ABSTRACT OF THE PORT ELIZABETH BROCHURE

Divergent climatic types occur in the Port Elizabeth map area.
The narrow Tsitsikamma Coastal Strip has a mild climate with average maximum winter and summer temperatures ranging between 19º and 23º C. This is the only area, apart from a few mountain terrains, where average annual precipitation exceeds 1000mm.

The topography of the map area is, to a large extent, characterised by a number of northwest-southeast striking mountain ranges and ridges such as the Tsitsikamma-Kareedouw, Kouga, Elands, Groot en Klein Wintershoek and the Kap River. These mountain ranges are often separated by valleys and plains such as Lang Kloof, Baviaanskloof and Steytlerville-Kirkwood.

Hydrogeology of the different geological units

- **Fractured Aquifers:** Consolidated hard rocks cover approximately 90% of the map area. This rock mass was formed over a period of about 800 million years, experiencing intrusion episodes in an early stage and subsequently endured several deformation phases.

  Gamtoos Group: The area underlain by the Gamtoos rocks is topographically so dissected, rugged, mountainous and generally inaccessible that it is often difficult to develop groundwater sources in localities where it can be utilized beneficially. The Group is generally not known for its advantageous groundwater potential.
  Table Mountain Group: The TMG consists of four units in the map area, namely the basal Sardinia Bay Formation, the Peninsula Formation, the Cedarberg Formation and the topmost Nardouw Subgroup High yielding boreholes, like the seven production boreholes of the Jeffreys Bay Municipality can be developed in the TMG.
  An abundance of springs issue from the TMG sandstones. Three kinds of springs can be distinguished Fracture and major structure controlled, relatively deep circulating springs with often large constant supplies, for example the Uitenhage Spring.
  Lithologically controlled, relatively shallow circulating springs
  Springs seeping from numerous small fractures and joints, very evident during and shortly following rainy spell.
  Bokkeveld Group: This Group is composed of two Subgroups in the map area namely:
  The basal Ceres Subgroup, consisting of alternating dark grey mudrock, lithozones and dark, very fine-grained muddy sandstone. Borehole yields and groundwater quality vary widely.
  The uppermost Traka Subgroup, consisting primarily of mudrock and rhythmitite and very subordinate sandstone. Borehole yield in the sandstone poor Traka Subgroup, seldom exceeds 5 l/s and are usually well below 1 l/s.
  Witteberg Group: Divided into four units in the map area namely the basal Weltevrede Formation, the Witpoort Formation, the Lake Subgroup and the topmost Kommadagge Subgroup. The largely argillaceous components of the Witteberg Group seldom yield more than 2 l/s in boreholes. Positioning of boreholes on fractures in the sandstone units close to shale units often poses the danger of poor quality groundwater being drawn in from the shale units.
  Dwyka Group: This group is an approximately 600m thick mass of diamicitite which contains a dark grey to greenish argillaceous matrix. Subordinate lenses of shale and sandstone occur sporadically. Due to their dense, impervious nature, the rocks of the Dwyka Group generally offer limited groundwater potential
  Ecca Group: Consists predominantly of laminated and platy argillaceous rocks and subordinate interbedded sandstones. A borehole yield analysis indicates that about 41% of boreholes yield less than 2 l/s. Yields of more than 5 l/s can, however, be obtained in fold, joint and fault structures where favorable recharge conditions exist.
  Beaufort Group: The Koonap, Middleton and Balfour Formations consist of between 70 – 80% of greenish-grey to red mudrock, and between 20 – 30 % sandstone. The Katberg Formation is largely a sandstone unit
  Suurberg Group: This group covers only 0.3 % of the map area. Topographically the area is dissected and rugged and somewhat inaccessible. Very few boreholes were recorded from the Suurberg rocks.
  Uitenhage Group: Represented by three Formations namely Enon, the Kirkwood and the topmost Sundays River Formations. Large outcrops of Uitenhage rocks occur from west of Alexandria to west of Kirkwood, east of Uitenhage north of Port Elizabeth and in the Gamtoos River Valley. The Uitenhage beds are a dense mass of rocks of low permeability. Its groundwater potential is thus limited.

- **Fractured and Intergranular Aquifers:** The only formation in the map area which contains intruded material, classifying it as a fractured and intergranular aquifer, occurs in a limited area southwest of East London. The region is heavily dissected topographically, with many of the dolerite sills capping high ground rendering many of the intrusion contact zones as well as the intergranular properties ineffective in terms of groundwater potential.

- **Intergranular Aquifers:** Covers approximately 10% of the map area and composed of the

  Algoa Group: This aquifer is a unique intergranular aquifer. Water seeps relatively rapidly through the highly porous, sandy calcareous material to the contact with underlying, usually impervious pre_Algoa rocks, from where it moves in the conglomerate seawards. Groundwater quality is generally potable.
  Coastal Sands: Occurs sporadically along the coast from Cape St. Francis to northeast of Port Alfred. It consists of wind-blown sand, overlying beach deposits such as beach sand pebbles and shell fragments.
  Alluvial Deposits: Occur principally along the flood plains of the Sundays, Gamtoos and Swartkops Rivers. It consists of an assemblage of largely unsorted boulders, pebbles, sand and clay.

Taking all the information into account, an analysis of the available data indicates that the highest percentage of water levels shallower than 10 m occur in the TMG and Beaufort Groups, as well as in the Coastal Sands and Alluvial Deposits

Evidence exists of deep groundwater circulation mainly in the TMG sandstones. To elucidate this phenomenon, the tectonics of the CFB and associated fracturing of the deeper sections of the TMG and its groundwater exploitation potential should be studied comprehensively.