60002239

Mining District File Summary Sheet

DISTRICT	Elko County General - 6000 2239 Coal Mine - 60002240 Elko - 6000 2241
DIST_NO	0050 - Elko Co Gen Elko - 1730 1150 - Coal Mine
COUNTY If different from written on document	Elko
TITLE If not obvious	Geologic and mineral potential of the Adobe Range, Elko Hills, and Adjacent Areas, Elko County, Nevada
AUTHOR	Ketner K
DATE OF DOC(S)	1970
MULTI_DIST (Y) N? Additional Dist_Nos:	See District/District no.
QUAD_NAME	Double Mountain 100K; Elko 100K
P_M_C_NAME (mine, claim & company names)	
COMMODITY If not obvious	
NOTES	Geologic article; geology; geologic map; oil shale; US Geological Survey Professional Paper 700B. p B105 - B108; Coal donation 4p.

Keep docs at about 250 pages if no oversized maps attached
(for every 1 oversized page (>11x17) with text reduce
the amount of pages by ~25)

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GEOLOGY AND MINERAL POTENTIAL OF THE ADOBE RANGE, ELKO HILLS, AND ADJACENT AREAS, ELKO COUNTY, NEVADA

By KEITH B. KETNER, Denver, Colo.

Abstract.—Ordovician to Triassic sedimentary rocks in the Adobe Range and neighboring hills are tightly folded and broken by thrust faults. At least one episode of thrusting is of Paleozoic age. The folding and a younger episode of thrusting took place in Mesozoic or very early Tertiary time. Although Paleozoic rocks have been intruded by two sizable stocks, metallic mineral deposits like those commonly associated with similar stocks in other parts of Nevada have not yet been found. Rocks adjacent to thrust faults and some steep faults are silicified and iron stained. Some of these altered rocks are slightly enriched in lead and zinc. The Permian System contains many weakly phosphatic beds and a few beds of moderately rich phosphate rock. The lower part of the Tertiary sequence includes extensive beds of oil shale similar to the well-known occurrence on the south edge of Elko.

Reconnaissance mapping of central Elko County was begun in 1966 in an effort to assess the mineral potential of the area as part of the U.S. Geological Survey's heavy-metals program. In particular, stratigraphic and structural conditions similar to those of the Carlin mine area (Hardie, 1966), Cortez (Gilluly and Masursky, 1965), and the Gold Acres mine (Ketner, 1965) were sought. Similar conditions found in the Swales Mountain area have been described (Ketner and others, 1968).

The present report outlines the geology of a large part of central Elko County adjacent to the Swales Mountain area (figs. 1, 2). J. G. Evans assisted in mapping the Elko Hills and Peko Hills. Geochemical tests for metals were made under the direction of A. P. Marranzino, and P_2O_5 analyses were made by G. D. Shipley. Helpful paleontologic data, to be discussed in a later report, were provided by a large number of paleontologists.

STRATIGRAPHY

Oldest rocks exposed in the area are a complexly faulted sequence known as western-facies rocks because they are thought to have been carried on thrust faults from a more westerly site of deposition. They are composed principally of chert, shale, siltstone, and limestone. The normal stratigraphic sequence and thickness of these beds cannot be determined owing to their complex structure, but the sequence ranges in age from Early Ordovician to Late Devonian.

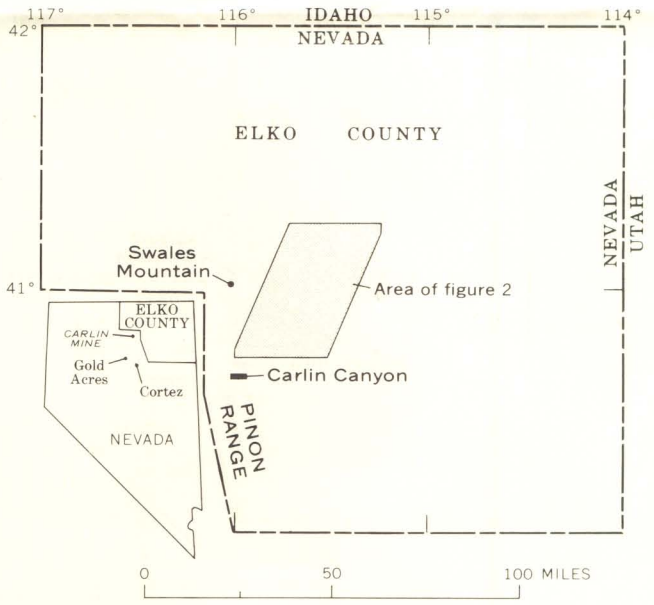

FIGURE 1.—Index map of Elko County, Nev., showing localities referred to in text and the area of figure 2.

The next younger rocks are assigned to the Chainman Shale. Exposures of the Chainman in the neighboring Pinon Range (fig. 1) were recently described by Smith and Ketner (1968). In the area of the present report the Chainman is composed largely of chert-grain sandstone and black siliceous shale. Its thickness, estimated from the width and attitude of the outcrop, is at least 5,000 feet; and its age, according to correlation with dated beds of similar lithology in the Pinon Range, is Mississippian.

The Diamond Peak Formation, which conformably

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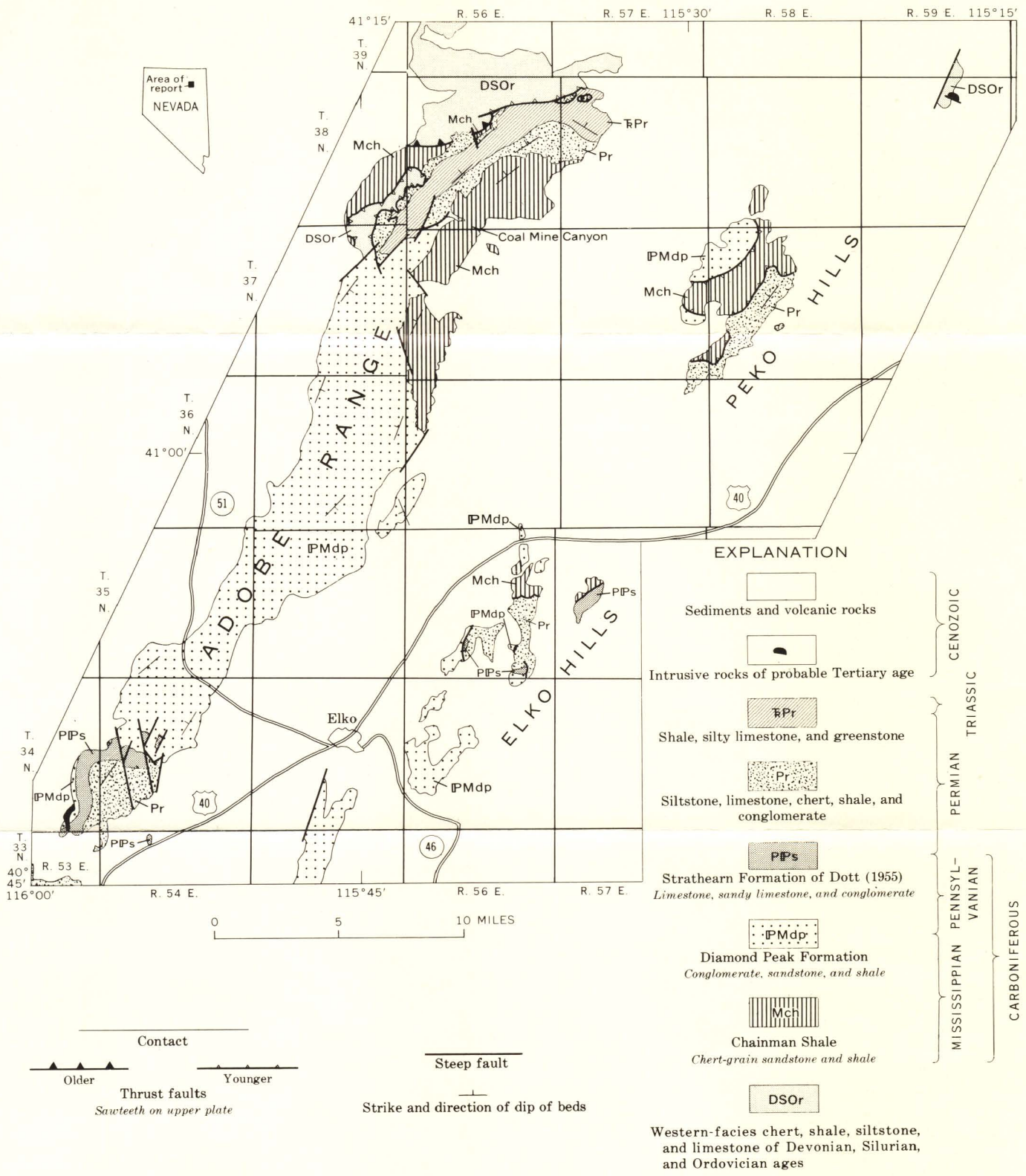

FIGURE 2.—Geologic sketch map of the Adobe Range, Peko Hills, and Elko Hills, Elko County, Nev. Geology by K. B. Ketner and J. G. Evans, 1966–69.

overlies the Chainman Shale, is composed almost entirely of conglomerate but contains some thin red beds, black shale, sandstone, and limestone. Pebbles and larger particles in the conglomerate are composed mainly of chert and quartzite and are about 1 foot in maximum diameter. The conglomerate is composed entirely of material derived from western-facies rocks. The contact with the Chainman Shale is conformable and abrupt. The thickness of the Diamond Peak is estimated to be 5,000 feet or more, and its age, determined from marine fossils, is Mississippian and Pennsylvanian.

The Strathearn Formation of Dott (1955) unconformably overlies the Diamond Peak Formation. Exposures of the Strathearn in the southern Adobe Range and in the Elko Hills are similar to those in the Carlin Canyon area which were fully described by Dott. The formation consists mostly of limestone, but locally contains sandy, conglomeratic, and cherty beds. The Strathearn is estimated to be about 1,200 feet thick. Its age is Late Pennsylvanian and Early Permian.

An unnamed sequence of Permian age overlies the Strathearn Formation. In the Carlin Canyon area this sequence was divided into three formations by T. G. Fails (1960). These proposed formations are not accepted in the present report because, owing to lateral changes in lithology, they could not be certainly identified beyond their type areas. The unnamed Permian sequence is composed principally of siltstone, limestone, chert, shale, and conglomerate. Nearly all beds in the upper half of this unit are abnormally phosphatic, and the phosphate resembles that of the Phosphoria Formation. This sequence lies conformably on the Strathearn Formation in the southern part of the area of this report but is more extensive than the Strathearn, and extends northward, overlapping Mississippian rocks in the northern Adobe Range. The age of the sequence is Early to Late Permian. Among the many fossil collections on which this age designation is based are two collections of the bivalve *Atomodesma*, rarely recorded from North America. In the southern Adobe Range, where the sequence is thickest, it is estimated to be at least 5,000 feet thick.

Overlying this sequence of Permian rocks in the northern Adobe Range is an unnamed formation resembling, in some respects, the Dinwoody Formation of southern Idaho. It is composed largely of soft dark shale that weathers greenish gray; platy, silty limestone; and a small amount of greenstone. The internal stratigraphic sequence of these lithic types has not been determined owing to complex structure and poor exposures. Its age, as determined from collections of brachiopods and ammonoids, is Late Permian and Early Triassic.

Overlying all older rocks with profound unconformity is a sequence of rocks probably entirely of Cenozoic age. In the northern Adobe Range, where it is best exposed, the basal unit is composed of very coarse conglomerate similar in appearance to the Diamond Peak Formation but much more coarse and containing boulders of conglomerate and sandstone derived from the Chainman and Diamond Peak Formations. Above the boulder conglomerate is a sequence several hundred feet thick of sandstone, limestone, and oil shale. The upper part of the Cenozoic sequence is composed of ash deposits, lava flows, and alluvial sand and gravel.

Two bodies of intrusive rock are exposed in the area of this report. One, a coarse-grained quartz monzonite, intruded shale of Ordovician age (fig. 2; T. 38 N., R. 59 E.). The other, a quartz porphyry, intruded the Diamond Peak and Strathearn Formations (fig. 2; T. 34 N., R. 53 E.). The ages of these intrusives are as yet unknown.

STRUCTURE

Structural relations in the area of this report indicate two episodes of thrust faulting and a period of folding. The oldest thrust exposed in the area carried Ordovician, Silurian, and Devonian rocks over the Mississippian Chainman Shale. Overlap of this fault by Permian rocks proves a Paleozoic age.

In a second stage of deformation, Paleozoic and Mesozoic rocks were compressed into northeast-trending folds. The best developed of these folds is a syncline that can be traced along the entire length of the Adobe Range.

Relatively young thrusts carried rocks ranging in age from Ordovician to Permian over the previously folded Permian and Permian to Triassic sequences. These thrusts probably resulted from a continuation of the forces that produced the Adobe Range syncline. This episode of folding and thrusting is clearly of post-Early Triassic age and represents forces acting from the northwest toward the southeast.

MINERAL POTENTIAL AND SUGGESTIONS FOR PROSPECTING

Although ore deposits in the region are commonly associated with stocks of acidic rocks, no minerals of economic importance were found in or near the two stocks exposed in the area of this report. However, aeromagnetic lines (U.S. Geol. Survey, 1967a, b) in the vicinity of one of them (T. 34 N., R. 53 E.) indicate the exposed part of this intrusive to be part of a much larger intrusive that extends westward from the

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outcrop under a cover of Tertiary sediments. The concealed part of this intrusive and associated rocks should be further investigated by geophysical methods and drilling.

Belts of silicified, iron-stained rock extend along some thrust faults in the northern Adobe Range (T. 38 N., R. 56 E.), in the Peko Hills (T. 37 N., Rs. 57, 58 E.), and along steep faults in the Elko Hills (T. 35 N., R. 56 E.). Some of these bands of altered rock are slightly mineralized. Spectrographic analyses of 100 samples of altered rock along thrusts in the Adobe Range indicated that there has been some enrichment in lead and zinc. However, the silver content of these samples averaged less than 1 part per million (ppm), and the gold content, determined by atomic absorption, averaged less than 0.02 ppm. Additional geochemical prospecting of these zones is warranted.

In the southern Adobe Range (secs. 3, 5, 8, and 10, T. 34 N., R. 54 E.), parts of the Diamond Peak Formation seem to be somewhat mineralized. Altered material from this area is slightly enriched in copper and silver. Although aeromagnetic lines give no indication of a concealed intrusive there and alteration is not intense, further geochemical prospecting is advisable in this area.

Permian rocks in the southern and northern Adobe Range and in the Peko Hills are significantly phosphatic. Outcrops of chert, siltstone, and limestone in these areas contain small percentages of phosphate, and concealed thin beds of very phosphatic rock are indicated by loose pieces scattered on the surface. Analyzed selected samples from the southern Adobe Range contained as much as 13 percent P_2O_5, and some samples from the Peko Hills contained about 20 percent. Because the richly phosphatic beds fail to crop out, their extent and thickness can be determined only after exploratory trenching in areas where loose pieces are found.

Oil shale in the Tertiary deposits is exposed in places along the east side of the Adobe Range and around the Elko Hills. The "coal mine" for which Coal Mine Canyon is named was a prospect opening in an exposure of oil shale about a quarter of a mile north of the Coal Mine Canyon road at the east edge of the Adobe Range (T. 38 N., R. 56 E.; see King, 1876, map IV). Because oil shale quickly disintegrates on exposure to air, outcrops are scarce and exploration is best done by trenching where loose pieces of oil shale or associated rocks are found at the surface. These have been found in the area of this report among the Elko Hills and along the east edge of the Adobe Range. Exposures of oil shale along the east edge of the Pinon Range (fig. 1) (J. Fred Smith, Jr., and Ketner, unpub. data) indicate a total north-south extent of at least 45 miles. It is very likely that the shale underlies nearly all the major valleys in the area of this report, but in most places the shale is deeply buried, approaching the surface only near the hills and mountain ranges.

REFERENCES

Dott, R. H., Jr., 1955, Pennsylvanian stratigraphy of Elko and northern Diamond Ranges, northeastern Nevada: Am. Assoc. Petroleum Geologists Bull., v. 39, no. 11, p. 2211–2305.

Fails, T. G., 1960, Permian stratigraphy at Carlin Canyon, Nevada: Am. Assoc. Petroleum Geologists Bull., v. 44, no. 10, p. 1692–1703.

Gilluly, James, and Masursky, Harold, 1965, Geology of the Cortez quadrangle, Nevada, *with a section on* Gravity and aeromagnetic surveys, by D. R. Mabey: U.S. Geol. Survey Bull. 1175, 117 p.

Hardie, B. S., 1966, Carlin gold mine, Lynn district, Nevada: Nevada Bur. Mines Rept. 13, pt. A, p. 73–83.

Ketner, K. B., 1965, Economic geology, *in* Gilluly, James, and Gates, Olcott, Tectonic and igneous geology of the northern Shoshone Range, Nevada: U.S. Geol. Survey Prof. Paper 465, p. 129–144.

Ketner, K. B., Evans, J. G., and Hessin, T. D., 1968, Geochemical anomalies in the Swales Mountain area, Elko County, Nevada: U.S. Geol. Survey Circ. 588, 13 p.

King, Clarence, 1876, Geological and topographical atlas accompanying the report of the geological exploration of the fortieth parallel: U.S. Geol. Explor. 40th Parallel.

Smith, J. F., Jr., and Ketner, K. B., 1968, Devonian and Mississippian rocks and the date of the Roberts Mountains thrust in the Carlin-Pinon Range area, Nevada: U.S. Geol. Survey Bull. 1251–I, p. I1–I18.

U.S. Geological Survey, 1967a, Aeromagnetic map of the Dixie Flats and Elko 2 quadrangles, Elko County, Nevada, scale 1:62,500: U.S. Geol. Survey open-file report.

——— 1967b, Aeromagnetic map of the Palisade 1 and Palisade 2 quadrangles, Eureka and Elko Counties, Nevada, scale 1:62,500: U.S. Geol. Survey open-file report.