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Pursuing Excellence

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DEPARTMENT OF MINING AND WATER RESOURCES ENGINEERING.

ASSESSING THE IMPACTS OF SOLID MINE WASTES ON THE ENVIRONMENT.

BY.

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Case study. Tiira gold field.

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ABSTRACT

Mining activities deteriorates the environment in numerous ways. One of the aspects of environment, it harms the most to the Soil, Water, vegetation and causes health problems. Thus, assessing the impacts of solid mine wastes on the environment (quality of Soil and Water) is extremely important for proper assessment of the impacts associated hazards. Due to the lack of proper planning and negligence of regulations, an appreciable amount of environmental degradation and ecological damage to environment occurs.

Tailing samples were collected from Tiira gold field. 4 tailing samples were collected and analyzed all samples analyzed in triplicate. for parameters like, iron(Fe), lead(Pb), Sulphur(S), Copper(Cu), Arsenic (As).

The soil samples were collected from the Tiira gold field. 5 samples of soil are collected and analyzed for the parameters like pH (5-6.5 acidic in nature), organic carbon, soil nitrogen (0-280 mg/kg which is low quantity), zinc, lead, iron of soil.

Physico-chemical quality of ground and surface waters from Tiira gold field and its environs was conducted between December 2016 to April 2017. This study was undertaken to determine whether physical, chemical and trace metal contamination of water sources and soil as well as whole environment in Tiira gold field is as a result of mining or geochemical and biochemical processes within the environment. Iron (Fe), and, physical parameters (pH, Total Dissolved Solids (TDS), Electrical Conductivity (E.C), Temperature) and chemical parameters in water samples were determined.

Hence all the parameters of soil and water are compared, the soil is more polluted than water. So for control the soil and water pollution it is suggested that appropriate steps must be taken by the industry, State Pollution Control Board and the Government to prevent pollution of soil and

Water samples were collected from 4 sampling points for the stream and underground water sources like protected wells and boreholes for trace metal analysis. The results showed that groundwater (pH of 6.05) was slightly acidic (low pH) compared to surface water (pH range 6.2-6.6 pH units) also slightly acidic. Groundwater electrical conductivity ranged from 635 to 855 µS/cm whereas that of surface water ranged from 451.67 to 774.72 µS/cm. Mining related contaminants detected in water samples in this study were As (ranging from values <0.001 to 0.002 mg/l), and Fe (with 0.136 and 0.143 mg/l being the respective minimum and maximum values).

Relationships between trace metals and chemical and physical parameters in surface water showed that Fe had a strong positive correlation with turbidity ($r = 0.0088$) and Fe also had a strong positive correlation with total dissolved solids ($r = 0.041$). temperature correlated positively with electrical dissolved oxygen ($r = 0.0714$) in surface water. Compared to WHO / EPA guideline, few of the ground and surface water supplies had one or more trace metal (Fe, As) levels outside acceptable limits set for drinking water. Most of them however have levels safe for human consumption.

DECLARATION

I hereby declare that this submission is my own work towards the Bachelor of Science in Mining Engineering and that, to the best of my knowledge, it contains no material previously published by another person nor material which has been accepted for the award of any other degree of the University, except where due acknowledgement has been made in the text.

SIGNATURE.....

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DEDICATION

This work is dedicated to my dear parents, Janet and Charles; and my brothers and sisters.

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ABBREVIATIONS AND ACRONYMS

USEPA: United States Environmental Protection Agency

WHO: World Health Organization

UNDP: United Nations Developmental Program

UNEP: United Nations Environmental Program

EPA: Environmental Protection Agency

GPS: Global positioning system.

TDS: Total dissolved solids.

PH.: Potential of hydrogen ions.

AAS: Atomic Absorption Spectrometry

EC: Electrical Conductivity.

BOD: Biochemical oxygen demand.

DO: Dissolved oxygen.

ANFO: Ammonium nitrate and fuel oil.

AMD: Acid Mine Drainage.

EC: Electrical Conductivity

TDS: Total Dissolved Solids

pH: Potential of Hydrogen

T: Tailings sample point

GW: Groundwater

SW: Surface Water

R: correlation between two elements.

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1.1 INTRODUCTION.

1.1.0 Background of the project.

Mining involves the management of large quantities of material to produce an end product. This process generates non-economic materials consisting of rock and overburden from mining and tailings from processing. These combined materials have traditionally been termed mine wastes which may be toxic. (*Johnson 2003*). The mining industry is producing 18billions cubic metres of solid mine annually. This figure is expected to double in the next 20-30years. (*Aswathanaryana, 2003*).

In Uganda, documentation of mine waste has been carried in Kasese where 5.5 million tons of cobalt tailings have been generated. (*mining sector Profile-Uganda-undated*).

These if not responsibly managed, the environment, health and safety impacts associated with mine wastes have the potential to directly affect communities of interest (COIs) and the ongoing operations of mines.

The amount of waste produced depends on the type of mineral extracted, as well as the size of the mine. Gold and silver are among the most wasteful metals, with more than 95-99 percent of ore extracted ending up as waste.

Ore is mineralized rock containing a valued metal such as gold or copper, or Sulphide substances. The ore is then crushed into finely ground tailings for processing with various chemicals and separating processes to extract the final product

By nature, mining involves the production of large quantities of waste, in some cases contributing significantly to a nation's total waste output.

There are approximately 2,500 industrial-sized mines world-wide. Nearly all of these mines, 99.3%, dispose of their mine tailings on-land. Mine tailings contain some of the metal bearing minerals, such as copper. The share of ore that becomes waste is about 20-60% for iron, 99% for copper, and 99.99% for gold (*Environment Canada, 2009*).

Mine wastes can cause; surface water pollution, underground pollution through seepage of heavy metals into the water, loss of vegetation due the formation of acids in case of Sulphide ores, land

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