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A Brief Summary of Hydrogeologic Conditions at Colter Bay

Staff at Grand Teton National Park are interested in constructing a water supply well at Colter Bay to provide groundwater for a heating system at the maintenance building. The design requirements call for a minimum of 65 gpm (gallons per minute). A test well has been constructed to a depth of 180 feet, but only produces 15 gpm. Park staff contacted me regarding the feasibility of continuing drilling to 300 feet to obtain the required flow rate. I advised them that they are unlikely to achieve a significant increase in production by drilling deeper.

This report presents a brief explanation of the hydrogeologic conditions at the Colter Bay area to help guide future decisions regarding well drilling in the area.

Previous Investigations

The USGS conducted an investigation of groundwater conditions in the area east of Jackson Lake to identify areas where water-supply wells could be constructed for facilities in the park (McGreevy and Gordon, 1964). No test holes were constructed at Colter Bay Village during this investigation. Apparently they recognized the poor potential for obtaining groundwater from the glacial moraine deposits that underlie the area.

A test hole was constructed near the water storage tank which is about 1½ miles northeast of Colter Bay Village. As McGreevy and Gordon (1964) describe it, the location was chosen “because of the convenience of the location to the reservoir, rather than for geologic advisability.” The hole was drilled to 200 feet through unsorted clay, silt, sand, gravel, and cobbles. No water was found and the hole was filled and abandoned.

The description of “unsorted clay, silt, sand, gravel, and cobbles” is typical for glacial moraine and glacial till deposits. These sediments are deposited beneath or at the edge of a glacier. There is no sorting or washing of the sediments by running water to remove the fine-grained portion of the sediments. The clay and silt that is included in the sediments cause the deposits to have low permeability. Wells constructed in glacial moraine or till deposits generally produce only a few gallons per minute, or less.

Several monitoring wells have been constructed in the vicinity of the wastewater lagoons at Colter Bay. These wells were constructed to monitor water levels and obtain groundwater quality samples adjacent to the lagoons. They do not require large pumping rates. State regulations require that monitoring wells be placed at wastewater lagoons regardless of whether they will produce a lot of water or very little water.

Water Supply Wells

Water supply wells for NPS facilities at Colter Bay and Jackson Lake Lodge are obtained from wells in the Pilgrim Creek valley upstream of the highway. Glacial moraine deposits in the valley were scoured out by the river that flowed through the valley when the glaciers were melting. The valley was subsequently filled by coarse sand and gravel sediments carried by Pilgrim Creek. The fine-grained silt and clay were carried away by running water in the creek. Only the larger, heavier sediments were deposited, creating a very permeable aquifer that is a prolific source of groundwater for wells.

Hydrogeology

A general geologic map is attached. It shows the general area of glacial moraine deposits at Colter Bay and the alluvial sand and gravel sediments associated with Pilgrim Creek. More detailed geologic maps are available, but this map illustrates the basic principles without being overly detailed.

The geologic map shows that the entire area in the immediate vicinity of Colter Bay Village is underlain by glacial moraine deposits. Wells constructed in the glacial moraine deposits are unlikely to yield more than a few gpm because the moraine deposits are an unsorted mix of clay, silt, sand, gravel, and cobbles. The unsorted nature of the deposits results in low permeability and slow rates of groundwater movement. Even though the sediments are saturated, groundwater simply cannot move to a well fast enough to keep up with the pumping rate. Wells constructed in moraine deposits are quickly pumped dry and take a long time to refill.

Potential Groundwater Sources

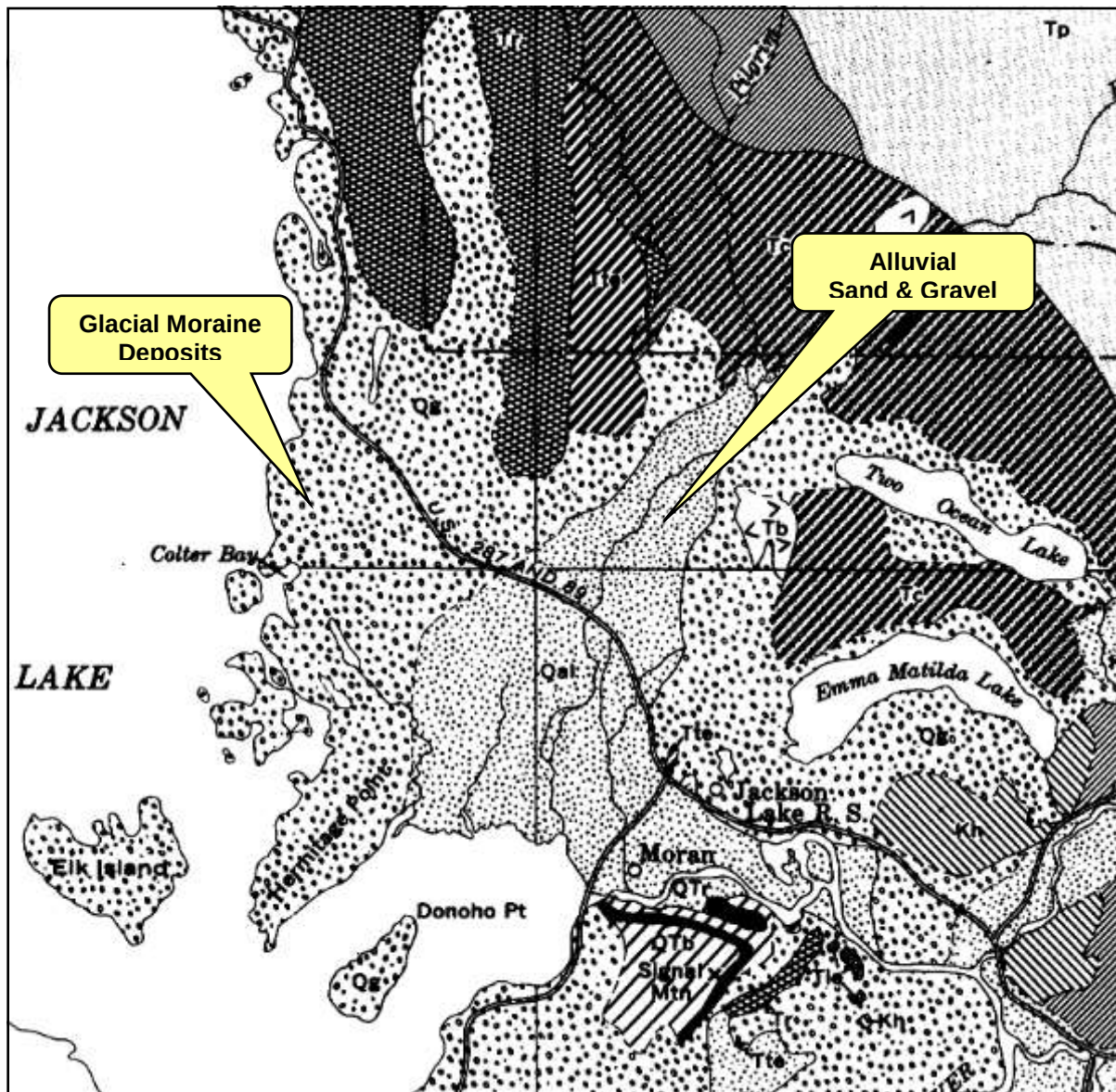
Wells constructed at Colter Bay Village are unlikely to yield more than a few gpm. The reported 15 gpm from the test well is on the high side of expected well yields for this area. Drilling deeper is unlikely to increase the yield significantly as the moraine and till deposits are probably many hundreds, if not thousands, of feet thick. Constructing multiple low-yield wells might be an option, but it would require 6-7 wells each producing 15 gpm to achieve the 100 gpm target.

Reinjection of the “used” water will be equally problematic. The same low permeability sediments that prevent high rates of production from a pumped well will limit the ability to dispose of the water by injection into the sediments.

The nearest area where 100 gpm groundwater extraction and injection wells can be constructed is the alluvium of Pilgrim Creek, upstream of the highway. The alluvial sediments become finer-grained south of the highway and it may be more difficult to achieve high yields for extraction or injection wells in that area.

References

McGreevy, Laurence J. and Ellis D. Gordon, 1964, *Ground-Water East of Jackson Lake, Grand Teton National Park, Wyoming*, U.S. Geological Survey Circular 494, 27 pp.



From McGreevy and Gordon (1964)

General geologic map of the Colter Bay Area