GEOPHYSICAL SIGNATURE OF THE PRETORIA SALTPAN IMPACT STRUCTURE AND A POSSIBLE SATELLITE CRATER; D. Brandt, R. J. Durrheim, & W. U. Reimold, Dept. of Geology, Dept. of Geophysics, Econ. Geol. Res. Unit, Dept. of Geology, University of the Witwatersrand, P.O. WITS, 2040, Johannesburg, R.S.A.

INTRODUCTION
The Pretoria Saltpan Crater is located in the southern portion of the Bushveld Igneous Complex, some 40 km NNW of Pretoria, South Africa, at 25°24'30"S/28°04'59"E. An origin by impact for this crater structure was recently confirmed [1]. The results of the only gravity reconnaissance carried out over the crater to date [2] failed to support an impact origin. With the aid of recent results obtained from a central drill-core, it was necessary to carry out more geophysical work which would include a gravity profile of higher resolution. A second, smaller, circular depression (about 400 m in diameter) to the SW of the crater is suggestive of a twin crater. This site had never been investigated, and thus various geophysical surveys were conducted.

RESULTS:
I MAIN CRATER: Thirty-three gravity stations were located along a single north-south traverse (Fig.2), extending ca. 300 meters beyond the crater rim. Both the gravity (Fig.1c) and topographic profiles (Fig.1a) are relative to an arbitrary base station near the crater floor. Due to the severe topography the gravity data reductions included terrain corrections. A centred anomaly (Fig.1c) of -3.2 mgals was obtained. A density of 2.67 g/cm³ was used for the relatively undisturbed surrounding granite. The low density muds, which fill the crater floor, are believed to be the primary contributor to the observed anomaly. Known parameters, i.e., densities and layer thicknesses, were used in constructing the gravity model seen in Fig.1d. The subsurface configuration was approximated using a number of slabs, the strike lengths of which decrease from the centre of the model outwards, in order to simulate the roundness of the actual body in plan view. The various densities used for each slab are tabulated in Fig.1d. The size of the negative anomaly plus the known densities may be used to infer the 3-dimensional geometry of the crater fill. Unlike the earlier interpretation [1], the data presented here appears to be compatible with the anatomy of a simple bowl-shaped impact crater. The magnetic anomaly (Fig.1b) which was obtained along the same traverse as the gravity profile exhibits the known regional trend together with signatures of the lamprophyric dykes found on the northern, inner slopes of the crater rim [3], but rules out the possibility that a magnetic volcanic pipe could exist below the crater sediments.

II POSSIBLE SATELLITE CRATER: The small circular depression (Fig.3), situated some 3.5 km to the southeast of the Pretoria Saltpan Crater is approximately 3 m deep. A very small gravity anomaly (Fig.4b) was found, contrary to what would be expected of an impact crater. However, it most probably represents the regional gravity trend. As in the case of the gravity, the magnetic anomaly (Fig.4a) only represents the regional magnetic trend. It does, however, exclude the possibility of the existence of a magnetic volcanic or kimberlite pipe of some sort. A ground probing radar survey was conducted across the feature, but was unsuccessful in that the wet upper conductive mud unit prevented penetration of the signals. Refraction seismic profiles and resistivity profiles indicated lithological breaks at 0.76 m and 26 m. Trenching revealed a calcrete-type layer at 0.76 m, and it is possible that at a depth of 26 m the granite floor to the depression is reached.

CONCLUSION
The negative gravity anomaly of the main crater that the gravity model produced, as well as the magnetic signature is within reasonable limits of an impact crater of these dimensions. The small circular feature which has the physical shape of a possible satellite impact structure does not show any typical geophysical signatures. As it is the only such feature in the entire area it should not be overlooked as a possible satellite crater. A drilling program may reveal interesting results and an explanation to the still inconclusive geophysical results.

ACKNOWLEDGEMENTS: The authors would like to thank the Barringer Crater Co. for their financial contribution to this project.

GEOPHYSICS OF THE PRETORIA SALT PAN IMPACT STRUCTURE: Brandt D. et al.

Fig. 1. a) Elevation profile across the Pretoria Salt Pan Impact Structure. b) Magnetic profile. c) Gravity profile. Note: right hand mgal scale is for the Fudali et al., (1973) profile only. d) Gravity model: density contrast of the bodies relative to the country rock are given in g/cm³.

Fig. 2. Elevation contour map showing: (a) Profile for this study. (b) Profile of Fudali et al., 1973.

Fig. 3. Oblique aerial view of the small, circular structure to the south-west of the Pretoria Salt Pan Impact Structure, taken from the NW, from a height of about 250 m. Rim-to-rim diameter of structure about 400 m.

Fig. 4. a) Magnetic profile across the small structure. b) Elevation profile with the gravity anomaly superimposed.