AGGREGATE RESOURCE INVENTORY ALONG POSSIBLE ROUTES FROM STRANGE LAKE, LABRADOR TO THE ATLANTIC COAST

by

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ABSTRACT

This report describes an aggregate resources inventory conducted along a proposed transportation route across northern Labrador, from the Strange Lake mineral deposit to Anaktalak Bay, 32 km south of Nain. The study was conducted as an aid to the possible construction of a route to transport ore to the coast, from where it can be shipped to industrial markets. The route selected follows the prevailing topography, has abundant coarse granular materials, and appears to be the cheapest to construct.

INTRODUCTION

Development of the Strange Lake mineral deposit will require a transportation route to deliver the raw or partially refined ore to markets in Canada or elsewhere. Due to the easterly trend of the topography, it is assumed that a route might be constructed eastward to the Labrador coast. Therefore, a project was undertaken to provide relevant landform mapping and aggregate resource data. A route southward or westward would be longer, transverse to topography and vastly more difficult and costly to construct.

The main objective of the project was to determine the quantity and quality of aggregate material along proposed routes to the coast. Surficial maps derived from airphoto interpretation, covering a 6 km wide corridor to the coast, were used as a guide to delineate and sample areas of potential aggregates. The project involved the locating and detailed sampling of any aggregate reserves in the map area. Attention was also given to problem or hazardous areas such as rock falls along narrow valley segments. Water depths were estimated in areas where eskers have been dissected by streams or have terminated in lakes. Extensive stretches of bogland and rock outcrops along the route were also noted as well as potentially unstable areas such as those with large deposits of clay and silt or areas of permafrost.

REGIONAL SETTING

The Strange Lake deposit is situated on the Quebec-Labrador border approximately 130 km west of Nain. It is in a dissected plateau region approximately 500 m above sea level. Major steep-sided valleys incise the plateau to the east. Quaternary deposits in the Strange Lake area are composed predominantly of tills, with two glaciofluvial outwash systems evident near the deposit, one trending east-northeast toward the Fraser Valley and the second trending eastward toward Ikadlivik Brook. Most of the major valleys are filled with outwash material and have treed floors. Crag and tail hills are common, some having lengths greater than 2 km. There is about 20% bog cover and less than 5% rock exposure. The plateau is a treeless landscape covered by a tundra flora and lies within the zone of discontinuous permafrost (McConnell et al., 1984). Numerous ponds and lakes cover much of the area.

The general geology is composed of rocks of gneissic and granitic lithologies, e.g. paragneiss, felsic to intermediate gneiss, granitic gneiss, granite, anorthosite, migmatite and amphibolite (Figure 1).

FIELD PROGRAM

Field sampling was conducted at 1 km intervals or less along most sections of the proposed routes. Where possible, samples were taken from natural exposures such as stream cuts, lake shores and gullied areas. From these exposures, samples were obtained which were free of plant debris and topsoil. Where natural exposures were not present, samples were taken from hand-dug pits that extended into the C horizon, in order to provide a fresh sample unaffected by weathering. 282 samples were collected for particle size analyses and/or lithological investigation. Sample types collected were gravel (136), sand (89), sandy gravel (26), till (14), sand/silt (11), silt(4) and clay (2). Petrographic numbers (Canadian Standard Association, 1973) obtained from field pebble analyses range from 150-300, indicating hard, durable aggregates suitable for most construction purposes.

DATA ANALYSES

A main objective of the field sampling program was to obtain grain-size analyses on all samples containing particles greater than +8 mm. Laboratory analyses will be conducted on all -8 mm sample fractions returned from the field. These analyses will include drying and splitting of samples and dry sieving of fractions down to -0.062 mm (Kirby et al., 1983).

This project is a contribution to the Canada-Newfoundland Mineral Development Agreement.

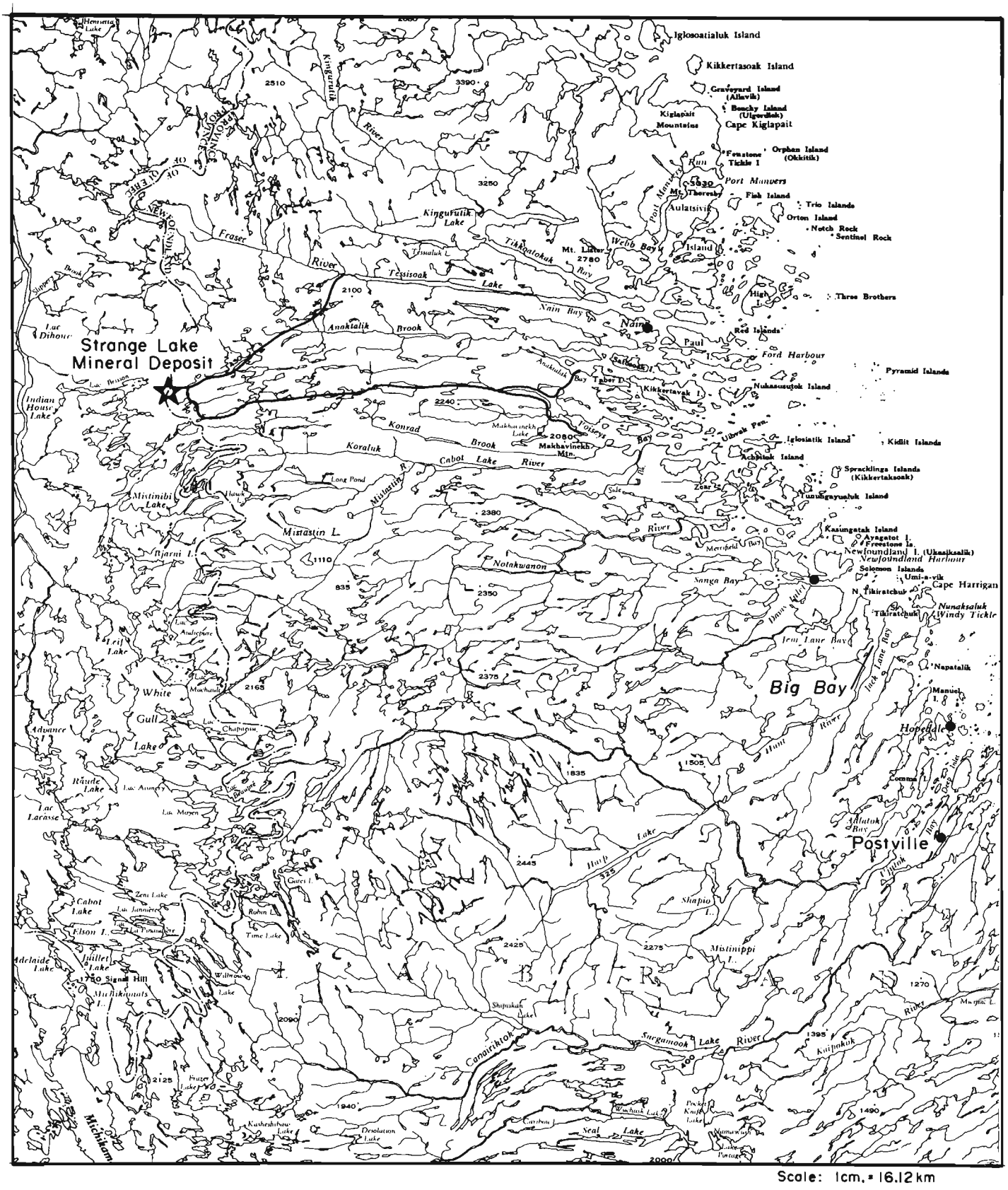
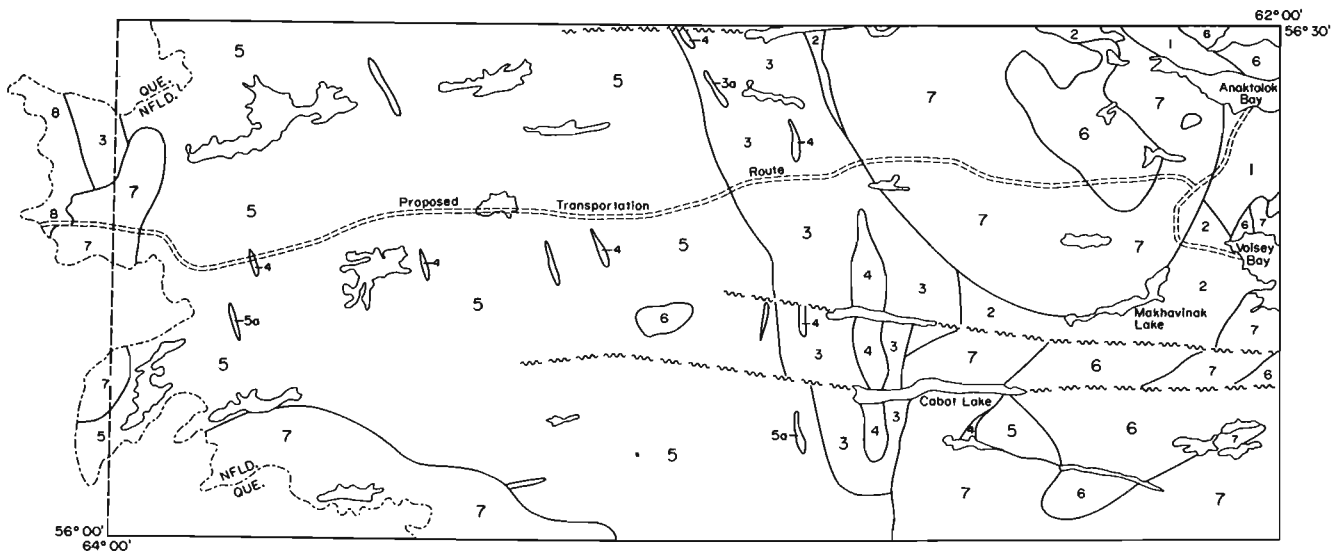


Figure 1: *Proposed Strange Lake transportation routes.*



LEGEND

Nain Province:

1 *Undivided gneiss*

Churchill Province:

2 *Garnet-quartz-feldspar gneiss*

3 *Felsic to intermediate granulite gneiss; 3a, paragneiss*

4 *Granite gneiss*

5 *Undivided migmatite 5a, paragneiss; 5b, amphibolite*

Elsonian plutons

6 *Anorthositic rocks*

7 *Granitic rocks*

8 *Strange Lake peralkaline granite*

Figure 2: *Generalized geology along the proposed Ikadlivik Brook transportation route. Compiled by B. Ryan, Newfoundland Department of Mines and Energy.*

A database management system (Scientific Information Retrieval System) designed for storage and retrieval of aggregate and surficial geology data (Atkinson, 1984) will be used to record all field and laboratory data.

PROPOSED ROUTES

Two routes originating at the Quebec-Labrador border near the Strange Lake mineral deposit and extending in an easterly direction toward the Labrador coast were studied. Route one was toward the Fraser Valley, and route two was along Ikadlivik Brook toward Voisey Bay and Anaktalak Bay.

Fraser Route

The Fraser route follows a continuous sequence of glaciofluvial outwash deposits. It originates near the Strange Lake deposit and is dominated by a series of long sinuous esker ridges. The esker system, which occasionally exceeds 20 m in height, trends in a roughly east-northeast direction. This proposed route follows the esker system with only minor diversions as far as the Fraser River canyon. No construction problems are expected to this point. However, access down into the Fraser Valley to Tasisuak Lake would present a major problem.

The Fraser Valley is a glacial trough and tributaries enter the major valley through hanging valleys. The height difference between the plateau and the valley floor is approximately 500 m, much of which is accounted for by vertical slopes (Batterson and Vanderveer, 1984). A tributary valley issuing into Tasisuak Lake, located approximately 20 km east of where the glaciofluvial outwash systems terminate on the plateau, has slopes gentle enough to

allow road construction. However, the 20 km route to this valley traverses an area of poor quality aggregate, composed mostly of a thin layer of silty till with associated mud boils, plus rock outcrops in several places. In addition, a number of gorges would have to be bridged or bypassed, increasing the cost and/or distance of construction.

If ore could be transferred from the plateau to the valley floor, other problems exist. Ocean-going vessels can traverse most of Tasisuak Lake, but the river mouth would have to be dredged or a series of locks constructed to provide an outlet to the ocean. Further, the Fraser River Valley in general and Tasisuak Lake in particular may have been deemed an arctic char protection area by the Federal Department of Fisheries and Oceans (Batterson and Vanderveer, 1984). It is therefore doubtful that any development would be permitted in the lake area. This route is less likely to be usable and was not studied in detail.

Ikadlivik Brook Route

The Ikadlivik Brook route, which was studied in greater detail, follows a glaciofluvial outwash system of considerable resource potential. This route is approximately 150 km long from the Strange Lake deposit site to Anaktalak Bay on the Labrador coast. It follows the Fraser route to 9 km east of the deposit, then turns south following two river channels for another 16 km to the next major eastward trending valley.

The 9 km section of the Fraser route is plotted along the top of a dissected esker composed of cobble-pebble gravel, with scattered boulders along parts of the ridge. Material along the river channels consists of fine sandy till, with a 2 km stretch of bogland separating the two channels. The bogland appears to be shallow, with scattered boulders protruding in places, and should not cause any major problem in construction. A more detailed study would be needed to determine the effects of permafrost on road construction in this area.

The route along the river channels joins a major esker/glaciofluvial outwash system which extends in an easterly direction across half of mapsheet 14D/5 and all of 14D/6, covering a distance of 53 km. The esker reaches heights of up to 20 m and is discontinuous, being dissected by either meltwater channels or channels connecting small lakes, or terminating in lakes. The aggregate along this section has a dominant gravelly texture, although boulder and sandy materials were sampled in several places. Water depths were taken at eight breaks in the esker system and ranged from 1.5-5.5 m. In those places where intervening waters are shallow, culverts and cut-and-fill operations could be employed. However, there are some places where currents are strong and a bridge or large culvert would have to be installed.

The esker system tapers off at the beginning of mapsheet 14D/7. A 6 km stretch of boulder till and fine sandy till was mapped to join up with the Ikadlivik Brook Valley. There are scattered mud boils and small patches of bogland along this section. The slope of the land is steep enough to allow adequate drainage by ditching if road construction occurs in the area.

Ikadlivik Brook has a well defined valley with sidewalls up to 140 m and a well developed valley floor. Abundant glaciofluvial outwash deposits are evident in the valley. These are largely kame deposits with associated kettleholes, and eskers. There is an abundance of good quality aggregate, although large deposits of sand, some silt and clays cover much of the lower part of the valley. Blasting of rock may be required at a few narrow sections along the valley. There are many rapids and shallow areas in the upper part of the valley, while in the lower half the river is deeper with fewer rapids.

Field work has been conducted along two access routes leading from Ikadlivik Brook to the ocean. One route extends past the confluence with Kogluklokoluk Brook and leads into Voisey Bay. The second route leads northward and exits Ikadlivik Brook via the Reid Brook Valley and terminates at Anaktalak Bay.

The Voisey Bay access route is approximately 0.5 km shorter than the Anaktalak Bay route and extends over an area containing granular material of predominantly sand size that overlies deposits of silt and clay. The stability of this route would have to be assessed for road construction. In addition, steep rock faces are an impediment in places, and water depth at the landward end of Voisey Bay may not be sufficient for ocean-going vessels. There are extensive shallows at the mouth of Ikadlivik Brook, although an adequate channel appears evident on the north side of the Bay opposite Garland Bight (Batterson and Vanderveer, 1984).

The alternative route, northward through the Reid Brook Valley, flows into Anaktalik Bay, which has deeper water than Voisey Bay. This route, although slightly longer, appears to be the best route to the coast. Deposits of coarser granular material were sampled along this route,

along with sand, silt and clay deposits. Along both routes, bridges or large culverts would have to be installed to cross the numerous streams entering the main river system.

CONCLUSION

A suitable transportation route could be constructed from the Strange Lake deposit following an esker/glaciofluvial outwash system in an east-northeast direction toward the Fraser Valley. However, apparently insurmountable problems are encountered on reaching the Fraser River Valley, such as the nearly 500 m vertical drop at the entrance down into the valley, an arctic char protection area along the Fraser River, and dredging or the construction of locks at shallow areas near the mouth of the river to provide access for ocean-going vessels. Therefore, this route must be deemed unsatisfactory.

The Ikadlivik Brook Valley route is the most suitable one to the Atlantic coast. Along the plateau section, large aggregate deposits and the well developed esker ridge should provide a suitable route and adequate construction materials, although several streams must be traversed. In the Ikadlivik Brook Valley, access to the ocean can be achieved by a route northwards through the Reid Brook Valley or southward into Voisey Bay. The Reid Brook route into Anaktalik Bay appears to be the most appropriate choice because of a deeper bay and the availability of deposits of coarser granular material.

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