PROPOSAL FOR PRELIMINARY EXPLORATION (G-3) FOR ALUMINOUS LATERITE, TITANIUM (Ti O_2), VANADIUM (V), GALLIUM (Ga) AND ASSOCIATED MINERALS IN SANSARPUR BLOCK (7.19 SQ KM), DISTRICT-KATNI, MADHYA PRADESH

COMMODITY: ALUMINOUS LATERITE, TITANIUM (TiO_2), VANADIUM (V), GALLIUM (Ga) AND ASSOCIATED MINERALS

BY

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PLACE: NAGPUR

DATE: OCTOBER, 2025

SUMMARY OF THE BLOCK FOR PRELIMINARY EXPLORATION (G-3 STAGE) FOR ALUMINOUS LATERITE, TITANIUM (Ti O_2), VANADIUM (V), GALLIUM (Ga) and ASSOCIATED MINERALS IN SANSARPUR BLOCK (7.19 Sq Km), DISTRICT-KATNI, MADHYA PRADESH

GENERAL INFORMATION ABOUT THE BLOCK

	Features	**Details**
	Block ID	Sansarpur G-3 Block
	Exploration Agency	Mineral Exploration and Consultancy Limited (MECL)
	Commodity	Aluminous Laterite, Titanium (Ti O_2), Vanadium (V), Gallium (Ga) and associated minerals
	Mineral Belt	Mahakoshal
	Completion Period with entire Time schedule to complete the project	12 Months
	Objectives	i. Geological mapping and Topographic Survey on 1:4000 scale. ii. To carry out surface sampling (BRS/Channel) and trenching to establish strike continuity, wherever it is required. iii. To take up exploratory drilling to confirm the strike and depth continuity of ore zones up to 40m vertical depth at 400m spacing. iv. To establish the inferred resources (333) for Aluminous Laterite, Titanium (Ti O_2), Vanadium (V), Gallium (Ga) and associated minerals as per UNFC norms & Minerals (Evidence of Mineral Contents) Rules- 2015.
	Whether the work will be carried out by the proposed agency or through outsourcing and details of the outsource agency	Geological mapping, Surface sampling, Trenching, drilling and chemical analysis will be carried out by the proposed agency.
	Name/ Number of Geoscientists	Two nos. of Geoscientist (1 Field + 1 HQ)
	Expected Field days (Geology) Geological Party Days	Geologist Party Days: 150 Days (Field) Geologist Party Days: 60 Days (HQ)

1	**Location**	
	The coordinates of the corner points of the proposed Sansarpur G-3 Block are as follows:	

Block Boundary Co-ordinates of Sansarpur G-3 Block, District - Katni, Madhya Pradesh, Area 7.19 sq km, (Toposheet No. 64A06)

Points	DD MM SS.SS		UTM (44N)	
	Lattitude (N)	Longitude (E)	Easting (m)	Northing (m)
A	23° 39' 15.89" N	080° 18' 9.21" E	428873.0373	2616139.771
B	23° 38' 57.85" N	080° 20' 50.09" E	433428.1208	2615563.421
C	23° 38' 23.91" N	080° 20' 50.35" E	433430.8445	2614519.613
D	23° 38' 7.02" N	080° 19' 42.15" E	431496.1503	2614009.233
E	23° 38' 27.62" N	080° 18' 4.85" E	428742.4751	2614656.11

	Villages	Rituwa, Sansarpur
	Tehsil	Bahoriband and Dhimarkheda
	District	Katni
	State	Madhya Pradesh
2.	**Area (hectares/ square kilometers)**	
	Block Area	7.19 sq km
	Forest Area	
	Government Land Area	Data Not Available
	Private Land Area	Data Not Available
3.	**Accessibility**	
	Nearest Rail Head	Katni Junction of West Central Railway Main line is located 21 km away in NNE direction from the proposed Block
	Road	The proposed block is well connected via NH-30 connecting Sihora to Sleemanabad and via Ligri-Rituwa-Sansarpur Road.The block can also be reached via Sleemanabad—Bandhi-Rituwa Road. The Highway NH-30 runs SW-NE and is about 4 km in the west from the western margin of the proposed block.
	Airport	Jabalpur in SW Direction, about 66 km from the block area
4	**Hydrography**	
	Local Surface Drainage Pattern (Channels)	The drainage pattern in the block is dendritic. General flow direction of the area is towards NE. Bijnaura Nadi, flows towards NE direction within the block.
	Rivers/ Streams	The drainage system of the proposed area part of Bijnaura River.Katni River shed etc.
5	**Climate**	

	Mean Annual Rainfall	Average annual rainfall is 900 mm The climate of the area is mainly tropical with clearly defined dry and rainy seasons. The humidity is generally low except during the monsoons.
	Temperatures (December) (Minimum) Temperatures (June) (Maximum)	Minimum temperatures 10°C Maximum temperatures up to 45°C
6	**Topography**	
	Toposheet Number	Part of SoI Topo sheet no. 64A06.
	Physiography of the Area	The topography in the proposed block is moderate to flat with occasional undulation indicating an overall slope towards NE. Maximum Elevation 478m –in the SW Minimum Elevation 426m – in the NE
7	**Availability of baseline geosciences data**	
	Geological Map (1:50K/ 25K)	1:12,500 (LSM map, Tikariya G-4 block, MECL, 2015) 1: 50,000 (LSM Map, Bhukosh)
	Geochemical Map	NGCM Data is available in NGDR. Previous geochemical sample analysis data were used to plan G3 level exploration in the area.
	Geophysical Map	NGPM Data is available in NGDR
8.	**Justification for taking up Reconnaissance Survey / Regional Exploration**	1. MECL (2024-25) conducted G-4 exploration in Tikariya G-4 block for over an area of 58.7 sq km and carried out Geological Mapping(1:12,500scale), Channel sampling, Trenching and drilling by 12 scout boreholes. The proposed block lies in the western part of the Tikariya G-4 block in which following Reconnaissance resources (334 category) has been reported –

Particulars	Reconnaissance Resource (mT)	Average Grade
Aluminous Laterite (Al□O□)	14.81	26.30%
Titanium (TiO□)	15.45	3.48%
Vanadium (V):	12.32	642.71ppm
Gallium (Ga)	2.44	57.70 ppm

2. Out of 12 boreholes, 10 boreholes have shown promising results. Among 10 positive BH, 5 of them falls in the proposed Sansarpur G-3 block.

BH No.	Zone thickness (m)			
	Al_2O_3 (>20%)	TiO_2 (>2%)	V (>500 ppm)	Ga (>50 ppm)
TKRBH-01	10.00	11.00	11.00	
TKRBH-02	15.00	15.00	15.00	15.00
TKRBH-05	12.00	12.00	14.00	
TKRBH-06	17.00	11.80	14.20	
TKRBH-12	12.15	12.15	12.15	2.00

3. Grade in 5 BH falling in the proposed boreholes ranging as follows-

Particulars	Range
Al_2O_3 (%)	23.60-32.27
TiO_2 (%)	3.01-4.15
V (ppm)	511-766
Ga (ppm)	58-61

4. 5 Boreholes falling in the proposed Sansarpur G-3 block has given following) resources (334 category) –

Particulars	Reconnaissance Resource (mT)	Average Grade
Aluminous Laterite (Al□O□)	8.97	26.35%
Titanium (TiO□)	8.61	3.55%
Vanadium (V):	9.17	646.33ppm
Gallium (Ga)	2.06	58.35ppm

5. On the basis of the above data, the proposed area has been strategically delineated for G-3 stage exploration, targeting Aluminous Laterite, Titanium (TiO_2), Vanadium (V), Gallium (Ga) and associated minerals.

SUMMARY OF THE BLOCK FOR PRELIMINARY EXPLORATION (G-3 STAGE) FOR ALUMINOUS LATERITE, TITANIUM (Ti O_2), VANADIUM (V), GALLIUM (Ga) and ASSOCIATED MINERALS IN SANSARPUR BLOCK (7.19 Sq Km), DISTRICT-KATNI, MADHYA PRADESH

1.1.0 INTRODUCTION

1.1.1 Laterite is a surface formation enriched in iron and aluminium, developed through prolonged and intense weathering of parent rocks under hot and humid tropical conditions. It commonly contains silica as an impurity and often occurs in association with bauxite. With increasing aluminium oxide and decreasing iron oxide content, laterite gradually grades into bauxite. Based on the dominant extractable metal content, laterites are classified into aluminous (bauxite), ferruginous (iron), manganiferous (manganese), nickeliferous (nickel), and chromiferous (chromite) types. Chemically, laterite with Fe_2O_3:Al_2O_3 ratio greater than one and SiO_2:Fe_2O_3 ratio less than 1.33 is termed ferruginous, while that with Fe_2O_3:Al_2O_3 ratio less than one and SiO_2:Al_2O_3 ratio less than 1.33 is termed aluminous.

1.1.2 Economically, laterite is regarded as a polymetallic ore, serving not only as a major source of aluminium but also containing iron, manganese, titanium, cobalt, nickel, and chromium, along with trace elements such as gallium and vanadium, which can be extracted as by-products. In India, laterite deposits are widespread, and almost all bauxite occurrences, except those in Jammu & Kashmir, are associated with laterite. These deposits commonly occur as cappings on hills and plateaus in Madhya Pradesh and other parts of the Deccan Peninsula, ranging from coastal regions to elevations of about 2,000 metres, with thicknesses reaching up to 60 metres.

1.1.3 A detailed exploration programme is essential to identify and evaluate the untapped iron ore resources. These formations, along with aluminous laterites (bauxite), often host economically significant quantities of iron, aluminum, and several associated trace elements of industrial and strategic importance. Systematic geological, geophysical, and geochemical studies, supported by subsurface exploration through drilling, can help delineate the extent, grade, and depth continuity of these resources.

1.1.4 Given the rising domestic demand for iron, manganese, bauxite, and other critical and strategic minerals including Ni, Co, Ti, V, Ga, Sc, REE etc. the discovery and development of new deposits have become increasingly important for ensuring resource security and supporting India’s growing industrial base. Comprehensive exploration will not only augment the national mineral inventory but also aid in identifying zones enriched with by-product elements such as gallium, vanadium, cobalt, and nickel, contributing to the sustainable and diversified utilization of the country's mineral wealth.

1.1.5 The Mahakoshal Supracrustal Belt is well known for its rich mineral potential, hosting occurrences of Iron, Manganese, Gold, Bauxite, Graphite, base metals, Dolomite/Limestone, and several other multi-mineral assemblages. During the year 2024–25, MECL carried out a Reconnaissance (G-4) survey for Iron, Manganese, and associated minerals in the Tikariya Block, Katni district, Madhya Pradesh, covering an area of 58.70 sq. km. The exploration activities included geological mapping on 1:12,500 scale, channel sampling, trenching, and drilling of 12 scout boreholes.

1.1.6 Based on the findings, Reconnaissance Resources (334) were reported for Aluminous Laterite (Al_2O_3), Titanium (TiO_2), Vanadium (V), and Gallium (Ga). Following the positive results of the Tikariya G-4 exploration, two potential blocks — (i) Sansarpur G-3 block (7.19 sq. km) and (ii) Saraswahi G-3 block (6.38 sq. km) — have been delineated in the western part of the Tikariya G-4 area for upgradation to the G-3 level. The present exploration proposal, submitted to the 15th TCC-II of NMET for consideration, aims to evaluate the strike and depth continuity of ore zones containing Aluminous Laterite (Al_2O_3), Titanium (TiO_2), Vanadium (V), Gallium (Ga), and other associated minerals.

1.1.7 With the global shift towards low-carbon technologies, the demand for Strategic andcritical minerals is projected to grow significantly. This rising demand underscores the urgent need for a focused and coordinated national effort to enhance domestic resource identification, assessment, and development, ensuring India's long-term strategic and economic resilience in the global critical minerals landscape.Critical minerals are essential for economic development, technological advancement, and national security. Their significance lies not only in their unique properties but also in their role across a wide array of strategic sectors. However, the limited availability, and the geographic concentration of their extraction and processing, often in a few countries, pose significant supply chain risks and potential disruptions.

1.1.8 The future global economy will increasingly rely on technologies that are mineral-intensive, particularly those involving lithium, graphite, cobalt, titanium, Vanadium, Gallium, Scandium, Rare earth elements (REEs) etc.. These minerals are fundamental to sectors such as high-tech electronics, telecommunications, transportation, defense, and most critically, to clean energy technologies needed for the global transition to a low-carbon economy.

1.1.9 As more countries commit to achieving Net Zero emissions, the demand for critical minerals is expected to surge. Therefore, it has become imperative to identify, assess, and develop resilient and sustainable value chains for minerals deemed critical to India's economic sovereignty, technological progress, and climate goals.

1.1.10 Taking into account key parameters such as domestic resource and reserve position, production trends, import dependency, strategic importance for future technologies and clean energy, and the role of fertilizer minerals in an agrarian economy, the Ministry of Mines (June 2023) constituted a Committee to identify minerals critical to India's national interest. Based on this comprehensive assessment, the Committee identified a list of 30 critical minerals vital for ensuring economic security, technological advancement, and energy transition:

Antimony, Beryllium, Bismuth, Cobalt, Copper, Gallium, Germanium, Graphite, Hafnium, Indium, Lithium, Molybdenum, Niobium, Nickel, Platinum Group Elements (PGE), Phosphorous, Potash, Rare Earth Elements (REEs), Rhenium, Silicon, Strontium, Tantalum, Tellurium, Tin, Titanium, Tungsten, Vanadium, Zirconium, Selenium, and Cadmium.

1.1.11 This critical mineral list serves as a strategic framework for resource prioritization, exploration planning, supply chain security, and policy formulation in alignment with India's long-term economic and energy goals.

(Source: "Critical Minerals for India", Report of the Committee on Identification of Critical Minerals, Ministry of Mines, June 2023).

1.1.12 The Mines and Minerals (Development and Regulation) Amendment Act, 2023 (dated 9th August 2023) introduced "Part D – Critical and Strategic Minerals" in the First Schedule of the Act. A total of 24 minerals have been officially notified as Critical and Strategic Minerals under this amendment.REE is also included in the list.

Sr. No	Mineral	Sr. No	Mineral	Sr. No	Mineral	Sr. No	Mineral
1	Beryl and other beryllium bearing minerals	7	Indium bearing minerals	13	Platinum group of elements bearing minerals	19	Tellurium bearing minerals
2	Cadmium bearing minerals	8	Lithium bearing minerals	14	Potash	20	Tin bearing minerals
3	Cobalt bearing minerals	9	Molybdenum bearing minerals	15	Minerals of 'rare earths' group	21	Titanium bearing minerals and ores (ilmenite, rutile and leucoxene)
4	Gallium bearing minerals	10	Nickel bearing minerals	16	Rhenium bearing minerals	22	Tungsten bearing minerals
5	Glauconite	11	Niobium bearing minerals	17	Selenium bearing minerals	23	Vanadium bearing minerals
6	Graphite	12	Phosphate (without Uranium)	18	Tantalum bearing minerals	24	Zirconium bearing minerals and ores including zircon

Fig 1.1 List of Critical and Strategic minerals included in Part D of the First Schedule of the MMDR Act.

1.1.13 A study conducted by the Council on Energy Environment and Water identified 12 out of 49 minerals that were evaluated as 'most critical' for India's manufacturing sector by Vision 2030 which increases the thrust for exploration of Strategic Minerals, Precious Metals, Platinum Group of Elements by the Government of India.

1.1.14 The "National Critical Mineral Mission" was announced in July 2024 and approved by the Union Cabinet on 29th January 2025. Timeframe has been kept for this mission is 7 Years (from FY 2024-25 to 2030-31). The National Critical Mineral Mission (NCMM) is a strategic initiative by the Government of India aimed at ensuring a secure, resilient, and self-reliant supply chain for minerals vital to the country's economic growth, clean energy transition, national security, and technological advancement. It focuses on the exploration, development, and processing of identified critical and strategic minerals in Schedule I-D of MMDR Act. It promotes private sector participation, international collaboration, and sustainable mining practices. The mission aligns with key national goals like Atmanirbhar Bharat, Viksit Bharat 2047, and Net Zero emissions by 2070.

1.2.0 BACKGROUND

The Government of India has emphasized the importance of exploring additional blocks for strategic and critical minerals across various states to enhance the nation's resource security. In line with this objective, the present proposal for Preliminary Exploration (G-3 stage) aims to assess the potential of Aluminous Laterite (Al□O□), Titanium (TiO□), Vanadium (V), Gallium (Ga), and associated elements in the Sansarpur Block, situated in Katni district, Madhya Pradesh. This proposal is conceived as a spin-off project and an upgradation of the Tikariya G-4 exploration work conducted by MECL during 2024–25, and is being submitted for evaluation under NMET funding and execution.

1.3.0 LOCATION AND ACCESSIBILITY

1.3.1 The block falls in the southern part of Katni District covering parts of Bahoriband and Dhimarkheda tehsils of Madhya Pradesh. The proposed block is well connected by road and rail networks. Katni Junction, located on the West Central Railway main line, lies about 21 km north-northeast (NNE) of the block. The area is accessible via National Highway-30 (NH-30), which connects Sihora to Sleemanabad and runs in a southwest–northeast (SW–NE) direction, approximately 4 km west of the block's western margin. Additional approach routes include the Ligri–Rituwa–Sansarpur Road and the Sleemanabad–Bandhi–Rituwa Road. The nearest airport is at Jabalpur, situated about 66 km southwest (SW) of the block area. The proposed block falls under the parts of Survey of India Toposheet No 64A06 (Plate No I).

1.3.2 The detailed location coordinates of the boundary points are listed in Table 1.

Table 1: Block Boundary Co-ordinates of Sansarpur G-3 Block, District - Katni, Madhya Pradesh (Area 7.19 sq km, (Toposheet No. 64A06)

Points	DD MM SS.SS		UTM (44N)	
	Lattitude (N)	Longitude (E)	Easting (m)	Northing (m)
A	23° 39' 15.89" N	080° 18' 9.21" E	428873.0373	2616139.771
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D	23° 38' 7.02" N	080° 19' 42.15" E	431496.1503	2614009.233
E	23° 38' 27.62" N	080° 18' 4.85" E	428742.4751	2614656.11

1.4.0 PHYSIOGRAPHY, DRAINAGE AND CLIMATE

1.4.1 Topography

The proposed block, falling in the southern part of the Katni district, Madhya Pradesh, forms part of Survey of India Toposheet No. 64A06. The topography of the area is moderate to nearly flat with occasional undulations, exhibiting an overall gentle slope towards the northeast (NE). The elevation ranges from a maximum of about 478 m above mean sea level (MSL) in the southwestern part to a minimum of about 426 m MSL in the northeastern part of the block.

1.4.2 Drainage

The drainage pattern of the area is dendritic, indicating uniform lithology and gentle terrain. The general drainage flow is towards the northeast (NE). The area forms part of the Bijnaura River system, which ultimately contributes to the Katni River watershed. Within the block, the Bijnaura Nadi flows northeastward, acting as the main surface drainage channel.

1.4.3 Climate

The climate of the area is tropical, characterized by distinct dry and wet seasons. The average annual rainfall is around 900 mm, mainly received during the southwest monsoon (June to September). The temperature varies significantly with the seasons — the minimum temperature during winter drops to about 10°C, while the maximum temperature during summer may rise up to 45°C. The humidity remains generally low except during the monsoon period.

1.5.0 FLORA AND FAUNA

1.5.1 The region is known for its diverse flora and fauna, which are typical of the central Indian region. The flora of the area is of the tropical dry deciduous type Noteworthy floral species include Mango (Mangifera Indica), Sal (Shorea robusta), Sagon (Tectona grandis), Mahua (Madhuka latifolia), Tendu (Disaphyros metamoxylon), Imli (Tamarindus indica), Neem (Azadirachta indica), Bamboo (Bambusa vulgaris) and Bel (Aegle marmacas).

1.5.2 Major fauna observed in the block area are boars, Cheetal, Sambar, Rabbits, Snakes and Foxes. Large size scorpians are commonly found here which are almost jet black to brownish black in colour.

2.0.0 REGIONAL GEOLOGY

2.0.1 The central part of the Indian Precambrian Shield is characterized by the presence of two separate crustal provinces; the Northern Crustal Province, which includes the Bundelkhand region, and the Southern Crustal Province, known as Bastar Cratonic Region. The Northern Crustal Province is divided into the Bundelkhand cratonic area and a more extensive zone of accretion to its south, following an ENE–WSW trend, recognized as the Central Indian Tectonic Zone (CITZ).

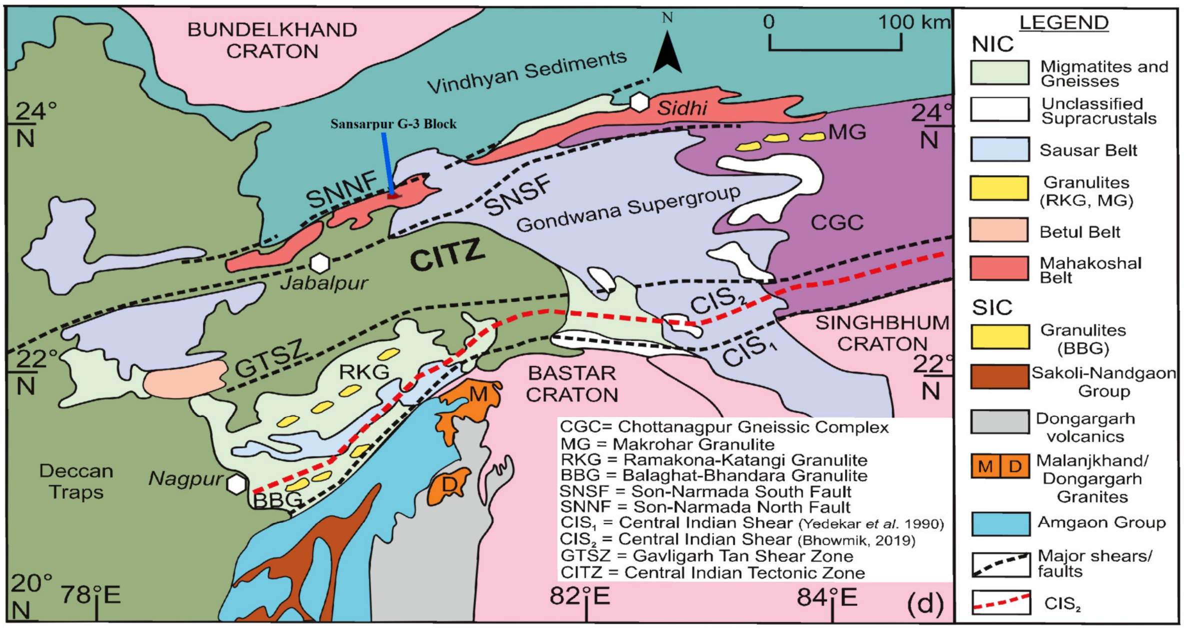


Fig 2.1 Geological map of the CITZ (modified after Deshmukh et al. 2017;Bhowmik, 2019) showing the location of Sansarpur (G-3 stage) Block, Katni, Madhya Pradesh alongwith spatial distribution of discrete lithological domains in the fold belt.

2.0.2 The Southern Crustal Province, also known as the Bastar Crustal Province, represents one of the oldest geological terrains of central India. It is characterized by widely dispersed Archean supracrustal sequences, including the Sukma Group, which forms part of an ancient cratonic nucleus. These supracrustals have undergone significant regional deformation and metamorphism, and are intruded by tonalite-trondhjemite-granodiorite (TTG) rocks older than 3.0 Ga. Younger supracrustals of Neo-Archean to Meso-Proterozoic age form distinct north–south trending volcano-sedimentary belts, intruded by later granitic phases that have reshaped the province's geological framework.

2.0.3 The Bundelkhand Crustal Province forms another major Archean nucleus (>3.0 Ga), represented by a semicircular granite-gneiss massif hosting enclaves of older supracrustals. Its southern and southeastern margins are overlain by the Bijawar Group, comprising metavolcanic and metasedimentary rocks of Paleo- to Meso-Proterozoic age. In the north, the Gwalior Group, temporally equivalent to the Bijawar sequence, occurs as a separate metasedimentary block. The Vindhyan sediments unconformably overlie the Bundelkhand massif's southern and western margins, separating it from the Mahakoshal belt of the Central Indian Tectonic Zone (CITZ) to the south and the Aravalli–Delhi belt to the west, marking a complex and long tectono-stratigraphic history.

2.0.4 The Central Indian Tectonic Zone (CITZ), formerly known as the Satpura Province, forms a major Proterozoic mobile belt (<2.5 Ga) bounded by the Son–Narmada North Fault (SNNF) in the north and the Central Indian Shear (CIS) in the south. It comprises several gneissic and supracrustal belts intruded by K-rich granitic bodies and local TTG remnants. Although much of the basement is concealed beneath Vindhyan, Gondwana, and Deccan Trap cover, three key supracrustal belts are recognized — the Betul (1.55–0.85 Ga), Sausar (1.1–0.95 Ga), and Mahakoshal (2.2–1.8 Ga) belts — separated by ductile to brittle-ductile shear zones such as the SNNF and SNSF.

2.0.5 The Mahakoshal Supracrustal Belt, a prominent component of the CITZ, extends for about 600 km from southwest of Jabalpur (Madhya Pradesh) to Palamau (Jharkhand), trending ENE–WSW to E–W. With an average width of 20 km and covering ~9000 sq. km, it forms a fault-controlled asymmetric rift basin bounded by the SNNF to the north and the SNSF to the south. The present Tikariya G-4 exploration block is situated within this belt. Regional geological mapping of the block (1:50,000 scale) confirms its stratigraphic placement within the Mahakoshal sequence.

2.0.6 To the north, the Mahakoshal belt is bordered by the Vindhyan Supergroup, except near Katni, where Archean basement gneisses intervene. The southern margin of the belt is marked by extensive Proterozoic granitic intrusions, locally in contact with Gondwana Supergroup rocks along the Son–Narmada South Fault. These features highlight the structural complexity and tectonic reworking along the southern CITZ corridor.

2.0.7 Lithologically, the Mahakoshal Group is dominated by metasedimentary rocks such as quartzite, phyllite, pelite, carbonate, greywacke, banded iron formations (BIF), and laterites, along with subordinate metabasalts, ultramafics, acid tuffs, and granitoids. Intrusions of mafic dykes, albitite bodies with alkaline affinity, and minor carbonatite occurrences add to the compositional diversity and metallogenic potential of the region.

2.0.8 Stratigraphically, the Mahakoshal assemblages have been divided into three major formations (Roy & Devrajan, 2000; Nair et al., 1995). The Chitrangi Formation, the lowermost unit, consists of basic and ultrabasic volcanic rocks, including pillow metabasalt, peridotitic lava, and calc-chlorite schist, representing pre-rift volcanic activity in shallow marine to shelf environments. Overlying it is the Sleemanabad (Agori) Formation, comprising clastic and chemical sediments like dolomite, marble, jasperite, BHQ/BMQ, and quartzite, with well-developed depositional structures such as bedding, color banding, and load casts — indicative of restricted rift-related sedimentation.

2.0.9 The Parsoi Formation, forming the youngest unit in the Mahakoshal Group, occupies a wide synclinorial structure in the southern part of the belt. It is characterized by tuffaceous phyllites interbedded with feldspathic quartzites, showing graded bedding, cross-lamination, slump structures, and local carbonaceous bands. Widespread quartz vein intrusions parallel to fold axes mark late-stage deformation. Together, these lithounits chronicle a long and complex history of volcanism, sedimentation, metamorphism, and tectonism within the Mahakoshal belt — an integral segment of the Central Indian Tectonic Zone.

2.0.10 Regional Geology map showing proposed block is given as Plate-II. Generalized regional stratigraphic sequence of Mahakoshal Group alongwith the litho units exposed in the region is given in the Table no 2 below-

Table No 2

Regional stratigraphic succession of Mahakoshal Group, after Nair et. al. (1995)

Group	Formation	Litho units
MAHAKOSHAL GROUP	Vindhyan Supergroup and Jungel Group of Sediments	
	Uncomformable and Faulted Contact	
	Intrusives	Dunite, gabbro, dolerite, quartz- porphyry and quartz veins, syenite and associated alkaline dykes, carbonatites, barite veins and lamprophyres/ trachytes and associated intrusives. Barambaba granite and equivalents.
	Parsoi Formation	Tuffaceous and carbonaceous phyllites, feldspathic quartzite and conglomerate, tuffaceous phyllite with metabasalt intercalations.
	Agori Formation or Sleemanabad Formation	BHQ and jasperiod with associated tuffs and ash beds.Impure marble, dolomite and inter- bedded calc-chlorite schist with occasional metabasalt lenses, conglomerate.
	Chitrangi Formation	Basic and ultrabasic plugs and dykes including periodtite and serpentinite, Agglomerates, metabasalt and peridotitic pillow lava.
Katni Gneissic complex (Basement)		Gneissic complex with associated mafic, ultramafic rocks and metasediments

2.1.0 REGIONAL STRUCTURE AND REGIONAL METAMORPHISM

2.1.1 The Mahakoshal Belt is bounded by two major crustal faults — the Son–Narmada North Fault (SNNF) in the north and the Son–Narmada South Fault (SNSF) in the south — which have remained tectonically active through successive geological periods. These faults define the belt's structural framework and have played a key role during the Mahakoshal orogeny and later tectonic reactivations. The rocks of the Mahakoshal Group record three distinct phases of deformation (D1, D2, and D3), with D1 and D2 being the most dominant, leading to the overall ENE–WSW structural grain of the belt.

2.1.2 The D1 and D2 deformation phases produced folds of predominantly flattening strain type, resulting from north–south compression. Progressive deformation led to the development of a major ductile shear zone along the southern margin, coinciding with the SNSF. This shear zone exhibits reverse slip movement towards the north and contains mylonitic foliations parallel to the dominant D1 schistosity. Sheath-like folds and ductile fabrics within the shear zone indicate high strain deformation, where granitoids and supracrustal rocks were both involved in shearing and shortening.

2.1.3 Structurally, the Mahakoshal belt is characterized by a complex pattern of upright to overturned folds, with axial planes dipping southerly. The first deformation (D1) generated tight, isoclinal, reclined folds with ENE–WSW striking foliations, particularly observed near Pan Umariya southwest of Imaliya village. The second deformation (D2) refolded these structures into vertical to reclined folds, producing co-axial patterns with gentle and steep plunges. The third deformation (D3) introduced open NNW–SSE trending warps and cross-faults, resulting in discontinuous ridges and structural traps, which are considered significant for localizing mineralization within the belt.

2.1.4 In the central Mahakoshal region, large-scale fold closures such as at Pan Umariya, Sihora, and Tindni indicate broad, map-scale structures, while minor folds display variable plunges (15°–80°) towards ENE and WSW, reflecting inhomogeneous strata. These folds range from tight to isoclinal, upright to reclined, and often exhibit sheath-like geometries, especially in areas like Sarda, highlighting intense ductile deformation. The overall structure thus records multiple compressional phases, overprinted by shearing and later brittle faulting events.

2.1.5 The non-diastrophic structures in the Mahakoshal belt represent preserved primary depositional features. These include compositional layering in Banded Iron Formations (BIFs), color banding in chert, jasper, and dolomite, and alternating silica- and mica-rich laminae in metapelites. Intercalations of phyllite within dolomite and calcareous lenses in argillaceous rocks suggest varied depositional environments. Flow structures such as vesicular textures, pahoehoe surfaces, and possible pillow structures are noted within metabasalts of the Shahdar, Madhana, and Sleemanabad areas, confirming their volcanic origin. The regional stratification generally trends ENE–WSW to WNW–ESE, with steep dips (70°–80°) towards the south, reflecting the tectono-stratigraphic complexity of the Mahakoshal supracrustal sequence.

2.1.6 The Mahakoshal Group has undergone regional metamorphism of low to medium grade, associated with the Proterozoic orogenic activity along the Central Indian Tectonic Zone (CITZ). Metamorphism in the belt is mainly greenschist facies in the northern and central parts, gradually increasing to amphibolite facies towards the southern margin near the Son–Narmada South Fault (SNSF). This variation reflects differential tectonothermal conditions produced by crustal compression, burial metamorphism, and intrusion of granitic bodies during the Mahakoshal orogeny. The dominant mineral assemblages include chlorite, actinolite, epidote, quartz, and albite, with higher-grade zones showing biotite, hornblende, and garnet development.

2.1.7 Metamorphic foliation (S1–S2) formed during successive deformation phases (D1 and D2) is parallel to the axial planes of major folds and shear zones. In the southern part, strong mylonitic fabrics and syn-kinematic recrystallization of quartz and mica indicate ductile deformation under elevated temperature–pressure conditions. Retrogressive changes, such as chloritization and sericitization, are also common, marking a late-stage cooling phase. Overall, the Mahakoshal belt records a polyphase metamorphic evolution, transitioning from low-grade greenschist to amphibolite facies, reflecting the complex tectonothermal history of the Central Indian mobile belt.

2.2.0 REGIONAL MINERALIZATION:

2.2.1 The **Mahakoshal Supracrustal Belt (MSB)**, extending across parts of Katni, Jabalpur, Dindori, and adjoining districts of Madhya Pradesh, represents a well-known Paleoproterozoic greenstone-supracrustal sequence of the Central Indian Tectonic Zone.

The belt is composed of metavolcanic and metasedimentary rocks such as basalt, phyllite, quartzite, banded iron formation (BIF), dolomite, and chert. Its geological evolution through volcanic, sedimentary, and tectonic events has created favourable conditions for the formation of a wide range of metallic and non-metallic minerals, making it one of the most mineral-prospective terrains in central India.

2.2.2 The dominant mineralisation in the Mahakoshal belt is of iron and manganese, primarily associated with the BIF horizons within the Saleemnabad and related formations. The iron ore occurs as hematite and magnetite within stratabound BIF units, often enriched by supergene processes forming lateritic caps. Manganese occurs as lenticular to pocket-like concentrations within cherty and phyllitic horizons. These deposits are structurally controlled and often show continuity along fold limbs and sheared zones.

2.2.3 In addition to iron and manganese, the region hosts bauxite and lateritic deposits, which have formed as secondary enrichment products through intense tropical weathering of aluminous and ferruginous rocks. The Katni–Jabalpur region in particular shows widespread lateritisation, with aluminous laterites containing appreciable Al_2O_3 and TiO_2 values. These lateritic caps represent potential resources for aluminous laterite and titanium exploration and are being actively evaluated by MECL and GSI under NMET programmes.

2.2.4 Carbonate rocks, mainly dolomite and limestone, form another significant lithounit of economic importance in the area. The limestones and dolomites of the Mahakoshal Belt are exploited extensively around Katni and adjoining regions for cement, lime, and metallurgical industries. These rocks often occur interbedded with chert and BIF, suggesting their deposition in a shallow marine environment contemporaneous with iron formation. The high-grade limestone occurrences, along with marble and dolomitic limestone, contribute substantially to the district's mineral-based economy.

2.2.5 Apart from these major commodities, the belt also shows occurrences of gold, base metals, and minor strategic elements. Gold is mainly found in quartz–carbonate veins and shear zones within metavolcanic and metasedimentary sequences, particularly near Jabalpur and Dindori sectors. Trace elements such as Ti, PGE, and REE have been reported from lateritic and ultramafic lithologies, indicating potential for future resource evaluation. Industrial minerals such as clay, marble, and building stone are also mined locally, adding to the region's mineral diversity.

2.2.6 Overall, the Katni–Jabalpur sector of the Mahakoshal Belt is a multi-mineral zone characterised by diverse lithological associations and structural controls. The combination of BIF-hosted iron and manganese, lateritic bauxite–titanium horizons, and extensive carbonate formations makes it a significant target for ongoing and future exploration. Integrated geological, geochemical, and geophysical studies are essential to delineate concealed or low-grade mineralisation and to upgrade the region's reconnaissance resources into defined and economically exploitable deposits.

3.0.0 GEOLOGY OF THE BLOCK

3.1.0 The proposed Sansarpur G-3 block, covering an area of 7.19 sq. km, is situated in the western part of the Tikariya G-4 block (58.70 sq. km), around Rituwa and Sansarpur villages in Katni district, Madhya Pradesh. The proposed block forms a part of the Mahakoshal Belt, comprising supracrustal metavolcanic and metasedimentary sequences and rocks belonging to the Agori Formation of the Mahakoshal Group, intruded by younger felsic bodies. The prominent lithounits mapped in the area include brecciated quartzite, phyllite, dolomite, limestone, conglomerate, quartz reef, and laterite. The laterites in the block, including those in the Sansarpur sector, are mainly aluminous laterites enriched in alumina alongwith titanium, vanadium and gallium etc.

3.2.0 The topography of the area varies according to the lithounits. Quartzites form prominent ridges, while dolomites and intrusive rocks constitute low mounds; the phyllites commonly occupy valleys. The general structural trend of the rocks is ENE–WSW to E–W, with moderate to steep dips predominantly towards the south.

3.3.0 The block exhibits diversified lithounits and mineral occurrences, representing a typical section of the Mahakoshal Group. The block is dominated by ENE–WSW trending ferruginous quartzites and laterites. The lateritic zones show both ferruginous and aluminous characteristics, with significant titanium enrichment and trace elements such as vanadium and gallium, as indicated by surface and borehole analyses of the parent Tikariya G-4 exploration work. An elongated ENE–WSW trending dolomite band occurs in the central part of the block, while phyllites are extensively developed throughout. Additionally, a conglomeratic horizon is exposed in the northeastern part of the block, further confirming the geological diversity and mineral potential of the Sansarpur–Tikariya sector. Block Geo Map on 1:12,5000 scale is given in Plate-III.

3.4.0 The generalized stratigraphy of study area is given in table below

Table No 3
Generalized Stratigraphic succession in and around the proposed block, After GSI

Group	Formation	Lithounits	Age
Qarternary		Alluvium	Late Cenozoic
		Laterite	
		Phyllite	
		Limestone, Dolomite	
		Quartzite/ Ferruginous quartzite/ BHQ	
----- Base Not Exposed -----			

3.5.0 **Mineralisation in the Block** Geological mapping and sample analysis from the Tikariya (G-4) block indicate notable iron, alumina, and dolomite mineralisation. Iron occurs mainly as goethite, limonite, and hematite, exhibiting metallic lustre and reddish to black streaks, prominently developed over ridges composed of ferruginous quartzite and laterite. The mineralisation follows a NE–SW to ENE–WSW trend, scattered across the block and concentrated along strike zones. Secondary enrichment is evident through iron leaching and lateritisation above the water table, forming supergene goethite and limonite zones. The iron ore is associated with submarine mafic volcanics, tuffs, and sedimentary sequences, classifying it as an Algoma-type deposit, typical of Archean supracrustal belts where banded iron formations alternate with chert layers.

3.5.1 Lateritic horizons in the area show high alumina and silica content, characterizing them as aluminous laterites rather than bauxites. These laterites are also enriched with titanium, vanadium, and gallium, highlighting their strategic and critical mineral potential in addition to their aluminium value. Alongside these, occurrences of dolomite and limestone are noted, while minor traces of gold, silver, and base metals further enhance the block's mineral diversity and economic significance. Apart from that, the region may be ideal for the search for other trace elements like Sc, REE. Present studies may throw some light on that as well.

4.0.0 PREVIOUS WORK

4.1.1 The following prospecting agencies have been involved in the exploration in and around the study area.

A. Geological Survey of India

B. Directorate of Geology and Mining, Madhay Pradesh

C. Mineral Exploration and Consultancy Limited.

4.1.2 BRIEF DETAILS OF THE EXPLORATION CARRIED OUT

4.1.3 Geological Survey of India

4.1.3.1 In the rich geological history of the Son-Narmada valley, the supracrustal rocks have been subjects of extensive study and exploration by both individual researchers and the Geological Survey of India (GSI). Over the years, these investigations have contributed to our understanding of the complex stratigraphy and composition of the Mahakoshal Group.

4.1.3.2 The significant study has been started way early by F.R. Mallet & Huges in 1833. They surveyed the parts of Jabalpur District and identified iron ore deposits associated with BIF and laterites in the area. He mentioned the presence of iron ore bands of varying thickness in the area.

4.1.3.3 During mid-20th century, Mathur (1951) and Kedar Narain (1955) played crucial roles in attempting to establish a stratigraphic sequence for the Mahakoshal Group. They classified the group into lower psammopelitic sequence (Parsoi Formation) and upper mafic BIF sequence (Agori Formation). This early work laid the groundwork for subsequent studies

4.1.3.4 Geological Mapping has been done by Sharma R.K. (1962-63) and Tiwari R.K. (1964-65) around the Sihora - Majhauli area which reflects the presence of banded quartzite, dolomite, phyllite, and epidiorite, forming an unclassified unit. Sharma's work further outlined a sequence of sedimentary deposition, with clastic sediments preceding chemogenic sediments, chert, dolomites, and intermittently basic lavas. Sharma also reported deposits of refractory clay, bauxite, red-ochre, fluorite, dolomite etc.

4.1.3.5 The redesignation of the supracrustal rocks as the Mahakoshal Group by Narain and Thambi in 1970 marked a significant milestone. This name persists in contemporary geological discussions.

4.1.3.6 During field session 1977-78, RK Gour & ND Gupta investigated the dolomites of Sleemnabad area and estimated around 1.97 million tonne of massive and bedded dolomite resource up to 4m depth.

4.1.3.7 In 1983, Jha and Gurusiddappa conducted a detailed study of the Mahakoshal Group in the Sihora - Majhauli area. Their findings included the occurrence of BIF, phyllite, and a lateritic cap over the supracrustals, hosting several iron ore pockets.

4.1.3.8 Throughout the late 20th century, various workers, including Bandyopadhyay and Roy (1987), Nair et al. (1995), and Devarajan and Shrivastava (1996), Singhai and Prasad (1997-98) provided valuable insights into the stratigraphy and composition of the Mahakoshal Group. These contributions ranged from classifications into different formations to proposals of threefold classifications, reflecting the complexity of the geological processes.

4.1.3.9 Singhai and Prasad, during field session 1997-98, conducted specialized thematic mapping around Sihora and Majhauli area and expressed possibilities of Iron ore in BHC, classified as proto-ore and recommended for small scale mining.

4.1.3.10 Fast-forwarding to the 21st century, the Geological Survey of India continued its exploration endeavours. The field season project (FSP) from 2015 to 2017 specifically focused on investigating iron ore in the Sihora and Gosalpur areas in the Jabalpur district.

4.1.3.11 The geological exploration for gold and basemetals of the Sleemanabad area in Central India has a rich history, with early memoirs by Medlicott (1860) and Oldham (1860) paving the way for subsequent investigations. Hacket's systematic mapping in 1869-71 labeled the rocks as Bijawars.In 1876, copper and lead occurrences near Sleemanabad were reported by Mr. Olpherts, leading to further investigations recommended by Hughes. The Memoir of Oldham, Datta, and Vredenberg (1901) partially deals into the area's geology. Prospecting activities continued in the early 20th century, with P. C. Dutt (1904-1906), Fermor (1906), and Burn & Co. (1906-1908) contributing to the understanding of the rocks' Dharwarian age. Krishnan (1932) noted similarities with the Gangpur Series. Crookshank and Ray (1937) suggested drilling in Imaliya, leading to geophysical investigations by Sinha (1951-52) and others.

4.1.3.12 The 1960s witnessed detailed mapping by Sharma (1961-63), emphasizing copper and lead mineralization along fault zones. Chande and Bhoskar (1969-70) reported mineralization along N-S trending shear fractures. Roy (1973-74) conducted regional integrated surveys, linking sulphide mineralization with fluorite-bearing quartz porphyry.

4.1.3.13 Subsequent years saw extensive exploration. Devarajan and Shrivastava (1993-94) recommended targeting late to post-tectonic quartz veins. Devarajan and Shrivastava (1994-95) carried out Transect Mapping in Bhula area on 1:25,000 scale to elucidate the lithostratigraphy and locate possible locii of mineralization.

4.1.3.14 Shrivastava and Agasty (1996) conducted large-scale mapping and sampling in Selarpur-Imalia-Barkhera block. The area was re-evaluated in 1997-98, with drilling uncovering gossanised zones. Extension projects continued until 2000, revealing additional mineralized zones through drilling and geophysical surveys.

4.1.3.15 In 2000-01, a new mineralized zone was identified, but proving the continuity was challenging. Trenching revealed a 5m wide gold-bearing zone. Geochemical sampling in Madhana block, east of Imaliya, and reconnaissance traverses identified auriferous zones. The total Gold resource in Imaliya block was estimated at 466011 ton (Au 1.27g/t) by cross section method during FSP 1997-2001.

4.1.3.16 Detailed Investigation for Polymetallic Mineralisation in The Imalia-Bhula-Nawalia Belt, Jabalpur Dist, MP was carried out by S.V.Choudhary and V. Natarajan in 2010-12.

4.1.3.17 Apart from extensive work for Iron, Copper and Gold in the area, investigation of Dolomite in Sleemnabad Area, District Jabalpur, Madhya Pradesh has been done by Gour R.K and Gupta N.D. During 1977-78, Investigation for flux grade limestone by Hore, M.K. et. al. (1965-1973) has been carried out in Niwar area of Jabalpur which is in the nort of the Tikariya G-4 exploration block

4.1.4 Directorate of Geology and Mining, Madhya Pradesh

4.1.4.1 During 1959-61, geologists from the Directorate of Geology and Mining (DGM) in Madhya Pradesh conducted a survey, mapping, and preliminary estimation of iron ore deposits around Sihora in the Jabalpur district.G.R. Rao of the DGM, MP in 1959, examined this area and referred the iron ore reserve to be low to medium grade. S.S. Mishra of the DGM, MP in 1961 established that the iron ore bands continue has vast continuation in the area.

4.1.5 Mineral Exploration and Consultancy Limited.

4.1.6 Tikariya G-4 Block

4.1.6.1 The Tikariya G-4 exploration block for iron, manganese, and associated minerals covers an area of 58.70 sq. km in Katni district, Madhya Pradesh. It lies between latitudes 23°37'3.33"N–23°40'55.30"N and longitudes 80°18'10.31"E–80°25'41.24"E, encompassing several villages such as Sansarpur, Rituwa, Tikariya, Bijaiya, Mahagawan, Ligri, Bhula, and Saraswahi. Geologically, the block forms a part of the Mahakoshal Belt, comprising metavolcanic and metasedimentary sequences of the Agori Formation, along with later intrusives. The major lithounits identified during mapping include brecciated quartzite, phyllite, dolomite, limestone, metabasalt, conglomerate, and laterite. The laterites, mostly aluminous in nature, are enriched in alumina, titanium, vanadium, and gallium, with a general lithological strike trending ENE–WSW and dipping 55°–80° towards the SSE.

4.1.6.2 Field mapping revealed widespread laterite and ferruginous quartzite exposures, particularly near Sansarpur, Bijaiya, Bhula, Ligri, and Padarbhata. Iron mineralisation, mainly in the form of goethite, limonite, and hematite, occurs along lateritic ridges and quartzite horizons. Patches of dolomite trending ENE–WSW were mapped across the block, prominently exposed near Rituwa, Sansarpur, Saraswahi,Bijaiya, Mahagawan, Pauniya etc., while steeply dipping limestone bands were noted near Rituwa and Amhata. Limited manganese mineralisation was also observed near Sansarpur village.

4.1.6.3 A total of 120 channel samples from 27 channels were analysed for major oxides and trace elements. Of these, 32 samples contained >35% Fe (ranging from 35.51–56.67%), and 49 samples had >20% Al_2O_3 (up to 37.40%). Two samples also reported high Mn values (29.71% and 31.12%), while anomalous Au values (2.62 ppm and 0.03 ppm) were recorded south of Sansarpur and Padarbhata. Additionally, five samples showed vanadium concentrations above 500 ppm, indicating the block’s potential for critical and strategic minerals.

4.1.6.4 Further, five trenches totaling 104 cu.m. were excavated to examine the strike and depth continuity of mineralised zones, yielding 65 samples. Among these, 12 trench samples showed >35% Fe and 36 samples had >20% Al_2O_3 (up to 31.68%). However, manganese and precious metals were below threshold levels in trench samples. Exploratory drilling covered 215 m in 12 boreholes, intersecting aluminous laterite, goethite, limonite, and aluminous clay. While Fe content was low, significant anomalies of Al_2O_3, TiO_2, V, and Ga were recorded across several boreholes, with zones up to 15 m thick showing promising enrichment.

4.1.6.5 In total, 205 borehole samples were analysed for major oxides and trace elements. Of these, 110 samples contained >20% Al_2O_3 (up to 36.17%), 100 samples showed >2% TiO_2 (up to 7.17%), 87 samples had >500 ppm V, and 21 samples contained >50 ppm Ga. One borehole sample reported 4 ppm Ag, though no significant gold anomalies were found. The results confirm the block’s potential for aluminous laterite with associated titanium, vanadium, and gallium mineralisation, though iron and manganese values remain below economic thresholds.

4.1.6.6 Resource estimation using both polygonal and cross-sectional methods confirmed the presence of substantial aluminous laterite and associated minerals. The polygonal method yielded 14.81 million tonnes of Al_2O_3 (avg. 26.30%), 15.45 million tonnes of TiO_2 (avg. 3.48%), 12.32 million tonnes of V (avg. 642.71 ppm), and 2.44 million tonnes of Ga (avg. 57.70 ppm). The cross-sectional method produced comparable results, validating the consistency of estimates, with variations well within permissible limits.

4.1.6.7 **Recommendations**

Based on the exploration results, a potential lateritic zone of around 14 sq. km, near Sansarpur-Bhula has been delineated. It was recommended that systematic G-3 level drilling be undertaken to assess the depth and grade continuity of the alumina-rich laterite and associated Ti, V, and Ga mineralisation. This will enable the State Government to upgrade the block for auction under Mining Lease (ML) category, unlocking its potential for bauxite-equivalent resources and strategic mineral exploration in the Mahakoshal Belt.

4.1.7 Salaiya G-4 Block

4.1.7.1 During 2023–24, MECL conducted a G-4 level reconnaissance survey for iron, manganese, and associated minerals in the Salaiya G-4 block (110.56 sq. km) located across Jabalpur, Katni, and Umaria districts of Madhya Pradesh, falling in parts of Toposheet Nos. 64A/02 and 64A/06. The block lies immediately west of the Tikariya G-4 block and exhibits diverse mineralisation, including iron ore, lateritic iron ore, aluminous laterite, and sulphide mineralisation. High-grade red oxide iron ore occurs in BHJ/BHC formations near eastern Sleemanabad, while micaceous hematite dominates other parts. Ferruginous laterites show a wide variation in iron content (13.09–51.25%), and bauxite mineralisation is restricted to lateritic mounds in the northern region. Additionally, sulphide mineralisation occurs at Imaliya, hosted within quartz porphyry veins showing structural control.

4.1.7.2 Based on geological mapping and sampling results, three potential sub-blocks have been delineated. Sub-block A (Amoch–Chhapra, 4.86 sq. km) hosts a large, continuous lateritic body (2.5 km × 1.5 km), while Sub-block B (Majhauli, 3.68 sq. km) comprises discontinuous aluminous laterite mounds (2 km × 0.5 km). Both areas are considered promising for aluminous lateritic iron ore exploration. A third area, Sub-block C (Salaiya

Phatak–Imliya, 3.71 sq. km), has been identified for gold and sulphide mineralisation, marking it as a zone of interest for further detailed investigation.

4.1.7.3 **Recommendations** 3 Nos. of G-3 blocks from the Salaiya G-4 Block out of Salaiya G-4 block has been upgraded-

i. Majhauli G-3 block for Laterite & Bauxite

ii. Amoch Chhapra G-3 block for Laterite & Bauxite

iii. Salaiya Phatak G-3 block for Copper, Lead, Zinc and associated Minerals

Note: Work in Majhauli G-3 block is completed and GR is also submitted in March 2025. Work in Salaiya Phatak and and Amoch Chapra block is in progress.

4.1.8 Talwa G-4 Block

4.1.8.1 During 2023-24, exploration for Iron, Manganese and associated minerals has been carried by MECL in Talwa G-4 block (80.50 sq. Km) which falls in parts of Toposheet No. 64A02 and 64A03 of Jabalpur,Katni District, Madhya Pradesh. Talwa G-4 block lies adjacently in the west of the Salaiya G-4 block. In Talwa G-4 Block, BHJ/BHC in the central sector reveals a wide range of iron (Fe) concentrations, with values spanning from 9.07% to 47.31%. On the other hand, an examination of 27 samples from lateritic iron in the north-eastern sector indicates iron content, ranging from 19.47% to 40.21%, alongside aluminium oxide (Al_2O_3%) assay values ranging from 8.02% to 40.56%. The analysis of bedrock and channel samples confirms the presence of economically feasible laterite deposits within the study area. Phyllite near Ponda village reveals manganese percentages ranging from 0.12% to 10.68% Mn, with 7 samples indicating manganese concentrations surpassing 5%. Examination of bedrock/channel samples and visual identification from manganese-bearing ferruginous phyllite delineates two manganese bands, 1 meter and 2.5-3 meters wide, extending approximately 300 and 800 meters in strike length, respectively.

4.1.8.2 **Recommendations**

The G4 exploration show promising assay values for Iron and manganese, although trenches near Ponda Village revealed lower-grade manganese. A manganese band stretching 800 meters in length and 3 meters in surface width was identified; suggesting further exploration through techniques like detailed mapping, geophysical surveys, and drilling could be beneficial. Additionally, analysis of Iron and manganese in lateritic formations indicates economic potential, suggesting sampling at 100-meter intervals, detailed mapping, and selective pitting could help understand mineralization patterns and depth persistence of mineralized zones, particularly in zones north of Dinarikhamaria and northeast of Darshani.

5.0.0 PLANNED METHODOLOGY

5.1.0 OBJECTIVE Based on the evaluation of geological data available, the present exploration program has been formulated to fulfill the following objectives:

I. To conduct detailed Geological mapping and Topographic Survey on 1:4000 scale.

II. To carry out surface sampling (BRS/Channel) and trenching to establish strike continuity, wherever it is required.

III. To take up exploratory drilling to confirm the strike and depth continuity of ore zones up to 40m vertical depth at 400m spacing.

IV. To establish the inferred resources (333) for Aluminous Laterite, Titanium (Ti O_2), Vanadium (V), Gallium (Ga) and associated minerals as per UNFC norms & Minerals (Evidence of Mineral Contents) Rules- 2015.

5.2.0 COMPONENTS OF EXPORATION WORK The details of different activities to be carried out are presented in subsequent paragraphs.

5.2.1 GEOLOGICAL MAPPING

Detailed geological mapping will be undertaken over the entire area of 7.19 sq. km on a 1:4000 scale to establish the lithological, structural, and mineralization framework in detailed manner in the Block. The mapping will focus on delineating and detailing various rock types identified during the G-4 exploration**,** their lithological contacts, and structural features such as faults, joints, folds, and fractures.

5.2.2 SURVEY WORK

Topographical survey will be conducted over the proposed 7.19 sq. km area at a 2-m contour interval on 1:4000 scale to generate an accurate and detailed terrain model. This survey will provide essential information on the surface relief, slope variation, drainage patterns, and accessibility, which are critical for planning exploration logistics and drilling operations. All drilled borehole locations, including collar points and depths, as well as the exploration block boundary, will be precisely surveyed using Differential Global Positioning System (DGPS) to ensure high positional accuracy. The DGPS data will aid in integrating geological, geochemical datasets with topography, and will form the base for generating various thematic maps and for future resource estimation work.

5.2.3 **SURFACE BEDROCK/CHANNEL SAMPLING:** A provision of 50 bedrock/channel samples has been made, which may be collected during geological traverses to assess the surface and near-surface mineralisation characteristics of the block.

5.2.4 **TRENCHING:** Around 12 Nos. of trenches has been planned in the first phase of the work to prove the continuity of the mineralsation zones/bodies identified during the parent Tikariya G-4 exploration programme. If the results of trench samples will give some encouraging results, further drilling may be taken on those locations. A provision of 240 cum of trenching and 120 no. of trench samples has been kept in provision.

5.2.5 **EXPLORATORY DRILLING**

5.2.5.1 Vertical exploratory drilling upto 40m depth has been planned in systematic manner in 400m interval. In the first phases drilling will be taken up in the 5 nos. of boreholes. After obtaining the results of the trenching work, further 12 nos. of boreholes may be taken up. So a total quantum of 680mof vertical drilling has been planned out of total 17 boreholes. In the first phase, boreholes will be drilled at 400 m interval within the mineralised bodies delineated during the Tikariya G-4 investigations. The second phase of drilling will focus on establishing the lateral and depth-wise extensions of the mineralised horizons and will be undertaken only after obtaining positive results from trenching. Geological Map showing proposed BH and trench plan is presented below in fig 5.1 and in Plate- III. Geological cross sections of boreholes of Tikariya G-4 blocks falling in the Sansarpur G-3 block including proposed borehole PBH-03 is presented in Plate-IV, while Geological cross–sections showing TKRBH-01 and PBH-03 are presented below in figure 5.2 and Fig. 5.3 respectively.

Proposed Sansarpur G3 Block showing proposed borehole location and proposed trench location, Katni District, Madhya Pradesh.

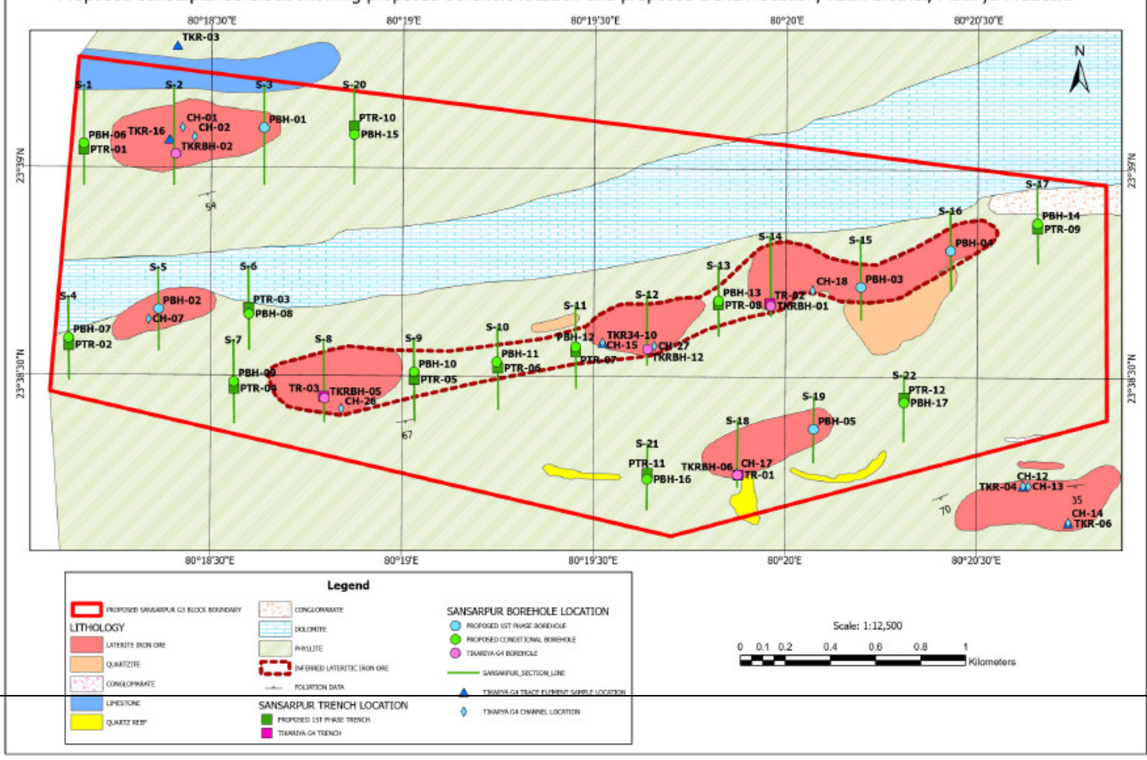


Fig5.1Geological Map showing Borehole plan in Sansarpur G-3 Block

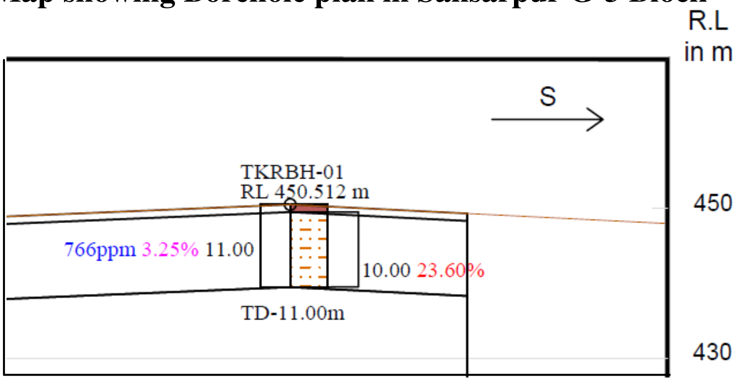


Fig 5.2- Geological Cross Section showing TRRBH-01 of Tikariya G-4 Block

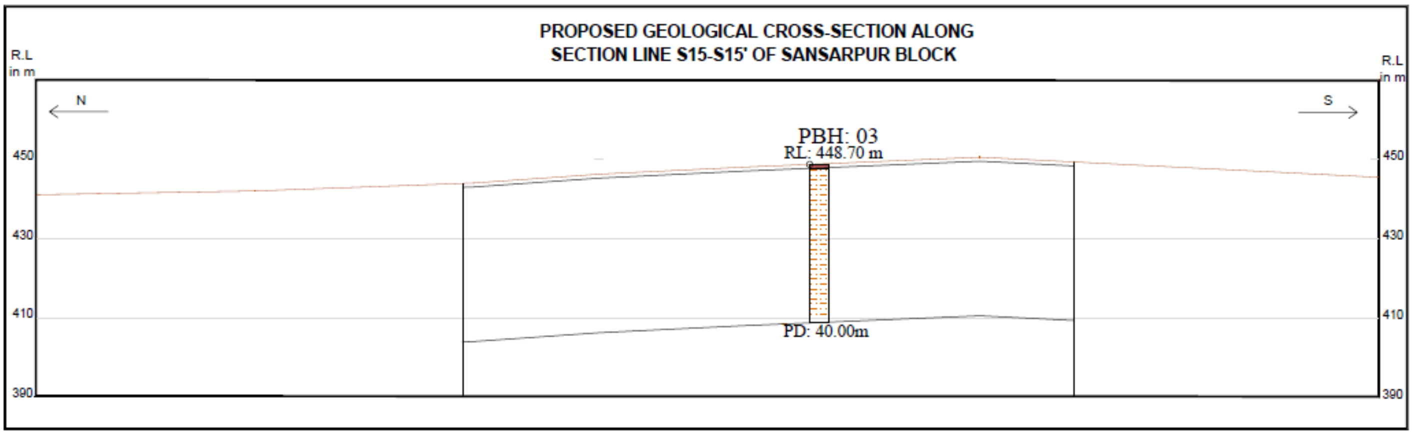
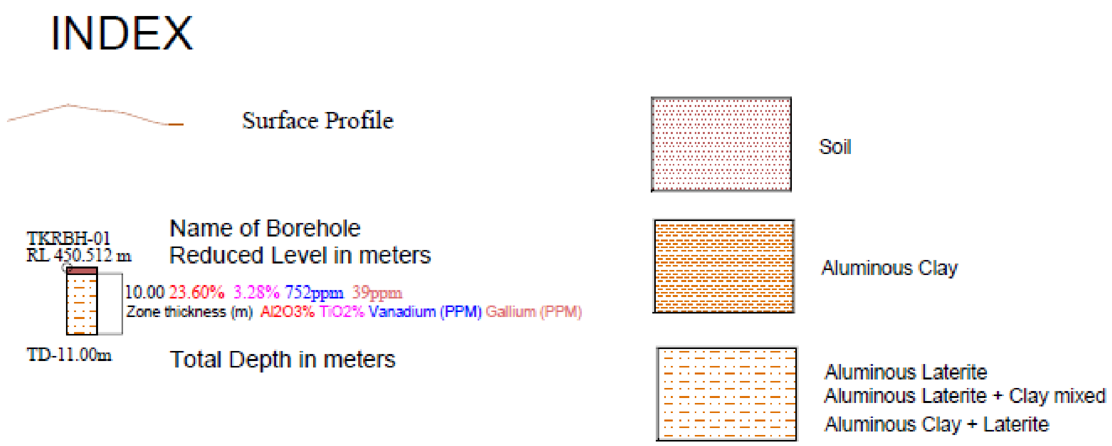


Fig 5.3- Geological Cross Section showing PBH-03 of the proposed Sansarpur G-3 Block



5.2.6 **Borehole Samples:** Borehole samples will be collected for 1m interval as per the lithological and mineralogical evaluation carried out during the borehole logging. Hence a provision of 620 nos of borehole core samples has been kept in provision.

5.3.0 CHEMICAL ANALYSIS

5.3.1 **By XRF:** All the 790 nos of samples including bedrock/channel samples (50 Nos), Trench samples (120 Nos) and borehole core samples (620 Nos) will be subjected to chemical analysis of Total Fe%, Total Mn%, Al_2O_3% P_2O_5%, CaO%, SiO_2%, Acid Insolubles, TiO_2, V and Ga through XRF at MECL's chemical laboratory facility Nagpur.

5.3.2 10% of primary samples, i.e., 79 nos will be analysed at NABL accredited laboratory as external check samples and will be analysed for Total Fe%, Total Mn%, Al_2O_3% P_2O_5%, CaO%, SiO_2%, Acid Insolubles, TiO_2, V and Ga through XRF.

5.3.3 **Trace elements by ICPMS(34 elements) :** 34 elemental analysis by ICPMS will carried out. for analysis of Sc, Y, La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Hf, Ta, Rb, Zr, Ge, Sr, Sn, As, Be, Nb, Mo, Cu, Pb, Zn, Li, Cs, Co & Ni . A provision of 200 samples has been kept in provision. In the current set up it is likely to get some good concentrations of few of these elements including REE.

5.4.0 PETROLOGICAL AND MINEROLOGICAL STUDIES:

5.4.1 During the course of Geological mapping, trenching, drilling and sampling, 10 nos. of samples from outcrops and borehole core samples of various litho units will be collected for Petrographic Studies and 10sampeles will be collected for mineragraphic studies.

5.5.0 XRD STUDY

5.5.1 To know the different mineral phases, 20 samples will be studied through XRD.

5.6.0 BULK DENSITY

5.6.1 On 10 nos. of bore hole core samples, bulk density studies will be carried out.

6.0.0 DETAILS OF NATURE AND QUANTUM OF WORK (NQT)and the targets are listed in **Table No.-5**

Table No-5
Envisaged Nature and Quantum of work (NQT) in Sansarpur G-3 block, Distt. Katni, Madhya Pradesh

Sl. No.	Item of Work	Unit	Target
1	**Detail Geological Mapping** (on 1:4,000 Scale)	Sq km	7.19
2	**Survey**		
	i) Topographic Survey (on 1:4,000 Scale)	Sq km	7.19
	ii) DGPS survey for Block Boundary and Boreholes	Nos.	22
3	**Geochemical Sampling**		
i	Bedrock/Channel samples	Nos	50
4	**Trenching**	Cu m	240
i	Trench Sampling	Nos	120
5	**Core Drilling**		
i	Drilling (5 BH in 1st phase + 12 BH in 2nd Phase) for 40m vertical depth	m	680
ii	Borehole Core Sampling	Nos	600
6	**Laboratory Studies**		
	i)Primary Samples for Total Fe%, Total Mn%, Al_2O_3% P_2O_5%, CaO%, SiO_2%, Acid Insolubles, TiO_2, V and Ga through XRF	Nos	790
	ii) External Check Samples for Total Fe%, Total Mn%, Al_2O_3% P_2O_5%, CaO%, SiO_2%, Acid Insolubles, TiO_2, V and Ga through XRF	Nos	79
	iii) Trace elements studies by ICP-MS (Sc, Y, La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Hf, Ta, Rb, Zr, Ge, Sr, Sn, As, Be, Nb, Mo, Cu, Pb, Zn, Li, Cs, Co & Ni)	Nos	100
7	**Petrographic studies**	Nos	10
8	**Mineragraphic studies**	Nos	10
8	**XRD Mineral phase analysis**	Nos	20
9	**Bulk Density studies**	Nos	10
10	**Report Preparation (5 Hard copies with a soft copy)**	Nos.	1
11	**Preparation of Exploration Proposal (5 Hard copies with a soft copy)**	Nos.	1

6.1.0 BREAK-UP OF EXPENDITURE

6.1.1 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. The total estimated cost is **Rs. 215.28 Lakhs.** The summary of cost estimates for preliminary exploration (G-3) is given in **Table No. - 6.**The detailed cost sheet is given as Annexure-I.

Table No. 6
Summary of cost estimates for Preliminary Exploration (G-3) in Sansarpur Block, District-Katni, Madhya Pradesh

Sl. No.	Item	Total Estimated Cost (Rs.)
1	Geological Mapping (LSM), Other Geological Work and Survey	3,894,924
2	Trenching	799,200
2	Drilling	7,031,260
3	Laboratory Studies	5,396,458
4	**Sub Total (1 to 4)**	**17,121,842**
5	Exploration Report Preparation	750,000
6	Proposal Preparation	342,437
7	Peer review charges	30,000
8	**Sub Total (1 to 7)**	**18,244,279**
9	GST 18%	3,283,970
10	**Total:**	**21,528,249**
	Say Rs. In Lakh	**215.28**

6.2.0 TIMELINE

6.2.1 The entire project is planned tentatively for 12 months.

Table No. 7
Tentative Time schedule / Action plan

Estimated timeline for Preliminary Exploration (G-3) for Aluminous Laterite, Titanium (Ti O2), Vanadium (V), Gallium (Ga) and associated minerals in Sansarpur Block, District: Katni, State: Madhya Pradesh[Block area- 7.19 sq. km; Schedule timeline- 12 months]

S. No.	Particulars	Months/ Days	1	2	3	4	5		6	7	8	9	10	11	12
1	Camp Setting	months	■					REVIEW							
2	Geological Mapping & Trenching	months	■	■	■										
4	Topographic Survey	months		■	■										
6	Core Drilling	m		■	■				■	■	■	■			
8	BH Core Sampling	Nos		■	■				■	■	■	■			
9	Camp winding	months											■		
10	Laboratory Studies	months			■	■	■		■	■	■	■	■		
11	Report Writing with Peer Review	months												■	■

List of Plates:

1.Plate-I Location Map

2.Plate-II Regional Geology Map showing proposed G-3 block

3.Plate-III Geological Map showing Proposed BH and Trench plan

4.Plate-IV Geological cross sections of boreholes of Tikariya G-4 blocks falling in the Sansarpur G-3 block including proposed borehole PBH-03

Estimated cost for Preliminary Exploration (G-3) for Aluminous Laterite, Titanium (Ti O2), Vanadium (V), Gallium (Ga) and associated minerals in Sansarpur Block, District: Katni, State: Madhya Pradesh
Block area- 7.19 sq. km; No of BH:17, Average Depth of BH: 40 m, Total Drilling : 680 m
Schedule timeline- 12 months, Review: after 05 months

Sl. No.	Item of Work	Unit	Rates as per NMET SoC 2020-21		Estimated Cost of the Proposal		Remarks
			SoC- Item- S. No.	Rates as per SoC	Qty.	Total Amount (Rs)	
A	**GEOLOGICAL WORK**						
1	**Geological Mapping (1:4000)**						
	Geologist man days (1 No.) for Geological map & Report (HQ)	days	1.1b	9,000	60	540,000	
	a) Geologist man days for Detailed Geological mapping/Channel Sampling/ Trenching, Drilling	days	1.2	11,000	150	1,650,000	
	b) Labour (field)	per worker	5.7	541	300	162,300	Amount will be reimburse as per the notified rates by the Central Labour Commissioner or respective State Govt. whichever is higher
	c) Sampler for Suface Samples/ Trench Samples / Core Samples Labour charge not included (1 sampler)	day	1.5.2	5100	111	566,100	Total 890 Nos of Samples / 8 Nos of sample per day =121
	d) 4 labours/ party (As per rates of Central Labour Commissioner)	day	5.7	541	444	240,204	Amount will be reimburse as per the notified rates by the Central Labour Commissioner or respective State Govt. whichever is higher
2	**Survey**						
i	Bore Hole Fixation and determination of co-ordinates & Reduced Level of the boreholes and Boundary points by DGPS	Per Point of observation	1.6.2	19,200	22	422,400	17 Core Drilling Boreholes + 5 Boundary Points = 22
ii	Charges of one qualified surveyor with Total Station for carrying out topographical survey in different RF and surface contouring at different interval	days	1.6.1a	8,300	30	249,000	Contouring at 2 m interval for preparation of base map on 1:4000 scale
iii	4 labours/ party (As per rates of Central Labour Commissioner)	days	5.7	541	120	64,920	Amount will be reimburse as per the notified rates by the Central Labour Commissioner or respective State Govt. whichever is higher
					Sub-Total A	**3,894,924**	
B	**Trenching**						
i	Trenching	Cu m	2.1.1	3330	240	799,200	
					Sub-Total B	**799,200**	
C	**DRILLING**						
i	Core Drilling upto 300m Soft Rock	per m	2.2.1.4a	7,168	680	4,874,240	1st phase - 5 BH, 2ndPhase-12 BH
ii	Land / Crop Compensation (in case the BH falls in agricultural Land)	per BH	5.6	20,000	17	340,000	Amount will be reimbursed as per actuals or max. Rs. 20000 per BH with certification from local authorities
iii	Construction of concrete Pillar (12"x12"x30")	per borehole	2.2.7a	2,000	17	34,000	
iv	Borehole plugging by cement	m	2.2.7b	150	680	102,000	
v	Transportation of Drill Rig & Truck associated per drill	Km	2.2.8	36	720	25,920	1 Rig Transport, 360 Km from Nagpur to Sansarpur
vi	Monthly Accommodation Charges for drilling Camp (Rs 50000/- per Month)	month	2.2.9	50,000	5	250,000	1 Rig Operation
vii	Drilling Camp Setting Cost	Nos	2.2.9a	250,000	1	250,000	
viii	Drilling Camp Winding up Cost	Nos	2.2.9b	250,000	1	250,000	
ix	Road Making (Flat Terrain)	Km	2.2.10a	22,020	5	110,100	Amount will be recalculated after Completion of Tender Process
x	Drill Core Preservation	per m	5.3	1,590	500	795,000	
					Sub Total- C	**7,031,260**	
D	**LABORATORY STUDIES**						
1	**Chemical Analysis**						
	i) Primary Samples for Total Fe, Total Mn, Al_2O_3, P_2O_5, Cao, SiO_2,, TiO_2 ,Acid insolubles + 2 additional elements (Va, Ga)	Nos	4.1.15a & 4.1.15b	5042	790	3983180	Surface Samples-50, Trench Samples-120, BH Samples-620
	ii)External Check Samples for Total Fe, Total Mn, Al2O3, P2O5, Cao, SiO2,, TiO2 ,Acid insolubles + 2 additional elements (Va, Ga)	per sample	4.1.15a & 4.1.15b	5042	79	398,318	10% of primary samples
	iii) 34 elemnts studies by ICP-MS (Sc, Y, La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Hf, Ta, Rb, Zr, Ge, Sr, Sn, As, Be, Nb, Mo, Cu, Pb, Zn, Li, Cs, Co & Ni)	per sample	4.1.14	7731	100	773100	
2.0	**Petrological / Mineralographic 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	Nos	4.3.2	1,549	10	15,490	
	d) Complete mineragraphic study report	Nos	4.3.4	4,232	10	42,320	
	e) Digital photomicrograph of thin & polished section	per sample	4.3.7	280	10	2,800	
3	XRD Mineral Phase Analysis	per sample	4.5.1	4,000	20	80,000	
4	Bulk Density Determination	Nos	4.1	3,540	10	35,400	
					Sub-Total D	**5,396,458**	
					Total (A TO D)	**17,121,842**	
E	**Geological Report Preparation**	**Nos**	**5.2**	For the projects having cost exceeding Rs. 150 lakhs but less than 300 lakhs - A minimum of Rs. 7.5 lakhs or 3% of the value of work whichever is more		**750,000**	Reimbursement will be made after submission of the final Geological Report in Hard Copies (5 Nos) and the soft copy to NMET.
F	**Preparation of Exploration Proposal**	**Nos**	**5.1**	2% or Rs. 500000 whichever is less	**1**	**342,437**	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.
G	**Report Peer Review Charges**	**lumpsum**	**As per EC decision**	**30000**	**1**	**30,000**	
H	**Total Estimated Cost without GST**					**18,244,279**	
I	**Provision for GST (18%)**					**3,283,970**	GST will be reimburse as per actual and as per notified prescribed rate
J	**Total Estimated Cost with GST**					**21,528,249**	
					Say, in Lakhs	**215.28**	

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