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HYDROLOGIC ATLAS OF THE BLACK HILLS, PENNINGTON
COUNTY, SOUTH DAKOTA
BLACKHAWK QUADRANGLE
Aquifer Susceptibility Maps

Aquifer Susceptibility:

Different rock types have greatly differing capabilities to hold and transmit fluids. ***Aquifers*** are bodies of rock capable of absorbing water at the surface and allowing it to flow to new areas underground. The area at the surface of the Earth where the rock mass is exposed and takes on the water is called the ***recharge area***. Rock masses lacking the ability to absorb and transport water are called ***aquicludes***.

The varying capabilities to absorb water are referred to as the ***aquifer susceptibility*** of a rock mass. The susceptibility rating is based upon the intrinsic characteristics of the rock, without regard to human influences. See the aquifer susceptibility chart at the bottom of each map for factors utilized in determining susceptibility rating.

Inyan Kara Group aquifer: (see map)

The 13 square mile recharge area for the Inyan Kara aquifer extends from the northwest to the southeast corners across the quadrangle with a width varying from one to three miles. The Inyan Kara Group is composed of the Fall River Formation and the underlying Lakota Formation.



Figure 1. View to southeast across Little Elk Creek. The Inyan Kara aquifer recharge area underlies the near hillside and the ridge in the middle distance.

The Inyan Kara consists of an interlaying of sandstone layers with mudstone. The **average** susceptibility rating (shown as yellow) is **low-medium**. **Sands and gravel units, e.g.** those along streams, may retain rain and snow-melt runoff in contact with the underlying sandstone. Therefore, a value of **high** susceptibility is assigned.

Minnelusa aquifer: (see map)

The Minnelusa aquifer in the Blackhawk Quadrangle consists of layers of limestone, dolomite, sandstone and shale in the lower part and dominantly sandstone and mudstone in the upper part (Hargrave, 2005).

As shown on the Aquifer Susceptibility Map, these rock layers are assigned a rating of **medium to high susceptibility** (shown in gold), although the sandstone units in the upper part might be at the upper limit of this range. Along drainages a rating of **high susceptibility** (shown in orange) is assigned to that part of the Minnelusa aquifer overlain by alluvial deposits. The increased rating results from the likelihood of a longer period of contact of water contained in the gravel (these gravels comprise an aquifer themselves) with the underlying layers.

Madison Aquifer (Pahasapa Limestone): (see map)

The Madison aquifer consists of layers of karstic limestone and dolomite (Miller, 2005). Because it is strongly affected by fractures and karst (caves, breccia pipes, etc.) it is assigned an overall rating of **high susceptibility** (red color).

Due to the ability of the overlying Minnelusa Formation to transmit fluids downward to the Madison, a buffer zone is deemed appropriate in the areas where this unit is less than 100 feet thick. This area is shown in light pink on the map.

References

- Francisco, E. M., 2008, Susceptibility and Vulnerability of the Inyan Kara Aquifer in the Blackhawk Quadrangle: unpub. M. S. thesis, South Dakota School of Mines and Technology, 81 p.
- Lisenbee, A. L. and Hargrave, R., 2001, Geologic Map of the Blackhawk Quadrangle, South Dakota, Geological Survey, South Dakota Department of Environment and Natural Resources, 7.5 Minute Geologic Quadrangle Map 5, 1,24,000 scale.