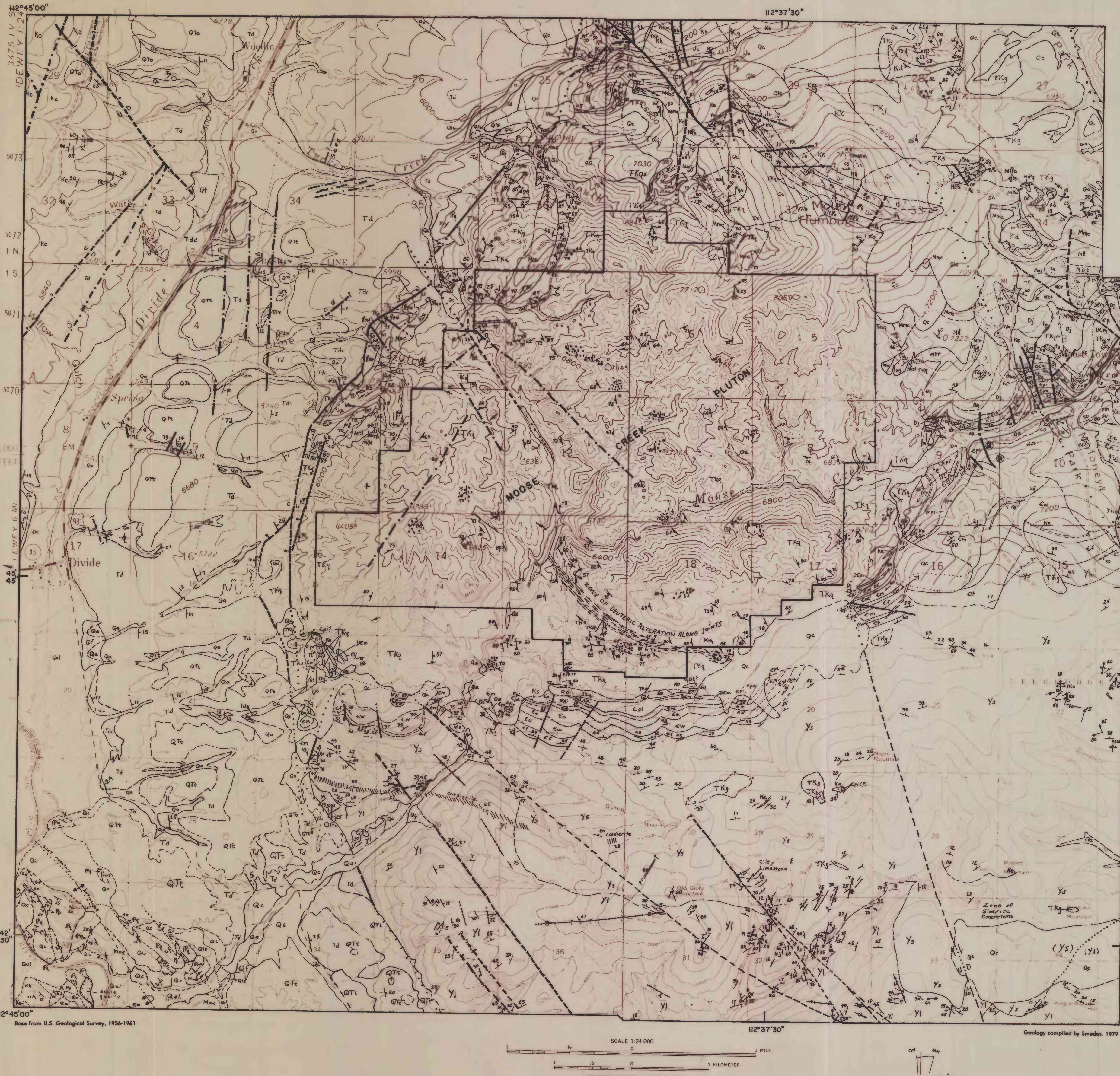
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

OPEN-FILE REPORT
80-836
PLATE 1



Base from U.S. Geological Survey, 1956-1961

Geology compiled by Smedes, 1979

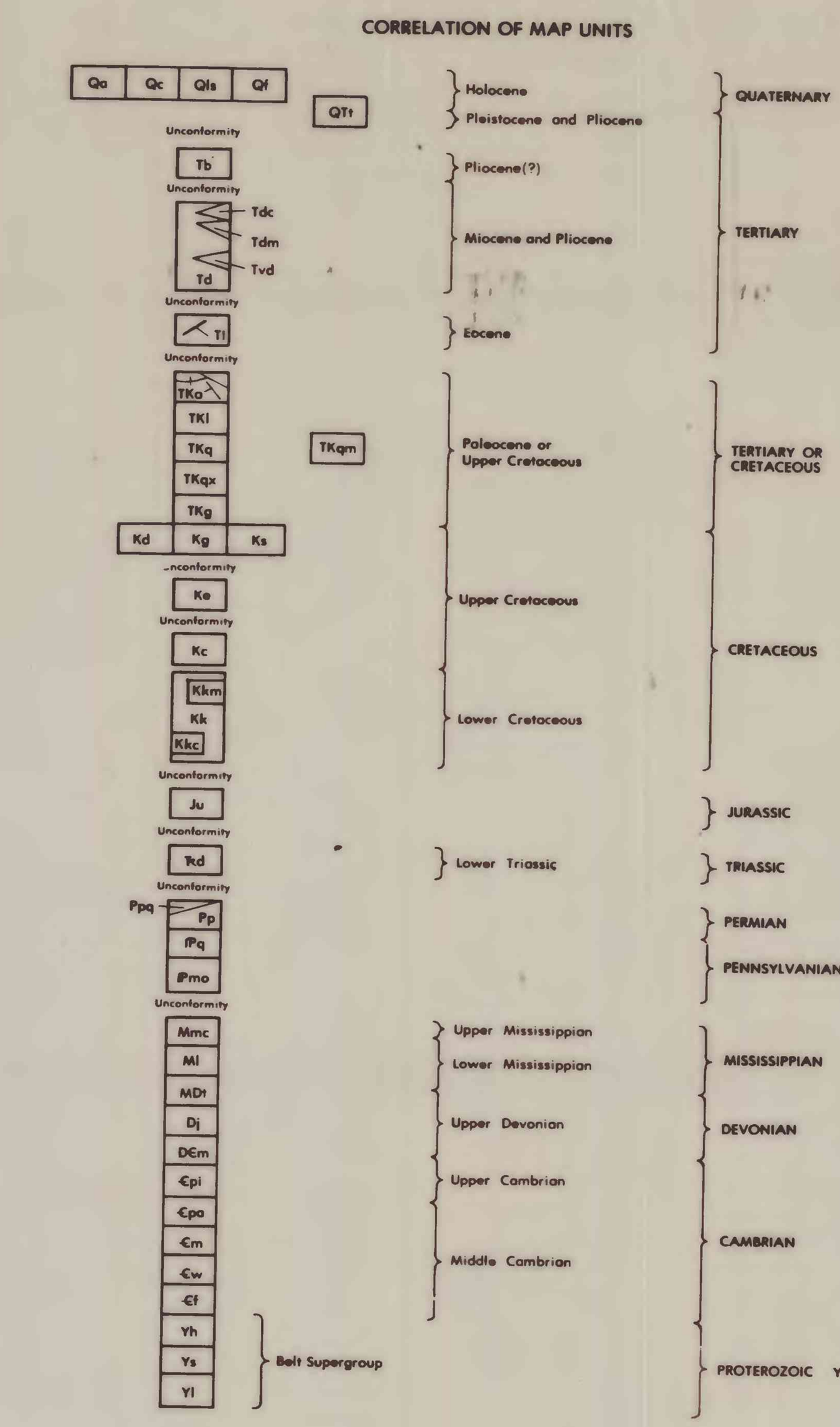
SCALE 1:24 000

CONTOUR INTERVAL 40 AND 80 FEET

PLATE 1.--GEOLOGIC MAP OF THE HUMBUG SPIRES PRIMITIVE AREA, SILVER BOW COUNTY, MONTANA

GEOLOGY AND MINERAL RESOURCES OF THE HUMBUG SPIRES INSTANT STUDY AREA, SILVER BOW COUNTY, MONTANA

CORRELATION OF MAP UNITS



DESCRIPTION OF MAP UNITS

Qa ALLUVIUM, COLLUVIUM, AND BOG DEPOSITS (HOLOCENE)

Qc COLLUVIUM (HOLOCENE)

Qls LANDSLIDE DEPOSITS (HOLOCENE)

Qf ALLUVIAL FAN (HOLOCENE)

QTt TERRACE GRAVELS (PLEISTOCENE AND TERTIARY)--Includes sand, silt, and gravel ("granite wash") and thick deposits of bouldery rubble. Log gravels on terraces commonly studded with wind-facetted stones. In part may correlate with Td in west part of map area

Tb BASALT (PLIOCENE(?)--Dark-reddish-brown, vesicular and amygdaloidal flows and breccias. Seems to rest unconformably on Td

Td ALLUVIUM, COLLUVIUM, AND LACUSTRINE DEPOSITS (PLIOCENE AND MIOCENE)--Intermontane basin deposits in Divide Creek valley consisting of large blocks, boulders, sand, silt, and clay. Volcanic ash in separate beds and admixed in the other deposits

Tdc Deposits cemented by calcite

Tdm Breccia and conglomerate lens of probable mudflow origin

Tdv Quartz latite; altered, light purple gray, strongly foliated; may be intrusive or lava flow. Inlier exposed in small stream valley surrounded by Qa; relations to Td uncertain

Tl LOWLAND CREEK VOLCANICS (EOCENE)--Porphyritic quartz latite; intrusive rocks probably related to second eruptive cycle of Lowland Creek

MOOSE CREEK PLUTON (PALEOCENE and-or UPPER CRETACEOUS)

TKa Aplite, alaskite, pegmatite, and related felsic rocks in dikes, sheets, and irregular bodies that cut quartz monzonite and granodiorite and locally extend short distances into country rock

TKl Leucocratic, fine-grained quartz monzonite; dike cutting west edge of xenolith-rich quartz monzonite

TKq Medium- to coarse-grained, mostly leucocratic, porphyritic quartz monzonite; phenocrysts of quartz and potassium feldspar conspicuous; weathers to grus. Locally cut by small dikes and irregular bodies of quartz porphyry

TKqx Medium- to fine-grained quartz monzonite and granodiorite that contains abundant inclusions of diorite, probably of metavolcanic origin. Probably older than TKq

TKqm MOOSETOWN PLUTON (PALEOCENE OR UPPER CRETACEOUS)--Medium-grained biotite quartz monzonite. Small bodies east of the Moose Creek pluton near Moose Town

TKg GRANODIORITE OF BURTON PARK (PALEOCENE OR UPPER CRETACEOUS)--Medium-grained, bluish-gray rock with poikilitic biotite phenocrysts in northeastern part of map area. Body along northwest border of Moose Creek pluton and small plugs that cut Precambrian rocks south of the pluton tentatively correlated with granodiorite of Burton Park

Kd DIORITE (UPPER CRETACEOUS)--Fine- to medium-grained rock in dikes and plugs

Kg GABBRO (UPPER CRETACEOUS)--Fine- to coarse-grained, highly porphyritic rocks with large phenocrysts of pyroxene

Ks SYENOGABBRO (UPPER CRETACEOUS)--Coarse-grained to very coarse grained rock, some pegmatitic. Contains large poikilitic biotite phenocrysts

Ke ELKHORN MOUNTAINS VOLCANICS (UPPER CRETACEOUS)--Basaltic and andesitic intrusive rocks

Kc COLORADO FORMATION (UPPER CRETACEOUS)--Light-brown and light-gray shale, siltstone, sandstone, and granule conglomerate; locally crossbedded. Metamorphosed to hornfels in map area

Kk KOOTENAI FORMATION (LOWER CRETACEOUS)--Gray to yellowish-brown sandstone interbedded with red and green mudstone. Metamorphosed to hornfels and granofels in map area

Kkm Freshwater limestone near top of formation mapped locally as key bed; probably correlative with "gastropod limestone" member elsewhere. Metamorphosed to marble in map area

Kkc Chert-pebble conglomerate mapped locally as key beds

Ju JURASSIC ROCKS--Maroon, brown, pale-orange, and gray sandstone, siltstone, shale, and calcareous shale. Metamorphosed to hornfels and granofels

₮d DINWOODY FORMATION (LOWER TRIASSIC)--Gray to brown, thin bedded, fossiliferous limestone and shale

Pp PHOSPHORIA FORMATION (PERMIAN)--Sandstone, phosphatic sandstone and shale, phosphorite, cherty siltstone, limestone, and shale

Ppq Quartzite. Mapped locally as upper member. Correlated with Shedhorn Sandstone Member

IPq QUADRANT FORMATION (PENNSYLVANIAN)--Medium-grained, quartz-rich sandstone. Metamorphosed to vitreous quartzite

IPMa AMSDEN FORMATION (PENNSYLVANIAN AND MISSISSIPPIAN)--Shale, siltstone, and sandstone, commonly calcareous. Metamorphosed to hornfels

Mmc MISSION CANYON LIMESTONE (MISSISSIPPIAN)--Massive to thick-bedded, light-gray limestone. Metamorphosed to marble

Ml LODGEPOLE LIMESTONE (MISSISSIPPIAN)--Medium- to thin-bedded, medium-gray limestone. Metamorphosed to marble

MDt THREE FORKS FORMATION (MISSISSIPPIAN AND DEVONIAN)--Shale, calcareous shale, and thin limestone beds. Metamorphosed to hornfels and marble

Dj JEFFERSON FORMATION (DEVONIAN)--Medium- to thin-bedded, dark-gray to very dark gray dolomite. Metamorphosed to dolomite marble

DЄm MAYWOOD AND RED LION FORMATIONS (DEVONIAN AND CAMBRIAN)--Thin-bedded shale, calcareous shale, and dolomitic quartz sandstone

Єpi PILGRIM DOLOMITE (CAMBRIAN)--Medium-bedded, medium- to light-gray dolomite; locally oolitic. Metamorphosed to dolomite marble

Єpa PARK SHALE (CAMBRIAN)--Light- to moderate-brown, thin-bedded shale. Metamorphosed to hornfels

Єm MEAGHER LIMESTONE (CAMBRIAN)--Medium-bedded, light-gray limestone. Metamorphosed to marble

Єw WOLSEY FORMATION (CAMBRIAN)--Thin-bedded, greenish-gray to silvery, bluish-gray shale. Metamorphosed to hornfels

Єf FLATHEAD SANDSTONE (CAMBRIAN)--Clean, fine- to medium-grained, quartz-rich sandstone. Metamorphosed to quartzite. May include some Precambrian quartzite at base

BELT SUPERGROUP (PROTEROZOIC Y):

Yh Helena Dolomite and Empire Formation (Proterozoic Y)--Helena dolomite consists of thin-bedded, laminated to podded, dolomitic claystone; laminae are delicate and crenulated. Metamorphosed to green and yellowish-gray calcsilicate hornfels in which primary bedding structure is preserved. Empire Formation below is variegated light-green, lavender, and gray, thin-bedded soft shale, siltstone, and subordinate calcareous shale. Both formations thin westward beneath an unconformity and pinch out in section 15 near edge of map

Ys Spokane and Greyson Formations (Proterozoic Y)--Thin-bedded, dark-gray argillite and subordinate siltstone. Weathers rusty red and has slaty to blocky jointing. Silty limestone marker bed and zone that contains sideritic concretions shown locally in lower part of unit

Yl Lahood Formation (Proterozoic Y)--Intertongued, poorly sorted, and crudely bedded conglomerate and coarse-grained arkosic sandstone. Thin-bedded and laminated sandstone, siltstone, and papery shale in lower part increase in thickness and abundance westward. Graded bedding and intraformational slump structures common. Clasts of gneiss and quartzite are as much as 50 m long

SYMBOLS

Inclusions of black granofels and hornfels in plutonic rocks

Tactite--Includes small bodies of various intrusive rocks

Southern limit of cordierite porphyroblasts in hornfelsed Spokane, Greyson, and Lahood Formations

Metalliferous quartz veins--Dashed where approximately located

Contact--Dashed where approximately located; dotted where concealed

Steep fault--Dashed where approximately located; queried where inferred; dotted where concealed. U, upthrown side; D, downthrown side; arrows indicate relative lateral movement

Lineament--Plotted from aerial photographs. Interpreted as fault or fracture zone

Sinkholes--Developed in the Meagher Formation along a fault across the upper part of Moose Creek in Maloney Park

Zone of brecciated rock

Anticline, showing direction of plunge

Syncline, showing direction of plunge

Generalized zone of tight intraformational folds, showing plunge

Overturned tight intraformational fold, showing direction of plunge

15 Strike and dip of beds

70 Strike and dip of overturned beds

Horizontal beds

75 Foliation in igneous rocks

80 65 Joints and sets of joints--Double box indicates vertical joint

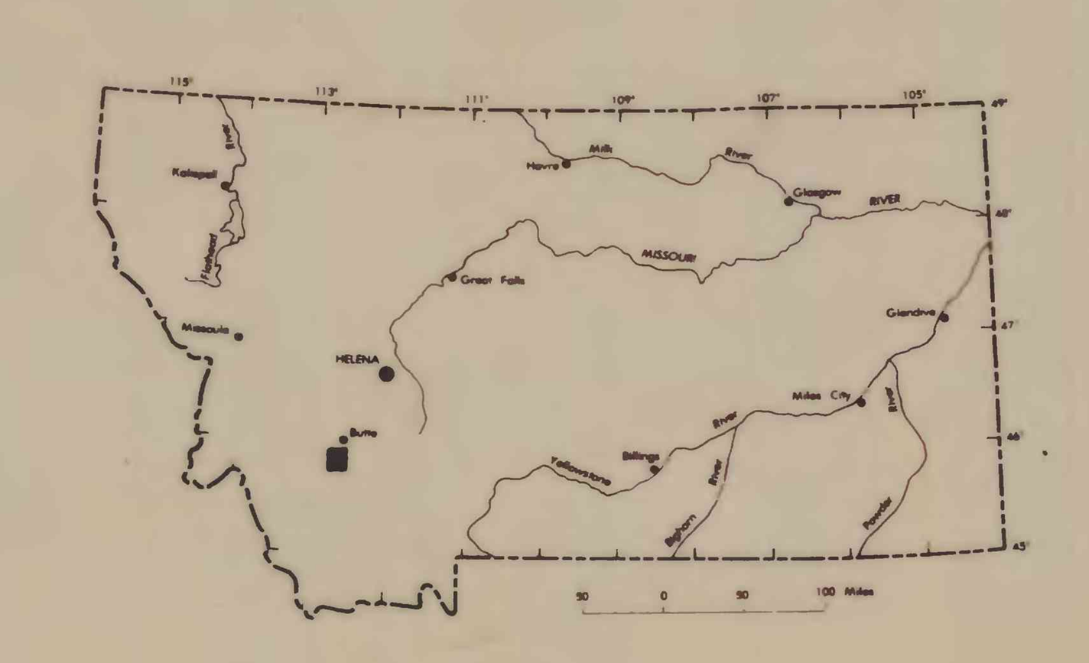
Zone of gently dipping, slightly arcuate, deuterically altered joints

Quarry

Mine shaft

Caved or flooded mine shaft

Adit; tick mark indicates adit caved, flooded, or otherwise inaccessible



INDEX MAP SHOWING LOCATION OF STUDY AREA