

1 Introduction

1.1 Introduction

The assessment of the stability (or related instability) of dolomite land prior to development there on is essential in areas underlain by dolomite. The stability assessment forms the foundation of all risk management and mitigation related to development on dolomite in the process of ensuring sustainable development. For this to take place, various parameters must first be evaluated and considered in defining the related risk. This is well demonstrated in Figure 1 below:



Figure 1: Dolomite Stability Investigation Framework

Source: Own construction (2012)

This document will pose to identify, define and assess the particulars that are necessary to accurately and efficiently define the dolomite stability in relation to the risk.

1.2 Problem statement

In South Africa, development on dolomite is inevitable due to the high amount of populated areas underlain by dolomite, such as about 25% of Gauteng (CGS, 2010). Due to the high risk associated with development on dolomite, it is essential to accurately evaluate the metastable conditions of the dolomite underlying the development. This entails a complex process in which various variables need to be considered and evaluated.

The research question is therefore: What is the best/optimum/essential combination of variables that must be considered and evaluated to accurately determine the susceptibility and sustainability of the development?

This research project will look at the practical implication of such a model, and will evaluate each of the parameters used in the model. This model will be based on a dolomite stability investigation that was undertaken by AGES North West for the Tlokwe City Council.

1.3 Objectives

The following aspects will form part of this research:

- 1) Background research on the geo-environmental setting of dolomite
- 2) Case study of dolomite stability assessment based on the following:
 - a. Desktop study – Including the basic evaluation parameters and geo-environmental background
 - b. Fieldwork - Geological mapping, geophysical surveys (Gravimetric and electromagnetic) and drilling (geotechnical drilling and logging)
 - c. Data interpretation and evaluation
- 3) Evaluations of various parameters used in the case study
- 4) Recommendations for optimum combination of the variables

1.4 Hypothesis

Due to the high variability of the conditions associated with dolomite and the various sinkhole formation processes, the parameters must be defined so as to assist in the evaluation of at least the following:

- Geo-environmental setting of the area
- Geological and geohydrological setting of the area, including the geological background of the area
- Conditions of development: Infrastructure and land use
- Condition of the dolomite:

- Depth to dolomite
- Weathering of dolomite
- Layering
- Internal structure
- Bedrock morphology
- Nature of blanketing layer
- Evaluation of actual dolomite related incidents in the direct area

1.5 Investigation methods

The evaluation parameters are based on a project done by AGES North West and funded by the Tlokwe City Council:

The data will be gathered by various field methods, including, but not limited to:

- Geological and geo-environmental mapping
- Geophysical surveys
- Geotechnical drilling up to a depth of 60 meters or 6 meters into competent bedrock

Data processing is done in the following Windows based programs:

- MS Excel
- Golden Software Surfer
- Golden Software LogPlotter

1.6 Structure of this paper

The first section of this paper (Chapter 1: Introduction and Chapter 2: Geo-environmental setting of dolomite) focuses on defining the broad risks related to dolomite. This is the foundation and background of the assessment of the risk related to dolomite and development on dolomite (Chapter 3: Sarafina Dolomite Stability Investigation). From this assessment an assessment methodology is derived, leading to the formation of a decision support system as a methodology for the assessment of dolomite land (Chapter 4: Decision support system parameters). The document is finalized and recommendations for future research are given in the last section of the document (Chapter 5: Conclusion and recommendations).