LIMESTONE IN THE VICINITY OF GRAY.

INTRODUCTION:

This report is concerned with calcareous strata on the southern fall of Mt. Elephant, extending from the immediate neighbourhood of Gray, at the junction of the Tasman Highway and the road to Dalmayne Colliery, along the Tasman Highway past the head of Elephant Pass, and thence about four miles in a north easterly direction parallel with a short minor road.

Gray is situated about four and a half miles south of the railway terminus at St. Marys, along the Tasman Highway.

PREVIOUS WORK:

Reference is made to the area under consideration, in a report by J. Milligan on Fingal and the East Coast, published in 1849. Gould's report of 1861 on Coalfields is illustrated by a geological sketch map which includes the Gray district. This map is notable for its delineation of limestone outcrops, but the map rather illustrates the geological structure of the district, than gives the correct position and slope of the outcrops; thus limestone is shown close to the summit of Mt. Elephant whereas in fact its position is on the lower slopes. A report made by Twelvetrees in 1901 contains a sketch map showing part of the Gray area. A more adequate description is given in the "Coal Resources of Tasmania" including a map by H.G.W.Keid of the Mt. Nicholas - Dalmayne - Fingal Coalfield showing contours with 200' intervals; but Mr. Keid's map covers a large area and its scale does not permit limestones to be shown separately from the other Permian formations.

TOPOGRAPHY:

The area is one of strong relief, there being a difference in altitude of about two thousand feet between the summit of Mt. Elephant and a point in the bed of Wardlaw Creek one and a half miles distant.

Two separate drainage systems are represented. To the north and west of Gray are the headwaters of the streams feeding the Break O'Day, a mature river flowing across a flood plain in a broad level valley to join the South Esk near Fingal. South-east of Gray are numerous streams flowing down the slopes of Mt. Elephant to unite as Wardlaw Creek and enter the sea at Saltwater Inlet. These streams, including the Wardlaw, flow through deep chasms with precipitous cliffs. They descend rapidly to sea level whereas the Break O'Day Plain has a general level of about eight hundred feet above the sea. The watershed between these two drainage systems is a narrow ridge carrying the road to Dalmayne Colliery at its junction with the Tasman Highway. In future times river capture seems inevitable at this point, which would result in rejuvenation of the mature valley of the Break O'Day and reversal of its drainage.

In sharp contrast to the broad level Break O'Day Plain, stretching westward from Mt. Elephant, the country to the south and east is a jumble of steep-sided valleys with narrow ridges separating their sinuosities. The denudation of these interflumes is still at an early stage and precipitous cliffs are common in the harder strata at the heads of valleys. Before entering the sea, streams on the eastern fall cross a narrow coastal plain diversified with sand-hills and lagoons.

GEOLOGY:

Upturned edges of lower Palaeozoic strata, in places invaded by granites, are overlain by an interconformable horizontal succession of Permian and Triassic deposits. The horizontal strata have been discordantly and concordantly intruded by dolerite with the formation of sills at various levels above the lime-stone, which occupies a more or less central position here, in the Permian succession, together with irregular transgressive intrusions. Mt. Elephant, a residual of erosion, is a flat topped pile of horizontal sedimentary strata protected by a thick capping of dolerite. Dolerite debris, on the southern slopes, showing fine flat jointing is indicative of small sills, and terraces with springs have been formed where sills outcrop.

The area is crossed from north to south by systems of anastomosing faults which are very difficult to trace in detail. To the west, the Break O'Day Plain is itself a shallow trough-faulted area between the Cornwall and Silkstone faults, and although the valley is essentially due to erosion and not to faulting, it is perhaps significant that alluvium is much more extensive in this down faulted area than elsewhere in the valley. Conversely Mt. Elephant, although a residual of erosion is bounded longitudinally by sub-parallel zones of faulting on either side.

THE LIMESTONES:

The Permian and Triassic beds are almost horizontal, having but a slight dip to the south, and the limestone occupies a central position in the Permian succession, being overlain by mudstone and underlain in some localities by mudstone or shale and in others by a fine sandstone. The thickness of limestone is about one hundred feet and it outcrops as a fringe or apron around the southern end of Mt. Elephant, below the Tasman Highway on the south-western aspect and below a short branch road on the south-eastern, but is not completely continuous, being cut out in places by faulting. Limestone also extends for a short distance on the south-eastern side of Wardlaw Creek, below the Dalmayne road, and again just to the north of the road junction at Gray, on the side of a gully.

The actual outcrops are in the form of cliffs or protruding joint blocks on steep slopes. The maximum height of sheer cliff is approximately fifty feet, the base of the cliff consisting of talus slopes and fallen blocks.

In hand specimen the rock is light grey to almost white in colour, with glittering facets of crystalline calcite on newly fractured surfaces. It is very highly fossiliferous. Under the microscope innumerable fossils and fossil fragments are seen. The chambers of gasteropod shells and interseptal interstices of corals being filled with crystalline calcite and occasionally with clumps of quartz grains. Small angular fragments of quartz are disseminated through the rock, but in very small amount. The matrix is a very fine grained mass of calcite with a small amount of silica and is stained with very fine laminated material. The bulk of the impurity is contained in the matrix and consists of fine clayey and shaly particles.

Although dolerite appears in the field in close proximity to the limestone, no actual contact was observed and no minerals of thermal metamorphic origin were observed under the microscope.

The chemical analyses, given in the table, show that these rocks are somewhat impure limestones. Percentages of Magnesia, Alumina and Iron are quite small and the impurities are contained in the acid insoluble portion. There may be also a small but measurable proportion of Phosphorus in some instances.

From the economic aspect, these limestones are not high grade, but contain more lime than is common with the Permian limestones of the State, and it seems probable that stone could be obtained from the deposit suitable for crushing and use as agricultural lime.

The outcrops being cliffs or on steep slopes are well adapted for quarrying and the overburden generally is light. The deposits are situated close to a main highway and within five miles of a railway terminus. They constitute a possible reserve of some magnitude of limestone suitable for agricultural purposes.

Signed: G. Everard,
GEOLOGIST

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Reg.No.	Map Ref.	Acid Insol.	P_2O_5	R_2O_5(3)	MgO	CaO	Ignition Loss	$CaCO_3$ calc.(2)
375/51	7 (0-10'(1)	36.2	0.1	1.9	0.6	32.7	28.1	58.4
376/51	(10-25'	16.8	trace	0.7	0.4	45.4	36.6	81.1
377/51	(10-25'	12.8	0.1	0.5	0.5	48.0	38.0	85.7
378/51	36 (25-40'	16.2	trace	0.7	0.5	45.7	36.6	81.6
379/51	(40-55	26.7	trace	1.3	0.5	39.0	31.3	69.7
380/51	39 (0-5	40.8	trace	2.3	0.6	30.2	25.7	53.9
381/51	39 (5-10	23.6	trace	2.0	0.5	40.6	33.4	70.7
382/51	43	22.6	trace	0.7	0.4	42.3	34.1	75.5
383/51	47(25'-35	37.3	0.2	2.3	0.6	32.2	27.4	57.3
384/51	(40 -50	17.9	trace	0.7	0.5	45.1	36.0	80.1
385/51	56(20-40)	20.8	0.2	0.7	0.5	43.0	34.7	76.8
386/51	66(10-40')	36.2	0.4	2.2	0.6	32.7	27.4	58.4
387/51	67	22.4	trace	0.9	0.4	42.0	33.8	75.0

(1) Measured down from surface.

(2) Calculated from CaO.

(3) $R_2O_3 = Al_2O_3 + Fe_2O_3 + TiO_2$.