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NATMAP CARTNAT

Canada's National Geoscience Mapping Program
Le Programme national de cartographie géoscientifique du Canada

STRATIGRAPHIC SECTIONS

1

E — Silty loess. Loess contains organic-rich bands, presumably lodgment rolls, the grassland soil — and cooking pits of a paleo-Indian encampment

LE — Bedded silty fine to medium sand. Bedding thickness 5 cm to 50. Scattered 5cm fossilized snow bedding

C — Obscured by slumping

GI — Granite, largely covered by Boreal sediment from the morning. Rumbleadrine sediments. All clasts from the Front Ranges immediately to the west

R — Steeply dipping shale bedrock

2

LE — Laminated heavy clay and silt and clay with interbedded sand. Dropstone lenses over the lowest 1 m. Weathere to a rough prismatic surface

LE — Interstratified diamicton, massive sand and silt with syndepositional slump structures. Abrupt contact with overlying clay-rich beds

TEl — Gravel, indurated, bouldery. Generally becomes finer upward. Clasts imbricated to about 210°. Clasts to 30 cm in length. All lithologies are from the Front Ranges to the west and Foothills (predominantly sandstone, limestone and dolostone)

3

GI — Massive indurated and disturbed gravel capped by stony diamicton (overgrown). Base and top of this unit are not visible. Many of the clasts are vertically oriented or are aligned into fold-like involution structures

4

E — Loess, finely stratified grey-brown silt. Several dark organic rich silt horizons near the base of unit

E — Buried chernozemic soil, dark grey to black. Developed in slightly pebbly clayey silt

LE — Interbedded fine sand and silt, scattered pebbles. Unit with distorted (syndepositional slumping?). Base of exposure is along a cliff (undisturbed strom of a landslide). Poss other exposures in the area, glaciolacustrine sediments are known to be at least 5 m thick

5

TEm — Diamicton (M), clayey silty matrix. Stone content about 10 percent. Stones up to 0.3 m in length, mean size 0.6-2.0 cm. Montane equivalent to Etrailles Train Till. Most lithologies are from the Rocky Mountains and Foothills

GI — Gravel, with clasts to 0.3 m, silty sand matrix. Clasts subrounded to round. Clasts are mostly carbonates with sandstone making less than 50 percent. No stratification was observed (exposure graded over)

R — Steeply dipping thinly bedded shale

6

O — Fibrous peat. Scattered clay partings
Mazama tephra (ca. 6700 a B.P.)

O — Fibrous peat. Scattered clay partings
Decomposed peat. Radiocarbon age 8320+140 (GSC 2651)

L — Marl and marly clay

L — Clay with mosses and shells

L — Clay with scattered pebbles and fragments of aquatic moss Radiocarbon age 15 820+180 a B.P. (GSC 2670), and 18 400 +/-190 a B.P. on aquatic moss (GSC 2669). Both ages are shown to be in error by approximately one radiocarbon half-life

LE — Loess, silt, dark brown chernozem soil developed on it. Loess contains fire-cracked rocks from paleo-Indian encampment

7

E — Thinly bedded silty sand

LE — Diamicton (M), moderately stony, indurated, light greyish brown. Lower 30 cm contains rip-ups of laminated silt and clay. Unit contains scattered Canadian Shield provenance pebbles and purple-banded quartzites from the Rocky Mountain Main Ranges

TEl — Laminated silt and sand and pebble gravel lenses. Lenses are discontinuous and have been intruded by the overlying till

TEm — Diamicton (M), massive, very stony and indurated, dark greyish brown. Stones up to almost 1m in length. Clasts of local origin. Stones are highly striated, especially along the gray shale. Stones are highly striated, especially along the gray shale. Average size of stones 8-5 cm. All pebble lithologies are from the Front Ranges immediately to the west. Clasts are of detached gravel up to 0.5 m. Contact between bedrock and till is sharp. The till is massive fine stony and clay-rich over the upper 30 cm. Sheared contact between till and mudstone with pebble frequency decreasing downward and matrix content increasing downward to unsheared mudstone

R — Massively bedded sandstone and mudstone

8

LE — Thinly bedded to laminated silts and clays. Bands alternate between light bands about 3 cm thick and dark bands about 1 cm thick. Scattered pebbles are present in the bands

TEm — Diamicton, grey stony clayey, sandy silt matrix. Stones to 20 cm. All stones Rocky Mountain and Foothills provenance (montane equivalent of Etrailles Trail TB) provenance

R — Steeply dipping black shale

9

E — Silt (loess), dark brown chernozem developed within it

LE — Stratified sandy silt and sand

TEl — Diamicton (M), light greyish brown sandy loam, moderately stony. Stone content decreases upward. Lithologies are from the Front Ranges. Clasts of TB contains Main Ranges purple banded quartzite and scattered (< 1 percent) Canadian Shield lithologies

TEm — Diamictes (M), dark greyish brown, indurated, very stony, contains boulders to 50 cm, generally oriented parallel to ice flow direction which is NW-SE, instead of proximately east-west. Matrix is clay. Main Ranges quartzite. Front Ranges provenance. Stony clayey silt matrix. Contact with overlying till is abrupt with a change in colour and texture over about 10 cm. Contact is marked by large boulders at the top of the lower diamicton. Underlying bedrock is structured. Mudstone has been flipped up and incorporated as rip-up clasts at the till giving the contact a gradational appearance

R — Fractured mudstone

LEGEND—SUBSURFACE UNITS

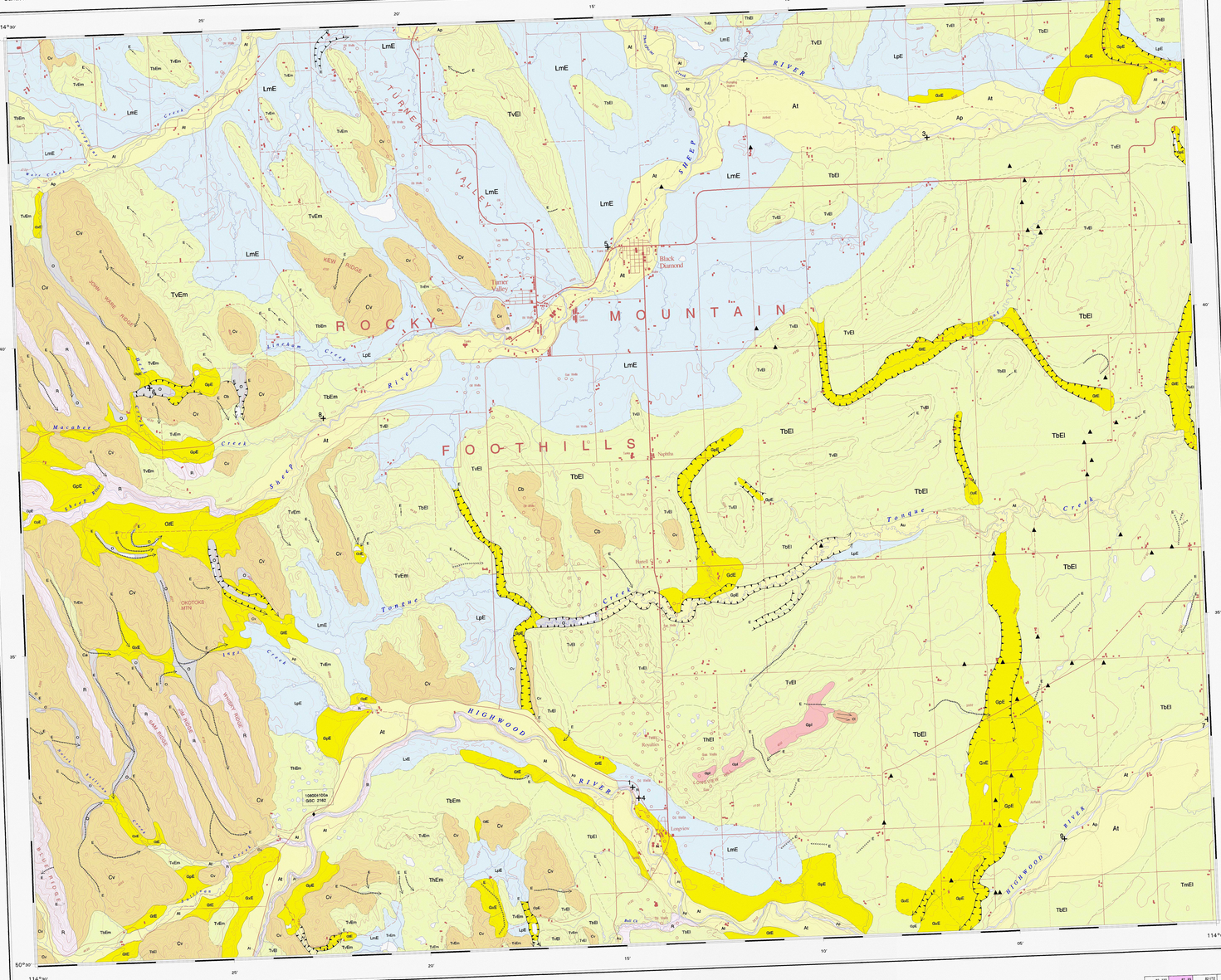
Post Glacial
- C — Covered by colluvium
- O — Peat and degraded peat
- E — Eolian fine sand and silt
- L — Lacustrine sand, silt and clay

Erratics Train Glaciation
- LE — Glaciolacustrine sand silt and clay
- TEl, TEm — Erratics Train Till (mixed Rocky Mountain, Foothills and Shield provenance) equivalent to the sand gravel overlayed by (mainly Rocky Mountain provenance)

Penultimate glaciation or older
- TBl — Till of Rocky Mountain Front Ranges and Foothills Provenance only
- GI — Coarse gravel outwash entirely of Rocky Mountain Front Ranges and Foothills provenance. May have been deposited at the end of the penultimate glaciation or during the onset of the Erratics Train Glaciation

Pregla cial
- R — Sandstone and shale bedrock

Vertical Scale (meters): 0, 5, 10



Copies of this map may be obtained from The Geological Survey of Canada
601 Booth Street, Ottawa, Ontario K1A 0E8
101 West Pender Street, Vancouver, B.C. V6B 1R8

LOCATION MAP

Geology by R.E. Jackson Jr. 1975 and 1990

Digital cartography by R.L. Allard, Geological Survey of Canada

Electrostatic plot produced by the Geological Survey of Canada

Any revisions or additional information known to the user would be welcomed by the Geological Survey of Canada

Open File 3075

SURFICIAL GEOLOGY

TURNER VALLEY

ALBERTA

Scale 1:50 000 - Échelle 1/50 000

Kilometres 1 0 1 2 3 4 Kilometres

Transverse Mercator Projection
Cm 114°15'; Scale Factor 1
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Projection transverse de Mercator
M.C. 114°15'; facteur d'échelle 1
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Digital base map from Surveys, Mapping and Remote Sensing Branch published at 1:50 000 scale. Generalized and modified by the Geological Survey of Canada

Copies of the topographical edition of this map may be obtained from the Canada Map Office, Department of Natural Resources Canada, Ottawa, Ontario, K1A 0E9

Mean magnetic declination 1995, 19°29' E, decreasing 7.1' annually. Readings vary from 18°18' E in the SE corner to 19°40' E in the NW corner of the map

Elevations in feet above mean sea level

82 J/16	82 J/9 OF 3075	82-I/12	82-I/13
82 J/7	82 J/8 OF 3074	82-I/5	82-I/4
82 J/2	82 J/1 OF 3073	82-I/4	82-I/3
82 I/15	82 I/14	82 I/10	82 I/11
		OF 3072	

AUTHOR, TOPOGRAPHIC EDITOR ACKNOWLEDGE AND WISH TO ACKNOWLEDGE GEOLOGICAL SURVEY OF CANADA (OPEN FILE 3075)

LEGEND

This legend is common to Open Files 3072 to 3075, coloured legend blocks indicate map units that appear on this map

QUATERNARY
HOLOCENE

POST ERRATICS TRAIN GLACIATION

m — ***MADE LAND:*** *urban artificial fill and mine waste*

Mn — ***NEOGLACIAL TILL:*** *diamicton, stony. Forms end and lateral moraines (denoted by symbol) and ground moraine. May contain glacial ice. Thickness 10 m to discontinuous*

O — ***ORGANIC DEPOSITS:*** *water-saturated sphagnum sp. peat and organic silt formed predominantly by the accumulation of vegetative material in bogs, fens, and swamps. Organic deposits are usually underlain by lacustrine silts and clays. Thicknesses up to 5 m*

Eb — ***EOLIAN DEPOSITS:*** *sand and silt transported and deposited by wind*
Eolian blanket: *sand, well sorted, massive. Forms gently undulating plains marked by crescent-shaped dunes. 1 to 3 m thick*

Ev — ***Eolian veneer:*** *silt and fine sand, well sorted, massive < 1m thick in scattered dunes and patchy coverings (indicated by pattern where known)*

Cb — ***COLLUVIAL DEPOSITS:*** *Stony diamicton resulting from the breakdown of bedrock through physical and chemical weathering and reworked and transported by gravitational processes . Colluvial deposits commonly include reworked glacial sediments with the limits of past glaciations*
Colluvial blanket sediments: *diamicton, stony, massive, 1 to 2 m thick*

Cv — ***Colluvial veneer sediments:*** *diamicton, stony, massive, <1 m thick or patchy with areas of exposed bedrock*

Ca — ***Colluvial apron sediments:*** *diamicton, bouldery, and sands and gravels, poorly sorted and stratified. Forms a wedge-shaped slope-toe complex of small steep debris flow and avalanche-dominated alluvial fans and solifluction deposits derived from bedrock or glacial debris up slope. Thickness ranges from <1 m at the upslope limit to up to 10 m or more in the thickest part of the apron*

Cc — ***Rockfall sediments:*** *rockfall deposits, bouldery, angular. Form cone shaped landforms at the angle of repose (talus) below steep bedrock slopes. Thickness range from 0 at the margins to 10 m near the midpoint of the cone*

Cl — ***Landslide sediments:*** *diamicton formed of broken rock, soil and glacial deposits within the limits of recent glacial landslides in a hummocky or ridged topography with ridges transverse to direction of movement. Thickness variable, up to 10 m or more (direction of movement indicated by arrows)*

Cu — ***Undivided colluvial sediments:*** *hummocky apron terrain adjacent to mountainous uplands possibly of mass wasting origin*

ALLUVIAL DEPOSITS: *gravel to silt size sediments deposited by streams either within channels or as overbank deposits. Deposits are usually stratified and moderately to well sorted, with the exception of some alluvial fan deposits*

Ap — ***Flood plain sediments:*** *gravel and sand, massive to stratified, moderately to well sorted and are locally overlain by or include lacustrine silt and clay and minor peat and organic silt deposited in abandoned channels and along flood-plain margins. Forms plains within about 1 m of present stream level which are subject to inundation during floods. Thickness 1 to 5 m*

At — ***Alluvial terrace sediments:*** *gravel and sand, massive to stratified, moderately to well sorted. Sediments are of flood plain origin now isolated from flooding by stream incision. Thickness ranges from a discontinuous covering on bedrock to several m. Where alluvial terraces are out of the present flood plains, total thicknesses of gravel and sand up to 5 m*

At — ***Alluvial fan deposits:*** *gravel and gravelly diamicton, stratified, poorly to moderately sorted. Forms fan-shaped landforms where streams enter larger valleys. In mountainous terrain, alluvial fans may be subject to inundation by debris flows. Thickness up to 10 m*

Au — ***Undivided alluvial sediments:*** *floodplains, fans, and terraces that cannot be subdivided at this map scale*

WISCONSINAN

ERRATICS TRAIN GLACIATION

ALLUVIAL DEPOSITS: *Gravel and sand deposited by streams that were not fed by glacial meltwaters but were graded to ice margins*

AtE — ***Alluvial terrace sediments:*** *Gravel and sand, stratified, moderately to well sorted. Sediments are of flood plain origin now isolated from flooding by stream incision. Thickness 1 to 5 m*

GLACIOLACUSTRINE DEPOSITS: *well stratified sand, silt and clay deposited in basins ponded by glacial ice. Where deposition was distant from ice margins, glaciolacustrine sediments underlie plains of gently rolling terrain. Where deposition was proximal to glacial ice, they may underlie ridged, hummocky, or pitted terrain caused by subsequent ice melting*

LvE — ***Glaciolacustrine veneer sediments:*** *silt, clay and fine sand, well stratified,thinly bedded to laminated or discontinuous. Thickness < 1 m thick to discontinuous*

LbE — ***Glaciolacustrine blanket sediments:*** *silt, clay and fine sand surface morphology conforms to underlying topography. Thickness 1 to 3 m*

LpE — ***Glaciolacustrine plain sediments:*** *silt, clay and fine sand, thinly bedded to laminated. Surface morphology is a plain and underlying topography is totally or largely obscured by these sediments. Thickness 1 to 99 m*

clLpE — ***Glaciolacustrine plain sediments (heavy clay phase):*** *heavy clay and silty clay, laminated. Surface morphology is a plain. Includes sediments from postglacial lakes. Thickness 1 to 20 m*

LmE — ***Rolling glaciolacustrine plain sediments:*** *fine sand, silt, and clay, thinly to massively bedded, surface morphology undulating with 1 to 2 m of local relief. Underlying topography is totally or largely obscured by these sediments. Thickness 1 to 20 m*

LxE — ***Ice-contact glaciolacustrine complex sediments:*** *silt and sand, gravel, diamicton in various proportions and stratigraphies may comprise up to 10 percent of this unit. Bedding thin to massive. Bedding parallel to or moderately deformed due to synsedimentary slumping and ice movement. Surface morphology is hummocky, jumbled and ridged with relief up to 10 m. Thickness 5 to 10 m*

GLACIOFLUVIAL DEPOSITS: *Sand, gravel and minor silt and clay deposited by streams flowing away from, or in contact with glacial ice, including deltas graded to former glacial lakes. Sorting ranges from poor and stratification from thin bedded to massive to poor and stratification from thin bedded to massive. Sediments often display evidence of synsedimentary collapse due to melout of buried or supporting ice*

GpE — ***Glaciofluvial plain and fan sediments:*** *gravel and sand, massive to thick bedded, former outwash plains and fans. Thickness 1 to 10 m*

GtE — ***Terraced glaciofluvial sediments:*** *gravel and sand, massive to thick bedded, former outwash plains and fans inclined into a succession of terraces. Thickness 1 to 10 m*

GdE — ***Glaciofluvial delta sediments:*** *sand, gravel and minor silt and clay, thinly bedded to massive, flat surfaced, delta-form in plan view, deposited as a delta in a former glacial lake. Thickness ranges from 5 to 10 m*

GxE — ***Glaciofluvial ice stagnation complex sediments:*** *sand, gravel, diamicton and minor silt and clay, thin bedded to massive. Bedding is frequently contorted and folded due to synsedimental ice melout. Land surface morphology includes hummocks, kettles, esker and crevasse-fill ridges 2 to 10 m in relief with minor elements of units* ***Gp*** *and* ***GI****. Thickness 5 to 10 m*

GuE — ***Undivided glaciofluvial and ground moraine sediments:*** *co-occurring glaciofluvial sediments and ground moraine too variable to resolve at the scale of mapping. Thickness 1 to 5 m*

MORAINAL DEPOSITS (TILL): *diamicton (pebble to boulder size clasts suspended in a poorly sorted matrix of sand size matrix) deposited directly from glacial ice; commonly massive, has been to some degree modified by glacial flow and/or deformation. Tills of two provenance types were deposited during the Erratics Train Glaciation: T El* ***(***Montane sheets of Rocky Mountain Front and Main ranges Precambrian and Paleozoic limestone, dolostone and quartzite, Foothills and Interior Plains Mesozoic and lower Tertiary sandstone, mudstone and coal, and Canadian Shield provenance pebbles and boulders from rocks, **T Bm** contains Rocky Mountain Precambrian and Paleozoic limestone, dolostone and quartzite (may include Precambrian igneous rocks south of Crowsnest river), and Foothills and lower Tertiary sandstone, shale, and coal (includes deposited by ice-dammed Proto lake). Some trace amounts of Canadian Shield provenance clasts may be locally present where montane ice overran preexisting till containing Canadian shield provenance clasts

TvEl, TvEm — ***Till veneer:*** *< 1 m thick or discontinuous with patches of exposed bedrock or colluvium* ***TvEm*** *generally contains more and coarser pebble and larger clasts than clast* ***TvEl*** *and both may contain extensive areas of thin (<1 m) and patchy colluvium*

TbEl, TbEm — ***Till blanket:*** *1 to 5 m of diamicton that conforms to the underlying topography. TbEm generally contains more and coarser pebbles and larger clasts than does* ***TbEl***

ThEl, ThEm — ***Hummocky moraine sediments:*** *diamicton and interstratified glaciofluvial gravel and sand, massive to thick bedded. Bedding slumped, faulted and folded by syndepositional ice melout. Land surface morphology variable amounts of ice-walled lake plain and kettle, hummocky, frame and kettle topography. Local relief of up to 90 m. Thickness may be tens of m*

WISCONSINAN OR PRE-WISCONSINAN

EARLY ADVANCE OF ERRATICS TRAIN GLACIATION OR REDULTIMATE GLACIATION

GLACIOLACUSTRINE DEPOSITS: *well stratified sand, silt, clay and minor gravel and diamicton deposited in lakes ponded by glacial ice*

LvI — ***Glaciolacustrine veneer sediments:*** *silt, clay and fine sand, well stratified, thinly bedded to laminated or discontinuous. Thickness < 1 m thick to discontinuous*

LpI — ***Glaciolacustrine plain sediments:*** *clayey silt with minor fine sand, thinly bedded to laminated 1 to 5 m thick*

LmI — ***Rolling glaciolacustrine plain sediments:*** *fine sand, silt, and clay, thinly to massively bedded, surface morphology undulating with 1- 2 m of local relief. Underlying topography is totally or largely obscured by these sediments. Thickness 1 to 20 m*

GLACIOFLUVIAL SEDIMENTS: *sand, gravel, and minor silt and diamicton deposited by streams flowing away from, or in contact with glacial ice. Sorting ranges from poor to poor and stratification from thin bedded to massive to poor and stratification from thin bedded to massive. Sediments often display evidence of synsedimentary collapse due to melout of buried or supporting ice*

GpI — ***Glaciofluvial plain sediments:*** *gravel and sand, massive to thick bedded, former outwash plains and fans inclined into a succession of terraces. Thickness 1 to 10 m*

GtI — ***Glaciofluvial terrace sediments:*** *gravel and sand, massive to stratified, moderately to well sorted. Sediments are of flood plain origin now isolated from flooding by stream incision. Thickness ranges from a discontinuous covering on bedrock to several m. Where alluvial terraces are out of the present flood plains, total thicknesses of gravel and sand up to 5 m*

GdI — ***Glaciofluvial delta sediments:*** *sand, gravel and minor silt and clay, thinly bedded to massive, flat surfaced, delta-form in plan view, deposited as a delta in a former glacial lake. Thickness ranges from 5 to 10 m*

GxI — ***Glaciofluvial ice stagnation complex sediments:*** *sand, gravel, diamicton and minor silt and clay, thin bedded to massive. Bedding is frequently contorted and folded due to synsedimental ice melout. Land surface morphology includes synsedimental ice melout, and crevasse-fill ridges 2 to 10 m in relief with minor elements of units* ***Gp*** *and* ***GI****. Thickness 5 to 10 m*

TvIl, TvIm — ***Till veneer:*** *< 1 m thick or discontinuous.* ***TvIm*** *generally contains more and coarser pebble and larger clasts than does TvIl and both may contain extensive areas of thin (< 1 m) and patchy colluvium*

TbIl, TbIm — ***Till blanket:*** *1 to 5 m thick but conforming to underlying topography*

ThIl, ThIm — ***Hummocky moraine sediments:*** *diamicton and interstratified glaciofluvial gravel and sand, massive to thick bedded. Bedding slumped, faulted and folded by syndepositional ice melout. May contain variable amounts of ice-walled lake plain and kettle, hummocky, frame and kettle topography. Local relief of up to 30 m. Thickness may be tens of m*

EARLY PLEISTOCENE OR PLIOCENE

GLACIAL OR NONGLACIAL

MORAINAL DEPOSITS? (TILL?): *stony diamicton, cemented in part to a caliche. Contains striated clasts on exclusively montane origin*

TbP — ***Till blanket:*** *cemented stony diamicton. Thickness 2-3 m. Rests on a succession of similar sediments of glacial or nonglacial origin*

PALEOZOIC TO EARLY TERTIARY

R — *Sandstone, siltstone, shales, conglomerate, coal and minor volcanic rocks of early Tertiary and Mesozoic age and limestone, dolostone and gypsum of Mesozoic age (includes areas of thin colluvial cover, bloodshots, sorted stone polygons in alpine areas)*

R-A — *Bedrock subject to rapid mass wasting processes (rockfall and snow avalanches)*

Geological boundary (defined, assumed, inferred)

Nivoglacial lateral and end moraine

Rock glacier

Cirque (E- Erratics Train Glaciation; ?- penultimate montane glaciation; ?- degraded cirque of uncertain age)

Arete (E- Erratics Train Glaciation; ?- older degraded ridges, penultimate montane glaciation or older)

Meltwater channel, large, small (arrow indicates flow direction), (E- Erratics Train Glaciation; ?- penultimate glaciation; ?- age unknown)

edge of ice walled channel

Esker, flow direction defined, undefined (E- Erratics Train Glaciation; ?- penultimate glaciation; ?- age unknown)

Streamlined glacial bedform: ice flow direction known, unknown (E- Erratics Train Glaciation; ?- penultimate glaciation)

Moraine (E- Erratics Train Glaciation; ?- penultimate glaciation; ?- age unknown)
End and Lateral
Recessional

Radiocarbon age

Vertebrate fossil locality

Ice limit (E- Erratics Train Glaciation, ?- early Erratics Train Glaciation or penultimate glaciation; ?- age unknown)

Former ice contact face in stratified drift

Stratigraphic section

One or more Foothills Erratics Train Erratic >1 m in length

Montane erratic close to or at the all time upper limit of montane glaciation

Continental erratic at or near the all time upper limit of continental glaciation

Lacustrine veneer

Organic veneer

Eolian veneer

Landslide, arrows indicate direction of movement

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