R. R. Coats

United States Department of the Interior
GEOLOGICAL SURVEY
Denver Federal Center
Denver, Colorado 80225

IN REPLY REFER TO:

Feb 14

Dear Lee,

Here is a crude first draft of the manuscript I told you about on the phone. As you can see, I plan to briefly mention the alined deposits that run from Mary's Mountain northeast to Lone Mountain because of their bearing on the origin of the Chicken Creek deposit. If you could beef up my descriptions of the veins south of Maggie Creek and the deposits at the Queen Ann locality I'd be very thankful. I have seen these deposits but am now very uncertain as to their form and the nature of the host rocks. In addition, I would appreciate any critical comments on the manuscript although it's not yet ready for a formal review. You can pass on the information on the Chicken Creek deposit to Bob Coats for the county map report but bear in mind that until this paper is published no one outside the Survey knows it exists.

Thanks in advance,

Keith Ketner

Replacement barite deposit in Devonian rocks, southern Independence Mountains, Nevada

by Keith B. Ketner

Abstract

Devonian greenstone, chert, and metaquartzite in the Blue Basin Quadrangle, southern Independence Mountains, Nevada are mineralized with barite of possible commercial grade and size. Textural evidence indicates the barite was deposited in the host rocks principally by a process of replacement and to a lesser extent by a process of displacement and expansion of the host rock material. None of the evidence suggests the deposit is syngenetic.

In the Singletree Creek and Blue Basin quadrangles (fig. 1) southern Independence Mountains, Ordovician to Devonian shaly and cherty rocks were thrust over Devonian and older carbonate rocks. The upper plate of this thrust is composed of several platelets separated by thrust faults (Lovejoy, 1959; Ketner, 1974). Devonian rocks in one of these platelets in the Chicken Creek drainage are mineralized with barite. The mineralized rocks which strike north and dip steeply west are exposed intermittently in sections 17, 20, and 29, T. 37 N., R. 53 E. (fig. 2 and Ketner, 1974, unit Dm). They consist principally of bedded chert, recrystallized chert or metaquartzite, limestone, and greenstone which originally was intermediate to basic lava.

The chert is in beds a few centimeters thick. Some of it is black, fine grained radiolarian chert identical to that in allochthonous Devonian units elsewhere (Gilluly and Gates, 1965) but much of it has an unusual texture that looks grainy or oolitic in hand specimen. The grains are spores or spore-like bodies close packed in a phosphate rich matrix and are mostly altered to chalcedony (fig. 3). Spores of this type in the Devonian Woodruff Formation (Smith and Ketner, 1968) have been identified tentatively as Tasmanites by J. M. Schopf (written comm. 1957). In places, the bedded chert has been recrystallized and bleached to form white medium grained metaquartzite. Remnants of Tasmanites can be recognized in some of the incompletely recrystallized rock. The cause of recrystallization is not apparent but may be a contact effect of intrusive Devonian lava. Only part of the chert and none of the other kinds of rocks are visibly affected. The sandstone is coarse grained, poorly sorted and crossbedded. It is composed largely of detrital grains of fossil hash limestone and fossil fragments but includes grains of greenstone and, rarely, chert, quartz, and shale. A few grains are composed wholly or partly of barite but it is impossible to determine whether the barite is detrital or has replaced some other kind of detrital grain. The limestone is composed largely of fine grained fossil hash with the same texture as limestone clasts in the sandstone beds. Greenstone is a vesicular, evengrained rock composed largely of close packed felted plagioclase laths (pilotaxitic texture) and lesser amounts of alteration products including carbonate and chlorite (fig. 4).

Carbonate fills vesicles and veins and is disseminated in small grains. Greenstone is interlayered with cross bedded, coarse sandstone and black, bedded chert in units less than 1 meter thick in one exposure. In another exposure it is closely associated with fossil hash limestone. Exposures are too poor to permit identification of pillow structures and it is impossible to determine whether the greenstone layers are extrusive flows or shallow sills.

The age of sandstone in the stratigraphic sequence that includes the barite deposits is late Upper Devonian based on conodonts identified by Charles Sandberg. However, the Tasmanites bearing beds at the base of the sequence are similar faunally and in some respects lithologically to Early Devonian beds near the base of the Woodruff Formation (Smith and Ketner, 1968). The sequence is therefor regarded as of Late Devonian and possibly also Early Devonian age.

Barite was seen only in section 29. This deposit is called the Chicken Creek deposit, for the nearby stream of that name, to distinguish it from other deposits discussed below. The principal exposure is a prominent outcrop of white massive barite 600 meters east northeast from the center of section 29. Dark gray barite is inconspicuously exposed about 100 meters downslope to the west. A third exposure is 150 meters north of the southeast corner of section 29. The third exposure consists of scattered loose pieces of barite and very inconspicuous small outcrops. Scattered small pieces of barite in the soil suggest that barite may underlie the surface between these exposures. Tertiary volcanic rocks, conglomerate, and limestone overlap the baritized Devonian rocks on the west. Quite possibly they conceal additional barite deposits.

Much of the barite has a moderate to high specific gravity as indicated in table 1. (etc. etc. data not yet assembled - KK)

The Chicken Creek barite deposit is the sixth in a remarkably straight alinement of seven known deposits in the southern Tuscarora and Independence Mountains (fig. 1). Because the association of the Chicken Creek deposit with the other six is important with respect to the origin of the deposit they are briefly described here. The Cherry Spring deposit (fig. 1, no. 1) seems to be a replacement body in a cherty, shaly limestone unit which is regarded as being a facies transitional between those of the miogeosyncline and eugeosyncline (Evans and Cress, 1972). Conodonts in this limestone indicate it is lower Upper Devonian (Clark and Ethington, 1967; C. G. Tillman, written comm., 1968). The Maggie Canyon deposits (fig. 1, no. 2) are veins along a high angle fault that separates allochthonous from autochthonous rocks and within the authochthonous Roberts Mountains Formation of Silurian age (L. Cress, written comm., 1974). The Queen Ann Mine (fig. 1, no. 3) is in a sequence of chert, shale, and limestone that is unquestionably of Ordovician age (Evans and Cress, 1972; Leland Cress, oral comm., 1974). The barite is strongly colored with iron oxide and the associated rocks are silicified. Although some parts of the deposit cut across bedding surfaces and are apparently replacements of shale and limestone other parts are the bedded type (Leland Cress, oral comm., 1974) of problematic origin. The Cottonwood Creek deposit (fig. 1, no. 4) is in a sequence of bedded chert, shale, and limestone, from which only Ordovician fossils have been obtained thus far.

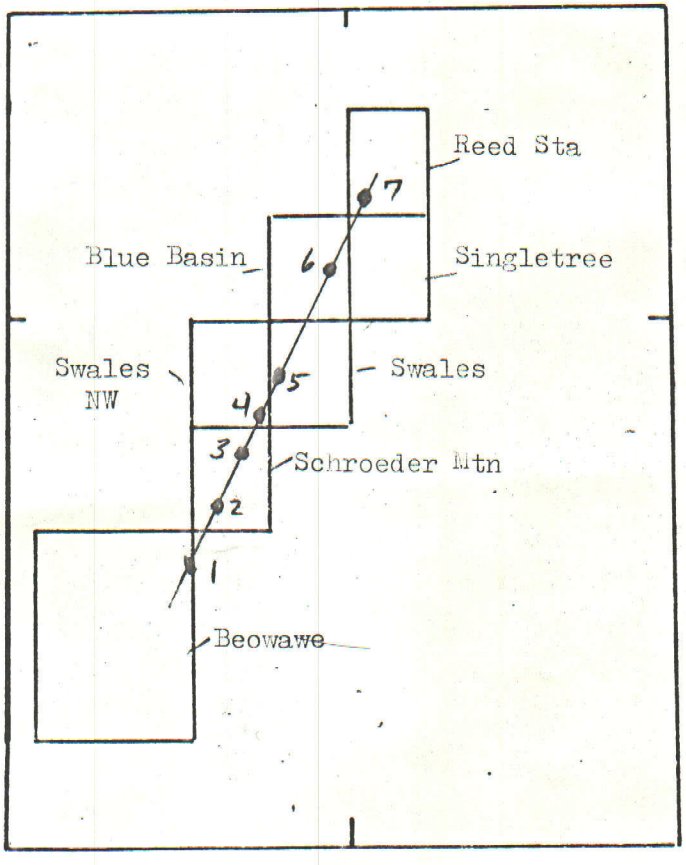
Parts of this deposit are strongly colored with iron oxide and spectrographic analysis indicates iron constitutes several percent of the barite rock (table 1), the lead and zinc content is also unusually high for barite deposits. The Fish Creek deposit (fig. 1, no. 5) extends intermittently for two miles along the regional trend shown in figure 1. It is in a sequence of chert, shale, and mudstone in which only Ordovician fossils have been found thus far (Evans and Ketner, 1971). Some of the barite is in the form of barite pebble conglomerate and in the form of rosettes whose blades apparently have distorted the bedding of the mudstone in which they grew. Most of the barite here, however, is of the bedded type. Many of the rocks closely associated with the barite are permeated with opal which in addition to filling pores in the mudstone has replaced carbonate rhombs. The Lone Mountain deposit (fig. 1, no. 7) is poorly exposed among rocks that have been regarded as of Ordovician or Silurian age (Lovejoy, 1959). Fossils collected recently by R. Coats and others from limestone lenses about one half mile (1 km) north of the deposit were identified by R. J. Ross as of Ordovician age. However, there is a distinct possiblity that the beds enclosing the barite deposit are of Devonian age. The evidence consists of nearby exposures, on strike with the barite, of Tasmanites chert identical to the Devonian Tasmanites chert near the Chicken Creek deposit.

Abundant and unequivocal textural evidence proves the bulk of the Chicken Creek deposit was formed by replacement of host rock material. Direct evidence of replacement is the transection of host rock textures by blades and rosettes of barite in greenstone, chert, and quartzite (fig. 5, 6, 7). The results of all stages of this pervasive process can be seen—from rocks in which the barite forms only small isolated crystals to rocks that are composed almost wholly of interlocking crystals of barite with isolated interstitial remnants of the original host material.

A small part of the deposit apparently was formed by displacement rather than replacement of host rock material. In some chert beds barite has crystallized in layers sub-parallel to the bedding and seems to have broken some of the beds apart by the force of crystallization (fig. 8).

The time of introduction of barite to the host rocks is somewhat uncertain but the bulk of evidence indicates barite was introduced long after consolidation of the host rocks rather than immediately after they were deposited. The disruption and displacemnt of some chert beds in the Chicken Creek deposit as shown in fig. 8 suggests that barite was introduced immediately after deposition of the chert when the chert was still soft and overlain by only a thin cover of sediment but this evidence is in conflict with the following evidence which indicates barite must have been introduced long after consolidation of host rocks.

The greenstone, now partially replaced by barite, must have been solid at the time of introduction of barite because textures are transected rather than displaced. Some of the chert was brittle at the time barite was introduced because quartz-filled fractures are offset by barite veins (fig. 9). Some chert apparently was recrystallized before barite was introduced (fig. 7). The regional distribution of barite deposits indicates the Chicken Creek deposit was formed after the host rocks were emplaced on thrust faults. The seven alined barite deposits shown in figure 1 are in rocks ranging in age from Ordovician to Devonian, are in both upper and lower plates of a major thrust fault or faults, and include vein, bedded, and replacement deposits.



Barite deposits:

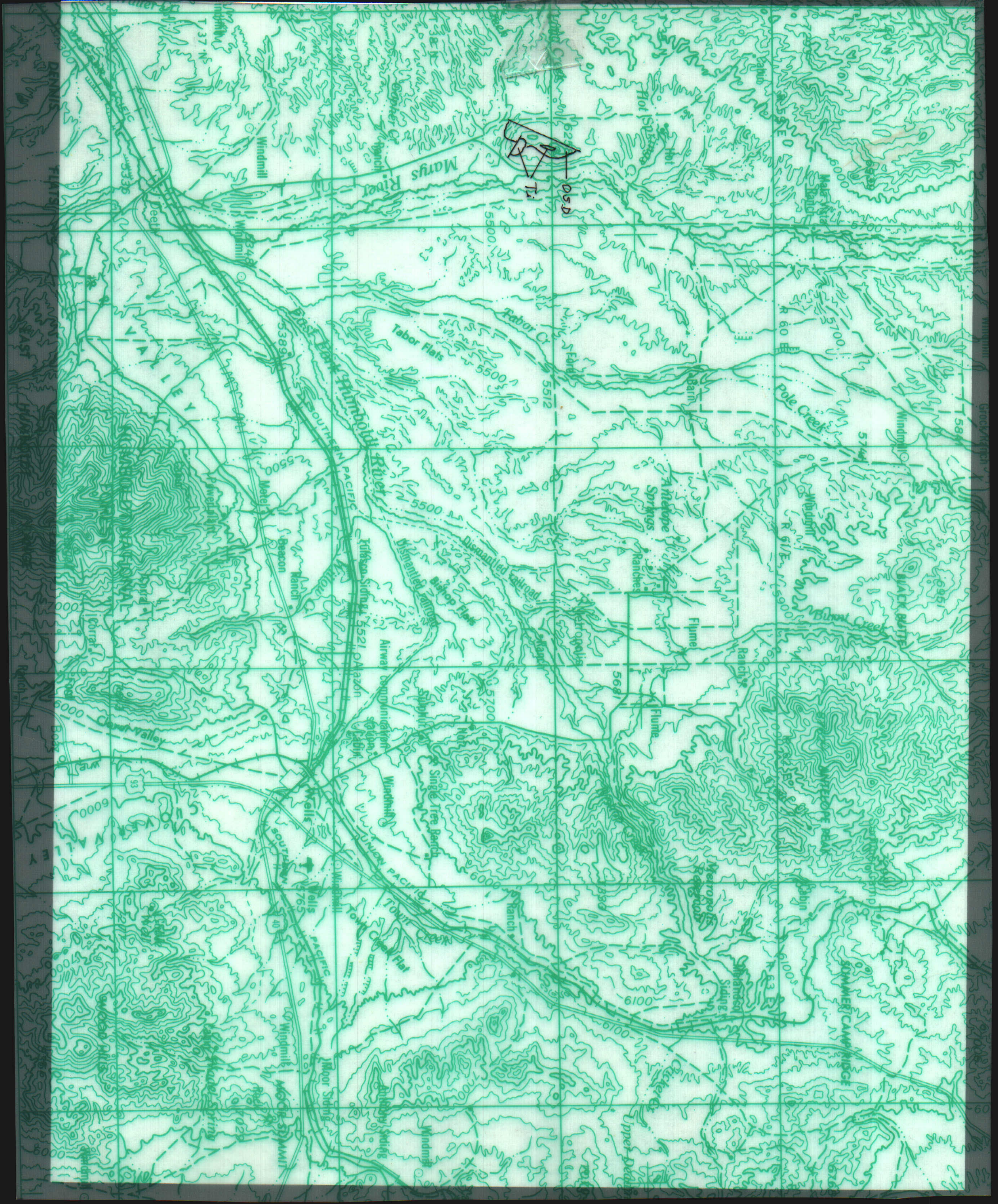
1. Cherry Spring
2. Maggie Creek
3. Queen Ann
4. Cottonwood Cr
5. Fish Creek
6. Chicken Creek
7. Lone Mtn

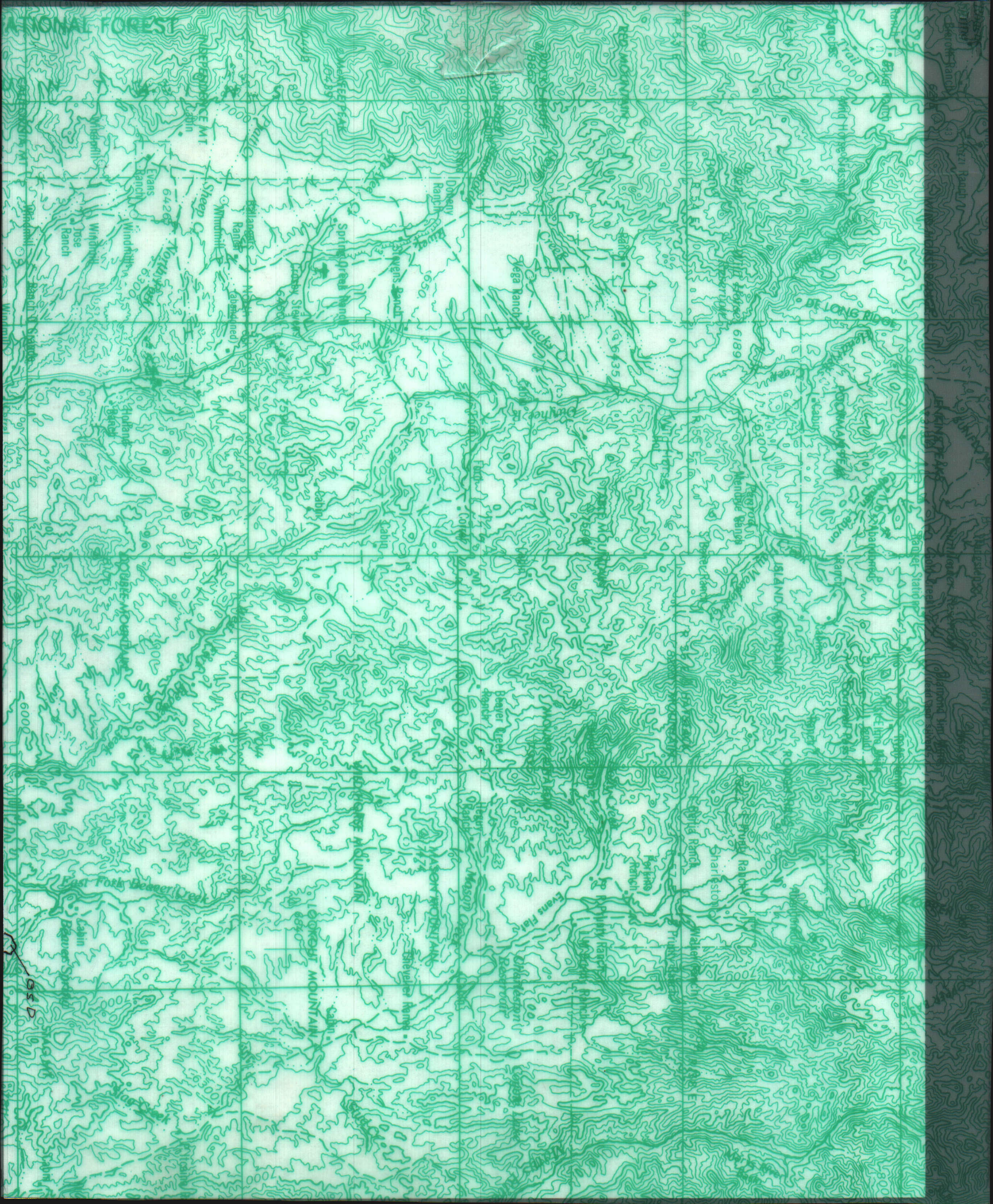
Exposures of rocks correlative with Ordovician to Devonian rocks in areas adjacent to this alinement in the southern Tuscarora and Independence Mountains are not known to contain barite deposits of significant size. It would require an incredible coincidence of events if these deposits had been formed at different times and places and then fortuitously were brought into nearly perfect alinement after a history of thrust faulting that began at the close of the Devonian Period (Smith and Ketner, 1968) and ocntinued to late Mesozoic time (Ketner and Smith, 1974).

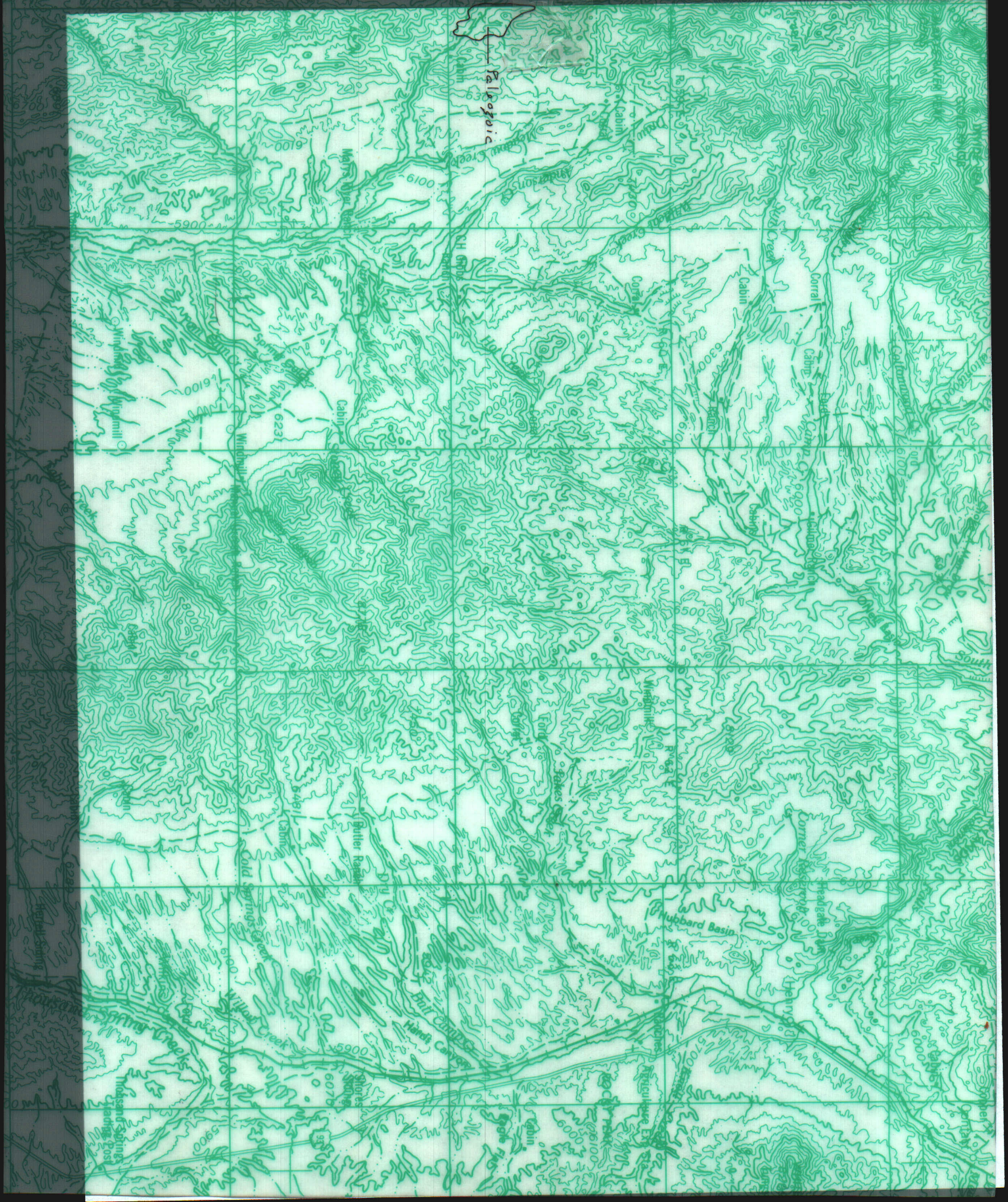
All of the evidence obtainable from the Chicken Creek barite deposit indicates barite was deposited in consolidated rock principally by a process of replacement and to a lesser extent by a process of displacement and to a very small extent by fracture filling. None of the evidence indicates the barite is a sedimentary mineral deposited at the same time the host rocks were deposited.

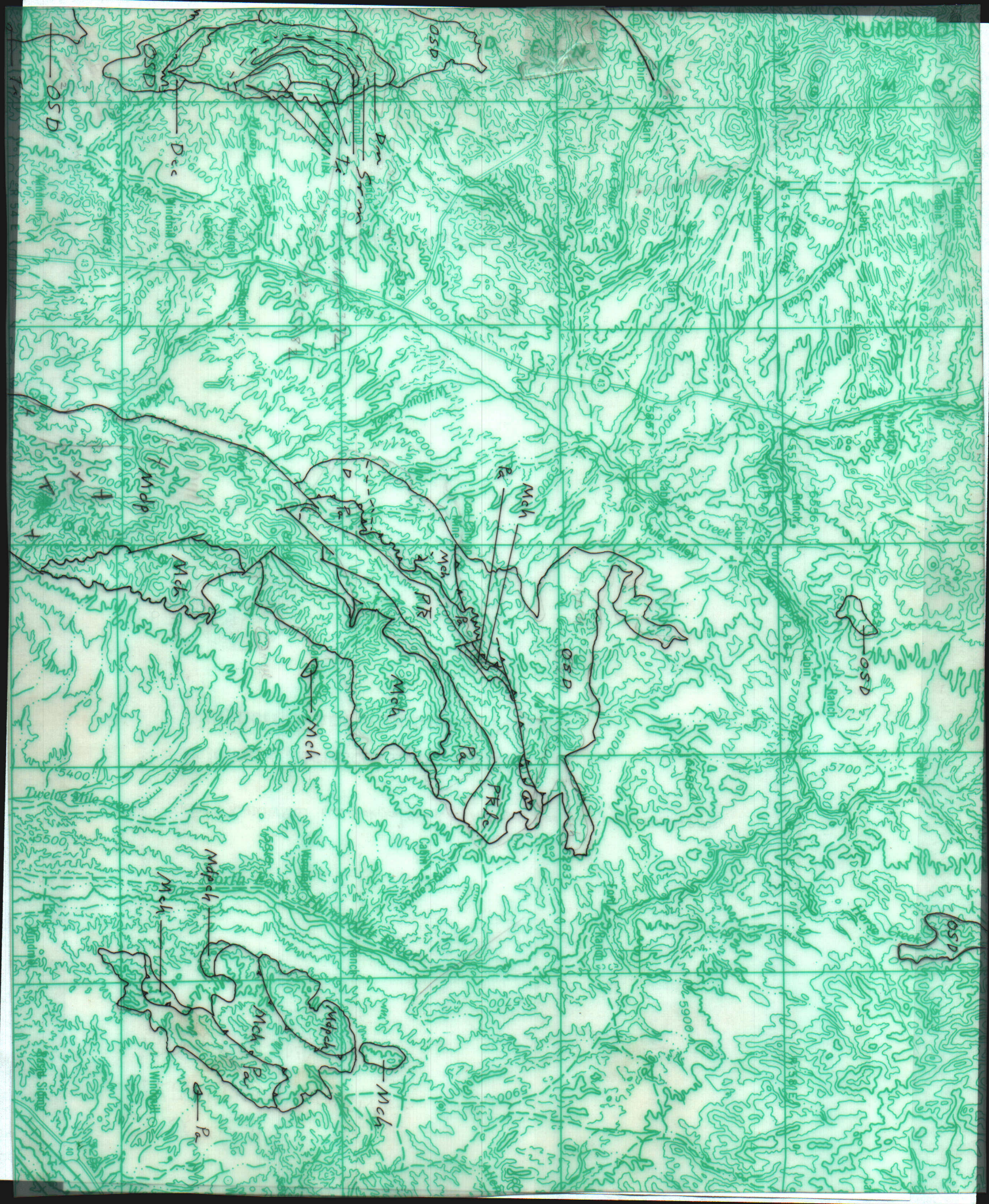
LANDER COUNTY
EUREKA COUNTY
WESTERN PACIFIC
Dunphy
Dunphy Ranch
Windmill
BOULDER VALLEY
Boulder Creek
TUSCARORA MOUNTAINS
Bob Creek
Abandoned
Ranch
EUREKA COUNTY
ELKO COUNTY
INDEPENDENCE MOUNTAINS
OSD
Paleozoic

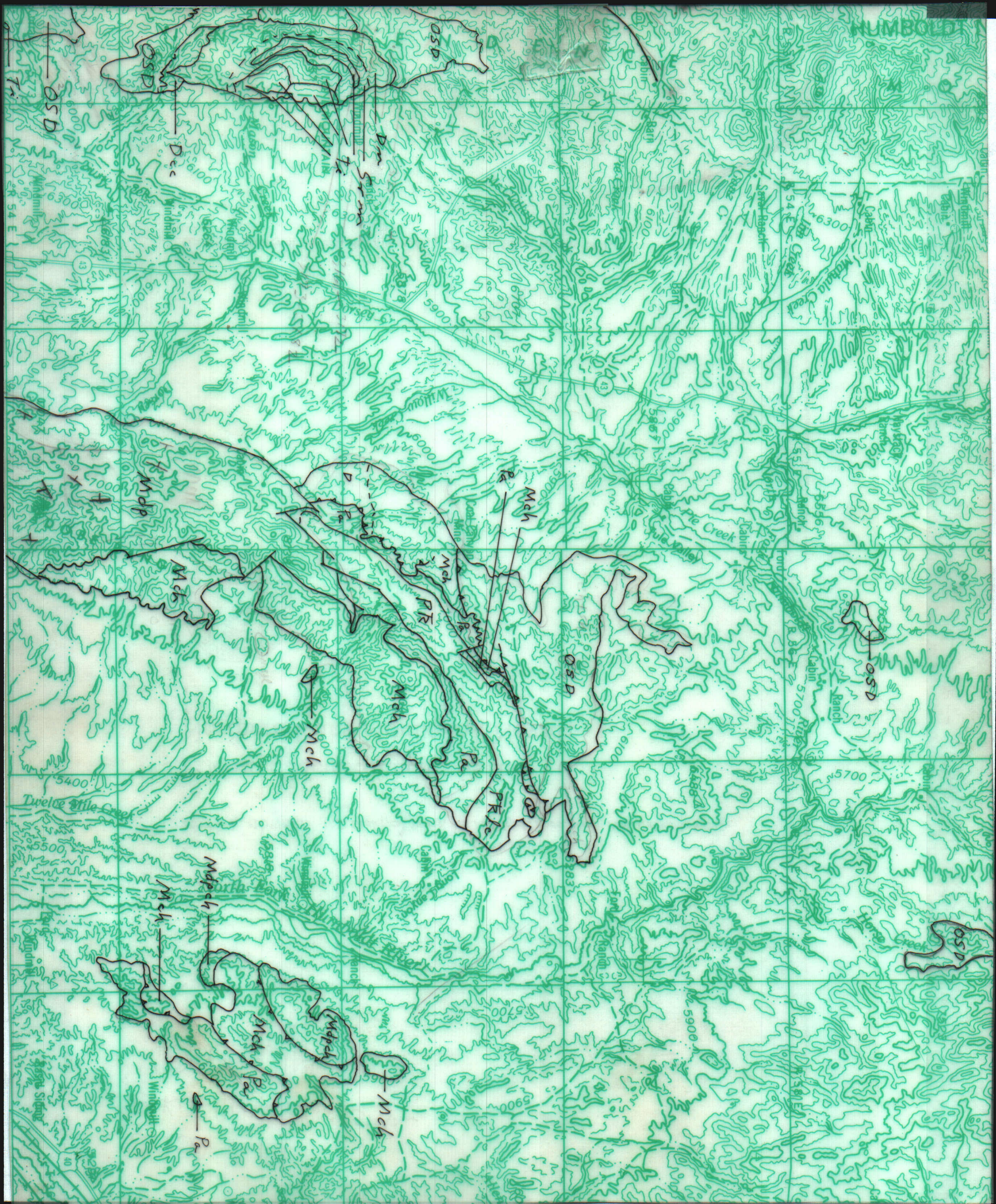

Mdp
Pa
PIPs
Mck
Elko
Humboldt River
North Fork
East Fork
VALLEY
Creek
Windmill
Ranch
Ranches
Beacon
6000
5500
5300


Marys River
Tabor Flats
Tabor Cr.
5500
East Fork Humboldt River
SOUTHERN PACIFIC
Dismantled Railroad
Pole Creek
Windmill
Clover Valley
Wells
UNION PACIFIC
6100


ATIONAL FOREST
DE LONG RIDGE
East Fork Beaver Creek


Paleozoic
Hubbard Basin
Cabin
Corral
6100
5900


HUMBOLDT
OSD
Dcc
Dm
Srm
Mch
Mdp
Mdpch
PIP
Pa
Twelve Mile Creek
Cabin
Ranch
5400
5500
5700
6300


HUMBOLDT
OSD
Dcc
Mdp
Mch
Pa
PR
PRfe
Mdpch
Twelve Mile Creek
5400
5500
5700
5900
6300


ELKO CO
EUREKA CO
TUSCARORA MOUNTAINS
S Fork Owyhee R
ELKO COUNTY
EUREKA COUNTY
OSD

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

ELKO EAST QUADRANGLE
NEVADA–ELKO CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)

Mapped, edited, and published by the Geological Survey
in cooperation with Nevada Bureau of Mines

Control by USGS and USC&GS

Topography by photogrammetric methods from aerial photographs taken 1955. Field checked 1957. Revised 1962

Polyconic projection. 1927 North American datum
10,000-foot grid based on Nevada coordinate system, east zone
1000-meter Universal Transverse Mercator grid ticks,
zone 11, shown in blue

Red tint indicates area in which only landmark buildings are shown

UTM GRID AND 1962 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24 000

CONTOUR INTERVAL 20 FEET
DOTTED LINES REPRESENT 10-FOOT CONTOURS
DATUM IS MEAN SEA LEVEL

ROAD CLASSIFICATION
Heavy-duty — Light-duty
Medium-duty — Unimproved dirt
U.S. Route — State Route

NEVADA
QUADRANGLE LOCATION

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER 25, COLORADO OR WASHINGTON 25, D. C.
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

ELKO EAST, NEV.
N4045—W11537.5/7.5

1962

AMS 2865 I SW–SERIES V896

J. Fred Smith

00500122