MARGINAL NOTES

PHYSIOGRAPHY AND DRAINAGE
The 115J/06 map area is located at the confluence of the Nisling and Donjek rivers. The main physiographic feature in the map area is the Nisling River valley that separates the Nisling and Dawson ranges. Uplands on either side of the Nisling River valley reach elevations of 1066 m and are unglaciated with exception to the southwest corner. The Nisling River valley reaches 5 km in width.

SURFICIAL GEOLOGY
The 115J/06 map area is predominantly unglaciated. The unglaciated surficial deposits consist of weathered bedrock colluvium, fluvial deposits, aeolian deposits, and organic material. At the highest elevations on summits and ridge tops the surficial deposits consist of locally weathered bedrock that has undergone minimal gravitational transport. Eroded bedrock landforms, such as tors, are not common in the map area. Slope deposits consist of colluviated weathered bedrock veneers and blankets that have textural properties reflecting the local bedrock lithologies. Aeolian additions into the soil profiles may be significant, especially near the Nisling River. Valleys draining the uplands have accumulated significant deposits of aeolian sand and silt derived from the Donjek and Nisling rivers during glacial periods (Fig. 1). The rivers would have been much larger and vegetation on the floodplain was likely minimal (Fig. 2). The glaciofluvial sands and silts would have been easily eroded by katabatic winds and directly deposited or washed into the neighboring tributaries. The thickest aeolian deposits are found north of the Nisling River.
Glacial deposits in the map area are limited to the southwest corner where pre-late Wisconsin McConnell limits and deposits were mapped along the Donjek River. These older glacial sediments likely date to the Reid glaciation that receded about 120,000 years ago. Additional evidence of glaciation in this area is the rock canyon that contains the Donjek River (Fig. 3 and 4). The canyon was initially cut by meltwater when the Cordilleran Ice Sheet advanced against the Nisling Range. Deposition of moraine in the paleo-Donjek River valley to the northwest forced the Donjek River to flow permanently through the canyon. Incision of the canyon also caused the base level to drop in Grayling Creek. Placer gold has been documented in Grayling Creek and the concentrations are likely enhanced by base level change.

PERMAFROST
Evidence of permafrost was found at all elevations in the map area. Pingos and thermokarst lakes are particularly common, likely due to the abundance of loess that has accumulated in the valleys (Fig 1, 5 and 6). Inactive areas of the Nisling River floodplain are also underlain by permafrost. This is particularly obvious by the lack of tree growth on large areas of the floodplain (Fig. 2).

DATA SOURCES
This surficial geology map was interpreted from high resolution digital stereo imagery (2.5 m panchromatic CartoSat-1 satellite data captured in 2007) and hard copy 1:40 000 scale aerial photographs flown in 1987 and 1989. Selective field checking was performed in June 2007 and July 2010.

Site Number	Location (UTM Zone 7, NAD 83)	Type	Results
07JB061	582710 E / 6903382 N	sluice	4 gold grains, one 1-2 mm in size
08JB043	582756 E / 6903273 N	sluice	no gold, but contains garnet and magnetite
08JB044	582902 E / 6903515 N	sluice	6-8 small gold flakes; abundant magnetite and garnets

Figure 1. A view to the northwest down a tributary to the Nisling River in the southeast corner of the map area. Aeolian sedimentation off the Nisling River has accumulated in valley bottoms such as this resulting in poorly drained and sluggish drainage. Permafrost is widespread in these environments.

Figure 2. A typical view of the Nisling River valley bottom and exposure of the fluvial gravel (08PL041). A silt-rich overbank unit caps the floodplain gravel resulting in poor drainage and widespread permafrost.

Figure 3. A view to the north of the Donjek River diversion canyon located in the southwest corner of the map area (near 08PL040). Upon exiting the canyon the Donjek River reforms its braided channel character. The Dawson Range is visible in the background.

Figure 4. A view to the northeast of the Donjek River as it heads towards the Dawson Range. Bedrock outcrops are common where the Donjek River cuts through the diversion channel in the southwest corner of the map area.

Figure 5. An oblique view to the north, over an open-system pingo, in a tributary to the Donjek River. Valleys that are proximal to the Donjek or Nisling rivers have thick accumulations of loess. This likely contributes to the occurrence of pingos in the area.

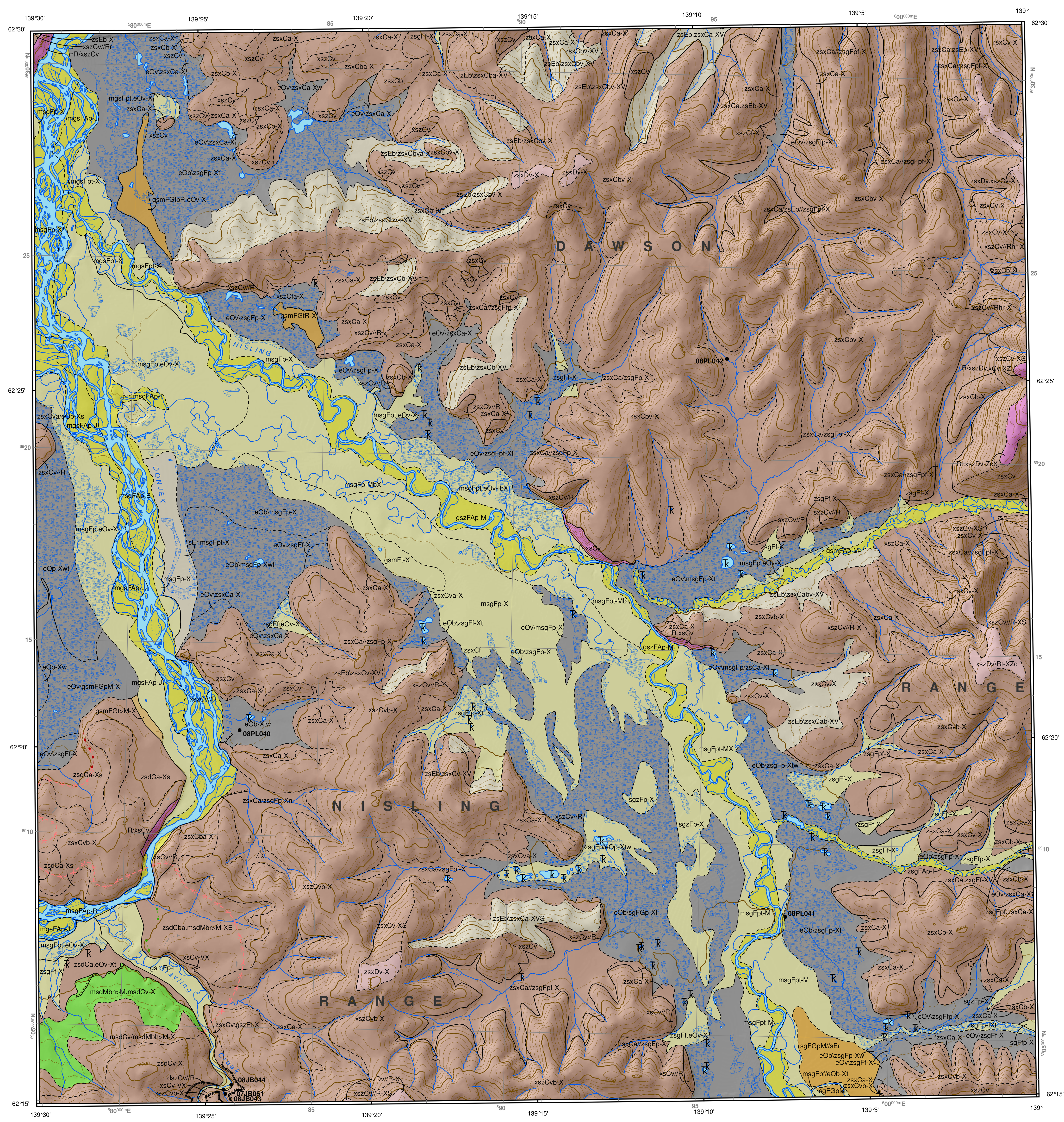
Figure 6. A view to the south of the same pingo depicted in figure 5. Surface soils on pingos can be relatively dry due to the morphology of the landform. As a result the vegetation often grows taller, and different species may occupy the landform compared to the surrounding valley-bottom environment.

SELECTED REFERENCES

Howes, D.E. and Kenk, E., 1997. Terrain classification system for British Columbia, Version 2. B.C. Ministry of Environment and B.C. Ministry of Crown Lands, Victoria, B.C.

Murphy, D.C., Van Staal, C. and Mortensen, J.K., 2007. Preliminary bedrock geology of part of Stevenson Ridge area (NTS 115J/3, 4, 5, 6, 7, 8, parts of 11 and 12; 115K/1, 2, 7, 8, 9, 10, parts of 15 and 16). Yukon Geological Survey, Open File 2007-9, 1:125 000 scale.

Murphy, D.C., van Staal, C. and Mortensen, J.K., 2008. Windy McKinley terrane, Stevenson Ridge area (115JK), western Yukon: composition and proposed correlations, with implications for mineral potential. In: Yukon Exploration and Geology 2007, D.S. Emond, L.R., Blackburn, R.P. Hill and L.H. Weston (eds.), Yukon Geological Survey, p. 225-235.



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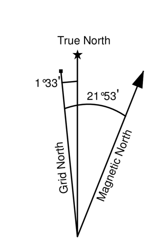
FIVE THOUSAND METRE GRID
Universal Transverse Mercator Projection
North American Datum 1983
Zone 7

CONTOUR INTERVAL 100 FEET
Elevations in feet above Mean Sea Level

SURFICIAL GEOLOGY
115J/06
YUKON

SCALE 1:50 000
0 1 2 3 4 5
kilometres



Use diagram only to obtain numerical values
APPROXIMATE MEAN DECLINATION NOVEMBER 2011
FOR CENTRE OF MAP

115J/12 TOM CREEK open file 2012-4	115J/11 DOYLE CREEK open file 2012-3	115I/10 COLORADO CREEK open file 2012-2
115J/05 WELLESLEY LAKE open file 2013-9	115J/06 open file 2013-10 MAP LOCATION	115J/07 MOUNT PATTISON open file 2013-10
115J/04 MACKINNON CREEK	115J/03	115J/02 ONION CREEK

TERRAIN CLASSIFICATION SYSTEM

This surficial geology map was classified using the Terrain Classification System for British Columbia (Howes and Kenk, 1997), with minor modification to meet standards set by the Yukon Geological Survey. For example, we have added some permafrost process subclasses to accomodate the wider variety of permafrost features found in Yukon. We have also added an age classification to distinguish materials deposited during different Pleistocene glaciations.

A sample map unit label is shown below to illustrate the terrain classification system. Surficial materials form the core of the polygon map unit labels and are symbolized with a single upper case letter. Lower case textures are written to the left of the surficial material, and lower case surface expressions are written to the right. An upper case activity qualifier (A = active; I = inactive) may be shown immediately following the surficial material designator. The glacial qualifier "G" may alternatively be written immediately following the surficial material to indicate glacially modified materials. Age is indicated by a capital letter that follows the surface expression but precedes the process modifiers. Geomorphological processes (capital letters) and subclasses (lower case letters) always follow a dash symbol ("-").

sgFGptM-Xs
GEOMORPHOLOGICAL PROCESS(ES) (-X = permafrost)
SUBCLASS(ES) (s = sheetflow)
AGE (M = McConnell)
SURFACE EXPRESSION (pt = plain, terrace)
QUALIFIER (G = glacial; A = active; or I = inactive)
SURFICIAL MATERIAL (F = fluvial)
TEXTURE (sg = sand, gravel)

COMPOSITE SYMBOL DELIMITERS:

Due to scale limitations, up to 4 terrain units may be included in a single map unit label (e.g. sgFGptM.dsmMbM/xsCv\zcLGpM-XsV). Each component is separated by a delimiter that indicates relative proportions between the components (".", "/", "//") or a stratigraphic relationship "\").

"." - terrain units on either side of the symbol are of approximately equal proportion
"/" - terrain unit(s) before the symbol is more extensive than the one(s) following
"//" - terrain unit(s) before the symbol is considerably more extensive than the one(s) following
"\" - terrain unit(s) before the "\" symbol stratigraphically overlies the one(s) following

1st terrain unit >50% of map unit / 2nd terrain unit 30-49% of map unit // 3rd terrain unit 10-29% of map unit \ Underlying terrain unit

SURFICIAL MATERIALS

Surficial materials are non-lithified, unconsolidated sediments. They are produced by weathering, sediment deposition, biological accumulation, human and volcanic activity. In general, surficial materials are of relatively young geological age and they constitute the parent material of most (pedological) soils. Note that a single polygon will be coloured only by the dominant surficial material, but other materials may exist in that unit.

HOLOCENE

O — Organic: Organic deposits are accumulations of vegetative matter thicker than 1 m. They are commonly found in floodplains, areas of near-surface permafrost such as north-facing slopes, and locations where there is poor drainage. Thin veneers of organic material are widespread and generally unmapped. Organic material in the map area commonly consists of peat with fibric to mesic decomposition.

E — Eolian: Sediment transported and deposited by wind. The dominant eolian sediment in the map area is loess, which is predominantly silty in texture with a smaller fraction of fine sand. Loess veneers and blankets were deposited over the landscape during the last (McConnell) glaciation. On stable sites, the loess is intact, whereas in cryoturbated or colluviated areas, the loess is reworked into the soil profile and its presence is indicated by the "z" textural symbol. Resedimented loess is a major component of colluvial aprons in the area. Ice-rich permafrost is common within low-lying eolian sediments.

C — Colluvium: Material transported and deposited by down-slope, gravity-driven processes such as creep, solifluction, landslides and snow avalanches. Colluvium is the dominant surficial material in the region as most of the area escaped Pleistocene glaciation. It commonly has a stratified structure with a highly variable texture and composition controlled by the parent material, transport mechanism and travel distance. Colluvium on uplands and slopes is generally derived from weathered bedrock and loess, resulting in a silt-rich diamicton containing angular, local bedrock clasts. On steeper slopes colluvium is generally coarser grained, as it has been deposited by rapid mass wasting processes such as rock fall, debris flows and avalanches. Slower processes such as sheetwash, solifluction and creep occur on gentler slopes and produce finer grained colluvium. Colluvial aprons found on lower slopes are commonly ice-rich and are primarily composed of resedimented loess and peat.

F, FA — Fluvial: Sediments transported and deposited by modern streams and rivers, found in floodplains, fans and terraces. Fluvial deposits typically consist of well-sorted stratified sand and gravel comprising sub-angular to rounded clasts. In unglaciated regions, low order streams are confined to very narrow V-shaped valleys and their fluvial deposits are generally not mapped due to scale limitations; their sediments, however, are more coarse grained and more locally derived than in higher order streams. Active fluvial (FA) materials are subject to regular flooding.

Glaciofluvial: Sediments transported and deposited by glacial meltwater above, in, below, or adjacent to a glacier. Glaciofluvial materials are deposited in meltwater channels, eskers, plains, terraces, kames and deltas. Sediments consist of moderately to well-sorted, rounded, stratified sand and gravel, although the nature and texture may vary locally depending on transport distance. Near surface ground ice is generally absent in glaciofluvial deposits unless there is a poorly drained underlying unit present.

- FG^{M} — LATE WISCONSIN - MCCONNELL (M)
- $FG^{>M}$ — PRE-LATE WISCONSIN - MCCONNELL (>M)
- FG^{R} — ILLINOIAN - REID (R)
- $FG^{>R}$ — EARLY PLEISTOCENE - PRE-REID (>R)

Morainal: Morainal (till) materials are diamicts deposited by either: primary glacial processes such as lodgement, deformation and melt-out (ablation); or secondary glacial processes caused by gravity and water. Therefore, this term applies to all types of till including flow tills, which are not directly deposited by glacial ice. Ablation tills are relatively coarse grained and tend to have a hummocky or rolling surface expression; lodgement tills typically have a finer grained matrix with fewer clasts and a smoother surface expression. Tills are generally colluviated when found on slopes. Permafrost is widespread within morainal deposits. As most of the region is unglaciated, morainal sediments are rare in the map area. Even in upland areas that show evidence of alpine glaciation, no morainal sediments remain as they have likely been buried in colluvium and/or modified by intense periglacial and colluvial processes.

- M^{M} — LATE WISCONSIN - MCCONNELL (M)
- $M^{>M}$ — PRE-LATE WISCONSIN - MCCONNELL (>M)
- M^{G} — EARLY WISCONSIN - GLADSTONE (G)
- M^{R} — ILLINOIAN - REID (R)
- $M^{>R}$ — EARLY PLEISTOCENE - PRE-REID (>R)

LG — Glaciolacustrine: Stratified sand, silt and clay deposited in a lake that formed on, in, under or beside a glacier; may contain dropstones (ice-rafted clasts). Ice-rich permafrost and thermokarst erosion is widespread in these deposits as they are generally poorly drained with high *in situ* moisture contents that promote the growth of massive ice lenses. Glaciolacustrine sediments are rarely exposed in the region.

PRE-QUATERNARY

R — Bedrock: Bedrock in the eastern portion of this map sheet primarily consists of Devonian-Mississippian carbonaceous muscovite-quartz phyllite or schist and quartzite of the Yukon-Tanana terrane. Cretaceous- Tertiary Donjek volcanics (dacite) underlie the western portion of the map sheet (Murphy *et al.*, 2007, 2008).

D — Weathered bedrock: bedrock decomposed or disintegrated *in situ* by processes of chemical and/or mechanical weathering, such as freeze-thaw. Weathered bedrock is common on unglaciated uplands, especially along ridge tops and near tors. The material texture is coarse grained and sandy where derived from plutonic bedrock, although a silty component may be present due to incorporation of loess by cryoturbation.

SYMBOLS

GEOLOGICAL BOUNDARIES:
defined
approximate
assumed

AGE OF GLACIAL FEATURES:
McConnell (M) - late Wisconsin
Gladstone (G) - early Wisconsin
Reid (R) - Illinoian
Pre-Reid (>R) - early to middle Pleistocene
age unspecified

GLACIAL FEATURES:
moraine ridge
meltwater channel
cirque
arete

GLACIAL LIMITS:
defined
approximate
assumed

OTHER LINEAR FEATURES:
escarpment
lineation (fault, joint, tension crack)
sand dunes
strandline

TOPOGRAPHIC FEATURES:
contours
streams
trails
wetlands

GROUND OBSERVATION SITES:
(labelled with site number, e.g. 10JB004)
field station
stratigraphic section
radiocarbon sample
cosmogenic sample
heavy mineral sample
erratic, unspecified age
erratic, Gladstone
erratic, Reid
no erratics found

OTHER SURFACE FEATURES:
open system pingo; uncollapsed, collapsed
tor
drumlin (coloured by glacial age)
cryoplanation terrace
kettle
landslide, active layer detachment
palsa
thermokarst pond
placer mine
Yukon mineral occurrence

TEXTURE

Texture refers to the size, shape and sorting of particles in clastic sediments, and the proportion and degree of decomposition of plant fibre in organic sediments. Texture is indicated by up to three lower case letters, placed immediately before the surficial material designator, listed in order of decreasing abundance.

Specific clastic textures
a - blocks: angular particles >256 mm in size
b - boulders: rounded particles >256 mm in size
k - cobbles: rounded particles >64 - 256 mm in size
p - pebbles: rounded particles >2 - 64 mm in size
s - sand: particles between >0.0625 - 2 mm in size
z - silt: particles 2 µm - 0.0625 mm in size
c - clay: particles ≤2 µm in size

Common clastic textural groupings
d - mixed fragments: a mixture of rounded and angular particles >2 mm in size
x - angular fragments: a mixture of angular fragments >2 mm in size (*i.e.*, a mixture of blocks and rubble)
g - gravel: a mixture of two or more size ranges of rounded particles >2 mm in size (*e.g.*, a mixture of boulders, cobbles and pebbles); may include interstitial sand
r - rubble: angular particles between 2 and 256 mm; may include interstitial sand
m - mud: a mixture of silt and clay; may also contain a minor fraction of fine sand
y - shells: a sediment consisting dominantly of shells and/or shell fragments

Organic terms
o - organic: general organic materials
e - fibric: the least decomposed of all organic materials; it contains amounts of well-preserved fibre (40% or more) that can be identified as to botanical origin upon rubbing
u - mesic: organic material at a stage of decomposition intermediate between fibric and humic
h - humic: organic material at an advanced stage of decomposition; it has the lowest amount of fibre, the highest bulk density, and the lowest saturated water-holding capacity of the organic materials; fibres that remain after rubbing constitute less than 10% of the volume of the material

SURFACE EXPRESSION

Surface expression refers to the form (assemblage of slopes) and pattern of forms expressed by a surficial material at the land surface. This three-dimensional shape of the material is equivalent to 'landform' used in a non-genetic sense (*e.g.*, ridges, plain). Surface expression symbols also describe the manner in which unconsolidated surficial materials relate to the underlying substrate (*e.g.*, veneer). Surface expression is indicated by up to three lower case letters, placed immediately following the surficial material designator, listed in order of decreasing extent.

a - apron: a wedge-like slope-toe complex of laterally coalescent colluvial fans and blankets. Longitudinal slopes are generally less than 15° (26%) from apex to toe with flat or gently convex/concave profiles

b - blanket: a layer of unconsolidated material thick enough (>1 m) to mask minor irregularities of the surface of the underlying material, but still conforms to the general underlying topography; outcrops of the underlying unit are rare

c - cone: a cone or sector of a cone, mostly steeper than 15° (26%); longitudinal profile is smooth and straight, or slightly concave/convex; typically applied to talus cones

f - fan: sector of a cone with a slope gradient less than 15° (26%) from apex to toe; longtitudinal profile is smooth and straight, or slightly concave/convex

h - hummock: steep sided hillock(s) and hollow(s) with multidirectional slopes dominantly between 15-35° (26-70%) if composed of unconsolidated materials, whereas bedrock slopes may be steeper; local relief >1 m; in plan, an assemblage of non-linear, generally chaotic forms that are rounded or irregular in cross-profile; commonly applied to knob-and-kettle glaciofluvial terrain

l - delta: landform created at the mouth of a river or stream where it flows into a body of water; gently sloping surfaces between 0-3° (0-5%), and moderate to steeply sloping fronts between 16-35° (27-70%); glaciofluvial deltas in the map area are typically coarse-grained with steep sides and gently inclined kettled or channeled surfaces

m - rolling: elongate hillock(s); slopes dominantly between 3-15° (5-26%); local relief >1 m; in plan, an assemblage of parallel or sub-parallel linear forms with subdued relief (commonly applied to bedrock ridges and fluted or streamlined till plains)

p - plain: a level or very gently sloping, unidirectional (planar) surface with slopes 0-3° (0-5%); relief of local surface irregularities generally <1 m; applied to (glacio)fluvial floodplains, organic deposits, lacustrine deposits and till plains

r - ridge: elongate hillock(s) with slopes dominantly 15-35° (26-70%) if composed of unconsolidated materials; bedrock slopes may be steeper; local relief is >1 m; in plan, an assemblage of parallel or sub-parallel linear forms; commonly applied to drumlinized till plains, eskers, morainal ridges, crevasse fillings and ridged bedrock

t - terrace: a single or assemblage of step-like forms where each step-like form consists of a scarp face and a horizontal or gently inclined surface above it; applied to fluvial and lacustrine terraces and stepped bedrock topography

v - veneer: a layer of unconsolidated materials too thin to mask the minor irregularities of the surface of the underlying material; 10 cm - 1m thick; commonly applied to eolian/loess veneers and colluvial veneers

GEOMORPHOLOGICAL PROCESSES

Geomorphological processes are natural mechanisms of weathering, erosion and deposition that result in the modification of the surficial materials and landforms at the earth's surface. Unless a qualifier (A (active) or I (inactive)) is used, all processes are assumed to be active, except for deglacial processes. Up to three upper case letters may be used to indicate processes. These are listed in order of decreasing importance and placed after the surface expression symbol, following a dash (-) symbol.

Subclasses are used to provide more specific information about a general geomorophological process, and are represented by lower case letter(s) placed after the related process designator. Up to two subclasses can be associated with each process. Process subclasses used on this map are defined with the related process below.

EROSIONAL PROCESSES

V - gully erosion: running water, mass movement and/or snow avalanching, resulting in the formation of parallel and sub-parallel, long, narrow ravines

FLUVIAL PROCESSES

B - braiding channel: active floodplain consists of many diverging and converging channels separated by unvegetated bars

I - irregularly sinuous channel: a clearly defined main channel displaying irregular turns and bends without repetition of similar features; backchannels may be common, and minor side channels and a few bars and islands may be present, but regular and irregular meanders are absent

J - anastamosing channel: a channel zone where channels diverge and converge around many islands. The islands are vegetated and have surfaces that are far above mean maximum discharge levels

M - meandering channel: a clearly defined channel characterized by a regular and repeated pattern of bends with relatively uniform amplitude and wave length

MASS MOVEMENT PROCESSES

F - slow mass movements: slow downslope movement of masses of cohesive or non-cohesive surficial material and/or bedrock by creeping, flowing or sliding

L - mass movement with an unspecified rate

R - rapid mass movements: rapid downslope movement by falling, rolling, sliding or flowing of dry, moist or saturated debris derived from surficial material and/or bedrock

Subclasses: (b) rockfall; (d) debris flow; (g) rock creep; (s) debris slide; (u) slump in surficial material

PERIGLACIAL PROCESSES

C - cryoturbation: movement of surficial materials by heaving and/or churning due to frost action (repeated freezing and thawing)

S - solifluction: slow gravitational downslope movement of saturated non-frozen overburden across a frozen or otherwise impermeable substrate

X - permafrost processes: processes controlled by the presence of permafrost, and permafrost aggradation or degradation

Z - general periglacial processes: solifluction, cryoturbation and nivation, possibly occuring in a single polygon

Subclasses: (e) thermokarst erosion; (f) thaw flow slides; (l) segregated ice; (n) pingo; (t) thermokarst subsidence; (r) patterned ground; (s) sheetwash; (w) ice-wedge polygons

DEGLACIAL PROCESSES

E - channeled by meltwater: erosion and channel formation by meltwater alongside, beneath, or in front of a glacier

H - kettled: depressions in surficial materials resulting from the melting of buried glacier ice

T - ice contact: landforms that developed in contact with glacier ice such as kames

SURFICIAL MATERIAL AGE

GLACIATION	TIME PERIOD	APPROXIMATE GLACIAL MAXIMUM	MARINE ISOTOPE STAGE
M - McConnell	late Wisconsin	15 000 years ago	2
G - Gladstone	early Wisconsin	55 000 years ago	4
R - Reid	Illinoian	130 000 years ago	6
>R - Pre-Reid	early to Middle Pleistocene	2.6 million to 200 000 years ago	8-102

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RECOMMENDED CITATION

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Any revisions or additional geological information known to the user would be welcomed by the Yukon Geological Survey.

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Energy, Mines and Resources
Government of Yukon

Open File 2013-10

Surficial Geology NTS 115J/06 Yukon (1:50 000 scale)

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