FACULTY OF ENGINEERING

DEPARTMENT OF WATER RESOURCES AND MINING ENGINEERING

FINAL YEAR PROJECT PROPOSAL REPORT

PERFROMANCE EVALUATION OF THE CONSEQUENCES OF SEGMENT FAILURE ON WATER DISTRIBUTION SYSTEM

(CASE STUDY: BUSITEMA UNIVERSITY WATER DISTRIBUTION SYSTEMS)

BY

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ABSTRACT

In recent years, water utilities have placed a greater emphasis on the reliability and resilience of their water distribution networks. This focus has increased due to the continuing aging of such infrastructure and the potential threat of natural or man-made disruptions. As a result, water utilities continue to look for ways to evaluate the resiliency of their systems with a goal of identifying critical elements that need to be reinforced or replaced. The simulation of pipe breaks in water reliability studies is traditionally modeled as the loss of a single pipe element. This assumes that each pipe has an isolation valve on both ends of the pipe that can be readily located and operated under emergency conditions. This is seldom the case. The proposed methodology takes into account that multiple pipes may be impacted during a single failure as a result of the necessity to close multiple isolation valves in order to isolate the "segment" of pipes necessary to contain the leak.

This document presents a simple graphical metric for use in evaluating the

performance of a system in response to a pipe failure. The metrics are applied to Busitema University water distribution systems in an attempt to illustrate the fact that different pipe segments may impact system performance in different ways. This information is critical for use by system managers in deciding which segments to prioritize for upgrades or replacement.

KEYWORDS: Reliability, Water Distribution Networks, Segment, Valve, Model Database

DECLARATION

I hereby declare that the information given in this report is my own and has never been used by any institution or university.

Signature …… Date …….

OUMA DENISH ROSDELL

APPROVAL

This proposal work has been approved by;

MR. OKETCHO YORONIMO

Signature ……

Date ……

DEDICATION

This report is dedicated to my family and friends who have helped me in one way or the other

“May the almighty God bless them”

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CHAPTER ONE:

1.0 **INTRODUCTION:**

This chapter briefly gives general information related to the research project by clearly outlining the problem identified, stating the objectives of the study and the methodology of how the objectives will be achieved towards obtaining a solution(s) to the problem identified.

1.1 **Background**

The water supply system at Busitema University was constructed as an independent mini system in 1971, at a time when Busitema was being established as a National College of Agricultural Mechanization. The system was established as part of the technical and infrastructure support to the college from the government of the former USSR. The boreholes feeding the system were drilled and developed in 1968. The system is reported to have functioned properly for about 10 years until it started experiencing electro-mechanical problems, probably due to aging of the electrical/mechanical components. This marked the genesis of the long history of recurrent technical malfunction problems. A substantial portion of the water infrastructure in the university, as many of other public assets built over 50 years ago, are now reaching the end of their useful life; which combined with rapid growth and changes in demographics have placed water distribution pipe networks at a state that requires revitalization. The continuing aging infrastructure along with the growing threat of natural and man-made disruptions have led water utilities to place a greater emphasis on developing better strategies to minimize the impact on the system users when a failure event occurs (i.e., improve the reliability of the system). Utilities in charge of operating and maintaining the distribution systems must address this concern with limited resources, while maintaining acceptable levels of service, managing risk, and considering the possible socio-economic impact on the community. Usually