APPENDIX 4

PETROLOGY

WEST MEREENIE #7, 4270' 0" - PETROLOGICAL ANALYSIS

1. INTRODUCTION

The sample provided for analysis was a 38mm diameter core plug for which the following core analysis results were determined:

SAMPLE NUMBER	DEPTH (Ft.)	POROSITY (%)	PERMEABILITY (md)
Core #2, samp. 3	4270.0	6.6	0.1

The petrological analysis was based on thin-section examination only and no additional analyses such as X-Ray Diffraction analysis or Scanning Electron Microscopy were carried out. The composition of the rock was determined by point counting 300 points in the thin-section.

2. TEXTURE

The rock is a fine sandstone with an average grain size of 0.13mm. It is moderately sorted despite the evidence of extensive bioturbation of the sample.

3. COMPOSITION

The composition of the rock from point count analysis is as follows:

QUARTZ	CHERT	FELDSPAR	IGNEOUS ROCK FRAGMENTS	METAMORPHIC ROCK FRAGMENTS	SEDIMENTARY ROCK FRAGMENTS	MICA	HEAVY MINERALS	OPAQUES	CARBONATE	CLAY	VISIBLE POROSITY
67.0	-	11.7	-	-	0.3	2.7	0.7	-	1.3	14.3	2.0

Feldspar is almost entirely of potash type and includes orthoclase, microcline and perthite. Plagioclase makes up less than 1% of the rock.

Lithic fragments are extremely rare and consist mainly of shale clasts possibly introduced during bioturbation.

Biotite appears to have been originally the most abundant mica in the rock although most of the mica has since degraded to illite clay.

Heavy minerals are rare but grains identified include tourmaline zircon and sphene.

The carbonate consists mostly of siderite which forms an intergranular cement but is extremely patchy in its distribution. Isolated patches of anhydrite cement are also present in the rock although the irregular distribution of this mineral caused it not to be recorded in the point count analysis.

By Pacoota standards the sample is relatively rich in clay although the 14.3% result is elevated by the inclusion of microporosity between the clay crystals which cannot be resolved under the optical microscope. The clay appears to be illite although positive identification would require the use of XRD analysis. The clay occurs as a pore filling and it also forms a coating on the framework grains throughout much of the rock.

4. DIAGENESIS

Quartz overgrowth cementation is widespread through the rock and is one of the main causes of porosity reduction. In some places where clay is almost absent, overgrowth cementation has been complete and no porosity remains. The small amount of siderite and anhydrite cement also contributes to porosity loss.

Probably the most important diagenetic process is the formation of authigenic illite clay which occurs as a grain coating and pore filling throughout most of the rock. Much of this clay appears to have formed from the decomposition of mica which was abundant in the sand when first deposited. Some detrital illite was probably also present in parts of the rock but this cannot now be separately distinguished from authigenic clay. The presence of this clay has restricted the development of quartz overgrowth cement and has allowed the retention of some porosity in the rock. Some of this porosity has been lost by partial dissolution at grain contacts to form sutured grains and microstylolites which are widespread through the clay-rich parts of the rock.

A small amount of secondary porosity has developed as a result of the dissolution of isolated framework grains, mostly feldspars, and possibly some carbonate cement.

5. POROSITY AND PERMEABILITY CHARACTERISTICS

Diagenetic changes have virtually eliminated primary, intergranular porosity and in those parts of the rock which are relatively clay-free, total cementation by quartz overgrowths has occurred. In addition, small amounts of siderite and anhydrite cement further contribute to porosity reduction.

Throughout much of the rock however, overgrowth development has been restricted by the presence of illite clay which coats grain surfaces and fills most of the available pore space remaining as a result of incomplete overgrowth development. Consequently, although the rock has moderate porosity by Pacoota standards, this porosity is mostly microporosity occurring between the clay crystals. A high proportion of microporosity severely restricts permeability and accounts for the core analysis result of 0.1md which is consistent with the rock characteristics apparent in thin-section.

A small amount of secondary porosity is present in the rock as a result of dissolution of some framework grains, mostly feldspars, and also possibly some carbonate and anhydrite cement. This secondary porosity is of limited extent with pores often lacking interconnection and consequently it does little to improve permeability.

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