GRANULAR RESOURCE INVENTORY
MACKENZIE
Bell River 116P
Produced for Indian & Northern Affairs
by Dept. of Energy, Mines & Resources

GRANULAR RESOURCE INVENTORY - MACKENZIE

BELL RIVER NTS 116P

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for - Department of Indian
and Northern Affairs

SUMMARY

In the Bell River map area unconsolidated granular material suitable for construction is available from two main sources. Gravel of fluvial origin is found in the stream channels of the Richardson Mountains. Rock detritus has formed as talus on the lower third of most mountain slopes. Both these sources have material of variable size and the deposits are of variable thickness. Some of the fluvial gravel and rock detritus would require crushing for construction material.

Bedrock which ranges in age from Precambrian to Cretaceous consists of shale, siltstone, sandstone, conglomerate and limestone. Bedrock underlying the Eagle Plain and Porcupine Plateau is flat-lying and weathers easily; the bedrock of the Richardson Mountains is more coherent than that in areas of lower elevation. Although bedrock could be crushed or ripped it may be more practical to use the fluvial gravel or rock detritus for construction material.

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INTRODUCTION

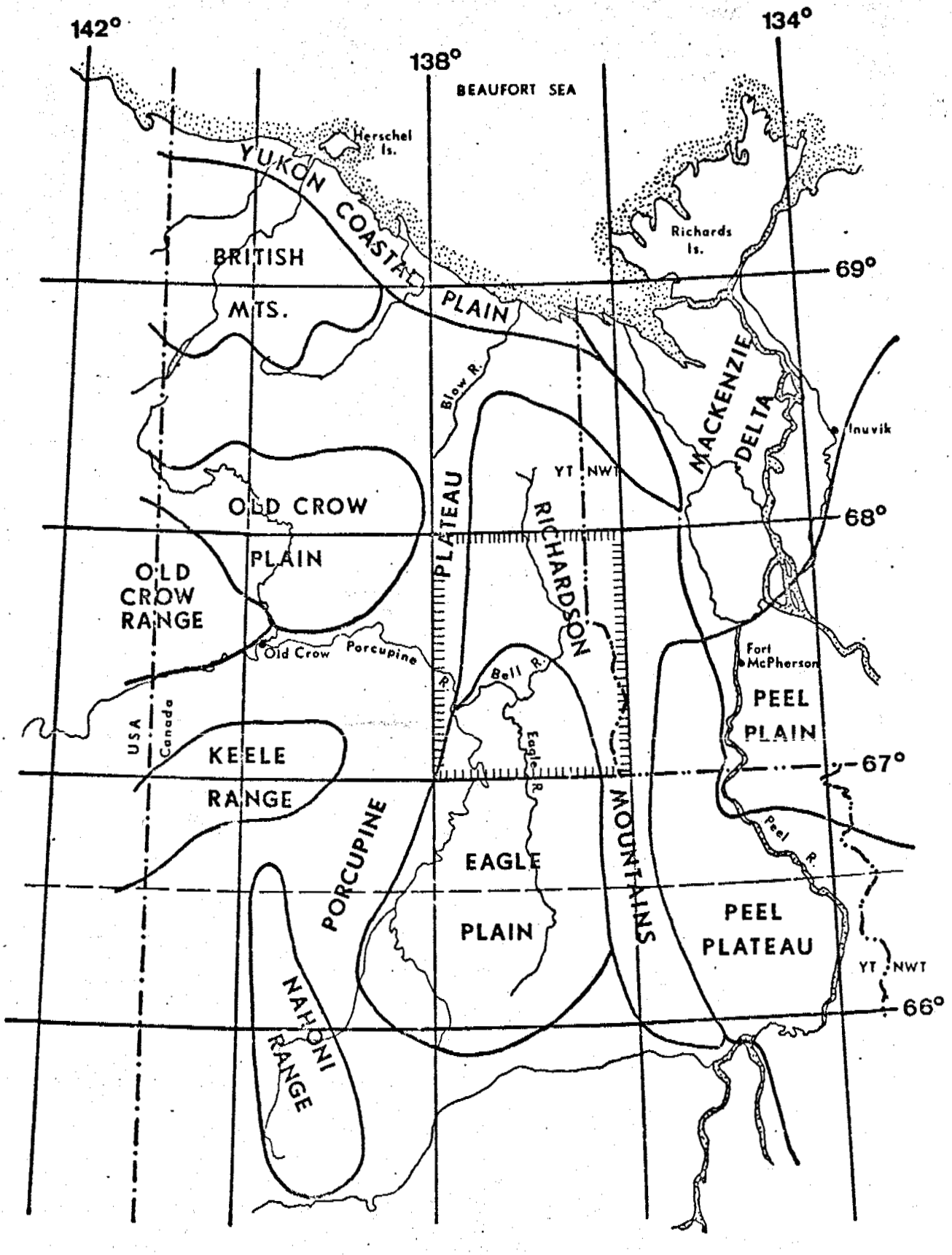
This report presents preliminary qualitative information on the distribution of unconsolidated deposits of granular material and bedrock available for construction purposes within the Bell River map area.

The information in this report has been compiled from published and unpublished information of the Geological Survey and from personal communication with officers of the Geological Survey of Canada. No quantitative assessment of construction material has been made because only minimal information on the deposit thicknesses, texture of material and quantity of ground ice is available.

Unconsolidated granular deposits have been highlighted on a geomorphologic map of Bell River (Hughes 1973). The units of this map were subdivided principally by airphoto interpretation with minimal field checking. This preliminary map will be open filed later in 1973.

The bedrock geology map, presented at a scale of 1:500,000, is derived from the published Geological Survey of Canada Map 10-1963 (D.K. Norris et al, 1963, scale 1:1,000,000). The rock units on this map are grouped according to age and gross lithology.

In the search for granular material the geomorphologic map was used in conjunction with the topographic and bedrock maps (Figures 2 and 4).



BELL RIVER

PHYSIOGRAPHIC REGIONS

0 40 80
mi.

after Bostock 1967

FIGURE 1

GENERAL GEOLOGY AND PHYSIOGRAPHY

Three physiographic regions are represented in the Bell River map area. The Richardson Mountains occupy the north and eastern portions of the map area; the Eagle Plain, containing the Eagle and Bell River Valleys, occupy the southwestern portion of the map area; and the Porcupine Plateau occurs along the western extremity of the map area (Figure 1). Magnitude of relief varies in each physiographic region as is shown on the geomorphologic and the topographic maps. The Bell River map area has not been glaciated except for the eastern portion which was covered in part by a continental glacier and part by alpine glaciers. Hence there is a noticeable lack of sand and gravel of glaciofluvial origin in this area. The majority of the surficial deposits are residual soils which have formed in place by disintegration and decomposition of the underlying rock. Silts and clays comprise most of the residual soil.

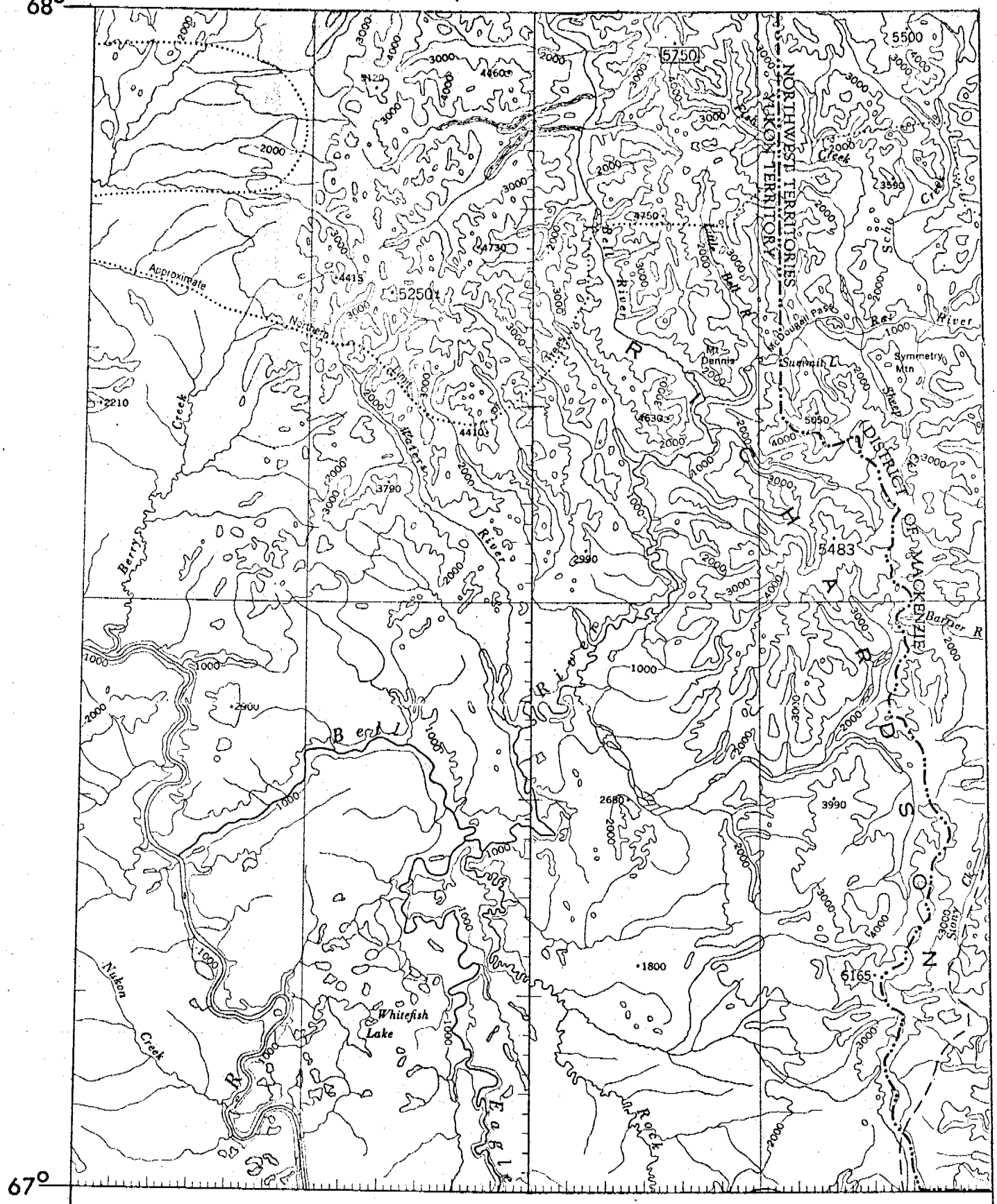
The division between glaciated and unglaciated terrain is shown on the geomorphologic map. In glaciated areas the surficial geology and landform legend is used; in unglaciated areas, the unglaciated terrain legend is used on the geomorphologic map.

Unconsolidated Granular Deposits

Unconsolidated granular material, suitable for construction purposes, exists in two forms in the Bell River map area.

Gravel of fluvial origin is found in almost all river beds within the Richardson Mountains. This material is coarse and much of it would have to be crushed for construction use. Thickness of these deposits varies from a few feet up to 50 feet. Ground ice content is probably low. On the geomorphologic map granular fluvial deposits have been accented with cross hatching.

The second and an abundant source of unconsolidated granular material



BELL RIVER 116P

TOPOGRAPHY

SCALE 1:500,000

FIGURE 2

is rock detritus which has collected on the lower slopes of the mountains forming talus deposits. This material is formed by mechanical erosion of the bedrock. These talus deposits are variable in size and cover the slopes to varying depths. In general the material becomes coarser and the deposits become thicker down the slope. Rivers have cut their course through this detritus thus forming the granular fluvial deposits. A typical mountain valley cross section is shown in Figure 3.

Because the material is coarse some crushing would be necessary to prepare this material for most construction purposes.

A minor source of unconsolidated granular material exists in the southeast portion of the map area. These two small gravel deposits are of glaciofluvial origin.

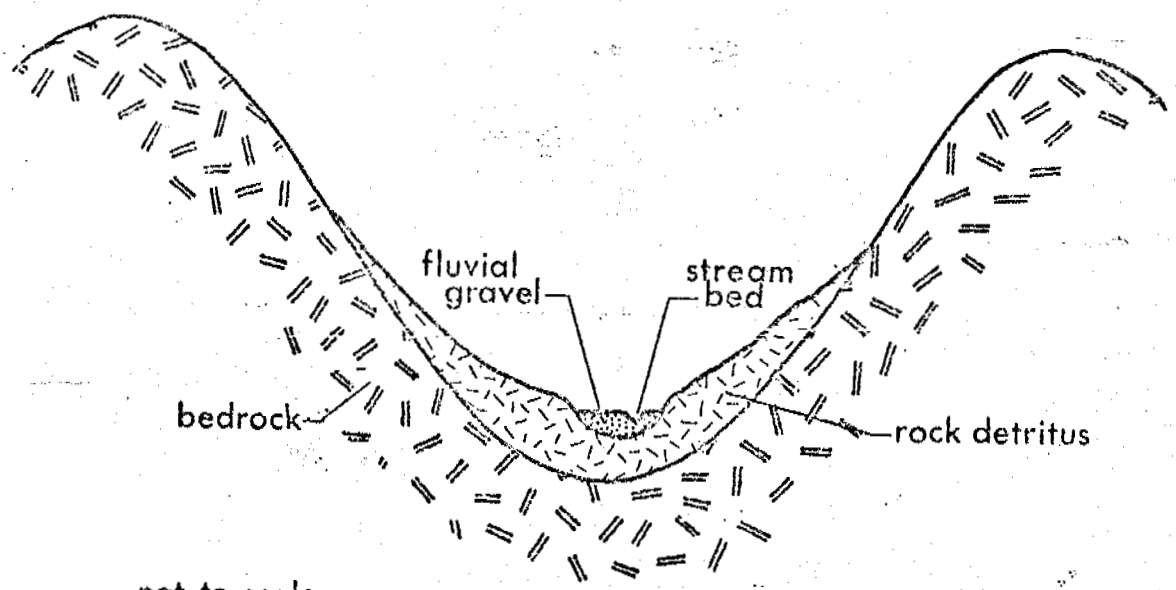
Other Unconsolidated Deposits

Deposits on the Eagle Plain and Porcupine Plateau are mostly fine silts and clays covered by organic material. Very little of this material is suitable for construction purposes.

Bedrock Geology

Bedrock which underlies the Eagle Plain and Porcupine Plateau is flat lying, easily weathered, and thus exposed only in the river and creek valleys. These rocks include Devonian, Carboniferous Permian and Cretaceous shale, siltstone, sandstone and conglomerate. Although outcrops are few it is believed that the depth to bedrock is generally less than 20 feet. This material, because it weathers easily, could be ripped and used for subgrade construction material.

The bedrock of the Richardson Mountains consists of shale, sandstone, conglomerate and carbonate ranging in age from Precambrian to Cretaceous. These rocks, although generally consisting of similar lithologies as those found on the plain, have greater coherence and do not weather as easily.



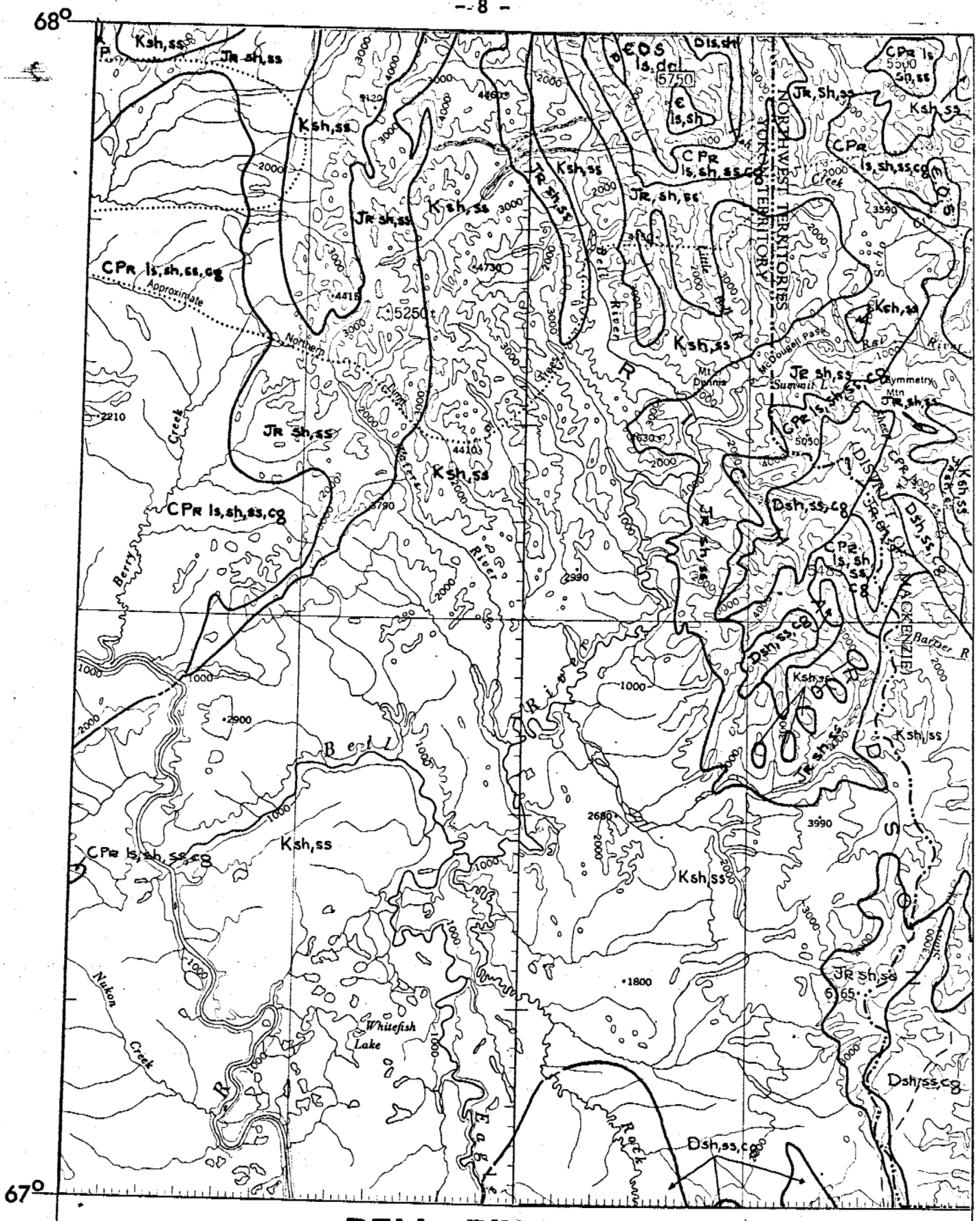
not to scale

-Figure 3

IDEALIZED MOUNTAIN—VALLEY CROSS SECTION

When these rocks do weather they break down mechanically to form coarse detritus.

Although the bedrock from the Richardson Mountains could be quarried and crushed for granular material it would be much more practical to use the detritus already formed.



BELL RIVER 116P
BEDROCK GEOLOGY
— SCALE 1:500,000

FIGURE 3 after Norris et al , 1963

Bedrock Geology Legend

The rock units which appear on the bedrock geology map (fig. 4) are grouped according to gross lithology and age.

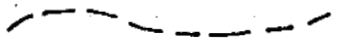
These units were derived from a more detailed geological map, whose units were subdivided largely on the basis of airphoto and stratigraphic interpretation. The units are identified by a two component code. The first component is upper case and designates age which is followed by a mnemonic code designating gross lithology, e.g. Dls - Devonian limestone. When no lithology follows the age component, the unit is composed of many of the rock types listed below.

Legend

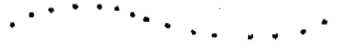
Age	Lithology
T - Tertiary	car - carbonate
K - Cretaceous	limestone and/or dolomite
JR- Jurassic	ls - limestone
TR- Triassic	dol - dolomite
PR- Permian	ss - sandstone
C - Carboniferous	sh - shale
D - Devonian	cg - conglomerate
S - Silurian	no mnemonic component
O - Ordovician	indicates unit is
Є - Cambrian	composed of many of
P - Precambrian	the above rock types

Symbols

Boundary of bedrock unit (approximate)



Boundary of bedrock unit inferred in areas of surficial cover



Limit of mapping

All units and symbols do not necessarily appear on the map

SOURCES OF INFORMATION

Bostock, H.S.
1967: Physiographic Regions of Canada; Geol. Surv. Can. Map 1254A.

Hughes, O.L.
1972: Surficial Geology of Northern Yukon Territory and Northwestern District of Mackenzie, Northwest Territories; Geol. Surv. Can. 69-36.

Hughes, O.L.
1973: Preliminary Map and Legend, Bell River 116P; Geol. Surv. Can. (unpublished)

Norris, D.K., Price, R.A., Mountjoy, E.W.
1963: Geology, Northern Yukon Territory and Northwestern District of Mackenzie, Geol. Surv. Can., map 10-1963.

Prest, V.K., Grant, D.R., Rampton, V.N.
1967: Glacial Map of Canada; Geol. Surv. Can. Map 1253A.

APPENDIX I, Part I

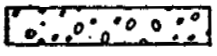
Unconsolidated Granular Materials

Each map sheet has a surficial geology legend (see appendix). This legend, differentiated by means of patterns, only indicates granular material classified by genetic characteristics. In some cases only part of a map unit has been patterned, indicating that only that portion is considered a suitable source for ganular material.

Legend

GLACIOFLUVIAL


coarse grained granular material: cobbles, pebbles, gravel; may be mixed with some coarse sand


mixed or interbedded sand and gravel


predominantly sand or sand with some fine material

GLACIOLACUSTRINE


coarse grained granular material: cobbles, pebbles, gravel; may be mixed with some coarse sand.

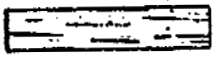

mixed or interbedded sand and gravel


predominantly sand or sand with some fine material

FLUVIAL

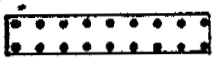

only sand and gravel deposits are patterned

MORAINAL


predominantly till; unsorted matrix of silt, clay, and sand imbedded with pebbles, cobbles and boulders

MARINE


coarse grained granular material: cobbles, pebbles, gravel; may be mixed with coarse sand


mixed or interbedded sand and gravel


predominantly sand or sand with some fine material

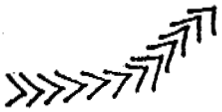
EOLIAN

fine and medium sandy material

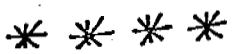
COLLUVIUM

only the patterned area is coarse grained

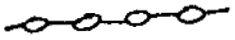
Symbols



eskers



gravel mounds



morainal ridge found within moraine

limit of glaciation

APPENDIX I, Part (ii)

Surficial Geology and Landforms (glaciated areas)

TEXTURE	GENESIS	MORPHOLOGY	SLOPE (superscript)
f fen	O organic	v veneer	1 moderate ($<5^{\circ}$)
p peat	M morainic	p plain	2 steep ($5^{\circ} - 15^{\circ}$)
c clay	G glaciofluvial	d drumlin	
si silt	L lacustrine	s fluted striated	
s sand	A alluvial fluvial	t terrace	
g gravel	C colluvial	h hummocky	
b boulder	E eolian	r ridged	$>15^{\circ}$ normally in Cx unit
t till	U upland, rolling bedrock controlled	e eroded	
	R rock outcrop	f fan	
		m rolling	
		c channelled	
		k kettled thermokarst	
		x complex	

Complex Units:

e.g. in: Mp-fO, fO constitutes 25% to 49% of area
: Mp-fO, fO = 5% - 24% of area

Using all four elements of the legend, a smooth ground moraine surface with moderate slope would be Mp^{1}; hummocky and ridged glaciofluvial gravel would be gGhr. Note that there are inconsistencies in the use of Mp and Mv mainly because of the difficulty in estimating till thickness.

APPENDIX Part (iii)

UNGLACIATED TERRAIN LEGEND

Preliminary Legend

- Hughes, 1973

1 - Physiographic Unit

M = more than 450m (1500 ft.) local relief
H = between 150m (500 ft.) and 450m (1500 ft.) local relief
L = between 30m (100 ft.) and 150m (500 ft.) local relief
P = less than 30m (100 ft.) local relief
B = Pediment
i.e. A gently sloping, rock-floored erosion surface at the base of a receding mountain front or plateau escarpment, or range of hills.

S = Scarp

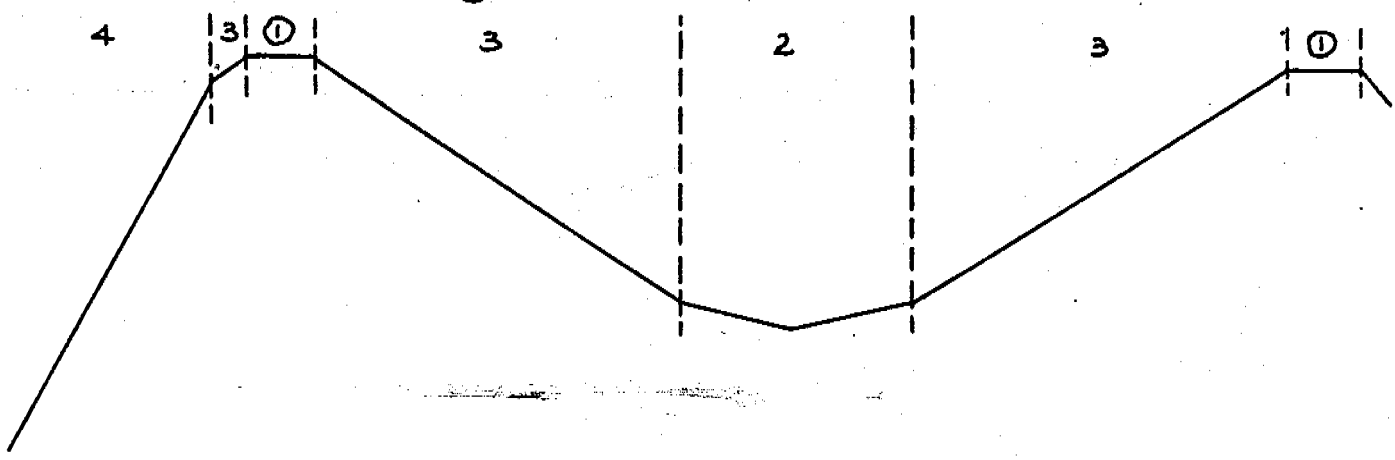
2 - Rock Type (no differentiation with age)

A = argillite
C = carbonates (limestone and dolomite)
Cg= conglomerate
Ch= chert
G = granite
Q = quartzite
S = sandstone
Sh= shale
Si= siltstone
V = volcanics

3 - Slope Class

4 = greater than 35°
3 = 15° to 35°
2 = 5° to 15°
1 = less than 5° (flat or gently sloping valley floors)
(1) = less than 5° (flat or gently sloping hill or mountain tops)

N.B. Slopes are listed in order of abundance.
i.e. 32(1) =



4 - Classification of Soil at or Near Surface (Unified Classification)

FIELD IDENTIFICATION PROCEDURES (Excluding particles larger than 3 inches and basing fractions on estimated weights)		GROUP SYMBOLS [a]	TYPICAL NAMES	INFORMATION REQUIRED FOR DESCRIBING SOILS
COARSE GRAINED SOILS: More than half of material is larger than No 200 sieve size	GRAVELS: More than half of coarse fraction is larger than No 4 sieve size	CLEAN GRAVELS (Little or no fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes	GW	Well graded gravels, gravel-sand mixtures, little or no fines.	Give typical name, indicate approximate percentages of sand and gravel, max. size, angularity, surface condition, and hardness of the coarse grains; local or geologic name and other pertinent descriptive information; and symbol in parentheses.
			Predominantly one size or a range of sizes with some intermediate sizes missing.	GP	Poorly graded gravels, gravel-sand mixtures, little or no fines.	
		GRAVELS WITH FINES (Appreciable amount of fines)	Non-plastic fines (for identification procedures see ML below).	GM	Silty gravels, poorly graded gravel-sand-silt mixtures.	
			Plastic fines (for identification procedures see CL below).	GC	Clayey gravels, poorly graded gravel-sand-clay mixtures.	For undisturbed soils add information on stratification, degree of compactness, cementation, moisture conditions and drainage characteristics.
	SANDS: More than half of coarse fraction is smaller than No. 4 sieve size. (For visual classifications, the ¼ size may be used as equivalent to the No. 4 sieve size.)	CLEAN SANDS (Little or no fines)	Wide range in grain sizes and substantial amounts of all intermediate particle sizes.	SW	Well graded sands, gravelly sands; little or no fines.	EXAMPLE:- Silty sand, gravelly; about 20% hard, angular gravel particles ½-in maximum size; rounded and subangular sand grains coarse to fine; about 15% non-plastic fines with low dry strength; well compacted and moist in place; alluvial sand; (SM)
			Predominantly one size or a range of sizes with some intermediate sizes missing.	SP	Poorly graded sands, gravelly sands; little or no fines.	
		SANDS WITH FINES (Appreciable amount of fines)	Non-plastic fines (for identification procedures see ML below).	SM	Silty sands, poorly graded sand-silt mixtures.	
			Plastic fines (for identification procedures see CL below).	SC	Clayey sands, poorly graded sand-clay mixtures.	
FINE GRAINED SOILS: More than half of material is smaller than No 200 sieve size. (The No. 200 sieve size is about the smallest particle visible to the naked eye)	IDENTIFICATION PROCEDURES ON FRACTION SMALLER THAN No. 40 SIEVE SIZE	DRY STRENGTH (CRUSHING CHARACTERISTICS)	DILATANCY (REACTION TO SHAKING)	TOUGHNESS (CONSISTENCY NEAR PLASTIC LIMIT)			
SILTS AND CLAYS: Liquid limit less than 50		None to slight	Quick to slow	None	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands with slight plasticity.	Give typical name; indicate degree and character of plasticity, amount and maximum size of coarse grains; color in wet condition, odor if any, local or geologic name, and other pertinent descriptive information, and symbol in parentheses.
		Medium to high	None to very slow	Medium	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	
		Slight to medium	Slow	Slight	OL	Organic silts and organic silt-clays of low plasticity.	For undisturbed soils add information on structure, stratification, consistency in undisturbed and remolded states, moisture and drainage conditions.
SILTS AND CLAYS: Liquid limit greater than 50		Slight to medium	Slow to none	Slight to medium	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.	EXAMPLE:- Clayey silt, brown; slightly plastic; small percentage of fine sand; numerous vertical root holes; firm and dry in place; loess; (ML)
		High to very high	None	High	CH	Inorganic clays of high plasticity, fat clays.	
		Medium to high	None to very slow	Slight to medium	OH	Organic clays of medium to high plasticity.	
HIGHLY ORGANIC SOILS		Readily identified by color, odor, spongy feel and frequently by fibrous texture.			Pt	Peat and other highly organic soils.	

Rock Detritus

D_1 = 77 mm to 256 mm

D_2 = 256 mm to

* = bedrock sub-outcrop

5 - Morphologic Modifier

Additional Information Related to the Bedrock Configuration.

c = cuesta (flank or slope of a hill)
m = mesa (tableland, flat topped mountain)
d = dissected (when unit is divided by deep incisions)
p = plain

6 - Miscellaneous

R.G. Rock Glacier

R.S. Rock Slide