



Minerals in Afghanistan



Cement Quality Limestone in Jabul Saraj Parwan Province, Afghanistan

AGS Investor Data Package No. 4

Excellent Exploration and Development Potential

SUMMARY

While Afghanistan is undergoing the process of stabilization and reconstruction, there is huge demand for good quality cement in the country. In spite of the fact that the country is endowed with abundant raw material resources for cement manufacturing such as high quality limestone, gypsum and, coal, about five to six million tons of cement is currently being imported annually from the neighboring countries, while the cement making raw materials of the country remain untouched.

The Government of Afghanistan (GoA) has recognized the need for developing a cement manufacturing industry as high priority target for industrial development because it can: 1) create much needed local employment, 2) reduce the country's dependence on foreign imports, and 3) improve building standards. Based on this policy, the Afghan Geological Survey (AGS) was given the task by His Excellency the Afghan Minister of Mines to assess the cement manufacturing raw materials of the country in the most strategically

located regions such as Jabul Saraj where discovery of new resources of limestone were needed for operation of the existing cement manufacturing facility .

According to the assessment conducted in the summer and fall of 2011 by a mapping team from the AGS, one of the several major resources of limestone suitable for cement production is located in the Jabul Saraj District of Parwan Province, some 5 km to the west of the city of Jabul Saraj and 15 km to the north of the provincial capital of Parwan Province, Charickar (Fig. 1).

The potential reserves of the high quality limestone of Vendian-Ordovician (V-O) age in the area are estimated at more than 1.5 billion tons (Fig. 2). In addition, sources that are essential for cement manufacturing such as coal (in Polli Khumri) is located at 130 km to the NW and gypsum in the vicinity of the limestone outcrops, in Ghorband Valley at about 3-5 Km to the west (Fig. 3).

LOCATION

The area of V-O limestone occurrences is located at about 5 km to the west of the cement factory at Jabul Saraj in Jabul Saraj District of Parwan Province (Figs. 1 and 2). Jabul Saraj is situated on a major asphalt road leading to Charikar-Kabul in the south and to the north to Puli Khumri-Mazari Sharif, the largest city in northern Afghanistan which is connected by a rail line to Hairatan Port on the banks of Amu Daria in the border with Uzbekistan. In addition, the coal resources of Pulli

khumri is located at about 120 Km to the northwest and large resources of gypsum to the west in the Ghorband Valley (Figure 3). According to 1:500,000 geologic map of Afghanistan, there are some areas of V-O limestone outcrops in the in the Ghorband Valley to the west (Figs 3 and 4) which indicate that the resources might be expanded. However, because of the complicated geology of the area and intensification of metamorphism to the west, further exploratory studies are warranted.

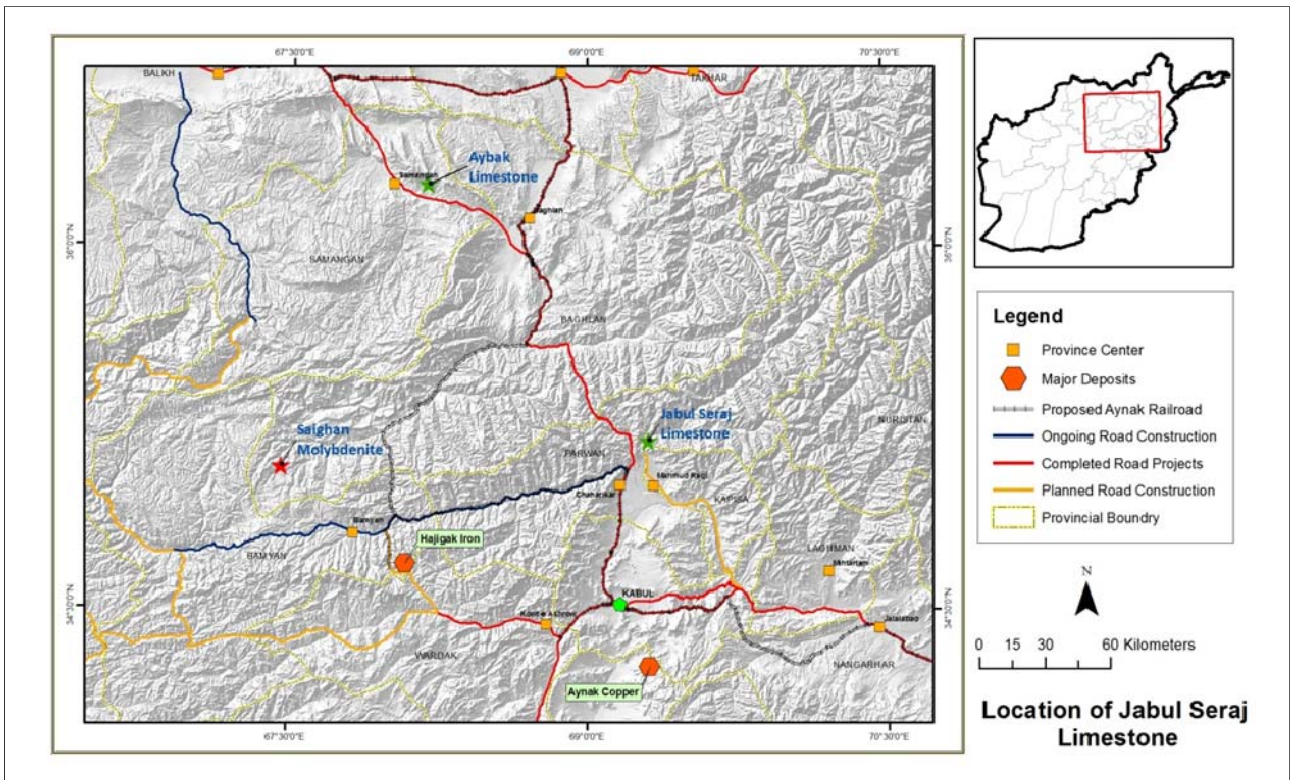


Figure 1: Location map of Jabul Saraj in relation to other major infrastructure Projects

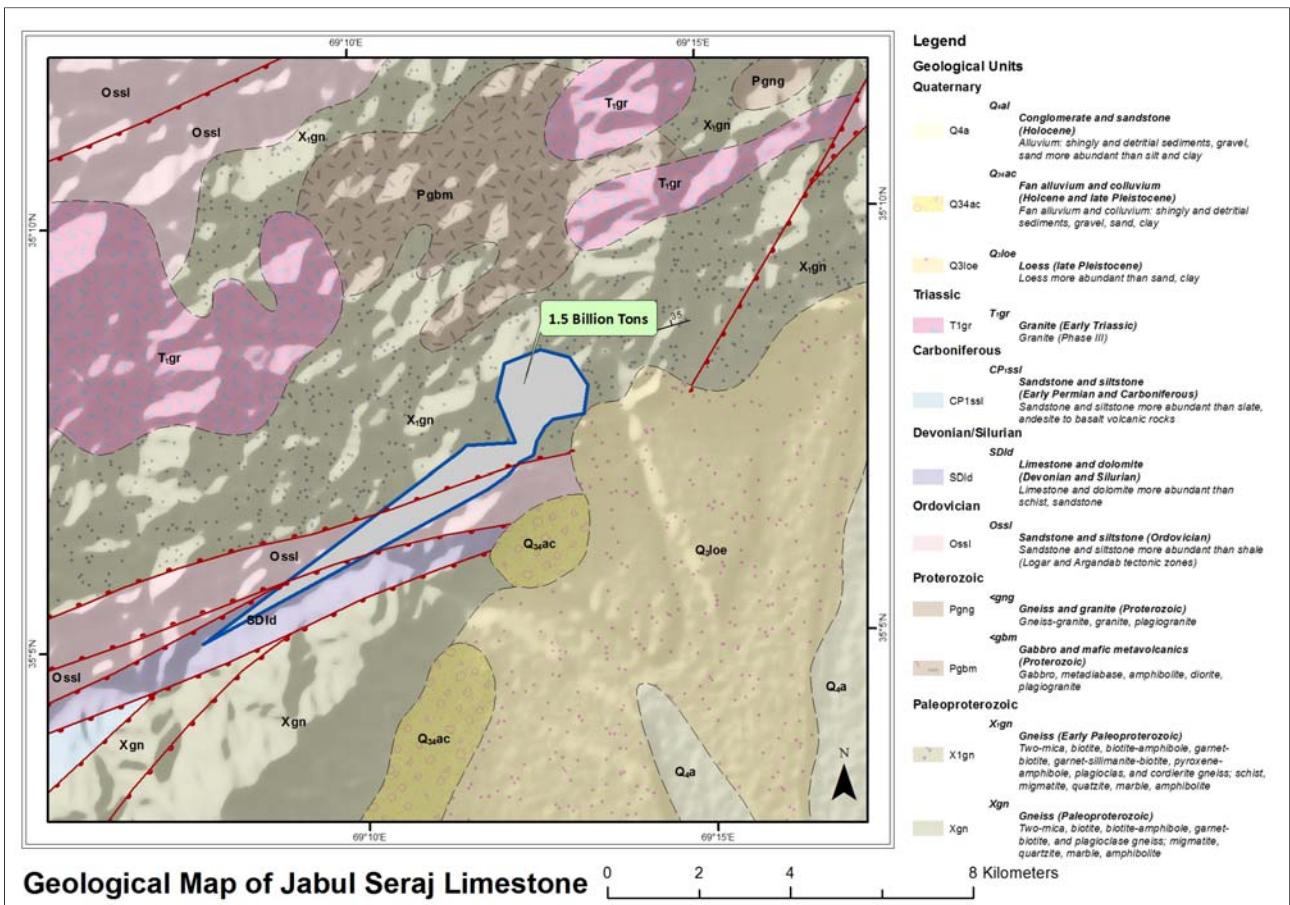


Figure 2: Geological setting of the limestone units with the block of resources estimated

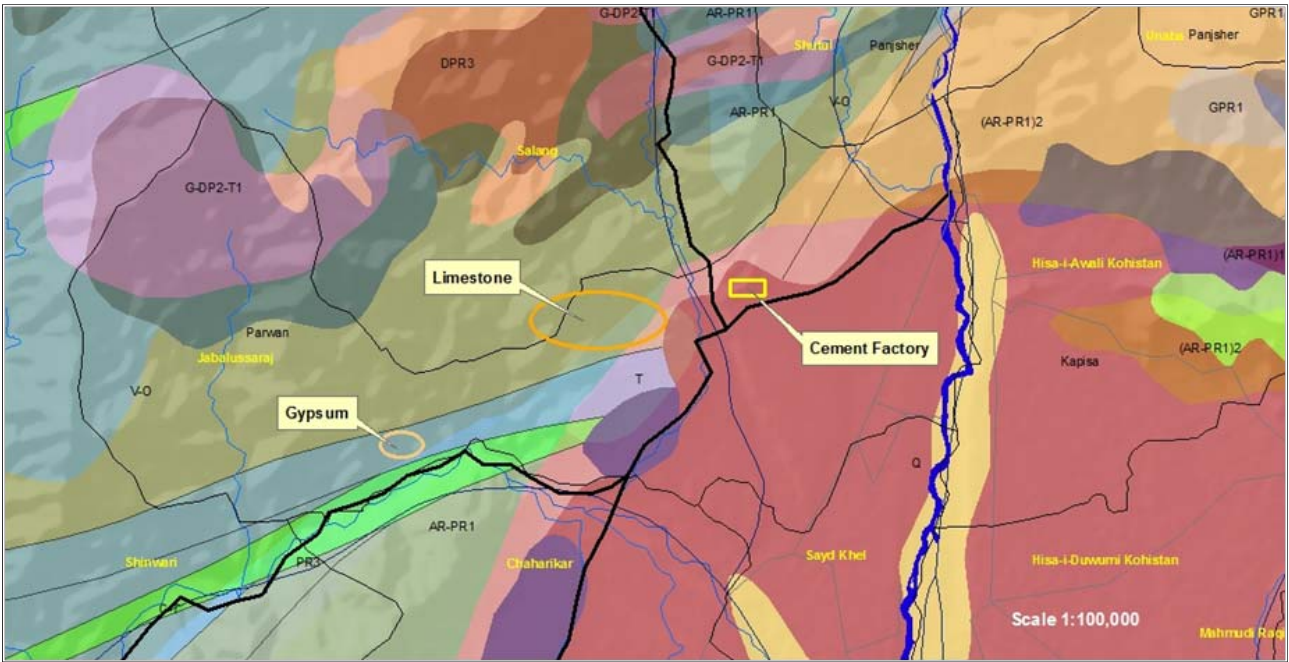


Figure 3: Geological map of the limestone units in Jabul Saraj, Parwan Province (scale 1:100,000) and occurrences of Pliocene Miocene gypsum to the West.



Figure 4. View of the V-O limestone outcrops



Figure 5. Outcrops of the Upper V-O limestone (op of the picture). The underlying carbonaceous schists are exposed at the bottom right.

CEMENT PRODUCTION IN AFGHANISTAN

Cement production in Afghanistan is the lowest in the world at 2 kg/capita/year (50,000t/yr), compared with Pakistan at 92 kg/capita and the United Kingdom (UK) at 200 kg/capita. In 2005, Afghanistan cement consumption was 2.5 million tones, but demand has been forecasted to reach 7.2 million tones/year in 2020¹. In 2005, Afghan cement production was only 16,000 tones/yr, down from 100,000 t/yr (from the Ghori Cement Factory at Pulli Khumri in Baghlan); the balance of the demand in 2005 came from Iran (1.8 million tons), Pakistan (4,000,000 tones)² and Uzbekistan and Turkmenistan (300,000 tones) (Mitchell and Benham, 2008)³. The reported wholesale cost of cement in Kabul is about \$110/tonne, inferring a total value for the sector of about \$275 million/year.

Currently, Afghan Cement LLC operates the Ghori I and Ghori II cement plants in Baghlan with production capacity of 400 and 1000 t/d respectively (i.e., approximately 500,000 tones/yr). The new Ghori III will have a 4,000 t/d (1.4 million t/yr) capacity and was expected to be

operational in late 2010. All Ghori cement's plants will eventually supply about 2 million t/yr or about 50% of the current national demand, and requiring gypsum inputs of about 85,000 t/yr, sourced from the Dodkash deposit, 18 km from the Ghori operations in Pulli Khumri (Mitchell and Benham, 2008).

The Jebel Seraj cement plant in Parwan Province (35.0920° N, 69.1630° E) is currently not operating because of the lack of power and limestone. However, in the summer of 2011, a team from the Afghan Geological Survey (AGS) assessed a Lower Paleozoic limestone formation for suitability as raw material for cement manufacturing. The team mapping data and chemical analyses indicate the presence of more than a billion ton of high quality limestone at a distance of less than 5 km from the current cement factory. Also construction of the Zandajan plant, Herat Province was abandoned in 1980 at approx. 80% completion. Negotiations are underway, however, with the Iranian Majd Industrial Pishgaman Company (MIP) to rebuild and operate the Zandajan cement facility near Herat. The new MIP plant will produce 1,000,000 tons of cement/year.

¹According to the Afghanistan Statistical Yearbook 2009-10, only 571,940 tonnes of cement were legally imported into the country, valued at \$38,265,000 (\$67.00/tonne) (Afghanistan Ministry of Commerce, 2010).

LOCAL GEOLOGY

36According to the 1:500,000 scale geological map of Afghanistan published by the United States Geological Survey (USGS) in 2007⁴ from the original Soviet map of 1977⁵ (Fig. 3), the limestone unit in Jabul Saraj area is of Vendian-Ordovician (V-O) age (Figure 3) and it varies in color from white to bright gray, and in some places to very reddish. The unit is underlain by Proterozoic crystalline schists and gneisses and it is overlain by Silurian and Devonian sandstones and schists. The limestones are intersected to the west by the Triassic granodiorites and

other granitoids. The Paleocene and Miocene deposits which are composed of gypsum, clay and sand are with unconformity covers the older deposits. However, those deposits are not show in the geological map because of the limited distribution. From the tectonic point of view, the area is located along one of the major plate suture zones of the region, the Badakhshan-Herat Fault where even the gypsum beds are folded. According to the analytical results from the local sampling program, the average percentage of CaCO₃ is 94% and CaO 51.8%. Average percentages of relevant oxides are negligible and are shown in Table 1.

Table 1. Chemical Characteristics of the limestone sample from the Jabul Saraj District

Sample No	CaO	SO ₃	Mgo	Sio2	AlO3	Fe2O3
9	49	0	3	1.1	1.6	2.4
18	52.22	0.6	3	0.8	3.26	1.2
27	53.27	0	1.76	2.3	0.36	0.39
30	52.22	0	0.5	0.1	2.36	0.39
32	51.55	0	4.04	0.8	1.17	0.98
33	50.12	0	1.5	1.1	1.31	1
34	50.77	0	1.51	0.7	0.79	0.41
35	52.75	0	1	0.7	0.19	0.29
36	52.22	0	1	0.5	1.51	0.89
38	51.87	0	1.5	0.8	1.71	1.09
39	46.3	0	1.5	1.3	1	0.49
44	52.57	0	0.75	0.5	1.51	0.89
45	50.82	0	1.51	1.1	1.31	1.09
47	53.62	0	1.08	2.1	0.41	0.59
48	53.97	0	1.26	6.1	0.9	1.09
49	52.92	0	1.2	3	0.66	1.14
50 B	54.32	0	1.51	1.1	1.31	1.09
50 A	53.97	0	0.25	1	0.3	0.19
51	54.67	0	1.26	1	0.26	0.49
52	53.27	0.8	0.75	1.5	0.46	0.79
53	51.87	0.3	1	1.1	1.11	1.09
54	53.27	0	1	0.5	0.51	0.24
56	51.5	0.7	1	0.6	0.36	0.89
57	48.36	0	0.25	3.25	0.6	0.39
59B	46.61	0	1.26	1.1	1.6	2.4
59 A	52.22	0.4	1	2.4	0.86	1.89
60	52.57	0	1.76	1	0.56	0.19
117	52.92	0	0.25	1.01	0.43	0.19
128	51.17	0	2.52	1.7	0.66	0.57
131	50.82	0	1.26	0.9	4.3	1.29
134	51.87	0	1.76	2.3	1.09	0.3
135 B	51.87	0	1.26	2.2	1.21	1.19
139	51.52	0	0.79	1.5	0.25	1.79
140	51.8	0	1.26	0.6	0.26	0.24
141A	53.2	0	1.5	3.1	1.71	1.29
145	53.7	0	1.73	0.4	0.35	0.39
150	53.3	0	0.39	0.5	0.16	0.59
151	55	0	1	0.3	0.19	0.29
153A	54.3	0.6	0.37	0.6	0.39	0.11
153B	54.6	0	1	0.5	0.26	0.49
154	54.7	0.2	0.39	0.3	0.41	0.34
156	54.6	0	0.5	0.4	0.61	0.59
158	52.6	0.6	0.31	0.5	0.22	0.69
163	52.2	0	0.29	0.7	0.96	0.29
164A	50.4	0	3	1.1	1.6	2.4
165	53.9	0	0.5	0.2	0.14	0.39
166A	53.2	0	1.5	3.1	1.71	1.29
167	52.2	0	1.26	0.7	0.46	0.29
Average	53.18	0.08	1.24	1.28	0.94	0.82

RESOURCE ESTIMATION

A preliminary estimate of limestone resources was made by applying outcrop dimensions to a depth of 250m taking into account limestone thickness above ground and applying a correction factor of 0.5. The area of resources estimate is outlined in Figure 2.

Table 2: Jabul Saraj Limestone Estimation of Resources

Specification	Area with the Block in Fig. 2
Area	58,000,000 m ²
Depth	200 m
Volume (factor 0.5)	1,566,000,000
Specific weight	2.7g/cm ³
Total Resources	1,566,000,000 tons

CONCLUSION

From a geologic and economic point of view, the area is very suitable for investment in the cement manufacturing and it is essential to build cement

plants with high production capacity. According to AGS assessment, the Jabul Saraj area of Parwan Province contains more than 20 billion tons of very high quality limestone and the resources can be quite easily expanded because the limestone units

GOVERNMENT STRATEGY ON INFRASTRUCTURAL DEVELOPMENT

The GoA and donor agencies involved with the reconstruction of Afghanistan have recognized and adopted mineral resources development as a national priority goal. Under this framework, the government is seeking to align the development of infrastructures with the exploitation of major mineral resources, in order to promote and enhance the development of other natural resources within

the same transportation corridor. With this objective, the GoA is in the process of continuously improving and upgrading various transportation options favorable for the development of natural resources, including minerals, construction materials and hydrocarbons.² Furthermore, the GoA has recently endorsed and adopted major changes in mineral laws, policies, and fiscal regime to promote Afghanistan as an attractive destination of foreign exploration and development investments.

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