SILICA SAND DEPOSITS IN THE LOVELL AREA, BIG HORN COUNTY, WYOMING

General Statement

At the request of the Wyoming Natural Resource Board, the writer examined and sampled four individual sandstone deposits and one limestone deposit in the northern part of Big Horn County. This reconnaissance examination, which was carried on during the period of April 26 through April 29, 1962, was undertaken relative to a proposed glass bottle manufacturing plant to be located in the Lovell area.

General Geology

Three of the sandstone deposits occur in the Cloverly formation of Early Cretaceous age. A fourth deposit, of limited areal extent, occurs in the Amsden formation of Mississippian-Pennsylvanian age and crops out in a canyon on the east side of the Bighorn River, about 6 miles northeast of Kane. Further study of this deposit was not conducted because of its limited exposure, lenticular nature, and the probability of an underground mining operation, even if the deposit was large enough to exploit.

The Cloverly formation is composed of two distinct units -- the Little Sheep mudstone member and the Himes member. The Little Sheep mudstone, which is the lowest unit and is composed of mudstones and lenticular chert-pebble sandstones, overlies the Jurassic Morrison formation. The overlying Himes member is composed of iron oxide-veined claystones and sandstones. Overlying the Himes member are the "rusty beds" of the Sykes Mountain formation, also of Early Cretaceous age.

The potential glass sand deposits occur in large channel-like sandstones of the Himes member. These sandstones, which are composed of fairly clean, fine-to medium-grained cross-bedded quartz sand, range in width from a few yards to more than one mile, and in thickness from a few feet to more than 100 feet.

The three deposits examined and described below have no overburden and are readily accessible from major highways and/or secondary roads. All can be easily quarried.

Descriptions of Individual Deposits

Name: Monte Cristo Beta #1

Approximate location: $SW\frac{1}{4}SE\frac{1}{4}$ & $SE\frac{1}{4}SW\frac{1}{4}$ sec. 11, $NW\frac{1}{4}$ sec. 13, $NE\frac{1}{4}$ sec. 14, T. 57 N., R. 95 W.

Massive sandstone, averaging about 30 feet in thickness, is exposed over a width of approximately 400 feet and extends along the strike for a distance of

approximately one mile. This bed, which strikes N. 50° W., and dips 23° SW., crops out as a hogback with the inface on the northeast and a long dip slope to the southwest. The rock, as exposed, is a yellowish-gray fine-grained cross-bedded soft and poorly cemented quartz sandstone. Traces of unidentified minute dark-colored ferromagnesian minerals and muscovite mica are present. Individual quartz grains vary in shape from subangular to subrounded and are not frosted. In places, a ferruginous stain, varying in color from yellowish-orange to pinkish-red to rust-colored, occurs along bedding planes and joints and transgresses bedding planes. This erratic distribution is evidently controlled by differences in permeability of the rock. Locally, very thin lenticular moderate brown to rust-colored fine-to medium-grained hard beds of sandstone occur along the top of the massive sandstone. To the northwest and southeast the sandstone loses its massive form and grades into thinner beds of shale and siltstone.

A composite series of chip samples (labeled Monte Cristo Beta #1) taken from, and representing, the lower 20 feet of this bed was obtained from a locality about 300 feet north of the discovery monument. A second composite sample (labeled Monte Cristo Beta #1a) was taken in a similar manner from a location about one-third of a mile north of, and along strike from, location no. 1.

This deposit, which is believed to be the most suitable from an economic standpoint, is conservatively estimated to contain four million short tons of easily quarried sandstone.

Name: Monte Cristo Alpha #1

Approximate location: $SW\frac{1}{4}$ sec. 27, $NE\frac{1}{4}$ & $NW\frac{1}{4}$ sec. 34, T.58 N., R.95 W.

A bed of sandstone, similar to that cropping out at Monte Cristo Beta #1, strikes N. 32° W., and dips from 5° to 15° NW. This bed crops out as a well-exposed dip slope with no overburden. The size and tonnage of this exposure approximates that occurring at Monte Cristo Beta #1. The lithology of the rock is also similar, except that variable-sized lenses of pale brown grit or conglomerate containing chert and quartz pebbles occur intercalated in the massive sandstones. A slightly greater percentage (although in trace amounts) of dark-colored ferromagnesian minerals is also present.

No samples for laboratory analyses were taken from this deposit since it is believed that the deposit at Monte Cristo Beta #1 is of better quality, has ample tonnage, and is more advantageously located to the proposed plant site.

Name: Blue Bottle #1 & 2

Approximate location: $E\frac{1}{2}$ sec. 15, T.55 N., R.95 W.

Sandstone averaging 30 feet thick crops out for approximately one mile along a hogback ridge. The outcrop, which is approximately 300 feet wide, strikes N. 43° W., and dips 22° to 30° SW. No overburden is present. The rock is a yellowish-gray fine-grained moderately hard and well-cemented cross-bedded quartz sandstone. Traces of unidentified dark-colored ferromagnesian minerals are present. The upper half of the outcrop is thin-bedded, while the lower half is massive or thick-bedded. The beds are irregularly and erratically stained with a yellowish to brownish-colored iron oxide which is localized along bedding planes and joints and also transgresses bedding planes.

A composite sample (labeled Blue Bottle #1 & 2) was taken from a small quarry located in the lower massive bed and from the outcrop of the upper thin-bedded unit. The quarry in the lower massive unit was the source of glass sand used in the Lovell glass factory, which was operated during the period 1918 to 1927. At least several million tons of sand are well-exposed and could easily be quarried from this deposit.

Conclusions and Recommendations

Abundant reserves of sandstone are available from the three deposits previously described. On the basis of the field examination and visible appearance of these sands, it would appear these are suitable raw material for use in the operation of a glass bottle manufacturing plant in the Lovell area.

Before these conclusions can be substantiated, however, it is necessary that comprehensive laboratory tests be conducted on the three samples collected from the above deposits. There is no universal set of specifications for glass sand; however, it is recommended that the following tests be conducted:

1. Chemical analyses to determine the amounts of silica, iron oxide, alumina, lime, magnesia, and alkalies. These analyses should also include tests for heavy metals and refractory oxides.

2. Laboratory beneficiation tests, such as washing, etc., to remove impurities.

3. Grain sizes should average about 80 mesh with no particles coarser than 30 mesh (40 mesh preferable) and a maximum of roughly two percent passing the 140 mesh sieve.

4. Glass batches from the above sand should be melted on a laboratory scale.

The three sand samples together with a sample of limestone from a nearby deposit (approximate location sec. 17, T.55 N., R.94 W.) and a sample of feldspar from a deposit on Casper Mountain, Natrona County, have been submitted to the Natural Resources Research Institute at the University of Wyoming for the necessary beneficiation and analytical tests. All three commodities are necessary

for the manufacture of glass.

The results of the laboratory work will provide a supplement to this field examination and provide further data as to the economic feasibility of establishing a glass plant at Lovell.

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