PROPOSAL FOR RECONNAISANCE SURVEY (G-4 STAGE) FOR GRAPHITE AND SULPHIDE IN GANACHARPURA BLOCK (33.60 SQ. KM), KOLAR DISTRICT, KARNATAKA

KOLAR SCHIST BELT

UNDER NMET PROGRAM.

COMMODITY: GRAPHITE AND SULPHIDE (Cu, Pb & Zn)

BY

MINERAL EXPLORATION AND CONSULTANCY LIMITED

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SEMINARY HILLS

PLACE: NAGPUR **DATE: MAY, 2023**

Summary of the Proposed Reconnaissance Survey (G-4) for Graphite and Sulphide (Cu,Pb & Zn) in Ganacharpura Block, Kolar District, Karnataka

Features	Details
Block ID :	**Ganacharpura Block (G-4) for Graphite and Sulphide (Cu,Pb & Zn)**
Current Exploration Agency	**Mineral Exploration and Consultancy Ltd. (MECL)** (Formerly Mineral Exploration Corporation Ltd.)
Previous Exploration Agency	**Directorate of Mines and Geology, Karnataka**
Geological Report (Previous stage Geological Report)	Rao, B. and Kailasam, T.P., MGD Record, Vol. XVIII Part 2, F.S. 1917-20, (DMG, Karnataka) "Mineral Resources of Kolar District" Bulletin. No. 27, page 36-37, F.S. 1974-75, DMG, Karnataka (Graphite Deposits of Ganacharpura area, Kolar District, Karnataka)
Commodity	**Graphite ad Sulphide (Cu,Pb & Zn)**
Mineral Belt :	Kolar Schist Belt
Budget &Time Schedule to complete the project	Rs.694 Lakhs, 14 months' time period
Objectives:	The present exploration program at G4 stage has been formulated to fulfil the following objectives: i) To carry out geological mapping on 1:12,500 scale to identify the surface manifestations and lateral disposition of the mineralized zones. ii) To collect surface Bedrock samples during mapping and analyze for graphite, copper, lead, zinc to identify potential zones of mineralization and future strategies for exploration. iii) To carry out surface geophysical survey (Induced Polarization (I.P), Self Potential (S.P), Resistivity, Magnetic and Gravity) for identification of concealed host rocks which bears graphite and copper, lead & zinc mineralization. iv) To carry out trenching/pitting work in the potential zones to prove the lateral continuity of the mineralization strike based on the results of geological mapping, geochemical sampling and geophysical survey. iv) To drill scout boreholes to prove lateral and vertical continuity of

<table>
<tr><td></td><td>graphite and base metals deciphered by geological mapping & geophysical studies.

v) To estimate reconnaissance category (334) graphite and base metals ore resources in the block as per UNFC norms & Minerals (Evidence of Mineral Contents) Rule- 2015 and Minerals (Evidence of Mineral Contents) Amendment Rule, 2021.</td></tr>
<tr><td>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:</td><td>The work will be carried out by Mineral Exploration and Consultancy Ltd. (MECL).</td></tr>
<tr><td>Name/ Number of Geoscientists :</td><td>Geologist: 01 HQ (60 days)
Geologist: 01 Field (150 days)</td></tr>
<tr><td>Expected Field days & HQ (Geology, Surveyor)</td><td>Geophysicist: 01 HQ (30 days)
Geophysicist: 01 Field (50 days)
Surveyor: 01 Field (120 days)</td></tr>
<tr><td>1. Location:</td><td></td></tr>
<tr><td>Location</td><td>The block is located at a distance of 13 kms north west of Kolar town. Block can be approached from Bangarapet railway station, which is towards South Western direction from the block. Nearest airport Kempegowda International Airport, Bengaluru is located at a distance of 83Km from the block.</td></tr>
<tr><td>Block boundary Coordinate.</td><td>Proposed Ganacharpura Block – 33.60 Sq. Kms
<table>
<tr><th rowspan="2">Points</th><th colspan="2">UTM (M)(Zone: 43N)</th><th colspan="2">GCS (DMS)</th></tr>
<tr><th>Northing</th><th>Easting</th><th>Latitude</th><th>Longitude</th></tr>
<tr><td>A</td><td>1447770</td><td>197566</td><td>13°04’ 51.92”</td><td>78°12’ 40.21”</td></tr>
<tr><td>B</td><td>1447716</td><td>201295</td><td>13°04’ 51.50”</td><td>78°14’ 43.92”</td></tr>
<tr><td>C</td><td>1438848</td><td>197457</td><td>13°00’ 01.79”</td><td>78°12’ 39.85”</td></tr>
<tr><td>D</td><td>1438797</td><td>201231</td><td>13°00’ 01.46”</td><td>78°14’ 45.01”</td></tr>
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Villages :	Ganacharpura
Tehsil/ Taluk :	Kolar
District:	Kolar District
State:	Karnataka
2. Area (hectares/ square kilometres)	
Block Area :	33.60 Sq. Km
Forest Area :	No forest area.
Government Land Area	Data not available
Private Land Area	The block area mostly comprises of private land
3. Accessibility	
Nearest Rail Head :	The nearest railway station is at Bangarpet at a distance of 13kms, which is located at South Western direction of the block.
Road :	National Highway (NH) 96 passes through north eastern side of the block. The block is well connected via network of state highway roads.
Airport :	The nearest airport is Kempegowda International Airport, Bengaluru is located at a distance of at 83 kms from the block towards north
4. Hydrography	
Rivers/ Streams	The drainage of the area is mainly controlled by tributaries of Palar River which is at a distance of around 7 kms from the block flowing from north-west to south-east.
5. Climate	
Mean Annual Rainfall :	The average annual rainfall is around 740 mm and the relative humidity is 46%.
Temperatures	Summer: Min 23^{o}C & Max. 30^{o}C in May- June Winter: Min. 10^{o}C & Max. 23^{o}C in December
6. Topography	
Toposheet Number	Survey of India Toposheet No. 57K/04
	The topography in the area is undulating plain with cluster of gneissic granite hills. The rock formations are running in NNE-SSW direction. The prominent feature of the block area is a ridge at 856m (MSL) to the west of old mining pit. The elevation of the ground ranges from 841m to 856m from MSL.

7. Availability of baseline geology data	
Geological Map	Geological Map available Scale-1:50,000, Bhukosh, GSI
Geochemical Map and Geophysical Map	NGCM data available.
8. Justification for taking up G4 stage mineral exploration	1. The proposed area has been explored and mining activities were carried out for graphite, in the past. Since then no exploration for resource upgradation has been carried out in the area thus further exploration will increase the level of confidence on quantity and quality of resource which will attract investors. Though graphite mining was carried out sulphide mineralization had been also reported from the area. 2. Graphite occurrences have been confirmed by field visit of MECL and few samples were collected and analysed. The analysis results are enclosed in Table No: 6.1. 3. The proposed block area has been partially explored (12 Hectares) with 4 nos. of drillholes by the DMG, Karnataka during year 1974-75 and proved the mineralisation of Graphite and Sulphide minerals. They proved about 10,200 Tonnes of Graphite resources with average carbon percentage of 3.25% in 12 Hectare area. They also indicated the mineralisation of Sulphide mineral (Cu) in Borehole No-02 with Cu% of 0.03% to 0.12%. Further work will establish the laeral and vertical continuation of the graphite mineralization along with associated sulphides. 4. Since most of the block area is covered with soil, geophysical survey (Self potential, (SP), Induced Polarization (IP), gravity, magnetic & resistivity survey) in the block will facilitate to demarcate the geophysical anomaly/mineralized zones of graphite/sulphides (Cu, Pb & Zn), which will help in the formulation of G-3/G-2 level exploration programme. 5. Considering the proximity of graphite mine pit area established by DMG, Karnataka, MECL suggested to take up G-4 stage exploration for graphite in larger area taking old mine pit of graphite in centre to know strike

	continuation. 6. Graphite demand from lithium-ion batteries, according to BNEF, is set to grow by 37% year on year to just under 447,000 tonnes in 2021, increasing fourfold by the end of the decade. Commercial vehicles will represent the fastest growth, with year-on-year demand doubling in 2021 (MEAI Publication, August, 2021). 7. The G-4 level explorations will be helpful in estimation of Reconnaissance (334) Resources, which will facilitate the State Govt. of Karnataka for auctioning of blocks.

1.0 INTRODUCTION

1.1 On enactment of MMDR Amendment Act 2015, Minerals (Evidence of Mineral Contents) Rules 2015 and Mineral Auction Rules 2015, Govt. of India directed State Governments to speed up exploration work for different Mineral Commodities in their respective state and put them for auction. Recently, some rules in the MMDR ACT have been amended which facilitates the state Govt. to auction the blocks with lower confidence level of exploration and put more and more blocks on auction. Accordingly, Department of Mines and Geology, Karnataka provided location of Ganacharpura graphite block in Kolar District to MECL and directed to verify the same for feasibility of exploration. MECL has carried out field visit to check the potentiality of the block and the same has been discussed in various State Technical Committee Meetings.

1.2 Based on the outcome of field visit conducted by MECL, the following proposal for reconnaissance survey of graphite and sulphide exploration has been formulated under NMET funding.

1.3 At present MECL intends to carry out Reconnaissance Survey at G-4 level of exploration in the proposed Ganacharpura Block for Graphite and base metals. Consent from Department of Mines & Geology, Govt. of Karnataka has been accorded to carry out exploration in the proposed Ganacharpura Block.

2.0 LOCATION AND COMMUNICATION

2.1 The Ganacharpura Block is located at a distance of 13 kms from Kolar town. The propose block can be approached from Bangarapet railway station, which is at a distance of 13 kms southwest from the block. The location of the Block is shown in **PLATE No-I**.

The Blocks fall in the Survey of India Toposheet No. 57K/04 and is bounded by the co-ordinates as listed in the **Table-2.1**

Table-2.1
Co-ordinates of corner points of proposed Ganacharpur Block (G-4) for Graphite and Sulphide Minerals District: Kolar, State: Karnataka

Points	UTM (M) (Zone: 43N)		GCS(DMS)		Area
	Northing	Easting	Latitude	Longitude	(Sq. Km.)
A	1447770	197566	13°04' 51.92"	78°12' 40.21"	33.60
B	1447716	201295	13°04' 51.50"	78°14' 43.92"	
C	1438848	197457	13°00' 01.79"	78°12' 39.85"	
D	1438797	201231	13°00' 01.46"	78°14' 45.01"	

2.3 The most characteristic mineralization associated with the Kolar schist belts are that of gold. The graphite and sulphide bearing schists of Kolar Schist Belt are commonly associated with banded iron formation.

3.0 PHYSIOGRAPHY AND DRAINAGE

3.1 Physiographically, the area is undulating plain with cluster of gneissic granite hills. The rock formations are running in NNE-SSW direction. The elevation of the ground ranges from 841m to 856m (ridge to the west of old mining pit) from MSL.

3.2 The drainage of the area is mainly controlled by tributaries of Palar which is at a distance of around 7 kms from the block flowing from north-west to south-east.

4.0 CLIMATE

4.1 The climate of the area has semi-arid type climate. Dry climate prevails for most part of the year. December is the coldest month with mean daily maximum and minimum temperatures being 23^0C and 10^0 C respectively. During peak summer, temperature rises up to 30^0 C.

The average annual rainfall is around 740 mm and the relative humidity is 46%.

5.0 FLORA & FAUNA

No forest, sanctuaries, national park, etc., exist in the vicinity of the blocks. The general floras are Teak, Sal, Bamboo and shrubs. No wild animals seen in this block for sighting of peacock, rabbit and fox.

6.0 PREVIOUS WORK

Louis Stromeyer, 1915 (DMG, Karnataka) noticed this deposit and gave brief account of the rocks of the region in MGD Record, Vol. XVIII Part 2. Balaji Rao and T.P. Kailasam, F.S. 1917-20 (DMG, Karnataka) conducted detailed mapping and prospecting operations by sinking few pits, trenches and shafts for exploration and exploitation of graphite deposits and produced about 200 tonnes of graphite. Subsequently, T.P. Krishna Dhar and B.P. Radhakrishna, 1937 (DMG, Karnataka) conducted the prospecting operation in and around the block area. Two mining pits (measuring 70-80m length, 30-40m width and 8-10m depth) were opened at eastern slopes of the ridge 856m and one of the shafts which was completely by debris were found out during exploration. The graphite lodes were exposed between the bended ferruginous quartzite and fissile quartzite and were also observed at the old working pits. Graphite found at surface contained about 12% of carbon, but at depths of 7 to 10m it improves to about 20%.

B. Rama Rao has discussed the occurrence of graphite deposits in ferruginous quartzites at Kolar Schist belt and Ganacharpura area in his "Mineral Resources of Kolar District" Bulletin. No. 27 page 36-37. During 1974-75, DMG Karnataka has carried out the exploration work in parts of proposed block (12 Hectare). Detailed surface geological mapping in 1:1000 scale having contour interval of 1m, 4 inclined boreholes (500 W) in different intervals, detailed core logging, sampling of the mineralized zone and resource estimation were carried out. Details of exploratory boreholes drilled at Ganacharpura Block (12Ha) are mentioned below in **Table: 6.1**:

Table-6.1
Previous Exploratory Borehole details in proposed Ganacharpur Block (G-4) for Graphite and Sulphide Minerals District: Kolar, State: Karnataka

BH No	Azimuth	Inclination	Depth Drilled (in m)	Lode intersection Graphite and Pyrite (m)	Remarks
G1	N50°W	50°W	139	101.29 - 115.32	7.72m – (3.62 C%) (Intermittent quartz schist with sulphide)
G2	N66°W	50°W	121	99.55-107.85	2.10m (0.090 C%) (intermittent quartz schist with sulphide)
G3	N45°W	50°W	49	31.28-44.01	3.17m (Quartz with graphite schist)
G4	N80°W	50°W	52	44.77-48.39	1.17m (0.85 C%) (Intermittent quartz schist with sulphide)
Total			361		

Based on above exploration data, 10200 tonnes of graphite resource have been estimated with average carbon percentage of 3.25% in 12 Hectare area. The borehole sample results indicated that sulphide mineralization in borehole no.- 02 was Cu% of 0.03% to 0.12%, which was considered promising for further exploration

6.1 MINERALIZATION POTENTIAL

6.1.1 T.P. Krishna Dhar and B.P. Radhakrishna, 1937 (DMG, Karnataka) conducted exploration in and around the block area, where two mining pits (measuring 70-80m length, 30-40m width and 8-10m depth) at eastern slopes of the ridge 856m and one shaft completely filled by debris were found out. The graphite lodes exposed between the banded ferruginous quartzite and fissile quartzite were observed at old working pits. Graphite found at surface contained about 12% of carbon, but at depths of 7 to 10m it improves to about 20%.

6.1.2 During 1974-75, DMG Karnataka carried out the exploration work in parts of proposed block (12 Hectare). Four inclined boreholes (500 W) in different intervals, were drilled which resulted in total 10200 tonnes of graphite resource estimation with average carbon percentage of 3.25% in 12 Hectare area. The borehole samples indicated that sulphide mineralization was present in BH No- 02 where Cu% varied between 0.03% to 0.12%. This was considered promising for sulphide mineralization and hence further exploration for sulphides was also recommended.

6.1.3 MECL has carried out field visit to check the potentiality of the block. Graphite occurrences have been confirmed by field visit of MECL and few surface bedrock sample were collcted from around the old working pit area. The results of the samples collected are given in **Table No: 6.1**.

Table No: 6.1
Analysis results of samples collected from proposed Ganacharpura Block

Sl. No.	Sample No.	Moisture (%)	Ash (%)	VM (%)	FC(%)
1	Sample-1	0.93	74.09	7.46	17.52
2	Sample-2	0.65	77.64	8.04	13.67
3	Sample-3	1.39	85.38	8.14	5.09
4	Sample-4	0.83	77.48	7.92	13.77

7.0 REGIONAL GEOLOGY

7.1 The study area is located near Kolar Gold field (KGF), Karnataka which is a greenstone schist belt situated in Eastern Dharwar Craton (EDC). The area is famous for its huge gold deposits. The late Archaean Dharwar craton is a collage of Archeaen gneissic complexes along with amalgamated island arcs of Neoarchean and Paleoproterozoic times. East and South of Dharwar craton shows resemblance with overprinting of the Neoproterozoic to earliest Palaeozoic orogeny.Pan-African Orogeny, but interior of the craton has escaped from significant

7.2 EDC consists mainly of late Archaean (2600-2500 Ma) granitoids, thin narrow elongated greenstone belts and Proterozoic sedimentary basins. The older (3400-3000 Ma) Tonalite-Trondhjemite–Granodiorite (TTG) basement gneisses are rare in EDC as compared to Western Dharwar Craton (WDC).

There is a progressive decrease in basement gneisses and increase in granitoid rocks from Closepet batholiths to the east up to Kolar Schist Belt. Greenstone belts of the EDC are stretched into linear arrays with a general N-S trend and are intruded by syn- and post-tectonic felsic rocks. Greenstone belts of the Eastern Dharwar Craton are reinterpreted as composite tectono stratigraphic terranes of accreted plume-derived and convergent margin-derived magmatic sequences based on new high precision elemental data; Manikyamba and Kerrich,(2012). The sector has smaller greenstone terranes along with prevalent bimodal volcanic rocks and occasional occurrence of komatiites; these are the Ramagiri-Hungund Superterrane (RHST), HuttiKolar-Kadiri, Narayanpet-Gadwal-Veligallu, and Nellur-Khammam greenstone terranes from west to east.

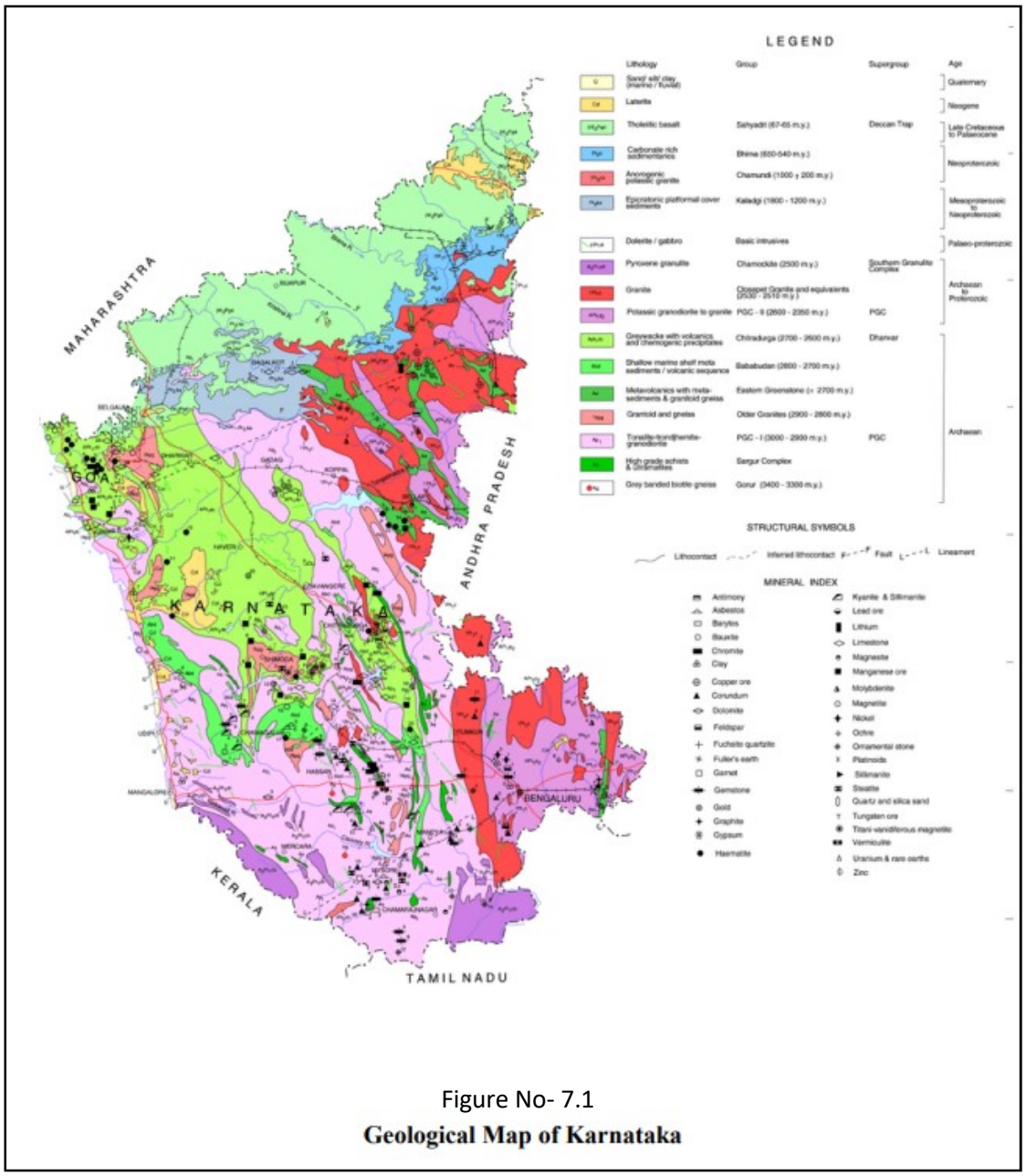


Figure No- 7.1

Geological Map of Karnataka

7.3 The stratigraphic column of the area mapped was derived from the order of superposition and the nomenclature was obtained from correlation with known successions in adjoining areas (after Shastry & Moitra, 1984). The stratigraphic succession of the area mapped in given below in Table 7.1. Regional Geology Map of the area is given as Plate No 5

7.4 According to Viswanatha and Ramakrishnan (1981), the Kolar Schist belt is a major synform plunging to the north (Text Fig. 3). Assuming the belt a synform, Viswanatha and Ramakrishnan (1981) worked out the stratigraphy of the belt, which is given in Table 3.1

Table 7.1
Stratigraphy of the Kolar Schist Belt
(Radhakrishna and Vaidyanadhan, Geological Society of India, 2011)

Group	Litho-associations
	Dolerite Dyke Quartz veins Granite (Patna, Bisanattam plutons)
	Acid Volcanics with polymictic conglomerate-volcanoclastic sediments (Champion Gneiss)
Kolar Group	Banded ferruginous chert Magnetite quartzite interbedded with graphitic schist Schistose amphibolite metabasalt and metagabbro
Tectonic Discontinuity	
----------Base not seen----------	

7.5 REGIONAL STRUCTURE

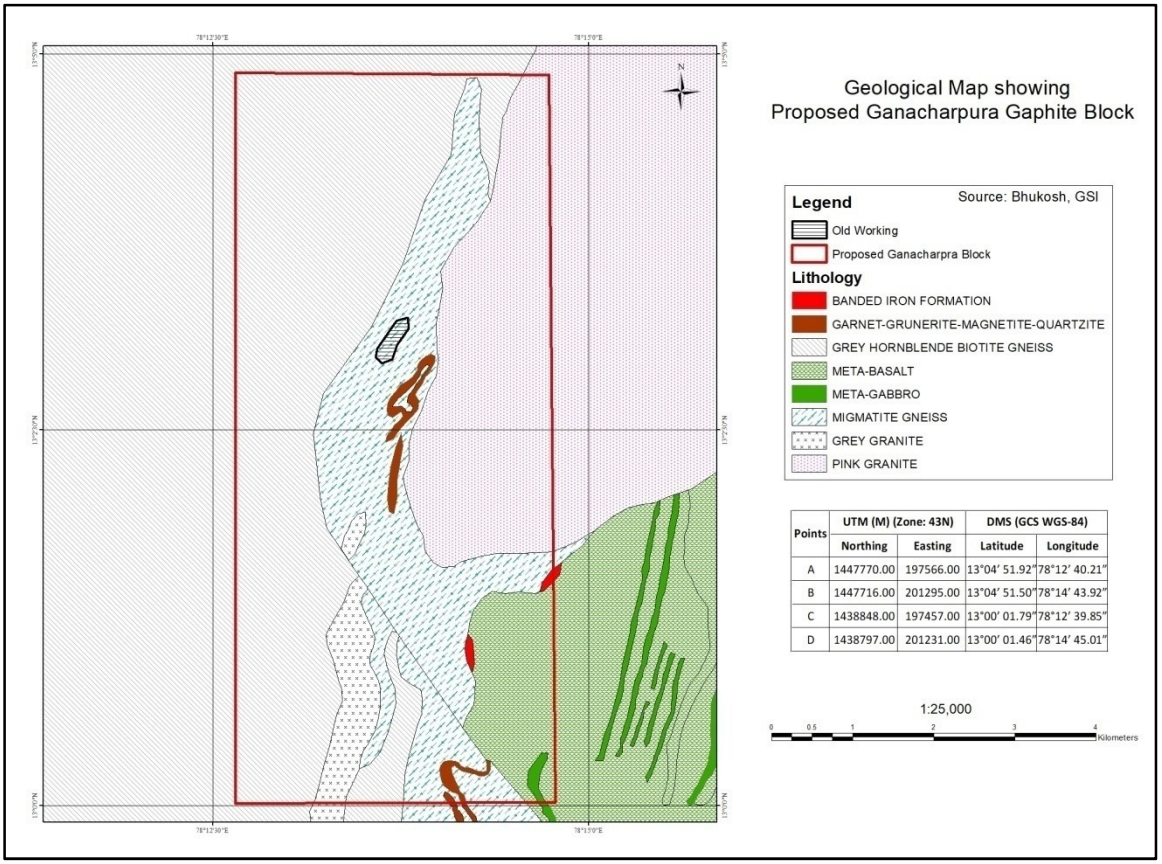
7.5.1 The overall structural pattern of Dharwar craton comprises with subparallel linear belts and stringers whose regional trend changes from NW-SE in the northern part to N-S in the south. Both the high-grade and low-grade belts show three principal episodes of folding. Parallelism of the first phase structures in the Sargur and the Dharwar rocks can be interpreted either as synchronous development or rotation of the earlier Sargur structures into parallelism with the younger Dharwar structures

7.5.2 Structurally, the belt is very complex and subjected to three or more phases of deformation. The belt is thought to be multiple refolded synform with a northerly plunge; Narayanaswami et al. (1960); Ziauddin and Ramachandra (1963). The greenstone pile appears to have been folded initially into NNE - SSW trending tight asymmetrical isoclinals folds (F-1), which were later refolded along NNW–SSE direction into broad open folds (F-2), producing broad antiformal and tight synformal structures. The F-2 deformation was, perhaps, accompanied by granodiorite – tonalite intrusion along the borders which also have identical lineation seen in volcanic pile. The intermittent weak phases of the last phase of deformation are thought to be accompanied by the intrusions of basic dykes in the area. In the KGF area, evidence of cross folding of N-S trending KSB synclinal axis along a NNW-SSE direction has been deciphered by S. Narayanaswami et al. (1960).

7.5.3 The rocks of KGF are affected by predominantly NW-SE trending faults. The most significant of them from north to south are the Balaghat north fault, the Mysore north and south faults and Gifford's fault system. Those faults have displaced the gold quartz sulphide lodes (Oriental lode type), whereas the gold quartz lodes (Champion lode) appear to be later to faulting; Rao et. al, (1994).

8.0 BLOCK GEOLOGY

8.1 The proposed block area is mostly covered by soil. Exposures are noticed in the elevated place such as ridges. The general liithounits present in the area are given Banded Ferruginous quartzite (BFQ), Quartz Schist (Graphite bearing schist), Amphibolites, Gneissic Granite.



Points	UTM (M) (Zone: 43N)		DMS (GCS WGS-84)	
	Northing	Easting	Latitude	Longitude
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Figure No. 8.1: Geology Map showing Ganacharpura Block

8.2 **Banded Ferruginous quartzite (BFQ):** BFQ exposed in the ridge area west of Ganacharpura Block. The trend of the rocks changes frequently due to number of minor folds. The trend at southern part is N-S and gradually it tilts towards east. The dip angle ranges from 78 degree to 88 degree towards east and west at places. At

some places dip is vertical. Graphite Mineralisation is seen in between the two quartzite bands. Graphite bearing quartz schist occurs as thin intercalations in BFQ. The section exposed inthe old workings indicate a highly fissile brown quartzite along the eastern margin of the graphitic schist and a thin band of iron rich quartzite along the western margin.

Figure No. 8.2

1444228 N/ 199445 E

Figure No. 8.3

1444202 N/199377 E

Figure No. 8.2 & 8.3: BFQs from Ganacharpura Block

8.3 **Quartz Schist (Graphite bearing schist):** Quartz Mica Schist (Graphite bearing schist) exposures are scanty being concealed under the soil cap. The exposures are seen as narrow linear bands in the BFQ. The trend is N-S directions and tilt towards N10 degree to 30 degree east. The dip angle ranges from 80 degree to 88 degree towards east and vertical in places. It is highly weathered, crumpled and pale green in colour. Flakes and fine grained graphite particles are distributed in soft clayey schist.

8.4 **Amphibolites:** Amphibolites are not exposed in surface. They are covered by soil cap. But they are intersected in the drill holes in the form of lensoidal bodies amidst the gneisses. They are highly weathered, foliated and green to pale green in colour.

Figure No. 8.4	Figure No. 8.5
	
1443946 N/199352 E	**199345 E/1443937 N**
Figure No. 8.4 & 8.5: Graphite Bearing Rock from Ganacharpura Block	

8.5 **Granite Gneiss:** Few clusters of blocky outcrops are exposed in the area. Gneissic Granite is highly decomposed and gritty and kaolinic. Several lenses of hornblende schist are found as inclusions win the gneisses.

9.0 OBJECTIVE:

9.1 The present exploration programme (G-4) has been formulated on the basis of previous regional data available, data provided by Department of Mines & Geology, Govt. of Karnataka and the data collected by MECL team during the field visit to graphite mines/pits to fulfil the following objectives: -

i) To carry out geological mapping on 1:12,500 scale to identify the surface manifestations and lateral disposition of the mineralized zones.

ii) To collect surface Bedrock samples during mapping and analyze for graphite, copper, lead, zinc to identify potential zones of mineralization and future strategies for exploration.

iii) To carry out surface geophysical survey (Induced Polarization (I.P), Self Potential (S.P), Resistivity, Magnetic and Gravity) for identification of concealed host rocks which bears graphite and copper, lead & zinc mineralization.

iv) To carry out trenching/pitting work in the potential zones to prove the lateral continuity of the mineralization strike based on the results of geological mapping, geochemical sampling and geophysical survey.

iv) To drill scout boreholes to prove lateral and vertical continuity of graphite and base metals deciphered by geological mapping & geophysical studies.

v) To estimate reconnaissance category (334) graphite and basemetals ore resources in the block as per UNFC norms & Minerals (Evidence of Mineral Contents) Rule-2015 and Minerals (Evidence of Mineral Contents) Amendment Rule, 2021.

10.0 METHODOLOGY OF EXPLORATION

The exploration program is proposed in accordance to the objective set for reconnaissance survey (G-4) of the 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.

10.1 Borehole Collar Point Survey by DGPS

10.1.1 The proposed boreholes shall be surveyed by DGPS in WGS-84 datum for 5 Boreholes will be fixed on the ground whose RL's and co-ordinates of survey and exploration points will be determined.

10.3 Geological Mapping

10.3.1 Large scale geological mapping on 1:12,500 scale will be carried out in the entire block by taking geological traverses to demarcate the surface manifestations and lateral disposition of the mineralized zones for graphite, copper, lead and zinc bearing formations with the structural features i.e. strike, dip, lineation / foliations etc. The contacts of different formations, identification of different lithological units, structural features, etc., will be carried out in detail. The geological map on 1:12,500

scale; will be generated based on the detail geological mapping of the block and interpretation of exploration data.

10.4 Geochemical Sampling

10.4.1 Bed Rock Sampling:

During the course of Geological mapping the bed rock samples shall be collected from the outcrops. A total 50 nos. bed rock samples for graphite and 20 nos. of bed rock samples for Cu, Pb & Zn will be collected from the block. Total 11 nos. check samples (5% internal + 10% External) will be analyzed both for graphite and Cu, Pb & Zn.

A provision of 10 nos. of bedrock samples for analysis of Au by fire assay method is proposed, as the BIFs and schists of the area are known to host Au mineralization and the proximity of the proposed block to the Kolar Gold field makes it a suitable area for indications of Au mineralization.

10.5.0 Geophysical Survey (NGPM/NGR)

10.5.3 In typical geological settings the variation in Resistivity, Conductivity and Self potential are very high for graphite. Density of the Graphite deposit varies significantly. On the basis of above properties, integrated Geophysical Survey comprising of Electrical Resistivity, Induced Polarization, Self Potential, Magnetic and Gravity are planned.

10.5.5 The area for geophysical survey will be demarcated on the basis of geological mapping and results of bedrock sample analysis. Total 30.00 Line Km of IP, SP, Resistivity and Magnetic Survey has been proposed at 20 m station interval and 200 m line spacing.

10.6. Exploratory Mining (Trenching):

10.6.1 Shallow trenching (excavation) shall be carried out in the potential zones identified based on the results of geological mapping, geochemical sampling and geophysical survey. A provision of shallow trenching on mineralized zones (1m wide X 2m deep) of 200 cubic meters is proposed. Trenching will be carried out on surface up to a

depth of 2 m (maximum 2 m depth from surface) after removal of soil/weathered column in the area. Locations of trenches on ground will be decided by field geologist based on field observations and positive outcome of the bedrock sampling and geophysical survey. The length of each channel sample will be 0.50 to 1 m in the same.

10.6.2 A provision of 150 no of primary & 23 nos. check samples (5% internal+10% External) are kept for trench sampling. Total 100 nos. of primary samples 15 nos. of check samples are proposed for Graphite (4 radicals i.e., Fixed Carbon (FC), Ash (A), Moisture (M), Volatile Matter (VM)) and 50 nos. of primary samples and 8 nos. of check samples are proposed for sulphide mineralization (9 radicals by AAS method). The trench walls will be mapped on 1:200 scale.

10.7 Surface Drilling

10.7.1 Based on the outcome of Geological Mapping, Bedrock Sampling, Geophysical survey and Trench Sampling results the extension of the mineralized zones (ore bodies) will be marked. Approximately 500.00 m of drilling in 5 scout boreholes at first level below the surface will be carried out to confirm the continuity of mineralized zones in strike & dip direction. The azimuth and angle of inclination of the proposed boreholes will be decided by the field geologist once the attitude (strike & dip) of mineralized zones (host rock) is deciphered after geological mapping.

10.8 Drill Core Logging and Sampling

10.8.1 The drill core will be logged for rock types, structural features, textures, intersection of mineralization/ore zones, types of mineralization and occurrence of various ore minerals. Rock quality designation (RQD) will also be undertaken.

10.8.2 During geological logging of drill core, mineralized zone will be marked on the basis of concentration of ore minerals and lithology. The mineralized (graphite & sulphides) part of drill core will be sampled as Primary sample. The length of each sample will be kept 1m within the ore zone depending upon the thickness of particular type of graphite and Cu, Pb & Zn and its physical character.

10.8.3 Total 100 nos. of primary samples will be analyzed for Graphite (4 radicals i.e., Fixed Carbon (FC), Ash (A), Moisture (M), Volatile Matter (VM)) and 50 nos. of primary samples will be analysed for Cu, Pb & Zn by AAS method. Total 10 nos. of composite samples will be analyzed for Graphite (Fixed Carbon (FC), Ash (A), Moisture (M), Volatile Matter (VM), SiO2, Fe%, Pb%) and 05 nos. of composite samples will be analyzed for sulphides 9 radicals by AAS method.

10.8.4 15 nos. of check samples (10% external+ 5% internal) will be analyzed for Graphite (4 radicals i.e., Fixed Carbon (FC), Ash (A), Moisture (M), Volatile Matter (VM)) and 8 nos of check samples (10% external+ 5% internal) will be analysed for 9 radicals by AAS method.

10.9 Specific Gravity Determination

To derive the tonnage factors, 10 nos. of samples are proposed to be subjected for specific gravity determination for both graphite and Cu, Pb & Zn. The samples are to be drawn from ore zones/ mineralised zones of both graphite and sulphide mineralization (Cu, Pb & Zn).

10.10 Petrography Minerography

10.10.1 During the course of Geological mapping and core logging 10 samples from various lithounits from surface and boreholes will be studied for petrography and 10 samples from mineralized zones will be studied for the ore mineral assemblages and their distribution, alteration, enrichment etc. in polished sections. A total 20 nos. digital microphotographs of thin and polished sections will be provided along the petrography and minerographic study report.

11.0 THE QUANTUM OF WORK PROPOSED

11.1 The Quantum of work proposed is given in **Table No. 11.1**

Table No. 11.1
Quantum of Work for Proposed Ganacharpura Block

Sl. No.	Description and Nature of Work	Unit	Target
A	**GEOLOGICAL WORK AND SURVEYING**		
1	Geological Mapping (1:12,500 scale)	Sq. km	33.60
2	Survey Work		
	i) Bore Hole Fixation	Nos.	5
	ii) BH Coordinate Determination by DGPS + 1 Base Point	Nos.	6
3	Geophysical Survey Induced Polarization (I.P), Self Potential (S.P) Resitivity Survey and Magnetic Survey	Line Km.	30.00
4	Exploratory Mining Trenching (1m x 2m x 200m)	Cum.	200
B	**EXPLORATORY DRILLING**		
1	Drilling up to 300m (Hard Rock)	m	500
2	Drill Core Preservation	Per m	200
C	**LABORATORY STUDIES**		
1	**Chemical Analysis**		
	i) Primary Samples: a) Bed Rock Samples, Trench Samples and Borehole Samples for Graphite (Proximate Analysis: Fixed Carbon, Ash, Moisture, Volatile Matter)	Nos.	250
	b) Bed Rock Samples, Trench Samples and Borehole Samples for Sulphides (9 radicals by AAS method)	Nos.	120
	c) Bedrock Samples for Au by Fire assay method	Nos.	10
	ii) Check Samples (10% external+ 5% internal): a) Bed Rock Samples, Trench Samples and Borehole Samples for Graphite (Proximate Analysis: Fixed Carbon, Ash, Moisture, Volatile Matter)	Nos.	38
	b) Bed Rock Samples, Trench Samples and Borehole Samples for Sulphides (9 radicals by AAS method)	Nos.	18
	c) Bedrock Samples for Au by Fire assay method	Nos.	2
	iv) Composite samples: for Graphite (10 nos.) and Sulphides (05 nos.)	Nos	15
2	**Physical Studies**		
	i) ICP-MS studies (34 Trace Elements-Cd, Sn, W, Sb, Ce, Nb, Ba, La, Bi, Co, Ni, Sr, Mo, V etc.).	Nos.	10
3	**Petrological Studies**		
	i) Preparation of thin section	Nos.	10
	ii) Study of Thin Section	Nos.	10
4	**Mineragraphic Studies (Surface & Core samples)**		
	i) Preparation of thin section	Nos.	10
	ii) Study of Thin Section	Nos.	10
5	**Specific Gravity Determination**		
	i) Graphite, Cu, Pb & Zn	Nos.	10
D	**Report Preparation (5 Hard copies with a soft copy)**	Nos.	1
E	**Preparation of Exploration Proposal (5 Hard copies with a soft copy)**	Nos.	1

12.0 COST ESTIMATE

12.1 The cost has been estimated based on actual schedule of rates mandated in the circular OM No. 61/1/2018/NMET dated 31st March 2020 for NMET funded projects which is **Rs. 694 Lakhs** The detailed cost sheet for G-4 exploration for Graphite and Sulphide in proposed Ganacharpura Block are given in **Table No. 1** of Excel Workbook.

Table 12.1
Summary of Cost Estimates

Sl. No.	Item of Work	Total estimated Cost (Rs)
1	Geological Mapping (LSM), Other associated Geological Work	₹ 21,37,848
2	Ground Geophysical Survey & Report	₹ 4,45,89,070
3	Mineral investigation by Trenching	₹ 6,66,000
4	Core Drilling & associated works	₹ 71,03,956
5	Laboratory Studies	₹ 15,39,938
6	Geologist at HQ for Maps and Report preparation	₹ 5,40,000
	Sub Total (1 to 6)	**₹ 5,65,76,812**
7	Exploration Report Preparation	₹ 16,97,304
8	Exploration Proposal Preparation	₹ 5,00,000
	Sub Total (1 to 8)	**₹ 5,87,74,116**
	GST 18%	**₹ 1,05,79,341**
	Total:	**₹ 6,93,53,457**
	Say Rs. In Lakh	**₹ 694**

13.0 TIME SCHEDULE

The proposed exploration programme is planned for reconnaissance survey (G-4). The work activities like camp setting survey and associated geological work, geophysical studies, drilling & laboratory work will be completed within 13 months' time. Report writing will take another 3 months' time with overlapping of one month laboratory studies. Thus, the total duration of the project shall be 14 months from the date of commencement of the project. The bar chart showing activities wise time schedule is placed at **Table-13.1**.

Table-13.1
Time Schedule for Reconnaissance Survey (G-4) for Graphite and Sulphides (Cu, Pb & Zn) in Ganacharpura Block, Kolar District, Karnataka

Sl. No	Activities	Units	Months															Total
			1	2	3	4	5	6	7		8	9	10	11	12	13	14	
1	Camp Setting	Months																30 days
2	Geologist Party days (1Party)	Months																150 days
3	Geophysist Party days (1Party) IP, SP, Resistivity and Magnetic Survey.	L.Km																50 days
4	Survey Party days (1 Party)	Months																120 days
5	Geophysist Party Days (HQ)	Months																30 days
6	Trenching	Months								REVIEW								600 Cu m
7	Surface Drilling (1 rig)	Months																500m
8	Sampling Party Days (1 Party) Surface/Trench/Core Samples	Months																150 Days
9	Camp Winding	Months																30 days
10	Laboratory Studies	Months																
11	Geologist Party days, HQ (1Party)	Months																60 Days
12	Report Writing and Peer Review	Months																3 month

14.0 JUSTIFICATION FOR TAKING UP EXPLORATION FOR GRAPHITE AND SULPHIDE IN GANACHARPURA, CHAGANANAHALLY, DISTRICT KOLAR, KARNATAKA.

14.1 The part (12 Hectares) of the proposed block area has been explored with 4 nos of core boreholes by the Department of Mining and Geology, Karnataka during year 1974-75 and proved the mineralization of Graphite and Sulphide minerals. They proved about 10200 Tonnes of Graphite resources with average carbon percentage of 3.25% in 12 Hectare area. They also indicated the mineralization of Sulphide mineral (Cu) in borehole no-02 with Cu% of 0.03% to 0.12%. Hence, DMG, Karnataka requested MECL for preparation of exploration proposal in respect of Ganacharpura Block, Kolar District, Karnataka State.

14.2 The proposed Ganacharpura Block lies along the north-west extension of Dharwar Group of formation. Field visit carried by MECL Geologist, confirmed the occurrences of graphite exposures within the blocks, samples were collected and analysis results are enclosed as **Table No-14.1**

Table No: 14.1
Analysis results of samples collected from proposed Ganacharpura Block

Sl. No.	Sample No.	Moisture (%)	Ash (%)	VM (%)	FC(%)
1	Sample-1	0.93	74.09	7.46	17.52
2	Sample-2	0.65	77.64	8.04	13.67
3	Sample-3	1.39	85.38	8.14	5.09
4	Sample-4	0.83	77.48	7.92	13.77

14.3 Since most of the block area is covered with soil, geophysical survey (Self potential, (SP), Induced Polarization (IP), gravity, magnetic & resistivity survey) in the block will facilitate to demarcate the geophysical anomaly/mineralized zones of graphite/sulphides (Cu, Pb & Zn), which will help in the formulation of G-3/G-2 level exploration programme.

14.4 The proposed area has been explored and mining activities were carried out for graphite, in the past. Since then no exploration for resource upgradation has been carried out in the area thus further exploration will increase the level of confidence on quantity and quality of resource which will attract investors. Though graphite mining was carried out sulphide mineralization had been also reported from the area.

14.5 Considering the proximity of graphite mine pit area established by DMG, Karnataka, MECL suggested to take up G-4 stage exploration for graphite in larger area taking old mine pit of graphite in centre to know strike continuation.

14.6 Graphite demand from lithium-ion batteries, according to BNEF, is set to grow by 37% year on year to just under 447,000 tonnes in 2021, increasing fourfold by the end of the decade. Commercial vehicles will represent the fastest growth, with year-on-year demand doubling in 2021 (MEAI Publication, August, 2021).

14.7 The G-4 level explorations will be helpful in estimation of Reconnaissance (334) Resources, which will facilitate the State Govt. of Karnataka for auctioning of blocks.

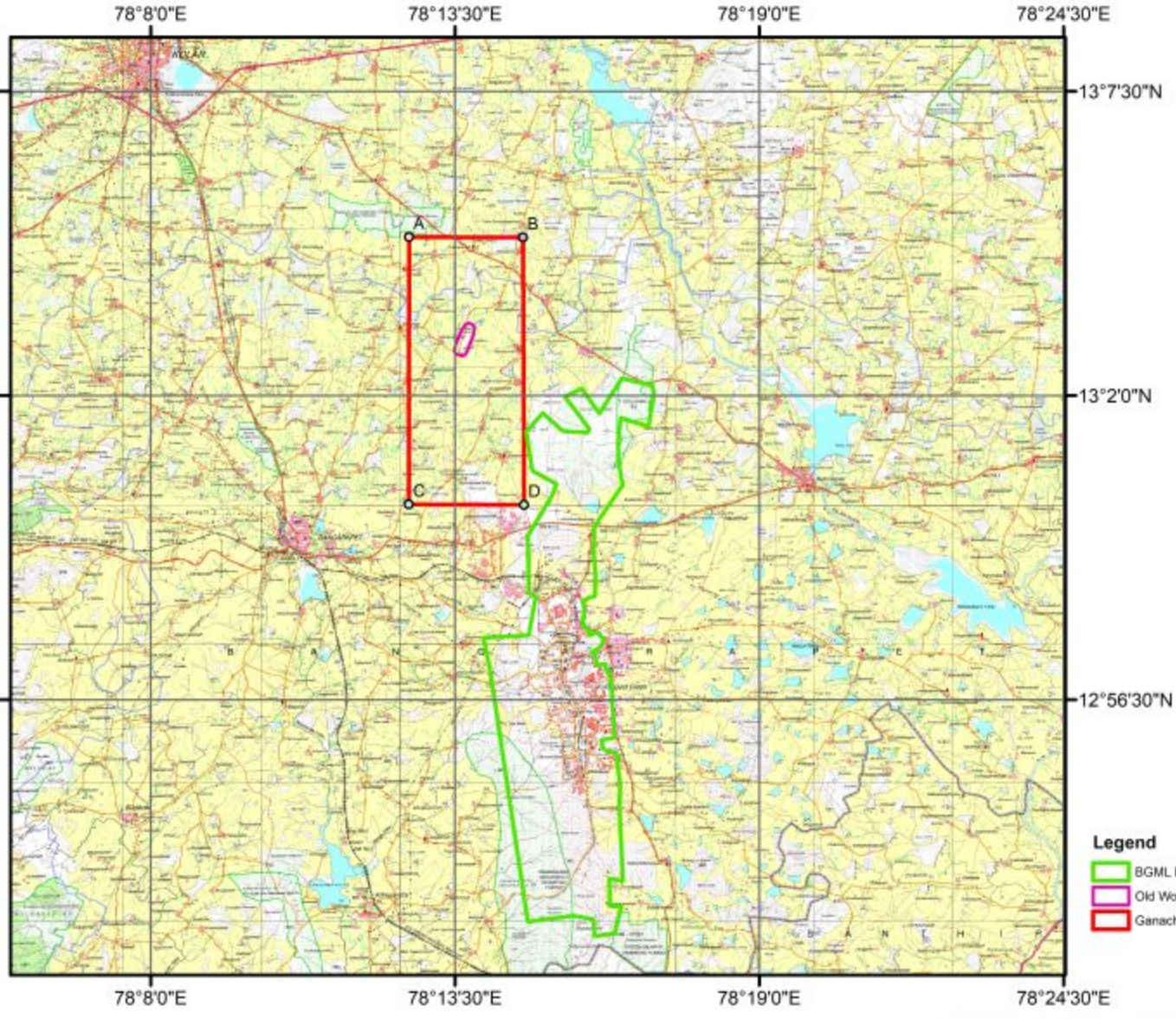
15.0 List of Plates:

1. Plate-I: Block Location Map of Ganacharpura Block in Toposheet no. 57K/4, Kolar District, Karnataka State.
2. Plate-II: Regional Geological Map of the Proposed Block (Scale 1: 200,000) (Source: Bhukosh).
3. Plate-III: Geological Map of the proposed block with sample locations (Scale 1: 50,000) (Source: Bhukosh).

16.0 List of References:

1. Rao, B. and Kailasam, T.P., MGD Record, Vol. XVIII Part 2, F.S. 1917-20, (DMG, Karnataka)
2. "Mineral Resources of Kolar District" Bulletin. No. 27, page 36-37, F.S. 1974-75, DMG, Karnataka (Graphite Deposits of Ganacharpura area, Kolar District, Karnataka)
3. Bhukosh Portal, GSI

LOCATION MAP OF PROPOSED GANACHARPURA GRAPHITE BLOCK



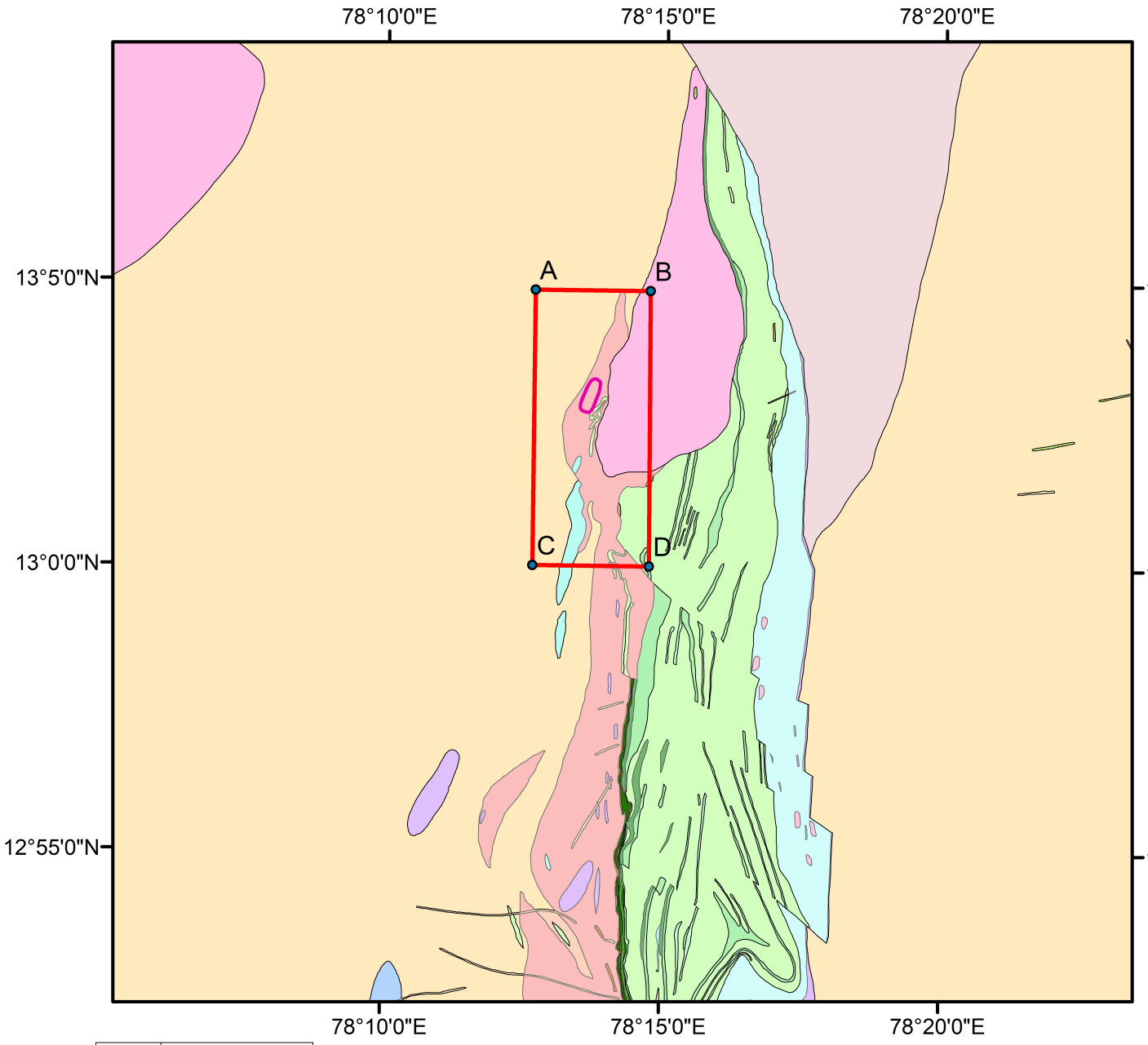
Sl.No	UTM 44N	
	Easting	Northing
A	197566	1447770
B	201295	1447716
C	197457	1438848
D	201231	1438797

1:200,000

3 1.5 0 3 6 9 12 Km

मिनरल एक्सप्लोरेशन एंड कंसल्टेंसी लिमिटेड
MINERAL EXPLORATION AND CONSULTANCY LTD.
Govt of India Enterprise, A Miniratna PSE

REGIONAL GEOLOGY OF GANACHARPUR GRAPHITE BLOCK , KOLAR SCHIST BELT



Sl.No	UTM 44N	
	Easting	Northing
A	197566	1447770
B	201295	1447716
C	197457	1438848
D	201231	1438797

1:200,000

3.5 1.75 0 3.5 7 10.5 14 Km

Legend

Geology

LITHOLOGY

- ACID TO INTERMEDIATE CHARNOCKITE
- ALKALI FELDSPAR GRANITE
- AMPHIBOLITE
- APLITE
- BANDED FERRUGINOUS CHERT
- BANDED FERRUGINOUS QUARTZITE
- BANDED IRON FORMATION
- BANDED MAGNETITE QUARTZITE
- BIOTITE GNEISS
- BIOTITE HORNBLENDE GNEISS
- BIOTITE SYENITE
- BIOTITE-HORNBLENDE SYENITE
- BLACK SILTY CLAY (ACTIVE FLOOD PLAIN)
- CALC SILICATE ROCK
- CARBONATITE
- CORDIERITE-SILLIMANITE SCHIST
- DOLERITE
- DUNITE
- EPIDOTE-HORNBLENDE GNEISS
- FELSITE
- FERRUGINOUS QUARTZITE
- FUCHSITE QUARTZITE
- GABBRO
- GARNET GNEISS
- GARNET-GRUNERITE-MAGNETITE-QUARTZITE
- GNEISS
- GRANITE
- GRANITE GNEISS
- GRANITOID
- GRANODIORITE
- GRAPHITE-CHLORITE SCHIST
- GRAYWACKE
- GREY BIOTITE GNEISS
- GREY BIOTITE GRANITE
- GREY GRANITE
- GREY HORNBLENDE BIOTITE GNEISS
- GREY HORNBLENDE BIOTITE GRANITE
- GREY HORNBLENDE GNEISS
- GREY HORNBLENDE GRANITE
- HORNBLENDE BIOTITE GRANITE GNEISS
- HORNBLENDE GNEISS
- HORNBLENDE GRANITE
- HORNBLENDE SYENITE
- HORNBLENDE-BIOTITE GNEISS
- KYANITE-SILLIMANITE QUARTZITE
- LAMPROPHYRE
- LATERITE
- LEUCO GRANITE
- META-ANDESITE
- META-BASALT
- META-GABBRO
- META-PYROXENITE
- META-ULTRAMAFITE
- MIGMATITE GNEISS
- NORITE
- PEGMATITE
- PINK GRANITE
- PINK GRANITE GNEISS
- PINK HORNBLENDE BIOTITE GRANITE
- PINK MIGMATITE
- POLYMICTIC CONGLOMERATE
- PORPHYRITIC GNEISS
- PORPHYRITIC HORNBLENDE GNEISS
- PORPHYRITIC HORNBLENDE SYENITE
- PYROXENE GRANULITE
- QUARTZ FELDSPAR PORPHYRY
- QUARTZ VEIN/REEF
- QUARTZ-BARITE VEIN
- QUARTZITE
- SYENITE
- ULTRAMAFITE
- Old Working
- Ganacharpura Block Boundary

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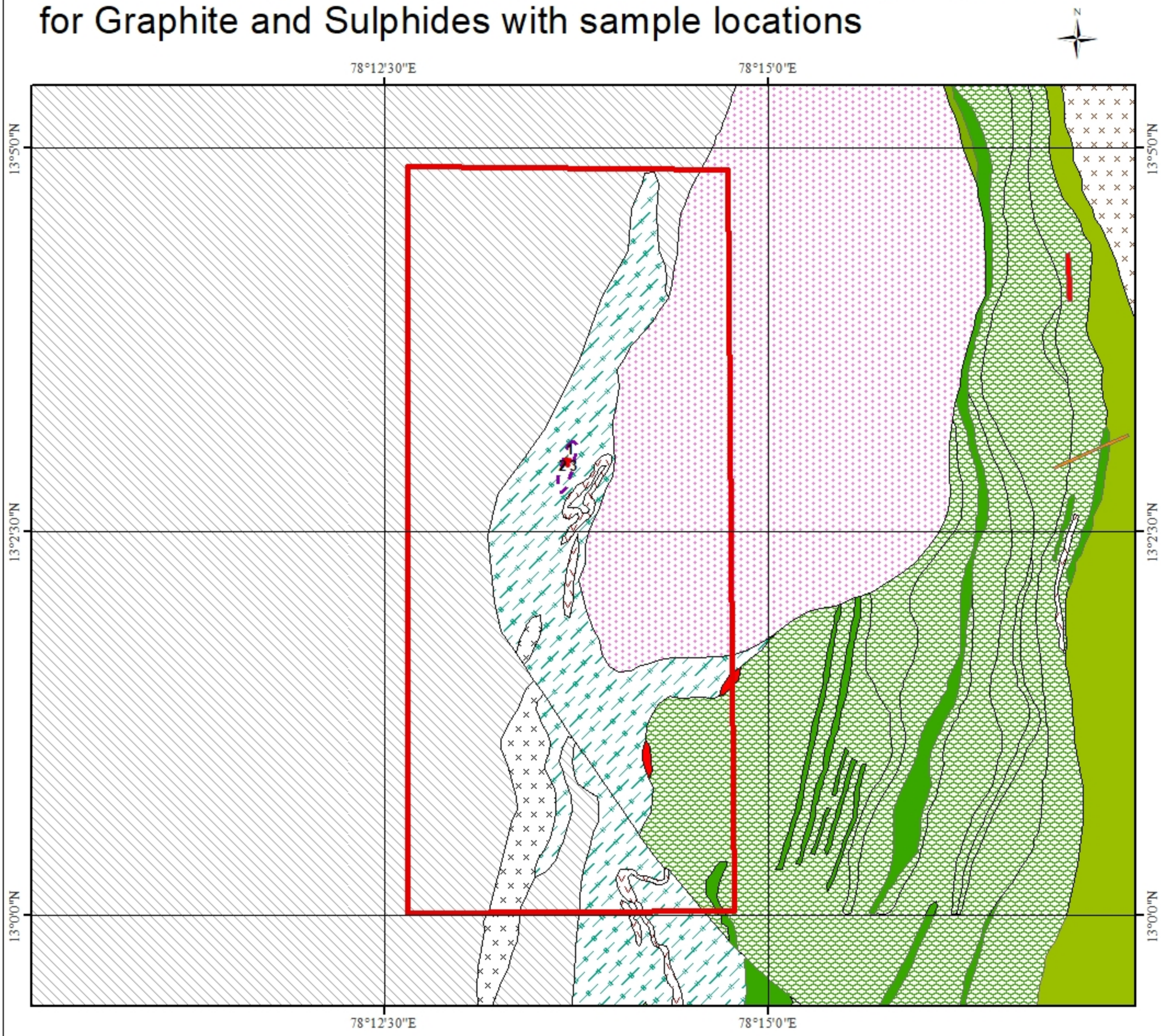
MECL

Geological Map showing Proposed Ganacharpura (G-4) Block for Graphite and Sulphides with sample locations



Legend

- Sample Location
- Old Working
- Proposed Ganacharpra Block

Lithology

- BANDED IRON FORMATION
- DOLERITE
- GARNET GNEISS
- GARNET-GRUNERITE-MAGNETITE-QUARTZITE
- GREY HORNBLENDE BIOTITE GNEISS
- META-BASALT
- META-GABBRO
- META-ULTRAMAFITE
- MIGMATITE GNEISS
- AMPHIBOLITE
- GREY BIOTITE GRANITE
- GREY GRANITE
- PINK GRANITE

1:50,000

0 0.475 0.95 1.9 2.85 3.8 Kilometers

Source: Bhukosh, GSI

Cost Estimates (as per NMET SoC) for Reconnaissance Survey (G-4) for Graphite and Sulphides (Cu, Pb & Zn) in Ganacharpura Block, Kolar District, Karnataka						
Total block area- 33.60 Sq Km; Completion Time- 15 Months						
S.N	Item of Work	Unit	Rates as per NMET SoC for F.Y 2020-21		Qty.	Total Amount (Rs)
			SoC Item S.No.	NMET Approved Unit Rates (Rs.)		
A	**Geological Mapping (LSM), Sampling and other Geological related activities.**					
1	**Large scale (LSM) Geological mapping and other geological activities**					
	a) Charges for One Geologist (1 No) (excluding Labour Charges) per day for Geological Mapping, (Field) (1:12,500) / Trenching / Drilling.	day	1.2 & 1.5.1a	₹ 11,000	150	₹ 1,650,000
	b) Labour (field) for Geological mapping work (2 Nos. per Geologist) @ Rs.700/- per day per person	day	5.7	₹ 494	300	₹ 148,200
	c) Surface/Trench/Core Sampling - Two Samplers per day (2 Party) excluding Labour charges.	day	1.5.2	₹ 5,100	48	₹ 244,800
	d) Labour for Sampling (4 Nos) @ Rs.700/per day per person.	day	5.7	₹ 494	192	₹ 94,848
					Sub-Total - A	**₹ 2,137,848**
B	**Geophysical Surveys #**					
1	IP, SP, Resistivity and Magnetic Survey	line km	3.4b	₹ 1,448,693	30.00	₹ 43,460,790
	Geophysicist man days for Geophysical Survey	days	3.18	₹ 11,000	50.00	₹ 550,000
	Geophysicist man days (HQ)	days	3.18	₹ 9,000	30.00	₹ 270,000
	a) Charges of One Surveyor (1 Party) excluding Labour charges	days	1.6.1.a	₹ 8,300	30	₹ 249,000
	b) Labour for Survey (4 Nos) @ Rs.700/per day per person	per worker	5.7	₹ 494	120	₹ 59,280
					Sub Total - B	**₹ 44,589,070**
C	**Mineral Investigation**					
	Trenching / Pitting $					
	Excavation of Trenches upto 2.0 m depth	per cu m	2.1.1	₹ 3,330	200	₹ 666,000
					Sub Total - C	**₹ 666,000**
D	**EXPLORATORY DRILLING**					
1	Drilling up to 300m (Hard Rock)	per metre	2.2.1.4 a	₹ 11,500	500	₹ 5,750,000
3	Borehole Pillaring - Construction of concrete Pillar (12"x12"x30")	per borehole	2.2.7.a	₹ 2,000	5	₹ 10,000
4	Transportation of Drill Rig & Truck associated per drill (To & Fro from CHQ)	per km	2.2.8	₹ 36	2,796	₹ 100,656
5	Monthly accommodation charges for field camp i.e for the activities such as Geological Mapping, Geophysics, Exploratory Drilling, Trenching, Sampling and etc	month	2.2.9	₹ 50,000	2	₹ 100,000
6	Drilling Camp Setting Cost (1Rig)	per drill	2.2.9a	₹ 250,000	1	₹ 250,000
7	Drilling Camp Winding up Cost (1Rig)	per drill	2.2.9b	₹ 250,000	1	₹ 250,000
8	Approach Road Making (Flat Terrain)	per km	2.2.10a	₹ 22,020	5	₹ 110,100
9	Drill Core Preservation (Includes cost of GI Core boxes, transportation charges, loading and unloading charges and manpower engaged in execution of the work.)	per m	5.3	₹ 1,590	200	₹ 318,000
10	Land / Crop Compensation (As per actuals as certified by local authorities subject to a maximum of 20,000 per bore hole)	per borehole	5.6	₹ 20,000	5	₹ 100,000
12	Fixation of boreholes, determination of co-ordinates and Reduced Level (RL) of the boreholes by DGPS (Including Labour charges)	Per point of observation	1.6.2	₹ 19,200	6	₹ 115,200
					Sub Total - D	**₹ 7,103,956**
E	**LABORATORY STUDIES**					
1	**Chemical Analysis - Surface sampling (Bed Rock Samples / Soil / Stream Sediment) / Trench / Core Samples)**					
i)	**Primary Core sample analysis for Graphite by Proximate analysis and Sulphides by AAS method and Au by Fire Assay method**					
	a) Bed Rock Samples, Trench Samples and Borehole Samples for Graphite (Proximate Analysis: Fixed Carbon, Ash, Moisture, Volatile Matter)	Nos	4.1.16	₹ 3,000	250	₹ 750,000
	b) Bed Rock Samples, Trench Samples and Borehole Samples for Sulphides (9 radicals by AAS method)	Nos	4.1.7a	₹ 2,506	120	₹ 300,720
	c) Bedrock Samples for Au by Fire assay method	Nos	4.1.5a	₹ 2,380	10	₹ 23,800
ii)	**Check sample analysis for Graphite by Proximate analysis and Sulphides by AAS method and Au by Fire Assay method (10% external+ 5% internal)**					
	a) Bed Rock Samples, Trench Samples and Borehole Samples for Graphite (Proximate Analysis: Fixed Carbon, Ash, Moisture, Volatile Matter)	Nos	4.1.16	₹ 3,000	38	₹ 114,000
	b) Bed Rock Samples, Trench Samples and Borehole Samples for Sulphides (9 radicals by AAS method)	Nos	4.1.7a	₹ 2,506	18	₹ 45,108
	c) Bedrock Samples for Au by Fire assay method	Nos	4.1.5a	₹ 2,380	2	₹ 4,760
iii)	**Composite sample analysis**					
	a) Proximate Analysis for Graphite Fixed Carbon, Ash, Moisture, Volatile Matter)	per sample	4.1.16	₹ 3,000	10	₹ 30,000
	b) For Sulphibes by AAS method	per sample	4.1.7a	₹ 2,506	5	₹ 12,530
iv)	ICP-MS studies (34 Trace elements-Cd,Sn,W,Sb,Ce,Nb,Ba,La,Bi,Co, Ni, Sr, Mo, V** etc).	per sample	4.1.14	₹ 7,731	10	₹ 77,310
v)	Whole Rock Analysis by XRF technique for major oxides	per sample	4.1.15a	₹ 4,200	10	₹ 42,000
vi)	**Petrological / Mineraographic studies**					
	a) Preparation of Thin section	per sample	4.3.1	₹ 2,353	10	₹ 23,530
	b) Study of thin section for Petrography	per sample	4.3.4	₹ 4,232	10	₹ 42,320
	c) Preparation of Polished section	per sample	4.3.2	₹ 1,549	10	₹ 15,490
	d) Study of Polished section for Mineragraphy	per sample	4.3.4	₹ 4,232	10	₹ 42,320
vii)	**Specific Gravity Determination**	per sample	4.8.1	₹ 1,605	10	₹ 16,050
					Sub Total - E	**₹ 1,539,938**
F	**Geological Map & Preparation of Reports at HQ**					
	Geologist man days (1 No.) for Preparation of Reports & Maps at HQ	days	1.2	₹ 9,000	60	**₹ 540,000**
G					**Total (A to F)**	**₹ 56,576,812**
H	**Geological Report Preparation**		**5.2.iii**			**₹ 1,697,304**
I	**Preparation of Exploration Proposal** (5 Hard copies with a soft copy) 2% of the Cost or Rs. 5.0 Lakhs whichever is lower 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.		**5.1**			**₹ 500,000**
J					**Total Estimated Cost without GST(G+H+I)**	**₹ 58,774,116**
K					**Provision for GST (18% of J)**	**₹ 10,579,341**
					Total Estimated Cost with 18% GST (J+K)	**₹ 69,353,457**
					or Say Rs. In Lakhs	***₹ 694***

Note:-

1. ***** Marked items not indicated in SoC and required to be taken up during the course of exploration shall be charged separately (as per actuals).
2. **$** Trenching/Pitting dimensions are tentative may vary depending upon the geology and field conditions.
3. **^** Satellite imageries shall be procured from website/NRSA as the case may be and procurement charges if any shall be charged at actuals.
4. **#** 2nd level of work shall be carried out after review of 1st level work i.e. Geological mapping, geochemical sampling and analysis and geophysical survey
5. The above cost estimates have been worked out based on the latest NMET SoC approved by MoM dated 31st March 2020. If any additional work is required which are not listed above shall be taken up and the charges for the same shall be as per SoC of NMET.
6. The rates applicable are as on 31.03.2021. The escalation for 2021-22 shall be charged as per as per RBI Indices, when available.

Sl. No.	Item of Work	Total estimated Cost (Rs)
1	Geological Mapping (LSM), Other associated Geological Work	₹ 2,137,848
2	Ground Geophysical Survey & Report	₹ 44,589,070
3	Mineral investigation by Trenching	₹ 666,000
4	Core Drilling & associated works	₹ 7,103,956
5	Laboratory Studies	₹ 1,539,938
6	Geologist at HQ for Maps and Report preparation	₹ 540,000
	Sub Total (1 to 6)	**₹ 56,576,812**
7	Exploration Report Preparation	₹ 1,697,304
8	Exploration Proposal Preparation	₹ 500,000
	Sub Total (1 to 8)	**₹ 58,774,116**
	GST 18%	**₹ 10,579,341**
	Total:	**₹ 69,353,457**
	Say Rs. In Lakh	**₹ 694**

Time Schedule for Reconnaissance Survey (G-4) for Graphite and Sulphides (Cu, Pb & Zn) in Ganacharpura Block, Kolar District, Karnataka																	
Sl. No.	**Activities**	Units	Months														Total
			1	2	3	4	5	6	7		8	9	10	11	12	13	14	
1	Camp Setting	Months																30 days
2	Geologist Party days (1Party)	Months																150 days
3	Geophysist Party days (1Party) IP, SP, Resistivity and Magnetic Survey.	Month vs. L.Km																50 days
4	Survey Party days (1 Party)	Months																120 days
5	Geophysist Party Days (HQ)	Months																30 days
6	Trenching	Months vs. Cu.m																600 Cu m
7	Surface Drilling (1 rig)	Months vs. m.																500m
8	Sampling Party Days (1 Party) Surface/Trench/Core Samples	Months																150 Days
9	Camp Winding	Months																30 days
10	Laboratory Studies	Months																1,012 Nos.
11	Geologist Party days, HQ (1Party)	Months																60 Days
12	Report Writing and Peer Review	Months																3 months

REVIEW