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**Submission of Detailed Proposal on
Reconnaissance survey for Bauxite, Titanium and
other associated minerals in Maharajpur –
Khamtala Area, Satna District of Madhya Pradesh.
(UNFC Stage- G4) under NMEDT**

Commodity:

Bauxite, Titanium and other associated minerals

By:

Ocean Drilling and Exploration Private Limited

Summary of the Proposed Maharajpur-Khamtala area for G4 stage exploration

SI No	Features	Details															
	Block ID	Maharajpur-Khamtala															
	Exploration Agency	Ocean Drilling & Exploration Pvt Ltd.															
	Previous Exploration Agency	GSI															
	Previous stage Geological Report)	G-4															
	Commodity	Bauxite, Titanium and other associated minerals															
	Mineral Belt																
	Completion Period with entire schedule to complete the project	10 months															
	Objectives	Phase-I a) Large scale mapping at 1:12,500 scale. b) Systematic collection of BRS/trench samples. Phase-II a) Scout drilling to delineate the continuity of the mineralized zone. b) Analysis of the collected sample and accordingly delineating the potential zone/area for further stage of exploration. c) Estimation of resources as per the guidelines of NMEDT. d) Final report preparation and submission to NMEDT.															
	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	All the work will be carried out by the proposed agency; some specialised work may be outsourced															
	Name / Number of Geoscientists	Geologist: 2 (Field) + 1(HQ)															
	Expected Field days (Geology, Geophysics, Surveyor)	Geologist party days on field: 120 Geologist party days in HQ: 30															
1.	Location																
	Latitude & Longitude	<table> <tr> <th>End point</th><th>Latitude (DMS)</th><th>Longitude (DMS)</th></tr> <tr> <td>A</td><td>24°23'13.380"N</td><td>80°35'37.136"E</td></tr> <tr> <td>B</td><td>24°19'43.684"N</td><td>80°37'44.787"E</td></tr> <tr> <td>C</td><td>24°25'57.323"N</td><td>80°43'16.149"E</td></tr> <tr> <td>D</td><td>24°29'22.367"N</td><td>80°40'58.678"E</td></tr> </table>	End point	Latitude (DMS)	Longitude (DMS)	A	24°23'13.380"N	80°35'37.136"E	B	24°19'43.684"N	80°37'44.787"E	C	24°25'57.323"N	80°43'16.149"E	D	24°29'22.367"N	80°40'58.678"E
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	Villages	Maharajpur, Khamtala, Paraswaniya															
	Tehsil/ Taluk	Raghurajnagar Tehsil															
	District	Satna															
	State	Madhya Pradesh															
2.	Area (hectares/ square kilometres)																
	Block Area	101.00 sq.km															
	Forest Area	NA															

	Government Land Area	Data not available
	Private Land Area	
3.	Accessibility	
	Nearest Rail Head	Unchehra is the nearest railhead, lying on the West Central Railways Mainline (Jabalpur-Prayagraj Railway)
	Road	SH 11 (22.3 km away), approachable by Parsowania-kamtala and Paraswania-Unchahra roads; interior area is approachable by un-metaleed roads.
	Nearest Airport	Satna Airport
4.	Hydrography	
	Local Surface Drainage Pattern (Channels)	Sub-dendritic drainage pattern is developed over Maihar sandstone because of homogeneous material with a gentle slope. Localized structurally controlled (sub-parallel) drainage pattern is observed in the eastern part of the study area.
	Rivers/ Streams	Satna river and Barha river.
5.	Climate	The area's climate is humid subtropical, with hot and semi-dry summers.
	Avg. Annual Rainfall	1066 mm
	Temperatures Minimum Maximum	16.1°C. 33.9°C.
6.	Topography	
	Toposheet number	63D/11
	Morphology of the Area	The study area is part of a tableland bounded by steep scarp faces of sandstone.
7.	Availability of baseline geoscience data	
	Geological Map (1:50K/ 25K)	NA
	Geochemical Map Geophysical Map (Aeromagnetic, ground geophysical, Regional as well as local scale GP maps)	NA
	Justification for taking Preliminary Exploration under G4	A. Background Information The Vindhyan Supergroup occupies a large part of the peninsular India over more than 1,00,000 sq km area covering parts of Madhya Pradesh, Bihar, Uttar Pradesh and Rajasthan and in terms of aerial coverage occupies third after Archaean and Deccan traps. In the study area, Rao and Lal (1974) of the Geological Survey of India (GSI) carried out work in toposheet no. 63D/11 with the objective of locating bauxite occurrences and conducting a preliminary assessment of their potential and grade. The geology of the area is represented by the Sirbu Shale overlain by the Maihar Sandstone of the Bhandar Group, Vindhyan Supergroup. The clay beds, which form the topmost unit of the Maihar Sandstone, are overlain by a 10–15 m thick laterite capping,

together forming detached hill clusters over the main plateau. Bauxite occurs in close association with these clay beds and the laterite cover.

A total of eight bauxite bodies have been identified: four on Raja Baba Hill near Parsowania, three on Khonda Hill near Kamtala, and one on Chui Hill near Kamtala. On Khonda and Chui Hills, the bauxite occurs as linear wedge-shaped bodies along scarp sections of laterite, whereas on Raja Baba Hill it is found mainly as pebbles and boulders in a lateritic matrix, and locally as a massive body.

Chemical analyses of bauxite samples from different bodies show Al_2O_3 ranging from 45.82% to 62.20%, SiO_2 from 1.07% to 5.56%, TiO_2 from 5.50% to 15.00%, Fe_2O_3 from 2.79% to 21.95%, and Loss on Ignition (LOI) from 24.15% to 30.24%. The average composition of the bauxite is estimated at approximately Al_2O_3 54%, SiO_2 2%, Fe_2O_3 8%, TiO_2 8%, and LOI 28%. In this report, the chemical analysis of 10 samples indicates Al_2O_3 values up to 62% and TiO_2 values up to 15%, which are considered encouraging for undertaking further exploration in the area.

In addition, during 2020–21, the Geological Survey of India (GSI) carried out an **NGCM project** under which **Shubham et al.** collected six BRS samples from the enriched lateritic–bauxite zone in Parasmania, Kamtala, Ladbud, Mohli, and Pahari villages. The analytical results are encouraging, as three of the six samples fall within the category of bauxite. These include BRS-1 from Parasmania (Al_2O_3 : 36.62%, SiO_2 : 2.89%, Fe_2O_3 : 31.04%), BRS-2 from Kamtala on Chui Hill (Al_2O_3 : 41.58%, SiO_2 : 2.32%, Fe_2O_3 : 23.72%), and BRS-4 from Mohli village (Al_2O_3 : 30.07%, SiO_2 : 6.91%, Fe_2O_3 : 44.88%).

Justification:

During 1973-74 assessment of bauxite was carried out and values of 10 samples are available in these 10 nos. samples following values reported:

1. Al_2O_3 - 59.49%, Fe_2O_3 -2.99%, TiO_2 -5.56%
2. Al_2O_3 - 59.7%, Fe_2O_3 -5.58%, TiO_2 -9.32%
3. Al_2O_3 - 48.54%, Fe_2O_3 -20.36%, TiO_2 -5.5%
4. Al_2O_3 - 54.86%, Fe_2O_3 -4.59%, TiO_2 -7.85%
5. Al_2O_3 - 62.21%, Fe_2O_3 -6.98%, TiO_2 -7.21%
6. Al_2O_3 - 58.66%, Fe_2O_3 -2.79%, TiO_2 -7.15%
7. Al_2O_3 - 57.19%, Fe_2O_3 -3.59%, TiO_2 -8.12%
8. Al_2O_3 - 55.73%, Fe_2O_3 -4.39%, TiO_2 -7.38%
9. Al_2O_3 - 48.84%, Fe_2O_3 -16.78%, TiO_2 -7.2%
10. Al_2O_3 - 45.52%, Fe_2O_3 -8.58%, TiO_2 -15%

In these samples encouraging values of Al_2O_3 and TiO_2 were reported and these values in the study area again reported during

		NGCM program of GSI where 06 nos. of BRS samples collected and following values were reported: 1. Al₂O₃- 36.62%, Fe₂O₃-31.04%, TiO₂-10.15% 2. Al₂O₃- 41.58%, Fe₂O₃-23.72%, TiO₂-11.25% 3. Al₂O₃- 9.16%, Fe₂O₃-46.97%, TiO₂-0.65% 4. Al₂O₃- 30.07%, Fe₂O₃-44.88%, TiO₂-2.93% 5. Al₂O₃- 1.38%, Fe₂O₃-52.12%, TiO₂-0.28% 6. Al₂O₃- 29.94%, Fe₂O₃-13.97%, TiO₂-3.16% Based on the recommendations of the Geological Survey of India (GSI) and the encouraging results for Bauxite & Titanium in the study area, a G-4 stage exploration is proposed for Bauxite, Titanium & other associated mineral in the Maharajpur – Khamtala Area, Satna District of Madhya Pradesh. The objective of the proposed G-4 stage exploration is to investigate the area and delineate the potential zones of the reported elements for further stage of exploration.
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Detail Project Report for Reconnaissance survey for Bauxite, Titanium and other associated minerals in Maharajpur- Khamtala Area, Satna District, Madhya Pradesh (G-4 Stage)

1. BLOCK SUMMARY

1.1 Physiography

The proposed Maharajpur-Khamtala area is part of the Survey of India toposheet No. 63D/11, Satna district, Madhya Pradesh. The proposed block marked on toposheet no. 63D/11 is attached in Plate I. Total area of the block is 101.00 sq. km. Topographically, the area is part of a tableland bounded by steep scarp faces of sandstone that runs roughly NE-SW. The plateau is bordered by steep escarpments.

1.2 Background Geology (Regional Geology, Geology of the area)

1.2.1 Regional Geology: The geological framework of the area comprises a wide range of lithological units extending from the Archaean to the Quaternary period. The exposed formations include the Archaean basement complex, the Palaeoproterozoic Mahakoshal Group, the Meso- to Neoproterozoic

Vindhyan Supergroup, the Triassic to Cretaceous Gondwana Supergroup, the Upper Cretaceous–Palaeocene Deccan Trap, and recent Quaternary alluvium deposits.

The eastern part of the study area is characterized by Archaean basement rocks represented by granites, gneisses, high-grade schists, metavolcanics, metasediments, and intrusive bodies. These basement rocks, together with associated granitic intrusions and metamorphic assemblages, form the foundation upon which the younger supracrustal sequences were deposited (Shrivastava et al., 1985–86).

The Mahakoshal Group of Palaeoproterozoic age is exposed mainly towards the south-southeastern part of the area and consists predominantly of phyllite, dolomite, quartzite, and banded iron formation (BIF). Mathur and Kedar Narain (1981) subdivided this succession into the lower Agori Group and the overlying Parsoi Formation, suggesting a faulted contact between them in the Sidhi–Sonbhadra region. Subsequently, Roy and Devarajan (2000) reclassified the Agori Group as the Agori Formation. The phyllites are typically grey to greenish-grey in colour and display prominent foliation, while dolomite bands occur interlayered within the phyllitic sequence.

The Vindhyan Supergroup represents one of the most extensive and thick sedimentary successions globally (Valdiya et al., 1982; Bose et al., 2001; Ray, 2006). These sediments accumulated within an intracratonic basin under predominantly shallow marine conditions and preserve an important record of Proterozoic geological evolution, including clues related to palaeoclimate, atmospheric changes, and early life. Stromatolitic limestone horizons reported from the Vindhyan succession (Prasad and Verma, 1991; Prasanna et al., 2010) indicate the existence of algal activity during Vindhyan times. In the present region, the Vindhyan rocks belong to the Meso- to Neoproterozoic era and are grouped into the Semri, Kaimur, Rewa, and Bhandar Groups.

Gondwana sedimentary sequences are developed in isolated intracratonic basins across Peninsular India, generally aligned along the ENE–WSW-trending Narmada–Son lineament and bordered by Precambrian terrains. Within the study area, the Upper Gondwana succession is represented by the Late Jurassic to Early Cretaceous Jabalpur Formation and the Mio-Pliocene Katni Formation. These units mainly comprise sandstone with subordinate shale, clay, and lateritic gravel horizons, occurring chiefly in the southwestern sector of the area.

The Deccan Trap basalts occur as capping over several hillocks associated with the Lameta Group. These basalts are typically dark grey and fine-grained in nature. Isolated lateritic caps are also developed over both the Mahakoshal and Vindhyan formations, and some of these laterites host bauxite and clay-rich pockets. Such clay accumulations are commonly observed along structurally disturbed and fault-controlled zones.

Table 1: Regional stratigraphy of the area (refer to 1:50000 scale GSI Map series, 2009).

GROUP/SUPERGROUP	FORMATION/GROUP/LITHOLOGY	AGE
	Alluvium	Quaternary
	Katni formation	Mio Pliocene
Deccan Traps	Basalt	Upper Cretaceous to Paleocene
	Lameta	
Gondwana Supergroup	Sandstone	Triassic to Cretaceous
Vindhyan Supergroup	Bhandar Group	Neo-Proterozoic

	Rewa Group	Meso to Neo-proterozoic
	Kaimur Group	Meso-proterozoic
	Semri Group	
	Mahakoshal Group	Paleo-proterozoic
	Gneiss (Basement)	Archean

1.2.2 Geology of the area:

The Vindhyan Supergroup of Central India forms a prominent ENE–WSW trending synclinal basin (Sanyal et al., 1987). The geological succession exposed within the study area comprises rocks of the Upper Vindhyan age (Meso- to Neoproterozoic), along with younger Lameta beds, Deccan Trap basalts, and post-Vindhyan laterite–bauxite formations.

A) Bhandar Group -

The Bhandar Group overlies the Govindgarh Sandstone of the Rewa Group and constitutes nearly 90% of the area covered under Toposheet No. 63D/11. It represents the last depositional phase of sedimentation within the Vindhyan Basin during the Neoproterozoic period. In the present study area, the group is chiefly represented by the shale-dominated Sirbu Formation and the sandstone sequence of the Maihar Formation.

A.1) Sirbu Formation

Sirbu Formation of Bhandar Group, which fringes the massive sandstone scarp of Maihar Formation, comprises around 40% of the region in the northern and eastern parts. It's made up of thinly laminated shale in purple, reddish-brown, Khaki green, and light olive green colours.

A.2) Maihar Formation

The Maihar Formation occupies most of the study area, mainly in the western, southern, and central parts. It is composed predominantly of sandstone forming steep escarpments and vertical cliffs. The formation includes pink sandstone at the base and gritty to clayey sandstone towards the upper part.

Colour banding observed in the Maihar Sandstone is likely due to variation in cementing material during deposition, while the spotted appearance in some places is attributed to secondary leaching of ferruginous matter, leaving behind lighter non-ferruginous patches.

The contact with the underlying Sirbu Shale is gradational and exposed along the escarpments. The formation shows well-developed sedimentary structures such as cross-bedding, symmetrical and asymmetrical ripple marks, ripple drift lamination, parting lineation, and current crescents.

B) Lameta Clay

The Lameta Clay beds of the Lameta Group unconformably overlie the Maihar Formation. These infratrappean clay horizons occur as isolated clusters of low hillocks developed over the Maihar Sandstone plateau at almost uniform elevations. The beds are intensely weathered and show close

association with laterite and bauxite mineralization, prominently exposed around Rajababa Hill near Parasmaniya.

C) Deccan Trap

Some of the hillocks of Lameta clay are capped by Deccan Trap basalt, which is fine-grained and dark grey in colour. Two basic bodies were marked on separate mounds near Barura and Gunjhir by K. Srinivasa Rao & Chaman Lal (1974).

D) Laterite/ Bauxite

Low-grade laterite and bauxite occurrences are prominently developed over Rajababa Hill, the northern slopes of Khohna, and Khonda Hill near Majgama. The laterite varies in colour from dark brown to pinkish and yellowish shades and is commonly associated with clayey material, whereas the bauxite is typically grey, massive, and pisolitic in character.

At Rajababa Hill near Parasmaniya, the laterite developed over clay horizons retains relict lamination and encloses partially altered fragments of laminated clay, indicating its origin through prolonged weathering of the underlying iron-bearing clay strata. Around the villages of Pahari, Maharaj, and Khakhara, lateritic exposures contain scattered boulders of Maihar Sandstone, suggesting their evolution over sandstone terrain. Poorly developed lateritic patches were also observed over the Maihar Sandstone near Mainan village.

Table 2: Stratigraphy of the study area. (From Geological Map of TS no. 63D11, GSI)

SUPERGROUP	GROUP	FORMATION	LITHOLOGY	AGE
			Alluvium	Recent
			Laterite	Cenozoic
Deccan Trap	Amarkantak Group			Upper Cretaceous to Paleocene
	Lameta Group			Upper Cretaceous
Vindhyan Supergroup	Bhander Group	Maihar Formation	Sandstone	Neo-Proterozoic
		Sirbu Formation	Shale	



Figure 1. Photograph showing Gritty Sandstone approx. 500m W of Gunjhir Village. (24°28'40.8": 80°41'17.7")



Figure 2. Photograph showing Laterite on Rajababa Hills, 500m SSE of 85A Sample. (24°21'40.1": 80°37'40.1")



Figure 3. Photograph showing Bauxite Near Khamtala Village. (24°23'03.6": 80°37'24.2")

1.2.3 Structure and Framework of the Area

The rock units in the study area predominantly exhibit a NE–SW trend with nearly horizontal to gently dipping strata (2°–5°) towards the southeast. The Vindhyan sedimentary succession preserves well-developed primary sedimentary structures, including bedding and cross-bedding. Bedding planes are characterized by thin laminations marked by distinct colour and compositional banding. In shale units, the banding is generally parallel and continuous, whereas sandstone beds commonly show discontinuous layering.

Prominent vertical joint sets are developed along four principal directions: NW–SE, NE–SW, NNW–SSE, and ENE–WSW. Palaeocurrent interpretation based on cross-bedding suggests sediment transport from the northwest. Well-developed cross-bedding is particularly observed within the Maihar Sandstone around the Parasmaniya area. Symmetrical as well as asymmetrical ripple marks are also commonly preserved within the Maihar Sandstone and Sirbu Shale of the Bhandar Group.

1.3 Mineral Potentiality Based on Geology and Geochemistry

A total of eight lensoid bodies of bauxite occur on three hillocks near Parasmaniya, Khamtala underneath an approx. 10m cover of laterite, which is associated with clay beds occurring on the top of Maihar sandstone and earlier reported as a prospective grade-1 bauxite resource of 20,000 tonnes by K. Srinivasa Rao & Chaman Lal (1974).

Table: Analytical results of samples collected by GSI (FS: 1973-74).				
S.no.	Sample no.	Al ₂ O ₃	Fe ₂ O ₃	TiO ₂
1	35/KSR/73-74	59.49%	2.99%	8.02%
2	44/KSR/73-74	54.7%	5.58%	9.32%
3	94/CL/73-74	48.54%	20.36%	5.5%
4	19/KSR/73-74	54.86%	4.59%	7.85%
5	6/CL/73-74	62.21%	6.98%	7.21%
6	26/KSR/73-74	58.66%	2.79%	7.15%

7	30/KSR/73-74	57.19%	3.59%	8.12%
8	31/KSR/73-74	55.73%	4.39%	7.38%
9	23/KSR/73-74	48.84%	16.78%	7.2%
10	39/KSR/73-74	45.52%	8.58%	15%

During 2020–21, the Geological Survey of India (GSI) carried out an **NGCM project** under which **Shubham et al.** collected six BRS samples from the enriched lateritic–bauxite zone in Parasmania, Kamtala, Ladbada, Mohli, and Pahari villages. The analytical results are encouraging, as three of the six samples fall within the category of bauxite. Out of six BRS samples, BRS-1, BRS-2 and BRS-5 fall in our proposed area.

Table: Analytical results of BRS samples collected during NGCM (FS: 2020-21) project by GSI.				
S.no.	Sample no.	Al ₂ O ₃	Fe ₂ O ₃	TiO ₂
1	BRS 1	36.62%	31.04%	10.15%
2	BRS 2	41.58%	23.72%	11.25%
3	BRS 3	9.16%	46.97%	0.65%
4	BRS 4	30.07%	44.88%	2.93%
5	BRS 5	1.38%	52.12%	0.28%
6	BRS6	29.94%	13.97%	3.16%

1.4. Scope for Proposed Exploration

This project proposes a reconnaissance survey (G-4 stage) consisting of geological mapping and topographical survey at 1:12,5000 scale in Maharajpur-Khamtala area of 101.00 sq. km. to investigate the area and delineate the potential zones of the reported elements for further stage of exploration.

1.5 Recommendations of previous exploration work

Srinivasa Rao, K and Chaman Lal carried out a reconnaissance survey of an area about 325 sq. km bounded between 24°15' & 24°30' and long 80°30' & 80°45' in toposheet no. 63D/11 has been carried out as a part time investigation during the FS 1973-1974; aiming to locate bauxite occurrences and to carry out a preliminary assessment of their potential and grade. A preliminary assessment of the bauxite potential, based purely on surface data indicates an aggregate tonnage of about 20,000 tonnes. Also, the chemical analysis of 10 samples indicates Al₂O₃ values up to 62% and TiO₂ values up to 15%, which are considered encouraging for undertaking further exploration in the area.

In addition, during 2020–21, the Geological Survey of India (GSI) carried out an **NGCM project** under which **Shubham et al.** collected six BRS samples from the enriched lateritic–bauxite zone in Parasmania, Kamtala, Ladbada, Mohli, and Pahari villages. The analytical results are encouraging, as three of the six samples fall within the category of bauxite. The analysis of the BRS samples and oxide concentrations around Parasmania and Khamtala villages indicates high concentrations of Al₂O₃, SiO₂, Fe₂O₃, and TiO₂. Some samples meet the criteria for lateritic bauxite,

while others are lateritic in nature. It was recommended to conduct detailed mineralogical studies and ore geology investigations to further explore the alumina potential in the area.

Based on this, a G4 stage reconnaissance survey is proposed in Maharajpur-Khamtala area of Satna district to delineate the potential zones of the reported elements for further stage of exploration.

1.6 Objectives of Exploration

1. To carry out geological mapping at 1:12,500 scale and establish surface mineralization by systematic mapping and sampling.
2. To collect surface samples to analyse them for Al_2O_3 , Fe_2O_3 , SiO_2 , TiO_2 & LOI.
3. 10 scout borehole (core drilling) to delineate the potential zone/area for further stage of exploration.
4. Estimation of grade and ore resource/reserve in accordance with MEMC Rule-2015 & NMEDT guidelines

2.0 PREVIOUS WORK

Previous Exploration details in the proposed area:

1. **Mallet (1869)** was the first to provide a detailed account of the Vindhyan basin's geology. The study area is located in the northeastern part of the Bhandar plateau, which is located in the basin's central region.
2. **Roy Chowdhary (1958)** discovered bauxite on the Raja baba hill near Parsowania; stating that the bauxite is superficial boulder bauxite with no economic potential.
3. **K. Srinivasa Rao & Chaman Lal (1974)** conducted preliminary assessment of the bauxite occurrences of Parsowania-Kamtala area; stating that the bauxite occurs in association with clay beds and laterite. A total of eight bauxite bodies have been located, among which four are on the Raja Baba Hill near Parsowania, three on the Khonda Hill near Kamtala, and one on the Chui Hill near Kamtala.
4. **Shubham Billawria, dr. Kuldeep Singh and Atul Kumar Rastogi (FS: 2020-2021)** carried out geochemical survey in parts of Satna and Panna districts of Madhya Pradesh; recording higher values of Al_2O_3 around Parasmania and high values of Fe_2O_3 and TiO_2 around Khamtala village.

3.0 AREA DESCRIPTION

Proposed G4 investigation area

The area falls under Survey of India Toposheet no. 63D/11 and covers about 101.00 sq. km. Localities present in the vicinity include Maharajpur, Khamtala, Paraswaniya. The coordinates of the proposed Maharajpur-Khamtala area's corner points are given in table below.

Proposed Area: Maharajpur-Khamtala Area (101.00 sq.km)		
Corner Points	Latitude	Longitude
	Toposheet no.: 63D/11	
A	24°23'13.380"N	80°35'37.136"E
B	24°19'43.684"N	80°37'44.787"E
C	24°25'57.323"N	80°43'16.149"E
D	24°29'22.367"N	80°40'58.678"E

4.0 PLANNED METHODOLOGY

4.1 Methodology of exploration: An area covering 101.00 sq. km. has been proposed for reconnaissance survey for bauxite, titanium & other associated minerals Maharajpur-Khamtala Area, Satna District, Madhya Pradesh. The objective of the exploration is aligned with the requirements of the Reconnaissance survey (G-4) stage as defined by the Minerals (Evidence of Mineral Contents) Rules, 2015 and subsequent amendments in 2021. The primary aim of this survey is establishing surface mineralization by systematic mapping and sampling and to assess subsurface continuity and estimate grade and ore resource/reserve. Accordingly, the following scheme of exploration has been formulated:

a) Geological Mapping (1:12,500 scale): Geological mapping and field traverse will be carried out on the entire proposed area at 1:12,500 scale where Maihar sandstone of Maihar Formation of Bhandar group occupies the major part of the study area.

b) Surveying: During the drilling programme, the survey party will carry out borehole fixation and determination of reduced levels and coordinates of the proposed 10 nos. of scout boreholes.

c) Trenching: 50 cubic meter of trenching may be done.

d) Drilling:

- i. **Scout Drilling:** Total 10 nos. of scout boreholes (core drilling) are proposed and tentative depth of each borehole is 30 m. Total meterage of drilling proposed is 300m.
- ii. **Drill Core Logging:** Preparation of geological litholog, core drilling registers, sampling register.

4.2 Laboratory studies:

- a) **BRS, trench sample and core sample:** A total 50 nos. of BRS samples and 5 nos. of check BRS/Channel Sample (10%) will be collected for laboratory studies. A total of 50 nos. of trench samples and 5 nos. of check trench samples along with total of 100 core samples and 10 nos. of check core samples are proposed to be collected.
- b) **Petrochemical samples (PCS):** A total 20 nos. of samples will be collected for whole rock analysis for classification of rocks and 2 nos. of check samples for the same are to be collected.
- c) **Analysis for Bauxite:** A total of 10 nos. of samples will be collected for combined determination of Trihydrate Alumina (THA-140°C), Monohydrate Alumina (MHA-240°C) & Reactive Silica.
- d) **Petrological sample preparation and study:** A total 10 nos. of thin polished section/ore microscopy samples will be prepared from surface and drill core. These samples will be studied to understand mineralogical, textural relationship with ore mineralization.
- e) **XRD study:** 10 nos. of samples will be undertaken for XRD studies for identification of minerals.

4.3 Estimation of resources

Estimation of resources will be done according to UNFC norms and the Minerals Evidence & Mineral Contents (MEMC) Rule- 2015 at the G-3 level and to meet the NMEDT objectives.

4.4 Report preparation

Submission of reports will be done as per the recommendations of NMEDT in compliance with G4 level as per MEMC 2015 and suggestions for follow-up work to upgrade the project, if deemed necessary.

5.0 NATURE, QUANTUM AND TARGET

The nature and quantum of work proposed are given in Table:

Reconnaissance survey for Bauxite, Titanium and other associated minerals in Maharajpur-Khamtala Area, Satna District, Madhya Pradesh			
Sl. No.	Item of work	Unit	Qty.
1.	Geological mapping (1:12,500)	Sq.km	101
2.	DGPS Survey (10 Boreholes)	Days	10
3.	A) Bed Rock Samples	Nos.	50
	B) Trench Samples	Nos.	50
	C) Core samples	Nos.	100
4.	Scout drilling (10 BHs)	m	300
5.	Laboratory studies		
a)	Chemical Analysis		
	i) Surface sampling :- BRS (Primary samples) Major oxides	Nos.	50
	ii) Check samples (BRS)	Nos.	5
	iii) Trench Samples + Check samples Major oxides	Nos.	50+5
	iv) Drill core (Primary+ check samples)	Nos.	100+10
	v) Analysis of one rock/soil sample for quantitative analysis + check samples	Nos.	20+2
b)	XRD-studies	Nos.	10
7.	i) Petrological samples (Surface samples)		
	a) Preparation of polished thin section	Nos.	10
8.	Combined determination of Trihydrate alumina, monohydrate alumina & reactive silica	Nos.	10
6.	Report preparation	Nos.	1
7.	Preparation of exploration proposal	Nos.	1

6.0 TIMELINE

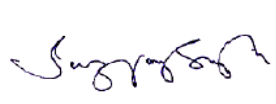
Time Schedule/Action Plan for Reconnaissance survey for Bauxite, Titanium and other associated minerals in Maharajpur- Khamtala Area, Satna District, Madhya Pradesh															
S.no.	Activity	Months/Days	Month												
			1	2	3	Review	4	5	6	Review	7	8	9	10	
1	Camp setting	months													
2	Geological mapping and Sampling	months													
4	Surface Drilling	months													
5	Core logging and sampling	months													
6	Geologist Man Days (Field)	days													
7	Geologist Man Days (HQ)	days													
8	Sampler Man days	Days													
9	Laboratory studies	Months													
10	Report Writing with Peer Review	months													
11	Camp Winding	months													





7.0 BREAK-UP OF EXPENDITURE:

Reconnaissance survey for Bauxite, Titanium and other associated minerals in Maharajpur- Khamtala Area, Satna District, Madhya Pradesh Area: 101.00 sq.km; Scale: 1:12,500, Drilling: 300 m, (Schedule timeline: 10 months; Review: After 3 and 6 Months) [Implementing Agency: M/s Ocean Drilling and Exploration Private Limited]							
S. No.	Item of Work *	Unit *	Rates as per NMET SoC 2025-26		Estimated Cost of the Proposal		Remarks
			SoC-Item No. *	Rates as per SoC *	Qty.	Total Amount (Rs)	
			(a)	(b)	(b)	(a*b)	
A	Geological Mapping, Other Geological Work & Surveying						
1	a. Geological Mapping (1:12,500 scale)	per sq.km.	1.1	18300	101	1848300	
	b. Charges for Geologist per day (Field)	day	1.2.1a(b)	14,500	120	1740000	
	c. Labours Charges; Base rate	day	5.8	556	240	133440	Amount will be reimbursed as per the notified rates by the Central Labour Commissioner or respective State Govt. whichever is higher.
2	Charges for Geologist per day (HQ)	day	1.2.1a	10,500	30	315000	
3	a. Charges for one Sampler per day (1 Party)	one sampler per day	1.2.1b	7,850	33	259050	
	b. Labours (4 Nos)	day	5.8	556	132	73392	Amount will be reimbursed as per the notified rates by the Central Labour Commissioner or respective State Govt. whichever is higher.
	Sub Total- A					43,69,182	
B	Trenching / Pitting						
1	Trenching	per cu. m	2.1.1	4125	50	2,06,250	50 nos.
	Sub-Total B					2,06,250	
C	SURVEY WORK (MoU)						
1	DGPS Survey for BH Fixation & RL determination	Per point of Observation	1.3.2	24000	10	240000	4 Block boundary points + 10 BH





	Sub-Total C						2,40,000
D	DRILLING (in-house)						
1	Core drilling (soft rock)	per m	2.2.1.1c	5500	300	16,50,000	10 BH; each 30 m depth (10*30)
2	Land / Crop Compensation (in case the BH falls in agricultural Land)	per BH	5.6	30,000	10	3,00,000	As per actual as certified by local authorities subject to a maximum of 30000 per bore hole
3	Construction of concrete Pillar (12"x12"x30")	per borehole	2.2.7	2000	10	20,000	Rs. 2000 per borehole
4	Borehole plugging by cement	lumpsum per borehole	2.2.8	10000	10	1,00,000	Rs. 10000 per borehole
5	Miscellaneous charges (Transportation of Drilling Rig, Accommodation for drill Camp, Camp setting and winding, construction of Approach Road and drill core preservation).	lumpsum	2.2.9(1)	For Drilling cost less than 50 Lakhs: 25% of Drilling Cost		4,12,500	
6	Drill core preservation	per m	5.3	1590	150	2,38,500	
	Sub Total D						27,21,000
E	LABORATORY STUDIES						
1	Chemical Analysis						
i)	Major oxides (WD XRF)-oxides+traces-24 elements)	per sample	4.1.17a	4,200	200	8,40,000	50 trench samples+ 50 BRS+ 100 core samples
ii)	Check samples (10%) Major oxides (WD XRF) - (oxides+traces-24 elements)	per sample	4.1.17a	4,200	20	84,000	
iii)	Analysis of one rock/soil sample for quantitative analysis of 14 REE elements + 9 trace element (U, Ta, Ge, Be, Hf, Sn, As, Rb, Th) by ICP-MS	per sample	4.1.15	7,400	20	1,48,000	
iv)	Check samples (10%)	per sample	4.1.15	7,400	2	14,800	
iv)	Analysis for Bauxite						
a)	Combined determination of Trihydrate Alumina (THA-140°C), Monohydrate	per sample	4.1.19a	7,500	10	75,000	





	Alumina (MHA-240°C) & Reactive Silica							
3	Physical & Petrological Studies							
i	Preparation of polished thin section	Nos	4.3.2	800	10	8,000		
ii)	Complete petrographic/ore microscopic study/mineragraphic report of rock sample (along with 5 nos. digital photo micrographs)	per Sample	4.3.4	2800	10	28,000		
iii)	XRD studies for identification of minerals (Random)	per sample	4.5.2	4000	10	40,000		
	Sub Total E					12,37,800		
	Total A+B+C+ D+E					87,74,232		
F	Geological Report Preparation	5 Hard copies with a soft copy	5.2	Total cost exceeding Rs. 50 lakhs but less than 150 lakhs.		2,50,000	Reimbursement will be made after submission of the final Geological Report in Hard Copies (5 Nos) and the soft copy to NMET.	
G	Peer review Charges		As per EC decision			30,000		
H	Preparation of Exploration Proposal	5 Hard copies with a soft copy	5.1	2% of approved project cost or 5 Lakh whichever is lower		1,75,485	EA will be reimbursed after submission of the Hard Copies and the soft copy of the final proposal along with Maps and Plan as suggested by the TCC-NMEDT in its meeting while clearing the proposal.	
I	Total Estimated Cost without GST					92,29,717		
J	Provision for GST (18% of J)					16,61,349.00	GST will be reimbursed as per actual and as per notified prescribed rate	
K	Total Estimated Cost with GST					1,08,91,066		
L	Rs. In lacs			or Say Rs. In Lakhs		108.91		
Note:								





1	Strict adherence to the Ministry of Finance's and GFR guidelines is mandatory. Every transaction must adhere to GFR rule 21.
2	In case of delay/non- performance, the appropriate action will be taken by competent authority against delinquent agency as per prevailing govt. of India rules/guidelines on procurement.
3	If any part of the project is outsourced, the amount will be reimbursed as per the Paragraph 3 of NMEDT SoC and Item no. 6 of NMEDT SoC. In
4	Necessary efforts should be made to minimize any adverse impact on the environment during exploration activities.
5	Any item of work not mentioned above shall be added as per SoC.
6	All the Geological Reports and data are to be uploaded on NGDR as per MERT template by the agency.

  
12/06/2024

8.0 REFERENCE

1. Mallet, F.R. (1869) On the Vindhyan Series as exhibited in the north western and central provinces of India. Mem Geol Sur Ind Vol 7, Pt. 1.
2. Roy Chowdhury, M.K. (1958) "Bauxite in Bihar, Madhya Pradesh, Vindhyan Pradesh, Madhya Bharat, and Bhopal". Mem Geol Sur Ind Vol 85.
3. Shukla, R. (1970) "A contribution to the knowledge of bauxite resources in Madhya Pradesh" Geol Sur Ind Symposium on Geology and Mineral Resources of Madhya Pradesh (P 15) Abstracts.
4. Srinivasa Rao, K & Chamanlal (1972) Report of Geological mapping of Vindhyan in parts of Banda District, UP and Satna District, MP. (Panna Diamond Investigation) Unpubl Report, Geol Surv Ind.
5. Shubham Billawria, Dr. Kuldeep Singh & Atul Kumar Rastogi (2023) Final report on geochemical mapping in toposheet no. 63D/11 in parts of Satna and Panna districts, M.P.

Plate I: Location of proposed “Reconnaissance survey for Bauxite, Titanium and other associated minerals in Maharajpur- Khamtala Area, Satna District, Madhya Pradesh” on toposheet no. 63D/11.

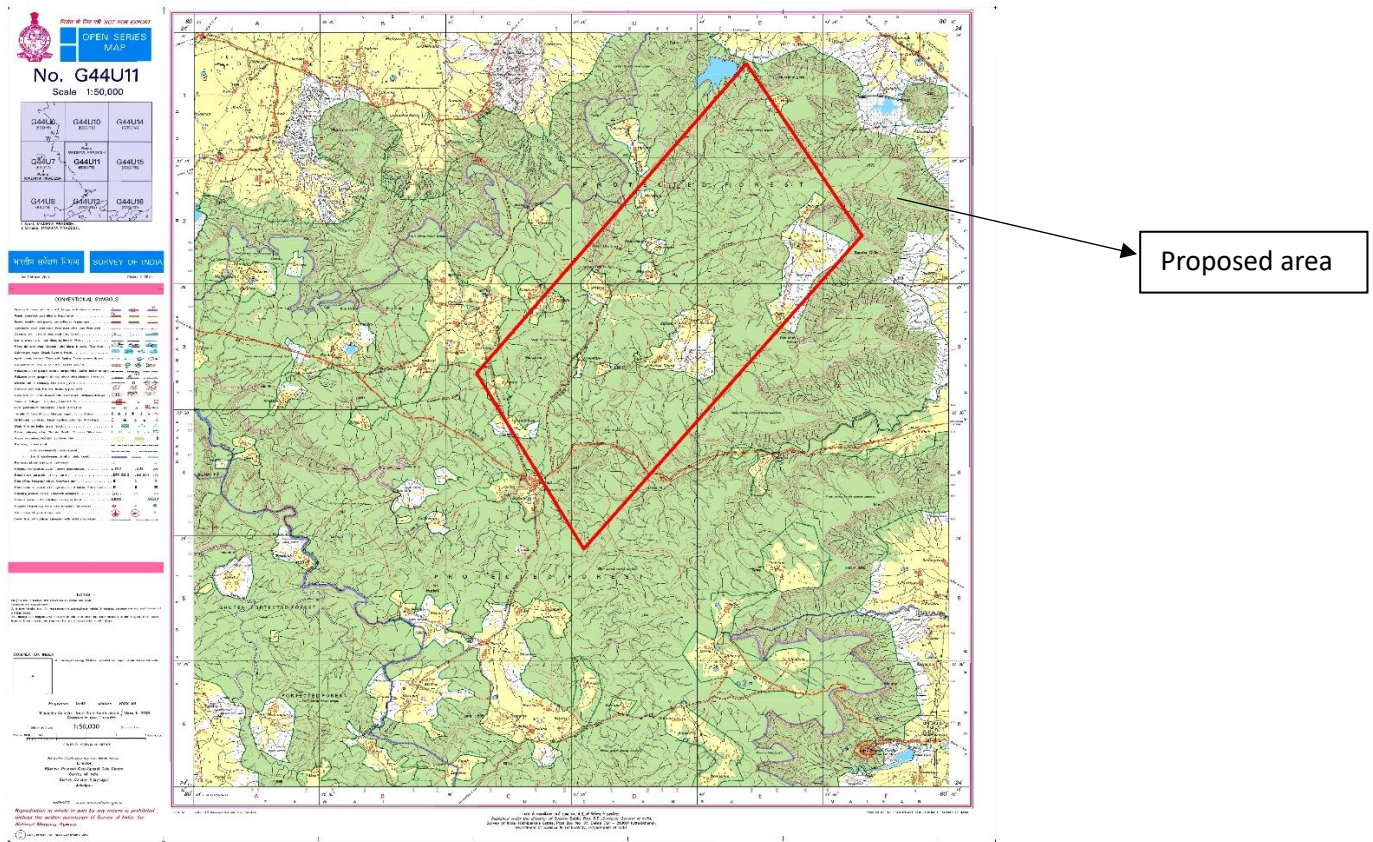


Plate II: Google earth image showing proposed area location.

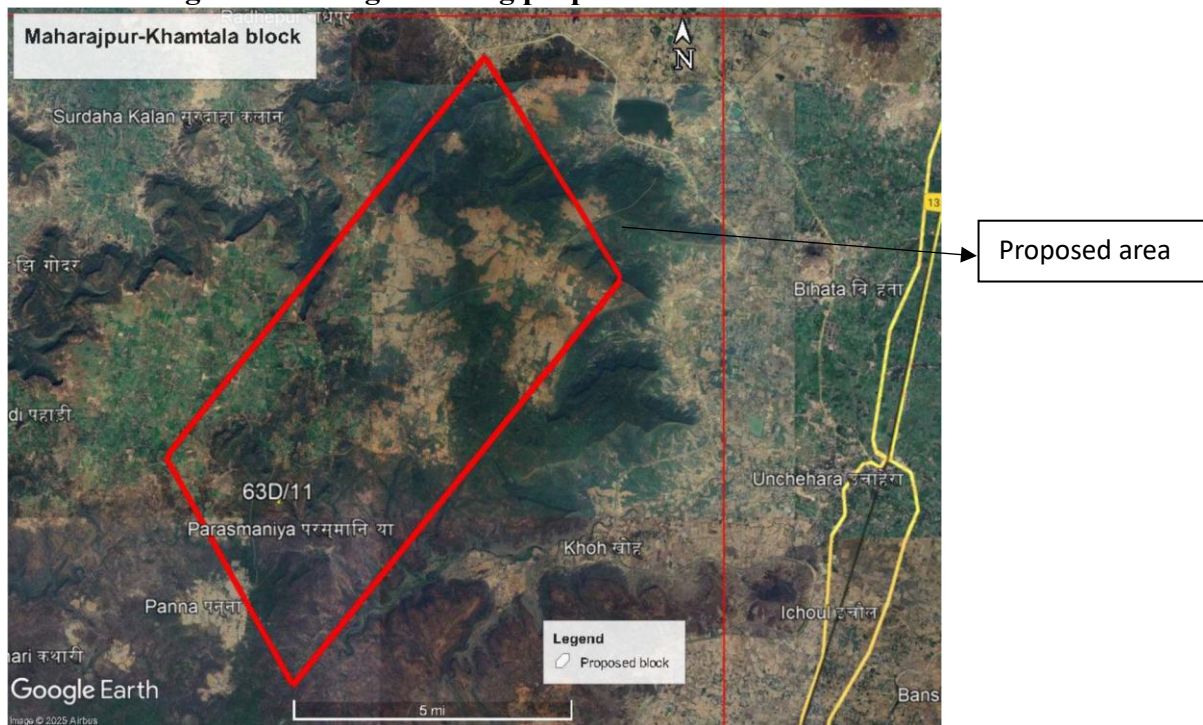


Plate II: Google earth image showing BRS samples of NGCM project(FS:2020-21) falling in our proposed area location.

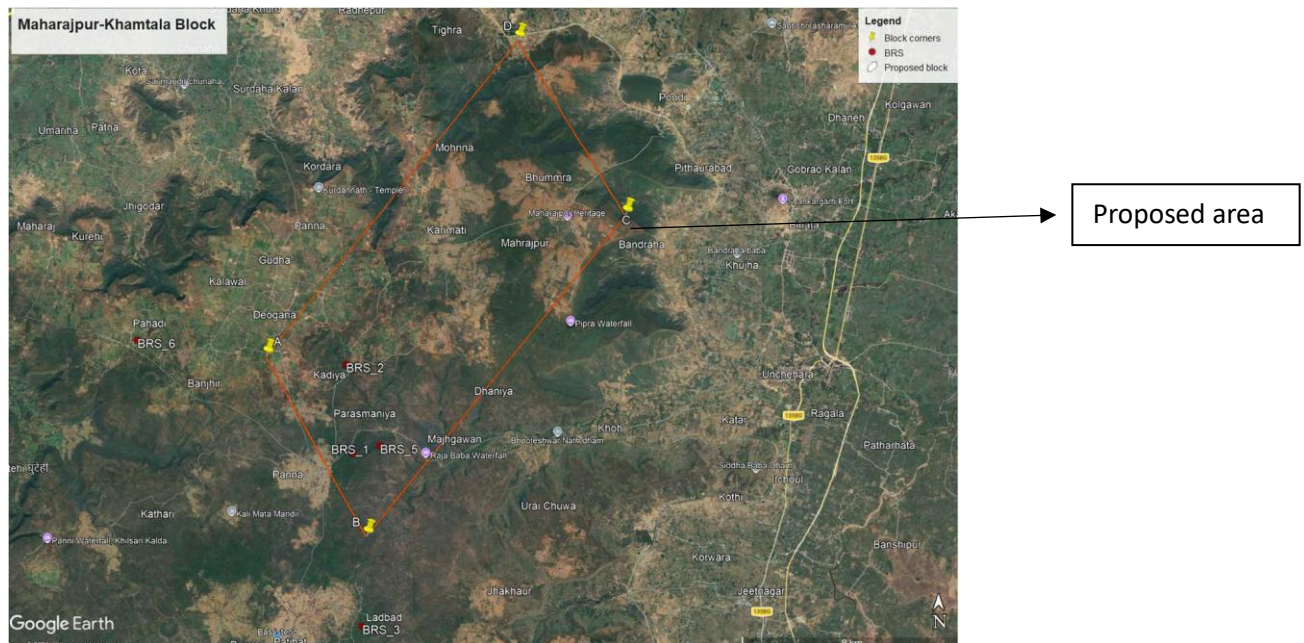


Plate IV: Geological map (Scale-1:63,360; GSI:1973-1974)

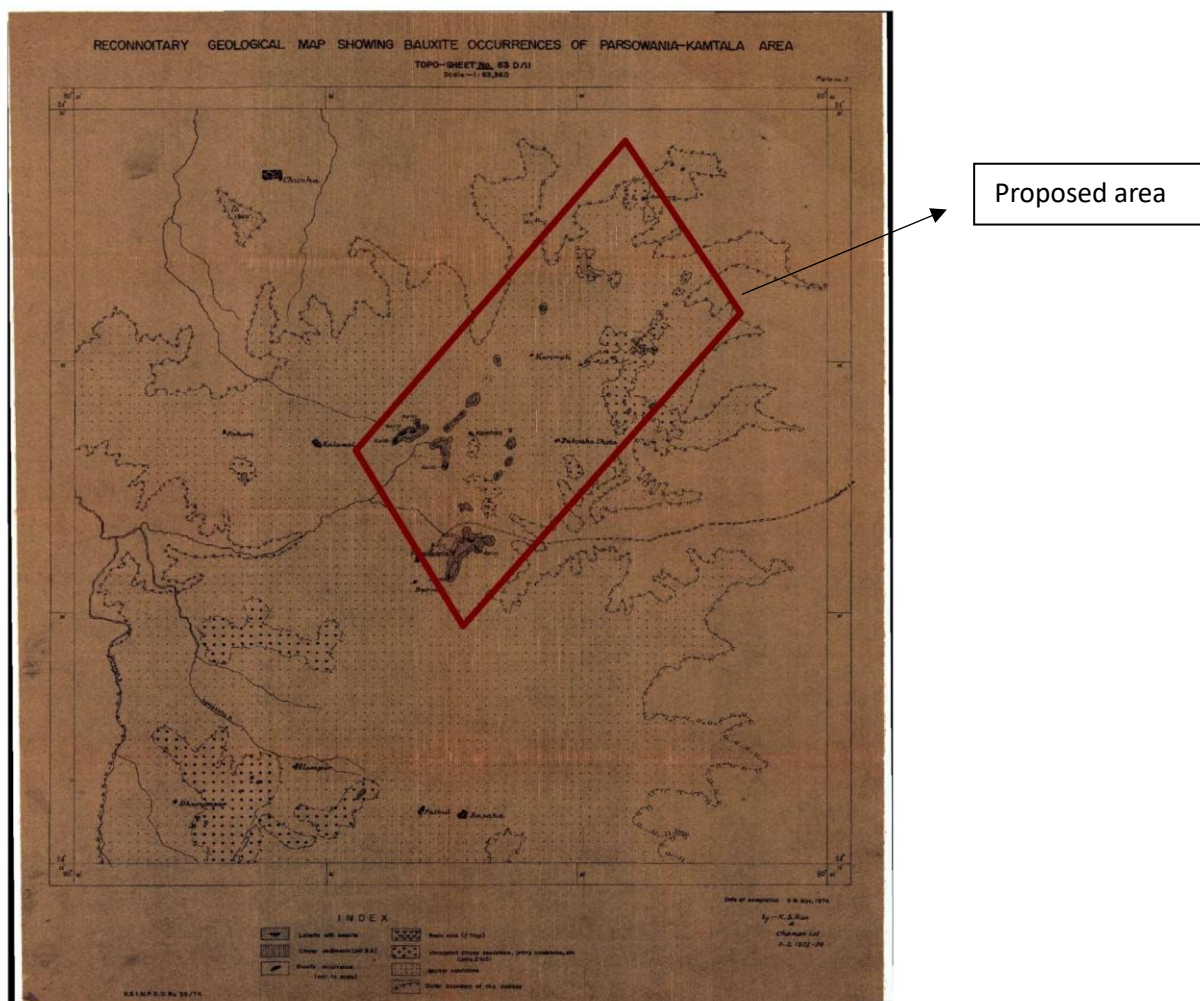
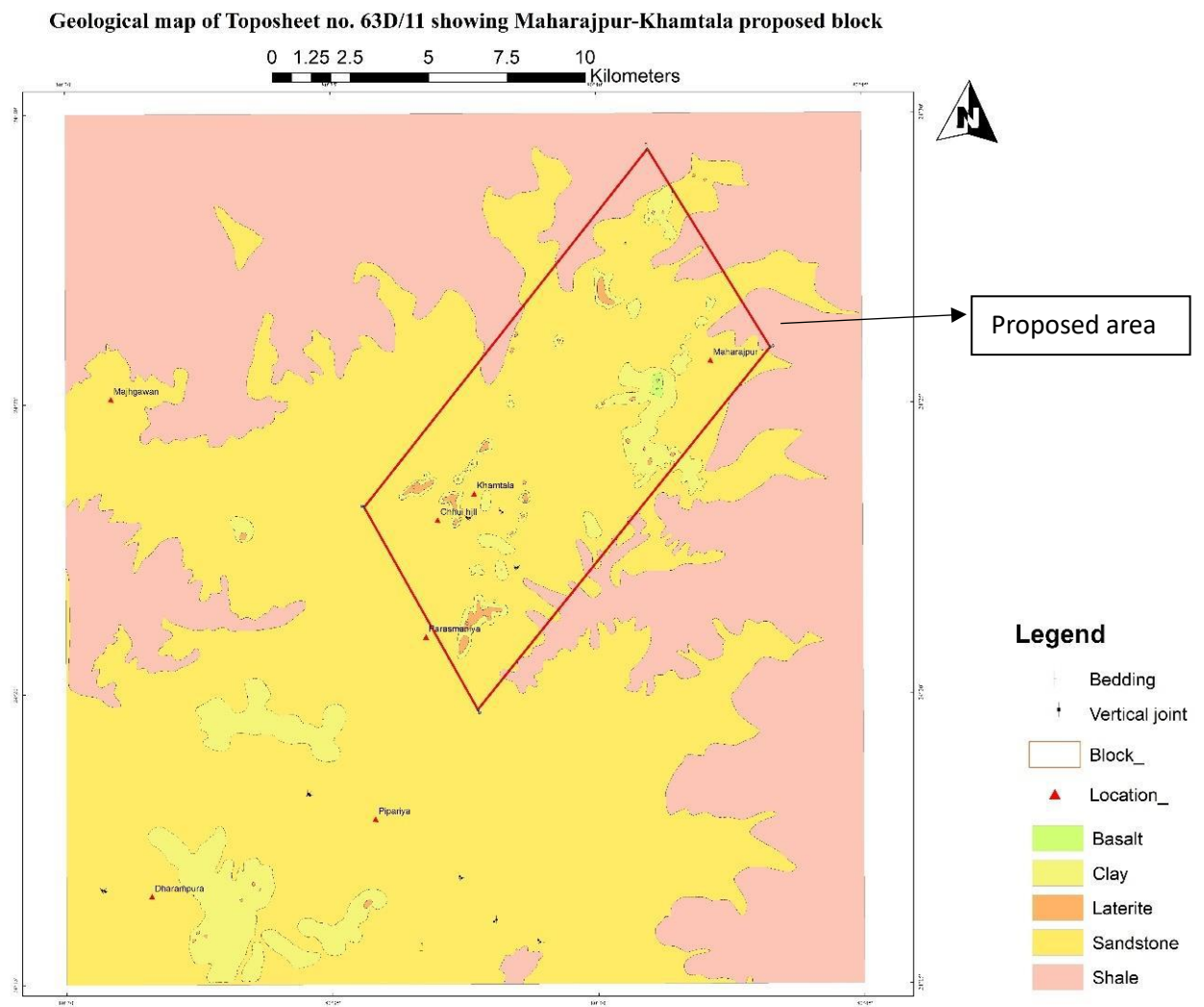


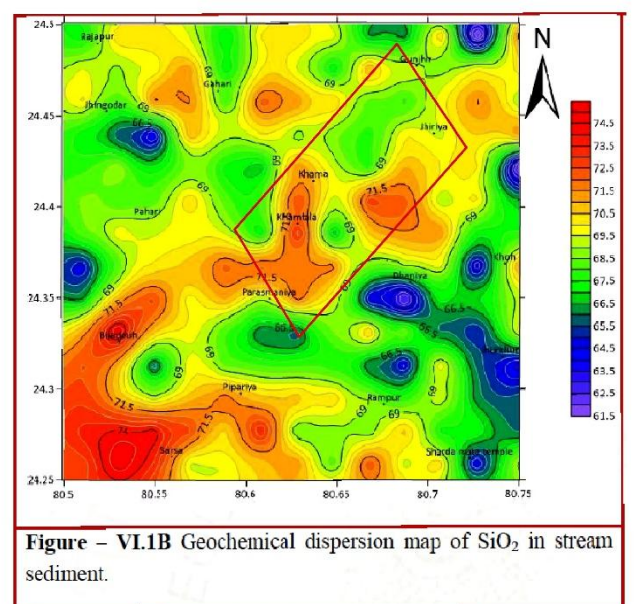
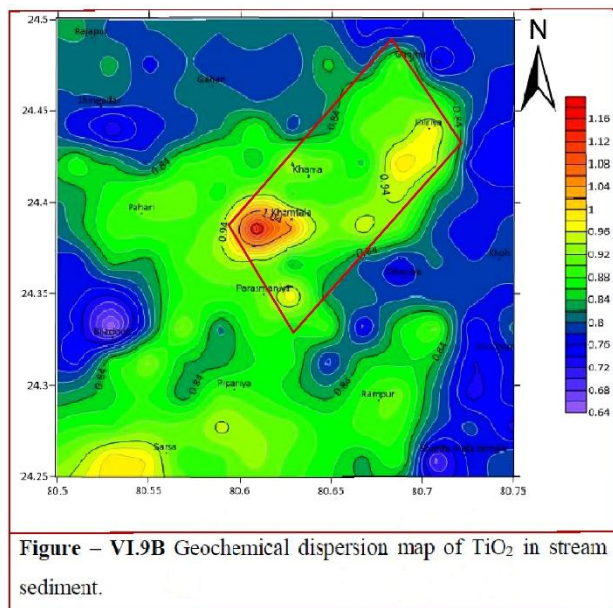
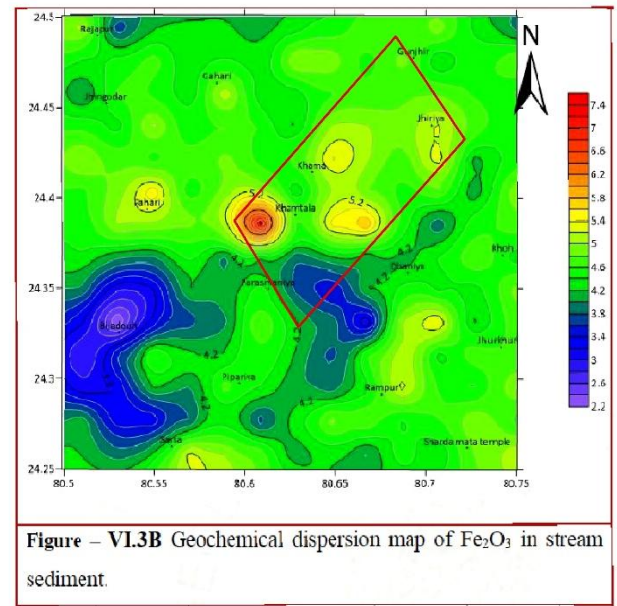
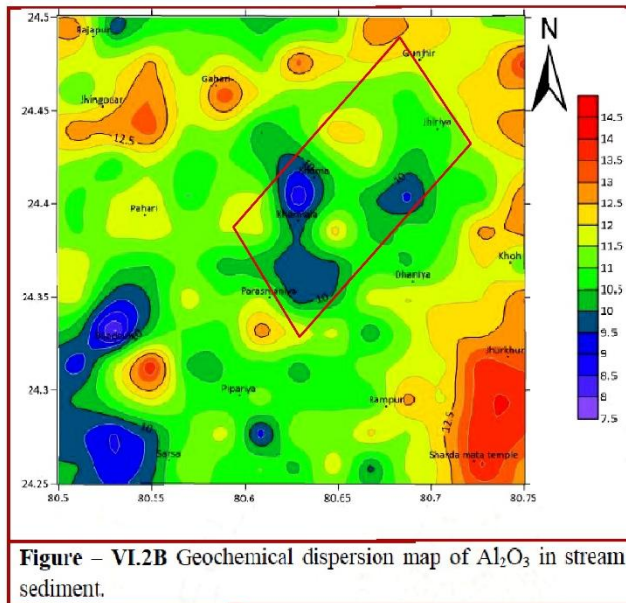
Plate V: Geological map (NGCM project; GSI:2020-21)

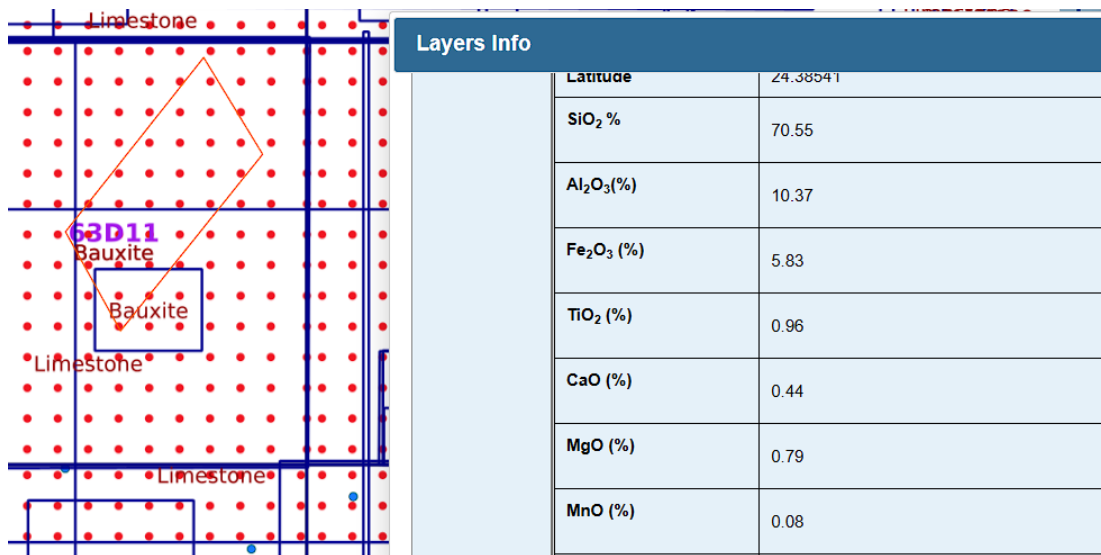
NGCM Exploration Data:

Geochemical mapping project was carried out by GSI in toposheet 63D/11 during F.S. 2020-21, covering part of the present study area. Three of the six samples collected by GSI fall within the category of bauxite.

In BRS:

- Al_2O_3 values ranging upto **41.58%**.
- Fe_2O_3 values ranging upto **52.12%**.
- TiO_2 values ranging upto **11.25%**.
- SiO_2 values ranging upto **39.17%**.

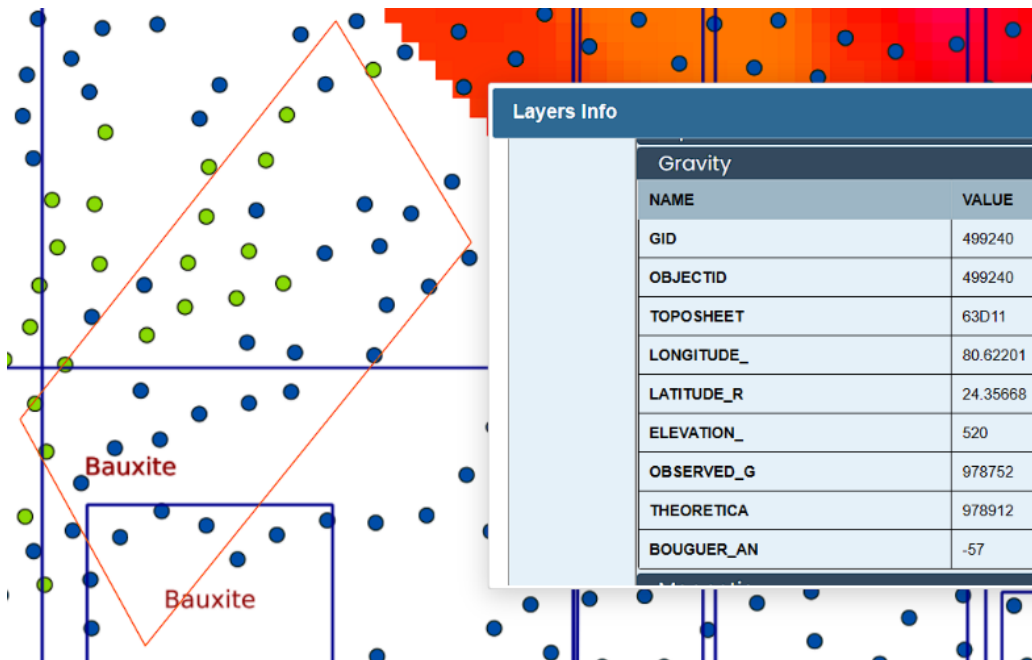


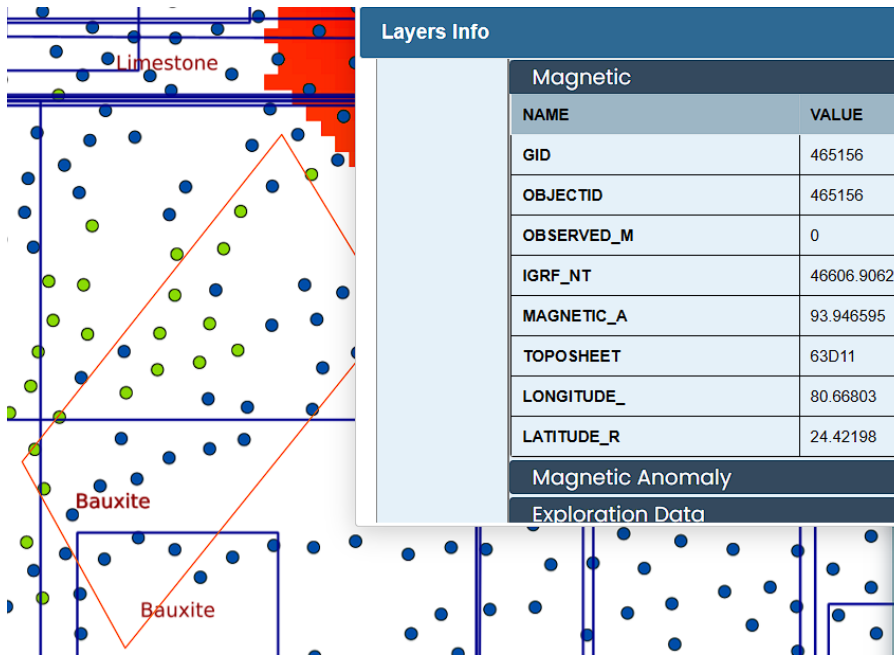


Here, the NGCM data map shows:

- SiO₂ = 70.55%
- Al₂O₃ = 10.37%
- Fe₂O₃ = 5.83%
- TiO₂ = 0.96%

Geophysical exploration data:

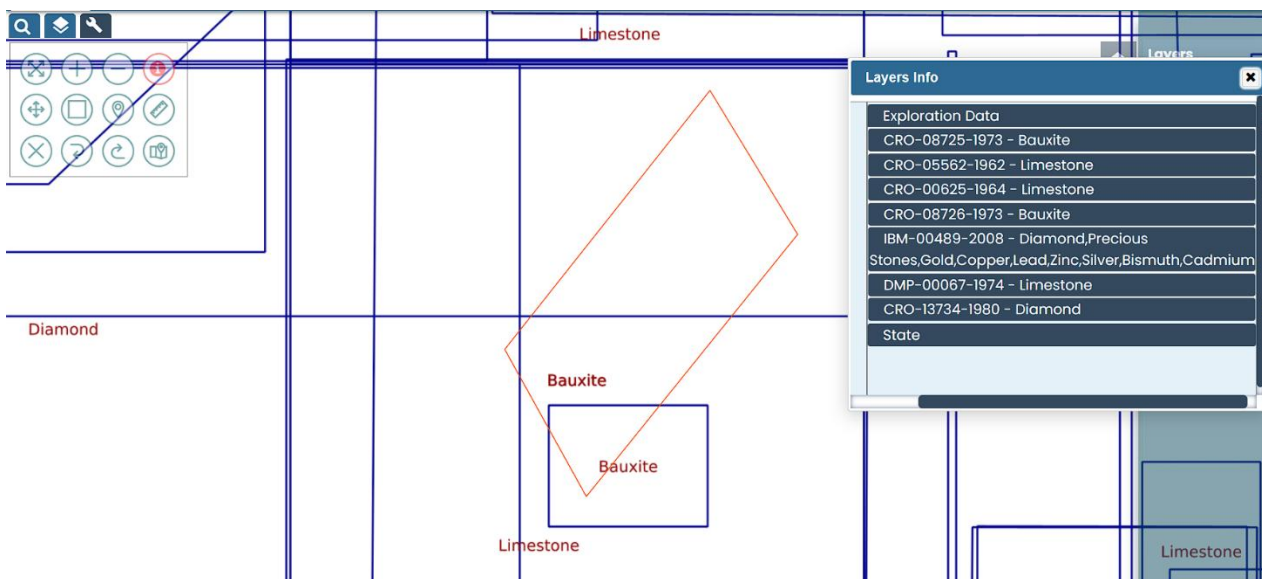




Here NGPM data map shows:

- Bouger gravity anomaly = -57 mGal
- Magnetic anomaly = 93.95 nT

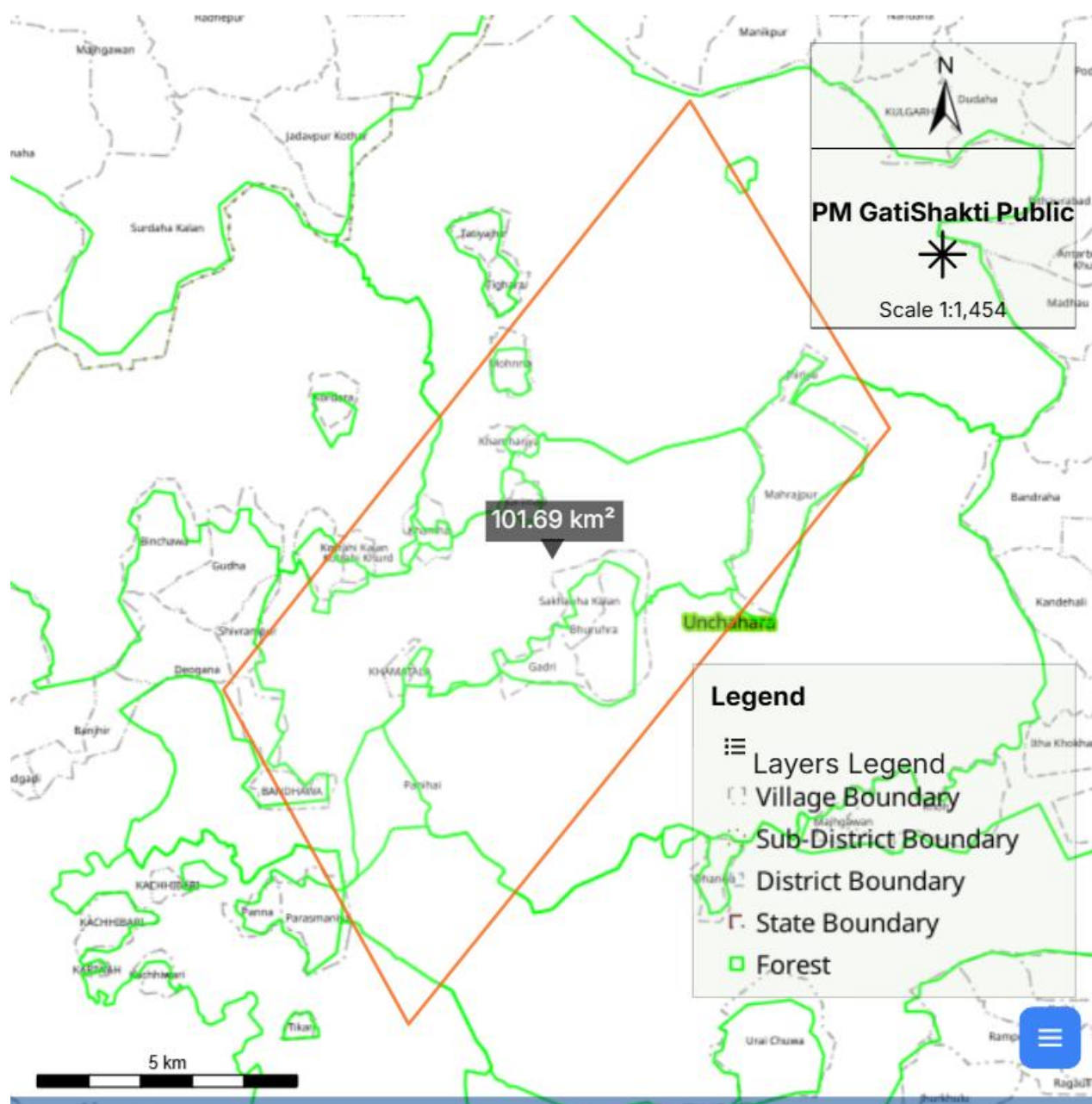
Map Showing Status of Exploration blocks on NGDR



Spatial analysis of nearby GSI blocks has been carried out using the NGDR database. The proposed area has been overlaid and examined.

No existing lease area is present within the proposed block. No previous mining activity was recorded in the area. Also, no old working has been recorded so far.

Map Showing Status of Proposed Area on PM Gatishakti portal



Overlay analysis of the proposed area with the forest layer has been carried out using the PM Gati Shakti portal.

Forest Type: Protected Forest

Proposed area is free from the buffer zone of International Boundary, Wildlife sanctuary, no-go zone, Biodiversity Park etc.