ABSTRACT

Electrolytic modelling using the dipole-dipole configuration (of unit dipole length) has been carried out to study the influence of finite strike extent on resistivity and induced polarisation effects. The model bodies 7.85 units (in terms of the dipole length) in length, 2.5 units in width, and 0.5 units thickness were fabricated out of a synthetic resin and graphite powder and had a constant resistivity $(\rho_1/2\pi)$ of 1.17 Ω ft. The resistivity of the surrounding electrolyte could be changed over a wide range to permit the simulation of reflection factor K from - 0.99 to - 0.28. Profiles were run perpendicular to the strike of the body at various positions along the strike over the body and outside it using dipole separations upto 5 units (N = 5). Four different depths of burial and 3 inclinations of the body have been dealt with in detail, the effect of the azimuth of the profiles has also been considered. The results are presented in the form of profiles, surface contours and pseudo-sections.

Among the chief findings are:

(i) The resistivity effects change very little along the strike as long as the traverse falls within the body;

outside the body, however, there is a very rapid change and the body becomes almost undetectable within a distance of 1½ times of the dipole length, and the higher N values show a slight improvement. (ii) A reduction of the resistivity of the surrounding medium leads to a reduction in the detectability of the body, and reaches a saturation for K = - 0.4 showing little variation thereafter. (iii) Shallow and medium depth bodies are better detected by lower N's, and higher N's are better suited to detect deeper seated bodies. (iv) The dip of the body in the range studied here has little effect on the resistivity pseudo-sections but is better indicated by the resistivity profile. In case of induced polarisation effects, it is found (i) both P.F.E. and M.F. effects are concentrated around the body, (ii) on the pseudo-sections the P.F.E. contours tend to dip in the same sense as the body for shallow depths, but in the opposite sense for larger depths. (iii) The induced polarisation effect over the edge comes down to about one half its value over the centre and further reduction takes place outside the body.

The profiles of P.F.E. are generally more complicated than the resistivity profiles, displaying several peaks and valleys depending upon the N used.

It has been found that surface contours of both resistivity and percentage frequency effect yield very

good estimates of the strike extent of the body. A comparison of resistivity values obtained over the bodies also permits a qualitative idea regarding the depth of burial.

A summary at the end includes also a discussion of the usefulness of different N values.

An instrument developed for time-domain induced polarisation studies has been described in detail and some results obtained with it using the Wenner and gradient arrays over the vertical and inclined dykes have been appended for comparison.