

# Physical and chemical characteristics of thermal springs in the Waterberg area in Limpopo Province, South Africa

J Olivier<sup>1\*</sup>, HJ van Niekerk<sup>1</sup> and IJ van der Walt<sup>2</sup>

<sup>1</sup> Department of Environmental Sciences, PO Box 392, Unisa 0003, South Africa

<sup>2</sup> Department of Geography and Environmental Studies, North-West University, Potchefstroom 2531, South Africa

## Abstract

The Limpopo Province in South Africa is richly endowed with thermal springs. Some have been developed for recreational, tourism or other purposes, while a number remain completely undeveloped. If the full economic potential of springs can be realised in a sustainable manner, they could make a substantial contribution to the local or even regional economy. The optimal use of a thermal spring is largely dependent upon its physical and chemical characteristics. This article focuses on the temperature and chemical features of 8 selected thermal springs located in the southern (Waterberg) region of the Limpopo Province, namely Warmbaths, Loubad, Vischgat, Die Oog, Rhemardo, Lekkerrus, Libertas and Buffelshoek. All of these springs are of meteoric origin, with water temperatures ranging from 30°C to 52°C. The mineral composition of the thermal waters reflects the geological formations found at the depth of origin. Changes in land use that occurred over the past few decades have apparently had no impact on the physical and chemical properties of the thermal spring waters. This effect may, however, become evident at a later stage due to a time lag in the migration of contaminants. The fluoride concentration of water from seven of the eight springs (all except Loubad) does not conform to domestic water quality guidelines and makes the water unfit for human consumption. Unacceptably high values of mercury were detected at Libertas. It is recommended that strict monitoring of the concentration of fluoride and other potentially harmful elements should be mandatory whenever the thermal spring water is used for bottling, domestic or full-contact recreational purposes.

**Keywords:** thermal springs, Limpopo Province, water temperature, chemical composition, trace elements