UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

Preliminary report on Orange and Gove Copper Mines, Strafford, Vermont

by

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U.S. Geological Survey

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The Orange and Gove mines lie about 1 3/4 miles northeast of the village of Strafford, Vermont, and about 4 miles north of the Elizabeth mine. One day was spent in examination of the mines and prospects, and a geologic map (pl. 1) was prepared. Several days have been spent in the vicinity in the course of regional study of the Orange County copper district.

The deposits are on the land of Mr. Glenn Titus of Strafford, but the mineral rights on the Orange mine, at least, are owned by Mrs. Reynolds, widow of the last operator. The Gove mine, which Mr. Titus states was last worked during the Civil War, consists of a small open cut and an inclined shaft of unknown depth, now filled with water. The size of the dump indicates that about 10,000 cubic feet of rock were removed. The Orange mine, also flooded, was worked briefly during the last war, and the remains of a shaft house and small mill are still standing. The workings consist of an inclined shaft on the order of 100 feet deep and a crosscut south into the footwall. _/

_/ Based on oral descriptions of Mr. T. Wilcox, Mr. Glen Titus, and the late Mr. Geo. Fox, all of whom had been in the mine.

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The dump is only slightly larger than that at the Gove mine. A few bags of unshipped concentrates at the Orange mine give some indication of the type of ore mined. Three small prospect pits and a prospect shaft were also dug in the area.

The ore deposits lie in needle amphibolite, probably of volcanic origin, which forms a well defined stratigraphic unit up to 1000 feet thick in the area. The amphibolite lies stratigraphically a few hundred feet below the top of the Waits River formation. A bed up to 50 feet thick of mica schist with abundant large garnets occurs locally at the contacts between the amphibolite and the calcareous rocks. In the vicinity of the Orange and Gove mines the rocks strike about N. 55° W. and dip 30° to 40° N. Cleavage is essentially parallel to the bedding, but shows a more constant orientation (see map). Regional geologic mapping suggests that the rocks are overturned.

The ore is an aggregate of pyrrhotite and chalcopyrite, as at the other mines in the district. Pyrite is abundant in small patches and veinlets at the Gove mine, but is not closely associated with the chalcopyrite. Pyrite is negligible at the Orange mine and adjacent prospects. Massive sulfide, largely pyrrhotite, forms the principal vein material, but examination of the dump fragments suggests that much of the chalcopyrite is found as tiny stringers and disseminations in the adjacent host rock. Sphalerite makes up about 6 percent of some of the massive sulfide. The average copper content of the massive sulfide is estimated to be 1 percent or less. A small amount of the adjacent wall rock may locally contain slightly more copper as disseminated

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chalcopyrite. The average zinc content is probably about the same as the copper content.

The principal gangue minerals are quartz, feldspar, and hornblende. Carbonate is generally present in small amounts, and a little tourmaline is found locally. Some of the sulfide at the Orange mine occurs in coarse garnet-biotite schist. All of the tourmaline, most of the quartz and carbonate, and some of the feldspar were probably introduced, whereas the hornblende, biotite, and garnet are unaltered constituents of the host rocks.

The ore occurs in veins that lie parallel to and a few feet or tens of feet south of the northern boundary of the amphibolite. The vein appears to lie on a small thrust fault at the top of the Gove shaft, and its relations cannot be determined elsewhere. Dump fragments at the Orange mine indicate that some sulfides are actually found in the garnet-mica schist to the north at this point. Exposures are inadequate to determine whether the sulfide vein at the Orange mine and adjacent prospects is continuous with that at the Gove mine, but the few observations that can be made suggest that the ore deposits lie in a single narrow poorly defined zone that only locally contains significant amounts of sulfide.

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The thickness of the vein at the top of the Gove shaft ranges from three inches to three feet. The wall rock contains small stringers and disseminations of sulfide within a foot or two of the vein. The veins are narrower where observed in the prospect pits, but that in the Orange mine could not be examined. In other mines in the region (Ely, Pike Hill) the vein zone may contain several branching veins, more or less parallel to one another, and similar conditions may well exist here.

The nature of the ore shoots developed by the mines is not known. There does not appear to have been any well-defined structural control of ore deposition, and by analogy with the similar but larger deposits at Pike Hill, the distribution of sulfides along the general vein zone may be very patchy.Limited observations, therefore, give little reason for hope of discovery of a large continuous ore shoot in this area.

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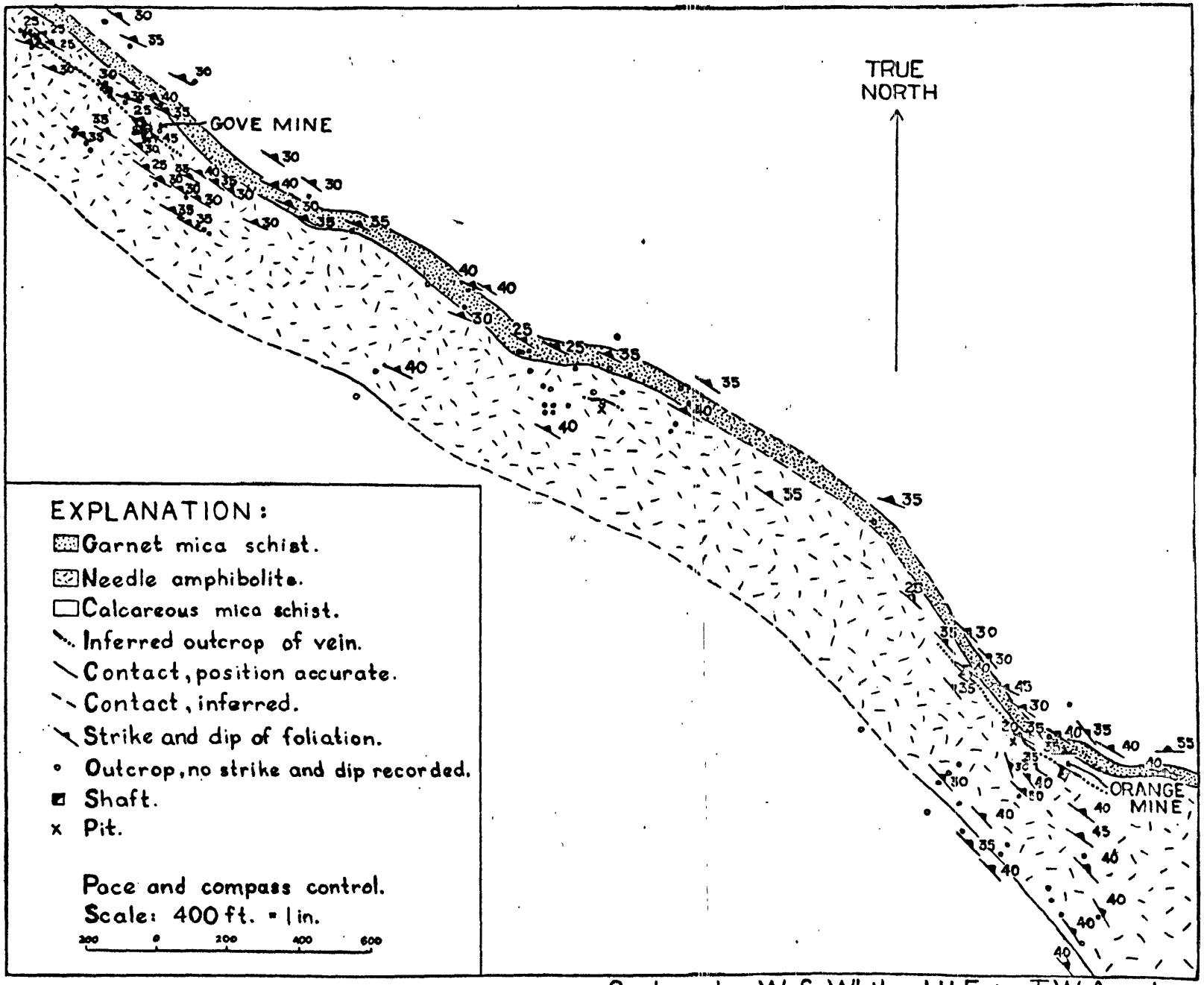
PRELIMINARY MAP
PLATE I



Geology by W. S. White, J. H. Eric, T. W. Amsden.

GEOLOGIC MAP OF ORANGE AND GOVE MINES AND PROSPECTS STRAFFORD, VERMONT