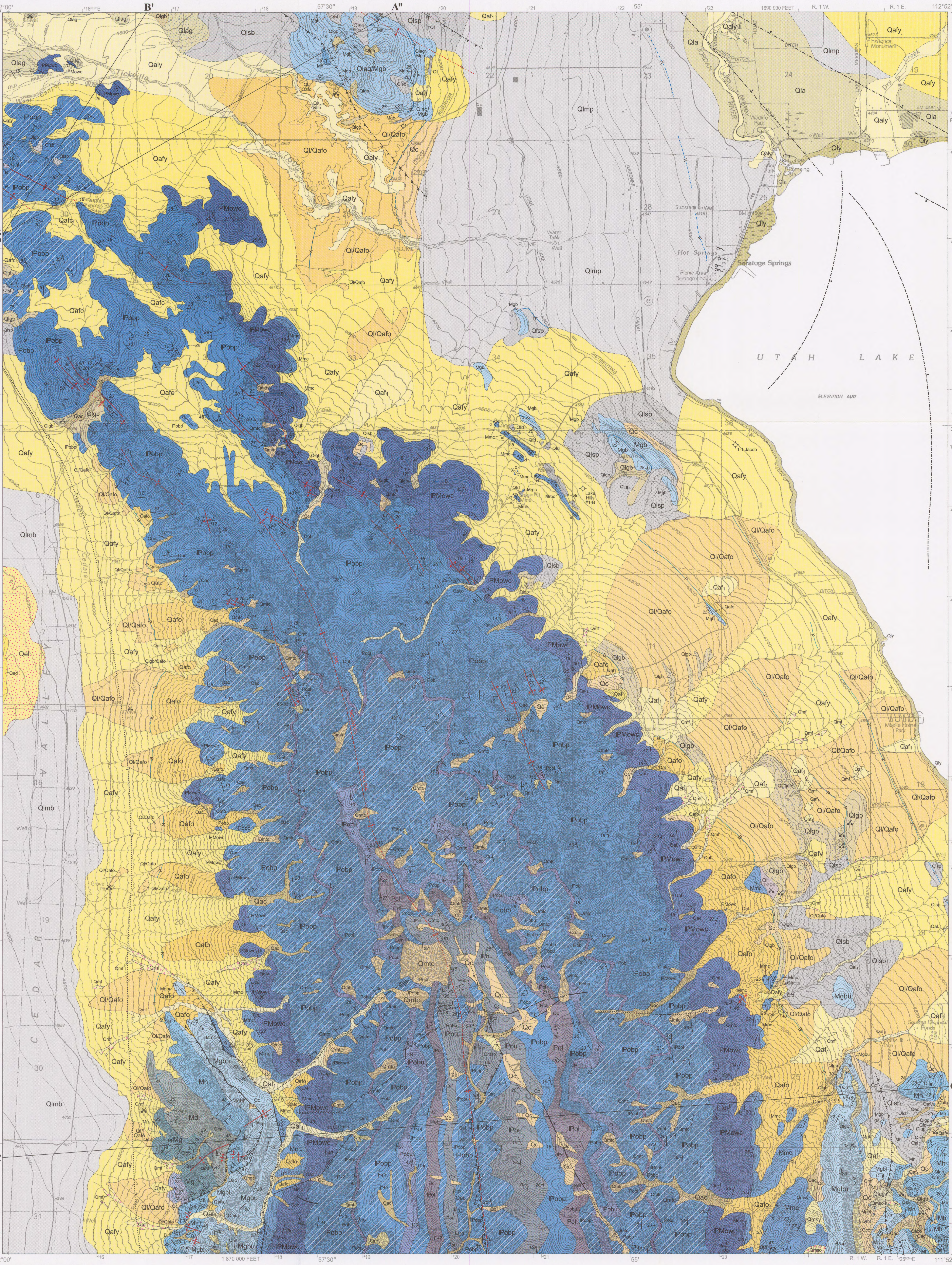
UTAH GEOLOGICAL SURVEY
a divison of
UTAH DEPARTMENT OF NATURAL RESOURCES
STATEMAP Agreement No. 01HQAG0100



Base from U.S. Geological Survey,
Saratoga Springs 7.5' quadrangle, 1994

SCALE 1:24,000

1 0.5 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0.5 0 1 KILOMETER

CONTOUR INTERVAL 20 FEET
SUPPLEMENTARY CONTOUR INTERVAL 10 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

Field work by author July 2001 to June 2002
Cartography by James Parker

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13°0'
234 mils

2004 MAGNETIC DECLINATION AT CENTER OF SHEET

GEOLOGIC MAP OF THE SARATOGA SPRINGS 7.5' QUADRANGLE UTAH COUNTY, UTAH

by

Robert F. Biek

2004

UTAH

QUADRANGLE LOCATION

1	2	3
4		5
6	7	8

1. Tickville Spring
2. Jordan Narrows
3. Lehi
4. Cedar Fort
5. Pelican Point
6. Goshen Pass
7. Soldiers Pass
8. Lincoln Point

ADJOINING 7.5' QUADRANGLE NAMES

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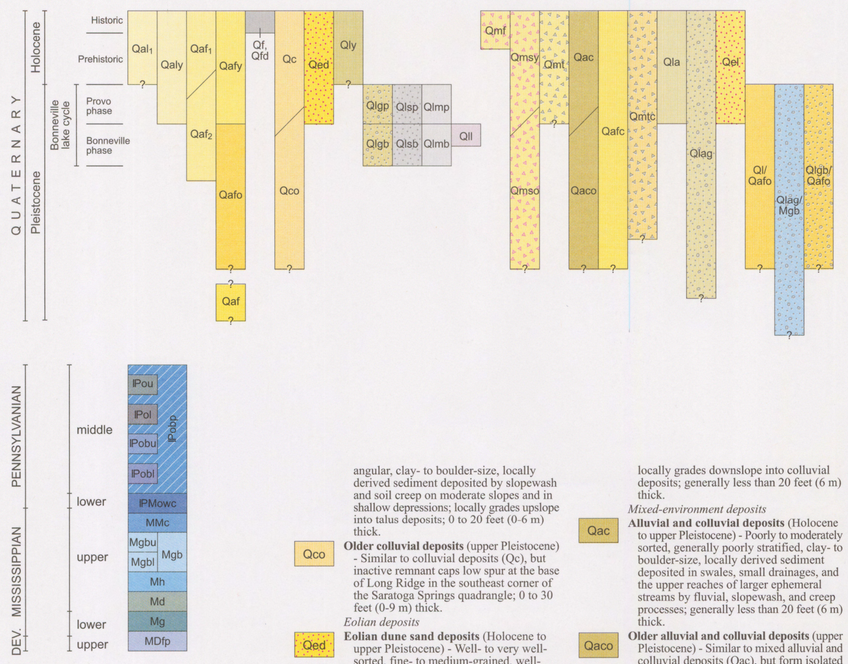
CORRELATION OF GEOLOGIC UNITS



MAP SYMBOLS

- Contact, dashed where approximately located, queried where uncertain
- Normal fault, dashed where approximately located, dotted where concealed, dotted and queried where inferred; bar and ball on down-dropped side
- Normal fault, concealed; bar and ball on down-dropped side; located by geophysical methods (Brimhall and others, 1976)
- Normal fault, concealed; inferred principally from gravity data (Bryant, 1992); very approximately located; bar and ball on down-dropped side
- Thrust or reverse fault, dashed where approximately located, dotted where concealed; saw teeth on upper plate
- Tear fault, dashed where approximately located, dotted where concealed; arrows show direction of relative offset
- Axial trace of anticline, dashed where approximately located, dotted where concealed; arrow shows direction of plunge
- Axial trace of syncline, dashed where approximately located, dotted where concealed; arrow shows direction of plunge
- Lake Bonneville shorelines; major shorelines of the Bonneville lake cycle. Mapped at the top of the wave-cut platform, dashed where approximately located
- B — Highest shoreline of the Bonneville (transgressive) phase
- P — Highest shoreline of the Provo (regressive) phase
- X — Other transgressive shorelines of the Bonneville phase (present above the Provo shoreline) and mostly regressive shorelines of the Provo phase (present below the Provo shoreline)
- Location of measured sections
- 31 Strike and dip of inclined bedding
- 30 Approximate strike and dip of inclined bedding
- Approximate strike and dip direction of inclined bedding
- Strike of vertical bedding
- Horizontal bedding
- Sand and gravel pit
- Quarry, cl = clay, no letter = crushed rock
- Prospect, cl = clay, c = calcite, no letter = metals
- Prospect trench, c = calcite, no letter = metals
- Adit
- Petroleum exploration well, plugged and abandoned
- Spring
- 5 Sample location and number
  - 1 = SS61202-8 3 = SS61202-7 5 = SS61202-3
  - 2 = LM-2 4 = LM-1

DESCRIPTION OF GEOLOGIC UNITS

QUATERNARY

Alluvial deposits

Qal1 **Stream deposits** (Holocene) - Moderately sorted sand, silt, clay, and pebble to boulder gravel deposited in stream channels; equivalent to the upper part of young alluvial deposits (Qaly); locally includes small alluvial-fan and colluvial deposits; mapped in ephemeral washes draining the Lake and Oquirrh Mountains; 0 to 20 feet (0-6 m) thick.

Qaly **Young alluvial deposits** (Holocene to upper Pleistocene) - Moderately sorted sand, silt, clay, and local pebble gravel deposited in river channels and flood plains; incised by Tickville Gulch and West Canyon Wash at north end of Lake Mountain, and locally contains considerable colluvium in the lower reaches of Tickville Gulch; locally includes loess; probably less than 20 feet (6 m) thick.

Qaf1 **Level-1 alluvial-fan deposits** (Holocene to upper Pleistocene) - Poorly to moderately sorted, clay- to boulder-size sediment deposited principally by debris flows at the mouths of active drainages; upper parts typically characterized by abundant boulders and debris-flow levies that radiate away from the apex of the fan; equivalent to the younger part of Qafy, but differentiated because they form smaller, isolated fans; probably less than 20 feet (6 m) thick.

Qaf2 **Level-2 alluvial-fan deposits** (lower Holocene to upper Pleistocene) - Poorly to moderately sorted, clay- to boulder-size sediment deposited principally by debris flows; incised by younger undifferentiated alluvial-fan deposits (Qafy); forms moderately dissected surfaces north of Cedar Fort; locally truncated by the Bonneville shoreline; probably less than 30 feet (9 m) thick.

Qafy **Younger undifferentiated alluvial-fan deposits** (Holocene to upper Pleistocene) - Similar to level-1 alluvial-fan deposits (Qaf1), but forms coalesced apron of post-Bonneville sediment shed off the Lake and Oquirrh Mountains; upper parts of fans are locally deeply incised; locally forms a pediment-like surface over the Manning Canyon Shale; commonly gradational to mixed alluvial-fan and colluvial deposits (Qafc) on upper parts of fans; includes sandy veneer in the Webb Cedars area; thickness unknown, but likely up to several tens of feet, with deposits north and west of Cedar Valley likely thicker.

Qafo **Older alluvial-fan deposits** (upper Pleistocene) - Similar to younger undifferentiated alluvial-fan deposits (Qafy), but forms deeply dissected alluvial apron truncated by, and thus predating, the Bonneville shoreline; upper parts of fans locally receive sediment from minor washes; thickness unknown, but likely more than several tens of feet.

Qaf **Alluvial-fan deposits** (upper Pleistocene) - Similar to older alluvial-fan deposits (Qafo), but preserved as very deeply dissected remnants on the flanks of the southern Oquirrh Mountains; upper parts of fans locally receive sediment from minor washes; includes two older, higher-level deposits, one at the mouth of Israel Canyon and one north of Limekiln Canyon; exposed thickness is about 150 feet (45 m) on the flanks of the Oquirrh Mountains.

Artificial deposits

Qf **Artificial fill** (Historical) - Fill used to create railroad bed in the northwest corner of the Saratoga Springs quadrangle; 0 to 25 feet (0-8 m) thick.

Qfd **Mine-dump deposits** (Historical) - Waste rock and overburden from clay quarries and one calcite quarry. Variable thickness.

Colluvial deposits

Qc **Colluvial deposits** (Holocene to upper Pleistocene) - Poorly to moderately sorted, angular, clay- to boulder-size, locally derived sediment deposited by slopewash and soil creep on moderate slopes and in shallow depressions; locally grades upslope into talus deposits; 0 to 20 feet (0-6 m) thick.

Qco **Older colluvial deposits** (upper Pleistocene) - Similar to colluvial deposits (Qc), but inactive remnant caps low spur at the base of Long Ridge in the southeast corner of the Saratoga Springs quadrangle; 0 to 30 feet (0-9 m) thick.

Eolian deposits

Qed **Eolian dune sand deposits** (Holocene to upper Pleistocene) - Well- to very well-sorted, fine- to medium-grained, well-rounded quartz sand that forms small dunes mostly stabilized by vegetation; 0 to 5 feet (0-2 m) thick.

Lacustrine deposits

Qly **Younger lacustrine and marsh deposits** (Holocene) - Silt, clay, and minor fine-grained sand deposited along the margin of Utah Lake; locally organic rich; probably 0 to 10 feet (0-3 m) thick.

Qlgb, Qlgp **Lacustrine gravel and sand** (upper Pleistocene) - Moderately to well-sorted, moderately to well-rounded, clast-supported, pebble to cobble gravel and lesser pebbly sand; thin to thick bedded; typically interbedded with or laterally gradational to sand and silt facies; gastropods common in sandy lenses; locally partly cemented with calcium carbonate; Qlgb deposited at and below highest Bonneville shoreline but above the Provo shoreline, and Qlgp deposited at and below the Provo shoreline; forms beach ridges, terraces, bars, and spits; 0 to 50 feet (0-15 m) thick.

Qlsb, Qlsp **Lacustrine sand and silt** (upper Pleistocene) - Coarse- to fine-grained lacustrine sand and silt, with minor gravel; typically well sorted and laminated in thick beds; gastropods locally common; grades downslope from sandy nearshore deposits to finer grained offshore deposits; shorelines typically poorly developed on this facies; Qlsb deposited at and below highest Bonneville shoreline but above the Provo shoreline, and Qlsp deposited at and below the Provo shoreline; probably less than 30 feet (9 m) thick.

Qlmb, Qlmp **Lacustrine silt and clay** (upper Pleistocene) - Calcareous silt (marl) with minor clay and fine-grained sand; typically thick bedded; Qlmb deposited below Bonneville shoreline but above the Provo shoreline in Cedar Valley, and Qlmp deposited below the Provo shoreline northwest of Utah Lake; contact with distal parts of younger alluvial-fan deposits is difficult to identify and commonly based on subtle geomorphic differences; thickness unknown.

Qll **Lagoon-fill deposits** (upper Pleistocene) - Borrow-pit excavations reveal sandy lacustrine deposits at base overlain by loess and slopewash deposits composed of very thick-bedded brown silt with minor fine-grained sand and few small pebbles; deposited in a small lagoon behind offshore gravel bar; 0 to 20 feet (0-6 m) thick.

Mass-movement deposits

Qmf **Debris-flow deposits** (Holocene) - Very poorly sorted, subangular, cobble- to boulder-size gravel in a matrix of silt, sand, clay, and pebbles; typically have well-developed levee deposits of angular rubble; mapped on level-1 (Qaf1) and younger undifferentiated alluvial-fan (Qafy) deposits; fresh morphology and only modest vegetation suggest most are of historical age; because of indistinct morphology, does not include finer-grained, distal portions of debris flows present on lower reaches of alluvial fans; typically less than 10 feet (3 m) thick.

Qmsy **Younger landslide deposits** (Holocene to upper Pleistocene) - Very poorly sorted, clay- to boulder-size, locally derived material deposited principally by rotational slides; characterized by slightly to moderately subdued hummocky topography; includes three slides derived from the lower Manning Canyon Shale; variable thickness up to about 30 feet (9 m).

Qmso **Older landslide deposits** (upper Pleistocene) - Similar to younger landslide deposits (Qmsy), but deeply incised and main scarps and hummocky topography have been extensively modified by erosion; includes one slide in the lower Great Blue Limestone and adjacent alluvial-fan deposits, one in the lower Manning Canyon Shale, and one in the Butterfield Peaks Formation; thickness highly variable.

Qmt **Talus deposits** (Holocene to upper Pleistocene) - Very poorly sorted, angular cobbles and boulders and finer-grained interstitial sediment deposited principally by rock fall on or at the base of steep slopes; locally grades downslope into colluvial deposits; generally less than 20 feet (6 m) thick.

Mixed-environment deposits

Qac **Alluvial and colluvial deposits** (Holocene to upper Pleistocene) - Poorly to moderately sorted, generally poorly stratified, clay- to boulder-size, locally derived sediment deposited in swales, small drainages, and the upper reaches of larger ephemeral streams by fluvial, slopewash, and creep processes; generally less than 20 feet (6 m) thick.

Qaco **Older alluvial and colluvial deposits** (upper Pleistocene) - Similar to mixed alluvial and colluvial deposits (Qac), but form isolated remnants deeply incised by adjacent streams; 0 to 20 feet (0-6 m) thick.

Qafc **Alluvial-fan and colluvial deposits** (Holocene to upper Pleistocene) - Poorly to moderately sorted, clay- to boulder-size sediment deposited by debris flows and slopewash in large, partly enclosed basins at the north end of Lake Mountain; 0 to about 40 feet (0-12 m) thick.

Qmtc **Talus and colluvium** (Holocene to upper Pleistocene) - Very poorly sorted, angular to subangular cobbles and boulders and finer-grained interstitial sediment deposited principally by rock fall on steep slopes; grades downslope into colluvial deposits; generally less than 20 feet (6 m) thick.

Qla **Lacustrine and alluvial deposits** (Holocene to upper Pleistocene) - Moderately to well-sorted, fine-grained sand, silt, and clay adjacent to the Jordan River; grades into silt and clay deposits of the Bonneville Lake cycle; includes network of anastomosing alluvial deposits and lacustrine silt and clay deposits at the sinks east of Fairfield, which grades upstream to young alluvial deposits, and sandy deposits that grade into young alluvial deposits northwest of Lake Mountain; thickness unknown.

Qlag **Lacustrine and alluvial coarse-grained deposits** (Holocene to upper Pleistocene) - Poorly to moderately sorted, clay- to boulder-size sediment deposited by debris flows, river channels, and slopewash, and moderately to well-sorted, moderately to well-rounded, clast-supported, pebble to cobble gravel and lesser pebbly sand; mapped where it is impractical to differentiate alluvial-fan, alluvial, colluvial, and nearshore lacustrine deposits; most areas probably represent pre-Bonneville alluvial and alluvial-fan sediments reworked by Lake Bonneville; 0 to about 60 feet (0-18 m) thick.

Qel **Eolian dune sand and lacustrine deposits** (Holocene to upper Pleistocene) - Well- to very well sorted, fine- to medium-grained, well-rounded sand that forms small, isolated dunes mostly stabilized by vegetation; low areas between dunes are calcareous silt (marl) with minor clay and fine-grained sand; dune sand is about 0-5 feet (0-2 m) thick, but thickness of lacustrine sediments is unknown.

Stacked-unit deposits

Ql/Qaf2, Ql/Qafo **Lacustrine deposits over older alluvial-fan deposits** (upper Pleistocene) - Older alluvial-fan deposits planated by wave action and partly concealed by a discontinuous veneer of lacustrine deposits; where lacustrine deposits not present, fan surface commonly covered by a lag of angular to subangular boulders; closely spaced, well-preserved strandlines are common on the upper parts of the fans, but are less well developed lower on the fans where lacustrine deposits tend to be finer grained and thicker.

Qlgb/ Qafo **Mixed alluvial and lacustrine gravel over older alluvial-fan deposits** (upper Pleistocene) - Older alluvial-fan deposits overlain by moderately to well-sorted, moderately to well-rounded, clast-supported, pebble to cobble gravel probably deposited as a gravel spit on the northwest side of Lake Mountain south of Webb Cedars; truncated on north by younger undifferentiated alluvial-fan deposits; a conspicuous scarp, probably of depositional origin, forms west side of deposit.

Qlag/ Mgb **Lacustrine and alluvial deposits over Great Blue Limestone** (Pleistocene/Upper Mississippian) - Mapped in the low hill north of Tickville Gulch that is cored by the Great Blue Limestone; closely spaced, well-preserved strandlines (wave-cut terraces) are present on this hill, but lacustrine sand and gravel forms only isolated deposits, which are mapped separately; surficial deposits (Qlag) are poorly sorted, subangular to subrounded cobbles and boulders of orthoquartzite and minor limestone that appear similar to wave-washed alluvial-fan deposits; minor moderately to well-sorted, moderately to well-rounded, pebble to cobble gravel forms a discontinuous veneer on wave-cut benches; most of the mapped exposures of Great Blue are limestone, so the preponderance of orthoquartzite boulders is puzzling - these deposits probably represent the remnants of old alluvial-fan deposits, possibly even of late Tertiary age, partly reworked by Lake Bonneville; thickness uncertain, but surficial deposits may locally exceed 60 feet (18 m) thick.

unconformity

PENNSYLVANIAN and MISSISSIPPIAN

Oquirrh Group (Upper Pennsylvanian to Upper Mississippian) - Principally calcareous sandstone, sandy limestone, limestone, and minor orthoquartzite that form the bulk of Lake Mountain and part of the southern Oquirrh Mountains; divided into, in ascending order, the West Canyon Limestone and Butterfield Peaks Formation; believed to be part of the Bingham sequence of Tooker and Roberts (1970); best exposed along or just below ridge crests – elsewhere, slopes are commonly covered by a veneer of colluvium and talus not practical to map at a scale of 1:24,000; ages from Gordon and Duncan (1970) and Davis and others (1994); only the lower 4,850 to about 5,500 feet (1,480-1,675 m) is preserved in the Lake Mountain syncline, but the group is in excess of 17,800 feet (5,425 m) thick in the Oquirrh Mountains (Tooker and Roberts, 1970) and about 25,000 feet (7,600 m) thick near Mt. Timpanogos (Baker, 1964).

IPobp **Butterfield Peaks Formation** (Middle – Lower Pennsylvanian [Desmoinesian – Morrowan]) - Interbedded, brown-weathering, fine-grained calcareous sandstone, medium-gray, fine-grained sandy limestone, minor orthoquartzite, and several limestone intervals, four of which are mapped separately; typically cyclically interbedded with several tens of feet of calcareous sandstone capped by gray limestone several feet thick; contains minor siltstone and mudstone interbeds that are very poorly exposed; forms ledgy to cliffy slopes. Calcareous sandstone is typically medium to thick bedded, light brownish gray to medium gray but grayish orange to brown weathering, very fine to fine grained, locally with planar, low-angle, and ripple cross-stratification and bioturbation; sandstone is commonly non-calcareous on weathered surfaces and so appears similar to orthoquartzite, but fresh surfaces are invariably calcareous. Orthoquartzite is grayish orange pink to light brown, very thick bedded, very fine to fine grained, with faint low-angle cross-stratification and a prominent conchoidal fracture; it is restricted to a prominent, 35-foot-thick (11 m) ledge between the "upper" and "lower" limestones and a few thinner beds above the "upper" limestone. Clastic intervals may thicken from west to east. Unmapped limestone intervals are typically medium gray, medium to thick bedded, locally with fine-grained sand, locally fossiliferous with syringoporid and rugose corals, bryozoans, brachiopods, and fossil hash, locally with irregularly shaped black chert nodules and ribbon chert, and commonly grade upward to finer grained, platy weathering limestone and argillaceous limestone; *Chaetetes* coral bed is about 325 feet (100 m) above the base of the formation. Measured section is 3,823 feet (1,166 m) thick, but the formation is up to 4,500 feet (1,370 m) thick in the Saratoga Springs quadrangle; Tooker and Roberts (1970) reported the formation is 9,070 feet (2,765 m) thick in the Oquirrh Mountains.

IPou **Upper limestone of Butterfield Peaks Formation** - Thin- to medium-bedded, medium-gray, fine-grained limestone and very fine to fine-grained sandy limestone with minor, brown-weathering, irregularly shaped black chert nodules; contains minor orthoquartzite at north end of Lake Mountain; forms ledgy slopes at the top of Lake Mountain; contains uncommon crinoid, brachiopod, bryozoan, and fusulinid fossils; sample LM-2 yielded abundant *Idiognathodus expansus* conodonts (middle to upper Desmoinesian) and sample SS61202-8 yielded sparse juvenile *Idiognathodus* sp. conodonts and abundant *Beedeina* sp. fusilinids (upper Desmoinesian); about 220 feet (67 m) thick.

IPol **Lower limestone of Butterfield Peaks Formation** - Thin- to medium-bedded, platy weathering, light- to medium-gray, fine-grained limestone with common, irregularly shaped black chert nodules; lower part contains minor spherical black chert nodules; upper part is typically medium to thick bedded, coarser grained, has less chert, and contains crinoid, bryozoan, and brachiopod fossils; forms slopes; sample LM-1 yielded sparse *Idiognathodus expansus* conodonts (middle to upper Desmoinesian) and abundant *Beedeina* sp. fusilinids (upper Desmoinesian), and sample SS61202-7 yielded sparse *Idiognathodus expansus* conodonts; about 320 feet (98 m) thick.

IPobu **Upper billiard ball limestone of Butterfield Peaks Formation** - Light-gray-weathering, medium-dark-gray, thin-bedded, fine-grained limestone with characteristic black spherical chert 0.25 to 2 inches (0.5-5 cm) in diameter in the lower two-thirds of the unit; upper part typically medium- to thick-bedded, medium- to coarse-grained limestone and fine-grained sandy limestone with common, irregularly shaped black chert nodules, and, in the upper 10 feet (3 m), brachiopod and crinoid fossils and fossil hash; forms slopes and saddles from about 2,600 feet (800 m) (west flank) to 3,200 feet (975 m) (east flank) above the base of the formation; sample SS61202-3 yielded *Idiognathodus expansus* conodonts (middle to upper Desmoinesian); 295 feet (90 m) thick.

IPobl **Lower billiard ball limestone of Butterfield Peaks Formation** - Divisible into two parts not mapped separately: lower half has a ledge-forming basal bed several feet thick of medium-dark-gray, medium- to coarse-grained fossiliferous limestone with crinoid fossils and fossil hash overlain by thin- to medium-bedded, laminated and platy weathering, fine-grained limestone and argillaceous limestone with typically abundant black spherical chert nodules 0.25 to 2 inches (0.5-5 cm) in diameter; upper half tends to be light- to medium-gray, medium- to thick-bedded limestone with planar and low-angle cross-stratification and uncommon irregularly shaped black chert nodules; forms slopes and saddles from about 1,400 feet (430 m) (west flank) to 1,800 feet (550 m) (east flank) above the base of the formation; 105 to 140 feet (32-43 m) thick.

IPMowc **West Canyon Limestone** (Lower Pennsylvanian [Morrowan] to Upper Mississippian) - Medium-light-gray to medium-gray, thick- to very thick bedded, fine- to medium-grained limestone and fossiliferous limestone; locally thin- to medium-bedded and laminated, and locally with brown-weathering silt and very fine grained sand laminae; macrofossils include crinoid columnals, brachiopods, bryozoans, and rugose corals; lower part forms ledges and slopes, upper part contains three prominent cliff-forming limestone beds with brown- to black-weathering irregularly shaped chert nodules and irregular beds that impart a slight "black banded" appearance, especially to the upper cliff; 18- to 25-foot-thick (5.5-7.5 m) cliff-forming, light-brown- to grayish-orange-pink-weathering, light-olive-gray to olive-gray, very thick bedded, fine-grained calcareous sandstone with planar and low-angle cross-stratification is present near middle of formation; upper and lower contacts are gradational and conformable; upper and lower parts correspond to slope-forming intervals 182 feet (55 m) and 145 feet (44 m) thick, respectively, that contain interbedded calcareous sandstone, limestone, and minor shale or mudstone; 1,025 feet (313 m) thick.

MISSISSIPPIAN

Mmc **Manning Canyon Shale** (Upper Mississippian) - Lithologically diverse, interbedded, black to grayish purple, calcareous and carbonaceous shale and siltstone; light-brown to pale-yellow-brown, very fine to fine-grained calcareous sandstone with planar and low-angle cross-stratification; brown-weathering, thick-bedded, fine-grained orthoquartzite with a vitreous and scintillating luster; and medium-gray to bluish-gray, thin- to thick-bedded fossiliferous limestone and argillaceous limestone; fossils include brachiopods, bryozoans, rare trilobites, and leaves; slopes and soils developed on Manning Canyon strata tend to have slight reddish-brown to lavender hues in contrast to the browns and grays of enclosing units; upper contact is conformable and gradational and corresponds to a change from predominantly clastic to predominantly carbonate strata; age from Gordon and Duncan (1970); Bullock (1951) reported thicknesses of 1,121 (west) and 1,419 (east) feet (342-433 m) at Lake Mountain.

Mgb **Great Blue Limestone, undivided** (Upper Mississippian) - Undivided in the north-central part of Saratoga Springs quadrangle due to inadequate exposure; age from Gordon and others (2000); thickness uncertain due to thrust faults, but regionally the formation is about 2,500 feet (750 m) thick (Gordon and others, 2000).

Mgbu **Upper limestone member** - Medium- to very thick bedded, bluish-gray limestone, locally cherty and fossiliferous with brachiopods, corals, and bryozoans; contains interbedded shales in lower part; typically forms ledges and cliffs; upper contact marks a prominent change from cliff-forming limestone to slope-forming shale; estimated to be about 2,100 feet (640 m) thick.

Mgbl **Long Trail Shale Member and lower limestone member, undivided** - **Long Trail Shale Member** is interbedded, reddish-brown, dark-gray, and grayish-purple calcareous and locally carbonaceous shale, and thin-bedded, medium-gray limestone and fossiliferous limestone; locally abundant rugose corals, pelecypods, brachiopods, and bryozoans; weathers to form strike valleys and saddles; commonly contains limonite pseudomorphs after pyrite; neither lower or upper contact of Long Trail Shale Member is exposed, but regionally they appear conformable and gradational; 90 feet (28 m) thick (Bullock, 1951). **Lower limestone member** is medium- to very thick bedded, light- to dark-gray but typically medium-gray limestone and fossiliferous limestone; upper part is typically thin-bedded and platy weathering argillaceous limestone and interbedded gray to grayish-purple shale; bryozoans are locally abundant; about 300 feet (90 m) thick.

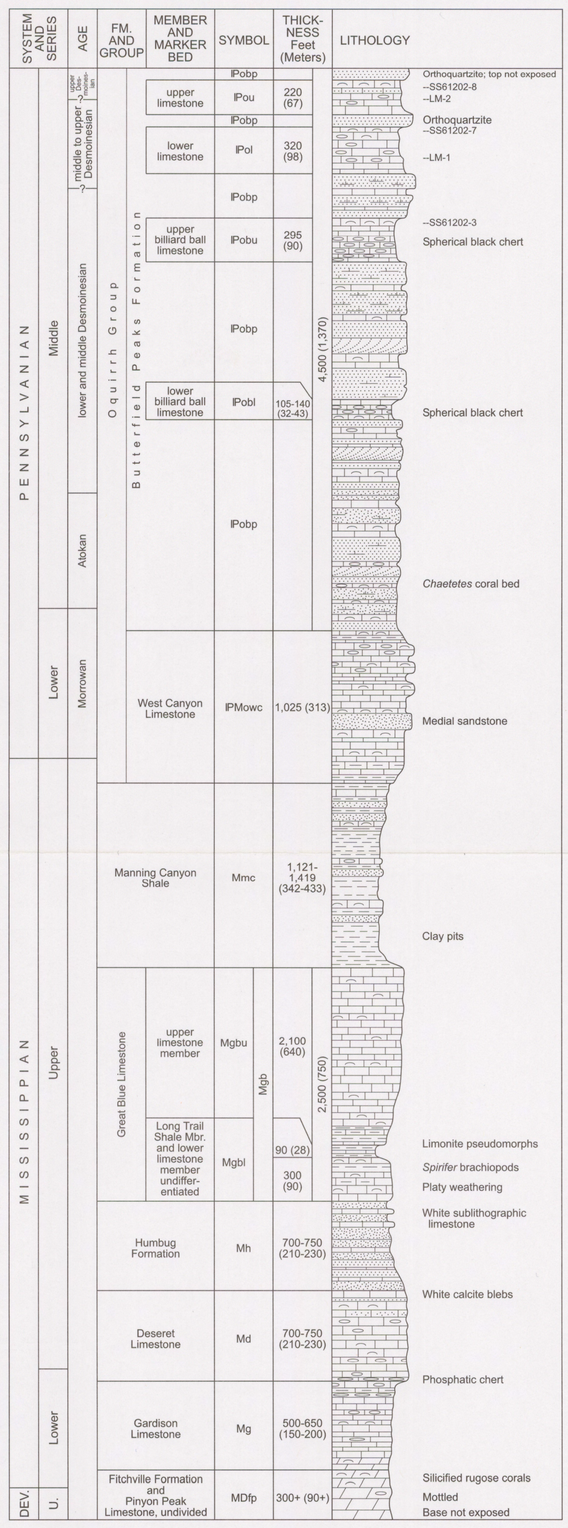
Mh **Humbug Formation** (Upper Mississippian) - Interbedded calcareous quartz sandstone, orthoquartzite, and limestone that weather to ledgy slopes. Sandstone is light- to dark-brown weathering, pale yellowish brown to olive gray, medium to very thick bedded, variably calcareous or siliceous, locally with planar or low-angle cross-stratification. Limestone rarely contains dark-gray chert nodules and is: (1) light gray weathering, medium dark gray, medium to thick bedded, and fine grained with local small white chert blebs; (2) dark gray, very thick bedded with small white calcite blebs; or (3) locally medium to coarse grained with sparse fossil hash. Upper half contains several distinctive, ledge-forming, white to light-gray, medium- to thick-bedded sublithographic limestone beds up to 10 feet (3 m) thick; contains intraformational, pebbly, quartzitic conglomerate beds in the Pelican Hills; upper contact is conformable and gradational and represents a change from interbedded sandstone and limestone to limestone; age from Morris and Lovering (1961); about 700 to 750 feet (210-230 m) thick.

Md **Deseret Limestone** (Upper to Lower Mississippian) - Medium- to very thick bedded, medium-dark-gray, variably sandy and fossiliferous limestone; contains distinctive white calcite nodules and blebs and local brown-weathering chert nodules; fossils include rugose corals, uncommon brachiopods, crinoids, bryozoans, and fossil hash; lower 20 to 30 feet (6-9 m) is marked by slope-forming, thin-bedded, black phosphatic chert likely of the Dell Phosphatic Member; upper contact is conformable and gradational and corresponds to a change from fossiliferous limestone to predominantly sandstone; age from Morris and Lovering (1961) and Sandberg and Gutschick (1984); about 700 to 750 feet (210-230 m) thick.

Mg **Gardison Limestone** (Lower Mississippian) - Medium- to very thick bedded, medium-gray to medium-dark-gray limestone, cherty limestone, and fossiliferous limestone; contains minor medium-dark-gray, medium- to thick-bedded dolomite near the base; chert is present as black, irregularly shaped nodules and thin, discontinuous beds; fossils include rugose and colonial corals, brachiopods, gastropods, and bryozoans replaced by white calcite; upper contact appears conformable and gradational and generally corresponds to a break in slope, with slope-forming, thinner bedded, cherty limestone below and thicker bedded, ledge- and cliff-forming limestone above; age from Morris and Lovering (1961); thickness uncertain due to structural complications, but probably about 500 to 650 feet (150-200 m) thick.

MISSISSIPPIAN and DEVONIAN

MDfp **Fitchville Formation** (Lower Mississippian and Upper Devonian) and **Pinyon Peak Limestone** (Upper Devonian), **undivided** - Light- to medium-gray, medium- to very thick bedded, medium- to coarse-grained dolomite, sandy dolomite, and uncommon cherty dolomite; middle part is mottled light and dark gray and upper part is especially fossiliferous; chert is light brown to pale red; fossils include rugose and syringoporid corals, brachiopods, and crinoids; upper contact marks a slight color change from light-gray dolomite with abundant silicified rugose corals below to darker gray dolomite and limestone above; age from Morris and Lovering (1961); incomplete section is about 300 feet (90 m) thick; Pinyon Peak Limestone may not be present.



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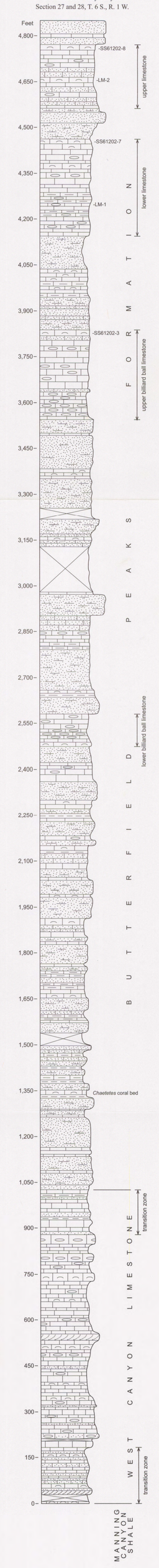
Lake Mountain Measured Section

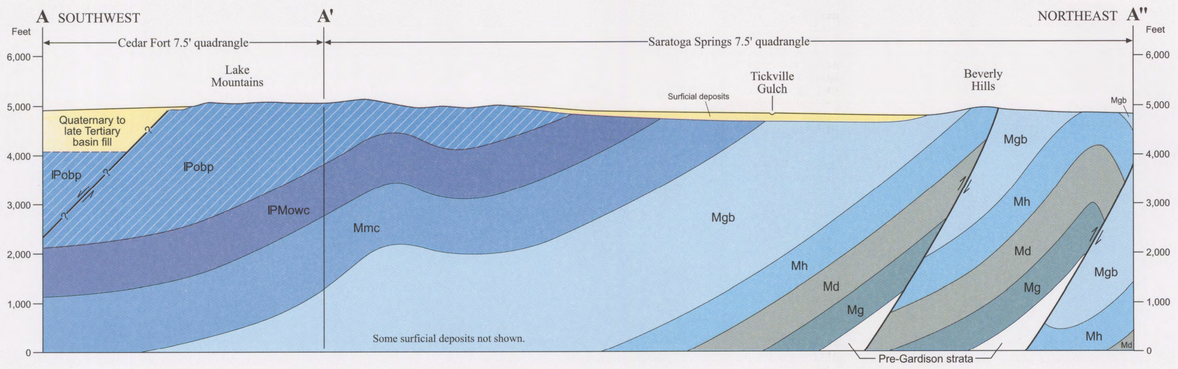
South side of Wiley Canyon
Section 27 and 28, T. 6 S., R. 1 W.

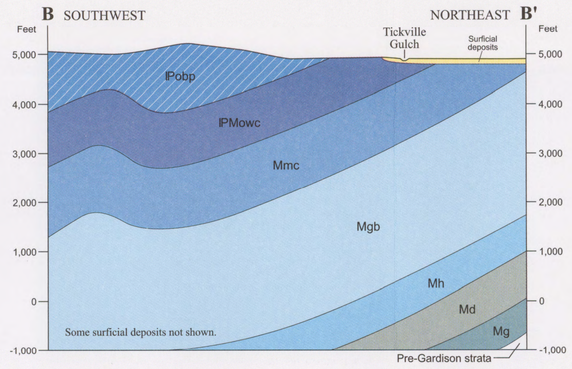


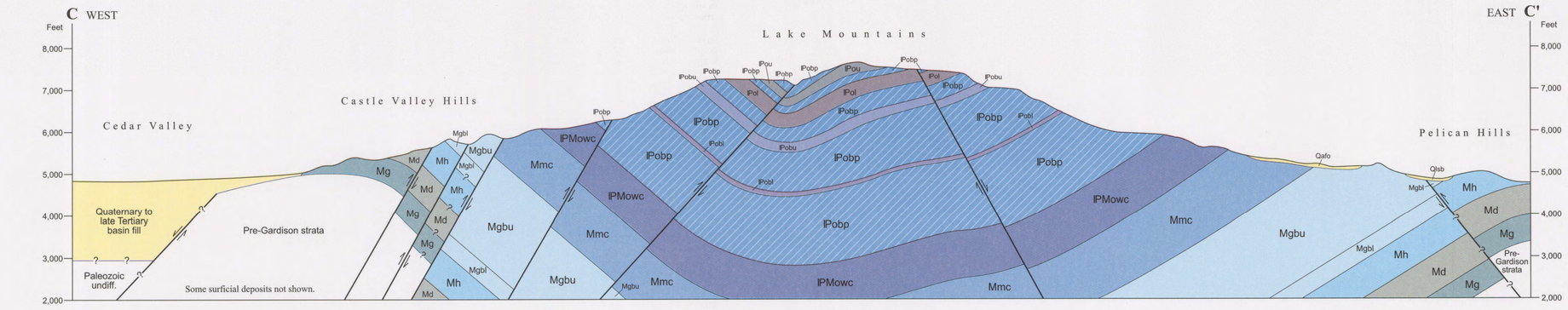
Explanation of Lake Mountain Measured Section

Sample No.	Interval	Rock Type	Fauna	Age
SS61202-8	Upper limestone	fusulinid packstone	sparse juvenile *Idiognathodus* sp., abundant *Beedeina* sp.	upper Desmoinesian
LM-2	Upper limestone	crinoidal packstone	abundant *Idiognathodus expansus*	middle to upper Desmoinesian
SS61202-7	Lower limestone	bimodal packstone	sparse *Idiognathodus expansus*	middle to upper Desmoinesian
LM-1	Lower limestone	skeletal packstone	sparse *Idiognathodus expansus*, *Beedeina* sp.	middle to upper Desmoinesian
SS61202-3	Upper billiard-ball limestone	skeletal packstone	*Idiognathodus expansus*, sparse *Beedeina* sp.	middle Desmoinesian

sandstone; calcareous sandstone; limestone; cherty limestone; fossiliferous limestone; sandy limestone; shaly limestone; cross-bedded sandstone; covered







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