PROPOSAL FOR PRELIMINARY EXPLORATION (G-3)
FOR REEs & COPPER IN
HIRNODA BLOCK
(8.76 SQ.KM AREA)
DISTRICT- JAIPUR, RAJASTHAN

COMMODITY: REEs AND COPPER

BY

MINERAL EXPLORATION AND CONSULTANCY LIMITED

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SEMINARY HILLS

PLACE: NAGPUR

DATE: 28th December 2024

Summary for Preliminary Exploration (G-3) for REEs and Cu in Hirnoda Block (8.76 Sq. km. area), Nagpur Dist., Maharashtra

	Features	**Details**
	Block ID	**Hirnoda Block**
	Exploration Agency	Mineral Exploration and Consultancy Limited (MECL)
	Commodity	**REEs and Cu**
	Mineral Belt	Delhi Super Group (Ajabgarh/Alwar Group)
	Budget & Time schedule to complete the project	1053.35 lakhs &15 months
	Objectives	Based on the (a) Available baseline Geoscience data of GSI from NGDR portal, (b) Previous Exploration Report of Hindustan Zinc Limited (HZL) Submitted to Chief Controller of Mines, IBM (c) Field visit by MECL's Geologist in and around Hirnoda Block, Dist- Jaipur, Rajasthan, the present exploration programme for preliminary exploration (G-3) has been formulated with the following objectives: - i) To carry out geophysical investigation by means of I.P. cum-resistivity, S.P., magnetic surveys with Profile Interval of 100m * 10m, i.e (Strike Interval * Station Interval) ii) To carry out geological & structural mapping on 1:4000 scale for the identification of Cu-REE bearing rock formation (host rock) with the structural features and observe surface manifestation with lateral disposition of the mineralized zones. iii) To prepare the topographic map of the area by contouring at 2m interval in 1:4000 scale. iv) To establish subsurface Geology of the earlier reported mineralised zones of Cu-REE by means of drilling. v) To assess the quality and quantity of the resources (333) as per UNFC norms & Minerals (Evidence of Mineral Contents) Rules- 2021.
	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 the proposed agency.
	Name/Number of Geoscientists	
	Expected Field days (Geology,	Geologist Party days: Field -210 days & HQ-60 days

	Geophysics, Surveyor)	Survey Party days: 30 days (for BH fixation and Topographic Survey)
		Sampling Party days: 30 days

1.	**Location**	The proposed exploration block is located in Hirnoda Village, which is a Village in Dudu Tehsil in Jaipur District of Rajasthan. It belongs to Jaipur Division. It is located 53 KM towards west from District headquarters Jaipur. 17 KM from Dudu. 56 KM from State capital Jaipur. Block falls under the parts of Survey of India Toposheet No 45N/05 and is bounded by latitude 26º 52' 32" Nto 26º 55' 28" N and longitude 75° 20' 09" E to 75° 22' 00" E (Plate No I).
	Latitude and Longitude	

BOUNDARY POINTS	WGS-84, UTM-43		WGS-84, DMS	
	EASTINGS	NORTHINGS	LONGITUDE	LATITUDE
A	533357.5043	2973110.04	75º 20' 09.0769" E	26º 52' 45.4513" N
B	534695.6196	2978134.923	75º 20' 58.0801" E	26º 55' 28.6564" N
C	536405.1545	2977679.678	75º 22' 0.0199" E	26º 55' 13.7025" N
D	534902.2171	2972698.687	75º 21' 5.0244" E	26º 52' 31.9450" N

	Villages	Hirnoda, Dhinda
	Tehsil/Taluk	Dudu
	District	Jaipur
	State	Rajasthan
2.	**Area (hectares/ square kilometres)**	
	Block Area	8.76 sq.km
	Forest Area	Non-Forest Area
	Government Land Area	Data not available
	Charagaha	Data not available
	Private Land Area	Data not available
3.	**Accessibility**	
	Nearest Rail Head	The nearest railhead is Jaipur Junction (about 54 km) and nearest railway station is Hirnoda Railway Station (about 02 km).
	Road	The block area is well connected to State headquarter Jaipur (55 Kms), by all weather metalled road from the Jaipur-Nagaur Road via Kalwar. Also it is well connected to district Headquarter Dudu (47 Kms), by all weather metalled road from NH-48.
	Airport	The nearest airport is Sawai Mansingh International Airport, Jaipur (about 55 km).
4.	**Hydrography**	
	Local Surface Drainage Pattern (Channels)	Sambhar Lake (An Inland Salt Lake) is about 20 Kms towards NNW from the block. The area has got Interior Drainage pattern.

	Rivers/ Streams	No Rivers/Stream passing through the block
5.	**Climate**	
	Mean Annual Rainfall	Average annual rainfall is 686 mm
	Temperature:	Minimum temperatures: below 6°C (December-January), Maximum temperatures: up to 40°C (April-May)
6.	**Topography**	
	Toposheet Number	45N/05
	Morphology of the Area	The area is almost flat terrain and covered with agriculture land. The average height of the area is 380m above MSL.
7.	**Availability of baseline geoscience data**	
	Geological Map (1:50K/25K)	1:50,000 (Bhukosh, Geological Survey of India)
	Geochemical Map	Not available.
	Geophysical Map (Aeromagnetic, ground geophysical, Regional as well as local scale GP maps)	Regional Gravity and Regional Magnetic Anomaly Map is taken into consideration.
8.	**Justification for taking up Reconnaissance Survey/ Regional Exploration**	i) The Hirnoda block falls in the Reconnaissance permit no. 7/2004 (Sawar-Jobner block) of M/s Hindustan Zinc Limited (HZL) measuring 4392.65 sq km of area in Ajmer, Jaipur and Tonk districts of Rajasthan. RP was awarded by the state govt. order no. F-18(1)/Gr-2/2005 dated 23/10/08 as per approval given by central govt. vide letter no. 4/149/2005. MIV dated 10/10/2007. Four blocks vis Block A (90.4 sq km), Block B (628.50sq km), Block C- (104.70sq km) and Block-D (170sq km), were demarcated. ii) M/S HZL drilled 31 inclined coring BHs in Block B, C and D. MECL taken into account BH No.- DD10SJ004 Which is falling within the proposed block and BH No.- DD11SJ014, falling outside the proposed Block which is about 10 Kms towards NE from BH No.- DD10SJ004. Both these BHs were proven positive in terms of REEs and Copper Mineralisation. **iii)** 4 REEs zone were encountered in BH No.- DD10SJ004 viz (**i) 3m @ 0.46 % La+Ce, Vertical Depth of 160m within Amphibolites (ii) 3m @ 0.28 % La+Ce, Vertical Depth of 177 m within Amphibolites (iii) 1.65m @ 0.36 % La+Ce, Vertical Depth of 216 m within Amphibolites (iv) 1.65m @ 0.64 % La+Ce**, **Vertical Depth of 231 m within Amphibolites** along with this 5 Low grade Cu Zones were also identified ranging **from 0.06 % Cu to 0.1 % Cu and Vertical**

		Depth varying from 112m to 231m, Copper mineralisation is hosted by Amphibolite and Biotite Gneiss both. iv) However, the proposed block falls into the retained Block B of the RP granted to HZL. During the interpretation of subsurface data, MECL has projected Cu-REE Mineralisation to the surface and correlated the projected surface mineralised zone of both the positive BHs and delineated the possible mineralised strike. v) The delineated possible mineralised strike corroborates with the negative Bouger anomaly map of gravity data (NGPM) downloaded from NGDR portal. vi) The high magnetic anomaly coincides with the proposed block, Anomaly Map of Gravity Data (NGPM) downloaded from NGDR portal.

PROPOSAL FOR PRELIMINARY EXPLORATION (G-3) FOR COPPER AND REEs IN HIRNODA BLOCK (8.76 SQ. KM AREA) DISTRICT- JAIPUR, RAJASTHAN

1.0.0 INTRODUCTION

1.1.0 Preamble:

1.1.1 Rare earths are characterized by high density, high melting point, high conductivity and high thermal conductance. These unique properties i.e., distinctive electrical, metallurgical, catalytic, nuclear, magnetic and luminescent properties make them indispensable for a variety of emerging high end and critical technology applications relevant to India's energy security i.e., clean energy technology, defence, civilian application, environment and economic areas. Demand for REE is expected to continue to grow, especially because of their use in low carbon technology. The ever-increasing demand for these Rare Metals and REE necessitates a concerted effort to augment the resource position of our country.

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

1.2.0 Background:

1.2.1 The Exploration for strategic, critical, rare metals, rare earths elements, PGE and precious metals is given top priority by Govt. of India after amendment of MMDR act 2015. Keeping this in view, the present proposal is being put up for Reconnaissance Survey (G-3) for REE and Cu in Hirnoda Block of Jaipur District in Rajasthan.

1.2.2 The Hirnoda block falls in the Reconnaissance permit no. 7/2004 (Sawar-Jobner block) of M/s Hindustan Zinc Limited (HZL) measuring 4392.65 sq km of area in Ajmer, Jaipur and Tonk districts of Rajasthan. RP was awarded by the state govt. order no. F-18(1)/Gr-2/2005 dated 23/10/08 as per approval given by central govt. vide letter no. 4/149/2005. MIV dated 10/10/2007. Four blocks vis Block A (90.4 sq km), Block B (628.50sq km), Block C- (104.70sq km) and Block-D (170sq km), were demarcated.

1.2.3 The M/S HZL drilled 31 inclined coring BHs in Block B, C and D. MECL taken into account BH No.- DD10SJ004 Which is falling within the proposed block and BH No.-

DD11SJ014, falling outside the proposed Block which is about 10 Kms towards NE from BH No.- DD10SJ004. Both these BHs were proven positive in terms of REEs and Copper Mineralisation.

1.2.2 4 REEs zone were encountered in BH No.- DD10SJ004 viz (**i) 3m @ 0.46 % La+Ce, Vertical Depth of 160m within Amphibolites (ii) 3m @ 0.28 % La+Ce, Vertical Depth of 177 m within Amphibolites (iii) 1.65m @ 0.36 % La+Ce, Vertical Depth of 216 m within Amphibolites (iv) 1.65m @ 0.64 % La+Ce**, **Vertical Depth of 231 m within Amphibolites** along with this 5 Low grade Cu Zones were also identified ranging **from 0.06 % Cu to 0.1 % Cu and Vertical Depth varying from 112m to 231m, Copper mineralisation is hosted by Amphibolite and Biotite Gneiss both.**

1.2.3 During the interpretation of subsurface data, MECL has projected Cu-REE Mineralisation to the surface and correlated the projected surface mineralised zone of both the positive BHs and delineated the possible mineralised strike.

1.2.4 The delineated mineralised strike corroborates with negative Bouger anomaly and high magnetic anomaly as per NGPM data downloaded from NGDR portal.

1.2.5 Based on the available data and demand of REEs and Cu, MECL has proposed preliminary exploration (G-3) exploration in Hirnoda Block.

1.3.0 Location& Accessibility of the Area

The proposed exploration block is located in Hirnoda Village, which is a Village in Dudu Tehsil in Jaipur District of Rajasthan. It belongs to Jaipur Division. It is located 53 KM towards west from District headquarters Jaipur. 17 KM from Dudu. 56 KM from State capital Jaipur. Block falls under the parts of Survey of India Toposheet No 45N/05 and is bounded by latitude 26º 52' 32" Nto 26º 55' 28" N and longitude 75° 20' 09" E to 75° 22' 00" E (Plate No I).

The coordinate of cardinal points of block boundary are as follows:

BOUNDARY POINTS	WGS-84, UTM-43		WGS-84, DMS	
	EASTINGS	NORTHINGS	LONGITUDE	LATITUDE
A	533357.5043	2973110.04	75º 20' 09.0769" E	26º 52' 45.4513" N
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D	534902.2171	2972698.687	75º 21' 5.0244" E	26º 52' 31.9450" N

The block area is well connected to State headquarter Jaipur (55 Kms), by all weather metalled road from the Jaipur-Nagaur Road via Kalwar. Also it is well connected to district Headquarter Dudu (47 Kms), by all weather metalled road from NH-48.
The nearest railhead is Jaipur Junction (about 54 km) and nearest railway station is Hirnoda Railway Station (about 02 km). The nearest airport is Sawai Mansingh International Airport, Jaipur (about 55 km).

1.4.0 Physiography, Drainage, Climate and Vegetation

1.4.1 The area comprises of wide spread plain land and almost flat terrain covered with agriculture land. The average height of the area is 380m above MSL.

1.4.2 The area experiences moderately dry and wet climate. The temperature rises from March onwards, reaching maximum up to 40°C during April-May. The winter sets from November and lasts upto February. Winter is moderate, temperature dropping below 6°C with occasional colder days. The monsoon sets in July and continues up to September, most of the rainfall occurs during the months of July and August. The annual rainfall is about 686 mm.

1.4.3 Most of the block area falls under the agriculture land, where one time crop being cultivated and there is no other significant flora is present in the area.

1.5.0 Previous Work

1.5.1 M/s. HZL carried out Reconnaissance Survey in the area measuring 4392.65 sq km in Ajmer, Jaipur and Tonk districts of Rajasthan, four blocks vis Block A (90.4 sq km), Block B (628.50sq km), Block C- (104.70sq km) and Block-D (170sq km), were demarcated M/s HZL drilled 31 inclined coring BHs in Block B, C and D. HZL drilled 31 inclined coring BHs in Block B, C and D.

1.5.2 NGPM and Geological Mapping on 1:50000 scale is done by GSI, and data was taken into consideration from NGDR Portal.

1.6.0 Regional Geology

1.6.1 Incidentally, the occurrences fall along a NE-SSW trending “Albitite line”, which comprises a 170 km long, structurally weak zone/lineament and axial trace of major folds in the KSB extending from Raghunathpura in Mahendragarh district of southern Haryana to Ladera-Sakun-Bichun in Rajasthan.

1.6.2 The post-Delhi magmatic activity in North Delhi Fold Belt (NDFB) is represented by alkali granites, pegmatites, aplites and albitites. The rocks of Delhi supergroup have undergone low to medium grade metamorphism (amphibolite facies) and polyphase deformation. First two deformations with N-S to NNE-SSW axial plane are coaxial while the third phase have E-W axial plane. Prominent shear zones are developed along the N-S to NNE-SSW axial planes, characterized by intense silicification, brecciation and ferruginisation. The NE-SW trending disposition of albitised granites indicate that the metasomatic fluids originated during reactivation of the NE-SW trending Khetri

lineament, caused pervasive albitisation of the preexisting rocks, the deformed lithounits providing conduits for the migration of large volumes of albitising fluids.

1.6.3 The albitite belt better known as 'Albitite line' initially known to occur over 170 km length (Ray 1987, 1990) has now been traced over 320 kms length in a NNE-SSW trending linear zone (Singh et al. 1998, 2013; Sinha-Roy et al.) along or in close proximity to major lineaments, from Tal in the SW Rajasthan to Dhandholi Mewara in the NE Haryana.

1.6.4 In southern part it is microcline (hence named microclinite), whereas towards north it is albite (hence named albitite). The grass trace of albitite-pyroxinite-microclinite belt nearly coincides with tectonic lineament both in the South and North Delhi Fold Belt in western India. Furthermore, the albitite and microclinite bodies occur either close to the contact of Sandmata Complex (Banded Gneissic Complex) with Delhis, or in close contact with rocks of the Alwar and/or Ajabgarh Group of the Delhi Supergroups that are intruded by post-Delhi aplites, granites and pegmatites (Choudhary et al. 1984).

1.6.5 A number of albitite occurrences have been reported amidst Archaean basement and the Meso-Proterozoic cover rocks of Delhi Supergroup in north-central and northern Rajasthan. These occurrences form a linear zone about 130 km in length and 5–12 km in width from Neorana in the north to Nayagaon in the south.

1.6.6 This zone has a regional NE–SW trend and occurs about 20–40 km east of known albitite line. A zone of albitite and albitized rocks in the Banded Gneissic Complex (BGC) around Bichun, Nayagaon, Asalpur and Dungarwara and amidst Delhi Supergroup rocks in the East Khetri basin around Chiplata, Sirsori ki Dhani, Ghasipura, Rela and Neorana is present. The delineated albitite occurrences are radioactive and some of them host significant uranium and REE, Y and Sc. These albitite occurrences represent an intracontinental rift zone parallel to the one established by Ray and assume significance for exploration for uranium and other polymetallic minerals (REE, Y and Sc).

1.6.7 However, the latest stratigraphy of the area as proposed after Ravindra and Reddy. (2012) is given in below.

Regional Litho-Stratigraphic Succession (after Ravindra and Reddy, 2012)

<table>
<tr><td colspan="2">Recent to sub-recent</td><td colspan="2">Blown Sand, Alluvium and Kankar</td></tr>
<tr><td colspan="2">Post-Delhi intrusives</td><td colspan="2">Quartz and Quartz-tourmaline veins, Pegmatite, Granite, Granite Gneiss, Amphibole Dykes</td></tr>
<tr><td rowspan="4">Delhi Supergroup (Lowe to Middle proterozoic)</td><td rowspan="2">Ajabgarh Group</td><td>Kushalgarh Formation</td><td>Impure siliceous marble, Calc-Gneiss, banded marble and Quartzite</td></tr>
<tr><td>Pratapgarh Formation</td><td>Massive quartzite with occasional conglomerates</td></tr>
<tr><td rowspan="2">Alwar Group</td><td>Kankwarhi Formation</td><td>Mica Schist, Flaggy micaceous quartzite</td></tr>
<tr><td>Rajgarh Formation</td><td>Arkose, Pebbly quartzite, Conglomerate with Schist and Quartzite</td></tr>
<tr><td colspan="4">----------Unconformity----------</td></tr>
<tr><td colspan="2">Pre-Delhi Intrusives</td><td colspan="2">Pegmatites</td></tr>
<tr><td colspan="2">Pre-Aravalli Supergroup</td><td colspan="2">Biotite Schist with Quartzite Bands</td></tr>
</table>

1.6.5 Geology of the block area

The Proposed Block is Covered by Blown Sand/ Aeolian Sand of Quaternary, No exposure of Outcrops can be seen on the Geological map available at 1:50000 scale downloaded from NGDR portal.

1.6.6 Regional Structure

(i) Two major phases of deformation (F2 and F3) were recognized. The F1 folds are not observed. The axes of F2 folds trend NNE-SSW to NE-SW while those of the F3 phase trend NW-SE. exhibiting NE-SW strike with low to moderate dips of 20° to 60° mainly due west.

(ii) Conglomerate with stretched (with major axis parallel to the regional strike direction) subangular to subrounded pebbles predominantly of quartz is well exposed near Govindi, Bawari and Bhagwanpura in Dansroli-Naka Ki Dhani- Raja area. The schistosity is parallel to bedding plane of quartzite with prominent current/cross beddings.

1.6.7 Metamorphism

The entire Sausar Fold Belt (SFB) is intensely deformed and has undergone upper amphibolite to granulite facies of metamorphism. The granite, pegmatite and quartz veins also occur as intrusives within Sausar Group of rocks.

1.6.8 Mineralization (Surface manifestation)

Albitite, microclinites, albitised-pegmatites/amphibolites and albitised meta sedimentary rocks of the meso-proterozoic Delhi Supergroup

1.7.0 Scope of Proposed Exploration

1.7.1 The proposed Preliminary Exploration (G-3 stage) program comprises topographical survey (1:4000 scale), geological mapping (1:4000 scale), and drilling of about 5000m with associated survey, chemical analysis& physical analysis and geological report preparation.

1.8.0 Observation and Recommendations of previous work

1.8.1 M/s. Hindustan Zinc Limited drilled 31 inclined coring BHs in Block B, C and D. The BH No.- DD10SJ004 Which is falling within the proposed block and BH No.- DD11SJ014, falling outside the proposed Block which is about 10 Kms towards NE from BH No.- DD10SJ004. Both these BHs were proven positive in terms of REEs and Copper.

1.8.4 REEs zone were encountered in BH No.- DD10SJ004 viz (**i) 3m @ 0.46 % La+Ce, Vertical Depth of 160m within Amphibolites (ii) 3m @ 0.28 % La+Ce, Vertical Depth of 177 m within Amphibolites (iii) 1.65m @ 0.36 % La+Ce, Vertical Depth of 216 m within Amphibolites (iv) 1.65m @ 0.64 % La+Ce**, **Vertical Depth of 231 m within Amphibolites** along with this 5 Low grade Cu Zones were also identified ranging **from 0.06 % Cu to 0.1 % Cu and Vertical Depth varying from 112m to 231m, Copper mineralisation is hosted by Amphibolite and Biotite Gneiss both.**

2.0.0 Previous Work / Background information

2.1.0 The Exploration for strategic, critical, rare metals, rare earths elements, PGE and precious metals is given top priority by Govt. of India after amendment of MMDR act 2015. Keeping this in view, the present proposal is being put up for Reconnaissance Survey (G-3) for REE and Cu in Hirnoda Block of Jaipur District in Rajasthan.

2.2.0 The Hirnoda block falls in the Reconnaissance permit no. 7/2004 (Sawar-Jobner block) of M/s Hindustan Zinc Limited (HZL) measuring 4392.65 sq km of area in Ajmer, Jaipur and Tonk districts of Rajasthan. RP was awarded by the state govt. order no. F-18(1)/Gr-2/2005 dated 23/10/08 as per approval given by central govt. vide letter no. 4/149/2005. MIV dated 10/10/2007. Four blocks vis Block A (90.4 sq km), Block B (628.50sq km), Block C- (104.70sq km) and Block-D (170sq km), were demarcated.

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2.5.0 During the interpretation of subsurface data, MECL has projected Cu-REE Mineralisation to the surface and correlated the projected surface mineralised zone of both the positive BHs and delineated the possible mineralised strike.

2.6.0 The delineated mineralised strike cooroborates with negative Bouger anomaly and high magnetic anomaly as per NGPM data downloaded from NGDR portal.

2.7.0 Based on the available data and demand of REEs and Cu, MECL has proposed preliminary exploration (G-3) exploration in Hirnoda Block.

3.0.0 Block description

3.1.0 The proposed exploration block is located in Hirnoda Village, which is a Village in Dudu Tehsil in Jaipur District of Rajasthan. It belongs to Jaipur Division. It is located 53 KM towards west from District headquarters Jaipur. 17 KM from Dudu. 56 KM from State capital Jaipur. Block falls under the parts of Survey of India Toposheet No 45N/05 and is bounded by latitude 26º 52' 32" Nto 26º 55' 28" N and longitude 75° 20' 09" E to 75° 22' 00" E

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The nearest railhead is Jaipur Junction (about 54 km) and nearest railway station is Hirnoda Railway Station (about 02 km). The nearest airport is Sawai Mansingh International Airport, Jaipur (about 55 km).

4.0.0 Objective of the proposed Reconnaissance Survey (G4):

4.1.0 Based on available baseline Geoscience data of GSI from NGDR portal, Previous Exploration Report of Hindustan Zinc Limited (HZL) Submitted to Controller General of Mines, IBM.

4.2.0 The objectives of the present Preliminary exploration (G-3) are as follows:

i) To carry out geophysical investigation by means of I.P. cum-resistivity, S.P., magnetic surveys with Profile Interval of 100m * 10m, i.e (Strike Interval * Station Interval)

ii) To carry out geological & structural mapping on 1:4000 scale for the identification of Cu-REE bearing rock formation (host rock) with the structural features and observe surface manifestation with lateral disposition of the mineralized zones.

iii) To prepare the topographic map of the area by contouring at 2m interval in 1:4000 scale.

iv) To establish subsurface Geology of the earlier reported mineralised zones of Cu-REE by means of drilling.

v) To assess the quality and quantity of the resources (333) as per UNFC norms & Minerals (Evidence of Mineral Contents) Rules- 2021.

5.0.0 Planned Methodology

5.1.0 In accordance to the objective set for preliminary exploration (G-3) of the block, the exploration programme is proposed. The Exploration shall be carried out as per Minerals (Evidence of Mineral Contents) Rule-2015. Accordingly, the following scheme of exploration is formulated in order to achieve the objectives. The details of different activities to be carried out are presented in subsequent paragraphs.

5.2.0 Surveying:

5.2.1 The block area would be tied up with the triangulation network and contouring/topographical survey will be updated in the block area. The surface features in the block area will be picked up and marked on the map on 1:4000 scale. The reduced levels and co-ordinates of boreholes, trenches and boundary coordinates would be determined. The contouring will be carried out at 2m interval.

5.3.0 Geological Mapping:

5.3.1 Geological mapping on 1:4,000 scale will be carried out in the entire block area. The rock types, their contact, structural features, mineralisation etc. will be mapped by taking traverses and will be marked on the map. Surface manifestations of the mineralisation available along with their surface disposition will also be marked on the map.

5.4.0 Geophysical Investigation:

5.4.1 To carry out geophysical investigation by means of I.P. cum-resistivity, S.P., magnetic surveys with Profile Interval of 100m * 10m, i.e (Strike Interval * Station Interval)

5.5.0 Exploratory Drilling:

5.4.1 Based on Geological Mapping and Geophysical Investigation the extension of the mineralized zones will be marked. To confirm the potentiality of mineralized zones in

strike & dip direction, approximately 5000.00 m of drilling (24 BHs) will be carried out for Second and third level of intersection of mineralized zones. The azimuth and angle of inclination of the proposed boreholes will be decided by the field geologist once the attitude (strike & dip) of mineralized zones (host rock) is deciphered after geological mapping and geophysical investigation.

5.5.0 Drill Core Logging

5.5.1 The borehole cores would be logged systematically. Viz. details of the litho units, colour, structural feature, texture, mineralization, besides the recovery, rock quality designation (RQD) and REE and Cu ore type would be recorded.

5.6.0 Drill Core Sampling

5.6.1 The mineralized part of drill core will be sampled as Primary sample. The length of each sample will be kept 0.50 m within the ore zone depending upon the thickness of particular type of REE and Cu ore and its physical characters. The primary core samples will be analysed for 34 elements i.e. Sc, Y, La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, V, Cu, Li, Cs, Ga, Sr, Zr, Sn, B, Hf, Ta, W, Th, U by ICP-MS. The cores of rocks 3 m immediate on footwall and 3 m immediate on hanging wall of mineralized zones would be sampled as far as possible, depending upon the intensity of mineralization, change in lithology and core recovery etc.

a) A total of 2500 no of primary core samples will be analysed for 34 elements i.e. Sc, Y, La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, V, Cu, Li, Cs, Ga, Sr, Zr, Sn, B, Hf, Ta, W, Th, U by ICP-MS.

b) Around 10% of Primary samples (250 numbers) will be sent to NABL External Labs for analysis of 34 elements i.e. Sc, Y, La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, V, Cu, Li, Cs, Ga, Sr, Zr, Sn, B, Hf, Ta, W, Th, U by ICP-MS.

5.7.0 Petrological and Mineragraphic Studies

5.7.1 Thin and polished section studies on drill cores samples would be done for ascertaining the petrographic and mineragraphic characteristics. These samples would be drawn from ore zones and host rocks. A provision of 20 specimens for petrographic and 20 specimens for mineragraphic studies has been kept in the block.

5.8.0 Identification of Mineral phases

5.8.1 Some of 10 samples from borehole cores can be considered for the identification of mineral phases by XRF, EPMA because the REE mineral phases needs to be identified.

5.9.0 Specific Gravity Study

5.9.1 A provision of 5 samples for specific gravity determination has been kept.

5.10.0 Quantum of work:

5.10.1 The quantum of work proposed by MECL in Hirnoda (G-3) Block is given in Table-5.1.

Table-5.1: Proposed Quantum of Exploratory Work in Hirnoda Block, District-Jaipur, Rajasthan.

Sl. No.	Item of Work	Unit	Proposed Quantum of work
1	Topographical Survey (1:4000)	sq. km	8.76
2	Geological Mapping (1:4000)	sq. km	8.76
3	Exploratory Mining (Trenching/Pitting) (1m x 2m x70m)	Cu. m	-----
4	Core Drilling	m.	5000
5	Sample Preparation & Chemical Analysis		
B.	**BRS and Borehole Core Samples**		
	i) Primary samples for 34 elements i.e. Sc, Y, La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, V, Cu, Li, Cs, Ga, Sr, Zr, Sn, B, Hf, Ta, W, Th, U by ICP-MS.	Nos.	2550
	ii) External Check sample (10% of Primary samples) for 6 radicals	Nos.	255
6	Mineral Phase identification by XRD	Nos.	15
7	Petrographic Studies	Nos	20
8	Mineragraphic Studies	Nos	20
9	Specific Gravity Studies	Nos	5
10	Report Preparation (Digital format)	Nos.	1

6.0.0 Manpower Deployment

6.0.1 Manpower deployment List may be provided later.

7.0.0 Break-up of Expenditure

7.1.0 The proposed exploration programme is planned for preliminary exploration (G-3). The work activities like camp setting, geological work, survey work, drilling & laboratory work, report writing will be completed within 11 months' time. The bar chart showing activities wise time schedule is placed at **Table-7.1.**

7.2.0 Tentative cost has been estimated based on Schedule of Charges (SoC) of projects funded by National Mineral Exploration Trust (NMET) w.e.f. 01/04/2020 and the total estimated cost is **Rs. 1053.35 Lakh.** The summary of tentative cost estimates for

Reconnaissance Survey is given in **Table No.-7.2** and details of tentative cost estimates are given as Annexure-I**.**

Table-7.1

Estimated time schedule for Preliminary Exploration (G-3) forREEs and Copper in Hirnoda Block, Districts: Jaipur, Rajasthan [Block area-8.80 sq. km; Schedule timeline- 15 months]

S. No.	Particulars	Months	1	2	3	4	5	Review	6	7	8	9	10	11	12	13	14	Review	15
1	Camp Setting	Months																	
2	Geophysical Survey																		
2	Survey Party days (1 Party)	days																	
4	Drilling (2 rig)	m																	
5	Geologist Party days (1 Party)	days																	
6	Sampling days forBRS and Core Sampling (1 Party)	days																	
7	Camp winding	Months																	
8	Laboratory Studies	days																	
9	Geologist days, HQ	days																	
10	Report Writing with Peer Review	days																	

Table No-7.2:
Summary of Tentative Cost Estimates for Preliminary Exploration (G-3)

Sl. No.	Item	Total
1	Geological Work	19,107,288
3	Laboratory Studies	4,356,420
4	Drilling	63,273,580
	Sub total	**86,737,288**
5	Report	2,000,000
6	Peer Review	30,000
7	Proposal Prepration	500,000.00
	Total	**89,267,288**
8	GST (18%)	16,068,111.80
Total cost including 18% GST		**105,335,400**
SAY, in Lakhs		**1,053.35**

8. 0.0 Justification:

i) The Hirnoda block falls in the Reconnaissance permit no. 7/2004 (Sawar-Jobner block) of M/s Hindustan Zinc Limited (HZL) measuring 4392.65 sq km of area in Ajmer, Jaipur and Tonk districts of Rajasthan. RP was awarded by the state govt. order no. F-18(1)/Gr-2/2005 dated 23/10/08 as per approval given by central govt. vide letter no. 4/149/2005. MIV dated 10/10/2007. Four blocks vis Block A (90.4 sq km), Block B (628.50sq km), Block C- (104.70sq km) and Block-D (170sq km), were demarcated.

ii) M/S HZL drilled 31 inclined coring BHs in Block B, C and D. MECL taken into account BH No.- DD10SJ004 Which is falling within the proposed block and BH No.- DD11SJ014, falling outside the proposed Block which is about 10 Kms towards NE from BH No.- DD10SJ004. Both these BHs were proven positive in terms of REEs and Copper Mineralisation.

iii) 4 REEs zone were encountered in BH No.- DD10SJ004 viz (i) 3m @ 0.46 % La+Ce, Vertical Depth of 160m within Amphibolites (ii) 3m @ 0.28 % La+Ce, Vertical Depth of 177 m within Amphibolites (iii) 1.65m @ 0.36 % La+Ce, Vertical Depth of 216 m within Amphibolites (iv) 1.65m @ 0.64 % La+Ce, Vertical Depth of 231 m within Amphibolites along with this 5 Low grade Cu Zones were also identified ranging from 0.06 % Cu to 0.1 % Cu and Vertical Depth varying from 112m to 231m, Copper mineralisation is hosted by Amphibolite and Biotite Gneiss both.

iv) However, the proposed block falls into the retained Block B of the RP granted to HZL. During the interpretation of subsurface data, MECL has projected Cu-REE Mineralisation to the surface and correlated the projected surface mineralised zone of both the positive BHs and delineated the possible mineralised strike.

v) The delineated possible mineralised strike corroborates with the negative Bouger anomaly map of gravity data (NGPM) downloaded from NGDR portal.

vi) The high magnetic anomaly coincides with the proposed block, Anomaly Map of Gravity Data (NGPM) downloaded from NGDR portal.

vii) Considering the available surface and subsurface data, along with field visit by MECL's geologists it is proposed to carry preliminary exploration (G-3) exploration in block for Cu-REE mineralisation.

9. 0.0 References:

- NGPM Data available on NGDR Portal
- Full comprehensive report of Reconnaissance permit (RP)-07/2004 for Lead, Zinc, Copper, Gold and associated Minerals granted to Hindustan Zinc Limited Submitted to Controller General, IBM on 04/04/2012.
- Report on "Reconnaissance survey for rare earth elements, rare metals and basemetals in Asalpur, Boraj, Bichun areas, Jaipur district, Rajasthan" (stage-G4) of GSI, submitted in February, 2024

List of Plates:

1. Plate-I: Block Location Map of Hirnoda Block in Toposheet no. 45N/05, District-Jaipur, Rajasthan.
2. Plate-II: Regional Geological Map of the area (Scale 1: 50,000).
3. Plate-III: Geological Map of the area (Scale 1: 25,000).
4. Plate-IV: Bougers Anomaly Map
5. Palte-V: Magnetic Anomaly Map

List of Annexures:

1. **Annexure-I:** Details of the total cost estimated for the Preliminary Exploration (G-3) in Hirnoda Block, District-Jaipur, Rajasthan.

Magnetic Anomali Map for Hirnoda Block (G3) in Jaipur, Rajasthan

N

Legend

Proposed_BB

Magnetic Anomaly

- -402.1924744 - -206.4944501
- -206.49445 - -10.79642588
- -10.79642587 - 184.9015984
- 184.9015985 - 380.5996226
- 380.5996227 - 576.2976468
- 576.2976469 - 771.9956711
- 771.9956712 - 967.6936953
- 967.6936954 - 1,163.39172
- 1,163.391721 - 1,359.089744

1:50,000

0 0.5 1 2 3 4 Miles

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Bouger Anomali Map for Hirnoda Block (G3) in Jaipur, Rajasthan

N

Legend

- -28.9810257 - -24.53005409
- -24.53005408 - -20.07908249
- -20.07908248 - -15.62811089
- -15.62811088 - -11.17713928
- -11.17713927 - -6.726167679
- -6.726167678 - -2.275196075
- -2.275196074 - 2.175775528
- 2.175775529 - 6.626747131
- 6.626747132 - 11.07771873

1:50,000

0 0.5 1 2 3 4 Miles

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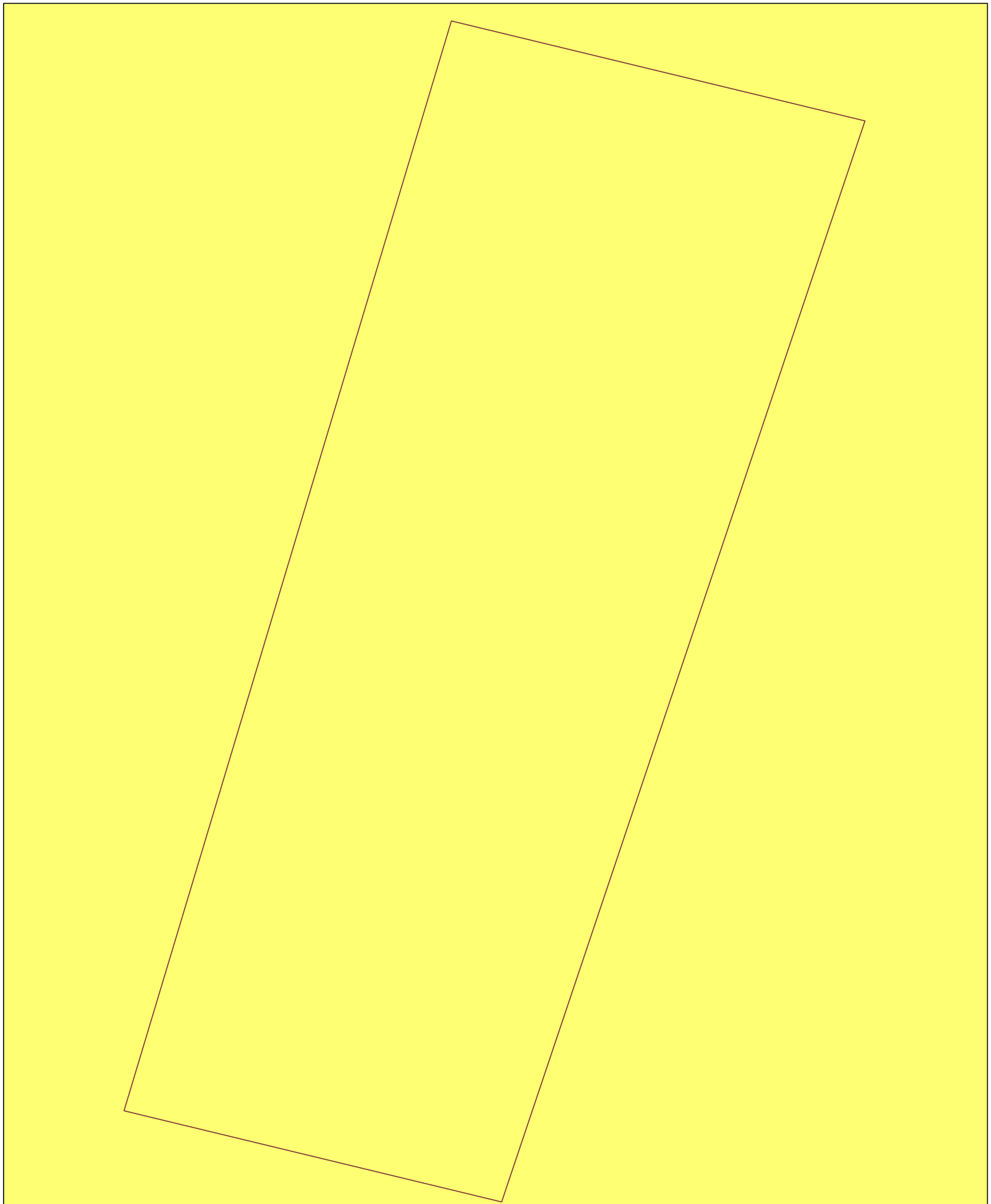
Block Geological Map (1:50000) for Hirnoda Block (G3) in Jaipur, Rajasthan



N

Legend

- BIOTITE SCHIST, GNEISS
- FINE AEOLIAN SAND AND SILT WITH OCCASSIONAL KANKAR
- FINE SAND, SILT AND CLAY
- PEGMATITE
- QUARTZITE

1:50,000

0 0.125 0.25 0.5 0.75 1 Miles

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Regional Geological Map for Hirnoda Block (G3) in Jaipur, Rajasthan

N

Legend

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0 0.5 1 2 3 4 Miles

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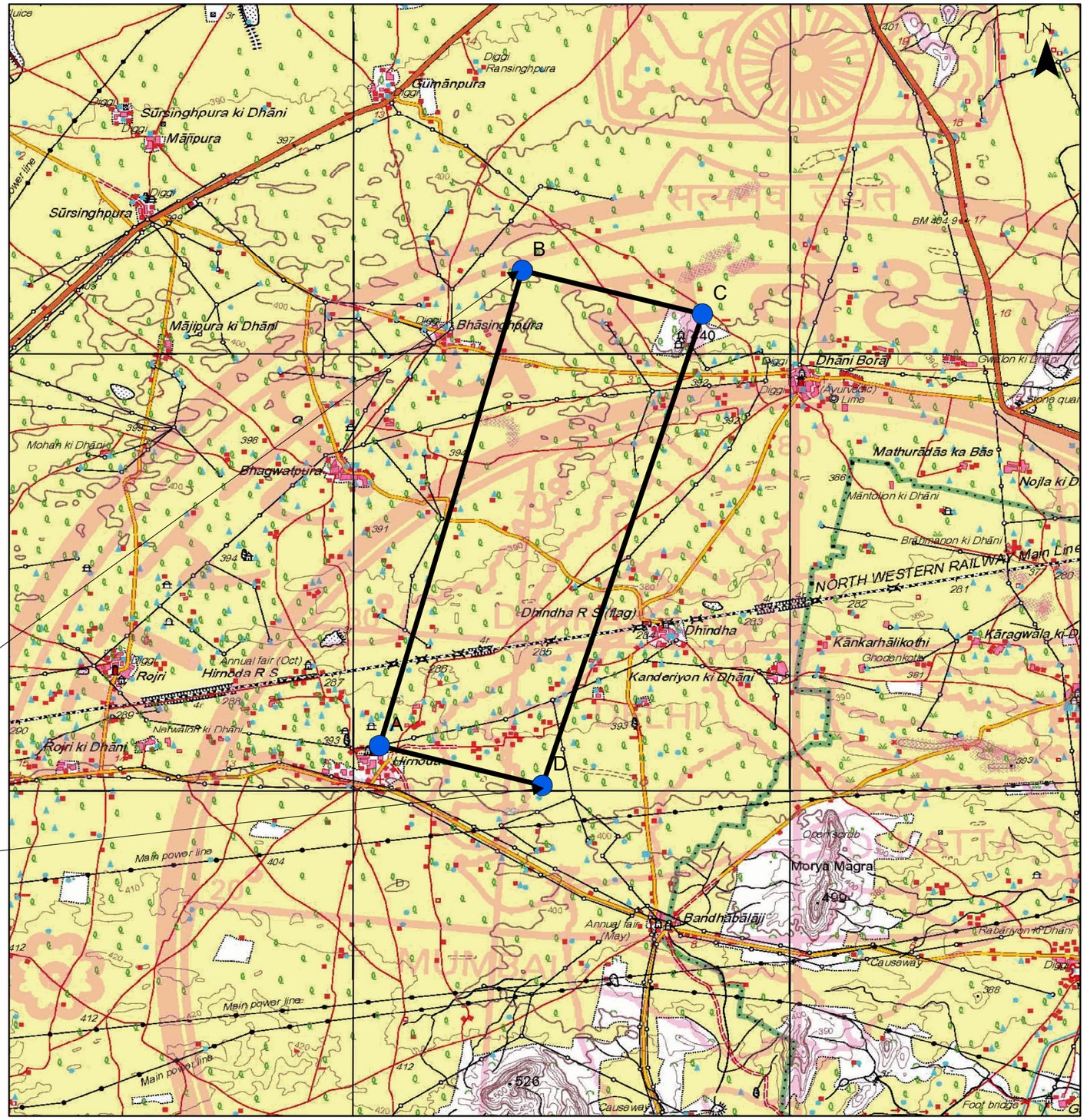
LOCATION MAP OF PROPOSED HIRNODA BLOCK (8.76 Sq Km) IN JAIPUR DISTRICT, RAJASTHAN



WGS-1984, ZONE-43			
Sr. No.	Cardinal Points	Eastings	Northings
1	A	533357.5043	2973110.04
2	B	534695.6196	2978134.923
3	C	536405.1545	2977679.678
4	D	534902.2171	2972698.687

0 0.75 1.5 3 4.5 6 Km

1:50,000

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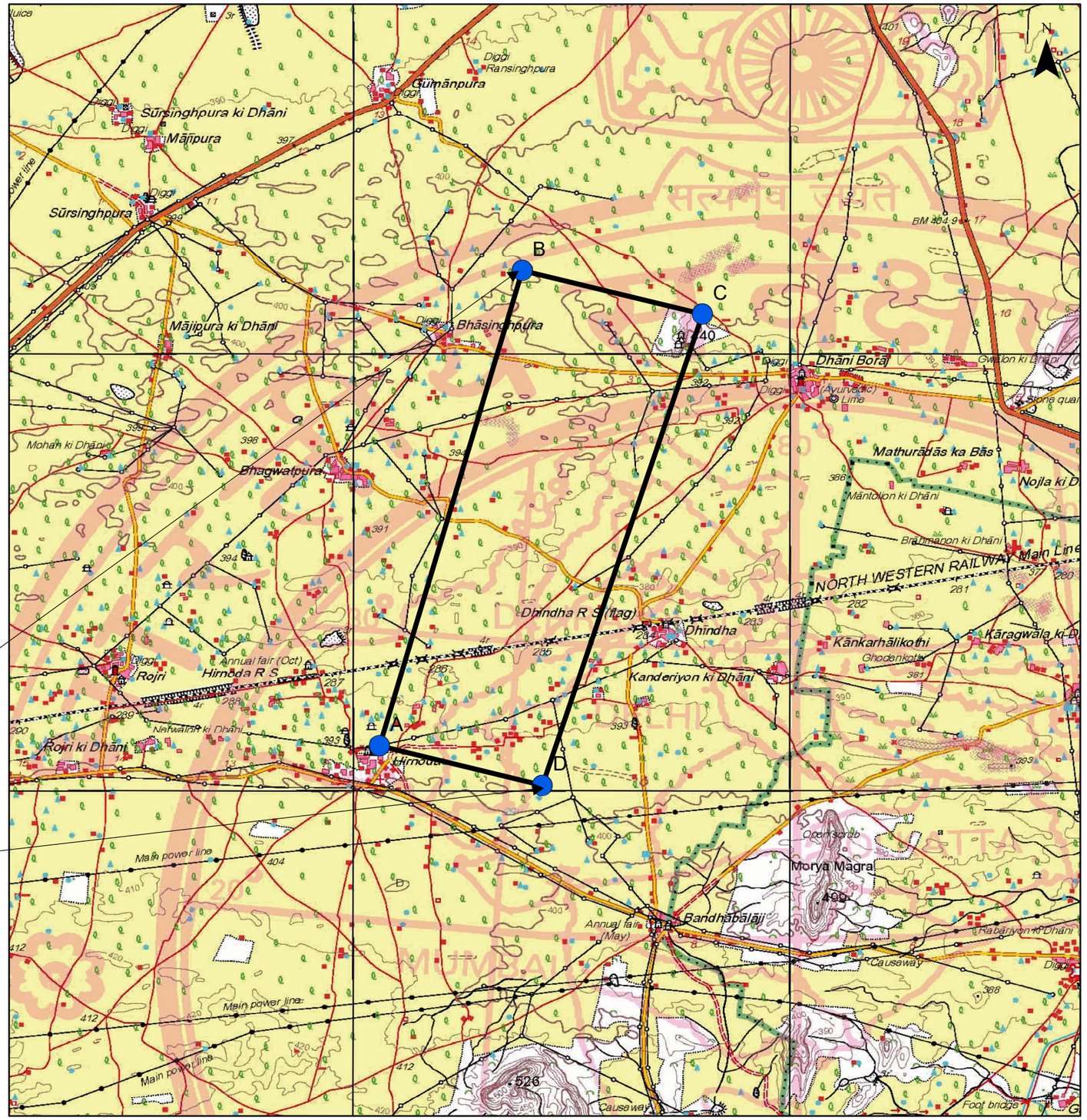

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0 0.75 1.5 3 4.5 6 Km

1:50,000

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Regional Geological Map for Hirnoda Block (G3) in Jaipur, Rajasthan

N

Legend

- BIOTITE SCHIST, GNEISS
- FINE AEOLIAN SAND AND SILT WITH OCCASSIONAL KANKAR
- FINE SAND, SILT AND CLAY
- PEGMATITE
- QUARTZITE

1:50,000

0 0.5 1 2 3 4 Miles

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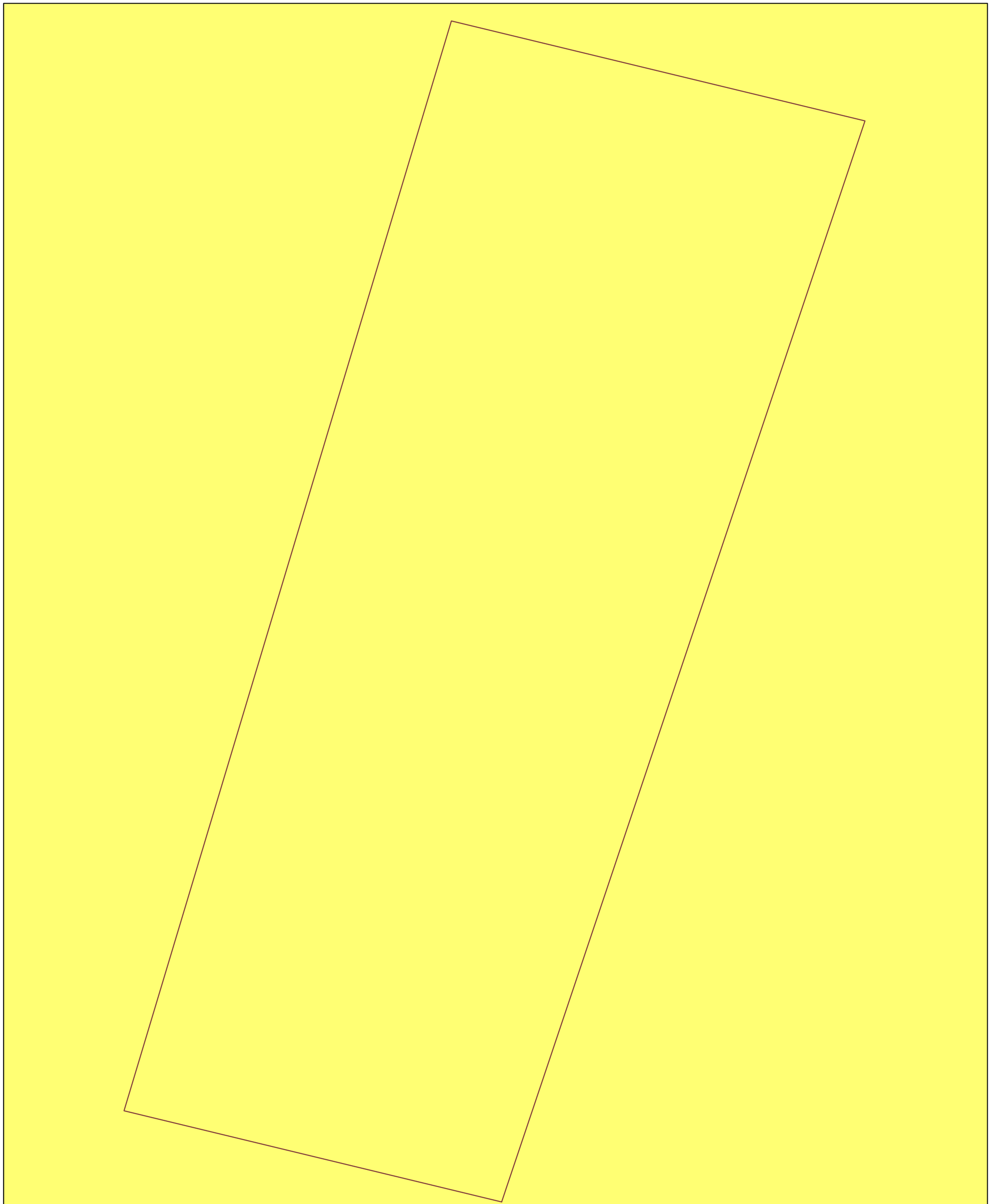
Block Geological Map (1:50000) for Hirnoda Block (G3) in Jaipur, Rajasthan



N

Legend

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1:50,000

0 0.125 0.25 0.5 0.75 1 Miles

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- 6.626747132 - 11.07771873

1:50,000

0 0.5 1 2 3 4 Miles

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Magnetic Anomali Map for Hirnoda Block (G3) in Jaipur, Rajasthan

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Legend

Proposed_BB

Magnetic Anomaly

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- -10.79642587 - 184.9015984
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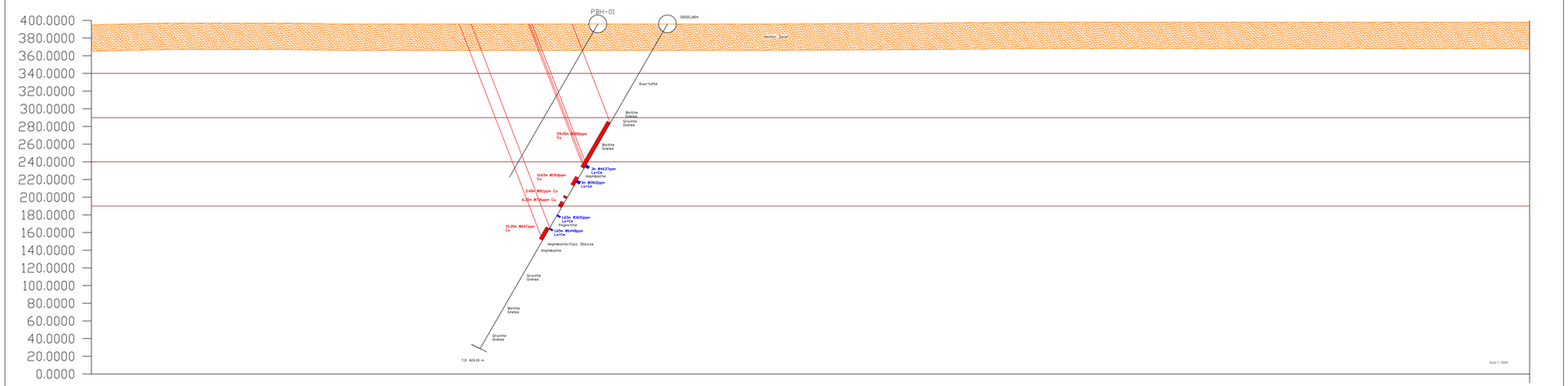
Geological Section along section S1-S1'



Estimated cost for Preliminary Exploration (G3) for REEs and Copper in Hirnoda block, District: Jaipur, Rajasthan. [Block area- 8.76 sq. km; BH No.- 24, BH Depth- 200m, Schedule timeline- 15 months]							
S. No.	**Item of Work**	**Unit**	**Rates as per NMET SoC 2020-21**		**Estimated Cost of the Proposal**		**Remarks**
			SoC-Item -Sl No.	**Rates as per SoC**	**Qty.**	**Amount (Rs)**	
A	**GEOLOGICAL WORK**						
1	**Mapping, Borehole logging, sampling & Report writing**						
i	Charges for one Geologist per- HQ	day	1.2	9,000	60	5,40,000	
ii	Charges for one Geologist- Field	day	1.2	11,000	210	23,10,000	Geological Mapping on 1:4000 Scale, BH Monitoring, Zone Identification and Geological Core-Logging etc.
iii	2 labours/ party (As per rates of Central Labour Commissioner)	day	5.7	526	420	2,20,920	Amount will be reimburse as per the notified rates by the Central Labour Commissioner or respective State Govt. whichever is higher
iv	Core Sampling -1 Samplers Labour charge not included	day	1.5.2	5,100	357	18,20,700	
v	4 labours/ party for smpling (As per rates of Central Labour Commissioner)	day	5.7	526	1,428	7,51,128	Amount will be reimburse as per the notified rates by the Central Labour Commissioner or respective State Govt. whichever is higher
2	**Geophysical Survey**						
i	I.P. cum-resistivity, S.P., magnetic	(8-10 Line Km)	3.4b	14,48,693	8.6	1,24,58,760	Profile Interval of 100m * 10m, i.e (Strike Interval * Station Interval totalling to 86 L.Km)
2	**Survey (on 1:4000 Scale)**						
i	Bore Hole Fixation and determination of co-ordinates & Reduced Level of the boreholes by DGPS and boundary coordinates	Per Point of observation	1.6.2	19,200	28	5,37,600	24 BHs and 4 boundary coordinates
ii	Charges of Surveyor	one surveyor per day	1.6.1a	8,300	45	3,73,500	
iii	Labours Charges for survey work	day	5.7	526	180	94,680	Amount will be reimburse as per the notified rates for unskilled labor by the Central Labour Commissioner or respective State Govt. whichever is higher
					Sub Total- A	**1,91,07,288**	
B	**DRILLING**						
i	Drilling upto 300m (Hard Rock) (2 rigs)	m	2.2.1.4a	11,500	5,000	5,75,00,000	
ii	Borehole deviation Survey	m	2.2.6	330	5,000	16,50,000	
iii	Land / Crop Compansation	per BH	5.6	20,000	24	4,80,000	Amount will be reimburse as per actuals or max. Rs. 20000 per BH with certification from local authorities
iv	Construction of concrete Pillar (12"x12"x30")	per borehole	2.2.7a	2,000	24	48,000	
v	Transportation of Drill Rig & Truck associated per drill	Km	2.2.8	36	1,860	66,960	Certification in this regard is required to be provided
vi	Monthly Accomodation Charges for drilling Camp (up to 2 Rigs)	month	2.2.9	50,000	5	2,50,000	
vii	Drilling Camp Setting Cost	Nos	2.2.9a	2,50,000	2	5,00,000	
viii	Drilling Camp Winding up Cost	Nos	2.2.9b	2,50,000	2	5,00,000	
ix	Approach Road Making (Flat Terrain)	Km	2.2.10a	22,020	6	1,32,120	Road Making will be considered as per the requirement and Road Making Charges will be reimbursed later
x	Core Preservation: One complete borehole plus mineralised cores of all the remaining Bhs	m	5.3	1,590	1,350	21,46,500	This amount will be reimbursed after successful delivery of the cores to concerned libraries/authorities
					Sub Total- B	**6,32,73,580**	
C	**LABORATORY STUDIES**						
1	**Chemical Analysis**						
i	**Primary & Check samples**						
	a.) BRS & Core samples (Sc, Y, La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, V, Cu, Li, Cs, Ga, Sr, Zr, Sn, B, Hf, Ta, W, Th, U, Ba, Co, Pb, Zn, Be, Ni, Cr) by ICPMS	Nos	4.1.14	7,731	2,550	1,97,14,050	Bed Rock Samples -50 & Core samples- 2500
	d.External (10%) Check samples for 34-Elements by ICPMS	Nos	4.1.14	7,731	255	19,71,405	
ii	**Composite Samples for REEs and Copper Zones**	Nos	4.1.14	7,731	250	19,32,750	
2	**Physical & Petrological Stusies**						
i	Preparation of thin section	Nos	4.3.1	2,353	20	47,060	
ii	Complete petrographic study report	Nos	4.3.4	4,232	20	84,640	
iii	Preparation of polished section	Nos	4.3.2	1,549	20	30,980	
iv	Complete mineragraphic study report	Nos	4.3.4	4,232	20	84,640	
v	Digital Photographs	Nos	4.3.7	280	20	5,600	
vi	Whole Rock Analysis (Major oxide and 8 additional trace elements) (SiO_2, Al_2O_3, Fe_2O_3, MnO, MgO, CaO, Na_2O, K_2O, K_2O, TiO_2, P_2O_5, FeO, $+H_2O$)	Nos	4.1.15a	4,200	15	63,000	
vii	Specific gravity studies	Nos	4.8.1	1,605	5	8,025	
viii	Bulk Density Determination	Nos	4.10	3,540	-	-	
ix	XRD	Nos	4.5.1	4,000	15	60,000	
x	EPMA	Per Hrs	4.4.1	8,540	8	68,320	
					Sub Total- C	**43,56,420**	
D					**Total A to C**	**8,67,37,288**	
E	**Geological Report Preparation**		**5.2**	For the projects having cost exceeding Rs. 300 lakhs - A minimum of Rs. 9 lakhs or 3% of the value of work whichever is more		**20,00,000**	

S. No.	Item of Work	Unit	Rates as per NMET SoC 2020-21		Estimated Cost of the Proposal		Remarks
			SoC-Item -Sl No.	Rates as per SoC	Qty.	Amount (Rs)	
F	**Peer review Charges**		**As per EC decision**			**30,000**	
G	**Preparation of Exploration Proposal (5 Hard copies with a soft copy)**	**5 Hard copies with a soft copy**	**5.1**	2% of the Cost or Rs. 5.00 Lakhs whichever is lower		**5,00,000**	
H	**Total Estimated Cost without GST**					**8,92,67,287.80**	
I	**Provision for GST (18% of I)**					**1,60,68,111.80**	GST will be reimburse as per actual and as per notified prescribed rate
J	**Total Estimated Cost with GST**					**10,53,35,399.60**	
				Rs. (in lakhs)		**1,053.35**	
Note:							
1	If any part of the project is outsourced, the amount will be reimbursed as per the Paragraph 3 of NMET SoC and Item no. 6 of NMET SoC. In case of execusion of the project by NEA on its own, a Certifiate regarding non outsourcing of any component/project is required.						