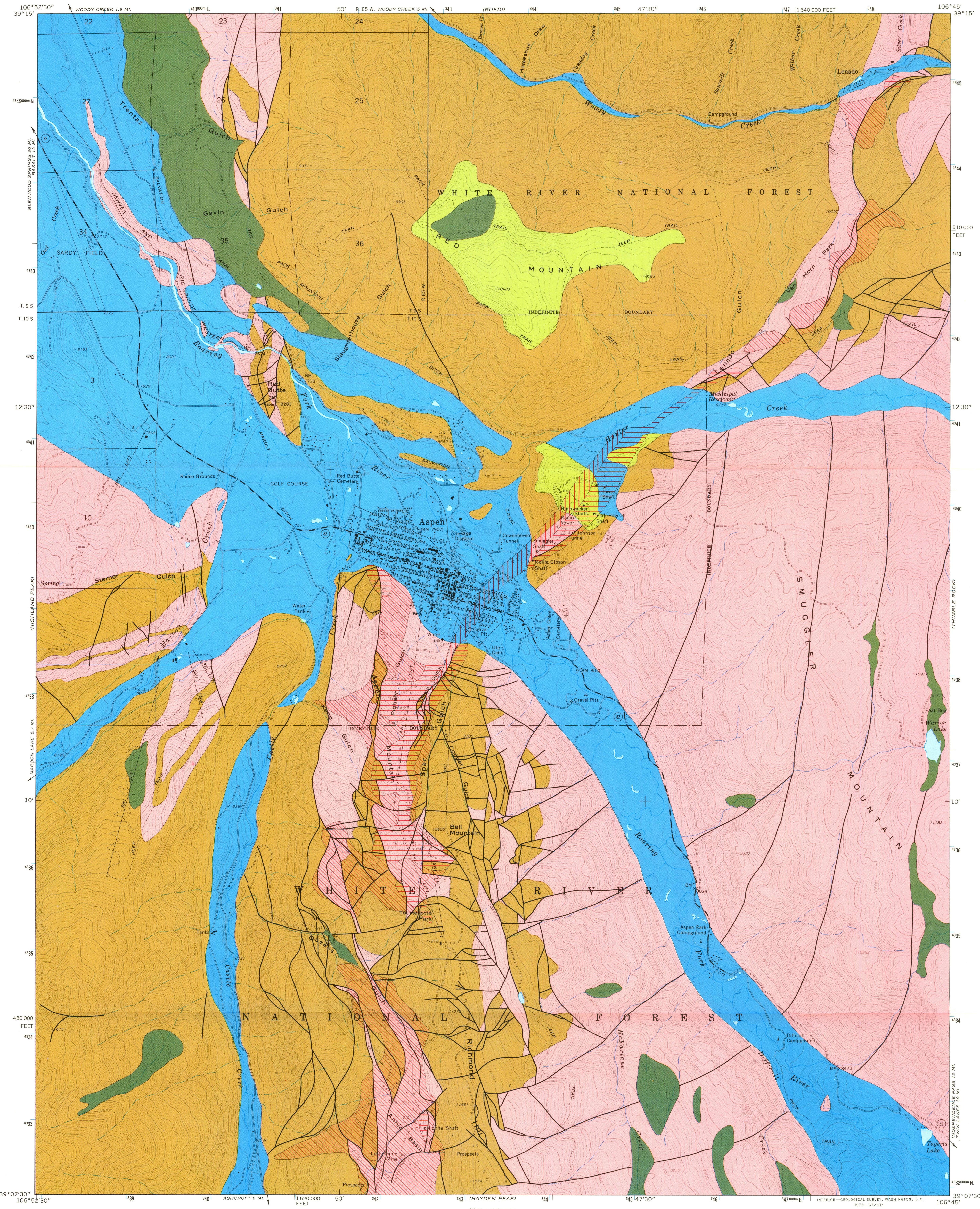
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

FOLIO OF THE
ASPEN QUADRANGLE, COLORADO
MAP I-785-B



Base from U.S. Geological Survey, 1960
10,000-foot grid based on Colorado coordinate system, central zone
1000-meter Universal Transverse Mercator grid ticks, zone 13, shown in blue

SCALE 1:24 000

CONTOUR INTERVAL 40 FEET
DATUM IS MEAN SEA LEVEL

EXPLANATION

sa — ALLUVIAL AND GLACIAL DEPOSITS – Sand, boulders, gravel, and clay. Deposits more than 100 feet thick in the Roaring Fork River valley; more than 50 feet thick in the Hunter, Castle, and Maroon Creek valleys; probably 10 to 50 feet thick in the Woody Creek valley. Yields 10 gallons per minute or more to wells.

sb — ALLUVIAL, COLLUVIAL, AND GLACIAL DEPOSITS – Boulders, gravel, sand, and clay. May be drained in places or have variable permeability. May yield useable quantities of water to wells where saturated.

sc — OLDER GLACIAL DEPOSITS – Boulders, gravel, sand, and clay. Drained in most of the area. May yield useable quantities of water where saturated.

bv — VARIABLE–PERMEABILITY BEDROCK – Sandstone, quartzite, limestone, and dolomite of Mesozoic and Paleozoic ages. Saturated permeable beds will yield moderate to large quantities of water to wells.

bl — LOW-PERMEABILITY BEDROCK – Shale, siltstone, claystone, granitic rock, and intrusive igneous rock of early Tertiary to Precambrian age. May yield no water to wells except where fractured. Fractures generally more common at or near faults.

AREA MINED BELOW STREAM LEVEL – Ground-water storage area.

AREA DRAINED BY NUMEROUS INTERCONNECTING MINEWORKINGS – Rocks generally drained to the level of the Roaring Fork River.

AREA OF SCATTERED UNCONNECTED TUNNELS – Rocks partly drained.

Fault

WATER RESOURCES

Water is relatively abundant in the Aspen quadrangle. Precipitation ranges from about 20 inches in the valley bottom at and northwest of Aspen to more than 30 inches on the high ridge at the southwest corner of the quadrangle. About two-thirds of the precipitation falls as snow. Much of the surface water available in the quadrangle is derived from snowmelt in the higher mountains to the east and south where as much as 50 inches of precipitation occurs on the crest of the Elk Mountains at the heads of Castle and Maroon Creeks.

The bulk of the water used in the Aspen quadrangle comes from surface water. The city of Aspen obtains its supply from Castle Creek. Water is diverted from the Roaring Fork River and from Castle, Maroon, and Hunter Creeks for irrigation of the valley between Aspen and the northwest corner of the quadrangle. Outside the area served by the city of Aspen, wells furnish most of the water used for domestic and stock purposes. Most of the wells are in valley fill which is recharged largely by precipitation, irrigation return flow, inflow from bedrock along the valley sides, and underflow from surface streams.

The Colorado State Engineer has records of about 100 wells in the Aspen quadrangle. About 80 are in alluvium of the Roaring Fork River valley, 15 in the alluvium of Castle, Maroon, and Hunter Creeks, and the rest are in bedrock. Yields are reported to range from 3 to 300 gallons per minute, most in the 10-to 30-gallon range. No information is available on the chemical or bacteriological quality of the water in relation to its source or depth, or in relation to density of population or area served by the sewage system.

Most of the wells are in the unit designated sa on the map. This unit is composed of glacial moraine and outwash, alluvial fans, and alluvium. Well logs suggest that permeable water-bearing gravels occur widely in the alluvial and glacial fill of the Roaring Fork River valley regardless of the deposits found on the surface. Because only five wells are reported to penetrate bedrock below the fill, the thickness and the configuration of the bottom of the fill are unknown. One well 168 feet deep did not penetrate bedrock. Wells penetrating more than 100 feet of valley fill are scattered along the valley from the airport to 2 miles southeast of Aspen and indicate that the fill is at least 100 feet thick in many places. Thicknesses of unit sa in Castle, Maroon, and Hunter Creeks may be somewhat less on the average, but few data are available. The valley fill of Woody Creek is probably much thinner.

Areas in unit sb are underlain either by thick deposits of gravel, sand, and clay that may contain some ground water or by thinner deposits which are saturated but are of variable permeability.

Areas designated as unit sc are underlain by thick deposits of boulders, gravel, sand, and clay but are probably well drained.

Permeability of the bedrock of the Aspen quadrangle ranges from low to high. The rocks have been divided into a unit of variable permeability (bv) and one of low permeability (bl). The unit of variable permeability (bv) is composed of sandstone, limestone, dolomite, quartzite, and siltstone. Some of the sandstones and carbonate rocks are moderately to highly permeable. In some areas these rock types are interbedded with siltstones and shales of lower permeability. Degree of cementation in sandstones, presence and interconnection of solution cavities in carbonate rocks, and fracture spacing affect the water storage and transmissivity of the rocks.

The unit of low permeability (bl) is composed of shales, claystones, siltstones, granitic rock, and porphyry.

Faults and fractures greatly affect water storage and transmissivity of the rocks. Some fault zones are more permeable than the rocks they pass through and provide avenues for movement for ground water, whereas other fault zones are less permeable and are barriers to movement of ground water. The major faults and fractures in the Aspen quadrangle are shown on the map. Many other fracture zones exist.

Abundant ground water played a role in the history of mining in the Aspen quadrangle. Mining to depths of as much as 1,400 feet below the level of the Roaring Fork River was hampered by large amounts of water flowing into mine workings through the fractured rock. Volin and Hild (1950) report that water was pumped at the rate of 3,250 gallons per minute in 1918 when the lower levels of the Smuggler mine were being worked. The expense of this pumping was a factor that led to the cessation of mining at deep levels and has discouraged any attempt to resume it. The abandoned mineworkings beneath the level of the Roaring Fork River (area mined below streamlevel on map) may represent a substantial reservoir of water not now used. Analyses of the water in the deep workings show that it is a bicarbonate and sulfate water such as would be expected in water of surface origin that descended through carbonate rocks (Bastin, 1925). These analyses did not include metals, such as lead, zinc, cadmium, or silver, which would also affect the suitability of water for some uses.

The area drained by numerous interconnecting mine workings on the map is underlain by extensive mineworkings and is probably drained to near the level of the Roaring Fork River, unless caving has locally produced impermeable seals. Aspen Mountain, for example, has very few surface indications of ground water, such as streams or springs. The mineworkings, the abundant faults, and the short distances to the deep valleys of the Roaring Fork River and Maroon Creek all contribute to this apparent lack of ground water on Aspen Mountain.

Other areas shown on the map as area of scattered unconnected tunnels have numerous prospect tunnels hundreds to thousands of feet long. Since no significant mineral production came from those tunnels, little is known about their exact length and shape. They do not constitute the system of interconnected workings as do those that underlie the areas discussed in the preceding paragraph. However, in places they may drain extensive volumes of rock and thus modify natural ground-water conditions.

REFERENCES

Bastin, E. S., 1925, Observations on the rich silver ores of Aspen, Colo.: U.S. Geol. Survey Bull. 750-C, p. 41-62.

Volin, M. E., and Hild, J. H., 1950, Investigation of Smuggler lead-zinc mine, Pitkin County, Colo.: U.S. Bureau of Mines Rept. Inv. 4696, 47 p.

MAP SHOWING GROUND-WATER POTENTIAL IN THE ASPEN QUADRANGLE, PITKIN COUNTY, COLORADO

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