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November 10, 1952

John F. Leonard,* Field Representative, Geological
Section, GJEB
TECHNICAL MEMORANDUM #22 - SOME OBSERVATIONS ON THE CHINLE FORMATION
OF ARIZONA

SYMBOL: GJEB:JHL

This will not be a technical paper, but will point out some of the things observed while working with the Chinle formation that may possibly be used as future criteria in prospecting the Chinle formation. It will also submit a theory for ore (uranium) that might be kept in mind by the geologist while making a study and while prospecting the formation.

I believe that Winston W. Marks, our Navajo Prospector, and I were the first to see and recognize an uranium deposit in the Chinle formation. This is irrespective of the uranium-bearing logs found in the Chinle formation that have been known of for some time.

Our Navajo prospector brought in the first sample, picked by sight, because of a distinctive yellow color found in the Chinle. This was not a carnotite yellow and turned out to be not the ore bearer of the Chinle, but was close enough to the ore zone to show some radiometric count and interested us in looking into the showing further. After finding the ore zone in the Chinle in this first discovery to be just below this yellow color, and after studying this deposit and others that have been found, we have developed the following criteria for prospecting the Chinle formation.

1. All of the present known and seen deposits have been in Gregory's "D" member of the Chinle and have been from the Shinarump contact to possibly 100 feet above the contact.
2. All deposits or showings have been just above or slightly above a blue shale of the Chinle.
3. All the deposits or showings have had a cobalt zone just above the uranium zone. This cobalt has been white or pink and is very light and powdery.
4. All the deposits or showings have had the following colors: yellow, white, orange with black streaks and/or flakes, and some shade of brown. It is believed that the orange with black is the ore zone. At a distance, these colors appear to be a brownish stain above a blue shale.

*John H. Leonard is the AEC Field Representative in charge of Navajo prospectors.

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5. All the deposits or showings have had some gypsum on or near the deposit. Sometimes there is a great deal and other times a very little, but in every case there has been some gypsum.

6. All the deposits or showings have had water-worn pebbles or rounded pebbles on or near the deposit. These pebbles are loose and scattered and of no thickness. They appear to be a gravel deposit, but are merely scattered pebbles of a gravel size.

The above possible criteria have been true of every deposit or showing we have seen, and, after working in the Chinle formation, it is very easy to spot these showings from a distance by the apparent brownish color above the blue shale. There is only one drawback to these criteria. We have found a number of places that have all the above criteria except the uranium, so each has to be examined as found with Geiger counter or scintillometer. I believe that the ideal way to prospect the Chinle in this area is with the scintillometer as a big portion of the area can be driven over with a four-wheel drive vehicle. I also believe that the Chinle would be ideal to prospect by air as you have the distinctive colors to go by and the formation consists of rolling "bad lands" that would not entail flying the rims.

The first Chinle deposit was found near Cameron, Arizona, and from the criteria we have developed, we have made discoveries also near Holbrook, Arizona. This gives us showings on the northern end of the Chinle formation near Cameron, Arizona, and also near the southern end near Holbrook, Arizona. This gives us an extensive area of Chinle that possibly may be productive.

Now, the one theory that I formed from traveling a lot of the Chinle with a scintillometer, and one that I would like to have the geologist keep in mind as he sees and studies the Chinle is this: I think that at least this lower member of the Chinle formation might have been a lake bed and that the deposition of the strata was formed by the feeder streams running into the lake. It appears to me that the ore zone is nearly all the same elevation and that the colors, cobalt, and uranium that I spoke of have all been laid down in a pattern over the entire area. In other words, at one time the streams carried the yellow color, another the cobalt, another the uranium, etc. The deposition then took place by the sediments settling upon reaching this still water. I have come to this conclusion because of finding large areas where we get scintillometer count of up to 150 over the entire area. I then believe that the heavy concentrations of uranium, cobalt

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came at the inlets of the streams and possibly at spring-holes. I believe that the petrified logs were scattered through the Chinle in this same method; with the heavy concentrations at inlets and the scatterings by becoming water-soaked and sinking at different places in the lake.

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