E. KARST LANDFORMS

Field Note E1. Overview

Karst (translated literally from German and Slavic languages as 'rocky mountain') is a topography which was formed by the dissolution of soluble rocks such as limestone, dolomite, and gypsum. It is characterized by underground drainage systems with sinkholes and caves. It has also been documented for more weathering-resistant rocks, such as quartzite, given the right conditions. Subterranean drainage may limit surface water, with few to no rivers or lakes. However, in regions where the dissolved bedrock is covered (perhaps by debris) or confined by one or more superimposed non-soluble rock strata, distinctive karst features may occur only at subsurface levels and be totally missing above ground. Figure 1 shows typical karst landforms.

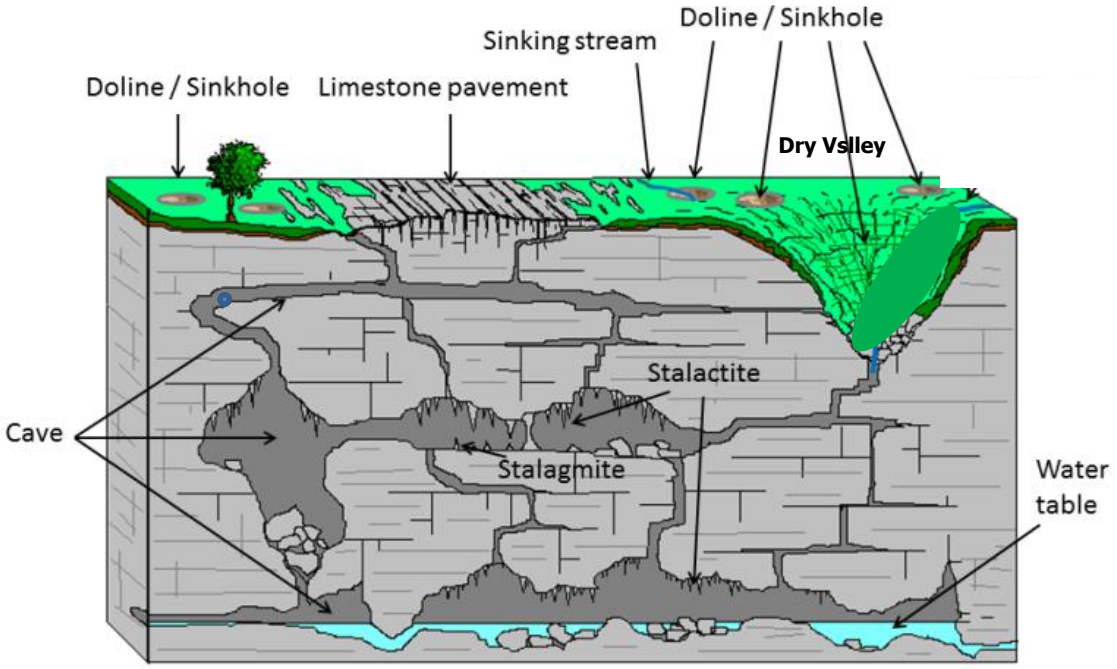

Figure 1. Generalised diagram (modified) showing typical karst landforms. The types of karst landforms in the Study Area are dry valleys, caves and dolines. As the annual rainfall is only about 350 mm a year, there are no sinking streams in the Study Area.

There is a multitude of karst landforms in the Study Area. A comprehensive research of the karst in SA and in the De Hoop area was conducted by Lin Russell some 20 to 30 years ago. The discussion about the formation of karst landforms, was excluded from the study.

The following paragraphs are brief descriptions of the typical karst landforms in the Study Area. These features are: dry valleys, caves and dolines. They are discussed in detail in the following Field Notes.

Dry valleys

A dry valley may develop on many kinds of permeable rock, such as limestone and chalk, or sandy terrains that do not regularly sustain surface water flow. Such valleys do not hold surface water because it sinks into the permeable bedrock. Many hypotheses have been advanced to explain dry valley development. They will, however, not be discussed here.

There are many dry valleys ('kloofs' or ravines) in the Study Area (Figures 2 and 3); they are typically deeply incised in the Hard Dunes (Figures 4 and 5).

The direction and the formation of some of the dry valleys maybe tectonically controlled. Read more in Chapter F.

Figure 2. Satellite image of dry valleys in the Hard Dunes (in De Hoop Nature reserve).

Figure 3. Satellite image of dry valleys in the Hard Dunes (near the shore of De Hoop Nature Reserve).

Figure 4. Topography map showing a series of dry valleys (SW of the Salt River Gorge).

Figure 5. Typical dry valley.

Caves

The Hard Dunes contain a multitude of caves and overhangs. They are exposed where parts of the hills collapsed (Figures 6 to 9). Some caves in the area are known to have been used as sources of bat guano, which was dug and sold by the early settlers.

Figure 6. Caves and overhangs (at Aasvoëlkrans).

Figure 7. Caves and overhangs in Langkloof.

Figure 8. Caves and overhangs (at Rooikrans). Note the 'honeycomb' weathering pattern.

Figure 9. Weathered pinnacles are the remains of a collapsed cave.

Dolines

Karst drains internally through fractures in the bedrock. This internal runoff tends to concentrate along more transmissive zones in the fractures or at fracture intersections and as a result dissolves a depression in the bedrock. Closed depressions, variously known as sinkholes or dolines, are one of the most characteristic features of karst landscapes. Bedrock dissolution is only one process contributing to the formation of closed depressions. Cave roof collapse can migrate upward to the surface, producing a collapse sinkhole (or doline). Figure 10 illustrates the formation of various types of dolines. The formation and types of dolines in the Study Area are still to be studied.

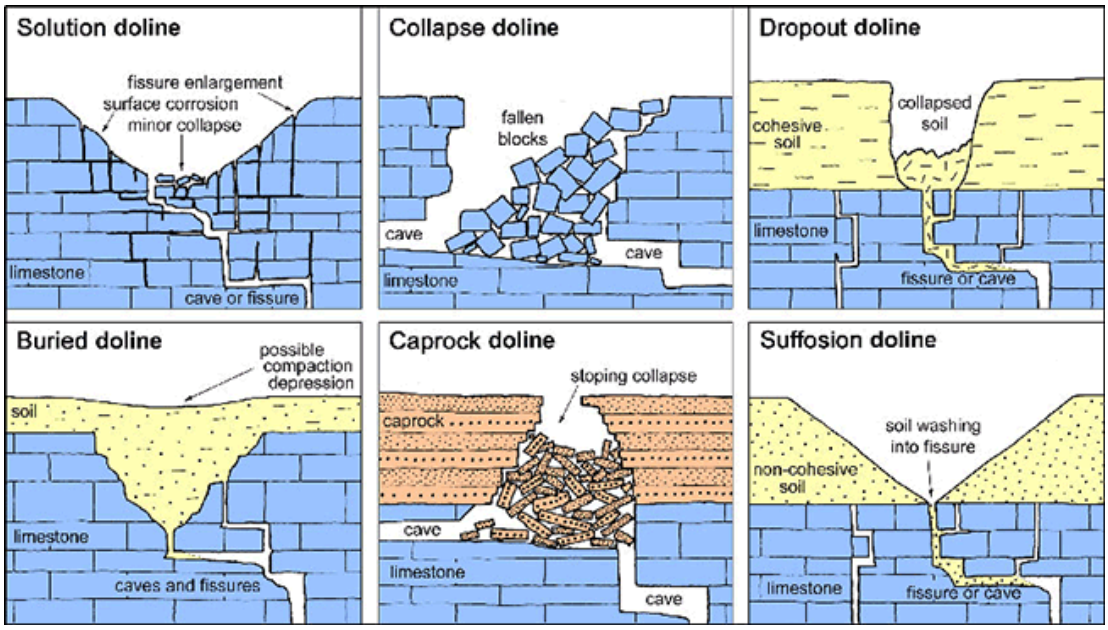

Figure 10. The formation of various doline types.

Most dolines in the Study Area are round (sometimes called ‘pan dolines’) (Figures 11 to 16).

Figure 11. Satellite image of a (nearly perfectly round) pan doline, ~70 m in diameter. Note the thick vegetation and trees on the rim.

The floors of all the dolines are a few meters lower than the surrounding surface. The dolines on sub-horizontal surface are shallower than those on a sloping surface. Most doline floors consist of soft sediment, covered with grass. In some dolines, this sediment contains red sand (see Chapter W) (Figures 12 and 13).

Figure 12. Doline, ~70 m in diameter, on a sub-horizontal surface.

Figure 13. Doline, ~80 m in diameter, on a gently sloping surface.

