GRANULAR RESOURCES AND

BEDROCK CONSTRUCTION MATERIALS -

WRIGLEY (95 O)

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INTRODUCTION

The Wrigley map-sheet is bounded by latitudes 63° and 64° N and longitudes 122° and 124° W.

Preliminary air photo interpretation plotted on a photomosaic map has been used as the basis for evaluating natural granular deposits in this area. Oil company shot hole records and pipeline company drilling reports provide some additional subsurface details. Information on bedrock materials come from published Geological Survey reports and maps.

It should be noted that much of the data on natural granular deposits contained in this report is subject to revision following field work and revised air photo interpretation of surficial geology by the Geological Survey of Canada (summer of 1972).

Available published and unpublished information indicates that the main source of construction material in the Wrigley area is the bedrock of twelve geologic formations exposed in the McConnell and Camsell Ranges (see bedrock geology map, Fig. 2).

Natural granular material is available in glaciofluvial and morainal deposits in the eastern half of the map- area, but probably not in amounts as extensive as those indicated by preliminary air photo interpretation[1].

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1 Definitions:

a. Glaciofluvial deposits are composed of sediments left by streams flowing from glaciers.
b. Glaciolacustrine deposits consist of sediment left in lakes fed by meltwater from glaciers.
c. Morainal deposits are sediments deposited directly from glacier ice.
d. Alluvial (fluvial) deposits are sediments deposited by post-glacial rivers and streams.

Deposits mapped as morainal plain, glaciofluvial terrace, and alluvial terrace along the Mackenzie, Wrigley, Ochre, Johnson, and Blackwater Rivers may also contain coarse granular material both on the surface and at depth.

GEOLOGIC DESCRIPTION OF EXPLOITABLE MAP UNITS

Natural granular material occurs as sediments deposited by various geologic processes, i.e. glacier activity and river deposition. Bedrock materials come from rock that can be mechanically crushed or has been broken down by natural weathering.

Glacial Deposits

High quality natural granular material, both coarse and fine, comes mostly from glaciofluvial outwash deposits. Glaciolacustrine deposits are also a good source of fine material[2]. Glacial till of morainal deposits is usually composed of fine material but, in some localities, has a high percentage of gravel.

Glaciofluvial Deposits (Gp, Gv, Gr, Gk, tM)

Glaciofluvial deposits in the Wrigley area are composed of sand and gravel. On the accompanying copy of a preliminary surficial geology

2 Gravel is sometimes found at depth as lenses and pods in glaciolacustrine deposits.

photomosaic map for 950, they have been coloured solid red (see preliminary surficial geology map and legend, Figs. 1 and 1c)[3].

The capital G in the unit mapped indicates the proposed glaciofluvial origin of the deposit and the lower case letter prefix indicates the principal type(s) of material expected there, e.g. silt (si), sand (s), gravel and/or sand (g), till (t). It should be noted that when two prefix letters are used the first refers to what is probably the most abundant constituent (see Map Legend, Fig. 1b).

Topographic expression visible on air photos is indicated by a suffix attached, e.g. plain (p), ridge (r), veneer (pv). Symbols such as <<<< (esker), also show surface expression of deposits.

Glaciofluvial units vary from flat and gently sloping (Gp, $\frac{Gv}{tM}$) to ridged (Gr, [eskers]). Thicknesses vary and, until field work is done, no values have been assigned and volumetric calculations remain incomplete.

Esker ridges ( ) are sinuous, ridged gravel and sand deposits formed by rivers beneath glacial ice. The material of these ridges is clean, well washed, and well sorted. A number of eskers appear in the eastern half of the Wrigley area.

Ground ice (thermokarst - k) and organic deposits (pO, fO) may make it difficult to exploit certain glaciofluvial plain deposits in the northeastern part of the map area.

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3 It should be noted that field work in 1972 will probably show many of the Gp deposits in the northeastern corner of the map to be till rather than glaciofluvial sands and gravels.

No estimate of available granular material recoverable from glaciofluvial units can be made at this time.

Glaciolacustrine Deposits

No glaciolacustrine deposits were identified in the Wrigley area from preliminary air photo interpretation However, it is possible that many of the deposits mapped as morainal and alluvial along the Mackenzie River are glaciolacustrine sands and silts with glaciofluvial gravel at depth. The area with possible glaciolacustrine material has been outlined on the photomosaic map in a light blue block pattern (see preliminary surficial geology map 950 and legend, Fig. 1 and 1c). Field checking, expecially of sections along river and stream valleys, will be necessary to identify and characterize these deposits.

Morainal Deposits
(Mh, Mpr)

Morainal deposits have been labelled with a capital M and appropriate textural and morphologic modifiers. Hummocky and ridged morainal areas have the greatest / potential for containing gravel as well as till. These deposits have been coloured yellow. Field mapping will give needed textural information, especially in the extensive area mapped as Mh along Blackwater Lake and River.

Ice content and organic cover in morainal areas is variable and controlled by topography. Ridged areas are well drained and have less organic cover and ground ice. In hummocky morainal deposits the area between the hummocks may contain thick organic material.

Alluvial Deposits
(Ap, At, Af)

Alluvial (fluvial) deposits are composed of silts, sands, and gravels deposited by rivers and streams. They have been coloured light green (see preliminary surficial geology map and legend, Figs. 1 and 1c). All alluvial deposits are mapped as A with textural and morphologic prefixes and suffixes.

Alluvial deposits form plains with little relief along present river and stream channels, terraces (flat surfaces) above present channels, and fans (sloping surfaces) at the base of mountain slopes.

Alluvial deposits have been recognized from air photographs along the Mackenzie and Blackwater rivers and along the mountain slopes but the principal materials in these deposits and their approximate thicknesses will be known only after field work is completed.

Bedrock

Limestones, dolomites, and sandstones of twelve geologic formations can be used as a source of construction materials[4]. These formations have been coloured on the Geological Survey of Canada bedrock map which accompanies this report (see bedrock map and legend, Fig. 2).

The eastern two-thirds of the map-area is underlain by Cretaceous shales with a thick cover of ground moraine and hence is a poor area for bedrock construction materials because of the soft rock type and lack of exposures.

4 A formation is a bed (of rocks) or assemblage of beds with well-marked upper and lower boundaries that can be traced over a considerable tract of country (Holmes, 1965).

Soft incompetent Devonian shales occupy a large part of the Mackenzie River valley west of the McConnell Range. These units, like the rock east of the range, are a poor source of construction material.

Competent limestones, dolomites, and sandstones form the McConnell and Camsell Ranges in the western third of the map-area. These formations are prime sources of bedrock construction material and will be described in more detail in order of decreasing quality.[5]

High Quality Bedrock for Construction Materials

The Nahanni Formation, unit 21, is a Middle Devonian limestone that is well exposed in both the McConnell and Camsell Ranges. Rocks of this formation are fairly competent and break into blocks with dimensions of three feet & larger. A few less competent beds of shaly limestone are present. The formation ranges in thickness from 750 feet in the Dahadinni River map-sheet to 300 feet in the McConnell Range and 360 feet in the Camsell Range. In the Camsell Range the presence of calcite veins should allow easier crushing of the rock.

The Franklin Mountain Formation (Ordovician and younger), unit 8, outcrops along the eastern side of the McConnell Range. On the north-east face of Mount Kindle it is 1,265 feet thick. The upper part of the formation (765 feet) is mainly tough dolomite and is thinly bedded to platy, making it easy to break by mechanical means. The lower beds are not quite as good a source of construction material as they contain

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5 Bedrock information comes from Geological Survey of Canada Paper 62-33 and from discussion with D. K. Norris, Geological Survey of Canada

red and green shales in addition to dolomite and limestone.

The Mount Kindle Formation, unit 9, is well exposed in the McConnell Range. It is Ordovician and younger in age and consists of a competent dolomite. The formation is approximately 900 feet thick and a fairly good source of construction material. It should be noted that the massive nature of the formation might make crushing somewhat difficult.

Unit 5, the Mount Clark Formation is a very good source of competent, rippable material, but it is found only in the eastern part of the McConnell Range. Near the peak of Cap Mountain this Cambrian sandstone formation is 450 feet thick.

The Arnica Formation, unit 15, is a competent Middle Devonian dolomite that is exposed in the Camsell Range. In the Wrigley and Dahadinni River map-areas it varies in thickness from 435 to 2,420 feet. The massive nature of the rocks of this formation may mean that crushing could be difficult. However, numerous calcite veins may make ripping easier.

Unit 25 is a competent Upper Devonian reefy limestone. It is located only on the Wrigley Plateau where it is 65 feet thick. The lower part is thinly bedded and may be easier to break than the thick- bedded top part.

The Lone Land Formation, unit 4, is Proterozoic in age and outcrops only in the eastern part of the Camsell Range at Cap Mountain where it is 965 feet thick. The basal beds (200 feet) of the formation are tough sandstone with some lenses of rounded quartz pebbles and the upper beds are shales, siltstones, and mudstones. The basal beds would

serve as a good source for bedrock construction materials but the upper beds would be poor.

Rock from unit 1, which is Proterozoic in age, might also be used for construction purposes. Unit 1 outcrops only on the eastern flank of the McConnell Range near Cap Mountain. It is composed of 1,700 feet of strata consisting of interbedded dolomite, sandstone, siltstone, and shale. The sandstone (10 foot thick beds) and dolomite would be the best source of construction material.

The Manetoe Formation, unit 17, is limited in outcrop area as it appears only in the Camsell Range where it is 135 feet thick. It is a competent dolomite both thin and thickly bedded, fractured and veined by calcite.

Unit 12 (Ordovician and younger in age) consists of 540 feet of dolomites and is located only in the Camsell Range. It is silty and sandy in texture and the basal beds are partly brecciated.

Secondary Bedrock Construction Materials

Two formations, units 16 and 24, can be used as sources of rippable bedrock. However, the outcrop pattern and rock types involved make them less desirable than the previously mentioned units.

The Middle Devonian Bear Rock Formation, unit 16, is a limestone breccia. It is well exposed in the McConnell Range and is approximately 1,100 feet thick. Some rocks in the formation break into blocks and some crumble into smaller fragments. The rocks of this unit are less competent than the Nahanni Formation which often occurs adjacent to it.

The Upper Devonian unit 24 is a sandstone with shale and siltstone interbeds. It occurs both east and west of the Mackenzie River but is generally mantled by glacial deposits of variable thicknesses. When the sandstone beds appear at the surface they can be used for construction purposes.

GEOGRAPHIC DISTRIBUTION OF EXPLOITABLE MATERIALS

Some natural granular deposits have been assigned an identification number, 0-1 for use in assembling data (see Fig. 1). Not all deposits are numbered, however, as the results of field mapping may revise the distribution and description of map units. Roman numerals I to III and geographic names designate groups of natural granular deposits discussed in this report (see overlay, Fig. 1a). Geographic names and capital letters A to C indicate areas where bedrock construction materials might be obtained (see bedrock map, Fig. 2). Further details of natural granular deposits, i.e. volumetric estimates of groupings and components will be added as field work and mapping are completed. A Bedrock Resources sheet is included in this report.

Natural Granular Materials

I. East Side Mackenzie River

This area lies between the McConnell Range and the Mackenzie River. Preliminary air photo interpretation has shown it to be largely morainal plain and alluvial terraces. However, the drainage pattern shown by numerous, closely spaced gullies, and the presence of organic

material (pok) may mean that some of these units are glaciolacustrine sands and silts with glaciofluvial gravels at depth. Field work is necessary both to determine the type of material present in these deposits and to ascertain the extent of good granular material available.

II. West Side Mackenzie River

This area west of the Mackenzie River also includes deposits along the Wrigley River valley. Area II is similar to area I because preliminary air photo interpretation has shown it to be largely morainal plain and alluvial terraces. Field work might show that glaciolacustrine and glaciofluvial materials occur in many of these map units.

III. Blackwater River (West of Blackwater Lake)

This area has been mapped as morainal and alluvial. It might well contain a certain amount of glaciofluvial and glaciolacustrine materials.

IV. Blackwater Lake - Upper Blackwater River

Deposits in this grouping include extensive hummocky morainal plains, glaciofluvial plains, esker deposits, and alluvial deposits. Field mapping might show that much of the glaciofluvial material (except for the eskers) is morainal. Also much of the hummocky morainal area may be morainal plain deposits with little potential for containing coarse granular material. The texture of the alluvial material will also be determined by field work.

V. Total Natural Granular Resources

Unavailable until field work is completed.

Bedrock Construction Materials

A. McConnell Range

Limestone of the Nahanni Formation, and limestone breccia of the Bear Rock Formation are abundant in the McConnell Range. Dolomite of the Mount Kindle and Franklin Mount Formations are also well exposed, especially in the eastern half of the range. Sandstones of unit 1 and the Mount Clark and Lone Land Formations are present in an area south and east of Ochre River. All the formations mentioned can be used as a source of construction material.

B. North Camsell Range

Limestone of the Nahanni Formation and dolomites of the Manetoe, Arnica, and unit 12 are all exposed in the Camsell Range and can be used for construction purposes. Sandstone of unit 24 is present but not well exposed.

C. Wrigley Plateau and Syncline

Sandstone of unit 24 and isolated outcrops of limestone unit 25 can be used for construction material where they are exposed. This area lies on both sides of the Mackenzie River, west of the McConnell Range.

Granular Resources Estimate

(In Progress)

Bedrock Resources

Formation	Rock Type	As a Source for Construction Materials	Availability*
A. McConnell Range			
Bear Rock	limestone breccia	fair	1
Mount Kindle	dolomite	good	2
Nahanni	limestone	good	3
Franklin Mountain	dolomite	good	4
Mount Clark	sandstone	good	5
Lone Land	sandstone	good	6
Unit 1	sandstone	good	7
B. North Camsell Range			
Nahanni	limestone	good	1
Arnica	dolomite	good	2
Manetoe	dolomite	good	3
Unit 24	sandstone shale	fair	4
Unit 12	dolomite	good	5
C. Wrigley Plateau and Syncline			
Unit 24	sandstone shale	fair (not well exposed)	1
Unit 25	limestone	good	2

*Most available unit in each area has been designated by the lowest number.

APPENDIX A

Sources of Information

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1972: Surficial geology and geomorphology of Camsell Bend, 95J, Geol. Surv. Can., Open File Series 93.

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Unpublished, Shot hole reports of oil-companies.

Legend (Figure 1c) - Wrigley (950)

Color	Pencil No.	Major General Symbol	Description
	744	G	Glaciofluvial sands and gravels some silts
	743	E	Eolian sands
	740 1/2	L	Lacustrine sands and silts, some gravels
	740	Lb	beach sands+gravels
	Any Striped Colour		At least 50% of the area enclosed is peat (pO) or fen(fO)
	751	A	Alluvial sands+gravels
	735	Mh Mr	hummocky and ridged moraine composed of glacial till
	737	M	Marine deposits of sands, silts and clays
	Red 744 Blue Stabilo 8741	G + L	Glaciofluvial, with an unknown percentage of lacustrine deposits
	Blue 740 1/2 Red Stabilo 8040	L + G	Lacustrine, with an unknown percentage of glaciofluvial deposits
	Green 751 Red Stabilo 8040	A + G	Alluvial, with an unknown percentage of glaciofluvial deposit
	Red 744 Green Stabilo 8043	G + A	Glaciofluvial, with an unknown % of alluvial deposits
	Yellow 735 Red Stabilo 8040	Mh + G	Morainal, with an unknown % of glaciofluvial deposits
	Blue 740 1/2		Possible Lacustrine sands, silts gravels
			eskers, (sand & gravel)
		0-1 (example)	Indicates an area where volumetric calculations have been made