CANADA

DEPARTMENT OF MINES AND TECHNICAL SURVEYS

GEOLOGICAL SURVEY OF CANADA
TOPICAL REPORT NO. 61

POTENTIAL AGGREGATE SOURCES
WELLAND CANAL AREA, ONTARIO

BY
E. B. OWEN

OTTAWA
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Introduction

This report is the result of a preliminary examination of bedrock exposed in three quarries in the Welland Canal area, Ontario made on October 3 and 4, 1962. The investigation was conducted at the request of The St. Lawrence Seaway Authority. It is planned to make a more thorough examination at some future date at which time samples for quality tests will probably be taken.

St. Catharines Crushed Stone Ltd.,

St. Catharines, Ontario.

This quarry is located on the Merrittville highway south of St. Catharines, on the edge of the Niagara escarpment, in lots 16 and 17, concession X, Grantham township, Lincoln county. The quarry is about four and a half miles west of locks 3, 4 and 5, Welland Canal.

Bedrock exposed in the quarry consists of massive, brownish - grey, buff weathering dolomite of the Lockport Formation. Shale is present only as thin, irregular partings. The flat-lying beds vary in thickness from 6 inches to 5 feet. The spacing between the vertical joint fractures is irregular ranging from 12 inches to 10 feet. In the upper 3 to 4 feet of bedrock brownish weathering has penetrated bedrock along the bedding and joint planes to a depth of about 1 inch. The floor of the quarry consists of dark grey shale of the Rochester Formation.

Minor quantities of groundwater were encountered at the dolomite-shale contact but were too small to hinder operations. However, it was reported the quarry is almost completely flooded during the winter months when operations are suspended.

Bedrock core from diamond drill holes put down in the unworked portions of the property is available for inspection by the Seaway Authority. The company would need about one week's notice to prepare the core for examination.

The average height of the working face in the quarry is 39 feet. To date about 1,200,000 cubic yards of rock have been taken from the quarry and there are about 4,000,000 cubic yards remaining. The production is chiefly used for road construction and coarse aggregate. Transit-Mix Ready Mix Company of St. Catharines and Ontario Hydro-Electric Power Commission have both used the material as aggregate.

Walker Bros. Limited,

Thorold, Ontario.

The quarry of Walker Bros. Limited is located on the edge of Niagara escarpment, one mile west of Thorold, in lots 31 and 32, concession X, Stanford township, Welland county. It is about 2 miles east of locks 3, 4 and 5, Welland Canal. Bedrock consists of a massive light grey, buff weathering dolomite of the Lockport Formation. Shale is present only as minor irregular partings. Bedrock exposed in the floor of the quarry consists of grey shale of the Rochester Formation. Groundwater encountered at the dolomite-shale contact is controlled by one 8-inch pump. However, in the winter when the operation is suspended the quarry is almost completely flooded.

In the lower part of the quarry face, which ranges from 20 to 35 feet in height, a few feet of grey dolomite belonging to the Decew Formation is exposed. The quality of this rock is similar to that of the overlying Lockport dolomite and consequently as far as construction materials are concerned the two formations can be considered as one.

Bedrock structures at Walker Bros. quarry are similar to those at St. Catharines Crushed Stone Limited. The dolomite beds exposed are flat-lying, vary in thickness from 4 inches to 3 feet and are weathered only in the upper 3 to 4 feet of bedrock.

The thickness of overburden at the quarry varies from 10 to 35 feet. It consists of clay overlying clay till which in turn directly overlies bedrock.

The quantity of material available is unlimited. The company is willing to permit exploratory drilling in any of the unworked parts of the property to investigate the quality of the rock.

The stone from the quarry is used chiefly as road material and coarse aggregate. It has been used as aggregate by the Transit-Mix Ready Mix Company and the Ontario Hydro-Electric Power Commission.

Queenston Quarries Limited,

Queenston, Ontario.

This is by far the largest of the 3 quarries visited. It is located on the edge of Niagara escarpment, 2 miles west of Queenston, in lots 47, 48 and 49, concession X, Niagara township, Lincoln county.

It is about 10 miles east of locks 4, 5 and 6, Welland Canal. The quarry is serviced by a branch line of the C.N.R.

Bedrock consists of massive, greyish-brown dolomite of the Queenston Formation. Very little shale is present. The beds exposed in the face of the quarry are similar in attitude to those in other quarries in the area. They are flat-lying, vary in thickness from 6 inches to 4 feet and are weathered only in the upper few feet. Jointing is vertical but is not as prominent as in bedrock visible in the other quarries. Bedrock exposed in the lower part of the quarry face is extremely massive with beds ranging from 2 to 7 feet in thickness.

The working face of the quarry has an average height of about 38 feet. The material from the upper 24 feet is used as road material and aggregate and that from the lower part as building stone well known throughout the Province of Ontario. It is planned to have a sand manufacturing plant in operation by April, 1963. An asphalt plant and a concrete batch plant are both presently located at the quarry.

The thickness of overburden is the least of the 3 quarries examined. It ranges from 5 to 12 feet and consists essentially of clay.

Conclusions

The following conclusions are made as a result of this preliminary investigation:

1. Bedrock exposed in the 3 quarries examined consists of massive, brownish-grey, buff weathering dolomite of the Lockport Formation. It is underlaid by grey shale of the Rochester Formation which is

exposed in the quarry floors.

2. Bedrock exposed in the quarries is similar to that which occurs at Lock 7, Welland Canal. The quality of the rock is excellent and it should yield satisfactory aggregate.

3. All rock exposed in the quarry faces is used in the production of aggregate. This includes the weathered material near bedrock surface. It is suggested, concrete in which the rock has been used and which has been placed for more than 5 years be examined to determine if the weathered material has any deleterious effect.

4. The attitudes of bedrock structures in the quarries examined are much the same. The southerly dip of the bedding is so shallow that, locally, the beds can be considered as horizontal. Faulting or folding do not occur. Joint fractures which are usually vertical are normally closed within 4 to 5 feet of bedrock surface. Consequently groundwater can not perculate far along these structures and weathering is confined to the upper few feet of bedrock.

5. The height of the working faces in the quarries examined is not great. It ranges from 20 to 39 feet. At Queenston Quarries the average height is about 38 feet but only the upper 24 feet is used to provide aggregate. The lower part is set aside as a source of building stone.

6. The Lockport Formation is the upper cliff-forming member of the Niagara escarpment and consequently all the quarries examined are located on the brow of the escarpment.

7. Small quantities of groundwater were encountered at the contact of the dolomite and underlying shale. These are unimportant and are easily controlled. The quarries of St. Catharines Crushed Stone Limited and of Walker Bros. Limited are shut down during the winter and allowed to flood. Queenston Quarries Limited produces aggregate all year round although the production of building stone is suspended during the winter months.