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THE SEARCH FOR KIMBERLITE AND LAMPROITE INTRUSIONS IN EASTERN LABRADOR: INITIAL REPORT OF A BEDROCK AND SURFICIAL-SEDIMENT SAMPLING SURVEY

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ABSTRACT

The recent discovery of economic concentrations of diamonds in kimberlites of the Northwest Territories prompted the Department of Natural Resources to undertake a regional kimberlite survey of eastern Labrador in the summer of 1994. The survey entailed ground investigations of lamprophyric intrusions around Aillik Bay, and a regional surficial-sediment sampling program for kimberlite-indicator minerals between Aillik Bay and Saglek Fiord. The alkaline intrusive rocks of the Aillik Bay area are disposed as numerous narrow dykes, none of which display any of the characteristic nodules and mineral assemblages indicative of passage through the eclogitic or peridotitic substrate that characterizes diamondiferous crust. The possible existence of diamondiferous intrusions in the remainder of eastern Labrador will be assessed once the sediment samples have been examined for kimberlite- and lamproite-indicator minerals.

INTRODUCTION

The discovery of diamonds in the Lac de Gras region of the Northwest Territories in 1990 (Gibbons and Atkinson, 1993) was the most significant event in mineral exploration in Canada in over a decade. The diamondiferous rocks were found in the Archean Slave Province of the Canadian Shield, a setting that has subsequently sparked diamond exploration in the Shield elsewhere in Canada (cf. Cranstone and Bouchard, 1993). These new initiatives have resulted in positive spin-offs in the business and scientific community across the country. Among the impacts of this activity are a boost to local economies brought about by the needs of the exploration industry, a detailed examination of some poorly known areas of the Shield in northern Canada, a re-evaluation of the mineral potential of otherwise neglected areas, and the confirmation that the Canadian Shield does host a world-class diamond deposit. An account of diamond genesis and ascent to the surface, summarizing the salient features of recent advances in the field, has been presented elsewhere by Ryan (1993), and the reader is referred to that overview and the references cited therein for the general features of diamond-bearing rocks. Suffice it to state here that diamonds are minerals of deep-seated origin, forming in thick mantle roots beneath continental crust that has been tectonically quiescent for over 1.5 billion years. The diamonds occur as xenocrysts and as indigenous components of eclogitic and peridotitic nodules within mantle-derived igneous intrusions that pass through the root and rise rapidly to the Earth's surface. Economic quantities of diamonds are restricted to kimberlite and lamproite, peculiar igneous rocks that originate over 200 km below the surface and are emplaced into stable Archean cratons and some peripheral mobile belts.

The Archean cratons of eastern and western Labrador are potential targets for diamond-bearing kimberlites and lamproites in this province, so the Geological Survey conducted a regional-scale program in eastern Labrador during the summer of 1994, as a first-pass appraisal of the area. The sampling areas in eastern Labrador were chosen based on i) a consideration of favourable regional geology, and ii) the local existence of alkaline intrusions. An added incentive for choosing eastern Labrador as the first region to be evaluated was the discovery of diamonds in kimberlitic dykes in western Greenland (Larsen, 1991; Appel, 1994), an area across the Labrador Sea that was once contiguous with the Canadian Shield of Labrador.

METHODS OF FINDING DIAMONDS IN GLACIATED REGIONS

In common with many other parts of Canada, including most of Labrador, the Lac de Gras area of the Northwest Territories is blanketed by a thick cover of glacial debris that obscures the diamond-bearing intrusions. Initial exploration for diamondiferous rocks in such terranes must therefore involve an indirect detective approach, the most common being the analysis of surficial-sediment samples for critical indicator minerals derived from eroded kimberlite and lamproite (cf. Craigie, 1993). The diamondiferous kimberlite field at Lac de Gras was found by systematic sampling of

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glacial moraine material and tracing kimberlite-indicator minerals back 'up-ice' to their source (*op.cit.*). Most of Labrador is similarly blanketed by glacial cover, but moraine and till deposits are relatively scarce in areas surveyed this summer. However, substantial accumulations of glaciofluvial and glaciomarine sediments are present (Klassen *et al.*, 1992), and these were the focus of surficial sampling for indicator minerals during the 1994 survey.

DESCRIPTION OF FIELD AREAS IN LABRADOR

The survey area in Labrador stretches from the Aillik Peninsula near Makkovik northward to Saglek Fiord (Figure 1). The 1994 sampling program took two approaches, both of which are tied together in the overall appraisal of the area. First, as noted above, the regional geology dictated the areas to be evaluated, within which the Aillik Peninsula, known to expose many alkaline intrusions, was chosen as a bedrock-sampling site. Second, where alkaline intrusive rocks may underlie glacial debris, surficial-sediment sampling was conducted; in fact, this technique was utilized throughout the whole sampling area, even in areas where significant outcrop is present.

Consideration of the geology of eastern Labrador in light of diamond exploration suggests that the most favourable area that could be defined as a terrane likely to contain kimberlitic intrusions comprises the Nain Province and the Makkovik Province (cf. Ryan, 1993). The Nain Province is Archean in age; the Makkovik Province comprises Archean crust reworked by Paleoproterozoic orogenesis. This prospecting terrane encompasses a 10- to 120-km-wide stretch of rocks along the coast between Cape Chidley in the north and Cape Aillik in the south (Figure 1). Its eastward projection across the Labrador Sea into the Greenland Shield correlates with the Archean craton and the Ketilidian belt to the south, both of which host diamondiferous intrusions (Larsen, 1991; Larsen and Rex, 1992).

The Archean Nain Province represents the most likely part of Labrador underneath which a lithospheric mantle root, a requisite for diamond formation, may be preserved. The northern part of the Nain Province is called the Saglek block; the southern part of the Nain Province is named the Hopedale block. The rocks in the Nain Province range between 3.8 Ga and 2.5 Ga, the majority of which are high-grade gneisses and granitoid intrusions. The Hopedale block differs from the Saglek block, however, in having remnants of 'greenstone belts'. This is a geological attribute in common with the Slave Province, implying that the southern area has undergone less uplift than its northern counterpart and may have a mantle root attached.

The Makkovik Province comprises Archean crust—an extension of the Hopedale block of the Nain Province—that was reworked and intruded by a variety of granitoid plutons in the Paleoproterozoic. A series of supracrustal rocks along the southern margin of Makkovik Province, the Aillik Group, was deformed and infolded with the reworked Archean gneisses at that time. The Cape Aillik area of the Makkovik Province was chosen for bedrock examination because lamprophyric intrusions of possible kimberlitic parentage have been found there.

The major part of the 1994 survey of eastern Labrador was devoted to surficial-sediment sampling, focusing on Pleistocene sand and gravel deposits that were derived from the Nain and Makkovik provinces rocks distal from the coast. Although little of the Nain and Makkovik provinces is now covered by glacial sediments, material eroded from all parts of the area is present as glaciofluvial and glaciomarine sand and gravel deposits. These may contain distinctive heavy minerals derived from kimberlitic and lamproitic intrusions located 'up-ice'. Such deposits were the targets of the sediment-sampling program, and included stream and river sands, beach sands, and esker sands. The general picture of the survey area from this perspective may be summarized as follows: i) The Aillik Peninsula and other coastal areas of the Makkovik Province are largely exposed bedrock, covered locally by a thin veneer of organic material. The only surficial sediment suitable for regional sediment sampling is beach deposits, the pebble composition of which indicates a source area ranging from a few to several kilometres to the southwest. ii) The Hopedale block of the Nain Province exposes vast expanses of bedrock, but also has the most extensive surficial cover of the surveyed area, comprising till, glaciofluvial and glaciomarine deposits. iii) The Saglek block of Nain Province, extending from Okakh Bay in the south to Saglek Fiord in the north, is largely exposed bedrock in the upland portions. The large glacial valleys, however, are hosts to a variety of glacial sediments including glaciofluvial outwash, glaciomarine deposits, ablation drift and poorly sorted till.

BEDROCK SAMPLING ON THE AILLIK PENINSULA

Two weeks, at the beginning of the field season, were spent examining the Aillik Peninsula of the Makkovik Province, a part of Labrador that has been known for over 50 years to contain lamprophyric dykes (cf. Kranck, 1939; Gandhi *et al.*, 1969; Hawkins, 1976; Foley, 1982; Malpas *et al.*, 1986), some of which may be related to kimberlitic magmatism. The program was dedicated primarily to the Aillik Bay shoreline, but some inland traverses were conducted, and short excursions were made to the Turnavik Islands and several small islands to the west of Aillik Peninsula.

The coastlines of the Aillik and Makkovik peninsulas and the Turnavik Islands are characterized by many narrow black- to brownish-yellow-weathering dykes, first recognized by Kranck (1939) as being lamprophyric in composition. King (1963), Hawkins (1976) and Foley (1982) provided descriptions of the mesoscopic aspects and structural setting of the dykes, and conducted petrological and geochemical examination of suites of samples to determine compositional and petrogenetic alliances. The reader is directed to these accounts for detailed analyses of the dykes, the discussion below to be aimed toward

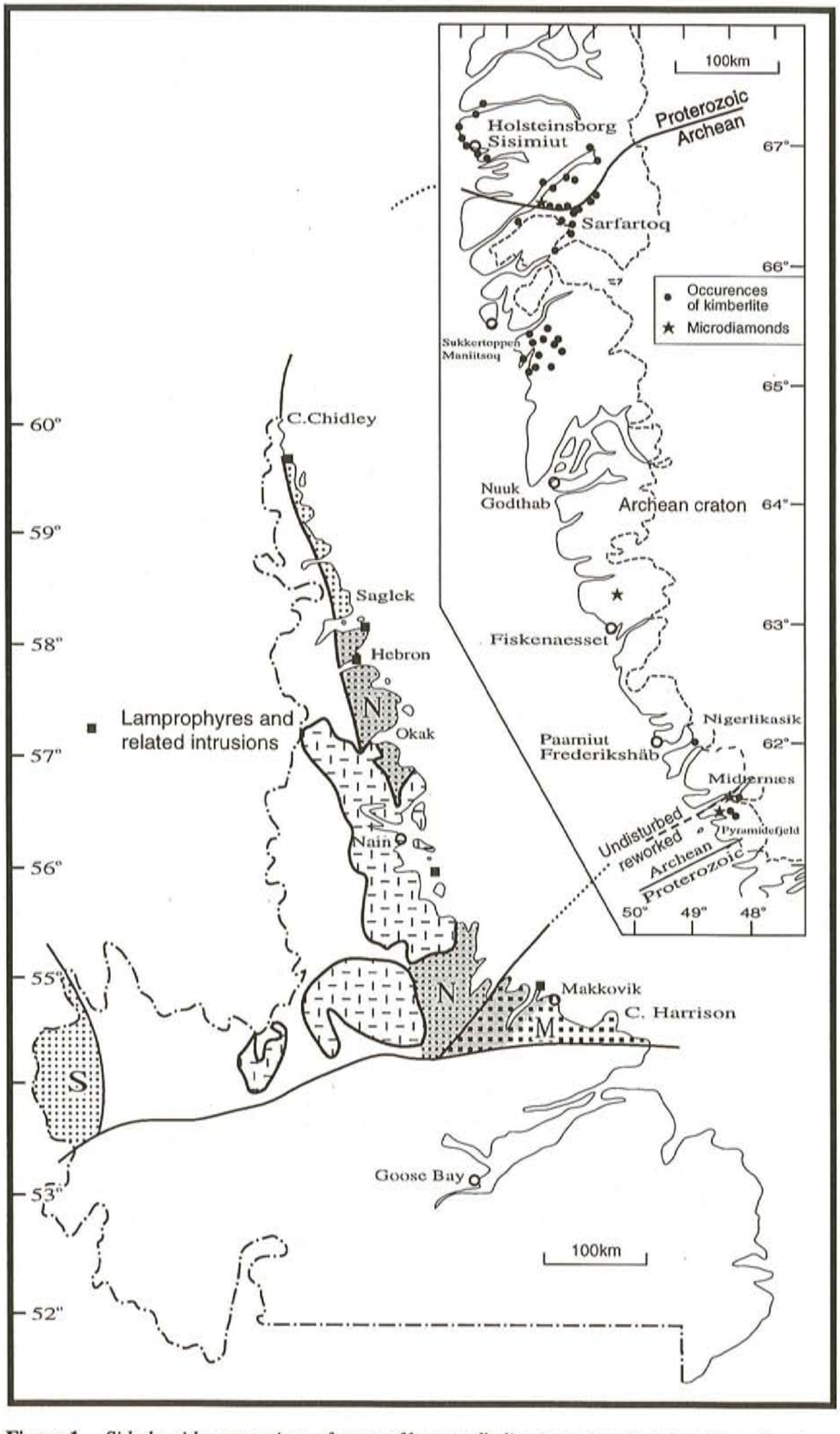

Figure 1. *Side-by-side comparison of areas of known alkaline intrusions in Labrador and western Greenland. Ornamented areas of Labrador are: Archean crust of the Nain (N) and Superior (S) provinces (small dots), reworked Archean crust of the Makkovik Province (larger dots), and Middle Proterozoic anorogenic intrusions (random dashes). Unornamented areas of Labrador are accreted orogens of Proterozoic age, the one between the Nain and Superior containing significant amounts of reworked Archean rocks. Map of Greenland is taken from Greenland Minex News, July, 1993. The area sampled for kimberlite/lamproite indicator minerals in 1994 is shaded.*

only those dykes examined by ourselves. Hawkins (1976) classified the dykes of the Aillik Bay area as chiefly monchiquitic and alnöitic lamprophyres, kimberlites, and carbonatites, and lesser hornblende peridotites and minettes. Malpas *et al.* (1986) re-classified them as aillikites (ultrabasic lamprophyres) and sannites (alkaline lamprophyres) and their terminology is the one adhered to in this paper; the nomenclature used at this juncture in our study is based solely on field criteria because petrographic examination and geochemical analyses have not yet been carried out. To assist the reader, a review of the terminology of lamprophyric rocks as applied to the Aillik Peninsula is given as an appendix to this report.

Dykes are easily spotted on the wave-washed shores of Aillik Bay because their dark colour contrasts with the generally light colour of the Aillik Group and granitic country-rock. Most of the dykes in this area are north-northwest trending, but east–west orientations are also present. Contact relations indicate that the lamprophyric dykes transgress older diorites and diabases; there is one location on a small island off Cape Aillik, however, where a vesicular mafic dyke (an olivine diabase?) truncating aillikite dykes was observed. Relative ages between the aillikite and sannite dykes are established in many outcrops but orientations may vary; for example, a shallowly dipping brown sannite dyke crosscuts subvertical orange aillikites at Cape Makkovik, yet at Cape Aillik where the same relations are shown between dykes it is the older aillikites that are the shallowly dipping intrusions. One outcrop, in which an orange-brown-coloured aillikite dyke crosscuts a dark-brown ocellar sannite, was examined.

The dykes around Aillik Bay commonly occupy linears because they are recessive weathering, but a few are more resistant than the host-rock and stand in relief above the host. They rarely exceed 1 m in width, and many occur as bifurcating and *en echelon* intrusions whose segments are not more than a few tens of metres in length. Morphological features, such as horned terminations and chilled margins, indicate that the dykes were emplaced rapidly via brittle fracture, the conduits being opened by a volatile front ahead of the rising magma (cf. Foley, 1989). Both Hawkins (1976) and Foley (1989) have shown that the orientation of the Aillik Bay lamprophyres is parallel to that of the major fracture systems in the area, but the temporal hiatus between the formation of the fractures and the intrusion of the dykes has not been firmly established. One puzzling feature of the Aillik Bay dyke swarm is that more dykes seem to be present along the coastline than inland. This may be an overall function of exposure and the tendency for most dykes to occupy debris-filled fractures. In some cases, however, the terminations appear real because an attempt was made to trace a few dykes inland along strike at several places, where sufficient outcrop seemed to guarantee visual continuity of the intrusions, but without success.

The following descriptions give the salient field characteristics of the dykes that were examined; other descriptions can be found in references cited above, especially in the theses of Hawkins (1976) and Foley (1982).

The most readily recognized aillikites are brown- to orange-weathering, olivine- and phlogopite-phenocrystic rocks that occur both as subvertical and subhorizontal intrusions. They are usually not more than 25 cm wide, and tend to form swarms of closely spaced, braided dykes and veins (Plate 1); many are layered. They commonly terminate along strike as a series of long pointed fingers. An abundance of olivine phenocrysts, weathering in positive relief above their groundmass, give the aillikite dykes a warty or pimply appearance. Magnetite crystals are prominent in some dykes, and disseminated small grains of a red mineral resembling garnet are present in one dyke at Cape Aillik. Some dykes are characterized by an abundance of country-rock fragments and glimmerite (mica-rich) and pyroxenite nodules (Plate 2).

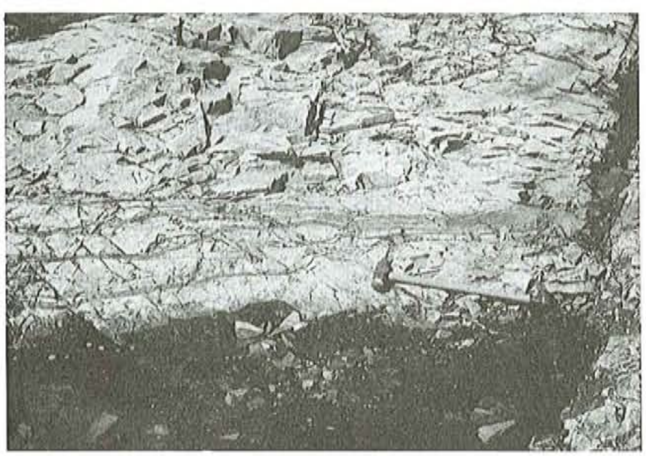

Plate 1. *Streamers of aillikite at left merge into the more coherent single dyke at the right; Cape Aillik.*

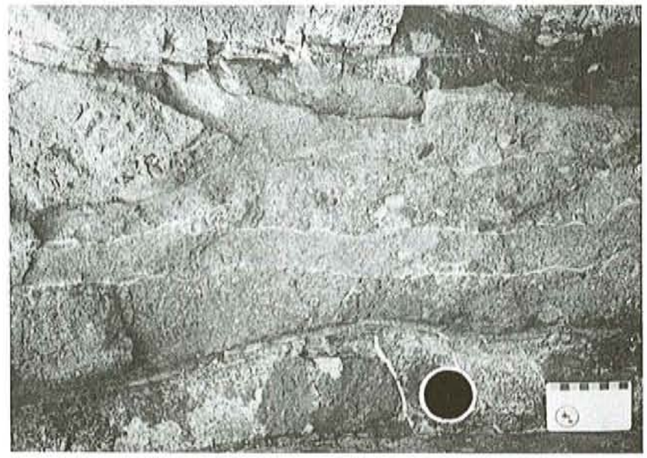

Plate 2. *Nodular inclusions in an aillikite dyke, Turnavik Islands. Note the white carbonate veins.*

Dark-brown-weathering sannites are more common than aillikites. They are massive to well-layered rocks, in many cases displaying ovoid to amoeboid carbonate-dominant ocelli. Scattered black clinopyroxene(?) phenocrysts are conspicuous in some dykes, and 'exotic' nodules and country-rock inclusions are locally abundant. Orange-brown, carbonate-rich selvedges, carbonate-rich fingers at dyke terminations, and carbonate veins that penetrate normal to dyke walls are locally common. Foley (1989) interpreted these to indicate that a carbonate-rich front moved ahead of the magma, but the dyke-normal attitude of some of the veins emanating from the marginal zones suggests that the carbonate-rich fluids migrated along dyke—wall-rock interfaces after the sannites had crystallized and were able to fracture (Plate 3). The similarity of the carbonate-rich parts of the sannite dykes to the aillikite dykes implies that the two dyke types are closely related genetically and temporally. One layered nodule-rich sannite dyke along the inner part of Aillik Bay has numerous strike-parallel serpentine veinlets. A peculiar feature noted in a few of the dykes is that some parts of the layering outline folds having an opposing 'sense of flow', giving rise to a sausage-shaped internal dyke structure that may be a section through an elongate bubble. Some layers in the sannite dykes contain fine acicular crystals of pyroxene oriented normal to the layering trend (cf. Hawkins, 1976), an orientation that can, in one case, be traced around the sausage-shaped structures noted above, indicating that such pyroxene needles are not solely a result of singular nucleation normal to the walls of the dyke as the intrusion cooled, but were generated preferentially in selected layers via some other mechanism.

In addition to the above dykes, there are rare carbonatites and peridotite dykes in the area (Hawkins, 1976; Foley, 1982). One massive, fine-grained, pale-grey to buff-coloured dyke, that appears to be a carbonatite, occurs on the shoreline near Cape Aillik. A crumbly, black- to dark-green-weathering, mica-rich peridotite, having carbonate ocelli, occurs on the east side of Aillik Bay.

A suite of samples from the dykes of the Cape Aillik area was collected for whole-rock geochemical analysis. Also,

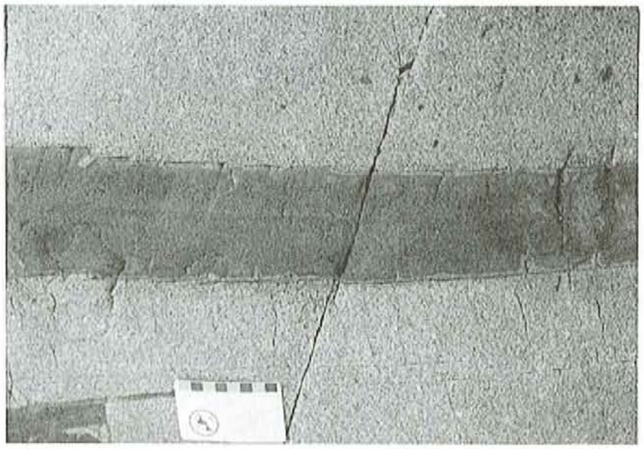

Plate 3. *Pale-coloured margin to this sannite dyke near Cape Aillik is carbonate. Note the migration of carbonate normal to dyke walls, implying infiltration into fractures across a solid dyke.*

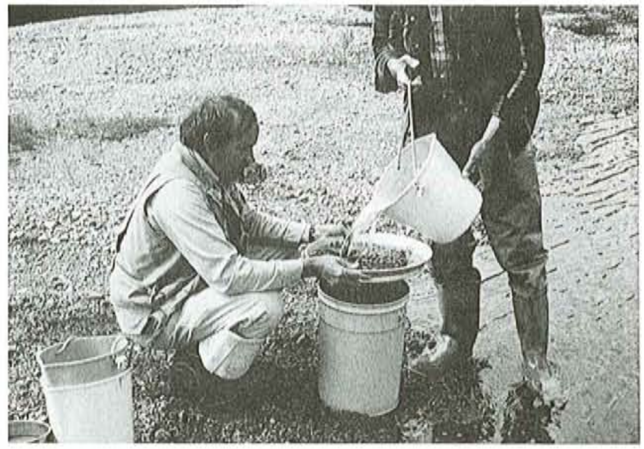

Plate 4. *Wet sieving of a sediment sample collected at a gravel bar in the Ugjuktok River.*

some of the nodular inclusions from the dykes will be examined for indications of eclogitic and garnetiferous peridotitic compositions, features which will provide clues to determine if the magmas were derived from sufficient depth in the asthenosphere to have possibly encountered diamond-bearing lithospheric mantle during ascent. The results of the petrographic and geochemical studies will be presented elsewhere upon completion of the laboratory phase of this project.

SEDIMENT SAMPLING AND ANALYSIS

A surficial-sediment sampling program was designed to provide a broad sweep of glacially derived sands that were considered to have been eroded from Nain Province and the Makkovik Province. The sampling program was devised to provide a maximum coverage based on coastal-sediment collection from several local fly-camps, and on inland collection from helicopter (utilizing 45 hours of flying time). Near-coast samples were collected around Aillik Bay, Ugjuktok Bay and between Okakh Bay and the Kiglapait Mountains. The inland sampling covered the area between Seal Lake and Davis Inlet in the Hopedale block and Makkovik Province in the south, and from Okakh Bay to Saglek Fiord in the Saglek block to the north. The surficial-sampling sites were designated prior to and during the field season, based on examination of maps showing the distribution of glacial sediments, especially the regional map of Klassen *et al.* (1992). Sites were chosen preferentially from areas of reworked glaciofluvial and glaciomarine deposits; in areas lacking such sediment, reworked ablation drift and eskers were sampled. Sixty-four bulk samples of river, stream and beach sediment were collected, wet sieved on site to <4 mm (Plate 4) and stored in heavy plastic sample bags. At most sites, a small sample for geochemistry and a random collection of 20 pebbles were also obtained. The sampling distribution is as follows: Makkovik Province between Aillik Bay and Kanairiktok River = 5 samples, Hopedale block between Kanairiktok River and Davis Inlet = 32 samples, Saglek block between Nain and Saglek Fiord = 27 samples. The bulk samples have undergone some post-season processing at the Department of Natural Resources Laboratory, in St. John's, where they have been dried in ovens and further sieved through a 1-mm mesh screen. The coarse fraction from this sieving has been saved for reference purposes and the fine fraction has been submitted to a commercial processor for heavy-mineral separation. The non-magnetic heavy-mineral fraction will be scrutinised for possible kimberlite-indicator minerals including pyrope garnets, chrome diopside, picroilmenite and chromite. Results of the heavy-mineral analyses are anticipated by late spring.

SUMMARY

A sediment- and bedrock-sampling program was conducted in eastern Labrador during the summer of 1994 in order to ascertain the potential of the region for kimberlitic and lamproitic intrusions. The sediment survey focussed on sands glacially derived from the Archean Nain Province (or craton) and the Archean to Proterozoic Makkovik Province. Most of the sand was collected from glaciofluvial sources, and will be examined for kimberlite- and lamproite-indicator minerals. The bedrock-sampling program was concentrated on the Aillik Peninsula in the Makkovik Province, an area where lamprophyric dykes, which may have a kimberlitic affinity, are locally abundant. The results of microscopic and geochemical studies to be carried out on the sample collection in the near future will be published at a later date.

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APPENDIX

NOMENCLATURE OF LAMPROPHYRIC ROCKS AT AILLIK BAY

The lamprophyric composition of many of the dykes that are exposed on the shoreline in the Makkovik region was first noted by E.H. Kranck in 1939. He recorded olivine + biotite-bearing alnöitic dykes from Aillik village, and briefly described their mineralogy and microscopic character. He was so impressed by the carbonate-rich aspect of some of these dykes that he proposed a new name for them—aillikite—and postulated that the carbonate was a primary magmatic phase. He identified melilite in some, and suggested that nepheline might be present in others. In a later report on the area, Kranck (1953) provided a petrographic breakdown of the lamprophyres, noting that there were alkaline, subalkaline and ultrabasic varieties. Some of the subalkaline lamprophyres (vogesite, kersantite, minette, odenite) that he described are most certainly related to the Kokkovik dioritic intrusions (Ermanovics, 1993). The Kokkovik intrusions are described by Ermanovics (*op. cit.*) as having 'lamprophyric affinities'. Among the ultrabasic lamprophyres, Kranck (1953) recorded monchiquite (a pyroxene + mica rock) and alnöite (an olivine + mica rock), but refrained, at that time, from using the term aillikite for the carbonate-rich types. He described the alnoites as having phenocrysts of olivine and biotite in a fine-grained groundmass of olivine, biotite, magnetite, perovskite and calcite. Monchiquites he described as having less carbonate, and containing abundant augite, in addition to lesser biotite, magnetite and sphene. He speculated that many of the ultrabasic dykes were intruded in a partly crystalline state, thus having a feature in common with kimberlites. King (1963) confirmed the lamprophyric character of many of the dykes on the Aillik Peninsula, and identified other dykes as hornblende peridotite. He presented descriptions of the field and microscopic character of the intrusions. He used Kranck's (1953) terminology, resurrecting the term aillikite for the carbonate-rich alnöites. Unlike Kranck (*op. cit.*), however, King (*op. cit.*) felt that the carbonate was a secondary alteration product in the dykes. He described the monchiquite dykes as comprising biotite phenocrysts in a matrix of poikilitic to euhedral salitic pyroxene, laths of biotite, magnetite, olivine apatite and carbonate. The alnöites, or aillikites, he described as biotite- and olivine-phenocrystic rocks having a groundmass composed of biotite, olivine, pyroxene and carbonate.

Hawkins (1976) was the first to undertake a focused examination of the Aillik Bay lamprophyres. His thesis provides a detailed account of their field and petrographic character, and he identified them as kimberlites, carbonatites and lamprophyres. Hawkins (*op. cit.*) follows the definition of kimberlite given by Mitchell (1970), essential to which is two generations of olivine and phlogopite, thus encompassing some of the alnöitic rocks of previous workers. He called all rocks with over 50 percent carbonate carbonatites. He used the term alnöite for those kimberlite-like lamprophyric dykes that have pyroxene and abundant melilite. For the other lamprophyric dykes, Hawkins (*op. cit.*) followed the nomenclature set out by Williams *et al.* (1955): minettes (orthoclase-bearing and having biotite as the dominant mafic) and monchiquites (feldspar-free rocks having alkali pyroxene or amphibole as the chief mafic). The reader is referred to Hawkins' (*op. cit.*) thesis for an account of the diversity within each category of dyke, but the following summary gives their main mineralogical features. The rocks which Hawkins (*op. cit.*) called minettes contain phenocrysts of biotite, clinopyroxene (augite), and lesser olivine in an alkali feldspar+biotite+augite+opaque oxides groundmass; carbonate ocelli may be present. He subdivided the monchiquites into carbonate-rich and carbonate-poor groups. His carbonate-poor category included rocks having phenocrysts of clinopyroxene, biotite, and opaque oxide (including perovskite) in a very fine-grained host of clinopyroxene, biotite, apatite and opaques. The carbonate-rich category included both porphyritic and non-porphyritic types, each having an abundance of carbonate ocelli. Phenocrysts phases in these dykes are augite, biotite, olivine, and opaque oxide; the matrix includes the foregoing plus calcite, analcime, and apatite. Hawkins (*op. cit.*) has devoted a significant amount of his thesis to very detailed observations on the characteristics of the monchiquitic dykes, including internal banding and termination structures. Kimberlite was the name that he used for dykes containing early crystallized megacrysts of olivine, phlogopite, apatite, and opaque oxides in a porphyritic groundmass of second-generation olivine, carbonate, phlogopite, augitic clinopyroxene, and opaque oxides, commonly having an abundance of glimmerite (mica-rich) and fenitized quartzofeldspathic crustal nodules. He subdivided them into four subtypes (kimberlite (s.s), micaceous kimberlite, carbonate-rich kimberlite and carbonate-rich micaceous kimberlite), locally all having gradational contacts within the same dyke. Carbonate ocelli in these dykes are either carbonate alone, or carbonate in combination with a silicate and opaque oxide; acicular carbonate also occurs within the matrix of these rocks. The petrographic features exhibited by the kimberlites are dealt with at considerable length in Hawkins' thesis (*op. cit.*). He recognized some carbonatites among the Aillik Bay suite, describing primary igneous rocks as fine-grained rocks containing calcite, dolomite, barite, opaque oxides and apatite. Metasomatic carbonatites were described as carbonate, phlogopite, and olivine-bearing rocks in which earlier minerals and textures are recognizable. Alnöite, named on the basis of the presence of melilite, was recognized as comprising a single dyke, characterized by olivine, phlogopite, opaque oxides, augite and apatite, in which melilite forms acicular grains on the margins.

The Aillik Bay dykes were subjected to close scrutiny again in 1980, this time for a thesis by Foley (1982). Foley re-evaluated the compositional spectrum of the Aillik dykes in light of contemporaneous discussions of lamprophyre terminology (Rock, 1977). Although Foley (1982) concurred with Hawkins and named the carbonate-rich rocks kimberlites, he introduced sannite as the name for the alkaline lamprophyres. He preferred sannite to minette and monchiquite (used by Hawkins, 1976) because he demonstrated that nepheline is present, the silica content is low, and the clinopyroxene has sodic (acmitic) rims (cf. Foley, 1989). Within the sannites, he recognized an olivine-rich subgroup (up to 35 percent olivine), but generally the sannites are characterized by Ti-rich salitic clinopyroxene and lesser olivine and poikilitic phlogopite in a matrix of pyroxene, biotite, magnetite, K-feldspar, apatite, nepheline, analcime, carbonate, rutile, and opaques; leucocratic ocellar structures are common. Foley's use of kimberlite for the carbonate-rich rocks was superceded by the re-introduction of the term aillikite by Malpas *et al.* (1986), thus recognizing these rocks as a subdivision of the ultrabasic lamprophyres. Aillikite was used by Malpas *et al.* (*op. cit.*), like Kranck (1953) and King (1963) before them, as a term for ultrabasic rocks having phenocrysts of olivine and phlogopite in a groundmass of carbonate, apatite, mica, magnetite, and perovskite; aillikites lack feldspar and feldspathoids. Glimmerite nodules are locally abundant in aillikite dykes. It is the terms used by Malpas *et al.* (1986) that have been adopted in this report because they make a simple field classification possible: sannites are dark- to grey-brown dykes, banded and are coarsely porphyritic, and have carbonate or carbonate+silicate globules (ocelli); aillikite dykes are yellow-orange-weathering, generally <30 cm wide, are rarely ocelli-bearing, and contain conspicuous mica and olivine megacrysts and glimmerite nodules.