GEOLOGIC AND RADIOMETRIC SURVEY

OF PART OF THE

MONKTON-STARKSBORO AREA

by

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INTRODUCTION

The purpose of this study was to conduct a ground survey of the radiometric anomaly located in the Monkton and Starksboro area (see Fig. 1), where abnormal concentrations of radioactive material were found to be present by Texas Instruments (1976). They conducted a reconnaissance airborne gamma-ray survey of a portion of New England for the U. S. Energy Research and Development Administration. The object of their survey was to "define those areas showing surface indications of a generally higher uranium content (uraniferous provinces) where detailed exploration for uranium would most likely be successful."

In the Lake Champlain 2-degree quadrangle (1:250,000), Texas Instruments (1976) found "preferred" and "suspect" anomalies (see Fig. 2). "Preferred" anomalies are "more significant anomalies showing uranium enrichment over the mean values for the geologic map units involved and over the mean U/Th and/or U/K ratios for those units. Most of these suggest possibilities for vein-type uranium prospects, but a few appear to indicate potential stratiform deposits."

The study area is Texas Instrument's (1976) Location No. 21, which is a "preferred" anomaly (see Fig. 2). They found the following ppm eU in the study area:

3.4 ppm in the Winooski, Mallet and Dunham Dolomite and Monkton Quartzite.

2.5 ppm in the Dunham Dolomite.

2.8 ppm in the Cheshire Quartzite.

Texas Instruments (1976) states that this occurrence "may be a vein-type accumulation, or may be similar to anomalies at Locations 5 and 6 (in the Milton area), which is a radioactive zone in the Milton dolomite along a mapped fault."

METHODS OF STUDY

The "preferred" anomaly in the Monkton-Starksboro area (Location No. 21), was studied by the authors. See Figure 3 for a map of the field area.

A very detailed survey of geology and radioactiviy was begun along a predetermied grid system on Hogback Mountain (see Fig. 4). This detailed work was abandoned when no appreciable readings were found using a gamma-ray spectrometer. Instead, a reconnaissance survey was done covering the whole area (see Fig. 3), trying to find the high concentrations that Texas Instruments (1976) reported.

STRATIGRAPHY

The rock units encountered in this study include the Late Precambrian Fairfield Pond Formation and the Lower Cambrian Cheshire and Dunham Formations. The geology of these units in western Vermont was compiled by Doll, et al. (1961), and has more recently been described by Tauvers (1982), Gregory (1982), Myrow (1983), and DiPietro (1983). Significant radiometric anomalies were not detected in the study area, and no contacts between major rock units were observed.

FAIRFIELD POND FORMATION

This unit was observed in only one outcrop at the eastern edge of the reconnaissance survey. It was mapped in this area by Doll, et al. (1961), as part of the Pinnacle Formation, but was later recognized as the Fairfield Pond Formation by DiPietro (1983). It consists of a homogeneous, fissile, grey to green chloritic phyllite with local occurrences of thin sandy beds.

CHESHIRE FORMATION

Lower Argillaceous Member: The argillaceous member of the Cheshire Formation occurs locally at the core of a regional north-plunging anticline. The hinge of this structure extends along the northern flank of Hogback Mountain where detailed mapping was initially undertaken for this study (see Fig. 4). The argillaceous Cheshire was also recognized in one hill on the east side of Route 116.

This member consists of thinly interbedded whitish and and dark gray phyllitic units. Intense deformation and chlorite grade metamorphism have heavily overprinted and obscured primary features such as bedding and bioturbation. Thus, the argillaceous member is typically recognized by alternating thin bands of fine to medium sand and fine gray phyllite oriented parallel to the dominant regional schistosity. Thicker massive sand units occur locally in beds up to 8 feet thick. Myrow (1983) showed that the lower Cheshire in the Bristol, Vermont area represents a tidal flat and restricted basin environment which is overlain by the transgressive deeper water upper member.

Upper Massive Member: The upper member of the Cheshire Formation was identified in outcrops north of Hogback Mountain and in samples taken from a drilled water well to the east of Hogback Mountain. The upper member consists primarily of massively bedded, light gray, coarse grained quartzite with only minor thin phyllitic partings.. It was shown by Myrow (1983) to represent high energy subtidal sand bodies deposited offshore from the lower Cheshire tidal flat sequence.

DUNHAM FORMATION

The Dunham Formation was described in detail for northwestern Vermont by Gregory (1982), who documented a

transgressive sequence of peritidal to subtidal shelf edge carbonate environments. No environmental analysis was attempted for this study. The Dunham is a highly varied unit consisting of thin to thick bedded dolomite with common zones containing vertical and horizontal worm burrows. Sandy beds up to 1 or 2 feet thick and occasional thin shaley partings were observed, with colors ranging from dark gray to cream to pink. One unit of dolomitic sandstone (blue color on Fig. 3), was located within the Dunham Formation and was estimated to be 40 to 60 feet thick. Cleavage and other deformation features are minimal throughout the Dunham in this area.

RADIOACTIVITY

No location in the study area, or just outside of the study area, were appreciable amounts of radioactivity found (see Fig. 3).

The highest readings in the area (40-60's) were found on Hogback Mountain in the quartzites of the lower member of the Cheshire Formation (see Fig. 4). Most of the readings in this lithology were uniformly in the 40's with one 50 and one 60. These two higher readings were not associated with any noticeable variation of the characteristics of the rocks.

The readings in the other lithologies in the study area ranged from 16 to 40, with most being in the 20's.

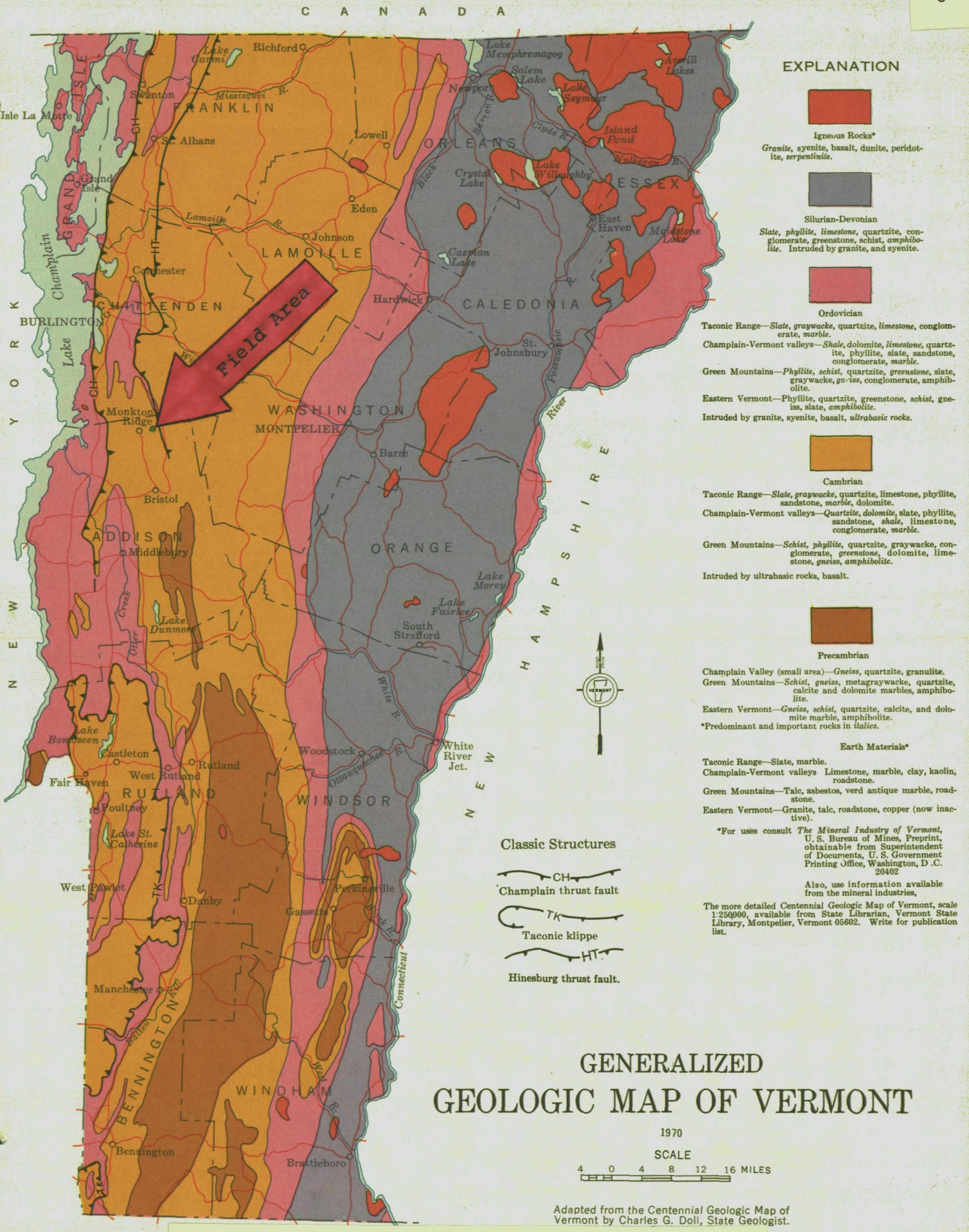

Figure 1. Location Map Showing Field Area.

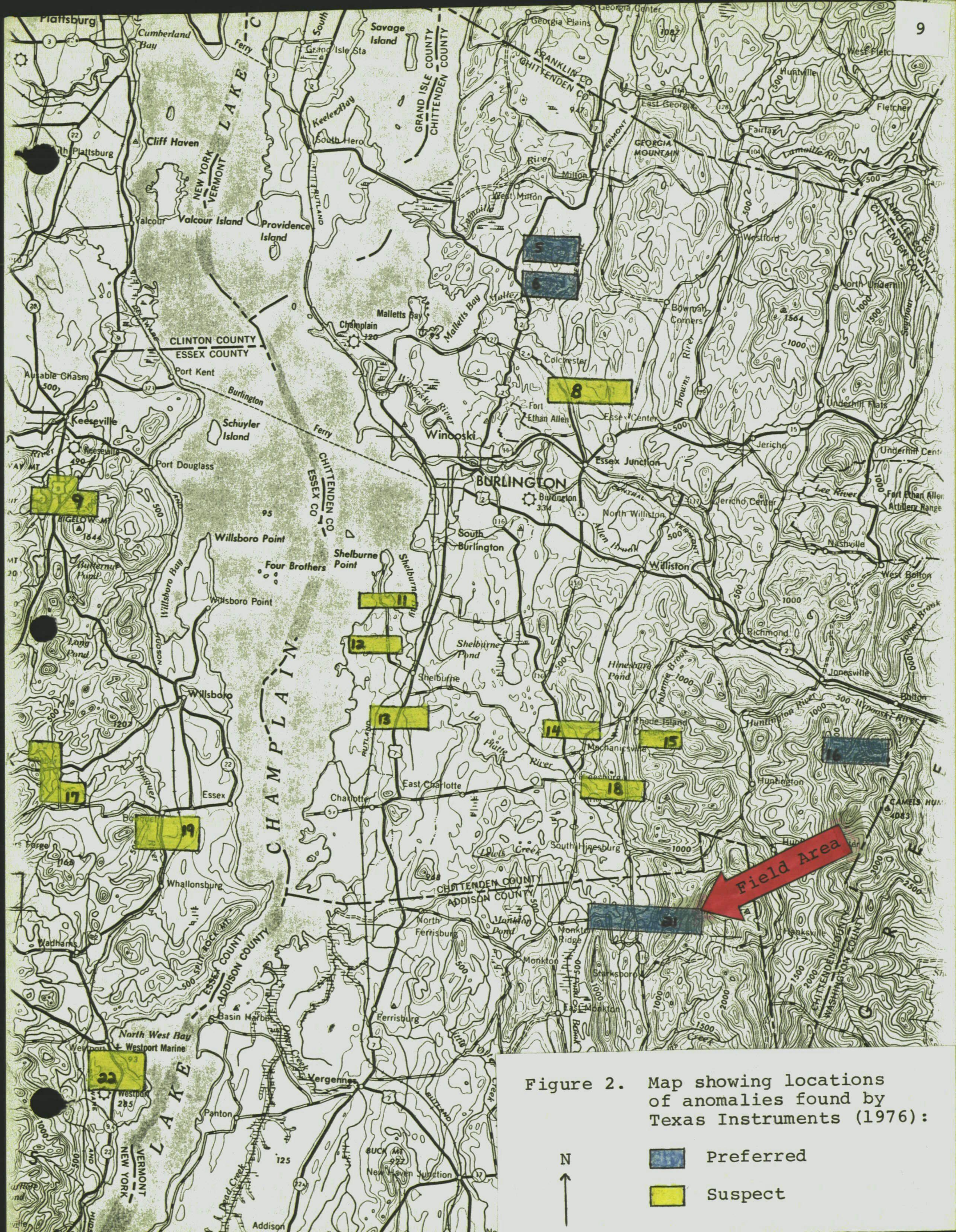

Figure 2. Map showing locations of anomalies found by Texas Instruments (1976):

N ↑

Preferred

Suspect

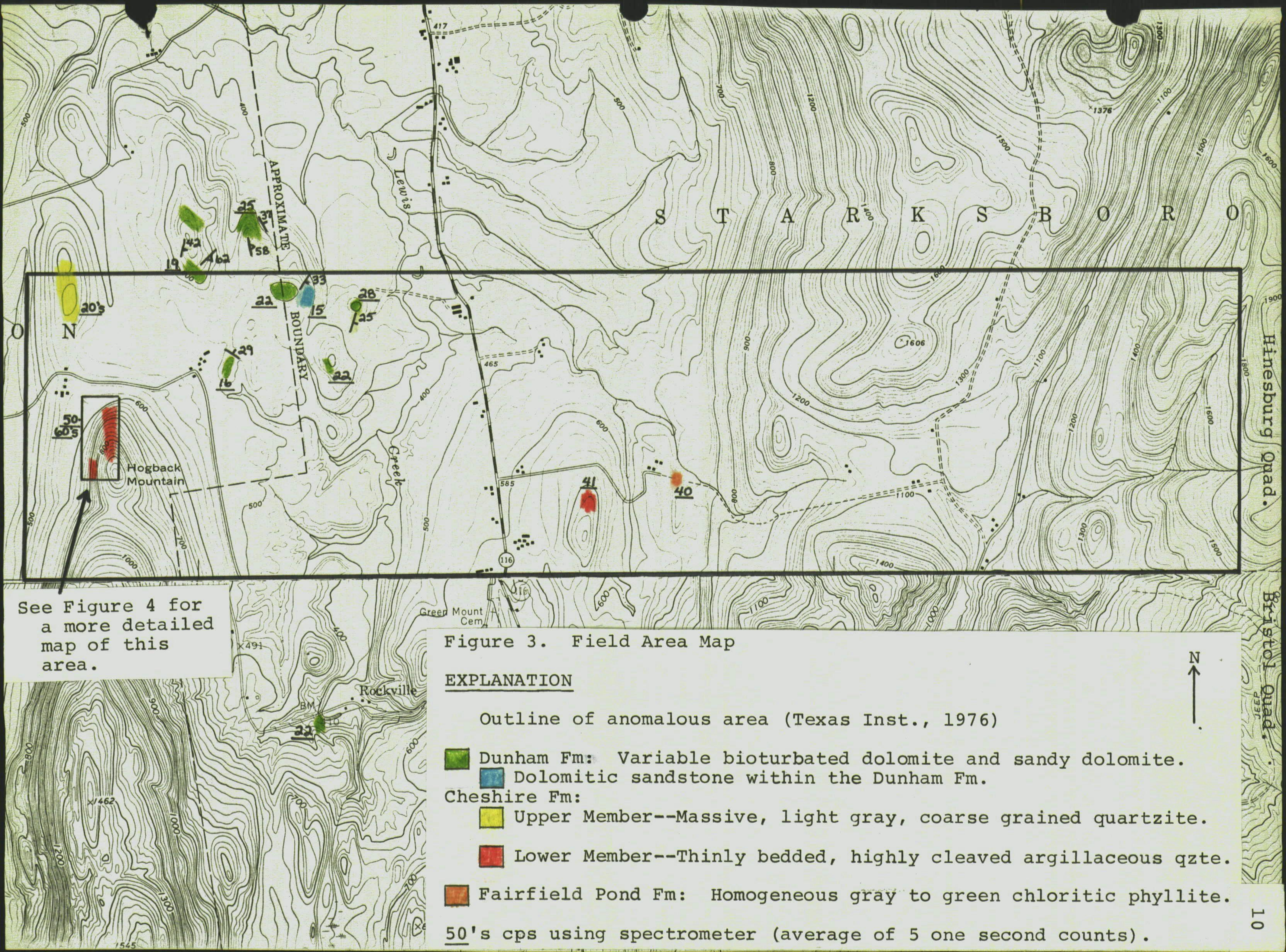

Figure 3. Field Area Map

EXPLANATION

Outline of anomalous area (Texas Inst., 1976)

Dunham Fm: Variable bioturbated dolomite and sandy dolomite.

Dolomitic sandstone within the Dunham Fm.

Cheshire Fm:

Upper Member--Massive, light gray, coarse grained quartzite.

Lower Member--Thinly bedded, highly cleaved argillaceous qzte.

Fairfield Pond Fm: Homogeneous gray to green chloritic phyllite.

50's cps using spectrometer (average of 5 one second counts).

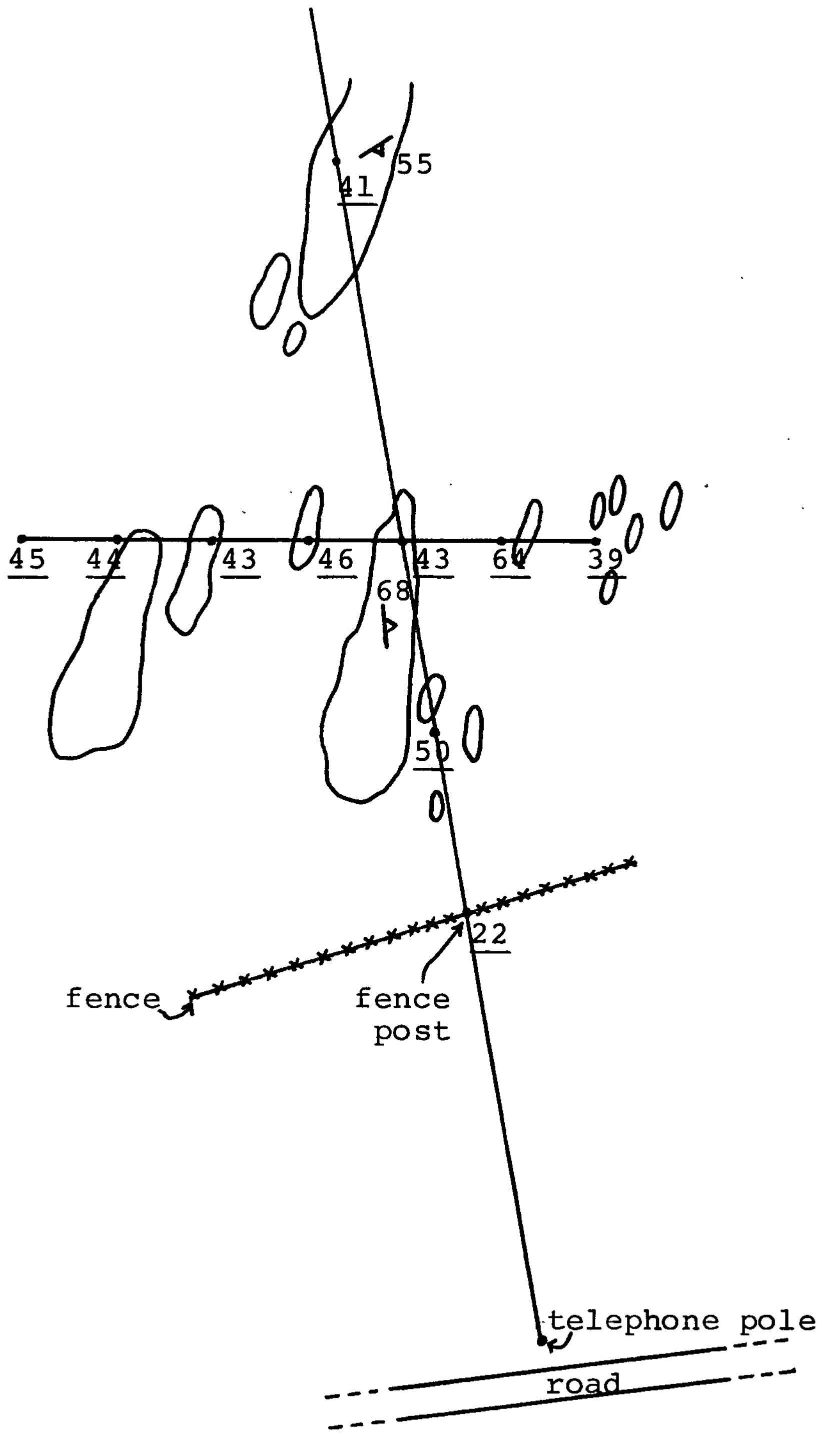

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Figure 4. Detailed map of part of the field area (see Figure 3 for location). All rocks are lower member of the Cheshire Formation.

Scale 1:1,200

<u>20</u> cps using spectrometer (average of 5 one second counts).

REFERENCES CITED

DiPietro, J. A., 1983, Geology of the Starksboro Area, Vermont: Vermont Geological Survey, Special Bulletin, No. 4.

Doll, C. G., Cady, W. M., Thompson, J. B., Jr., and Billings, M., compilers and editors, 1961, Centennial geologic map of Vermont: Vermont Geological Survey, scale 1:250,000.

Gregory, G. J., 1982, Paleoenvironments of the lower Cambrian Dunham Dolomite, northwestern Vermont: Master's thesis, University of Vermont, Burlington, VT, 91 p.

Myrow, P., 1983, A paleoenvironmental analysis of the Cheshire Formation in west-central Vermont: Master's thesis, University of Vermont, Burlington, VT, 210 p.

Tauvers, P. R., 1982, Bedrock geology of the Lincoln area, Vermont: Vermont Geological Survey, Special Bulletin, No. 2.

Texas Instruments, Inc., 1976, Airborne geophysical survey of a portion of New England: Prepared for the U. S. Energy Research and Development Administration, Grand Junction Office, contract nos. E(05-1)-1666 and E(05-1)-1667, GJO-1666-1.