

COMMODITY: GLAUCONITE AND REE MINERALIZATION

**PROPOSAL FOR “PRELIMINARY EXPLORATION FOR GLAUCONITIC
SHALE/SANDSTONE AND ASSOCIATED REE MINERALIZATION IN
BANSKURAH-BIRBIRA BLOCK, MAHASAMUND DISTRICT, CHHATTISGARH”**

**BY
GEOLOGICAL SURVEY OF INDIA
STATE UNIT: CHHATTISGARH**

**PLACE: RAIPUR, CHHATTISGARH
DATE: 10th JUNE 2026**

Summary of the Block for G3 Level Exploration

GENERAL INFORMATION ABOUT THE BLOCK

Feature	Details
Project Title	Preliminary exploration for glauconitic shale/sandstone and associated REE mineralization in Banskurah-Birbirablock, Mahasamund District, Chhattisgarh.
Year	2026-2027
Commodity	Glauconite and REE mineralization.
Exploration Agency	Geological Survey of India, Central Region, State Unit: Chhattisgarh, Raipur
Tehsil/Taluka	Mahasamund
District	Mahasamund
State	Chhattisgarh
Project stage	G3
Approved in PSC (No.)	10 th PSC
Block ID	M2ASMIF-MEP/NC/CR/SU-CG/2026/200711
Mineral Belt / Geological Domain	Chhattisgarh Basin
Block Area	2.88 sq. km
Completion Period	One year (2026-2027)
Objectives	To establish the sub-surface continuity and estimate the resource of glauconite and REE mineralization.
Personnel	Two geoscientists
Expected Field Days	Officer-1: 100 days; Officer-2: 50 days; Supervisory Officer: 10 days
Toposheet / Degree Sheet	64 K/4

1. Location

Banskurah-BirbiraBlock

Cardinal Points	Latitude	Longitude
A	21°13'25.587"N	82°10'22.491"E

Cardinal Points	Latitude	Longitude
B	21°13'04.604"N	82°10'57.567"E
C	21°14'10.266"N	82°11'42.396"E
D	21°14'31.301"N	82°11'07.310"E
Tehsil/Taluk	Mahasamund	
District	Mahasamund	
State	Chhattisgarh	

2. Area

Block Area	2.88 sq. km.
Forest Area	No forest area lies within the proposed project however southeastern part of the study area covers the Sirpur Reserve forest
Government Land Area	Data not available
Private Land Area	Data not available

3. Accessibility

Nearest town	Mahasamund town, about 15 km to the Banskurah and Birbira
District headquarters	Mahasamund, about 11 km southeast of Tumgaon
Nearest Rail head	Mahasamund, about 11 km southeast of Tumgaon
Nearest Airport	Raipur, 60 km

4. Hydrography: Small seasonal streams

5. Climate: Tropical.

6. Topography: Gently undulating to flat terrain

7. Availability of baseline geoscience data

Geological map	Large-scale geological mapping and earlier G4 investigations by GSI in and around the block
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Geochemical data	Surface chemical data from Sandstone, Shale and Granite samples in and around the block, NGCM
Geophysical data	NA

8. Justification for taking up G3 level exploration

1. The Banskurah–Birbira block in Mahasamund district forms part of the sedimentary succession of the **Chhattisgarh Supergroup**, specifically represented by rocks of the **Chandarpur Group**, comprising shale/siltstone horizons of the Chaporadih Formation, which are known to host glauconite mineralization.
2. Reconnaissance survey (G-4 stage) carried out during FS: 2024–25 has established the presence of glauconite-bearing horizons with associated REE enrichment. Channel sample CHS-03 recorded TREE value of **118.83 ppm with 5.67 wt% K₂O**, while CHS-04 yielded **286.69 ppm TREE with 6.18 wt% K₂O**, indicating significant enrichment of REE and potassic phases.
3. Trench sampling in the same horizon (Trench-3) has yielded encouraging subsurface results with TREE values ranging from **206.98 ppm to 401.77 ppm** and K₂O values between **5.6 wt% and 6.35 wt%** in shale/siltstone units of Chaporadih Formation, thereby confirming lateral persistence and enrichment of mineralization.
4. The observed surface and subsurface geochemical anomalies, coupled with consistent lithological control of glauconite-bearing shale/siltstone horizons, indicate a favourable environment for REE and associated mineralization, warranting systematic subsurface evaluation.
5. In view of the encouraging analytical results obtained during G-4 stage investigation, a G-3 stage preliminary exploration programme is proposed to assess the **lateral and vertical continuity**, thickness variation, and grade distribution of the mineralized horizons for their glauconite and REE potential.

PRELIMINARY EXPLORATION FOR GLAUCONITIC SHALE/SANDSTONE AND ASSOCIATED REE MINERALIZATION IN BANSKURAH-BIRBIRA BLOCK, MAHASAMUND DISTRICT, CHHATTISGARH

1.1.0 INTRODUCTION

Potash is the most widely used fertilizer in the country. India's entire requirement is being imported and is a drain on foreign exchange. Potassium is one of the three essential elements, i.e., N, P, K, for the growth of the plants. Importance and significance of potash in agriculture as well as for human and animal health is well established. About 95% of potash production is consumed by the fertilizer industry; the rising trend of potash consumption is likely to continue in future because of increased demand of fertilizer for agriculture purpose.

2.1.0 BACKGROUND INFORMATION

The area is largely occupied by the sedimentary rocks of the Chandarpur Group of Chhattisgarh Supergroup of meso-neo-Proterozoic age. A small portion of NW-SE trending Dongargarh granite is also present in the area.

A G3 stage mineral exploration project taken up during field season 2026-27 in Banskurah and Birbira area in toposheet nos. 64K/04 in Mahasamund District of Chhattisgarh. The study area selected

considering anomalous values of K₂O as well as other geological and geomorphological factors.

The Chhattisgarh Basin sediments covering an area of about 36,000 sq. km in Bastar Craton unconformably overlies the Archean crystalline basement, the Neoarchean Sonakhan Group and the Neoarchean to Paleoproterozoic Dongargarh-Kotri volcanics. The Chhattisgarh Supergroup of rocks tectonically juxtaposed against the metamorphosed and deformed rocks of the Bilaspur-Raigarh-Surguja belt and CGC in the north. The Chandarpur and Raipur groups belonging to Chhattisgarh Supergroup occupy the majority of the Chhattisgarh basin area. Chandarpur Group is represented by arenaceous-argillitic litho-assemblage, whereas overlying Raipur Group is composed of argillitic-carbonate suite (Patranabis-Deb and Chaudhuri, 2008 & 2010).

The present proposal aims to test the subsurface continuity of indications identified in earlier studies and to advance the block to G3 level.

The proposal is linked with the annual plan of GSI and focuses on establishing grade, thickness, and continuity of Glauconite and REE mineralisation within the Banskurah and Birbirablock.

3.1.0 LOCATION AND ACCESSIBILITY

The study area enjoys excellent accessibility, with Mahasamund serving as the nearest urban center and Raipur, the capital city of Chhattisgarh, located just 60 km to the west. The region is well-connected to Raipur via the Mumbai–Kolkata National Highway (NH-6), a major, well-maintained roadway ensuring smooth travel. Mahasamund Railway Station, situated on the Southeastern Railway line, further enhances regional connectivity. The total proposed block area is 2.88 sq. km.

4.1.0 PHYSIOGRAPHY, DRAINAGE AND CLIMATE

The block lies within the Banskurah and Birbira area near Tumgaon is characterized by a **physiography** of gently undulating structural plains within the Mahanadi Basin, and a fertile soil composition of black Kanhar and yellow Matasi loam. Its **drainage** is dominated by the proximity of the Mahanadi River to the west, with local ephemeral streams and village tanks serving as the primary conduits for surface runoff and irrigation recharge. The **climate** is tropically wet and dry, marked by scorching summers where temperatures often exceed 42°C, a monsoon-driven rainy season providing an annual average of 1,200 mm of rainfall, and mild, pleasant winters.

5.1.0 PREVIOUS WORK

During FS 2008-10, M. C. Patel and Y. Pandey carried out geochemical mapping in toposheet no. 64K/06 and 64K/08. They have reported higher values of K₂O ranging from 0.91% to 3.76% in south-eastern part of toposheet no. 64K/06. The higher values are reported in the area occupied by rocks belonging to Chaporadih and Kansapathar formations. Based on the above result, the Pairaguda and Jhalpani area has taken up for G4 stage investigation. Subsequently, during FS 2010-12, A. Singh and S. M. Dewalkar have carried out geochemical mapping in adjoining toposheet no. 64K/02 and 64K/03. They have reported higher values of K₂O in southeastern part of Toposheet no. 64K/03 ranging from 1.18% to 4.57%.

During FS 2012-13, Pattnayak et al. have carried out geochemical mapping (GCM) in Toposheet no. 64K/04. The authors have reported higher values of K₂O in northern and central part of T.S. no 64K/04. A total of 27 no. of composite samples fall within the proposed study area out of which, 13 composite sample show K₂O content from 1.2% to 1.99%, 10 composite samples have K₂O content from 2% to 2.99% and higher values of K₂O in 04 composite samples ranging from 3% to 4.29%.

During FS:2024-25, reconnaissance survey (Stage G4) of glauconite mineral was carried out by G. Saxena and B. Kumar, in toposheet nos. 64K04 in Mahasamund District, Chhattisgarh with an objective to delineate the glauconite bearing horizon in the area. The area is represented by successions

of Chandarpur Group of Chhattisgarh Supergroup.

In the proposed Banskura-Birbra block, channel sample CHS-03 (1m) recorded a TREE concentration of 118.83 ppm and K₂O content of 5.67 wt%. Corresponding trench (3x1x1m³) samples from Trench-3 indicate TREE values of 369.71 ppm with 5.6 wt% K₂O in sample TR-3/1, 401.77 ppm with 6.23 wt% K₂O in sample TR-3/2, and 206.98 ppm with 6.35 wt% K₂O in sample TR-3/3.

6.1.0 GEOLOGY OF THE AREA

The Chhattisgarh Basin sediments covering an area of about 36,000 sq. km in Bastar Craton unconformably overlies the Archean crystalline basement, the Neoarchean Sonakhan Group and the Neoarchean to Paleoproterozoic Dongargarh-Kotri volcanics. The Chhattisgarh Supergroup of rocks tectonically juxtaposed against the metamorphosed and deformed rocks of the Bilaspur-Raigarh-Surguja belt and CGC in the north. The Chandarpur and Raipur groups belonging to Chhattisgarh Supergroup occupy the majority of the Chhattisgarh basin area. Chandarpur Group is represented by arenaceous-argillitic litho-assemblage, whereas overlying Raipur Group is composed of argillitic-carbonate suite (Patranabis-Deb and Chaudhuri, 2008 & 2010).

The Banskurah-Birbra block is geologically situated within the Chhattisgarh Supergroup, specifically targeting the glauconite-bearing horizons of the Chaporadih Formation (comprising shale and siltstone) and the Kansapathar Sandstone. The lithostratigraphy is dominated by these sedimentary sequences, where glauconite occurs as greenish pellets and authigenic grains within the fine-grained silts and mature sandstones, indicating a shallow marine depositional environment. Structurally, the block exhibits a gentle dip, with mineralization potential tied to the stratigraphic continuity of these glauconitic layers across the Mahasamund region. The primary objective of the G-3 stage exploration in this block is to systematically delineate the thickness, persistence, and % K₂O content of these glauconite-bearing units through close-spaced pitting, trenching, and core sampling, moving beyond the regional reconnaissance of previous field seasons.

7.1.0 OBJECTIVES OF THE PROPOSED EXPLORATION PROGRAMME

The present exploration programme has been formulated with the following objectives:

1. To carry out detailed mapping on 1:4,000 scale and delineate glauconite and REE mineralization zones through bedrock and channel sampling.
2. To test the depth continuity, thickness, and grade of mineralised zones through systematic drilling and borehole logging.
3. To generate adequate geological, geochemical, and analytical data for preliminary resource appraisal of REE and associated mineralisation in the block.
4. To provide the basis for further stage advancement and focused exploration planning in the Banskurah and Birbra block

8.1.0 PROPOSED SCHEME OF EXPLORATION

The proposed investigation aims to establish a comprehensive geological, mineralogical, and geochemical understanding of the glauconite-bearing horizons within the study area. Detailed geological mapping at 1:4000 scale over 2.88 sq. km (1.2 km × 2.44 km) is planned to delineate lithounits accurately and identify glauconite-bearing zones. This mapping is particularly necessary because surface exposure of the Chaporadih Formation is extremely limited, requiring reassessment of the thickness and continuity of the Kansapathar Formation for improved stratigraphic modelling.

To determine glauconite mineralogy and associated clay assemblages, XRD analysis of at least ten glauconite-bearing samples will be carried out. Establishing glauconite type is essential for

understanding the source and distribution of potash within the formation. Further, modal and weight percentage estimation of glauconite in 15 representative samples will be undertaken using an iso-dynamic separator or a similar technique. These quantitative estimates are required for deriving realistic grade inputs for preliminary resource estimation. The investigation will also address the anomalous REE concentrations identified in sandstone units by evaluating adjacent granite bodies and shale interbeds to determine potential sources of enrichment.

A subsurface exploration programme comprising 18 boreholes drilled to 50 m depth each (total 900 m) is proposed. The boreholes are planned at an approximate spacing of 400 m, ensuring adequate lateral coverage across the target area while maintaining cost-effective drilling density appropriate for preliminary resource assessment. This drilling layout will provide reliable vertical and lateral information on glauconite-bearing horizons. Approximately 750 core samples will be collected for lithological logging, petrographic examination, mineralogical studies, and geochemical characterization. These core datasets are vital for defining horizon thickness, grade variability, sedimentary features, and subsurface continuity.

A structured laboratory programme accompanies drilling activities. This includes BRS (10 nos.) for baseline lithochemistry, PCS (5 nos.) and PS (25 nos.) for petrographic and sedimentological evaluation, EPMA samples (5 nos.) for micro-chemical characterization, XRD samples (10 nos.) for mineral confirmation, and 20 check samples for analytical quality control. Major oxide and trace element analyses will be conducted for all 750 core samples and associated sample types to establish compositional trends, potash potential, and REE distribution within the formation. Bulk-density determination (2 nos.) will support tonnage computations, while one ore-beneficiation test will evaluate the upgradability of glauconite and its response to physical processing.

Collectively, the proposed investigation will generate the integrated geological, mineralogical, and geochemical information required for preliminary resource evaluation and for determining the scientific basis for subsequent exploration and feasibility studies.

9.1.0 QUANTUM OF WORK

Item of Work	Unit	Proposed Quantum
Detailed Mapping (1:4000)	sq. km	2.88 sq. km (1.2 km X 2.44 km)
Subsurface exploration: drilling	m	900
BRS	m	10 nos.
Core Samples	nos.	750 nos.
XRD	nos.	10 nos.
PCS	nos.	5 nos.
PS	nos.	25 nos.
EPMA	nos.	5 nos.
Check sample	nos.	40 nos.
Isodynamic separation (modal and weight percentage estimation)	nos.	15 nos.
Bulk Density#	nos.	02 nos.
Ore Beneficiation\$	nos.	01 nos.

Bulk density to be carried out for glauconitic/ REE bearing sandstone and shale.

\$ Ore beneficiation will be carried out for glauconite and REE.

10.1.0 COST

Summary of the Cost estimates

Sl. No.	Item	Total Estimated Cost (Rs.)	Funding
1	Geology and Survey	0	By GSI
2	Drilling	49,50,000/-	NMEDT
3	Survey work	0 /-	By GSI
4	Laboratory studies	0	By GSI
5	Geologist at HQ	0	By GSI
	Sub Total (1to 4)	49,50,000/-	NMEDT
6	Exploration Report Preparation	0	By GSI
7	Proposal Preparation	0	By GSI
8	Peer review charges	0	By GSI
9	Sub Total (1to8)	49,50,000/-	By GSI
10	GST18%	8,91,000/-	
	Total:	58,41,000/-	
	Rs. In Lakh	58.41	

Cost Calculation

Item of Work			Unit	SoC-Item -Sl No. NMEDT	Rates as per NMET SoC 2025	Estimated Cost		
						Qty.	Total Amount (Rs)	
D. Drilling - OUT SOURCED								
18.a	DRILLING	Drilling in/ Drilling in Soft rock/ Strata: HQ size borehole up to 400m Depth and NQ Size beyond 400m depth in case of NQ size drilling is done before 400m depth, the rate shall decrease by 20%	m	2.2.1.1c		5,500.00	900	₹ 49,50,000.00
18.b		Drilling in/ Drilling in Hard rock/ Strata: HQ size borehole up to 400m Depth and NQ Size beyond 400m depth in case of NQ size drilling is done before 400m depth, the rate shall decrease by 20%	m	2.2.1.1d		10,000.00	0	₹ 0.00
18.c		Drilling in/ Drilling in Very Hard rock/ Strata: HQ size borehole up to 400m Depth and NQ Size beyond 400m depth in case of NQ size drilling is done before 400m depth, the rate shall decrease by 20%	m	2.2.1.1e		12,650.00	0	₹ 0.00
18.d		Drilling for Lignite	m	2.2.1.1a		4,783.00	0	₹ 0.00
18.e		Drilling for Coal	m	2.2.1.1b		7,975.00	0	₹ 0.00
18.a		Mechanised Auger Drilling for soft strata up to 30m depth	m	2.2.2.1		4,760.00	0	₹ 0.00
18.b		Hand Auger drilling in soft strata up to 30 m depth	m	2.2.2.2		3,808.00	0	₹ 0.00
18.c		RC Drilling	m	2.2.3		8,870.00	0	₹ 0.00
18.d		Non coring drilling	m	2.2.4		4,000.00	0	₹ 0.00
19	DRILLING RELATED EXPENDITURE	Borehole Deviation Survey by Multishot survey tool (interval 6m; azimuth and inclination to be recorded)	per shot	2.2.5		330.00	0	₹ 0.00
20		Land / Crop Compensation (in case the BH falls in agricultural Land)	per BH	5.6		30,000.00	0	₹ 0.00

21		Construction of concrete Pillar (12"x12"x30")	per borehole	2.2.7a		2,000.00	0	₹ 0.00
22		Borehole plugging with cement	per borehole	2.2.8		10,000.00	0	₹ 0.00
23		Miscellaneous Charges (Transportation of Drilling Rig, accommodation for Drilling Camp, Camp setting and winding, construction of approach road)	Lumpsum	0	2.2.9.4	For Drilling cost >2 Cr: 10 % of the Drilling Cost with a maximum ceiling of Rs.25 Lkh	2500000	₹ 0.00
24		Drill Core Preservation- One complete BH plus mineralised cores of all the BHs of the block/ prospect to be preserved in GI Core boxes and subsequently transported to the notified core repository.	per m	X		1,590.00	0	₹ 0.00
Total Cost D- outsourced								₹ 49,50,000.00
Total (Drilling)								₹ 49,50,000.00
GST 18%								₹ 8,91,000.00
Total Fund Required inclusive of 18% GST								₹ 58,41,000.00
								~0.58 Cr

11.1.0 TIME SCHEDULE

The work programme is proposed for FS 2026–27, with field, laboratory, reporting, and circulation milestones as summarized below.

The proposed exploration programme is planned in such a way that all the activities like mapping, surface sampling, drilling, core sampling and associated geological work and laboratory work will be completed within 10 months. Report writing will take 4 months with 2 months overlapping with laboratory analysis. Thus, the total duration of the project for completion of the above exploration will be 12 months from the date of commencement of the project.

SCHEDULED TIME FOR THE PROPOSED G-3 LEVEL EXPLORATION													
S.No	Activities	APR 2026	MAY 2026	JUN 2026	JUL 2026	AUG 2026	SEP 2026	OCT 2026	NOV 2026	DEC 2026	JAN 2027	FEB 2027	MAR 2027
.		1	2	3	4	5	6	7	8	9	10	11	12
1	Surface sampling												
2	Geological Detailed Mapping (1:4000)												
3	Laboratory studies												
4	Core drilling*												
5	Coresampling												
6	Report writing/Peer review												
*Time loss on account of monsoon/agricultural activity/forest clearance/local law & order problems will be addition to above time line.													

Fig 1: Location Map of Banskurah-Birbira block, Mahasamund District, Chhattisgarh

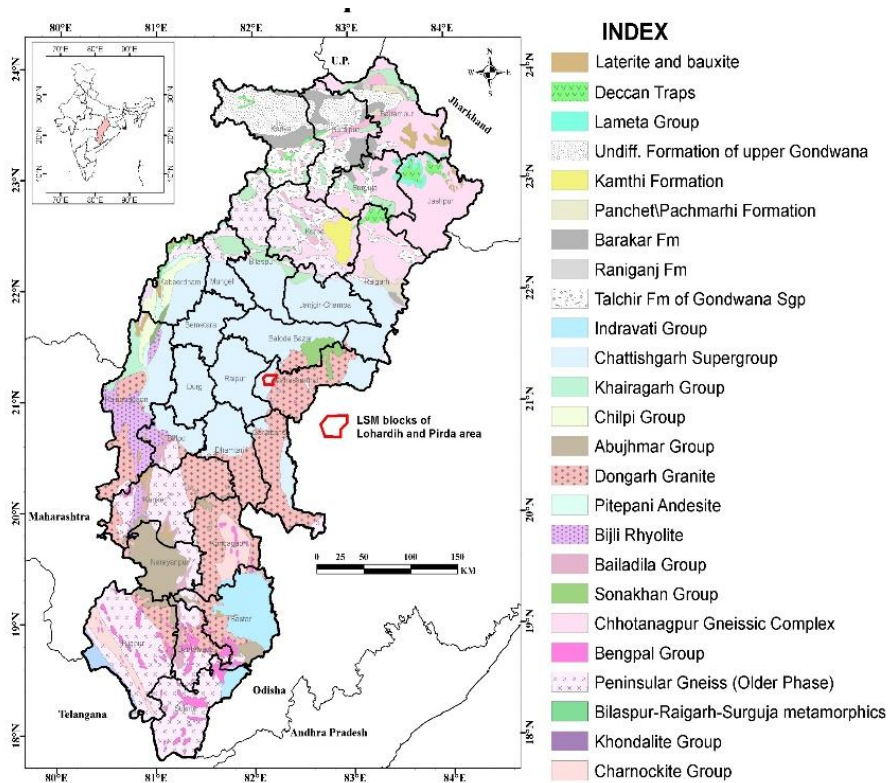
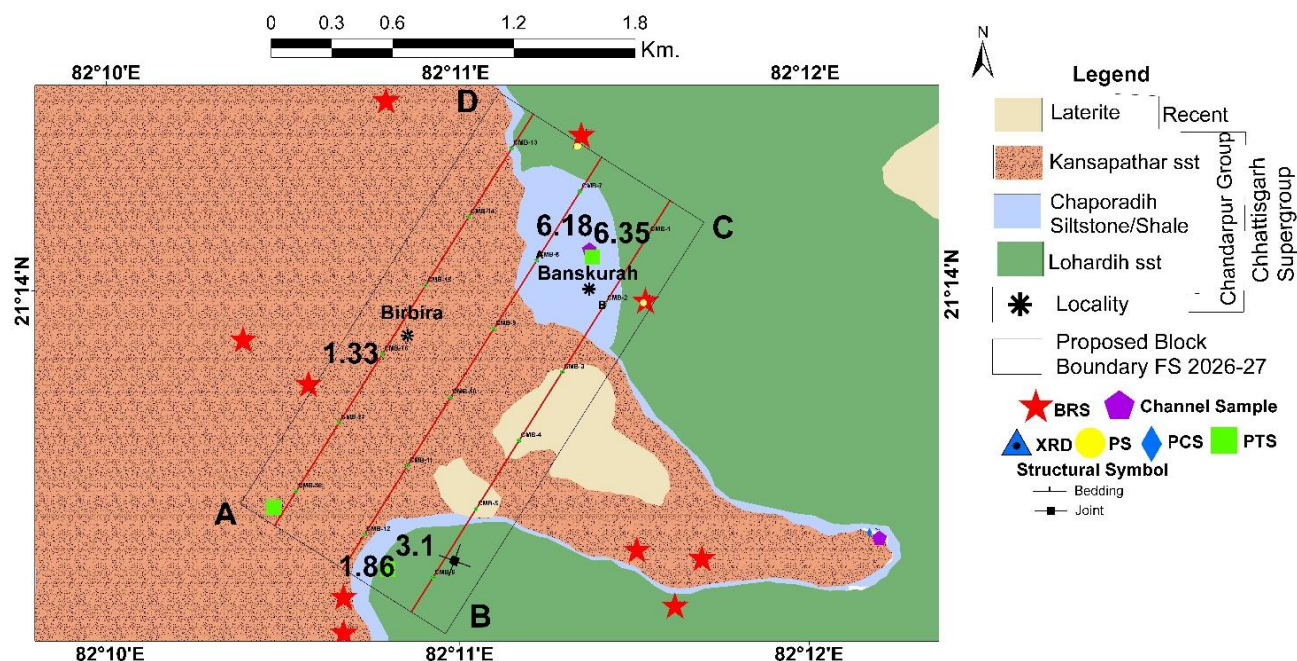


Fig 2: Geological Map of Banskurah-Birbira block, Mahasamund District, Chhattisgarh (FS 2026-27)



Sample no.	TREE (in ppm)	K ₂ O (in wt%)	Sample no. (3x1x1m ³)	TREE (in ppm)	K ₂ O (in wt%)	Lithology
CHS-03 (1m)	118.83	5.67	TR-3/1	369.71	5.6	siltstone/ shale of Chaporadih Formation
			TR-3/2	401.77	6.23	
			TR-3/3	206.98	6.35	
CHS-04 (1m)	286.69	6.18				

Fig 3: Tentative borehole location points in Banskurah-Birbira block, Mahasamund District, Chhattisgarh (FS 2026-27)

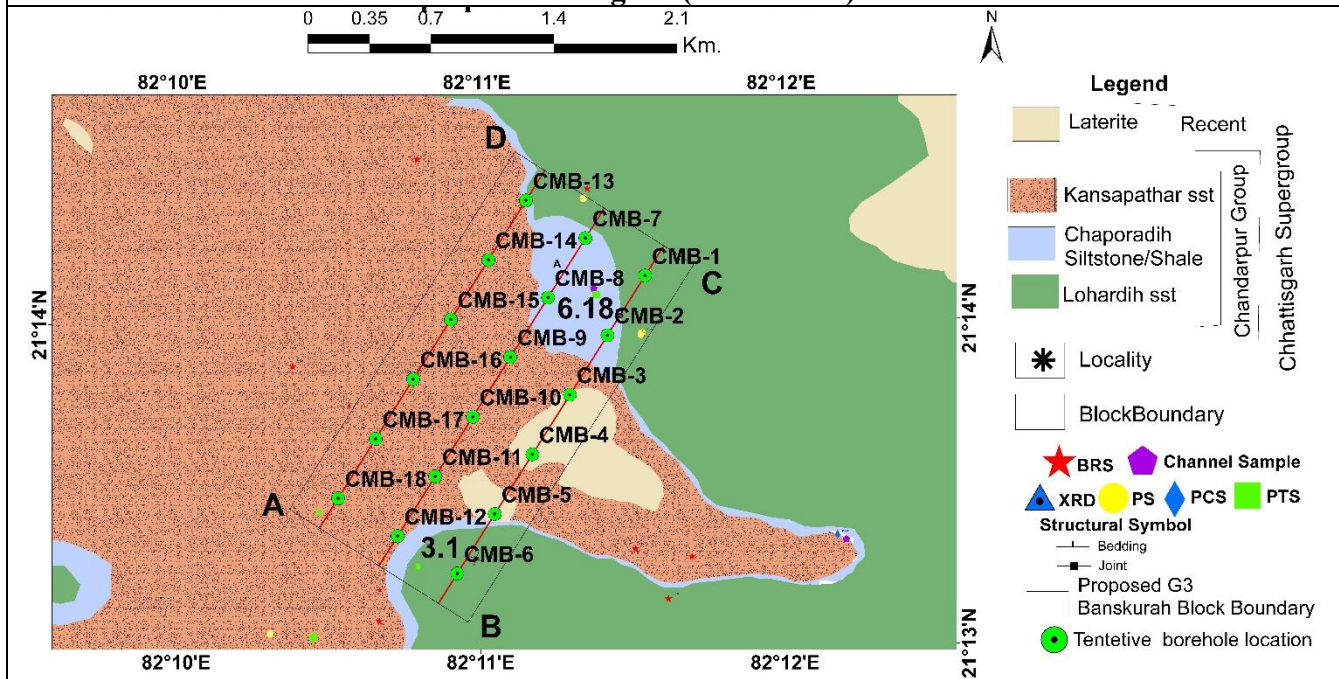


Fig 4: Satellite image of Banskurah-Birbira block, Mahasamund District, Chhattisgarh (FS 2026-27)

