



**BUSITEMA
UNIVERSITY**
Pursuing Excellence



**FACULTY OF ENGINEERING
DEPARTMENT OF MINING AND WATER RESOURCES
ENGINEERING**

**DEVELOPING A DRAINAGE MASTER PLAN FOR LUBIGI CATCHMENT USING
GIS AND REMOTE SENSING**

BY

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**A final year project report submitted to the department of water resources and mining
engineering in partial fulfillment for the award of the Bachelor of Science in Water
Resources engineering degree of Busitema University**

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DECLARATION

I AINEMBABAZI HELLEN hereby confirms that the information contained in this report to the best of my knowledge is the true representation of what transpired during the process of carrying out this project and that it has never been submitted to any academic institution for the award of a bachelor's degree. I hereby declare that this is my original work done basing on engineering aspects and guidance from my supervisors.

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ACKNOWLEDGEMENT

I would like to give thanks to the almighty GOD for my good health, life, and for taking me this far.

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It is my pleasure also to thank my classmates, and other friends for making my life enjoyable even in difficult moments.

DEDICATION

I dedicate this project report to all my family members; my Dad Mr. ByambaraVareriano,my Mum Mrs. Bambara Jane Kyomukama, Brothers;Tukahirwa Gilbert, and Ayebazibwe Albert, Sisters;KemigishaHilder and Kenyangi Allen, and all my cousins especially Muhozi Isaac, my husband Mr. TiwangyeJavis,and my children; AtukundaAnnastacia and Asingwire Jason for their love and care.

ABSTRACT

This report presents the results of a study to develop a drainage master plan for storm water. Drainage master plan involves drainage improvement plans, best management practices, focuses on the adequate surface drainage of the area as this will help in solving the problem of floods in the area.

The study analyzed the baseline information in chapter three which includes physical development of the catchment, rainfall pattern and the existing drainage channel. The prevailing conditions of the existing drainage system were observed and studied and it was found out that most of them are covered and some of them are blocked and clogged in sections. Different data techniques were employed which included field measurements and observations and oral interviews. It was found out that the ongoing physical development, topographic nature and the existing drainage system are the major causes of floods in Lubigi catchment.

In this report, I present a geographic Information System (GIS) for hydrological data development for a drainage master plan developed to reduce flooding in the catchment area. Arc-GIS and HEC-HMS to estimate area of the catchment (35.6m^2), land use (which include commercial, wetland, residential, and peripheral residential), hydrological soil groups (the catchment belongs to group D), soil texture (i.e. clay and clay loam), and runoff curve numbers are also presented. Discharge was estimated using the rational method, the calculated values of mean discharge ($1566.56\text{m}^3/\text{s}$), and standard deviation (176.92) were used to estimate the design discharge for different return periods using Gumbel distribution method. The design discharge ($2025.3474\text{m}^3/\text{s}$) for a 50 year return period was used in the design because it is recommended in urban drainage manual for urban areas. The drainage channel was designed in Auto CAD with top width of 41m, bottom width of 35m, depth of 3m free board of 1.5m and slope of 1:1, for leveling the slope of the channel, the volume of cut and fill was calculated, and then the hydraulic behavior of the existing and designed channel was simulated by using HEC-RAS. This proved that according to discharge the channel won't over flow.

LIST OF ACRONYMS

DWRM	Directorate of Water Resources Management
GIS	Geographical Information System
DEM	Digital Elevation Model
MWE	Ministry of Water and Environment
NARO	National Agricultural Research Organization
NFA	National Forestry Authority
NRSA	National Remote Sensing Agency
QGIS	Quantum Geographical Information Systems
RS	Remote Sensing
SCS-CN	Soil Conservation Service Curve numbers
UBOS	Uganda Bureau of Statistics
UNMA	Uganda National Meteorological Authority
USDA	United States Department of Agriculture

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CHAPTER ONE

1.0 Introduction

1.1 Back ground

A significant part of the development of urban areas occurs without the provision of basic infrastructure and services. Proper water and sanitation services, drainage systems, waste management and durable quality housing are often lacking (Vestbro, 2011). For a long time, urban drainage systems have existed as a crucial city infrastructure to collect and convey storm water and wastewater away from urban areas.

It is estimated that approximately 72 percent of urban residents in Sub-Saharan Africa live in slums (Vestbro, 2011). There are different factors that contribute to incidences of flooding and most of them are connected to how areas develop and how the land is used and managed (Ramin, 2009). Rainfall duration and amount, poor drainage infrastructure, the sealing of ground surfaces through the construction of buildings, roofs and roads that restrict the natural pathways of rainwater can hinder and change natural rainwater run-off patterns. Bernstein (1995) notes that 3.2 million children under the age of 5 years die each year from diarrhoeal diseases largely as a result of poor sanitation contaminated drinking water and associated problems from poor drainage and hygiene.

Lubigi catchment is one of the areas in Kampala city with a fast population growth which has resulted into encroachment on the wetlands, the construction of unplanned buildings and poor drainage systems. The drainage master plan will reduce the adverse effects of flooding on people and property and also protect the existing and proposed drainage system as well as the community's general well being.

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