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# 8. GORDON RIVER LIMESTONE DEPOSITS

by S. M. Rowe

## INTRODUCTION

A survey of the Gordon River limestone deposits was carried out early in 1962 to determine the quantity and grade of limestone available for potential use in smelting Savage River iron ore. The limestone was continuously sampled where outcrops permitted along a traverse through the most promising quarry site. The contacts of the limestone with the underlying and overlying formations were located and extended by photointerpretation throughout the limestone belt.

## LOCALITY AND ACCESS

The Limestone crops out along Limekiln Reach which extends approximately from 8 to 16 miles from the mouth of the Gordon River. Access is by launch from Strahan, the trip across Macquarie Harbour and up the river to the beginning of Limekiln Reach taking about four hours.

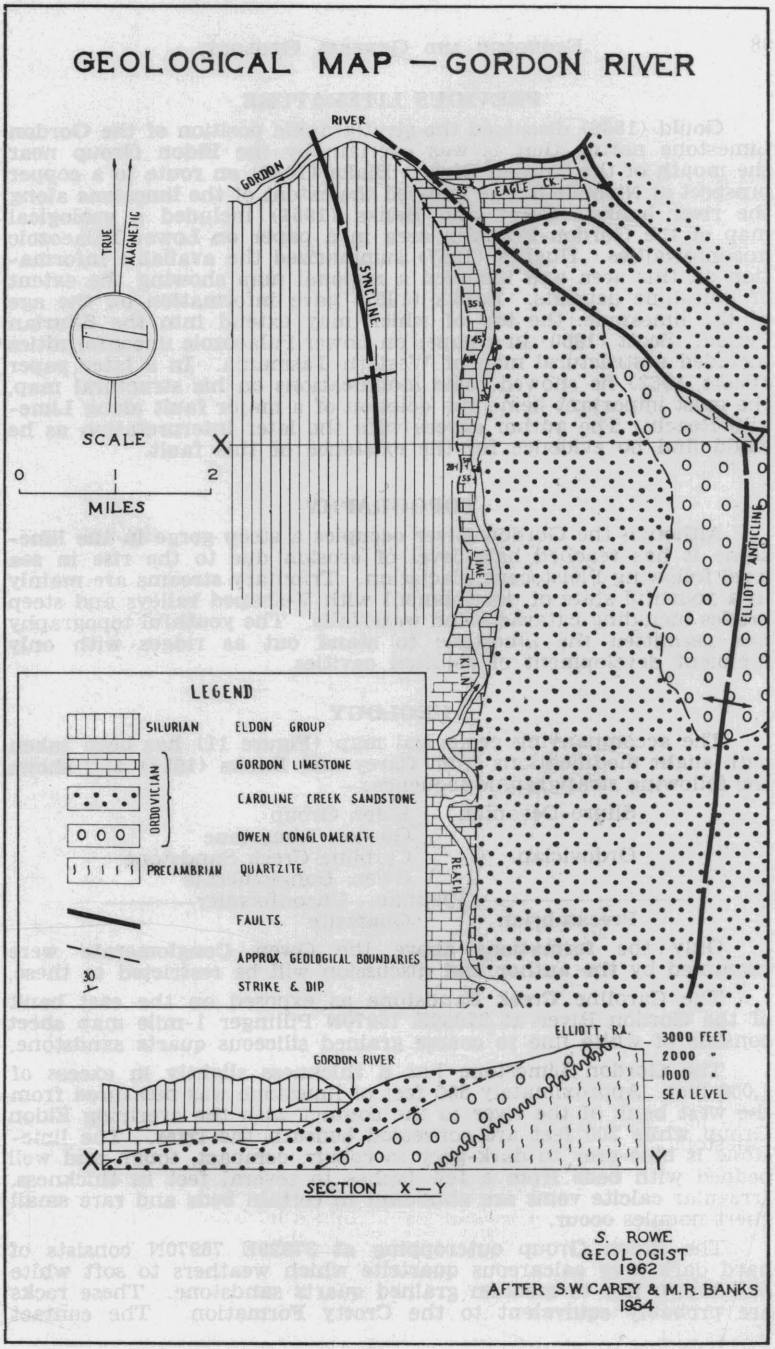


FIGURE 11.

5 cm

## PREVIOUS LITERATURE

Gould (1866) discussed the stratigraphic position of the Gordon Limestone noting that is was overlain by the Eldon Group near the mouth of the Gordon River. Blake (1938) en route to a copper prospect at Nicholls Range mapped the extent of the limestone along the river banks. Carey and Banks (1954) included a geological map of the Gordon-Franklin area in a paper on Lower Palaeozoic unconformities. Hughes (1957) summarized the available information on this area and included a regional map showing the extent of limestone deposits. Banks (1957) gave information on the age of the limestone, the top of which may extend into the Silurian Period. Scott (1960) in a paper on Lower Palaeozoic unconformities included a structural map of Western Tasmania. In a later paper (Scott, 1962) he showed some modifications on his structural map, the most important being the deletion of a major fault along Limekiln Reach. The author agrees with the later interpretation as he could find no evidence for the existence of this fault.

## TOPOGRAPHY

Although the Gordon River occupies a steep gorge in the limestone it has reached base level of erosion due to the rise in sea level following Pleistocene glaciation. Tributary streams are mainly in a youthful state of development with V-shaped valleys and steep grades including cataracts and waterfalls. The youthful topography has permitted the limestone to stand out as ridges with only incipient development of solution cavities.

## GEOLOGY

The accompanying geological map (Figure 11) has been taken with slight modifications from Carey and Banks (1954) and shows the following stratigraphic sequence:—

| | |
|---|---|
| Siluro-Devonian | Eldon Group |
| Ordovician | Gordon Limestone |
| | Caroline Creek Sandstone |
| | Owen Conglomerate |
| ——————— | Tyennan—Unconformity ——— |
| Precambrian | Quartzite |

Only the formations above the Owen Conglomerate were examined by the author and discussion will be restricted to these.

The Caroline Creek Sandstone as exposed on the east bank of the Gordon River at 37060E 76970N Pillinger 1-mile map sheet consists of white fine to coarse grained siliceous quartz sandstone.

The Gordon Limestone has a thickness slightly in excess of 1,000 feet. Approximately 850 feet of limestone was measured from the west bank of the river to the contact with the overlying Eldon Group while 200 feet are concealed beneath the river. The limestone is blue-grey to dark-grey in colour, compact, tough and well bedded with beds from a few inches to several feet in thickness. Irregular calcite veins are abundant in certain beds and rare small chert nodules occur.

The Eldon Group outcropping at 37020E 76970N consists of hard dark grey calcareous quartzite which weathers to soft white and brown fine to medium grained quartz sandstone. These rocks are probably equivalent to the Crotty Formation. The contact

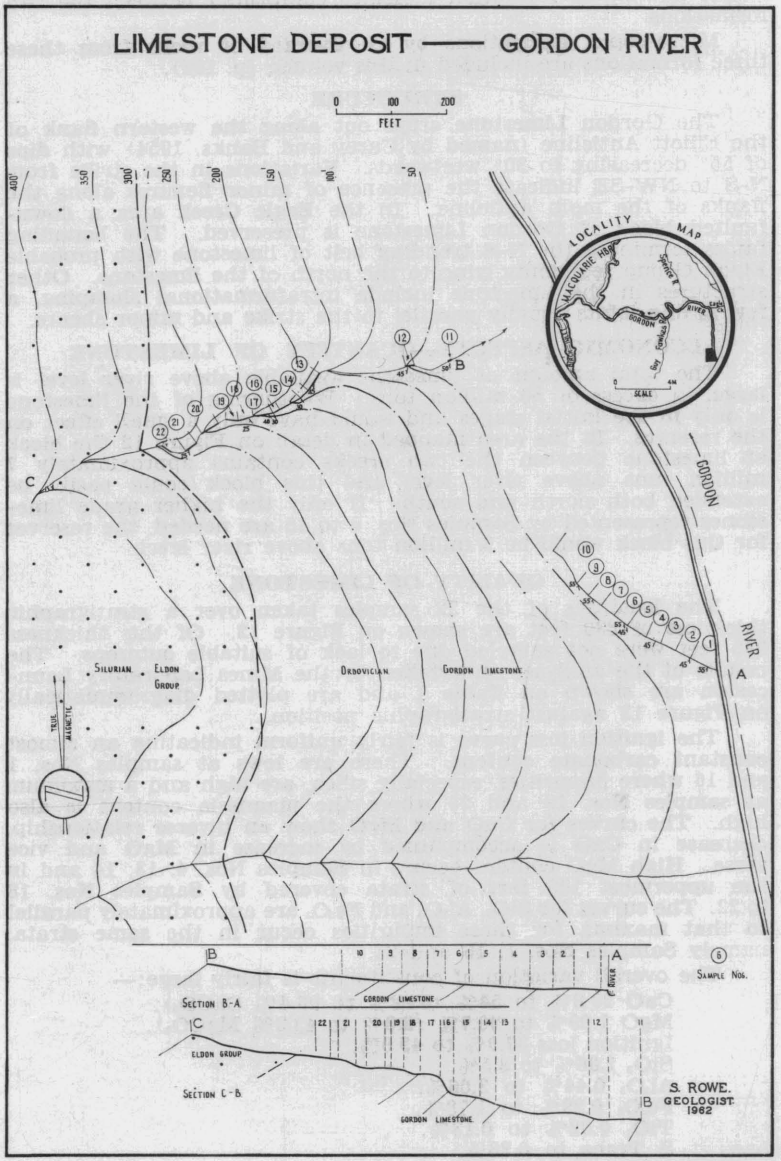


FIGURE 12.

5 cm

with the underlying Gordon Limestone is covered by boulders and rubble but dip in formation indicates conformity between the two formations.

Microscopic descriptions by G. Everard of rocks from these three formations are included in this volume (p. 106).

## STRUCTURE

The Gordon Limestone crops out along the western flank of the Elliott Anticline (named by Carey and Banks, 1954) with dips of 55° decreasing to 20° westwards. Variations in the strike from N-S to NW-SE indicate the presence of minor flexures along the flanks of the main anticline. In the Eagle Creek area a down-faulted block of Gordon Limestone is preserved. The bounding faults terminate the N-S trending belt of limestone with probable Eldon Group sediments lying to the north of the limestone. Other structures in the limestone include intraformational slumping, a few strong joints usually parallel to the strike and minor shears.

## ECONOMIC ASPECTS—QUANTITY OF LIMESTONE

The total amount of limestone available above river level is large, in excess of 50 million tons. Weathering of the limestone is only in the initial stages and would have only a small effect on the reserves. In the area mapped in detail on Figure 12 the block of limestone between the two creeks contains approximately 7 million tons above river level and this block could easily be extended both north and south. If only the higher grade limestones represented by Samples Nos. 5 to 15 are needed, the reserves for this block would be 3 million tons above river level.

## QUALITY OF LIMESTONE

The localities of the 22 samples taken over a stratigraphic thickness of 830 feet are shown on Figure 12. Of this thickness 345 feet were not sampled due to lack of suitable outcrops. The results of the analyses undertaken by the Mines Laboratory Launceston are shown on Table I and are plotted diagrammatically on Figure 13 against stratigraphic position.

The ignition loss curve is fairly uniform indicating an almost constant carbonate content. There are lows at samples Nos. 1 and 16 where impurities, especially silica, are high and a maximum at samples Nos. 19 and 20 where the magnesia content is also high. The curves for CaO and MgO show an inverse relationship, decrease in CaO is accompanied by increase in MgO and vice versa. High MgO content occurs in Samples Nos. 4, 13, 14 and in the uppermost 145 feet of strata covered by Samples Nos. 18 to 22. The curves for $SiO_2$, $Al_2O_3$ and $Fe_2O_3$ are approximately parallel so that maxima for these impurities occur in the same strata, namely Samples Nos. 1, 16 and 21.

The overall variation of constituents is fairly large:—

CaO 29.8% to 54% (53.2% to 96.4% $CaCO_3$).
MgO 1.09% to 20.7% (2.3% to 43.3% $MgCO_3$).
Ignition loss 37.9% to 45.0%.
$SiO_2$ 1.86% to 8.5%.
$Al_2O_3$ 0.44% to 3.06%.
$Fe_2O_3$ 0.29% to 1.78%.
$TiO_2$ 0.02% to 0.13%.
S Trace to 0.28%.
MnO 0.01% to 0.08%.
$P_2O_5$ 0.01% to 0.04%.

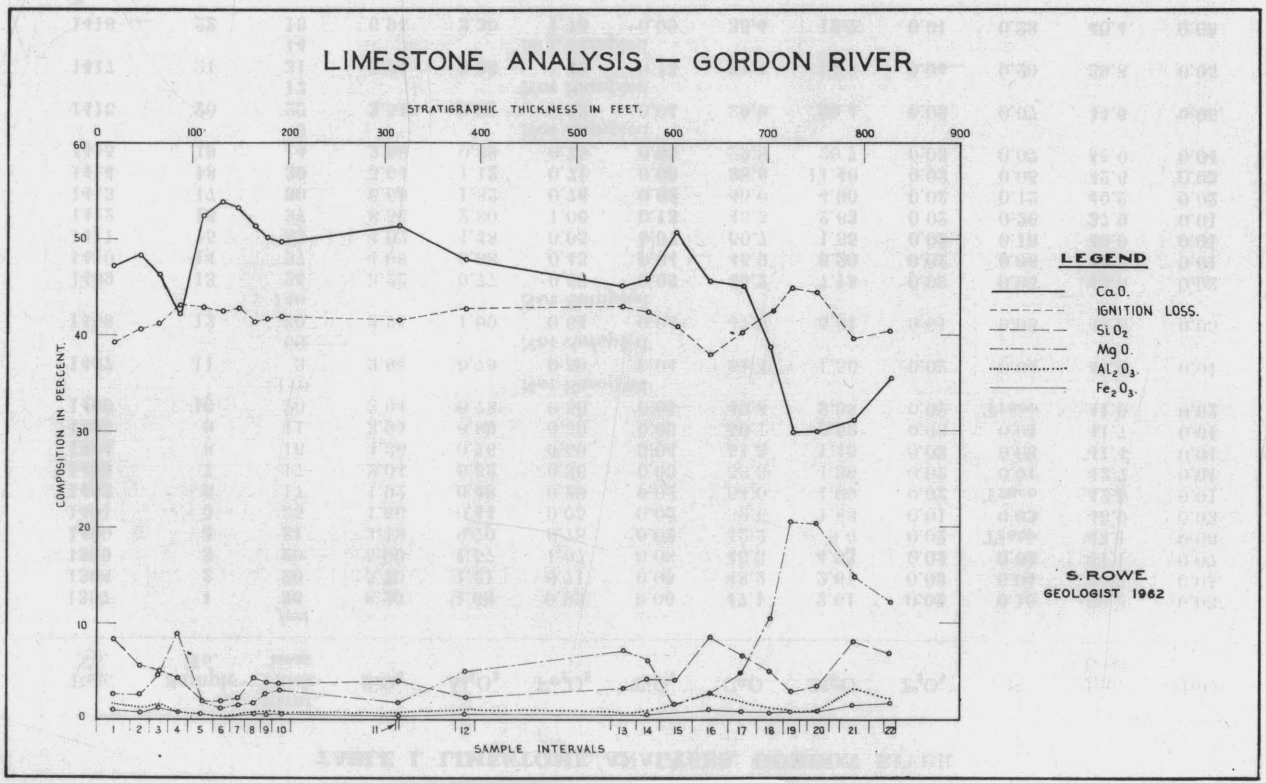


FIGURE 18.

5 cm

## TABLE I. LIMESTOME ANALYSES, GORDON RIVER

| Reg. No. | Sample No. | Strat. Thick-ness | $SiO_2$ | $Al_2O_3$ | $Fe_2O_3$ | $TiO_2$ | CaO | MgO | $P_2O_5$ | S | Ign. Loss | MnO |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *feet* | | | | | | | | | | |
| 1397 | 1 | 36 | 8.20 | 1.68 | 0.93 | 0.06 | 47.1 | 2.61 | 0.02 | 0.10 | 39.2 | 0.03 |
| 1398 | 2 | 20 | 5.70 | 1.21 | 0.71 | 0.05 | 48.2 | 2.61 | 0.02 | 0.04 | 40.7 | 0.05 |
| 1399 | 3 | 20 | 5.00 | 1.57 | 1.07 | 0.08 | 46.3 | 4.63 | 0.02 | 0.08 | 41.1 | 0.07 |
| 1400 | 4 | 21 | 4.18 | 0.70 | 0.78 | 0.02 | 42.2 | 9.0 | 0.02 | Trace | 43.1 | 0.06 |
| 1401 | 5 | 25 | 1.86 | 0.44 | 0.05 | 0.02 | 52.6 | 1.88 | 0.01 | 0.03 | 43.0 | 0.03 |
| 1402 | 6 | 17 | 1.92 | 0.48 | 0.29 | 0.02 | 54.0 | 1.09 | 0.02 | Trace | 42.5 | 0.01 |
| 1403 | 7 | 17 | 2.04 | 0.52 | 0.36 | 0.03 | 53.3 | 1.36 | 0.02 | 0.01 | 42.7 | 0.01 |
| 1404 | 8 | 16 | 4.26 | 0.76 | 0.50 | 0.04 | 51.3 | 1.46 | 0.03 | 0.03 | 41.4 | 0.01 |
| 1405 | 9 | 11 | 3.94 | 0.89 | 0.50 | 0.05 | 50.1 | 2.62 | 0.03 | 0.04 | 41.7 | 0.01 |
| 1406 | 10 | 20 | 3.94 | 0.78 | 0.50 | 0.04 | 49.8 | 3.08 | 0.02 | Trace | 41.9 | 0.02 |
| | | 110 | | | Not Sampled | | | | | | | |
| 1407 | 11 | 3 | 3.94 | 0.79 | 0.50 | 0.04 | 51.4 | 1.56 | 0.02 | 0.04 | 41.6 | 0.01 |
| | | 60 | | | Not Sampled | | | | | | | |
| 1408 | 12 | 20 | 2.34 | 1.00 | 0.64 | 0.04 | 47.9 | 5.61 | 0.01 | 0.08 | 42.8 | 0.05 |
| | | 140 | | | Not Sampled | | | | | | | |
| 1409 | 13 | 25 | 3.22 | 0.77 | 0.50 | 0.03 | 45.2 | 7.18 | 0.02 | 0.05 | 43.0 | 0.02 |
| 1410 | 14 | 27 | 4.06 | 0.88 | 0.43 | 0.04 | 45.9 | 6.20 | 0.02 | 0.06 | 42.5 | 0.01 |
| 1411 | 15 | 33 | 4.02 | 1.48 | 0.05 | 0.07 | 50.7 | 1.55 | 0.02 | 0.16 | 40.9 | 0.01 |
| 1412 | 16 | 37 | 8.56 | 2.80 | 1.00 | 0.13 | 45.5 | 2.63 | 0.02 | 0.26 | 37.9 | 0.01 |
| 1413 | 17 | 30 | 6.68 | 1.82 | 0.78 | 0.08 | 45.0 | 4.90 | 0.02 | 0.12 | 40.2 | 0.02 |
| 1414 | 18 | 30 | 5.04 | 1.12 | 0.71 | 0.06 | 38.8 | 11.40 | 0.02 | 0.06 | 42.6 | 0.03 |
| 1415 | 19 | 14 | 2.98 | 0.89 | 0.78 | 0.06 | 29.8 | 20.7 | 0.03 | 0.07 | 45.0 | 0.04 |
| | | 9 | | | Not Sampled | | | | | | | |
| 1416 | 20 | 22 | 3.54 | 0.91 | 0.93 | 0.04 | 29.9 | 20.4 | 0.03 | 0.07 | 44.6 | 0.05 |
| | | 12 | | | Not Sampled | | | | | | | |
| 1417 | 21 | 31 | 8.24 | 3.06 | 1.42 | 0.13 | 31.1 | 14.8 | 0.04 | 0.20 | 39.8 | 0.05 |
| | | 14 | | | Not Sampled | | | | | | | |
| 1418 | 22 | 13 | 6.94 | 2.30 | 1.78 | 0.09 | 35.4 | 12.2 | 0.01 | 0.28 | 40.4 | 0.08 |

The higher grade limestone crops out from 150 feet to 600 feet west of the river over a stratigraphic thickness of 520 feet. This is the interval represented by Samples Nos. 5 to 15 which have an average carbonate content of 95.4% comprising 89.4% $CaCO_3$ and 6.0% $MgCO_3$. The average content per cent of other components is 3.23 $SiO_2$, 0.80 $Al_2O_3$, 0.47 $Fe_2O_3$, 0.04 S, 0.02 MnO and 0.02 $P_2O_5$. Normally in the Gordon Limestone the quality of beds remains constant over large distances so these results may be regarded as giving an accurate estimate of the grade of these beds in this area.

## QUARRY SITES

The area of limestone suitable for quarrying extends along the west bank of the river from 1 to 4 miles south of Eagle Creek. The most promising site for a quarry is 3 miles south of Eagle Creek in the area shown on Figure 12. Steep cliffs abutting the water would permit loading direct into a boat in the river. The river is quite deep and would be navigable for ocean going vessels after dredging the bar at the mouth of the river. Other good quarry sites occur 1½ miles and 3¾ miles south of Eagle Creek. These additional sites were not examined in detail but it is anticipated that the quantity and quality of limestone available would be comparable with the sampled area.

## CONCLUSION AND RECOMMENDATIONS

The survey established the presence of large reserves of high grade limestone which could be readily quarried and transported by boat. Further work on these deposits is not warranted at this stage, though before development commences more detailed sampling and surveying would be required.

## ACKNOWLEDGEMENTS

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