total organic carbon ranges from 0.57 to 7.81 and the vitrinite reflectance is 1.2 R_O.

Although no coal was cored, a gas estimate ranging from 1.0 to 1.5 bcf/sq mi (0.07 to 0.11 billion cu m/sq km) was calculated using a graphic solution based on existing coal desorption data from other areas. Coal beds were identified from geophysical logs in the stratigraphic interval from the Tertiary Fort Union Formation through the Upper Cretaceous Mesaverde Group; coal rank was determined from a vitrinite reflectance profile in the Pacific Creek area. The aggregate thickness of coal in this interval is 200 ft (61 m), and the coal rank ranges from high volatile C bituminous to medium volatile bituminous.

The results obtained in this limited study indicate that the direct method of gas desorption works at great depths and provides what appears to be fairly reliable gas estimates. Calculations of the amount of gas contained in coal beds show that a very large volume of gas has been generated.

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Environment Favorable for Deposition of Uranium, Jefferson River Basin, Southwestern Montana

Evaluation of 2° quadrangles for the U.S. Department of Energy's National Uranium Resource Evaluation (NURE) has shown that numerous Tertiary basins in southwestern Montana are potentially favorable for uranium deposits. However, only a few criteria essential for uranium deposition have been substantiated in each favorable basin. These criteria include one or more of the following: demonstrable source rock, evidence that uranium has been leached from the source and transported in surface or ground water, favorable host lithologies, potential reductants, and permeability contrasts. A small area of the Jefferson River basin adjacent to the northern end of the Rader Creek pluton of the Boulder batholith is of particular interest because it meets most of these criteria.

As much as 65% of the uranium has been leached from higher parts of the Rader Creek granodiorite during unroofing. This is indicated by trend surface analysis of modal data and major oxides from the pluton, and by significant correlations between elevation and U_3O_8, Th/U, and other selected geochemical variables within the pluton.

Surface drainage and near-surface ground water within the Rader Creek pluton carry leached uranium eastward into the Jefferson River basin. Streams draining the pluton contain up to 25 ppb uranium, whereas ground water from wells in the Tertiary basin sediments just adjacent to the pluton contains up to 50 ppb uranium. These fluvial and lacustrine Tertiary sediments were derived mainly from the Boulder batholith. Permeability contrasts in these sediments provide suitable sites for uranium concentrations. Traces of carbonaceous material and reduced sulfur-bearing hot springs are indications of adequate reductants for uranium.

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Model for Origin and Distribution of Low-Temperature Geothermal Resources in Rio Grande Rift, Southern Rocky Mountain Complex

Compilations of geologic and geophysical data from the Rio Grande rift indicate numerous geothermal anomalies, a few of which have been confirmed by subsurface temperature measurements. With the exception of anomalies associated with the Jemez Mountains, and possibly those near Socorro, there is no strong evidence to indicate that the anomalies are magmatic in origin. However, there is a strong correlation between the locations where the ground water discharges from one basin to the next, and the confirmed geothermal anomalies. A ground-water flow model, based on slow flow through the deeper basin horizons, explains the magnitude and distribution of the confirmed anomalies. Ground-water flow in the model is driven by the hydraulic gradients in the basins with no closed thermal convection cells. Regionally high heat flow heats the ground water but the anomalies are located where the hot water rises naturally at the constrictions at the southern ends of the basins. The model indicates that intermediate to low temperature geothermal fluids may be encountered by deep (3 km) drilling in the basins, although low permeabilities at these depths may restrict production of fluids. It is more economically attractive to tap the flow systems where the hot water rises naturally at the basin constrictions. Data from two 300-m wells in the Las Alturas geothermal anomaly in south-central New Mexico are consistent with the ground-water flow model and indicate that near maximum temperatures may be reached at relatively shallow depths and deeper drilling may not encounter significantly higher temperatures.

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Petrology of Pennsylvanian Tensleep Sandstone, Lost Soldier Field, Wyoming

The Pennsylvanian Tensleep Sandstone in the Lost Soldier field of Sweetwater County, Wyoming, is composed of texturally homogeneous, fine-grained sandstones and interbedded dolomite beds. Geologic setting and sedimentary features indicate that the Tensleep was deposited in supratidal-eolian environments. Detailed, petrographic, cathodoluminescence, and SEM analyses of core samples show nine diagenetic events in the Tensleep: (1) early calcium sulfate cementation; (2) precipitation of feldspar overgrowths; (3) poikilotopic nodular calcite cementation; (4) nodular anhydrite cementation; (5) late anhydrite cementation; (6) precipitation of silica overgrowths and silicification of carbonates; (7) alteration of feldspar; (8) dolomite cementation and dolomitization; and (9) hydrocarbon migration and accumulation. Four diagenetic facies with specific patterns of alterations have been identified: (1) early carbonate-precipitation facies; (2) early anhydrite-cementation facies; (3) primary carbonate-grain facies; and (4) nodular-cementation facies. Diagenetic alterations in each diagenetic facies were primarily controlled by lithologic characteristics within the original depositional environments. The carbonate-rich diagenetic facies are closely associated with the supratidal sabkha depositional facies. The anhydrite-rich facies is related to the interdune sabkha depositional facies, and the nodular-cementation facies is present within rocks deposited in the eolian-dune facies.

Reservoir qualities (porosity and permeability) of the Tensleep Sandstone in the Lost Soldier field vary considerably and, with the mineral composition of the Tensleep, were modified significantly by diagenetic alterations. They can be estimated from knowledge about the distributions and associations of depositional and diagenetic facies.