end of the sampling period will be compared to the NEPA standards.

Stations

The Monitoring stations will be changed as the activities progress. The monitoring stations established will be based on the prevailing winds and most sensitive human receptors.

12.4.3 Monitoring Frequency

Prior to the construction, a monitoring baseline will be established for both particulate matter and noise. This will involve continuous monitoring for these parameters over a 48-hour period along the length of the proposed site.

During construction, monitoring will be carried out randomly twice per month or as stipulated by NEPA only along the sections that are under construction at the time. This particularly relates to both Components. Thereafter, the monitoring can be reduced to once per month or as required by NEPA.

12.4.4 Management and Mitigation Measures

In addition to the monitoring procedures, the Contractor will ensure that these measures are followed:

- All equipment to be utilised during construction must be properly serviced so as to reduce the potential for harmful emissions.
- All stakeholders that may be affected directly along the route should be given written notice of the works to be carried out and the timeframe for the potential disruption.
- The contractor should ensure that work that is likely to generate significant amount of dust does not take place during windy conditions
- Trucks transporting sand or other fine construction material shall be covered to avoid dust emissions.
- Monitoring will be necessary. The parameters to be monitored during construction include PM_{10}.
- Frequent wetting and other methods of dust suppression is recommended where excavation is taking place.
- Roads that are used for transportation of materials should be watered to avoid dust emissions.
- All workers must be supplied with the required personal protective gear.

12.4.5 Key Performance Indicators

The following KPIs have been selected in order to evaluate the effectiveness of the air quality monitoring system.

Table 12-4: Key Performance Indicators

No.	Key Performance Indicator	How will it be monitored and measured	Responsibility
1	Equipment maintenance log and schedule	Review and inspection of documentation	Contractor. Results to be presented to the Implementing Agency
2	Notices to stakeholders	Review and inspection of documentation	Contractor. Results to be presented to the Implementing Agency
3	Air quality parameters within NEPA standards	Results certificates	Contractor. Results to be presented to the Implementing Agency
4	Log of wetting frequency	Review and inspection of documentation	Contractor. Results to be presented to the Implementing Agency
5	Use of personal equipment gear	Review and inspection of documentation	Contractor. Results to be presented to the Implementing Agency

12.4.6 Roles and Responsibilities

It is the responsibility of the Contractor to ensure that all mitigation measures are carried out and that monitoring reports are prepared. The Contractor should ensure that an EHS Manager is employed to oversee the specific requirements of this plan.

The Implementing Agency is responsible for monitoring the contractor to ensure that monitoring is being undertaken and mitigation measures are being enforced.

12.4.7 Data Analysis and Reporting

The sampled data will be compared to NEPA's standard for air quality and included in the environmental monitoring report prepared and submitted to NEPA. If there are any exceedances, this will be reported immediately to the EHS Manager to allow for the implementation of corrective measures or adjustment in management strategies based on the results and where practicable to the operations.

12.5 Noise

12.5.1 Monitoring Standards

The NRCA Standards are presented in Table 4-1. The NEPA permit will stipulate the frequency with which monitoring should take place. Noise level readings, wind direction and any unusual local noise sources will be recorded. Measurements will be taken using approved and calibrated sound level meters. The frequency spectrum of the noise will be measured.

The results at the end of the sampling period will be compared with NEPA standards.

Table 12-5: Noise Standards

Description	Standard	
	Average Timing	**NRCA (NEPA)**
Noise	Between the hours of 7a.m. and 10p.m for an industrial area And 10pm to 7am	75 dBA 70dBA
	Between the hours of 7a.m. and 10p.m for a Commercial Area And 10pm to 7am	65dBA 60dBA

12.5.2 Monitoring Equipment and Stations

Ambient noise measurements will be conducted simultaneously, at the same stations sampled for air quality during construction. A calibrated sound level meter will be used to measure noise. The model of the equipment will be clearly stated, and the meter will be calibrated before each survey.

Monitors will be located approximately 1.5 m above the ground and no closer than 3m to any reflecting surface (e.g., wall). In general, the noise level limit is represented by the background or ambient noise levels that would be present in the absence of the facility or noise source(s) under investigation. In addition, before and after the survey, the instrument will be checked with a calibrator, which is factory calibrated.

12.5.3 Monitoring Frequency

The noise level readings will be taken over a period of 2-3 minutes and the average (geometric mean) noise level recorded in decibels (dBA). These readings will be taken at the same time as the air samples.

12.5.4 Management and Mitigation Measures

In addition to the monitoring procedures, The Contractor will ensure the following noise reduction options are implemented where necessary.

- Workers must be properly protected from noise above 90dBA using the appropriate protective gear (according to US OSHA Permissible Noise Exposure Limits). The National Institute for Occupational Safety (NIOSH) recommended exposure limit for occupational noise exposure is 85dBA for an 8 Hour shift.
- The AECs are located in an industrial area and as such noise should not exceed 75dBA.
- All pneumatic tools to be used in close proximity to offices should be fitted with an air exhaust silencer.
- Utilise noise mitigation measures (including the construction of bunds, metal sheet walls) in order to limit noise levels at sensitive receptors.
- Ensure that equipment to be used meets industry best standard in relation to noise attenuation.

- Ensure that construction works are only undertaken in defined working hours (weekdays 8h00 – 17h00 and weekends 8h00 – 13h00). In the event that noisy activities are undertaken outside of the specified working hours, all noise receptors will be informed of such activities in advance.
- Assess and manage all noise complaints.
- Undertake noise monitoring at locations with persistent noise complaints.
- Vehicle speeds should be limited to 20km/h on unpaved surfaces.

12.5.5 Key Performance Indicators

The following KPIs have been selected in order to evaluate the effectiveness of the noise monitoring system.

Table 12-6: Key Performance Indicators

No.	Key Performance Indicator	How will it be monitored and measured	Responsibility
1	Equipment maintenance log and schedule	Review and inspection of documentation	Contractor. Results to be presented to the Implementing Agency
2	Notices to stakeholders	Review and inspection of documentation	Contractor. Results to be presented to the Implementing Agency
3	Noise parameters within NEPA standards	Results certificates	Contractor. Results to be presented to the Implementing Agency
4	Log of Complaints	Review and inspection of documentation	Contractor. Results to be presented to the Implementing Agency
5	Use of personal equipment gear	Review and inspection of documentation	Contractor. Results to be presented to the Implementing Agency

12.5.6 Roles and Responsibilities

It is the responsibility of the Contractor to ensure that all mitigation measures are carried out and that monitoring reports are prepared. The Contractor should ensure that an EHS Manager is employed to oversee the specific requirements of this plan.

The Implementing Agency is responsible for monitoring the contractor to ensure that monitoring is being undertaken and mitigation measures are being enforced.

12.5.7 Data Analysis and Reporting

The results from the sampling exercise will be compared to NEPA's noise pollution standards and included in the environmental monitoring report prepared and submitted to NEPA. If there are any exceedances, this will be reported immediately to the EHS Manager to allow for management strategies to be changed according to the results.

SECTION 3

CONSULTATION PLAN AND GRIEVANCE MECHANISM

13 MASP Consultation Strategy and Plan

The purpose of this Consultation Strategy and Plan is to outline the measures to be used for stakeholder engagement, dissemination of project information, and grievance management.

This strategy is critical to allow for two-way communication between the project proponent and the persons who are directly or indirectly impacted by the activities to be undertaken. These include communication with stakeholders who are both internal and external to project implementation.

This strategy will be utilised as a key element in all the proposed management, monitoring and mitigation measures outlined in this document.

The plan includes provisions for managing the following:

- Stakeholder mapping;
- Consultation plan including time scheduling;
- Grievance modalities and mitigation procedures;
- Reporting.

Implementation of this strategy will be the responsibility of the Implementing Agency for the Project.

13.1 Stakeholder Identification and Analysis

All stakeholders are participants in the planned implementation of the project in one capacity or the other. However, some have more direct and important roles than others.

This implied order of functional involvement has been summarised in this section.

Medium Interest Stakeholders

Their roles may be based on a specific administrative mandate and capability/capacity which is a standard engagement for them (for example, National Environment and Planning Agency [NEPA]).

Stakeholders with Important Interests

These stakeholders have important information or specific action-based deliverables on which project implementation must rely. The Stakeholder Consultation process will not qualify as robust if these entities are not consulted.

Critical Stakeholders

These stakeholders are critical engines of project development both in relation to conceptual planning and actual resource deployment. This also includes affected parties who will be impacted by this programme. These persons must be consulted.

Table 13.1: Stakeholder Identification

Stakeholders that have a Participatory Role in the Project's planned Implementation	**Participatory Role**	**Current Interest Focus**	**Current Interest Rating**
Ministry of Science, Energy and Technology (MSET)	Facilitating	Technology Input – Linkages with SRC for training	**MEDIUM INTEREST STAKEHOLDERS**
The Ministry of Health	Facilitating and Procurement	Public Health Inspection of Facilities	
National Environment and Planning Agency	Regulatory	Environmental permits/ licences	
National Land Agency	Facilitating	Land ownership and titling	
Independent lawyer(s)	Procurement and Facilitating	Support Land ownership changes	
Jamaica National Heritage Trust	Regulatory	Guidance on changes to sites with key heritage features	
Mines and Geology Division	Regulatory	Facilitating the extraction of material from rivers or quarries	
JPSCo	Facilitating and Procurement	Electricity supply (AMC Complex only)	
Subcontractors	Facilitating and Procurement	The details of the involvement of these subcontractors are yet to be worked out. They will perform contracted functions whether on the renovation of the AMC complex or farm management, or as to be determined.	
Contract workers	Facilitating	These will likely comprise the workforce of the subcontractors.	
Equipment suppliers	Procurement	As likely determined by subcontractors	
Contract service providers	Procurement and Facilitating	As likely determined by subcontractors and Client	
Facilitators of Project			**STAKEHOLDERS WITH AN IMPORTANT INTEREST**
National Irrigation Commission	Facilitating	Irrigation Water Supply	
National Land Agency	Facilitating	Land acquisition and titling	
National Water Commission	Facilitating and Procurement	Water supply (AMC Complex plus interfaces with existing networks in Agro Parks)	
Water Resources Authority	Regulatory	Licence for Well Drilling, Pumping, and Monitoring	

Stakeholders that have a Participatory Role in the Project's planned Implementation	Participatory Role	Current Interest Focus	Current Interest Rating
Dept. of Cooperatives and Friendly Societies	Facilitating	Supporting the registration and maintenance of Farmers' Groups	
Implementers – Stakeholders influencing Project			**CRITICAL STAKEHOLDERS**
Ministry of Industry, Commerce, Agriculture and Fisheries	Implementing Agency	Overarching	
Agro Investment Corporation	Operations	Manage operations of Agro Parks and AMC Complex	
Municipal Corporations	Facilitation and Planning	Local Government Inputs – Possible interactions with the Inter-Agency Committee, Parish Disaster Committee, Parish Development Committee	
National Works Agency	Procurement	Structural works	
Social Development Commission	Facilitating	Social environment	
National Solid Waste Management Authority	Procurement and Facilitating	Waste management	
Planning Institute of Jamaica	Facilitating	Project planning and funding	
Affected Stakeholders			
All Agro Parks and Packaging facilities	Affected communities	Impacts negative or positive	
Communities surrounding all Agro Parks	Affected communities	Impacts negative or positive	
AMC Complex – Spanish Town Road	Surrounding community	Impacts negative or positive	
Stakeholders Able to Affect the Project			
Jamaica Social Investment Fund	Procurement and Facilitating	Liaise with existing projects funded in the project area	
Government of Jamaica/Adaptation Fund Programme (GOJ/AFP)	Procurement and Facilitating	Liaise with existing projects funded in the project area	
Inter-American Institute for Cooperation on Agriculture (Jamaica)	Procurement and Facilitating	Liaise with existing projects funded in the project area	
RIU Group of Hotels	Market	Market for agricultural produce	
Grace Kennedy	Market	Market for agricultural produce	
Progressive	Market	Market for agricultural produce	
Lee's Food Fair	Market	Market for agricultural produce	

Stakeholders that have a Participatory Role in the Project's planned Implementation	**Participatory Role**	**Current Interest Focus**	**Current Interest Rating**
Spur Tree Spices	Market	Market for agricultural produce	
Chefs and Accountants	Market	Market for agricultural produce	
Everything Fresh	Market	Market for agricultural produce	
Jamaica's Finest	Market	Market for agricultural produce	
Hi-Pro	Procurement	Provision of seeds	
New Port Fersan	Procurement and Facilitating	Training Provision of pesticides and fertilizers	
American Airlines	Procurement and Facilitating	Facilitating export within short time frame	
Fly Jamaica	Procurement and Facilitating	Facilitating internal movement of goods Montego Bay–Kingston	
Caribbean Airlines	Procurement and Facilitating	Facilitating export within short time frame	
Idel Brown	Procurement	Exporter - Market for agricultural produce	
Patsy Duncan	Procurement	Exporter - Market for agricultural produce	
Seaboard Shipping and Freight,	Procurement	Secure Fast transport of produce to UK	
Corrpak	Procurement	Packaging Material	
Jamaica Customs	Facilitating	Granting Export of Goods	
DHL	Procurement	Export Services	

13.1.1 Stakeholder Analysis

The following table presents the mapped stakeholders and the level of engagement needed.

Table 13.2: Mapping of Stakeholders

Stakeholders	**Level of Engagement**	**Participation /Needs**
Stakeholders Agro Park Workers and residents as well as surrounding communities	Consult, Involve, Collaborate	Awareness – messages to inform stakeholders on activities Two-way consultation to guide project understanding, and likely out-turns of the ESA and associated plans, also mitigation responses to negative impacts or on beneficial activities Participation ranges across: Regulatory bodies that provide guidelines to be followed, the requisite permits, and monitoring Collaboration to ensure relevant agencies and authorities are engaged
Stakeholders that are involved in the Project's development and planned implementation, irrespective of current interest rating	Consult, Involve, Collaborate	
Stakeholders who can influence Project Implementation	Consult, Involve, Collaborate	Project understanding, and likely out-turns of the ESA and associated plans, also mitigation responses to negative impacts or on beneficial activities
Internal Stakeholders		
Contractor	Transact, Consult, Involve	Training and sensitisation on lender requirements for completing contracted work Collaboration to ensure two-way communication regarding any issues, mitigation measures, or positive impacts
Servicing company/ companies	Transact, Consult	
Renovation Contractors	Transact, Consult, Involve	
Services and facilities suppliers	Transact, Consult	
Security agencies	Transact, Consult	Collaboration regarding security issues or breaches
Media Houses	Monitor Inform	To inform message for awareness

13.2 Consultation Schedule

A schedule has been developed for the consultations intended to facilitate disclosure of information on the project (Appendix VII). It is anticipated that engagement will help to build and maintain over time a constructive relationship with all stakeholders.

13.2.1 Pre-MASP

The table below illustrates the project consultation schedule presented for the pre-construction phase of the project and shows the various types of communication strategies recommended for each type of stakeholder identified.

Table 13.3: Proposed Pre-MASP Consultation Schedule

PROJECT PHASE	STAKEHOLDER	TIMING	METHOD OF COMMUNICATION
ESA Phase	Property and Agro Park Manager, workers and users	At the start of project – site reconnaissance	Rapid interviews with select informants within sample Agro Parks to gain understanding of the main issues and to introduce them to the project
	Key implementing agencies and other interested stakeholders	Towards the end of the ESA, after the Draft Report has been reviewed and approved by the IDB	Meeting to discuss findings of the assessments, to gain feedback and solicit buy-in
Post ESA Phase	Key institutions involved in the development and implementation of MASP: • MICAF • AIC • NIC	After the submission Final ESA and ESMP	Focused meetings on their mandate, strengths and weaknesses to determine institutional recommendations to support implementation of MASP successfully Focused meetings to fully develop MASP components and activities
Post ESA Phase	All Stakeholders in Table 12.1	Once MASP has been properly defined	Stakeholder meeting to launch the draft programme and solicit feedback
Post ESA Phase	All Stakeholders in Table 12.1	Once MASP has been finalised and funding approved	Media launch the MASP

13.2.2 MASP – Operation

The table below shows the details for communication required during the execution of MASP. It outlines the communication needs, timing and method for the stakeholders relevant for each management plan.

Table 13.4: Stakeholder Consultations during the Operation of MASP

#	Plan	Communication Needs	Timing	Method
1	Worker Health and Safety Plan during Renovation Activities	Training of employees about health and safety procedures and personal protective gear that need to be worn during renovation activities especially at the AMC Complex	Before and periodically during the renovation works	Training and sensitisation sessions with contract workers on site Bulletins on the notice boards on site as reminders, safety signs
2	Solid Waste Management Plan	Communication to solid waste collectors to receive and remove solid and hazardous waste offsite to appropriate off-site disposal Communication to workers about the procedures for handling and disposing of solid and hazardous waste material	Prior to the start of renovation	Collectors to be advised via letter and telephone conversation Worker sensitisation sessions
3	Environmental and Social Management Plan	Training of Agro Park Managers and Property Managers	Prior to implementation of MASP	Training and sensitisation sessions Documentation to be handed over to manager
4	Farm Management Plan	Training of Agro Park Managers, farmers and users	As prescribed by Farm Management Plan	Training and sensitisation sessions

13.2.3 Reporting

The results of engagement activities conducted throughout the project must be presented. At the end of each phase/major milestone, the subsequent results can be appended. Engagement activity summaries should include the following information:

- Stakeholder engaged (name and contact details)
- Date and location of meeting (photograph if possible)
- Topic of meeting
- Feedback received from stakeholder
- Answers from Implementing Agency

- If the Implementing Agency commits to something, the commitment should be recorded as part of a commitment register identifying a responsible entity/person, and a deadline as appropriate.

14 Grievance Mechanism

A grievance mechanism will have to be in place once the programme has been developed and execution has begun. This mechanism will allow for concerns/complaints to be received by any stakeholder/party and to facilitate resolutions on behalf of the affected individuals. It will require the implementing agency, MICAF, to respond within a specified time. This mechanism offers the implementing agency and affected communities/ stakeholders an alternative to external dispute resolution processes.

It will be the responsibility of the implementing agency to update and modify this procedure or complaint mechanism as the full contours of the final project are known and agreed.

The grievance process outlined below covers component I and 2 activities. The implementing agency will receive complaints and facilitate the recording of concerns and grievances about the environmental and/or social performance of MASP. MICAF will need to facilitate a resolution of the affected communities, institutions or individuals. The grievance mechanism is scaled to the risks and adverse potential impacts of the project. It facilitates the prompt address of concerns using an understandable and transparent process that is appropriate, based on the Jamaican scenario, and readily accessible to all segments of the affected communities.

The mechanism is at no cost and is without retribution. The mechanism will not impede access to judicial or administrative remedies. The implementing agency will inform the affected communities and institutions about the mechanism during its stakeholder engagement process and as appropriate, to safeguard the interests of the project.

The recommended approach below is specific to internal stakeholders and external stakeholders.

14.1 Internal and External Stakeholders

Both internal and external stakeholders will place any complaint through the mechanism proposed. It should be allowed that complaints cannot only be received at the main MICAF office at Hope Gardens, but at each Agro Park and facility being upgraded under the MASP through the Property Manager or Agro Park Manager.

Step 1

The process of accepting grievances is the first step which can take on varying levels of formality as outlined in the Table below. The following section outlines the Grievance Collection Form that complainants will first need to complete. Grievance can be recorded at the temporary facility. Grievances can also be logged anonymously based on the nature of the problem.

Table 14.1: Methods for Grievance Receipt, from Least to most formal

Level of Formalisation	Examples
Least formal: Oral complaints received face-to-face	Staff charged with collection of grievances writes down complaints at group or individual meetings, during field visits, or at designated locations.

Level of Formalisation	Examples
Somewhat formalised: Oral complaints received through remote-access methods	Staff accepts grievances through a designated telephone line.
More formalised: Written compaints received face-to-face	Staff accepts written submissions from an individual or a group at group or individual meetings, during site visits, or at designated locations.
Most formalised: Written complaints recevied through remote access methods	Complaints come in via regular mail, Internet, or grievance collection boxes (consider having multiple locations). Complainants submit written grienvances to third parties (to be forwarded to the company or the thrid party designated to administer the company grievance mechanism.

While oral complaints are accepted from both internal and external stakeholders, a grievance collection form provided in the following section should be completed by the stakeholder following oral face-to-face or remote communication. This form will be made available at all sites slated for upgrading or development under MASP.

Step 2

The logging of complaints rests with the on-site Property or Agro Park Manger. Following the logging of a complaint, the grievance will be addressed. A response must be prepared for the grievant.

Should the grievant not be satisfied with the response provided, he/she moves on to step 3.

Step 3

Grievances that cannot be handled in Step 2 will be taken to the designated authority within the Implementing Agency. A further root cause analysis should be done to identify another appropriate corrective action and the Grievance Monitoring Form in the following section completed.

The complainant will then be informed in writing of the decision to correct the action within a forty-day working period.

Step 4

If the complainant does not feel that the grievance has been adequately addressed, the matter would go to court if the complainant so desires.

14.1.1 Grievance Collection Form

(Used by Stakeholder)
Case No. _____
Applicant's Name _____

□ I wish to submit complaint anonymously.
□ I demand that my personal details not be disclosed without my consent.

Address:_____
_____
Telephone: _____
Email: _____
Sex: Male [ ] Female [ ]
Age Group: <16 [ ] 16 to 25 [ ] 26 to 45 [ ] 46 to 65 [ ] >65

Description of Comments/Complaint: *(Subject of case, when did it occur, location, who is involved, effects of situation)*
_____
_____
_____
_____
_____

Date of Incident: _____
□ One-time incident/complaint (date_____)
□ Happened more than once (indicate how many times: _____)
□ Ongoing (a currently existing problem)

According to the applicant, what measures would provide solution to the problem?
_____
_____
_____
_____
_____
_____

Signature: _____
Date: _____

Note: Please forward this form to: Office of the Implementing Agency,
Jamaica
Telephone: _____
Email: _____

14.1.2 Grievance Monitoring Form

(Used by Grievance Manager)
This Form is the responsibility of the Grievance Officer.
Case No. _____
Applicant's Name _____
Address:_____
_____
Telephone: _____
Email: _____
Sex: Male [ ] Female [ ]
Age Group: <16 [ ] 16 to 25 [ ] 26 to 45 [ ] 46 to 65 [ ] >65

Complaint

_____
_____
_____
_____
_____
_____

Root Cause Analysis

- List all the possible contributing factors
- Identify most probable reason

_____
_____
_____
_____
_____

Corrective Action

_____
_____
_____
_____
_____

Preventative Action if problem can re-occur

_____
_____
_____
_____
_____

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16 Appendices

16.1 Appendix I – Details of Component II of the MASP

1. **Subcomponent 1: Development of a comprehensive framework for agricultural PPPs;**

The objective of this subcomponent is to develop an agricultural PPP framework that establishes the procedures, rules and institutional responsibilities related to the identification, evaluation, implementation and management of agricultural PPPs in Jamaica.

The framework will take into account existing GOJ PPP policies and institutions and will develop, in consultation with GOJ, specific PPP protocols for the agricultural sector; a typology of agricultural PPP models and practical guidance for selecting, funding and operationalizing agricultural PPPs.

The subcomponent will finance: (i) the engagement of one international and one local consultant to develop the framework in consultation with GOJ and other stakeholders; (ii) legal services to develop contractual models; (iii) technical workshops for GOJ staff in coordination with the DBJ; and (iv) a communications budget increase to awareness of the benefits of agricultural PPPs within the public and private sectors.

2. **Subcomponent 2: Market-driven agricultural PPPs to improve productivity and farm to market linkages**

This subcomponent will use a competitive process to identify at least four market-driven agricultural PPPs that will link smallholder farmers to markets through the establishment of commercial alliances with large buyers, with a preference for inclusive arrangements based on AEZs.

It will finance matching grants and technical assistance (TA) for smallholder farmers that will enable them to meet the quality, quantity and timeliness requirements of large buyers with established markets, through increases in capacity and productivity brought about through access to finance, technology, equipment and TA.

A central objective will be to learn about the conditions under which small farmers can be successful in such arrangements, to disseminate these throughout the sector and to generate more interest on the part of the smallholder farmers and buyers to engage in similar arrangements on AEZs.

To build these partnerships, TA grants will be provided to facilitate participatory stakeholder dialogue for the purposes of strengthening relationships, identifying solutions to problems within the supply chain, and selecting specific improvements that could increase productivity. These will be incorporated into a concept note to be submitted on behalf of the alliance by the large buyer.

Shortlisted applicants will be invited to submit a full proposal for which a TA grant will also be provided.

In the case of alliances based on AEZs, the application process will provide an opportunity to identify upgrades to public infrastructure on AEZs that could further improve the productivity of the alliance. These will be formally analysed, and if approved, may be funded by sub-component 3 (see below).

Applications will be judged on their potential to improve productivity and income, to apply new technologies including climate smart approaches, and to facilitate the greater participation in such arrangements of small farmers, including women and youth.

If a proposal is approved, farmers will be provided with matching grants that will contribute toward the cost of, amongst other things, training, equipment, new technology, improved post-harvest handling facilities, storage, lab testing, and input packages to enable farmers to better meet quality, quantity and timeliness standards and increase sales to large buyers.

Additional TA grants will also be available throughout the execution of the project to continue dialogue and problem solving within the alliance with a view to encouraging longer term, more trusting and productive commercial relationships in the sector.

3. **Subcomponent 3: Public infrastructure and services to support market-driven agricultural PPPs**

This subcomponent will finance: (i) the provision and improvement of public infrastructure on AEZs including roads, drainage, irrigation systems and buildings to enable, support and/or increase the productivity of approved market-driven PPPs; (ii) necessary technical studies including those related engineering and design; project feasibility, social and environmental analysis; and due diligence for the selection and contracting of private partners; and (iii) the procurement of approved machinery and equipment to be utilized by GOJ on a cost-recovery basis to mechanize agricultural tasks and increase farmer productivity on AEZs.

The subcomponent will also finance (iv) an expanded Farmer Field Training program.

4. **Subcomponent 4: Development of a pilot Productivity Innovation Fund**

This subcomponent will develop a pilot Productivity Innovation Fund (PIF) to stimulate applied research and development of technologies and/or processes or services with high potential to increase competitiveness and productivity within the Jamaican agricultural sector. The objective of the PIF will be to generate practical local knowledge that accelerates the commercialization, adoption and/or demonstration of innovative techniques or products on AEZs and within the wider Jamaican agricultural sector.

The PIF will make a minimum of three matching grant awards. The application process will consist of an initial and a full application stage. Applications by consortia consisting of private firms, educational institutions and farmers' organizations will be encouraged. TA may be offered to assist disadvantaged groups whose initial applications are approved for the full application stage.

The subcomponent will finance (i) the cost of establishing and administering the pilot fund; (ii) a communication budget; and (iii) the development and dissemination of knowledge tools such as case studies and impact reports.

5. **Subcomponent 5: Systems and tools to strengthen management and data collection in agro-economic zones.**

The objective of this subcomponent is to assist the GOJ in strengthening the capacity of AIC in its management of AEZs, and in the collection of data that will provide clarity to GOJ about the economic impact of its AEZ investments.

The subcomponent will finance:

(i) a 5-year vision and strategy document for AEZs;

(ii) An operations, HR and management plan to formalise procedures and to determine the optimum mix of staffing and skills to manage AEZs effectively;

(iii) A study to identify the key opportunities for cost-recovery on AEZs;

(iv) The development of a master plan for AEZs including: a full digital inventory and catalogue of AEZ lands under AIC management; a database for the digital storage of key information pertaining to land leases on AEZs, including: lease contracts and all related payment information (in concert with the AIC property department); historical and real time data on crop production including acreages under production, yields and returns on investment (in concert with GOJ); historical and current data related to water tables and quality (in concert with NIC); a record of farmer capabilities and capacities; details of equipment, infrastructure and farming practices used on each lease holding; a schedule and budget for the maintenance of roads and other infrastructure on each AEZ; and an Infrastructure gap analysis (roads, irrigation, drainage, structures, electrical).

(v) training, staffing and equipment to improve the quality and regularity of data collection on AEZs (in coordination with MICAF's Agricultural Marketing Information Division).

16.2 Appendix II - List of Association and Members on Agro Park

Name of Association	Position	Name and Sex
Yallahs Water Users Association	President:	Mr. Gregory Thomas (M)
	Vice President:	Mrs. Aldean Biggs-Scott (F)
	Secretary:	Ms. Pamelita Dann (876-303-1525) (F)
	Treasurer:	Ms. Carol Young (F)
	Public Relation Officer:	Mr. Eric Williams (876- 409-6500) (M)
	Marketing Officer:	Mr. Lawrence Lynch (M)
	Maintenance Manager:	Mr. Grandville Francis (M)
Ebony Park Agricultural Cooperative (EPAC)	President:	Anthony Grant (President 876-354-5111) (M)
	Members	Richard Watson (M) Cornel McKen (M) Deon Hall (F) Joseph Morrell (M) Lorene Lindsay (F) Dean Menzie (M) Oliver Mair (M) Howard Forbes (M) Michael Hutchinson (M) Winchroy Budhoo (M) Denzil Dyer (M) Linford Cooper (M) Leonard Morgan (M) Lascelles Richardson (M) Ashton Hewitt (M) Eric Blair (M) Thomas Burton (M) Naptali Morant (M) Garry Larmond (M) Milton Henry (M) Merick Watson (M)
Spring Plain Farmer's Association	President:	Govinda Fisher (876-533-6330) (M)
	Vice President:	Bilton Forbes (M)
	Secretary:	Gary Nelson (M)
	Treasure:	Clinton Hutchinson (M)
	PRO:	Harold Corridice (M)
	Members	Esther Martin (F) Sonia Mclean (F) Rupert Barrett (M) Norval Cameron (F) Phillip Cristobol (M) Herbert Drummonds (M) Simon Dyer (M)

Name of Association	Position	Name and Sex
		Christopher Griffiths (M) Costell King (M) Leslie King (M) Symore Morgan (M) Stanley Heweitt (M) Jason Miller (M) Darvin Nichol (M)
New Forest/ Duff House Water Users Group	President:	Clinton Oscar (876) 403-6840 (M)
	Members	Jeff Stephenson (M) Conrad Murray (M) Carmeta Atkins (F) Clinton Oscar (M) Winston Oscar (M) Suzette Rankine (F) Conrad Murray (M) Jennifer Reid McDonald (F)

16.3 Appendix III – GlobalGAP-Certified Farms

	Name of Farmer		Crop Certified	Family
	Yallahs Agro Park			
1	Eric Williams	M	Capsicums (Pepper/ Chillies)	Solanaceae
2	Gary Mclean	M	Capsicums (Pepper/ Chillies)	Solanaceae
3	GrandVille	M	Capsicums (Pepper/ Chillies)	Solanaceae
4	Leila Thomas	F	Capsicums (Pepper/ Chillies)	Solanaceae
5	Lawrence Lynch	M	Melons (Citrullus lanatus)	(cucurbitaceae)
6	Raman Rowe	M	Melons (Citrullus lanatus)	(cucurbitaceae)
7	Pamelitta Dann	F	Onions (Allium cepa)	Liliaceae
	New Forest/Duff House			
1	Carmeta Atkins	F	Melons (Citrullus lanatus)	cucurbitaceae
			Onions (Allium cepa)	Liliaceae
			Thyme (Herb) Thymus	Lamiaceae
2	Clinton Oscar	M	Capsicums (Pepper/ Chillies)	Solanaceae
			Melons (Citrullus lanatus)	cucurbitaceae
			Onions (Allium cepa)	Liliaceae
			Thyme (Herb) Thymus	Lamiaceae
3	Conrad Murray	M	Capsicums (Pepper/ Chillies)	Solanaceae
			Onions (Allium cepa)	Liliaceae
			Thyme (Herb) Thymus	Lamiaceae
4	Jeff Stephenson	M	Capsicums (Pepper/ Chillies)	Solanaceae
			Melons (Citrullus lanatus)	cucurbitaceae
			Onions (Allium cepa)	Liliaceae
			Thyme (Herb) Thymus	Lamiaceae
5	Jennifer Ried	F	Onions (Allium cepa)	Liliaceae
			Thyme (Herb) Thymus	Lamiaceae

	Name of Farmer		**Crop Certified**	**Family**
6	Suzette Rankine	F	Onions (Allium cepa)	Liliaceae
			Thyme (Herb) Thymus	Lamiaceae
7	Winston Oscar	M	Melons (Citrullus lanatus)	cucurbitaceae
			Onions (Allium cepa)	Liliaceae
			Thyme (Herb) Thymus	Lamiaceae
	Plantain Garden River			
1	Arthur Johnson	M	Capsicums (Pepper/ Chillies)	Solanaceae
2	Charmaine Blair-Stewart	F	Pumpkins (Cucurbita)	Cucurbitaceae
3	Clarence Thompson	F	Capsicums (Pepper/ Chillies)	Solanaceae
4	Dennis Brown	M	Capsicums (Pepper/ Chillies)	Solanaceae
5	Donald Shephard	M	Pumpkins (Cucurbita)	Cucurbitaceae
6	Gary McLean	M	Pumpkins (Cucurbita)	Cucurbitaceae
7	Janet Barrett-McIntosh	F	Capsicums (Pepper/ Chillies)	Solanaceae
8	Keith Thomas	M	Pumpkins (Cucurbita)	Cucurbitaceae
9	Khani Thompson	M	Capsicums (Pepper/ Chillies)	Solanaceae
10	Lance Gill	M	Capsicums (Pepper/ Chillies)	Solanaceae
11	Lancelot Briscoe	M	Cassava Root (Yucca / Manioc)	Euphoriaceae
			Pumpkins (Cucurbita)	Cucurbitaceae
12	Nigel Levy	M	Capsicums (Pepper/ Chillies)	Solanaceae
13	Patrick Solomon	M	Pumpkins (Cucurbita)	Cucurbitaceae
14	Wilton Field	M	Capsicums (Pepper/ Chillies)	Solanaceae
	Ebony Park/ Spring Plain			
1	Anthony Grant	M	Sweet Potatoes (Ipomoea batatas)	Convolvulaceae
			Melons (Citrullus lanatus)	Cucurbitaceae

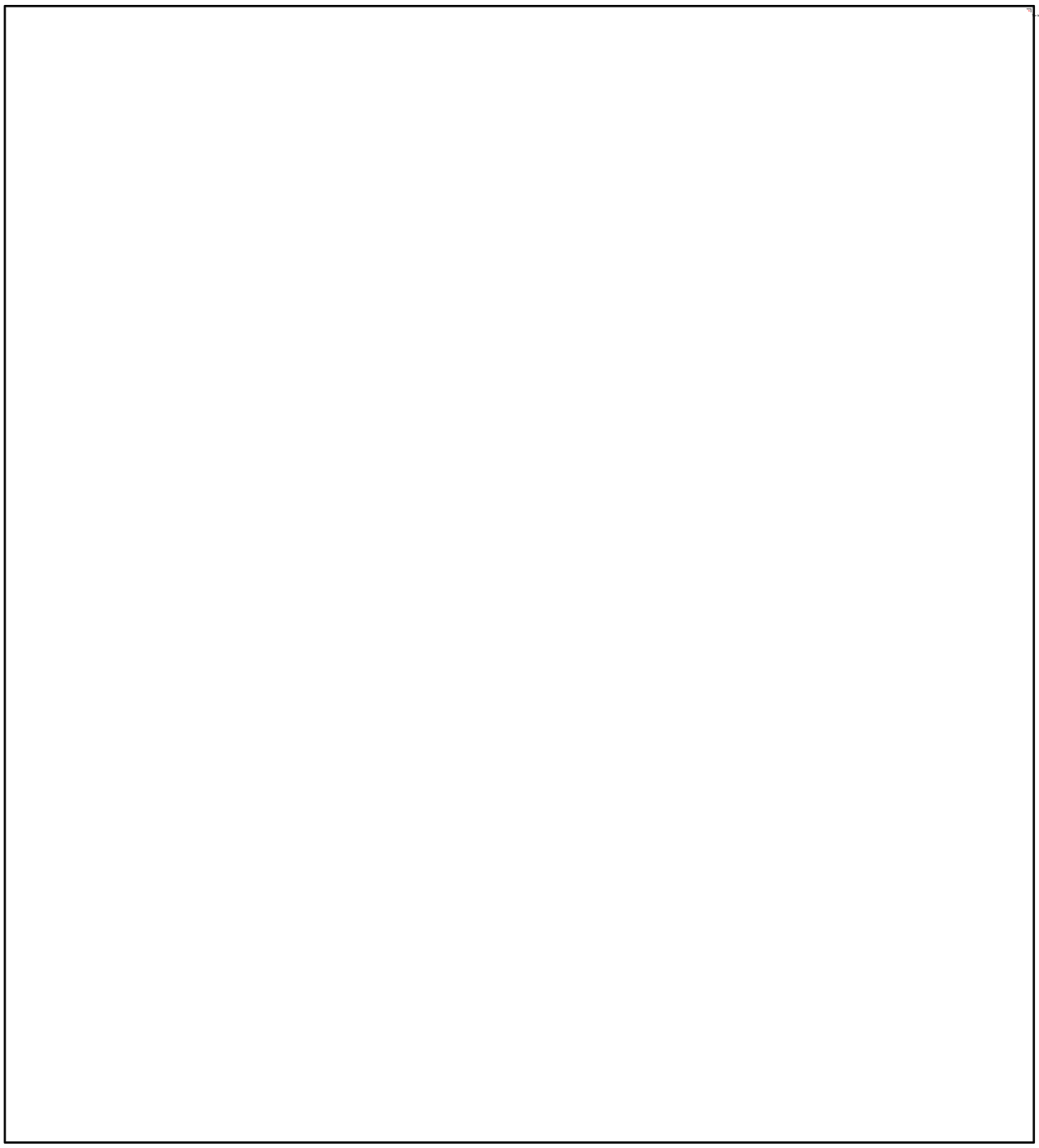
	Name of Farmer		**Crop Certified**	**Family**
			Pumpkins (Citrullus lanatus)	Cucurbitaceae
			Onions (Allium cepa)	Liliaceae
			Capsicums (Pepper/ Chillies)	Solanaceae
2	Ashton Hewitt	M	Capsicums (Pepper/ Chillies)	Solanaceae
			Sweet Potatoes (Ipomoea batatas)	Convolvulaceae
			Onions (Allium cepa)	Liliaceae
3	Eric Blair	M	Sweet Potatoes (Ipomoea batatas)	Convolvulaceae
			Pumpkins (Citrullus lanatus)	Cucurbitaceae
4	Gary Coulton	M	Sweet Potatoes (Ipomoea batatas)	Convolvulaceae
			Melons (Citrullus lanatus)	Cucurbitaceae
			Pumpkins (Citrullus lanatus)	Cucurbitaceae
			Capsicums (Pepper/ Chillies)	Solanaceae
5	Lorene Lindsay	F	Sweet Potatoes (Ipomoea batatas)	Convolvulaceae
			Pumpkins (Citrullus lanatus)	Cucurbitaceae
6	Michael Hutchinson	M	Sweet Potatoes (Ipomoea batatas)	Convolvulaceae
			Pumpkins (Citrullus lanatus)	Cucurbitaceae
			Onions (Allium cepa)	Liliaceae
			Capsicums (Pepper/ Chillies)	Solanaceae
7	Napthali Morant	M	Sweet Potatoes (Ipomoea batatas)	Convolvulaceae
			Pumpkins (Citrullus lanatus)	Cucurbitaceae
8	Richard Watson	M	Sweet Potatoes (Ipomoea batatas)	Convolvulaceae
			Pumpkins (Citrullus lanatus)	Cucurbitaceae

	Name of Farmer		**Crop Certified**	**Family**
			Onions (Allium cepa)	Liliaceae
9	Thomas Burton	M	Sweet Potatoes (Ipomoea batatas)	Convolvulaceae
			Pumpkins (Citrullus lanatus)	Cucurbitaceae

16.4 Appendix IV - List of AMC Complex Customers (April 30, 2019)

1. Agri-Life Foundation Limited
2. Antillean Import Export
3. Cap Consulting Ltd.
4. Carita (Jamaica) Limited
5. Dr. Michael Whittingham
6. First Choice Export
7. Grace Food Processors (Canning)
8. Jamaica Export Trading Co. Ltd.
9. Liquid Traders Limited
10. Marsharpe Company Ltd.
11. MTAC Networking Management Ltd.
12. OSHERMS Consultants
13. Palmetto Exports Limited
14. Primrose Myers
15. Seacrest Trading Co. Ltd.
16. Spike Industries Ltd.
17. Sunland Distributors Ltd.
18. Tropical Foods Distributors Ltd.
19. Trout Hall Ltd.
20. Viomark Trading Ltd.
21. VIP Attractions
22. VKBH Customs Broking

16.5 Appendix V – Sample of Appointments for Export of Produce



16.6 Appendix VI - Relevance of Suggested Water Quality Monitoring Parameters

Table: Suggested Water Quality Monitoring Parameters

Parameters (units)	NRCA Ambient Water Quality Standard	Background and Relevance
Faecal Coliform (MPN/100ml)	-	Microorganisms are a part of all ecosystems. They assist ecosystem processes by breaking down organic matter and also act as food sources for higher organisms. They are also important to the biogeochemical cycles for example nitrogen and carbon cycles. Faecal coliform are subset of the family of *Enterobacteriaceae* and are used as water quality indicators, especially for potable water. These are very hardy, non-spore forming, gram negative, lactose fermenting rods which can survive as either obligate or facultative anaerobes. Faecal Coliform includes bacteria such as Escherichia coli (*E. coli*), as well as other types of Coliform bacteria that are naturally found in the soil. Faecal Coliform bacteria exist in the intestines of warm-blooded animals and humans, and are found in bodily waste, animal droppings, and naturally in soil. Most of the Faecal Coliform in faecal material (faeces) is comprised of *E. coli* which can cause illness in humans. The presence of Faecal Coliform in ambient water may indicate recent contamination of the groundwater by human sewage or animal faeces which could contain other bacteria, viruses, or disease-causing organisms. For this reason, Coliform bacteria are considered "indicator organisms"; their presence warns of the potential presence of disease causing organisms and they are widely used to assess the risk of diseases due to their nature and the fact that other pathogens may be difficult to detect by conventional methods and should alert the person responsible for the water to take precautionary action.
Nitrate as Nitrogen (mg NO_3^-/L)	0.1 – 7.5	Nutrients are chemicals that are essential for growth. Regarding plants, these include (but are not limited to) nitrogen (N), phosphorus (P), sulfur (S). Nitrogen, phosphorus, along with potassium are considered primary nutrients with nitrogen and phosphorus being the limiting nutrients responsible for plant growth. Nutrients have indirect adverse effects on aquatic ecosystems. Primarily, increased nutrients influence the growth and accumulation of plant and algal biomass resulting in eutrophication, especially in slow moving waters. This process reduces the available oxygen (as well as it can affect the pH of the water body) to the higher organisms and often results in death of these organisms. Eutrophication may also hinder the provision of viable ecosystem services such as recreation, fishing and hunting and may interfere with drinking water treatment and use of water bodies by other industrial facilities.
Phosphate (mg PO_4^{3-}/L)	-	
Total Suspended Solids (mg/L)	0.01 – 0.8	TSS comprises of those inorganic and organic solid particles dispersed in a water body. Several factors can contribute to the TSS content of ambient water bodies, these include but are not necessarily limited to: Decaying biological matter, point sources such as industrial and sewage effluent discharge, and

Parameters (units)	NRCA Ambient Water Quality Standard	Background and Relevance
		Dredging activities. TSS is widely regarded as a key pollution indicator as it greatly affects aquatic ecosystems negatively; primarily by hindering the breathing processes of aquatic organisms. High TSS content will increase the turbidity of the affected system and will reduce the sunlight reaching the phytoplankton and other aquatic plants thereby limiting photosynthesis and by extension dissolved oxygen concentrations. TSS also affects the treatment process of water as it can block filters which can potentially lead to the proliferation of microorganisms especially in systems where chlorination is not employed. Solids passing through the filtration phase will reduce the effectiveness of chemical treatment by interacting with the chemicals used thereby reducing the concentrations available for effective treatment.
Chloride (mg Cl^-/L)	5.0 – 20.0-	Chloride is a major constituent of most waters. It is normally present in low concentrations in surface waters, while groundwater will contain varying amounts of chloride depending on the surrounding geology. Chloride is widely distributed in the environment, generally as sodium chloride (NaCl), potassium chloride (KCl) and calcium chloride ($CaCl_2$). The weathering and leaching of sedimentary rocks and soils and the dissolution of salt deposits release chlorides into water. Chloride my also get into the environment via surface runoffs and sewage effluent discharge. High Chloride concentration will affect the conductivity, salinity and TDS of a water body and may be indicative of saline intrusion in groundwater sources; indicating that the water is being overdrawn.
Salinity (ppt)	-	Salinity is a measure of the content of salts in soil or water. Salts are highly soluble in surface and groundwater and can be transported with water movement. Widespread vegetation clearance, poor land use, poor irrigation and industrial practices have made it easier for salts to be transported to the soil surface or to waterways. Excessive amounts of dissolved salts in water can affect agriculture, drinking water supplies and ecosystem health. High concentrations of salts pose hazards for the environment as well as affecting agriculture and infrastructure and therefore, the wider economy. High levels of salinity in water and soil may cause native vegetation to become unhealthy or die and lead to a decline in biodiversity through dominance of salt-resistant species, potentially altering ecosystem structures.
Alkalinity (mg $CaCO_3$/L)	-	pH is a measure of the acidity or the basicity of a solution. It ranges from acidic (<7units) to basic (>7units), solutions with a pH of 7 are classified as neutral. A water body will can typically resist some changes in pH; this is called the buffering capacity and can be assessed by quantifying the ANC (alkalinity) of the water body. pH affects most chemical and biological processes in water, and it is one of the most important environmental factors limiting the distribution of species in aquatic habitats as different species have a different tolerance for pH. Most freshwater bodies have a normal pH in the range of 6 to 8 pH units.
pH (pH units)	7.00 – 8.40	

Parameters (units)	NRCA Ambient Water Quality Standard	Background and Relevance
Conductivity (mS/cm)	0.15 – 0.6	Conductivity is a measure of the ability of water to pass an electric current. This is affected primarily by the presence of inorganic solutes such as chloride (Cl^-), nitrate (NO_3^-), sulfate (SO_4^{2-}), and phosphate (PO_4^{3-}) ions or metal ions, for example sodium (Na^+), magnesium (Mg^{2+}), calcium (Ca^{2+}), iron ($Fe^{3+,2+),}$ and aluminium (Al^{3+}) among others; these ions also make up the total dissolved solids content of a water body and also influence salinity. Dissolved organic compounds tend not to conduct electrical current very well and therefore have very little effect on conductivity of a solution and are usually undetected as dissolved solids. Conductivity and TDS are also affected by temperature as this affects the mobility of these ions. Conductivity/TDS in ambient water is affected primarily by the geology of the area through which the water flows as well as it may be affected by point sources of contamination. Ambient water from areas with granite bedrock tend to have lower conductivity because granite is composed of more inert materials that do not ionize. On the other hand, ambient water from areas with clay soils tend to have higher conductivity because of the presence of materials that ionize when washed into the water; similarly, water moving through areas of limestone rocks will also have notable conductivity/TDS values due to the dissolution of calcium carbonate ($CaCO_3$) in these rocks. Without having to assess the nutrient parameters, conductivity/TDS data gives general information on the amount of dissolved ionic compounds in water samples. This can also give indications of saline intrusion for the ground waters sources. Also, if there are any point sources of discharges to the surface water body, this can alter the conductivity depending on their make-up. A failing sewage system would raise the conductivity of nearby groundwater sources because of the increase in the concentrations of ions for example chloride, phosphate, and nitrates.
Biochemical Oxygen Demand (mg O_2/L)	0.8 – 1.7	Oxygen demand (OD) is defined as the amount of oxygen required to oxidize a compound to its final oxidation products. When this demand is created via chemical oxidative processes it is called chemical oxygen demand (COD) and when the demand is created via biochemical pathways it is called biochemical oxygen demand (BOD). Oxygen Demand in this sense refers to the demand for oxygen by aquatic systems and do not generally consider the demand for higher organisms in these systems. Organisms, however, compete with the environment for oxygen and as such in an unpolluted system, the oxygen demand as determined by COD and BOD is should be low. When COD and BOD are low it means there is a low concentration of oxidizable matter (primarily organics) in the water body and as such, the dissolved oxygen (DO) is typically high in these cases. DO, COD and BOD are used to monitor the pollution levels in natural water bodies and are generally classified as 'key pollution indicators'. These parameters are typically affected by point sources of pollution. BOD and COD has the potential to
Dissolved Oxygen (mg O_2/L)	-	
Chemical Oxygen Demand (mg O_2/L)	-	

Parameters (units)	NRCA Ambient Water Quality Standard	Background and Relevance
		negatively impact water availability as capital input may be required to design treatment systems to convert these waters into water for potability.
Pesticide Screen	-	Pesticides are used to prevent certain insects and weeds from consuming agricultural plants. These are generally organic in nature. Overuse of pesticides can contaminate groundwater and surface water through leaching.
Copper (µg Cu/L)	-	Metals occur in all ecosystems, although natural concentrations will vary both spatially and temporally. Land disturbances can increase erosion and mobilize metals causing them to get into ambient water systems. Human activities can redistribute and concentrate metals in areas that are not naturally rich in metals. Unlike sediment and nutrient impairments, metal contamination in ambient water tend to go unnoticed unless it is extreme (for extremely high concentration of Fe^{3+} can turn a stream rust brown). While some metals are essential as nutrients, all metals can be harmful at elevated levels, but there are noted metals that toxic in minute amounts. Adverse effects on the ecosystem will result when metals are biologically available at toxic concentrations. For some metals, for example iron, copper and zinc, will impart undesirable qualities to water that is intended to be used as potable water. High concentration of metals in water also limits its use in industrial applications.
Zinc (µg Zn/L)	-	
Boron (µg B/L)	-	
Manganese (µg Mn/L)	-	
Iron (µg Fe/ L)	-	
Magnesium (µg Mg/L)	3600 – 27000	
Sodium (µg Na/L)	4500 – 12000	
Calcium (µg Ca/L)	40000 – 101000	
Potassium (µg K/L)	740 – 5000	
Hardness (mg $CaCO_3$/L)	127.0 – 381.0	Assess the proportion of calcium and magnesium in water. Hard water has the negative effect of forming scales on industrial equipment resulting in high overhead and capital expenses relayed to cleaning, repairing and replacing damaged equipment.

16.7 Appendix VII - MASP Consultation Plan and Report Template

COMMUNITY MEETING		
COMPONENTS	**DETAILS**	**EXPECTED OUTCOMES**
VENUE		
DATE		
TIME		
INVITEES		
MEANS OF INVITING		
REQUIRED ATTENDANCE		
RECORD OF MEETING MANAGEMENT		
PURPOSE OF MEETING		
POST MEETING		

Stakeholders that have a Participatory Role in the Projects planned implementation	**Participatory Role**	**Current Interest Focus**
Ministry of Science, Energy and Technology (MSET)	Facilitating	Technology Input - Linkages with SRC for Training
The Ministry of Health	Facilitating & Procurement	Public Health Inspection of Facilities
National Environment and Planning Agency	Regulatory	Environmental permits/ licences
National Land Agency	Facilitating	Land ownership and titling
Independent lawyer(s)	Procurement and Facilitating	Support Land ownership changes
Jamaica National Heritage Trust	Regulatory	Guidance on changes to sites with key heritage features
Mines and Geology Division	Regulatory	Facilitating the extraction of material from rivers or quarries
JPSCo	Facilitating & Procurement	Electricity supply (AMC Complex only)
Subcontractors	Facilitating & Procurement	The details of the involvement of these subcontractors is yet to be worked out. They will perform contracted functions whether on the renovation of the AMC complex or farm management, or as to be determined.
Contract workers	Facilitating	These will likely comprise the workforce of the subcontractors.
Equipment suppliers	Procurement	As likely determined by Sub contractors
Contract service providers	Procurement and Facilitating	As likely determined by Sub contractors and Client
Facilitators of Project		
National Irrigation Commission	Facilitating	Irrigation Water Supply
National Land Agency	Facilitating	Land acquisition and titling
National Water Commission	Facilitating & Procurement	Water supply (AMC Complex plus interfaces with existing networks in Agro Parks)
Water Resources Authority	Regulatory	Licence for Well Drilling, Pumping and Monitoring
Dep of Cooperatives and Friendly Society	Facilitating	Supporting the registration and maintenance of Farmers Groups
Implementers - Stakeholders influencing Project		
Ministry of Industry Commerce Agriculture and Fisheries	Implementing Agency	Overarching
Agro Investment Corporation	Operations	Manage Operations of Agro Parks and AMC Complex

Stakeholders that have a Participatory Role in the Projects planned implementation	**Participatory Role**	**Current Interest Focus**
Municipal Corporations	Facilitation & Planning	Local Government Inputs – Possible interactions with the Interagency Committee, Parish Disaster Committee, Parish Development committee
National Works Agency	Procurement	Structural works
Social Development Commission	Facilitating	Social Environment
National Solid Waste Management Authority	Procurement & Facilitating	Waste Management
Planning Institute of Jamaica	Facilitating	Project Planning and Funding
Affected Stakeholders		
All Agro Park and Packaging facilities	Affected Community	Impacts negative or positive
Communities surrounding all Agro Parks	Affected Community	Impacts negative or positive
AMC Complex – Spanish Town Road	Surrounding Community	Impacts negative or positive
Stakeholders Able to Affect the Project		
Jamaica Social Investment Fund	Procurement & Facilitating	Liaison with Existing Projects funded in the project area.
Government of Jamaica/Adaptation Fund Programme (GOJ/. AFP)	Procurement & Facilitating	Liaison with Existing Projects funded in the project area.
Inter-American Institute for Cooperation on Agriculture (Jamaica)	Procurement & Facilitating	Liaison with Existing Projects funded in the project area.
RIU Group of Hotels	Market	Market for agricultural produce
Grace Kennedy	Market	Market for agricultural produce
Progressive	Market	Market for agricultural produce
Lees Food Fair	Market	Market for agricultural produce
Spur Tree Spices	Market	Market for agricultural produce
Chefs and Accountants	Market	Market for agricultural produce
Everything Fresh	Market	Market for agricultural produce
Jamaica's Finest	Market	Market for agricultural produce
Hi Pro	Procurement	Provision of Seeds
New Port Fersan	Procurement & Facilitating	Training Provision of Pesticides and fertilizers
American Airlines	Procurement & Facilitating	Facilitating Export within short time frame
Fly Jamaica	Procurement & Facilitating	Facilitating Internal movement of goods Montego Bay-Kingston
Caribbean Airlines	Procurement & Facilitating	Facilitating Export within short time frame

Stakeholders that have a Participatory Role in the Projects planned implementation	**Participatory Role**	**Current Interest Focus**
Idel Brown	Procurement	Exporter - Market for agricultural produce
Patsy Duncan	Procurement	Exporter - Market for agricultural produce
Seaboard Shipping and Freight,	Procurement	Secure Fast transport of produce to UK
Corrpak	Procurement	Packaging Material
Jamaica Customs	Facilitating	Granting Export of Goods
DHL	Procurement	Export Services