

Field Examination of the Springs for  
Water Supply for Newcastle, Weston County, W

October 7, 1941

Mr. L. C. Bishop  
State Engineer  
Cheyenne, Wyoming

Dear Mr. Bishop:

The writer, in company with Mr. N. B. Bennett, Jr., spent September 6, 1941, in a field examination of the springs from which the town of Newcastle, Weston County, Wyoming, receives its water supply. In addition, some attention was paid to the nature of the flow of Stockade-Beaver Creek.

General geological setting.--- The region in question lies in Ts. 45, 46 and 47 N., R. 60 W., and is underlain by bedded sedimentary rocks. These beds have been tilted so that they are inclined westward at relatively low angles, the older beds being exposed in the eastern part of the area and successively younger ones to the west.

The youngest rocks of interest are the 500 feet of red shales and siltstones, with some beds of gypsum, which constitute the Spearfish formation. The Spearfish is underlain by a thin-bedded limestone, the Minnekahta, about 40 feet thick, which in turn rests on the Opeche red shales and siltstones, about 75 feet thick. The Opeche overlies the Minnelusa formation, which is about 500 feet thick, and is made up of an alternating sequence of sandstones and limestones, with minor proportions of other sorts of rocks. Underlying the Minnelusa is the Pahasapa limestone, about 500 feet thick. The Pahasapa is a massive gray limestone and

is notably cavernous in the Black Hills region. The oldest beds exposed are the Englewood thin-bedded lavender limestones, about 50 feet thick. To the east of the area, in South Dakota, the Deadwood formation is exposed below the Englewood. The Deadwood is the oldest of the sedimentary units and rests on pre-Cambrian crystalline rocks.

#### SURFACE WATER

Stockade-Beaver Creek. -- The valley of Stockade-Beaver Creek is cut in the Minnelusa formation in its upper reaches in T. 47 N., R. 60 W., and to the southward in Ts. 46 and 45 N., R. 60 W., it diagonals across younger formations so that it crosses the Minnekahta limestone and Opeche shale. Through most of the two southern townships it is cut in the Spearfish formation.

Stockade-Beaver Creek is a perennial stream in the region of its headwaters, but a short distance south of the intake of the Newcastle pipeline the stream dries up and at the time of the writer's inspection the valley of Stockade-Beaver Creek was dry for a distance of about 11 miles. Farther south the valley is again occupied by a flowing stream.

The disappearance of the water is explained by the fact that the Minnelusa formation is made up of many beds which are pervious and into which water can be taken. That the basal sandstone, at least, is an aquifer is attested by the large flowing well drilled near Osage in 1941. Water entering the Minnelusa along the upper reaches of Stockade-Beaver Creek would migrate downward and westward and would never appear down-valley.

It seems likely that there is little or no underground flow of water along the part of the valley where Stockade-Beaver Creek is dry. Along the parts of the stream where there is surface flow there are many trees, but along the dry part of the stream course there are no trees and little evidence of alluvial deposits which would support an underflow.

The flow of surface water along the lower part of Stockade-Beaver Creek can be explained as originating in the springs along the east side of the valley about four miles north of the LAK Ranch, and perhaps by springs along the stream course. The water at the head of the stream, therefore, is unrelated to the flow farther downstream.

#### ORIGIN OF STOCKADE-BEAVER VALLEY

In the geologic past the ancestral Stockade-Beaver Creek flowed at a higher elevation and across impervious beds above those now at the surface. In addition, the flow of the stream was probably greater, as there is ample evidence through the Rocky Mountain region to show that there was greater precipitation and run-off during early early post-glacial time than now. The down-cutting action of the stream continued until the valley was cut to its present position. With a decrease in precipitation, the flow of the headwaters has diminished until it is so low as to be completely imbibed by the pervious rocks in the region where the stream disappears.

SPRINGS

The three springs examined, namely, Parmalee, Bear Canyon, and Bear Run, issue from the lower part of the sedimentary section. The ultimate source of the water is in rain and snow which falls on the region to the east of the springs, is imbibed by the pervious sediments, travels down the westwardly inclined beds, and rises to the surface as artesian springs. There is no scientific basis for the view expressed by some, that this water has its source in the Big Horn Mountains.

Parmalee Spring. -- Parmalee Spring issues from the Pahasapa limestone and there are good exposures near the spring. The basal sandstone member of the Minnelusa is exposed on the valley wall just northwest of the intake of the pipeline to Newcastle. The lower course of the canyon in which the spring is located is across beds higher in the Minnelusa, and that formation occupies the surface between the intake and the junction of this canyon and Bear Canyon.

Bear Canyon Spring. -- Bear Canyon Spring probably issues from the Deadwood formation. There are no exposures at the spring, but the contact of the Pahasapa limestone and the Englewood limestone is exposed on the canyon wall just north of the spring, and several hundred feet above it. The course of Bear Canyon is therefore across the Pahasapa limestone and the Minnelusa formation to its junction with Parmalee Canyon. The lower part of Bear Canyon appears to be an old abandoned canyon with essentially no evidence of a stream channel in its flat bottom.

North Fork of Bear Run Spring. -- A spring in the canyon of the north fork of Bear Run issues from the Pahasapa limestone. The valley floor is about 50 feet wide and alluvium-filled, the spring flowing out of alluvium. About 600 feet up the canyon from the spring is an excellent exposure of Pahasapa limestone. The course of Bear Run, therefore, is across the Pahasapa limestone and the Minnelusa formation.

SURFACE FLOW FROM PARMALEE,  
BEAR CANYON, AND BEAR RUN SPRINGS

Since the flows of Parmalee and Bear Canyon springs are taken into the Newcastle pipeline and that from Bear Run Springs is diverted for irrigation, there is no way of determining how far this water might flow down Stockade-Beaver valley before being absorbed by the pervious bedrock. It was reported to the writer that prior to the installation of the Newcastle pipeline the flows of the Parmalee and Bear Canyon springs disappeared before reaching Stockade-Beaver valley.

Since the water from these springs would necessarily flow over the cavernous Pahasapa limestone and the pervious beds in the Minnelusa, it seems likely that it would not flow far from the springs before being completely imbibed by those porous sediments.

SUMMARY

(1) The headwaters of Stockade-Beaver Creek are apparently absorbed by pervious beds in the Minnelusa formation.

(2) The course of this water would be down the dip of the beds, to the west, and not to the south as underflow along the valley of Stockade-Beaver Creek.

(3) Water from Parmalee, Bear Canyon, and Bear Run Springs, if allowed to do so, would expectably follow the same course and would not flow to or far down Stackade-Beaver valley.

Respectfully yours,

Horace D. Thomas  
State Geologist

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