



Hydrology adapted from Rush, 1974, and Scott, Snales, Rush, and VanGlenburgh, 1971

LITHOLOGIES

WP-1: Ruby Mountains Locality
Chainman Shale: (Divisible into three subunits)
Upper subunit: Dark-gray to black carbonaceous gray-wacke and claystone with limestone interbeds from 7 to 15 cm (3 to 6 in.) thick; about 229 m (750 ft) thick
Middle subunit: Gray limestone; thickness about 31 m (100 ft)
Lower subunit: Gray to black soft shale, with interbeds of silty claystone to platy siltstone; thickness about 47 m (155 ft).
 Total unit thickness about 306.3 m (1,005 ft) (Rigby, 1960; Hose and Blake, 1976)

WP-2: Cherry Creek Range Locality
Chainman Shale: Dark-gray to black shale and gray platy siltstone or silty shale, with thin interbeds of dark, bituminous fine-grained limestone and some lighter colored beds of organic limestone in the lower part, and thin beds of detrital limestone in the upper part. Fritz (1968) reports 11 m (35 ft) of fine- to medium-grained light-colored quartzite near the middle; thickness varies greatly; maximum thickness estimated at 488 m (1,600 ft) (Hose and Blake, 1976)

Pilot Shale: Mainly gray, platy, dolomitic siltstone, with interbeds of quartzose silty shale; locally includes thin beds of nodular, clayey and silty limestone and claystone that are calcareous in places (Hose and Blake, 1976). The limestone beds total 5 m (16 ft) in thickness (Fritz, 1968) and 31 m (100 ft) above the basal contact. Total thickness 188 m (615 ft) (Fritz, 1968)

Pioche Shale: (Divisible into two subunits)
Upper subunit: Gray siltstone interbedded with gray fine-grained, thinly bedded limestone; thickness 262 m (860 ft)
Lower subunit: Brown, micaceous siltstone with some thin quartzitic interbeds near the base, and thickly bedded limestone about 50 m (155 ft) above the base; thickness 128 m (420 ft) (Fritz, 1968)

WP-3: Northern Egan Range Locality
Chainman Shale: Dark-gray to black shale and gray, platy siltstone or silty shale, with thin interbeds of dark, bituminous, fine-grained limestone and light-colored beds of organic limestone in the lower part, and thin beds of detrital limestone in the uppermost 15 m (50 ft) (Hose and Blake, 1976); thickness 309 m (1,015 ft) (Fritz, 1960)

Pilot Shale: Mainly gray, platy, dolomitic siltstone, with interbeds of quartzose silty shale, and locally, thin beds of clayey and silty limestone and claystone (Hose and Blake, 1976). No thickness reported, but inferred to be about 152 m (500 ft)

Secret Canyon Formation: Siltstone and shale with much gray, fine-grained, platy limestone; thickness 541 m (1,775 ft) (Fritz, 1968)

Pioche Shale: (Divisible into two subunits)
Upper subunit: Gray, clayey shale interbedded with siltstone; includes some thin layers of fine-grained limestone; thickness of subunit 262 m (860 ft) (Fritz, 1968)
Lower subunit: Brown, micaceous siltstone with some thin, quartzitic interbeds near the base, and thickly bedded limestone 50 m (155 ft) above the base; thickness of subunit 128 m (420 ft)
 Total thickness of unit 370 m (1,280 ft) (Fritz, 1968)

McCoy Creek Group of Misch and Hazzard (1962): (Divided, in the northern Egan Range (Misch and Hazzard, 1962; Woodward, 1963) into seven subunits designated by letters from the basal subunit upward)

Subunit G: Varicolored metasiltstone, argillite, slate, and phyllite. Slaty cleavage typical of more clayey layers in upper part, and thickly bedded, very coarse grained quartzite and pebble conglomerate 29 m (95 ft) thick in lower part. Subunit nearly 426 m (1,400 ft) in total thickness (Woodward, 1963)

Subunit E: Lower part mainly gray quartzite with thin interbeds of metasiltstone. Thick bed of quartzite and pebble conglomerate 43 m (140 ft) thick near middle of subunit. Subunit predominantly green slate and metasiltstone. Total thickness of subunit 671 m (1,110 ft) (Woodward, 1963)

Subunit C: **Upper part:** Silty slate; thickness 221 m (725 ft); underlain successively by interbedded fine- to coarse-grained quartzite and silty slate, thickness 37 m (120 ft); and by phyllite and thinly slabby silty slate, thickness 96 m (315 ft). **Lower part:** Coarse-grained to conglomeratic quartzite; thickness 37 m (120 ft). Total subunit thickness is 221 m (725 ft) (Woodward, 1963)

Subunit B: **Upper part:** Dark phyllite with a little fine-grained, thinly layered white quartzite interbedded, thickness 139 m (455 ft). **Lower part:** Gray quartz-mica phyllite, thickness exposed 153 m (535 ft) Total exposed thickness 302 m (990 ft)

WP-4: Northern Schell Creek Range
Chainman Shale: Dark fissile shale, interbedded with lenticular quartzite as much as 76 m (250 ft) thick. Unit thickness of 457 m (1,500 ft) probably caused by structural repetition (Dechert, 1967). Bauer, Cooper, and Breitrack (1960) say thickness is 457 m (1,500 ft) Approximate thickness of 305 m (1,000 ft) inferred from thicknesses in nearby ranges

Pilot Shale: Dark, thinly platy, calcareous siltstone interbedded with some shale, and, in the lower part, a few thin limestone layers (Dechert, 1967). Young (1960) found the unit absent in places but elsewhere as much as 183 m (600 ft) thick

Dunderberg Shale: Mainly gray, fissile shale with many thin beds of limestone and some thicker limestone beds which predominate in the upper part of the unit and decrease in number downward; thickness is 220 m (720 ft) (Dechert, 1967)

Pioche Shale: Dark, laminated, micaceous siltstone in very thin, platy to crinkly beds, interbedded with fine-grained, calcareous, micaceous sandstone layers that decrease in number downward; thickness of unit 180 m (590 ft) (Dechert, 1967)

McCoy Creek Group of Misch and Hazzard (1962): (Divided in the northern Schell Creek Range into eight units designated by letters from the basal contact upward)
Unit E: Upper part interbedded to interlaminated, very fine-grained, schistose, platy phyllite to slaty argillite, with nonschistose metasiltstone. Contains thin beds of quartzite near middle, and in increasing number downward. Thickness of unit 457 m (1,500 ft) (Misch and Hazzard, 1962)

Unit C: (Divisible into four subunits, designated from base of unit upward by numerical subscripts)
Subunit C₄: Gray, somewhat lustrous, very fine grained slaty phyllite interlaminated with gray metasiltstone; contains quartzite beds in lower part; thickness from 61 to 91 m (200 to 300 ft)
Subunit C₃: Chiefly thinly to thickly bedded quartzite with some interbeds of silty phyllite; thickness about 244 m (800 ft)
Subunits C₂ and C₁: Lithologically similar: predominantly dark, slaty, lustrous, thinly bedded to slabby, locally fissile phyllite that is thinly interbedded with dark, platy, nonschistose metasiltstone; minor interbeds of gray slabby quartzite distinguishes C₂ from quartzite-free C₁; combined thickness of subunits C₂ and C₁ about 366 m (1,200 ft) (Misch and Hazzard, 1962)

Unit B: Mainly phyllite that grades downward into phyllitic schist; contains a few layers of amphibolite located about midway in the unit, and a few interbeds of marble about two-thirds of the distance below the top of the unit; thickness about 549 m (1,800 ft) (Misch and Hazzard, 1962)

WP-5: Antelope Range Locality
Chainman Shale: Chiefly dark shale, with interbeds of siltstone; includes several lenses of evenly bedded quartzose sandstone as much as 61 m (200 ft) thick in upper part; thickness about 305 m (1,000 ft) (Avent, 1962)

Pilot Shale: Mainly gray, calcareous siltstone; contains a medium-grained, blue-gray, evenly bedded, crinkly limestone 8 m (25 ft) thick about 26 m (85 ft) above the basal contact; thickness 228 m (744 ft) (Avent, 1962)

WP-6: Kern Mountains Locality
Chainman Shale: Mainly dark, highly fissile shale with interbeds of very finely crystalline black limestone; contains some clayey and sandy, platy limestone and calcareous shale in lower part, and in the Kern Mountains, interbeds of quartzite. Thickness in the Deep Creek Range might be 335 m (1,100 ft), and, in the Kern Mountains and northern Snake Range is 457 to 609 m (1,500 to 2,000 ft) (Nelson, 1966)

Pilot Shale: Chiefly light-colored, calcareous and silty shale, and clayey limestone; contains a distinctive bed of gray limestone from 6 to 15 m (20 to 50 ft) above the base. Thickness from 122 to 165 m (400 to 540 ft) (Nelson, 1966)

Kanosh Shale: Dark, fissile shale; more than 152 m (500 ft) thick (Nelson, 1966)

Cabin Shale: Dark, micaceous siltstone, interlaminated with micaceous shale; more than 152 m (500 ft) thick (Nelson, 1966)

WP-7: Southern Snake Range Locality
Chainman Shale: Gray shale and siltstone, with interbeds of sandy limestone and calcareous sandstone; upper part alternation of shale and sandstone; estimated thickness between 305 and 610 m (1,000 and 2,000 ft) (Whitebread, 1969)

Pilot Shale: Gray, platy, calcareous siltstone and calcareous to noncalcareous shale, with some interbeds of dark limestone; upper part interbedded silty limestone and limestone; estimated thickness from 122 to 244 m (400 to 800 ft) (Whitebread, 1969)

Osoeila Argillite: Varicolored, locally color banded, clayey and silty argillite in alternating laminae; locally phyllitic and marked by cleavage; thickness 243 m (800 ft) (Misch and Hazzard, 1962)

WP-8: Southern Schell Creek Range Locality
Chainman Shale: Mainly dark, very carbonaceous, non-calcareous clay shale (Divisible into three subunits)
Upper subunit: Clay shale, interbedded with layers of light-colored quartzose sandstone and quartzite as much as 3 m (10 ft) thick, and some thin beds of argillite, conglomerate, and mudstone, with limestone in the uppermost part; thickness about 91 m (300 ft)
Middle subunit: Contains few sandstone beds except for a 15-m (50-ft) layer locally present; thickness about 152 m (500 ft)
Lower subunit: Chiefly alternation of shale and siltstone that yields blocky shale; thickness about 91 m (300 ft)
 Total thickness of unit about 335 m (1,100 ft) (Drewes, 1967). Thickness extremely variable, ranges from 91 to 366 m (300 to 1,200 ft) (Conway, 1965)

Lincoln Peak Formation: (Divisible into three subunits)
Upper subunit: Partly shale, locally phyllitic or slaty shale, with from 30 to 75 percent of subunit thinly bedded limestone
Middle subunit: Gray, platy limestone with some silty partings
Lower subunit: Mainly gray, fissile to platy, silty to limy, partly micaceous shale, with scattered thin interbeds of limestone that constitute less than 10 percent of the subunit. Thickness of unit about 488 m (1,600 ft) (Drewes, 1967)

WP-9: Central Egan Range Locality
Sheep Pass Formation: (Divisible into six subunits designated by letters from the basal contact upward)
Subunit F: Siltstone and claystone, calcareous in lower part; thickness 45 m (147 ft)
Subunit D: White, siliceous, extremely fine-grained siltstone containing chert nodules; thickness 223 m (731 ft)
Chainman Shale: Mainly black to gray shale and siltstone, with thin interbeds of calcareous shale and fine-grained dark to light limestone; locally some mudstone and platy shale. In the northern part of the locality limestone totals 31 to 46 m (100 to 150 ft) in thickness 76 m (250 ft) downward (Brokaw and Shave, 1965). In the southern part Playford (1961) reported 274 m (900 ft) of shale over 15 m (50 ft) of siltstone, and Kellogg (1960, 1963) reported black to gray shale with interbeds of calcareous siltstone over mudstone and platy shale; has total thickness of unit (in adjacent Lincoln County) 274 to 305 m (900 to 1,000 ft), and at Sheep Pass Canyon, 221 m (724 ft). Brokaw found 457(?) m (1,500(?) ft) in the Ely 7.5-minute Quadrangle, and Brokaw and Barosch (1968) reported a range in thickness of 122 to 762 m (400 to 2,500 ft) in the Ripetown 7.5-minute Quadrangle

WP-10: Jakes Wash Locality
Chainman Shale: (Divisible into three subunits)
Middle subunit: Very fissile, noncalcareous, bituminous shale with interbeds of thinly layered, clayey limestone; no thickness given for subunit; inferred to exceed 152 m (500 ft).
 Total thickness of the unit is 512 m (1,680 ft) (Lloyd, 1959)

WP-11: Northern White Pine Range Locality
Chainman Shale: Humphrey (1960) appears to describe two subunits.
Upper subunit: Black, carbonaceous, fissile shale with a few sandy interbeds in the upper part. North of Hamilton its thickness is about 579 m (1,900 ft) thick if not repeated by faulting; in Illipah Canyon the shale subunit is more than 152 m (500 ft) thick
Secret Canyon Shale: (Divisible into four subunits designated (Humphrey, 1960) by numerals from the basal contact upward)
Subunit 1: Micaceous, thinly bedded, calcareous shale; thickness more than 243 m (800 ft) near the Trench Mine, but the basal contact is not exposed

WP-12: Pancake Range Locality
Chainman Shale: (Divisible into four subunits by Stewart (1962), here designated by letters from the basal contact upward)
Subunit D: About 58 percent gray siltstone, 40 percent sandstone, 1 percent silty limestone, and less than 1 percent conglomerate; thickness at least 201 m (660 ft)
Subunit C: About 93 percent silty claystone to clayey siltstone, 5 percent sandy siltstone, and 2 percent quartzose to feldspathic sandstone; thickness about 180 m (590 ft)
Subunit B: Lithologically similar to subunit D, above. Sandstone forms beds as much as 61 m (200 ft) thick, limestone beds as much as 30 cm (12 in.) thick; thickness of subunit about 366 m (1,200 ft)
Subunit A: Gray siltstone to silty claystone, with a bed of limestone 3 m (10 ft) thick; thickness of subunit about 326 m (1,070 ft)
 Total thickness of unit about 1,073 m (3,520 ft) (Stewart, 1962)

EXPLANATION

- Locality boundary, approximate
- Locality extends into adjacent county; adjacent part shown on map of adjacent county
- Contact of exposed bedrock unit composed predominantly of clay-rich rock, with a dissimilar unit adjacent
- Fault; can constitute the contact of an exposed bedrock unit composed predominantly of clay-rich rock, with a dissimilar unit adjacent
- Location of reported thickness
- ★ County seat
- Town or village
- Ⓜ U.S. Interstate Highway, with designation
- Ⓢ U.S. Highway, with designation
- Ⓢ State Route, with designation
- General direction of ground-water flow
- Boundary of discharge areas

PLATE 7. --LOCALITIES OF EXPOSED CLAY-RICH BEDROCK IN WHITE PINE COUNTY, NEVADA, SUITABLE FOR FURTHER INVESTIGATION

