GEOPROCESS FILE
SUMMARY REPORT

LABERGE MAP AREA
N.T.S. 105E

INTRODUCTION

The GEOPROCESS FILE is a compilation of information and knowledge on geological processes and terrain hazards, including mass movement processes, permafrost, flooding risks, faults, seismic activity and recent volcanism, etc. Please refer to the GEOPROCESS FILE Introduction and User's Guide for more in-depth information on how the maps were developed, which other GEOPROCESS FILE maps are available, how to utilize this inventory and how to interpret the legend. Special interest should be taken in the detailed description of the terrain hazard map units. Appendices in the User's Guide include summary papers on the geological framework, permafrost distribution, and Quaternary geology in Yukon and a list of comprehensive GEOPROCESS FILE references.

This report includes a brief discussion of the scope and limitations of the GEOPROCESS FILE compilation maps and summaries followed by summaries of the bedrock geology, surficial geology and terrain hazards for this N.T.S. map area, and a list of references.

Geological Processes and Terrain Hazard Compilation Maps

The GEOPROCESS FILE map units were drafted on the 1:250,000 topographic base maps through interpretation from bedrock geology maps, surficial geology maps and in some cases terrain hazard maps at various scales. The compilation maps have a confidence level reflecting the original source material. All materials used to produce the maps are listed in the references attached to each map. A file containing the documentation used to construct these maps is available at the Indian and Northern Affairs library in Whitehorse, Yukon. Areas for which no surficial geology or terrain hazard information is published were left blank. Summary reports on surficial geology and terrain hazards for these map sheets were written by extrapolating the data from adjacent map sheets or smaller scale maps. Information from small scale (e.g. 1:1,000,000) maps was used for the summary reports, but not redrafted onto the 1:250,000 GEOPROCESS FILE maps.

The GEOPROCESS FILE compilation maps are intended as a first cut planning tool; the legend on the maps describes the general aspects of terrain hazards (also see below) and associated geological processes. **These maps should never replace individual site investigations for planning of site specific features, such as buildings, roads, pits, etc.**

Bedrock Geology Summaries

Each 1:250,000 N.T.S. map area is described according to morphogeological belts and terranes defined by Gabrielse *et al.* (1991) and Wheeler *et al.* (1991). Bedrock geology (including structure) and mineral occurrences are briefly described and taken largely from the referenced, most recent 1:250,000 geological map with additional contributions from Wheeler and McFeely (1991), and Yukon MINFILE (1993). A summary paper ("A Geological Framework for Yukon") in Appendix A of the Introduction and User's Guide provides a framework and context for each of the bedrock summaries.

The level of knowledge and understanding of Yukon geology is constantly evolving with more detailed mapping and development of geological models. Names, ages and terrane affinities of rock units on the most recent 1:250,000 geological maps may, in some cases, now be considered incorrect. Thus information contained within some of the bedrock geology summaries may be out of date. Although much of the information reflects the knowledge at the time that the source map was published, additional information has been inserted whenever possible to assist the user in merging the information with current geological maps, concepts and understanding. The age ranges for similar packages of rocks may

also vary between map areas since the actual rocks, or at least the constraints on their age, may vary between map areas.

BEDROCK GEOLOGY

The southern and western portion of the Laberge map area is in the Intermontane Belt, whereas the northeastern portion is in the Omineca Belt. The two belts are separated by the large northwest-trending, strike-slip Teslin Fault.

The rocks in the Intermontane Belt are part of Quesnel and Stikinia Terranes, both interpreted as Mesozoic volcanic arc terranes. Quesnel Terrane (Tatchun Belt of Tempelman-Kluit, 1984) rocks are composed of 220 million year old volcanic breccia, augite porphyry basalt and chlorite amphibolite schist. Stikine Terrane consists of similar rocks and includes a thick sequence of folded sedimentary strata. The sedimentary rocks are 220 to 160 million years old and are dominated by Lewes River Group greywacke, limestone and shale; Laberge Group shale, greywacke, conglomerate and arkose; and Nordenskiold Formation dacite tuff.

The Omineca Belt is underlain by metamorphosed sedimentary and igneous rocks of the Teslin Suture Zone, Yukon Cataclastic Terrane and the Seminof Hills block. These rocks are equated with the Kootenay Terrane or Yukon-Tanana Terrane, but may include some parts of the Slide Mountain Terrane. The rocks include 290-250 million year old granite gneiss ("Selwyn Gneiss"); 350-250 million year old Anvil Allochthon amphibolite, greenstone, serpentinized dunite, and augen amphibole gneiss; Nisutlin Allochthon muscovite quartz schist and marble; 320-300 million year old Seminof Formation basalt; and one billion to 300 million year old Boswell Formation phyllite, greywacke, chert, conglomerate, limestone and gabbro.

The eastern and northeastern-most portions of the map area are underlain by Cassiar Terrane rocks (Omineca Crystalline Belt in Tempelman-Kluit 1984) which consist of 570-400 million year old Askin Group dolomite, Nasina Formation graphitic siltstone and Kechika Group phyllite. This package overlies pre-650 million year old Ketza Group marble, schist and granodiorite gneiss.

Several exposures of 140 to 60 million year old Tantalus Formation chert pebble conglomerate, siltstone and gritty sandstone occur on the western and eastern margins of Stikine Terrane. Mount Nansen Group volcanic rocks (approximately 110 million years old) near Packers Mountain consist mainly of dacite and rhyolite, while the volcanic rocks in the Teslin Mountain area are mainly andesite, greenstone and volcanic breccia. Several scattered occurrences of 80 million year old Open Creek volcanic rocks consist of columnar jointed dacite flows and flow breccia in the eastern part of the area. Extensive flows of 70 million year old Carmacks Group hornblende feldspar porphyry, augite andesite and feldspar porphyry andesite flows occur in the southwestern part of the map area, as well as part of a large hornblende syenite intrusion.

Suites of 215 and 186 million year old granitic rocks form small plutons throughout the map area. Numerous small plutons are associated with the aforementioned volcanic units.

Mineral Deposits and Occurrences

Although there are 60 mineral occurrences in the Laberge map area, only 27 of them host known mineralization. Most of the occurrences are limited to small copper skarns or copper-gold veins in Stikine Terrane rocks. None of the mineral occurrences have any defined tonnages; however, the Loon occurrence, a gold-silver-copper vein, has received recent exploration attention. The Loon occurrence and similar veins are near the Livingstone Creek placer camp which has produced placer gold for most of this century. Although the region has been glaciated, it is thought that the east-trending creek valleys and their pre-glacial placers were not ravaged by the northerly advance of the glaciers. At least seven small deposits of coal, associated with Tantalus Formation conglomerate, are also known in the Laberge map

area.

SURFICIAL GEOLOGY

The main source of information for the Laberge map area is a surficial geology map by Klassen and Morison (1987).

The surface deposits of the Laberge map area are associated with the most recent Cordilleran ice sheet, the McConnell glaciers, believed to have covered south and central Yukon between 26,500 and 10,000 years ago. Most of the area was covered by the Cassiar lobe which flowed towards the northwest from the Cassiar Mountains. Streamlined morainal deposits (drumlins) indicating a northwesterly ice flow direction are abundant west and north of Lake Laberge.

The Quaternary deposits are dominantly composed of morainal sediments; either moraine or mixed colluvial and morainal veneers are present at high elevations. The lower to mid-elevations are covered by either streamlined or incised moraine deposits, or moraine blankets. Bedrock outcrops are common at elevations greater than 1200 m. Till, or more correctly diamicton of glacial origin, is an unsorted mixture of coarse material ranging in size from pebble to boulder, with a matrix of clay, silt and sand. The general composition of the till matrix in the adjoining map to the south (Whitehorse NTS map 105 D) indicates a wide range of content of sand (50 to 70%) and silt (20 to 35%), and usually lower clay content (5 to 20%). This low clay content is reflected by the low plasticity of the matrix. Morainal deposits can usually provide a stable base, if there is no permafrost present. Isolated lenses of permafrost may be present on north facing slopes and at high elevations, where thick organic deposits are present over the Quaternary sediments.

The Yukon, Teslin, South and North Big Salmon Rivers, and the Klusha and Mandanna Creek valley floors are commonly benched and covered by glaciofluvial sand and gravel. The glaciofluvial sand and gravel have variable thickness and composition, are usually stable surfaces, however may contain undesirable lithologies (weak) for their potential use as aggregate. Silt and fine sand caps up to 2 m thick are commonly found over the low relief glaciofluvial gravelly deposits. In addition to the glaciofluvial gravel, the largest river floors contain alluvial deposits. The composition of these deposits can vary rapidly over short distances and depth and may also range from well to very poorly drained.

Small glaciolacustrine deposits are found north of Lake Laberge, and north and south of Fox Lake. These fine-grained sediments may contain large bodies of segregated ice (permafrost) and thermokarst subsidence may occur if the surface of these deposits is disturbed.

The White River tephra (1,200 years B.P.) is found close to the surface of most landforms in this area, except on active landforms such as landslides, alluvial terraces and fans, colluviating slopes, etc.

TERRAIN HAZARDS

Slope failures in steep bedrock represent the highest risk hazard in the area. This hazard is restricted to the south central map area. Flooding of major flood plains of the lowest terraces of the major rivers is common.

Seismicity

There are 15 recorded seismic events within the map area. All of the recorded events are 4.0 to 4.999 or less in magnitude.

Mass Movement Processes

A few small earth flows or landslides were mapped in the Big Salmon Range, but no large slumps or slides were identified. Snow avalanches could occur on steep bedrock slopes and can entrain large volumes of boulders and debris. Development of any kind in close proximity to steep escarpments, ridges, cirques and arrêtes prone to these hazards should be discouraged. Map units labelled cs refer to colluvium covered slopes which may be active.

Permafrost

This area lies within the discontinuous permafrost zone (Brown, 1967). Permafrost distribution is expected to be sporadic (Heginbottom and Radburn, 1992). Permafrost indicated by solifluction lobes and stripes and sorted stone polygons is locally present at high elevations in colluvial and morainal deposits.

Ice content is nil to low in most active landforms and in coarse well drained sediments, such as glaciofluvial and fluvial sand and gravel. Low to moderate ice content is possible in morainal and colluvial deposits, where small ice lenses, veins and crystals may be present. Ice content would be highest in fine-grained clayey and silty sediments such as alluvial terraces, glaciolacustrine sediments and the lower part of alluvial and colluvial fans. Permafrost is more likely to be present in these landforms if they are covered by thick mosses or organic soils.

Thermokarst collapse and thaw slides are possible hazards in fine-grained glaciolacustrine and fluvial sediments around Fox Lake and Lake Laberge.

Flooding and Other Risks

Floods related to ice-jams, snow melt and summer rainstorms are possible hazards in lower reaches of most streams in the area. For example, ice jams are common on the lower reaches of the Yukon River below Lake Laberge (Underwood McLellan Ltd., 1983). The steep portions of alluvial fans, in addition to the flooding risk, are also exposed to the additional possibility of mud and debris flows associated with a rapid increase in discharge.

References

Laberge Map Area
N.T.S. 105E

To be thorough, check the references for adjacent N.T.S. map sheets and the General Reference List (See Introduction and User's Guide).

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