

**PROPOSAL FOR RECONNAISSANCE SURVEY (G-4 STAGE) FOR GOLD AND
ASSOCIATED MINERALS IN JAMTOLA-KHANDAPAR BLOCK, BALAGHAT
DISTRICT, MADHYA PRADESH
(96.62 sq.km Area)**

COMMODITY: GOLD AND ASSOCIATED MINERALS

BY



**MINERAL EXPLORATION AND CONSULTANCY LIMITED
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SEMINARY HILLS**

PLACE: NAGPUR

DATE: 20thSEP 2023

Summary of the Block for Reconnaissance Survey (G4 Stage)
GENERAL INFORMATION ABOUT THE BLOCK

Features	Details
BlockID	JAMTOLA KHANDAPAR G4 BLOCK
CurrentExploration Agency	Mineral Exploration and Consultancy Limited, Nagpur
Commodity	Gold
Mineral Belt	Quartz vein within Phyllites in the Chilpi Group of Palaeo-Meso Proterozoic Age is serving as source for Gold.
Completion Period with entire Time schedule to complete the program	14 months
Objectives	The exploration scheme of Jamtola-Khandapar G4 block is formulated with the following objectives: 1.To carry out Geological & structural mapping on 1:12,500 scale for demarcation of Gold bearing host rock with the structural features to identify the surface manifestations and lateral and vertical disposition of the mineralized zones. 2.To collect Surface samples including bedrock, Stream, Soil, Channel samples and Trench samples & to analyze for Gold and associated minerals to shape up for further course of Exploration program. 3. Pitting / trenching will be done to expose the concealed host rock and mineralization. 4.Geophysical Survey to delineate the suitable Auriferous zones. 5.If phase-I exploration data will give positive results, 5 Nos. of scout boreholes may be drilled 6.To estimate resources as per UNFC norms Minerals (Evidence of Mineral Contents) Amendment Rules 2021. 7.To upgrade the block to the higher level of exploration.

	Whether the work will be carried out by the proposed agency or through outsourcing and details thereof Components to be outsourced and name of the outsource agency	The work will be carried out by the exploration agency (MECL).
	Name/Number of Geoscientists	Nos. of Geoscientists: 2 (1Field + 1HQ)
	Expected Field days(Geology,Geophysics,Surveyor)	Geologist Party days:150 field + 60 HQ Survey Party Days : Nil
1.	Location	
	Villages	Khandapar, Patpari, Jamtola, Kinarda, Kiniyan, Barwahi, Katangi etc
	Tehsil	Baihar, Paraswada
	District	Balaghat
	State	Madhya Pradesh
2.	Area (hectares/square kilometers)	
	Block Area	96.62 km
	Forest Area	Some Portion of the area falls in Sarekha and Jatta Reserve forest and in parts of Protected forest.
	Government Land Area	No data available
	Private Land Area	No data available
3.	Accessibility	
	Nearest Rail Head	Balaghat Jn (~40km) in SW direction from the block
	Road	The MP SH-26 which connects Khategaon and Amarkantak passes through the NW corner of the proposed block in between Ukwa and Baihar. NH-543 is the spur road of National Highway 43 that passes through Balaghat.
	Airport	1.Gondia in Maharashtra (~65km in SW direction) 2. Jabalpur in MP (~145 km in SW direction)
4.	Hydrography	
	Local Surface Drainage Pattern (Channels)	The Tannur Nadi and its tributaries drain the area. The drainage pattern of the area is dendritic in nature.
	Rivers/Streams	1. Tannur Nadi 2. Ghughra Nala 3. Kaknor Nala
5.	Climate	
	Mean Annual Rainfall	Avg. 460 mm
	Temperatures (Minimum)	14 Degrees (Dec-Jan)
	Temperatures(Average)	42 Degrees (May)
6.	Topography	

	ToposheetNumber	64C/09
	Morphology of the Area	The highest elevation in the area is 697 m above MSL in the east of Khandapar and the general ground level is 553 m above MSL near Bhutna.
7	Availabilityof baseline geoscience data	
	Geological Map (1:50K/25K)	Available in 1:50,000
	Geochemical Map	Geological Survey of India under National Geochemical Mapping program systematic stream sediment sampling was carried out in the study area in 1 X 1 km interval in grid pattern. A total of 23 stream sediment samples generated falls within the proposed block. None of the samples has given the values for Gold.
	Geophysical Map (Aero-geophysical, Ground geophysical,Regional as well as local scale GP-maps)	National Geophysical mapping in Toposheet no. 64 C/09 has been carried out by GSI with an objective to prepare Bouguer gravity and magnetic (Total Field) maps. As shown by geophysical prospecting, Quartz veins cannot be discriminated by the magnetic and gravity method with such a large station spacing (Fig-2.1 and Fig-2.2). However, volcanic rocks, which are especially dacitic, with hornblende crystals, seem to give rather big magnetic anomalies. Therefore, the magnetic method could be used to discriminate veins and to define their rate of alteration and their size and dimensions. According to the Bouguer gravity anomaly, there is a basic discontinuity at the center portion of the proposed block. The lowest magnetization is a sign of alteration in the same portion. This discontinuity is the alteration zone dividing the block into three parts. The western side & Northeastern portion has a higher density base rock than the central portion. Considering these mineralized zones are characterized with low magnetization and high density contrast; one should select such zones for further investigation

8.	Justification for taking up G3 stage mineral exploration	I. From the previous studies of GSI done by Khan et.al., (1995) 14 bedrock samples analysed for gold (by AAS) from the Khandapar quartz vein, out of which four samples have given encouraging values of Gold (0.2 gm/t, 0.4gm/t, 0.7gm/t, and 2.2gm/t). II. It is observed that the gold mineralization is hosted in Quartz vein within Phyllites of Chilpi Group of Palaeo-Meso Proterozoic Age. A thorough study of the entire area may be required to evaluate the Gold mineralization.\ III. Based on the evidences of Gold mineralization within the block, present Reconnaissance Survey exploration program at G-4 level has been prepared. Geological mapping, surface sampling, Geophysical Exploration and pitting/trenching will be helpful in assessing the lithology, disposition, extent and quality of the mineralized zones, structural features etc. IV. The Reconnaissance Survey (G4) will eventually help in delineating the area for G-3 level of exploration, which in turn will facilitate the state Government for auction of block.
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1.1.0 INTRODUCTION:

- 1.1.1 India ranked 6th in the world gold production in the year 1905, whereas, presently it produces gold from three mines namely Hutti, Uti, Hirabuddni of HGML in Karnataka and from one private mine in Projana Mine (Kundarkocha) in Jharkhand besides as by-product from the copper mines of HCL.
- 1.1.2 At present, the production of gold in India is a meagre one to two tonnes per annum only. But the fascination for the gold in our country is unlimited. Domestic demand of gold is mainly met through imports. The increasing demand of gold can be eased with the exploration of new gold deposits of economic importance. The growing demand for the metal, has created the requirement for exploration in strategic mineral, precious metals, PGE and Cobalt. The exploration of such minerals, and metals are getting thrust by Government of India.
- 1.1.3 In last two decades, there has been no deposits of any sizeable dimension found in our country.

1.2.0 LOCATION AND ACCESIBILITY

- 1.2.1 The block is located in Baihar and Paraswada tehsil of Balaghat district in Madhya Pradesh (Plate-I). Major villages in the proposed block are Khandapar, Patpari, Jamtola, Kinarda, Kiniyan, Barwahi, Katangi etc.
- 1.2.2 The proposed block is situated about 40 km in NE direction of Balaghat which is the district head quarter. The proposed block is well connected to Balaghat via MP SH-26 which connects Khategaon and Amarkantak and passes through the NW corner of the proposed block. NH-543 is the spur road of National Highway 43 that passes through Balaghat. Balaghat Junction (station code: BTC) is situated on the Jabalpur-Nainpur-Gondia section of South East Central Railway in Madhya Pradesh. The nearest airport from the proposed block is situated in Gondia in Maharashtra (~65km in SW direction). Another airport is there in Jabalpur, MP (~145 km in SW direction).
- 1.2.3 The proposed block has the area of 96.62 sq km and it falls in Survey of India Toposheet No. 64C/09.

1.3.0 CLIMATE

The Average annual rainfall is 460 mm The climate of the area is mainly tropical with clearly defined dry and rainy seasons. The humidity is generally low except during the monsoons. The

area comes within the semi arid zone with temperature ranging from 10°C (Dec-Jan) to 45°C (May).

1.4.0 FLORA FAUNA

The Block falls in the part of Sarekha and Jatta Reserve forest and in parts of Protected forest. The forest trees include Saja (*Terminalia Somentosa*), Sarai (*ShoreaRobusta*), Bija (*Pletocarpus marsupium*) and Bamboo (*Dendrocalamus strictus*). The common wild animals reported include bison, bear, monkey and deer.

1.5.0 REGIONAL GEOLOGY

1.5.1 Regionally, the area falls near the southern boundary of the Central India Tectonic Zone (CITZ) and Bastar Craton.

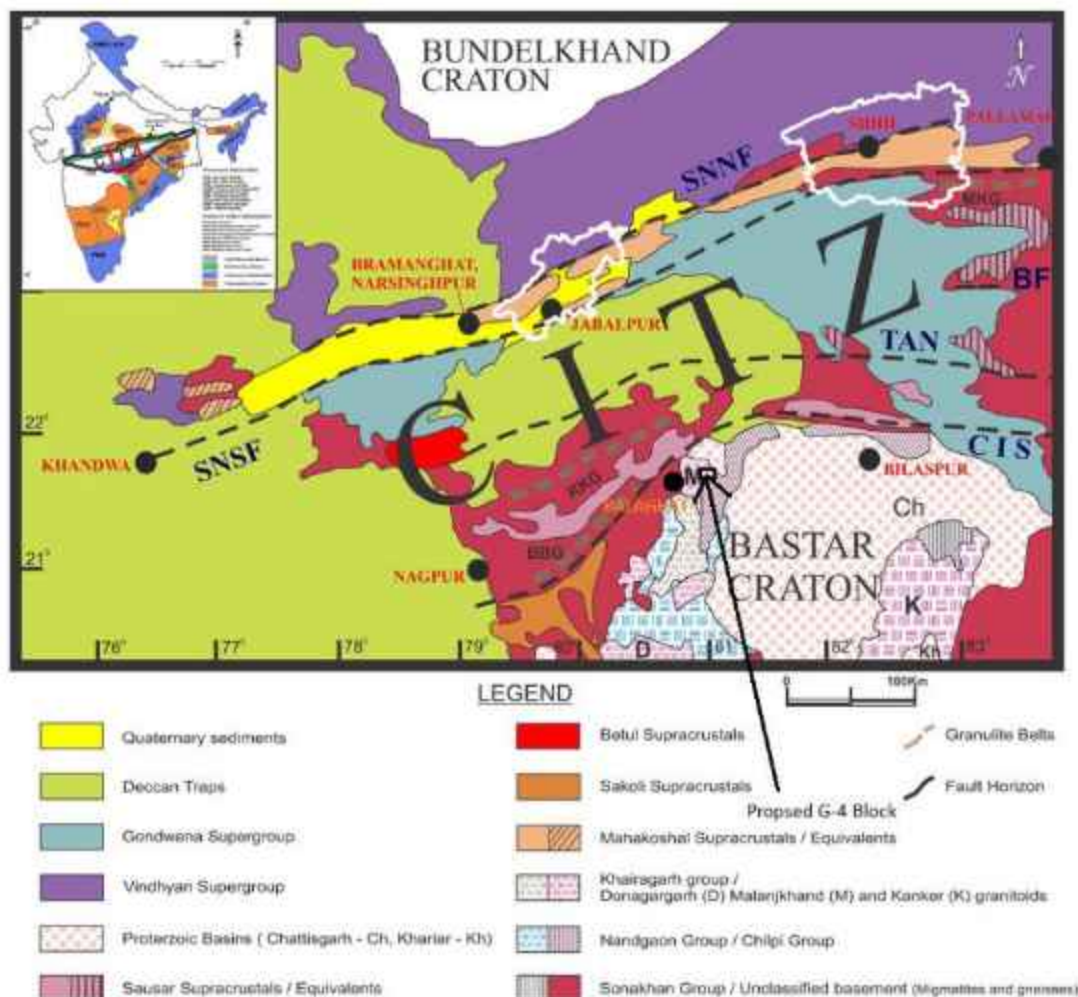


Fig-1.1 Geological Map of central sector of the Central Indian Tectonic Zone (CITZ) (with Proposed block location (modified after Ramachandra & Roy, 2001; Roy et al., 2002). Inset: Geological map of India showing the location of CITZ. CITZ Central Indian Tectonic Zone, SNNF Son Narmada North Fault, SNSF Son Narmada South Fault, BF Balram Fault, TAN Gavilgarh Tan Shear Zone, CIS Central Indian Suture, MKG Makrohar Granulite Belt, RKG Ramakona Katangi Granulite Belt, BBG Balaghat Bhandara Granulite Belt, Ch Chattisgarh Basin, Kh Khariar Basin, D Dongargarh Granite, M Malanjkhnad Granite, K Kanker Granite

- 1.5.2 Central Indian Tectonic Zone (CITZ) in the Nagpur-Balaghat area, trending in the E-W to ENE-WSW direction with about 20 to 40 km wide and 300 to 350km long. The belt is made up of four major geologic components, from south to north; the southern granulite belt, the supra-crustal metasedimentary rocks of the Sausar Group, reworked inliers of the Tirodi gneiss and the northern granulite belt.
- 1.5.3 Due to the effect of CITZ, the area in an around of CITZ including the proposed block area has undergone intense shearing which is responsible factor for various mineralization in the area including Gold, Copper, Manganese etc. The area lies in SW of the famous Malanjhand Copper deposit. Part of Sausar group also falls in the area. The Chilpi Group was deposited between 2100 and 1800 Ma (Mohanty, 2015).
- 1.5.4 Stratigraphy, structure and metamorphism of the metasedimentary rocks of the eastern parts of Balaghat district have been studied by many workers since the last decade of the nineteenth century due to the economic significance of the manganese deposits in this area. Similarly, the Malanjhand copper mine and its environs have also been studied by many workers ever since the old workings at Malanjhand came into light during late nineteenth century.
- 1.5.5 The area is exposed with granite gneiss of Amagaon Gneissic Complex, Gniesses and Migmatites of Tirodi Gneissic Complex, Intrusive Granites of Malanjhand Granite, Muscovite Schist, Schistose Grit of Sausar Group, Phyllites, Quartzite and Conglomerates of Chilpi Group and Basalts of Deccan Trap and Laterites (PLATE-II). Gold Mineralisation is observed in the Quartz veins present within phyllites.
- 1.5.6 Major Lithology present in the area is Phyllites of Chilpi Group of Palaeo-Meso Proterozoic age which is present in the central, eastern and southern part of the area within which Malanjhand Granite is observed as intrusive which is the second dominant lithogy in the region. Western part of the region is characterized by granite gneiss of Amagaon Gneissic Complex and Gniesses and Migmatites of Tirodi Gneissic Complex.
- 1.5.7 Regional stratigraphic succession of the litho-units after GSI is illustrated in the Table 1.1

Table 1.1
Regional Stratigraphic sequence of Litho units (After GSI)

Age	Group	Lithology
Recent to sub-recent	---	Laterite
Eocene to Up cretaceous	Deccan Trap	Basalt
-----Unconformity-----		
Palaeo-Meso Proterozoic	Chilpi Group	Pegmatites and Quartz veins, Phyllite with lenses of schistose grit and Crystalline limestone, quartzite. Ortho quartzite and conglomerate.
Palaeo Proterozoic	Sausar Group	Schistose grit, Muscovite Schist
-----Unconformity-----		
Palaeo Proterozoic	Malanjhand Granitoid	Granite
-----Unconformity-----		
ARCHAEN	Amgaon Gneissic Complex	Granite gneiss with migmatite gneiss
	Tirodi Complex	Granitic gneisses with migmatite/granite

1.6.0 GEOLOGY OF THE BLOCK

1.6.1 The area mostly exposes lithounits belonging to Amagaon Gneissic Complex, Gniesses and Migmatites of Tirodi Gneissic Complex, Intrusive Granites of Malanjhand Granite, Phyllites, Quartzite of Chilpi Group and Basalts of Deccan Trap and Laterites (PLATE-II). Gold Mineralisation is observed in the sheared quartz veins present within phyllites near Khandapar area.

1.6.2 Following important lithologies are present in the area

- i) **Granitic gneisses with migmatite/granite** This lithology belongs to Archaen aged Tirodi Gneissic complex which is the oldest rock present in the region. It is present as elongated stretch in the west central part of the block having NE-SW trend.
- ii) **Granite gneiss with migmatite gneiss** belongs to Amagaon Gneissic Complex are present in the western part of the block. These are of Archaen age having foliation of NE-SW and dipping towards NW.

- iii) **Malanjkhanda Granitoid Intrusive** Granites of Malanjkhanda Granitoid group is present in the central part of the block as one of the dominant lithology in the block along with a few amphibolites dykes within it. This body forms a suite of rocks varying from diorite, quartz diorite, adamellite to granodiorite. The granodiorite is coarse grained, pinkish grey to grey in colour and comprises quartz, feldspar and mafics. Hornblende is the chief mafic mineral along with chlorite being an alteration product. Shearing along the earlier mentioned trends are common also in the granodiorite. Free quartz is present predominantly within granodiorite. Inconsistent Copper mineralisation is present within these lithologies.
- iv) **Phyllites, Quartzite with Pegmatites and Quartz veins** Major lithology present in the area is Phyllites of Chilpi Group of Palaeo-Meso Proterozoic age which is present in the central, eastern and southern part of the area the metasedimentary sequence of the study area along with quartzite at places. These are having NE-SW strike and dipping towards NW. Pegmatites and quartz veins which have been emplaced into the metasediments are of different dimensions. The quartz vein exposed near Khandapar has visible indications of Gold mineralisation, are observed in the younger quartz veins. This quartz vein has undergone ductile deformation along with the surrounding metasediments (Khan et.al. 1995).
- v) **Basalt and Laterites** Erosional remnants of Deccan Traps specially basalts occur at few places in the northwestern part of the area. Laterite development is also observed at places within the block.

1.6.3 The tentative stratigraphic sequence of litho units exposed in the Block area (After GSI) is given in Table 1.2.

Table 1.2
Stratigraphic sequence of the Jamtola-Khandapar G4 Block for Gold
(After GSI)

Age	Group	Lithology
Eocene to Upper Cretaceous	Deccan Trap	Basalt
-----Unconformity-----		
Palaeo-Meso Proterozoic	Chilpi Group	Pegmatites and Quartz veins, Phyllite with lenses of schistose grit and Crystalline limestone, quartzite. Ortho quartzite and conglomerate.
-----Unconformity-----		
Palaeo Proterozoic	Malanjkhanda Granitoid	Granite
-----Unconformity-----		

Age	Group	Lithology
ARCHAEAN	Amgaon Gneissic Complex	Granite gneiss with migmatite gneiss
	Tirodi Complex	Granitic gneisses with migmatite/granite

1.7.0 REGIONAL STRUCTURE

- 1.7.1 Tripathi et. al. carried out the mapping and elucidated the Stratigraphy and Structure of the Chilpi Group in details. They correlated the metasediments of the 64B/12 and 64C/09 with the metasediments and the gneisses occurring further west and north-west which were thought to be the continuation of the Sausar rocks. The rocks of the Malanjkhanda area fall in the strike continuity of the rocks of the Ukwa area and have striking lithological and structural similarity with the rocks of the Sausar Group around Ukwa and Khara area (Tripathi et.al. 1973 p. 24). They also mentioned about the similar metamorphism.
- 1.7.2 Isoclinal folds as well as oblique folds are observed within the migmatites in the northwestern part, in the vicinity of the major NNE-SSW trending shear zone. The isoclinal folds show axial planes disposition varying from NNE-SSW in the area north of Khandapar to ENE-WSW west of Ramtola. The axial planes dip towards WNW to NW at angles varying from 25° to 45°.
- 1.7.3 In the greenish grey granite gneiss, the crudely developed pervasive feature is more due to crystal-plastic flow of quartz around the feldspar porphyroclasts than parallel alignment of mafics (Fig. 15). The trend of the flattened and partly recrystallized quartz ribbons in greenish grey granite gneiss (Figs. 13 and 45) varies from N05°E to N15°E in the Jatta block of Khan et. al. (1995). The trend of the regional foliation in the greenish grey granite gneisses vary from N40°E to N55°E. Foliation in greenish grey granite gneiss abut against that of the metasediments at a few places such as the area north of Kinarda which are away from the main high strain zone.
- 1.7.4 Primary structures are rarely observed in the metasediments. Stratification is visible in the conglomerate as observed in the Bhutna River section with a fining upward nature. The conglomerate grades into the overlying ferruginous quartzite which shows cross bedding. The palaeocurrent direction measured at Bhutna section is from south-east to north-west. Graded bedding is very clearly observed in the Bhutna section. Rarely scour and fill structures are also observed. In phyllites, a planar feature, resembling bedding planes are found to be thin kink bands under the microscope. In crystalline limestone, though recrystallisation has obliterated the

primary features, associated jasper bands (as seen east of Saraitola) represent the primary stratification. The unambiguous stratigraphic way-up criteria at Bhutna section indicates that successively younger rocks are observed from south-east to north-west.

- 1.7.5 The trend of foliation in the metasediments varies from NE-SW in the southeastern part to NNE-SSW in the eastern areas. The strike of foliation in the area south of Baigatola and south of Kinarda is almost ENE-WSW with shallow (15° - 20°) dip towards NNW. Between Khandapar and Baigatola the foliation trends show variation from NNE-SSW in the western part to ENE-WSW in the eastern part. The pervasive foliation in the phyllite dips at gentle to moderate angles.
- 1.7.6 The development of foliation within the amphibolites and the presence of folded enclaves of amphibolite in the granite gneiss with parallelism in their fabric indicate the earlier events of deformation and granite emplacement. The amphibolites have been invaded by the greenish grey granite gneiss.

1.4.0 REGIONAL METAMORPHISM

- 1.4.1 The effect of CITZ Sausar has induced high-grade metamorphism in the area and it has been suggested that partial melting of the metasediments of the Sausar Group has given rise to part of the gneisses (para-gneiss) intimately associated with it. This has created a controversy on the stratigraphic position of "Tirodi Gneiss" vis-a-vis Sausar Group (Phadke 1990). In general, metamorphic grade is highest in the western and northwestern part of the area where Amagaon Gneisses, Migmatites and Tirodi Gneisses are present. Under the microscope, the amphibolite bearing rocks in the Khandapar area show assemblages in which biotite is replaced by bluish green hornblende. Biotite rich cores show brownish yellow pleochroic colour and are being replaced by bluish green hornblende around the rims (Jaggi, et. al. 1993-94) This indicates the transition from greenschist facies to amphibolite facies (Epidote amphibolite facies).

2.0.0 PREVIOUS WORK

- 2.1.0 Gold mineralization is associated within the quartz vein present in Palaeo-Meso Proterozoic aged phyllites of Chilpi Group of rocks. Some of the bed rock samples, collected by Khan et.al., (1995) from the Khandapar quartz vein, described earlier have analysed very interesting values of gold. Out of the 14 bedrock samples analysed for gold (by AAS), four samples have given very encouraging values (0.2 gm/t, 0.4gm/t, 0.7gm/t, and 2.2gm/t).

- 2.1.1 During the systematic mapping, the area was covered by Tripathi et.al. (1973). These authors classified the rocks in the area into an Archaean Basement Complex overlain by Precambrian metasediments. They further divided the Archaean Basement Complex into two Groups, namely Older Metamorphics and Younger Metamorphics. According to them, the amphibolites and mica schists which occur as isolated patches within the granite and granite gneiss belong to the Older Metamorphic Group. While, "Younger Metamorphics" of these authors constitute quartz veins, pegmatite, basic dykes, gabbro, greenish grey granite, gneiss and andesite. The Precambrian metasediments which overlie the Archaean Basement Complex include mainly the Chilpi Group, which starts with a basal conglomerate and successively overlain by orthoquartzite, grit, calc-silicates, marble with thin bands of mica schist, epidote quartzite, crystalline limestone, sericite mica schists, phyllite with lenses of grit, bands of manganese, and intruded by pegmatite and quartz vein.
- 2.1.2 These authors, who presumably carried out the mapping under the item "Elucidation of the Stratigraphy and Structure of the Chilpi Group", retained this title for the report. However, they made an attempt to correlate the metasediments of the 64B/12 and 64C/09 with the metasediments and the gneisses occurring further west and north-west which were thought to be the continuation of the Sausar rocks. They wrote that „the rocks of the Malanjhand area fall in the strike continuity of the rocks of the Ukwa area and have striking lithological and structural similarity with the rocks of the Sausar Group around Ukwa and Khara area" (Tripathi et.al. 1973 p. 24). They also mentioned about the similar metamorphism. However, the title and abstract of their report refers, to the metasediments as Chilpi Group.
- 2.1.3 In a subsequent paper, Tripathi (1979) included Baihar gneisses also along with the Older Metamorphics of earlier stratigraphy (Tripathi, 1973). In this paper he mentioned that pockets of these gneisses occur within the Malanjhand granodiorites (Tripathi, op. cit., p. 162). However, the metasediments south - west of Malanjhand were considered in this work as Chilpi which have undergone higher grade of metamorphism and deformation than the Chilpi rocks in the Taregaon area, further east.
- 2.1.4 Chilpi Ghat section and the surrounding areas were mapped by Tripathi et.al. (1975). They reported that the Chilpi Group commences with a conglomerate bed whose base is not seen and is overlain by metavolcanics and which are in turn overlain by metasedimentaries.
- 2.1.5 On the basis of the studies carried out along the type section of the Chilpi Ghat, Das Gupta et.al. (1981), divided the Chilpi Ghat series into Lower Metavolcanics and Upper Metasedimentaries.

- 2.1.6 Over the years geological, geochemical (Udhoji, 1976; Neelakantam 1973; 1974), geophysical (Chatterji et.al. 1974; Dash, et.al. 1972; Dutta, et.al. 1975), subsurface (Neelakantam et.al. 1974; Jaiswar and Guha 1975; Khan et.al. 1992) investigations as well as ground checking of aeromagnetic anomalies (Shukla, 1987) have been carried out in many blocks where indications of mineralisation were suspected. This include investigations of quartz veins such as that occurring near Khandapar (Neelakantam, 1973), Chilpi-Granitoid contacts (Neelakantam et.al. 1974), and within granitic rocks (Jaiswar et.al. 1975, Shukla 1987).
- 2.1.7 Some of the bed rock samples, collected by Khan et.al., (1995) from the Khandapar quartz vein, described earlier have analysed very interesting values of gold. Out of the 14 bedrock samples analysed for gold (by AAS), four samples have given very encouraging values (0.2 gm/t, 0.4gm/t, 0.7gm/t, and 2.2gm/t).
- 2.1.8 Pal, A. B. and Sindhupe G.L. (2004) mentioned that age old gold panning along the streams, ancient workings for gold mineralization in the quartz veins emplaced in Malanjkhanda granitic pluton along the peripheral contacts of older rocks of Amgaon Gneiss and Nandgaon Volcanics besides shear controlled zones drew the attention of present authors to take up detailed survey. These quartz veins are the locales for future exploration of copper-gold mineralization. Garhi Dongri and Khandapar, occurring at the peripheral contacts, may be gold rich and copper poor in mineralization and are very significant.
- 2.1.9 Bhargava, Ind Pal (2000) have located old workings at the Khandapar hill range. Surface samples indicated copper and gold mineralization in quartz veins. In Khandapar prospects, quartz veins occur at the contacts of Malanjkhanda Granite with Nandgaon Volcanics and Amgaon Gneiss respectively. At Khandapar prospect, quartz veins samples show copper content that ranges 14 to 591 ppm and gold from 0.10 to 0.23 g/t. Soil samples show highest copper of 234 ppm and gold 0.38 g/t.

2.1.10 NGCM INVESTIGATIONS

Geological Survey of India under National Geochemical Mapping program systematic stream sediment sampling was carried out in the study area in 1 X 1 km interval in grid pattern. A total of 23 stream sediment samples generated falls within the proposed block. None of the samples has given the encouraging values for Gold, Cu, Pb, Zn etc.

2.1.11 NGPM INVESTIGATIONS

National Geophysical mapping in Toposheet no. 64 C/09 has been carried out by GSI with an objective to prepare Bouguer gravity and magnetic (Total Field) maps. As shown by geophysical prospecting, Quartz veins cannot be discriminated by the magnetic and gravity method with such a large station spacing (Fig 2.1 and Fig. 2.2). However, volcanic rocks, which are especially dacitic, with hornblende crystals, seem to give rather big magnetic anomalies. Therefore, the magnetic method could be used to discriminate veins and to define their rate of alteration and their size and dimensions.

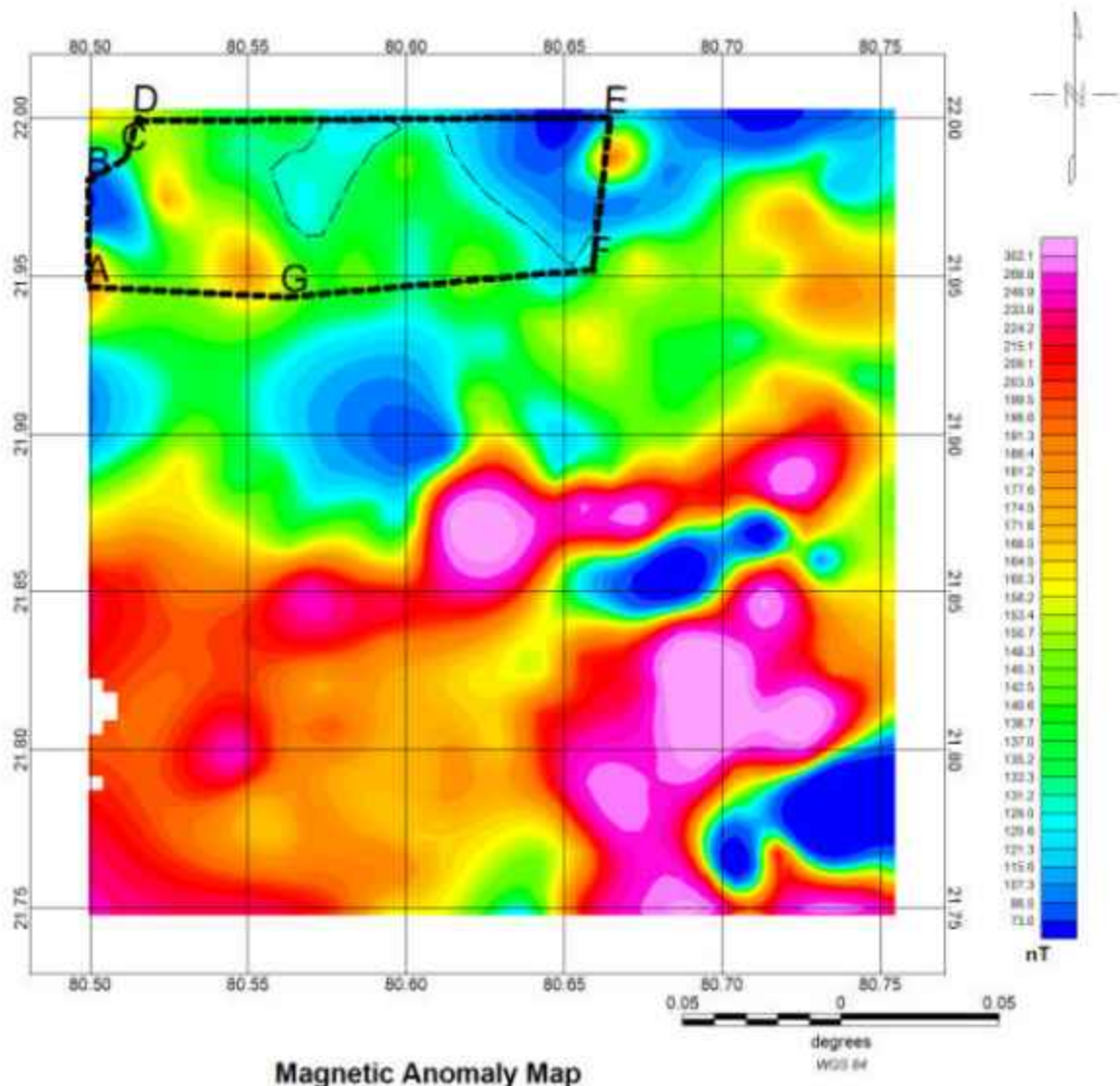


Fig. 2.1 Magnetic Anomaly Map based on the NGPM Data

According to the Bouguer gravity anomaly, there is a basic discontinuity at the center portion of the proposed block. The lowest magnetization is a sign of alteration in the same portion. This

discontinuity is the alteration zone dividing the block into three parts. The western side & Northeastern portion has a higher density base rock than the central portion.

Considering these mineralized zones are characterized with low magnetization and high density contrast; one should select such zones for further investigation.

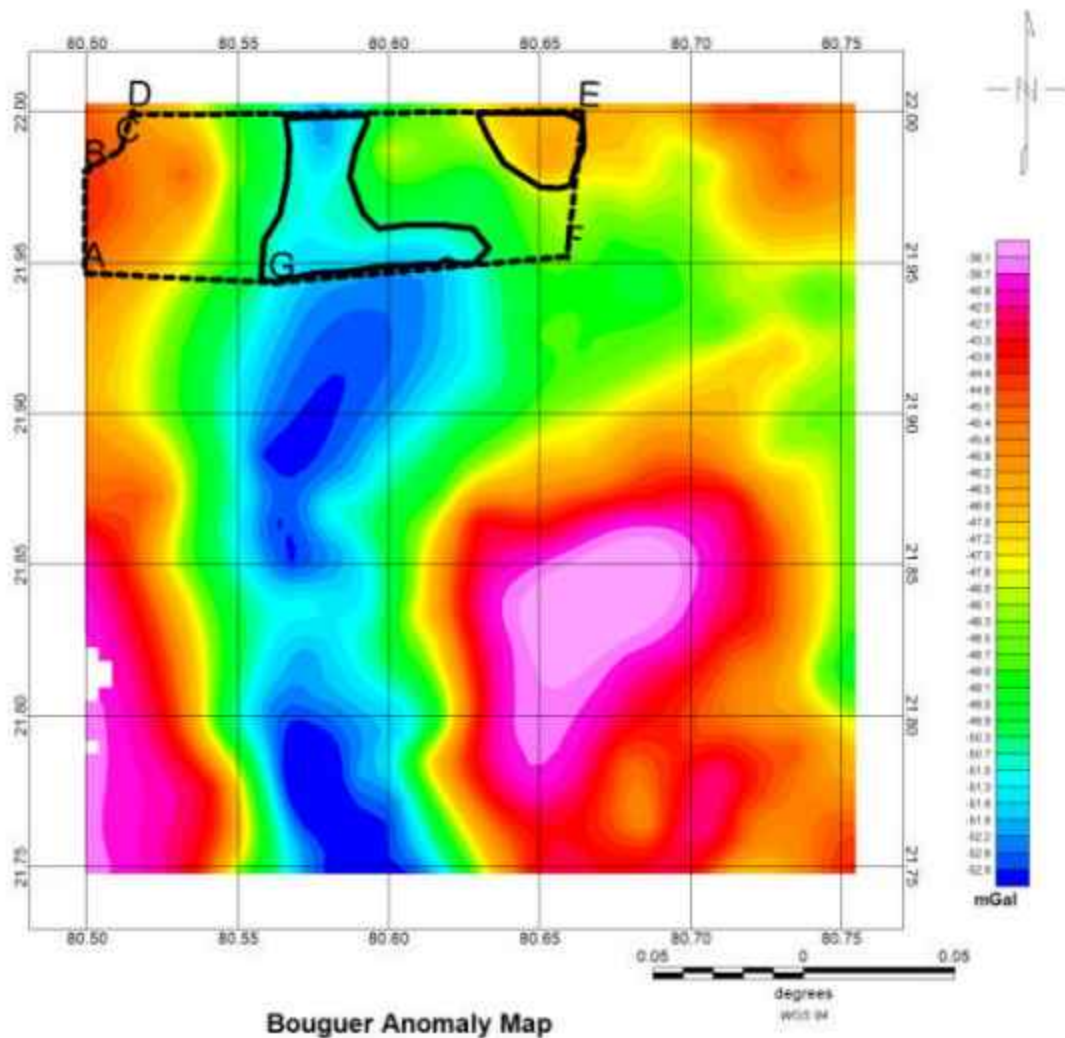


Fig. 2.2 Gravity Anomaly Map based on the NGPM Data

3.0.0 BLOCK DESCRIPTION

3.1.0 The proposed Jamtola-Khandapar G-4 block for gold and associated minerals falls in Survey of India Toposheet No. 64C/09 and covers an area of 96.62 sq km in and around villages Khandapar, Patpari, Jamtola, Kinarda, Kiniyan, Barwahi, Katangi etc. of Balaghat District,

Madhya Pradesh. The block location is given in **PLATE-I**. The Co-ordinates of the corner points of the block area both geodetic and UTM are given in **Table No.-3.1**

Table No.-3.1 Block Boundary Co-ordinates of Jamtola-Khandapar G-4 Block for Gold and associated minerals, District-Balaghat, Madhya Pradesh (Toposheet No. 64C/09) : Area- 96.62 sq km					
Sl. No.	Block Cardinal Points	Datum: WGS-84			
		Geographic (DD°MM' SS.SS'')		UTM (Zone- 44)	
		Latitude	Longitude	Easting (m)	Northing (m)
1	A	21°56'47"N	80°30'00"E	448369.73	2426977.18
2	B	21°58'49"N	80°30'01"E	448410.65	2430728.19
3	C	21°59'17"N	80°30'41"E	449560.48	2431585.4
4	D	22°00'00"N	80°30'55"E	449966.13	2432906.24
5	E	21°59'59"N	80°39'51"E	465334.79	2432834.27
6	F	21°57'07"N	80°39'33"E	464806.90	2427547.03
7	G	21°56'36"N	80°33'45"E	454822.64	2426619.23

4.0.0. PROPOSED SCHEME OF EXPLORATION

4.1.0 In accordance to the objective set for reconnaissance survey (G-4) of the block, the exploration programme is proposed for Jamtola-Khandapar block. The Exploration shall be carried out as per Minerals (Evidence of Mineral Contents) Rule-2015. Accordingly, the following scheme of exploration is formulated in order to achieve the objectives. The details of different activities to be carried out are presented in subsequent paragraphs.

4.2.0 Surveying

After Initial work, when the exploratory drilling of scout borehole will taken up, Survey work will be done for the fixation of boreholes. Determination of RL and co-ordinates of the boreholes will be undertaken by DGPS/ Total station.

4.3.0 Geological Mapping

4.3.1 Geological mapping will be done in the entire 96.62 sq km area on 1:12,500 scale. Rock types, their contact, structural features will be mapped. Surface manifestations of the ore bodies available along with their surface disposition will be marked on map.

4.4.0 Surface Geochemical sampling (Bed Rock/Channel/Stream Sample):

4.4.1 During the course of Geochemical Sampling, around 200 nos. of bed rock /channel/Stream samples shall be collected from the suitable surface locale. A total of 200 no of primary, 10 no

of internal check and 20 no of external check surface samples will be analysed for Au and Ag by fire Assay method. 10% of Primary samples (20 Nos) will be sent to NABL External Labs as External Check Samples. While, 5% of Primary samples (10 Nos) will be analyzed in MECL Labs as Internal Check Samples.

- 4.4.2 Total $50+5+3=58$ nos of primary and check (5% Internal Check+10% External Check) samples will be analysed for Cu, Pb & Zn, Co & Mo assay.

Note: Sample analysis for Gold will be done from the powdered samples of -100mesh. Other sample analysis will be done from the powdered samples of -200mesh.

4.5.0 Exploratory Mining (Trenching/Pitting)

- 4.5.1 Trenching (Excavation) shall be carried out in the potential zones identified based on the results of geological mapping and geochemical sampling. A provision of trenching/pitting of 150 cubic meter has been planned. Trenching work will be carried out by cutting trenches of 1m width and up to 2m depth in the area to expose the source rock and mineralization. Locations of pits/trenches on ground will be decided by field geologist based on field observations. Trenches will be geologically mapped thoroughly. Around 100 nos. of trench samples shall be collected.

- 4.5.2 A total of 100 no of primary, 5 no of internal check and 10 no of external check trench samples will be analysed for Au and Ag by fire Assay method. 10% of Primary samples (10 Nos) will be sent to NABL External Labs as External Check Samples. While, 5% of Primary samples (5 Nos) will be analyzed in MECL Labs as Internal Check Samples.

- 4.5.3 Total $30+3+2=35$ nos of primary and check (5% Internal Check+10% External Check) samples will be analysed for Cu, Pb & Zn, Co & Mo assay

Note: Sample analysis for Gold will be done from the powdered samples of -100mesh. Other sample analysis will be done from the powdered samples of -200mesh.

4.6.0 Geophysical Survey

An integrated Ground Magnetic, Resistivity, Self-Potential and Induced Polarization is planned to carry out in the proposed area to identify the structural features and mineralization as detailed manner. After initial work, grid spacing will be decided. A total 50 Line Km is planned for the survey.

4.7.0 Core Drilling

- 4.7.1 Based on Geological mapping, Geochemical and Geophysical studies and trenching/pitting (Excavation), the extension of the mineralized zones (ore bodies) will be marked. To find out

the potentiality of mineralized zones, 5 Nos of scout boreholes involving 500m of drilling will be carried out for upper level of intersection of mineralized zones. Around 100 nos. of BH samples shall be collected. It is envisaged to collect samples of 0.50 meter each for analyzing the gold and silver mineralization. The mineralized cores including the cores of immediate footwall and hanging wall rocks (3 m length each) would be sampled at 1 m interval, as far as possible, depending upon the intensity of mineralization, change in lithology and core recovery etc.

4.7.2 Thus, a total of 100 no of primary, 5 no of internal check and 10 no of external check BH samples will be analysed for Au and Ag by fire Assay method. Borehole deviation survey will also be done to monitor the deviation of the drilling path, if any. 10% of Primary samples (10 Nos) will be sent to NABL External Labs as External Check Samples. While, 5% of Primary samples (5 Nos) will be analyzed in MECL Labs as Internal Check Samples.

4.7.3 A total of 30 samples would be analysed as composite samples for Au and Ag by Fire Assay method.

4.7.4 Total $30+3+2=35$ nos of primary and check (5% Internal Check+10% External Check) samples will be analysed for Cu, Pb & Zn, Co & Mo assay.

Note: Sample analysis for Gold will be done from the powdered samples of -100mesh. Other sample analysis will be done from the powdered samples of -200mesh.

4.8.0 Petrological & Mineralogical Studies:

During the course of Exploration programme, 15 samples from various litho units from surface, Pit/Trench/Channels and lithounits intersected in boreholes will be studied for petrography and 15 samples from mineralized zones will be studied for the ore mineral assemblages and their distribution, alteration, enrichment etc in polished sections.

4.9.0 Specific Gravity Determination:

To derive the tonnage factors, 10 nos of samples are proposed for specific gravity determination. The samples are to be drawn from ore zones / mineralized zones.

4.10.0 Whole Rock Analysis:

Whole Rock analysis for SiO_2 , Al_2O_3 , Fe_2O_3 , TiO_2 , MnO, CaO, Na_2O , $\text{K}_2\text{O}+\text{H}_2\text{O}$, MgO, P_2O_5 , CO_2 , S and LOI will be carried out on 10 Nos samples to check the rock types, their variation in chemical composition.

5.0.0 JUSTIFICATION FOR TAKING UP THE BLOCK:

From the previous studies of GSI done by Khan et.al., (1995) 14 bedrock samples analysed for gold (by AAS) from the Khandapar quartz vein, out of which four samples have given

encouraging values of Gold (0.2 gm/t, 0.4gm/t, 0.7gm/t, and 2.2gm/t).It is observed that the gold mineralization is hosted in Quartz vein within Phyllites of Chilpi Group of Palaeo-Meso Proterozoic Age. A thorough study of the entire area may be required to evaluate the Gold mineralization. Based on the evidences of Gold mineralization within the block, present Reconnaissance Survey exploration program at G-4 level has been prepared. Geological mapping, surface sampling, Geophysical Exploration and pitting/trenching will be helpful in assessing the lithology, disposition, extent and quality of the mineralized zones, structural features etc.The Reconnaissance Survey (G4) will eventually help in delineating the area for G-3 level of exploration, which in turn will facilitate the state Government for action of block.

6.0.0. QUANTUM OF WORK

The quantum of work proposed by MECL in Jamtola-Khandapar block is given below:

Table-V – Proposed quantum of work for G4 level exploration for Gold and associated minerals at Jamtola-Khandapar block, Balaghat District, Madhya Pradesh

Sl. No.	Item of Work	Unit	Proposed Quantum of work
1	Geological Mapping (on 1:12,500 Scale)	sq km	96.62
2	Survey Work		
	i) Bore Hole Fixation, RL & Coordinate Determination by DGPS	Nos	5
3	Geophysical Survey		
	I.P. ,Resistivity, S.P., Magnetic	Line km	50
4	Trenching	cu m	150
5	Core Drilling (5 Scout Boreholes)	m	500.00
6	Sample Preparation & Chemical Analysis		
A.	Surface samples (Bedrock/Channel/Stream etc Samples)		
	i) Primary, 5% Internal & 10% External check for Au & Ag by fire Assay	Nos.	230
	ii) Primary,5% Internal & 10% External check For 5 Radicals (Cu, Pb, Zn, Co & Mo)	Nos.	58
B.	Trench Samples		
	i) Primary, 5% Internal & 10% External check for Au & Ag by fire Assay	Nos.	115
	ii) Primary,5% Internal & 10% External check For 5 Radicals (Cu, Pb, Zn, Co & Mo)	Nos.	35
C.	BH samples		
	i) Primary, 5% Internal & 10% External check for Au & Ag by fire Assay	Nos.	115

Sl. No.	Item of Work	Unit	Proposed Quantum of work
	ii) Primary, 5% Internal & 10% External check For 5 Radicals (Cu, Pb, Zn, Co & Mo)	Nos.	35
D.	Composite Samples for Au & Ag	Nos.	30
7	Whole Rock Analysis For SiO ₂ , Al ₂ O ₃ , Fe ₂ O ₃ , TiO ₂ , MnO, CaO, Na ₂ O, K ₂ O+H ₂ O, MgO, P ₂ O ₅ , CO ₂ , S and LOL.	Nos	10
8	Petrographic Studies	Nos	10
9	Mineragraphic Studies + Photomicrographs	Nos	10
10	Specific Gravity	Nos	10
11	Report Preparation (Digital format)	Nos.	1

7.0.0 MANPOWER DEPLOYMENT

Manpower deployment List will be provided later.

8.0.0 BREAK-UP OF EXPENDITURE

Tentative Cost has been estimated based on Schedule of Charges (SoC) of projects funded by National Mineral Exploration Trust (NMET) w.e.f. 01/04/2020. The total estimated cost is Rs. **271.28 Lakh**. The summary of tentative cost estimates for Reconnaissance Survey (G-4 Level) is given in **Table No.-8.1** and details of tentative cost estimates is given in **Table No.-8.2**. Tentative Time schedule/action plan for proposed Reconnaissance Survey (G-4) Block is given in **Table No. 8.3**.

Table No-8.1

Summary of Tentative Cost Estimates for Reconnaissance Survey (G-4 Level) Exploration

Sl. No.	Item	Total
1	Geological Work	28,68,900
2	Pitting & Trenching	4,99,500
3	Geophysical Work	80,16,745
4	Drilling	73,43,780
5	Laboratory Studies	27,28,558
	Sub total	2,14,57,483
6	Report	10,72,874
7	Peer Review	30,000
8	Proposal Preparation	4,29,149.66
	Total	2,29,89,507
9	GST (18%)	41,38,111.23
	Total cost including 18% GST	2,71,27,618
	SAY, in Lakhs	271.28

Table 8.2 Estimated cost for Reconnaissance survey (G4) for Gold and associated minerals in Jamtola-Khandapar Block, District: Balaghat , State: Madhya Pradesh.
[Block area- 96.62 sq. km; Schedule timeline- 14 months]

S. No.	Item of Work	Unit	Rates as per NMET SoC 2020-21		Estimated Cost of the Proposal		Remarks
			SoC-Item -SI No.	Rates as per SoC	Qty.	Amount (Rs)	
A	GEOLOGICAL WORK (1:12,500 scale)						
i	Charges for one Geologist- Field	day	1.2	11,000	150	16,50,000	
ii	Charges for one Geologist per- HQ	day	1.2	9,000	60	5,40,000	
iii	2 labours/ party (Rs 443/day/labour) (As per rates of Central Labour Commissioner)	day	5.7	494	300	1,48,200	Amount will be reimburse as per the notified rates by the Central Labour Commissioner or respective State Govt. whichever is higher
iv	Core Sampling -1 Samplers Labour charge not included	day	1.5.2	5,100	75	3,82,500	
v	4 labours/ party (Rs 443/day/labour) (As per rates of Central Labour Commissioner)	day	5.7	494	300	1,48,200	Amount will be reimburse as per the notified rates by the Central Labour Commissioner or respective State Govt. whichever is higher
					Sub Total- A	28,68,900	
B	GEOPHYSICAL SURVEY						
i	I.P. cum Resistivity, S.P., Magnetic	8-10 Line Km	3.4b	14,48,693	5	72,43,465	
ii	Charges for one Geophysicist per day at field	day	3.18	11,000	30	3,30,000	
iii	Charges for one Geophysicist per day at HQ	day	3.18	9,000	15	1,35,000	
iv	Surveyor Work	days	1.6.1a	8,300	30	2,49,000	
v	4 labours/ party (Rs 443/day/labour) (As per rates of Central Labour Commissioner)	day	5.7	494	120	59,280	
					Sub Total- B	80,16,745	
C	PITTING AND TRENCHING						
i	Trenching	Cu m	2.1.1	3330	150	4,99,500	
					Sub Total- C	4,99,500	
D	DRILLING						
i	Drilling upto 300m (Hard Rock) (1 rigs)	m	2.2.1.4a	11,500	500	57,50,000	
ii	Borehole deviation Survey	m	2.2.6	330	500	1,65,000	
iii	Land / Crop Compansation	per BH	5.6	20,000	5	1,00,000	Amount will be reimburse as per actuals or max. Rs. 20000 per BH with certification from local authorities
iv	Construction of concrete Pillar (12"x12"x30")	per borehole	2.2.7a	2,000	5	10,000	
v	Transportation of Drill Rig & Truck associated per drill	Km	2.2.8	36	500	18,000	Certification in this regard is required to be provided
vi	Monthly Accomodation Charges for drilling Camp (up to 2 Rigs)	month	2.2.9	50,000	4	2,00,000	
vii	Drilling Camp Setting Cost	Nos	2.2.9a	2,50,000	1	2,50,000	
viii	Drilling Camp Winding up Cost	Nos	2.2.9b	2,50,000	1	2,50,000	
ix	Approach Road Making (Flat Terrain)	Km	2.2.10a	22,020	4	88,080	Road Making will be considered as per the requirement and Road Making Charges will be reimbursed for max. 4 km.
x	Bore Hole Fixation and determination of co-ordinates & Reduced Level of the boreholes and by DGPS	Nos	1.6.2	19,200	6	1,15,200	*5 Boreholes and 1 base station
xi	One complete borehole plus mineralised cores of all the remaining Bhs	m	5.3	1,590	250	3,97,500	This amount will be reimbursed after successful delivery of the cores to concerned libraries/authorities
					Sub Total- D	73,43,780	
E	LABORATORY STUDIES						
i	Chemical Analysis						
ii	Bedrock/Channel/Stream/Trench/BH etc Samples) for Au and Ag						
	a) Primary samples for Au & Ag by fire Assay	Nos	4.1.5a	4,760	400	19,04,000	
	b) Internal Check samples (5% of Primary samples)	Nos	4.1.5a	4,760	20	95,200	
	c) External Check sample (10% of Primary samples)	Nos	4.1.5a	4,760	40	1,90,400	
iii	Bedrock/Channel/Stream/Trench/BH etc Samples) for Cu, Pb, Zn, Co, Mo						
	d) Primary samples for Cu, Pb, Zn, Co, Mo	Nos	4.1.7b	2,506	110	2,75,660	
	e) Internal Check samples (5% of Primary samples)	Nos	4.1.7b	2,506	7	17,542	
	f) External Check sample (10% of Primary samples)	Nos	4.1.7b	2,506	11	27,566	
iv	Preparation of thin section	Nos	4.3.1	2,353	10	23,530	
v	Complete petrographic study report	Nos	4.3.4	4,232	10	42,320	
vi	Preparation of polished section	Nos	4.3.2	1,549	10	15,490	
vii	Complete mineragraphic study report	Nos	4.3.4	4,232	10	42,320	
viii	Digital Photographs	Nos	4.3.7	280	10	2,800	
ix	Whole Rock Analysis (Major oxide and 8 additional trace elements)	Nos	4.1.15a & b	7,568	10	75,680	
x	Specific Gravity Determination	Nos	4.8.1	1,605	10	16,050	
					Sub Total- E	27,28,558	
F					Total A to E	2,14,57,483	
G	Geological Report Preparation		5.2	For the projects having cost exceeding Rs. 50 lakhs and less than Rs. 150 lakhs - A minimum of Rs. 2.5 lakhs or 5% of the value of work whichever is more		10,72,874	Reimbursement will be made after submission of the final Geological Report in Hard Copies (5 Nos) and the soft copy to NMET.
H	Peer review Charges		As per EC decision			30,000	
I	Preparation of Exploration Proposal (5 Hard copies with a soft copy)	5 Hard copies with a soft copy	5.1	2% of the Cost or Rs. 5.0 Lakhs whichever is lower		4,29,150	EA has to submit the Hard Copies and the soft copy of the final proposal along with Maps and Plan as suggested by the TCC-NMET in its meeting while clearing the proposal.
K	Total Estimated Cost without GST					2,29,89,507	
J	Provision for GST (18% of I)					41,38,111.23	GST will be reimburse as per actual and as per notified prescribed rate
K	Total Estimated Cost with GST					2,71,27,618.04	
				or Say Rs. In Lakhs		271.28	
Note:							
1	If any part of the project is outsourced, the amount will be reimbursed as per the Paragraph 3 of NMET SoC and Item no. 6 of NMET SoC. In case of execution of the project by NEA on its own, a Certificate regarding non outsourcing of any component/project is required.						

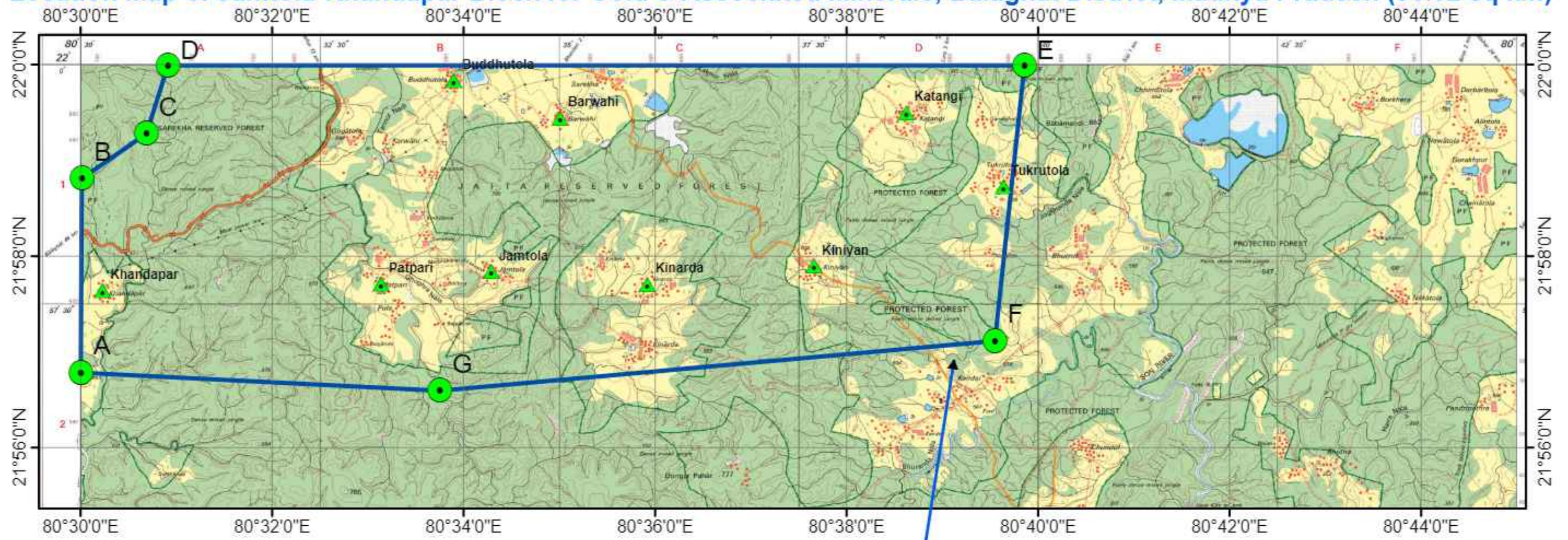
Table 8.3

Table 8.3 Timeline for Reconnaissance survey (G4) for Gold and associated minerals in Jamtola-Khandapar Block, District: Balaghat , State: Madhya Pradesh. [Block area- 96.62 sq. km; Schedule timeline- 14 months]																		
S. No.		Months /Days	1	2	3	4	5	6	Review	7	8	Review	9	10	11	12	13	14
1	Camp Setting	months																
2	Geological	months																
3	Survey days	days																
4	Geophysical Work	months																
5	Trenching	cu.m																
6	Drilling (1 rig)	m																
7	Geologist days	days																
8	Sampling days, Core Sampling	days																
9	Camp winding	months																
10	Laboratory Studies	months																
11	Geologist days, HQ	days																
12	Report Writing with Peer Review	months																

List of Plates:

1. Plate-I: Location Map of the Proposed Jamtola-Khandapar G4 Block, Distt.-Balaghat, Madhya Pradesh
2. Plate-II: Regional Geological Map with Proposed Jamtola-Khandapar G4 Block, Distt.-Balaghat, Madhya Pradesh

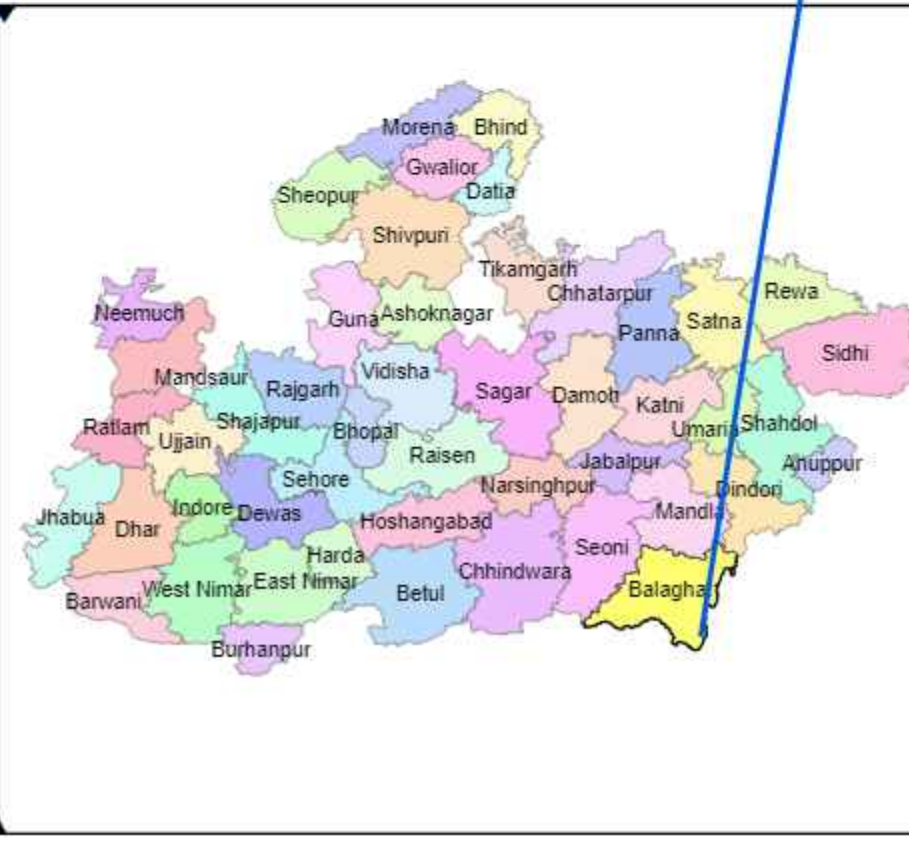
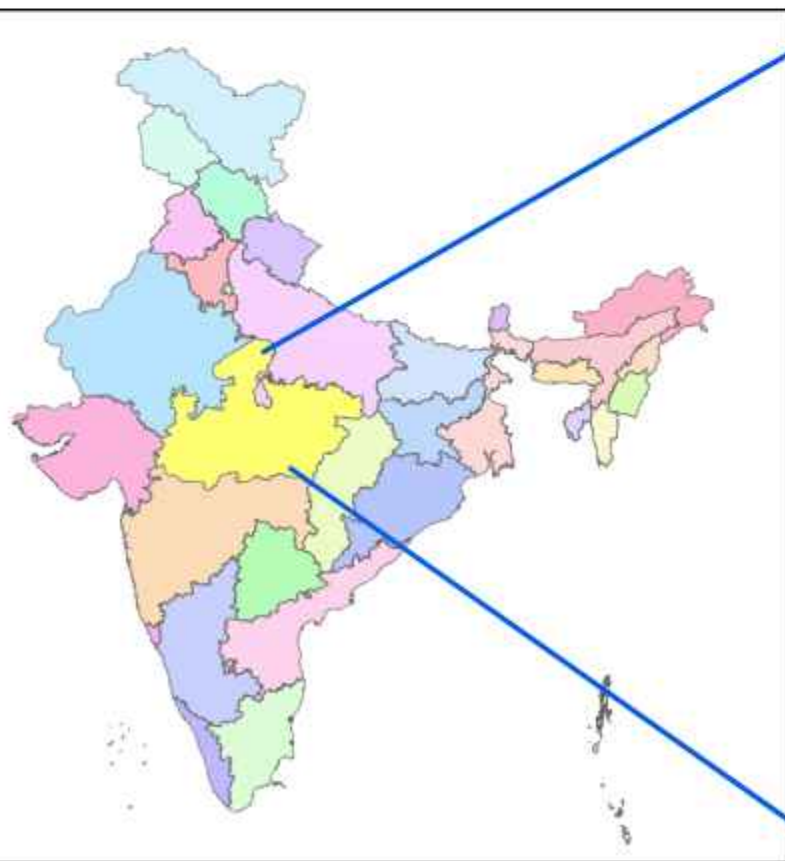
Location Map of Jamtola-Khandapar Block for Gold & Associated Minerals, Balaghat District, Madhya Pradesh (96.62 sq km)



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Part of the Toposheet No. 64C/09



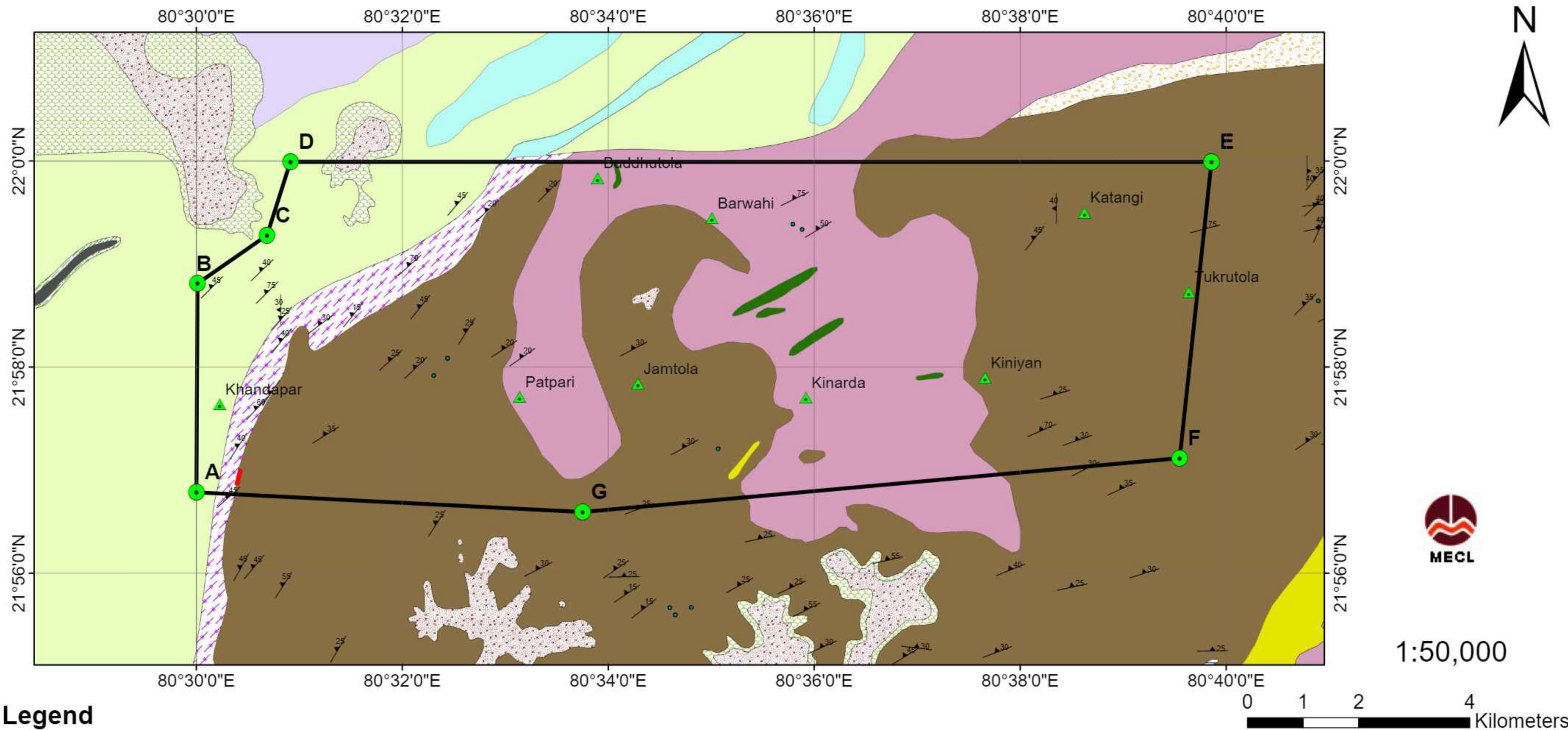
Legend

- Jamtola-Khandapar Block Points
- ▲ Village
- Jamtola-Khandapar Block

Block Boundary Co-ordinates of Jamtola-Khandapar G-4 Block for Gold and associated minerals, District-Balaghat, Madhya Pradesh (Toposheet No. 64C/09) : Area- 96.62 sq km

Sl. No.	Block Cardinal Points	Datum: WGS-84			
		Geographic (DD°MM' SS.SS")		UTM (Zone- 44)	
		Latitude	Longitude	Easting (m)	Northing (m)
1	A	21°56'47"N	80°30'00"E	448369.73	2426977.18
2	B	21°58'49"N	80°30'01"E	448410.65	2430728.19
3	C	21°59'17"N	80°30'41"E	449560.48	2431585.4
4	D	22°00'00"N	80°30'55"E	449966.13	2432906.24
5	E	21°59'59"N	80°39'51"E	465334.79	2432834.27
6	F	21°57'07"N	80°39'33"E	464806.90	2427547.03
7	G	21°56'36"N	80°33'45"E	454822.64	2426619.23

Regional Geology Map Showing Jamtola-Khandapar G4 Block for Gold and associated minerals (96.62 Sq. km), District-Balaghat, MP



Legend

- ▲ Village
- Jamtola-Khandapar Block Points
- Khandapar_Quartz_vein
- Jamtola-Khandapar Block
- Oriented_Structure_Line
- └ Oriented_Structure_Plane
- AMPHIBOLITE
- BASALT
- CONGLOMERATE
- CRYSTALLINE LIMESTONE
- GNEISS/MIGMATITE
- GONDITE/MANGANESE ORE
- GRANITE
- GRANITE GNEISS/MIGMATITE
- LATERITE
- MUSCOVITE SCHIST
- PHYLLITE
- QUARTZITE
- SCHIST
- SCHISTOSE GRIT

Block Boundary Co-ordinates of Jamtola-Khandapar G-4 Block for Gold and associated minerals, District-Balaghat, Madhya Pradesh (Toposheet No. 64C/09) : Area- 96.62 sq km					
Sl. No.	Block Cardinal Points	Datum: WGS-84			
		Geographic (DD°MM' SS.SS'')		UTM (Zone- 44)	
		Latitude	Longitude	Easting (m)	Northing (m)
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7	G	21°56'36"N	80°33'45"E	454822.64	2426619.23

GEOLOGICAL MAP OF THE KINARDA-BHURRAK AREA, BALAGHAT DISTRICT, MADHYA PRADESH

(PART OF TOPOSHEET 64C/9)

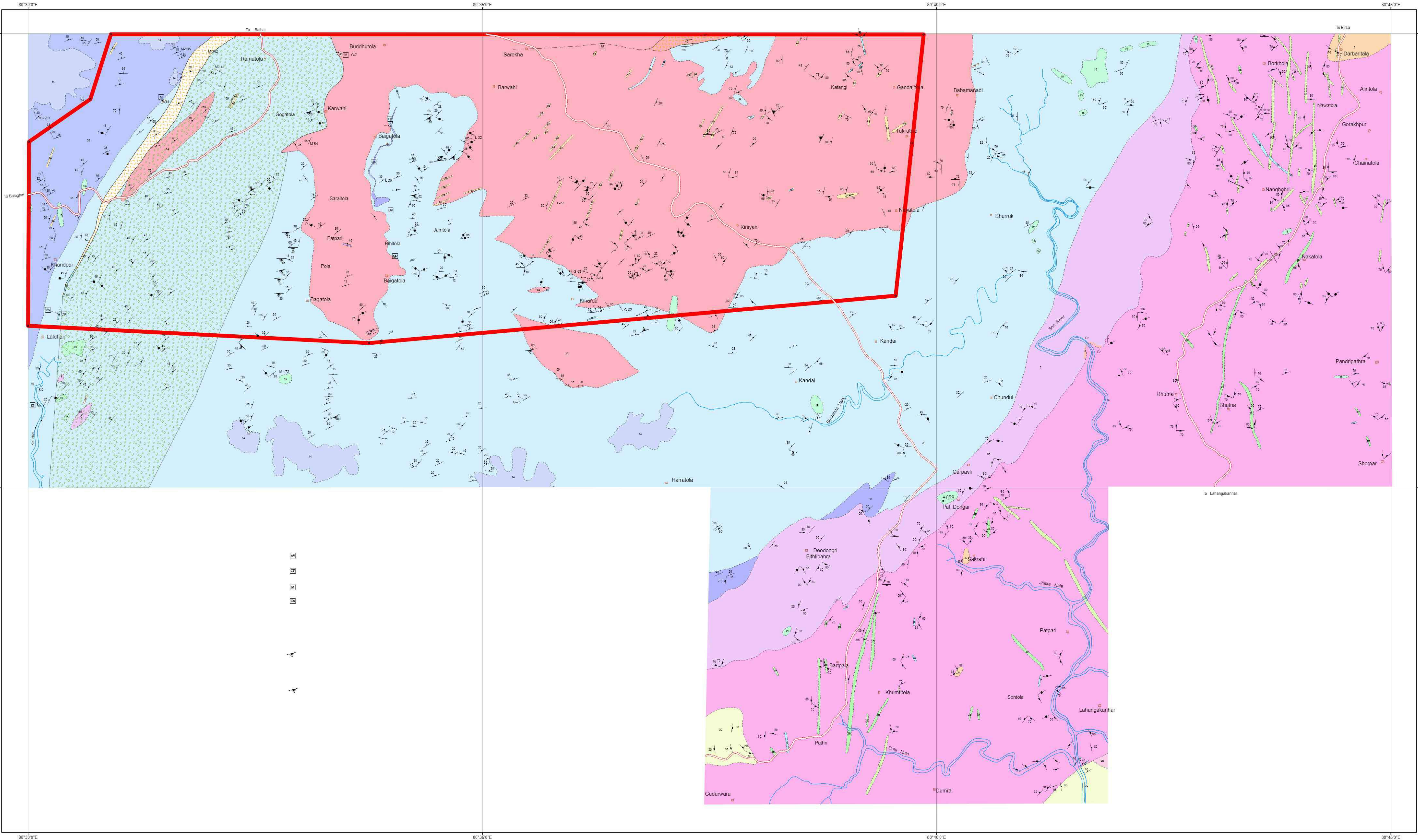
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Plate No. 01



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LEGEND

- 15 LATERITE
- 14 BASALT
- 13 QUARTZ VEIN
- 12 PHYLLITE
- 10 LIMESTONE/DOLOMITE
- 9 QUARTZITE
- 8 CONGLOMERATE
- 7 DOLERITE DYKE
- 5 FINE GRAINED, CRUDELY FOLIATED BIOTITE GRANITE
- 4 COARSE GRAINED, SUB PORPHYRITIC HORNBLende BEARING GRANIToids
- 3B MIGMATITE
- 3A GREENISH GREY GRANITE GNEISS
- 2D METAGABBRO
- 2C GABBRO
- 2B METAVOLCANICS
- 2A AMPHIBOLITE
- 1 MARBLE

INDEX

- Very High Strain Zone
- High Strain Zone
- Village
- Bedding(S0)
- Foliation(S1)
- Lineation (L2 - Stretching)
- Lineation (L1 - Minor Fold Axis)
- Foliation Vertical S2
- Joints
- Grenulation Cleavage
- Joint Vertical
- Foliation Inclined
- Gold
- Graphite
- Limestone/Marble
- Copper
- Spot Height
- Metal Road
- Unclassified Road
- River
- Fault
- Shear Line
- Inferred
- Observed

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J.N. Solanki Geologist(Jr.), M.K. Devarajan Geologist(Jr.)