THE REPUBLIC OF UGANDA
MINISTRY OF WATER AND ENVIRONMENT

EMERGENCY PREPAREDNESS AND RESPONSE PLAN (EPRP) FOR THE MULTI-PURPOSE WATER FOR CLIMATE RESILIENCE AND IRRIGATION DEVELOPMENT FOR LIVELIHOOD TRANSFORMATION (MWACRID) PROJECT IN THE SUB-COUNTIES OF MASINDI-PORT AND KIGUMBA IN KIRYANDONGO DISTRICT; MIRYA AND KIMENGO IN MASINDI DISTRICT, UGANDA

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ABBREVIATIONS AND ACRONYMS

Abbreviation	Full Form
AfDB	African Development Bank
DWD	Directorate of Water Development
EHSS	Environment Health Social and Safety
EIA	Environmental Impact Assessment
EPRP	Emergency Preparedness and Response Plan
ESIA	Environmental and Social Impact Assessment
ESMMP	Environmental and Social Management and Monitoring Plan
ESMS	Environmental and Social Management System
FGDs	Focus Discussion Groups
GOU	Government of Uganda
GPS	Global Positioning System
HOD	Head of Department
IWRM	Integrated Water Resources Management
LC 1	Local Council 1
M&E	Monitoring and Evaluation
MoU	Memorandum of Understanding
MWACRID-P	Multi-Purpose Water for Climate Resilience and Irrigation Development for Livelihood Transformation Project
MWE	Ministry of Water and Environment
NEMA	National Environment Management Authority
NGOs	Non-Governmental Organizations
OHS	Occupational Health and Safety
PPE	Personal Protective Equipment
SCBA	Self-Contained Breathing Apparatus
SOPs	Standard Operating Procedures
ToR	Terms of Reference
WTP	Water Treatment Plant

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1 INTRODUCTION

1.1. Background

The Emergency Preparedness and Response Plan (EPRP) has been developed to guide all stakeholders - including contractors, consultants, local government officials, and project beneficiaries—on how to prepare for, respond to, and recover from emergencies that may arise during the construction and operational phases of the Multi-Purpose Water for Climate Resilience and Irrigation Development for Livelihood Transformation (MWACRID) Project. The project is being implemented in the sub-counties of Masindi-Port and Kigumba in Kiryandongo District, as well as Mirya and Kimengo in Masindi District, Uganda. This plan reinforces the project's commitment to safety, sustainability, and compliance with the African Development Bank's (AfDB) environmental and social safeguard policies. This plan ensures consistent procedures are in place across all project components to minimize risk to human health, the environment, infrastructure, and financial investment. The project will consist of two major components: a potable water supply infrastructure and an irrigation water supply system. Key features include diversion canals, intake and pump stations, treatment plants, transmission and distribution pipelines, and various support facilities such as process buildings, control rooms, electrical and maintenance buildings, administrative offices, and reservoir tanks. Each component is designed to enhance water access for both domestic use and irrigation purposes. A detailed description of these components is provided in appendix 1.

1.2. Purpose of the Plan

The purpose of this plan is to provide measures and guidance for the establishment and implementation of emergency preparedness and response plan for the Multi-Purpose Water for Climate Resilience and Irrigation Development for Livelihood Transformation (MWACRID) Project. The purpose of the EPRP is to:

(a) Provide a plan, which facilitates public safety by notifying all appropriate authorities and stakeholders;
(b) Provide information to all stakeholders to allow for an informed evaluation to be made during emergency events;
(c) Provide a plan of action for foreseeable flood emergencies affecting safety of the MWACRID Project and local communities;
(d) Ensure all personnel and visitors are given the maximum protection from unforeseen events;
(e) Ensure all personnel are aware of the importance of this plan to support the protection of life and property.

The plan is intended to assist the Contractor, Employer, the local community and any other stakeholders in responding swiftly and effectively in the event of an emergency at the MWACRID Project.

This plan is primarily biased to emergency preparedness and response to MWACRID –Project water reservoirs and bulk water transmission lines and associated risks directly linked to the proposed bulk water supply infrastructure.

It is important to note that other common emergencies or risks associated with the MWACRID-P associate project's such as marram borrow areas, water abstraction point, rock blasting for rocky areas and a host of other policies, procedures and plans that the Contractor has developed with respect to MWACRID -P.

Therefore; this Emergency Preparedness and Response Plan in a bid avoid duplication of other plans and procedures already prepared by the contractor will prioritize and discuss bulk water transmission lines and water reservoir(s) for MWACRID P, an aspect which is not exhaustively addressed in the other MWACRID P plans, procedures and policies.

As a minimum, the 'Emergency Preparedness and Response Plan' shall address the management of situations and scenarios resulting from the following emergency conditions as presented in Table 1-1 below:

Table 1-1: Some of the Risks that could be associated with MWACRID-P construction and management

Emergency Conditions	Risk Statement	Remarks
a) Extreme natural floods	Low	• River Nile flooding occurrences are reportedly low.
b) Earth quakes	Moderate - Low	• Masindi and Kiryandongo districts in Uganda are located in the Mid-western part of the country. While neither district is specifically within the most seismically active areas, both are situated in an area generally considered to be of moderate to low seismic risk.
c) Abnormal flows resulting from the emergency operation of upstream dams	High	• Karuma Hydropower Plant is located downstream. • Flooding of islands between Port Masindi and Isimba Hydropower plant is likely.
d) Abnormal flows resulting from the failure of natural systems (landslides and river outbursts)	Low	• Landslides are reportedly not common within the River Nile basin
e) Rapid change of permeability of the water reservoir body, foundation or abutments	Low	• Design minimises probability of occurrence
f) Storage, handling and use of explosives	Moderate	• Proper permits will be obtained before any storage and this will also ensure proper handling of the explosives minimizing the effect
g) Fuel and chemical storage, handling and use	Moderate	• Fuel is a predominant entity of any construction project. Proper follow up of Health & Safety management plan will mitigate any risks.

Emergency Conditions	Risk Statement	Remarks
		Chemical usage is minimal, but waste handling techniques are also extensively discussed in waste management plan.
h) Wild fires	Moderate	• The Kiryandongo – Masindi Area is part of the cattle corridor, it records a high number of bush fires during the dry seasons. Emergency Contact of District Fire Department will be maintained
i) Fire hazard	Low	• Implementation of Health and Safety management plan minimises probability of occurrence
j) Site security or terrorism or civil unrest	Low	• Private Security guards, Police and Army will form a Three zone safety for all project entities
k) Epidemics/Out breaks e.g. COVID-19, Ebola, Cholera, Dysentery, Hepatitis B, Tuberculosis etc)	Moderate	• Mitigation measures will be put in place, including Worker and community sensitization about influx and will work closely with Local health bodies.
l) Wild life encounters	Moderate	• The project area has reported wild life encounters and additionally there is a nearby protected area (Murchison Falls National Park and Kaduku Central Forest Reserve)

1.3. Scope of the EPRP

In accordance with good practice, an Emergency Preparedness and Response Plan shall contain (as a minimum) five (5) basic elements:

1. Notification Flowchart and Contact Information;
2. Emergency Detection, Evaluation, and Classification;
3. Responsibilities;
4. Preparedness Activities; and
5. Schematic layout of the bulk water transfer systems.

1.4. Project Scope and Risk Overview

The project involves constructing and operating a water transfer and irrigation system that includes river intake works, treatment plants, transmission pipelines, reservoirs, pumping stations, and a wide-reaching distribution network serving small holder, commercial farms and rural populations in Masindi and Kiryandongo Districts.

Given the technical complexity and geographical coverage, several emergency scenarios have been identified, including:

i. Failure of storage reservoirs, pipelines, or treatment structures.
ii. Overflow of the diversion canal due to sedimentation or blockage.
iii. Fire and explosion at fuel storage points or electrical substations.
iv. Chemical spills, especially involving chlorine and flocculants.
v. Occupational accidents (falls, electrocution, mechanical injury).
vi. Natural hazards such as floods, earthquakes, or severe storms.
vii. Power outages affecting SCADA and pump operations.
viii. Public unrest or acts of vandalism.

2 EMERGENCY PREPAREDNESS ACTION AND PROCEDURES

Response to any emergency arising out of Incident or Failure associated with the Multi-Purpose Water for Climate Resilience and Irrigation Development for Livelihood Transformation (MWACRID) Project will be greatly improved by having information in the hands of responsible persons in order to properly determine risks and possible outcomes.

It is designed to control and respond in the shortest time possible to an emergency that may occur affecting both workers and the general public.

This Emergency Preparedness and Response Plan is applicable to all phases of the MWACRID Project, including both the construction phase and the operation phase. During the construction phase, contractors will aid their subcontractors in case of an emergency; however, the ultimate responsibility for the safety and well-being of subcontracted employees remains with the respective contractors.

During the operation phase, the MoWE, or a nominated operator, will be responsible for implementing this EPRP. This includes ensuring that all staff, operators, and maintenance teams are trained in emergency response protocols and that appropriate emergency contact procedures are in place.

Any emergency, serious injury, or dangerous occurrence regardless of the project phase must be immediately reported following the emergency preparedness action and response procedure in figure 2-1 to the designated emergency response contact and the responsible safety officer. Clear communication lines and response mechanisms shall be maintained throughout the project lifecycle to ensure coordinated and effective emergency response.

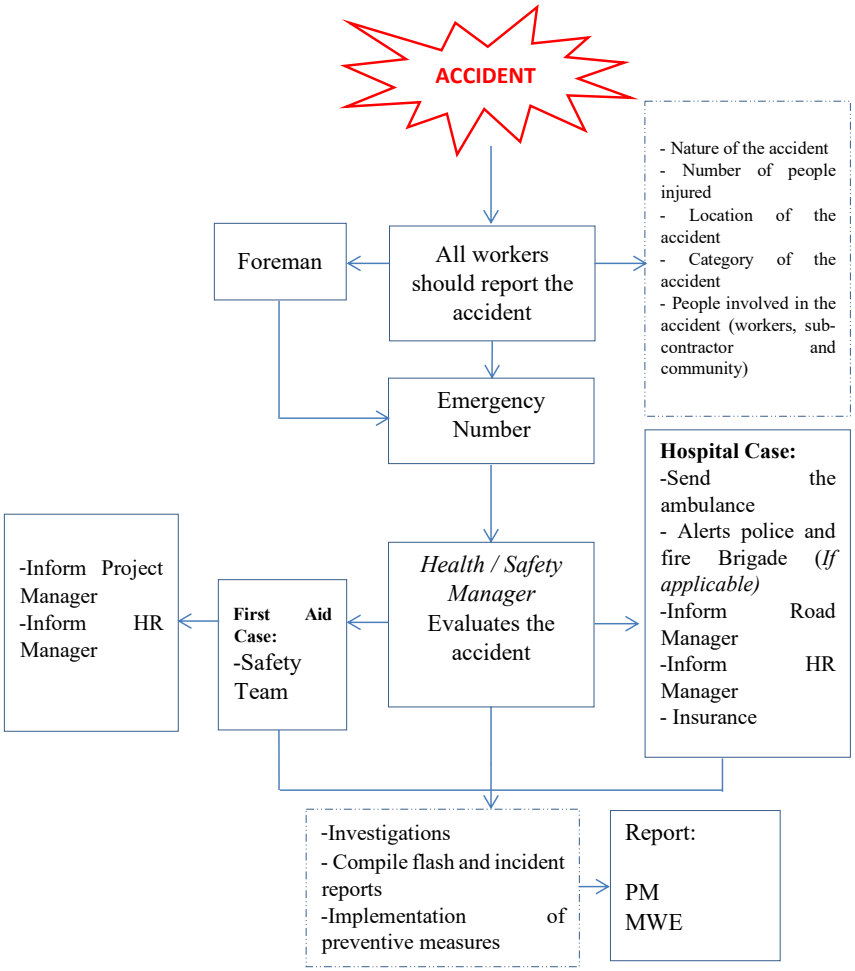

Figure 2-1: Emergency preparedness action and response procedure

2.1 Description of the emergency

All workers MUST report the accident to the supervisor or emergency number immediately and report the following:

- Nature of the accident
- Number of people that were injured
- Location of the accident
- Category of the accident
- People involved in the accident (workers, sub-contractors, community)

1. The emergency number must report to the Health and Safety Manager about the accident as mentioned in 1 above.

2. All workers must go to the assembly points if the occasion demands it.
3. The Health and Safety Manager evaluates the accident as below:
    - Is it a First Aid case? If yes…., must communicate to the Safety team so that they provide the first aid treatment to the causalities.
    - Is it a Hospital case? If yes…., must call the ambulance van to transport the injured person/people to the hospital. Alert the police and fire brigade as soon as possible (if applicable).
    - Both of the above cases must be report to the Project Manager and HR Manager (if it is a hospital case must report to the insurance company and makes contact with any victims' family).
4. The Health and Safety Manager, Safety team, supervisor's :
5. Investigation of the accident
6. Compile flash and incident reports
7. Implementation of the preventive measures
8. The Project Manager, Health and Safety Manager:
9. Report the accident to PM, MWE

DON'T

i. Don't move a Seriously Injured Person, unless they are in Life Threatening danger.
ii. Don't assume that someone else has raised the alarm.
iii. Don't take unnecessary risks.
iv. Don't destroy or alter evidence of the accident.

2.2 Types of Emergencies

There are three levels of emergencies:

LEVEL 1-MINOR INCIDENT: A Minor Incident is defined as a local event with limited impact, which does not affect the overall activities. The environmental emergency preparedness and response plan may not be activated.

LEVEL 2- EMERGENCY: An Emergency is defined as a serious event that completely disrupts one or more activities. Involves multiple resources and Environmental Emergency preparedness and response plan will be activated to the extent necessary.

LEVEL 3- DISASTER: A Disaster is defined as a very serious event that seriously impairs or halts the activities. The Environmental Emergency preparedness and response plan will be fully activated.

2.3 Potential Emergency Scenarios

Based on project activities and infrastructure, the following emergency scenarios have been identified:

i. Structural Failures: Collapse or leakage of reservoirs, pump stations, pipelines, or intakes.

ii. Flooding: Due to overflows or sedimentation blockage, especially near the diversion canal and storage reservoirs.
iii. Fire and Explosions: Electrical faults at pumping stations, control rooms, or fuel storage areas.
iv. Hazardous Material Spills: Chemical leaks (e.g., chlorine, coagulants) at treatment plants.
v. Occupational Accidents: Falls, machinery-related injuries, or confined space hazards during operations or maintenance.
vi. Power Failures: Interruptions affecting pumping, treatment, and SCADA systems.
vii. Community-related Incidents: Unauthorized access, vandalism, or protest disruptions.
viii. Natural Disasters: Earthquakes, landslides, or severe weather events affecting infrastructure integrity.

2.3.1 Reservoir Failures

Potential Risks:

i. Structural collapse due to design flaws, poor construction, or ground instability
ii. Overtopping caused by heavy rains or valve failure
iii. Leakage from wall cracks or failed joints
iv. Erosion of embankments
v. Contamination of stored water

2.3.2 Pipe Burst along the Transmission Line

Potential Risks:

i. Flooding of agricultural land or residential areas
ii. Supply disruption to treatment plants or farms
iii. Soil erosion and undermining of nearby roads or infrastructure
iv. Danger to passing vehicles or workers near exposed burst points

2.4 Other Emergency Response Actions

2.4.1 Malicious Human Actions (Sabotage, Vandalism, or Terrorism)

The Contractor / MWE shall:

- If malicious human activity that could endanger public safety is suspected, contact the Uganda Police Force (both Masindi and Kiryandongo Police Stations) for their help in evaluating the situation.
- If the embankment or a spillway has been damaged or partially removed, provide temporary protection in the damaged area by putting in place sandbags, riprap materials, or plastic sheets weighted with sandbags. Use pumps and siphons to help reduce the water level in the reservoir.
- If the water supply has been contaminated, immediately close all inlets to the water supply system and notify appropriate authorities.
- If facing threat or development of foreign military force incursion or civil war, or rebel activities contact the Uganda Police Force (UPF) or Ministry of Defense and Veteran Affairs (MoDVA).

- It's important to note that all the Contractor's workplaces will be under fulltime private security surveillance and additionally all work places will be fenced to limit an authorized access to MWACRID – P workplaces or sites.

2.4.2 Fires and Wildfires

Every employee has a role to play in fire prevention and the emergency preparedness plan. It is therefore important to comply with the following:

- Always obey no "No Smoking" signs.
- Do not allow or use open flame near flammable material or fumes.
- Know where the nearest fire extinguisher is and how to use it.
- Workers should always be warned not to tamper with fire-fighting equipment; Let them know it is there for their safety and protection.
- Used fire extinguishers shall be reported in order for them to be refilled. Never return them to their location directly after use.
- All staff shall be familiar with evacuation procedures.
- Know the locations of the fire alarms near the workstation.
- Know where the nearest fire extinguisher is and know how to use it.
- Know the locations of emergency exit routes and assembly points
- Participate in emergency preparedness drills.
- Do not attempt to fight fire if you are not trained.

In case of fire, alert colleagues, emergency body (fire brigade) before attempting to fight it.
The risk of wild fires or bush fires shall be managed taking the following preparedness actions:

- The MWE Staff and the Contractor's E&S Officer will periodically investigate wildfire or bushfire abatement issues.
- Develop and maintain individual bushfire plans for all MWACRID – P sites.
- Establish and maintain a 10-metre buffer zone (defense line) between the grassy surroundings and MWACRID – P sites.
- The contractor shall install fire hydrants at strategic locations throughout the MWACRID – P workplace sites.

2.4.3 Wildlife Management

A variety of wildlife species occur in the area specifically at Port Masindi on River Nile – the water abstraction point for the project. Unexpected wildlife encounters (especially Hippos and Crocodiles) could result in incidents / accidents with project workers, including vehicular accidents.

Several measures will be implemented to track and repel nuisance animals, including reporting of sightings and prohibiting interference or interactions between Project personnel and wildlife.

Wildlife reports should identify the animal(s) and include:

- location, including nearest personnel, property or process to the sighted animal(s);
- trajectory:

- wildlife walking away from personnel, property or processes (positive);
- wildlife walking towards personnel, property or processes (negative); and
- behavior of the animal(s).

Prior to construction, a detailed system for alerting personnel around the project area will be developed an availed to all personnel. Alarm methods and other communication, such as radio communication and use of air horns, of imminent threats or incidents involving wildlife will be established:

- personnel encountering wildlife should raise an alarm as per the alerting system to be developed, or the equivalent. It is every employee's responsibility to ensure a clear alert is issued if danger is imminent to themselves or their co-workers;
- following the alarm, a general wildlife report will be broadcast (likely via radio), indicated above;
- workers on the ground near the encounter are to monitor the animal's trajectory noninvasively;
- follow-up notifications are to be issued if the sighting changes;
- the Environmental and Social Safeguards Officer or Area Supervisor of the affected area may give instructions to stop work and proceed to safety at a nearby Assembly Point, or prepare for field evacuation;
- the first actions are avoidance and distancing measures by moving personnel, property or process away from the animal and/or its predicated trajectory;
    - avoidance may be achieved by planning work to avoid known wildlife inhabitancies, populations and areas when possible.
    - distancing may be achieved by separating or actively evacuating personnel, processes or property from wildlife to reduce the risk of incident or injury to personnel or the animal(s). Further, to leave an animal that is displaying "normal behavior" sufficient space to not habituate the animal to human presence, or processes or property by unnecessarily initiating discouraging or deterrent measures. This includes vehicle movement in proximity to bears or wildlife by maintaining proper distance that does not affect the animals.
- if avoidance or distancing measure cannot be taken then preparation for deterrence measures must be taken. In this situation, Ministry of Tourism Wildlife and Antiquities (MTWA) must be contacted and personnel and trained wildlife responders will follow their directions;
- once a situation has been downgraded or resolved, management personnel will issue a radio communication to allow workers in the affected area to resume unrestricted activity; and
- the appropriate wildlife sighting/incident documentation must be completed and forwarded to the Environment and Social Safeguard's Officer.

Following a wildlife emergency incident, an investigation and report would be submitted to the Contractor's Environment and Social Safeguard's Officer. Proper recordkeeping is critical to effectively managing wildlife issues before they arise. The Contractor's Environment and

Social Safeguard's Officer will maintain a record of all sightings, alerts and actions taken for regulatory reporting purposes.

2.4.4 Epidemic Management

MWE and the Contractor shall undertake the following to prevent occurrence of an epidemic outbreak in MWACRID - P:

- Medical checkups will be conducted to employees if any case arises, with key focus on communicable diseases;
- All project cooks and tea girls will be required to obtain medical certificates from both Masindi and Kiryandongo District Public Health Offices, clearing them to handle or prepare food for others.
- Workers will be routinely trained on avoidance and prevention of communicable diseases.
- All major work places will have a clinic.
- Contractor will establish and develop a working relationship a clinic or health center within the project area to handle emergencies which cannot be treated at the site clinic(s).
- Work with Masindi and Kiryandongo district public health offices and Uganda Red Cross Society in case of any epidemic outbreak on site or within the district.
- Contractor will routinely fumigate all workplaces as a form of vector and pest control.

2.5 Response Procedures

2.5.1 Introduction

After an unusual or emergency event is detected or reported, the Project Manager will be responsible for classifying the event. All decisions and actions shall be made in accordance within the laid down procedures

2.5.2 Structural Failure / Canal Overflow

i. SCADA alarms alert operations staff of abnormal pressure or water levels.
ii. Immediately shut down upstream pumps and close isolation valves.
iii. Engineering team inspects the damage. If necessary, erect barriers to prevent further flooding.
iv. Community leaders and LC1s are informed in areas downstream.

2.5.3 Chemical Spill (e.g., chlorine leak)

i. Clear the area and initiate spill containment with kits.
ii. Don chemical PPE and isolate the leak.
iii. Contact NEMA and MWE.
iv. Transport contaminated material for disposal at certified facility.

2.5.4 Reservoir Failures

i. Trigger Alarm & SCADA Notification: If equipped with SCADA, system alerts must be monitored 24/7 for rapid detection of abnormal water levels or pressure.
ii. Evacuate Personnel & Nearby Communities: If a breach is detected, evacuate all workers and inform LC1s of nearby villages to move residents from downstream danger zones.
iii. Isolate the Reservoir
    a. Close inlet valves to prevent further water inflow.
    b. Open controlled outlet valves if safe, to reduce pressure by gradual release.
iv. Deploy Emergency Response Team (ERT): Engineering and HSE teams to inspect the damage, stabilize the structure (e.g., with sandbags, plastic sheeting), and prevent further erosion.
v. Coordinate with Authorities: Alert MWE, district disaster response units, and Uganda Police or Army Engineers if dam breach risk is high.
vi. Public Communication: Use radio announcements, community loudhailers, and SMS alerts to notify the public.
vii. Activate Emergency Draining: If risk is imminent, controlled draining through spillways or low-level outlets must be initiated.
viii. Post-Incident Measures
    a. Conduct technical damage assessment.
    b. Test water quality if contamination is suspected.
    c. Record incident and update emergency plans.

2.5.5 Pipe Burst along the Transmission Line

i. Automatic Pressure Drop Alert (via SCADA): SCADA should signal sudden drops in pressure, prompting remote or manual shutdown.
ii. Stop Pumping Immediately: Shut off all upstream pumps feeding the affected pipeline section to halt the flow.
iii. Isolate the Damaged Section: Close nearest upstream and downstream gate valves or butterfly valves.
iv. Assess the Site: Send the engineering team to identify the burst point, assess terrain impact, and evaluate access for repair teams.
v. Drain & Secure Area
    a. Open nearby washout valves to depressurize and drain residual water.
    b. Cordone off the area to restrict unauthorized access.
vi. Community Safety
    a. Alert nearby farmers and residents, especially if floodwaters are moving toward settlements or livestock areas.
    b. Use signage and temporary fencing around exposed sections.
vii. Initiate Repairs
    a. Mobilize repair crew with excavation, welding, or pipe replacement tools.
    b. Conduct hydrostatic pressure testing before re-commissioning.

viii. Post-Incident Monitoring
   a. Recheck SCADA for normal pressure restoration.
   b. Document the cause (e.g., surge, corrosion, sabotage) and preventive lessons.
   c. Inspect similar pipeline segments for related weaknesses.

2.5.5.1 Fire out Breaks;

1. All workers must report the emergency case to supervisor(s) or emergency number immediately and provide the following information:

- Nature of the emergency case
- Number of people that were injured
- Location of the emergency case
- Category of the emergency; If fire type:

- **CLASS "A" FIRES**: Ordinary combustible such as rubbish, paper, rags, scrap lumber, etc. These are fires that require a cooling agent for extinguishment. Recommended extinguishers are; water by use of a hose pipe, through pump type water cans, pressurized extinguishers.
- **CLASS "B" FIRES**: Flammable liquids, oils and grease. Fires that require a smothering effect for extinguishment. Recommended extinguishers are; Carbon Dioxide, Dry Chemical and Foam.
- **CLASS "C" FIRES**: Electrical equipment. Fires that require a non-conducting, extinguishing, agent. Recommended extinguishers; carbon Dioxide and Dry Chemical.

- People involved in the emergency incident (workers, sub-contractors, community)

2. Fire fighter: Commence firefighting with extinguishers.

3. Health and Safety Manager: if the fire is extinguished, must inform the fire brigade and Project Manager about the end of the emergency, if the fire is not extinct, handover to fire brigade and provide updates or brief them on the status.

At the same time the supervisor of the section should start to remove workers from all sections and instruct workers to gather at the meeting point and register all the available workers in the respective work sections. This is done to identify any missing worker(s) as a result of the emergency incident.

4. After extinguishing the fire, the supervisor(s) instructs to resume work in non-affected areas and relay instructions to workers.

5. Health and Safety Manager start to initiate accident investigations and evidence collection, if there is any act of violence or vandalism must notify the relevant authorities.

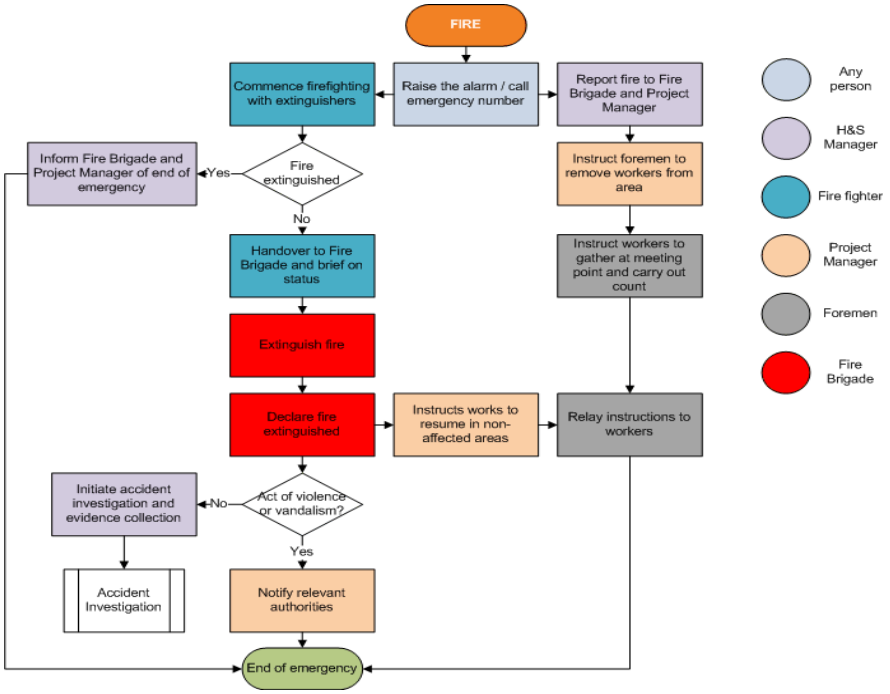

Figure 2-2: Fire Emergency Response Actions

2.5.5.2 Implementation

i. Fire drills to be carried out regularly to ensure that the workers are equipped with satisfactory knowledge for handling fire out breaks;
ii. Fire assembly points are identified in all the various camps and clearly indicated with signage to enable the worker identify it easily in case there is any fire out break
iii. Emergency exits,
iv. Smoking areas are to be identified and indicated with signage to prevent workers from smoking were ever they find which can easily cause fire out breaks Fire extinguishers

2.5.6 Medical Emergency Response

If accidents happen, various actions will be undertaken. The actions are detailed in figure 2.3 below.

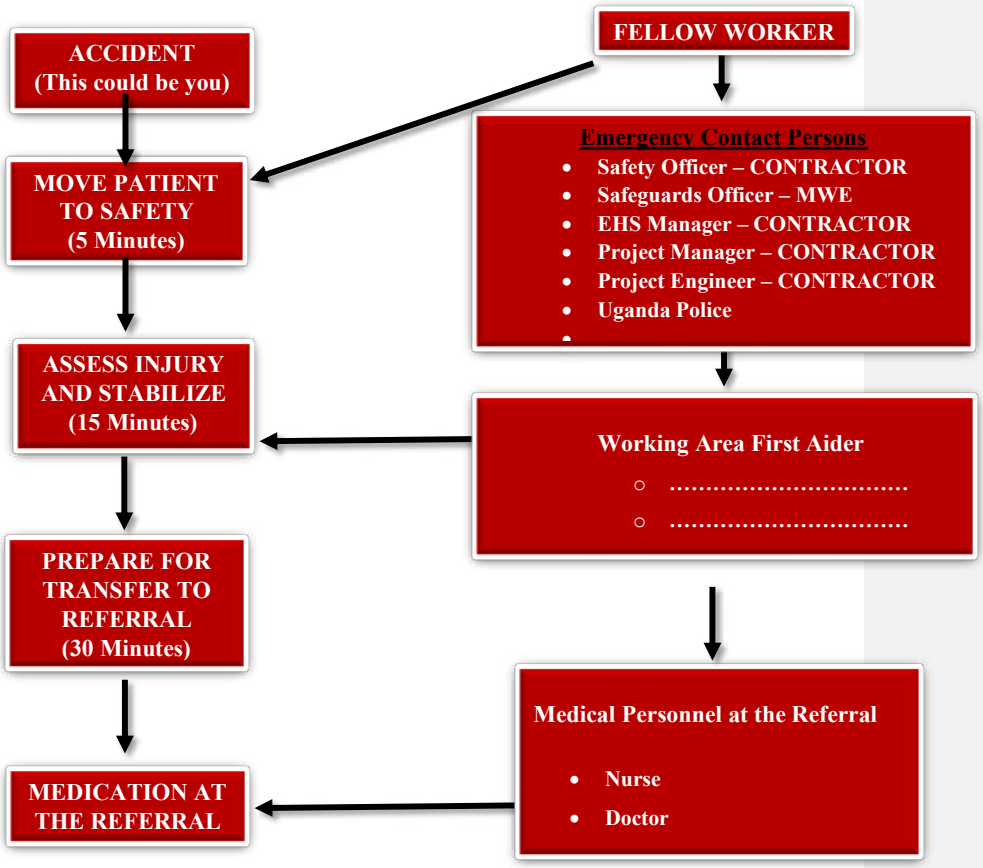

Figure 2-3: Medical Emergency Response

COMMUNICATION ACTION

FELLOW WORKER

- Don't panic
- Call for help
- Put on gloves
- Move patient to safety
- Put patient in comfortable or safe position
- Call first aider

FIRST AIDER WORKER

- Ensure the patient is in a safe position;
- Check air way
- Remove anything blocking the air way with a soft cloth
- Apply cervical collar if neck injury suspected
- Check breathing
- Stop bleeding (gauze and bandage)
- Prevent further damages
- In case of fracture apply splits
- Contact the safety Officer to rush the patient to the clinic

NURSE AT THE CLINIC

- Assess the injury and complete first aid
- Inform the doctor
- Inform the safety officer about the out come

i. ~~

]]Aall workers these among others include gumboots, hand gloves, elements and reflectors, overalls etc.

2.5.7 Earthquake

2.5.7.1 Preparedness Measures

i. Structural Design Compliance
    a. Ensure all reservoirs, pump stations, and buildings are built to withstand seismic forces in accordance with Uganda Seismic Code (UNBS/BS EN 1998).
    b. Use reinforced concrete with appropriate ductility and base isolation where needed.
ii. Critical Equipment Anchoring
    a. Secure chemical tanks, pumps, and SCADA equipment with anchorage systems to prevent toppling or movement.
iii. Emergency Evacuation Plans
    a. Establish clear evacuation routes from confined areas like pump stations, valve chambers, and control rooms.
    b. Post maps and signage showing safe assembly points away from structures.
iv. Training and Drills
    a. Train staff on "Drop, Cover, and Hold" and post-earthquake evacuation procedures.
    b. Conduct annual earthquake drills simulating operational disruption and injuries.
v. Emergency Stock
    a. Maintain emergency kits with water, food, flashlights, radios, first aid, and thermal blankets in secure storage containers.

2.5.7.2 Response Actions

i. During Earthquake
    a. All personnel should Drop (to the ground), Cover (head and neck), and Hold until shaking stops.
    b. Stay away from windows, shelves, and tall equipment.
ii. After Earthquake
    a. Evacuate to designated assembly points.
    b. Conduct headcount and identify injured personnel.
    c. Shut down all high-voltage and pressurized systems (valves, pumps, generators).
    d. Inspect key infrastructure for visible cracks, tilting, or leaks.
    e. Do not re-enter buildings or confined spaces until cleared by an engineer.
    f. Coordinate with Office of the Prime Minister (Disaster Department) and MWE.

2.5.8 Lightning

2.5.8.1 Preparedness Measures

i. Install Lightning Protection Systems (LPS)

a. Equip all pump houses, treatment plants, reservoirs, and chemical stores with lightning rods, grounding networks, and surge protectors.

ii. Shield SCADA and Electrical Panels
    a. Use surge protection devices (SPD) on sensitive equipment and ensure proper earthing of all control and communication panels.

iii. Weather Monitoring and Alert Systems
    a. Integrate weather radar alerts from Uganda National Meteorological Authority (UNMA) into the SCADA dashboard.

iv. Awareness and Training
    a. Educate workers not to shelter under trees or near metal pipelines during storms.
    b. Ensure all workers know where safe shelter (enclosed buildings) is located.

2.5.8.2 Response Actions

i. During Lightning Storm
    a. Immediately cease all outdoor activities, especially on metallic structures like pipelines and scaffolding.
    b. Instruct workers to seek shelter in enclosed buildings.
    c. Do not touch electrical equipment, water pipes, or exposed metal.
    d. Disconnect backup generators and isolate grid power temporarily if surge risk is high.

ii. After Lightning Strike
    a. Inspect electrical systems, SCADA, and pump controls for surge damage.
    b. Check reservoirs and pipeline telemetry systems for functionality.
    c. Account for all personnel and report any injuries.
    d. Document incident and report to MWE.

2.5.9 Snake and Scorpion Bites

In case of a snake bite especially a typical case were a victim has a clear identity of a snake to be venomous e.g. spitting cobra, puff adder, black mamba among others or in instances where the snake has been killed and/or a clear description of specie is known to be venomous beyond reasonable doubt, it ought to be treated as an emergency and thus first aid care interventions must be instituted e.g. making a small incision on the bite site with a sterile blade and to tourniquet the area intermittently to allow the flow of blood, prior to evacuation of the victim to the nearest health facility to mitigate neuro toxicity so as to save life.

Furthermore, signs of neurotoxicity to be observed generally for all the cases of snake bite i.e. altered or loss of consciousness, not responding to painful stimuli, breathlessness among others, equally this should be treated as an emergency requiring urgent evacuation to the nearest hospital for further investigations and management. However, in case of a non- poisonous snake bite cases these can be treated as non emergency and therefore be referred to as normal routine cases referred to the health facility to be managed. Similarly, for scorpion bites they can be handled carefully as they can be severely painful, by their very nature and thus urgent first aid care must be instituted to alleviate pain before or as they are referred to the nearest

hospital.

2.5.10 First Aid Box Contents for Work Fronts

In the event of an accident or health emergency at the construction or operation site, immediate first aid is critical to minimizing injury and preventing further harm before professional medical help arrives. As part of the EPRP, well-stocked first aid boxes shall be maintained at all active work fronts and operation facilities. Table 2-1 below lists the minimum recommended contents of these first aid boxes. These items are intended to address common workplace injuries such as cuts, burns, sprains, and exposure to irritants, ensuring timely and effective on-site response by trained first aid personnel.

Table 2-1: First Aid Box Contents for Work Fronts

ITEM DESCRIPTION	QTY
Bandages	10
Cotton Wool	Enough
Crepe Bandages	5
Strapping	1
Sulphadiazine Cream	1
Pair of Scissors	1
Disinfectant (Povine)	1
Deep Heat Rub (Diclofenac Topical)	1
Hand Sanitizer / Soap Bath	1
Gauze Swabs	10
Vazeline Gauze	1 packet
Gloves Examination	20 pairs
Triangular Bandages – Armsling	10

2.5.11 Ambulance

- The telephone number is **0800**;
- The procedure will be as follows:
    a) Give the name of the company
    b) Give the address and the nearest Km;
    c) Type of the incident;
    d) Gender and age of the patient;
    e) Is the patient conscious and breathing;
    f) Give your name;
- This information will be passed onto every contractor who is appointed to the Project.
- The ambulance number must be entered on any Emergency Telephone List maintained

by individual contractors.

2.6 Emergency Preparedness Measures

The proposed MWACRID project involves the construction and operation of critical water infrastructure including pump stations, reservoirs, irrigation networks, chemical storage units, and treatment facilities. These facilities present various operational and environmental risks such as equipment failure, chemical spills, fire hazards, and natural events like flooding.
This section outlines the key emergency preparedness measures designed to minimize loss of life, property damage, environmental contamination, and service disruptions. The measures are categorized into infrastructure safeguards, training and awareness, and emergency equipment provision, and are applicable across both construction and operational phases. They are tailored to ensure rapid response, effective risk mitigation, and compliance with national and international best practices for water and irrigation infrastructure safety.

2.6.1 Infrastructure Safeguards

i. All pump stations, reservoirs, and treatment plants must include backup power sources (diesel generators and solar arrays where applicable).
ii. SCADA systems shall be used to monitor flow, pressure, and equipment status in real-time.
iii. Surge tanks and air valves must be installed to prevent pipe bursts from water hammer effects.
iv. Fire suppression systems (hydrants, extinguishers, sand buckets) are to be installed at all fuel, generator, and switchgear rooms.
v. Chemical storage areas must have bunds, spill kits, warning signage, and ventilation.

2.6.2 Training and Awareness

i. All new staff and workers must undergo EPRP orientation during induction.
ii. Toolbox talks must include regular refreshers on fire safety, chemical handling, and evacuation drills.
iii. Quarterly emergency simulation exercises must be conducted and documented.
iv. Local communities living within 1 km of the project infrastructure shall be sensitized on risks and warning signals.

2.6.3 Emergency Equipment

Every active construction or operation site must have:
i. Fully stocked first aid kits
ii. Personal Protective Equipment (PPE) for emergency responders
iii. Spill containment and cleanup kits (absorbents, neutralizers, gloves)
iv. Fire extinguishers for electrical, fuel, and chemical fires
v. Flashlights, megaphones, and signage for emergency communication

3 EMERGENCY MANAGEMENT STRUCTURE AND RESPONSIBILITIES

MWE requires all contractors and stakeholders to adopt a harmonized structure for emergency response. An Emergency Management Structure for the plan will constitute various officers. These are presented in Table 3-1 and figure 3-1 below:

Table 3-1: Emergency Response Command System (ERCS)

Role	Responsibilities
MWE Emergency Coordinator	Leads emergency planning and coordination across the project. Notifies AfDB and national authorities. Oversees post-incident analysis and plan revision.
Contractor HSE Manager	Acts as on-site incident commander. Coordinates immediate response, activates site response teams, and liaises with MWE.
Site First Aid and Rescue Team	Provides immediate first aid. Coordinates evacuation and transport to nearby health facilities. Keeps first aid inventory stocked.
Engineering Supervisor	Evaluates the integrity of infrastructure post-incident. Approves restoration works and assesses technical risks.
Security Manager	Manages access control, crowd management, and incident isolation. Alerts local police if necessary.
Communication Officer	Prepares public statements, handles media, and ensures timely updates to workers and nearby communities.

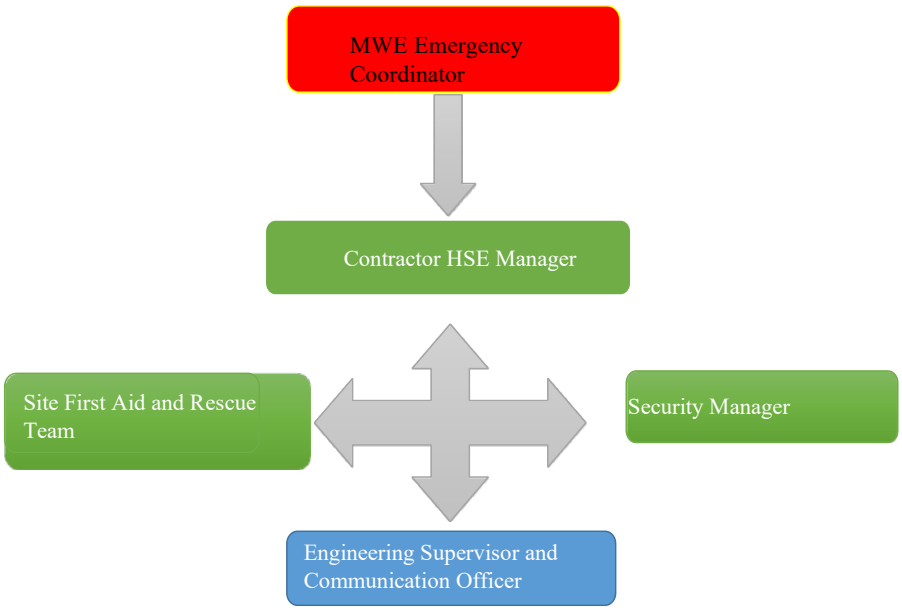

Figure 3-1: Emergency Command Structure

3.1 Roles and Responsibilities

In order to successfully implement the emergency preparedness plan, the responsibility goes to all project staff since emergencies are everywhere. For this case all project site staff will be given sensitization, tool box talks and training on the emergency preparedness plan. The Contractor will be responsible for the site training and sensitization.

3.1.1 Role of Health, Safety, Social and Environment (HSSE) Manager

The HSSE Manager will:

i. Ensure all procedures outlined in the Plan are implemented on site;
ii. Ensure availability of resources;
iii. Communicate the importance of emergency preparedness to the various department head so as to pass it on to their subordinates;
iv. Periodically review the plan;
v. Verify implementation of corrective and preventive actions;
vi. Recognize and respond to community concerns.;
vii. Ensure that the appropriate safety equipment and signage are placed as emphasized in the plan;
viii. Coordinating outside emergency services such as medical aid and local fire departments.

3.1.2 Role of Safety officer

The Safety Officer will implement all plan activities. This will include systematic coordination and implementation of the plan activities to mitigate likely impacts of the emergencies.

3.1.3 Role of Departmental Managers

Each Departmental Manager has the responsibility to ensure that the objectives of the Emergency preparedness plan are achieved. These among others include:

i. Checking and Ensuring that staff are trained and sensitized on the emergency preparedness plan.
ii. Ensure that the workers are trained to use the various safety equipment used during emergencies for example the fire extinguishers.
iii. Ensure that the emergency preparedness operations comply with the relevant legislation requirement, including the Occupational Health and Safety Act , Cap 231.
iv. Implement the emergency response plan to prevent the damages that can lead to down time.
v. Ensure that safety equipment is availed in the departments for emergency preparedness.
vi. Investigate emergencies to ensure that mitigation measures are got to ensure preparedness.
vii. Provide safety equipment (personal protective equipment).

viii. The Health and Safety Manager will assume the role of Safety coordinator at the site.

3.1.4 Role of Workers

i. Identify the common type of emergencies in the work area.
ii. Respond in case you encounter a situation.
iii. Respond when an emergency alarm is activated.
iv. Ask your supervisor for more information and training**.**
v. Regularly wear PPEs on site and request the new PPEs in case what they have is worn out.

In order to implement the emergency management program, the contractor is focusing on the following elements

i) **Prevention**, the contractor is focused on setting up and implementing policies and procedures to minimize the occurrence of emergencies.
ii) **Preparation**, the company has taken on activities and procedures to ensure that workers are ready to effectively respond. This is implemented through trainings, drills, tool box talks, worker's sensitization among others.
iii) **Response**, the company is continuously informing the workers on the actions to be taken incase an emergency occurs.
iv) **Recovery**, the company has put in place practices to ensure that the situation resume that to normal after the emergency has occurred.

This emergency preparedness plan will be implemented in all our work sections that is along the pipe line, the contractor's camp, the consultants' camp and the pre-cast yard.

3.1.5 Alerting Employees in Case of an Emergency

i Ensure that alarms are installed, distinctive and recognized by all employees as signal to evacuate the work area or perform actions identified in the plan.
ii Avail an emergency communication system such as a public address system.
iii Ensure that the alarm is heard, seen, or otherwise perceived by everyone at the work place.

3.2 Emergency Contacts

To ensure prompt and coordinated response during emergencies, a clear visible list of emergency contacts will be displayed at all active work fronts and operational areas. Some of these contacts including those for the MWE Officials, Kiryandongo District Officials, Masindi District Officials and other institutions in the respective districts are given in Table 3-2 below. An emergency contact for the Contractor's HSE (Health, Safety, and Environment) Manager will also be included once the contractor is selected.

Table 3-2: A list of emergency contacts will be displayed in the various work places

MWE Officials		
Eng. Wasswa Joseph	Regional Manager, Water for Production (Central)	0705422785
Eng. Ronald Kato Kayizzi	Team Leader, Water for Production	
Eng. Jemba Ibrahim	Engineer	0755233060
Victor Ampurire	Environmental Officer	0773601814
Mugabe Motram	Environmental Officer	0782717329
Kiryandongo District Officials		
Martin Jacan Gwokto	Chief Administrative Officer (CAO	(+256)772460408
Mpuuga Percy	Agricultural Engineer	(+256)774626576
Muhumuza Samuel	Water Officer	(+256)772845618
Ojara John Bosco	Agriculture Engineer	(+256)782243429
Bonny Okot	District Vice Chairperson	(+256)774641957
SP Suubi Sam	District Police Commander (DPC)	(+256)773664299
Dan Muganzi	Resident District Commissioner (RDC)	(+256)774400000
Akweteireho Jonathan	Deputy Resident District Commissioner	(+256)772854099
Inasuku Natasha Gloria	Assistant Resident District Commissioner	(+256)762428259
Other Institutions – Kiryandongo District		
Uganda Police		(+256)718 731 761
Regional Hospital		+256 392001 705/+256 772535450
NWSC Regional Office		0800 100 977
Masindi District Officials		
Namulondo Tappy	Chief Administrative Officer (CAO	(+256)773955548
Ocen Alfred	Water Officer	(+256)776336995
Kabagong Kassem	District Vice Chairperson	(+256)782267287
Karungi Sylivia	Secretary Social	(+256)777386758
Nyakato Pamela	Secretary Finance	(+256)774787465
Bigabwa Geofrey	Secretary for production	(+256)772922654
Patrick Asiimwe	Deputy Resident District Commissioner (RDC)	(+256)751517916
Tugume Hellen	Assistant Resident District Commissioner	(+256)786799352
Byaruhanga Cosmas	District Chairperson	(+256)772417137
Magezi Godfrey Abwooli	Planner	(+256)772450508
Mugume Bright	LCIII – Kimengo Subcounty	(+256)789011517
Other Institutions – Masindi District		
Uganda Police		(+256)714 667950
Regional Hospital		+256 392700744/+256 414255146
NWSC Regional Office		0800 100 977

3.3 Resource List

In this section, emergency resources are presented. They include evacuation routes, emergency assembly point PPE and Emergency Exit.

3.3.1 Evacuation Routes or Emergency Exists

The contractor is to ensure that the evacuation routes and emergency exists meet the following conditions:

i. Clearly mark and well lit.
ii. Wide enough to accommodate the number of evacuating personnel.
iii. Un-obstructed and clear of debris at all times.
iv. Unlikely to expose evacuating personnel to additional hazards.

These evacuation routes should be clearly shown on the site layout plan for all employees to see.

3.3.2 Emergency Assembly Point- Accounting for Employees after Evacuation

After evacuation the contractor still has a task of accounting for the employees after evacuation as follows;

i. Employees should gather at the emergency assembly point after evacuation.
ii. Take a head count after evacuation. Identify the names and last known locations of any one not accounted for and pass them to the supervisor.
iii. Establish procedures for further evacuation incase the incident expands. This may consist sending employees home by normal means or providing them with transportation to an offsite location.

3.3.3 Safety Equipment to Be Provided for Emergency

Employee need personal protective equipment to protect during emergencies, since workers are exposed to a lot of hazards at the work place. The contractor is supposed to provide personal protective equipment such as;

i. Hard hats or elements for the head protection.
ii. Safety shoes and gum boots for foot protection.
iii. Safety glasses, goggles or face shield for eye protection.
iv. Face masks or gas masks for proper respiration.
v. Gloves for hands protection.
vi. Reflective jackets for visibility.
vii. Overalls for body protections among others.

3.4 EMERGENCY DRILL SCHEDULE

This schedule outlines planned emergency drills that simulate real-world incidents to test and improve preparedness across project sites.

3.4.1 Purpose:

i. To ensure all staff are familiar with their emergency roles and procedures.

ii. To test the effectiveness of communication systems, PPE, and response times.
iii. To identify gaps and improve training and resource allocation.
iv. To comply with MWE and AfDB emergency readiness requirements.

Table 3-3: Emergency Drill Schedule

Drill Type	**Location**	**Responsible Party**	**Notes**
Fire Response	Kaduku Pump Station	Contractor	Include community observers
Chlorine Leak Response	Domestic Water Treatment Plant (DWTP)	Contractor	Joint drill with local fire services
Structural Failure Simulation	Intake Canal	All Contractors	SCADA-based test response
Flood Evacuation	Irrigation Fields	Contractor	With LC1s and Rescue teams
Civil Unrest Scenario	All Sites	MWE / Security	Law enforcement coordination

3.5 CHEMICAL INVENTORY AND MATERIAL SAFETY DATA SHEETS (MSDS)

This section provides an overview of the hazardous chemicals stored and used at various project facilities, particularly the Domestic Water Treatment Plant (DWTP) and Irrigation Water Treatment Plant (IWTP).

3.5.1 Purpose:

i. To ensure all personnel are aware of the types, quantities, and risks associated with the chemicals on-site.
ii. To comply with occupational health and safety regulations.
iii. To facilitate quick and safe emergency response during spills, leaks, or exposure incidents.

3.5.2 MSDS (Material Safety Data Sheets):

Each chemical must have an MSDS posted at its storage site. The MSDS provides detailed technical and safety information such as:

i. Chemical composition
ii. Handling and storage procedures
iii. First aid and fire-fighting measures
iv. Spill response guidelines
v. Disposal instructions

Table 3-4: Chemical Inventory and Material Safety Data Sheets

Chemical	**Location**	**Quantity**	**Storage Type**	**Hazards**	**PPE Required**
Chlorine Gas	Domestic Water Treatment Plant (DWTP)	6 Cylinders	Ventilated cage	Toxic, Reactive	SCBA, Gloves, Apron
Ferric Chloride	Irrigation Water Treatment Plant Store	10 Drums	Bunded Store	Corrosive	Goggles, Boots
Alum (Liquid)	Domestic Water Treatment Plant (DWTP)	5 Drums	HDPE Tanks	Skin Irritant	Face Shield

4 COMMUNICATION AND REPORT

4.1 Communication Strategy

The probable emergencies have been categorized into two, internal and external. For effective communication, two communication strategies have been developed tailored to the respective recipients as described below.

4.2 Internal Communication

This communication strategy will be used in communicating internal emergencies. The recipients will therefore be the contractor's employees who are most likely to comprise of unskilled, semi-skilled and skilled labour. It is most likely that most of the unskilled labour will be illiterate and will only understand the local language; however, skilled and semi-skilled labour will have knowledge of the English language and some may actually not fully understand the local language.

A number of communication channels will be put in place and every employee taken through their operation for proper understanding. These channels will mainly be meant to notify staff of emergencies upon their occurrence and will therefore have to be timely. They will include verbal communication, use of signage and instruments like use of gongs, bells or sounding of alarms/ sirens. The employees will then assemble at a designated place for formal communication of the emergency at hand. Unless otherwise, English, Runyakitara and Luganda will be the languages used for verbal communication. A record will then be noted and forwarded to higher levels in the company for further action and strategies laid, to prevent the emergency from happening again in future.

4.2.1 External Communication

External communication will be needed for emergencies which have an impact on external individuals or where their involvement is deemed necessary to effectively handle an emergency. Due to the different classes of recipients, this strategy will further be divided into two, one for the locals and the other, for the officials including NGOs.

4.2.1.1 External Communication for Locals

External communication to the local people will be done through their leaders unless the emergencies directly affect them and there is need for immediate communication, in which case, informal communication channels like immediate assembling of nearby individuals will be used.

4.2.1.2 External Communication to Lead Agency Officials

These include central government agencies including the lead agencies, district officials and NGOs. This form of communication is very important because the officials involved provide guidance on the handling of emergencies and rescues in case of security emergencies.

This communication will be official and mainly in the form of writing. Only authorized Contractor personnel will make this kind of communication and a record of this will be maintained.

Exception in this strategy will be communication to security and rescue personnel in case of security emergencies. In this case, emergency contact numbers will be made available to all the employees who will use them as soon as possible.

4.3 Emergency Drills

It is of extreme importance that the Scenarios of all discussed Emergencies will be generated and an Evacuation Procedure will be followed for assessing the positive impact of this EPRP. The Frequency of Drills can be Semi – Annual or Quarterly based on the criticality that can be decided by the Employer and Contractor.

All events of the drill have to noted and then recorded for performance analysis
Any gaps identified during the drill should be depicted with reasons and the mitigation measures have to be immediately implemented and this EPRP has to be updated accordingly.
The Total implementation of an EPRP is the responsibility of the HSE Manager (or designated Emergency Response Coordinator). He has to be in line with all Local Legislative requirements before commencing any drills. It is also advised to inform the local authorities and make them part of the drill.

4.4 Reporting

All accidents, incidents and near misses shall be reported, recorded and investigations carried out to ascertain their causes within the project and in the communities. Any pollution incident presenting a potential threat for example, shall be reported to the emergency centre as soon as possible.

Post Incident Reports will include description of the emergency and development of the situation; description of response measures taken; description of assistance rendered; assessment of the complete response operation; assessment of assistance rendered by others; costs incurred during the response; an estimate of environmental and economic damage; description and analysis of problems encountered in responding to the emergency; recommendations regarding possible improvement of existing arrangements and, in particular, provisions of the Plan. A quarterly Emergency Drill Analysis has to be submitted for record.

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APPENDICES

Appendix 1: Project Description for MWACRID

1. Introduction

Uganda's rapidly growing population, largely dependent on rain-fed agriculture, faces mounting challenges from climate variability, including erratic rainfall, droughts, and declining food security, with only 0.1% of farming currently using irrigation. In Masindi and Kiryandongo Districts, these issues are particularly acute, affecting both crop production and livestock due to inadequate water supply. To address this, the Government of Uganda, with support from the African Development Bank, is undertaking a feasibility study for a multi-purpose bulk water transfer and irrigation project aimed at supplying water to 15,000 hectares across key sub-counties. The initiative will benefit smallholder and commercial farmers, support agro-industrialization, enhance climate resilience, and contribute to Uganda Vision 2040 by promoting sustainable agricultural transformation.

1.1. Project Location

The proposed Multi-Purpose Water for Climate Resilience and Irrigation Development for Livelihood Transformation (MWACRID) Project for both small holder farmers and commercial farmers is located in the sub counties Masindi-Port, Kigumba -Kiryandongo District and Mirya and Kimengo sub counties in Masindi District (see Figure 1). Masindi District, located in the mid-western region, covers approximately 4,200 square kilometers and is bordered by Kiryandongo to the east, Nwoya to the north, and several other districts. Kiryandongo District, also in western Uganda, covers around 3,600 square kilometers and shares borders with Nwoya, Masindi, and other neighboring districts. Masindi Port, the project's proposed water source catchment area, lies along the western banks of the Nile River, about 194 km northwest of Kampala and 49 km from Masindi town. Known for attracting tourists for various leisure, religious, and business purposes, Masindi Port is strategically located near the Nile River, which serves as the primary water source for the project. Its coordinates are 1°41'54.0" N, 32°04'40.0" E.

1.2. Project components and proposed locations

The Masindi Port Bulk Water Supply and Irrigation Infrastructure is designed as electricity powered multipurpose water system to meet the water demand of 12700 ha net irrigation area, 10,340 livestock heads and 87,000 population in the sub counties of Masindi Port in Kiryandongo District, Mirya and Kimengo sub counties in Masindi District.

The first phase of the project considers supply of raw water to the farms of Soul Agric, Afrokai, Kazire, Zamburi, Kisiriza Excellence Ltd, CMG, Muhazi Heritage, Norma Agric, Lochab, Asiri, Medium scale farms and Kimengo area. Treated Drinking water shall also be supplied to Kimengo Town, Masindi Port town, Misenyi, Mile10 and Kiziba TC.

The main project components include the following:

1. Diversion sump along shores of River Nile at Masindi Port.
2. Off-shore Water Abstraction Pipeline into the diversion sump.
3. Intake Structure, sedimentation tank and Raw Water Pump station on the about 2000 m from Masindi-Port.

4. Drinking Water Treatment Plant (DWTP) and Drinking Water Pumping Station.
5. 33kV Power line extension from the neighboring substation to the Masindi-Port (over 40km).
6. Administration Office Block, Laboratory, Workshop, Staff Houses, Ware House.
7. Ductile Iron Raw Water Pumping Transmission Main (18.5 km, DN 1600 PN 35).
8. Ductile Iron Treated Water Pumping Transmission Main (18.7 km, DN 300 PN 30).
9. Storage Tanks at NFA hill.
10. Reservoirs at the farms.
11. Main and Submain Distribution Lines covering the commercial farmers.
12. Main Distribution line for treated water in the towns of Masindi-Port, Misenyi, Mile10 and Kiziba TC.
13. Installation of SCADA and automation of the Plant and Irrigation operations
14. Supply of 2No sets of Earth moving equipment each comprising of an Excavator, Bull dozer, wheel loader, Tipper Truck.

The intake from the River Nile will be equipped with submersible pumps to meet the demand for irrigation, domestic use, livestock watering, and rural industries. Raw water from the intake will be transmitted through Galvanized Iron (GI) pipes to the treatment plants and pumped to storage tanks located at NFA hill. From there, a by-gravity distribution system will supply water to the delivery points, ensuring sufficient water supply for various purposes.

The following are the components for Masindi Port Bulk Water Supply and Irrigation Infrastructure in Masindi and Kiryandongo District and their proposed location points.

COMPONENT	**EASTING**	**NORTHING**
Abstraction Point	399176.11 m E	187377.93 m N
Treatment Unit	397217.02 m E	188027.82 m N
Reservoir	381192.32 m E	193929.09 m N

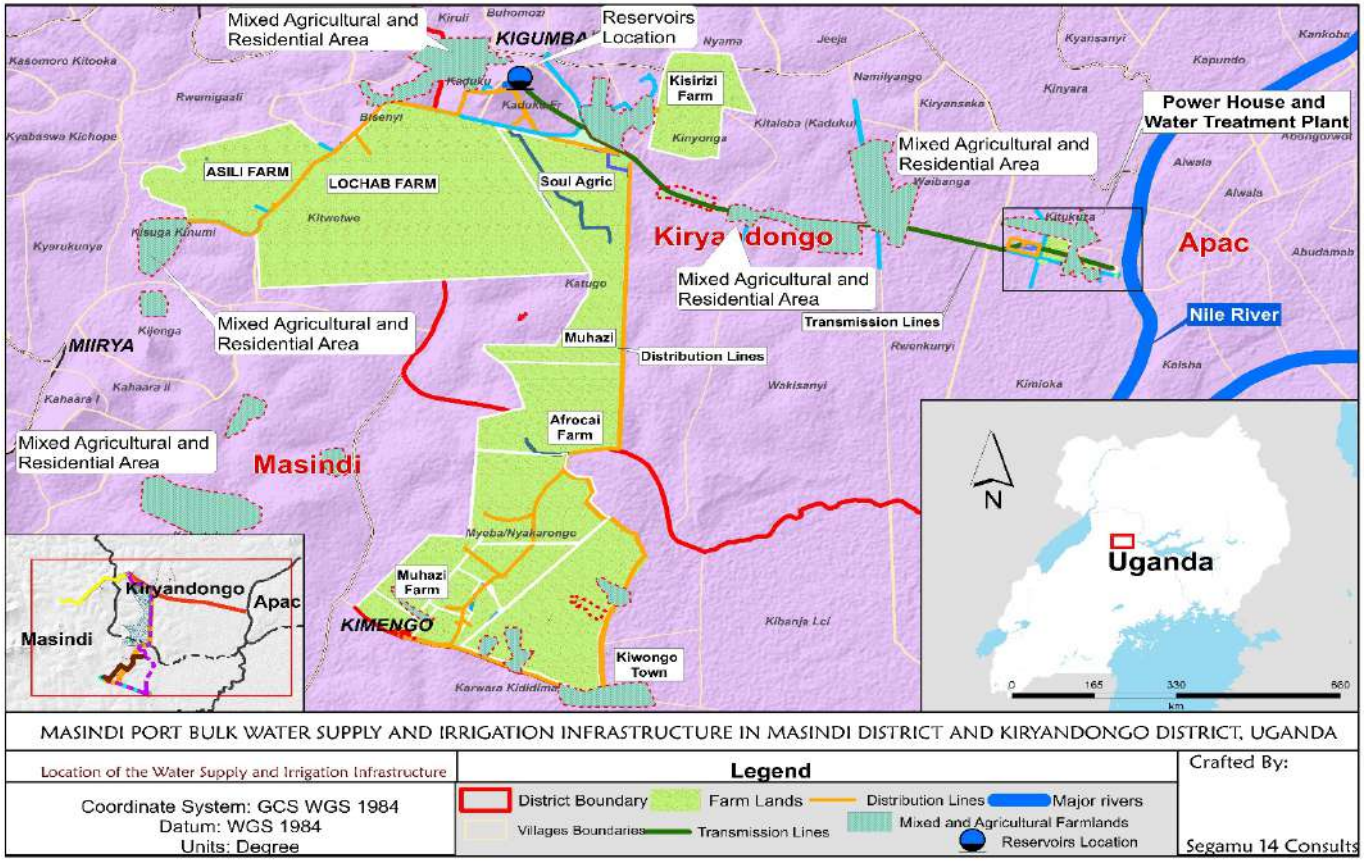


Figure 1: Map showing the location of the proposed MWACRID Project
(Source: Study Team)

1.2.1. Proposed Water source

The abstraction point of the water supply project is located along the Kyoga Nile in Masindi Port, 18 km downstream the outlet of Lake Kyoga (Kimyoga Village, Waibanga Parish, Masindi Port Sub County, Kibanda County, Kiryandongo District at UTM Coordinates 36N 399074.31 187379.09). The Nile River Basin in Uganda covers massive wetlands and forms dense rivers, lakes and marshes.

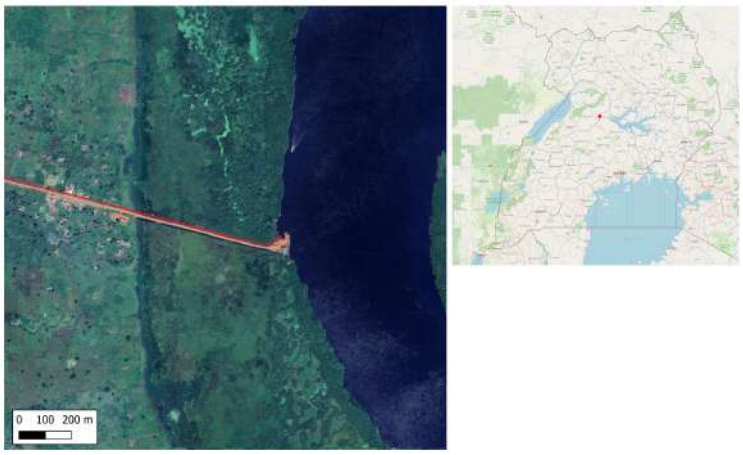


Figure 2: Abstraction point location
(Source: Study Team)

Plate 1: Proposed location for the project abstraction point on River Nile

1.2.2. Intake Works and Raw Water Pumps

The water intake system is crucial for extracting and delivering water efficiently. Factors such as water availability, sediment transport, environmental regulations, and constructability were carefully considered during the project studies process. The intake will be located next to the

Nile River, with two pump stations transferring water to the sediment and water treatment plant.

To ensure sustainable water extraction, detailed hydrological studies and historical data analysis are essential. Ownership of the intake source is also crucial to avoid disputes and ensure access. Intake location must consider security threats and pollution risks.

Proper protection measures, including fencing, stormwater drains, and access control, are necessary for intake design. Intake structures must prevent clogging, scouring, and maintain stability under varying flow conditions. Pumping options like suction pumps and submersible pumps are considered depending on river water levels.

Based on pre-feasibility study findings, the Masindi Port bulk water multipurpose project is designed to serve 50,000 people for 25 years. The intake from River Nile will consist of 7 submersible pumps with a capacity of 370,333 m^3/day each for irrigation and livestock, and 2 other pumps for domestic water supply with a capacity of 4,667 m^3/day. The total flow from the intake will be 375,000 m^3/day. Raw water will be transmitted through various pipes to meet demands for irrigation, domestic use, livestock watering, and rural industries.

For the pump selection, high-efficiency centrifugal or vertical turbine pumps are considered. Intake structure design includes type, location, dimensions, screens, and filtration. Pumping systems should be capable of handling flow rates and accommodate maintenance. Materials should be corrosion-resistant, and environmental considerations are crucial.

Additional features like flow measurement and control systems are recommended for efficient operation. Safety measures should be in place for construction and operation. Overall, the design aims to provide a reliable and sustainable water supply system.

This submission includes a detailed description of the water intake and supply system, pump station, treatment plant, and transmission lines. The system serves municipal water supply and irrigation purposes, with treatment processes tailored to each. Transmission lines and reservoirs are designed to ensure efficient water distribution and storage for urban and agricultural needs..

1.2.3. Treatment Plant

The incoming raw water from the pumping station in Masindi Port will have to meet a demand of 325.000 m3/day, of which 320.000 m3/day will be for irrigation and 5000 m3/day for drinking water consumption. Treatment for the drinking water section will be more stringent to ensure excellent quality drinking water output, while for water intended for irrigation will undergo a treatment that removes the sediments that can cause problems of clogging the electromechanical parts of irrigation systems.

Raw water arriving at the plant will be conveyed to an equalization/homogenization tank, capable of providing a useful volume of at least 15.000 m3, considering a retention time of about one hour. From that tank, the water will proceed to:

- Fine screening: 8 parallel lines providing a flow rate of 8 × 2.000 m3/h with mesh openings around 20 mm, to retain suspended particles having larger sizes. The retained material is sent to a compactor by augers and bagged.
- Pre-sedimentation: 8 circular sedimentation tanks with a diameter of 40 m, ensuring a capacity of 8 × 2000 m3/h with a retention time of about 90 minutes, which allow the removal of suspended solids by gravity.

After pre-sedimentation, the water will reach a flow divider/equalizer and then be sent to the treatments. Water destined for irrigation use (approximately 13.330 m3/h) will reach a storage tank capable of regulating the outflow and managing any changes in the flow rate, before being sent to the lifts and fed into the distribution network.

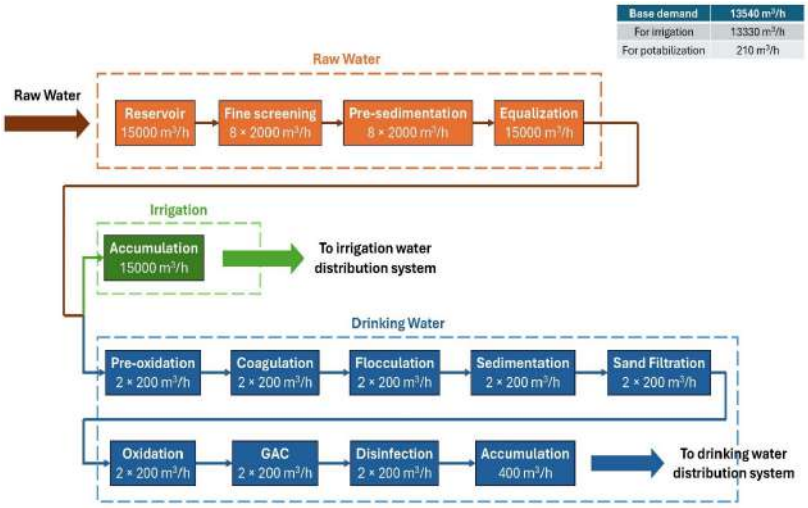


Figure 3: Water Treatment Process and Flow Diagram
(Source: Study Team)

The proposed site for the treatment plant is located along Masindi Port road at GPS coordinates UTM 36N 397217.02 m E, 188027.82 m N on open grassland with shrubs and scattered trees.

Plate 2: The proposed site for the treatment plant

1.2.4. Transmission Mains

The proposed transmission line begins from the Masindi port water source towards the Kampala Gulu Highway and then crosses the Kampala Gulu Highway up to Kaduku Hill. An extra transmission line is proposed to connect the proposed reservoir at Kaduku Hill to the sub-reservoir at Soul Agric farm.

The section of the proposed transmission mains from the source to Kampala Gulu highway is characterized by, initially a gentle ascend towards the main road followed by a short steep section leading towards the last section running along the highway junction. This section was also characterized by moderate to sharp horizontal and vertical curves. The adjacent areas are mainly comprised of savanna grassland with some lined trees, gardens and lined settlements, especially in the section located within town centres. The section of the transmission mains along the Masindi Port to Kampala Gulu highway generally passes through mainly Flat terrain sections and is therefore characterized by gentle to steep vertical curves. Furthermore, due to the nature of the terrain, a significant portion of the area adjacent to the road along which the transmission main is proposed to be installed is flat, with no embarkments created during the process of road construction. Most of the areas outside the road reserve are used for the cultivation of crops.

From the intake to the treatment and sedimentation plants the irrigation pipeline sized as DN 1600 mm PN 10 and the drinking water pipeline sized as DN 300 mm PN 10 are approximately 800 m long.

From the plants, the main transmission pipelines reach the reservoirs on NFA hill following a path 18’700 m long. The irrigation pipeline is sized as DN 1600 PN35. The proposed transmission main for the treated water from the treatment plant to the reservoir at Kaduku hill is sized as DN 400 mm PN 30.
2No. surge tanks will be provided to absorb sudden rises of pressure (water hammer effect) caused by rapid changes in water velocity, to protect the conduit system from high internal pressures and assisting the pumps with regulation characteristics.

1.2.5. Storage reservoirs and distribution network

The proposed reservoir site is located approximately 8km from Masindi Port road and it crosses the Kampala Gulu highway to Kaduku Hill. The site is located on a hilly terrain of Kaduku Central Forest Reserve.

Plate 3: Proposed location of the reservoir point

Three options of the water scheme have been analysed. The alternatives mainly differ by operating time, storage capacity, pressure at the farms as seen in the analysis of alternatives.

1.2.6. On-farm storage tanks

The on-farm storage tanks (alternatives n. 1 and 2) shall be excavated and will be of varying capacity and will protect with a dam liner as summarized in Table 1. They consist of two scenarios i.e. Option 1 where the demand is met daily for each farm and Option 2 where the demand for the week is supplied once or twice a week. The required volume per week is estimated considering the irrigation water requirement and an irrigation efficiency of 70%.

Table 1: On farm storage tanks' volume

Farm	**Net irrigation area (Ha)**	**Required Volume Per week**	**Proposed Storage (Option 1 ≈ 50% daily demand)**	**Proposed Storage (Option 2 ≈ 30% weekly demand)**
Soul Agric	1,640	297,561.6	21,254	86380
Afrokai	1,220	231,897.6	16,564	73366
Kazire	392	115,153.9	8,225	36431
Zamburi Farm	130	23,587.2	1,685	7462
Kisiriza Excellence Ltd	750	115,171.2	8,227	39066
CMG	81	13,296.96	950	4,510
Muhazi Heritage	1,562	377,879	26,991	118,075
Norma Agric	130	21,340.8	1,524	6,574

Lochab	4,000	967,680	69,120	308,200
Asiri	1,448	237,703.7	16,979	71,355
Medium scale farms	320	52,531.2	3,752	16,182
Kimengo area	1,000	172,800	12,343	53,231
Total	**12,673**	**2,390,209**	187,615	820,814

(Source: Study Team)

1.2.7. Farmers Summary

Below is a table summarizing the stakeholder farmers, their respective farm sizes, and main crops. This table provides an overview of each farm's cropping pattern.

Table 2: Stakeholder Farmers and Cropping Patterns

Name of Farm/Stakeholder	**Enterprises**	**Coverage (Ha)**
Soul Agric	Maize	671
	Banana	81
	Coffee	219
	Pawpaw	81
	Macadamia	121
	Hass Ovacado	405
	Guava	20
	Fruits	20
	Soyabeans	20
	Apiary (bee keeping)	2
	Total	**1,640**
Afrokai	Hass Ovacado	243
	Macadamia	162
	Cashew nuts	105
	maize	710
	Total	**1,220**
Kazire	Medicinal (Cactus)	81
	Lemon	126
	Pasture for Cows	81
	Maize	104
	Total	**392**
Zamburi Farm	Coffee	40
	Hass Ovacado	40
	Maize	49
	Total	**130**
Kisiriza Excellence Ltd	Grain and Tubers	200
	Citrus/Oranges/Horticulture	80
	Pasture	150

Name of Farm/Stakeholder	Enterprises	Coverage (Ha)
	Agro-forestry	120
	Exotic Cattle and Goats	200
	Total	**750**
CMG	Maize	81
	Goat and Cows	
Muhazi Heritage	Sugarcane	**1,562**
Norma Agric	Maize	**130**
Lochab	Sugarcane	**4,000**
Asiri	Maize	**1,448**
Quantum Foods	Poultry Farm (200,000 birds)	**360**
Presidential Hub	100	**40**
Uganda Investment Authority		
Kimengo Area	Maize and High Value Crops	**1,000**
Others Identified from Masindi and Kiryandongo DLG (See Annex 3)	Maize	**320**
Kiryandongo District Local Government Staff (10No.)		
Masindi District Local Government Staff (10No.)		
	Total	13,073

(Source: Study Team)

1.2.8. Potential command areas

1.2.8.1. Water Source and Command Area Overview

The project Crop farming area covers a total of **13,033 hectares**, while livestock farms cover **2,311 hectares**. The main water source is projected to be the Nile River.

1.2.8.2. Overview of Crop Farms in the Command Area

The crop farms in the project area grow a variety of staple and high-value crops. Maize, soybeans, sugarcane, Hass avocado, and macadamia dominate the landscape, benefiting from the irrigation system's reliable water supply.

Table 3: Crop Farms

Name of Farm/Stakeholder	Enterprises	Acreage (Ha)
Soul Agric	Maize, Banana, Coffee, Pawpaw, Macadamia, Hass Avocado, Guava, Fruits, Soybeans, Apiary (bee keeping)	1,640

Name of Farm/Stakeholder	Enterprises	Acreage (Ha)
Afro-Kai	Hass Avocado, Macadamia, Cashew Nuts, Maize	1,220
Kazire	Medicinal (Cactus), Lemon, Pasture for Cows, Maize	392
Zamburi Farm	Coffee, Hass Avocado, Maize	130
Kisirizi Excellence Ltd	Grain and Tubers, Citrus/Oranges/Horticulture, Pasture, Agro-forestry, Exotic Cattle and Goats	750
CMG	Maize	81
Muhazi Heritage	Sugarcane	1,562
Norma Agric	Maize	130
Lochab	Sugarcane	4,000
Asiri	Maize	1,448
Quantum Foods	Poultry Farm (200,000 birds)	360
Kimengo Area	Maize and High Value Crops	1,000
Others Identified from Masindi and Kiryandongo DLG	Maize	320
Total		**13,033**

(Source: Study Team)

Livestock Farms

Livestock farming occupies a significant part of the command area, with **2,311 hectares** dedicated to raising cattle, goats, sheep, pigs, and poultry. These farms are vital to the region's economy and rely heavily on the irrigation system to meet their daily water requirements. Table 4 below summarizes the key livestock holdings.

Table 4: Key livestock holdings

No.	Farm	Location	Holding (Ha)
1	Nuwahereza	Myeeba	516
2	Gen. Kashaka	Kitaleba	377
3	Quantum Foods	Masindi Port	360
4	Kamugunda Eric	Nyinarwenkunyi	202
5	Gen. Birungi	Wakisanyi	121
6	Elites (Eng. Davis)	Wakisanyi	60
7	Sande Katarahiya	Kitaleba	60
8	Mbabali Zeverio	Kitaleba	60
9	Nuwe	Katuugo	52
10	Ebenezar	Myeeba	48
11	Nkamuhabwe Fred	Kiryanseka	48

No.	Farm	Location	Holding (Ha)
12	Kiiza Kensi	Wakisanyi	40
13	Hon. Kiiza Godwin	Kimyoka	40
14	Ntatunda George	Rwenkunyi	40
15	Nuwagira Godfrey	Katuugo	40
16	Bataringaya Fred	Katuugo	36
17	Save More	Wakisanyi	32
18	Mugisha Patrick	Kitaleba	32
19	JERAP (Pamela farm)	Kitaleba	28
20	Wandera Stephen	Waibango	28
21	Butale George	Nyinarwenkunyi	23
22	Mahooro Justine	Rwenkunji	23
23	Martin Matsiko	Kitukuza	20
24	Eden	Namilyango	20

(Source: Study Team)

1.2.9. Water balance and availability

The maximum water demand for "Port bulk water supply and irrigation infrastructure in Masindi District" is 375,000 m^3/day (peak monthly demand).

As described at previous paragraph, the Flow Duration Curve at the Kyoga outlet shows that the 80% dependable flow is 74.4 Mm^3/day. Taking into consideration environmental flow estimated at 20% of the dependable flow the available discharge for abstraction is 60 Mm^3/day. The available flow largely covers the maximum water demand for Masindi Port Bulk Water Supply and Irrigation system, which is results about 0.6% of the available flow.

Based on the results of the hydraulic model, the water abstraction effect is translated in a decrease of the water level of 1 centimeter. This is considered insignificant in terms of impacts.

Downstream Masindi Port, the available data from NBI at Kyoga lake and Albert lake (https://nilebasin.org/nile-basin-flow-forecast-system) show no significant flow differences at the two stations, but a balance between the water losses, abstractions and additional contribution from the inter-catchment. Furthermore, considering that the main planned systems that might affect the river flows and dynamics between Kioga and Albert Lakes are:

- Tochi irrigation scheme supplied by Tochi river (1000 ha net area);
- Karuma hydropower plant is located 80 km downstream Masindi Port;
- Feasibility Study & Preliminary Design for the Development of Water Supply and Sanitation Infrastructure for the new Cities of Fort Portal, Hoima and Lira, which is still at initial stage.

It is concluded that the impact of abstraction on downstream users at large scale is not significant.

1.2.10. Considerations on Climate change.

The catchment's water availability trend can be referred to the Lake Victoria water level, whose seasonal and inter-annual fluctuations are mainly due to precipitation.

Figure 4 shows the projected annual Standardized Precipitation Evapotranspiration Index (SPEI) through the end of the century. The SPEI is an index which represents the measure of the given water deficit in a specific location, accounting for contributions of temperature-dependent evapotranspiration and providing insight into increasing or decreasing pressure on water resources – i.e., negative values for SPEI represent dry conditions. At an aggregated national level, Uganda is projected to maintain its current level of wet conditions, however, while some areas of the country will experience heightened wetness, other areas will experience significant increases in aridity.

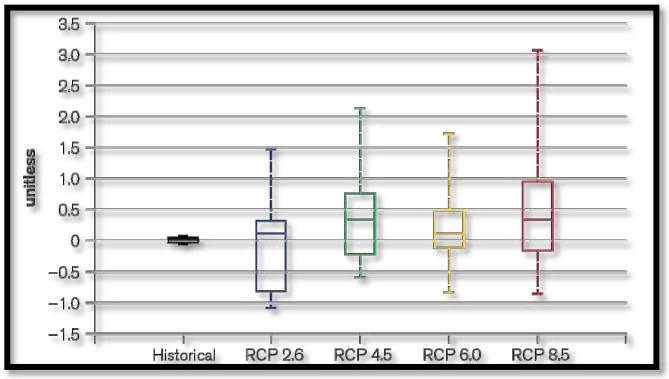
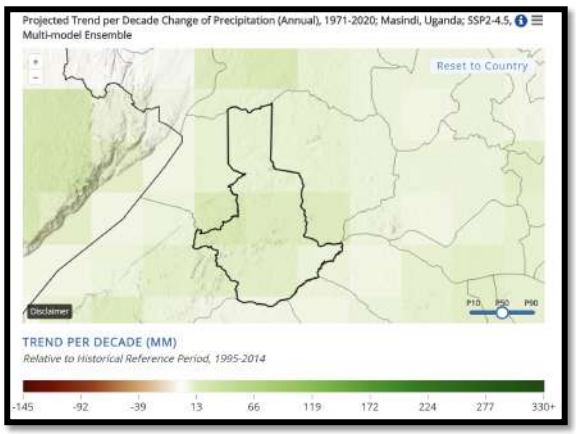


Figure 4: Annual SPEI drought index in Uganda for the period 1986 – 2099 (source: WB, CLIMATE RISK COUNTRY PROFILE)

With regard to the study area, the WB Climate Change Knowledge Portal provides the projected precipitation and temperature trends under various Shared Socioeconomic Pathways (SSPs) scenarios. As shown in figure 5, for the project area it is observed an increased trend in precipitation meaning that the natural water balance should not change and affect the project water abstraction.



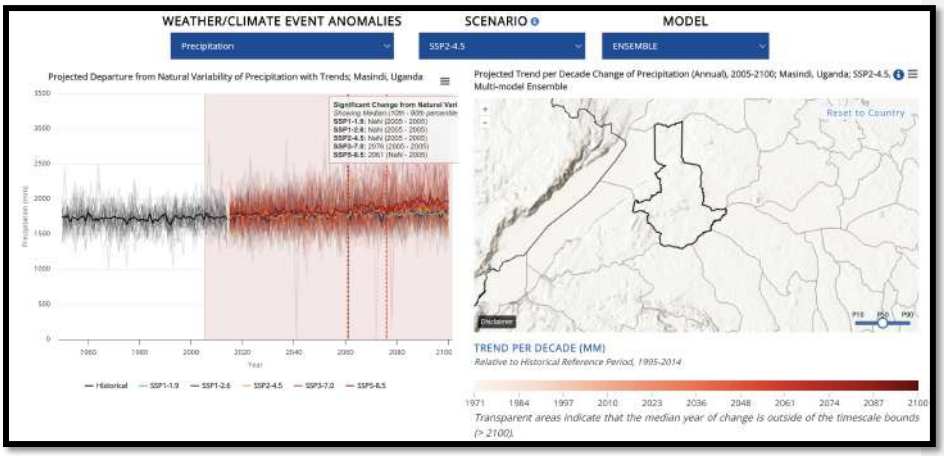


Figure 5: Top: projected trend per decade changes of precipitation (annual) under SSP2-4.5. bottom: precipitation trend under different SSP scenarios
(Source: World Bank Climate Change Knowledge Portal)

1.2.11. Flood risk

The rainy seasons in the study area occur in March ~ May and August ~ November. Flood events at Masindi Port consists of the outflow of Lake Kyoga, River Kafu and the floods within the interval basin from Kyoga Lake to Masindi Port. Both Lake Victoria and Lake Kyoga have an attenuation effect on the peak flood that results flattened.

The Project for Master Plan Study on Hydropower Development in the Republic of Uganda (JICA, 2011) analysed the probable flood of the Nile River at Masindi Port by taking the annual maximum discharge from the year 1896 to 2008 and fitting the maxima to the log Pearson type III probability distribution function. The probable flood of the Nile River obtained by probable distribution function results as follows:

- 100-year flood： 2,400 m3/s
- 200-year flood： 2,650 m3/s
- 1,000-year flood：3,400 m3/s.

The analysis of probable floods (100-, 200-year floods) was carried out by implementation of the hydraulic model HEC-RAS; the geometry of the model is based on the bathymetric survey carried out in January 2025. As presented in figure 6 below, the maximum water levels don't affect the water abstraction area.

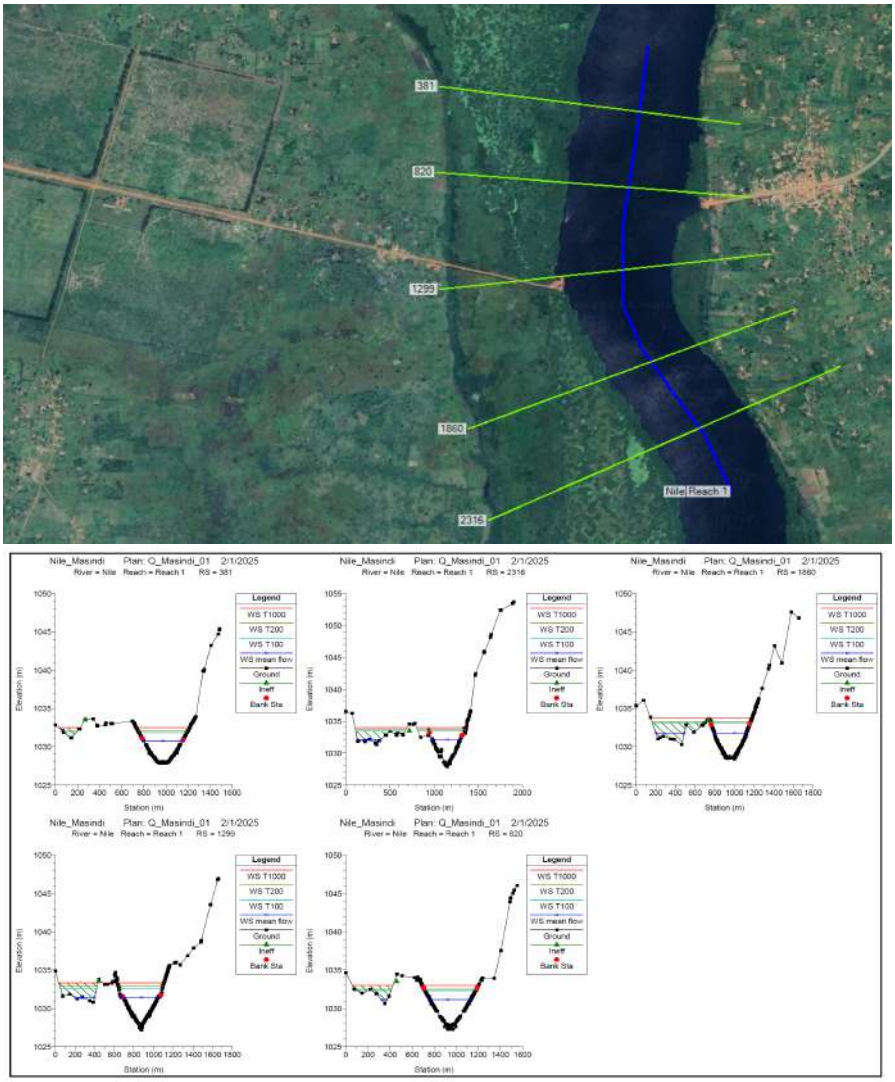


Figure 6: Planimetry and hydraulic results of the simulated water levels in correspondence of 5 sections of the River Nile. The water abstraction point is between sections 820 and 381

1.2.12. Construction phase

1.2.12.1. Overview of components to be constructed

The Masindi Port Bulk Water Supply and Irrigation Infrastructure Project involves the phased construction of a fully integrated system to deliver reliable irrigation and domestic water supply. The infrastructure includes a wide range of components, each playing a vital role in the delivery, treatment, storage, and distribution of water.

1.2.12.1.1. River diversion works

The construction of the dam begins with a river diversion process to enable dry working conditions. This involves two primary steps. First, a diversion channel is excavated with sufficient capacity to carry floodwater based on a selected return period. Second, the material from this excavation is used to construct a temporary coffer dam that blocks the river's natural path and redirects its flow through the diversion channel downstream of the construction site.

1.2.12.1.2. Dam construction process

The dam will be constructed following a structured sequence of activities. It starts with site investigations to gather geotechnical and hydrological data necessary for the design. Engineering works then translate these findings into detailed designs for the dam body, spillway, intake, and outlet structures. Site clearing removes vegetation and topsoil from the construction area, followed by the preparation of borrow pits to provide construction materials like clay, gravel, and rock.

The dam foundation will be excavated and treated to ensure stability before embankment construction begins. The embankment will be compacted in layers, with time allowed for natural settlement. A key structural element is the cut-off trench or keyway excavated beneath the dam to prevent seepage. Vegetation will be planted on the downstream face to prevent erosion, while the upstream face will be protected from wave action using riprap or concrete lining.

An outlet pipe and intake structure will be embedded in the dam body to regulate water releases. Once all structures are complete, the dam will be gradually filled, with continuous monitoring for structural integrity. A maintenance and inspection program will be established to ensure long-term safety and functionality.

1.2.12.1.3. Irrigation scheme

Water for irrigation will be abstracted from the Nile River through a dedicated intake structure equipped with coarse and fine screens to remove debris and sediments. This intake is connected to a raw water pumping station housing seven horizontal split-case centrifugal pumps, each operating at 125 kW. These pumps are designed to transfer water at a flow rate of 526 L/s and a total dynamic head of 20 meters. To ensure reliability, the system will incorporate variable speed drives (VSDs), backup generators, and anti-cavitation protections.

From the intake, water will be conveyed to the Irrigation Water Treatment Plant (IWTP) via a transmission pipeline of DN 1600, PN 32, extending 1.75 km to the plant and an additional 18.1 km (including 2.1 km above ground) from the plant to the storage reservoirs. The IWTP will treat the water using a sequence of coagulation and flocculation, sedimentation, and filtration processes, making it suitable for agricultural irrigation. Sedimentation reservoirs located adjacent to the IWTP will allow heavy particles to settle before water proceeds through treatment.

Treated water will be pumped from the IWTP to four high-elevation irrigation reservoirs, each with a capacity of 24,000 m³, resulting in a total capacity of 96,000 m³. These reservoirs are strategically positioned to supply the irrigation network via gravity. A clear water pump station, equipped with seven large-capacity pumps (each with power ratings up to 2,115 kW), will ensure water delivery to these reservoirs under peak demand conditions. Pumps will operate up to 24 hours daily during the irrigation season and will be supported by SCADA-integrated VSDs for energy-efficient performance and remote monitoring.

The irrigation distribution network has been designed to serve approximately 12,673 hectares of farmland through a pressurized system operating 18 hours per day. The pipeline diameters range from 200 mm to 1,600 mm, with pressure ratings from PN 10 to PN 32, optimized to maintain flow velocities between 0.6 and 3.0 m/s and pressure heads of 20–50 meters at the delivery points. The network includes pressure-reducing valves to control excess pressure at delivery points (especially in farms such as Soul Agric, Kisirizi Excellence, Afrokai, and Asili), and gate valves for isolating sections during maintenance.

To manage system air and sediment, air valves (D80) will be placed at high points, and washout valves (D250) will be installed at low points, allowing for system flushing and sediment removal. Water hammer protection is provided through two surge tanks that buffer against pressure surges caused by rapid changes in flow. Thrust blocks will be constructed at pipeline bends and junctions to resist hydraulic forces.

Complementing the irrigation infrastructure, a drainage system will be developed to collect and safely dispose of excess irrigation and stormwater, especially in low-lying or poorly draining fields. The entire network will be managed via SCADA systems, providing real-time control over flow rates, pressures, and operational status, ensuring high service reliability and reduced energy consumption.

1.2.12.1.4. Water supply system

1.2.12.1.4.1. Water intake and treatment

The domestic water supply system operates independently from the irrigation network and is designed to provide potable water to over 87,000 people by 2049. A dedicated intake structure on the Nile River will abstract raw water at a continuous rate of 56 liters per second (equivalent to 4,838.4 m³/day). The intake is connected via a 600 mm HDPE pipeline to the treatment facility and includes coarse screens (20–30 mm) and fine screens (5 mm) made from stainless steel (SS304) to remove debris and suspended solids. Two submersible slurry pumps, each rated at 3 kW and capable of delivering 10 L/s, will convey raw water from the intake reservoir to the Domestic Water Treatment Plant (DWTP).

At the DWTP, water will undergo a multi-stage treatment process to meet WHO potable water standards. Treatment steps include coagulation and flocculation to agglomerate fine particles, sedimentation in settling tanks, filtration through dual-media sand and gravel layers, activated carbon filtration to remove taste and odor compounds, and final disinfection using both

chlorine dosing and ultraviolet (UV) light systems. The plant is designed for a steady operational capacity of 56 L/s, operating 18 hours per day to meet average and peak daily demands, with provision for future scalability.

1.2.12.1.4.2. Storage and transmission

After treatment, potable water will be stored in a primary reservoir with a capacity of 3,100 m³, supported by an emergency reservoir of 1,000 m³. These reservoirs are constructed using reinforced concrete and include overflow drains, outlet pipes, and maintenance access features. From these storage facilities, water will be transmitted via DN 400 GI PN 32 pipelines, designed for a flow velocity of 0.8 m/s and maximum head losses of 2.01 m/km. The transmission line extends from the treatment facility to elevated tanks located at key distribution points to ensure adequate pressure across the network.

A set of multistage centrifugal pumps will be installed to lift treated water from the DWTP to the elevated tanks. Each pump will operate under a Total Dynamic Head (TDH) of 220 meters, delivering up to 26.2 L/s. The system requires pump motors in the 90–200 kW range, operating at 80–90% efficiency. Pumps and impellers will be constructed from corrosion-resistant materials such as stainless steel, cast iron, or bronze to withstand prolonged exposure to high pressure and treated water.

1.2.12.1.4.3. Distribution and control systems

The distribution system will serve the parishes of Kimengo, Kaduku, Waibango, Bigando, and Kiguulya, as well as growing towns including Asiri, Bisenyi, Mile 10, Kiziba, and Masindi Port. The population to be served is projected to increase from approximately 41,620 in 2024 to 87,143 by 2049. Pipes will be laid at an average trench depth of 2 meters and supported by sand bedding and backfill. They will be equipped with air valves at high points and washout chambers at low points to manage air release and sediment flushing. Pressure-reducing valves and flow meters will be installed to regulate supply and monitor consumption patterns.

A Supervisory Control and Data Acquisition (SCADA) system will be integrated into all critical infrastructure to provide real-time data on flow rates, reservoir levels, pressure, turbidity, and chlorine dosing. The control panel will include IP65-rated enclosures with protection relays, emergency shut-off, and level sensors. This system will enhance operational efficiency and enable remote monitoring and troubleshooting.

1.2.12.1.4.4. Operation and resilience

The domestic water supply system is designed for 24/24-hour operation, with a distribution time of 18 hours per day. It will accommodate daily and seasonal variations in demand, with contingency measures for peak flows and emergency storage. To enhance system resilience, the project includes grid-based power supply with provision for diesel-powered backup generators at key nodes. Energy efficiency will be optimized using Variable Speed Drives (VSDs) on pumps to adjust flow rates in response to real-time demand.

A phased implementation approach will prioritize service delivery to high-need communities in the early stages while allowing for modular expansion. Maintenance protocols will be established, including scheduled inspection of pumps, valves, control panels, and pipelines. Preventive maintenance logs and SCADA alarm histories will support long-term sustainability and cost-effective operation of the water supply system.

1.2.13. Construction activities

1.2.13.1. Site Clearing, Excavations and levelling

The first stage of the construction phase is site clearing for both section of the proposed project construction and for stock piling material covered with tarpaulin to reduce material erosion. Site clearance should be only limited to areas required for construction to reduce on the impact on biodiversity.
This is followed by setting out of site for construction alignment and leveling using various survey and construction equipment and materials. This is then followed by the excavation phase that will generate a lot of cut and spoil material to be removed from the site.

1.2.13.2. Compaction works

Compaction works follow the excavations stage which involves use of machinery e.g. compactors and generators for energy supply. This stage of construction will be essential prior to constructing the foundation through creation of a stable working space. It will also be the major determining factor for the alignment of the station.

1.2.13.3. Materials Mobilization, Handling and Storage

Materials such as concrete, cement, hoop iron, sand, gravel stone aggregates, pipes and the like will basically be acquired from the nearest and suitable site giving materials and licensed traders that meet the specifications. Transportation will be by road. Provision will be made for bulk storage of materials on site.

1.2.13.4. Concrete works

Concrete columns will be erected to provide structural support and a stable foundation for key infrastructure such as pump stations, treatment plant buildings, and elevated water tanks. Additional concrete works will include the construction of slabs, drainage channels, platforms, and support bases. Wall construction will primarily use concrete blocks, complemented by cement mortar, sand, and reinforcement bars. Roofing works will involve timber trusses and iron sheets, while finishing works will use materials such as glass panes and metal fixtures. Most of these materials are expected to be sourced from the local and regional markets.

The table below presents the main construction materials expected to be used on-site. The exact quantities of material to be used will be specified in the detailed Bills of Quantities (BoQ).

Table 5: Major construction materials and proposed sources

Material Type	Indicative Volume (Est.)	Proposed Source Location	Source Type and ESIA Consideration
Marram (for backfilling, access roads, and sub-base layers)	To be confirmed in BoQ	Kimengo area (local borrow pit)	To be extracted from acquired site subject to ESIA approval
Rock Fill and Aggregates	To be confirmed in BoQ	Kiryandongo Stone Quarry	Private supplier – NEMA certified
Sand (for concrete and plastering)	To be confirmed in BoQ	Masindi Riverbeds or nearby licensed sites	Private supplier – NEMA certified
Clay (for specific applications, e.g., lining or block making)	To be confirmed in BoQ	Identified nearby farm plots	On-site or nearby extraction – ESIA required if thresholds are exceeded

1.2.13.4.1. Material Sourcing and Environmental Compliance

All materials for concrete works will be sourced in compliance with national environmental regulations. Marram and clay will likely be sourced from locally acquired borrow pits that will require a separate site-specific ESIA will be conducted in line with the requirements of the National Environment Act, Cap 181 and the National Environmental and Social Assessment) Regulations, 2020.

Sand, aggregates, and rock fill will be procured from licensed private suppliers with valid NEMA clearances. Preference will be given to nearby certified quarries and sand suppliers to minimize transportation impacts and stimulate local economic participation.

The contractor shall be required to submit documentation confirming the legal and environmental compliance of all material sources prior to mobilization. Additionally, all borrow pits will be rehabilitated post-use to prevent erosion, ponding, or other adverse environmental effects..

1.2.13.4.2. Mechanical Works

i. **Water source station**

The water source stations will comprise of pumps and power source most like solar, pipe line, including guard house and sanitary facilities. All exposed pipe work leading into; within and out of the pump house shall be galvanized iron pipe. Fittings to be provided include non-return valve, gate valves, meter and pressure gauges. The whole installation shall be earthed and provided with lightning protection.

ii. **Installation of storage reservoir tank**

This will involve excavations for the tank foundation footings, building of footprints, transporting of the tank parts / components and installation of the reservoir tank.

iii. **Installation of transmission and distribution water lines**

This will involve excavation of shallow trenches in the identified areas that is through bush lands, gardens (with consent from owners) road reserve along some of the roads in the area to route the water transmission and distribution lines, installation of the water transmission and distribution lines and backfilling of trenches. Being generally rural, there may not be existing underground service lines for water, electricity, optic fibre, and the like likely to be affected in the project area.

1.2.13.5. Civil works

This will involve ferrying, to the water source location site, materials (cement, bricks, sand and roofing materials), foundation excavations and building works, chain link fencing and power generator/solar installations. On the station will be a chlorination room connected to the reservoir tank. The chlorination room will be a concrete floor, rendered block work structure. The water will be disinfected by dosing with calcium hypochlorite solution.

1.2.13.6. Electrical services

The station will be connected to Hydro power which will be supplemented by solar power.

1.2.14. Operation and Maintenance of the Proposed Water Supply System

The proposed bulk water supply system will require full time technicians to manage the scheme on a daily basis to be able to ensure the system is running well, clean tanks when necessary, repair any breakages as they happen, ensure security for the installed infrastructure. A designated team of technicians will co-ordinate the operation and management of water supply systems. It is anticipated that the client and partners will handle O&M costs.

1.2.14.1. Periodic Upgrading/Maintenance of the Energy Supply

One of the areas that are likely to cause great injury to the environment if not addressed well is the sanitation and energy system at the station. Major activities to this effect will be geared towards periodic upgrading of the energy systems to avert any would be fire occurrence from electric short circuits. The reservoir tank will be periodically maintained. Rain water from the roofs (of infrastructure on site) will also be harvested and used for sanitary purposes on site.

1.2.14.2. Emergency/safety support systems

The project operator will ensure periodic monitoring of the safety support systems. The structure will be fitted with fire extinguishers and fire alarms for emergency firefighting. These will periodically be upgraded to maintain their functionality. A functional first aid kit and Emergency contacts should be put in place to cater for any emergency cases at the site.

1.2.14.3. Solid and liquid waste management

Housekeeping will be key in promoting tidiness, preventing disease outbreak, accidents and environmental pollution during operation/occupancy of the facilities. Effective collection, storage and disposal of all wastes will be given priority and periodically undertaken. Maintenance and periodic cleaning of the toilet and bathroom will be undertaken to ensure a hygienic environment. Proper maintenance of the physical structures will also be among the regular activities that will be carried out during the operation phase to ensure a tidy operating environment.

1.2.14.4. Security, Health and Safety provisions

During the operation phase, there will be health and safety as well as security concerns which will need attention. These will include noise, dust, disease and accidents as well as communicable diseases. Security of the site and premises, security of workers and security of equipment. Stringent measures such as engineering controls, training of personnel, provision of appropriate and adequate PPE like nose masks, ear muffs, gloves and safety clothes, installation of safety signage among others should be put in place.

The community will be safe guarded by fencing off the site, installation of safety signage and through conducting of sensitization programmes.

1.2.15. Decommissioning and Rehabilitation

Decommissioning and rehabilitation activities will focus on the removal of temporary construction-related structures and facilities that are not part of the permanent MWACRID project, and on the restoration of the construction footprint in compliance with environmental regulations and landowner expectations. At the end of the construction phase, all temporary facilities established to support project implementation will be dismantled and removed from the site. These include: contractor's workers' camps; workshops and fabrication yards; site offices and temporary storage areas; mobile sanitary facilities; temporary access roads (if not integrated into access routes) and waste management and fuel storage facilities.

All construction debris, unused materials, and waste (including scrap metal, plastics, and timber) will be collected, sorted, and disposed of in accordance with NEMA-approved waste handling procedures. Non-hazardous waste will be taken to licensed disposal sites, while any hazardous waste, if generated, will be handled by registered hazardous waste handlers. Waste tracking documentation will be maintained for accountability.

Structures that form part of the operational MWACRID project and the water supply system will remain intact and functional. These permanent structures are critical for the long-term function of the irrigation and water supply system.

Once decommissioning of temporary facilities is complete, affected areas will be rehabilitated to restore ecological stability and allow for continued agricultural use or natural regeneration, depending on the landowner's preferences. Rehabilitation measures will include regrading, backfilling borrow pits, and replanting with native vegetation and grasses such as elephant grass to stabilize soils and prevent erosion. In areas where trees were cleared, environmentally suitable tree species will be replanted to support biodiversity and landscape recovery.

All decommissioning and rehabilitation activities will be guided by a NEMA-approved Decommissioning Plan, and will include stakeholder engagement, especially with local landowners and authorities, to ensure the process meets social and environmental expectations.

Appendix 2: Lay out Plan for the proposed project