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GEOLOGICAL REPORT ON CEMENT MATERIALS AT DALMAYNE AND MT. PETER.

INTRODUCTION -

This report embodies the results of a brief examination around the Dalmayne Mine and Mt. Peter. The particular object was to examine the deposits of limestone and coal and any deposits of clay materials which might be located, in order to determine the possibilities of establishing a cement industry. Coal and limestone have long been known to occur within easy distance of each other at Dalmayne, and, as clay has been located in the vicinity, the conditions are generally suitable for cement manufacture. At. Mt. Peter, similar limestone occurs and clay deposits could possibly be located by extended search. Coal could be obtained from Dalmayne or Mt. Paul, but the various deposits are not so advantageously situated as at Dalmayne

LOCATION AND ACCESS -

The Dalmayne and Mt. Peter districts are situated on the East Coast of Tasmania. Dalmayne is eight miles south of St. Marys, the terminus of the State Railway from Conara, and Mt. Peter is twenty-three miles to the south of Dalmayne. There is a general absence of suitable harbours on this part of the coast, the nearest being Coles Bay about thirty-five miles to the south of Dalmayne. A railway is at present in the course of construction from Coles Bay to Dalmayne as a means of transporting the coal from Dalmayne mine and exporting it. This railway is being constructed by the East Coast Development Company and will serve the whole of the country between Coles Bay and Dalmayne.

COAL -

The coal deposits of the Dalmayne mine have been fully described in the Tasmanian Geological Survey Mineral Resources No. 7 - The Coal Resources of Tasmania - and the following notes are taken from the above report.

Seven seams are known within the area and occur at altitudes from 680 to 1340 feet above the sea. They outcrop on the flanks of the East Coast Range and under such conditions that they be advantageously worked by adits. Of these seven seams only one, the Delta, has been opened up to any extent. A main adit has been driven in this seam in a general south-westerly direction from 660 feet and several bords have been opened up on it both to the north west and south-east. This seam has a total thickness of 13 feet 7 inches from which possibly 10 to 10½ feet of coal may be obtained. Leases 6435/M and 6436/M are likely to be most productive of those held by the Company.

Altogether the leases contain a maximum of 550 acres of coal-bearing country. In calculating the reserves, only four seams with a total thickness of 20 feet are considered. These include the Delta, Theta and Iota seams with thicknesses included in the calculations of 8, 4, and 3 feet respectively. On a basis of 4 seams with a thickness of 20 feet extending over an area of 500 acres, the reserves are 12,000,000 tons. These would be augmented by the coal in the remaining seams when properly developed.

The quality of the coal is indicated by the analyses in the attached table (No. 1). The coal is similar to the other East Coast coals in that the ash content is somewhat high, as is also the fixed carbon, while the volatile combustible matter is -- correspondingly low. The calorific value of 9200 to 9400 b.t.u. is very fair for such a coal. Investigation has shown that ther is no danger of spontaneous combustion with Tasmanian coals, even in the powdered form if stored dry. From this and other points of view the Tasmanian East Coast coals are particularly suitable for use in the powdered form.

(15)

LIMESTONE -

Dalmayne area - Limestone outcrops on the eastern part of the Dalmayne leases in the creeks and gullies and as small cliffs on the hillside. The chief outcrops are on the eastern portion of Lease 8135/M and the adjacent portions of the crown land to the west (last held as Lease 9184/M). The limestone and enclosing strata belong to the Permo-Carboniferous system. The basal beds of this system consist of conglomerates and grits unconformably overlying Cambro-Ordovician slates and quartzites. These rocks pass upwards into sandstones with interbedded shales, the total thickness of this basal series being 170 feet. The limestone beds overlie the above and in the chief branch of -- Piccanini Creek a thickness of 170 feet is exposed. A very small thickness (not exceeding 30 feet) of strata overlie the limestone and underlie the felspathic sandstone series of the Trias-Jura system.

In Piccaninny Creek the basal beds of the Permo-Carboniferous system overlie the quartzites at an altitude of 260 feet above sea-level, while the limestones overlie the basal beds at 430 feet. On the north-eastern corner of lease 8135/M, the quartzite extent to altitudes of-600 feet, while about the centre of the lease the basal conglomerates occur at 330 feet above the sea. This difference in altitude of the Cambro-Ordovician basement is due either to faulting or the occurrence of an island of Cambro-Ordovician rocks in the Permo-Carboniferous seas. The former is the most probable explanation and would coincide with the Cornwall fault as mapped by Mr. Keid (Coal Resources of Tasmania). Though this fault has affected the extension of the limestone to the north east, it does not affect that, or the working thereof, to the south west of the probable fault.

The limestone outcrops in two areas as shown on the accompanying plan. The larger of these covers approximately 100 acres and the smaller 20 acres. The total thickness of the limestone is 170 feet and a conservative estimate of the average thickness over the above areas may be taken as 100 feet. The amount of limestone available would therefore be 10,000 acre-feet An acre-foot of limestone of specified gravity 2.5 contains 8000 tons or allowing 33 1/3 for voids, solution channels, etc., 2000 tons, The reserves on the above areas are therefore 20,000,000 tons. In addition, the limestone continues to outcrop along the flanks of the hills to the north west for a considerable distance. This extension provides further reserves if required. It is to be noted also that the limestone extends westerly under the hills, but cannot be economically worked owing to the overburden of coal measures.

The quality of the limestone is shown by the analyses of samples Nos. 3, 6 and 7. Sample No. 3 represents a band of pink limestone 5 to 6 feet thick outcropping in Piccaninny Creek. With a calcium carbonate content of 90% and silica of 7.2%, it is of suitable quality for standard Portland cement manufacture. Sample No. 7 represents a sample from a small cliff face south of and immediately below the track to the Dalmayne mine.

This sample has a content of 79.25% calcium carbonate, 17.40% silica and 1% iron and alumina. The silica content is too high in relation to the calcium carbonate content to permit this limestone to be used for manufacture of standard Portland cement.

It must be noted that these samples represent only individual bands and not the full thickness of limestone. Representative sampling is impossible in this area because of the lack of outcrops, only a few low cliffs being available, except in Piccaninny Creek. Even in the creek where a partial section of the limestone is exposed the rock is generally wet and under such conditions that a representative sample cannot be taken without a fair amount of work. The above analyses indicate that some bands are suitable for use in standard cement manufacture while others are not, being on the border line between suitable and unsuitable. (16)

The limestone which is shown outcropping on the attached plan occurs practically free of overburden and so is favourable for economical working. This applies especially to the ridge along which the track to the Dalmayne coal mine passes and on which the limestone can be seen outcropping. The same conditions hold on the ridges to the south and north, but there is more soil and hill detritas on these ridges. In addition to the limestone shown on the plan, it must be remembered that the limestone extends under the hills to the west, but is of course overlain by the coal-bearing strata.

Mt. Peter District - A large tract of country around Mt. Peter is occupied by Permo-Carboniferous rocks. On the eastern flanks thereof and immediately adjacent to Saltwater Lagoon these rocks occur down to sea level. The lowest beds consist of conglomerates which pass up into sandstones, these being overlain in turn by limestones at an altitude of 110 feet. The limestones ext extend right to the summit of the hills (380 feet) so that the thickness is at least 270 feet. The same limestones are observed outcropping on the hills for one or more miles to the north of Saltwater Lagoon. Time did not permit of a detailed examination of this region, but it may be safely assumed that large quantities amounting to many millions of tons are present. The conditions are very favourable for economical working, the limestones extending to the summits of the hills with no overlying strata acting as overburden.

Sample No. 6 is a roughly representative one taken from a larger sample of 200 feet of limestone near Saltwater Lagoon. With a content of 88.80% calcium carbonate and 7.80% silica, it is suitable for cement manufacture. This sample, while not absolutely representative, certainly indicates the possibility of the full thickness of limestone, at this locality, being suitable for cement manufacture. The limestone here represents the same beds as at Dalmayne, but is 23 miles distant therefrom so that it is unwise to make comparisons between the two with the object of determining the suitability of the full thickness at Dalmayne. Time did not permit of a search for clay deposits, but such could possibly be located in the large tract of flat country along the railway route and extending easterly between Mt. Peter and Long Hill to the coast.

CLAY MATERIALS -

A limestone of the type discussed above with 80 to 90% calcium carbonate and ~~12-4e~~ 8 to 18% of silica has to be mixed with clay in order to produce a suitable mixture for cement manufacture. Several materials which might be suitable for eem such a purpose were located during this brief examination and were sampled to determine their composition.

Shales - Sample No. 4 represents a 3 foot seam of light-coloured shale of Trias-Jura age outcropping in Piccaninny Creek. Sample No. 5 represents a dark-coloured shale immediately underlying the above and with a thickness of approximately 27 feet. The samples were of the nature of grab, rather than representative ones. In sample No. 4 the ratio of silica to ferric oxide and alumina is 2.25 to 1, while in No. 5 the corresponding ratio is 3.06 to 1. The former ratio is rather low, but the latter is quite suitable to mix with high grade limestones. The shales at their outcrop in Piccaninny Creek are covered by overburden of felspathic sandstones, etc. and so the conditions are not ideal for economical working. Exploratory work by trenches, shafts, etc. at the altitudes at which they should occur in other parts would easily determine the mostsuitable localities where these shale beds could be mined if required.

Clay - A low lying area of granite occurs near the intersection of the road and the aerial ropeway to Piccaninny Point. Shallow holes sunk on this area revealed a soil and subsoil of clay which would probably in depth give place to completely -- weathered granite. Sample No. 8 was a grab sample of this -- material which therefore contains 48.12% silica, 4.52% ferric oxide and 36.20 alumina. The ratio of silica to ferric oxide and alumina is 1.18, which is much too low for use with high grade limestones. In spite of this, however, this clay may find a use in supplying alumina as the limestone is not high grade but contains a considerable amount of silica with little or no alumina. This material occurs under favourable conditions as regards -- working as the only overburden would be the sandy soil. The lower limit of the deposit will be irregular depending on its junction with the unweathered granite beneath. In order to determine the extent and thickness so as to estimate the reserves available, it would be necessary to sink numerous shallow shafts and trenches. This work could be easily and quickly carried out and would envolve no great expense.

Other deposits - In addition to the above deposits located during the brief examination, other deposits of clay materials might be located by further examination if required.

Possibilities in this connection are :-

(a) The alluvial flats along the lower parts and mouth of Piccaninny Creek.

(b) Other beds of mudstone and shale contained in the Trias-Jura and Permo-Carboniferous systems

(c) Wide belts of slates (and other clay derived therefrom by weathering) in the Cambro-Ordovician system.

CONCLUSIONS AND RECOMMENDATIONS -

The above brief examination was devoted chiefly to two of the most important materials used in the manufacture of cement limestone and clay. A series of limestone beds occur at Dalmayne where they attain a thickness of 170 feet, and also at Mt. Peter where they are 270 feet thick. The reserves at both -- places are sufficient to warrant the commencement of a cement industry provided other factors are suitable. The conditions under which the limestone outcrops, are favourable for economical working. It is the quality of the limestone that is somewhat doubtful and needs further investigation. The analyses show that it has a content of calcium carbonate ranging from 79 to 90%, with a corresponding silica content from 17.4 to 7.2%.

These limestones with the low calcium carbonate and high silica contents are unsuitable for the production of standard

Portland cement. The better grades of limestones are, however, quite suitable. The question then arises as to whether there is sufficient of these better grade ores present to be economically mined, or alternatively, whether the average quality of the whole of the limestones might not be suitable. The solution is probably along the latter lines.

It is therefore recommended that steps should be taken to ascertain the average quality of the limestone. This could be done by surface prospecting or by boring. The latter would giv the best results, though it might be more costly. The conditions are more favourable for determiningthe quality at Mt. Peter than at Dalmayne. Several possible clay materials were located and sampled. The shales at Dalmayne are of suitable composition to mix with high grade limestone for standard Portland cement. As the limestone contains a high proportion of silica as impurity, it is possible that these shales might not be suitable to mix with it. The clay overlying the granite adjacent to the main road is relatively high in alumina and low in silica. Though unsuitable to mix with high grade limestones, it is much more suitable to mix with the silicious limestones of the East Coast. It is -- therefore recommended that if the limestones are investigated and found to be satisfactory, this area of clay should be investigated further as to its extent and quality by the sinking of numerous shallow prospect holes.

The following figures briefly indicate the favourable prospects if the materials conform to the general compositions -- indicated above. Assuming the limestone corresponds generally to that of the Mt. Peter sample, a suitable mixture for the production of standard Portland cement could be obtained by using 85% limestone and 15% the clay overlying the granite. This mixture would contain 75% calcium carbonate, 13.83% silica, and 7.7% alumina. This composition could be varied by altering the proportions of the above materials, or even using some of the Trias-Jura shales. It would be impossible to use limestones of lower grades containing only 85% calcium carbonate or perhaps less. As stated above, however, the first problem is to prove the existence o large reserves of limestones of this quality which can be economically worked.

(sd) P. B. NYE

GOVERNMENT GEOLOGIST.

Hobart,

15th May, 1926.

TABLE No. 1

ANANYSES OF COAL

Sample No.		411	412	413	414	415
Proximate Analysis	(Moisture 105°	4.46	3.56	4.81	4.50	5.10
	(Volatile matter	22.22	21.14	20.47	18.68	18.52
	(Fixed carbon	55.30	54.76	50.53	51.40	49.04
	(Ash	18.02	20.54	24.19	25.42	27.34
Ultimate Analysis	(Sulphur	0.69	0.41	0.41	0.33	0.34
	(Hydrogen		4.17			3.94
	(Carbon		52.50			49.06
	(Oxygen		21.47			18.42
	(Nitrogen		0.91			0.90
Heat Values	(B.T.U.		9431			9243
	(Evaporative)					
	(Powers)		9.75			9.55
Specific gravity			1.68			

TABLE No. 2

ANALYSES OF LIMESTONE AND CLAY MATERIAL.

CONSTITUENT	Sample Number					
	3	4	5	6	7	8
Silica	7.20	63.12	66.00	7.80	17.40	48.12
Ferric oxide	0.44	2.84	5.94	0.72	1.00	4.52
Alumina		25.16	15.86			36.20
Calcium Carbonate	90.23			88.80	79.25	
Magnesium Carbonate	0.60			0.60	0.75	
H2O at 115° C		1.26	1.00			1.40
200° C		0.34	0.32			0.70
255° C		0.30	0.32			0.58
Red Heat		6.14	5.46			9.38