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UNIVERSITY**  
*Pursuing Excellence*

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

**FINAL YEAR PROJECT REPORT  
DESIGN AND SIMULATION OF A WATER TREATMENT SYSTEM FOR  
SURFACE RUNOFF – A CASE STUDY OF YMCA WAKISO CAMPUS**

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

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## ABSTRACT

This report acknowledges water scarcity in YMCA wakiso campus which led to the excavation of a valley dam where surface off and spring water collects, this project report potrays the background of the institute, the current water sources and how the surface run off and spring water that flows into the valley dam gets polluted. It also points out both main and specific objectives of this proposal, the justification, the purpose and scope of study.

Literature review on surface run off and spring water, it also explains the physical, chemical and biological characteristics of water and their measurement methods and also the existing methods of surface water treatment. This report also explains what a catchment is, catchment characteristics that influence run off and literature on different available methods that are used to treat runoff , methods of simulating a water treatment system and the different methods of economic analysis.

Methodology in this project report shows how the objectives were accomplished. It also explains how the data concerning the project was collected and obtained beginning with collection of water samples, analysis of results and also the formulae for design of various water treatment components, reasons as to why those particular components were selected and the conceptual diagram for the whole water treatment system.

This final year project report also shows the results that were obtained after this research project, the different components that were designed for the water treatment system, the results and graphs of simulation and also the benefit cost analysis method was used to analyses the economic viability of the project.

This report also indicates the conclusions on every objective of the project and recommendations that were made after the conduction of the research.

## DECLARATION

I **NAMALE CAROLINE** hereby declare that, this report is a true work of my hands and has never been presented by any person or institution for an academic award

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## **LIST OF ACRONYMS**

YMCA	Young men's Christian association
WHO	World Health Organisation
ETAAS	Electra thermal atomic absorption spectrometry
FAAS	Flame atomic absorption spectroscopy
BHP	Brake horse power
WHP	Water horse power
NPV	Net present value
BIRM	Best iron/manganese removal
ALUM	Aluminium sulphate
NTU	Nephelometric turbidity indicator unit
PPR	Polypropylene

# CHAPTER ONE

## 1.0 INTRODUCTION

### 1.1 BACK GROUND OF STUDY

YMCA comprehensive institute has six branches which include Kampala, Jinja, Mukono, Mbarara, Kasese and Wakiso campus which is located in Buwambo parish in Wakiso district.

The wakiso campus became a degree awarding institute starting with September 2017 intake and the institution is yet to transform into a fully-fledged university within the next five years which puts the campus at a greater advantage of enrolling more students in the years to come (Daily monitor 3<sup>rd</sup> March 2015).

The campus currently has three water sources, the borehole which has a submersible pump that pumps water to a 20m<sup>3</sup> water tank, a manual borehole which is ineffective (the bore hole takes 5 minutes to release water) and a valley dam where surface run off collects when it rains and spring water which flows to the valley dam as well, the institute has one thousand students with a daily demand of 63m<sup>3</sup> which led to a deficit of 43m<sup>3</sup>.

Surface run off is the flow of water that occurs when excess storm water or other sources flow over the earth's surface because rain arrives more quickly more than the soil can absorb it or because of impervious areas. Run off that occurs on the ground surface before reaching the channel is called non-point source. If a non-point source contains man-made contaminants or natural forms of pollution such as rotting leaves the run off is a non- point pollution source. When run off flows along the ground it can pick contaminants for example pesticide residues of DDT it is estimated that only 10% to 15%of pesticide reach the target organism leaving the remainder absorbed in air, water and soil (Pedro and Valley, no date) Before it reaches the dug valley dam.

Erosion of soils that contain smaller particles generates turbidity in the water collected in the valley dam. The principal environmental issues associated with surface run off are the impacts to the collected in the valley dam through transport of water pollutants to the valley dam ultimately these consequences translate into human health risk and aesthetic impact to the water in the valley dam. Some of the contaminants of great effect that arise from surface runoff are petroleum substances , herbicides and fertilizers(Wang *et al.*, 2016) since most of the people in wakiso are farmers the impact translates to water pollution since the valley dam receives runoff carrying various chemicals or sediments.

The water in the valley dam is not put to use (compromised) regarding health risks and drinking water aesthetics (that is odour colour and turbidity effects), the valley dam at YMCA is not lined making the water to come into contact with the soil which makes it more turbid and also geological properties of the soil affecting the water quality.

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