Minerals in Afghanistan

SHIRBATU GRANITE DIMENSION STONE

Bamyan Province

Excellent Exploration & Development Potential

SUMMARY

Exotic dimension-stone quality granites which form the Shirbatu Granite Complex (SGC) were identified by Afghanistan Geological Survey (AGS) geologists during the 2010 field season. The Shirbatu Granite complex is centered on 67.559^{0}E longitude and 34.861^{0}N latitude, and is located approximately 225 road km NW from Kabul, the capital city of Afghanistan.

The body comprises spectacular porphyritic to equigranular, coarse-medium grained, commonly phenocycryts of pinkish orthoclase and microcline feldspars embedded in medium-fine grained feldspars, quartz, and micas. Mapping has delineated extensive outcropping over an area of 164km^2 and exposure of minimum 200m vertical depth with an inferred resource of 32 billion m^3 based on outcrop dimensions. The Shirbatu Granite Complex (Figure 1) forms part of the larger "Bamyan Granitoid Complex" in the region, and holds equal potential for exploration, development, and exploitation of decorative stone and construction materials. Excellent road network connecting Kabul City is in place with other development options for railway route and energy/power under investigation in connection with the development of the nearby world-class Hajigak iron ore deposit.

Figure 1 A contact of the Shirbatu Granite Complex with Permian meta-sediments (dark grey in color).

LOCATION

The Bamyan Granite Complex is centered on 67.559^{0}E longitude and 34.861^{0}N latitude, and located within 20km west of the town of Shibar in Bamyan Province. The BGC body is further linked by approximately 225 road km NW from Kabul, (Figure 2).

GOVERNMENT STRATEGY ON INFRASTRUCTURAL DEVELOPMENT

The national Government of Afghanistan (GoA) and donor agencies involved with the reconstruction of the country 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.[1] Furthermore, the GoA has recently endorsed and adopted major changes in mineral laws, policies, and fiscal regimes to promote Afghanistan as an attractive destination of foreign exploration and development investments.

The Shirbatu Granite Complex which forms this spectacular resource for building and dimension stones is located in the central part of Bamyan Province, Afghanistan. The granite complex is well positioned by its close proximity to the Hajigak world-class iron ore deposit, (Figure 2). Hajigak is the second largest solid mineral deposit in Afghanistan and the GoA is currently investigating various transportation options to facilitate the development of this mega resource. Development of Shirbatu granite resources will benefit immensely by sharing infrastructure under development for Hajigak.

Roads

The Shirbatu Granite Complex is connected to Kabul, the capital city of Afghanistan, via two road networks. The preferred road is via Parwan, where the approximate total road distances of 225km, (Figure 2). This road is currently being upgraded and sealed from Kabul to Banda-e-Amir.

The second access road from Kabul is via Wardak Province. This road is about 180km long and passes by the Hajigak iron ore deposit. This road is passable but certain portions require major upgrading and reconstruction.

Proposed Railway

A feasibility study for a proposed railway link to Shirbatu has been commissioned by the GoA and Metallurgical Corporation of China (MCC) in September 2010. The feasibility study will review options to link Kabul via Jabulsaraj, Hajigak and to the north, with a view to connect with the existing railway network in the northern region. This infrastructure will support transportation of bulk commodities, including copper concentrates from Aynak, iron ore from Hajigak, and coal from the Northern provinces. When this infrastructure comes on stream, it will pass through the Shirbatu resource, (Figure 2). The railway infrastructure will greatly promote bulk transportation of granite slabs to markets in Kabul and the northern region and thus enhance the economic viability of mass production of this huge granite resource.

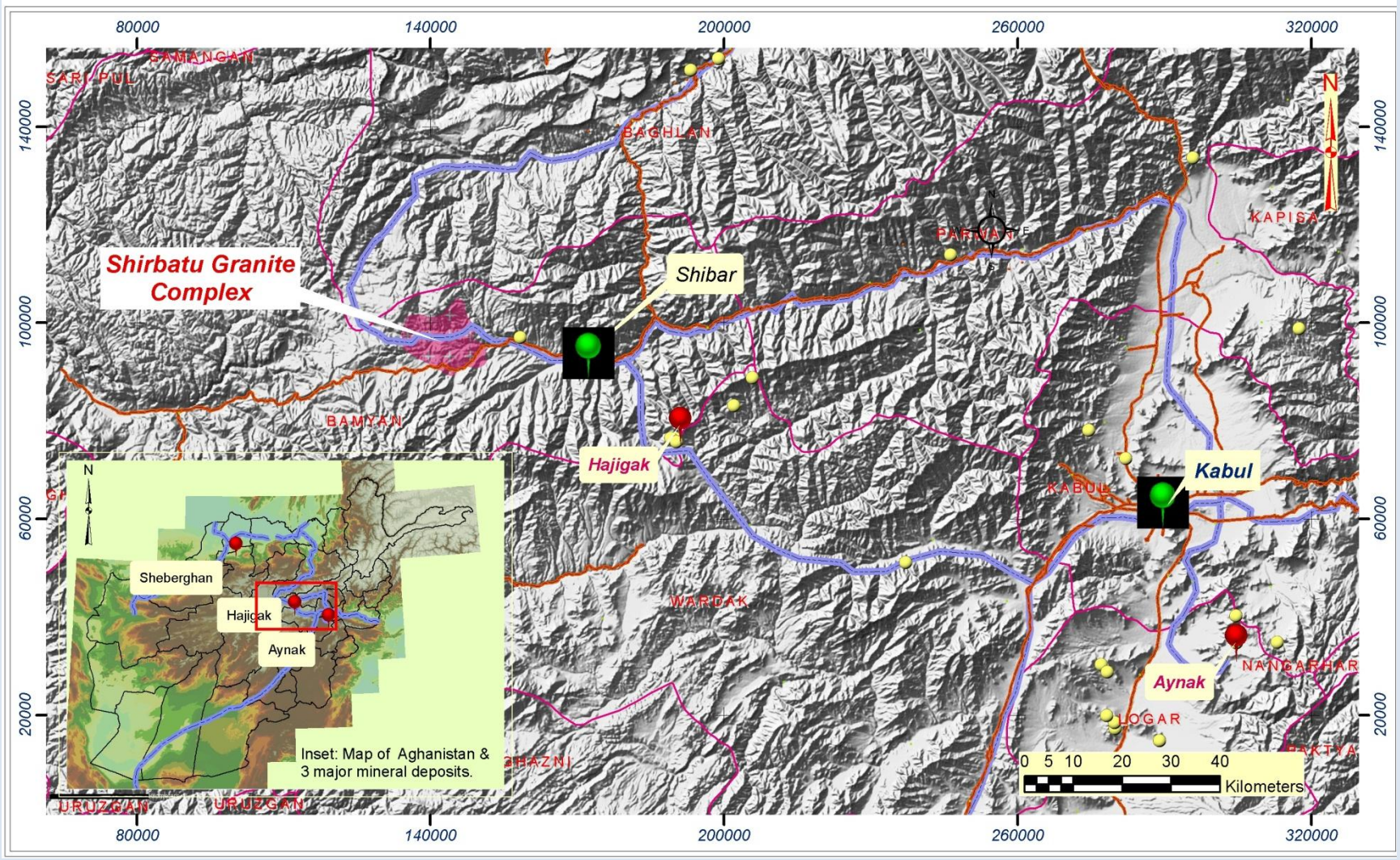

Figure 2 Location map with existing and planned infrastructure and major deposits. The blue lines show sections of the proposed railway route, currently under feasibility studies. Red lines show major road network. Red pins are major mineral deposits and the yellow spheres are mineral deposits with indicated/inferred resources.

Power and Electricity

The township of Bamyan is serviced by a thermal power station. The major power supply from Uzbekistan to Kabul runs some 150 km east of Shirbatu. The GoA is seeking private sector investment for the development of the Sheberghan gas fields to create a processing facility for the treatment of high sulfur gas and condensate, a transmission pipeline and a 100-150 MW power plant as an alternative energy source for Afghanistan and the Hagijak iron ore project. The Sheberghan gas fields (15.687 TCF estimated gas reserves) are located approximately 260km to the NW of Shirbartu, (Figure 2).

GEOLOGY OF THE SHIRBATU GRANITE COMPLEX

Bamyan Granitoid Complex

The Shirbatu granite is part of a huge Triassic aged calc-alkaline batholith, the so called "Bamyan Granitoid Complex" (Figure 3) that extends over thousands of square kilometers from the SW to the NE across Bamyan and Baghlan Provinces. The complex was formed during Early to Late Triassic time as a result of subduction of an oceanic crust along the southern margins of the Eurasian plate. The complex intruded Proterozoic and Paleozoic strata and is unconformably overlained by Cretaceous and younger sediments.[ii]

Absolute age determinations yielded two distinct ages for the Bamyan Granitoid Complex; 200-240ma and 95-155ma, (Abdullah et al, 1978). The age determination therefore indicated two distinct igneous phases for the Bamyan Granitoid Complex. Phase I (Early Triassic) is consisting of granites and grandiorites, while Phase II (Late Triassic) is made of granites, alaskite granites, granosyenites, quartz syenites and granosyenite porphyries.

The Phase I granitoid rocks crop out to the NE of the Shirbatu Complex and are represented by coarse-grained granite porphyry and light-grey and grayish-pink granite and granodiorite. They consist of plagioclase (25 to 35%), microcline (25 to 30%), quartz (25 to 32%), biotite (5 to 8%), and accessory apatite, zircon, and other minerals. The texture of the rocks is porphyritic, hypidiomorphic-granular and poikilitic.

Shirbatu Granite Complex

*Phase II rocks which also include the "Shirbatu Granite Complex", are represented by **granites**, alaskite granite, granosyenite, quartz syenite and syenite porphyry. They are medium-grained, massive light grey and grey-pink rocks with aplitic, graphic and porphyritic textures consisting of*

- *microcline (up to 65%),*
- *oligoclase (10 to 30%),*
- *quartz (15 to 30%),*
- *biotite (5 to 7%) and*
- *accessory zircon, garnet, apatite, and other opaque minerals.*

The porphyry granites exhibit the typical granitic texture with elements of pegmatite texture, (Figure 3). This type of textures is extremely exotic looking when polished.

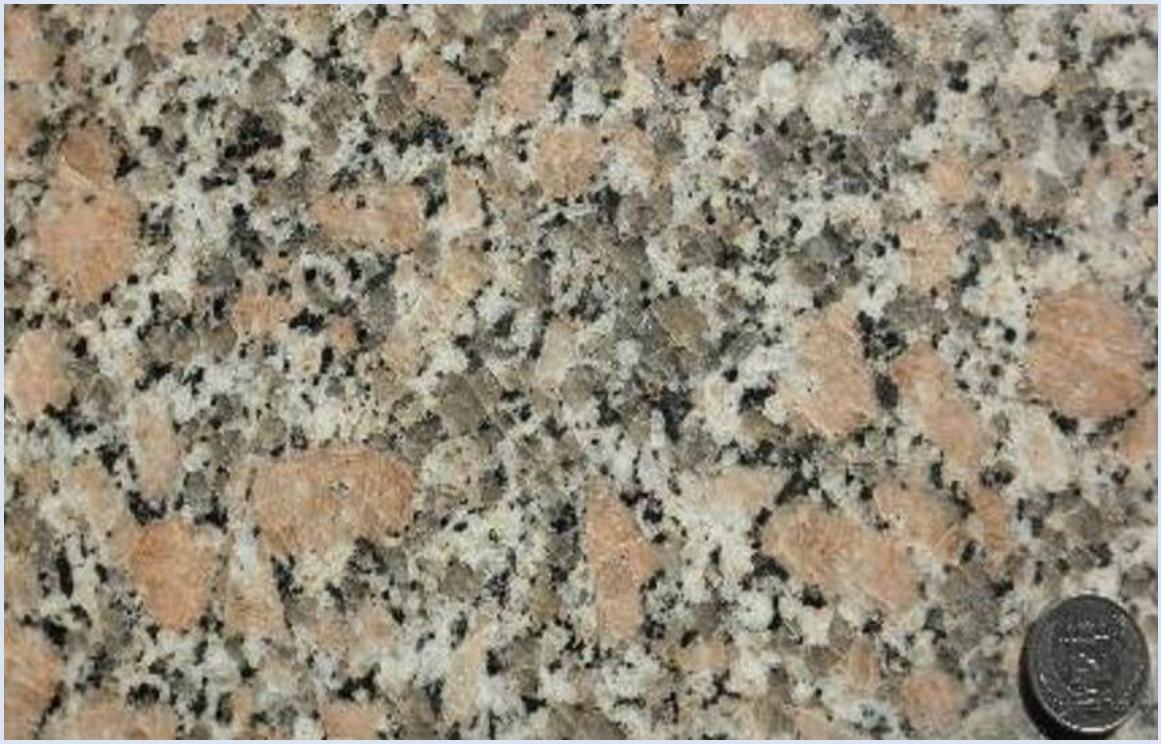

Figure 3 A polished slab of coarse grained porphyritic granite. Abundant coarse grained pinkish orthoclase feldspar embedded in relatively medium-fine grain plagioclase feldspar (grey) and quartz (white) and biotite (dark minerals).

LOCAL GEOLOGY

The Shirbatu Granite Complex (SGC) crops out at the surface over an area of 164 km^2. The Shirbatu Granite was formed during the Phase II intrusion of granites and granodiorites. There are also some veins and stocks of alaskite granites and granosyenites. At this locality, the complex intruded Limestones of Upper Permian age, (Figure 4).

The contact aureole within the sedimentary rocks is characterized by development of skarn and marbelization of limestones, actinolization and biotitization of volcanogenic rocks and serpentinization of dolomites. The presence of migmatized and hornfelsed contact aureoles are up to several hundred meters wide.

Several dyke series associated with the complex are represented by pegmatites and, less frequently, diorite porphyry and diabase bodies; measuring a few meters thick and a few dozen meters long, confined mainly to the contact zones of the intrusive.

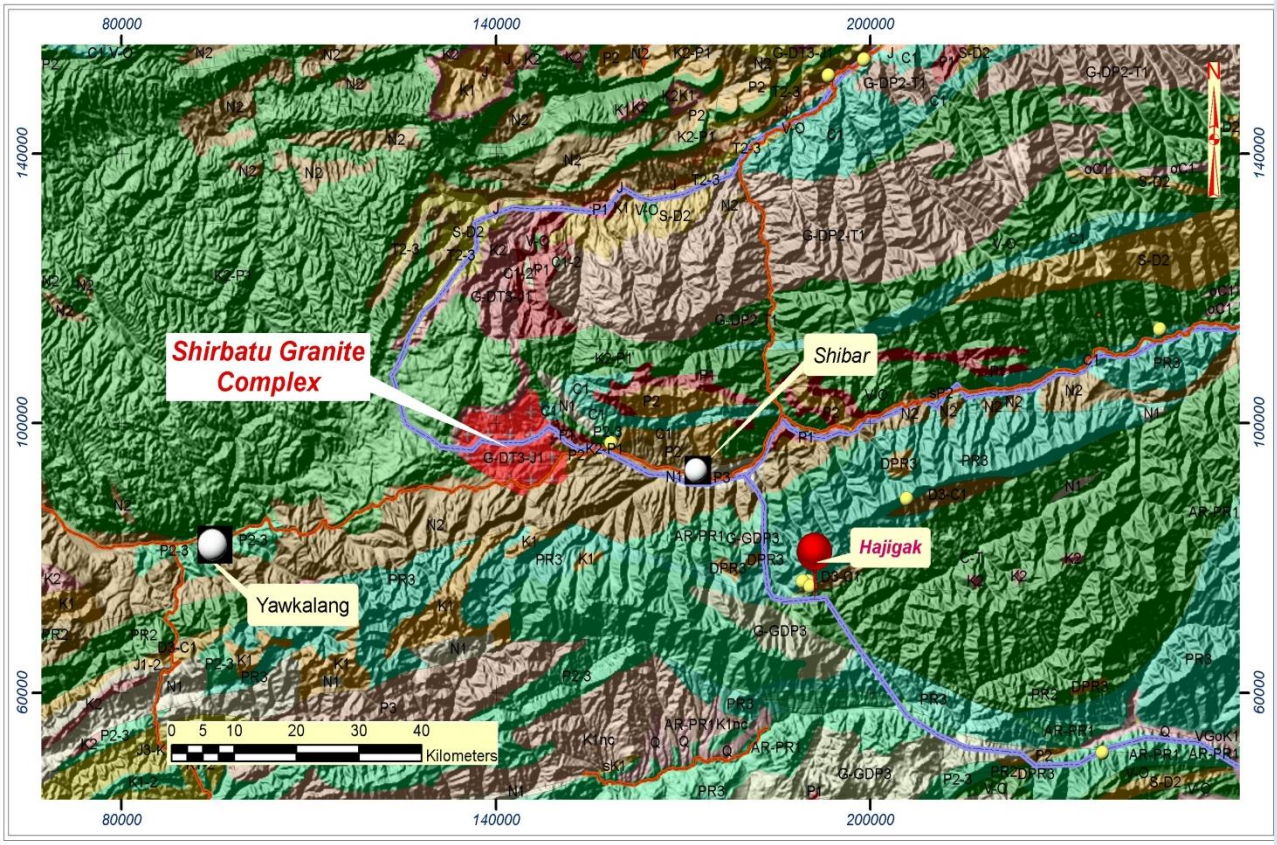

Figure 4 Shirbatu Granite Complex is located some 50km to the west of Shibar, capital of Bamyan Province along the main road (thick black line) connecting Bamyan with Band-e-Amir and Yakawlang. G-DT3-J1 and G-DP2-T1 are phase I and phase II igneous complexes, respectively. The Shirbatu Granite Complex intruded sedimentary host rocks of Upper Permian Limestone and terrigenous sediments, (K2-P1 and C2) which are unconformably overlain by Neogene (N2) sediments (conglomerates, sandstone and siltstone) (Geology after USGS compiled from Soviet Union maps, 2007)

ECONOMIC POTENTIAL

The granites from Shirbatu massif exhibit beautiful textures when polished and can be used as very valuable building stone and decorative tiles for covering floors, sidewalks, vanities, kitchens tables, and other needs. The granite body is fresh, massive less weathered and fractured.

Texturally, coarse grains of feldspars and quartz are embedded in a finer grained of the same minerals with minor accessories giving a "porphyritic texture", (Figure 3). Less commonly are medium grained equigranular textures giving the rocks exotic appearance when cut and polished, (Figures 5).

The inferred resource for decorative building stone at the Shirbatu Granite Complex is approx. 32.8 billion m^3.

The road infrastructure is being upgraded and access to major markets in the north and to Kabul City will be excellent. With the further railway development, transportation of bulk commodities will be greatly improved.

The production of high quality tiles for decorative purposes and by-products for road aggregates and other usages can be fully established after detailed feasibility studies.

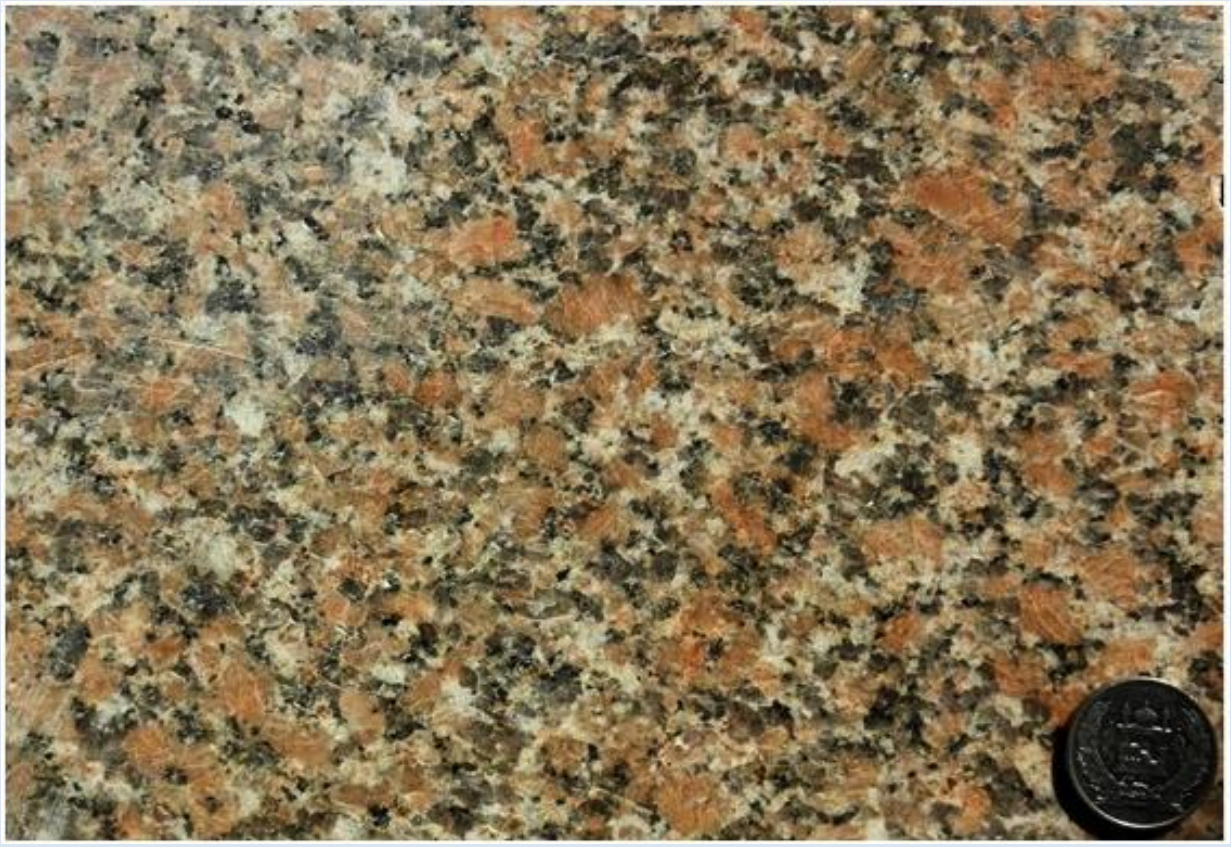

Figure 5 A polished slab of medium grained equigranular granite, comprising >60 vol.% of pinkish orthoclase feldspar.

KEY CONTACTS

The GoA has recognized the country's mineral resources as valuable assets that can be developed to create employment and promote economic independence. Under this goal, the GoA has recently made significant policy changes following its transition from state operator to regulator and is now driving infrastructural development with a view to enhancing and promoting mineral resource development. The GoA is constantly seeking investment from private and foreign investors to develop the huge and very diverse mineral resource potential of Afghanistan.

For further information on technical and investment matters, please contact the following offices within the Ministry of Mines, The Islamic Republic of Afghanistan.

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REFERENCES

***Abdullah, Sh and Chmyriov, V M** (editors in chief). 2008. Geology and Mineral Resources of Afghanistan. 2 Volumes. British Geological Survey - Occasional Publication No. 15. (Reprint of the 1980 English translation of the 1977 Russian publication).*

***Peters, S.G., Ludington, S.D., Orris, G.J., Sutphin, D.M., and Bliss, J.D**., eds., 2007, Preliminary Non-Fuel Mineral Resource Assessment of Afghanistan: U.S. Geological Survey Open–File Report 2007-1214.*

***SanFilipo, J.** 2005. Assessing the Iron Ore Resources of Afghanistan, USGS Information sheet*

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[11] ***Raw Materials Group 'The Case for an Afghanistan Development Corridor'**, submitted by Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH in association with Projekt-Consult GmbH, June 2010.*

[ii] ***Stazhilo-Alekseev K.F. et al. 1976, Abdullah et al. 1978***