In addition to the continuous record of penetration rate, a plot of penetration rate versus depth will be maintained by the mud logger. The plot should not lag more than 15 feet behind total depth. As it becomes available, lithologic data will be recorded on the same log. The mud logger will make the log readily available to rig supervisory personnel at all times.

The "d" Exponent

It is anticipated that an automatic driller may not be available, and if available, may fail to function properly. Therefore, the "d" exponent for shales will be plotted versus depth to establish bit dulling trends. Departure from the normal trend toward lower values of "d" will be considered a definite indication of abnormal pressure. To be most effective, the exponent should be plotted for each 10 feet of shale drilled.

Surface Shale Density

The mud logger will maintain a plot of surface shale density versus depth. Density determinations are to be attempted every 10 feet or as often as drilling rate permits. Every effort will be made to effect measurements on clean shale samples only. All data obtained are to be plotted on the same log on which penetration rate and lithology are recorded. Shale densities which fall above the gradually increasing trend line are to be considered a definite indication of abnormal pressure.

Pressure Kick

A true pressure kick will be sufficient evidence of abnormal pressure. The well is to be logged following containment of the kick.

Secondary Methods For Abnormal Pressure Detection

Connection Gas and Trip Gas

An increase in gas from connection to connection or from trip to trip can be indicative of a gradually decreasing overbalance. The mud logger will continuously monitor gas content.

Gas Cutting

Although gas cutting perse is not an indicator of higher pressure, continued gas cutting while circulation can indicate that a complete bottoms-up circulation is advisable so that shale densities can be checked.

Sloughing Shale

An increase in cuttings can be indicative of underblanced conditions. Long shale slivers with sharp, angular edges and curved surfaces can be expected if a shale interval is drilled underbalanced.

Torque and Drag

An increase in shale cuttings can cause an increase in torque and