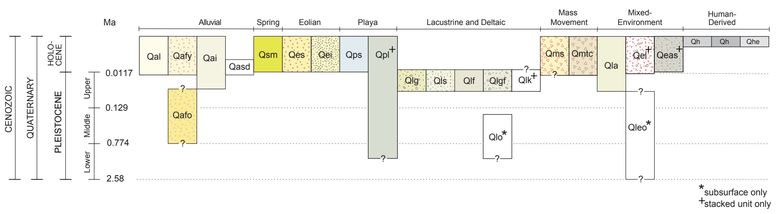
UTAH GEOLOGICAL SURVEY
a division of
Utah Department of Natural Resources

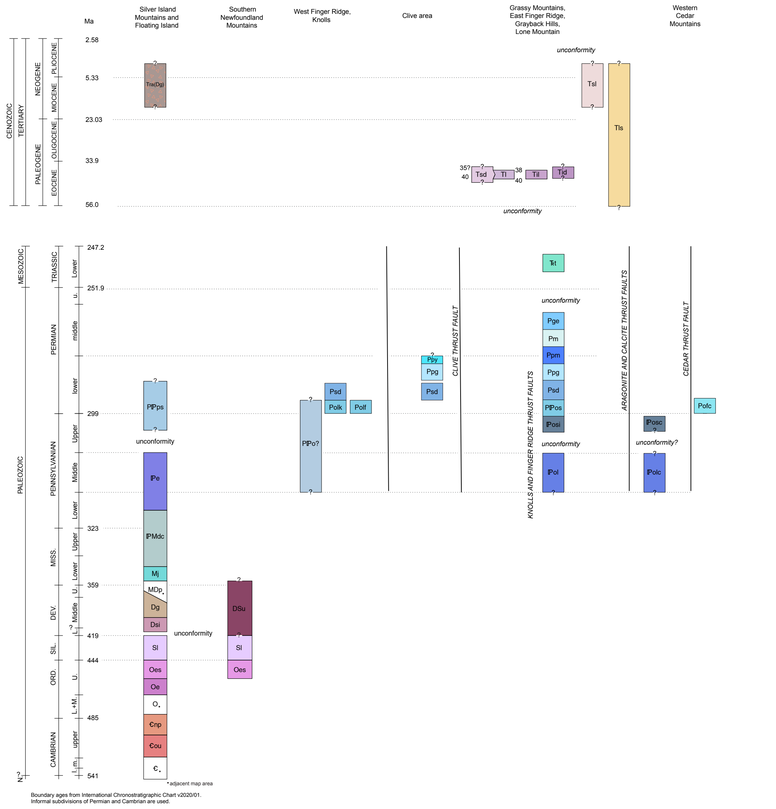
Plate 2
Utah Geological Survey Open-File Report 731
Interim Geologic Map of the Bonneville Salt Flats
and East Part of the Wendover 30' x 60' Quadrangles—Year 3

CORRELATION OF QUATERNARY GEOLOGIC UNITS

Depositional Environments



CORRELATION OF TERTIARY, MESOZOIC, AND PALEOZOIC GEOLOGIC UNITS



Boundary ages from International Chronostratigraphic Chart v2020/01.
Informal subdivisions of Permian and Cambrian are used.

GEOLOGIC SYMBOLS

- Contact
- Contact, approximately located, between upper and lower units of Guilmette Formation
- Channel of Old River Bed delta (map unit Qasd)
- Steeply-dipping normal fault – Dashed where approximately located, dotted where concealed; bar and ball on downthrown side
- Normal fault, geophysical, gravity – Located from gravity data, concealed and very approximately located; bar and ball on downthrown side
- Low-angle normal fault – Dashed where approximatley located, dotted where concealed; boxes on downthrown side
- Fault with unknown geometry and offset – Dashed where approximately located, dotted where concealed; queried where existence and location inferred
- Thrust fault – Dashed where approximately located, dotted where concealed; dotted and queried where existence and location inferred; teeth on hanging wall; bar and ball where later normal movement
- Lineament – From aerial photo interpretation
- Lineament, geophysical – Located from gravity data, concealed and very approximately located
- Igneous dike (unit Tid)
- Axial trace of anticline – Dashed where approximately located, dotted where concealed; arrow shows plunge
- Axial trace of overturned anticline – Dashed where approximately located, dotted where concealed, dotted and queried where existence and location is inferred
- Axial trace of syncline – Dashed where approximately located, dotted where concealed, dotted and queried where existence and location is inferred
- Axial trace of overturned syncline – Dotted where concealed
- Minor folds – anticline, overturned syncline
- Lake Bonneville shorelines (Currey, 1982; Chen and Maloof, 2017; this study) –
  - Bonneville shoreline 5213–5328 feet (1589–1624 m)
  - Provo shoreline 4856–4925 feet (1480–1501 m)
  - Stansbury shoreline ~4446–4500 feet (~1355–1372 m), dashed where approximately located
- Approximate area with no Lake Bonneville deposits in subsurface (see Oviatt and others, 2020)
- Earthen dike for evaporation ponds
- Sedimentary bedding attitude –
  - 20 — Inclined
  - Inclined, photo interpreted
  - Vertical
  - 20 / 50 — Overturned
- Mine or quarry
- Sand and gravel pit
- BC1 — Sediment core and label (see table 1)
- CS-5 — Sediment pit/trench and label (see table 1)
- Lozange section — Sediment natural exposure and label (see table 1) – adjacent map area
- DH1 — Hydrocarbon exploration well and label – Dry hole (see table 3)
- 2,C — Geochemical and geochronology samples, and label (see tables 4, 5)
- BW2 — Geochemical sample and label (see table 4)
- BW14 — Fossil sample and label (see table 6)
- Qes/Qaf — Stacked unit – Indicates thin cover of first unit overlying second unit

See booklet for geologic unit descriptions, acknowledgments, references, figures, and tables.

GEOLOGIC UNITS

- Qal—Stream alluvium
- Qafy—Younger fan alluvium
- Qafo—Older fan alluvium
- Qai—Alluvial silt
- Qasd—Alluvial sand of Old River Bed delta
- Qsm—Spring and marsh deposits
- Qes—Eolian sand
- Qei—Eolian silt
- Qps—Playa salt
- Qlg—Lacustrine gravel
- Qls—Lacustrine sand
- Qlf—Lacustrine fine-grained deposits
- Qlgf—Lacustrine gravel and fine-grained deposits
- Qlo—Older lacustrine deposits [subsurface only]
- Qms—Landslide deposits
- Qmtc—Talus and colluvium
- Qla—Lacustrine and alluvial deposits, undivided
- Qleo—Older lacustrine and eolian deposits, undivided [subsurface only]
- Qh—Human disturbance
- Qhw—Waste management facilities
- Qhe—Evaporation ponds
- Qpl—Playa mud over lacustrine fine-grained over lacustrine and eolian deposits
- Qei/Qlf—Eolian silt over lacustrine fine-grained deposits
- Qei/Qlg—Eolian silt over lacustrine gravel
- Qei/Qlk—Eolian silt over lacustrine carbonate deposits
- Qei/Qla—Eolian silt over lacustrine and alluvial deposits
- Qes/Qafy—Eolian sand over younger fan alluvium
- Qes/Qlg—Eolian sand over lacustrine gravel
- Qes/Qlf—Eolian sand over lacustrine fine-grained deposits
- Qes/Qlgf—Eolian sand over lacustrine gravel and fine-grained deposits
- Qes/Qla—Eolian sand over lacustrine and alluvial deposits
- Qes/Qafo—Eolian sand over older alluvial-fan deposits
- Qes/IPosc—Eolian sand over Oquirrh Group, sandstone and siltstone unit (Cedar thrust sheet)
- Qel/IPol—Eolian and lacustrine deposits over Oquirrh Group, limestone unit (Aragonite thrust sheet)
- Qel/IPosc—Eolian and lacustrine deposits over Oquirrh Group, sandstone and siltstone unit (Cedar thrust sheet)
- Qel/IPolc—Eolian and lacustrine deposits over Oquirrh Group, limestone unit (Cedar thrust sheet)
- Qlg/Tl—Lacustrine gravel over latite lava flows
- Qeas/Qpl—Eolian and alluvial sand over playa mud over lacustrine fine grained over older lacustrine deposits
- Tsl—Salt Lake Formation
- Tra(Dg)—Rock avalanche breccia of Guilmette Formation
- Tls—Tertiary limestone
- Tl—Latite lava flows
- Til—Latitic intrusion
- Tsd—Tuffaceous sandstone and tuff
- Tid—Dacitic intrusions
- Tkt—Thaynes Formation
- Pge—Gerster Formation
- Ppy—Plympton Formation
- Pm—Murdock Mountain Formation
- Ppm—Phosphoria Formation, Meade Peak Member
- Ppg—Park City Formation, Grandeur Member
- Psd—Permian sandstone, dolomite and limestone
- Polf—Oquirrh Group, limestone unit (Finger Ridge thrust sheet)
- IPPo?—Oquirrh Group, undivided? (Knolls thrust sheet?)
- Polk—Oquirrh Group, limestone and sandstone unit (Knolls and South Knolls thrust sheet)
- PPPos—Oquirrh Group, sandstone and limestone unit (Calcite and Aragonite thrust sheets)
- IPosi—Oquirrh Group, sandstone and siltstone unit (Calcite and Aragonite thrust sheets)
- IPol—Oquirrh Group, limestone unit (Calcite and Aragonite thrust sheets)
- IPosc—Oquirrh Group, sandstone and siltstone unit (Cedar thrust sheet)
- IPolc—Oquirrh Group, limestone unit (Cedar thrust sheet)
- Pofc—Oquirrh Group, Freeman Peak Formation and Curry Peak Formation, undivided (footwall of Cedar thrust sheet)
- PPPps—Pequop Formation, Ferguson Mountain Formation and Strathearn Formation, undivided
- IPe—Ely Limestone
- IPMdc—Diamond Peak Formation and Chainman Shale, undivided
- Mj—Joana Limestone
- DSu—Undivided dolomite and limestone
- Dg—Guilmette Formation
- Dsi—Simonson Dolomite
- Sl—Laketown Dolomite
- Oes—Ely Springs Dolomite
- Oe—Eureka Quartzite
- Cnp—Notch Peak Formation
- Cou—Orr Formation, upper part

Note - Duplicated queried units not included here

LITHOLOGIC COLUMN

Silver Island Mountains and Floating Island

CHRONO-STRATI-GRAPHIC UNIT	GEOLOGIC UNIT	MAP SYMBOL	THICKNESS Feet (Meters)	LITHOLOGY / NOTES
PERMIAN lower	Pequop Formation, Ferguson Mtn Fm, Strathearn Fm	PPps	2550+ (365+)	top not exposed
PENN. U				Unconformity
PENN. M	Ely Limestone	IPe	500+ (150+)	base not exposed
PENN. L				not in contact and fault
MISS. U	Diamond Peak Fm, Chainman Shale	IPMdc	200+ (60+)	commonly structurally thinned
MISS. L	Joana Ls	Mj	0-130 (0-40)	fossiliferous
DEVONIAN Upper	Pilot Shale	MDp*		adjacent map area
DEVONIAN Upper	Guilmette Formation	Dg	2230 (680)	stromatoporoids; coral and algal heads
DEVONIAN Middle	Simonson Dolomite	Dsi	1270 (390)	
DEVONIAN L.–?				Unconformity
SIL.	Laketown Dolomite	Sl	500+ (150+)	Unconformity
ORDOVICIAN Upper	Ely Springs Dolomite	Oes	200+ (60+)	Unconformity
ORDOVICIAN Upper	Eureka Qtz	Oe	100-200+ (30-60+)	
ORDOVICIAN Lower-Middle	CP Dol, WR Qtz	O*		adjacent map area
ORDOVICIAN Lower-Middle	Lehman Fm			
ORDOVICIAN Lower-Middle	Kanosh Sh			
ORDOVICIAN Lower-Middle	Lower Pogonip Group			
CAMBRIAN upper	Notch Peak Formation	Cnp	1640 (500)	
CAMBRIAN upper	Orr Fm: CS Sh Mbr	Cou	425+ (130+)	fossiliferous
CAMBRIAN upper	Orr Fm: JW Ls Mbr	Cou		fossiliferous
CAMBRIAN upper	Orr Fm: C Sh Mbr	Cou		fossiliferous
CAMBRIAN upper	Orr Fm: Big Horse Ls Mbr	Cou		fossiliferous
CAMBRIAN upper	Lamb Dol	C*		
CAMBRIAN middle	Toano Limestone	C*		adjacent map area
CAMBRIAN lower	Killian Springs Formation	C*		
CAMBRIAN lower	Prospect Mountain Quartzite	C*		
NEO. ?				

LITHOLOGIC COLUMN

Southern Newfoundland Mountains

CHRONO-STRATI-GRAPHIC UNIT	GEOLOGIC UNIT	MAP SYMBOL	THICKNESS Feet (Meters)	LITHOLOGY / NOTES
DEVONIAN	Guilmette Fm	DSu	2300+ (700+)	top not exposed
DEVONIAN	Simonson Dol			
DEVONIAN	Lone Mtn Dol?			Unconformity?
SIL.	Laketown Dolomite	Sl	850 (260)	Unconformity
ORD. U	Ely Springs Dolomite	Oes	~590 (180)	base not exposed

LITHOLOGIC COLUMN

Finger Ridge thrust sheet

CHRONO-STRATI-GRAPHIC UNIT	GEOLOGIC UNIT	MAP SYMBOL	THICKNESS Feet (Meters)	LITHOLOGY / NOTES
PERMIAN lower	Oquirrh Group: limestone unit	Polf	1182+ (360+)	*Schwagerina* *S. tersa*

Finger Ridge thrust fault

LITHOLOGIC COLUMN

Knolls and South Knolls thrust sheets

CHRONO-STRATI-GRAPHIC UNIT	GEOLOGIC UNIT	MAP SYMBOL	THICKNESS Feet (Meters)	LITHOLOGY / NOTES
PERMIAN lower	Permian sandstone, dolomite and limestone	Psd	1200+ (365+)	
PERMIAN lower	Oquirrh Group: limestone and sandstone unit	Polk	3300–5000+ (1000–1500+)	*Schwagerina wellsensis* *S. frankinensis*; *Schwagerina* *Pseudofusulina* *Paraschwagerina* *Schubertella*; *Schwagerina* *S. wellsensis* *Eoparafusulina* *Pseudoschwagerina* *Schubertella*

Knolls thrust fault

LITHOLOGIC COLUMN

Clive thrust sheet

CHRONO-STRATI-GRAPHIC UNIT	GEOLOGIC UNIT	MAP SYMBOL	THICKNESS Feet (Meters)	LITHOLOGY / NOTES
Knolls thrust fault				
PERMIAN lower	Plympton Formation	Ppy	200+ (60+)	*N. sulcoplicatus*
PERMIAN lower	Park City Fm, Grandeur Member	Ppg	850+ (260+)	
PERMIAN lower	Permian sandstone, dolomite and limestone	Psd	850+ (260+)	

Clive thrust fault

LITHOLOGIC COLUMN

Grassy Mountains, Finger Ridge, Grayback Hills, Lone Mountain
(Aragonite and Calcite thrust sheets)

CHRONO-STRATI-GRAPHIC UNIT	GEOLOGIC UNIT	MAP SYMBOL	THICKNESS Feet (Meters)	LITHOLOGY / NOTES
Tert.	Salt Lake Fm.	Tsl	20+ (6+)	
Tert.	Tert. limestone	Tls	20 (6)	
TERT. Eocene	Latite lava	Tl	35+ (11+)	
TERT. Eocene	Tuffaceous sandstone and tuff	Tsd	307+ (94+)	Unconformity; Ammonoids
TRIASSIC Lower	Thaynes Formation	Tkt	1930+ (590+)	Conodonts; Ammonoids
PERMIAN lower–middle	Gerster Fm	Pge	311+ (95+)	Unconformity
PERMIAN middle	Murdock Mountain Formation	Pm	1643 (500)	
PERMIAN middle	Phosphoria Fm, Meade Peak Member	Ppm	233+ (71+)	
PERMIAN lower	Park City Fm, Grandeur Member	Ppg	1000± (300±)	
PERMIAN lower	Permian sandstone, dolomite and limestone	Psd	>850 to 3374+ (>260 to 1029+)	
PERMIAN lower	Oquirrh Group: sandstone and limestone unit	PPPos	1500–9004 (460–2754)	*Schwagerina*; *Mesogondolella* *Sweetognathodus* *Psuedoschwagerina*
PENNSYLVANIAN Upper	Oquirrh Group: sandstone and siltstone unit	IPosi	1934–2500 (590–760)	*Triticites*; *Triticites*
PENNSYLVANIAN Upper	Oquirrh Group: limestone unit	IPol	1607+ (490+)	Unconformity; *Fusulina*; *Neognathodus* *Idiognathodus*

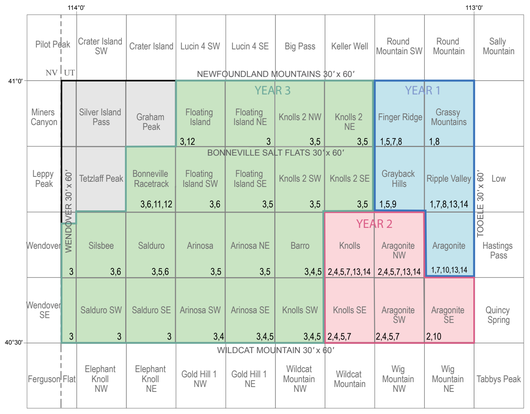
Aragonite, Calcite and other thrust faults

LITHOLOGIC COLUMN

Western Cedar Mountains
(Cedar thrust sheet)

CHRONO-STRATI-GRAPHIC UNIT	GEOLOGIC UNIT	MAP SYMBOL	THICKNESS Feet (Meters)	LITHOLOGY / NOTES
Aragonite and Calcite? thrust faults				
PENNSYLVANIAN Upper	Oquirrh Group: sandstone and siltstone unit	IPosc	1400± (425±)	*Streptognathodus*
PENNSYLVANIAN ?				Unconformity?
PENNSYLVANIAN Middle	Oquirrh Group: limestone unit	IPolc	1900± (580±)	
PERM. I. O.G.		Pofc	~400+ (~120+)	Cedar thrust fault

PRIMARY SOURCES OF GEOLOGIC MAPPING



1. Clark [UGS] and Oviatt [KSU] (2017-18), photogeologic and limited field mapping
2. Clark [UGS] and Oviatt [KSU] (2018-19), photogeologic and limited field mapping
3. Clark [UGS] and Oviatt [KSU] (2019-20), photogeologic and limited field mapping
4. Clark [UGS] and Page [DRI] (2020), mapping of ORB delta channels

   Clark [UGS] and Hardwick [UGS] (2020), mapping of faults and lineaments from gravity data [Year 1-3 map area]
5. Boden (2016)
6. Bowen and others (2018)
7. Dames & Moore and others (1987)
8. Doelling (1964)
9. Doelling and others (1994)
10. Maurer (1970)
11. Miller and others (in progress)
12. Schaeffer (1960)
13. Solomon (1990)
14. Solomon (1993)