

**PROPOSAL FOR PRELIMINARY
EXPLORATION FOR BAUXITE
(G-3 STAGE)**

GARHPAT BLOCK

NMET FUNDED PROJECT

DISTRICT– LOHARDAGA, JHARKHAND



cmpdi
A Mini Ratna Company

सेन्ट्रल माईन प्लानिंग एण्ड डिजाइन इन्स्टीच्यूट लिमिटेड
(कोल इण्डिया लिमिटेड की अनुषंगी कम्पनी / भारत सरकार का एक लोक उपक्रम)
गोन्दवाना प्लेस, कान्के रोड, राँची - 834 031, झारखंड (भारत)
Central Mine Planning & Design Institute Limited
(A Subsidiary of Coal India Limited / Govt. of India Public Sector Undertaking)
Gondwana Place, Kanke Road, Ranchi - 834 031, Jharkhand (INDIA)
CORPORATE IDENTITY NUMBER - U14292.TH1975GOI001223

PROPOSAL FOR G3 LEVEL EXPLORATION FOR BAUXITE IN THE GARHPAT BLOCK

DISTRICT - LOHARDAGA, JHARKHAND

1. Introduction

- 1.1.** The importance of bauxite is well known in the production of Alumina (Al_2O_3) and also in other industries viz. abrasives, refractories, chemical and cement. The properties like lightness of metal Aluminum, its high resistance to atmospheric corrosion and good electrical conductivity make it a popular metal and is being used for making household utensils and therefore known as 'poor man's gold'. The Aluminum metal being a good substitute for nonferrous metals like copper, zinc which are scarce and costly metals has further necessitated development of Aluminum industry throughout the world.
- 1.2.** Reserves/Resources of bauxite in the country as on 1.4.2015, as per NMI database, based on UNFC system have been placed at 3,896 million tonnes. These resources include 656 million tonnes Reserves and 3,240 million tonnes Remaining Resources. By grades, about 77% resources are of Metallurgical grade. The resources of Refractory and Chemical grades are limited and together account for about 4%. By States, Odisha alone accounts for 51% of country's resources of bauxite followed by Andhra Pradesh (16%), Gujarat (9%), Jharkhand (6%), Maharashtra (5%) and Madhya Pradesh & Chhattisgarh (4% each).
- 1.3.** On enactment of MMDR Amendment Act-2015, Minerals (Evidence of Mineral Contents) Rule-2015 and Mineral Auction Rule-2015, Govt. of India directed State Governments to speed up exploration work for different Mineral Commodities in the respective states for auctioning of the blocks.
- 1.4.** An MOU has been signed between Department of Mines and Geology (DMG), Government of Jharkhand and Central Mine Planning & Design Institute Limited (CMPDI) for exploration of various mineral blocks by CMPDI in the state of Jharkhand.

- 1.5. DMG, Government of Jharkhand requested CMPDI to take up exploration work of Bauxite in 2 Blocks in Lohardaga district of Jharkhand.
- 1.6. On request of CMPDI DMG, Jharkhand provided information required for preparation of exploration proposals pertaining to Bauxite deposit vide letter No भूनि अंवे – 13/200-983 dt. 25/06/2021
- 1.7. Accordingly, CMPDI prepared the proposal for G-3 Level exploration for Bauxite in the Garhpat Block, District - Lohardaga, Jharkhand and put up for consent of DMG, Jharkhand for taking exploration work under NMET funding.
- 1.8. After consent of DMG, Jharkhand, Proposal of exploration of Bauxite in Garhpat Block, Lohardaga District, Jharkhand was prepared and presented in 33rd meeting of TCC for NMET funding. The proposal was not recommended by TCC citing the reason *Quote “After detailed deliberations, the committee opined that about 50% area of the proposed block is covered with the Chhotanagpur Granite Complex rock and is devoid of any laterite/bauxite material. In view of this, the committee suggested not to take up exploration in the Garhpat Block” Unquote.*
- 1.9. Keeping in view the observations of TCC the block area has been modified and the revised block boundary is covered by lateritic material (as per 1:50000 map of GSI). Accordingly the proposal of exploration has also been modified.
- 1.10. The exploration in the block is to be carried out in G-3 stage.

2. Location and Communication :

- 2.1. The Garhpat Block falls in Survey of India Toposheet No.73 A/10 and is bounded by the following Co-ordinates which is located in Lohardaga district of Jharkhand.

Co-ordinated (DMS Datum WGS-1984)		
Sl No.	Latitude	Longitude
A	23° 34' 58.007" N	84° 35' 5.283" E
B	23° 34' 37.957" N	84° 35' 44.529" E
C	23° 34' 18.477" N	84° 36' 5.435" E
D	23° 33' 58.996" N	84° 36' 24.677" E
E	23° 33' 51.632" N	84° 36' 9.711" E
F	23° 34' 4.698" N	84° 35' 57.357" E
G	23° 34' 18.020" N	84° 35' 33.259" E

H	23° 34' 21.669" N	84° 35' 20.183" E
I	23° 34' 28.207" N	84° 35' 17.750" E
J	23° 34' 32.312" N	84° 35' 5.739" E
K	23° 34' 52.230" N	84° 34' 57.377" E

2.2. The Garhpat block is located at a distance of 15 kms from Kisko block office. Kisko is connected to Lohardaga district HQ with metal road of about 10 kms .The nearest railway station is Lohardaga, located at a distance of 26 Kms. from the block. The distance from Lohardaga town to Ranchi the state capital is 75 km, connected by an all-weather metalled road. Thus Garhpat Block is located at a distance of about 100 km from Ranchi.

3. Physiography & Drainage :

3.1. The Lohardaga district covers the south - western part of Chhotanagpur plateau. Physiographically this area can be divided into two parts; the tablelands, about 975m high, and the valleys about 600-650m in elevation. In general the area comprises a series of flat topped ridges, detached from each other by narrow valleys. Small nalas and rivulets originating from these ridges join up and flow west-wards and eastwards into the North Koel and South Koel rivers respectively.

3.2. Garhpat Plateau is tableland located in Kisko block of Lohardaga District. The bauxite deposits under reference are characterized by the extensive blanket of plateau laterite on an almost flat topography, locally known as “pat”. The flatness of the plateau together with well-defined steep scarp faces gives distinct feature to the topography of the deposits with gentle slope towards south-west.

4. Climate & Rainfall :

4.1. Climate :

The district experience warm humid climate with three well defined seasons i.e. summer, winter and Monsoon. The winters commence from middle November and extend up to middle of March. December is the coldest month. During winter the temperature goes down to 4°C. Summer starts from middle of March and continues up to middle of June, when the temperature shoots up to 42°C.

4.2. Rainfall :

The monsoon sets in by the middle of June and continue till the middle of October. The annual normal rainfall in the district is 1137 mm. 83.5% of total rainfall occurs during the monsoon months only.

5. Previous Work :

5.1. The first account of the bauxite and the aluminous laterite of India was given by Sir C.S.Fox in 1923 (Mem. Geol.Survey of India, XLIX,1923).The discovery of a large number of bauxite deposits in erstwhile Bihar, now Jharkhand came to light in 1943-47 as a result of the field work carried out by Dr. M.K.Roy Chowdhury of G.S.I. Subsequently, Dr.Roy Chowdhury (1958,1965) presented a detailed account of the geology and the economic aspect of the individual deposits of bauxite of Jharkhand and M.P. The results of his work are well documented in the Memoirs of the Geological Survey of India, Volume-85, published in 1958 and in Geol. Surv. Ind. Bull 25 published in 1965.

5.2. Bauxite deposits of the area around Lohardaga, Jharkhand erstwhile Bihar, were investigated during the field-season 1961-62 by N. Majumdar of GSI and report titled “Report On The Bauxite Deposits Near Lohardaga Area Ranchi District, Bihar”was published in 1963. He has reported 1.2m -2.1m of bauxite at an average depth of 1.5m in Garhpat.

6. Regional Geology :

6.1. The Regional Geological succession of the area after Roy Chowdhury (1958) is as given in table below :

General Stratigraphic Sequence of the Area		
Age	Group/Formation	Litho-units
Recent		Alluvium, conglomerate and carbonaceous shale.
Tertiary to Recent		Laterite. Bauxite and lithomarge
Cretaceous	Lameta	Limestone and basalt ferruginous grit
Proterozoic		Quartz vein

Archean to Proterozoic	Chhotanagpur granite Gneissic complex	Diorite, granite, granite gneiss
Archean to Paleoproterozoic	Unclassified Metamorphics	Limestone, calc-silicate rock, quartzite, phyllite, slate, mica schist, hornblende schist, amphibolite, talc schist

6.2. The principal rock formation of this area comprises what has been earlier designated as the Chotanagpur granite gneiss, which is a composite rock type. Laterite and bauxite in this area rest on the older Chotanagpur granite gneiss comprising the various types of granite gneiss, porphyritic granite, granulitic rocks, quartz veins and pegmatites.

7. Occurrence of Bauxite in the area :

7.1. The occurrence of bauxite in the lateritic sequence are mainly bouldery / pockety type, consists of bauxite boulders, cobbles and pebbles with inter binding material of ferruginous laterite, morrum and clays. Closed spaced bauxite boulders are also seen spreading over a short distance. Lensoidal, pinch & swell types of structures are observed in the cross section nearby Serendag west block, Lohardaga district. As such there is no significant pattern found in occurrence of bauxite boulder within the zone of bauxitization. Narrow and impersistent bands and patches of non-ore intervene the bauxite zone. Hence, occurrence of bauxite in the area is erratic in nature.

7.2. Garhpat plateau is the NW extension of Pakhar Pat. In old abandoned quarries 2m – 4m of bauxite has been observed.

8. Proposed Exploration Programme :

8.1. Objective :

Preliminary exploration (G3) of bauxite in the Garhpat block is to be carried out:

- To prove the occurrences of bauxite zone(s) along the longer axis as well as along a direction at right angle to the longer axis.
- To assess the bauxite resources of the block both quantitatively and qualitatively.

- To facilitate the Department of Industry, Mines & Geology (DIMG), Government of Jharkhand for auctioning of the Bauxite Block by evaluating the deposit as per the Minerals (Evidence of Mineral Contents) Rules, 2015.

8.2. Exploration Scheme:

8.2.1. Topographical Survey:

The area under investigation i.e. bauxite plateau around Garhpat measuring about 1.63 Sq. Km. will be surveyed with triangulation network. The length of the block in the longer axis is 2.8 km and the maximum width of block is 0.8km. The block will be tied up with the survey network by triangulation station. Contouring is to be carried out at 2m interval. Reduced level of the boreholes and survey stations are to be determined with reference to the Survey of India Bench Mark as available at the plateau top. All the boreholes, important surface features, survey stations & Pits are to be marked and tied with the survey network. The block boundary will be surveyed by DGPS & Total Station in WGS-84 datum.

8.2.2. Detailed Geological Mapping :

The total study area of 1.63 Sq. km. will be mapped on 1:2000 scale with the exposures of laterite, bauxite etc. as available at the top of the plateau along with the structural details marked on a plan before going for activities like drilling, sampling, pitting etc. A geological plan with topographical contours, borehole points, pits, surface features etc. on 1:2000 scale is to be prepared and finalized before finally leaving the worksite after completion of all exploratory activities.

8.2.3. Drilling:

10(Ten) Vertical boreholes at the grid of 400m X 400m are proposed for G3 stage of exploration in the block. The boreholes will be drilled by core drilling methods up to lithomarge to estimate G3 level bauxite resources. As the floor of the bauxite zone is not known, the average depth of the boreholes is considered to be 20 m. Total 200m of drilling is involved in the proposed G3 state of exploration. The details of proposed boreholes are given the table below:

Details of Proposed Boreholes					
Sl No.	Proposed Borehole No.	Depth to be drilled (m)	Sl No.	Proposed Borehole No.	Depth to be drilled (m)
1	P-1	20	2	P-2	20
3	P-3	20	4	P-4	20
5	P-5	20	6	P-6	20
7	P-7	20	8	P-8	20
9	P-9	20	10	P-10	20
Grand Total 10 Boreholes : 200m					

8.2.4. Pitting for Bulk Density :

Bulk density will be determined in field by putting 1m X 1m X 1m pit. Two pits will be taken up for determination of bulk density.

8.2.5. Geological Core logging:

Geological core logging will be carried out carefully by recording minute details and lithological characters of the rock formations including colour, texture, mineralogical composition, structural details, and lithological variations along with visual estimate in respect of Al₂O₃ content encountered in the boreholes. At this stage, the overburden, the roof and floor of the bauxite zones are to be marked as per $\geq 40\%$ Al₂O₃ , $< 5\%$ SiO₂ & $\geq 40\%$ Al₂O₃ , $< 8\%$ SiO₂ cut-off grade as the deposit is of high alumina and high silica bauxite type.

8.2.6. Core Sampling:

Borehole cuttings, the material which will be obtained by dry drilling, will be dried in sun light and sampled for a uniform length of 1.00 m so that each sample falls between fixed reduced levels in all the boreholes. But the top and the bottom samples will usually be less than 1 m. length as the R.L of the collar of the borehole and the floor of bauxite zone will be in fraction of whole number. Later, keeping in view the bouldery / pockety nature of the deposit, the sampling will be carried out according to lithological changes. In bauxite zone, the sample length will be reduced from 1m to 0.50m if required, while in the transition zone / Bauxitic clay zone the length of sample may increase. Each sample thus obtained, will be crushed to (-) 60 mesh size and its quantity will be further reduced to 1000

gram by coning quartering. The material will be further crushed to (-) 120 mesh size. Two representative samples weighing about 100 grams each will be taken from this, one of which will be sent for primary analysis for five radicals, i.e., Al₂O₃, SiO₂, Fe₂O₃, TiO₂ & LOI and others samples needs to be kept for the purpose of check analysis. The remaining 800 gms sample will be kept for preparation of composite samples & special tests.

8.2.7. Check Samples:

10% of the total primary samples shall be analyzed for 5 radicals as internal check analysis and 5% of the total primary samples will be analyzed for same 5 radicals from other NABL accredited laboratory as external checks to test the reliability of sampling and analytical data.

8.2.8. Borehole Composite Samples:

After receipt of analytical results of primary samples of the borehole core, bauxite zones will be marked at $\geq 40\%$ Al₂O₃ & $< 5\%$ SiO₂ and $\geq 40\%$ Al₂O₃ & $< 8\%$ SiO₂ for each of the boreholes. For each of the bauxite zones encountered in boreholes, composite samples shall be prepared by mixing each primary sample within the respective zone in their length proportions and reducing the sample by coning and quartering method for drawl of final sample to be analysed for 7 radicals viz. Al₂O₃, SiO₂, Fe₂O₃, TiO₂, V₂O₅, and P₂O₅ & LOI respectively. About 10% of the Borehole-core composite samples will be analysed for 14 radicals viz. Al₂O₃, SiO₂, Fe₂O₃, TiO₂, V₂O₅, P₂O₅, LOI, MnO, MgO, CaO, Na₂O, K₂O, SO₃ & Organic Carbon. However, provision for analysis of 30 nos. of composite sample for 14 radicals has been made in the proposal which may vary depending upon actual no. of bauxite zone encountered in the boreholes.

8.2.9. Analysis for “Reactive Silica” & “Total Available Alumina Content”:

10 nos. of composite samples will be analysed for “Total available alumina” (i.e. Tri-hydrate & Mono-hydrate) and “Reactive Silica content”. The samples should be selected in such a manner that the entire bauxite bearing areas are represented by them.

8.2.10. Specific Gravity and Porosity Determination:

Apparent specific gravity of lump samples will be determined by waxing method with a Walker's Steel Yard balance. The same specimens after powdering to (-) 100 mesh size will have to be used for determination of their true specific gravity by Pycnometry using Kerosene. The porosity values need to be calculated from the apparent and true specific gravity values. A total of 5 nos. of samples are to be subjected to determination of specific gravity and porosity respectively.

8.2.11. Determination of Bond Work Index :

5 Nos of samples -6 mesh size will be subjected for determination of Bond work Index to know the nature & grindability properties of bauxite ore.

8.2.12. Spectroscopic Studies:

The bauxite zones needs to be studied for trace element distribution by Emission Spectroscope. Semi-quantitative analysis in respect of Pb, Zn, Ni, Co, Mo, Sn, V, Ga, Zr, Cr, As, Sb, Bi & Ge for the same set of samples as selected for analysis of Total Available Alumina & Reactive Silica (SiO₂) content as mentioned in para 8.2.9 need to be carried out by emission spectroscopic studies.

8.2.13. Mineragraphic and Petrographic Studies:

To know about the mineralogical composition and interrelation among the constituent minerals 25 rock specimens from the area will be taken up for Petrographic studies. 25 nos. of ore specimens from the bauxite zones will also be studied in polished section to know about the constituent ore minerals, their mode of occurrence, textures and other mineragraphic characteristics of bauxite.

8.2.14. XRD studies:

A total of 5 Nos. bauxite samples representing the Garpat Bauxite deposit will be subjected to X-Ray Diffraction studies to know about the general distribution pattern of the constituent minerals of the ore. The samples should be selected from the borehole composite samples in a pattern to represent the bauxite ore of the Garpat deposit.

8.2.15. REE Studies:

The samples of Saprolite zone (lithomarge clay) will be subjected to REE studies which includes seventeen REE elements for which provision of 100 samples has been done in the block.

8.2.16. Quantum of work :

The proposed quantum of exploratory work (G3) in the Garhpat block is tabulated below:

Proposed Quantum of Work, G3 stage Exploration in Garhpat Block			
Sl no.	Item Details	Unit	Quantum
1.	Topographic Survey (Contour interval 2m) & Geological Mapping (1:2000 scale)	Sq. Km.	1.63
2.	i) Core drilling 10 BHs each of 20 m depth to be drilled up to lithomarge.	m	200
3.	Pitting for determination of Bulk density (1mX1mX1m) – 2Nos.	Cu.m	2
4.	Sampling & Chemical Analysis		
i)	Primary samples to be analysed for 5 radicals viz. Al ₂ O ₃ , SiO ₂ , Fe ₂ O ₃ , TiO ₂ & LOI		
	a) Borehole Core samples	Nos.	150
	b) Check samples (10% internal)	Nos.	15
	c) Check samples (5% external)	Nos.	7
	d) REE	Nos.	100
ii)	Composite samples		
	a) Borehole Core samples (to be analysed for 7 radicals, viz. Al ₂ O ₃ , SiO ₂ , Fe ₂ O ₃ , TiO ₂ , V ₂ O ₅ , P ₂ O ₅ & LOI)	Nos.	25

	b) Composite Core samples (14 radicals, viz. Al ₂ O ₃ , SiO ₂ , Fe ₂ O ₃ , TiO ₂ , V ₂ O ₅ , P ₂ O ₅ , LOI, MnO, CaO, MgO, K ₂ O, Na ₂ O, SO ₃ & Organic carbon	Nos.	10
	c) Total available Alumina	Nos.	10
	d) Total available Reactive Silica content	Nos.	10
iii)	Physical Studies		
	a) ICP-MS for 14 trace elements viz. Pb, Zn, Ni, Co, Mo, Sn, V, Ga, Zr, Cr, As, Sb, Bi, Ge	Nos.	10
	b) Petrographic Studies	Nos.	5
	c) Mineragraphic Studies	Nos.	5
	d) Sp. Gravity & porosity determination	Nos.	5
	e) Determination of Bond Work Index	Nos.	5
5.	Geological Report Preparation { As per Minerals (Evidence of mineral contents) Rule-2015 }	Nos.	1

9. Time Schedule and Cost Estimate :

Time Schedule 12 months & total project cost is 82.82 lakhs.

10. Justification :

10.1. Preliminary geological work has been carried out by GSI as well as DMG, Jharkhand in the area. MECL has also carried out exploration in the adjoining area which has established occurrence of Bauxite with thickness varying from 4 to 6 m. The outcrops of Bauxite are observed in the field and the ongoing illegal mining activities in the proposed area have also exposed the Laterite / Bauxite profile in the block. The above fact signifies that the plateau is potential bauxite bearing and may have a good prospect to be explored further for up gradation to G3 level.

10.2. DMG, Government of Jharkhand requested CMPDI to take up exploration work of Bauxite in 2 Blocks in the Lohardaga district of Jharkhand for up gradation of the

property as per the MMDR Amendment Act and Mineral Auction Rule, 2015 to enable the state government for auctioning of the Bauxite blocks. On request of Jharkhand Government, CMPDI decided to take up the exploration work of Bauxite for G3 level and accordingly prepared the proposal for G3 Level exploration for Bauxite in the Garhpat Block, District - Lohardaga, Jharkhand and put up for evaluation and consent of DMG, Jharkhand to carry out exploration work through NMET funding.

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**List of Plates:**

1. Location Plan
2. Topographical Plan (RF- 1:50000)
3. Geological Plan of the Area (RF- 1:50000)
4. Proposed Borehole Location Plan (RF- 1:10000)

## SUMMARY OF GARHPAT BLOCK

The Garhpat Block falls in Survey of India Toposheet No.73 A/10 and is bounded by the following Co-ordinates which is located in Lohardaga district of Jharkhand.

| <b>Co-ordinated (DMS Datum WGS-1984)</b> |                          |                          |
|------------------------------------------|--------------------------|--------------------------|
| <b>Sl No.</b>                            | <b>Latitude</b>          | <b>Longitude</b>         |
| <b>A</b>                                 | <b>23° 34' 58.007" N</b> | <b>84° 35' 5.283" E</b>  |
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Bauxite deposits of the area around Lohardaga, Jharkhand erstwhile Bihar, were investigated during the field-season 1961-62 by N. Majumdar of GSI and report titled "Report on the Bauxite Deposits near Lohardaga Area Ranchi District, Bihar" was published in 1963. He has reported 1.2m -2.1m of bauxite at an average depth of 1.5m in Garhpat.

The Regional Geological succession of the area after Roy Chowdhury (1958) is as given in table below:

| <b>General Stratigraphic Sequence of the Area</b> |                                       |                                                |
|---------------------------------------------------|---------------------------------------|------------------------------------------------|
| <b>Age</b>                                        | <b>Group/Formation</b>                | <b>Litho-units</b>                             |
| Recent                                            |                                       | Alluvium, conglomerate and carbonaceous shale. |
| Tertiary to Recent                                |                                       | Laterite. Bauxite and lithomarge               |
| Cretaceous                                        | Lameta                                | Limestone and basalt ferruginous grit          |
| Proterozoic                                       |                                       | Quartz vein                                    |
| Archean to Proterozoic                            | Chhotanagpur granite Gneissic complex | Diorite, granite, granite gneiss               |

|                             |                           |                                                                                                                     |
|-----------------------------|---------------------------|---------------------------------------------------------------------------------------------------------------------|
| Archean to Paleoproterozoic | Unclassified Metamorphics | Limestone, calc-silicate rock, quartzite, phyllite, slate, mica schist, hornblende schist, amphibolite, talc schist |
|-----------------------------|---------------------------|---------------------------------------------------------------------------------------------------------------------|

The principal rock formation of this area comprises what has been earlier designated as the Chotanagpur granite gneiss, which is a composite rock type. Laterite and bauxite in this area rest on the older Chotanagpur granite gneiss comprising the various types of granite gneiss, porphyritic granite, granulitic rocks, quartz veins and pegmatites.

On the basis of available geological information about bauxite occurrence in the Garhpat Area, for G3 stage of Exploration in the block, total 10 boreholes involving a total tentative meterage of 200 meter have been proposed at a grid interval of 400 meter \* 400 meter for carrying out the entire exploration activity in G3 stage.

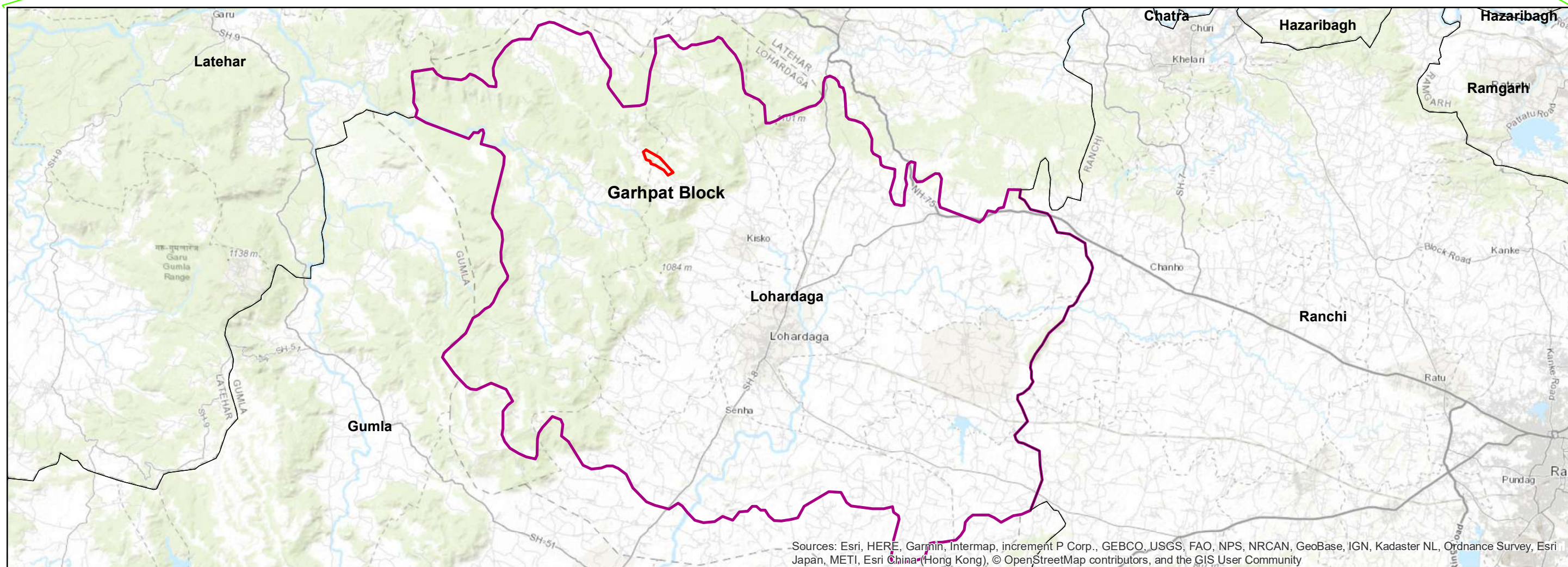
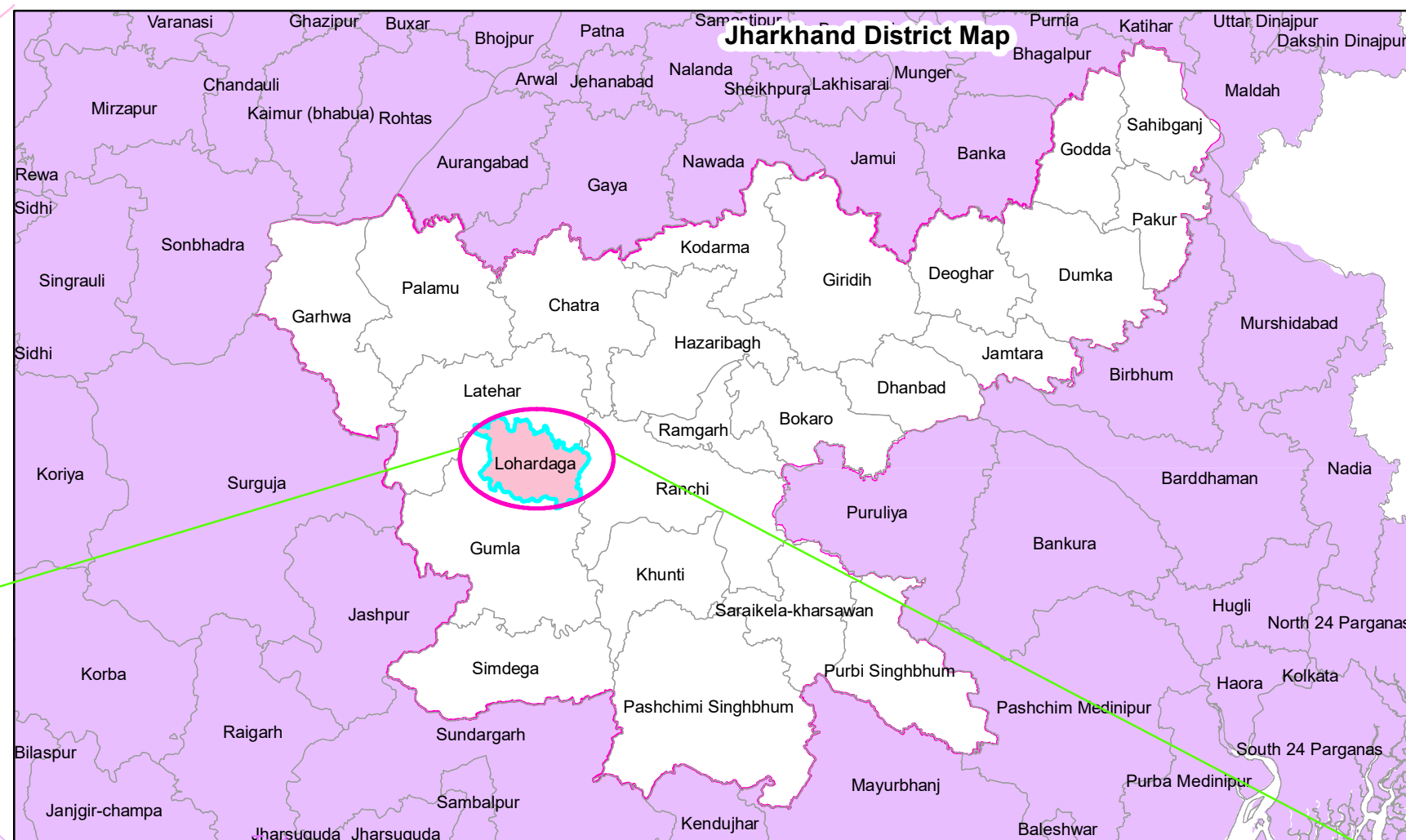
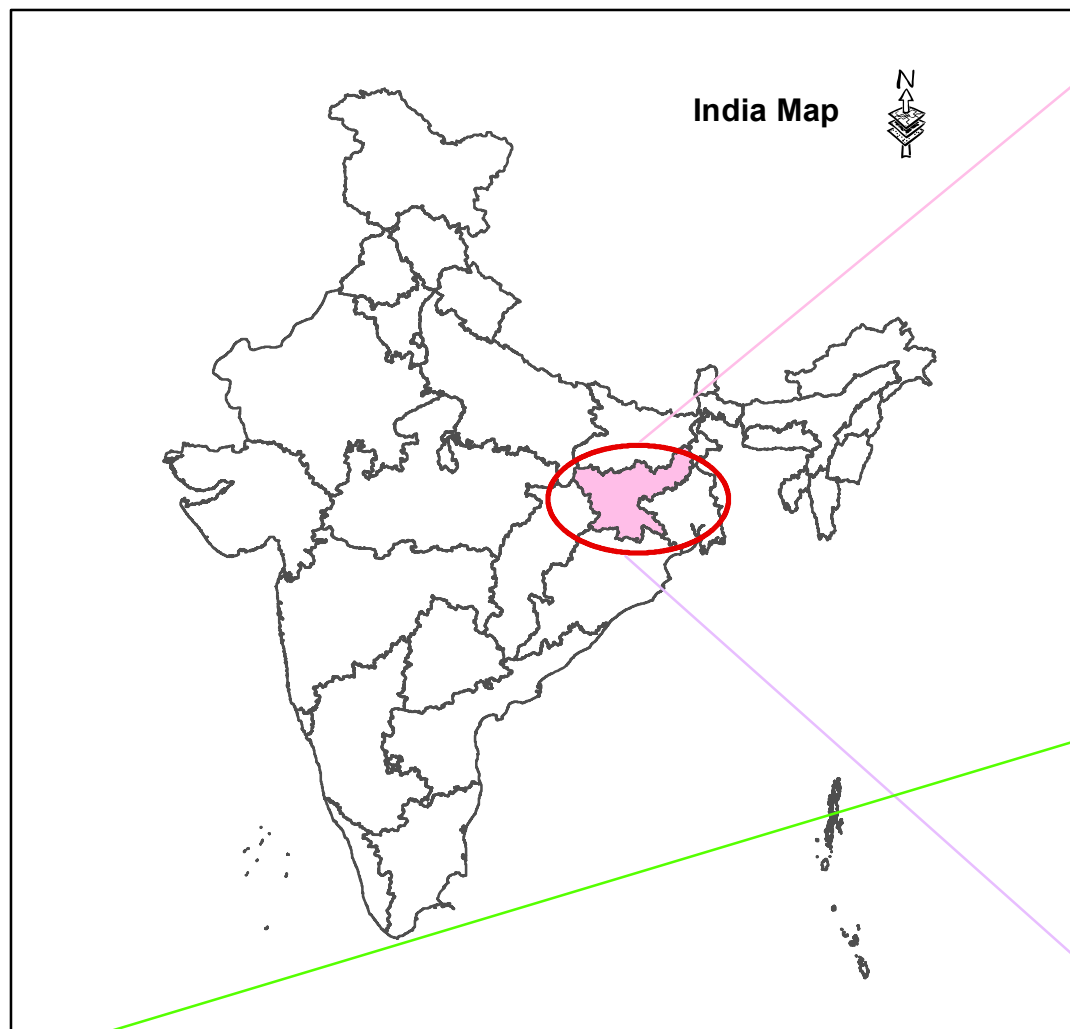
Preliminary exploration (G3) of bauxite in the Garhpat block is to be carried out with following objectives:

- To prove the occurrences of bauxite zone(s) along the longer axis as well as along a direction at right angle to the longer axis.
- To assess the bauxite resources of the block both quantitatively and qualitatively.
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| <b>Proposed Quantum of Work, G3 stage Exploration in Garhpat Block</b> |                                                                              |                |                |
|------------------------------------------------------------------------|------------------------------------------------------------------------------|----------------|----------------|
| <b>Sl no.</b>                                                          | <b>Item Details</b>                                                          | <b>Unit</b>    | <b>Quantum</b> |
| 1.                                                                     | Topographic Survey (Contour interval 2m) & Geological Mapping (1:2000 scale) | <b>Sq. Km.</b> | <b>1.63</b>    |
| 2.                                                                     | i) Core drilling 10 BHs each of 20 m depth to be drilled up to lithomarge.   | <b>m</b>       | <b>200</b>     |
| 3.                                                                     | Pitting for determination of Bulk density (1mX1mX1m) – 2Nos.                 | <b>Cu.m</b>    | <b>2</b>       |

|    |                                                                                                                                                                                                                                                                                                                |             |            |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|------------|
| 4. | Sampling & Chemical Analysis                                                                                                                                                                                                                                                                                   |             |            |
|    | Primary samples to be analysed for 5 radicals viz. Al <sub>2</sub> O <sub>3</sub> , SiO <sub>2</sub> , Fe <sub>2</sub> O <sub>3</sub> , TiO <sub>2</sub> & LOI                                                                                                                                                 |             |            |
|    | a) Borehole Core samples                                                                                                                                                                                                                                                                                       | <b>Nos.</b> | <b>150</b> |
|    | a) Check samples (10% internal )                                                                                                                                                                                                                                                                               | <b>Nos.</b> | <b>15</b>  |
|    | a) Check samples ( 5% external )                                                                                                                                                                                                                                                                               | <b>Nos.</b> | <b>7</b>   |
|    | a) REE                                                                                                                                                                                                                                                                                                         | <b>Nos.</b> | <b>100</b> |
|    | Composite samples                                                                                                                                                                                                                                                                                              |             |            |
|    | a) Borehole Core samples (to be analysed for 7 radicals, viz. Al <sub>2</sub> O <sub>3</sub> , SiO <sub>2</sub> , Fe <sub>2</sub> O <sub>3</sub> , TiO <sub>2</sub> , V <sub>2</sub> O <sub>5</sub> , P <sub>2</sub> O <sub>5</sub> & LOI)                                                                     | <b>Nos.</b> | <b>25</b>  |
|    | a) Composite Core samples (14 radicals, viz. Al <sub>2</sub> O <sub>3</sub> , SiO <sub>2</sub> , Fe <sub>2</sub> O <sub>3</sub> , TiO <sub>2</sub> , V <sub>2</sub> O <sub>5</sub> , P <sub>2</sub> O <sub>5</sub> , LOI, MnO, CaO, MgO, K <sub>2</sub> O, Na <sub>2</sub> O, SO <sub>3</sub> & Organic carbon | <b>Nos.</b> | <b>10</b>  |
|    | a) Total available Alumina                                                                                                                                                                                                                                                                                     | <b>Nos.</b> | <b>10</b>  |
|    | a) Total available Reactive Silica content                                                                                                                                                                                                                                                                     | <b>Nos.</b> | <b>10</b>  |
|    | Physical Studies                                                                                                                                                                                                                                                                                               |             |            |
|    | a) XRD Studies                                                                                                                                                                                                                                                                                                 | <b>Nos.</b> | <b>10</b>  |
|    | a) Petrographic Studies                                                                                                                                                                                                                                                                                        | <b>Nos.</b> | <b>5</b>   |
|    | a) Mineragraphic Studies                                                                                                                                                                                                                                                                                       | <b>Nos.</b> | <b>5</b>   |
|    | a) Determination of Bond Work Index                                                                                                                                                                                                                                                                            | <b>Nos.</b> | <b>5</b>   |
| 5. | Geological Report Preparation { As per Minerals ( Evidence of mineral contents ) Rule-2015 }                                                                                                                                                                                                                   | <b>Nos.</b> | <b>1</b>   |

# Location Map of Garhpat Bauxite Blocks, Lohardaga, Jharkhand



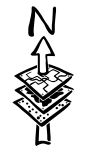
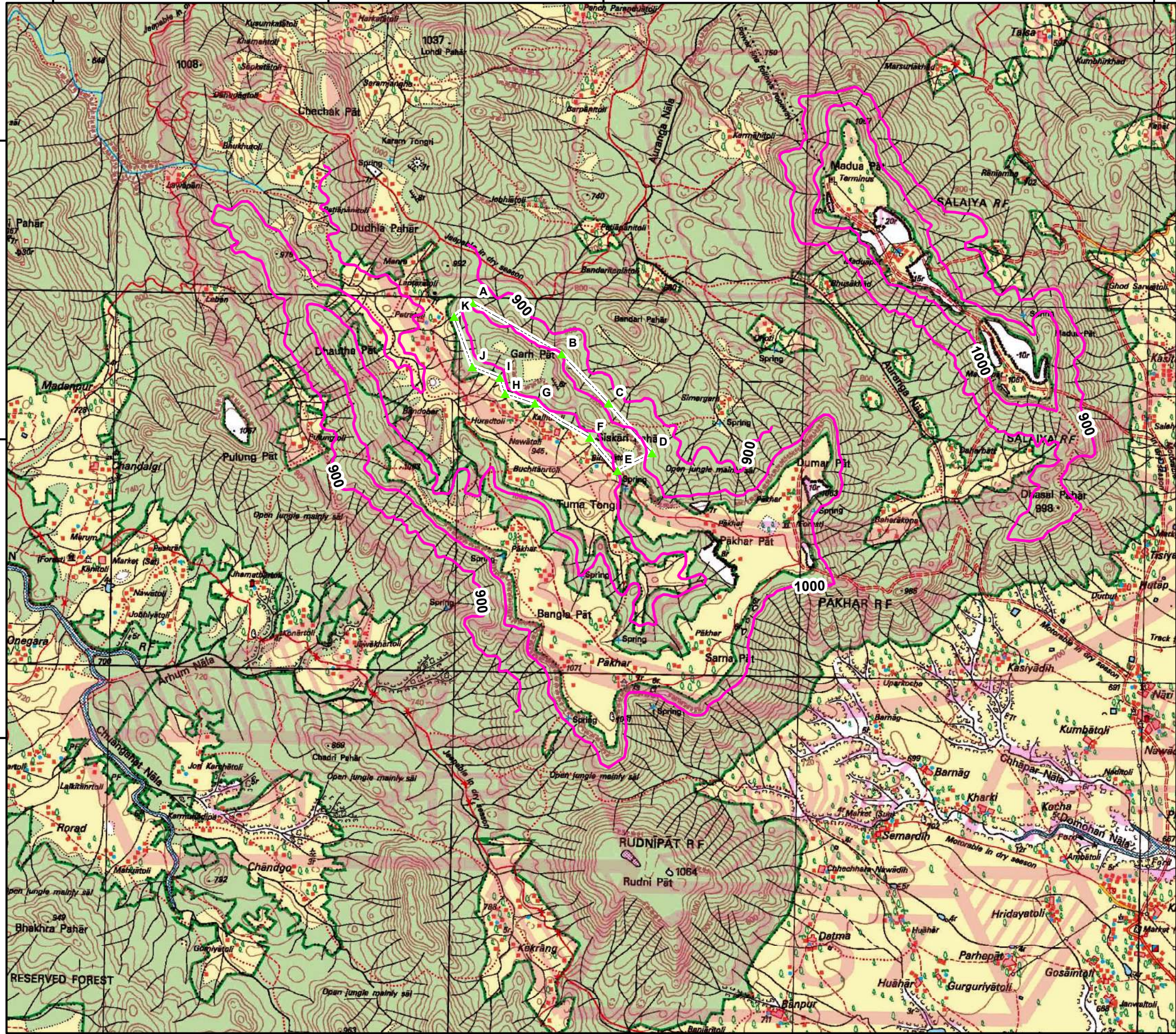
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), © OpenStreetMap contributors, and the GIS User Community

84°32'0"E 84°34'0"E 84°36'0"E 84°38'0"E 84°40'0"E

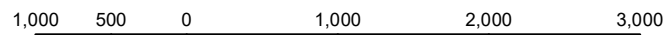
23°36'0"N

23°34'0"N

23°32'0"N



1:50,000



Meters

Topographical Map Garhpat Block  
 District-Lohardaga, Jharkhand  
 SOI Toposheet No -73A/10

23°36'0"N

23°34'0"N

23°32'0"N

84°32'0"E 84°34'0"E 84°36'0"E 84°38'0"E 84°40'0"E

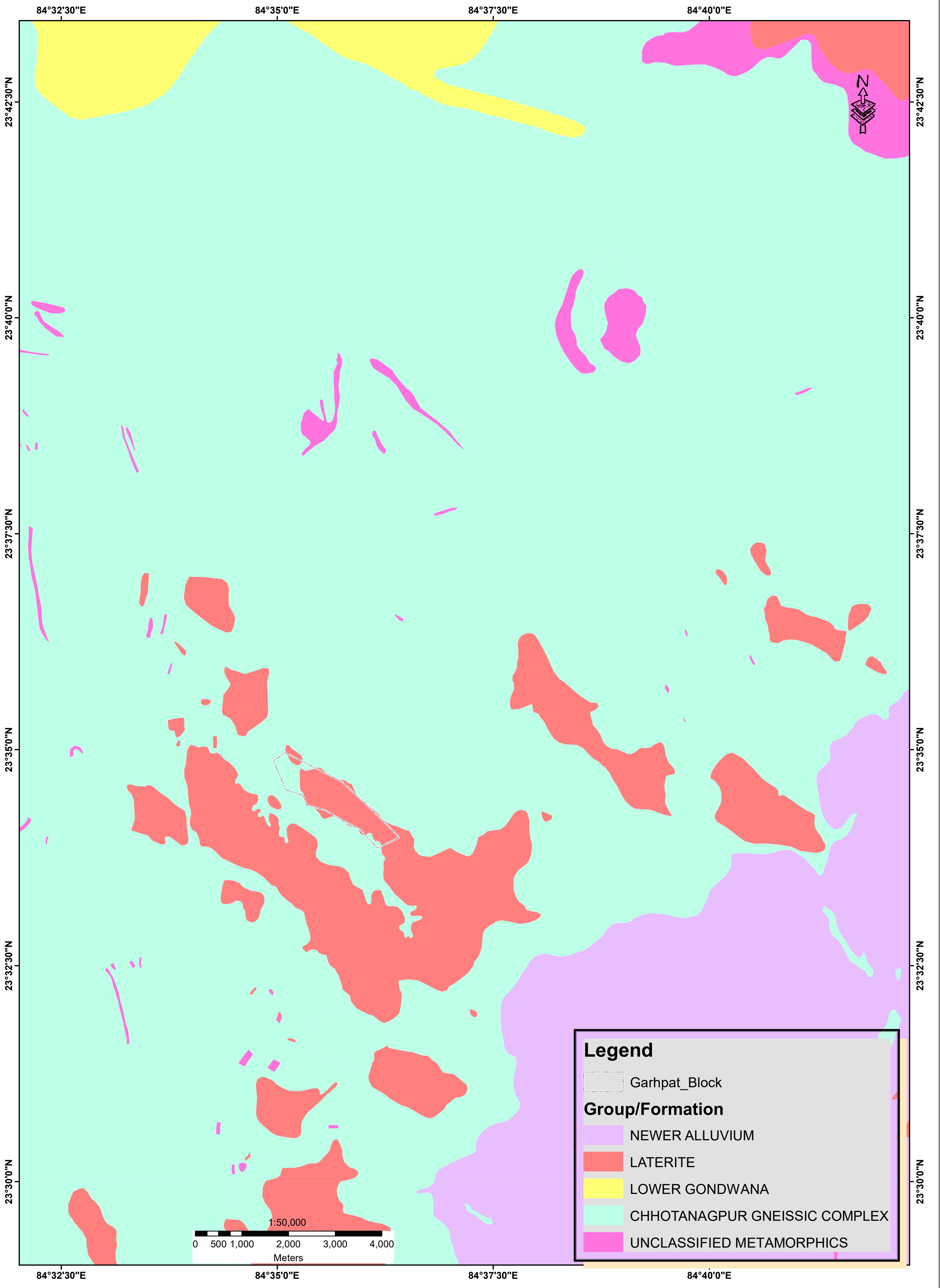
### Legend

- ▲ Garhpat\_New\_Cardinal\_Points
- Surface\_contours
- Garhpat Block

Map Datum WGS-1984

Geological Map of a Part of Lohardaga District, Jharkhand

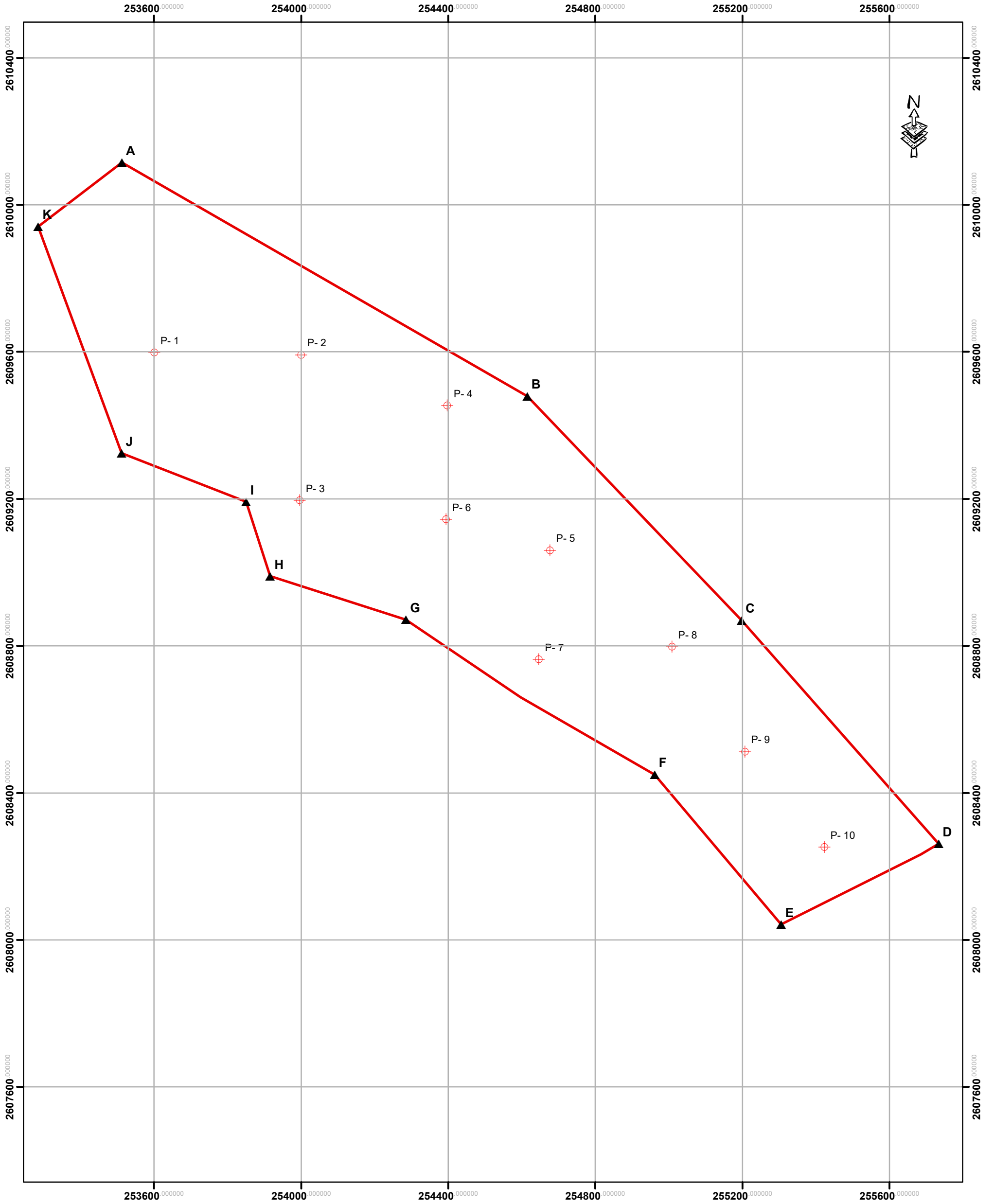
[SOI TS no 73A/10 , Source : GSI(BHUKOSH)]



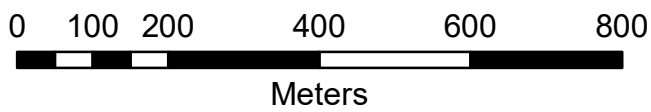
**Legend**

- Garhpat\_Block
- Group/Formation**
- NEWER ALLUVIUM
- LATERITE
- LOWER GONDWANA
- CHHOTANAGPUR GNEISSIC COMPLEX
- UNCLASSIFIED METAMORPHICS

# Proposed Borehole Location Plan For Preliminary Exploration of Bauxite, Garhpat Block District- Lohardaga, Jharkhand



1:10,000



**Legend**

- ⊕ GARhpat\_BH\_31MAy
- ▲ Cardinal\_Points
- Garhpat Block

| Point | Cardinal Points   |                   |
|-------|-------------------|-------------------|
|       | Lat               | Long              |
| A     | 23° 34' 58.007" N | 84° 35' 5.283" E  |
| B     | 23° 34' 37.957" N | 84° 35' 44.529" E |
| C     | 23° 34' 18.477" N | 84° 36' 5.435" E  |
| D     | 23° 33' 58.996" N | 84° 36' 24.677" E |
| E     | 23° 33' 51.632" N | 84° 36' 9.711" E  |
| F     | 23° 34' 4.698" N  | 84° 35' 57.357" E |
| G     | 23° 34' 18.020" N | 84° 35' 33.259" E |
| H     | 23° 34' 21.669" N | 84° 35' 20.183" E |
| I     | 23° 34' 28.207" N | 84° 35' 17.750" E |
| J     | 23° 34' 32.312" N | 84° 35' 5.739" E  |
| K     | 23° 34' 52.230" N | 84° 34' 57.377" E |