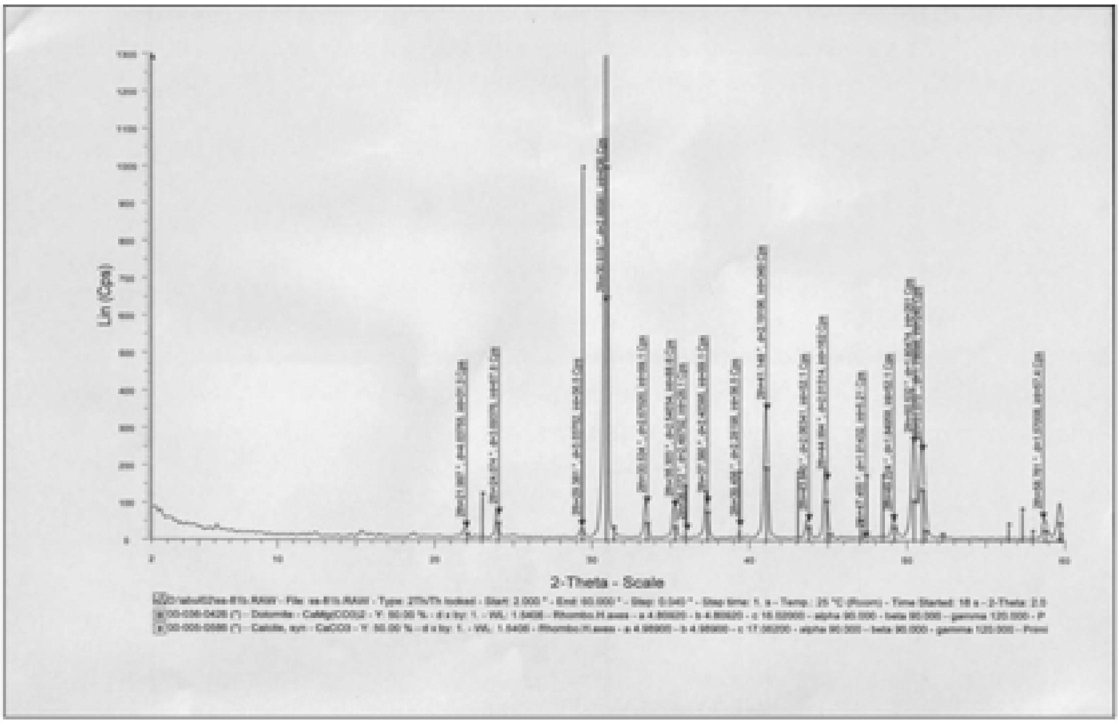

Fig. 56: X-ray diffraction pattern of sample No 81B (surface of the North Hill).

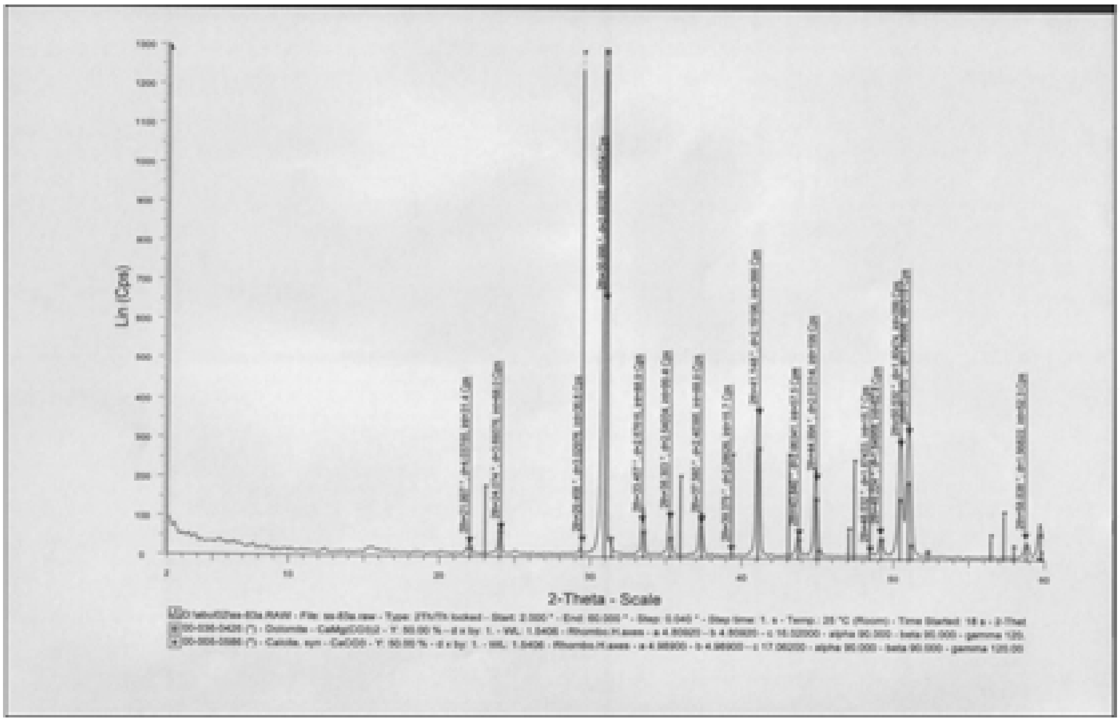

Fig. 57: X-ray diffraction pattern of sample No 83A (surface of the North Hill).

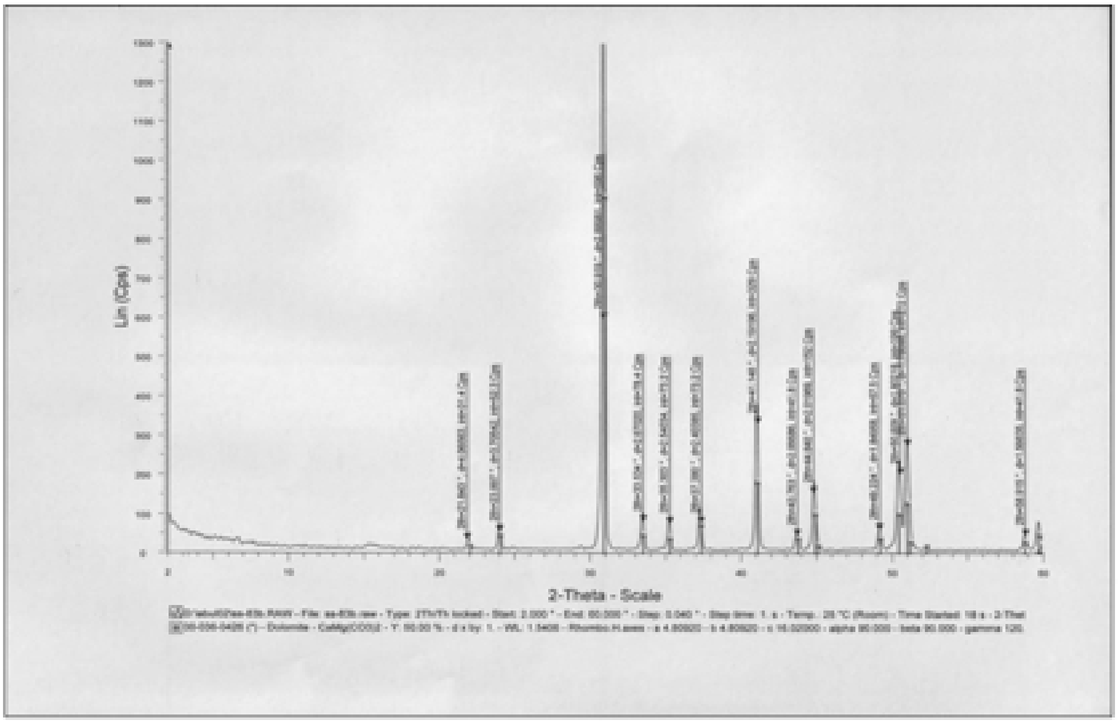

Fig. 58: X-ray diffraction pattern of sample No 83B (surface of the North Hill).

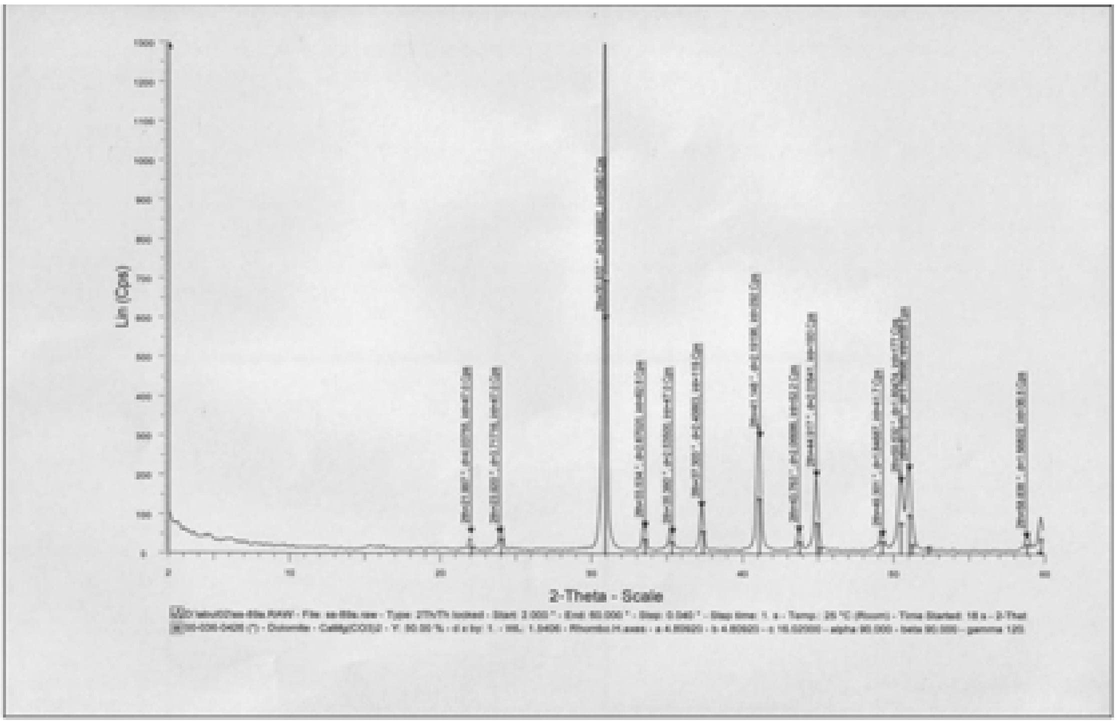

Fig. 59: X-ray diffraction pattern of sample No 89A (surface of the North Hill).

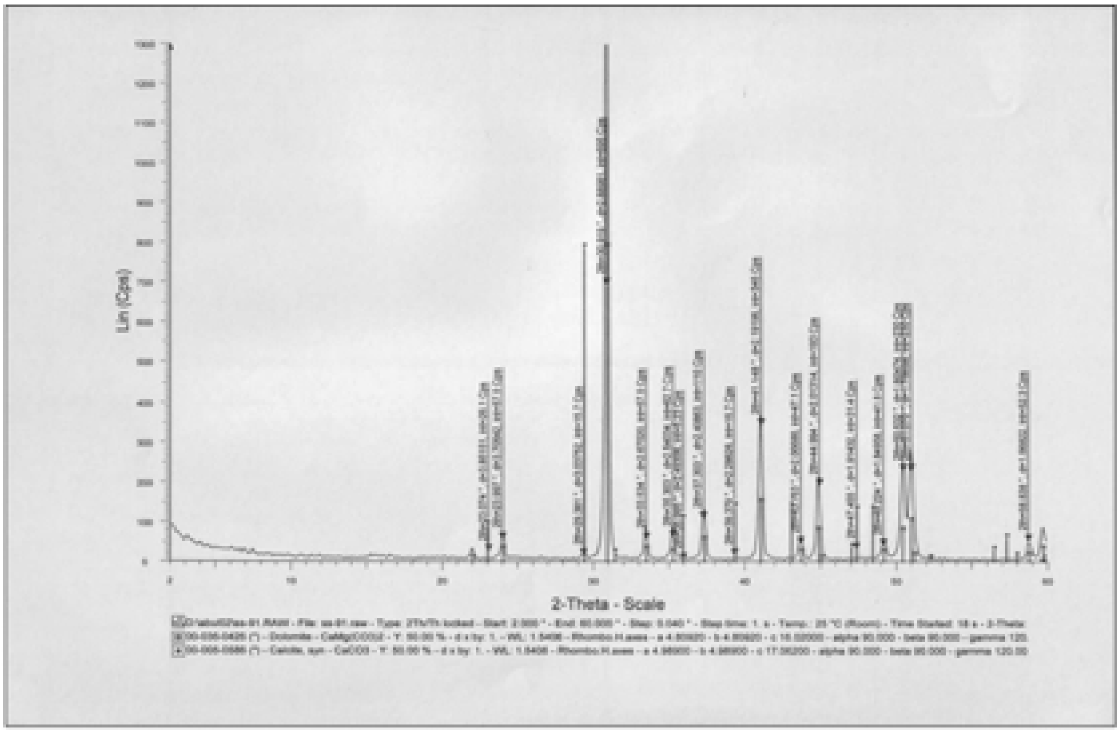

Fig. 60: X-ray diffraction pattern of sample No 91 (surface of the North Hill).

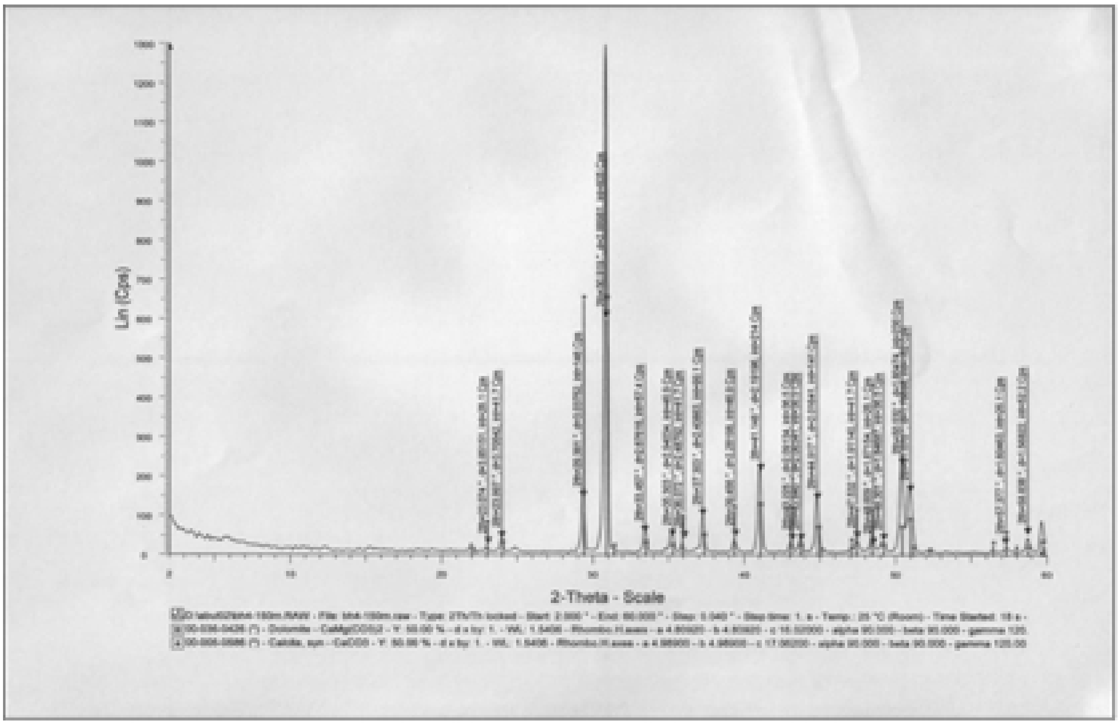

Fig. 61: X-ray diffraction pattern of sample No BH4 15.0 m depth (North Hill).

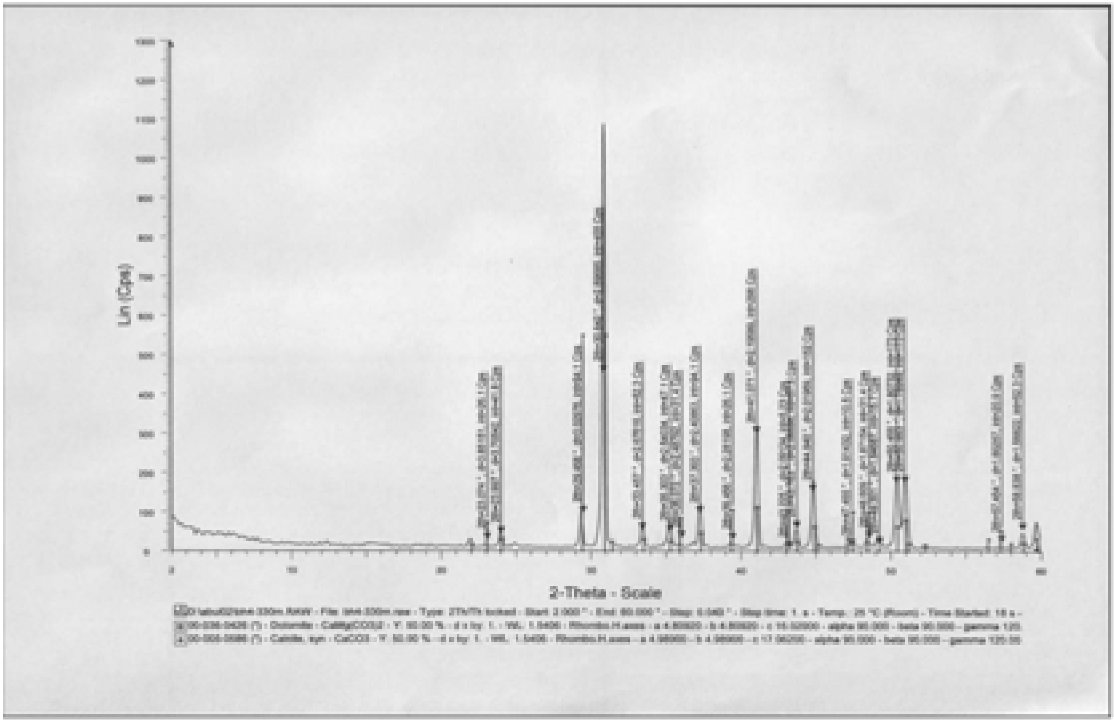

Fig. 62: X-ray diffraction pattern of sample No BH4 33.0 m depth (North Hill).

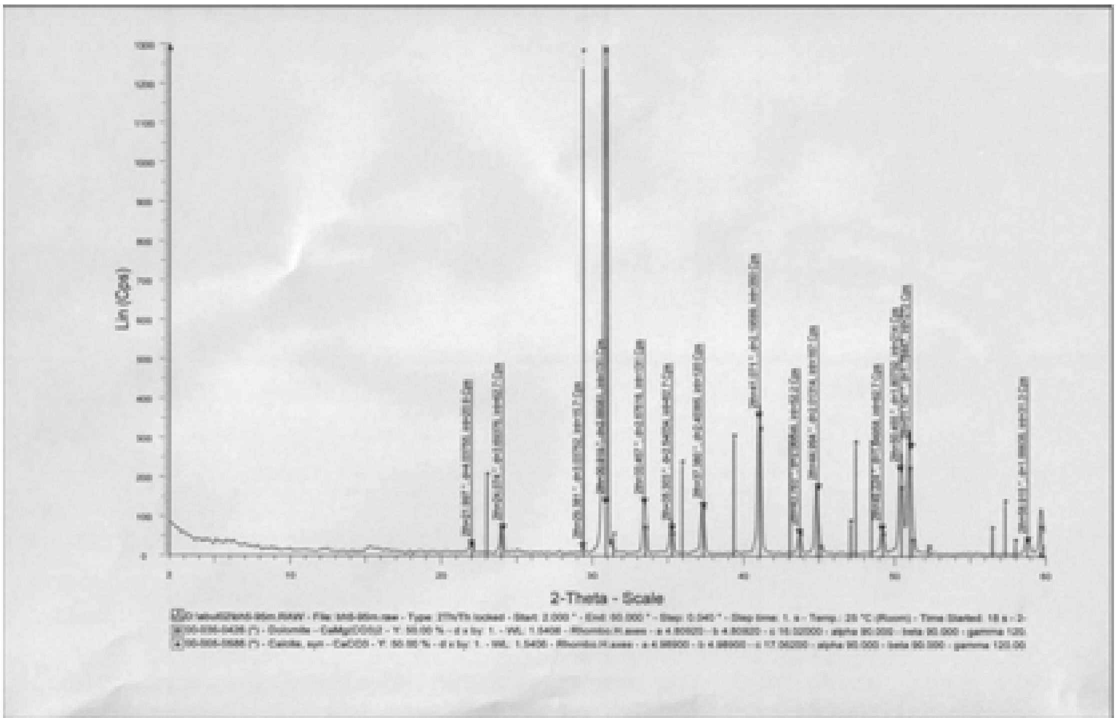

Fig. 63: X-ray diffraction pattern of sample No BH5 9.5 m depth (North Hill).

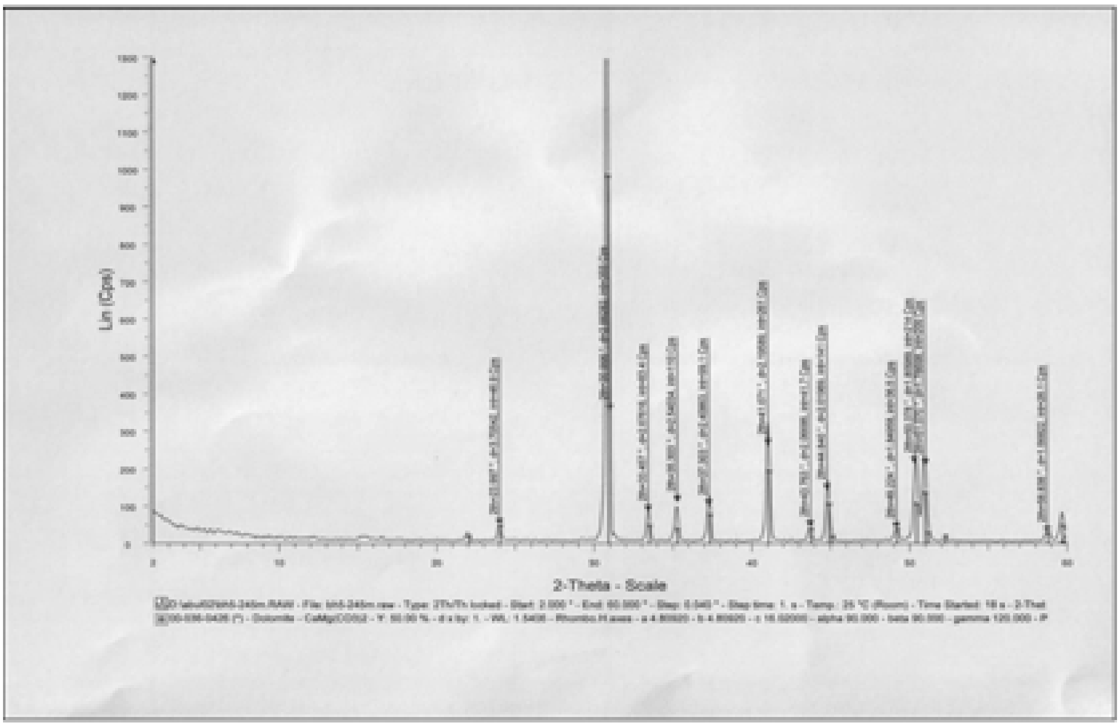

Fig. 64: X-ray diffraction pattern of sample No BH5 24.5 m depth (North Hill).

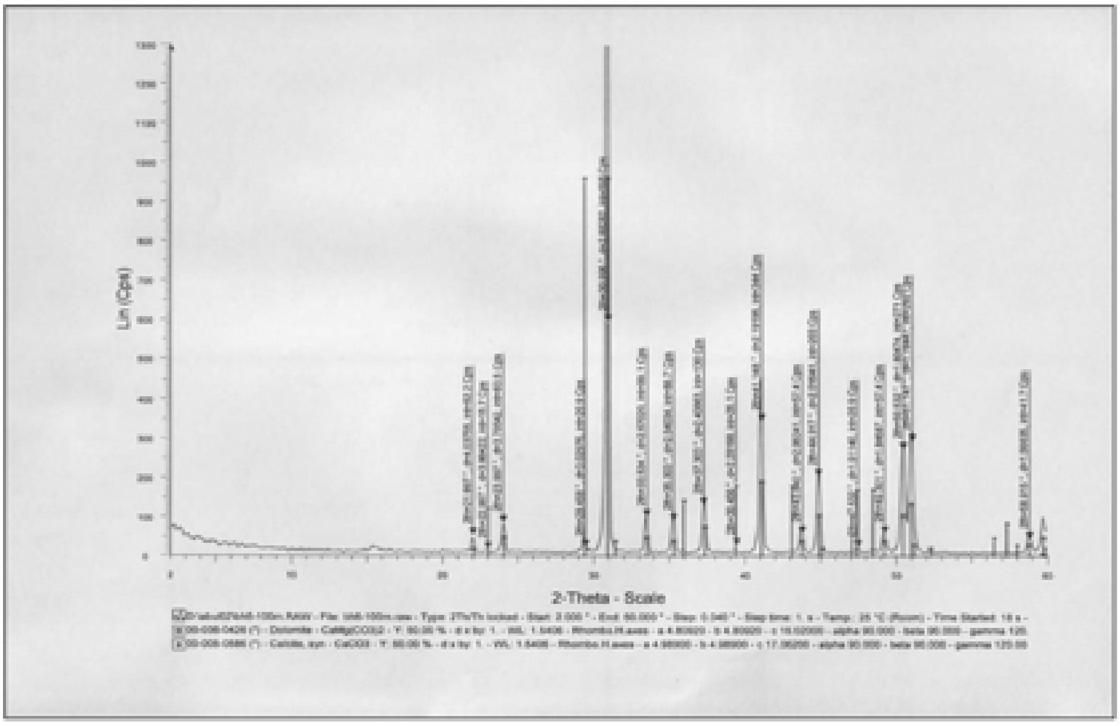

Fig. 65: X-ray diffraction pattern of sample No BH6 10.0 m depth (North Hill).

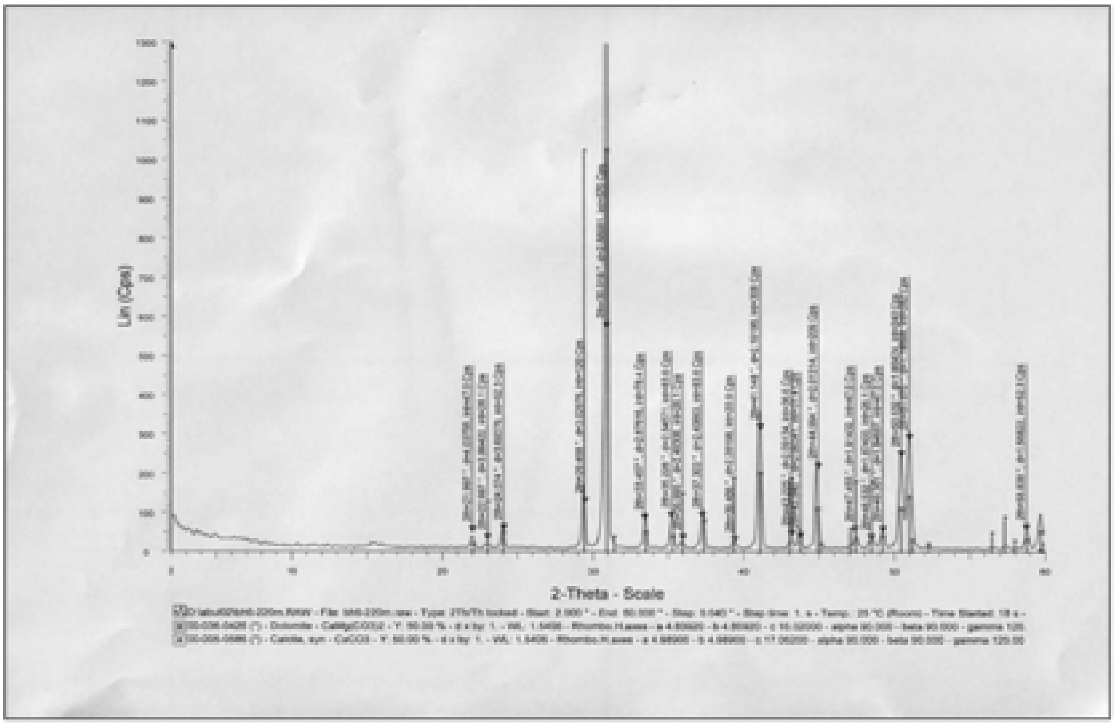

Fig. 66: X-ray diffraction pattern of sample No BH6 22.0 m depth (North Hill).

The Result

10 surface samples, 5 each from the South Hill and North Hill, were analysed. Table 12 shows the calculated weight percentages of dolomite and calcite, based on the XRD data for the 10 samples. The calculated weight percentages of MgO and CaO are also depicted.

Table 12: The Percentages of Dolomite, Calcite, MgO and CaO from XRD Data

Place (Hill)	Sample No.	Weight Percentages (Minerals)		Weight Percentages (Oxides)	
		Dolomite	Calcite	MgO	CaO
South Hill	59B	81.6	18.4	17.70	35.10
	61B	84.3	15.7	18.29	34.42
	77A	97.2	2.8	21.10	31.07
	77C	92.7	7.3	20.12	32.27
	80	95.0	5.0	19.10	31.40
	Average	90.2	9.8	**19.26**	32.94
North Hill	81B	98.6	1.4	21.40	30.75
	83A	98.8	1.2	21.44	30.74
	83B	99.2	0.8	21.53	30.61
	89A	100.0	0.0	21.70	30.40
	91	99.0	1.0	21.48	30.66
	Average	99.1	0.9	**21.51**	30.63

Apart from confirming the mineral identification made using polarizing microscope (that the most abundant mineral of the rock is dolomite, not calcite), the XRD technique has also supported the validity of data produced by the atomic absorption technique (AAS), as set out in section 5.2 below. The calculated weight percentages of MgO and CaO from XRD data were comparable to the AAS data.

5.2 CHEMICAL COMPOSITION

5.2.1 Atomic Absorption Spectrometry

The weight percentages of MgO and CaO in the dolomitic limestone of the studied area have been determined using an instrumental method known as atomic absorption spectrometry (AAS). The spectrometer used is PerkinElmer Model 3300.

By this method, a sample powder of known weight was dissolved using concentrated HCl. Lanthanum chloride (5% W/V la) was also added as a buffer to control ionization interferences, which are recognised to be a major source of analytical error. The sample solution is ionized by burning it in temperature of about 3000°C. The fuel for the combustion is air-acetylene mixture. During the ionization cathode lamps will pass through the ionized solution a specific wavelength, which is indicative of the element. If the element is present in the sample, the ionized atom will absorb the wavelength. The amount of intensity loss will be related to the amount of element in the sample.

For the identification of Ca, λ = 422.7 nm from a single element cathode lamp was used, as compared to λ = 202.6 nm for Mg. For quantitative analysis, series of standard solution of Ca and Mg with known concentrations were separately prepared. The absorption for each standard was measured and plotted against its concentration. The absorption-concentration calibration curve is a linear graph. The absorption from a sample (unknown material) was projected to this calibration graph to get its elemental concentration.

To verify the measurement, a certified reference material of similar type as the unknown sample material to be analysed was run for the interested element using the prepared calibration graph. The observed concentration value for the element was compared to the recommended value given by the reference material. The method is said to have high accuracy if the observed value approximates the recommended value.

For this study, we used certified reference material IPT 48 Calcareous Dolomite to check the accuracy and the validity of AAS data. The result below shows that the CaO and MgO values produced are valid and acceptable:

	Recommended Value	**Observed Value**
CaO	31.0%	31.5%
MgO	21.2%	21.7%

The Result

Geological characteristics of the occurrence - The dolomite was formed under diagenetic conditions by the action of sea water on calcareous mud or by organogenetic formation. At the Sg. Siput including the both hills, the dolomite is considered as a primary dolomite. It was formed by direct precipitation from sea water, by chemical reaction; mostly are due to metasomatic substitution during the diagenesis of aragonite (limestone) by magnesium in sea water.

Type of deposit - The dolomite is classified as the chemical sedimentary rock. The deposit is widespread in the area as mentioned above. Based on our study, the deposit of dolomite at both hills is homogenous which means, it was deposit at the same area and environment. Therefore, the magnesium content is also almost homogenous inside the dolomite, supported by consistent result gained from our analyses.

Dimensions - Different with the occurrence of gold or tin, the dolomite is a homogenous rock. The magnesium constituent inside the dolomite is widespread and homogenous, not comparable or following certain structure such as quartz vein or fracture.

Grade of minerals - The grade of dolomite is based on chemical contained, especially magnesium oxide (MgO). Please refer to MgO contained in this report.

For this study, a total number of 100 samples had been analysed for their MgO and CaO weight percentages. The distribution of the samples is as follows:

	Surface		Borehole
South Hill	20	BH-1	9
		BH-2	10
		BH-3	11
North Hill	20	BH-4	10
		BH-5	10
		BH-6	10
Total	40		60

Table 13: The MgO and CaO weight percentages in above ground samples from the South Hill (20 samples).

Sample No.	**Weight Percentage MgO**	**Weight Percentage CaO**	**Weight Percentage CaO/MgO**
59A	19.32	30.71	1.59
59B	19.92	30.88	1.55
60A	18.20	29.90	1.64
60B	17.87	30.19	1.69
61A	21.18	33.31	1.57
61B	19.56	32.52	1.66
62	20.43	29.44	1.44
63A	19.35	30.74	1.59
63B	19.94	30.26	1.52
64	20.59	29.60	1.44
77A	21.43	33.22	1.55
77B	18.60	32.32	1.74
77C	18.76	31.88	1.70
77D	17.92	29.11	1.62
77E	20.27	31.02	1.53
78A	18.10	29.49	1.63
78B	18.05	28.57	1.58
79A	17.93	31.51	1.76
79B	18.78	29.61	1.58
80	17.19	30.57	1.78
Average (20)	**19.17**	**30.74**	**1.61**

Table 14: The MgO and CaO weight percentages in below ground samples from the South Hill (30 samples).

Sample No.	Weight Percentage MgO	Weight Percentage CaO	Weight Percentage CaO/MgO
	Borehole No. BH-1		
BH-1 3.5M	19.40	29.40	1.52
BH-1 6.5M	20.31	31.61	1.57
BH-1 12.5M	17.30	30.57	1.77
BH-1 15.5M	18.09	29.04	1.61
BH-1 18.5M	17.34	30.49	1.76
BH-1 21.5M	17.78	28.69	1.61
BH-1 24.5M	18.39	29.01	1.58
BH-1 27.5M	17.74	28.59	1.61
BH-1 30.5M	17.14	32.31	1.89
Average (9)	**18.17**	**29.97**	**1.66**
	Borehole No. BH-2		
BH-2 7.5M	19.16	30.80	1.61
BH-2 10.5M	18.71	27.80	1.49
BH-2 13.5M	18.92	27.72	1.47
BH-2 16.5M	19.05	27.98	1.47
BH-2 19.5M	18.20	28.67	1.57
BH-2 22.5M	20.03	30.30	1.49
BH-2 25.5M	19.37	28.97	1.50
BH-2 28.5M	18.08	28.80	1.59
BH-2 31.5M	21.25	31.78	1.50
BH-2 34.0M	21.52	31.62	1.47
Average (10)	**19.43**	**29.44**	**1.52**
	Borehole No. BH-3		
BH-3 10.5M	18.17	31.58	1.74
BH-3 13.5M	17.07	31.22	1.83
BH-3 16.5M	15.50	31.21	2.01
BH-3 19.5M	18.46	31.83	1.72
BH-3 22.5M	17.90	30.98	1.73
BH-3 25.5M	18.05	32.63	1.81
BH-3 28.5M	18.17	32.40	1.78
BH-3 31.5M	20.36	31.47	1.55
BH-3 34.5M	16.25	31.14	1.92
BH-3 37.5M	20.34	32.13	1.58
BH-3 40.5M	19.64	30.82	1.57
Average (11)	**18.17**	**31.58**	**1.75**
Main Average	**18.59**	**30.33**	**1.64**

Table 15: The MgO and CaO weight percentages in above ground samples from the North Hill (20 samples).

Sample No.	Weight Percentage MgO	Weight Percentage CaO	Weight Percentage CaO/MgO
81A	21.15	30.02	1.42
81B	21.56	30.33	1.41
81C	18.63	28.27	1.52
82	21.28	31.67	1.49
83A	20.84	31.02	1.49
83B	21.65	30.75	1.41
84	19.04	28.20	1.48
85A	19.30	28.91	1.50
85B	19.21	28.12	1.46
86A	19.15	28.43	1.48
86B	18.75	29.48	1.57
87	18.97	27.72	1.46
88	19.54	28.76	1.47
89A	20.90	30.37	1.45
89B	20.48	29.86	1.46
90	21.37	30.55	1.43
91A	19.87	29.50	1.48
91B	19.78	29.01	1.47
92A	19.87	29.50	1.48
92B	19.83	30.04	1.52
Average (20)	**20.06**	**29.53**	**1.47**

Table 16: The MgO and CaO weight percentages in below ground samples from the North Hill (30 samples).

Sample No.	Weight Percentage MgO	Weight Percentage CaO	Weight Percentage CaO/MgO
	Borehole No. BH-4		
BH-4 6.0M	19.93	28.59	1.43
BH-4 9.0M	19.24	28.89	1.50
BH-4 12.0M	19.30	29.28	1.52
BH-4 15.0M	19.10	28.69	1.50
BH-4 18.0M	19.16	30.22	1.58
BH-4 21.0M	19.53	29.25	1.50
BH-4 25.0M	18.79	29.97	1.59
BH-4 27.0M	19.44	29.28	1.51
BH-4 30.0M	19.54	28.58	1.46
BH-4 33.0M	19.54	29.60	1.51
Average (10)	**19.34**	**29.24**	**1.51**
	Borehole No. BH-5		
BH-5 3.5M	18.32	27.83	1.52
BH-5 6.5M	18.03	27.83	1.51
BH-5 9.5M	20.73	29.98	1.45
BH-5 12.5M	19.40	28.11	1.45
BH-5 15.5M	19.14	28.49	1.49
BH-5 18.5M	20.53	29.87	1.45
BH-5 21.5M	19.21	28.22	1.47
BH-5 24.5M	18.09	27.55	1.52
BH-5 27.5M	19.58	29.21	1.49
BH-5 30.5M	18.31	27.10	1.48
Average (10)	**19.13**	**28.50**	**1.49**
	Borehole No. BH-6		
BH-6 4.0M	17.50	29.96	1.71
BH-6 7.0M	19.03	30.51	1.60
BH-6 10.0M	18.76	32.18	1.72
BH-6 13.0M	18.28	29.59	1.62
BH-6 16.0M	17.96	32.83	1.83
BH-6 19.0M	19.40	28.35	1.46
BH-6 22.0M	17.88	31.32	1.76
BH-6 25.0M	18.86	30.96	1.64
BH-6 28.0M	20.73	31.56	1.52
BH-6 31.0M	19.86	30.88	1.55
Average (10)	**18.83**	**30.81**	**1.64**
Main Average	**19.10**	**29.52**	**1.55**

6 THE RESERVE OF DOLOMITIC LIMESTONE

By utilizing and combining the works on reserve (combination of data from Sections 2, 3 and 4 of this report) and the quality of the deposits (Section 5 of this report), the following data on net volume and tonnage of deposits, as well as the tonnages for MgO, Mg, CaO and Ca for the limestone making the South Hill and the North Hill are estimated.

6.1 THE SOUTH HILL

6.1.1 Above Ground Reserve

6.1.1a *Cavity*

The above ground cavity is estimated at 25%. The basis: eye-level ground mapping gave 12% area, calculated by counting squares. On site visual estimation from topography indicated higher percentage, up to 25%, obscured by thick vegetation cover.

6.1.1b *Volume*

Plan area of the hill	94,750 sq. m (23.41 acres)
Average height of the hill (above ground level)	47.7 m
Estimated cavity volume	25%
Volume of limestone in the hill	4,519,575 cu m
Less 25% cavity	1,129,894 cu m
Net volume	**3,389,681cu m**

6.1.1c *Tonnage of Dolomitic Limestone Hill*

Net volume	3,389, 681 cu m
SG	2.86
Tonnage	3,389,681 x 2.86
	9,694,488 tonnes

6.1.1d *Tonnage of Magnesium*

Tonnage of limestone	9,694,488 tonnes
Average % of MgO	19.17%
Tonnage of MgO	**1,858,433 tonnes**
Average % of Mg	11.50%
Tonnage of Mg	**1,114,866 tonnes**

6.1.2 Below Ground Reserve (30 meters depth)

6.1.2a *Cavity*

The below ground cavity is estimated at 20%. The basis: drilling data gives an average value of 5% and geophysical survey indicated the presence of cavity of 35% to 40%. From the drilling and geophysical survey, an arbitrary figure of 20% was chosen.

6.1.2b *Volume*

Plan area of the hill	94,750 sq. m (23.41 acres)
Overburden thickness from geophysical survey	8 m
Average thickness of limestone	22 m
Estimated cavity volume	20%
Volume of limestone in the hill	2,084,500 cu m
Less 20% cavity	416,900 cu m
Net volume	**1,667,600 cu m**

6.1.2c *Tonnage of Dolomitic Limestone Hill*

Net volume	1,667,600 cu m
SG	2.86
Tonnage	1,667,600 x 2.86
	4,769,336 tonnes

6.1.2d *Tonnage of Magnesium*

Tonnage of limestone	4,769,336 tonnes
Average % of MgO	18.59%
Tonnage of MgO	**886,620 tonnes**
Average % of Mg	11.15%
Tonnage of Mg	**531,781 tonnes**

6.1.3 Total Reserve

6.1.3a *Volume*

Net volume (above ground)	3,389,681cu m
Net volume (below ground)	1,667,600 cu m
Total net volume	**5,057,282 cu m**

6.1.3b *Tonnage of Dolomitic Limestone Hill*

Tonnage (above ground)	9,694,488 tonnes
Tonnage (below ground)	4,769,336 tonnes
Total Tonnage	**14,463,824 tonnes**

6.1.3c ***Tonnage of Magnesium***

Tonnage of MgO (above ground)	1,858,433 tonnes
Tonnage of MgO (below ground)	886,620 tonnes
Total Tonnage of MgO	**2,745,053 tonnes**
Tonnage of Mg (above ground)	1,114,866 tonnes
Tonnage of Mg (below ground)	531,781 tonnes
Total Tonnage of Mg	**1,646,647 tonnes**

6.2 THE NORTH HILL

6.2.1 Above Ground Reserve

6.2.1a ***Cavity***

The above ground cavity is estimated at 20%. The basis: eye-level ground mapping gave 15% area, calculated by counting squares. On site visual estimation from topography indicated higher percentage, up to 20%, obscured by thick vegetation cover.

6.2.1b ***Volume***

Plan area of the hill	37,250 sq. m (9.20 acres)
Average height of the hill (above ground level)	38.38 m
Estimated cavity volume	20%
Volume of limestone in the hill	1,429,655 cu m
Less 20% cavity	285,931 cu m
Net volume	**1,143,724 cu m**

6.2.1c ***Tonnage of Dolomitic Limestone Hill***

Net volume	1,143,724 cu m
SG	2.86
Tonnage	1,143,724 x 2.86
	3,293,925 tonnes

6.2.1d ***Tonnage of Magnesium***

Tonnage of limestone	3,293,925 tonnes
Average % of MgO	20.06%
Tonnage of MgO	**660,761 tonnes**
Average % of Mg	12.04%
Tonnage of Mg	**396,589 tonnes**

6.2.2 Below Ground Reserve (30 meters depth)

6.2.2a *Cavity*

The below ground cavity is estimated at 12.7%. The basis: drilling data for 3 boreholes gave an average value of 12.7%. Geophysical survey indicated no cavity.

6.2.2b *Volume*

Plan area of the hill	37,250 sq. m (9.20 acres)
Overburden thickness from geophysical survey	6 m
Average thickness of limestone	24 m
Estimated cavity volume	12.7%
Volume of limestone in the hill	894,000 cu m
Less 12.7% cavity	113,538 cu m
Net volume	**780,462 cu m**

6.2.2c *Tonnage of Dolomitic Limestone Hill*

Net volume	780,462 cu m
SG	2.86
Tonnage	780,482 x 2.86
	2,247,731 tonnes

6.2.2d *Tonnage of Magnesium*

Tonnage of limestone	2,247,731 tonnes
Average % of MgO	19.10%
Tonnage of MgO	**429,317 tonnes**
Average % of Mg	11.46%
Tonnage of Mg	**257,590 tonnes**

6.2.3 Total Reserve

6.2.3a *Volume*

Net volume (above ground)	1,143,724 cu m
Net volume (below ground)	780,462 cu m
Total net volume	**1,924,186 cu m**

6.2.3b ***Tonnage of Dolomitic Limestone Hill***

Tonnage (above ground)	3,293,925 tonnes
Tonnage (below ground)	2,247,731 tonnes
Total Tonnage	**5,541,656 tonnes**

6.2.3c ***Tonnage of Magnesium***

Tonnage of MgO (above ground)	660,761 tonnes
Tonnage of MgO (below ground)	429,317 tonnes
Total Tonnage of MgO	**1,090,078 tonnes**

Tonnage of Mg (above ground)	396,589 tonnes
Tonnage of Mg (below ground)	257,590 tonnes
Total Tonnage of Mg	**654,179 tonnes**

6.3 THE SOUTH AND NORTH HILLS (COMBINED)

From Section 6.1 and 6.2 above, it is estimated that:

6.3.1 **Volume**

Net volume of South Hill	5,057,282 cu m
Net volume of North Hill	1,924,186 cu m
Total Net Volume	**6,981,468 cu m**

6.3.2 **Tonnage of Dolomitic Limestone Hills**

Tonnage of South Hill	14,463,824 tonnes
Tonnage of North Hill	5,541,656 tonnes
Total Tonnage	**20,005,480 tonnes**

6.3.3 **Tonnage of Magnesium**

Tonnage of MgO of South Hill	2,745,053 tonnes
Tonnage of MgO of North Hill	1,090,078 tonnes
Total tonnage of MgO	**3,835,131 tonnes**

Tonnage of Mg of South Hill	1,646,647 tonnes
Tonnage of Mg of North Hill	654,179 tonnes
Total tonnage of Mg	**2,300,826 tonnes**

7 RECOMMENDATION ON QUARRYING TECHNIQUES

This section focuses on the quarrying technique that can be used to extract the dolomite from the dolomite hills. It can be divided into extraction by drilling, blasting, crushing, screening, grading and storage prior to loading and transportation.

Drilling and blasting

Dolomite can be extracted by surface quarrying using drilling and blasting techniques. It begins by drilling holes for blasting compound filling. In choosing a proper drill to be used, the rock strength of the quarry has to be determined. The angle of drill holes was used to obtain a clean resulting face of quarry. AN-FO explosive or its equivalent can be used for the primary blasting. After the blasting, precariously balanced pieces would have been removed by the scouring action of the blasted rock surface.

Crushing, screening and grading

After removing the rock from the surface of the quarry, the impact hammer is used to break large blocks into small pieces which are transported by lorries from the mines to the primary crusher. After that, the dolomite is transported to the primary stockpile by conveyer. From primary stockpile, the dolomite is moved to the primary surge bin and then moved to the primary screen. The second and third crushing and screening will be conducted to get a proper sized product as required. The class of size of the aggregate produce can be between 4 mm to 22 mm, 22 mm to 28 mm and 28 mm to 50 mm.

All industrial dolomite quarries also produce significant quantities of crushed rock aggregate, sand and dust. The crushed rock aggregate can be used as building materials. Sand and dust can be used as a plant nutrient. It is because dolomite can neutralise soil acidity and rectify the magnesium deficiencies in the soil.

Appendix 1:

Company Profile of UKM Pakarunding Sdn. Bhd. (“UKM”) and credentials of consultants

UKM, which is previously known as the Bureau of Consultancy and Innovation, was established in 1979 under the auspices of the Chancellery, UKM Holdings, of Universiti Kebangsaan Malaysia (“University”) It was formed to further the University’s need for expansion and direct involvement in capital building. It was incorporated in October 2001 and started its operation in January 2002 with the main purpose to cater for commercial activities, including consultancy works. This is to facilitate working relationship between the University and the nation at large, removing some of the hindering bureaucratic process and providing the harmonious liaison between the academic corpus and the firm’s clientele.

UKM offers a wide range of services, which can be grouped as EIA services, social studies, business and management, project management and consultation, information technology and communication, and consultative works in the field of geology and environment.

UKM has a pool of more than 100 experts in various fields, mostly PhD holders, ready to offer their consultative services to the public as well as private sectors. Prof. Hamzah Bin Mohamad is a recognized expert in industrial minerals, as well as analytical techniques using X-ray diffraction (XRD) and X-ray fluorescence (XRF). Prof. Wan Fuad Wan Hassan is an economic mineralogist, with specialities, amongst other things, in gold and tin exploration. Prof. Abdul Ghani Bin Md. Rafek is a well-known Malaysian engineering geologist, specializing in tunneling and slope stability. Mr. Mohd. Rozi Bin Umor is a petrologist by formal training but has been involved in many projects in mineral exploration.

In the area of geology, engineering geology and earth resources, UKM has completed a number of important projects, for example: “Feasibility study on Bukit Sagu limestone hills, Kuantan, Pahang and the surrounding metasediments as sources for cement plant”, “Mineral resource development plan for Pahang State, Malaysia”, “Engineering geology aspects of Kuala Lumpur — Karak Highway second tunnel”, and the prestigious “Engineering geology aspects of the Kuala Lumpur SMART tunnel”. The above mentioned academics are either leading the team or participated actively in these projects.

The project team members consist of the following:

(i) The project team is headed by Professor Dr. Hamzah Bin Mohamad, who is the Head of geology program at the University. Prof. Hamzah, aged 56, completed his PhD at the University of Strathclyde in 1980 and obtained his professorship in 1997. He specializes in geology, geochemistry, industrial mineralogy, usage of X-ray techniques in characterization of geological and environmental materials. Amongst other things, he was the project leader for determination of chemical composition of 200 bore holes samples from Bukit Sagu limestone in Pahang State for YTL Corporation Berhad (a public company listed on Malaysian Stock Exchange) for its proposed cement plant and ascertaining the amount of magnesium and chlorine as the reactive element, and was involved in the Pahang State Development Corporation’s master plan for mineral resource development which identified potential areas for future mineral resource developments. About 300 projects have also been completed in the area of mineralogical and chemical characterization of geological and environmental materials since 1980, involving a wide range of geological and environmental materials. Most characterizations were made using the X-ray diffraction technique (XRD) and X-ray fluorescence technique (XRF), supported by microscopic and some wet chemical analyses. The main groups of materials studied are geological (rock, minerals, ores, soils, sediments, etc.), environmental (ashes, sludge, etc.), industrial (barite, silica sand, clay, limestone, zeolite, etc.) and archaeological (bricks from old building, forts, etc.) materials.

(ii) Professor Dr. Wan Fuad Wan Hassan is from the School of Environmental and Natural Resource Sciences of the University. Prof. Wan completed his PhD in mining geology at the University of Leeds, UK in 1982, and his master's degree in mining geology and mineral exploration at the University of Leicester, UK in 1976. He is a member of the London Mineralogical Society and the London Institute of Mining and Metallurgy. He specializes in mining geology, applied geochemistry, and ore deposit petrology. Prof. Wan was the project leader for the study of gold mineralization for Peninsular Malaysia, and is a consultant to the Pahang State Government for its State mineral resources development plan. He was also involved in the mineral resource development plan for Pahang State, Malaysia, mainly in the area of identification of the metallic mineral resources.

(iii) Professor Dr. Abdul Ghani Bin Md. Rafek is from the School of Environmental and Natural Resources Sciences of the University. He obtained his PhD from Ruhr University in Germany in 1984. His areas of expertise include engineering geology, geophysics, environmental issues and assessment. Prof. Abdul Ghani is a member of German Geotechnical Society. Prof Ghani was involved in the second Genting Sempah Tunnel between the states of Selangor and Pahang with the primary role as a geomechanical expert. A large number of rock material testing was conducted in conjunction with this project. He also performed rock mechanics testing during the engineering, geological and subsurface investigation of SMART tunnel project in Kuala Lumpur. Rock mechanics testing included uniaxial compression tests, tensile strength tests, point load tests, Los Angeles abrasion test and the material description. Further testing was conducted during the actual tunneling which included uniaxial compression and tensile strength tests as well as the characterization of materials that were causing unusual wear to the cutting tools and plants.

(iv) Mr. Mohd. Rozi Bin Umor graduated in geology from the University and further pursued his master degree in Petrology at the University. He is expected to complete his PhD in Igneous Petrology at the University in early 2008. He has been involved in various projects including a study on the possible alternative resources of cobalt, chromium and nickel in Sabah, gold mineralization in Peninsular Malaysia, and a preliminary study on prospect of tin mining in Perak.

Appendix 2:

Technical Glossary

AN-FO	means ammonium nitrate/fuel oil (most often No. 2 fuel oil, or diesel fuel, but sometimes kerosene or even molasses). It is by far the most widely used explosive in coal mining, quarrying, metal mining, and civil construction.
Calcite/$CaCO_3$	The carbonate mineral, calcite, is a chemical or biochemical calcium carbonate corresponding to the formula $CaCO_3$ and is one of the most widely distributed minerals on the Earth's surface. It is a common constituent of sedimentary rock, limestone in particular. It is also the primary mineral in metamorphic marble. It also occurs as a vein mineral in deposits from hot springs, and also occurs in caverns as stalactites and stalagmites. Calcite is often the primary constituent of the shells of marine organisms, e.g., plankton (such as coccoliths and planktic foraminifera), the hard parts of red algae, some sponges, brachiopoda, echinoderms, most bryozoa, and parts of the shells of some bivalves, such as oysters and rudists). Calcite represents the stable form of calcium carbonate.
Canada Code	CIM Standards on Mineral Resources and Reserves — Definitions and Guidelines, developed by the CIM Standing Committee on Reserve Definitions which establishes definitions and guidelines for the reporting of exploration information, mineral resources and mineral reserves in Canada.
Canada Code — Limestone	CIM Best Practice Guidelines — Estimation of Mineral Resources and Mineral Reserves. These guidelines have been prepared by the Canadian Institute of Mining and Metallurgy and Petroleum (CIM) led Estimation Best Practices Committee. They are intended to assist the Competent Person(s) in the planning, supervision, preparation and reporting of Mineral Resource and Mineral Reserve (MRMR) estimates.
CaO	Calcium oxide, commonly known as burnt lime, lime or quicklime, is a widely used chemical compound. It is a white, caustic and alkaline crystalline solid. As a commercial product, lime often also contains magnesium oxide, silicon oxide and smaller amounts of aluminium oxide and iron oxide. Calcium oxide is usually made by the thermal decomposition of materials such as limestone, that contain calcium carbonate ($CaCO_3$; mineral name: calcite) in a lime kiln.

Competent Person

Under the JORC Code, among others, a "Competent Person" must have a minimum of five years experience which is relevant to the style of mineralization and type of deposit under consideration and to the activity which that person is undertaking. The key qualifier in the definition of a Competent Person is the word "relevant". Determination of what constitutes relevant experience can be a difficult area and common sense has to be exercised. For example, in estimating mineral resources for vain gold mineralization, experience in a high-nugget, vein-type mineralization such as tin, uranium, etc. will probably be relevant whereas experience in, say, massive base metal deposits may not be. The key word "relevant" also means that it is not always necessary for a person to have five years experience in each and every type of deposit in order to act as a Competent Person if that person has relevant experience in other deposit types. For example, a person with (say) twenty years experience in estimating mineral resources for a variety of metalliferous hard-rock deposit types may not require five years specific experience in (say) porphyry copper deposits in order to act as a Competent Person. Relevant experience in the other deposit types could count towards the required experience in relation to porphyry copper deposits. As a general guide, persons being called upon to act as Competent Persons should be clearly satisfied in their own minds that they could face their peers and demonstrate competence in the commodity, type of deposit and situation under consideration.

VALMIN Code defines competence as having relevant education, qualifications, experience, professional expertise and holding appropriate licences (where required) so as to have a reputation that gives authority to statements made in relation to particular matters.

Under the UK Code, a Competent Person must have a minimum of five years experience relevant to the style of mineralization and type of deposit under consideration and to the activity which that person is undertaking. The wordings on the key qualifier of the word "relevant" are almost identical to those found under the JORC Code.

US Code defines a Competent Person as an engineer, geoscientist or other mining professional who must have a minimum of five years experience which is relevant to the style of mineralization and type of deposit under consideration and to the activity which that person is undertaking. The wordings on the key qualifier of the word "relevant" are almost identical to those found in the UK Code.

The Canada Code defines a "Qualified Person" as an individual who is an engineer or geoscientist with at least five years of experience in mineral exploration, mine development or operation or mineral project assessment, or any combination of these; has experience relevant to the subject matter of the mineral project and the technical report. The wordings on the key qualifier of the word "relevant" are almost identical to those found in the UK Code.

UNFC defines qualified person(s) as a person(s) with the appropriate qualifications to assess resources/reserves of the type of commodity in question. The qualifications and experience required will vary from country to country.

Industrial Minerals

Canada Code — Limestone: An Industrial Mineral is any rock, mineral or other naturally occurring substance of economic value, exclusive of metallic ores, mineral fuels and gemstones; that is, one of the non-metallic minerals.

An estimate need not attain or incorporate a rigorous and complete understanding of all factors and inter-relations at an early stage in the life of a project. The classification of the mineral deposit as Probable/Proven Mineral Reserves should always reflect the level of understanding of the project, which is a function of the stage of exploration/development.

In estimating either a mineral resource or a Mineral Reserve for an industrial mineral deposit, the QP should give priority to: (i) the value of the intended mineral product; (ii) market factors; and (iii) applicability of the market criteria to the mineral deposit being assessed. The classification of an industrial minerals deposit as a MRMR is affected to a significant degree by a number of factors that are less applicable to metallic mineral deposits, including: particular physical and chemical characteristics; mineral quality issues; market size; the level of the producer's technical applications knowledge; market concentration; and transportation costs.

Best Practice in the estimation of MRMR of industrial minerals centres on determination of components of the Market, Value, and Costs. Market considerations incorporate not only the requirement for detailed market analyses and/or contracts of sale, but also recognition that markets for many industrial minerals are relatively small, may have a high degree of producer concentration, or may have very high technical barriers to entry, thus imposing limits or constraints on achievable market volumes. Value is a function of (i) product quality in relation to consuming industry or customer specification, (ii) product price, and (iii) project robustness. Costs comprise (i) mining costs, (ii) processing costs, and (iii) transportation and special handling costs.

Industrial mineral deposits differ significantly from other, more typical metallic mineral deposits and even amongst themselves. These differences may be reflected in the data density required for certain confidence intervals. For example, the sampling points (e.g. drill holes) required for an industrial mineral deposit that exhibits strong structural and grade continuity (e.g. a bed of homogeneous limestone) may be more widely spaced than they would be for a typical volcanogenic massive sulfide (VMS) deposit where either structure and/or grade are less uniform. The QP shall use reasonable judgment in the context of the deposit type, style and formation of the particular mineral deposit being assessed, and the objective of the estimation process (i.e. inferred, indicated or measured mineral resource/Probable or Proven Mineral Reserve).

Customer specifications for industrial mineral products are frequently based solely on physical properties rather than, or in addition to, chemical characteristics. Sample testing should include those tests that will provide the physical characteristics and chemical analyses that relate to the specifications of the end product.

Determination of the chemical and physical characteristics of an industrial mineral often involves procedures and tests that are not part of the normal activity of an analytical laboratory. The QP should ensure that the physical and chemical analytical work conducted on the industrial mineral is appropriate and relevant to the identification of the properties of interest in the intended application(s), and that the laboratory has the requisite experience and necessary equipment to conduct the required tests.

JORC Code	The Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves, prepared by the Joint Ore Reserves Committee of the Australasian Institute of Mining and Metallurgy, Australian Institute of Geoscientists and Minerals Council of Australia (JORC).
MgO	Magnesium oxide, or magnesia, is a white solid mineral that occurs naturally as periclase and is a source of magnesium. It has an empirical formula of MgO. It is formed by an ionic bond between one magnesium and one oxygen atom. Magnesium oxide is easily made by burning magnesium ribbon which oxidizes in a bright white light, resulting in a powder.
Mineral Reserves	Canada Code: The economically mineable part of a measured or indicated mineral resource demonstrated by at least a Preliminary Feasibility Study. This study must include adequate information on mining, processing, metallurgical, economic, and other relevant factors that demonstrate, at the time of reporting, that economic extraction can be justified. A Mineral Reserve includes diluting materials and allowances for losses that may occur when the material is mined.

	UK Code: A 'Mineral Reserve' is the economically mineable part of a measured and/or indicated mineral resource. It includes diluting materials and allowances for losses, which may occur when the material is mined. Appropriate assessments, which may include feasibility studies, have been carried out, and include consideration of, and modification by, realistically assumed mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors. These assessments demonstrate at the time of reporting that extraction is justified. Mineral Reserves are sub-divided in order of increasing confidence into Probable Mineral Reserves and Proved Mineral Reserves.
	Mineral, Ore, and Dolomitic Limestone are used interchangeably.
Modifying Factors	UK Code: Consideration of factors affecting extraction, including mining, metallurgical, economic, marketing, legal, environmental, social and governmental.
	US Code: The term 'Modifying Factors' is defined to include mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors
	JORC Code: The term 'Modifying Factors' is defined to include mining, metallurgical, economic, marketing, legal, environmental, social and governmental considerations.
Probable Mineral Reserve	JORC Code: A 'Probable Ore Reserve' is the economically mineable part of an indicated, and in some circumstances, a measured mineral resource. It includes diluting materials and allowances for losses which may occur when the material is mined. Appropriate assessments and studies have been carried out, and include consideration of and modification by realistically assumed mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors. These assessments demonstrate at the time of reporting that extraction could reasonably be justified.

UK Code: A 'Probable Mineral Reserve' is the economically mineable part of an indicated, and in some circumstances, a measured mineral resource. It includes diluting materials and allowances for losses, which may occur when the material is mined. Appropriate assessments, which may include feasibility studies, have been carried out, and include consideration of, and modification by, realistically assumed mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors. These assessments demonstrate at the time of reporting that extraction is justified.

Canada Code: A 'Probable Mineral Reserve' is the economically mineable part of an indicated and, in some circumstances, a measured mineral resource demonstrated by at least a preliminary feasibility study. This study must include adequate information on mining, processing, metallurgical, economic, and other relevant factors that demonstrate, at the time of reporting, that economic extraction can be justified.

Proven Mineral Reserves

Canada Code: The economically mineable part of a measured mineral resource demonstrated by at least a Preliminary Feasibility Study. This Study must include adequate information on mining, processing, metallurgical, economic, and other relevant factors that demonstrate, at the time of reporting, that economic extraction is justified.

UK Code: A 'Proved Mineral Reserve' is the economically mineable part of a measured mineral resource. It includes diluting materials and allowances for losses, which may occur when the material is mined. Appropriate assessments, which may include feasibility studies, have been carried out, and include consideration of, and modification by, realistically assumed mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors. These assessments demonstrate at the time of reporting that extraction is justified. The choice of the appropriate category of Mineral Reserve is determined primarily by the relevant level of confidence in the mineral resource and after considering any uncertainties in the modifying factors. Allocation of the appropriate category must be made by the Competent Person.

	JORC Code: A 'Proved Reserve' is the economically mineable part of a measured mineral resource. It includes diluting materials and allowances for losses which may occur when the material is mined. Appropriate assessments and studies have been carried out, and include consideration of and modification by realistically assumed mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors. These assessments demonstrate at the time of reporting that extraction could reasonably be justified
	UNFC: A proved mineral reserve is the economically mineable part of a recoverable quantity assessed by a feasibility study or actual mining activity usually undertaken in areas of detailed exploration (measured recoverable quantity). It includes diluting materials and allowances for losses which may occur when material is mined and milled. Appropriate assessments, which include feasibility studies, have been carried out, and include consideration of, and modification by, realistically assumed mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors. These assessments demonstrate, with a high degree of confidence at the time of reporting, that extraction is justified.
Specific gravity	Specific Gravity (SG) is a special case of relative density defined as the ratio of the density of a given substance, to the density of water (H_2O). Substances with a specific gravity greater than 1 are heavier than water, and those with a specific gravity of less than 1 are lighter than water. Based on the SG-value of a given substance, the density of that substance can be calculated.
UK Code	Code for Reporting of Mineral Exploration Results, Mineral Resources and Mineral Reserves (in United Kingdom, Ireland and Europe), prepared by the Institute of Materials, Minerals and Mining Working Group on Resources and Reserves in conjunction with the European Federation of Geologists, the Geological Society of London and the Institute of Geologists of Ireland.
UNFC	United Nations Framework Classification for Fossil Energy and Mineral Resources.

US Code	SME Guide for Reporting Exploration Results, Mineral Resources, and Mineral Reserves adopted by the United States Society for Mining, Metallurgy, and Exploration. The United States Securities and Exchange Commission ("US SEC") regulates the reporting of exploration results, resources and reserves for public reporting. The reporting of exploration results, resources and reserves may also be subject to other national and international rules and regulations. These rules and regulations vary from time to time, and at any given time may not be totally in consistent with the content of the SME Guide.
VALMIN Code	Reporting guidelines for mineral reserves prepared by the VALMIN Committee, a joint committee of the Australasian Institute of Mining and Metallurgy, the Australian Institute of Geoscientists and the Mineral Industry Consultants Association.