

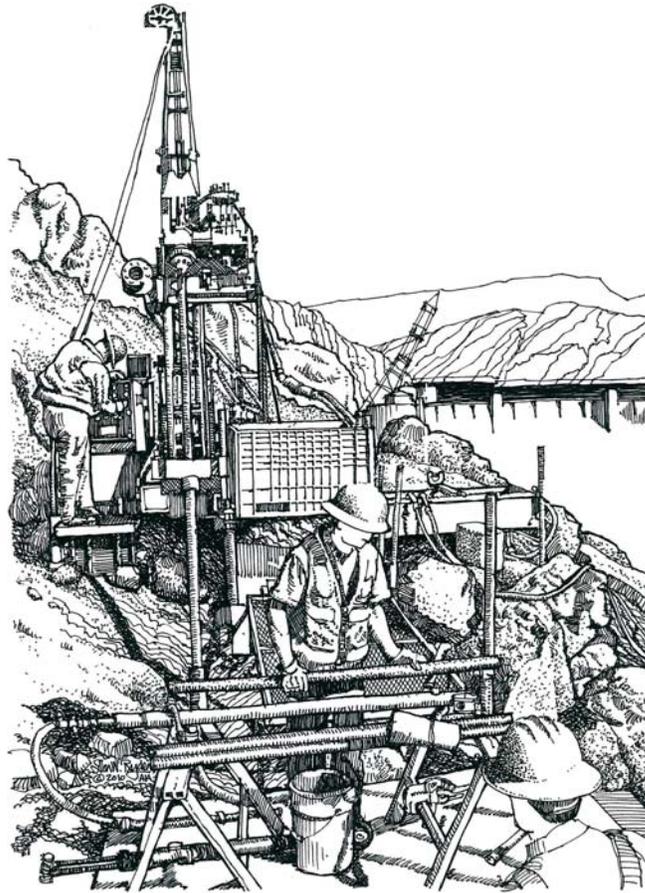


**LAND SURVEYING ABOVE**

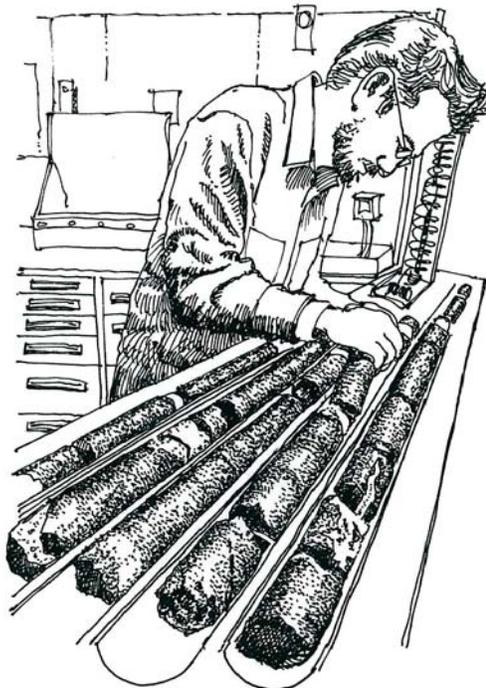
The bridge engineers needed accurate measurements of the land surface to help them fit the River Bridge perfectly into the rugged canyon.

Land surveyors carefully drew topographic maps to record the width of the canyon and the height of the cliffs where the roads meet the bridge. These contour maps were used to determine the location for placing the foundations on the canyon face.

For the roadways approaching the River Bridge, the landform maps and cross sections showed the civil (highway) engineers where to cut the hills, fill the valleys, and bridge the canyons. Their goal was to balance the amount of rock that they had to move within the project area. They tried to avoid the great expense of moving rock to or from the site. Engineers used computer models of many possible earthwork designs to find the most practical and economical placement of the new roadways.



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**ROCK CORE BORING BELOW**

Geotechnical (rock and soil) engineers bored deep into the earth searching for solid bedrock upon which to build the River Bridge foundations.

In some places, the upper layer of rock was not strong enough to support the heavy foundations. Only deeper solid bedrock could bear the structural loads. Large boring machines drilled deep into the earth to pull up rock cores. These two-and-one-half-inch-round rock cores were sometimes over thirty feet long. They showed the depths where layers change from fragile to firm. Dozens of borings were needed to cover the foundation locations because the strength of rock can vary just yards apart.

Engineers boxed and labeled the rock core segments as they removed them from the earth. They sent cores to the laboratory for strength testing. The geotechnical engineers compared the rock cores to determine the best type and depth of foundations to build.

**The rock cores displayed nearby are actual samples bored from the River Bridge foundation sites. These cores were used for guiding the design of excavations and foundations.**