

CHAPTER 6

PROPOSED MODIFICATION OF THE GEOTECHNICAL CLASSIFICATION SYSTEM DEVELOPED BY ZAWADA (2000)

6.1 INTRODUCTION

The reasoning behind this modification is to simplify the proposed system by Zawada (2000), in order to improve the utilization of the compiled geotechnical maps. A map was compiled to demonstrate the proposed modifications (Appendix 3). This was necessary for comparison with the existing geotechnical map (Appendix 2), to indicate the recommended modifications which were applied to the classification system.

6.1.1 Classification

The following modifications were recommended and applied:

- The ranking of geotechnical factors in order of decreasing rank (Table 22), in terms of overall significance to land use issues (financial and/or environmental), provides a systematic approach in which data is imported in the database. It is strongly recommended that no alteration needs to take place in the way that information is imported into the database, which was designed specifically for this classification system. Changes to the database could not be done due to cost and time related factors associated with the development of a new geotechnical database system.

Although the classification of the ranked list into groups having critical and subcritical status should fall away to simplify the system. Geotechnical factors only need to be ranked in terms of their overall significance to land use issues, as presented in Table 31.

Table 31: Ranking of geotechnical factors, in order of decreasing rank.

Ranked	Mapped Geotechnical Factor
1	Inundation (flooding)
2	Sinkhole formation
3	Slope instability
4	Active, expansive or swelling soil
5	Excavatability of ground
6	Collapsible soil
7	Subsidence
8	Erodible soil
9	Dispersive soil
10	Acidic soil
11	Compressible soil
12	Shallow water table
13	Permeability of soil

- A classification system was developed to distinguish between areas potentially favourable, less favourable and unfavourable for the development of single storey houses. The different geotechnical factors and their severity classes are individually evaluated for each numbered geotechnical area in terms of these three development categories (Table 32). Those geotechnical factors that may pose an environmental constraint for developments such as cemetery sites, waste disposal sites and pit latrines, are indicated by hatching (Table 32).
- This classification implies that for a geotechnical area to be favourable, all the geotechnical factors must be favourable. One or more less favourable geotechnical factor place the geotechnical area in a less favourable class, while one or more unfavourable geotechnical factor classify the site as unfavourable for development.

Table 32: Alphabetical listing of geotechnical factors, their severity classes, development potential classification and those with environmental constraints for the Rietvlei Dam map sheet.

Geotechnical factor Severity class		Development potential	Environmental constraint
Act2	Expansive soil present (expected heave unknown)	Favourable	
Act3	Low Expansion (0-5mm)	Favourable	
Act4	Medium Expansion (5-30mm)	Less favourable	
Act5	High Expansion (>30mm)	Unfavourable	
Col2	Collapse potential present (amount of decrease in soil unknown)	Favourable	
Col3	Low collapse potential (1-5%)	Favourable	
Col4	Medium collapse potential (5-10%)	Less Favourable	
Col5	Severe collapse potential (10-20%)	Unfavourable	
Con2	Area has compressible soil	Favourable	
Ero2	Erodible soil is present	Favourable	
Exc2	Excavatability problems anticipated (unspecified)	Favourable	
Exc3	Slight excavatability problems, refusal at >1,5m on boulders.	Favourable	
Exc4	Moderate excavatability problems, refusal between 0,5 - 1,0m.	Less favourable	
Exc5	Severe excavatability problems, refusal at <0,5m.	Unfavourable	
Inu2	Area at risk for inundation/flooding	Unfavourable	
Per2	Low permeability (<4 × 10 ⁻⁶ - 9 × 10 ⁻¹⁰ cm/s)	Not described in terms of development potential.	
Per3	Medium permeability (<4 × 10 ⁻⁴ - 4 × 10 ⁻⁶ cm/s)		
Per4	High permeability (>4 × 10 ⁻⁴)		
Sha2	Shallow water table present	Unfavourable	
Sin2	Area susceptible to sinkhole formation.	Unfavourable	
Slo2	Unstable slope	Unfavourable	
Sub2	Induced subsidence anticipated	Unfavourable	

- Those geotechnical areas with one or more than one geotechnical factor classified as an environmental constraint (Table 32) are indicated in the Table of Geotechnical factors (Appendix 3). It was necessary to delineate those areas that can be negatively effected by developments such as cemetery sites, waste disposal sites and the facilitation of ground based sanitation systems (pit latrines or septic

tanks). Geotechnical factors classified as an environmental constraint (Table 32) are based on criteria normally taken into consideration during site specific investigations for the above mentioned type of facilities.

6.1.2 Presentation

- The choice of colour assigned to each 'number of geotechnical area', presented in the 'table of geotechnical factors' (Appendix 3), should be decided on by the mapper. The colour of the most problematic geotechnical factor (primary factor) in terms of land-use for the specific 'number of geotechnical area' can be used. The other geotechnical factors (secondary factors) present for that area can be indicated by coloured hatching codes. Each geotechnical factor with severity classes, colour codes and hatching is presented in 'Geotechnical factors: Explanation and severity classes' (Appendix 3).

A distinctive colour was assigned to each geotechnical factor (presented in the table 'Geotechnical factors: Explanation and severity classes' (Appendix 3)). The shade of colour depends on the different severity classes of each geotechnical factor, with the darkest colour assigned to the most severe class (for example Exc5, is dark green) and the lightest colour assigned to the least severe class (for example Exc3, is light green). This is incorporated next to each severity class in the table 'Geotechnical factors: Explanation and severity classes' (Appendix 3), thus reducing the number of tables that need to be read and the complexity of the system. The colour and/or hatching assigned to each 'number of geotechnical area' is presented in the 'table of geotechnical factors'.

As for example the geotechnical area numbered 321 is coloured as a shade of red (as for active clays which is first on the ranking list), although severe excavatability problems represented by the code Exc5 (green is the denoted colour for excavatability) also exists for that specific number and could be regarded as a higher impact than low expansiveness (Act3), as represented in Appendix 2. For this reason, the number of geotechnical area', number 321 should rather be

coloured a dark green (severe excavatability problems) which will immediately highlight the severity of the primary (prominent) geotechnical factor present in a specific 'number of geotechnical area' (Appendix 3). The secondary geotechnical factor (Act3) can then be represented by a coloured hatching code (Appendix 3). The primary geotechnical factor in a specific numbered geotechnical area is shaded in the 'Table of geotechnical factors' (Appendix 3) for easy identification.

Geotechnical areas are classified as areas of different development potential. A distinction is made between areas which are favourable (yellow), less favourable (orange) and unfavourable (red) for development of single storey houses, as shown in the 'Table of Geotechnical Factors'. Those geotechnical areas that may pose an environmental constraint are indicated by hatching. The development potential and environmental constraint of geotechnical areas are presented on a 1:100 000-scale complimentary map. This will provide useful information to the town planner and/or developer and hereby improve the utilization of the map.

Each geotechnical area has a unique number listed in the Table of Geotechnical factors, as well as a superscript number linked to the specific colour code. Permeability was not taken into account with the colour coding, but can be read from the 'Table of Geotechnical Factors'.