

Iowa Geological & Water Survey Rock Library

Located among the corn fields northwest of Coralville, on the University of Iowa's Oakdale Campus, is one of the state's most unusual libraries. The Iowa Geological and Water Survey (IGWS) Oakdale Research Facility houses the IGWS Rock Library, a collection of rock samples that constitutes the primary resource for our understanding of the geology of Iowa. The library includes rock samples from over 38,000 sites around the state, most of which were collected during the drilling of water wells. Additionally, the library contains almost 465,000 feet of drill "core" (cylinders of rock drilled for research programs) and rock samples collected at quarries and natural exposures by IGWS staff geologists.

Drill Chip Samples

The water well samples are small chips of rocks that are washed out of a drill hole during rock-bit drilling, the most common drilling technique. These samples were provided by well drillers, who collect "cuttings" (chips of the rocks being drilled) through successive five-foot depth intervals, and place these cuttings in sample bags which are labeled to identify the well and sample depth. The drillers also prepare a logbook in which they note the rock intervals penetrated, casing used, depth of water, and other pertinent information. IGWS personnel regularly visit well drillers to collect the samples and logbooks. When these samples arrive at the Rock Library, the information from the drillers' logbooks is entered into a computerized sample tracking system and the well is assigned a unique number called a "W-number." Next, the well samples are prepared for microscopic study. Each sample bag is opened and a portion of the sample scooped out and washed to remove mud used in the drilling operation. The sample is then dried and placed in an envelope which in turn, is placed inside a larger envelope that contains some of the unwashed material from that interval. The envelopes are labeled with the W-number and depth interval, and when all samples from the well have been processed the samples are boxed and shelved for future study.

Study of Chip Samples

Selected sets of well samples are studied by IGWS staff geologists and [striplogs](#) are produced, with deep wells (in excess of 1500 feet) and municipal water wells having the highest priority. Each sample is examined under a binocular microscope to identify the "lithologies" (rock types), proportions of each lithology, fossils, mineral grains, and other characteristics of the sample. This information is recorded on a long strip of cardboard called a "stripllog." In addition to a written description of each sample, the stripllog includes a graphic description which displays each lithology as a color and includes symbols for fossils and minerals. When all samples from a well have been studied the "stratigraphy" (the names of the various geologic units encountered during the drilling) is identified and

indicated on the striplog. Finally, the striplog is completed by filling in the "header" information at the top of each striplog, including the well location, owner, driller, dates drilled and studied, and other important information. Information from these striplogs is then entered into a computer database. The striplogs are archived in the IGS main office in Iowa City where they are accessible to geologists or the general public.

To date, the IGWS Rock Library has cutting samples from 38,360 wells, including over 1.5 million samples representing over 9.8 million feet (1869 miles) of drilling. This sample saving program is strictly voluntary, however, the saving of samples is required for all permitted wells (wells that will produce in excess of 25,000 gallons of water per day) and for oil, gas, and mineral exploration wells.

Drill Core Samples

In addition to the cuttings samples, the Rock Library contains cores from over 1,697 research wells, totaling over 464,000 feet. These cores are drilled using a special drill bit that looks like a short length of pipe impregnated with diamonds on one end. These diamonds bore through the rock, cutting out a cylinder of rock which is recovered through the center of the hollow drill pipe. Many of the cores in the IGWS Rock Library were drilled and donated by mineral research companies, gas companies who drilled cores to access and evaluate underground storage facilities, mine and quarry operators in Iowa, and consultants who collected the cores in the course of environmental studies. Additionally, many of the cores were drilled by the Iowa Geological & Water Survey, which operated its own research drilling program from the early 1970s until late 1992. These cores are especially valuable for geologists, since the cores provide a virtually continuous look at rocks which normally lie deeply buried, some not exposed anywhere in Iowa. These cores range in size from over 4" in diameter down to about 1", and provide researchers with material to test the rock for minerals, collect and identify fossils which are used in stratigraphic identification, test the rock's "porosity" (its ability to hold water, oil, or gas) and "permeability" (the ability of water, oil, or gas to move through the rock), and its structural properties.

Computerization of Sample Data

Information from the samples in the IGWS Rock Library is currently stored in several computer database files. [GEOSAM](#), the IGWS geological sample tracking program, contains the header information for each W-number, each well's current status (studied or unstudied), and the physical location of the samples in the library. GEOSAM also links other databases which contain additional information for each W-number. The GEO program contains generalized information about the lithologic and stratigraphic information from all wells that have been studied (about 21,690). GEO is currently being updated to include all of the information that is currently recorded on striplogs. A series of

other computer databases are also employed to provide easy access to such information as water quantity and quality. These computer databases are accessible to IGWS staff geologists and constitute a primary tool utilized by staff to respond to information requests and for research projects. These and other databases are continually updated and made available to other state agencies and the public through the Iowa Department of Natural Resources-Natural Resources Geographic Information System.

A Resource for Today and Tomorrow

The IGWS Rock Library contains rock samples that have been collected and studied almost continuously since 1933. It would cost over \$185 million to commercially drill and recollect the cutting samples repositied in the library today. Preparation and study of these samples would cost an additional \$13 million. To drill the core samples in the rock library today would cost \$50 million, with an additional \$2.0 million required to prepare and study the cores. The **total replacement value of the drill samples in the IGS Rock Library is about \$250 million**. The library represents an irreplaceable resource for the citizens of Iowa!

The IGWS Rock Library continues to grow. Recent changes in requirements for well drilling associated with the Iowa Groundwater Protection Act of 1987 have led to an increase in the number of well samples received at the library. In 1991 the library received a record 420 sets of well samples totaling about 140,000 feet. These well samples constitute the greatest source of information on the subsurface geology of Iowa. Study of these samples allows IGWS geologists to improve our understanding of the nature and distribution of the rock and water resources of Iowa, knowledge necessary to locate the groundwater utilized by the citizens and industries of Iowa, to assess its quantity and quality, to evaluate and properly utilize the State's mineral resources, and to encourage exploration for potential future resources such as oil or gas.

As government, industry, and the general public become increasingly conscious of environmental concerns, the need for a detailed understanding of the State's geology will be of primary importance to preserve and even improve the land, water, and air quality in Iowa. The IGWS Rock Library will continue to acquire, analyze, and reposit rock data for Iowa, and will make this information available to everyone in as complete and easily accessible a format as possible.