Figure 2. Slabbed core from a typical tight-oil reservoir.

Unconventional tight-oil reservoirs consist of fine-grained, organic-rich rocks that are not porous and permeable like conventional reservoir rocks, such as sandstones and carbonates.

Most tight-oil reservoir rocks were deposited in the still waters of ancient seas where nutrient-rich environments created abundant growth of organic flora. Over millions of years, the deposition of fine-grained silt and clay particles with the abundant flora produced shale layers hundreds of feet thick. These organic-rich shales generated billions of barrels of crude oil as the layers were buried under thousands of feet of accumulated sedimentary rocks.

Figure 2 shows an organic-rich core from the Bakken development, which may be the largest onshore oilfield in North America and is the most active of all tight-oil developments. Last year over 1,700 producing wells were drilled into the Bakken, and it is currently producing over 900,000 BOPD.

The opportunities for Core Laboratories in the development of tight-oil reserves begin with drilling and coring operations, continue through completion and stimulation of the wells, and last as long as crude oil is produced to the surface.

Each of Core's three operating segments has multiple opportunities to provide services that help optimize reservoir performance in tight-oil developments.

RESERVOIR DESCRIPTION SERVICES

As shown in Figure 3, many tight-oil developments, such as the Bakken, Eagle Ford, and especially the Permian Basin, have multiple stacked tight-oil zones.

In this example a vertical well is drilled down into tight-oil Zone A, from which horizontal wells are drilled in opposite directions. Each lateral section in Zone A extends 9,000 feet from the vertical wellbore.

Laterals are subsequently drilled from this vertical well into Zones B and C. Lateral lengths are determined by reservoir rock quality and numerous other parameters, many of which are evaluated by Core Laboratories.

A second vertical well is drilled to enable complete development of the multiple stacked tight-oil zones, including a dual-lateral well, stretching 12,000 feet in each direction, in the thick and prospective Zone E interval.

The cored interval from a prospective tight-oil reservoir shown previously in Figure 2 is typical of the rock that Core Lab will analyze to determine the reservoir quality. Core Lab has analyzed hundreds of thousands of feet of core from unconventional tight-oil reservoirs, most from North America, especially the U.S., but from many international prospects as well.