

**PROPOSAL FOR PRELIMINARY
EXPLORATION FOR BAUXITE,
VANADIUM, TITANIUM AND
ASSOCIATED MINERALS
(G-3 STAGE)**

**RUDNI PAT
BLOCK**

NMET FUNDED PROJECT

**DISTRICT– LOHARDAGA,
JHARKHAND**

By



**MINERAL EXPLORATION AND COSULTANCY LIMITED
DR. BABASAHAH AMBEDKAR BHAWAN
SEMINARY HILLS NAGPUR**

Summary of the Block for Preliminary Exploration (G-3)

GENERAL INFORMATION ABOUT THE BLOCK

	Features	Details
	Block ID	Rudni Pat Block (1.10 sq km)
	Exploration Agency	Mineral Exploration & Consultancy Limited (MECL)
	Commodity	Bauxite, Vanadium, Titanium, & Associated Minerals
	Mineral Belt	Chhattisgarh-Jharkhand belt (Chhota Nagpur Granite Gneiss)
	Completion period with entire Time schedule to complete the project	12 Months
	Objectives	The present exploration program at G3 stage has been formulated to fulfil the following objectives: 1. Preparation of Geological map on 1:4,000 Scale. 2. To carry out and topographical survey on 1:4000 scale at 2m contour interval. 3. To prove the continuation of Bauxite zone(s) in the proposed block which is present in the south western side of running Pakhar Bauxite Mine. Also to confirm the Bauxite occurrence up to the vertical depth of 30m below ground level. 4. Seven bore holes will be drilled upto the 30m depth and two borehole upto 50m i.e. (till basement or whichever is earlier) 5. To assess the quality and the thickness of Bauxite horizons to estimate the Bauxite resources at G-3 (333) level in the block both quantitatively and qualitatively. 6. Along with Bauxite, resources of Titanium, Vanadium and Associated Minerals will be also reported if encouraging values are encountered. 7. To carry out exploration as per MMDR Act – 1957 (Amended 2020) Minerals (Evidence of Mineral Contents) Rules, 2015 (Amended 2021) and Mineral Auction Rule – 2015 (Amended 2021 & 2024) and as to facilitate Government of India/Jharkhand for auctioning of the block based on the outcome of exploration.
	Whether the work will be carried out by the proposed agency or through outsourcing and details thereof. Components to be outsourced and name of the outsource agency	Work will be carried out by MECL.
	Name/Number of Geoscientists	Two nos. Geoscientist (Field + HQ)
	Expected Field days (Geology, surveyor)	Geologist Party days: 180 days
		Surveyor Party days: 45 days
1.	Location	The Rudni Pat Block area falls in Survey of India Toposheet No. 73A/10 and covers total area of 1.10 sq.km. The block area falls in and around the villages Semardih, Pakhar, Tehsil-Kisko, Dist- Lohardaga, Jharkhand.

Latitude and Longitude	<u>Corner cardinal points of Rudni Pat G3 Block (1.10 sq.km)</u>				
	BLOCK BOUNDARY COORDINATES				
	Sl.No	Cardinal Points	(WGS-84, DMS)		(UTM, Zone-45N)
			Latitude	Longitude	Easting Northing
	1	A	23° 31' 26.623" N	84° 36' 09.219" E	255216.508 2603580.087
	2	B	23° 31' 24.482" N	84° 36' 19.712" E	255513.155 2603509.204
	3	C	23° 31' 24.416" N	84° 36' 28.278" E	255756.209 2603508.473
	4	D	23° 31' 20.413" N	84° 36' 36.737" E	255994.615 2603375.968
	5	E	23° 31' 13.209" N	84° 36' 41.984" E	256138.896 2603131.237
	6	F	23° 31' 10.133" N	84° 36' 54.619" E	256496.195 2603051.167
	7	G	23° 31' 04.244" N	84° 36' 54.726" E	256496.249 2602870.002
	8	H	23° 30' 59.886" N	84° 36' 44.668" E	256208.623 2602740.934
	9	I	23° 30' 48.825" N	84° 36' 41.556" E	256114.698 2602401.776
	10	J	23° 30' 48.241" N	84° 36' 35.461" E	255941.355 2602386.601
	11	K	23° 30' 51.181" N	84° 36' 33.097" E	255870.131 2602478.314
	12	L	23° 30' 58.160" N	84° 36' 25.287" E	255657.766 2602696.702
	13	M	23° 30' 59.626" N	84° 36' 17.340" E	255595.595 2602742.836
	14	N	23° 30' 55.158" N	84° 36' 12.822" E	255444.470 2602607.849
	15	O	23° 30' 57.653" N	84° 36' 09.043" E	255196.303 2602688.780
	16	P	23° 31' 04.668" N	84° 36' 07.114" E	255151.183 2602905.381
	17	Q	23° 31' 07.992" N	84° 36' 01.723" E	254994.260 2603010.388
	18	R	23° 31' 20.305" N	84° 35' 59.729" E	254944.001 2603390.180
	19	S	23° 31' 25.459" N	84° 36' 02.169" E	255015.914 2603547.650
Villages	Semardih, Pakhar				
Tehsil/Taluk	Kisko				
District	Lohardaga				
State	Jharkhand				
2. Area (hectares/ sq. km)					
Block Area	1.10 sq.km (110.00 Ha)				
Forest Area	Rudni Pat Reserve Forest with Open jungle, mainly Sal occupies major part of the block. (Partly Forest & Partly non- forest)				
Government Land	Data not available				

	Area (Bilanam)	
	Charagaha	Data not available
	Private Land Area	Data not available
3.	Accessibility	
	Nearest Rail Head	Lohardaga Railway Station (15 Kms), Ranchi Railway Station (80 Kms.)
	Road	Latehar-Lohardaga Road passes on eastern side of the block which merges to the national highway NH-143A (Gumla-Kuru Road). Motorable/ metaled roads are available in the area.
	Airport	Ranchi around 80 km from the block.
4.	Hydrography	
	Local Surface Drainage Pattern (Channels)	Lohardaga district is drained by the tributaries of three major river of the state viz. North Koel, South Koel and Damodar. The plateau region in west of Lohardaga town is the major water divide for north and south Koel River. The plateau region of the district is highly dissected by down cutting of the tributaries of these rivers. A few natural springs are noted in the area.
	Rivers/ Streams	No major river exists in the area.
5.	Climate	
	Mean Annual Rainfall	Average annual rainfall is 1137 mm.
	Temperatures (December) (Minimum) Temperatures (June) (Maximum)	Minimum temperatures 4 ⁰ C (Nov-Jan) Maximum temperatures up to 42 ⁰ C (March-June)
6.	Topography	
	Toposheet Number	73 A/10
	Morphology of the Area	Rudni Pat Plateau is tableland located in Chota Nagpur plateau forming the watershed between the North and South Koel rivers. The Bauxite deposit under reference is characterized by the extensive blanket of plateau laterite on an almost uneven 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 slope towards north-east. The range of elevation of the varies approximately between 1050 and 1100 m from MSL in plateau region.
7.	Availability of baseline geoscience data	
	Geological Map (1:50K/25K)	Regional geological map sourced from NGDR portal (1:50K) available.
	Geochemical Map	Not applicable.
	Geophysical Map (Aeromagnetic, ground geophysical, Regional as well as local scale GP maps)	Not applicable.
8.	Justification for taking up Preliminary Exploration	1. The proposed Rudni Pat (G3) block area lies in the Bauxite bearing plateaus of Chhattisgarh-Jharkhand belt forming a part of the Pre-Cambrian shield of the Indian Peninsula. They consist mainly of Chhotanagpur Granite Gneiss. 2. Preliminary geological work has been carried out by GSI as well as DMG, Jharkhand in the area. MECL & CMPDI has also carried out exploration (G3/G2) in around the adjoining areas which has established occurrence of Bauxite with thickness varying from 3.00 to 7.00 m.

		3. The MECL team visited the Rudni Pat block and nearby mine areas. The pits in the existing mines have bauxite occurrences up to 25m depth. The outcrops of Bauxite are observed in the field and the old excavation in the proposed block has confirmation of the Laterite /Bauxite profile in the Rudni Pat block. 4. Bauxite surface samples were collected from the block showing encouraging results of high Alumina (Al_2O_3), Titanium (TiO_2), Vanadium, Gallium with low Silica (SiO_2) in the range of 55.00-57.00%, 9.60-10.31%, 500-800 ppm, 135-149 ppm and 1.40-2.00% respectively. 5. Considering similar geological setup with known deposits, available literature and previous worker's recommendations, the area hold potential to explore in detail with holistic exploration approach. Hence, preliminary exploration at G3 stage in the proposed area to be taken up to ascertain the exact potentiality of the prospect for Bauxite along with associated Titanium, Vanadium and Associated minerals as given above. 6. Existing running Pakhar Bauxite Mine by M/s Hindalco Industries Ltd lying in the north-east of the proposed block. 7. After discussion with State Government, MECL decided to take up the exploration work of Bauxite, Titanium, Vanadium & Associated minerals in the Rudni pat Block, District – Lohardaga, Jharkhand through NMET funding. The positive outcome of the present exploration would be helpful and facilitate the Govt. of India/Jharkhand for auctioning of the block.
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**PROPOSAL FOR G3 LEVEL EXPLORATION FOR BAUXITE, VANADIUM,
TITANIUM, & ASSOCIATED MINERALS IN THE RUDNI PAT PLATEAU
DISTRICT - LOHARDAGA, JHARKHAND**

1.0.0 Introduction

- 1.1.1 Bauxite is basically an aluminous rock that contains hydrated aluminium oxide as main constituent and iron oxide, silica & titania as minor constituents present in varying proportions. Hydrated aluminium oxides present in the bauxite ore are diasporite and boehmite, $\text{Al}_2\text{O}_3 \cdot \text{H}_2\text{O}$ (Al_2O_3 :85%; Al:45%); gibbsite or hydrargillite, $\text{Al}_2\text{O}_3 \cdot 3\text{H}_2\text{O}$ (Al_2O_3 :65.4%; Al:34.6%), and bauxite (containing colloidal alumina hydrogel), $\text{Al}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$ (Al_2O_3 :73.9%; Al:39.1%). The iron oxide in bauxite ore is present as haematite or goethite; silica as clay; and free quartz & titania as leucoxene or rutile. Bauxite is the principal ore of aluminium which is one of the most important non-ferrous metals used in the modern industry.
- 1.1.2 The importance of Bauxite is well known in the production of Alumina (Al_2O_3) and also in other industries viz. abrasives, refractory, chemical and cement. The properties like lightness of metal aluminium, 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 aluminium metal being a good substitute for non-ferrous metals like copper, zinc which are scarce and costly metals has further necessitated development of aluminium industry throughout the world.
- 1.1.3 Resources of bauxite in the country as on 01.04.2020 as per Indian Mineral Year book 2022 are placed at 4,958 million tonnes. These resources include 646 million tonnes reserves and remaining 4,311 million tonnes remaining resources. By grades, about 79% resources are of Metallurgical grade (I, II & Mixed). The resources of Refractory and Chemical grades are limited and together account for about 4 %. By States, Odisha alone accounts for 41% of country's resources of bauxite followed by Chhattisgarh 20%, Andhra Pradesh (12%), Gujarat (8%), Jharkhand (6%), Maharashtra (5%) and Madhya Pradesh (4%). Major bauxite resources are concentrated in the East Coast bauxite deposits in Odisha and Andhra Pradesh.
- 1.1.4 The production of bauxite is 22,494 thousand tonnes in 2021-22 increased by 10% as compared to previous year. There are 126 reporting mines in 2021-22 as against to 134 in the previous year. Ten principal producers having 41 mines contributed 91.40% of total production. NALCO is the leading producer and contributed 33% of the total production. The share of Public Sector mines was about 49% of the total production in 2021-22, as against 52% in the previous year.
- 1.1.5 On enactment of MMDR Act – 1957 (Amended 2020) Minerals (Evidence of Mineral Contents) Rules, 2015 (Amended 2021) and Mineral Auction Rule – 2015 (Amended 2021 & 2024), Govt. of India directed State Governments to speed up exploration

work for different Mineral Commodities including Critical and Strategic minerals in the respective states for auctioning of the blocks.

1.1.6 Based on the mineral potentiality of the prospect and previous work carried out by GSI, MECL and CMPDIL in the vicinity around running Bauxite Mines. MECL requested DMG, Govt. of Jharkhand for providing consent required for preparation of exploration proposal pertaining to Rudni Pat Block, Distt. Lohardaga, Jharkhand vide letter No.: MECL/EXPL/File/DMG JH. /2023-24/241 Dated: 09.01.2025. The consent was obtained from DMG, Jharkhand with letter number भु 0 नौ० अन्वे०-05/2025-157 Dated:24.02.2025.

1.1.7 The exploration in the block is to be carried out in G-3 stage. Boreholes will be drilled initially at 400m x 400m grid interval so that the resources can be estimated at G-3 level. Then the block can be ready for auctioning by Government of India/Jharkhand depending on the commodities.

2.0.0 Location and Communication

2.1.1 The Rudni Pat block falls in Survey of India Topo-sheet No.73 A/10 and is bounded by the following co-ordinates under Rudni Pat plateau which is located in Lohardaga district of Jharkhand.

Table: 2.1
Rudnipat proposed Block Boundary Coordinates (Area-1.10 sq km)

BLOCK BOUNDARY COORDINATES					
Sl.No	Cardinal Points	(WGS-84, DMS)		(UTM, Zone-45N)	
		Latitude	Longitude	Easting	Northing
1	A	23° 31' 26.623" N	84° 36' 09.219" E	255216.508	2603580.087
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19	S	23° 31' 25.459" N	84° 36' 02.169" E	255015.914	2603547.650

The Rudni Pat plateau 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 distance from Lohardaga town to Ranchi the state capital is 55 km, connected by an all-weather metalled road. Thus, Rudni Pat plateau is located at a distance of about 84 km from Ranchi. The nearest railway station is Lohardaga, located at a distance of 30 km from the plateau.

2.2.0 Physiography & Drainage

2.2.1 Rudni Pat Plateau is tableland located in Chota Nagpur plateau forming the watershed between the North and South Koel rivers. The Bauxite deposit under reference is 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 north-east.

2.2.2 The Lohardaga district covers the south-western part of Chota Nagpur plateau. The range of elevation of the Rudni Pat block varies approximately between 1050 to 1100m from MSL in plateau region. The topography of the proposed block is undulating and rugged. Lohardaga district is drained by the tributaries of three major river of the state viz. North Koel, South Koel and Damodar. The plateau region in west of Lohardaga town is the major water divide for north and south Koel River. The plateau region of the district is highly dissected by down cutting of the tributaries of these rivers.

2.3.0 Climate & Rainfall

2.3.1 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 4⁰C. Summer starts from middle of March and continues up to middle of June, when the temperature shoots up to 42⁰C.

2.3.2 Rainfall

The monsoon sets in by the middle of June and continues 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.

3.0.0 Previous Work

3.1.1 F.S: 2016-17, “Regional Geochemical Mapping in toposheet nos. 73A/10 and 73A/14 (A1 quadrant) in Lohardaga, Latehar, Chatra and Ranchi districts of Jharkhand”

was carried out by Ms Poonam Nagar (Geologist) and Ms Indrani Karmakar (Geologist)

- 3.1.1.1 The area forms a part of the Chhotanagpur plateau. Broadly the area comprises of granite gneiss of CGC and sandstone, siltstone etc. of Gondwana Supergroup rocks. Alluvium of quaternary age and unclassified metamorphic occur as patches.
- 3.1.1.2 A total 808 sq. km area was systematically mapped by three different media; stream sediment, soil and water as per the NGCM guideline on 1:50000 scale.
- 3.1.1.3 Soil sample studies show uniform distribution of elements. Higher concentration of SiO₂ in samples is mostly governed by granite gneiss. Aluminium concentration is higher in samples where CGC is capped by laterite. Higher values of Fe₂O₃ are present where laterite is present. Al₂O₃ show higher values in south- western and central part of toposheet no.73A/10 and this is due to the presence of laterite in these areas. Fe₂O₃ values are higher in central part around Pakhar R.F. where laterite is the dominant lithology.
- 3.1.1.2 LREE enrichment is present in the soil samples with min value of 116.81 and maximum of 693.56 PPM, TREE content is a min of 140.62 to max 781.84 ppm. These high REE's values are observed over granite.
- 3.1.2 Preliminary exploration has been carried out in Siskaripat block by MECL in the year 2024 which covers an area of 0.28 sq.km, block lies in part of Survey of India Toposheet No.73A/10. Exploration site is located 13km northwest from Kisko village (block of Lohardaga dist.) and approximately 25 km from Lohardaga, District headquarters, Jharkhand.
- 3.1.2.1 Regionally the different lithounits in the study area consist of granite gneiss of Chhotanagpur Granite Gneissic Complex (CGC) with enclaves of unclassified metamorphics intruded by pegmatites and thick veins of quartz. Minor outcrops of Damodar Supergroup rocks are also exposed at few places. Bauxite bearing areas are popularly known as "pat" in Chhotanagpur plateau, the laterite/bauxite are developed over the gneissic country rock belonging to Chhotanagpur Gneissic Complex (CGC).
- 3.1.2.2 The Bauxite deposits of Pakhar Plateau are the result of Silica leaching process of alumina rich rocks and it occurs on flat topped Plateau region as blanket of laterite/bauxite deposit. The major Bauxite mineral is gibbsite with minor amount of Boehmite and Cliachite minerals.
- 3.1.2.3 The present exploration works include Topographic survey (Contour interval 2m) and Geological mapping (1:4000 scale) followed by exploratory drilling work.

- 3.1.2.4 The estimated resources in the block area may be placed under Inferred Mineral Resource (332) category as per the Minerals (Evidence of Mineral Contents) Rules, 2015, amended upto 14th Dec 2021.
- 3.1.2.5 Bauxite resources of 2.99 MT with an average grade of alumina 35.57%, silica 4.96%, TiO₂ 7.76%, Vanadium 1501.76 ppm and Gallium 83.74 ppm were estimated at Al₂O₃ ≥ 30 % and SiO₂ ≤ 7% cut-off.
- 3.1.3 HINDALCO INDUSTRIES group is working extensively in the Pakhar area and successfully mining bauxite in the name of Pakhar Mines located in the north eastern side of the proposed Rudni Pat Block.

4.0.0 Regional Geology

- 4.1.1 Regionally the different lithounits in the study area consist of granite gneiss of Chhotanagpur Gneissic Complex (CGC) with enclaves of unclassified metamorphics intruded by pegmatites and thick veins of quartz. Minor outcrops of Damodar Supergroup rocks are also exposed at few places. Bauxite bearing areas are popularly known as “pat” in Chhotanagpur plateau, The laterite/bauxite are developed over the gneissic country rock belonging to Chhotanagpur Gneissic Complex (CGC).

Table 4.1
Geological Succession of the Lohardaga Dist, Part of Topo-sheet no 73A/10
(After GSI)

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
Carboniferous to Juarassic	Damodar Super Group	Suprapanchet formation: Sandstone grit, clay Panchet formation: Red shale, sandstone, mudstone Raniganj Formation: Sandstone, shale with coal Barakar formation: Sandstone, siltstone, shale with coal Talchir formation: Shale, sandstone with conglomerate
Proterozoic		Quartz vein
Archean (?) - 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

4.1.1.1 **Unclassified metamorphics**

Unclassified Metamorphics which occur as enclaves within the Chhotanagpur Gneissic Complex are represented by slate, phyllite, mica-schist, quartzite, limestone, lime silicate rock epidiorite, hornblende, talc schist, amphibolites and quartz.

4.1.1.2 **Chhotanagpur Gneissic Complex (CGC)**

The rocks CGC are characterized by an assemblage of gneissic rocks consisting of coarse-grained grey granite gneiss, garnetiferous grey granite gneiss, grey medium grained granite gneiss and pink medium grained granite gneiss. The CGC is the most dominant rock type in the area. Outcrops of Granite, granite-gneisses can be observed in the bed of the Auranga river. A coarse-grained granite consists of quartz, alkali feldspars, biotite along with the accessory minerals which includes sphene, apatite, Fe- ore minerals etc. The granitic rocks weathered to kaolinite are found near Barnag village. Garnetiferous granite gneiss is also reported around Kharchapani.

4.1.1.3 **Pegmatite and vein quartz**

These occur as intrusive within the Chhotanagpur gneissic complex. The largest of the veins forming a ridge of about 1.5 km length and 0.5 km width occurs to the north of Rampur village. At Lawapani and Jobiyatoli village, pegmatite veins were found intruding the CGC.

4.1.1.4 **Sandstone**

Grey, mottled, medium to coarse-grained, often pebbly and conglomeratic and occasionally laminated sandstone and shale and are found to occur on the surface mostly as isolated parallel to sub-parallel, arcuate bodies, north-east and north-west of Munger and south-west of Jalim. They are also exposed along the Auranga river and its tributaries like, Gowa nala etc. Feldspathic sandstone with thin beds of ferruginous sandstone is exposed along Auranga river.

4.1.1.5 **Laterite & Bauxite**

In situ laterite capping occurs on the top of the plateau (high flat-topped hills), The lateritic capping is pisolitic in texture. The laterite/bauxite is developed over the gneissic country rock belonging to Chhotanagpur Gneissic Complex. Laterite/Bauxite outcrop has been exposed in Maduapat, Siskaripat, Anvrapat Pakhar and proposed Rudnipat areas. In some areas laterite is directly in contact with granitic body, and the granite near contact here hardly shows any effect of lateralisation.

4.2.0 Block Geology

The Rudni Pat plateau is a part of great tableland of Chhotanagpur Granite Gneiss. The Bauxite /Laterite profile could be seen as exposure and the abandoned pits of Rudni Pat Plateau. The reported major basal rocks of the area are metamorphic comprising quartzite, phyllite, mica-schist etc. Presence of traps and /or Upper Gondwana sediments at the base of laterite profile may be thin and patchy.

4.2.1 Occurrence of Bauxite in the Area

The occurrence of Bauxite in the lateritic sequence are mainly boulder/pocket type, consists of Bauxite cobbles, boulders and pebbles with interbinding material of ferruginous laterite, morrum and clays. Closed spaced Bauxite boulders are also seen spreading over a short distance. Narrow and impersistent bands and patches of non-ore intervene the Bauxite zone. Hence, occurrence of Bauxite in the area is erratic in nature. Rudni plateau is the south-west extension of Pakhar Pat. In the proposed block, around 6.00m to 8.00m of Bauxite has been observed.

5.0.0 Proposed Exploration Programme

5.1.0 Objectives:

Preliminary exploration (G3) of Bauxite, Titanium, Vanadium and Associated Minerals in the Rudni Pat block is to be carried out:

1. Preparation of Geological map on 1:4,000 Scale.
2. To carry out a topographical survey on 1:4000 scale at 2m contour interval.
3. To prove the continuation of Bauxite zone(s) in the proposed block which is present in the south western side of running Pakhar Bauxite Mine. Also to confirm the Bauxite occurrence up to the vertical depth of 30m below ground level.
4. Seven bore holes will be drilled upto the 30m depth and two borehole upto 50m i.e. (till basement or whichever is earlier)
5. To assess the quality and the thickness of Bauxite horizons to estimate the Bauxite resources at G-3 (333) level in the block both quantitatively and qualitatively.
6. Along with Bauxite, resources of Titanium, Vanadium and Associated Minerals will be also reported if encouraging values are encountered.
7. To carry out exploration as per MMDR Act – 1957 (Amended 2020) Minerals (Evidence of Mineral Contents) Rules, 2015 (Amended 2021) and Mineral Auction Rule – 2015 (Amended 2021 & 2024) and as to facilitate Government of India/Jharkhand for auctioning of the block based on the outcome of exploration.

5.2.0 Exploration Scheme

5.2.1 Topographic Survey:

The area under investigation i.e. Bauxite plateau around Rudni Pat Plateau measuring about 1.10 Sq. Km. will be surveyed with triangulation network. The length of the block in the longer axis is 1.60 km and the maximum width of block is 0.75 km. The block will be tied up with 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 and the borehole points will be surveyed by DGPS & Total Station in WGS-84 datum.

5.2.2 Detailed Geological Mapping:

The total study area of 1.10 Sq. km. will be mapped on 1:4000 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 1:4000 scales is to be prepared and finalized before finally leaving the worksite after completion of all exploratory activities.

5.2.3 Drilling:

Nine (09) vertical boreholes (coring) at 400m x 400m grid are proposed for G3 stage of exploration. The shape of the proposed Rudni Pat block is erratic & irregular. In order to establish the continuity of ore body, taking into account the boulder/pocket nature of deposit, boreholes have been proposed to have better control on resource estimation. 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 and targeting minimum 5m intersection of lithomarge in order to check the possibility of REE concentration, the average depth of the boreholes is considered to be 30 m. Out of 09 boreholes, 02 boreholes is proposed to be drilled up to 50m or basement (whichever is earlier). Total 310.00 m of drilling is involved in the proposed G3 stage of exploration. The details of proposed boreholes are given the Table no 5.1.

Table- 5.1 RUDNI PAT BLOCK FOR G-3 (AREA-1.10 sq km)				
PROPOSED BOREHOLE POINTS				
Sl.No.	PBH NO.	EASTING (m)	NORTHING (m)	PROP DEPTH (m)
1	P-1	255074.98	2603473.77	30.00
2	P-2	255074.98	2603073.77	30.00
3	P-3	255474.67	2603384.47	50.00
4	P-4	255474.98	2603073.77	30.00
5	P-5	255442.29	2602706.25	30.00
6	P-6	255876.85	2603322.28	30.00
7	P-7	255876.997	2602969.85	50.00
8	P-8	255283.27	2602623.84	30.00
9	P-9	256279.27	2602946.83	30.00
TOTAL METERAGE (M)				310.00

Note: The location and depth of the proposed boreholes is tentative and may subject to change as per actual geological and field conditions.

5.2.4 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, lithological variations along with visual estimate in respect of Al_2O_3 content encountered in the boreholes. At this stage, the overburden, the roof and floor of the Laterite/Bauxite zones are to be marked as the deposit is of high alumina and low silica Bauxite type.

5.2.5 **Core Sampling:**

Borehole cuttings, the material which will be obtained by dry drilling, will be dried in sunlight and sampled for a uniform length of 1.00m 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 1.00m 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 boulder/ pocket 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 / Laterite and clay zone the length of sample may increase. Each sample thus obtained, will be crushed to (-) 120 mesh size and its quantity will be further reduced to 500 grams by coning and quartering. The material will be further crushed to (-) 200 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 oxides i.e., Al_2O_3 , SiO_2 , Fe_2O_3 , TiO_2 & LOI, Elements Vanadium (V) and Gallium (Ga) at Chemical Laboratory of MECL, Nagpur. Remaining 100g of primary samples needs to be kept for the purpose of check analysis. The total number of primary samples generated will be around 270 nos. The remaining 300 grams sample will be kept for preparation of composite samples for analysis of spectroscopic, XRD, total available alumina and reactive silica, other elements and REE, etc for future reference.

5.2.6 **External Check Samples:**

10% of the total primary samples i.e. 27 nos. shall be analysed for five oxides i.e., Al_2O_3 , SiO_2 , Fe_2O_3 , TiO_2 & LOI, Elements Vanadium (V) and Gallium (Ga) from other NABL accredited laboratory as external checks to test the reliability of sampling and analytical data.

5.2.7 **Analysis for Reactive Silica and Total Available Alumina Content:**

18 No's of primary samples will be analysed for Total available alumina and Reactive Silica content. The samples should be selected in such a manner that the entire Bauxite bearing areas are represented by them.

5.2.8 **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.

5.2.9 **Spectroscopic Studies:**

The primary samples i.e. 18 nos. collected from Saprolite/lithomarge zone will be analyzed for 34 elements distribution by Emission Spectroscope. Semi-quantitative analysis for sample package i.e. 17 other elements viz. Li, Ga, V, In, Be, Ge, Mo, Cr, Ta, W, Ba, Co, Rb, Sr, Zr, Nb, Ni ; 17 REE viz. La, Ce, Pr, Nd, Sm, Pm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Sc, Y; needs to be carried out by mass spectroscopic studies ICP-MS (sequential technique).

5.2.10 Petrographic Studies:

Total 09 nos. of selected bedrock/ borehole core samples shall be collected during the course of geological mapping/exploratory drilling and the same shall be subjected to petrographic studies including preparation of thin section and study of thin section.

5.2.11 X-Ray Diffraction Studies:

Total 09 nos. of selected borehole core samples shall be subjected to XRD for identification of minerals.

5.2.12 Quantum of Work:

The proposed quantum of exploratory work (G3) in the Rudni Pat block is furnished in Table-5.2.

Table 5.2: Proposed Quantum of Work, G3 stage Exploration in Rudni Pat Block			
S. No	Item details	Unit	Quantum
1	Topographic Survey (Contour interval 2m) & Geological Mapping (1:4000 scale)	Sq. Km.	1.10
2	Bore Hole Fixation and determination of co-ordinates & Reduced Level (RL) of the boreholes and demarcation of lease hold boundary points by DGPS (19 Bh point and 09 Boundary pts)	Nos.	28
3	Core drilling (400m x 400 grid) 09 boreholes. Out of 09 BHs, 07 BHs of 30 m depth to be drilled up to lithomarge and 02 borehole are proposed to be drilled up to 50m or basement (whichever is earlier)	m	310.00
4	Pitting for determination of Bulk density (1mX1mX1m) – 2Nos.	C .um	02
5	Sampling & Chemical Analysis		
	Primary samples to be analysed for 5 radicals and 2 elements viz. Al ₂ O ₃ , SiO ₂ , Fe ₂ O ₃ , TiO ₂ , LOI, V, Ga		
a)	Borehole Core samples	Nos.	270
b)	Check samples (10% external)	Nos.	27
6	Physical Studies		
a)	ICPMS (sequential technique) for 34 elements i.e. 17 other elements viz. Li, Ga, V, In, Be, Ge, Mo, Cr, Ta, W, Ba, Co, Rb, Sr, Zr, Nb, Ni ; 17 REE viz. La, Ce, Pr, Nd, Sm, Pm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Sc, Y	Nos.	25
b)	XRD studies	Nos.	09
c)	Combined determination of THA, MHA and Reactive Silica	Nos.	09
7	Petrographic Studies	Nos.	09
8	Preparation and Study of Polished Section & Thin Section	Nos.	09
9	In-situ Bulk Density	Nos.	02
10	Geological Report Preparation {As per Mineral (Evidence of mineral contents) Rule-2015}	Nos.	01

6.0.0 Time Schedule and Cost Estimates

6.1.0 Time Schedule:

The project work shall be executed within an approved timeline of 12 months including field activities viz. geological mapping (1:4000), collection of surface samples, pitting, exploratory drilling, associated laboratory studies and geological report preparation. The progress of project shall be reviewed after 06 months.

TIME SCHEDULE/ACTION PLAN FOR PRILIMINARY EXPLORATION (G-3) FOR BAUXITE, VANADIUM, TITANIUM & ASSOCIATED MINERALS IN RUDNI PAT BLOCK (1.10 SQ KM), DISTRICT- LOHARDAGA, JHARKHAND.																
Sl. No.	Activities	Unit	MONTHS													
			1	2	3	4	5	6	REVIEW	7	8	9	10	11	12	
1	Camp Setting	day														
2	Geologist Party days in Field (1 Party)	day														
3	Survey Party days (1 Party)	day														
4	Core Drilling (1 rig)	m.														
5	Sampling Party days, Core Sampling	day														
6	Camp Winding	day														
7	Laboratory Studies	Nos.														
8	Geologist Party days in HQ (1 Party)	day														
9	Report Writing & Peer review	day														
NOTE:																
1	Commencement of project may be reckoned from the day the exploration acreage is available along with all statutory clearances.															
2	Time loss on account of monsoon/agricultural activity/forest clearance/local law & order problem/ lockdown etc. will be additional to above time line.															

6.2.0 Cost Estimates:

Tentative cost has been estimated based on Schedule of Charges (SoC) of projects funded by National Exploration Trust (NMET).

The total cost estimate of **Rs. 120.61 Lakhs** is being proposed for completion of exploratory work up to G3 level. Activity wise break-ups of the same are furnished below:

Table: 6.2

Summary of Activity wise Cost Estimates		
Sl. No.	Activities	Estimated Cost (Rs.) - G3 level
1	Geological work	39,15,120
2	Mineral Investigation (Drilling & Pitting-Trenching)	37,55,880
3	Laboratory studies (Chemical Analysis, Physical & Petrological Studies & Geotech. Lab)	18,53,394
Sub-Total		95,24,394
4	Proposal Preparation	1,90,488
5	Geological Report Preparation	4,76,220
6	Peer review charges	30,000
Total		1,02,21,102
7	GST (18%)	18,39,798
Total Cost including 18% GST		1,20,60,900
SAY IN LAKHS		120.61

7.0.0 Justifications

7.1.0 Preliminary geological work has been carried out by GSI as well as DMG, Jharkhand in the area. MECL & CMPDI has also carried out exploration in around the adjoining areas which has established occurrence of Bauxite with thickness varying from 3.0m to 7.0m. The outcrops of Bauxite are observed in the field and the exposed pits in the proposed area have confirmation of the Laterite / Bauxite profile in the block varying in thickness from 6.00m to 8.00m. The above fact signifies that the plateau is potential Bauxite bearing and may have a good prospect to be explored to G3 level.

7.2.0 The MECL team visited the Rudni Pat block and nearby mine areas. The pits in the existing mines have bauxite occurrences upto 25m depth. The outcrops of Bauxite are observed in the field and the exposed pits in the proposed block have confirmation of the Laterite / Bauxite profile in the Rudni Pat block. Team collected Bauxite samples from the block showing encouraging results of high Alumina (Al₂O₃), Titanium (TiO₂), Vanadium, Gallium with low Silica (SiO₂) in the range of

55.00-57.00%,9.60-10.31%,500-800ppm,135-149 ppm and 1.40-2.00% respectively.
Results are given below for the reference:

Sender No.	Al ₂ O ₃ %	SiO ₂ %	Fe ₂ O ₃ %	TiO ₂ %	V PPM	Ga PPM	LOI %
RUD/01	54.80	2.19	6.67	9.58	718	143	26.34
RUD/02	55.75	1.82	5.14	10.31	577	135	26.62
RUD/03	54.81	1.55	6.98	9.69	829	148	26.59
RUD/04	56.72	1.39	4.79	9.81	652	149	26.93

7.3.0 DMG, Government of Jharkhand discussed with MECL to take up exploration work of Bauxite blocks in the Lohardaga districts of Jharkhand for up gradation of the area as per the MMDR Amendment Act,1957 (Amended 2020) and Mineral Auction Rule, 2015 (Amended 2021) to enable the state government for auctioning of the Bauxite blocks. On discussion with Jharkhand Government, MECL decided to take up the exploration work of Bauxite for G3 level and accordingly prepared the proposal for G3 Level exploration in the Rudni Pat Block, District – Lohardaga, Jharkhand through NMET funding.

List of Plates:

1. Location Plan.
2. Regional Geological Map.
3. Google Earth Image Rubni Pat Block
4. Proposed Rudni Pat Block with Sample Location
5. Proposed Borehole Location Plan

LOCATION MAP

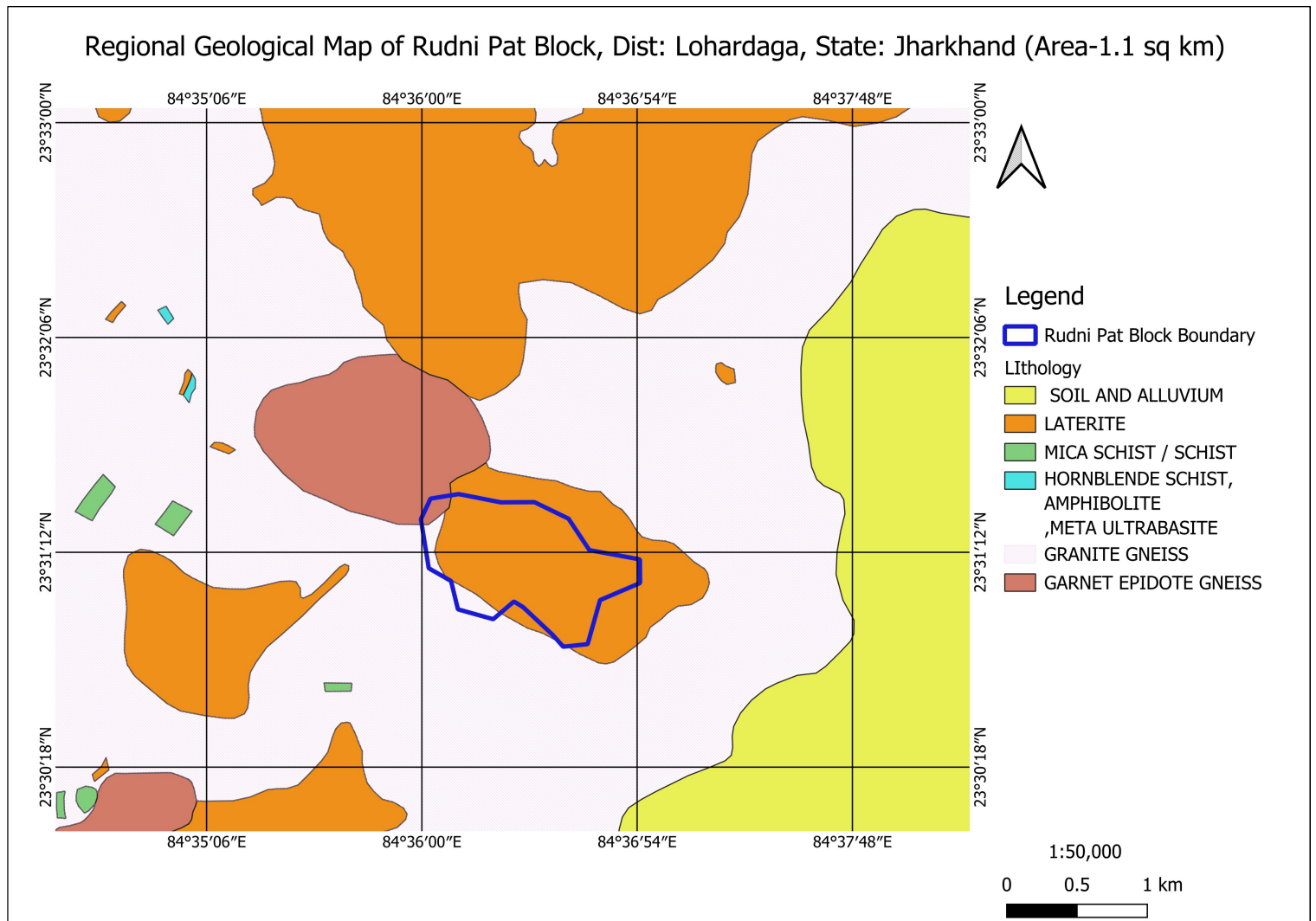
LOCATION MAP OF RUDNI PAT BLOCK FOR G3, DIST: LOHARDAGA, STATE: JHARKHAND (AREA - 1.1 sq.km)



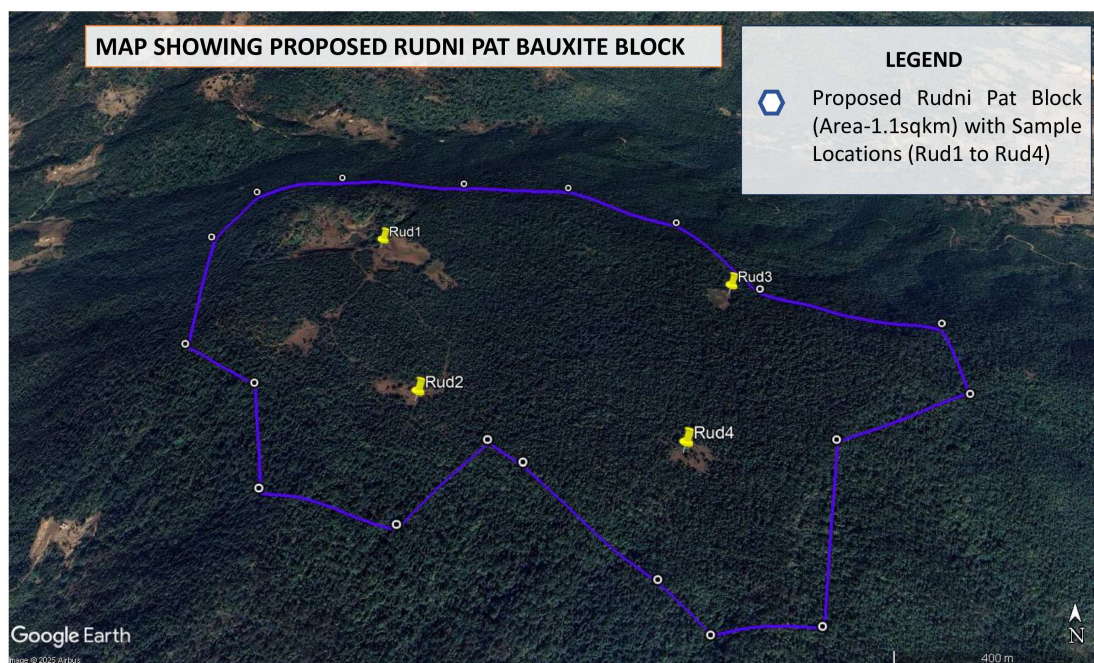
Block Boundary Co-ordinates of Proposed Rudni Pat (G-3) Area: 1.1 sq km

(WGS-84 Degree minute seconds)			(UTM Zone 48N)		
Coordinate	UTM Zone	UTM Easting	UTM Northing	UTM Easting	UTM Northing
1	23° 33' 16" N	84° 34' 59" E	2605650.587	2605650.587	2605650.587
2	23° 33' 16" N	84° 36' 13" E	2605650.587	2605650.587	2605650.587
3	23° 33' 16" N	84° 37' 26" E	2605650.587	2605650.587	2605650.587
4	23° 33' 16" N	84° 38' 40" E	2605650.587	2605650.587	2605650.587
5	23° 33' 16" N	84° 39' 53" E	2605650.587	2605650.587	2605650.587
6	23° 33' 16" N	84° 41' 07" E	2605650.587	2605650.587	2605650.587
7	23° 33' 16" N	84° 42' 20" E	2605650.587	2605650.587	2605650.587
8	23° 33' 16" N	84° 43' 34" E	2605650.587	2605650.587	2605650.587
9	23° 33' 16" N	84° 44' 47" E	2605650.587	2605650.587	2605650.587
10	23° 33' 16" N	84° 46' 01" E	2605650.587	2605650.587	2605650.587
11	23° 33' 16" N	84° 47' 14" E	2605650.587	2605650.587	2605650.587
12	23° 33' 16" N	84° 48' 28" E	2605650.587	2605650.587	2605650.587
13	23° 33' 16" N	84° 49' 41" E	2605650.587	2605650.587	2605650.587
14	23° 33' 16" N	84° 50' 55" E	2605650.587	2605650.587	2605650.587
15	23° 33' 16" N	84° 52' 08" E	2605650.587	2605650.587	2605650.587
16	23° 33' 16" N	84° 53' 22" E	2605650.587	2605650.587	2605650.587
17	23° 33' 16" N	84° 54' 35" E	2605650.587	2605650.587	2605650.587
18	23° 33' 16" N	84° 55' 49" E	2605650.587	2605650.587	2605650.587
19	23° 33' 16" N	84° 57' 02" E	2605650.587	2605650.587	2605650.587
20	23° 33' 16" N	84° 58' 16" E	2605650.587	2605650.587	2605650.587
21	23° 33' 16" N	84° 59' 29" E	2605650.587	2605650.587	2605650.587
22	23° 33' 16" N	85° 00' 43" E	2605650.587	2605650.587	2605650.587
23	23° 33' 16" N	85° 01' 56" E	2605650.587	2605650.587	2605650.587
24	23° 33' 16" N	85° 03' 10" E	2605650.587	2605650.587	2605650.587
25	23° 33' 16" N	85° 04' 23" E	2605650.587	2605650.587	2605650.587
26	23° 33' 16" N	85° 05' 37" E	2605650.587	2605650.587	2605650.587
27	23° 33' 16" N	85° 06' 50" E	2605650.587	2605650.587	2605650.587
28	23° 33' 16" N	85° 08' 04" E	2605650.587	2605650.587	2605650.587
29	23° 33' 16" N	85° 09' 17" E	2605650.587	2605650.587	2605650.587
30	23° 33' 16" N	85° 10' 31" E	2605650.587	2605650.587	2605650.587
31	23° 33' 16" N	85° 11' 44" E	2605650.587	2605650.587	2605650.587
32	23° 33' 16" N	85° 12' 58" E	2605650.587	2605650.587	2605650.587
33	23° 33' 16" N	85° 14' 11" E	2605650.587	2605650.587	2605650.587
34	23° 33' 16" N	85° 15' 25" E	2605650.587	2605650.587	2605650.587
35	23° 33' 16" N	85° 16' 38" E	2605650.587	2605650.587	2605650.587
36	23° 33' 16" N	85° 17' 52" E	2605650.587	2605650.587	2605650.587
37	23° 33' 16" N	85° 19' 05" E	2605650.587	2605650.587	2605650.587
38	23° 33' 16" N	85° 20' 19" E	2605650.587	2605650.587	2605650.587
39	23° 33' 16" N	85° 21' 32" E	2605650.587	2605650.587	2605650.587
40	23° 33' 16" N	85° 22' 46" E	2605650.587	2605650.587	2605650.587
41	23° 33' 16" N	85° 23' 59" E	2605650.587	2605650.587	2605650.587
42	23° 33' 16" N	85° 25' 13" E	2605650.587	2605650.587	2605650.587
43	23° 33' 16" N	85° 26' 26" E	2605650.587	2605650.587	2605650.587
44	23° 33' 16" N	85° 27' 40" E	2605650.587	2605650.587	2605650.587
45	23° 33' 16" N	85° 28' 53" E	2605650.587	2605650.587	2605650.587
46	23° 33' 16" N	85° 30' 07" E	2605650.587	2605650.587	2605650.587
47	23° 33' 16" N	85° 31' 20" E	2605650.587	2605650.587	2605650.587
48	23° 33' 16" N	85° 32' 34" E	2605650.587	2605650.587	2605650.587
49	23° 33' 16" N	85° 33' 47" E	2605650.587	2605650.587	2605650.587
50	23° 33' 16" N	85° 35' 01" E	2605650.587	2605650.587	2605650.587
51	23° 33' 16" N	85° 36' 14" E	2605650.587	2605650.587	2605650.587
52	23° 33' 16" N	85° 37' 28" E	2605650.587	2605650.587	2605650.587
53	23° 33' 16" N	85° 38' 41" E	2605650.587	2605650.587	2605650.587
54	23° 33' 16" N	85° 39' 55" E	2605650.587	2605650.587	2605650.587
55	23° 33' 16" N	85° 41' 08" E	2605650.587	2605650.587	2605650.587
56	23° 33' 16" N	85° 42' 22" E	2605650.587	2605650.587	2605650.587
57	23° 33' 16" N	85° 43' 35" E	2605650.587	2605650.587	2605650.587
58	23° 33' 16" N	85° 44' 49" E	2605650.587	2605650.587	2605650.587
59	23° 33' 16" N	85° 46' 02" E	2605650.587	2605650.587	2605650.587
60	23° 33' 16" N	85° 47' 16" E	2605650.587	2605650.587	2605650.587
61	23° 33' 16" N	85° 48' 29" E	2605650.587	2605650.587	2605650.587
62	23° 33' 16" N	85° 49' 43" E	2605650.587	2605650.587	2605650.587
63	23° 33' 16" N	85° 50' 56" E	2605650.587	2605650.587	2605650.587
64	23° 33' 16" N	85° 52' 10" E	2605650.587	2605650.587	2605650.587
65	23° 33' 16" N	85° 53' 23" E	2605650.587	2605650.587	2605650.587
66	23° 33' 16" N	85° 54' 37" E	2605650.587	2605650.587	2605650.587
67	23° 33' 16" N	85° 55' 50" E	2605650.587	2605650.587	2605650.587
68	23° 33' 16" N	85° 57' 04" E	2605650.587	2605650.587	2605650.587
69	23° 33' 16" N	85° 58' 17" E	2605650.587	2605650.587	2605650.587
70	23° 33' 16" N	85° 59' 31" E	2605650.587	2605650.587	2605650.587
71	23° 33' 16" N	86° 00' 44" E	2605650.587	2605650.587	2605650.587
72	23° 33' 16" N	86° 01' 58" E	2605650.587	2605650.587	2605650.587
73	23° 33' 16" N	86° 03' 11" E	2605650.587	2605650.587	2605650.587
74	23° 33' 16" N	86° 04' 25" E	2605650.587	2605650.587	2605650.587
75	23° 33' 16" N	86° 05' 38" E	2605650.587	2605650.587	2605650.587
76	23° 33' 16" N	86° 06' 52" E	2605650.587	2605650.587	2605650.587
77	23° 33' 16" N	86° 08' 05" E	2605650.587	2605650.587	2605650.587
78	23° 33' 16" N	86° 09' 19" E	2605650.587	2605650.587	2605650.587
79	23° 33' 16" N	86° 10' 32" E	2605650.587	2605650.587	2605650.587
80	23° 33' 16" N	86° 11' 46" E	2605650.587	2605650.587	2605650.587
81	23° 33' 16" N	86° 12' 59" E	2605650.587	2605650.587	2605650.587
82	23° 33' 16" N	86° 14' 13" E	2605650.587	2605650.587	2605650.587
83	23° 33' 16" N	86° 15' 26" E	2605650.587	2605650.587	2605650.587
84	23° 33' 16" N	86° 16' 40" E	2605650.587	2605650.587	2605650.587
85	23° 33' 16" N	86° 17' 53" E	2605650.587	2605650.587	2605650.587
86	23° 33' 16" N	86° 19' 07" E	2605650.587	2605650.587	2605650.587
87	23° 33' 16" N	86° 20' 20" E	2605650.587	2605650.587	2605650.587
88	23° 33' 16" N	86° 21' 34" E	2605650.587	2605650.587	2605650.587
89	23° 33' 16" N	86° 22' 47" E	2605650.587	2605650.587	2605650.587
90	23° 33' 16" N	86° 24' 01" E	2605650.587	2605650.587	2605650.587
91	23° 33' 16" N	86° 25' 14" E	2605650.587	2605650.587	2605650.587
92	23° 33' 16" N	86° 26' 28" E	2605650.587	2605650.587	2605650.587
93	23° 33' 16" N	86° 27' 41" E	2605650.587	2605650.587	2605650.587
94	23° 33' 16" N	86° 28' 55" E	2605650.587	2605650.587	2605650.587
95	23° 33' 16" N	86° 30' 08" E	2605650.587	2605650.587	2605650.587
96	23° 33' 16" N	86° 31' 22" E	2605650.587	2605650.587	2605650.587
97	23° 33' 16" N	86° 32' 35" E	2605650.587	2605650.587	2605650.587
98	23° 33' 16" N	86° 33' 49" E	2605650.587	2605650.587	2605650.587
99	23° 33' 16" N	86° 35' 02" E	2605650.587	2605650.587	2605650.587
100	23° 33' 16" N	86° 36' 16" E	2605650.587	2605650.587	2605650.587
101	23° 33' 16" N	86° 37' 29" E	2605650.587	2605650.587	2605650.587
102	23° 33' 16" N	86° 38' 43" E	2605650.587	2605650.587	2605650.587
103	23° 33' 16" N	86° 39' 56" E	2605650.587	2605650.587	2605650.587
104	23° 33' 16" N	86° 41' 10" E	2605650.587	2605650.587	2605650.587
105	23° 33' 16" N	86° 42' 23" E	2605650.587	2605650.587	2605650.587
106	23° 33' 16" N	86° 43' 37" E	2605650.587	2605650.587	2605650.587
107	23° 33' 16" N	86° 44' 50" E	2605650.587	2605650.587	2605650.587
108	23° 33' 16" N	86° 46' 04" E	2605650.587	2605650.587	2605650.587
109	23° 33' 16" N	86° 47' 17" E	2605650.587	2605650.587	2605650.587
110	23° 33' 16" N	86° 48' 31" E	2605650.587	2605650.587	2605650.587
111	23° 33' 16" N	86° 49' 44" E	2605650.587	2605650.587	2605650.587
112	23° 33' 16" N	86° 50' 58" E	2605650.587	2605650.587	2605650.587
113	23° 33' 16" N	86° 52' 11" E	2605650.587	2605650.587	2605650.587
114	23° 33' 16" N	86° 53' 25" E	2605650.587	2605650.587	2605650.587
115	23° 33' 16" N	86° 54' 38" E	2605650.587	2605650.587	2605650.587
116	23° 33' 16" N	86° 55' 52" E	2605650.587	2605650.587	2605650.587
117	23° 33' 16" N	86° 57' 05" E	2605650.587	2605650.587	2605650.587
118	23° 33' 16" N	86° 58' 19" E	2605650.587	2605650.587	2605650.587
119	23° 33' 16" N	86° 59' 32" E	2605650.587	2605650.587	2605650.587
120	23° 33' 16" N	87° 00' 46" E	2605650.587	2605650.587	2605650.587
121	23° 33' 16" N	87° 01' 59" E	2605650.587	2605650.587	2605650.587
122	23° 33' 16" N	87° 03' 13" E	2605650.587	2605650.587	2605650.587
123	23° 33' 16" N	87° 04' 26" E	2605650.587	2605650.587	2605650.587
124	23° 33' 16" N	87° 05' 40" E	2605650.587	2605650.587	2605650.587
125	23° 33' 16" N	87° 06' 53" E	2605650.587	2605650.587	2605650.587
126	23° 33' 16" N	87° 08' 07" E	2605650.587	2605650.587	2605650.587
127	23° 33' 16" N	87° 09' 20" E	2605650.587	2605650.587	2605650.587
128	23° 33' 16" N	87° 10' 34" E	2605650.587	2605650.587	2605650.587
129	23° 33' 16" N	87° 11' 47" E	2605650.587	2605650.587	2605650.587
130	23° 33' 16" N	87° 13' 01" E	2605650.587	2605650.587	2605650.587
131	23° 33' 16" N	87° 14' 14" E	2605650.587	2605650.587	2605650.587
132	23° 33' 16" N	87° 15'			

REGIONAL GEOLOGICAL MAP



GOOGLE EARTH IMAGE SHOWING PROPOSED RUDNI PAT BLOCK



PROPOSED BOREHOLE LOCATION PLAN OF RUDNI PAT BLOCK

