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GRANULAR AGGREGATE-RESOURCE MAPPING IN THE RODDICKTON–MAIN BROOK AREA, GREAT NORTHERN PENINSULA, NEWFOUNDLAND

M.J. Ricketts and S.V. Vatcher
Geochemistry, Geophysics and Terrain Sciences Section

ABSTRACT

In 1992, a regional granular aggregate-resource mapping program commenced on the west coast and northern tip of the Great Northern Peninsula, aimed at locating suitable granular aggregate deposits for local community needs and for use by the construction industry. The project was initiated because of the demand for, and a general lack of, good-quality granular aggregate materials. In 1995, the mapping program was extended to the eastern part of the Great Northern Peninsula to cover the area around Roddickton and Main Brook.

This report provides preliminary results of 1:50 000-scale aggregate mapping around Roddickton and Main Brook. The largest known aggregate deposits are located near Conche, First Salmon Pond and Beaver Brook. Update work in NTS map area 12I/4, on the west coast of the Great Northern Peninsula, resulted in sampling a large deposit near the end of Five Mile Road. This deposit is possibly the largest gravel and sand deposit north of Gros Morne National Park.

INTRODUCTION

Aggregate-resource mapping is an ongoing regional-mapping program conducted in areas where existing aggregate maps are either outdated or preliminary, and, where there are aggregate shortages. The earlier 1992 field season marked the beginning of a regional granular aggregate-resource mapping program on the Great Northern Peninsula (Ricketts and House, 1993). This project was initiated as a result of increased aggregate demand and a general lack of good-quality aggregate. Aggregate shortages in this area are a long-term problem (Vanderveer, 1980); the first year of this project covered the west coast and northern tip of the Great Northern Peninsula (NTS map areas 2M/5, 6, 11, 12, 12I/4, 5, 6, 11, 14, 15, 12P/2, 7, 8 and 9, Figure 1). In 1995, the project was extended to cover the Roddickton–Main Brook map area (NTS map areas 2L/13, 2M/4, 12I/9, 12I/16 and 12P/1, Figure 2). As a result of earlier preliminary investigations along the Five Mile Road deposit, in NTS map area 12I/4 (Figure 3), further investigations were considered necessary. These investigations were conducted near the end of the 1995 field season.

Mineral aggregates, as used in the context of this report, are defined as any hard, inert material such as gravel, sand, crushed stone or other mineral material that is used in the construction industry (Carter, 1981; Rutka, 1976). Aggregates are used extensively in all types of construction activities related to domestic, industrial or other developments. Natural sand, gravel and crushed rock aggregates are fundamental to the man-made environment and represent a large proportion of the materials used in the construction industry (Smith and Collis, 1993). Road construction is another major use of aggregate material in Newfoundland and Labrador. Municipal water and sewer systems, driveway construction, backfill and building foundations all require aggregate.

The guidelines from the Newfoundland Department of Works, Services and Transportation (1987) specify three categories of aggregate materials; 1) aggregates less than 19 mm in diameter with a specified proportion of finer grain sizes and 3 to 6 percent silt–clay and used as Class A gravel: aggregates between 19 mm and 102 mm in diameter with a specified proportion of finer grain sizes and 3 to 6 percent silt–clay and used as Class B gravel; 2) processed to mix with a cementing agent to form concrete, asphalt and mortar; and 3) unprocessed, out of pit material.

Not all quarry materials are suitable as aggregate. Vanderveer (1983) defined the quality of mineral aggregate by its composition. Aggregates containing too much or too little silt and clay when used in road construction can cause instability, such as flowage in the case of too much fine material, or the loss of compaction properties in the case of too little fine material. Too much fine material in concrete (> 2 percent) can interfere with the bonding process between the

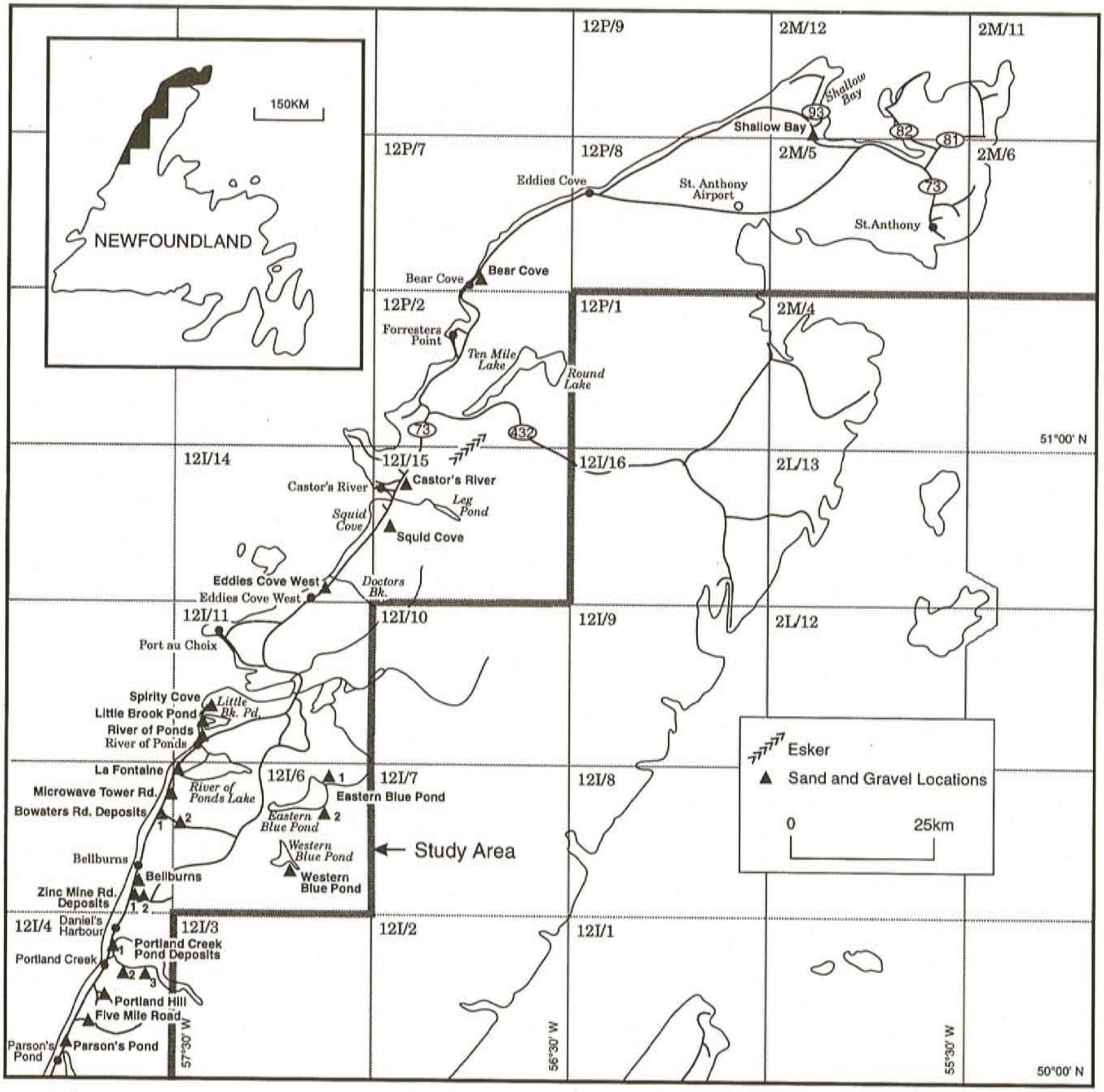

Figure 1. *Sketch map illustrating the 1992 field area; also shown are the locations for the sand and gravel deposits.*

aggregate and the cementing agent. The presence of deleterious substances such as silt–clay coating or iron-oxide staining on the surface of the aggregate, and the presence of blade-shape fragments, often cause bonding problems with the cementing agent, and/or the breakdown of aggregate with time.

Aggregates are a high-volume, low-cost material. The cost of transport represents about 30 percent of the delivered price (Vanderveer, 1982). Thus, the location of resources relatively close to the users is important. In the case of insular Newfoundland, the situation of users (throughout the entire 112 000 km^2 island) makes a regional mapping project of resources vital. Some areas of the Great Northern Peninsula severely lack sand and gravel deposits. In many areas, deposits of granular material are both thin and discontinuous. This partly accounts for the large number of shallow borrow pits in the area, some covering significant acreage. Rock quarries, and rock rubble where aggregate can be mined without blasting have also been utilized to secure sufficient

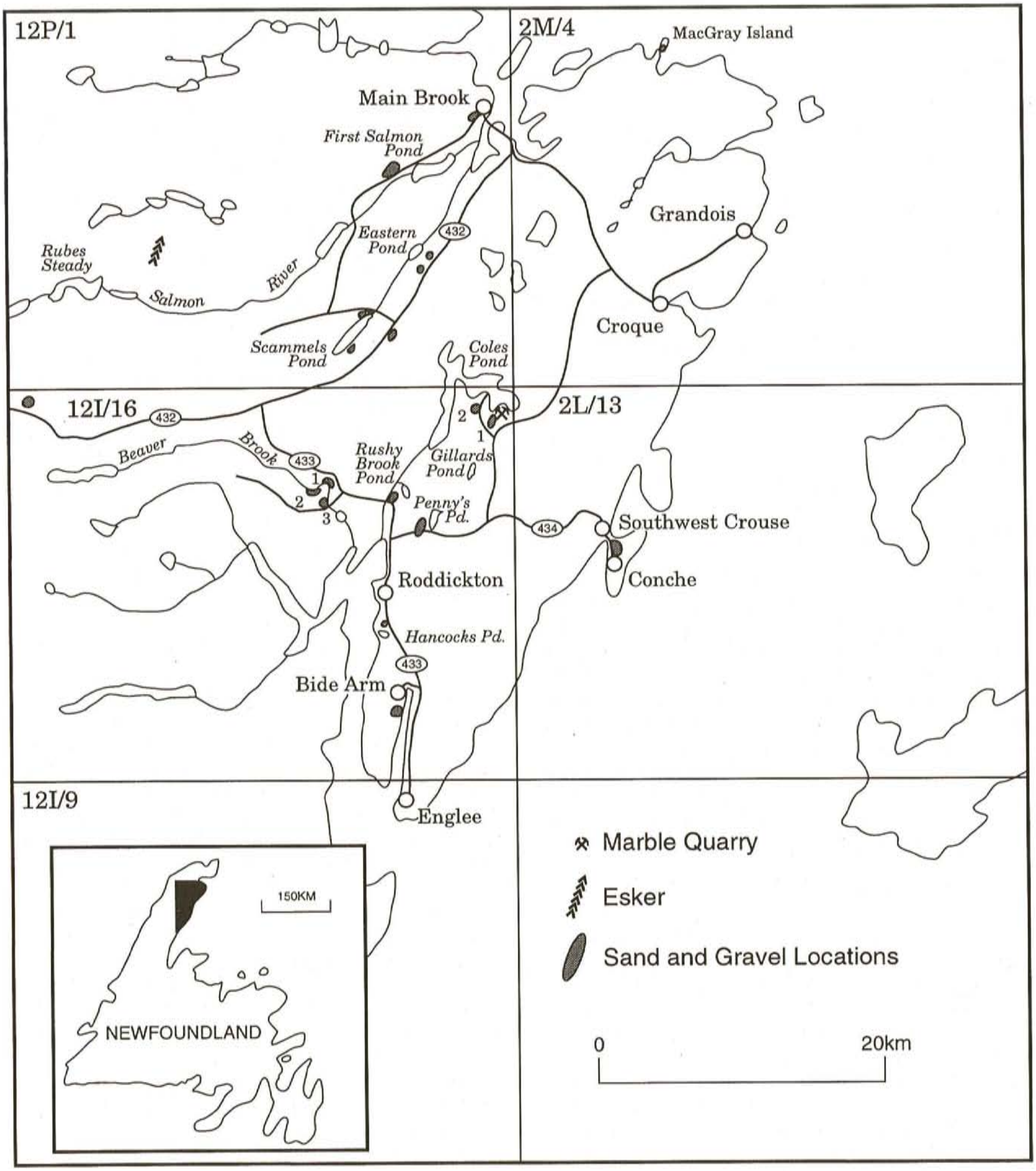

Figure 2. *Sketch map illustrating the 1995 field area; also shown are the locations for the sand and gravel deposits.*

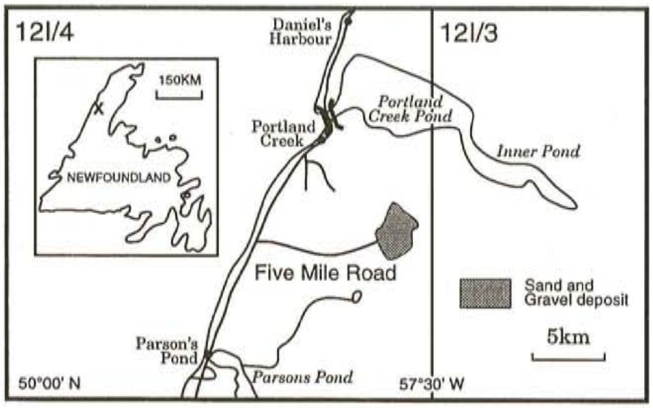

Figure 3. *Five Mile Road gravel and sand deposit.*

supplies of aggregate and fill. In many areas, there is concern about road-side quarries being used as dumping grounds for household garbage, car wrecks and other discarded items, and waste material associated with quarrying operations. By finding alternative aggregate sources, away from road sides, and regulating quarry activity it may be possible to minimize these problems in the future.

The objectives of the aggregate-resource mapping program are to locate, map and sample sand, gravel and till materials. Field sampling concentrated on raised marine deposits consisting of deltas and beaches, which are the major sources of sand and gravel in this area. Sampling to locate tills with low silt content was also conducted. Till is generally regarded as poor-quality aggregate, due to its large silt–clay fraction, and therefore was given less attention during field investigations. Results will help road builders, contractors and consultants determine sources and quality of material available in a given area, and evaluate transport distance for these materials to a specific job site.

PREVIOUS WORK

Surficial geological mapping at 1:50 000 scale (based largely on reconnaissance aerial photographic interpretation) has been completed for most of the field area (Kirby *et al.*, 1989). Detailed surficial mapping has been completed for NTS map area 12I/4 (Proudfoot and St. Croix, 1991). Previous surficial mapping indicated that most of the study area was below sea level several times, resulting from glacial advances and retreats, and Grant (1972a and b; 1992) estimated that sea level was once 150 m above the present day level. The Great Northern Peninsula was covered by ice during the Late Wisconsinan and the subsequent rebound has left many marine deposits well above present day marine limits. Numerous raised marine deposits such as beaches and deltas are located several kilometres inland from the present day shoreline. If volumes are large enough these raised marine deposits could be a good aggregate source.

An aggregate-resource study was conducted by the provincial geological survey from 1978 to 1982 (Environmental Geology Section, 1983a and b; Kirby *et al.*, 1983) that covers a 6-km-wide corridor along all major roads and a wider radius around towns and cities in Newfoundland and Labrador. In addition to these data, geotechnical bedrock maps were compiled at a scale of 1:250 000 (Bragg, 1986). Bedrock-aggregate mapping at a scale of 1:50 000 was conducted on the Northern Peninsula (Bragg, 1992, 1994a and b) to locate suitable bedrock deposits in areas where granular aggregates are scarce and/or of poor quality.

MAPPING AND ANALYTICAL METHODS

Field work was undertaken in a similar manner to that outlined by Kirby *et al.* (1983). Interpretation of 1:50 000-scale black-and-white airphotos was used to locate potential deposits of sand and gravel. Following this, interpretation of coloured airphotos at 1:12 500 scale was conducted in selected areas based on deposit type (e.g., marine, glacio-fluvial, till) to delineate deposit boundaries. Where exposures were present, field sampling was carried out at 0.5 to 1.0 km intervals in outwash deposits, and at 1.5 to 2 km intervals in till. Additional samples were taken in each deposit wherever sediment type changes were observed, where quality differences were apparent, or wherever sediments of variable quality or texture could potentially be quarried separately.

Where possible, samples were taken from natural exposures such as stream-cuts, shorelines, and gullies or from man-made exposures such as road cuts, and pit and quarry excavations. Where these types of exposures were not available, samples were collected from 1-m-deep hand-dug pits. In total, 83 sites were examined and 50 samples collected in the study area. The samples consisted of 19 gravels and sandy gravels, 17 till, 11 sand and 3 silt.

Sampling provided material for petrographic and grain-size analyses, and Los Angeles Abrasion (ASTM Standards C88-83, 1990) and Soundness Tests (ASTM Standard C 131-89, 1990). Approximately 15 kg of material was collected for field sieving. Field sieving and petrographic analysis were performed on all samples containing >8mm-size material. A split (70 to 140 g) of the sand–silt–clay fraction (<8mm) was retained for laboratory sieve analysis, which involved drying and splitting the sample to a manageable size (70 to 140 g) and wet and/or dry sieving of each sample following the procedures outlined by the Geological Survey (Ricketts, 1987). A computer graph program (available at the Geological Survey, Department of Natural Resources) is used to plot results as cumulative curves to calculate percentages of gravel, sand, and silt–clay or individual sieve percentages for each sample (Ricketts, 1993). Los Angeles Abrasion and Soundness Test are currently unavailable.

CLAST-TYPE ANALYSIS

Aggregate samples were examined to determine the petrographic characteristics (Bragg, 1990; Ontario Ministry of Transport, 1987; Canadian Standards Association, 1973) of the pebble fraction (16 mm to 32 mm) as a preliminary means of determining aggregate quality for construction purposes. On the basis of petrographic examination, a petrographic number is assigned to each aggregate sample. The petrographic number, which can range from 100 to 1000, is derived by taking the sum of the percentage of each rock type present in the pebble fraction (in a sample of approximately 100 pebbles) multiplied by a petrographic factor (based on soundness and durability) assigned to that rock type. The petrographic factor is determined mostly by type and grain size of the rock in a given sample, and also by the presence of silt–clay coatings, weathering, staining, degree of sphericity, rounding and fractures. The lower the petrographic number, the better the quality of aggregate material. For example, a clean, hard, fresh granite would normally have a petrographic number of 100, whereas for a friable, soft shale it would be 1000. Most surficial aggregate deposits contain a combination of different rock types with different petrographic factors. The proportion of each of these components determines the petrographic number (Table 1). Petrographic numbers may be regarded as subjective in defining aggregate quality but this information does determine if the aggregate is good or poor, and whether there is a need to conduct additional analytical procedures to determine quality. For most purposes, aggregate material used in concrete requires a petrographic number of 135 or less, whereas in road asphalt and Class A and B gravels a petrographic number of 150 or less is acceptable (Newfoundland Department of Works, Services and Transportation, 1987). Petrographic numbers above 150 are regarded as high and indicate a need to conduct other analytical procedures.

Pebble roundness, the number of fracture faces and their sphericity are important considerations in using an aggregate for concrete. These factors affect the bonding capabilities of concrete, and the amount of water necessary to make a concrete that has a direct relation on the strength of a concrete (Committee 363, 1992).

PHYSIOGRAPHY AND GEOLOGY

Large segments of the map area are covered by bare rock or rock covered by thin soil layers and vegetation, and numerous small bog patches can be found in depressions in the rock. Marine sediments are present in some areas where sea levels have dropped. Raised marine ridges are common along the north coast but these are thin (usually less than one half metre thick) and are not suitable for quarry development. Marine sand and gravel are common in some valleys and other low lying areas.

Table 1. Example illustrating how to calculate a petrographic number for a granular aggregate sample containing more than one rock type

Rock type	# of pebbles	Petrographic %	Factor
shale	12	22 x 10 =	220
granite	27	50 x 1 =	50
sandstone	10	19 x 3 =	57
schist	5	9 x 6 =	54
		Total =	381
Petrographic Number		=	381

Thin and discontinuous tills are located along the western part of the map area. Lineated till ridges, generally 500 to 1000 m long, are common along the northern part of NTS map area 12I/16, and the southwest quarter and parts of the southeast of NTS map area 12P/1. These lineated ridges contain tills of varying granular composition. Bare rock knobs and rock concealed by thin soil layers and vegetation are found between these till ridges.

The study area can be divided into two distinctive geological zones. These are, the St. George Group and Table Head Formation in the west, and the allochthonous sedimentary rocks, volcanic and ultrabasic rocks in the east. The common rock types found in the map area are limestone, dolostone, greywacke, slate, conglomerate, sandstone, siltstone, tuff, basalt, diorite, gabbro, shale, gneiss and granite (Stouge, 1983a and b; and Smyth, 1982).

POTENTIAL DEPOSITS

The following are brief descriptions of the larger known granular deposits in the 1995 study area (Figure 2, Table 2). The descriptions include deposit location, dimensions, exposure types, grain-size analyses and petrographic results for each deposit. Grain-size and petrographic analyses are based on a compilation of sample data collected during 1995 and previous sampling programs since 1977. These deposits are located at Conche, MacGray Island, Coles Pond, Beaver Brook, Route 432, First Salmon Pond and Rubes Steady.

Conche

A marine terrace (Plate 1), located in the vicinity of an abandoned airfield between the communities of Conche and Southwest Crouse, is being used as an aggregate source for these two communities. It is approximately 500 m long, 70 m wide and 4 to 8 m thick. Grain-size analyses of three samples taken from quarry exposures show an average 82.2 percent gravel, 17.4 percent sand and 0.4 percent silt-clay. The quarry is 200 m long and 50 to 70 m wide indicating that more than half of this deposit remains for future aggregate use.

Table 2. Summary results of the sand and gravel analyses of aggregate samples collected in the Roddickton – Main Brook area, Newfoundland

		Grain-size Analyses				Petrographic Analyses			
Deposit	Estimated m^3	No. of samples analyzed	% Gravel +5 mm	% Sand +78 μm to 5 mm	% Slt-Cly -78 μm	No. of samples analyzed	Petro. range	Petro. average	Comments
Conche	224 000	3	82.2	17.4	0.4	3	300-479	385	Gravel from quarry in marine terrace
MacGray Island	22 500	1	81.8	18.1	0.1	1	112	112	Gravel from marine terrace
Coles Pond 1	60 000	1	68.4	30.7	0.9	1	171	171	Gravel from abandoned quarry with 2 to 3-m-high exposure Generally less than boulder size material
Coles Pond 2	30 000	1	57.6	41.1	1.3	1	335	335	Gravel from abandoned quarry in marine terrace with 2-m-high exposure. Contains shell fragments
Beaver Brook 1	16 000 to 300 000	1	76.8	20.7	2.5	1	272	272	Gravel from 10-m-high river bank exposure.
Beaver Brook 2	900 000	3	2.9	93.0	4.1	3	266-348	312	Fine to coarse sand from 6-m-high river bank exposure
Beaver Brook 3	30 000	2	45.0	48.3	6.7	1	334	334	Gravel and silt-sand-gravel from 2-m-thick deposit, underlain by marine silt and clay
Route 432	1 000	1	34.8	52.5	12.7	1	260	260	Data analyses from one of numerous till ridges
First Salmon Pond	156 750	4	42.5	56.0	1.5	3	131-153	140	Glaciofluvial sand and gravel visible along 3-m-high quarry exposure
Rubes Steady	48 000	1	71.2	28.1	0.7	1	237	237	1.5-km-long esker
Five Mile Road	45 000 000	5	69.8	29.4	0.8	5	102-167	131	Sand and gravel from glaciofluvial terrace

Note: Estimated quantities in table are based on airphoto analysis and field investigation along road cuts, shallow hand-dug pits and natural exposures. Grain-size percentages are based on a compilation of sample data for each deposit.

Plate 1. *Gravel quarry in marine terrace deposit near the communities of Conche and Southwest Crouse (NTS 2L/13).*

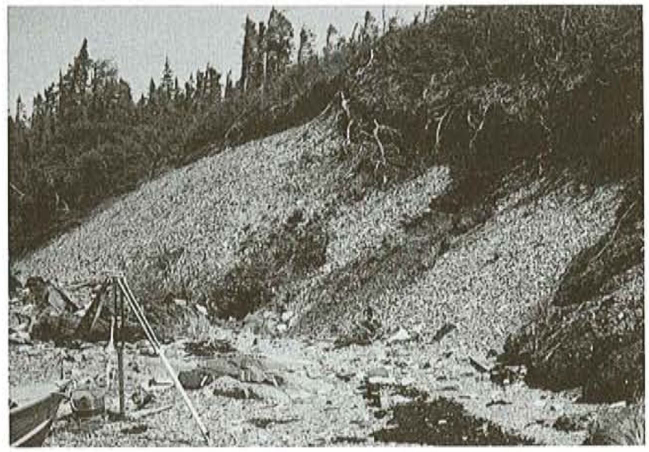

Plate 2. *A 3.5-m-high gravel exposure along the shoreline in a delta deposit (NTS 2M/4).*

The pebble fraction generally consists of low sphericity, subangular pebbles having 4 to 6 fracture faces. Pebble types include siltstone, medium and coarse sandstone, dolomite and highly weathered undefined pebbles. Petrographic quality is poor with petrographic numbers ranging from 300 to 479 (Table 2). These high petrographic numbers are mainly the result of intensely to highly weathered undefined pebbles (25 percent) and weathered to highly weathered siltstone and sandstone (50 percent).

MacGray Island

The MacGray Island deposit (Plate 2) is a marine delta situated near the southwest tip of MacGray Island, in the north end of NTS map area 2M/4. This deposit is approximately 100 m long, 75 m wide, and up to 3.5 m thick along a shoreline exposure. Grain-size analyses of sampled material collected from a 3-m-high shoreline exposure indicate this deposit consists predominantly of pebble gravel, with over 75 percent of grain sizes between 4 mm and 32 mm.

The pebble fraction has very low sphericity, is subangular, and has 4 to 6 fracture faces. Pebble rock types consist of 95 percent limestone, 3 percent granite, 1 percent siltstone and 1 percent fine sandstone. Good petrographic quality in this deposit is due to the high percentage of fresh, hard limestone pebbles, resulting in a low petrographic number (Table 2).

Coles Pond 1

The Coles Pond 1 deposit (Plate 3) is situated in the northeast corner of NTS map area 12I/16, less than 500 m from the Coles Pond marble quarry. This marine gravel deposit is situated in a valley area with outcrops on the west side and a stream bordering the east side. Remaining reserves in this deposit cover an area approximately 600 m long, 50 m wide and up to 3 m thick. Grain-size results of sampled material taken from a 2.9 m exposure along the face of an abandoned quarry (Plate 3) shows 68.4 percent gravel, 30.7 percent sand and 0.9 percent silt–clay.

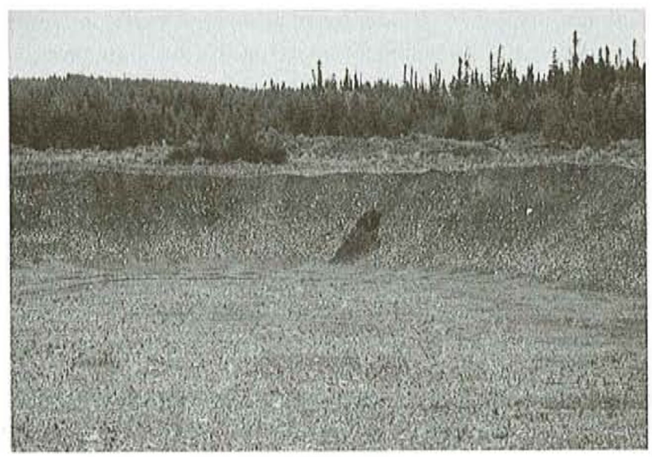

Plate 3. *Gravel quarry in the Coles Pond 1 deposit (NTS 12I/16).*

Pebble types consist mainly of limestone and minor amounts of dolostone, and lesser amounts of fine sandstone, quartz pebbles, gneiss and highly weathered undefined pebbles. Petrographic quality is reduced by the presence of shale and moderately weathered dolomite, and highly weathered sandstone and undefined pebbles, resulting in a high petrographic number (Table 2).

Coles Pond 2

The Coles Pond 2 deposit is located approximately 1 km west of the Coles Pond 1 deposit in the northeast corner of NTS map area 12I/16. This marine gravel deposit is situated in a depression between rock knobs. Remaining reserves cover an area approximately 150 m long by 100 m wide. Grain-size analyses of sampled material taken from a 2-m-high quarry exposure show 57.6 percent gravel, 41.1 percent sand and 1.3 percent silt–clay.

Pebble type consists mainly of fresh to slightly weathered limestone, and minor amounts of slightly weathered to moderately weathered siltstone and medium-grained sandstone. Poor petrographic quality is due to weathered limestone, sandstone and siltstone, resulting in a high petrographic number (Table 2).

Beaver Brook 1

The Beaver Brook 1 deposit (Plate 4) is situated along the north side of Beaver Brook, less than 1.5 km south of Route 433, 10 km from Roddickton. Airphotos show little change from the gravel site location to the surrounding till deposits. Site and sample data indicate the deposit is either a narrow gravel zone along Beaver Brook measuring 160 m by 10 m by 12 m or a deposit that may extend inland from Beaver Brook covering an area by about 160 m by 150 m by 12 m. Further work will be required to define the correct deposit size. Analyses of sample material indicate this deposit contains 76.8 percent gravel, 20.7 percent sand and 2.5 percent silt–clay.

Petrographic analyses of sampled material show that this deposit contains nine rock types, some showing varying degrees of weathering. These rock types consist of 50 percent dolomite, 21 percent limestone, 10 percent shale, and minor quantities of granite, siltstone, sandstone, gneiss, arkose and some highly weathered undefined clasts. The pebbles have very low sphericity, are subangular and have 5 to 6 fracture faces. Poor petrographic quality is mainly the result of 10 percent shale content and high weathering in 15 percent of the dolomite pebbles, resulting in a high petrographic number of 272 (Table 2).

Beaver Brook 2

The Beaver Brook 2 deposit (Plate 5) is situated on the south side of Beaver Brook, 1 km north of a forest access road, 3 km to Route 433. The deposit is approximately 1 km long and 150 m wide. Three samples were taken from different stratigraphic units at 2-m-high intervals, along a 6-m-high river-bank exposure. Analyses of these samples

Plate 4. *Gravel along 12-m-high exposure in the Beaver Brook 1 deposit (NTS 12I/16).*

Plate 5. *Sand along 6-m-high exposure in the Beaver Brook 2 deposit (NTS 12I/16).*

indicate a fining downward sequence from top to bottom having coarse- to medium-grained sand at the top and medium to fine sand and silt–clay near the bottom of the exposure. Averaged sample analyses show 2.9 percent gravel, 93 percent sand and 4.1 percent silt–clay.

Petrographic analyses for this sand deposit were done on grain sizes from 1 to 4 mm with the aid of a stereo-microscope. Larger grain sizes were not present. Grain types consisted of 45 percent fresh to highly weathered sandstone, 24 percent quartz grains, 18 percent granite, 8 percent arkose, 2 percent gabbro and 2 percent siltstone. High petrographic numbers, ranging from 266 to 348 (Table 2), result from 40 percent slightly weathered to intensely weathered sandstone grains.

Beaver Brook 3

The Beaver Brook 3 deposit is situated at the intersection of Beaver Brook and a forest access road, 3 km southwest of Route 433. This marine gravel deposit is approximately 200 m long, 100 m wide and 1 to 2 m thick. Site investigations along the stream bank show sandy gravel and silty sandy gravel, underlain by marine silt–clay. Grain-size analyses of two samples taken from the gravel unit show an average of 45 percent gravel, 48.3 percent sand and 6.7 percent silt–clay.

Pebbles in this deposit have medium sphericity, are subangular to subrounded and have 5 to 7 fracture faces. Pebble types consist of 33 percent limestone, 28 percent dolomite, 14 percent siltstone, 10 percent sandstone, 7 percent, high to intensely weathered, undefined pebbles, 5 percent shale and 3 percent granite. The poor petrographic quality is the result of the shale content and the highly to intensely weathered undefined pebbles (Table 2).

Route 432

Numerous lineated till ridges are located in the northern part of NTS map area 12I/16 and the southern part of NTS map area 12P/1. These till ridges may provide a source of granular aggregate if local sand and gravel sources are not available. One of these till ridges was sampled in the northwest corner of NTS map area 12I/16, along a forest access road, 2 km east of Route 432. This till deposit is 100 m long, 25 m wide and 4 m thick and the grain-size analysis of one sample, collected from a 2.5-m road cut, contained 34.8 percent gravel, 52.5 percent sand and 12.7 percent silt–clay (Table 2). Grain sizes were dispersed nearly evenly throughout all sieve fractions.

Pebbles in this deposit have low sphericity, are subangular to subrounded, and have 3 to 7 fracture faces. Pebble types consist of 41 percent fresh and highly weathered granite, 40 percent slightly weathered to moderately weathered sandstone, 11 percent fresh limestone, 6 percent shale and 2 percent phyllite. A high petrographic number of 260 is the result of the shale content, and the weathered sandstone and granite.

First Salmon Pond

The First Salmon Pond deposit (Plate 6) is located along a forest access road, 1 km northwest of Salmon River, near the mouth of Salmon Pond. Sand and gravel in this deposit are used to supply aggregate for the Main Brook area. This glaciofluvial deposit covers an area approximately 550 by 50 m, and is 2 to 10 m thick. Grain-size distribution is variable throughout the deposit, ranging from 47 percent to 96 percent sand. Average grain-size results determined from analyses of four samples collected from quarry exposures show 42.5 percent gravel, 56 percent sand and 1.5 percent silt–clay.

Plate 6. *Sandy gravel exposure in the quarry near First Salmon Pond (NTS 12P/1).*

Pebbles have medium sphericity, are subrounded and have 4 to 7 fracture faces. The good petrographic quality is due to the high percentage of fresh limestone pebbles (Table 2). Petrographic numbers are higher for sampled material where minor shale and weathered sandstone are present.

Rubes Steady

An esker sampled north of Salmon River is situated in dense woods approximately 4 km northeast of Rubes Steady. This dissected esker deposit is not accessible by road and is far from potential markets. The esker is 1 km long, 12 m wide and 2 to 5 m high. Grain-size results, determined from material collected from a 1-m-deep hand-dug pit, show 71.2 percent gravel, 28.1 percent sand and 0.7 percent silt–clay.

The pebbles have low sphericity, are subrounded and have 5 to 6 fracture faces. Pebble types consist of 59 percent fresh to moderately weathered fine- and medium-grained sandstone, 27 percent fresh to moderately weathered limestone, 5 percent shale, 5 percent quartzite and 4 percent granite. Poor petrographic quality is due mainly to weathered shale, sandstone and limestone (Table 2).

Other Smaller Deposits

Several other deposits were investigated during the field season. These deposits were depleted by previous aggregate removal or are too small in size to set up a quarry operation. Some of these deposits include those near Gillards Pond, Rushy Brook Pond, Hancocks Pond and Bide Arm, Main

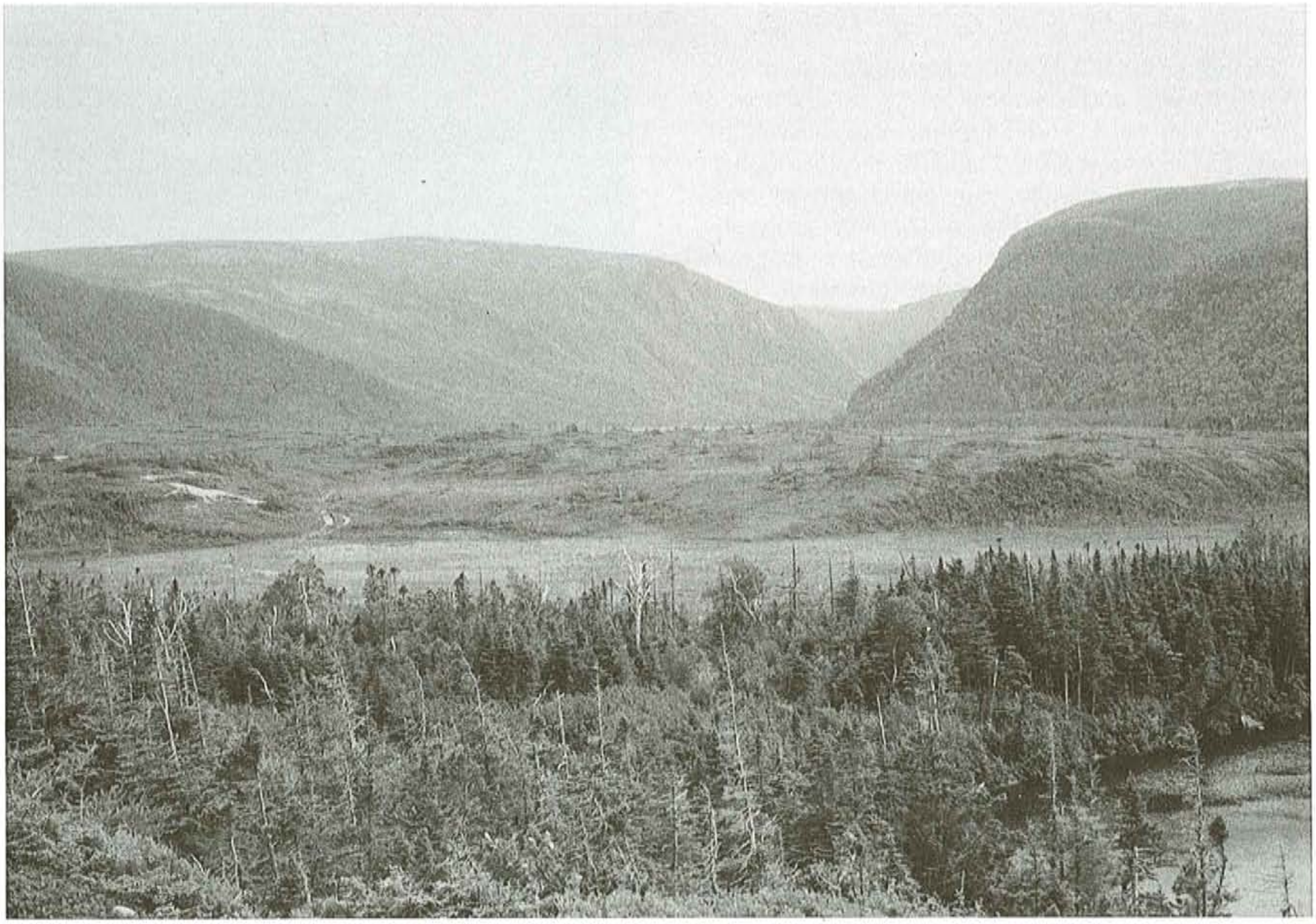

Plate 7. *Glaciofluvial terrace deposit near the end of Five Mile Road (NTS 12I/4).*

Brook, Eastern Pond, Scammels Pond and Penny's Pond. These smaller deposits have low silt–clay content and variable petrographic qualities.

Review Work (NTS Map Area 12I/4)

The NTS map area 12I/4 contains granular aggregate sources consisting of marine, glaciofluvial and aeolian deposits (Grant, 1986; Kirby *et al.*, 1983; Proudfoot and St. Croix, 1991). In 1992, a sampling program was conducted in most of these areas. Update work in 1995 focused on the Five Mile Road deposit (Ricketts and House, 1993) southeast of Portland Creek (Figure 3, Plate 7). This deposit is 5.5 km east of Route 73 and is accessible by a poorly maintained gravel road. The deposit covers a 2- to 3-km^2 area and is up to 18 m thick. It is possibly the largest deposit of sand and gravel on the Great Northern Peninsula, north of Gros Morne National Park.

Grain-size analyses of 5 samples collected from stream (Plate 8) and road side (Plate 9) exposures indicate that the deposit contains 69.8 percent gravel, 29.4 percent sand and 0.8 percent silt–clay (Table 2). Pebbles have low to medium sphericity, are subrounded to subangular and have 6 to 9 fracture faces. Pebble rock types consist of 67 percent granite, 9 percent gneiss, 9 percent diorite, and minor quartz pebbles, quartzite, volcanic rocks, gabbro and sandstone. Good petrographic quality in granular samples is due to a high percentage of fresh, hard granite and diorite pebbles.

Favourable grain-size analyses and good petrographic results indicate this will be a good aggregate for use in concrete or road-construction projects. However, the distance from the main highway, remoteness from potential markets and cabin development in the area will have negative effects in developing this deposit as a source of aggregate material.

SUMMARY

The Roddickton–Main Brook area has a few, large, good-quality, granular aggregate-resource deposits. The area is covered by thin granular deposits overlying bedrock. Marine

Plate 8. *Gravel in 3.5-m-high stream cut in glaciofluvial terrace near the end of Five Mile Road (NTS 12I/4).*

Plate 9. *Gravel in 2-m-high exposure in glaciofluvial terrace near the end of Five Mile Road (NTS 12I/4).*

gravels are present in many areas but these deposits are not substantial enough to allow quarry activity. Tills in the area are generally silty in texture and only suitable as fill material.

Most deposits are small and have been quarried in the past or are inaccessible. These deposit types include those located at MacGray Island, Coles Pond, Beaver Brook 3, the till ridge near Route 432, and the esker near Rubes Steady.

Low silt–clay content is necessary for aggregates used in concrete and asphalt. All gravel deposits sampled in the Roddickton–Main Brook area meet this requirement. Deposits 2 and 3 at Beaver Brook have 4.1 and 6.7 percent silt–clay, but even these are within a suitable range to meet standards for most construction requirements. Low silt–clay content reduces the need for washing the material, thereby reducing overall cost. In some areas, screening or crushing may be necessary to remove the coarse aggregate fraction.

Results of petrographic analyses indicate a variable petrographic quality throughout the study area. Only aggregate at Salmon River, Five Mile Road and MacGray Island show petrographic numbers low enough to indicate suitable aggregate material for use in asphalt and/or concrete type projects. The deposit at MacGray Island is inaccessible by road and is too small to be considered for a quarry operation. Other deposits show variable quality and may require other analytical procedures to determine their suitability for use in concrete such as those outlined by the Canadian Standards Association (1973).

There are adequate aggregate reserves in the Conche area to supply the local market, although quality may vary throughout the deposit. A deposit near First Salmon Pond will continue to be the main source of aggregate for Main Brook for many years. If deposits at Beaver Brook are proven to be substantial enough and access roads are constructed, these deposits could be used as an aggregate source (depending on future test results and Canadian Standards Association requirements for projects) for the communities of Roddickton, Bide Arm and possibly Englee. Demand for granular aggregate in the communities of Croque and Grandois is small but the only nearby sources of material consist of thin silty till and small pockets of silty marine gravel, which are suitable only for fill. Supplying high-quality aggregate to these areas will require trucking over long distances, or blasting and crushing suitable bedrock. Shipping aggregate by water is an unlikely alternative in this area because of the low demand.

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REFERENCES

ASTM Standards
1990: Annual Book of ASTM Standards Section 4, Construction, Volume 04.02, Concrete and aggregates, C88-83, C131-89.

Bragg, D.J.
1986: Geotechnical bedrock compilation maps of

Newfoundland. Scale 1:250 000 (supplemental Report 83-2). Newfoundland Department of Mines and Energy, Mineral Development Division, Open File NFLD/1485.

1990: Reconnaissance assessment of bedrock aggregate in central Newfoundland. *In* Current Research. Newfoundland Department Of Mines And Energy, Geological Survey Branch, Report 90-1, pages 7-11.

1992: Bedrock-aggregate assessment of the Northern Peninsula of Newfoundland. *In* Current Research. Newfoundland Department of Mines and Energy, Geological Survey Branch, Report 92-1, pages 13-15.

1994a: Site location map with reference to rock types and petrographic numbers, NTS 2L/13 and 2L/14. Newfoundland Department of Mines and Energy, Geological Survey Branch, Open File 002M/04/0067, Map 94-172.

1994b: Site location map with reference to rock type and petrographic numbers, NTS 12I/09, Newfoundland Department of Mines and Energy, Geological Survey Branch, Open File 012I/227, Map 94-195.

Canadian Standards Association
1973: CSA standard A23.2.30, Rexdale, Ontario, pages 207- 209.

Carter, P.D.
1981: The economics of mineral aggregate production and consumption in Newfoundland and Labrador. Newfoundland Department of Mines and Energy, Mineral Development Division, Report, (GS# NFLD/1246), 112 pages.

Committee 363
1992: State-of-the-art report on high strength concrete. American Concrete Institute, Detroit, Michigan, Report ACI 363R-92.

Environmental Geological Section
1983a: Site data and 1:50,000 scale maps. Field maps for all surficial and glacial mapping and aggregate resource mapping projects. Newfoundland Department of Mines and Energy, Mineral Development Division, Open File NFLD/1267.

1983b: 1:50,000 scale aggregate resource maps outlining zones of aggregate potential within a 6-km-wide corridor in Newfoundland. Newfoundland Department of Mines and Energy, Mineral Development Division, Open File NFLD/1300.

Grant, D.R.
1972a: Postglacial emergence of northern Newfoundland. *In* Report of Activities. Geological Survey of Canada, Paper 72-1, Part A, pages 100-102.

1972b: Surficial geology, western Newfoundland. *In* Report of Activities. Geological Survey of Canada, Paper 72-1, Part A, pages 157-160.

1986: Surficial geology map for Port Saunders. Scale 1:250 000. Geological Survey Of Canada, Map 1622A.

1992: Quaternary Geology of St. Anthony–Blanc-Sablon area, Newfoundland and Quebec. Energy Mines and Resources, Geological Survey of Canada, Memoir 427, 60 pages.

Kirby, F.T., Ricketts, R.J. and Vanderveer, D.G.
1983: Inventory of aggregate resources of Newfoundland and Labrador. Newfoundland Department of Mines and Energy, Mineral Development Division, Report 83-2, 36 pages.

1989: Selected geomorphological maps of Newfoundland. Newfoundland Department of Mines and Energy, Mineral Development Division, Open File NFLD (1693), Maps 88-151 and 88-251.

Newfoundland Department of Works, Services and Transportation
1987: Specifications Book, Tendering Section, St. John`s, Form 315 and Form 904, 12 pages.

Ontario Ministry of Transport
1987: Procedure for the petrographic analysis of coarse aggregate. Ontario Ministry of Transportation, Engineering Materials Office, Soils and Aggregates Section, 20 pages.

Proudfoot, D., and St.Croix L.
1991: Landform classification and surficial geology of the Portland Creek map sheet, N.T.S. 12I/4. Newfoundland Department of Mines and Energy, Geological Survey Branch, Scale 1:50 000, Open File 012I/04/0212, Map 91-163.

Ricketts, M.J.
1987: Coastal Labrador aggregate resources. Newfoundland Department of Mines and Energy, Mineral Development Division, Mineral Resource Report 5, 50 pages.

1993: Aggregate resource graph program (Graph V3). Newfoundland Department of Mines and Energy, Geological Survey Branch, Open File NFLD/2270.

Ricketts M.J. and House, F.
1993: Granular aggregate-resource mapping of the west and northern tip of the Great Northern Peninsula, Newfoundland. *In* Current Research. Newfoundland Department of Mines and Energy, Geological Survey Branch, Report 93-1, pages 161-174.

Rutka, A
1976: Economic use of mineral aggregate in road construction (Draft Report). Ontario Ministry of Transportation and Communications. Prepared for Presentation to the Mineral Aggregate Working Party, March 17,1976.

Smith, M.R and Collis, L
1993:Aggregates: Sand, gravel and crushed rock aggregates for construction purposes (2nd edition). Geological Society of London, Geological Society–Engineering Geology Special Publication No 9, 339 pages.

Smyth, W.R.
1982: Port Saunders geology map (parts of 12I & 2L). Newfoundland Department of Mines and Energy, Mineral Development Division, Open File NFLD/1294, Map 82-53.

Stouge, S.
1983a: Notes on the geology of the St. Julien's map area (2M/4), Great Northern Peninsula, Newfoundland. Newfoundland Department of Mines and Energy, Mineral Development Division, 16 pages, (To accompany Map 82-68).

1983b: Notes on the geology of the Salmon River map area (12P/1), Great Northern Peninsula, Newfoundland. Newfoundland Department of Mines and Energy, Mineral Development Division, Map 82-69.

Vanderveer, D.G.
1980: A summary of aggregate resources in Newfoundland (2nd Draft Report). Internal document. Newfoundland Department of Mines and Energy, Mineral Development Division, 18 pages. GS# NFLD/2573.

1982: Municipal planning and aggregate resources-a brief synopsis. Newfoundland Department of Mines and Energy, Mineral Development Division, Unpublished report, 2 pages.

1983: Aggregates—the often maligned and often forgotten mineral. *In* 19th Forum on the Geology of Industrial Minerals. Proceedings. *Edited by* S.E. Yudt. Ontario Geological Survey, Miscellaneous Paper 114, pages 65-78.