



ENVIRONMENTAL IMPACT ASSESSMENT STUDY
KIPSIRICHET DAM
LONDIANI SUB-COUNTY OF KERICHO COUNTY



(Ref: JFK/EIA/2018)

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EXECUTIVE SUMMARY

This report covers the E.I.A. Study for the proposed Kipsirichet Dam within James Finlays (K) Ltd. (JFK), Lemotit Farm. The Lemotit farm is located in Seramek sub-location, Lemotit location, Londiani Sub-County of Kericho County.

The E.I.A. is a legal requirement under the Environmental Management and Co-ordination Act, 1999, the Environmental Management and Co-ordination Amendment Act, 2015 and the Environmental (Impact Assessment and Audit) Regulations, 2003. Additionally, the design of the dam and the dam's inflow furrow has been undertaken by a consultant engineering firm and an application for authorization of construction of works has been prepared and submitted to Water Resources Authority (WRA) in compliance with the Water Act 2016 and the Water Resource Management 2007 regulations.

JFK Lemotit Farm currently consists of approximately 37 ha of floriculture grown under drip systems and greenhouses with the remaining area of the 460 ha farm principally under Eucalyptus and Pine as a commercial crop. JFK wishes to increase the area under floriculture to approximately 60 ha over the next 2 years, necessitating the development of additional water storage within the farm to provide required reliability of water resources to support the proposed additional irrigation water needs.

JFK thus proposes to construct an earth dam on Kipsirichet valley within the JFK Lemotit Farm to store greenhouse and surface runoff. Details of various components of the proposed earth dam include: –

	Component	Description
1	Embankment	Crest Level – 9m above ground level, crest length of 297.5m and width of 5m Base – 14m
3	Reservoir	Volume – 122,866m ³ at normal water level
4	Spillway	Level – 7m
5	Draw Off Works	200mm uPVC class E Compensation Pipe, Inspection Chambers
6	Ancillary Works	Site Clearance of foundation & Impoundment area, temporary access road, Fencing, Warning sign

The approximate cost of the project is KES.44.7 million (inclusive of VAT).

The environmental concerns during the *construction phase* relate to removal or disruption of vegetation most of which currently consist of various grasses, shrubs and commercial tree crop, generation of wastes/debris /litter from site clearance waste, construction materials such as metal, concrete, cement bags, and domestic waste associated with the workforce etc., safety of workers, noise and air pollution. These concerns can be mitigated through revegetation after completion of the construction, well supervised construction and proper attention to occupational safety practices and proper disposal of wastes generated.

The environmental concerns during the *operational phase* of the dam relate to increased risk of drowning, downstream flow and water quality issues attributed to the dam, pests attributed

to the expanded water habitat such as water rats, snakes, geese, mosquitos, liver fluke, snails, invasive water plants and possible dam failure. These concerns will be continually addressed by JFK through measures such as complaints handling mechanisms, pest monitoring and control, dam monitoring and risk reduction activities. WRM Rules (2007) requires the dam owner to carry out dam inspection and in the case of proposed Kipsirichet dam, this should be done every three years by a qualified water professional as it is under Class B of dam classification. An environmental management and monitoring plan (EMMP) has been developed for the project which will be implemented and monitored from time to time via Annual Environmental Audits to be submitted to NEMA by JFK. In addition, JFK will have to adhere to dam safety plan and dam inspection regime.

This report documents the environmental and social context of the project, the process of disclosure and consultation followed to develop this report, the relevant legislation and policy framework, details of the proposed project, a description of operations, working conditions during implementation phase, project cost, materials to be used, by products, wastes and method of disposal, potential environmental impacts and their mitigation, and a decommissioning plan after the augmentation. The report presents the Environmental Management and Monitoring Plan (EMMP) that has been developed in consultation with the project proponent, and an analysis of alternative options considered by the proponent.

From the environmental impact assessment conducted and detailed in this report, the benefits/positive impacts of the Kipsirichet Dam outweigh the risk of negative impacts. The risks of negative project impacts are minimal and the project proponent has duly planned to implement the proposed mitigation measures. This report therefore recommends that the project be accorded NEMA approval subject to the mitigation measures highlighted in the EMMP being implemented by the concerned parties as the project does not pose serious environmental concerns. In addition, the proposed dam will lead to expansion of horticultural activities which in turn shall lead to increased employment and improved economic status.

KIPSIRICHET DAM
ENVIRONMENTAL IMPACT ASSESSMENT STUDY

Lead Expert

I, **MICHAEL KARIUKI THOMAS**, of *Rural Focus Ltd, P.O. Box 1011, Nanyuki*, confirm that the EIA Study Report for Kipsirichet Dam has been developed under my supervision. I confirm that I am a licensed Lead Expert with the National Environmental Management Authority (No. 0129).



Signature: _____

Date: 24th July 2018

Proponent Approval

I, **JANE NDIRANGU**, have legal authority to sign on behalf of **JAMES FINLAYS KENYA LTD., LEMOTIT FARM** and have read the EIA Study Report and accept the findings and recommendations of the report. I accept the Environmental Management and Monitoring Plan and will strive to fulfil its obligations.



Signature: _____

Position: Sustainability, Environment and Safety Manager

Date: 24th July 2018

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ACRONYMS

amsl	above mean sea level
asl	above sea level
BoQ	Bill of Quantities
CAP	Chapter
CM	Cubic metres
COK	Constitution of Kenya
DOHSS	Directorate of Occupational Health and Safety Services
EA	Environmental Audit
EAP	Environmental Action Plan
ECD	Early Childhood Development
EIA	Environmental Impact Assessment
EMCA	Environmental Management and Co-ordination Act, 1999
EMMP	Environmental Management & Monitoring Plan
FAO	Food and Agriculture Organization
GI	Galvanised Iron
GoK	Government of Kenya
HDPE	High Density Polyethylene
HSE	Health Safety and Environment
JFK	James Finlays (Kenya) Limited
MWI	Ministry of Water and Irrigation
NEAP	National Environmental Action Plan
NEMA	National Environment Management Authority
NGO	Non-Governmental Organisation
NWMP	National Water Master Plan
OHS	Occupational Health and Safety
O & M	Operation and Maintenance
PPE	Personal Protective Equipment
<i>spp.</i>	Species
uPVC	unplasticized Polyvinyl Chloride
VAT	Value Added Tax
WRA	Water Resources Authority
WRUA	Water Resource Users Association

1 INTRODUCTION

The following is a brief description of the project background, objectives and project identification/justification. The report has been prepared to include as much information as possible in order to make environmental self-audits easier. The terms of reference for the study are included in **Appendix A**.

1.1 Project Background

James Finlays (Kenya) Limited (JFK), formally called African Highlands Produce Company Limited started growing tea in Kericho in 1925. The company's land, currently comprising of 10,330 ha, is spread across Kericho and Bomet Counties. The company grows tea on 5,159 ha, Eucalyptus trees on 2,891 ha, timber on 178 ha and flowers on 113 ha. The rest of the land is occupied by camps, amenities and protected natural forests.

James Finlays (Kenya) Limited (JFK), under its subsidiary Finlays Flower started growing flowers in 1989 and has over the years grown to be one of the largest cut flower producers in Kenya. Currently, it is mainly growing spray carnations, gypsophila, standard carnations and roses. Approximately 100 greenhouses on 113ha produce some 40 million stems annually. The flowers are exported to the United Kingdom, European Union, Middle East and the Dutch Auctions.

Due to a recent review in business strategy, JFK plans to close the flower growing operations in Tarakwet and Chemirei over the next two years and expand its Lemotit Flower Farm from the current 37ha to 60ha over the same period. The total workforce of the flower farms is 2,667 employees, comprising of 1,424 men and 1,243 women. The expansion of Lemotit Farm flower production calls for additional water resources and JFK thus proposes to construct an earth dam, the Kipsirichet Dam on the ephemeral Kipsirichet valley within the JFK Lemotit Farm to store greenhouse and surface runoff to support the increased irrigation needs.

JFK Lemotit Farm currently consists of approximately 37 ha of floriculture grown under drip systems and greenhouses with the remaining area of the 460 ha farm principally under a crop of Eucalyptus and Pine. A map of the area indicating project site is provided in Appendix D.

1.2 Objective of the Project

The overall objective of the proposed dam project is to provide additional water resources for irrigation purposes to support proposed expansion of the flower farm in the JFK Lemotit Farm. The project proponents intend to achieve this by constructing a 122,000m³ capacity earth dam within the farm.

1.3 Project Justification

The greenhouses within the Lemotit farm provide an expansive catchment for rainwater harvesting. From the existing 37ha greenhouse area, runoff from 14ha is currently being harvested and channelled to the existing Lemotit dam. The remaining 23ha is currently not being harvested due to the farm topology which makes it difficult to direct the runoff to the existing Lemotit dam. This runoff drains to the Kipsirichet valley and often causes flooding and water logging in neighbouring farms downstream during the wet seasons. Greenhouse

runoff from these existing 23ha and the proposed additional 23ha (totalling to 46ha), together with surface runoff from the Kipsirichet valley catchment (2.25km²) form substantive sources to feed the proposed Kipsirichet dam. Construction of the dam will not only harness this runoff but also mitigate the crop damage and losses associated with flooding on the farms downstream of the Lemotit farm. It will additionally enable JFK to undertake the proposed expansion which has economic benefits as it will benefit both the company as well as the community.

A Water Resources Survey of the Lemotit Farm conducted in 2017 indicated that a dam with a 7m water depth and 122,000m³ capacity was the most economic way of providing sufficient water security to support the floricultural expansion at the Lemotit Farm.

1.4 This Report

In the introduction (**Chapter One**), the report highlights a brief description of the project background, objectives and project identification/justification.

The views and recommendations from the area residents as well as other stakeholders have been highlighted in **Chapter Two**. The proposed project has been well received as it will bring about some benefits to the community such as creating jobs and mitigation of flooding downstream of Lemotit Farm. The methodology used in conducting this EIA has also been presented in chapter Two.

The legal framework against which the project must comply has been reviewed in **Chapter Three**. The pertinent statutes which have been reviewed include the EMCA, EIA/Audit Regulations, Water Act, Public Health Act, Factories and other places of Work Act, Physical Planning Act, etc.

The Project's baseline characteristics have been documented in **Chapter Four** for the purpose of providing data against which the project monitoring may be carried out in the future. Information in this chapter touches briefly on climate, water resources, topography, land tenure and land use, infrastructural situation, social economic setting, as well as the population profiles of the project area.

Chapter Five, Six and Seven describe the activities to be encountered during the project construction phase. The Chapters also highlights the expected by-products and the method of waste disposal as well as the decommissioning plan.

The possible Environmental Impacts and their mitigation have been highlighted in **Chapter Eight**.

Chapter Nine of the report highlights the project alternatives. The idea is to compare the proposed dam with other project alternatives i.e. borehole drilling, piping water from the upcoming Londiani Multi-purpose dam, which have been found to be costly and unreliable and the Londiani dam may take time before it is operational.

To assist in the implementation of identified mitigation and monitoring strategies, an Environmental Management and Monitoring Plan (EMMP) has been developed and is presented in **Chapter Ten**. It dwells on the various environmental management strategies and procedures and identifies the institutional management roles and responsibilities. It ensures that monitoring is undertaken and that the results are analysed during all phases of the project.

Finally, **Chapter Eleven** covers the conclusion and recommendations of this EIA report.

2 METHODOLOGY AND CONSULTATIONS

The information/data to compile the EIA report was gathered through review of existing documentation, field visits and participatory methods like interviews.

2.1 EIA Process

Due to the extensive nature of the EIA process, it was necessary to commence the process early during the project cycle. The process was initiated at the stage of feasibility study. The stages of the EIA process are summarised in the following sections.

2.1.1 Scoping

Scoping is the process of brainstorming on the issues and alternatives that need to be considered in the EIA process. It helps to determine which impacts are likely to be significant and thus require more focus in the EIA process. This is a valuable step at the start of the EIA process and as part of the EIA Study Report development, as it can mitigate against unexpected issues arising later in the project. The scoping analysis also helps to inform on data availability and gaps, determine the appropriate scope of the assessment, suggest suitable survey and research methodologies and help to eliminate issues that could otherwise consume time and resources to investigate.

The scoping process involved discussions with the project proponent and desk review of existing project reports, plans and site assessment by the EIA study team.

2.1.2 Analysis of Potential Impacts

The scoping process of the EIA was followed by the analysis of the potential impacts. This involved analysing the potential impacts identified during scoping to determine their exact nature, scale, magnitude, likelihood, extent, effect as well as possibility for reversibility.

This analysis promotes better understanding of the potential impacts and provides information on whether the impact is positive or negative and, if negative, whether it is acceptable, requires mitigation or is not acceptable. In addition, this analysis helped in distinguishing primary and secondary impacts.

Primary impacts are those typically associated with construction, operation and maintenance of a structure and are generally more obvious and easy to quantify. These impacts can be negative as well as positive. In this study, the following were identified as potential primary impacts:

- Removal of soil and vegetation impacting on habitats;
- Increase/decrease in habitat for pests e.g. waterfowl, fish, aquatic insects (mosquitoes), snails, etc.;
- Change in the natural hydrological pattern which may impact on floods and low flow conditions downstream;
- Degradation of water quality due to erosion, excessive storm water and discharge of contaminated effluent;
- Increase in dust and noise;
- Increase in traffic and risk of accidents;
- Influx of immigrant workers;

Secondary impacts are those that are induced by the project or the primary impacts. The following were identified potential secondary impacts of the project:

- Reduction/increase and change in reliability in downstream water availability impacting domestic, agricultural, livestock wildlife and environmental conditions;
- Increase/decrease in social cohesion. This can be conflicts between project proponent and the local communities related to control of the structure, and sharing or attributing benefits and impacts;
- Increase/decrease in local population;
- Increase/decrease in businesses, employment, commerce and livelihoods;
- Increase in health risks e.g. drowning, traffic, *malaria*, *schistosomiasis* etc.
- Increase in local utilities and services;

The potential impacts were considered for the different stages of the project (site investigations, construction, operation and maintenance). This information was used to identify the mitigation measures and attribute responsibility in the mitigation plan.

2.1.3 Identification of Mitigation Measures

The analysis of potential positive and negative impacts was then followed by the identification of mitigation measures to address the potential negative impacts. The aim of mitigation is to either eliminate or reduce negative impacts. Some of the mitigation options include; avoidance of impact, reduction of impact and restoration to original state.

2.1.4 Analysis of Alternatives

After the analysis of potential impacts and the identification of mitigation measures, analysis of options and alternative ways to meet the same objectives was considered with an aim to identify the least damaging option. At this point, comparison of potential impacts and mitigation options were made against a series of alternative designs, locations, technologies and operation so as to identify the most desirable combination. The process was guided by clearly articulated project objectives so that the analysis of alternatives does not digress into the consideration of irrelevant options.

In this case, analysis of alternatives included the following considerations:

- 1) **Different location.** While this issue is mainly of particular importance where there are cultural or special habitats that should be protected, where a particular location might increase the likelihood of conflicts (e.g. over pasture or between domestic users and livestock/wildlife) or increase the likelihood of environmental degradation for example by attracting more livestock than the environment can sustain, in this case the listed factors do not apply as the proposed site is whole within private land owned by the proponent;
- 2) **Different design.** This involved considering different ways (in terms of technology or structure) of supplying water to serve the intended purpose using alternative means;
- 3) **Different way to meet same objective.** This included consideration of alternative sources and modification/expansion existing Lemotit Dam without the need to develop a new source;

- 4) **No project.** This option essentially provides a basis of comparison with the proposed project and other alternatives. The no-project option is not necessarily a static situation as external factors such as demand for water, employment and livelihoods are dynamic.

2.1.5 Environmental Management and Monitoring Plan

The Environmental Management and Monitoring Plan (EMMP) sets out the indicators, timeframe, cost and responsibility for the management of the impacts and implementation of the mitigation measures. The EMMP is elaborated to sufficient detail to address the identified adverse impacts. Some of the areas that have been covered in the EMMP include but are not limited to: Description of prioritized mitigation activities, timelines and resources to ensure delivery of the EMMP, a communication plan as well as monitoring strategies.

2.1.6 Decommissioning Plan

Decommissioning of a small dam can arise for a number of reasons which may include:

- The structure has filled with sediment or for whatever reason cannot provide the stream of benefits for which it was constructed;
- The structure has become an uncontrolled public safety hazard. This could arise if proper maintenance of the spillway was neglected by the owner and WRA decides to withdraw the water permit;
- The owner of the structure decides to decommission the structure.

Decommissioning a structure does not necessarily mean removing the structure because the process of decommissioning may cause negative environmental and/or social impacts. Decommissioning implies making the structure safe through a process of analysis of the options and impacts, and establishing a decommissioning plan that aims to secure the best long term beneficial impacts to both the social and bio-physical environment.

In the event that the removal of the structure is inevitable, then breaching, in the case of a dam, may be considered. Gradual emptying the dam or lowering the water level (by cutting down the spillway or opening the scour pipes) to reduce pressure on the embankment should be undertaken before any breaching of the embankment is undertaken.

2.2 Public Consultation, Disclosure and Participation in the EIA Process

2.2.1 Public Disclosure and Consultation

Public disclosure and consultation is a regulatory requirement but experience has also proven that it adds value to the project and helps mitigate future conflicts and negative impacts.

Public disclosure and consultation is particularly important during the EIA process firstly because completion of most EIA processes demand it and cannot be said to have effectively occurred without it and secondly because the EIA process begins at the initial stages of the project and thus provides a great opportunity to set the pace on public disclosure and consultation and win the trust and collaboration of stakeholders.

Relevant plans for public disclosure and consultation must therefore form part of the EIA process. It is important that the disclosure process provides time and resources to ensure that

the affected communities have an opportunity to understand the implication of potential social and environmental impacts. An individual impact may cause a cascade of other secondary impacts and it is this association of cause, effect and impacts that should be fully disclosed.

2.2.2 Stakeholder Analysis and Consultation

Stakeholder analysis is the process of identifying interested and affected parties and considering how best to consult with these parties. The outcome should be a Stakeholder Engagement Plan (SEP) that documents who, how and when stakeholders will be consulted regarding what aspects of the project throughout the various stages of the project.

The goal of stakeholder engagement during the EIA process is to engage with interested and affected stakeholders in order to provide accurate and timely information on the merits and demerits of the proposed water conservation structure, facilitate discussions to register comments and concerns, and enable stakeholders to participate meaningfully in the EIA process. The expected outcome of this engagement is a well-informed body of stakeholders, including the project proponent, with an understanding of the potential benefits and impacts of the project, where concerns that they raised have also been addressed. The support of stakeholders provides the project with the social licence for project implementation.

2.2.3 Methodology for Stakeholder Engagement

The consultant used participatory methodologies which included:

1. **Public meeting (baraza).** This is appropriate for reaching a larger number of people. Adequate attention was given to announcing the intended meeting. The meeting was coordinated and announced through the Area Chief assisted by the Assistant Chiefs of the area. The approach adopted by the Area Chief was notices channelled through the local day schools, local churches, local CBOs, and through mobile technology (The area Chief has created a WhatsApp Group for the Location and all important notices are posted in the group);
2. **Key informant interviews.** These are one-on-one interviews with key informants like local leaders, thematic experts, and individuals who are likely to be directly affected by the project;
3. **Focus Group Discussions.** This approach was adopted in discussion with James Finlays (Kenya) Ltd employees and local opinion leaders. It provided an environment in which group members could speak more freely and discuss internally to formulate and voice an opinion that perhaps could not be discussed in a public baraza.

An important part of the stakeholder consultation process is the documentation of who was consulted, what was disclosed, and what opinions were expressed. The following documentation has been submitted to substantiate that public consultation was conducted:

- Signed participation lists from public meetings and focus group discussions;
- Minutes of meetings;
- Signed key informant forms which document the opinions of the informant;
- Copy of materials that were discussed or shared with the public and stakeholders;
- Photographs.

2.3 Data Collection Procedures

A three-stage process essentially covered the development of this EIA Project report:

- Literature review of relevant documents;
- Site reconnaissance to the proposed Kipsirichet Dam Project;
- Consultations with the project proponent; and
- Consultation with relevant stakeholders' i.e. downstream area residents, neighbouring institutions and government agencies and representatives.

Data collection was carried out using checklists, questionnaires, individual and group interviews, observations and photography, as further described below.

2.3.1 Desk Study

This included documentary review on the nature of the proposed activities, project documents, project design documents including layouts and profiles, and relevant legislative and regulatory frameworks among others.

2.3.2 Proposed Water Source and Project Area Assessment

Field visits were carried out specifically for physical inspection of the catchment area and the proposed dam and inflow furrow area characteristics, along with its environmental status in order to determine the anticipated impacts. It also included taking photographs of the proposed water sources site, the proposed dam site and other important features within the site and the surrounding areas. Additionally, assessment was carried downstream of the proposed dam site to establish activities and settlements that may be affected by the proposed project.

2.3.3 Public Consultations and Disclosure

It is incumbent on the project proponent to disclose the nature and scope of the project so that the public can be fully informed and provided with an opportunity to consider the potential impacts of the projects. The public disclosure and consultation process has been designed to help the public and interested stakeholders to understand the project and document their concerns. These concerns can then be addressed through the design of the project's environmental monitoring and mitigation plan.

The public's interest in the Kipsirichet Dam project is foreseen to arise as a result of the possibility of unknown or unforeseen effects being occasioned by the project along with the risk of aggravation of any existing water use conflicts.

Taking cognisance of the fact that public participation is a right enshrined in the Kenyan Constitution and the important role that public consultations and disclosure plays in promoting acceptability of a project, identifying possible effects of the project as well as availing critical information for the design of the project to mitigate any possible effects, the project proponent has undertaken public and stakeholder consultations through a team of EIA Consultants. The Consultant EIA field team carried out stakeholder consultations in order to determine whether the downstream area residents, and surrounding community and other interested parties were aware of the proposed project, had any issues of concern related to the proposed project and if they were in support or opposing the project.

The methodology for consultations used was preceded by making preliminary site visits on the proposed dam site (Lemotit Farm) and discussions with the proponents by the EIA Lead Expert so as to aid in the structuring of the questionnaires and identify the key stakeholders. This preliminary site visits were made between January and November 2017.

After this, questionnaires were designed to capture both the interested and affected parties who include the general public in the downstream villages and the major stakeholders (key informants).

The questionnaires were designed to capture information on whether the proposed development will have significant impacts on the following:

- Local residents/neighbours;
- Natural ecology of the area;
- Recreation and aesthetic values;
- Public health and safety;
- Effect on water resources and quality;
- Effect on soils;
- Effect on infrastructural facilities;
- Effect on socio-economic aspects;
- Effects on agricultural activities; and
- Effects on security.

The EIA team then carried out both individual and public consultations on 13th, 14th and 15th December 2017. The discussions on the proposed project during these consultations focused on, but were not limited to:

- Background of the proposed project and what exactly the project will entail;
- Potential positive and negative impacts of the projects;
- Stakeholders views and feedback on the proposed project;
- Stakeholders support to the proposed project;

During these consultations, the stakeholders got a clear understanding of the proposed project following necessary briefing by the EIA field team. This information helped in assessing the impact of the project on the environment as well as on the social economic status of the area residents.

Key informants who gave their views during the main consultations included:

1. Jane Ndirangu – JFK Sustainability, Environment, Health and Safety Manager
2. Japheth Langat – JFK Lemotit Farm Manager
3. Joash Korir – JFK Engineering Manager
4. Joash Oruta – WRA Kisumu Sub-Regional Manager
5. Daudi Kitur – County Government of Kericho, Director Environment & Natural Resources
6. Paul Karanja – NEMA Officer, Kericho County Office
7. William Sigei – Londiani Sub-County Water Officer
8. Stanley Bett – Area Member of County Assembly
9. Reuben Kemboi – Chief, Lemotit Location
10. Sarah Sigei – Chief, Tuiyobei Location

11. Antony Oduor – Water Rights Officer, Water Resources Authority
12. Henry Inyambula – Chairman, Kipchorian WRUA
13. Reuben Ben Okumu – Organising Secretary, Kipchorian WRUA
14. Elisha Kiprotich Mursi – Chairman, Community Elders Committee
15. Richard Rono – Vice Chairman, Lemotit Dispensary Board
16. Aggrey Ochieng Omolo – Principal, Kapcheplanga Secondary School

The EIA team further held a public meeting with downstream area residents at Nairobi Shopping Centre in Lemotit Location on 15th December 2017. See attached list of attendants and minutes of public consultation meetings in **Appendix B**.



Plate 1: The Area MCA Addressing the Public Baraza



Plate 2: An EIA team member addressing the Public Baraza



Plate 3: Visit to the Existing Lemotit Dam



Plate 4: Visit to the Proposed dam Site

2.4 Analysis of Questionnaires & Feedback from the Public Baraza

Ten key stakeholders were identified and questionnaires admitted to them. Analysis of the comments in the questionnaire indicates that all the key stakeholders support the project. The identified potential negative impacts highlighted by the key stakeholders for which mitigation measures need to be provided include:

- Accidents, dust and noise pollution during construction phase
- Accidents, specifically drowning in the operational phase.

On the hand the key stakeholders stated the potential project benefits as follows:

- Creation of employment
- Flood control especially in the downstream farms
- Increased water supply

Table 1 summarises the response from the questionnaires.

Table 1: Questionnaires Analysis

No. of questionnaires submitted	Filled	Filled and collected	Filled and not collected	Not filled	Those rejecting the project	Those approving the project	No. not aware of the project
10	9	8	1	1	None	All	None

Copies of the completed questionnaires are presented in **Appendix C**.

The following are feedback from the consultations and Public Baraza:

- The opinion leaders and members of the public who were consulted support the project;
- JFK, has always provided water for livestock to the area residents during dry seasons from the breached dam located at the proposed site. Considering that there will be controlled access to the site after construction of the proposed Kipsirchet Dam, both the opinion leaders and members of the public requested for provision for an alternative watering point for livestock particularly during the dry session;
- The opinion leaders and members of the public also requested for employment consideration for local residents (both skilled and unskilled);
- Opinion leaders supported surface runoff harvesting as opposed to any river diversions.

Feedback from public consultations have been incorporated in the report.

2.5 EIA Team composition

The EIA Team composed of the following experts:

- | | |
|-------------------------|--|
| 1. Engineer Mike Thomas | Lead Expert/Hydrologist/Water Resources Development Specialist |
| 2. Ruth Amondi | Lead Expert/Water Resources Management/ Environmental Specialist |
| 3. Caroline Macharia | Sociologist/ Associate Expert |
| 4. Maxwell Barasa | Geologist |
| 5. Joe Otieno | Civil Engineer |

3 RELEVANT LEGISLATION AND POLICY FRAMEWORK

This Chapter summarizes the relevant policies, legal and institutional frameworks that have a bearing on the proposed construction of a 122,000 m³ capacity earth dam within the JFK Lemotit Farm. It is a requirement that the proponent complies with the following policies and laws.

3.1 Environmental Management Principles and Guidelines

The project proponent is expected under law and set practice to consider and exercise the principles and guidelines of environmental management as follows:-

3.1.1 Sustainability

In the course of implementing the proposed project, the project proponent is expected to use resources sustainably and source materials from suppliers that have been identified as practicing sustainable resources use, thereby maintaining the potential of the natural resources to meet the needs and aspirations of present and future generations.

3.1.2 Intergenerational Equity

Operations and activities undertaken at all the stages of the proposed project ought to be designed to comply with the principle of intergeneration equity in resources use of both natural and man-made resources. Additionally, various resource users in the current generation should not have their resource use ability compromised by the proposed project.

3.1.3 Prevention

The project proponent should undertake all the preventive and viable measures to protect the environment in the first place, throughout all the phases of the project (Construction, Operation and Decommissioning) rather than allow damage to take place then take remedial action. Prevention is far less costly than mitigating environmental damage.

3.1.4 Precaution

The project proponent should undertake all the necessary precaution in the making of environmental decisions where there is scientific uncertainty and such uncertainty should not be used as a reason for not taking cost effective measures to prevent environmental harm.

3.1.5 Polluter Pays Principle

Polluters of natural resources are required to bear the full environmental and social costs of their activities. Therefore, should the project proponent cause damage to private properties or public utilities such as roads or public goods such as water bodies, measures to compensate the affected should be instituted immediately.

3.1.6 Public Participation

The project proponent will ensure environmental democracy and involvement of the public, especially local communities in environmental and developmental decisions that it seeks to

make, which affect their lives. The public participation process shall be open and transparent, provide valuable information on key impacts, potential mitigation measures and possible alternatives as well as enlightens the community on the opportunities and benefits that could arise from a project.

3.1.7 Cultural & Social Principal

Due consideration shall be made of the local environment management systems in the course of implementing the project and due care shall thus be exercised while introducing technologies that may conflict with the existing environmental management systems.

3.2 Policy Framework

The following are some of the policies that are relevant to the Kipsirichet Dam Project:-

3.2.1 National Environment Action Plan (NEAP)

The NEAP for Kenya was prepared in mid 1990s. It was a deliberate policy effort to integrate environmental considerations into the country's economic and social development. The integration process was to be achieved through a multi-sectoral approach to develop a comprehensive framework to ensure that environmental management and the conservation of natural resources are an integral part of societal decision-making.

3.2.2 National Environmental Policy (2013)

The National Environmental Policy aims at integrating environmental aspects into national development plans and the broad objectives of policy include:

- Optimal use of natural land and water resources in improving the quality of human environment;
- Sustainable use of natural resources to meet the needs of the present generations while preserving their ability to meet the needs of future generations;
- Integration of environmental conservation and economic activities into the process of sustainable development; and
- Meet national goals and international obligations by conserving bio-diversity, arresting desertification, mitigating effects of disasters, protecting the ozone layer and maintaining an ecological balance on earth.

The various Acts and Regulations addressing environmental management seek to make provisions that enable the achievement of the National Environmental Policy objectives. The project proponent will thus endeavor to observe the provisions of the various statutes that are aimed at maintaining a clean and healthy environment.

The proposed project is guided by this policy in putting measures in place to ensure there is environmental conservation activities to ensure sustainable development.

3.2.3 National Water Policy (2000)

The objective of the National Water Policy is to lay the foundation for the rational and efficient framework for meeting the water needs for national economic development, poverty alleviation, environmental protection and social well-being of the people through sustainable

water resource development and management. The policy describes the guidelines that promote comprehensive water resources management and development with the private sector and community participation as the prime movers in the process to guarantee sustainability.

The policy underscores the threat of water resources due to degradation of water catchment areas affecting siltation; run-off, water balance and groundwater recharge characteristics. This has led to the diminishing or drying up of the water resources. The paper calls for preservation, conservation and development of national water resources for the benefit of all Kenyans. The policy stresses the need for developing options for mitigating negative impacts as well as enhancing positive ones through a careful analysis of the environment. This is aimed at improving the environment on which the water development sustenance depends.

The policy further states that the government will support initiatives aimed at development of appropriate water and sanitation facilities in the rural areas as a means of attracting viable economic activities and improving health.

The proposed project is guided by this policy as it is a private sector investment in the rural area which aims at improving economic activities and thus ensures sustainable water resources use and environmental protection to protect the investment.

3.2.4 National Water Resources Management Strategy (NWRMS) - 2012- 2017

The formulation of the NWRMS 2012-2017 was guided by the emergence of new developments in the water resources sub-sector through policy development brought about by the Constitution of Kenya 2010, the vision 2030, the Water Bill 2014, the National Rain Water Harvesting and Storage policy, the guidelines on the use of trans boundary water resources and the National Water Master Plan (NWMP) 2030.

The strategy was founded on major thematic areas in water resources management. These included data acquisition and management, water resource planning and allocation, adequate quantity and quality water resources, catchment protection and management, human resource development and management and financial resources mobilization and accountability. Based on these thematic areas, strategic objectives were formulated and are identified as follows;

- Strengthening monitoring networks to enhance data collection and improve information management system;
- Improving the use of water resources management tools for effective water resources planning and allocation;
- Strengthening stakeholder collaboration to enhance water storage and adaptation to climate change impacts;
- Strengthening enforcement mechanism and collaboration for effective catchment protection and conservation;
- Building staff capacity and improve work environment;
- Enhancing resource mobilization and effective use of finances;

The strategy recognizes the negative impact on water resources due to environmental changes and the continued demand for water services.

The development of NWMP 2030 has taken into account and has highlighted key area of concern. These include the per capita water which is estimated to be 1985m³ up from 647m³

in 1992. The former included flood water which can be harnessed through storage which would therefore make per capita water above the global benchmark of 1000m³ per capita. The MWI has emphasized on storage development through which the National Water Harvesting and Storage Policy which provides a framework for water harvesting including mandatory requirement to provide buildings with rainwater harvesting systems, has been developed.

The NWMP 2030 aims at progressively increasing availability of water resources through accurate assessment, optimal management and development of existing potentials. This entails enhancing water storage through designing additional large/medium and small-scale storage facilities as envisaged in Vision 2030. It also entails promoting rainwater harvesting and storage systems, re-establishing green water storage area such as wetlands and forests, water saving technologies, ground aquifer re-charging, recycling treated effluent water, and restoring and rehabilitating identified storage systems constructed since the colonial period.

The proposed project is in line with this policy as it aims at promoting rainwater harvesting and increasing storage and it turn increasing availability of water resources.

3.2.5 National Land Policy (2009)

The National Land Policy address the critical issues of land administration, access to land, land use planning and environmental degradation. The policy recognizes the need for security of tenure for all and secures the rights over land as well as provides for sustainable growth, investment and the reduction of poverty. Additionally, the policy designates all land in Kenya as public, community or private land. As such, the policy ensures that all land is put into productive use on a sustainable basis by facilitating the implementation of key principles on land use, productivity targets and guidelines as well as conservation.

The proposed project aims to improve productivity of the land by increasing production of flowers for economic growth.

3.2.6 Kenya Vision 2030

The Kenya Vision 2030 is Kenya's long term development blueprint, that aims to create a globally competitive and prosperous country providing high quality of life for all its citizens by the year 2030. The Kenya Vision 2030 identifies Kenya as a water scarce country and the economic and social developments anticipated by vision 2030 require more high quality water supplies than at present. The country therefore aims to conserve sources and start new ways of harvesting and using rain and underground water.

The 2030 vision for water and sanitation is to ensure that improved water and sanitation are available and accessible to all. It identifies water among the focal sectors to achieving development. The Social Pillar which aims to build a just and cohesive society enjoying equitable social development in a clean and secure environment identifies water and sanitation, the environment, equity and poverty eradication among the key sectors to achievement of desired transformation of society. Under the economic pillar which aims to maintain a sustained economic growth of 10% per annum over the next 25 years, increasing value in agriculture is indetified as a key strategy to contribute to the aspired economic growth.

The proposed project will provide employment opportunities during implementation to casual workers and thereafter will offer employment to various farm workers and eventually a

reward to the proponent from the increased production. This will go a long way in poverty alleviation.

3.3 Legal Framework

3.3.1 The Constitution of Kenya (2010)

The Constitution of Kenya 2010 has placed certain key requirements to be met, as regards water resources management, by the national and county governments. In particular, Article 35 confers to every person the right to: access information (Water Resources Management Information) held by the State and the state shall publish and publicize this information as it affects the Nation. Article 42 confers to every person the right to a clean and healthy environment. Clean and safe water is central to this environment; Article 43(d) confers to every person the right to clean and safe water in adequate quantities. The management of water resources in the country is therefore geared towards achieving these constitutional requirements.

The COK [Section 62. (1) (g) and (i)] classifies among other issues that government forests, water catchment areas, specially protected areas and all rivers, lakes and other water bodies as defined by an Act of Parliament as public land, vest in and are held in trust for the people of Kenya by the national government [Section 62 (3)].

3.3.2 The Environmental Management and Co-ordination Act EMCA, 1999 and the Environmental Management and Coordination Amendment Act, 2015

The Environmental Management and Co-ordination Act, 1999 (Principal Act) and the Environmental Management and Co-ordination Amendment Act, 2015 aim to ensure successful environmental management in Kenya using four main principles:

- The sustainability of the environment and natural resources;
- The precautionary principle (*the principle that where there are threats of damage to the environment, whether serious or irreversible, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation*)
- The integration of environmental considerations into development planning and management; and
- The encouragement of public participation in any environmental decision-making.

Part VII on Environmental Audit and Monitoring section 68 and 69 specifically details the need to undertake Environmental Impact Assessments of all projects likely to cause negative impacts to the environment. In addition, the Legal Notice No. 149 of 2016 classifies all dams as “high risk” projects that must undergo Environmental Impact Assessment Study.

Part III of the Environmental (Impact Assessment and Audit) Regulations 2003 details the guidelines for Environmental Impact Assessment. The regulations require that EIA and EA be conducted in accordance with the issues and general guidelines spelled out in the second and third schedules of the regulations. These include considerations of the issues on the second schedule which include ecological, social, landscape, land use and water. The general guidelines on the third schedule are on impacts and their sources, project details, national legislation, impacts and their mitigation measures, management plan and environmental auditing schedules and procedures. Section 17 of part III details the need for public consultation to seek the views of persons who may be affected by the project.

Part IV Section 18(1) of the Environmental (Impact Assessment and Audit) Regulations 2003 details the contents of the Environmental Impact Assessment report to be submitted to NEMA.

It is therefore mandatory that an Environmental Impact Assessment be undertaken by proponents of this type of project to ensure that the activities of the proposed project comply with all the legal and institutional frameworks that are in place to safeguard and protect the environment. Such EIA must be carried out by an expert registered by NEMA.

Activities identified in the Second Schedule of EMCA require an EIA license. The first step in the application for an EIA license is the submission of a Terms of Reference in the required format and details. In addition to the Environmental Management and Coordination Act, legislations pertinent to this report on a national level are outlined below.

This EIA Study Report has been prepared in line with requirements and guidelines of this legislation.

3.3.3 The Environmental Management and Coordination (Water Quality) Regulations, 2006

The project will also be required to comply with the conditions set in the Environmental Management and Coordination (Water Quality) Regulations of 2006 (Legal Notice No. 120), among them the domestic water quality standards as stipulated in the First Schedule. Though the proposed dam is primarily for irrigation purposes, some of the water users downstream of the dam use the water for domestic purposes during the wet seasons, thus making some of the provisions of these regulations applicable.

Part II of the regulation provides for Protection of Sources of Water for Domestic Use. Regulation 4 (2) states that no person shall throw or cause to flow into or near a water resource any liquid, solid or gaseous substance or deposit any such substance in or near it, as to cause pollution.

Part III provides for water for industrial use and effluent discharge. Regulation 11 states that no person shall discharge or apply any poison, toxic, noxious or obstructing matter, radioactive waste or other pollutants or permit any person to dump or discharge such matter into the aquatic environment unless such discharge, poison, toxic, noxious or obstructing matter, radioactive waste or pollutant complies with the standards set out in the Third Schedule to these regulations.

The proposed project aims at increasing flower production. The effluent discharge from the flower pack house will be safely discharged to ensure pollutants don't get to water bodies. It is noted that the proponent operates a wetland where effluent water is pre-treated before being discharged into the environment.

3.3.4 Environmental Management and Coordination (Waste Management) Regulations, 2006

The project shall ensure compliance with the Environmental Management and Coordination (Waste Management) Regulations of 2006 (Legal Notice No. 121) particularly with dealing with waste generated during the construction and operational phases of the dam.

This Report identifies safer ways of waste disposal to help the proponent in meeting requirements as per this regulation.

3.3.5 Environmental Management and Coordination (Wetlands, River Banks, Lakes Shores and Sea Shore Management) Regulations, 2009

The project shall ensure compliance with the Environmental Management and Coordination (Wetlands, River Banks, Lake Shores and Sea Shore Management) Regulations of 2009 (Legal Notice No. 19).

Part II section 12 and 13(1) highlights the need for a water abstraction permit from WRMA (now WRA) and an EIA licence from NEMA. This report has been prepared as part of the requirements to obtain the EIA license, while the application for the WRA authorization is also underway.

Part II section 14(1) states “Every owner, occupier or user of land which is adjacent or contiguous to a wetland shall, with advice from the Authority, have a duty to prevent the degradation or destruction of the wetland, and shall maintain the ecological and other functions of the wetland”.

Section 14(2) states “Any person who fails, neglects or refuses to protect a wetland under sub-regulation (1) commits an offence”.

Part IV section 21(1) highlights the need for an Environmental Impact Assessment when undertaking a project which may have a significant impact on a wetland.

3.3.6 The Water Act 2016

The Water Act 2016 provides for the management, conservation, use and control of water resource, providing regulatory and management measures for the supply of water services as well as for water resource management. The Act also has strict guidelines on water abstraction from rivers or watercourses and groundwater and stipulates that a permit is required in all cases of proposed diversion, abstraction, obstruction, storage or use of water. This dam project is therefore bound by this Act.

The Water Act 2016 has made provisions for the formation of Water Resources Authority (WRA) described in section 3.4.2. In order to complete water permit application process to WRA, the project will be required to submit an EIA Study Report, among other requirements.

3.3.7 Water Resources Management Rules, 2007

Part I section 56 all through to section 58 provides specific guidance with regard to dams. Section 56 provides criteria for dam classification which is presented in the Fourth Schedule. Section 57 states that dam shall be designed and supervised by appropriate category of qualified water resource professional. Section 58 states that a dam shall be constructed by the appropriate category of contractor. Section 59 (1) requires that the dam owner ensures that the dam is inspected according to criteria provided in the Fourth Schedule and the inspection report prepared and submitted to the Authority.

JFK will have to comply with the inspection requirements as it is one of the conditions considered before permit renewal for dams.

Part I section 60 and 61 provides design guidelines for net freeboard and return period for design of dam spillway respectively.

Kipsirichet dam according to the Fourth Schedule is classified as Class B dam (medium risk) that should be designed and supervised by qualified water resource professional of at Panel I C1 and Panel I C2 and constructed by a contract of category C1 or C2. In addition, JFK should ensure that the dam is inspected every three years by a Panel I C2 or Panel I C1 qualified professional.

Part VII Section 97 of the Rules states that the Authority shall, where applicable require an applicant to show evidence of compliance with the provisions of the EMCA. Section 99 states the need for controlling and measuring devices for accurate measurement of the water abstracted. Though the main water source for the dam shall be runoff harvested from greenhouse catchments, it is also anticipated that surface runoff that forms the seasonal Kipsirichet stream will also feed into the dam during the rainy seasons.

The WRM Rules, 2007 Part VIII section 104 states that the Authority shall be paid for water abstracted by any person in possession of a valid water permit or supposed to have a valid water permit. The first schedule part 2 provides the fees requirement for assessment and issuance of permits per water use category.

Part XII of the WRM Rules, 2007 gives the reserve –related to quantity and its probability and quality of the resource. Section 128 subsection 2 states that establishing reserve shall be guided by:

- a) Ecological vulnerability
- b) Vulnerability of population dependent on the water resource
- c) Local observations with respect to the naturalized flows or water levels of the minimum values observed during periods of prolonged drought
- d) Where water flow is known to be normally perennial, then the reserve quantity shall be sufficient to ensure perennial flow; and
- e) Consultations with the Water Resources Users Association where it exists.

Section 129 (2) states that any person may complain to the Authority if:

- a) He/she is unable to obtain sufficient water from the water resource for basic human needs as a result of the reserve being violated; or
- b) As a result of the person's observations, the person considers the ecology is threatened as a result of the reserve being violated.

The response to the violation of the reserve is stated in the Seventh Schedule of the WRM Rules, 2007.

3.3.8 Agriculture Act, Cap 318

The Agriculture Act provides legislative control over soil conservation and land development. The clearing of vegetation in steep slope areas without authorisation is forbidden. This is pertinent to the dam Project as some parts of the project site are sloppy and some vegetation will require to be cleared to make way for the dam.

3.3.9 Factories and Other Places of Work Act, Cap 514

The Factories and Other Places of Work Act (Cap 514) provides for standards related to the infrastructure and working conditions in workplaces. An abstract of the Act is supposed to be displayed in the workplaces.

The proposed project is bound by this Act. However, it is noted that the proponent has a well-defined structure on public/workers' safety.

3.3.10 Public Health Act, Cap 242

This is an Act of Parliament which makes provision for good public sanitation and maintenance of health. This Act provides the impetus for a healthy environment and gives regulations to waste management, pollution and human health. Part III section 17-18 highlights on what the proponent should do in case of an outbreak of infectious diseases within the project site. The infectious diseases apply to small pox, plague, cholera, typhus fever, acute poliomyelitis, rabies and many more as highlighted in this section.

The Public Health Act makes provision for securing and maintaining health. For instance, the county governments are supposed to take measures for preventing any pollution dangerous to health of any supply of water that the public uses for domestic purposes and purifying the sources that have been polluted. They are also supposed to take action against persons causing pollution to the water sources.

3.3.11 Physical Planning Act Cap 286 (2010)

This Act provides for the preparation and implementation of physical development plans for connected purposes. It provides for a hierarchy of plans in which guidelines are laid down for the future physical development of areas (national, regional and local) referred to in a specific plan. The Act also promotes public participation in the preparation of plans and requires that in preparation of plans, proper consideration be given to the potential for economic development, socio-economic development needs of the population, the existing planning and future transport needs, the physical factors which may influence orderly development in general and the possible influence of future development upon natural environment. The Act additionally makes provisions for the requirement for EIA and EA. Any change of use of the actual development without authority constitutes an offence.

3.3.12 Other Legislation

Other legislation pertinent to the operation of the proposed project are listed below. However, these other acts relate to employment and contractual conditions, rather than to the environmental dimension of the work operations.

- The Employment Act Cap 226
- The Workmen's Compensation Act Cap 236
- The Trade Union Act Cap 223
- The Trade Dispute Act Cap 234
- The National Hospital Insurance Act Cap 255
- The National Social Security Fund Act Cap 258

3.4 Institutional Framework

Several institutions are involved in water resource and environment management in Kenya. These organizations include the Ministry of Water and Irrigation, Ministry of Environment and Natural Resources, National Environment and Management Authority, Water Resources Authority and the County Governments. The entity charged with overall responsibility in environmental management in Kenya is the NEMA.

3.4.1 National Environment Management Authority

NEMA was founded and mandated under EMCA to exercise general supervision and coordination over all matters relating to the environment and to be the principal instrument of the government in the implementation of all policies relating to the environment.

This EIA Study Report shall be submitted to NEMA for review and further issuance of license to undertake the proposed project. The annual environmental audits shall also be submitted to NEMA.

Any complaints by the public on environmental pollution is lodged with NEMA for follow up and intervention.

3.4.2 The Water Resources Authority (WRA)

The Water Act, 2016 allows for the establishment of the Water Resources Authority (WRA) whose functions, among others are to:

1. Formulate and enforce standards, procedures and Regulations for the management and use of water resources and flood mitigation;
2. Regulate the management and use of water resources as well as enforce the regulations;
3. Issue water permits for water abstraction, water use and recharge, enforce the conditions of those permits;
4. determine and set permit and water use fees and collect water permit fees and water use charges;
5. provide information and advice for formulation of policy on national water resource management, water storage and flood control strategies

Application for authorization to construct works for purposes of impounding water (storage) is submitted to WRA. WRA then reviews the application and issue a permit to construct works.

The Project Proponent has already submitted an application to WRA and has been issued with Authorization to Construct Works and this has been provided in Appendix G.

3.4.3 Other Governing Bodies

The Directorate of Occupational Health and Safety Services (DOHSS), Ministry of Labour, is mandated to inspect work places and occupational health and Safety issues. The DOHSS also requires that they approve building plans for the workplaces before they are built.

3.5 International Conventions and Treaties

Some of the international resolutions relating to the general adequacy and conditions of water resources include:

- 1) UNCED, Rio de Janeiro Earth Summit, 1992 Agenda 21- deals with the protection of quality and supply of freshwater resources: application of integrated approaches to the development, management and use of water resources
- 2) World summit on sustainable development
- 3) 3rd World Water Forum held in Kyoto, Japan in 2003 which resolved to:
 - a. Reduce by half the proportion of people without access to hygienic sanitation facilities by 2015
 - b. Reduce by half the people without sustainable access to adequate quantities of affordable and Clean water
 - c. Provide water, sanitation and hygiene for all by 2025; and
 - d. Ensure environmental sustainability during the same period.

3.6 Awareness of Governing Legislation

JFK has demonstrated awareness regarding legislation relevant to the project operations and acknowledges the importance and need for the EIA project report and environmental audits. JFK has further put in place structures and mechanisms and is working towards compliance to all the relevant legislation. JFK ensures compliance to EMCA by preparing and submitting annual environmental audits to NEMA for the current activities.

JFK understands that its activities interact with the environment in a very complex manner and economic prosperity is dependent on how well the environment is taken care of. In this regard, JFK has developed a comprehensive Health, Safety and Environmental Policy.

3.7 JFK Health, Safety and Environmental Policy (HSE)

JFK's HSE Policy is governed by the Swire Group of Environmental Policy (It's parent company). This policy has the following essential elements:

Impact Assessment Guidelines: These guidelines provide for the assessment of impact of JFK operations on the natural environment and in particular the effects of pesticides and fertilizers used on workers, spray operators, consumers, wildlife, aquatic life and water resources;

Pollution Prevention and Control: This policy provides for adoption of processes, practices, materials or products that avoid, reduce or control pollution;

Efficient Natural Resource Utilization: For better utilization of natural resources including water, JFK wherever possible incorporates recycling, treatment, process changes, control mechanisms, resource conservation and material substitution;

Risk Reduction: The HSE lays down a strategy for minimizing health and safety risks to workers, the company continually conducts Health, Safety and Environmental Audits whose outcome is a Risk Register that enables the Company to fully understand the impact of its operations and corrective actions to be put in place. Based on the risks identified, the Company's Health, Safety and Environment Committee jointly sets objectives and targets for

continuous improvement, prevention of pollution and reducing of risks to workers and the environment;

In-house Training: All company personnel in positions of responsibility are trained to ensure full understanding of the reasons, targets and requirements of the HSE policy.

Effective Communication: The policy provides guidelines to ensure effective communication channels, both internal and external and at all levels;

Enforcement: To ensure that the company operations are conducted in a safe and healthy environment, and that the welfare of the employees is monitored and maintained, Managers, Heads of Departments and Supervisors must ensure that the HSE policy is enforced and observed by all employees and those who may be affected by the company's activities;

Right to Know: JFK emphasizes that employees and other persons affected by the rules contained in the HSE manual must know, understand and adhere to the rules. Awareness raising enhances the understanding of the roles and responsibilities of each worker;

HSE Committee: JFK has a HSE Committee that meets quarterly to review current policy programmes and related matters that arise from weekly and monthly reports from within each department. The committee is responsible for identification and design of action plans for continuous improvement;

Participatory Process: Employees fully participate and make suggestions in the development of HSE guidelines used by departmental heads and Managers;

Personal Protective Equipment (PPE): The HSE policy requires provision of PPE to ensure that the workers are adequately and appropriately protected from injury.

4 BASELINE ENVIRONMENTAL CONDITIONS

The location and the environment in which the project will be working in are outlined below.

4.1 Location and Coverage

The proposed project is situated within JFK's 460 ha Lemotit Farm.

Administratively, the farm is located in Saramek Sub-location, Lemotit Location, Londiani Sub-County of Kericho County.

Physically, the farm lies about 8 Km to the North West of Londiani Township and 60 Km from Kericho town at an altitude ranging from 2320m to 2370m asl. The Tinderet Hills are to the north of the farm and Mt Londiani to the east. The farm is located on GoK, Department of Survey map sheet 118/1, within the coordinates E 779500-784000; N 9985000-9986500.

The proposed dam site is at coordinates; Northings 9985052.883mN, Eastings 781631.180E, and Elevation of 2339m. and is within the Kipsirichet valley which falls within the Kipchorian River sub-basin which lie within the drainage basin of Nyando River. The proposed dam is expected to serve the irrigation needs of an additional 23 ha over the next two years.

The farm is accessed through an all-weather marram road.

A map of the Project area is presented in **Appendix D**.

4.2 Geology and Soils

The geology of the Lemotit Farm comprises of banded tuff, trachytic and basaltic lavas. The tuffs outcrop on the surface in a few places due to erosion. The tuffs are generally covered by younger Pleistocene volcanics.

The soils of the area are developed on Tertiary or older basic igneous rocks found in the upper middle-level uplands. They consist of Nitosols which are well drained, extremely deep, reddish brown, friable clay with humic topsoil. There are areas with clay soils and impeded drainage in the Lemotit and Kipsirichet bottomlands bordering the farm in the West and East respectively.

4.3 Climate

4.3.1 Rainfall

The mean annual rainfall for Kericho County ranges between 1200mm and 2200mm. The rainfall is bimodal with the long rains being experienced between April and June and short rain is between September and November. The rainfall for the microclimate of the farm has been monitored over a period of 12 years and it shows a mean annual rainfall of 1319mm for the farm. Figure 1 presents annual rainfall data collected over a period of 12 years (2005-2016)

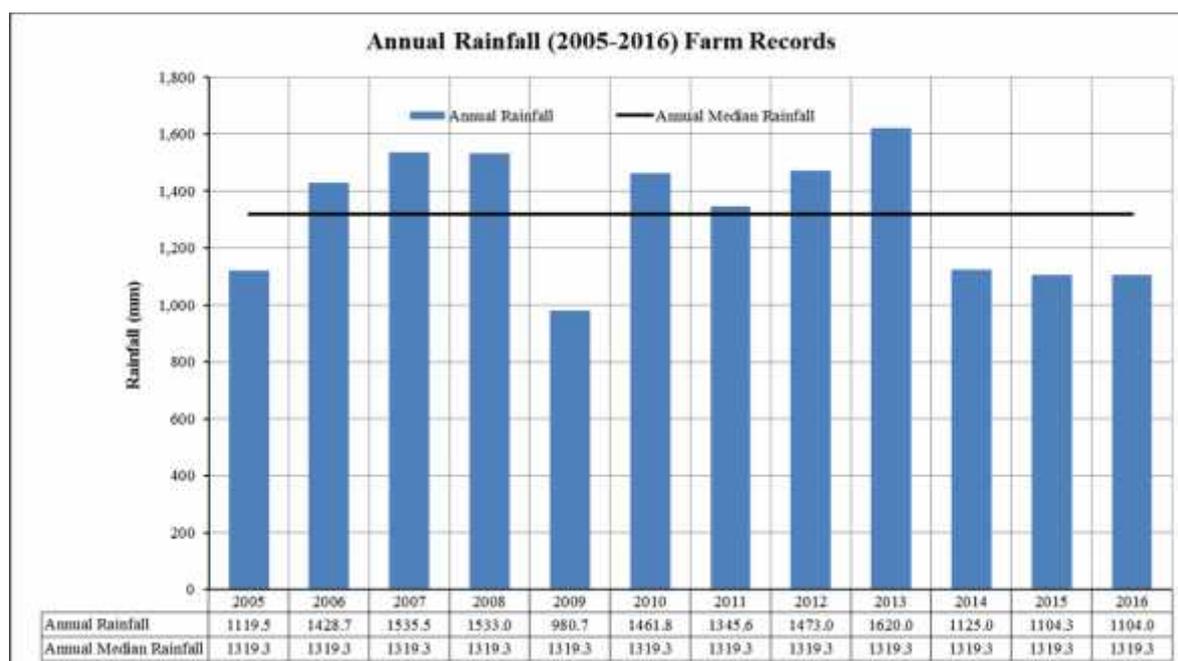


Figure 1: Annual Rainfall Record for Lemotit Farm

4.3.2 Temperature

Kericho County is reported to experience a temperature range from a minimum of 7°C in the upper zone and a maximum of 27°C in the lower zone. An average minimum temperature of 7.0°C and maximum of 24.4°C for the study area were obtained using FAO's CropWat software for the Molo Hydro-met station.

4.3.3 Evaporation

Despite the presence of a full meteorological station at the Londiani Forestry Training Institute, no substantial evaporation data is available. The evaporation from open water surface has thus been established using the FAO ClimWat software for the Molo station due to its close proximity to the farm (approximately 30 km), and similarity in elevation as can be seen in Table 2 below.

Table 2: Coordinates of Lemotit Farm and Molo Hydro-met Station

Location	Longitude(°)	Latitude(°)	Altitude (mASL)
Finlays Lemotit Farm	35.53	-0.13	2445
MOLO-PJR Hydro-met Station	35.73	0.23	2449

The ETo values provided by CropWat were converted to Eo (open water evaporation) using **Error! Reference source not found.** (Wilson p.57, 1990). This resulted in an average annual and monthly open water evaporation of 1589mm and 132mm.

4.4 Topography

The general terrain consists of undulating to rolling topography.

4.5 Water Resources

Table 3 below shows the water resources that currently exist within the farm.

Table 3: Summary of Lemotit Farm water sources and uses:

Type of Use	Water Source	Description	Comments
Irrigation	Lemotit Dam	Irrigation & Misting	Water source is from Lemotit River and rainwater harvesting from greenhouse roofs
Domestic	Borehole 1	Reservoir & Community	Good yield, heavily used
	Borehole 2	Simotwet	Poor yield
	Borehole 3	Elite	Average yield but not in use
	Borehole 4	Kalyet	Average yield but not in use

The following water sources exists outside of the farm

- **Lemotit River:** This is the main water source in the area. It is a perennial river with several abstractors upstream of Lemotit farm.
- **Seasonal Streams:** There are some seasonal streams including the Kipsirchet stream that supply water to the residents during the rainy season.
- **Community Managed Water Supply Schemes:** The existing community managed water supply schemes is one that operates a borehole that was drilled and equipped by JFK. This water is specifically for domestic use.

4.6 Land Tenure and Land Use

Land tenure in Kericho is mainly either leasehold or freehold. Lemotit farm is under a leasehold agreement for 55 year starting the year 1999.

The land use is mainly for agricultural activities. The farm is mainly planted with eucalyptus and pine trees but also has flowers grown under greenhouses. The land use in the neighbourhood is mainly small scale agriculture.

4.7 Infrastructural Situation

4.7.1 Transport network

The main road is the road connecting Londiani to Muhoroni, C35. There exists public transport on this road which are mainly 14-seater and 7-seater public service vehicles (matatus). The project site is off the Londiani-Muhoroni Road and is accessed through all-weather marram road. There are limited public service vehicles on this road. However, motorbike taxis are very common on this road.

The access road to project site was graded by the project proponent and is in a good condition.

4.7.2 Information communication technology (ICT), telecommunications and Energy

The area is well covered by Safaricom and Airtel Signals. There is also electricity supply by the Kenya Power and Lighting Company.

4.8 Population Profiles, Education, Health and Social Amenities

4.8.1 Population

The area's population is estimated to be 7,500. This is the total population within the sub-location.

4.8.2 Education

There exists a primary and day secondary school in the area. There is also a ECD centre.

4.8.3 Health Facilities

The Project area is served by two health facilities namely; Lemotit Dispensary and James Finlays Dispensary: Lemotit Dispensary is a public health facility while James Finlays Dispensary was constructed within Lemotit Farm for offer medical services to the workers and their families. However, the facility can also serve the general public.



Figure 2: Lemotit Dispensary

4.9 Sanitation Facilities and Solid waste management

Households around the project area use pit latrines for human waste disposal. It was noted that Londiani Town is not yet served by sewerage network and waste disposal is either onsite treatment (septic tanks) or most commonly, pit latrines.

Solid waste is managed at household level. However, it was noted that James Finlays has a designated area for solid waste disposal and treatment. The main solid waste generated by the farm are rejects of flowers which is used to prepare compost manure. In addition, JFK has constructed latrines/toilets at designated area within the farm for use by field workers.

4.10 Flora and Fauna

The vegetation in the area has changed over time. The current vegetation is mainly planted pine, cypress and eucalyptus. However, remnants of the original vegetation could be seen at the proposed site and mainly composed of lantana camera, warburgia ugandensis and grass.

The project site has mainly grass, shrubs and also eucalyptus trees that will have to be cleared. It should be noted that the eucalyptus is a commercial crop planted by JFK and are routinely harvested for sale.

The animal species in the area include birds, hares, ant eater, rats, snakes and frogs.



Vegetation cover around the proposed dam site

4.11 Socio-Economic Setting

The economic activities in the area are mainly agricultural activities (both commercial and subsistence), trade and formal employment. A part from JFK which mainly deal with horticultural crops, the other locals mainly grow maize and beans. The local trading centre is known as Nairobi Trading Centre mainly composed of small retail shops, butcheries, small hotels and posho mill.

JFK is one of the company that have employed people therefore improving their socio-economic power. It is noted that the construction of the dam will lead to expansion of the horticultural activities in the area which in turn means increased employment and improved economy.

5 ACTIVITIES DURING THE IMPLEMENTATION AND COST

The project cycle involves several stages which include Project concept, Feasibility Study, Construction Phase, Operation Phase and Decommissioning Phase. Each phase is associated with certain activities.

5.1 Project Activities

Activities involved in the implementation of the proposed project can be summarised as construction of an earth dam and associated ancillary works. A summary of components details is presented in Table 4.

Table 4: Components within Proposed Water Project

	Component	Description/Details
1	Embankment	Maximum height of 9m above ground level, depth of water is 7m, length of 297.5m and crest width of 5m
2	Impoundment area	Approximately 51,557m ² at normal water level and shall be wholly contained within Lemotit Farm
3	Storage capacity	122,866m ³ at normal water level
4	Spillway	Weir length of 15m in a control channel of 0.15m X 2.0m grouted stone on both upstream and downstream of sill
5	Draw off pipe	200mm class E uPVC in concrete surround with anti-seepage collars
6	A valve Chamber	Fitted with a 8inch gate valve and a master meter

5.1.1 Construction Phase

The following activities will be undertaken during the construction phase:

- Land clearing
- Stripping of top soil
- Excavation of soil (both spoil and borrow material)
- Installation of Filter Blanket and Toe Drain
- Placement and compaction of borrow material
- Excavation of spillway
- Installation of draw off pipe (200mm uPVC Class E in concrete surround),
- Construction of a valve chamber (masonry chamber)
- Installation of water meter and gate valve
- Installation of water pump
- Fencing (Post and wire)
- Installation of staff gauge
- Provision of temporary access road

However, it is worth noting that the net impact of the proposed dam is expansion of the horticultural activities within Lemotit Farm. After construction of the proposed dam, JFK plans to construct additional greenhouses.

5.1.2 Operational Phase

There are no much activities in the operational phase apart from monitoring of the dam (water level and safety) and pumping of water.

However, the operational phase requires a proper inspection and monitoring plan to mitigate against possibility of dam failure.

5.2 Kipsirichet Dam Project Design and Construction

JFK has indicated that a water demand rate of 70 m³/ha/day for both irrigation and domestic demand is a realistic estimate of water demand by the farm. This rate includes water for irrigation and conveyance losses. JFK stated that the water demand rate can be reduced by 30% using efficient technology which would make the water demand rate approximately 50 m³/ha/day.

The proposed water source is rain water harvesting from greenhouse roofs and surface runoff harvested from the catchment area for the proposed dam including direct rainfall.

JFK intends to increase area under flower production by 23ha bringing the total area under flower production to 60ha. The daily water demand is therefore estimated to be 4,200m³.

A design for the proposed dam has been done and reviewed by a qualified and registered Dam Engineer.

It is an earth dam with a 9m high crest level and 7m spillway level. The front face will be installed with rip-rap to minimize erosion. A core trench shall be constructed as per the design details and a filter blanket and toe drain installed. A seepage inspection chamber shall also be installed to monitor any seepage from the dam wall.

See the full design report in **Annex 1**.

5.3 Dam Operation and Maintenance

The following aspects should be monitored to ensure the safe and sustainable operation of the dam. Routine checks should be carried out monthly during the initial year of operation and then according to a fixed schedule in future years.

5.3.1 Embankment

- The crest should be monitored to ensure that the edges do not erode and the crest width does not deteriorate. If required, additional material should be placed on the crest and a good grass cover maintained;

- The crest and slopes should be monitored for cracks. The location, alignment and depth of crack should be reported to the consultant. Cracks should be in-filled by compacting similar soil into the crack.
- The crest should be resurveyed every 5 years to check for slumping and low spots;
- The downstream slope should be maintained with a thick grass cover. Careful attention should be given to spots where vegetation does not take. These areas should be dressed with top soil and planted with grass starters;
- The up-stream face should be checked for signs of wave or wind erosion. Any erosion of the slope should be addressed by improving the rip rap cover;
- Trees and bushes should NOT be allowed to grow on the embankment;
- The embankment should be monitored for burrowing animals. In the event that burrowing animals are found they should be removed and their burrows excavated and back filled with compacted material;
- The downstream slope should be monitored for seepage or leaks. Wet patches, excessive vegetation growth in one patch, depressions or slumping should be noted and reported to the consultant. Normal seepage flows should be monitored.
- The outflow from the filter/seepage blanket should be monitored and the discharge recorded. The water level should be recorded at the same time as measuring the filter blanket discharge.

5.3.2 Spillway

- The spillway sill should be maintained in good condition and repaired immediately if required;
- Trees and bushes should NOT be allowed to grow in the spillway channel;
- The spillway channel should be monitored for signs of erosion. Any areas that are eroded should be treated by grassing the channel or construction of a concrete sill;
- The spillway channel should be maintained free of debris.

5.3.3 Water Quality

- The water quality of the dam water is affected by the quantity and type of sediment, nutrient and chemical loading.
- Fish should be introduced into the dam. Fish kill will act as an indicator to poor water quality. The water quality should be investigated immediately after evidence of fish kill and the source of the water quality problem determined and addressed immediately.
- Water sampling for chemical composition should be done once a year to monitor water quality changes.

5.3.4 Environmental Aspects

- A new dam means that a new habitat has been introduced. This can mean more pests such as aquatic plants and animals (water rats, snakes), birds (geese eating crops), or insects (mosquitoes, liver flukes in cattle, bilharzias parasites) or it can mean an attractive aesthetic and functional amenity. In order to ensure that the habitat does not become a breeding ground for pests, careful monitoring of the situation is required. This involves recording cases of pest or health impacts that have derived from the dam and formulating a plan to minimise or eliminate those pests.

- The dam will certainly have increased the risk of drowning. Fencing, awareness raising, control and supervision of recreational water equipment and provision of life saving rings should be incorporated in the plan to prevent any possible drowning.

5.3.5 Complaints Handling

- A mechanism should be put in place to encourage downstream water users to visit the dam and see how it works.
- Downstream users should be encouraged to notify JFK Lemotit Farm of any complaints or issues that they may have as a result of the dam. Complaints may include decreasing water quality, not enough flow in the stream during the rainy season, etc. JFK should make special efforts to respond to complaints and should follow up with the complainants to let them know what action is being taken.

5.4 Dam Safety Plan

The impoundment of water by a dam forms a hazard so due consideration is required to the nature of the hazard, the risk of harm/or damage, and mitigation measures that can be undertaken to minimize the risks.

An Emergency Action Plan (EAP) is a tool which can be used in identification of preventive measures that can reduce the scale of harm and damage in the event of a dam failure. It is advisable that the dam owner/operator in collaboration with other relevant parties develops an Emergency Action Plan. The EAP document details the following:

- Dam owner and/or operator
- Local emergency management offices
- Local county and administration officials
- Local police station
- Water resource user associations
- Downstream residents, water users and downstream dam owners
- Local Red Cross offices
- Media

The EAP should clearly indicate person and organization responsible for the maintenance and operation of the dam and the persons responsible for implementing different components of the EAP including coordinating the response.

5.6 Organization and Management Aspects

The current and the future organisation and management aspects of the project are discussed below.

5.6.1 Project structure and organisation

JFK has an existing organization structure. The project shall fit within the existing structure and is expected to be managed and operated by the technical team. However, on issues of environment and safety, it is expected that the JFK's environment and safety department shall be in charge.

5.6.2 Water Resources Conflict

Water resources related conflict has been reported around the area but not specifically with JFK. However, to mitigate on potential conflict, JFK has had an arrangement with the local community to water their livestock at the farm's breached dam. In addition, JFK has drilled and equipped boreholes to supply water for domestic use to the community living around the project area.

The proposed project intends to harvest runoff from the JFK's greenhouses and hence it is not expected to generate any conflict on water use or access.

5.6.3 Ownership of the Project

The project is owned by James Finlays (Kenya) Limited. This is a private company with well-defined governance structure.

5.7 Environmental Awareness

Discussions were held with technical staff from JFK. JFK operates an environment, health and safety department which is mandated to ensure that all activities carried out by the farm does not cause harm to environment and that workers operate under safe environment.

Existence of this department within JFK demonstrates their awareness for environmental conservation and protection.

5.8 Gender Issues

The nature of work involved in the project implementation require skilled labour with minimal support from unskilled labour. Generally, men will be more involved in the project construction, but opportunities will be offered to interested able women too. We however note that the unskilled labour providing services in the flower farm are mostly women. This again is because of the nature of work involved in the flower industry.

5.9 Health and Hygiene

The proposed project is mainly to provide water for irrigation use. For improved health and safety and hygiene, JFK has drilled several boreholes in the farm that supply safe water for domestic use to the residents.

Access to the dam will be restricted in order to avoid situations where people may come and collect water from the dam for domestic use. Warning boards shall also be posted on site informing people of deep dam waters and to restrict access by unauthorised personnel whether company employees or the surrounding community.

The farm has provided welfare and sanitation facilities around the farm for workers including toilets, drinking water, rest areas and eating areas which are properly maintained by the company.

5.10 Legal Aspects

5.10.1 Registration of the Lemotit Farm

JFK is a company registered under the company's act. It is a legal entity.

See a copy of certificate of registration in **Appendix E**.

5.10.2 Land Ownership

The land on which the dam shall be constructed belongs to JFK. A copy of the land document is presented in **Appendix F**.

5.10.3 Water Permit Application

JFK has applied for authorization to construct works and has been issued with Authorization WRMA/12/KSM/1GE/10732/S from Water Resources Authority.

A copy of the WRA Authorization and WRUA approval are presented in **Appendix G**.

5.11 Project Cost and Financing

The bill of quantities of the project gives an estimate of the materials to be used and their estimated cost (See **Appendix H**). Table 5 below is a summary of the project cost.

Table 5: Project Cost Estimates

Item	Description	Amount (KSh.)
1	Preliminaries	2,050,000
2	Excavation and Earthworks	33,586,570
3	Filter Blanket	5,631,667
4	Drawoff Works	543,266
5	Concrete Works and Reinforcement	695,000
6	Masonry Works	13,600
7	Iron Mongery	20,000
	Add 5% Contingency	2,127,005
	Grand Total Cost	44,667,109

The project will be financed by JFK.

6 MATERIALS AND EQUIPMENT TO BE USED, PRODUCTS, BY-PRODUCTS, WASTES AND METHODS OF DISPOSAL

During the development/construction of the Kipsirichet dam project, several materials will be used and wastes will be generated. This section briefly discusses the materials used, wastes generated and the method of disposal.

6.1 Materials to be used

Various materials will be used in most of the project activities.

- Soil - borrow material used in the construction on dam wall
- Stones - Riprap placed on the upstream face of the dam wall to protect is from erosion
- Cement - used in the construction of chambers and concrete collars and sill
- Sand - Used as material for filter blanket and in construction of chambers and concrete collars and sill
- Ballast – Used as material for filter blanket and construction of sill
- Reinforcement steel bars – used in construction of sill on the spillway
- UPVC Pipe – Used as pipeline for abstracting water from the dam
- Grass – Planted on the downstream phase of the dam to protect it from erosion

6.2 Equipment to be used

The following equipment shall be used:

Equipment/Machinery	Function
Bulldozer	Site clearance, excavation, trimming
Excavator	Borrow excavation and loading of tippers
Dam scoops	Borrow excavation and placement
Tippers	Earth movement from borrow area to dam site
Grader	Levelling, trimming placed construction material
Sheepfoot roller	Compaction of levelled material
Water Bowser	Applying water to material
Harrow	Turning material to ensure proper mixing with water
Mixer	Mixing concrete
Vibrator	Consolidate fresh concrete by releasing trapped air
Tractor	Water supply, compaction among other uses

6.3 Personal Protective Equipment (PPE)

Occupational Safety and Health Act, No. 15 Of 2007 and revised in 2010, provides for safety, health and welfare of workers and all persons lawfully present at workplaces, which includes construction sites. The Act also requires that in workplaces where employees are exposed to wet or to any injurious or offensive substances, the employers must provide and maintain clothing and appliances that are adequate, effective and suitably protective.

The workers will be provided with PPEs like helmets, reflector jackets, dust covers, sound mufflers, overalls, goggles, hard-nosed boots and gloves.

6.4 Products, By-products, Wastes Generated and Waste Disposal Methods

The possible wastes during and after construction, and their disposal methods include:

- Remains of materials supplied, which include sand, ballast, steel bars and cement. These materials can be used on other construction activities by the client. It is however expected that the remains will be minimal as the design only allows for up to 10% variation.
- Packaging materials for cement: This shall be disposed of by burying in designated waste pit;
- Excess top soil: this can be spread downstream of the dam and planted with grass to restore the site.
- Oil jericans: should be collected, cleaned for reuse or given to container dealers

On completion of the construction the sites will be cleared and left clean and free from debris, hydrocarbons and waste, and all pits and trenches will be filled up.

7 DECOMMISSIONING PLAN

Decommissioning of the project looks at three possibilities; transfer of management or donation of the project as a going concern, the transfer or donation of the project for a different use and the abandonment of the project. It does not deal with the decommissioning of the project as a result of civil disturbances or acts of God.

7.1 Transfer of Management or Donation of the Project as a Going Concern

In the event that the ownership and management of the JFK Lemotit Farm is transferred or the project is donated as a going concern, the new owner will assume all responsibilities associated with the project operations. Copies of all environmental project report, audits and NEMA correspondence will be made available to the transferee/recipient. The transferee/recipient will be expected to adhere to the environmental management plans and any other issues raised in the documentation.

7.2 Transfer or Donation of the Project for a Different Use

In the event that the project is transferred for a different use other than the intended use, a study shall be conducted to assess if the water quality and site location are suitable for the proposed alternative use. If the water quality or site location present challenges to the new intended use, then a measure on how to make the project suitable for the new intended use must be presented to the relevant authorities for approval before implementation.

The most important this is that the alternative use does not present additional negative impacts to the environment including human health.

7.3 Abandonment of the Project

Abandonment of the proposed dam may arise due to several reasons as follows:

- The structure has filled with sediment or for whatever reason cannot provide the stream of benefits for which it was constructed;
- The structure has become an uncontrolled public safety hazard. This could arise if proper maintenance of the spillway was neglected by the owner and WRMA decides to withdraw the water permit;
- The owner of the structure decides to decommission the structure.

In addition, the proposed storage intends to harvest runoff from greenhouses. In the event that JFK stops flower production and removes the greenhouses, then it would mean that the dam shall never be filled and in many cases will remain dry especially during the dry season.

In the event that this happens, JFK may want to abandon the project, recover and rehabilitate the land for alternative use. Section 41 of the Water Act, 2002 provides for abandonment of permitted activities. The WRA may order the water permit holder (project) to remove all or any works in connection with the permit failure to which the authority will remove them at the permit holders cost.

8 POTENTIAL ENVIRONMENTAL IMPACTS, MITIGATION MEASURES REQUIRED DURING AND AFTER IMPLEMENTATION OF THE PROJECT

The project will have both positive and negative impacts to the environment. However, the positive impacts outweigh the negative ones.

8.1 Positive Economic, Socio-cultural and Environmental Impacts

During the Planning and Design phase the following are some of the positive impacts of the project:-

- Awareness creation on the proposed project through the various consultations that occur at this stage. This provides an opportunity for the various stakeholders to be informed about the project and to give their views on the project which helps in improvement of some of the design aspects, helps the project obtain support of stakeholders and in the long run ensure sustainability of the project
- Employment opportunities particularly for professionals such as Engineers, Surveyors, Environmentalist, Sociologists, among others, providing a gain of fees for services rendered which has some positive impact on the economy in general.

During construction the following are some of the immediate benefits to the local communities:

- Employment creation of the locals- the project will provide the unemployed with jobs and a source of income. The project will make use of the local artisans and casual labour.
- Building of on the job skills of the locals. Since the artisans and casual workers will remain behind after the project construction they will use some of the skills so acquired during similar projects and also during maintenance (e.g. desilting of the dams)
- Boosting of local businesses because some of the materials/services may be sought from local service providers

During operational phase the project is likely to have the following positive impacts to the beneficiaries and the nation:

- The project proponent will have additional water resources to support the planned expansion of the flower farm resulting in increased production and positive impacts on the economy
- Realization of the expansion of the farm will create job opportunities for necessary farm workers therefore creating an opportunity for the local communities to access jobs and earn an income
- Having the additional dam in the farm will also prevent increased pressure and competition on other water sources existing in the area
- With the channelling of the greenhouse runoff into the dam, the current problem of flooding and water logging of the downstream farms will also be resolved therefore averting crop loss and improving the land use during the wet seasons
- Introduction of aquatic biodiversity as the dam creates/introduces a new habitat

During decommissioning after construction the following are possible positive impacts of the project:

- If decommissioning involves transfer of the project to another user, then it means the new user does not have to construct another dam therefore minimizing negative impacts of construction of another dam;
- If the decommissioning involves demolition of the dam, then the positive impacts may include:
 - ✓ Improved aesthetics of the area as the contractor restores the site and re-vegetate as necessary;
 - ✓ Job creation for the skilled and unskilled workers involved in demolition exercise;
 - ✓ Increased runoff downstream that can be harvested and stored by an interested person.

8.2 Potential Negative Environmental Impacts and Mitigation Measures

The following sub-sections summarise the possible negative impacts during and after completion of the project. Practical and appropriate mitigation measures have been recommended.

8.2.1 During Design and Planning

- While the public consultation serves to raise awareness and as an avenue to collect feedback they also create potential to heighten expectations and speculation. To mitigate this, it is important for the design team to document any concerns raised and address them as they occur, particularly those that directly relate to the proposed project. The proponents should also keep open channels of communication with stakeholders and have in place avenues of sensitizing the community and other stakeholders.
- Surveys and other studies like excavation of test pits required for the design may result in some disturbance or destruction of vegetation and soils. These studies are however necessary and the occasioned disturbance or destruction is usually minimal, however, the team conducting the studies should take necessary measure to ensure minimum/limited clearance of the vegetation to facilitate survey of site, and that the test pits are refilled after soil sampling.

8.2.2 During construction

Negative impacts are most common in the construction phase. However, most of the impacts in this phase are usually temporary and resolve as soon as the construction is completed. During construction, some of the possible negative impacts and their mitigation measures are presented in Table 6.

Table 6: Possible impacts and mitigation measures during implementation

Possible adverse environmental impacts during implementation	Mitigation measures
Generation of spoil material from the	<ul style="list-style-type: none"> • Re-use the excavated soils as much as possible,

Possible adverse environmental impacts during implementation	Mitigation measures
earth work and excavation	where feasible <ul style="list-style-type: none"> • Dispose soil in area identified by design team and approved by landowner/s
Generation of wastes/ debris / litter from pieces of pipes, metal, concrete, cement bags, etc.	<ul style="list-style-type: none"> • The debris to be collected and disposed in designated waste dumpsites. • Metallic pieces could be taken back for use in fabrication • Wastes could also be sold to recyclers/fabricators • Proponent to take preventative measures though use of BoQ and purchase of only what is needed to minimize possibility of waste
Liquid / solid waste related to humans.	<ul style="list-style-type: none"> • A pit latrine at a suitable site on the construction site will be dug and used by those working at the site. • Provide covered solid waste bins at the construction site and ensure they are emptied regularly to prevent odour and vermin
Noise Generation from excavation and other construction equipment and motor vehicles delivering materials or transferring spoil or waste	<ul style="list-style-type: none"> • Limit construction to daytime • Where possible consider labour based methodologies • Contractor should ensure compliance to EMCA in relation to noise levels • Workers on site during use of machinery that generate noise should be provided with appropriate PPE • Limit equipment and vehicle idling time as much as possible to prevent unnecessary noise • Where possible, use equipment designed with noise control elements
Dust Emission from excavation and other earthworks and movement of motor vehicles	<ul style="list-style-type: none"> • Wet affected construction area and roads • Maintain equipment fleet in good working condition
Accidental Spillage and Leakage of construction machinery fuel, grease and oil	<ul style="list-style-type: none"> • Construction machinery and vehicles should be maintained as per specification to prevent such leakage • Ensure proper storage of fuels and other chemicals
Vegetation and Biodiversity Loss due to clearing of the site where the dam is to be constructed	<ul style="list-style-type: none"> • Contractor should ensure proper marking of area required for the construction works and limit clearing to those areas • Revegetate as much as possible upon completion of construction

Possible adverse environmental impacts during implementation	Mitigation measures
<p>Injuries to the workers resulting from use of hand held tools or machinery, sprains due to heavy loads, falls etc. The injuries may range from scratches to serious cuts or broken limbs or loss of sight.</p>	<ul style="list-style-type: none"> • Contractor vetting to ensure compliance with legal requirements and company regulations governing suitability for the specific job. • Proponent will develop and commit the contractor to site occupational health and safety rules, • Work permit issuance to ensure work progresses only if safety and other standards are observed. • Workers will be provided with PPEs, which include gloves, boots, goggles, aprons, ear protection, etc. • Health and safety awareness creation on ESH hazard and near miss reporting, accident prevention, control and reporting. This should be done before and continuously on the job • Do first aid training and provide first aid kits • Install safety signage in the construction work areas and limit access of the site by other members of the public • Provide workmen compensation insurance to take care of major injuries; may create a fund to take care of major work related injuries. • In case of any accident it shall be reported as per company and DOSHS regulations
<p>Increased water demand for construction works as well as for drinking, sanitation and hygiene of the workers</p>	<ul style="list-style-type: none"> • The contractor will ensure efficient water use to prevent wastage
<p>Dehydration due to lack of water during construction or drinking from contaminated sources</p>	<ul style="list-style-type: none"> • Workers will be provided with clean drinking water to avoid dehydration and drinking of water from contaminated sources
<p>Exhaustion from work/overworking</p>	<ul style="list-style-type: none"> • Provide breaks at certain times of the day and week; discuss scheduling of work with workers
<p>Slight disturbance on the neighbouring community due to presence of strangers and activities during construction</p>	<ul style="list-style-type: none"> • Explain the activities to the neighbouring community. • The construction area will be cordoned off so that anyone who is not working on the site is not allowed into the construction site
<p>Spread of communicable diseases and other infections</p>	<ul style="list-style-type: none"> • Provide sanitation and personal hygiene facilities • Ensure awareness raising on proper sanitation and hygiene
<p>Potential social disturbance and conflicts</p>	<ul style="list-style-type: none"> • Clarify contracts and explain the plan to the local residents

8.2.3 After project implementation

There are far more significant positive impacts after the implementation of the project than the negative ones. The potential negative impacts and their mitigation measures are outlined below.

Table 7: Possible impacts and mitigation measures after construction

Possible adverse environmental impacts after implementation	Mitigation measures
Increased aquatic biodiversity by the expanded water habitat created by the dam may also results in pests such as aquatic plants mosquitos, liver fluke, snails, water rats that may cause various nuisance	<ul style="list-style-type: none"> • Careful monitoring of the dam environment, recording cases of pest/health impacts and formulating and promptly implementing appropriate pest elimination measures.
Increased risk of drowning	<ul style="list-style-type: none"> • Fencing of the dam area and restricting access to the area • Installing warning signs at the dam area
Flow and water quality issues attributed to the dam	<ul style="list-style-type: none"> • Proponent to have in place a complaints handling mechanism for downstream users which they should be informed about and encouraged to report any complaints • Proponent to ensure follow up and appropriate resolution of the complaints raised • For the amount abstracted from the seasonal Kipsirichet stream, it will be regulated via a flow control/measuring device to ensure that abstraction does not exceed permitted level. Provision will also be made for compensation flow during such periods
Unlikely event of dam failure	<ul style="list-style-type: none"> • Proponent through the professionals they engage will ensure sound design, acquiring of all the necessary approvals and authorizations and proper construction supervision • Risk reduction activities such as planting indigenous trees on the river valley to absorb energy of any excessive spillway flow or flash floods • Prior to construction it should also be ensured that there are no houses built close to the river valley • Monthly dam monitoring and necessary extra visits for example before start of rainy season or after event of heavy rainfall. • In the event that any problem is identified then intensive monitoring will be required and necessary

	<p>remedial measures taken including notifying downstream residents</p> <ul style="list-style-type: none"> • In the event that dam failure appears likely, then an evacuation plan which should include an emergency contact list should be implemented.
Increased population leading to competition for social services	<ul style="list-style-type: none"> • Engage as many locals as possible for unskilled labor • Expand facilities to accommodate additional staff
Potential conflicts due to unmet expectations	<ul style="list-style-type: none"> • Continuous engagement with the community prior to and after project completion to ensure that they understand the operations of the dam, what is and is not permissible and any alternatives the proponent may have made for the community

8.3 Demobilization after Construction

After the conclusion of the project construction, the contractor will ensure that unnecessary material and structures will not be left on the project site. This will involve demolition of all site offices, site camps, signage, pegs and any other temporary structures that were erected to facilitate the construction.

All wastes in form of metals, stone, wires, plastics and uPVC that will have accumulated during the construction period will also require to be properly disposed of in accordance to NEMA guidelines. Remains of the excess construction material will not be left dispersed on the project site but will be removed from the site and stored in an environmentally friendly manner for future use. The same will apply to the tools and machines.

8.4 Health and Safety Plan Workers and Community Members

The construction work is not expected to pose any significant health or Safety risk to the community especially because the site is well within the Lemotit farm and a bit out of reach for the public. There is however need to take precaution so as to ensure the health and safety of workers and community members. In this regards, the contractor will be required to undertake the following health and safety measures to minimize health and security risks: -

- Properly demarcate the work site and post a guard to ensure access to the site is restricted to construction staff and supervisors only.
- Provide his workers (and visitors) with protective gear such as nose masks, boots, overalls, sound mufflers, goggles etc. These should have been taken care of in the project budget/cost. The contractor will also create awareness of Safety on the workers.
- Use competent and experienced staff to minimize chances of an accident.
- Ensure the construction equipment are well serviced and in good working condition.
- Ensure there is a properly equipped first aid kit at the site and a person trained in the same.
- Ensure there is a standby vehicle in case of accidents and any need for medical evacuation.

- Ensure trenches and any pits, if left unattended should be clearly labelled and wherever possible covered, to prevent people from falling into them. Where trenches are very deep, proper formwork support will be set up to prevent walls from falling onto workers. Ensure that workers have workmen compensation insurance cover to compensate them in case of major injuries.

8.5 Sustainability and Future Plans

The project design is such that if all factors remain constant and that climate change effects does not lead to reduced rainfall, then the project should be able to operate and support the proposed expansion work sustainably.

9 ANALYSIS OF ALTERNATIVES

9.1 General

This section analyses the possible alternatives to the proposed project based on the rationale that the alternative should be economically feasible, with minimal adverse environmental impacts and minimal time delays.

9.2 Analysis of Dam Project Alternatives

Other alternatives to supply the farm with water would be:

(i) **Exploring option to ensure full exploitation of the 4 boreholes that exist within the farm**

While this may seem a viable alternative, it is certain that the yield generated will not be adequate to support the irrigation needs for the current proposed and future expansions of the farm.

(ii) **Drilling additional boreholes**

When the Lemotit farm was being started, a water resources survey was undertaken and both dam and borehole options were recommended. The farm opted for boreholes at the time and proceeded to drill four boreholes on different sites of the farm. However, of the four only one has recorded high and reliable yield and is currently being used for domestic purposes at the farm and to also supply the community via various water points. Two of the remaining borehole have average yield and the fourth has poor yield. One of these boreholes was also handed over to the community and is currently fully used and managed by the community. Based on the experience with the existing boreholes, drilling additional borehole may not necessary provide adequate water to support the proposed farm expansion. In addition, from the proponent experience with the existing dam and the fact that there is expansive greenhouse catchment to harvest rainwater, the dam option has proved most attractive.

(iii) **Piping water from the proposed upcoming Londiani Multipurpose dam**

The distance from the farm to the proposed Londiani dam site, coupled with the fact that this is an upcoming dam project which could take a couple of years to be commissioned makes this option not viable. The planned expansions on the Lemotit farm is immediate, falling within the next two years, beginning in 2018 and postponing to the time when the dam will be commissioned will mean loss of the benefits that would have otherwise been gained by both the proponent and the community within that period.

(iv) **Increasing Lemotit Dam height by 1m.**

Increasing the dam height by 1m will not provide adequate additional storage to support the proposed expansion work. Additionally, the Lemotit River course on which the dam is constructed is currently experiencing a reduction in flow due to additional abstraction upstream of the dam and catchment degradation.

9.3 Analysis of Project Materials Alternatives

There are minimal options in terms of materials for the proposed project. While there are no alternatives to the borrow material, filter blanket material, sill and inspection chamber, the draw off pipes can either be of HDPE, Galvanized Steel or UPVC.

There is no benefit in replacing the pipe material with any of the alternatives.

9.4 Analysis of Project Location Alternative

The current proposed dam site was arrived at after a number of water resources surveys and a topographical survey. Due consideration was made of the boundaries of the farm with the intention to have the site located within the farm. The area already under floriculture, various farm facilities and the eucalyptus and pine plantation as well as the existing dam in the farm were also considered. Due to the farm topography (it has a distinct ridge with two valleys on either side) runoff from the greenhouses on one side of the ridge is already being harvested and directed to the existing dam and the proposed dam site is therefore on the second valley to cater for storage of greenhouses runoff and surface runoff on that side. The location of the greenhouses and farm facilities were additionally considered to ensure they were not affected by the dam flood area. There is a breached dam slightly upstream of the proposed dam site and the vegetation cover of the proposed site primarily comprise of various grasses and shrubs which means less disruption of the current environment. There is also already a road leading to the site which means that there will be no need to cut down the surrounding eucalyptus plantation to access the area. Relocating the dam site to another location within or outside the farm is therefore not viable owing to the aforementioned considerations.

9.5 The No Project Alternative

The no project alternative implies that the project is not implemented and the status quo is maintained. This would mean that the proponent abandons the planned expansions for which the dam is being constructed to support. This will also mean foregoing of the benefits that would have otherwise been gained by both the proponent and the community if the project is implemented. While this option has the least or no effect on the environment, such an option would be most suitable in the event of probable extreme negative impacts which is not the case for the proposed project. This alternative therefore is not a viable alternative from a socio-economic and partly environmental perspective.

10 ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

The following Environmental Management Plan summarises the main points contained in the previous sections to highlight the measures required to reduce the negative environmental impacts or risks associated with the project activities.

Table 8: Environmental Management and Monitoring Plan

ITEM/ IMPACT	OBJECTIVE	MITIGATION MEASURE	BY WHEN	INDICATOR	BY WHO	APROX. COST (KSh.)	MONITORING
Impact of the project infrastructure	Reduce risk of injury or death	<ul style="list-style-type: none"> Permits to work to ensure work only commences if safety controls and measures are in place. Secure infrastructure properly by fencing and where needed have a guard; Ensure structural strength of the embankments to avoid collapse & injury/death Supervision of the contractor by proponent to ensure continuous compliance. Continuous Refresher trainings and project meetings 	Continuous	Observations	Proponent Design Team Contractor	150,000	During and after construction
Soil erosion	Control soil erosion	<ul style="list-style-type: none"> Monitor to ensure minimal soil erosion & put proper 	Immediately/ continuous	Observations	Contractor, Proponent	15,000	During and after construction

ITEM/ IMPACT	OBJECTIVE	MITIGATION MEASURE	BY WHEN	INDICATOR	BY WHO	APROX. COST (KSh.)	MONITORING
		<p>soil conservation measures as needed</p> <ul style="list-style-type: none"> • Earthworks should be controlled so that land that is not required for construction works is not disturbed • Wherever possible earthworks should be carried during the dry season to prevent soil from being carried away by the surface runoff. • Practice catchment management within the catchment area • Maintain the vegetative cover within the surrounding environment 					
Vegetation loss	Conservation of Ecology	<ul style="list-style-type: none"> • The clearance of site for construction purposes shall be kept to a minimum. The contractor shall clearly mark out the extent of clearing within the approved work site. • Instruct all construction workers to restrict clearing 	Immediately/ continuous	Observations	Contractor	10,000	During and after construction

ITEM/ IMPACT	OBJECTIVE	MITIGATION MEASURE	BY WHEN	INDICATOR	BY WHO	APROX. COST (KSh.)	MONITORING
		<p>to the marked areas and not to work outside defined work areas.</p> <ul style="list-style-type: none"> Landscaping and revegetation of the site after completion of construction 					
Air and Noise Pollution	Reduce the possibility of air and noise pollution	<p>The contractor shall be responsible for the control of air emissions and dust arising from his operations and activities and shall ensure the following;</p> <ul style="list-style-type: none"> Noise levels comply with the noise prevention rules. Workers are trained on management of air pollution from vehicles and machinery and dust minimisation techniques. All construction machinery is maintained and serviced in accordance with the contractor's specifications. Dust generating activities (excavations) are not carried out during times of strong winds. 	During construction	Observations	Contractor	10,000	During construction

ITEM/ IMPACT	OBJECTIVE	MITIGATION MEASURE	BY WHEN	INDICATOR	BY WHO	APROX. COST (KSh.)	MONITORING
		<ul style="list-style-type: none"> • Vehicles delivering sand are covered to reduce spills and windblown dust. • Vehicles speed is limited to minimise the generation of dust on site and on haul routes • Water to be sprinkled on dusty roads as necessary. 					
Health and hygiene	Reduce risk of water borne diseases	<ul style="list-style-type: none"> • Ensure that water supplied to the workers is safe for domestic use; • Proper waste management through sanitary facilities provision and usage 	During operation of the project	Observations and project records		50,000	After construction/during operations- quarterly
Waste management	Reduce and recycle waste	<ul style="list-style-type: none"> • Compost organic waste; • Recycle metallic & plastic ones 	During and after construction	Project Report; observation	Contractor & project staff	50,000	During and after construction
Occupational health & safety	Reduce the risk of occupational injury	<ul style="list-style-type: none"> • OHS Risk assessments and management; • Create awareness on safety expectations, prevention controls, precautions and mitigation; • Train on OHS; • Fence off/enclose site; 	During and after construction	Project report; certificates	Contractor & Project committee	15,000	During and after construction

ITEM/ IMPACT	OBJECTIVE	MITIGATION MEASURE	BY WHEN	INDICATOR	BY WHO	APROX. COST (KSh.)	MONITORING
		<ul style="list-style-type: none"> • Ensure safety of the elevated structures; • Monitor and report any safety incidences 					
		<ul style="list-style-type: none"> • Provide appropriate PPEs 	During and after construction		Contractor & Project committee	50,000	
		<ul style="list-style-type: none"> • Engage qualified workers/artisans or train them appropriately 	During and after construction		Contractor & Project committee	10,000	
	Reduce Air & Noise Pollution during excavation	<ul style="list-style-type: none"> • Provide sound mufflers; • Construct during day time to avoid nuisance at night; • Provide noise masks/; • Provide dust covers; • Wet work areas to minimise dust 	-do-	-do-	-do-	100,000	-do-
Provide emergency services	<ul style="list-style-type: none"> • Establish a catalogue of key emergency situations and their response plans; • Conduct drills on emergencies; • Train workers on first aid; • Provide first aid kit; • Provide standby vehicle 	-do-	-do-	-do-	50,000	-do-	

ITEM/ IMPACT	OBJECTIVE	MITIGATION MEASURE	BY WHEN	INDICATOR	BY WHO	APROX. COST (KSh.)	MONITORING
	Reduce the risk of injury by fire	Establish fire prevention & response policy, Training, emergency facilities provision and servicing and fire drills	On the existing project site	Project Report	Contractor	10,000	During construction.
	Safety of workers from stored/stacked materials	Risk assessments and management; Ensure that materials are stored or stacked in such manner as to ensure their stability and prevent any fall or collapse	During and after construction/rehabilitation	Inspection/ observations	Contractor & project staff; project management	15,000	During and after construction/rehabilitation

The mitigation measures, elaborated in this EMMP are achievable and it is strongly recommended that they be implemented in totality. The EMMP forms the basis for the formulation and implementation of an Integrated Environment, Health and Safety Policy that will be geared towards minimizing risks to the environment and human health and safety.

Based on the results of this EIA Study, it is apparent that with the adoption and implementation of the EMMP, the any likely adverse impacts will be adequately countered.

11 CONCLUSIONS AND RECOMMENDATIONS

11.1 Conclusion

The result of this EIA Study has indicated that there are no significant and persistent negative impacts likely to be generated by the activities of the proposed project. Most of the potential negative impacts to be generated have been rated as low and short-term and most of the impacts are positive and are beneficial to the public at large and the country. The benefits of the proposed Kipsirichet Dam Project outweigh the risk of the negative impacts.

It is therefore concluded that the proposed project will not compromise the wellbeing of the Lemotit residents or the area ecological and environmental conditions. The development will rather ensure some benefits to both the project proponent as well as the community. Therefore, the proposed development should be approved by NEMA to facilitate its implementation.

11.2 Recommendations

Most of the environmental, socio-economic impacts that will result from the proposed development were found to be positive. Workable mitigation measures were established to offset the negative impacts. The following recommendations should be adhered to ensure smooth implementation of the project.

1. Waste collection bin will be provided at the construction site. Waste will be disposed of in an environmentally friendly manner following standards set by EMCA 1999.
2. Construction team will be supervised while at work and it should be ensured they are aware of Safety precautions during the construction phase.
3. The proponent will develop a dam safety plan and adhere to dam inspection regime.
4. During decommissioning all the waste and unused building materials will be removed safely from the site and dumped in a manner that is approved to the EMCA 1999.
5. Workers will be provided with the right working tools and Safety gears to prevent accidents. Well-equipped first aid kit should also be made available to the workers.
6. The construction area will be hoarded and signage installed instructing the public to keep off these sites.
7. The construction activities will be undertaken by a qualified contractor/Engineer who will follow to latter details of the approved drawing and the set construction standards.
8. Implementation of the proposed mitigation measures and compliance with EMMP will be ensured.

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APPENDIX A

TERMS OF REFERENCE

APPENDIX B

PUBLIC CONSULTATIONS PARTICIPANTS LIST

APPENDIX C

COMPLETED QUESTIONNAIRES

APPENDIX D

MAP OF THE PROJECT AREA

APPENDIX E

CERTIFICATE OF REGISTRATION

APPENDIX F

LAND DOCUMENTS

APPENDIX G

WRA AUTHORIZATION AND WRUA COMMENTS

APPENDIX H

BILLS OF QUANTITIES

APPENDIX I - SITE PHOTOS



Some of the Greenhouses at Lemotit Farm



Vegetation at the Proposed Site for Kipsirchet Dam



Ground Condition at the Proposed Site



Area downstream of proposed dam that is prone to flooding during rainy season