
WILSON M. LAIRD CORE AND SAMPLE LIBRARY

By Ed Murphy

Introduction

The North Dakota Geological Survey has stored the drill cuttings (samples) and rock cores from oil and gas wells drilled in North Dakota since 1918 when the first oil and gas permit was issued to the Des Lacs Western Oil Company to drill the Blum no. 1 in Ward County. In 1942, the first rock core was cut in North Dakota by Carter Oil Company while drilling the Semling no. 1 in Oliver County. State law requires oil companies to collect drill cuttings every ten feet in a vertical well and every 30 feet in a horizontal well. These cuttings and a representative section of any rock core that is obtained are to be submitted to the Geological Survey for archiving in the core and sample library. Because these laws were enacted prior to the discovery of oil in the state, we have one of the most complete collections of drill cuttings and cores in the nation.



Figure 1. Core and samples (drill cuttings) laid out on a work table in the laboratory of the core library. The core on the left is a rocker core of limestone taken from the Mission Canyon Formation at a depth of 3,780 feet in Tom F. Marsh's Clark no. 1 well in Burleigh County. The whole core on the right is limestone taken from the Mission Canyon Formation at a depth of 3,400 feet in I.J. Wilhite's Jensen U.C.L.I. no. 1 well in Bottineau County. The drill cuttings in the sample pan in the foreground are shales and mudstones from the Bakken Formation at a depth of 10,220 to 10,230 feet in Terra Resources Kling no. 1-7 well in Dunn County. More than half of the core in the core library is whole core that will eventually be slabbed and photographed.

Oil and Gas Drill Cuttings and Cores

For sixty years, samples and cores were stored in various buildings on the campus of the University of North Dakota, moving from one to another as they outgrew each location. The current facility, the Wilson M. Laird Core and Sample Library, was built in 1980. The 20,000 square-foot core library houses more than 150,000 three-foot-long boxes. Approximately 120,000 of these boxes contain core and 30,000 contain drill cuttings. We archive cuttings from 11,600 of the 15,300 oil and gas wells that have been drilled in North Dakota, along with 375,000 feet of core that was obtained from 3,900 wells (fig. 1). Coring adds additional cost to a well, which is one of the main reasons that only 25% of the oil wells are cored. Cores typically range in length from 20 to 200 feet with an average length of 38 feet. There are three notable exceptions to this rule; the Blanche Thompson No. 1, the Solomon Bird Bear No. F-22-22-1, and the Angus Kennedy No. F-32-24-P. These three wells were drilled between 1951 and 1954, at a crucial time when both the Geological Survey and industry were trying to determine the character, age, and thickness of rocks in the Williston Basin, especially the older, deeper rocks. To that end, the companies drilling these three wells did extensive coring. In 1951, the Blanche Thompson was drilled by the California Oil Company in Bottineau County. A total of 1,664 feet of core was obtained from rocks ranging in age from Cretaceous to Precambrian at depths of 2,740 to 8,270 feet. The Angus Kennedy was drilled in 1954 by the Socony-Vacuum Oil Company in Dunn County. A total of 1,480 feet of core was obtained from rocks ranging in age



Figure 2. Core from the Solomon Bird Bear well fills the bottom two rows of bins on the left side of the photograph all the way down the first aisle of the core and sample library. Core from the Blanche Thompson well occupies the bottom two rows all the way down the aisle on the right side.



Figure 3. On the left: The view visitors had walking through the front door of the core library for the past 19 years. Julie LeFever's (subsurface geologist and manager of the core facility) makeshift office is to the left, in a space originally designed to be a laboratory. On the right: the view visitors now see.

from Pennsylvanian to Devonian between depths of 7,500 to 11,300 feet. The most impressive well by far, however, is the Solomon Bird Bear. In 1954, the Mobil Producing Company drilled the Bird Bear well in Dunn County. Mobil cored 4,735 feet of rock in this 13,480 foot-deep well, a truly staggering amount of core. Even more impressive, the basal 3,000 feet of the hole was continuously cored. As a result of this well, we have, near the center of the Williston Basin, good control of rocks ranging in age from Pennsylvanian to Devonian and a continuous record of Silurian and upper Ordovician rocks (fig. 2).

Core Library Remodeling Project

The core library consists of a sample and core warehouse, a laboratory for core and sample study, and a second lab area that has been used for office space since 1989. In 2006, we were told by contractors that the roof was beyond repair and would have to be replaced. In addition, acid vapors had corroded all the exposed metal surfaces in the laboratory (light fixtures, air ducts, etc). These vapors were generated when Survey and industry geologists, as well as university students, working in the laboratory tested for the presence of calcium carbonate by dropping a weak solution of hydrochloric acid (10%) onto rocks. During the 2007 legislative session, funding was approved for repairs and remodeling. The repairs included replacing the old leaking roof, while remodeling included renovation of the laboratory, complying with the fire code, installing brighter lighting throughout the building, adding a reception area and a microscope room, and creating offices in an area that had been used as "temporary office space" by the core

library manager for the past 19 years (fig. 3). We installed an air exhaust system in the laboratory so we could vent acid vapors to the outside. Display cabinets were also installed in the reception area. The cabinets contain North Dakota rocks, minerals, and fossils as well as items related to Wilson M. Laird, State Geologist of North Dakota from 1941 to 1969 (fig. 4). We occasionally run student tours through the facility and the display cabinets will be a focal point of those tours. In addition, we have a number of industry geologists from throughout the country who come to the facility to view core who will appreciate the display.

A large-scale remodeling project such as this is disruptive no matter when it takes place. Unfortunately, the timing of this project was especially inconvenient, occurring during the last quarter of 2007 and the first two quarters of



Figure 4. The newly installed display cabinets and portrait of Wilson M. Laird in the reception area of the core library.

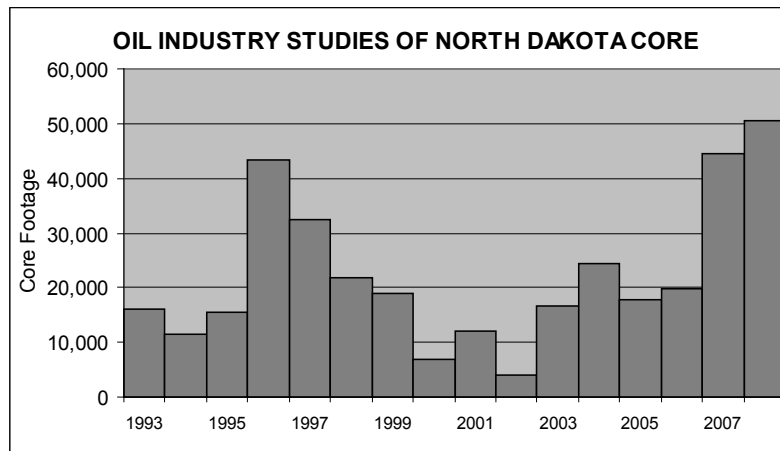


Figure 5. Interest in the Bakken Formation resulted in record usage of the Wilson M. Laird Core and Sample Library by industry in 2007 and 2008. Totals for December 2008 had not been compiled when this article went to press.

2008 while we were experiencing the highest usage of the core library by industry in the last 15 years (fig. 5). Over the last two years, increasing numbers of industry geologists and engineers have been studying cores from the Bakken and Three Forks Formations, along with the other oil-producing horizons, to determine where to purchase acreage, where to drill oil wells, and how best to complete those wells. Typically, an industry geologist will study 1,000 feet of core during a two-or-three-day visit to the core library (fig. 6).

Photography and Reboxing Projects

As noted in the January 2006 DMR Newsletter (vol.33, no.1), the Geological Survey began photographing cores, thin sections, and acetate peels in the latter half of 2004. So far, we have photographed 48,500 feet of core as well as 15,100 thin sections and 700 acetate peels that are in the core library archives. This has generated more than 205,000 photographs for the Oil and Gas Division's subscription website. Virtually all of the nonconfidential Bakken, Three Forks, Birdbear, and Ratcliffe core has been photographed and placed on the website. In addition, we have replaced 10,400 damaged boxes and will replace another 30,000 boxes in the future.

Core Library Open House

We held an Open House on December 10, 2008 to commemorate the repairs and remodeling to the 28-year-old building. Legislators and University officials were the primary attendees. A number of posters were displayed throughout the building to illustrate the many functions we perform. Core from the Bakken and Three Forks Formations was displayed in the laboratory. Refreshments were served courtesy of the North Dakota Petroleum Council.



Figure 6. Kent Hollands (laboratory technician) removes core from the shelving to be studied by industry geologists. Removing and returning core to the upper six rows of shelves is a much more difficult task. For a typical two-or-three-day industry core study, we pull 330 boxes (weighing a total of about 13,000 pounds) from the shelves, place them in the laboratory for study, and then return them to the shelves when the scientists are through examining them.