

GRANULAR AGGREGATE MAPPING IN THE ARGENTIA AND PLACENTIA MAP AREAS (NTS 1N/4,5)

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ABSTRACT

Surficial aggregate mapping undertaken in the Argentia and Placentia areas is part of a continuing regional survey to locate aggregate deposits, to help alleviate construction problems, resulting from aggregate shortages and poor-quality aggregate.

Several granular deposits have been identified as suitable for construction aggregates. In the Placentia map area (NTS 1N/4) potential deposits have been located near Gerald's Pond, Smith's Pond, Big Weeks Pond, Rocky Island Pond, Duck Pond, Southeast Placentia River, Cataract Brook and Kelly's Pond. In the Argentia map area (NTS 1N/5) potential deposits have been located near Stag Pond, Sparrows Pond, Northeast River, Fitzgerald's Pond, Fitzgerald's Pond Park, Big Pond, Lookout Pond and Rhodie's Pond. All of these deposits are believed to contain clean sources of gravel and sand, and range in volume from about 10 000 to 400 000 m³ of aggregate. Several deposits are within 1 km of major transportation routes. Other deposits are less accessible, or are too small to recommend as potential resource areas.

INTRODUCTION

Gravel and sand aggregates constitute a naturally occurring building material in Newfoundland and Labrador, and are second to iron-ore production, in total volume produced. The objectives of the aggregate mapping program are to locate, map, and sample the sand, gravel and till deposits, in support of construction activities, and to make recommendations for the reservation of deposits for future development. Knowledge of the nature and distribution of the surficial deposits assists in locating these materials. The properties of aggregate materials, as determined by their composition and mode of formation may help determine the extent and limitations of their uses, for various purposes. Deposits laid down or reworked by meltwater, such as outwash sand and gravel, eskers, kames, and other ice-contact deposits, are economically the most important. These deposits have low silt-clay content and do not generally require washing during processing.

Definition of aggregate depends on the producer, location and use of the material (Smith and Collis, 1993). Aggregate, as used in the context of this report, is 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. Road construction is a major use of aggregate material. Water and sewer systems,

driveway construction and building foundations all require aggregate. Another major use is backfill and topsoil for landscaping.

Aggregate materials can be i) processed and used as Class A gravel (aggregate with a diameter of less than 19 mm having a specified proportion of finer grain sizes and 3 to 6 percent silt-clay; Department of Transportation, 1999) or Class B gravel (aggregate with a diameter less than 102 mm, having a specified proportion of finer grain sizes and 3 to 6 percent silt-clay; Department of Transportation, 1999); ii) processed to mix with a cementing agent to form concrete, asphalt and mortar; and iii) used as unprocessed material.

Not all quarry materials are suitable as aggregate. Vanderveer (1983) defined the quality of mineral aggregate by its composition. The silt-clay quantity is important; high silt-clay can cause instability, such as flowage; low silt-clay can result in loss of compaction. Too much silt-clay in concrete (> 2 percent) can interfere with the bonding process between the aggregate and the cementing agent. High silt-clay aggregate (greater than 15 percent) can be used for earth-filled dams, fill and subgrade road material. The presence of deleterious substances (such as silt-clay coating or iron-oxide staining on the surface of the aggregate), or blade-shape fragments commonly cause bonding problems with the cementing agent or the breakdown of aggregate with time.

The demand for aggregate is closely associated with construction activity. Road construction and maintenance is by far the most important use of mineral aggregates. Aggregates are characterized by their high bulk and low unit value, so that the economic value of a deposit is a function of its proximity to a market area as well as quality and size (Vanderveer, 1982). Thus, the location of resources relatively close to the user is important. The potential for extractive development is greatest in urban fringe areas where land-use competition is greatest. Comprehensive planning and resource-management strategies are required to make the best use of available resources, especially in those areas experiencing rapid development. Such strategies must be based on a sound knowledge of the total aggregate resource base at both local and regional levels.

PHYSIOGRAPHY

The study area is located on the Avalon Peninsula, Newfoundland (Figure 1), between longitude 53°30'W and 54°00'W, and latitude 47°00'N and 47°30'N. It covers two 1:50 000-scale map areas (Figure 2); Placentia (NTS map area 1N/4) and Argentia (NTS map area 1N/5). The topography varies from generally rolling hills and areas of bog, to stony, barren surfaces with short ranges of hills, to the gently sloping shorelines around St. Mary's Bay. Elevations are generally 60 to 120 m above sea level (asl), with a few areas rising to about 200 m and one area, near Fitzgeralds Pond Park, rising more than 320 m (asl). The western part of the study area, in the vicinity of Long Harbour and Argentia, is characterized by barren, irregular and rough topography with numerous bedrock outcrops. The shoreline is more rugged, irregular, and indented than the shoreline of St. Mary's Bay and is characterized by more bedrock exposures with cliffs over 180 m high.

Like most of Newfoundland, the area has numerous small streams and ponds. Till is the dominant overburden type in the area, generally thicker in the eastern and northern parts of the map area. Glaciofluvial deposits are more common along the Southeast and Northeast River valleys. Bog cover is common throughout the map area.

PREVIOUS WORK

Summers (1949) and Henderson (1972) provided the most complete description of surficial deposits on the Avalon Peninsula. Summers' (*op. cit.*) discussion on glaciation included descriptions of geographical features such as eskers and moraine ridges, but focused mainly on reconstruction of flow patterns. Henderson (*op. cit.*) described glacial and postglacial deposits, from which he deduced the glacial and postglacial history of the Avalon Peninsula. The Avalon Peninsula was covered by an ice cap centred over St.

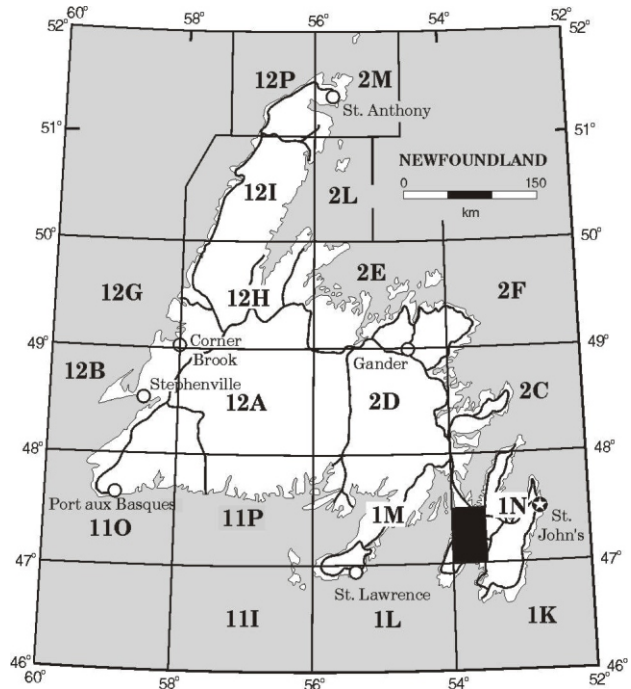


Figure 1. Study area.

Mary's Bay, which subsequently disintegrated into a number of smaller dispersal centres along the major peninsulas of the Avalon (Summers, *op. cit.*; Henderson, *op. cit.*). Most glaciofluvial deposits associated with melt-out of the ice cap were deposited down the major valleys and are found offshore today (Henderson, *op. cit.*).

Catto's (1998a) interpretation of glaciation on the Avalon recognized three phases in a continuum of glaciation. Phase 1 marked the accumulation of ice centres along the axes of the major peninsulas, and expansion seaward. During phase two, lowering sea level allowed the development of an ice centre in St. Mary's Bay, which expanded north, covering most of the Avalon. Phase three was marked by the collapse of the St. Mary's Bay ice centre, and rapid draw-down into St. Mary's and Conception bays, and the persistence of the Trinity Bay ice stream. Catto demonstrated the importance of local conditions in the generation of glacial flow patterns, and the necessity for detailed field mapping and analysis.

McKillop (1955) released a preliminary report on a survey of beaches throughout the area, provided detailed descriptions of most beaches, including type of beach (bar or strand), dimensions, size of material, lithology, and sometimes the sphericity and rounding of material. He also recommended the types of local or general use to which these resources may be applied.

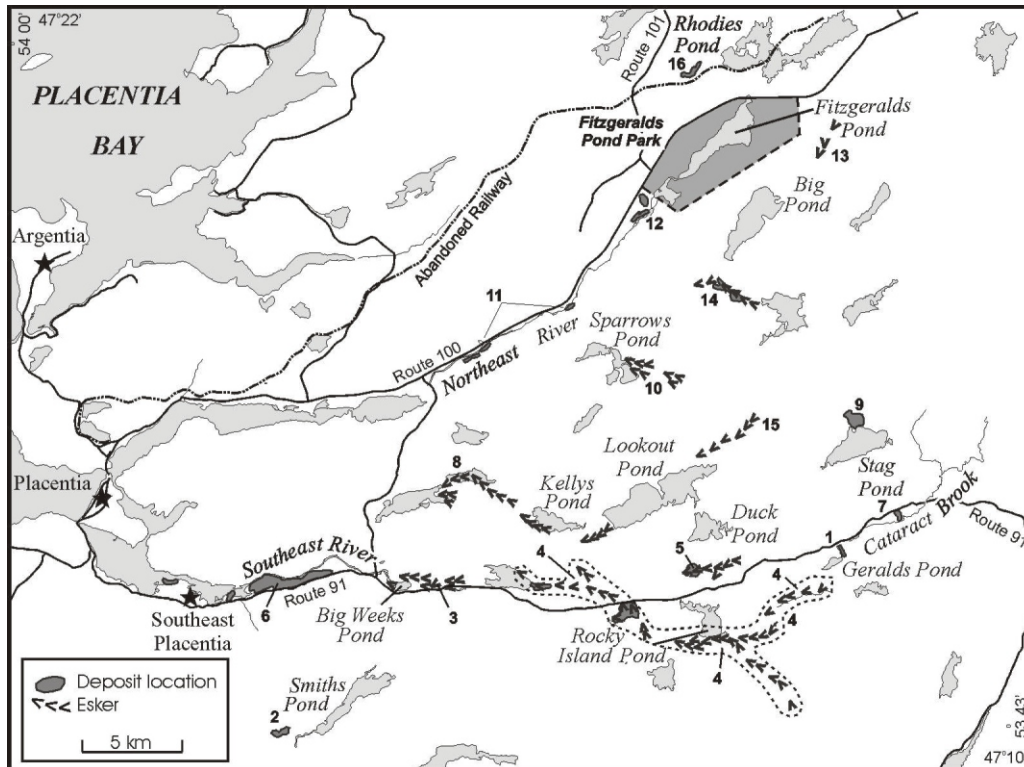


Figure 2. Granular aggregate deposit locations in the Placentia and Argentia map areas. Deposit locations are: 1) Gerald's Pond, 2) Smith's Pond, 3) Big Weeks Pond, 4) Rocky Island Pond, 5) Duck Pond, 6) Southeast Placentia, 7) Cataracts Brook, 8) Kelly's Pond, 9) Stag Pond, 10) Sparrows Pond, 11) Northeast River, 12) Fitzgerald's Pond, 13) Fitzgerald's Pond Park, 14) Big Pond, 15) Lookout Pond, and 16) Rhodies Pond.

The surficial geological maps available for the area, Vanderveer's mapping, at a scale of 1:50 000 (Vanderveer, 1975) and Catto's mapping (1998b, c) show generalized deposits, and ice-flow features. Surficial interpretation by Catto (*op. cit.*) is more detailed, showing more polygons to outline deposit types. Liverman and Taylor (1989) compiled surficial data at 1:250 000 scale and later released this data in digital format (Liverman and Taylor, 1994).

An aggregate resource study was conducted by the Department of Mines and Energy from 1978 to 1982 (Environmental Geology Section, 1983a, b, c; Kirby *et al.*, 1983) that covers a 6-km-wide corridor along all roads in Newfoundland and Labrador. This study outlined areas of potential aggregate within the corridor area. In addition to these data, geotechnical bedrock maps were compiled at a scale of 1:250 000 (Bragg, 1985). Later, Bragg (1994) released site location maps at 1:50 000 scale showing rock types and petrographic numbers. This was followed by a report (Bragg, 1995) with information on the petrographic quality of different rock types, to determine their potential as construction aggregate.

MAPPING AND ANALYTICAL METHODS

The assessment of granular aggregates can be complex because of the availability of a great variety of materials, and because available information is insufficient to determine quality of material in localized areas for pit and quarry operations. Much interpretation is involved and the degree of error in tonnage estimates can be high. Interpretation of aerial photographs (1:50 000-scale black-and-white, 1:20 000-scale black-and-white and 1:12 500 scale colour) is the first stage in locating potential deposits. Airphoto interpretation is used to produce preliminary landform classification maps that show the distribution

and nature of the various deposits found within an area. These maps commonly show a variety of tills, sand, and gravel deposits. Till is a sediment deposited by glaciers, commonly with a wide variety of grain sizes. Sand and gravel is commonly formed by fluvial action, either by glacial meltwater or streams. Granular aggregate maps are a derivative of landform classification maps supplemented by ground proofing and sampling; they subdivide potential aggregate deposits into high, moderate, or low potential for aggregate production (Ricketts, 2002a, b). The size of the deposit can be determined if its areal extent and average thickness are known or can be estimated. Thickness values are approximations, based on the face heights of pits developed in the deposit, road-side exposure or features of the general landscape such as the height of ridges or terraces above the surrounding terrain. From all data, individual deposits may be assigned one of four zones, with zone 1 being the area of highest potential (Kirby *et al.*, 1983).

In addition to the data collected from aerial photographs, information on the various sediment types was

obtained in the field by examining natural exposures (e.g., stream cuts, shorelines, and gullies) or man-made exposures (e.g., road cuts, and pit and quarry excavations). Where exposures were not available, samples were collected from 1-m-deep hand-dug pits. In some places, hand-dug pits were not practical because of boulders or a thick, cemented B-horizon, making it difficult to see the undisturbed parent material. Lack of exposures meant that deposit thickness was difficult to assess. The scarcity of vertical sections, combined with the presence of a concealing surface mat of organic material in many places, made positive interpretation of the nature and extent of the glacial sediments heavily dependent upon evaluation of the geomorphology. Thus, in most instances, surface form was an important aspect in recognition of the unit mapped. Obvious landform boundaries were the basis of many delineations. Other features recorded in the field were sediment thickness, stoniness, presence of compact layers and the presence of vegetation.

Sampling provided material for petrographic and grain-size analysis. Approximately 15 kg of material was collected for field sieving at each site. Field sieving and petrographic analysis were performed on most samples containing >8mm size material. A split (70 to 140 g) of the sand–silt–clay fraction (<8 mm) 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 Ricketts (1987). This data was used to describe deposits based on texture (Table 1). Cobble and boulder content (aggregate too coarse for sieving) was estimated in the field.

The suitability of aggregate depends on physical properties and the capability of the rock to withstand stresses placed upon it when it is used as a construction material. The lithology of the pebble fraction (16 to 32 mm) was evaluated to define the petrographic characteristics (Bragg, 1995; Ontario Ministry of Transportation 1994; Canadian Standards Association, 1973). The petrographic number can range from 100 to 1000, and 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 (Ricketts and Vatcher, 1996). 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 (clean, thin, medium or thick), weathering (fresh, slightly, moderately, highly, or intensely weathered), staining, degree of sphericity, rounding and fracturing. 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 a friable shale would have a petrographic

Table 1. Description of sand and gravel aggregates based on grain-size composition

Description	Composition
Gravel	< 5 % sand
Sandy gravel	5 to 20 % sand
Very sandy gravel	> 20 % sand
Sand/gravel	About equal
Very gravelly sand	> 20 % gravel
Gravelly sand	5 to 20 % gravel
Sand	< 5 % gravel

number of 1000. Most deposits contain a combination of different rock types having different petrographic factors. The proportion of each of these components determines the petrographic number. 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 up to 150 is acceptable (Department of Transportation, 1999). The rounding of pebbles, 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, the amount of water necessary to make a concrete, which has a direct relation on the strength of a concrete.

AGGREGATE POTENTIAL

Till is widespread over most of the area, varying in composition, commonly in relation to underlying bedrock. In some localities, supraglacial till overlying basal till was noted. The supraglacial till is generally coarser, having most of the fines flushed away by meltwater. Basal tills are more common. Generally basal tills have a silt–clay content of 15 to 30 percent, which renders most of these deposits unsuitable for most construction purposes, unless washed to remove the silt. Potential quarry sites for low silt–clay tills is outlined on 1:50 000-scale maps by Ricketts (2002a,b).

Glaciofluvial deposits, such as eskers, are generally the most suitable deposits for aggregate material. Generally these deposits are clean, low silt–clay gravel materials resulting from deposition by meltwater. The largest esker in the study area is 17 to 18 km long and found near Rocky Island Pond along the Colinet–Southeast Placentia road (Route 91). Other eskers in the map area range from 1 to 5 km long. Some eskers diverge at one or more places to form esker complexes. Most of the larger esker ridges contain gaps of varying lengths where material either was not deposited or has been removed by erosion. Average height of the ridges vary between 5 and 10 m, with a few eskers reaching heights of 12 to 15 m.

Several potential sand and gravel deposits were identified in the study area. In the Placentia map area (NTS 1N/4) deposits are located near Gerald's Pond, Smiths Pond, Big Weeks Pond, Rocky Island Pond, Duck Pond, Southeast Placentia, Cataract Brook and Kellys Pond (Figure 2). In the Argentia map area (NTS 1N/5) reserves are located near Stag Pond, Sparrows Pond, Northeast River, Fitzgeralds Pond, Fitzgeralds Pond Park, Big Pond, Lookout Pond, and Rhodies Pond (Figure 2). All deposits are believed to contain clean sources of aggregate ranging in quantity from approximately 10 000 to 400 000 m³. Several deposits are within one kilometre of major roads. Other deposits are less accessible, or are too small to outline as potential resource areas. A total of 109 samples were collected for grain-size analyses, mostly from 1-m-deep hand-dug pits. Petrographic analyses was completed on 94 pebble samples, and show a range of petrographic numbers from 110 to 370. Although reserves are large in some areas, the presence of varying amounts of weathered shale, siltstone and sandstone decreases the petrographic quality.

In most deposits, sample analysis indicate clean, coarse aggregates showing less than one percent silt-clay and variable sand-gravel concentrations (Figure 3). Deposits listed below range from gravelly sands to cobble-boulder gravels. These deposits are mostly suitable for coarse-grained aggregate uses. Fine-grained aggregates (sand) are less common. Deposits most suitable for fine-grained aggregate uses, may include Cataract Brook and Fitzgeralds Pond. These two deposits have near equal amounts of coarse and fine aggregate. Other deposits may be quarried for fine-grained aggregate, but will have greater volumes of waste material if the coarse fraction is not used.

GERALD'S POND

The Gerald's Pond deposit is situated in a bog and forest area between Gerald's Pond and Route 91 (Figure 2). This kame deposit consists of two parallel gravel ridges, 200 and 250 m long, 10 to 20 m wide, and 3 to 5 m high. These ridges contain well-drained, poorly compacted, sandy gravel. Grain-size analyses indicate this deposit is 86.8 percent gravel, 12.6 percent sand and 0.6 percent silt-clay (Table 2), based on analysis of two samples collected (Table 2). The pebble fraction is subrounded to subangular and has a thin silt-clay coating that washes off fairly easily. Pebble types consist of fresh to moderately weathered siltstone (62 percent), fresh to moderately weathered sandstone (21 percent), moderately weathered shale (14 percent), quartz pebbles (2 percent) and conglomerate (1 percent). Petrographic numbers for two samples are 219 and 300.

SMITHS POND

The Smiths Pond deposit is in a 250 by 125 m hummocky area, covered by barrens and thick forest growth. It is located 1 km west of Smiths Pond and 4 km south of Route 91 (Figure 2). The deposit consists of a 6-m-thick unit of poorly sorted, moderately compacted, very well-drained gravel and sand. Analysis of one sample showed 53 percent gravel, 46.1 percent sand and 0.9 percent silt-clay (Table 2). Pebbles are subrounded to subangular and have a thick, fine sand and silt coating that washes off fairly easily. Pebbles consist of fresh, siltstone (64 percent), volcanics (22 percent) and sandstone (12 percent), and highly weathered undefined pebbles (2 percent). The sample has a petrographic number of 121.

BIG WEEKS POND

The Big Weeks Pond deposit is situated in a forested and barren area, on the north side of Big Weeks Pond, 500 m from Route 91 (Figure 2). The deposit is in an area of hummocky terrain, and includes the western end of a 15-km-long, dissected esker system. Aggregate varies from sandy, compacted till to pebbly gravel and boulder gravel. Lenses of washed pebble aggregate are apparent in some areas. Grain-size analyses of four samples indicate this deposit contains 67.9 percent gravel, 29.5 percent sand and 2.6 percent silt-clay (Table 2; Figure 3). Pebbles consist of slightly weathered siltstone (82 percent) and sandstone (10 percent), quartzite, (7 percent) and moderately weathered meta-sediments (1 percent). Petrographic numbers of samples ranged from 132 to 232 with an average of 208.

ROCKY ISLAND POND

The Rocky Island Pond deposit is part of a 17-km-long esker system (Plate 1), including a ridge complex near Rocky Island Pond, along Route 91 (Figure 2). The ridge complex covers an area of 300 m², including several small ponds and bogs. This deposit has been quarried intermittently for more than three decades and has a large reserve. Generally the deposit is 5 to 8 m high, and 10 to 12 m high in a few places. It consists of moderately sorted, well-drained, moderately compacted, cobble gravel to gravelly sand (Plate 2). Grain-size analyses of 23 samples indicate this deposit contains 67.7 percent gravel, 30.9 percent sand and 1.4 percent silt-clay (Table 2; Figure 3). Pebbles are subrounded to subangular and have a silt and fine sand coating that washes off fairly easily. Pebble types consist of fresh to slightly weathered siltstone (49 percent), fresh to moderately weathered sandstone (41 percent), slightly

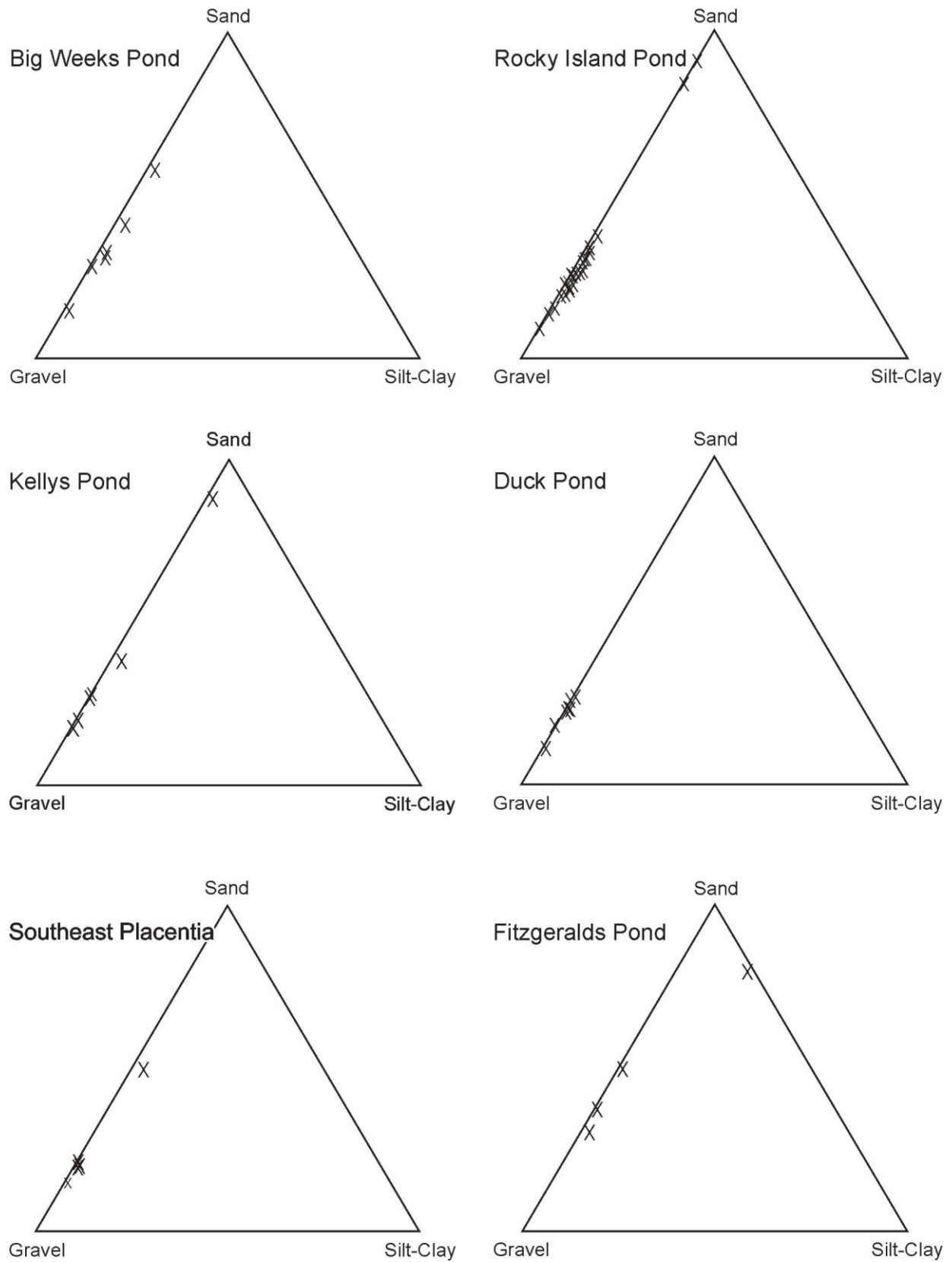


Figure 3. Ternary plots of samples collected from deposits near Big Weeks Pond, Rocky Island Pond, Kellys Pond, Duck Pond, Southeast Placentia and Fitzgeralds Pond.

Table 2. Summary of sample data collected from glaciofluvial deposits in the Argentia and Placentia map areas (NTS areas 1N/4 and 5)

Deposit	Estimated m ³	Mean Grain-size Analyses				Petrographic Numbers (PN)			
		No. of Samples Analyzed	% Gravel +5 mm	% Sand .078mm to -5 mm	% SI-Cl -.078	No. of Samples Analyzed	PN Average	PN Range	Morphology
Geralds Pond	30 000	2	86.8	12.6	0.6	2	260	219-300	Kame ridges
Smiths Pond	150 000	1	53.0	46.1	0.9	1	121		Gravel hummocks
Big Weeks Pond	400 000	6	67.9	29.5	2.6	6	208	132-232	Esker, and gravel hummocks
Rocky Island Pond	400 000	23	67.7	30.9	1.4	19	233	125-370	Dissected esker
Duck Pond	100 000	8	77.6	21.8	0.6	6	233	155-300	Eskers, and gravel hummocks
S.E. Placentia	30 000	5	75.9	23.0	1.1	4	119	110-123	Eroded gravel
Cataract Brook	10 000	2	53.0	46.6	0.4	2	150	129-172	Gravel ridge
Kellys Pond	200 000	6	64.3	33.6	2.1	4	196	140-300	Esker
Stag Pond	100 000	2	73.7	25.9	0.4	2	160	147-173	Gravel ridges
Sparrows Pond	150 000	3	77.0	22.5	0.5	3	143	129-159	Eskers
Northeast River	40 000	3	86.0	13.7	0.3	3	160	123-233	Gravel ridges
Fitzgeralds Pond	100 000	4	47.1	48.1	4.8	2	208	154-262	Eroded gravel
Fitzgeralds Pond Park	25 000	2	66.2	32.7	1.1	2	142	140-143	Eskers
Big Pond	90 000	2	74.6	24.8	0.6	2	136	130-142	Esker, and gravel hummocks
Lookout Pond	150 000	1	75.3	19.0	5.7	1	174		Dissected esker
Rhodies Pond	50 000	2	79.2	20.0	0.8	2	145	144-145	Gravel ridges

Note: Estimated quantities in table are based on airphoto analysis and field investigations along road cuts, shallow hand-dug pits and natural exposures. Grain-size results and petrographic numbers (PN) are based on a compilation of sample data for each deposit.



Plate 1. Part of a 17-km-long esker system located along Route 91, between Colinet and Southeast Placentia. The esker averages 6 to 8 m in height, but may reach heights of 10 to 12 m in places.

weathered to moderately weathered shale (4 percent), quartz pebbles (2 percent), slightly weathered gneiss (1 percent), quartzite (1 percent), arkose (1 percent) and highly to intensely weathered undefined pebbles (1 percent). Petrographic numbers ranged from 125 to 370 with an average of 233.

DUCK POND

The Duck Pond deposit covers a 1 km² area, located 200 m north of Route 91, 7 km west of Cataracts Provincial Park (Figure 2). It is composed of eskers and hummocky terrain. The hummocks and esker are barren and have scattered tree growth. Areas between the hummocks are bog covered. There are several small ponds throughout the area. The deposit varies from very

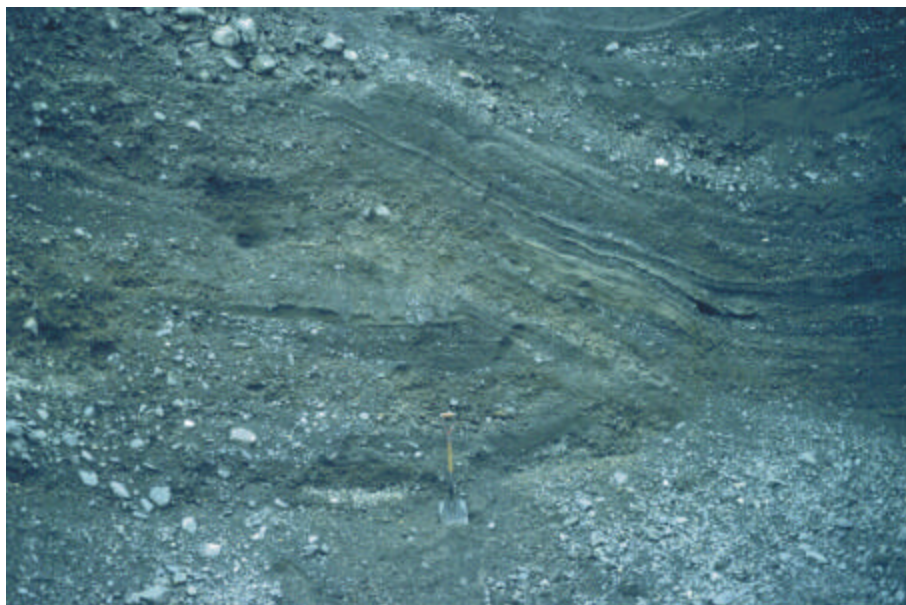


Plate 2. Rocky Island Pond quarry; the aggregate consists of moderately sorted, well-drained, moderately compacted cobble gravel to gravelly sand.

sandy to cobble gravel, consisting of 77.6 percent gravel, 21.8 percent sand and 0.6 percent silt–clay (Table 2; Figure 3), based on analyses of eight samples. Pebbles are subangular to subrounded having a medium to thick silt and fine sand coating that washes off fairly easily. Pebble types consist of fresh to moderately weathered sandstone (55 percent), fresh to slightly weathered siltstone (40 percent), moderately weathered shale (2 percent), volcanics (2 percent), and gneiss (1 percent). Petrographic numbers ranged from 155 to 300, with an average of 233.

SOUTHEAST PLACENTIA

The Southeast Placentia deposit is located in a dense wooded area 2 km east of Southeast Placentia, between the Southeast River and Route 91 (Figure 2). The deposit contains moderately compacted to poorly compacted, well-drained, boulder gravel to sandy gravel, in ridges 7 to 10 m high. The ridges (possibly erosional features) are orientated in a east–west direction along the Southeast River. Grain-size analyses of 5 samples indicate this deposit contains 75.9 percent gravel, 23 percent sand and 1.1 percent silt–clay (Table 2; Figure 3). Pebbles are subrounded to subangular and have moderate to thick, fine sand and silt coatings that wash off easily. Pebbles consist of fresh to moderately weathered siltstone (58 percent), fresh sandstone (34 percent), conglomerate (3 percent), shale (2 percent), highly weathered undefined pebbles (2 percent) and arkose (1 percent). Petrographic numbers of four samples collected are 110, 122, 122 and 123.

CATARACT BROOK

The Cataract Brook deposit is located 2 km west of Cataracts Park, between Cataract Brook and Route 91 (Figure 2). This deposit is a 100 by 20 m gravel ridge, and varies in height from 2 to 10 m. The ridge is barren with bog near the west side and thick tree growth on the east. The deposit varies from very gravelly sand to very sandy gravel. Grain-size analysis, based on two samples collected, indicate this deposit contains 53 percent gravel, 46.6 percent sand and 0.4 percent silt–clay (Table 2). Pebbles are subangular and have a fine sand coating that washes off easily. Pebbles consist of fresh to slightly weathered sandstone (85 percent) and siltstone (12 percent), and slightly weathered to highly weathered undefined pebbles (3 percent). Petro-

graphic numbers of samples collected are 129 and 172.

KELLYS POND

The Kellys Pond deposit is located between Kellys Pond and Beaver Pond, 2 km east of the access road from Route 100 to Route 91, and 2 km north of Route 91 (Figure 2). The deposit is a 3.5-km-long esker ridge. It is covered by dense tree growth, with mostly bog, barrens and ponds along the sides of the ridge. Six samples collected from hand-dug pits and lakeshore exposures indicate areas of good to poor drainage, very poor to well-compacted material, and textures ranging from slightly gravelly sand to sandy gravel, cobble gravel and cobble–boulder gravel. Grain-size analyses of sampled material indicate an average of 64.3 percent gravel, 33.6 percent sand, and 2.1 percent silt–clay (Table 2; Figure 3). Pebbles are subangular to subrounded and have fine sand and silt–clay coating that washes off with little difficulty. Pebbles types consist of fresh to slightly weathered siltstone and sandstone (89 percent), fresh to moderately weathered shale (7 percent), moderately to highly weathered undefined pebbles (3 percent), and conglomerate (1 percent). Petrographic numbers of samples collected are 140 to 300.

STAG POND

The Stag Pond deposits are located on the north side of Stag Pond, 3 km north of Route 91 (Figure 2). The deposits consist of 11 gravel ridges in a 400 m² area. The ridges, cov-



Plate 3. *The Sparrows Pond esker is 1700 m long and 2 to 8 m high. The esker system contains poor to moderately sorted, well-drained, poorly compacted sand–gravel to sandy gravel.*

ered in low bush growth and barrens, range from 50 to 200 m in length, and are 1 to 10 m in height. The ridges consist of poorly compacted, very well-drained, moderately sorted, very sandy gravel. Samples collected from two hand-dug pits indicate this deposit contains 73.7 percent gravel, 25.9 percent sand and 0.4 percent silt–clay (Table 2). Pebbles are subrounded to subangular and have a fine sand and silt coating that washes off with little difficulty. Pebble types consist of fresh to moderately weathered sandstone (62 percent), fresh to highly weathered siltstone (26 percent), conglomerate (4 percent), quartzite (3 percent), intensely weathered undefined pebbles (2 percent), shale (2 percent) and quartz pebbles (1 percent). Petrographic numbers of two samples collected are 147 and 173.

SPARROWS POND

The Sparrows Pond deposit is located east of Sparrows Pond, 3 km southeast of the Route 100 (Figure 2). The deposit is a 1700-m-long esker ridge, 2 to 8 m high. The esker is barren along the top and surrounded by bog and tree growth (Plate 3). It is composed of very well-drained, poorly compacted, moderately sorted, sand–gravel to sandy gravel. Grain-size analyses of three samples indicate this deposit contains 77 percent gravel, 22.5 percent sand, and 0.5 percent silt–clay (Table 2). High boulder content was noted at one sample site. Pebbles are subrounded to subangular and have a fine sand and silt–clay coating that washes off easily.

Pebble types consist of fresh to moderately weathered sandstone (59 percent), fresh siltstone (26 percent), fresh to moderately weathered shale (10 percent), conglomerate (4 percent) and highly weathered undefined pebbles (1 percent). Petrographic numbers of three samples are 129, 140 and 159.

NORTHEAST RIVER

The Northeast River deposit is situated in a dense wooded area along the southeast side of the Northeast River, 6 km southwest of Fitzgeralds Pond Park (Figure 2). The deposit consist of two ridges, 250 m and 100 m long, lying parallel with the river. The deposit contains well-drained, poorly compacted, massive, cobble–boulder gravel. Grain-size analyses of three samples indicate this deposit contains 86 percent gravel, 13.7 percent

sand and 0.3 percent silt–clay (Table 2). Pebbles are subrounded to subangular and have a fine sand and silt coating that washes off easily. Pebble types consist of fresh to moderately weathered sandstone (59 percent), fresh to intensely weathered siltstone (37 percent), quartz pebbles (3 percent), and shale (1 percent). Petrographic numbers of three samples are 126, 123 and 233.

FITZGERALDS POND

The Fitzgeralds Pond deposit is an eroded gravel deposit situated in a barren area with minor tree growth. It is located near the southwest end of Fitzgeralds Pond Park, 200 m southeast of Route 100 (Figure 2). The deposit is a well-drained, poorly compacted, moderately sorted gravel and sand. Textures range from very sandy gravel to slightly gravelly sand. Grain-size analyses of four samples indicate it contains 47.1 percent gravel, 48.1 percent sand and 4.8 percent silt–clay (Table 2; Figure 3). Pebbles are subrounded to subangular and have a fine sand and silt–clay coating that washes off fairly easily. Pebble types consist of fresh to moderately weathered shale (43 percent), fresh sandstone (41 percent) and siltstone (14 percent), arkose (1 percent), and undefined pebbles (1 percent). Petrographic numbers of two samples are 154 and 262.

FITZGERALDS POND PARK

The Fitzgeralds Pond Park deposit is located in an area of forest growth, barrens and bog, 1.4 km south of Route



Plate 4. *The Big Pond esker is 750 m long and 3 to 5 m high. The aggregate in this deposit consists of poorly sorted, well-drained, poorly compacted sandy gravel to cobble gravel.*

100, near the east end of Fitzgeralds Pond Park (Figure 2). This deposit consists of a 500-m-long dissected esker. It is a well to moderately drained, poorly compacted, poorly sorted, very sandy gravel. Grain-size analyses of two samples indicate this deposit contains 66.2 percent gravel, 32.7 percent sand, and 1.1 percent silt–clay (Table 2). Pebbles are subrounded to subangular and have a fine sand and silt coating that washes off fairly easily. Pebble types consist of fresh to moderately weathered sandstone (60 percent), fresh siltstone (26 percent), shale (6 percent), arkose (4 percent), quartzite (2 percent), slightly to highly weathered gabbro (1 percent), and undefined pebbles (1 percent). Petrographic numbers of two samples are 140 and 143.

BIG POND

The Big Pond deposit is located in an area of barrens, bog and forest growth, 1 km south of Big Pond and 3 km southeast of Route 100 (Figure 2). The deposit consists of hummocks, and a 1500-m-long dissected esker (Plate 4). It contains a well-drained, poorly compacted, poorly sorted, sandy to cobble gravel. Grain-size analyses of two samples indicate this deposit contains 74.6 percent gravel, 24.8 percent sand and 0.6 percent silt–clay (Table 2). Pebbles are subangular and have a fine sand and silt coating that washes off fairly easily. Pebble types consist of fresh to moderately weathered sandstone (60 percent), fresh to moderately weathered shale (23 percent), fresh siltstone (13 percent), fresh to moderately weathered quartz pebbles (2 percent), and fresh to highly weathered undefined pebbles (2 percent).

Petrographic numbers of two samples are 130 and 142.

LOOKOUT POND

The Lookout Pond deposit is a 2-km-long dissected esker (Figure 2) oriented in a northeast direction near the north end of Lookout Pond. Barrens, bog and dense tree growth are common along the length of the esker. A cobble, sandy gravel sample was taken from a 1.2-m-deep hand-dug pit on top of the esker ridge. A silt coating was clearly visible on the coarse fraction. A second pit was dug but it was impossible to get an adequate sample of material for sieving due to boulders. Grain-size analyses of one sample showed 75.3 percent gravel, 19 percent sand and 5.7 percent silt–clay (Table 2). Pebbles are subangular and have a fine sand and silt coating that washes off with slight

difficulty. Pebble types consist of fresh to moderately weathered sandstone (47 percent), fresh siltstone (34 percent), shale (11 percent), quartz pebbles (5 percent), and fresh to highly weathered undefined pebbles (3 percent). The sample has a petrographic number of 174.

RHODIES POND

The Rhodies Pond deposit is in an area surrounded by bog, barrens and low bush. It is located along an abandoned railway, 1 km east of Route 101 between Route 100 and Route 202 (Figure 2). The deposit is a 750-m-long gravel ridge (Plate 5), 10 to 15 m wide and averages 6 m in height. There is bedrock outcrop along the west end of the deposit. The surface of this pebble–cobble gravel deposit is strewn with boulders along its western end, although grain sizes were notably finer in hand-dug pits in this area. Grain-size analyses of two samples indicate this deposit contains 79.2 percent gravel, 20 percent sand and 0.8 percent silt–clay (Table 2). Pebbles are subrounded to subangular and have a thin coating of fine sand and silt that washes off fairly easily. Pebble types consist of fresh sandstone (53 percent) siltstone (36 percent), shale (9 percent), moderately to intensely weathered undefined pebbles (2 percent). Petrographic numbers for the two samples were 144 and 145.

SUMMARY

Knowledge of the nature and distribution of the surficial aggregate deposits (sand, gravel and other low silt–clay



Plate 5. *The Rhodies Pond gravel ridge is 750 m long and 5 to 8 m high. It consists of moderately sorted, well-drained, very poorly compacted pebble–cobble gravel.*

materials) can assist in estimating construction costs of projects requiring aggregate. When it is necessary to identify new aggregate sources for production of large quantities of construction material, close attention to the surficial geology of the area and the bedrock lithology in the surrounding area should aid in making this choice. In a large-scale operation it might be more economical to truck granular products longer distances rather than use inferior material close at hand; processing cost could be lower and the quality of the product higher, therefore, offsetting the high cost of transportation.

Gravel deposits located in the Argentia–Placentia region are located in the central part of the map area, mostly along the Southeast and Northeast river valleys. Areas to the north and south are deficient in large gravel deposits suitable for quarry sites. These southern and northern parts of the map area contain till, till veneers, bog and bedrock outcrop. Tills are generally high in silt and clay and unsuitable for most high-quality aggregate uses, or expensive to use if removal of the silt and clay is required (by screening and washing). Some areas of low silt–clay tills were located in the northern part of the study area, and may be suitable for use in some construction projects. Data on these low silt–clay tills is available on open file maps.

Work in the Argentia and Placentia area has revealed several new potential gravel deposits. The area of greatest potential is a large esker system near Rocky Island Pond, along the Colinet–Southeast Placentia road. This deposit has low silt–clay content, although petrographic quality is vari-

able. Proximity to the road also increases the potential of this deposit. The Big Weeks Pond deposit, which is part of the Rocky Island Pond esker system, is another large deposit that has low silt–clay content. Other, but smaller, deposits located within a short distance of roads are located at Duck Pond, Gerald's Pond, Southeast Placentia, Northeast River, Fitzgerald's Pond and Rhodies Pond. Less accessible deposits are located near Smith's Pond, Kelly's Pond, Stag Pond, Sparrows Pond, Lookout Pond, Fitzgerald's Pond Park and Big Pond.

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