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1987/64. A dolomite quarry near Smithton.

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Abstract

A small quarry being worked near Edith Creek contains dolomite of a quality comparable with other outcrops of dolomite in the Smithton area.

INTRODUCTION

Following a request from Mr J. House, for advice on the operation of his dolomite quarry, a brief inspection and sampling of the deposit was made in October 1987.

The 'quarry' is best described as a very small excavation dug into the side of a steep hill. The small excavation consists of a pit, with water several metres deep covering the bottom. The steep hillside has been terraced to stabilise the slope, and in this process mounds of debris have been pushed into the pit obscuring the working places.

LOCATION AND ACCESS

The quarry, within mining lease 1275 P/M held by J. H. & M. F. House, is located 12 km south-west of Edith Creek [CQ33523] and is reached via the Roger River Road. The land on which the quarry is situated is owned by the quarry operator.

GENERAL GEOLOGY

The dolomite being quarried is part of the Smithton Dolomite of Precambrian age. The quarry is nestled against the flank of a basalt-capped hill. Green and red weathered metamorphosed and contorted shale lie over the dolomite and under the basalt cap.

Within the quarry occur 'floaters' of dolomite in a debris of broken and contorted shale. In one place, a large piece of dolomite has been eroded, with clay filling large solution-formed cavities and channels, making large clay 'plugs' between 'columns' of dolomite. Some of these infillings are two metres high and over one metre wide. The lurid green, blue and red colourings of the shale are presumed to be caused by thermal alteration by the overlying basalt.

Dolomite occurs extensively throughout the Smithton area. Nye *et al.* (1934) noted two main types of dolomite: a good quality coarse-grained crystalline rock, and a fine-grained light grey type of variable grade (Corbett, 1982).

PREVIOUS WORK

Dolomite in the Smithton area has been examined and sampled by Nye, Finucane and Blake (1934) and Hughes (1957). The results are summarised in Corbett (1982).

In 1971 two drill holes were drilled close together, about one kilometre north-east of Irishtown [440696], by the Marble Cliff Quarries Company. Numerous analyses were made of the dolomite intersected in these holes.

One hole was drilled north of Edith Creek [395636]. A number of holes were drilled around the town of Smithton in 1945 by the BHP Company. Logs, but no analyses, exist for these holes.

QUALITY

Samples were taken from various parts of the 'quarry' and from stockpiles of saleable material. Qualitative and semi-quantitative mineralogical analyses were made of each sample using X-ray diffraction techniques, which relate the height of the principal peaks of the minerals obtained to the proportions of these minerals in each sample. These samples are from what rock was available. No actual bedrock of dolomite is exposed in the quarry.

A rough approximation of the percentages of each mineral present can be calculated from this method:

	1	2	3	4	5	6	7
Dolomite	95	97	94	90	-	-	-
Chlorite	1	-	1	2	66	47	66
Quartz	-	-	1	1	21	38	37
Calcite	-	2	2	1	5	11	6
Goethite	-	-	1	2	-	-	-

1. Boulder of dolomite breccia near pond in base of quarry.
2. Crushed dolomite, sale product.
3. Powdered dolomite, sale product.
4. Dolomite 'sand', sale product.
5. Blue altered rock, overlying dolomite.
6. Blue altered rock, overlying dolomite.
7. Red altered rock, overlying dolomite.

COMPARISON WITH OTHER DOLOMITE SAMPLES

Dolomite is a mineral composed of approximately equal quantities of the carbonates of magnesium (Mg) and calcium (Ca) in equal molecular proportions, the formula for dolomite being (Ca.Mg)(CO₃)₂. Pure magnesium carbonate (MgCO₃) is called magnesite and pure calcium carbonate (CaCO₃) is calcite. The rock dolomite is a sedimentary rock containing 50% or more by weight of the mineral dolomite. Limestone is a sedimentary rock containing 50% or more by weight of the mineral calcite.

For comparative purposes, rock samples can be analysed using XRF analysis which gives the composition of a sample in terms of various oxides. Pure dolomite is composed of:

- 54.35% mass CaCO₃
- 45.65% mass MgCO₃

In an XRF or 'whole rock' analysis, the calcium and magnesium are reported as oxides, and so pure dolomite would have the analysis:

- 30.4% CaO
- 21.7% MgO
- and 47.9% CO₂ (from the carbonates)

The proportion of magnesium given as MgO in the whole rock analyses can be converted back to %dolomite by the following conversion:

MgO (% mass)	Equiv. MgCO ₃ (% mass)	Equiv. dolomite (% mass)
5	10.5	23.0
10	20.9	45.7
20	41.7	91.6
21	44.0	96.2
21.5	45.0	98.5

Analyses of known dolomite occurrences in the Smithton area are as follows:

Sample	CaO	MgO	CO ₂ by ignition loss	SiO ₂	Al ₂ O ₃	P ₂ O ₅	C	FeO	Fe ₂ O ₃
1	31.12	21.48	46.73	0.08	0.36	Trace	0.02	0.24	
2	31.22	21.64	46.14	0.20	0.48	Trace	0.156	0.24	
3	31.32	21.50	46.68	0.12	0.36	Trace	0.032	0.12	
4	31.22	21.56	46.64	0.08	0.48	Trace	0.028	0.12	
5	31.60	22.22	46.84	0.08	0.40	Trace	0.03	N.D.	0.08
6	28.70	19.72	43.60	4.60	3.18	0.029	0.20	0.84	0.37
7	28.30	19.76	43.31	4.88	3.06	0.03	0.25	0.78	0.44
8	28.64	19.32	43.35	4.80	3.56	0.03	0.25	0.87	0.47
9	28.40	20.36	43.73	3.80	3.38	0.028	0.35	0.74	0.29
10	28.00	19.20	43.63	5.08	3.86	0.035	0.25	0.71	0.35
11	28.20	14.62	40.75	6.64	8.24	0.054	0.65	1.26	0.76
12	29.80	19.40	44.73	2.12	3.54	0.04	0.35	1.03	0.71
13	28.00	19.98	42.48	5.52	3.68	0.03	0.40	0.94	0.40
14	30.40	21.56	44.83	3.28	0.42	0.06	0.05	0.38	0.15
15	31.20	21.36	46.46	0.52	0.56	0.10	0.14	0.71	0.65
16	20.27	22.88	46.16	1.76					
17	20.58	21.38	45.62	3.36					
18	19.99	22.48	46.70	1.48					
19	29.04	23.15	46.17	2.02					
20	30.3	21.3		<0.10	0.20	0.06		0.24	0.09
21	30.4	23.0		0.20	0.15	0.16		0.17	0.09
22	28.9	20.7		2.1	1.2	0.13		0.23	0.99
23	28.0	19.5		4.8	1.7	0.80		0.25	1.7

- Samples 1-5 from near Blackwood Bridge
- 6-10 from near Irishtown;
- 15 from Watsons Bend (near quarry currently worked by Smithton Dolomite Pty Ltd). Analyses from Nye et al. (1934), exact locations in Corbett (1982).
- 16 Sample 1/1A DDH1, 1971 drilling near Irishtown
- 17 Sample 1/2 DDH1, 1971 drilling near Irishtown
- 18 Sample 1/3, DDH1, 1971 drilling near Irishtown
- 19 Sample 2/1, DDH2, 1971 drilling near Irishtown
- 20 Boulder of dolomite, base of House's quarry
- 21 Crushed dolomite, sale product, House's quarry
- 22 Powdered dolomite, sale product, House's quarry
- 23 Dolomite sand, sale product, House's quarry

CONCLUSIONS

The dolomite occurring in Mr House's lease would appear to be equivalent in quality to other deposits of dolomite in the Smithton area. The friable nature of this dolomite is possibly due to the effects of heating/cooling resulting from the emplacement of the overlying basalt, and/or also from tectonic upheaval. The shales are very distorted and have certainly been subject to shearing of some sort. Parts of the deposit have weathered to produce a dolomite 'sand' of an orange-yellow colour. The colouring is due to the presence of iron minerals (e.g. goethite) in the 'sand'. The quarry may even be in a fault zone of friable, weathered dolomite and dolomite sand and slickensided shale. Further examination of the area would be necessary to determine the exact field relationships between basalt, shale, weathered dolomite, dolomite sand and clay. The extent of the dolomite deposit cannot be ascertained without further work. Drawing comparisons with other outcrops in the Smithton district, the deposit is not likely to be large, although if only a few thousand tonnes per year were mined then the 'not large' deposit would last for many years. The yellow dolomite 'sand', which is prized as an agricultural aid, may be limited in extent and appears to have resulted from intense weathering in various 'pockets' of the dolomite.

Before further work is done, a few points should be clarified.

MARKET: The market of the product must clearly be defined, whether agricultural, metallurgical, or both. The agricultural usefulness of the product is already established. Any potential metallurgical use should be investigated by sending a reasonable-sized sample to possible end users of the dolomite for metallurgical purposes (e.g. Temco at Bell Bay).

TARGET: Having established what the operator wishes to supply - dolomite or dolomite sand for agricultural purposes or dolomite for metallurgy, a target must be defined to delineate whether further prospecting is for dolomite bedrock, dolomite sand, or both.

INVESTIGATIONS: To really ascertain how large the deposit is and assess the quality, the area must first be mapped, and then drilled. Drilling is an expensive operation and unless an expanding market is anticipated, the expense may not be fully justified.

RECOMMENDATIONS

The dolomite on Mr House's lease is equal in quality to other outcrops of the Smithton Dolomite, and is evidently highly prized as an agricultural additive. The orderly mining of this resource is essential to enable the operator to make the operation viable. Clearly no further progress can be made mining into the large hill, due to the enormous amount of overburden which would have to be moved. However mining could continue away from the hill (northwards) and eastwards, if large piles of waste overburden were first cleared away.

The operator should:

1. Determine the size of the available market.
2. Determine the size of the deposit, firstly by having the area mapped.

- 3. After mapping, decide whether the deposit warrants drilling, after ascertaining drilling costs.
- 4. Lay out the mine, under the guidance of a mining engineer, so as to maximise extraction of the dolomite.

Further reconnaissance mapping of the area could be done to aid specific mine planning, should the proposed scale of mining indicate this.

REFERENCES

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