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Pursuing Excellence

FACULTY OF ENGINEERING

DEPARTMENT OF MINING AND WATER ENGINEERING

FINAL YEAR PROJECT REPORT

ASSESSING THE ENVIRONMENTAL IMPACTS OF OPEN PITS OF ARTISANAL AND SMALL SCALE GOLD MINES

CASE STUDY: TIIRA GOLD MINES-BUSIA DISTRICT

BY

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DECLARATION

I, Bwambale Philip, declare that all the educative material contained in this booklet is an account of my own efforts and has never been submitted to any university or institution for an academic award.

Signature..... Date.12./.06./.2018

APPROVAL

This report has been submitted after the approval of the following supervisors.

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DEDICATION

I dedicate this report to my parents the Late Buguma Ernest and Kabugho Nyesi, together with my siblings, fellow students for their tremendous support inform of finances and advices during the compilation of this report.

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ABSTRACT

ASM open pit mining is a form of mining characterized by open cut techniques to extract easily accessible near-surface ores covered by relatively thin layers of overburden soils or bedrock. In the area of Tiira consists of 100pits and 10pits where mapped and the samples were collected from 3pits out of 10pits using the random sampling method, because the mineralogy is the same. The study shows the negative impacts of open pits to the environment and there mitigation measures. From the results indicate the pits angle of inclination ranges from (47^0 - 67^0) which is above the recommended pit slope angle of 45^0 there is pit failure. The PH levels of the water in the 5 sampled pits ranges from (6.23-6.49) which is below the recommended PH levels of (6.5-8) USEPA 2010, the concentration of the metal elements in the water is above the recommended standards by the WHO and EPA. Thus there a potential of Acid generation in the pits, The plasticity results carried on the over burden indicate that the plasticity index is above the rainfall intensity of 23.42% to 23.27% thus the rainfall does not affect the overburden to flow as slurry to the nearby gardens to cause soil infertility.

The mitigation measures according to the research findings include the following, acid buffering using lime and open lime channels should be constructed around the active pits, for abandoned pits backfilling using the waste rock from the pits and process tailings for saprolite a backfill of 29314.897T/m^3 of saprolite and for laterite a backfill of 49704.192T/m^3 is required to block the contact between the water and the soil rocks. For pit failure proper pit slope design whereby for miners working in saprolite rocks and laterite rocks the width to height ratio of the pit slopes is 3:2 and 4:3 respective to reduce on pit wall failure. Construction of a rock fall protection catch fence in the pits to reduce on falling rocks and also pit wall scaling

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ACRONYMS

ASM artisanal and small scale gold mining

AMD acid mine drainage

PPM parts per million

Mg/l milligram per liter

WHO world health organization

EPA environmental protection agency

GIS Geographical information system

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CHAPTER ONE

1 INTRODUCTION

1.1 BACKGROUND OF THE STUDY

Artisanal and small- scale mining has become one of the developing world's most important activities, contributing significantly to the local employment, foreign exchange earnings and national gross domestic product(Byizigiro, Raab and Maurer, 2015). ASM open pit mining is a form of mining characterized by open cut techniques to extract easily accessible near-surface ores covered by relatively thin layers of overburden soils or bedrock(Monjezi *et al.*, 2009).

In Nigeria, there exist very many abandoned open – mine pits in and around residential environment. These previous mining sites have properties built very close to them, especially in Dorowa, a suburb of Bukuru, in Jos South local government area properties are poorly set out around the precinct of these pits. It was discovered that abandoned open - mine sites in the neighborhoods are death traps to young children, building collapse and degradable environment among others(Awaomim, 2013)

In 2012, an online search of Ghanaian newspaper articles resulted in 19 articles reporting 23 separate incidents of accidents and injuries among ASM miners occurring between 2007and 2012. The causes of accidents resulting in injuries as analyzed from the media sources also indicated that falls were the most common cause of accidents (25%), followed by entrapment from the collapse of mine pits (about 22%),. In two ASM sites in Indonesia, pit collapses occur between 2 and 5 times per year (Netoff and Chan, 2009).

Artisanal and Small-scale mining tends to destroy vegetation and farmlands, creates open pits and causes displacement of the people(Dumakor-Dupey and Bansah, 2017)

In Tiira area located in Busia district. The miners create pits to extract the gold, the pits are abandoned and rarely un reclaimed. This has resulted into a number of challenges to the environment.

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