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December 8, 1989

Dr. Anthony W. Gorody
Senior Scientist
Basic Research
Gas Research Institute
8600 West Bryn Mawr Avenue
Chicago, Illinois 60631

Subject: Contract No. 5089-260-1855
Monthly Technical Report

Dear Dr. Gorody:

Enclosed are four copies of the Monthly Technical Report for the month of November 1989.

We wish to thank you and the other GRI personnel who have helped in getting this project operational.

Sincerely,

Wilford L. Forsberg
Treasurer

Enclosure

cc: M. L. Allison
J. B. Hulen
D. L. Nielson
D. A. Petty
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DEFINITION OF STRATIGRAPHIC HETEROGENEITY USING DIPMETER LOGS

Monthly Report
November 1, 1989 through November 30, 1989

Prepared By:

THE UNIVERSITY OF UTAH RESEARCH INSTITUTE

Jeffrey B. Hulen
M. Lee Allison
Dennis L. Nielson
Wilford Forsberg

For

GAS RESEARCH INSTITUTE

Contract No. 5089-260-1855

GRI Project Manager
A. W. Gorody

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1.0 Work Planned for the Month

Planned work for November 1989 centered on initial measurement of sedimentary body geometries, in outcrop of the fluvial and wave-dominated deltaic sandstone facies of the Upper Cretaceous Ferron Sandstone Member of the Mancos Shale. The measurements, collected at representative Ferron exposures in central Utah, were to be plotted in preliminary fashion to allow assessment of their merit in potential characterization of such sandstones through analysis of dipmeter logs, particularly using statistical curvature analysis techniques (SCAT).

2.0 Work Completed During the Month

On November 10, a meeting was held at the University of Utah Research Institute in order to coordinate the following week's field studies at Ferron Sandstone outcrops near Ferron and Emery, Utah, on the gently southwest-dipping flank of the Laramide-age San Rafael upwarp. M. Lee Allison, Jeffrey Hulen, Susan Lutz, Dennis Nielson, and consultant (and Ferron sandstone expert) Paul Anderson concurred at this meeting that the initial work should involve measurement of all possible planar and curviplanar features in selected vertical sections of the Ferron Sandstone at sites visited during the August 1989 orientation field trip. The rationale in this approach was to simulate, as closely as possible, an ideal dipmeter-log trace at each site. The resulting data would be plotted as SCAT diagrams in order to begin ascertaining the utility of this technique in discriminating various sandstone structures and facies.

Following this meeting, the month's field studies, completed the week of November 13, were planned to coincide with those of Noel Tyler and his colleagues from the Texas Bureau of Economic Geology (TBEG). During this time, at the Muddy Creek site, in sec. 13, T22S, R6E, near Emery Utah, TBEG conducted in situ permeameter studies of a thick Ferron delta-front and fluvial sandstone sequence. Discussions with Tyler's group, and with visiting geologists Rex Cole and Art Trevena from Unocal Corporation, greatly assisted selection of sections for detailed measurement. Moreover, Cole and Trevena, who conduct Unocal field training seminars focused on the Ferron, kindly provided, for examination and discussion, slabbed core from a nearby shallow drill hole. Comparison of the fresh Ferron core with its weathered equivalents was also very helpful to our outcrop work.

Four detailed sections were measured near the site of the TBEG permeameter studies. The sections, ranging in thickness from 16.5 ft to 63.1 ft, spanned lower- and upper-shoreface, marine-delta front sandstones into stacked sandstone sequences of fluvial-channel origin. The data derived from these sections provide clues to differences in the two sandstone types that can be measured by the dipmeter log.

Planar and curviplanar features likely to be recorded by the dipmeter log in the measured delta-front sandstones, including bed boundaries, set boundaries, and internal stratification, show predominantly shallow dips and a wide range of dip azimuths. These features generally dip at <10°, with occasional dips approaching 20o measured on local trough cross-bedding. By contrast, dips of all these features commonly exceed 20° and locally exceed 30° in the fluvial sandstone sequences. Dip azimuths of all features show a wide range, but definite preferred orientation is believed to reflect paleocurrent directions of individual channels. Convolute bedding high in one channel sequence not unexpectedly shows extreme variability in both dip angles and azimuths.

3.0 Associated Work

None.

4.0 Problems Encountered

None.

5.0 Work Planned for Next Month

During December, weather permitting, additional Ferron Sandstone sections will be measured in a marine-dominated portion of the unit a few miles north of the Muddy Creek site. The data collected from these sections will be compared with those from the dominantly fluvial Muddy Creek rocks and plotted as hypothetical dipmeter logs and SCAT diagrams to assess their usefulness in identifying such rocks using dipmeter analysis. Our field data has been sent to our consultant Andy Bangston for his analysis.

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