GL02441

McCOY GEOPHYSICS

Preliminary Report

27 January 1980

by

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McCOY GEOPHYSICS

Heatflow, gravity, magnetics and self-potential surveys were performed over the McCoy area. In addition a passive seismic survey was supplemented by a refraction experiment utilizing 3 blasts. The results of these studies are shown in schematic form on the accompanying maps and overlays, and may be directly compared to the generalized geologic base map (Figure 1). A magnetotelluric survey is still to be run, and an electromagnetic survey operated by LBL has not yet been reported on.

Heatflow

The heatflow survey was obtained from 46 wells of which 38 were drilled by AMAX (Figure 1A). Holes were drilled to 40 or 50 meters, but some available wells (at McCoy Mine and Hole in the Wall Well) are 70 and 150m, respectively. Heatflows were computed from thermal gradients and measured and estimated conductivities of cuttings.

The majority of the wells fall on the McCoy property and extend in a NS zone 10km wide between the New Pass range and Augusta Mts. Because the high heatflow occurs within this same zone, the thermal extent of the anomaly is clearly defined only on the east, where wells drilled into the border region of adjacent Antelope Valley exhibit low thermal gradients.

Within the thermal area, high heatflow occurs at the McCoy Mine (14hfu) and 3km SE of Hole in the Wall Well No. 2 (18hfu). Both of these anomalies fall on a major lineament expressed by Hole in the Wall wash, and discussed below in the section on self-potential. An extension of the thermal anomaly to the north is indicated by a third high (11hfu), 4km north of McCoy Mine. The highest heatflow was obtained 4km north of the end of the Edwards Creek Valley, where 23hfu were measured. This high coincides with the intersection of two magnetic low trends, the most prominent SP dipolar anomaly, and a zone of P-wave delay.

Magnetics

The McCoy aeromagnetic map shows the intersection of major fault trends (Figure 3). A narrow magnetic low extends from the Edwards Creek Valley into the Antelope Valley (from A to B). It appears to be a structural low separating the two magnetic highs C and D. Magnetic high C is probably related to the Augusta Mountains horst block. Anomaly D occurs over the New Pass Range horst. A second series of magnetic lows extends north-northwesterly into Dixie Valley (from A to E). The strike direction of the faults bounding these lows suggests they are right-lateral faults caused by east/west extension. Anomaly F occurs over intrusive rocks of the Humboldt lopolith. The magnetic low, G, in the intersection zone may be caused by hydrothermal alteration.

Gravity

The complete Bouguer gravity map of the McCoy prospect shows the intersection of two gravity lows (Figure 2A). The Edwards Creek Valley graben occupies the gravity low along the center edge of the map (A). A second graben-fill structure causes the gravity low in the Antelope Valley (B). The fault zone along the west margin of the Edwards Creek Valley appears to continue to the northeast, forming a narrow structural and gravity low which separates the south end of the Augusta Mountains from the New Pass Range (C). A second narrow structural low extends in a northwesterly direction from the Edwards Creek Valley to Dixie Valley (A to D to E). Faults along this low generally form an orthogonal set with faults along the west side of the Edwards Creek graben. This relationship suggests that faults having northwesterly strike are probably right-lateral and that they formed in response to north/south compression.

Seismic studies

MicroGeophysics Corporation conducted a passive seismic survey during 31 days in June and July 1979. Twenty-two stations were occupied during the survey.

Microearthquake epicenters based on a linear increase of velocity with depth, are plotted in Figure 3. Of 36 microearthquakes recorded, 30 could be located, but not all fall on our map. In the map area all events of magnitudes greater than -0.4 should have been recorded. Due to the limited number of events, a contour map of strain release is not warranted in this report. Clusters of three events occurred in the vicinity of the McCoy Mine; in an area 5km south of Hole in the Wall; and near Horseshoe Well south of the McCoy property. Faults, determined from fault-plane analysis are shown on the map, but are poorly controlled, and are not in good agreement with mapped faults.

The Poisson's ratio map (Figure 3A) shows several areas in which the ratio exceeds 0.35. Those on the east and south appear to be due to sedimentary fill in the basins. The high occurring to the west of the McCoy Mine in the northern high heatflow area is likely due to high fracture permeability in a zone in which faulting is prevalent. At this time there is no evident explanation of the high ratios to the north and west. The zone of low Poisson's ratio in the center of the map indicates an area of low fracturing or anomalously low P-wave velocity, or both.

A P-wave delay study, based on arrivals from 9 teleseisms was reinforced with information from refraction measurements derived from 3 blasts in local mines. The principal results of this work are highlighted in Figure 3B. The blue zones of seismic advance appear to correspond to zones of outcrop, except that extending parallel to the thermal anomaly, which may express velocity enhancement due to silicification. The shallow delay in the central area was determined from the refraction survey and appears to result from a thickening of caldera fill. The P-wave delays on the north and west were not confirmed by refraction information and have no present interpretation. That on the southeast, however, correlates with the highest heatflow and largest self-potential anomaly. It reveals a mass of low-velocity material "somewhere near the surface". This area is to be given particular scrutiny during the forthcoming MT survey.

Self-potential survey

MicroGeophysics Corporation ran a self-potential survey along 6 1/2 EW lines and 4 NS tie lines. The former followed generally every other section line. The results were later examined by R. Corwin, whose comments are incorporated in this discussion.

In the map of Figure 4, only salient features are illustrated. Of greatest importance is the negative anomaly that roughly corresponds to the heatflow anomaly. This feature can possibly be an example of the classic thermoelectric anomaly, in which case the amplitudes (90mv at the south end, and 50mv at the north) would translate to 180°C and 100°C, near surface, respectively, and higher temperatures at depth. An alternative explanation that would produce the necessary coupling coefficient boundaries would be a zone of hot water flashing to steam, capped by a silicified layer.

Within the broad negative, several smaller anomalies appear. The negative at the McCoy Mine may be due to mineralization in addition to a heatflow (14hfu) effect. The dipole to the west (Hole in the Wall Well, No. 2) marks a boundary over which heatflow of 18hfu was measured. At the south end, the highest measured heatflow (22hfu) occurs at another SP boundary (mapped as a fault separating Triassic sediments from Tertiary volcanics. The extension of the negative eastward, might be due to the presence of graphitic sediments of Western facies rocks in that vicinity.

A major regional feature seems to express itself across the McCoy area as a transition from positive on the south to negative on the north; i.e., a very broad dipolar trend having its axis along Hole in the Wall wash. This major drainage corresponds to a structural lineament (visible on Landsat photos) that extends WNW through Hyder Hot Springs and Seven Devils Hot Springs in Dixie Valley.

Of the localized positive features in the western half of the map, only that farthest west can be explained at this time. It occurs over a mineralized zone and is likely related to the oxidation/reduction process in groundwater.

Note

The geophysical information summarized above may be compared with a report by H. D. Pilkington (1979), entitled "Geology of the McCoy Area, Nevada". Sections of this report on gravity and magnetics were written by Fred Berkman; the remaining sections were prepared by Arthur L. Lange. Contractors' reports on which the discussions are based are the following:

MicroGeophysics Corporation

McCoy, Nevada Microearthquake Survey. 8 October 1979.

McCoy, Nevada, Gravity Survey. 1 January 1980

Self-potential Survey, McCoy, Nevada. 15 June 1979.

DEAN PILKINGTON

GEOLOGY OF THE McCOY AREA, NEVADA

H. D. Pilkington
AMAX Exploration, Inc.

CONTENTS

ILLUSTRATIONS

INTRODUCTION

The McCoy area straddles the Lander County-Churchill County line in central Nevada approximately 40 miles northwest of Austin (Figure 1). The area is sparsely populated and within the proposed unit area there are no inhabitants. The area is crossed by a network of dirt roads.

Topographically, the area lies at the junction of the Augusta Mountains, the Clan Alpine Mountains and the New Pass Range (Plate I). The mountain ranges have considerable relief, Mount Grant in the Clan Alpine Mountains is 9,966 feet and Cane Mountain in the Augusta Range stands at 8,409 feet. The valley floors average 3,500 to 4,500 feet in elevation. Within the proposed unit area the relief is more subdued with elevations ranging from about 6,000 feet to about 4,500 feet.

Vegetation within the proposed unit area is quite sparse. The lower slopes of the mountains are brush covered with some grass. The upper slopes have juniper and a few piñon pine. Water flows in the canyons and washes only during the snow melt or following torrential rains.

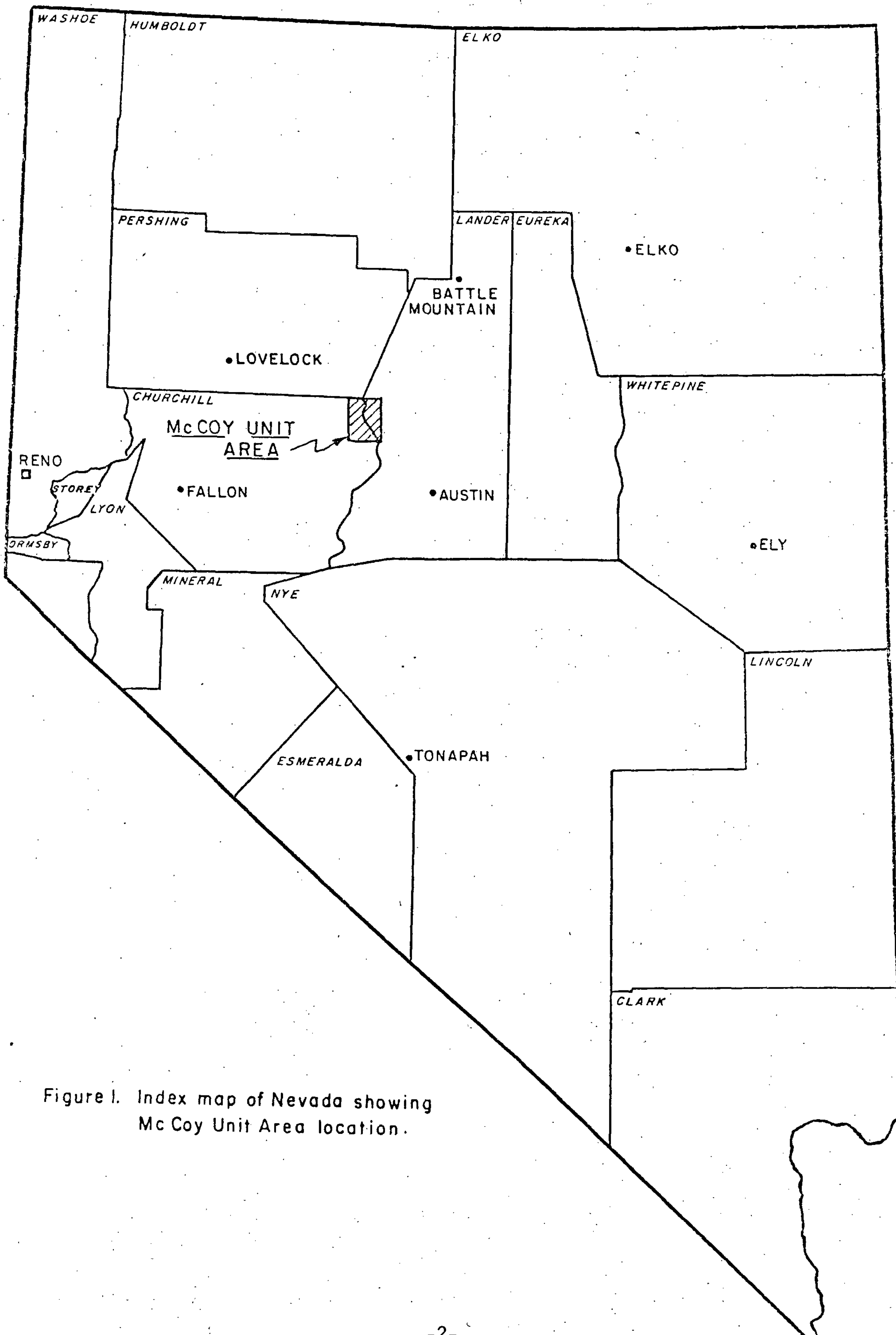

Figure I. Index map of Nevada showing
Mc Coy Unit Area location.

ROCK DESCRIPTIONS

Paleozoic Rocks

Rocks of Paleozoic age are exposed in the northern part of the New Pass Range (Plate I) and the southern part of the Augusta Mountains. These strata have been referred to the Havallah sequence (Silberling and Roberts, 1962) of Permo-Pennsylvanian age. Along Gilbert Creek on the east side of the New Pass Range the Havallah sequence rests upon older Paleozoic rocks.

The Lower Paleozoic rocks in Nevada were deposited in the Cordilleran geosyncline. The eastern (Miogeosynclinal) part is characterized by a carbonate assemblage with minor shale and sandstone. The lower Paleozoic rocks may be as much as 15,000 feet thick (Gilluly, J. and Gates, O., 1965). The western (Eugeosynclinal) part of the geosyncline the strata consist up to 50,000 feet of chert, clastic sediments and intercalated volcanics. During Late Devonian and Early Mississipian time, the Antler orogeny culminated in the Roberts Mountain thrust which carried the eugeosynclinal assemblage eastward over the miogeosynclinal rocks.

During Pennsylvanian and Permian time sediments derived from the Antler orogenic belt to the east were being deposited in a rapidly subsiding eugeosynclinal trough. These strata consist of chert, volcanics, shale, siltstone, sandstone, conglomerate and limestone of the Havallah sequence. The Permo-Pennsylvanian rocks were thrust eastward along the Golconda thrust in Late Permian and Early Triasic time.

Havallah Sequence

The Havallah sequence comprises the Pumpernickel and Havallah Formations where they can be differentiated or the undifferentiated temporal equivalents. The main outcrops of the Havallah sequence occur on the east-flank of the New Pass Range south of the McCoy Unit area. The rocks consist of chert, siltstone (shale or argillite), sandstone, conglomerate, limestone and greenstone. Chert and siltstone consitute about 75 percent of the section and are generally thin bedded and light greenish gray to yellow brown in color. The sandstones and conglomerates are usually yellow brown and contain abundant grains or clasts of chert. The limestones are very dense, finely crystalline rocks of various shades of gray. The greenstones consist of volcanic breccias, mud flows and tuffs variously altered to aggregates of chlorite, calcite, sericite, clays and iron oxide.

The rocks exhibit axial plane cleavage and lineation. In general, the cleavage appears to be parrallel to bedding suggesting isoclinal folds. The 2-3 mile outcrop width in the New Pass Range suggests the original thickness may have been several thousand feet.

Mesozoic Rocks

Rocks of Mesozoic age are exposed in the Clan Alpine Range, New Pass Range and Augusta Mountains (Plate I) of the proposed McCoy Unit area. The principal units are the Augusta sequence (Silberling and Roberts, 1962) of Triassic age, the Middle Jurassic Humboldt lopolith (Speed, 1976), and granitic rocks of probable Cretaceous age.

Augusta Sequence

The Triassic Augusta sequence in the McCoy area has been subdivided into five map units (Plate 1). The units are best exposed in the New Pass range and the Augusta Mountains.

Conglomerate (TRc) - The basal Triassic unit is a detrital member made up of conglomerate, siltstone, sandstone and minor tuff. The unit thins rapidly to the south in the New Pass Range and reaches a thickness of about 2,000 feet in the northern part of the New Pass Range. The contact of the detrital unit with the underlying Havallah sequence is apparently unconformable throughout the New Pass Range. In the proposed McCoy Unit area the detrital unit is in fault contact with the Havallah sequence (Plate I). The unit is conformably overlain by the Favret Formation.

Favret Formation (TRf) - In the McCoy area the Favret Formation consists of about 600 feet or dark gray, thin bedded limestones with interbedded black shale and red to tan silstones. The strata contain middle Triassic ammonites (Silberling, 1956) which have been correlated with rocks in Favret Canyon on the west side of the Augusta Mountains. The thickness appears to remain fairly constant throughout the Augusta Mountain-New Pass Range area; however, the amount of intercalated siltstone increases to the south.

Augusta Mountain Formation (TRa) - The Favret Formation in the New Pass Range and Augusta Mountains (Plate 1) is overlain by the Augusta Mountain Formation (Muller, Ferguson and Roberts, 1951). The unit has been divided into three members consisting of a lower member of massive, dark gray bioclastic dolomitic limestone. The middle member consists of thin bedded gray limestones and calcareous shales. The upper member is a massive gray limestone. The rocks are fossiliferous indicating a Middle to Late Triassic age. The Augusta Mountain Formation is conformably overlain by the Cane Springs Formation.

Cane Springs Formation (TRcs) - The Upper Triassic Cane Springs Formation (Muller, Ferguson and Roberts, 1951) was named for exposures on the southeastern flank of Augusta Mountain. The unit is about 1,500 feet thick and consists of thick bedded, massive, medium gray limestone with minor dolomite, shale and conglomerate. The carbonate rocks exhibit a pronounced planar parting parallel to bedding. The Cane Springs is conformably overlain by the Osobb Formation.

Osobb Formation (TRo) - The Late Triassic Osobb Formation represents highest stratigraphic unit in the Triassic section in the McCoy area (Plate I). It is composed of medium to fine-grained, well sorted, crossbedded quartz sandstone with carbonate cement. Some massive limestone, shale and conglomerate are interstratified with the sandstone. The maximum thickness exposed in the Augusta Mountains is 2,500 feet.

Humboldt Lopolith (Jg)

The large complex of gabbroic rocks known as the Humboldt lopolith (Speed, 1976) crops out in the Stillwater Range and northern Clan Alpine Mountains (Plate I). The lopolith is elliptical in plain view, with a northwest trending major axis of 50km which is about twice the short axis. The volume calculated by magnetic modeling is between 1,700 and 2,500 km^3. The radiometric age of coexisting biotite and hornblende from gabbro in the Clan Alpine Range is 145 ±5 m.y. and 165 ±5 m.y. respectively which indicates a Middle Jurassic age (Kulp, 1960).

Granitic Rocks (Kg)

Intrusive rocks of probable Mesozoic age are found along the eastern margin of the Clan Alpine Range (Plate I). The rock are hypidiomorphic granular quartz monzonites to granodiorites. The rocks are texturally and chemically similar to other plutonic rocks in Lander County dated at 90 to 160 m.y. by K-Ar methods (Silberman and McKee, 1971).

Cenozoic Rocks

Volcanic and sedimentary rocks of Cenozoic age crop out over most of the McCoy area. The volcanic rocks are mostly of Tertiary age and occur in all of the upland and mountainous areas. Some sedimentary rocks are intercalated with the Tertiary volcanics; however, the bulk of the Cenozoic sediments are of Quaternary age and represent alluvial fans and lacustrine deposits.

Tertiary Rocks

Tertiary rocks in the McCoy area are mostly volcanic, but sediments comprise approximately one-fifth of the total. All the Tertiary rocks are stratified; however, the individual units are lenticular and the stratigraphic section varies from place to place. The following generalizations can be made regarding the Tertiary: (1) The oldest volcanic rocks (K-Ar age of about 36 m.y.) accumulated on an erosional surface with low relief which transects all older rock units within the map area; (2) The first phase of volcanic activity is characterized by andesitic and dacitic flows; (3) Quartz latitic to rhyolitic ash-flow tuffs with K-Ar ages ranging from 20-34 m.y. spread across the area; (4) The final phase of Tertiary volcanic activity is represented by basalt and andesitic basalts of about 16 m.y. age; (5) Sedimentary rocks are found interlayered with all of the Tertiary volcanic rocks; however, most of the sediments are of latest Miocene and Pliocene age.

Andesite and Dacites (Tad) - The oldest Tertiary volcanics in the McCoy area are flows, ash flows and flow breccias of black to dark gray andesite and dacite (Plate I). The main exposures are in the Clan Alpine Mountains and along the west flank of the Augusta Mountains. Phenocrysts or crystal fragments composed of hornblende, biotite and plagioclase are common.

Quartz Latite and Rhyolite Ash-Flow Tuffs - The most abundant Tertiary volcanic rocks in the McCoy map area (Plate I) are the rhyolitic ash flow tuffs of early Oligocene to early Miocene age. Within the proposed McCoy Unit area the rhyolites have been subdivided into four map units, while in the Clan Alpine Mountains and the New Pass Range the unit is mapped as undivided rhyolite.

Undifferentiated Rhyolite (Tr)

The undivided rhyolites consist of a lower succession of densely welded tuffs which are pale lavender in color. Crystal fragments comprise 5-15 percent of the rock and consist of quartz, plagioclase, sanidine and minor biotite. The upper succession of ash-flow tuffs are reddish-brown with 10-25 percent crystal fragments and 5-10 percent lithic fragments. The most common crystal fragments are quartz with nearly equal amounts of sanidine and plagioclase. Some of the densely welded flow units are vitrophyres. In general, the upper succession appears to correlate with four mapped units distinguished within the proposed McCoy Unit area as described below.

Ash-Flow Tuff (Twt_3)

The oldest mappable unit recognized within the proposed McCoy Unit area consists of three ash-flow units. The basal unit east of the McCoy Mine is a dark black vitrophyre with plagioclase and sanidine crystals. The vitrophyre is overlain by buff to gray-brown crystal lithic tuff with a strong eutaxitic texture. A similar unit has been observed at the base of the upper succession of rhyolites in the northern Clan Alpine Mountains. The upper cooling unit is a light colored crystal poor ash-flow unit. The average K-Ar age is reported to be 29.4 m.y. (Stewart and McKee, 1977).

Edward Creek Tuff (Tec)

The most abundant ash-flow tuff within the proposed unit area is the Edward Creek Tuff as defined by McKee and Stewart (1971). The map unit consists of five or more lithologically similar cooling units. The degree of welding varies both laterally and vertically. The crystal tuff consists of 5-25 percent crystal fragments of plagioclase and K-spar. Biotite and quartz are present within some of the cooling units. The rocks are typically pink to reddish-brown in color and weather to distinctive knobby surface. The basal cooling unit commonly contain gas cavities up to two inches in diameter. Sanidine age dates are reported as 26.9 m.y. and 27.0 m.y. (McKee and Stewart, 1971).

The Edwards Creek tuff varies from 200 to 500 feet in thickness. The variation is in part due to low relief surface upon which the ash-flow accumulated and in part due to the post depositional erosion which has locally removed one or more of the upper cooling units.

McCoy Mine Tuff(Ttm)

Within the McCoy Unit area the Edwards Creek Tuff is overlain by a sequence of cooling units of quartz latite ash-flow tuffs, with significant biotite crystals. The rocks range from pinkish-tan to weakly welded flow units to pinkish-brown in the strongly welded cooling units. The thickness of the McCoy Mine Tuff is approximately 300 feet. The radiometric age date on two samples is is 26.3 m.y. (Stewart and McKee, 1977).

Bates Mountain Tuff(Tbm)

The Bates Mountain Tuff (Stewart and McKee, 1968) is most common in the southeast part of the McCoy Unit area (Plate I). The map unit comprises 2-4 cooling units which range from 50-150 feet in thickness. All the cooling units are in general similar in lithology and and consist of a lower non-welded unit which grades upward into a cliff forming densely welded unit. The upper most cooling unit contains abundant gas cavities, often called the "swiss cheese" unit.

The crystal tuff contains about 10 percent crystals of sanidine and quartz. Plagioclase and biotite are always present but in small amounts. The weakly welded cooling unit is grayish-pink, and the strongly welded units are pink to reddish-brown. Compositionally, the rocks are typical rhyolites. The youngest radiometric age thus far determined for the Bates Mountain Tuff is 22.1 m.y. and the oldest is about 24.4 m.y.

Sedimentary Rocks - Sedimentary rocks are found at various horizons in the Tertiary rocks. Most of the sediments are younger than the ash-flow tuffs; however, some intercalated sediments are found in the oldest Tertiary volcanics. Two distinct ages of sediments have been mapped in the McCoy area. The older sediments (Ts_1) are tuffaceous sandstone, conglomerates and air-fall tuffs which overlie the Tertiary volcanics which suggest a maximum age of 22-24 m.y.

The younger Tertiary sediments (Ts_2) have been dated as late Miocene and early Pliocene age on the basis of vertebrate fauna.

Andesite and Basaltic Andesite (Tad_2) - In the McCoy map area the youngest of the alkalic-calcalkalic volcanics are the andesites found to the north of the unit area. The rocks are dark gray with phenocrysts of hornblende and plagioclase in a very dense groundmass. Potassium-argon ages range from 14.8-163 m.y. (Stewart and McKee, 1977).

Basalts (Tb) - Within the Clan Alpine Mountains and at several localities along the west flank of the Clan Alpines, Olivine basalt rest upon older Tertiary rocks. Whole rock age determinations indicate ages of 10-14 m.y. for the Olivine basalts.

Quaternary Rocks

Quaternary deposits consist of extensive alluvial fans along the mountain fronts in the Augusta Mountains, Clan Alpine Mountains and New Pass Range (Plate I). The basins are filled with lacustrine sediments and the valleys all have recent stream sediments. Local travertine deposits are found around the hot springs.

Alluvium(Qal) - Within the McCoy map area no attempt has been made to distinguish Pleistocene and Recent alluvial fans. Certainly many of the alluvial fans in Edwards Creek Valley and Dixie Valley are terraced and thus must be older than late Pleistocene. Likewise, in the McCoy area no attempt was made to differentiate recent alluvium from older alluvium.

Travertine(Qt) - In the vicinity of the McCoy Mine over one square mile of travertine has been mapped (Plate I). The travertine lies unconformably upon the eroded and tilted Triassic rocks. The travertine dips gently to the west and as only slightly disected.

STRUCTURE

The rocks in the McCoy map area reflect a long and complex structural history. There have been at least four major orogenic periods since early Paleozoic time. The structure produced are quite diverse and include thrust faults, folds and block faults. The following discussion will center on regional deformation rather than individual structures.

Antler Orogeny

The oldest rocks exposed in the Augusta Mountains and the New Pass Range are the Havallah sequence of Permo-Pennsylvanian age. East of the New Pass Range along Gilbert Creek and further east in the Ravenwood Mountains, Lower Paleozoic rocks are exposed. Siliceous and volcanic assemblages were thrust eastward over carbonate assemblages in Late Devonian or Early Mississippian time. Both the upper plate and lower plate rocks are strongly folded and faulted.

Sonoma Orogeny

During Late Permian or Early Triassic the siliceous and volcanic rocks of the Havallah sequence were thrust eastward by the Golcanda thrust. The age of thrusting is now generally regarded as Sonoman. The Havallah sequence are strongly folded into isoclinal folds with axial planes parallel to foliation.

Nevada Orogeny

In middle Jurassic time folding and thrusting of the Mesozoic rocks and underlying rocks occurred. The folds have a northwest trend and increase in intensity upward stratigraphically. Thrusting is associated with the most intense folding. In the Augusta and New Pass Mountains the rocks were refolded into broad open southwest trending structures.

In the western part of the McCoy area the Middle Jurassic orogeny was associated with keratophyric volcanism and the emplacement of the Humboldt lopolith of gabbroic composition. The lopolith and syntectonic suite of rocks are thrust over triassic and Early to Middle Jurassic pelitic sediments.

Cenozoic Structures

The oldest Cenozoic structures are the volcano tectonic features associated with the 22-35 m.y. old ash-flow tuffs. In Late Miocene time the Basin and Range structures began to develop. Movement on the Basin and Range faults continues to the present day.

GEOTHERMAL ANOMALY

The geothermal anomaly in the McCoy area has been defined geochemically and thermally. The water well at the McCoy mercury mine provides the one water sample available and the thermal anomaly is defined by measurements in 40 shallow thermal gradient holes and 5 existing holes.

Geological Manifestations

Mercury deposits of the Wildhorse Mine and McCoy Mines (Plate I) may represent a manifestation of the geothermal anomaly. The deposits occur in silicified limestone near the base of the Middle Triassic section. The mineralization consists of cinnabar and mercury chloride minerals or films, veinlets and crystal aggregates along fractures and cavities. Gangue minerals include quartz, calcite, barite, pyrite and stibnite. The mineralization, at least the silicification, occurs in rocks of the Edwards Creek tuff (27 m.y.) so the age of mineralization is post Edwards Creek tuff.

The second geological manifestation, and one directly attributable to the geothermal activity is the square mile outcrop of travertine (Plate I) west of the McCoy Mine. The thickness of the travertine mound is approximately 20 feet. No orifice was found for the spring; however, the warm well at the McCoy Mine undoubtedly taps the plumbing which was responsible for the travertine deposit.

Geochemical Manifestations

The well at the McCoy Mine produces a hot sodium-bicarbonate water which may be diluted by cold groundwater. An analysis of the water is shown below:

Temp (°C)	39
pH	7.05
Cl	22
F	4.4
SO_4	54
HCO_3	611.6
CO_3	0
SiO_2	44
Na	260
K	15
Ca	43
Mg	9
Li	0.3
OH	0
Cu	0
B	1.3
Mo	0
NH_3	0.74
TDS	1065.3
$TSiO_2$(°C)	96
TNa/K(°C)	127
TNa-K-Ca(°C)	153
Cl/F	5.0
Cl/SO_4	0.4
Cl/HCO_3	0.0
Cl/Li	73.3

The SiO_2-enthalpy (warm water) mixing model applies at McCoy. The calculations indicate a minimum equilibrium temperature of 186°C with an 85% coldwater fraction

Thermal Manifestations

The thermal anomaly at McCoy is based upon thermal measurements taken in 40 shallow temperature gradient holes (Plate II) drilled by AMAX and in 5 existing holes (number 83-87 on Plate II). The thermal well map shows the hole location, hole number, temperature at 100 meters, thermal gradient data, depth to the 200°C isotherm and heatflow.

The complete thermal data package for each hole is given in Appendix I. The data includes the depth-temperature data, depth-temperature graph and a lithologic description of the drill cuttings for each hole.

The thermal data for the 45 temperature gradient holes contoured as heatflow are shown in Plate III. The conductivity values are based upon twelve measurements and the remainder are assumed values consistent with the measured values.

The three-dimensional projection of the thermal anomaly with depth is shown as temperature at 500, 1,000, 2,000 and 3,000 meters (Plate IV-VII). Since we are interested in temperatures in excess of 200°C those areas colored red are of interest.

UNIT AREA

The location of the unit area boundary rests ultimately upon the thermal anomaly found at McCoy. Geologically, the thermal anomaly shows some fault control, but has no apparent relationship to the surface lithologic units (Plate I) and heatflow overlay.

The eastern and western boundaries for the proposed unit area are based upon the 200°C contour projected to the 3,000 meter depth (Plate VII). The northern and southern boundaries have been arbitrarily drawn, in order to restrict the size of the area, since the 200°C contours are open-ended. Thus, the northern boundary has been drawn along the north side of sections 32, 33 and 34 T24N R40E. Likewise the southern boundary was drawn along the southern side of sections 23 and 24 T23N R39E and sections 19 and 20 T23N R40E.

The geographic criteria used in drawing the boundaries was to follow the section lines and to include all sections containing 50 percent or more area defined by the 200°C contour (Plate VII).

EXPLORATION WELLS

The size of the proposed McCoy Unit area is such that two exploration wells (see Plate II and VII) are planned, one for the northern area (A) and one for the southern part (B) of the area (Plate I). The thermal data for the shallow ΔT holes suggest that 610 meter exploration wells can be expected to reach temperatures in excess of 200°C. Therefore, the proposed test well for the northern area will be a 24-7 location, section 7 T23N R40E and for the southern area will be a 56-8 location, section 8 T22N R40E.

Well 24-7 will be collared in rocks of the Mesozoic Cane Springs Formation, a few feet about the base. The hole should bottom in rocks of the Augusta Mountain Formation or the underlying Favret Formation of Triassic age. Potential production would be related to fracture porosity in the Triassic rocks. At this time nothing can be said about the depth and thickness of probable producing zones.

Well 56-8 will be collared in the undifferentiated ash-flow tuffs of Tertiary age. The hole should bottom in rocks of the Triassic Osobb Formation or older units depending upon the extent of the early Tertiary erosion. Potential production will be related to fracture porosity. At this time nothing can be said about the depth or thickness of probable producing zones.

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