PROPOSAL FOR RECONNAISSANCE SURVEY (G-4 STAGE) FOR COPPER, LEAD, ZINC AND GOLD IN LARON BLOCK (45.00 SQ.KM) DISTRICT- JHANSI, UTTAR PRADESH

COMMODITY: COPPER, LEAD, ZINC AND GOLD

BY

MINERAL EXPLORATION CORPORATION LIMITED
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SEMINARY HILLS
NAGPUR (MH)

PLACE: NAGPUR
DATE: 24.08.2021

Summary of the Block for Reconnaissance Survey (G-4 Stage)
GENERAL INFORMATION ABOUT THE BLOCK

	Features	**Details**
	Block ID	LARON BLOCK
	Exploration Agency	Mineral Exploration Corporation Limited (MECL)
	Commodity	Copper, Lead, Zinc and Gold
	Mineral Belt	Bundelkhand Gneissic Complex
	Completion period with entire Time schedule to complete the project	18 months
	Objectives	Based on the evaluation of previous work, the present exploration program has been formulated to fulfil the following objectives: i) To carry out Geological & structural mapping on 1: 12,500 scale for demarcation of Copper, Lead, Zinc and Gold bearing formations (host rock) with the structural features to identify the surface manifestations and lateral disposition of the mineralized zones. ii) To collect surface (Bedrock/soil/stream sediment) samples & analyse for Cu, Pb, Zn & Au and decide further course of Exploration program. iii) To carry out surface geophysical survey (Induced Polarization (I.P), Magnetic and Time Domain Electromagnetic to demarcate concealed Copper, Lead, Zinc and Gold bearing formations. iv) To carry out trenching to expose Copper, Lead, Zinc and Gold bearing formation concealed under soil. v) To carry out channel and trench samples collect from Copper, Lead, Zinc and Gold bearing formations to demarcate mineralised zones. vi) To drill 5 scout boreholes up to 50m vertical depth to prove the strike and depth persistence of ore bearing formation mapped in the area which in turn will

		decide the future course of Exploration program at G-3/G-2 category of UNFC. vi) To estimate reconnaissance Copper, Lead, Zinc and Gold resources along with accessory elements as per UNFC norms and Minerals (Evidence of Mineral Contents) Rules-2015 at G-4 level.
	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	Work will be carried out by the proposed agency (MECL).
	Name/Number of Geoscientists	One no. Geoscientist
	Expected Field days (Geology, Geophysics, surveyor)	Geologist Party days: 270 days
		Survey Party days: 210 days

<table>
<tr><td>1.</td><td>Location</td><td></td></tr>
<tr><td></td><td>Latitude and Longitude</td><td>
<table>
<tr><td rowspan="2">BB POINT</td><td colspan="2">WGS 84</td></tr>
<tr><td>LONGITUDE</td><td>LATITUDE</td></tr>
<tr><td>A</td><td>78° 54' 13.0893" E</td><td>25° 14' 59.9315" N</td></tr>
<tr><td>B</td><td>78° 58' 42.8811" E</td><td>25° 15' 00.0356" N</td></tr>
<tr><td>C</td><td>78° 58' 34.7954" E</td><td>25° 14' 12.1729" N</td></tr>
<tr><td>D</td><td>78° 58' 13.3562" E</td><td>25° 12' 58.9486" N</td></tr>
<tr><td>E</td><td>78° 52' 50.9459" E</td><td>25° 09' 26.0193" N</td></tr>
<tr><td>B to C</td><td colspan="2" rowspan="2">Along the State Boundary Between M.P. and U.P.</td></tr>
<tr><td>D to E</td></tr>
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</td></tr>
<tr><td></td><td>Villages</td><td>Katera village in Katera Nagar Panchayat of Jhansi district situated northern corner of the Block. The block could be approached from Jhansi city and Mauranipur city by metal road of 60km and 30km respectively. The nearest railway station is Teharka, Madhya Pradesh which is 7Km and real head is Jhansi. The nearest airport is Gwalior, Madhya Pradesh is about 150Km.</td></tr>
<tr><td></td><td>Tehsil/Taluk</td><td>Mauranipur</td></tr>
<tr><td></td><td>District</td><td>Jhansi</td></tr>
<tr><td></td><td>State</td><td>Uttar Pradesh</td></tr>
<tr><td>2.</td><td>Area (hectares/ square kilometres)</td><td></td></tr>
<tr><td></td><td>Block Area</td><td>45.00 sq.km</td></tr>
<tr><td></td><td>Forest Area</td><td>The block co-ordinates were subjected in the Decision Support System (DSS) of Forest Department, Ministry of Environment, Forest and Climate Change (MOEFCC). It has been found that the block area is under “not inviolate”. (Go)-Non Forest area.</td></tr>
<tr><td></td><td>Government Land Area (Bilanam)</td><td>Data not available</td></tr>
<tr><td></td><td>Charagaha</td><td>Data not available</td></tr>
<tr><td></td><td>Private Land Area</td><td>Most of the area is private cultivated land</td></tr>
<tr><td>3.</td><td>Accessibility</td><td></td></tr>
<tr><td></td><td>Nearest Rail Head</td><td>Mauranipur (30km) and Jhansi (60km)</td></tr>
<tr><td></td><td>Road</td><td>The block is 10 km south east of Teharka village on Jhansi-Mauranipur Road and connected by metalled road, which passes through the block.</td></tr>
<tr><td></td><td>Airport</td><td>Gwalior (150 km)</td></tr>
<tr><td>4.</td><td>Hydrography</td><td></td></tr>
<tr><td></td><td>Local Surface Drainage Pattern (Channels)</td><td>Bundelkhand Region lies between the Indo-Gangetic Plain to the north and the Vindhyan Range to the south. The Bundelkhand Plateau lies to the east of the Central</td></tr>
</table>

		India Plateau and is bounded on the northeast by the Rewa – Panna plateau. The topography is mostly undulatory plain with isolated hills rising abruptly and form steep and nearly inaccessible scarps. The elevation of the study area ranges from 220m above mean sea level to 407m above mean sea level. The highest elevation of the area is 407m above MSL north of Katera RF. The mean slope of the entire region is towards east.
	Rivers/ Streams	Major drainage of the Bundelkhand region is through its numerous perennial rivers and their tributary rivulets and seasonal streams, which join the Yamuna River in the north. Jaldabar Nala and Sukhnai Nadi are the two major rivers flowing in the area. The overall drainage pattern in the study area is sub dendritic to dendritic, characteristic of granitic terrain. Small to large dams have also been constructed at the junction of river course and quartz reef. Quartz reefs are excellent natural barrier to impound water in form of small reservoir to meet the requirements of local people.
5.	**Climate**	
	Mean Annual Rainfall	The annual average rainfall recorded is about 900 mm
	Temperatures (December) (Minimum) Temperatures (June) (Maximum)	Minimum temperatures $6^{O}C$. Maximum temperatures up to $47^{O}C$.
6.	**Topography**	
	Toposheet Number	54K/16
	Morphology of the Area	The study area forms part of Bundelkhand plateau. Low dissected hills and valley of structural origin, pediment and pediplain of denudational origin. The general elevation 300m.
7.	**Availability of baseline geosciences data**	
	Geological Map (1:50K/25K)	Geological map on 1:50000 scale (Source: Bhukosh)
	Geochemical Map	-
	Geophysical Map (Aeromagnetic, ground geophysical, Regional as well as local scale GP maps)	-

8.	**Justification for taking up Reconnaissance Survey/ Regional Exploration**	i) Application of Hyperspectral / Multispectral Remote Sensing techniques towards Mapping of Alteration / Mineralized Zone and Building up of Spectral Library in parts of Bundelkhand Gneissic Complex, Tikamgarh and Chhatarpur districts, Madhya Pradesh and Jhansi district, Uttar Pradesh carried out by GSI during the F.S. 2016-18 (Trina V. Vyas et. al.), to established mapping of alteration / mineralized zones using ASTER & Landsat 8 (OLI) data and field studies in Bundelkhand Massif. In this study they mentioned that copper sulphides like azurite were seen in quartz reefs south of Laron, while chalcopyrite was seen in E-W trending quartz reef north-east of Parara and NE-SW tending reef north of Baron. Malachite disseminations were observed in quartz reefs south of Laron. Sulphide mineralization (azurite, chalcopyrite and other Cu sulphides and malachite stains were observed in brecciated quartz based on field observation. **Based on the potential of the block, GSI strongly recommended for further exploration potentiality in these areas.** ii) Based on the evaluation of previous work, the present Reconnaissance Survey program at G-4 level has been prepared. Geological Mapping & surface sampling combined with Geophysical Survey (Induced Polarization (I.P), Magnetic and Time Domain Electromagnetic) in anomalous areas will be helpful in assessing the disposition of the mineralized zones, structural features like shears and faults if any. iii) The Exploration will be helpful in estimation of Copper, Lead, Zinc and Gold reconnaissance resources in the block. iv) The Reconnaissance Survey will help in planning of detailed exploration program (in case upgraded to G-3/G-2 level) which in turn will facilitate the state Government for Action of Block.

PROPOSAL FOR RECONNAISSANCE SURVEY (G-4 STAGE) FOR COPPER, LEAD, ZINC AND GOLD IN LARON BLOCK (45.00 SQ.KM AREA), DISTRICT- JHANSI, UTTAR PRADESH

1.1.0 PREAMBLE

1.1.1 Copper is a soft, malleable, and ductile metal with very high thermal and electrical conductivity. copper is one of the few metals that occurs in nature in directly usable metallic form (native metals) and is an important non-ferrous base metal having wide industrial applications, ranging from defence, space programme, railways, power cables, mint, telecommunication cables, etc. India is not self-sufficient in the production of copper ore. In addition to domestic production of ore and concentrates, India imports copper concentrates for its smelters. The domestic demand for copper and its alloys is met through domestic production, recycling of scrap and by imports.

1.1.2 The world reserves of copper metal are assessed at 830 million tonnes of copper content. Chile has the largest share, accounting for about 20% of world reserves, followed by Australia (11%), Peru (10%), Russia (7%), Indonesia, Mexico & USA (6% each) and China (3%). The world mine production of copper decreased by 2.41% at 20.2 million tonnes of metal content in 2017 as compared to 20.7 million tonnes of metal content during previous year. Chile continued to be the largest single producer of copper in 2017 with 27% share followed by Peru (12%), China (8%), USA (6%) and Congo Dem. Republic. (5%).

1.1.3 Copper is one of the most recycled metals of all the metals. The recycling of copper scrap is gaining importance worldwide simply because of the fact that recovery of copper metal from scrap requires much less energy than its recovery made from primary source. Besides, it enables conservation of natural resources.

1.1.4 Copper with its unique physical, mechanical and electrical properties, has played a vital role in the industrial growth of a nation. In India, around 75% of demand is met through imports. The increasing demand of copper metal in the country could be eased with the exploration of new copper deposits of economic importance.

1.1.5 Largest reserves/resources of copper ore to the tune of 813 million tonnes (53.81%) are in the state of Rajasthan followed by Jharkhand with 295 million tonnes (19.54%) and Madhya Pradesh with 283 million tonnes (18.75%). Copper reserves/ resources in Andhra Pradesh, Gujarat, Haryana, Karnataka, Maharashtra, Meghalaya, Nagaland, Odisha, Sikkim, Tamil Nadu, Telangana, Uttarakhand and West Bengal accounted for remaining 7.9% of the total all India resources.

1.1.6 The total reserves/resources of copper ore as on 1.4.2015 as per NMI database, based on UNFC system, are estimated at 1.51 billion tonnes. Of these, 207.77 million tonnes (13.74%) fall under 'Reserves category' while the balance 1.30 billion tonnes (86.25%)

are remaining resources category. Gradewise there are no reserves with 1.85% or more copper grade. However, 203.83 million tonnes reserves fall under 1% to below 1.85% Cu grade. Of the total ore resources 8.28 million tonnes (0.55%) comprise ore containing 1.85% Cu or more and 657.92 million tonnes (43.53%) resources fall under 1% to below 1.85% Cu grade.

1.1.7 During preceding decades, no large scale metal deposit has been discovered in India. However, the possibility of working of small mineral bodies in proximity to each other, though technological advances and increased operational efficiency cannot be ruled out. Therefore, it is necessary and imperative to locate and explore such small metal deposits in cluster.

1.1.9 The geological milieu of Bundelkhand Gneissic Complex constitutes an interesting area for the mineral search especially for Copper, Lead, Zinc and Gold mineralization. The field study by GSI during FS. 2016-18 in its report of Application of Hyperspectral / Multispectral Remote Sensing techniques towards Mapping of Alteration / Mineralized Zone and Building up of Spectral Library in parts of Bundelkhand Gneissic Complex, Tikamgarh and Chhatarpur districts, Madhya Pradesh and Jhansi district, Uttar Pradesh has revealed the mineral incidence namely copper and sulphides evinced interest for reconnaissance survey (G4).

1.2.0 Background information

1.2.1 Alteration minerals (pyrophyllite, diaspore, chlorite) occurring in vugs, fracture filling and small pockets (at places) are observed in quartz reefs around west of Laron, east of Parara. Apart from the above presence of copper like azurite were seen in quartz reefs south of Laron, while chalcopyrite was seen in E-W trending quartz reef north-east of Parara. Malachite disseminations were observed in quartz reefs south of Laron and north of Baron. All the evidences include field observations were shown by GSI during their campaign for Hyperspectral / Multispectral Remote Sensing techniques towards Mapping of Alteration / Mineralized Zones. However, the quartz veins/reef occurring in Bundelkhand Massif are one of the important loci akin for base metals mineralization. The thrust given after MMDR Amendment Act, 2015 by Government of India on mineral exploration as well as the impetus for Copper, Lead, Zinc and Gold and which is imperative for MECL to put up the proposal of Reconnaissance Survey (G4 stage) for Copper, Lead, Zinc and Gold mineralization in Laron block, encompassing 45.00 Sq. Km, Mauranipur Tehsil, Jhansi district, Uttar Pradesh.

1.3.0 Location and Accessibility

1.3.1 Katera village in Katera Nagar Panchayat of Jhansi district situated northern corner of the Block. The block could be approached from Jhansi city and Mauranipur city by metal road of 60km and 30km respectively. The nearest railway station is Teharka, Madhya

Pradesh which is 7km and real head is Jhansi. The nearest airport is Gwalior, Madhya Pradesh is about 150km. The Parara, Bhata, Laron and Katera are the main villages in the study area. The block falls in Survey of India Toposheet No.54K/16. The cardinal points of the block as below:

BB POINT	WGS 84	
	LONGITUDE	LATITUDE
A	78° 54' 13.0893" E	25° 14' 59.9315" N
B	78° 58' 42.8811" E	25° 15' 00.0356" N
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B to C	Along the State Boundary Between M.P. and U.P.	
D to E		

1.4.0 Physiography

1.4.1. Bundelkhand Region lies between the Indo-Gangetic Plain to the north and the Vindhyan Range to the south. The Bundelkhand Plateau lies to the east of the Central India Plateau and is bounded on the northeast by the Rewa – Panna plateau. The topography is mostly undulatory plain with isolated hills rising abruptly and form steep and nearly inaccessible scarps. The proposed area is characterized by denudational hills with inselberg of small hillocks and long serrated ridges of quartz reefs. The pediplane covered intermittently with cultivated fields and valleys. The elevation of the study area ranges from 220m above mean sea level to 407m above mean sea level. The maximum elevation in the area is 407m above MSL north of Katera RF and average ground level of the area is 300m above MSL.

1.4.2 Sub-dendritic to dendritic drainage pattern predominantly developed in the area. The area is drained by two main rivers, namely Jaldabar Nala and Sukhnai Nadi. Small to medium dams have also been constructed at the junction of river course and quartz reef. Quartz reefs are excellent natural barrier to impound water in form of small reservoirs to meet the requirements of local people.

1.4.3 The study area has a hot and semi-humid to semi-arid (during summers) climate. Minimum temperatures vary from around 6^{o}C to 12^{o}C during winters and maximum temperatures varies from 42^{o}C to 47^{o}C during summers. Generally, the hottest days are in May and the coldest days in December or January. The annual rainfall recorded is about 900 mm. Violent local squalls of short duration are sometimes generated in summer. The cloud of dust can be so thick that it becomes dark even during the day.

1.4.4 Mixed vegetation in the area with varieties of trees viz; Teak, Mahua, Khair, Neem and varieties of bushes, open shrub, Tendu leaf and Katha are present especially in the forest area.

1.5.0 Regional Geology

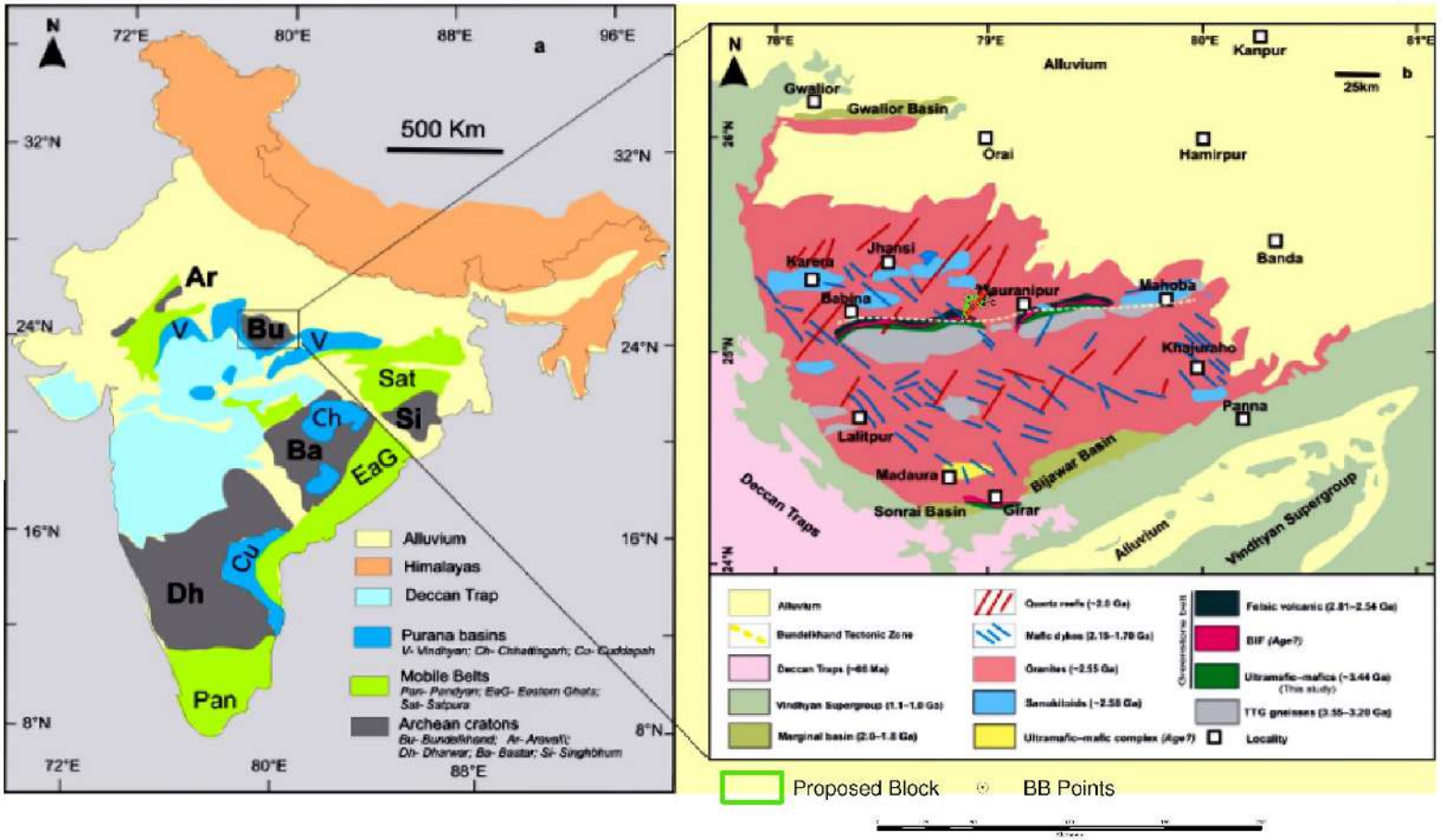
1.5.1 The Bundelkhand Craton is situated immediately to the north of the Central India Tectonic Zone (CITZ), a major suture that marks the trace of ocean closure in the central part of the Indian Peninsula (Acharyya, 2003) with an exposed area of around 26,000 km^2. The Bundelkhand Craton is bound by the Son-Narmada faults in the south, the Great Boundary Fault that separates the Aravalli Group of rocks in the west, and the Yamuna Fault to north separating from the fore deep basin of the Himalayas (Singh et al., 2007) and Vindhyan Supergroup in the east. The Craton consists of five major geological units: (1) Bundelkhand Massif, (2) early Proterozoic sedimentary basins (Bijawar and Gwalior Groups), (3) middle to Late Proterozoic sedimentary basins (Vindhyan Supergroup), (4) Malwa/Deccan Trap with inter- and intra-trappean sedimentaries, and (5) Quaternary deposits of marginal alluvium plain. An E–W trending, about 200 km long, brittle-ductile shear zone, known as the Bundelkhand Tectonic Zone (BTZ), transects the craton into two unequal halves (Malviya et al., 2006).

1.5.2 The Bundelkhand Massif comprises the Bundelkhand gneissic complex (BGC) of Meso- Neoarchean age, the Bundelkhand metasedimentary and metavolcanics (BMM); the Madawara igneous complex (MIC) and Neoarchean-Paleoproterozoic Bundelkhand granitoids (BG) (Ram Mohan et al., op cit). Mesoproterozoic quartz reefs and mafic dyke swarms are also integral part of the Bundelkhand Massif (Pradhan et al., 2010). TTG (Tonalite Tronjhemite Granodiorite) Gneissic rocks of BGC form the basement along with metasedimentaries and volcanics, exposed as linear E-W trending belts. Bundelkhand Massif predominately consists of pink to grey granitoids (ca. 90%), which are intrusive into a relict gneiss-greenstone basement (Basu, 1986). The relict greenstone-gneiss basement consists of TTGgneisses, grey gneisses, metabasic rocks, ultramafic rocks, BIFs, quartzite, schist and calc-silicate rocks, which commonly occur as enclaves within younger and more abundant granitoids (Singh etal., op cit). Two greenstone complexes are recognized in the relict basement; the central Bundelkhand complex comprising the Babina–Mauranipur greenstone belt, and the southern Bundelkhand complex consisting of the Rungaon–Girar greenstone belt (Singh and Slabunov, 2015). The central greenstone complex constitutes high-Mg metabasic rocks, serpentinised ultramafic rocks, BIFs and felsic to intermediate volcanics (Malviya et al., 2007). The southern greenstone complex largely consists of quartzite, ultramafic rocks and BIFs. The basement rocks are multiply deformed and metamorphosed, recording at least two phases of metamorphism (Singh et al., 2007). The stratigraphic succession of Bundelkhand Massif is presented by many authors and is compiled in the table given below:

Table 1: Stratigraphic successions of the Bundelkhand Massif

Pascoe, 1950	Jhingran, 1958	Saxena, 1961	Prakash et al, 1976	Basu, 1986	Singh, 2015
Peridotites, pyroxenites (partially altered to serpentinites and talc actinolite dolerite-trap dykes) Bundelkhand Granite Complex with quartz reef and with inclusions of Mahroni Schist	Basic dykes Quartz reefs Granites (of ten megascopic types) Relict metasediments equivalent to Dharwars (?)	Dolerite and other basic dykes Quartz reefs Pink granites, migmatites ---unconfirmity--- Metasedimentary rocks	**Madura Formation:** (Pre-to-post-Bijawar age): **a:** dolerite dykes, granite member, quartz vein pegmatite, graphic granite **b:** Gabbro member: coarse to medium grained gabbro, pillow lava, ultrabasic member; milky dense sheared veins quartz. **Bundelkhand, granite Formation:** Dull pink, dense fine grained to porphyritic granite: coarsely crystalline pink un-foliatedgranites and migmatities. ---- Unconformity ----- **Berwar Formation:** Iron-formation, carbonate rock, grey green slates, Fuschsite quartzsite and conglomerate. ---- Unconformity ----- **Rajaula Formation:** Sedimentation- volcanism (amphibolites, biotite-feldspar foliated gneisses.)	Dolerites Quartz reef (with pyrite, chalcopyrite, pyrophyllite and diaspore) Aplite, Esmeraldite Porphyries,Pegmatite Leucocratic granites Migmatites & Syenites Medium grained porphyritic granites, Coarse grained porphyritic granite, Coarse biotite granite Gneisses. ---- Unconformity ----- **Pre Bundelkhand Rocks:** Banded iron-formation Metabasites, gneisses, marble, schists, Metamorphosed mafics and amphibolite.	Madauara Ultrabasics Mafic Dykes and Swarm Quartz Reef **Bundelkhand Granite Complex:** Fine grain leucogranite Coarse grain leucogranite Foliated biotite granite Biotite granite Hornblende granite **(Pre-Bundelkhand Granitoids)** **Newer Metamorphic Group:** Metavolcanics Banded Magnetite Quartzite, micaceous quartzites, commingtonite-grunerite-garnet magnetite schist.Talc chlorite schist, actinolite-tremolitte- talc schist, hornblende- chlorite - epidote schist, garnet chloriteactinolite schist **Older Metamorphic Group:** Biotite-gneiss, hornblende-biotite gneisses, sillimanite gneisses, amphibolite, garnet sillimanite gneisses. Tonalite-trondhjemite gneisses, granite-gneisses, migmatites.

Geological Map of Bundelkhand Craton showing Proposed Block



1.5.3 The structural grain of the Bundelkhand Massif is manifested by emplacement of various rock types like quartz reefs and mafic dykes. Also structures like fold, fault, shearing is present in Older Metamorphics as well as Bundelkhand Granite. Polyphase banded gneisses of Bundelkhand Gneissic Complex (BGC) show early tight to isoclinals and reclined folds (f1) which are refolded by reclined folds (F2) that are coaxial and coplanar with F1 folds. The third set of folds is open to close, disharmonic folds. Superposed fold patterns including hook shapes are common. Subsequent to folding the gneisses have undergone two phases of shearing (Ramakrishna and Vaidyanathan, 2010). The rocks of Bundelkhand metasedimentary and metavolcanics (BMM) are present along Babina-Mauranipur-Mohar Shear zone and generally trending in E-W direction with a dip to the north but at many locations, the rocks strike in NW-SE and NE-SW due to complex schistosity and deformation. The Bundelkhand massif is traversed by two prominent sets of lineaments one having the general NE-SW trend and another trending NW-SE. The NE-SW one is observed as quartz veins and reefs, the NW-SE one as mafic dykes. Joints are developed to various extents in all rock types. In the granites, three set of joints are commonly developed NE-SW, NW-SE and E-W

1.6.0. Geology of the Block

1.6.1. The area exposes enclaves and xenoliths of Gneisses, migmatites, amphibolites schist within the granitic rock. The dominant lithology of the area is granite and coarse grained granite of Bundelkhand Gneissic Complex has the largest areal extent. Porphyritic granite, medium grained granite, fine grained granite and granite gneiss are also present in the area. Large enclaves of amphibolites belonging to Older Metamorphic Group are exposed in midst of the younger granites. Numerous quartz reefs and dolerite dykes are intruding the granitoids. North-East trending quartz reefs and North-West trending basic dykes are quite prominent. Thin dykes of ultramafic, gabbro and thin veinlets of carbonatite and syenite are also present. Pyrite and chalcopyrite disseminations are present. Chalcopyrite may have emplaced along with secondary sericite and quartz bearing vein. Alteration clay has been noticed in a quarry near Sindhur south west of Parara. Alteration is occurring as small pockets at the base of quartz hill west of Barana Tal. Alteration minerals (pyrophyllite, diaspore, chlorite) occurring in vugs, fracture filling and small pockets (at places) are observed in quartz reefs around west of Laron, east of Parara, west of Kachneo, east of Magarpur. Other minerals associated with pyrophyllite are quartz, feldspar, muscovite and kaolinite. Mineral assemblages of quartz reefs show anhedral quartz, sericite, alkali feldspar with opaques. Iron oxide veins and secondary silica veins are seen in the majority of the thin sections. The alteration has taken place along the shear planes. Iron oxide veins (may be hematite) are ramifying the rock in a crisscross pattern in thin section. Magnetite is also present.

1.6.2 The targeted quartz reefs are mainly trending NE-SW. The ferruginous quartzite having high specific gravity was folded with bands parallel to S0 or S1 (with dip 80^{o} due to SE). The associated quartz reef has been emplaced in two generations. The pink coarse grained granite gneiss bears orientation of orthoclase feldspar, quartz and mafic minerals. This gneiss outcrop bears two sets of cross cutting joints. The general

orientation of foliation is N60^{o}W S60^{o}E. Another closely spaced gneissic orientation is N10^{o}W-S10^{o}E. This may be accorded to tectonic disturbance or shearing.

Stratigraphic Sequence (After GSI)

	Soil vein
Intrusives	Quartz vein Dolerite/Gabbro dyke Quartz reefs, syenite veins Carbonatite.
Bundelkhand Granite	Fine grained pink granite Medium grained granite Coarse grained pink granite Coarse grained pink porphyritic granite Coarse grained grey granite -grey- Granite gneiss
Older Metamorphics	Amphibolites, Hornblende-biotite schist, Gneiss and migmatite.

1.7.0 Mineral Potentiality based on geology, PGRS data, geophysics etc.

1.7.1 Alteration minerals (pyrophyllite, diaspore, chlorite) occurring in vugs, fracture filling and small pockets (at places) are observed in quartz reefs around west of Laron, east of Parara. Apart from the above Copper sulphides like azurite were seen in quartz reefs south of Laron, while chalcopyrite was seen in E-W trending quartz reef north-east of Parara. Malachite disseminations were observed in quartz reefs south of Laron and north of Baron. All the evidences include field observation were shown by GSI during their campaign for Hyperspectral / Multispectral Remote Sensing techniques towards Mapping of Alteration / Mineralized Zone. However, the quartz veins/reef occurring in Bundelkhand Massif are one of the important loci akin for base metals mineralization. Based on the evaluation of previous work and rock formations in the area the present Reconnaissance Survey program at G-4 level has been proposed for Copper, Lead, Zinc and Gold in block area.

1.8.0 Previous Work

1.8.1 The Bundelkhand area is referred by Medlicott (1859) who mapped in various parts of the present Madhya Pradesh between 1860 and 1869. Oldham (1859), Hacket (1870) and Mallet (1872) mapped the granite and gneissic rocks of Bundelkhand province as Bundelkhand Granite. The word “Bundelkhand Gneiss” was coined by Dr. A. M. Heron (1935), who considered it as the oldest rock of Archaean age and correlated it with Banded Gneissic Complex and Berach Granite of Rajasthan. The term “Bundelkhand Gneiss” was later modified by Mishra (1949), Mishra and Saxena (1955) as Bundelkhand Granite and associated rocks. These workers are of the opinion that the Bundelkhand Granite is a hybrid rock formed due to intermixing of the pre-existing formation with later granites. Later, Mishra and Saxena (1955), Mathur and Iqbal (1975) in course of mapping in Pungwan-Salaiya-Bhusor-Jamtoli area identified the rocks belonging to granite-granodiorite family older than the Bundelkhand Granite. Jhingran and Puri (1956) studied the Bundelkhand Granite in detail. They described that Bundelkhand Granite is dominantly granodiorite in composition, grading locally into adamellite. They favoured that granite has evolved from anatexis, palingenesis and metasomatism process. Mathur (1954), Saxena (1957), Mishra and Saxena (1955)

concluded that the Bundelkhand granite is of metasomatic origin. Mishra and Sharma (1974-1979) suggested an anatectic model of evaluation of granite and also worked on the origin of quartz reefs, pyrophyllite and diaspore. Sisodiya (1979-80) also worked on these pyrophyllite and diaspore deposits. Other geological investigations relating to minerals etc., in the Bundelkhand area were also carried out by GSI workers viz. Chatterjee (1941-42), Mehta (1944-45), Krishnaswamy (1945-46) and Roy Chowdhury (1947-48). The appraisal was conducted by K.K. Srivastava, A.K. Basu, and Amitava Mukherjee during the field season 1969- 70. Base metal investigation in Bundelkhand area has been carried out in Tikamgarh and Chhatarpur area by M. Mani (1971-72) and Mathur and Mahapatra (1975-76).

1.8.2 Gurusiddappa et al. (1984-85), reported specks, stringers and thin veinlets of pyrite, chalcopyrite, covellite along the joints and minor fracture planes within the grey-gneisses. Indications of specks and stringers of pyrite and chalcopyrite with stains have been reported within the medium-grained pink rock. The authors also reported diaspore and pyrophyllites occurring in the form of pocket deposits along quartz reefs trending northeast with fracture plane within metasedimentary rocks along these reefs cutting across. Few pockets of kaolin occur within the area due to alteration of feldspars. Large scale mapping and base metal exploration for an area of 600 sq.km of Bundelkhand granitic terrain in Gwalior district were carried out by Chellani and Chakraborty (2001). The chemical analysis of chip samples collected across shear zones/ lineaments at regular intervals indicate a relatively good mineralisation near Lakhnauti but poor mineralisation near Barera, Bilua, Antri and Aniti. Large scale geological mapping and analysis of channel samples collected from 800m long, 4-6m wide NNE-SSW trending shear zone revealed average copper assay value of 2100 ppm average assay width of 2.49m. The maximum value of copper mineralisation was 5625 ppm. Vikash Kumar Suman and Asrar Ahmad (2015-16) reported the presence of specks of sulphide near Sokra village during STM. Large scale mapping on 1:12,500 scale was carried out in parts of Gatholi Kalan, Dongra Khurd, Pyasa, Kusmar, Baron, Gona, Uldana Kalan and Saidpur areas. The pyrophyllite was observed within the groundmass of quartz-sericite-pyrophyllite schist affected by hydrothermal activity due to the intrusion of quartz veins. During the F.S. 2016-2018, GSI carried out Application of Hyperspectral / Multispectral Remote Sensing techniques to prepare Alteration / Mineralized Zone in Tikagarha and Jhansi Districts of Madhya Pradesh and Uttar Pradesh respectively. Sulphide and carbonate minerals, such as pyrite, chalcopyrite, azurite and malachite respectively, have been identified during the field work near Laron, Murara, Parara, Kumarpura, Sakera and Baron.

2.0.0 Observation and Recommendations of previous work

2.0.1 During the F.S. 2016-2018, GSI carried out Application of Hyperspectral / Multispectral Remote Sensing techniques towards Mapping of Alteration / Mineralized Zone, was prepared using Landsat8 OLI and ASTER multispectral image applying different image processing techniques like band ratio and principal component transformation (PCT), Relative Band Depth (RBD) analysis. A probable alteration zone map of the study area was prepared using Landsat 8 OLI data performing band ratio and principal component transformation to highlight the hydroxyl and iron oxide bearing minerals. Prior to that, the ASTER data was studied

in different band combinations and stretched. The intersection of aeromagnetic break lines along with alteration zones and sulphide minerilization are mostly falling within the area of High magnetic & Low gravity anomaly field. During ground validation in the area, advance argillic zone like Pyrophyllite mineral is observed from Laron adivasi, Laron, Ayara, Parara and Barana villages, on the basis of field observation and collected field & lab spectrum of rock samples. Sulphide and carbonate minerals, such as pyrite, chalcopyrite, azurite and malachite respectively, have been identified during the field work near Laron, Murara, Parara, Kumarpura, Sakera and Baron based on field observation. Thin section studies corroborate occurrence of Chalcopyrite in quartz studied near Parara and Baron. Aluminium is very low i.e., 3.23%, iron content is high (32.70%) and manganese (3.23%) in quartz of Chandera. The high iron and manganese content may have been added by late stage hydrothermal fluids. Quartz-sericite-pyrite type alteration is the most widespread in the study area, which at places are associated with epidote, chlorite and clay minerals like pyrophyllite, diaspore, kaolinite, montmorillonite, illite, muscovite and iron alteration minerals.

2.0.2 The granite is always known to bear sulphide mineralization in disseminated form. Bundelkhand Craton hosts extensive granitoids. After the emplacement of the younger granites of Bundelkhand massif, the residual fluids after assimilation of hot water were emplaced as giant quartz veins. The residual magmatic liquid hosts various sulphides. These sulphides when reacts with hot aquatic fluids results in the formation of hydro-sulphate. Hydro-sulphate fluids accumulate disseminated metallic phases and reduce them to sulphides like chalcopyrite and chalcocite. These were emplaced along with the quartz reefs. Secondary phases of hydrothermal activities, the Cu-sulphides were altered to malachite. The thin veneer of soil covering pediment areas may contain some clay which is picked up in alteration maps. The areas with granitoids as lithology are always known to be hosting syn hydrothermal or post hydrothermal activities resulting in mineral assemblages like epidote and chlorite. These minerals are also part of propyllitic alteration zone.

2.0.3 Principal component analysis (PCA) method using ETM+ data which is highlighting the copper minerals, as bright pixels in the image and were validated in and around Jyar, Laron, Parara, Baron, Sakera and Bari villages, where geophysical data showing strong aeromagnetic and high magnetic & low gravity anomaly. This clearly indicates that the area under study is not barren and these hydrothermal systems might be associated with sub surface mineralisation which (barring a few locations) might not have been exposed at many places. In view of the above, some areas have been identified for carrying out the further exploration

2.0.4 Further geological and geophysical studies may be launched/proposed for taking up exploration near Sanori, Birdha, an area where the evidence of sulphide mineralisation like pyrite, chalcopyrite, chalcocite and covellite etc. are observed. Also, quartz reefs near Tarichar Khurd, Karguwan, Laron, Murara, Parara, Biraro Khas, Kumarpura, Sakera and Baron may be considered for further exploration as sulphide such as pyrite, chalcopyrite and carbonate mineral like malachite have been identified during the field work. Out of these areas Tarichar Khurd, Laron, Baron and Parara are strongly recommended for further studies. In view of the field evidences on sulphide mineralisation collected from the Sanori, Birdha, Karguwan, Laron, Murara, Parara, Biraro Khas, Kumarpura, Sakera and Baron area it is proposed to carry out geophysical

survey especially electromagnetic, SP, IP and resistivity survey which might give some clue in identification of subsurface mineralised zones conductive zones if any.

2.0.5 Pyrophyllite and Diaspore are constituents of alteration assemblages associated with many porphyry sulphide deposits of the world like Kennard, Kazakhstan, El Salvador and Malanjkhand. Therefore, it is proposed to carry out geophysical survey especially electromagnetic, SP, IP and resistivity survey might give some clue in the identification of subsurface mineralised zones.

3.0.0 Scope of Proposed Exploration

3.0.1 The Reconnaissance survey at G-4 stage proposed exploration program comprises of Geological mapping (1:12,500 scale), Surface sampling (Bedrock, soil, stream sediment), Trenching, Geophysical survey, drilling of 5 Nos of scout boreholes involving about 500m drilling with associated survey, chemical analysis, physical analysis and Report preparation.

3.1.0 Block description

3.1.1 The Laron block falls in Survey of India Toposheet No. 54K/16 and covers an area of about 45.00 sq.km. The villages in and around the blocks are Parara, Laron, Katera, Bhata and Nuna of Jhansi District of Uttar Pradesh State. The block location is given in **PLATE-I.** The Co-ordinates of the corner points of the block is given in **para 1.3.1**.

4.0.0 Planned Methodology

4.0.1 In accordance to the objective set for the block, the exploration programme is proposed. The Exploration shall be carried out as per Minerals (Evidence of Mineral Contents) Rules-2015 and Minerals (Evidence of Mineral Contents) Amendment Rules-2021. The details of different activities to be carried out are presented in subsequent paragraphs:

4.1.0 Geological Mapping (1:12,500 Scale)

4.1.1 Geological Mapping will be done in the entire 45.00 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 the map.

4.2.0 Geochemical Sampling

4.2.1 Surface sampling (Bed Rock /Stream sediment):

During the course of Geochemical Sampling the bed rock samples shall be collected from the outcrops along with soil and stream sediment samples. A total of 160 no of primary samples from bed rock/soil/stream sediment (from ultramafic rocks) will be collected and analysed for assay of Cu, Pb & Zn. Total 24 no of check samples (5% internal + 10% external) will also be analysed for assay of Cu, Pb & Zn. A total of 60

no of primary samples from bed rock/soil/stream sediment (from ultramafic rocks) will be collected and analysed for assay of Au. Total 9 no of check samples (5% internal + 10% external) will also be analysed for assay of Au.

4.3.0 Surveying:

4.3.1 The block boundary will be surveyed by DGPS and total station in WGS-84 datum for demarcation of block boundary points. Survey party will be associated with channel sample collection for taking up the location of sample points and plotting it on the map for proper interpretation of the sample data. Survey party will also update the surface features in the block. During drilling, scout borehole fixation and determination of reduced level and co-ordinates of the boreholes only will be undertaken.

4.4.0 Geophysical Survey:

4.4.1 Based on the analytical values of geochemical samples, Geophysical Survey is proposed to know the geology and geological settings of the area, variation of conductivity, resistivity and magnetic properties of the host rock. So integrated Geophysical Surveys consisting of Induced Polarization (I.P), Magnetic and Time Domain Electromagnetic have been planned to carry out in proposed area. The survey has been planned in a grid pattern of 20m x 200m for Induced polarisation & Magnetic and 40 x 200m for Electromagnetic (EM). The profile lines will be laid in East – West direction which is almost perpendicular to the strike direction of the area. A total of 51.9 line km of I.P, 2643 station of Magnetic and 1322 Soundings / profiling of Time Domain Electromagnetic have been planned. The Approximate time period to conduct the survey will be around 5 months (4 months for acquiring data and 1 month for processing and interpretation).

4.5.0 Exploratory Mining (Trenching/Pitting)

4.5.1 Shallow trenching (Excavation) shall be carried out in the Cu, Pb, Zn & Au anomaly zones identified based on the results of geochemical sampling and Geophysical Studies. A provision of shallow trenching on mineralized zones (if any) (1m wide X 2m deep) with 600 cubic meters is kept. Trenching will be carried out on surface up to a depth of maximum 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 Cu, Pb, Zn & Au anomaly zones identified and field observations. A provision of 400 no of primary & 60 no of check (5% internal+10% External) trench/channel samples are kept for analysis of Cu, Pb & Zn. Another provision of 110 no of primary & 17 no of check (5% internal+10% External) trench/channel samples are kept for analysis of Au. The trench walls will be mapped on 1:200 scale.

4.6.0 Core Drilling:

4.6.1 Based on the results of trench samples, the extension of the mineralized zones (ore bodies) will be marked. To find out the continuity of mineralized zones in strike & dip direction, 5 no scout boreholes involving 500m of drilling will be carried out for upper (first) level of intersection of mineralized zones. 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.

4.7.0 Drill Core Logging:

4.7.1 The drill core will be logged for rock types, structural features, textures, intersection of ore zones, types of mineralization and occurrence of various ore minerals. The logging for determination of Rock Quality Designation/determination (RQD) will also be undertaken.

4.8.0 Drill Core Sampling:

4.9.1 During geological logging of drill core, mineralized zone will be marked on basis of concentration of ore minerals and lithology. Total 150 no of primary and 23 no of check (5% Internal Check+10% External Check) samples will be analysed for Cu, Pb & Zn. Total 60 no of primary and 9 no of check (5% Internal Check+10% External Check) samples will be analysed for Au.

4.9.0 Whole Rock Analysis:

4.9.1 Whole Rock analysis for SiO_2, Al_2O_3, Fe_2O_3, TiO_2, MnO, CaO, Na_2O, K_2O+H_2O, MgO, P_2O_5, CO_2, & S radicals will be carried out on 10 Nos samples to check the rock types, their variation in chemical composition.

4.10.0 Petrological & Mineralogical Studies:

4.10.1 During the course of Geochemical sampling and core logging 30 samples from various litho units from surface and in borehole cores will be studied for petrography in thin section and 30 samples from mineralized zones will be studied for the mineragraphy (ore mineral assemblages and their distribution, alteration, enrichment etc.) in polished sections.

4.11.0 Specific Gravity Determination:

4.11.1 The specific gravity will be determined for 20 samples from the mineralized zones intersected in the boreholes in Petrology laboratory of MECL.

4.12.0 ICP-MS studies (34 Trace elements):

4.12.1 A total of 20 Nos of composite samples shall be subjected for the study of trace elements (34 elements) by ICP-AES/ICP-MS method

5.0.0 Nature, Quantum and Target

5.0.1 Details of the particular, quantum and the targets are tabulated in **Table No.-2.**

Table No-2
Envisaged Quantum of proposed work in Rangapura Block

Sl. No.	Item of Work	Unit	Target
1	**Remote Sensing (Satellite Imagery) study**	Sq km	45.00
2	**Geochemical Sampling (Bed Rock/Soil Sample/Stream sediment)**		
	a) For Cu, Pb, & Zn	Nos.	160
	b) For Au	Nos.	60
3	**Geophysical Survey***		
	a) Magnetic	Nos. of Stations	2643
	b) Electro Magnetic sounding	Nos. of Stations	1322
	c) I.P	Line Km	51.9
4	**Trenching***	Cu m	600
5	**Drilling (coring)****		
	a) Drilling	m	500
6	**Laboratory Studies**		
	I. Geochemical Sampling (Bed Rock/Soil Sample/Stream sediment)		
	i) Primary Samples		
	a) For Cu, Pb & Zn	Nos	160
	b) For Au by fire assay	Nos	60
	ii) Check Samples (5% Internal + 10% External)		
	a) For Cu, Pb & Zn	Nos	24
	b) For Au by fire assay	Nos	9
	II. Trench Samples		
	i) Primary Samples		
	a) For Cu, Pb & Zn	Nos	400
	b) For Au by fire assay	Nos	110
	ii) Check Samples (5% Internal+10% External)		
	a) For Cu, Pb & Zn	Nos	60
	b) For Au by fire assay	Nos	17
	III. Drill Core Samples		
	i) Primary Samples		

Sl. No.	Item of Work	Unit	Target
	a) For Cu, Pb & Zn	Nos	150
	b) For Au by fire assay	Nos	60
	ii) Check Samples (5% Internal+10% External)		
	a) For Cu, Pb & Zn	Nos	23
	b) For Au by fire assay	Nos	9
	vi) Composite Samples *		
	a) For Cu, Pb, Zn, Co, Ni	Nos	20
	b) For Au by fire assay	Nos	20
7	**Physical Studies**		
	a) Trace elemental Studies (34 elements) By ICP-MS	Nos.	20
8	**Petrological Samples (Surface & BH Core Samples)**		
	a) Preparation of Thin Section	Nos	30
	b) Study of Thin Section	Nos	30
9	**Mineragraphic Studies (Surface & BH Core Samples)**		
	a) Preparation of Polished Section	Nos	30
	b) Study of Polished Section	Nos	30
10	**Whole Rock Analysis**		
	For SiO_2, Al_2O_3, Fe_2O_3, TiO_2, MnO, CaO, Na_2O, K_2O+H_2O, MgO, P_2O_5, CO_2, & S.	Nos	10
11	**Specific Gravity Determination**	Nos.	20
12	**Report Preparation (5 Hard copies with one soft copy)**	Nos.	1
13	**Preparation of Exploration Proposal (5 Hard copies with a soft copy)**	Nos.	1
* **The work to be decided after review of Geological Mapping & surface Sampling**			
** **The work to be decided after review of Geophysical Survey & Trench Sampling**			

6. 0.0 Manpower Deployment

6.0.1 Manpower deployment List may be provided later.

7.0.0 Break-up of Expenditure

7.0.1. 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 and the total estimated cost is **Rs. 705.24 Lakh.** The summary of tentative cost estimates for Reconnaissance Survey (G-4 Level) is given in **Table No.- 3** and details of tentative cost estimates is given in **Table No. – 4.**

Table No- 3
Summary of Tentative Cost Estimates for Reconnaissance Survey (G-4 Level) Exploration

Sl. No.	Item	Total
1	Geological Work	4,752,060.00
2	Pitting & Trenching	1,980,000.00
3	Geophysical Survey	38,408,119.00
3	Drilling	7,525,400.00
4	Laboratory Studies	4,982,561.00
	Sub total	**57,648,140.00**
5	Report	1,729,444.20
6	Peer Review	10,000.00
7	Proposal Preparation	380,000.00
	Total	**59,767,584.20**
8	GST (18%)	10,758,165.16
Total cost including 18% GST		**70,525,749.36**
SAY, in Lakhs		**705.26**

7.0.2 The proposed exploration programme envisages geological mapping, surface sampling, geophysical survey, trenching, scout drilling, sample preparation and laboratory studies, which will be completed within 16 months, geological report preparation will take 3 months, peer review will take 1 month with one month overlapping with lab works. Therefore, a total of 19 months is planned for completion of the entire proposed programme. Tentative Time schedule/action plan for proposed Reconnaissance Survey (G-4) for Copper, Lead, Zinc and Gold is given in **Table No.-5.**

8. Justifications:

i) During the F.S. 2016-18 (Trina V. Vyas et. al.), Application of Hyperspectral / Multispectral Remote Sensing techniques towards Mapping of Alteration / Mineralized Zone and Building up of Spectral Library in parts of Bundelkhand Gneissic Complex, Tikamgarh and Chhatarpur districts, Madhya Pradesh and Jhansi district, Uttar Pradesh carried out by GSI to established mapping of alteration / mineralized zones using ASTER & Landsat 8 (OLI) data and field studies in Bundelkhand Massif. In this study they mentioned that presence of copper mineralisation like azurite were seen in quartz reefs south of Laron, while chalcopyrite was seen in E-W trending quartz reef north-east of Parara and NE-SW tending reef north of Baron. Malachite stains were observed in quartz reefs south of Laron. Sulphide mineralization (azurite, chalcopyrite and other Cu sulphides) and malachite stains were observed in brecciated quartz based on field observation. Principle component analysis (PCA) method using ETM+ data which is highlighting the copper minerals, as bright pixels in the image and were validated in and around Jyar, Laron, Parara, Baron, Sakera and Bari villages, where geophysical data showing strong aeromagnetic and high magnetic & low gravity anomaly. This clearly indicates that the area under study is not barren and these hydrothermal systems might be associated with sub surface mineralisation which (barring a few locations) might not have been exposed at many places. In view of the above, some areas have been identified for

carrying out the further exploration. **Based on the potentiality of the block, GSI strongly recommended for further exploration studies in these areas.**

ii) Based on the evaluation of previous work, the present Reconnaissance Survey program at G-4 level has been prepared. The Geological Mapping combined with surface sampling and Geophysical Survey will be helpful in assessing the disposition of the mineralized zones, structural features like shears and faults if any.

iii) The Exploration will be helpful in estimation of reconnaissance resources of Copper, Lead, Zinc and Gold in the block.

iv) The Reconnaissance Survey will help in planning of detailed exploration program (in case upgraded to G-3/G-2 level) which in turn will facilitate the state Government for Action of Block.

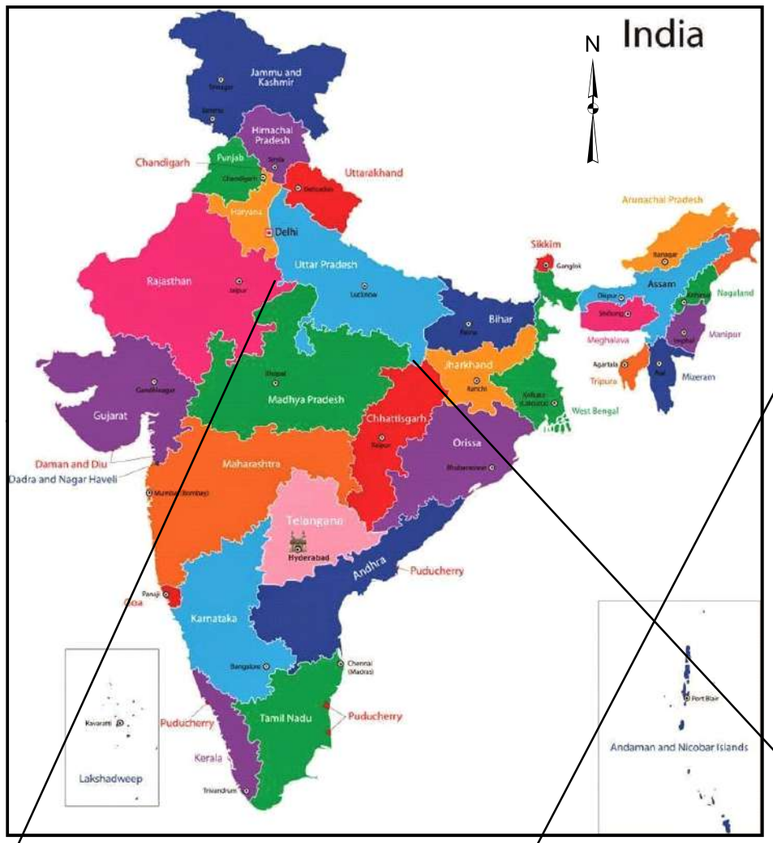
9. References:

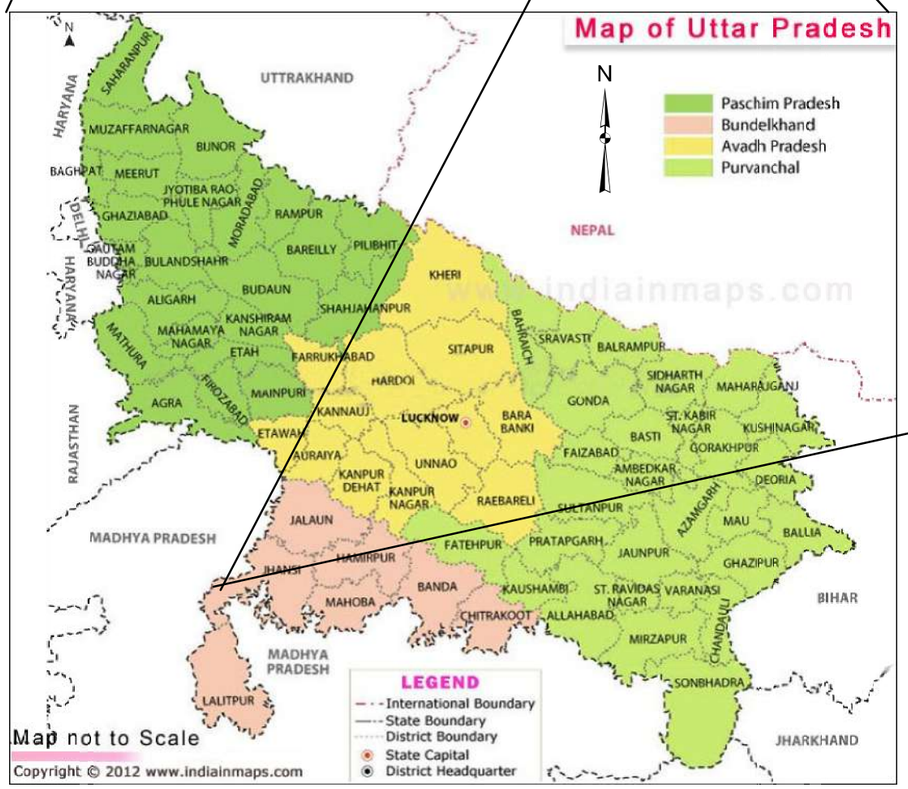
1. Mukherjee A. (1974): Geology of parts of Khajraha, Maror, Jhansi district, Uttar Pradesh and Tikamgarh district, Madhya Pradesh; Unpublished Reports, GSI, FS – 1973-74.
2. Saxena, M. N. (1961): Bundelkhand granites and associated rocks from Kabrai and Mauranipur areas of Hamirpur and Jhansi dist. V.P. India; Research Bull. (N.S.) of the Punjab University, v. 12, pp. 85-107
3. Trina V. Vyas et. al. (2018): Application of Hyperspectral / Multispectral Remote Sensing techniques towards Mapping of Alteration / Mineralized Zone and Building up of Spectral Library in parts of Bundelkhand Gneissic Complex, Tikamgarh and Chhatarpur districts, Madhya Pradesh and Jhansi district, Uttar Pradesh.

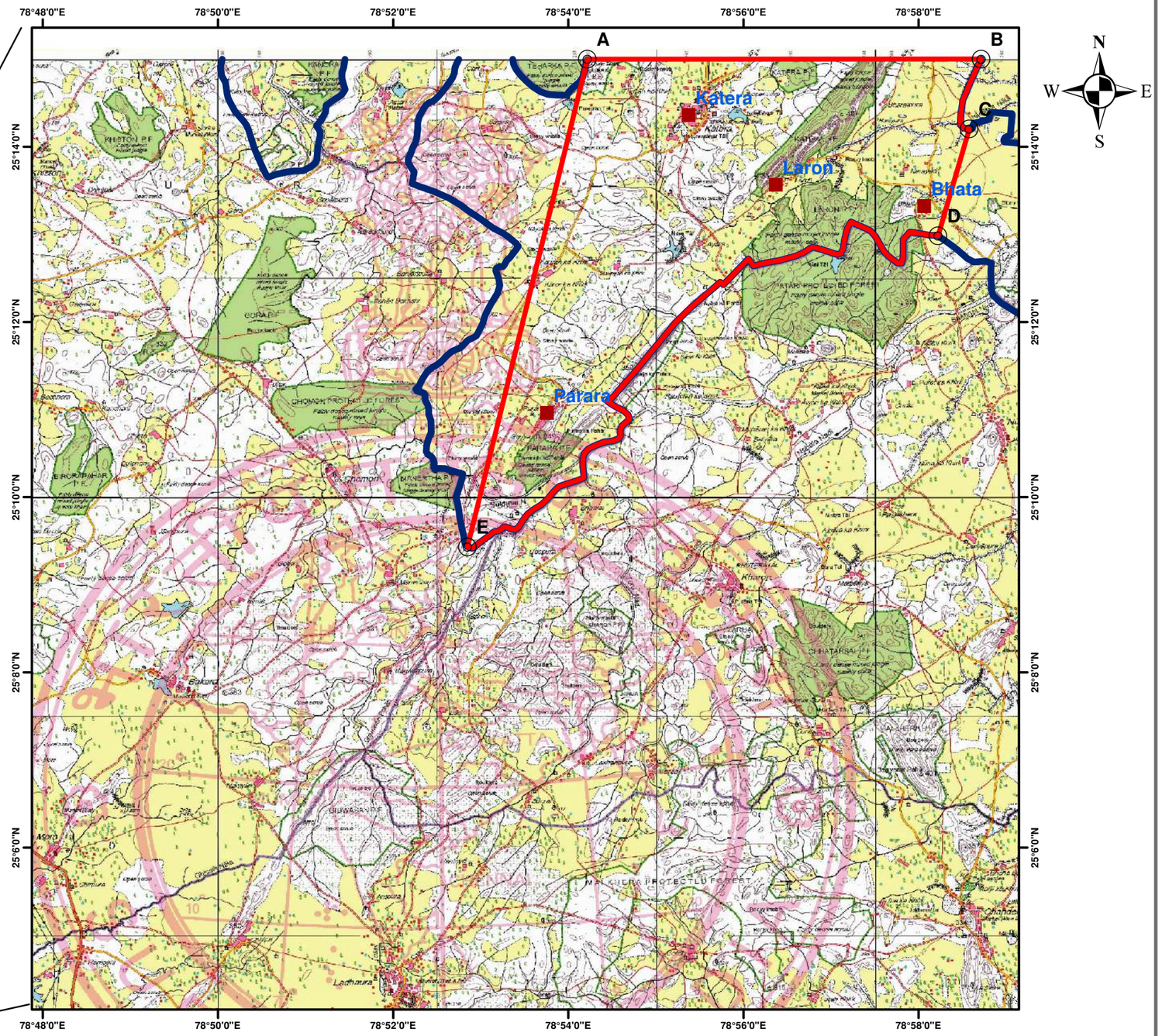
List of Plates:

1. **Plate-I: Location Map of Laron Block, District Jhansi, Uttar Pradesh.**
2. **Plate-II: Regional Geological Map showing Laron Block (Source: Bhukosh), Jhansi District, Uttar Pradesh**

LOCATION MAP OF LARON BLOCK (45 Sq. Km.), DISTRICT- JHANSI, UTTAR PRADESH







BB POINT	LONGITUDE	LATITUDE
A	78° 54' 13.0893" E	25° 14' 59.9315" N
B	78° 58' 42.8811" E	25° 15' 00.0356" N
C	78° 58' 34.7954" E	25° 14' 12.1729" N
D	78° 58' 13.3562" E	25° 12' 58.9486" N
E	78° 52' 50.9459" E	25° 09' 26.0193" N
B to C	Along the State Boundary Between M.P. and U.P.	
D to E		

(Part of Toposheet No. 54K/16)

1.5 0.75 0 1.5 3 4.5 6
Kilometers

Plate- I

मिनरल एक्सप्लोरेशन कार्पोरेशन लिमिटेड
MINERAL EXPLORATION CORPORATION LTD.
Govt of India Enterprise, A miniratna PSE
MECL

Regional Geological Map of Laron Block, Jhansi, U.P.

78°45'0"E 78°50'0"E 78°55'0"E 79°0'0"E

25°20'0"N 25°15'0"N 25°10'0"N 25°5'0"N 25°0'0"N

N W E S

Murara
Nivari
Katera
Laron
Bhata
Parara
Birora Khas
Baron
Kuwanpura
Sakera
Siaoni
Parakhera
Jeora Mora
Ladhaura
Gotet
Chandera

A B C D E

Kilometers

Part of Toposheet No.: 54K/15 & 54K/16

Plate- II

LEGEND

- ALLUVIUM
- AMPHIBOLITE
- COARSE GRAINED, PORPHYRITIC GRANITE
- FINE GRAINED GRANITE
- MEDIUM GRAINED GRANITE
- SAND/CHANNEL ALLUVIUM
- CLEAVAGE/FOLIATION/SCHISTOSITY (S1)
- JOINT
- Shear_Zone
- Dyke
- Proposed Block Boundary_54K_16_UP
- BB POINT_54K_16_UP