



EXPLANATION FOR  
CONTOURED DIAGRAMS OF  
STRUCTURES AT TUNNEL LEVEL  
Lower hemisphere plots. Contoured in  
percent per one percent area.  
Shaded areas contain no poles.  
Symbols show attitude of planes  
corresponding to minutes

Symbol	Unit	Period
Qs	QUATERNARY	QUATERNARY
Ti	TERTIARY	TERTIARY
Tm	TERTIARY	TERTIARY
Tn	TERTIARY	TERTIARY
Kp	CRETACEOUS	Upper Cretaceous
Ks	CRETACEOUS	Lower Cretaceous
Js	JURASSIC	Upper Jurassic
Jm	JURASSIC	Lower Jurassic
Pp	PERMIAN AND PENNSYLVANIAN	PERMIAN AND PENNSYLVANIAN
Pm	PERMIAN AND PENNSYLVANIAN	PERMIAN AND PENNSYLVANIAN
Pc	PRECAMBRIAN	PRECAMBRIAN

Symbol	Description
Qs	SURFICIAL DEPOSITS (QUATERNARY)—Includes fluvial and glacial deposits
Ti	LATITE AND RHYOLITE PORPHYRY DIKES AND SILLS (TERTIARY)—Dikes generally fine grained to aphantic and porphyritic. Younger and older than Montezuma stock
Tm	MONTEZUMA QUARTZ MONZONITE (TERTIARY)—Medium-grained and generally porphyritic; phenocrysts of orthoclase. Single indicator alteration
Tn	FINE-GRAINED APFITE BODIES AND DIKES
Kp	PIERRE SHALE (UPPER CRETACEOUS)—Brownish-gray silty shale, shaly siltstone, and shaly sandstone
Ks	NOBISRA FORMATION (UPPER CRETACEOUS)—Sandy shale and calcareous shale, interbedded with thin-bedded dark-gray to black limestone
Js	FORT HAYS LIMESTONE MEMBER—Gray dense medium-bedded limestone contains partings of calcareous shale
Jm	BENTON SHALE (UPPER AND LOWER CRETACEOUS)—Dark-gray shale and limy shale
Jn	ALTERED ROCKS (UPPER AND LOWER CRETACEOUS)—Hornblende—Probably Pierre Shale and Benton Formations
Jp	METAMORPHOSSED SHALE SANDSTONE—Probably Pierre Shale
Jq	LIME-SILICATE ROCK—Probably Nobisra Formation
Jr	DAKOTA GROUP (LOWER CRETACEOUS)—Quartzite and sandstone, and interbedded dark-gray shale
Js	MORRISON FORMATION (UPPER JURASSIC)—Light-gray sandstone and shaly sandstone
Jt	ENTRADADITO SANDSTONE (UPPER JURASSIC)—Light-gray medium-grained crossbedded sandstone
Ju	LYONS FORMATION (TRASSIC AND PERMIAN)—Red and variegated dolomitic siltstone, sandy siltstone, and sandstone
Jv	MARION FORMATION (PERMIAN AND PENNSYLVANIAN)—Red, pink, and gray arkose and conglomeratic siltstone
Pp	PRECAMBRIAN ROCKS
Pg	Pegmatite
Pi	Silver Plume Granite—In dikes, sills, and irregularly shaped plutons
Pj	Hornblende gneiss—Intervened hornblende gneiss, amphibolite, and biotite-quartz-plagioclase gneiss, medium to fine-grained
Pk	Silicified biotite gneiss and schist—Intervened biotite-quartz-plagioclase gneiss and schist, medium to fine-grained
Pl	Blotite gneiss and schist—Blotite-quartz-plagioclase gneiss and schist, biotite-microcline gneiss, and thin layers of hornblende-plagioclase gneiss
Pm	Aplite

Symbol	Description
—	Contact—Dashed where approximately located; quieted where inferred
—	FAULT—Showing dip: Dashed where approximately located. Arrow couple indicates relative movement. Minor faults, veins, and joints not shown
—	FAULT FROM SURFACE PROJECTION
—	FAULT OR SHEAR ZONE—Showing dip: Dashed where approximately located
—	SHEAR ZONE FROM SURFACE PROJECTION—Showing relative direction of movement
—	VEIN FROM SURFACE PROJECTION
—	STRIKE AND DIP OF BEDS
—	Inclined
—	Vertical
—	STRIKE AND DIP OF FOLIATION
—	STRIKE AND DIRECTION OF DIP OF FOLIATION
—	TUNNEL STATION

Symbol	Description
—	Limestone
—	Sandstone
—	Arkose sandstone
—	Shaly sandstone
—	Siltstone
—	Shale
—	Sandy shale
—	Limy shale
—	Claystone
—	Shaly limestone
—	Hornblende
—	Gneiss
—	Apfite
—	Pegmatite
—	Granite
—	Quartz monzonite
—	Lime-silicate rock

GEOLOGIC PLANS AND SECTIONS, EQUAL-AREA PLOTS OF STRUCTURAL DATA, AND ENGINEERING DATA FOR THE ROBERTS TUNNEL FROM STATION 0+00 TO STATION 694+57, SUMMIT COUNTY, COLORADO