Reservoir description and production characterization of the Lower Zone of the Hibernia Formation as tested in the HMDC Hibernia B-16_2 well, Hibernia Field, Offshore Newfoundland.

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HMDC Hibernia B-16_2 was the second well drilled from the Hibernia Platform, a gravity based structure located in 80 m of water, 315km southeast of St. John's, Newfoundland. This deviated well was drilled to a total depth of 4477m and was evaluated with a series of cores, logging while drilling (LWD), open and cased-hole wireline log suites. Following rig release on November 30, 1997 a total of 38.0m of perforations were completed and the well was put on production with peak rates of 7,300 m³/d (~46,000 bbls/day). Excellent reservoir quality and crude oil characteristics have contributed to a productivity index (PI) of 4.5 m³/day/kPA (195 bbl/day/psi).

This core display will illustrate the nature of selected perforated zones from the interpreted upper delta plain setting of the Lower Zone of the Hibernia Formation (“B4” pool). Approximately 120m of 102mm diameter core was recovered using conventional and gel-coring techniques. Analytical results from routine core analysis have recorded transmissivity (kh) values of 210,000mD-m over the gross perforated interval, with average porosities of 18%. Very high permeability values (>10,000 mD air) derived from log analysis have been corroborated by tests of core plugs conducted at reservoir conditions. Additionally, preliminary well test analysis indicates effective permeability to oil in the range of 3,000 mD. These permeabilities are attributed to a well-connected network of pore spaces preserved in medium to coarse-grained sandstone with moderate silica overgrowths and minor clay minerals.

Acquisition of borehole images was limited to the RAB/ADN* (Resistivity-at-the-Bit, Azimuthal Density Neutron) tool. LWD resistivity images are not as detailed as standard wireline images, but they do show some features associated with the stacked sequence of multi-storied channel, bar, and abandonment facies recovered in the core. Dips picked from shale intervals of the LWD resistivity images result in a structural dip of 3 degrees toward N4W which is consistent with the seismically interpreted structural dip of about 5 degrees to the north. The computation of current bedding directions is problematic due to image resolution. Preliminary work has shown, however, that bedding features within sands is more varied than the regional south to north direction determined from other wells in the field. This comparison of core with RAB images will demonstrate the uses and limitations of current LWD imaging technology in the Hibernia field development.

Cased hole logging first confirmed adequate cementing of the 178mm liner. Baseline measurements of pressure and temperature were recorded by a permanent downhole gauge located 296m above the midpoint of perforations. Initial reservoir pressure and temperature were determined to be 39,759 kpa and 98 °C respectively. The spinner portion of the CPLT production logging tool confirms formation fluid influx to the wellbore proportional to the permeability-net thickness product (kh) from core across the same interval.

Future work will involve additional analysis of all petrophysical and analytical data and monitoring of possible gas migration (or pressure support) from above an apparent gas-oil contact that was picked from Modular Formation Dynamics Tester (MDT*) pressure test gradients. Incorporation of data from wells proposed to be cored in the future will also provide a means to address issues of reservoir continuity, once water and gas injection is scheduled to begin in Q2 1998.

* Mark of Schlumberger123