CONTACT INFORMATION
Mining Records Curator
Arizona Geological Survey
3550 N. Central Ave, 2nd floor
Phoenix, AZ, 85012
602-771-1601
http://www.azgs.az.gov
inquiries@azgs.az.gov

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J. J. Durek
Oakland, California

October 29, 1971

J. E. Kinnison
Tucson, Arizona

File
Blue

White Tank Copper Project,
Geological Comments

In your memorandum to me of August 30, 1971, you raised several points with reference to the White Tank project, and commented briefly thereon. In the vein of maintaining a two-way communication to share thoughts and ideas, I make the following reply. I did not answer immediately because there was no great urgency in this matter. However, some of the points you raised are of interest, not only to the White Tank project, but to Arizona copper exploration in general.

1. The north-northwest fault which transects the White Tank mountains, somewhat obliquely, and projects near the northern edge of the Copeland altered zone is certainly the most striking structural feature of the White Tank mountains, considered from a geomorphic standpoint. The fault or fault zone is demonstrably long, and has decidedly influenced the present topography. I note that you state a distrust of northwest-striking faults, relative to ore deposition, because many are youthful and stem from the block-faulting period of the middle or latter Tertiary. This is certainly true, as you know, in eastern Arizona; I believe the same is true for western and central Arizona although there may be more divergence of block-fault trends, particularly west of Wickenburg where the Harcuvar and Harquahala ranges are transverse to the northwest trend. Also however, a northwest elongation of intrusive bodies, and a northwestern alignment to regional zones of mineralization suggest that the northwest direction of faulting is important to the process of ore deposit localization. The problem is to discern in any particular case whether the fault is indeed in part pre-mineral, or whether it is entirely post-mineral. In the case of White Tank, this cannot be entirely resolved with information at hand. While there are local northwest fracture zones which control mineralization on State Section 2, I do not know whether these are in fact related to the strong northwest fault in the White Tank range itself. I would suspect the probability is high that there is a relationship, but that the present geomorphic features associated with the fault in the center of the range is due to erosional effects of a relatively youthful period of faulting. In so far as we know, the fault zone in the center of the range is not mineralized. Drilling in conjunction with IP results, which latter show that there is a bedrock pediment north of State Section 2, show that the fault has apparently had little effect on the process of pediment formation, although the effect in the mountainous terrain is notable.

2. In regard to rhyolites in western Arizona, or in Arizona in general, I have the following comments. First, I assume that you are speaking of intrusive rhyolites rather than the rhyolitic-welded tuffs which form a portion of the pre-mineral volcanic sequence of the latest Cretaceous and possibly early Tertiary span of time, perhaps marking the beginning of the Laramide revolution. Regarding intrusive rhyolitic rocks, I recognize that many are clearly associated with the volcanic piles of middle Tertiary, post-porphyry copper age. Quartz-gold veins occur in a few places in the Galiuro mountains and also in the Tortilla mountains south of Superior, localized along rhyolite dikes which intrude the post-ore volcanics of those ranges. The Tiger deposit is a well known example of such association. I am not too familiar with the younger mineralization in volcanics in eastern Arizona, although I have briefly visited a quartz-silver vein in the middle Tertiary volcanics near Duncan, which shipped silica flux to Morenci for many years. In western Arizona, the relative ages of volcanics with respect to Laramide versus middle Tertiary is insufficiently sorted out at this time to allow first statements, but I certainly have the feeling that much of the vein mineralization in the Big Horn mountains, and perhaps the Eagle Tail mountains, will eventually prove to be middle Tertiary. On the other hand, a number of the porphyry copper districts do in fact include among the Laramide intrusives volcanic-textured sills and dikes of rhyolitic composition, including some which are apparently intrusive ignimbrites. Examples would be the Patagonia district near Red Mountain, and the Esperanza area in the Sierrita mountains. In both instances the intrusive rhyolites are mineralized at such places as they occur within the general zone of porphyry copper alteration and mineralization. Pre-mineral rhyolite dikes are noted at Mission, and the dacite at Silver Bell is a very conspicuous representative of the pre-mineral acid volcanic intrusive. For many years the Silver Bell dacite was believed to be simply a fine-grained intrusive of ordinary type, but recent work by Barry Watson has demonstrated that it is a part of a thick (3,000 feet) intrusive ignimbrite. The smaller tongues of this intrusive which occur as sills within the Paleozoic sediments and as irregular bodies in the igneous rocks, is a host for part of the ore. Part of the Sacaton ore is in dacite. With these occurrences in mind, the presence of felsite or rhyolite dikes in the Copeland property does not necessarily suggest a middle-Tertiary, basin-and-range event. I note that in listing the preceding examples of porphyry districts with intrusive rhyolites, that all of those listed occur in the mineral zone which trends regionally from the Patagonia mountains through Silver Bell and thence through Sacaton, and that I have not listed any deposits further east. Upon thinking briefly of south-eastern Arizona, no clear-cut examples come to mind. Annan Cook has described a swarm of pre-mineral rhyolite dikes in the Safford area in what he terms "lone star shear zone." These I have not seen and I cannot comment upon. If Cook is correct in correlating these dikes with a rhyolite plug which he believes is in a near-surface

vent, certainly the Safford deposits are a shallow phenomena.

JEK/bl