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Supplement to the report on
SAMMON'S CREEK GRAVITY DATA
INTERPRETATION

The necessity of writing this supplement arose from closer examination of seismic and gravity data over the area of future drilling location (line 23X) and of the most confusing structural situation (line 107X). As far as gravity is concerned, we found that gravity effects of near surface geology are much stronger, than we had anticipated. This occurs when carbonates of the Hume formation (density 2.75-2.8 g/cc) reach the surface (for instance SP 356-372 of line 107X), making our choice of Bouguer density of 2.35 g/cc incorrect. In such places the Bouguer gravity will be stronger than it should be, because the attraction of carbonates with density contrast of 0.4 g/cc (2.75-2.45 g/cc) was not taken into account. The problem was mentioned in chapter VI of our report (page 14), but only later have we realized that the difference may amount up to 5 mgals or more, depending on the size of outcrops.

The problem of variable density in Bouguer correction is a rather complicated one and is not solved yet in general. In our particular case we solved the problem by computing the gravity effect of carbonates between the surface and sea level by POLYGRAV (assuming a certain geometry) and by subtracting it from previously calculated Bouguer gravity.

The attached (figures 1 and 2) illustrate the process for lines 107X and 23X accordingly. Here the dot-dashed lines represent the original gravity and solid line represents gravity, corrected for near surface effects. Note that such correction reduces the anomaly by 3.5-4.5 mgals and shifts the location of gravity maximum to the south-west (to the left on profile display). After this correction was made, we created the geological models, based strictly on seismic interpretation and calculated the gravity effects of these models. We purposely did not make any alterations of geological models in order to find out which one is closer to the reality. Finally we came to the following conclusions.

<u>Line 107X</u>

1. <u>The anticline model</u> (fig. 1,a) evidently is very far from reality and <u>must be abandoned.</u>

2. <u>The second model</u> (fig. 1,b) is qualitively better and <u>supports the thrust hypothesis.</u> That forced us to change our original interpretation of southern anomoulous trend as caused by deep seated normal fault. Now we think of it as the second thrust, roughly parallel to the northern one. That fits better into the regional tectonic framework and can be confirmed by gravity and seismic data from other lines. The appropriate change has been made in structural interpretation map (plate 4).

3. We still cannot adequately explain the observed gravity over the "wedge" between SP 368-388. Observed gravity strongly suggest that low density material should be placed there in order to eliminate the strange "hump" in calculated gravity between SP 368-400. We have no choice but to conclude that the "wedge" is primarily Cambrian section, which is the only low density material available. The question of its origin - whether it has been introduced into section by intricate thrust tectonics or it is a primary sedimentary feature (as we originally suggested) - remains open.

Line 23X

1. As we can see from figure 2 (part "A" represents our original interpretation, part "B" - interpretation after correction for near surface effects), the interpretation here is considerably simpler and is dominated by the same two major thrust planes which we see on line 107X. The problem which we can't explain on this line is that to the northeast of the thrust faults the modelled gravity is much higher than the observed gravity. We could explain this by increasing the depth of the Hume (thus increasing the vertical offset caused by the thrust fault), but this is badly at odds with the seismic picture. We can only suggest that there is some fundamental change (decrease) in the density of the Protoerozoic section as one goes northeast. We realize that this is an ad hoc arguement, but we have no better explanation.

2. In terms of the drilling decision for the proposed well on line 23X, the major question as we see it is where the thrust fault is just NE of the proposed location. We place it where we do (reaching the surface at SP 507) based on the inflection point of the observed gravity, the break slope, and the occurence of carbonate outcrop as defined by shothole logs. It could be up to 5 shot points farther to the northeast, but we doubt it. The depth at which the drill will intersect the fault plane cannot be constrained by gravity modelling, although we believe our model is the most reasonable picture. However, given the uncertainty of the interpretation and the need to know where the second fault plane is in order to establish a regional interpretation in which one can have confidence, we suggest that the well be planned to intersect the second fault plane if that is within reach of the rig chosen. There is always a small chance of thin Cambrian slice being repeated, but we believe the prime justification for a deep well is (1) the risk of error in the present interpretation and (2) the need for stratigraphic control.

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