



**BUSITEMA
UNIVERSITY**
Pursuing Excellence

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

FINAL YEAR PROJECT

**APPLICATION OF A HYDRAULIC SIMULATION TOOL TO PREDICT THE
FUTURE PERFORMANCE OF WATER SUPPLY SYSTEMS**

(CASE STUDY: NAJJEMBE TOWN WATER SUPPLY SYSTEM)

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*A final year project report submitted to the Department of Water Resources and Mining
Engineering as a partial fulfillment of the requirements for the award of a Bachelor of Science
degree in Water Resources Engineering*

May 2016

ABSTRACT

The provision of adequate and reliable water supply to meet both the present and future demand time is becoming a challenge for most water utilities in developing countries. The water supply deficit in Uganda has brought about water governance by application of a range of technical tools to regulate the development and management of water resources and provision of water services. The existence of technical gap regarding the prediction of future performance for water supply systems in Uganda followed by provision of possible improvements in the existing systems formed the basis of this study. This study aim at predicting the future performance of water supply system with Najjembe town WSS as a case study.

The data collection methods included literature and documentary review, land survey programs and participatory methods such as customer survey questionnaire, key informant interviews and observation. The topographical data was obtained using a GPS. The collected data was analyzed using Microsoft excel and WaterCAD V8i flex tables. The simulation model for Najjembe town WSS was developed using WaterCAD V8i (SELECT series 1) as a simulation tool.

The study results revealed that Najjembe town WSS currently has a total safe yield of 11.5 m³/hr. UFW was among the performance indicators studied and it was found to be 3.19%. The Average monthly water supplied by the water utility is 4100.125 m³ serving a population of 4,900 people leading to a Per Capita demand for water of 27.89 L/day. The areas of Kasokoso, Gangu, Kabula and Sesse do not completely have access to piped water supply while Nsakya A, Nsakya B and Mubango have access to piped water. Pumps currently installed at the WSS have total maximum operating flow of 559.33 m³/day, less than the total projected future water demand of 903.79 m³/day. From the start time of the simulation of 0.00 hrs, the water level in the tanks dropped drastically to 0.2m and the tank became empty from 4.10 hrs to 24.00 hrs when the present water system was made to serve the future demand thus the future water demand could not be met.

It was conclude that, the town of Najjembe currently has a good distribution system in place but will not have capability to serve the whole town in the nearby future of 15 years from present. It was also suggested that either one or more new borehole(s) with safe yield of ≥ 627.79 m³/day be drilled to supplement on the existing system and that an additional tank of storage capacity 800 m³ be constructed to Supplement the currently existing twin reservoir.

DECLARATION

I **DADEBO DERRICK** declare that, this project report titled '*Application of a hydraulic simulation tool to predict the future performance of water supply systems*' is a result of my own effort and investigations. The material in this report has never been submitted to any university or institution of higher learning for any academic qualifications.

Signature: 

Date: 02/6/2016



APPROVAL

This report has been submitted for examination with our approval as the Candidate's University supervisors.

MR. SSEMBATYA MARTIN

Signature:.....

Date:.....

(Main Supervisor)

MR. KIMERA DAVID

Signature:.....

Date:.....

(Co Supervisor)

DEDICATION

I dedicate this piece of work to all men and women, who design, construct, operate, evaluate performance, protect and predict the future performance of water supply systems on planet earth.

ACKNOWLEDGEMENTS

I would like to acknowledge the guidance of the Almighty God in my life.

I extend my gratitude to Mr. Ssembatya Martin and Mr. Kimera David, my project supervisors, for their unending support and guidance throughout this project work. It was a wonderful experience working with you!

I would like to thank the staff in the department of Mining and Water Resources engineering from Busitema University for the guidance and assistance during development of this project work.

I thank my mother, Mrs. Bakko Majorine for the gift of unending guidance given to me from the time I was dropped on planet earth. Your efforts in nurturing my dreams cannot be put into words. You are my biggest strength on earth!

Lastly, I would like to thank my dear Friend Obura Denis for his support and co-operation in all aspects of my academic life while at Busitema University since 2012.

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LIST OF ACRONYMS

GoU	Government of Uganda
MWE	Ministry of Water and Environment, Uganda
DWD	Directorate of Water Development
WSDF	Water and Sanitation Development Facility
UBOS	Uganda Bureau of Statistics
WHO	World Health Organization.
UNICEF	United Nations International Children's Fund
NWSC	National Water and Sewerage Cooperation
NWSS	Najjembe Water Supply and Sanitation System
WSSB	Water Supply and Sanitation Board
SDG	Sustainable Development Goal
NDP	National Development Plan
UFW	Unaccounted For Water
NBFU	National Board Of Fire Underwriters
TC	Town Council
WDS	Water Distribution System.
SC	Sub County
DWRM	Directorate of Water Resources Management
JICA	Japan International Cooperation Agency

CHAPTER ONE: INTRODUCTION

This chapter provides the background to this research study. The aim and objectives are presented and the scope of the work is specified.

1.1. Background

The cost of failing to properly address the water and sanitation gap is significantly higher than the cost of addressing it (Muhairwe, 2010). The challenge of inadequate service provision is brought up by the fact that population growth and the mounting pressures of increasing urbanization as well as industrialization have offset much of the gains in service coverage (Gentry et al. 1997).

The Government Uganda is committed to the implementation of recently launched Sustainable Development Goals by United Nations (UN) in 2015. Pillar 6 of the SDGs aim at increasing access to water supply and sanitation services to all its population by 2030 (UN, 2015 and WHO-UNICEF, 2015).

The Ugandan government has undertaken different reforms in quest for addressing irregularities that exist in water resources management which affect coverage and equity in water supply and sanitation distribution around the country. Among them include transformation of town councils and sub counties into municipal councils for quick monitoring.

Though the Government of Uganda (GoU) through its reforms joined Najjembe SC with Kawolo SC and Lugazi TC into a municipality Council (New Vision, 2015), there are few alternative portable water sources to supplement the only one existing public water supply system in Najjembe sub-county so as to meet the demand (MWE-DWD, 2010). There is no assurance of reliability and efficiency of Najjembe town WSS to continuously meet the water demand in the future.

The population of 10,503 people and the high annual population growth rate of 3.8% (UBOS, 2014 Census) in Najjembe town creates the need to predict the future performance of the only one existing WSS in the town if it can meet the demand in future due to expected population growth, annexation of areas, urbanization, sign of wholesale agreements and industrialization that are likely to spark off in the area. This will ensure proper and sustainable future planning for the WSS assets. Thus the prediction of this water system's capability to adequately serve its

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