PRELIMINARY EXPLORATION (G3 LEVEL) FOR REE & ASSOCIATED RARE METALS IN THE NB-2 BLOCK OF THE NORTHERN PART OF THE SIWANA RING COMPLEX, BALOTRA DISTRICT, RAJASTHAN UNDER NMEDT FUNDING

Commodity – REE & Associated Rare Metals (RM)

By

INTELLIGENT MINING SOLUTIONS

MINING TECH CONSULTANCY SERVICES LTD

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Place: Ahmedabad

Date: November 24, 2025

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Summary of the Block for G3 stage exploration

	Features	Details
	Block ID	MTCS/NMEDT-007/2025/RJ/Siwana-NB2
	Current Exploration Agency	Mining Tech Consultancy Services Limited (MTCS), Ahmedabad
	Previous Exploration Agency	Geological Survey of India – G4 Level
	G4 stage Geological Report (Previous stage Geological Report)	1. Geological mapping at **1:12,500 scale** in the northern Siwana Ring Complex identified **32 rhyolitic flows** and several felsic dykes enriched in REE. 2. Chemical analysis of rhyolite samples showed **ΣREE+Y values from 91.76 ppm to 9764.68 ppm**, average **1844.84 ppm**. 3. Felsic/rhyolite dykes recorded **ΣREE+Y values between 144.77 ppm and 7678.75 ppm**, average **1400.14 ppm**. 4. Channel samples yielded **ΣREE+Y values ranging from 261.73 ppm to 6224.81 ppm**. 5. **Flow Nos. 14 and 15** in NB-2 block are highly enriched, with ΣREE+Y up to **8027.71 ppm** and **7528.11 ppm** respectively. 6. LREE dominates over HREE with **LREE:HREE ratio ~4:1**, maximum LREE > **5000 ppm**, HREE up to **992 ppm**. 7. REE-bearing minerals such as **monazite and perisite** identified in both plutonic and volcanic phases; accessory minerals include **zircon, ilmenite, haematite**. 8. Remote sensing and aeromagnetic surveys confirmed **continuity of favorable lithounits** and **potassium-thorium anomalies**, indicating subsurface mineralization potential. 9. These results strongly justify **upgrading NB-2 block to G3 stage exploration** for systematic drilling and advanced mineralogical studies.
	Commodity	Rare Earth Elements (REE) & associated Rare Metals (RM)
	Mineral Belt	Siwana Ring Complex, Malani Igneous Suite, Western Rajasthan
	Block Location	Siwana / Baltora Dist/ Rajasthan
	Completion Period with entire time schedule to complete the project	12 Months
	Objectives	**The exploration scheme of NB2 REE-RM block has been formulated with the following objectives:** 1. Preparation of geological map on 1:2000 scale. 2. To collect Bedrock samples for analysis of REE & RM for identification of mineralization and host rock. 3. Pitting within the selected locations during mapping. 3. Drilling of boreholes to determine the subsurface occurrence of host rock and mineralized zones.

<table>
<tr><th></th><th>Features</th><th>Details</th></tr>
<tr><td></td><td></td><td>4. Preparation of Geological Report as per Minerals (Evidence of Mineral Contents) Amendment Rules 2015 including further course of exploration program.</td></tr>
<tr><td></td><td>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</td><td>The work will be carried out by the exploration agency (MTCS).</td></tr>
<tr><td></td><td>Name/ Number of Geoscientists</td><td>Three (2 Field + 1 HQ).
Names will be provided prior to filed work.</td></tr>
<tr><td></td><td>Expected Field days (Geology, Geophysics, Surveyor)</td><td>Geology – 180 days (geological mapping & drilling)
Surveyor – 30 days</td></tr>
<tr><td>1.</td><td>Location</td><td></td></tr>
<tr><td></td><td>Latitude- Longitude</td><td>
<table>
<tr><th rowspan="2">Block corner points / Cardinal Points</th><th colspan="2">WGS-84</th></tr>
<tr><th>Latitude</th><th>Longitude</th></tr>
<tr><td>A</td><td>25.754296</td><td>72.358811</td></tr>
<tr><td>B</td><td>25.756422</td><td>72.369967</td></tr>
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</table>
</td></tr>
<tr><td></td><td>Villages</td><td>Kitnod</td></tr>
<tr><td></td><td>Tehsil/ Taluk</td><td>Siwana Tehsil</td></tr>
<tr><td></td><td>District</td><td>Balotra</td></tr>
<tr><td></td><td>State</td><td>Rajasthan</td></tr>
<tr><td>2.</td><td>Area
(hectares/ square Kilometres)</td><td></td></tr>
<tr><td></td><td>Block Area</td><td>2.00 sqkm</td></tr>
<tr><td></td><td>Forest Area</td><td>Not Available</td></tr>
<tr><td></td><td>Government Land Area</td><td>Not Available</td></tr>
<tr><td></td><td>Private Land Area</td><td>Not Available</td></tr>
<tr><td>3.</td><td>Accessibility</td><td></td></tr>
<tr><td></td><td>Nearest Rail Head</td><td>Balotra, 20 km in NW direction from the proposed Block</td></tr>
<tr><td></td><td>Road</td><td>The State Highway-325 passes above the northern margin of the block</td></tr>
<tr><td></td><td>Airport</td><td>Jodhpur (94 km) in NE direction from the block</td></tr>
<tr><td>4.</td><td>Hydrography</td><td></td></tr>
<tr><td></td><td>Local Surface Drainage Pattern (Channels)</td><td>Only perennial Nalas are present inside the block. Flows towards North direction</td></tr>
<tr><td></td><td>Rivers/ Streams</td><td>The drainage system of the proposed area part of Luni River watershed</td></tr>
<tr><td>5.</td><td>Climate</td><td></td></tr>
</table>

	Features	Details
	Mean Annual Rainfall	The average rainfall is 250-300mm
	Temperatures (December) (Minimum) Temperatures (June) (Maximum)	During summer (March to June), the maximum temperature generally varies between 46 ^{o} and 51 ^{o}C. Night temperature decreases considerably to 20^{o} –29 ^{o}C. January is the coldest month. During winter (December to February), minimum temperatures may fall to 2 ^{o}C at night.
6.	**Topography**	
	Toposheet Number	Part of SoI Topo sheet no. 45C/05 & 45C/06.
	Morphology of the Area	The area has a hilly topography with RL varying from 190 mRL to 390mRL. Rhyolitic cliffy hills are in the south-central part of the block and aeolian sand is covering the foothills.
7	**Availability of baseline geoscience data**	
	Geological Map (1:50K/ 25K)	1:12,500 (LSM map, Lal and Ghosh, 2021)
	Geochemical Map	NGCM Data is available in NGDR. Previous geochemical sample analysis data were used to plan G3 level exploration in the area.
	Geophysical Map (Aero-geophysical, Ground geophysical, Regional as well as local scale GP maps)	Data is available in NGDR
8.	**Justification for taking up G3 stage mineral exploration**	1. Present block (NB-2) lies in the northern part of the Siwana Ring Complex, part of the Malani Igneous Suite, which is known for REE and rare metal mineralization. 2. The block contains peralkaline granites and felsic volcanics that are enriched in REE and associated with rare metals. 3. Previous chemical analyses show ΣREE+Y values upto 8027 ppm in rhyolite flows, along with Nb, Zr. 4. REE-bearing minerals such as monazite and perisite have been identified in the area. 5. Aeromagnetic and spectrometric surveys confirm favorable lithounits and high potassium-thorium anomalies. 6. REEs are critical for technology and energy sectors, making this block strategically important for resource security. 7. The block is recommended for G3 stage exploration with a clear work plan including mapping, drilling, and mineralogical studies.

PROPOSAL FOR PRELIMINRY EXPLORATION (G3 LEVEL) FOR REE AND ASSOCIATED RARE METALS IN NB-2 BLOCK OF THE NORTHERN PART OF THE SIWANA RING COMPLEX, BALOTRA DISTRICT, RAJASTHAN

1. INTRODUCTION

Rare Earth Elements (REE) and Rare Metals (RM) are the cornerstone of cutting-edge technologies that power renewable energy, electric mobility, electronics, and strategic industries. Their unique properties enable high-performance magnets, advanced batteries, and critical components for aerospace and defense, making them essential for a sustainable and technologically advanced future. India possesses significant geological potential for these resources, and with focused exploration and innovation, we have an opportunity to unlock new deposits that will strengthen our resource security and position the nation as a global leader in the green and high-tech economy.

Rare Earth Elements (REE) 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 the country's energy security i.e. clean energy technology, defense, civilian application, environment and economic areas. Because of their use in low carbon technology, the demand for REE is expected to increase in the coming years. Therefore, to fulfill the increasing demand of REE & Rare Metals, there is a need of exploring new REE & RM deposits in the country.

REEs are a collection of 17 elements in the periodic table: Scandium (Sc), Yttrium (Y) and 15 elements of Lanthanide Group with atomic numbers 57 to 71: Lanthanum (La), Cerium (Ce), Praseodymium(Pr), Neodymium (Nd), Promethium (Pm), Samarium (Sm), Europium (Eu), Gadolinium (Gd), Terbium (Tb), Dysprosium (Dy), Holmium (Ho), Erbium (Er), Thulium (Tm), Ytterbium (Yb) & Lutetium (Lu).

The lanthanide elements are divided into two groups: Light Rare Earth Elements (**LREE**) having atomic numbers 57 to 62 (La, Ce, Pr, Nd, Pm & Sm) and Heavy Rare Earth Elements (**HREE**) with atomic numbers 63 to 71 (Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb & Lu) and Y, Sc. Due to their geochemical properties, these rare earth elements are dispersed and not often found concentrated as rare earth minerals for economic exploitation. Generally, the LREEs are more abundant in the earth's crust and easily extractable than the HREEs.

On the other hand, critical minerals are those minerals that are essential for economic development and national security. These are required for the advancement of many sectors, including high-tech electronics, telecommunications, transport, defense etc. They are also vital for the low carbon emissions economy and the renewable energy technologies required to meet the 'Net Zero' commitments of various countries around the world. Hence, it has become a priority to identify and develop value chains for the minerals which are critical to our country.

As per MMDR Amendment 2023 Part D, the list of 24 *Critical and Strategic Minerals* is given below:

1. Beryl and other beryllium bearing minerals
2. Cadmium bearing minerals
3. Cobalt bearing minerals
4. Gallium bearing minerals
5. Glauconite
6. Graphite
7. Indium bearing minerals
8. Lithium bearing minerals
9. Molybdenum bearing minerals
10. Nickel bearing minerals
11. Niobium bearing minerals
12. Phosphate (without uranium).
13. Platinum group of elements bearing minerals.
14. Potash
15. Minerals of the "rare earths" group not containing Uranium and Thorium
16. Rhenium bearing minerals
17. Selenium bearing minerals
18. Tantalum bearing minerals
19. Tellurium bearing minerals
20. Tin bearing minerals
21. Titanium bearing minerals & ores (ilmenite, rutile and leucoxene).
22. Tungsten bearing minerals.
23. Vanadium bearing minerals
24. Zirconium bearing minerals and ores including zircon

This emphasizes the thrust for exploration in strategic minerals, precious metals, REEs and Platinum Group Elements within the country.

2. BACKGROUND

The exploration for strategic and critical elements has been accorded top priority by the Government of India following the amendment of the MMDR Act, 2015. In this context, the project titled *'**PROPOSAL FOR PRELIMINARY EXPLORATION FOR REE AND ASSOCIATED RARE METALS IN THE NB 2 BLOCK OF THE NORTHERN PART OF THE SIWANA RING COMPLEX, BALOTRA DISTRICT, RAJASTHAN**'* has been officially allotted to MTCS during the 4th Joint Meeting of Technical Cum-Cost Committees (TCC-I & TCC-II) of National Mineral Exploration and Development Trust (NMEDT), held on 10th November, 2025 in hybrid mode. The meeting aimed to allocate 15 blocks carved out by the Geological Survey of India from the Siwana Ring Complex, Rajasthan for exploration through NMEDT funding. It was jointly chaired by Dr. S. Ravi, Dy. Director General, GSI and Chairman, TCC-I, and Shri Pradeep Singh, Dy. Director General, GSI and Chairman, TCC-II, with other committee members attending via VC mode.

Upon receipt of the nomination order from NMEDT, MTCS has conducted a site visit to this location on 23rd November 2025 & collected samples for chemical analysis.

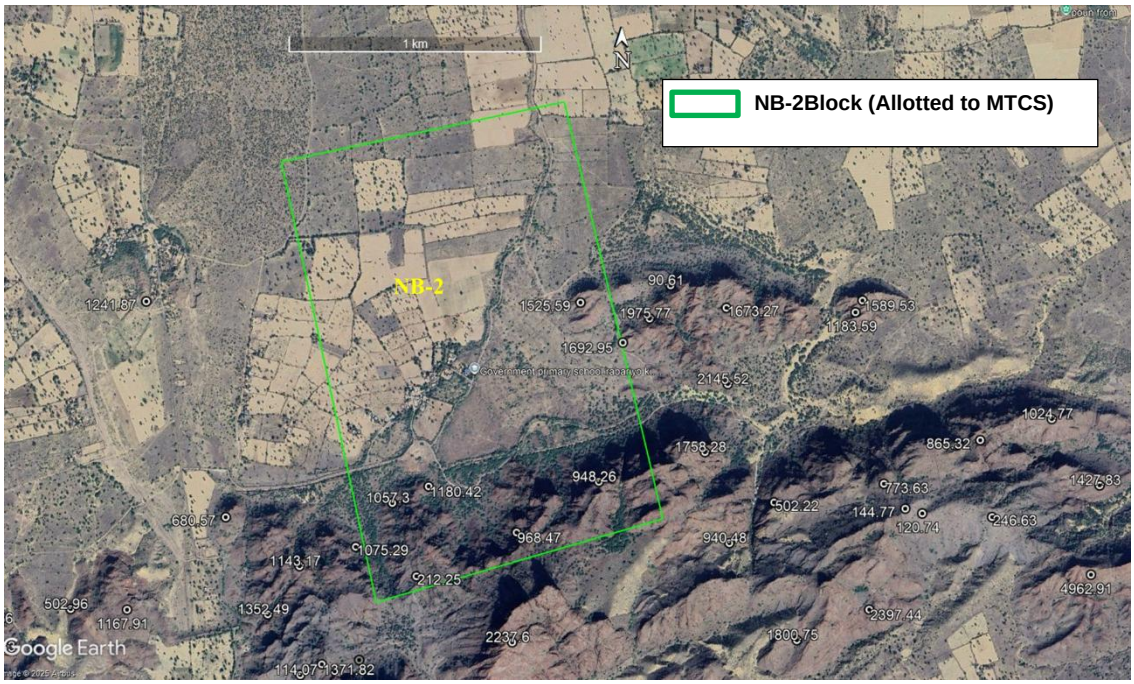


Fig 1: Map showing block boundary

3. BLOCK SUMMARY

3.1. Location & Accessibility

The block lies about 12 km NW of Siwana town which is located 132 km east of Barmer and 35 south-east of Balotra. Block falls under the parts of Survey of India Toposheet No 45C/5 & 45C/6.

State Highway 325 connecting Siwana to Thapan passes through the northern margin of the proposed block. The nearest railway station is Balotra Railway Station (about 20 km) and the nearest airport is Jodhpur located 94 km NE from the block.

3.2. Physiography & Drainage

The area exhibits a hilly terrain, with elevation (RL) ranging from 190m to 390m. The block is dominated by rhyolitic cliffy hills while the foothill zones are covered by aeolian sand deposits.

The drainage system of the proposed block is influenced by the Luni River. This river serves as the principal drainage feature in the broader region.

3.3. Regional Geology

The magmatic evolution of Siwana Ring Complex, part of Neoproterozoic Malani Igneous Suite (MIS); ca. 771±2 Ma (Torsvik et al. 2001), 745 Ma (Dhar et al., 1996; Rathore et al., 1999) can be divided into 3 phases (Kumar and Sharma, 2020). First phase is represented by bimodal volcanism of acid and basic flows (acid flows > basic flows). It is intruded by second, plutonic phase comprising arfvedsonite-reibeckite-aegirine bearing per-alkaline Siwana Granite. The third phase being later intrusive phase includes rhyolite, microgranite, andesite and felsite dykes. All these three phases host anomalous ΣREE+Y concentration and the third phase is more enriched (Kumar and Sharma, 2020). Peralkaline igneous rocks, carbonatites, feldspathoid bearing rocks are the main source of REE minerals (± HFSE, U & Th etc) and therefore are suitable host for targeting

REE/RM mineralisation. Peralkaline granites, volcanics and associated zoned pegmatoids are considered to be storehouse of REE and rare metals (Nb–Ta, Zr–Hf, Sn, W, Be) (Pollard, 1995) and in layered intrusions, the mineralisation mostly appears in the more evolved parts of the complexes (Dostal, 2017).

In the Western Indian Craton of Rajasthan, basement rocks and overlying supracrustal belts of Aravalli and Delhi Supergroups have witnessed magmatic events of volcanics and granitoids of Palaeo- to Neo-Proterozoic ages. Granitoids of different ages (~ 1.8 Ga, ~1.7 Ga, ~1.4 Ga, ~ 1.1Ga and 850-750 Ma) have intruded into these belts. MIS magmatism occurred during Neoproterozoic age and comprised peralkaline (Siwana), metaluminous to mildly peralkaline (Jalore) and peraluminous (Tusham and Jhunjhunu) granites with cogenetic carapace of acid volcanics (welded tuff, trachyte explosion braccia and perlite) and is characterised by volcano-plutonic ring structure and radial dykes (Singh and Vallinagayam, 2009). Three phases in Siwana magmatic activity is widely observed: i) the basal peralkaline (lower 24 flows), ii) middle meta-aluminous (top 21 flows), and iii) reappearance of peralkaline phase as intrusives (Siwana granite) at the end (Chittora and Bhushan, 1994).

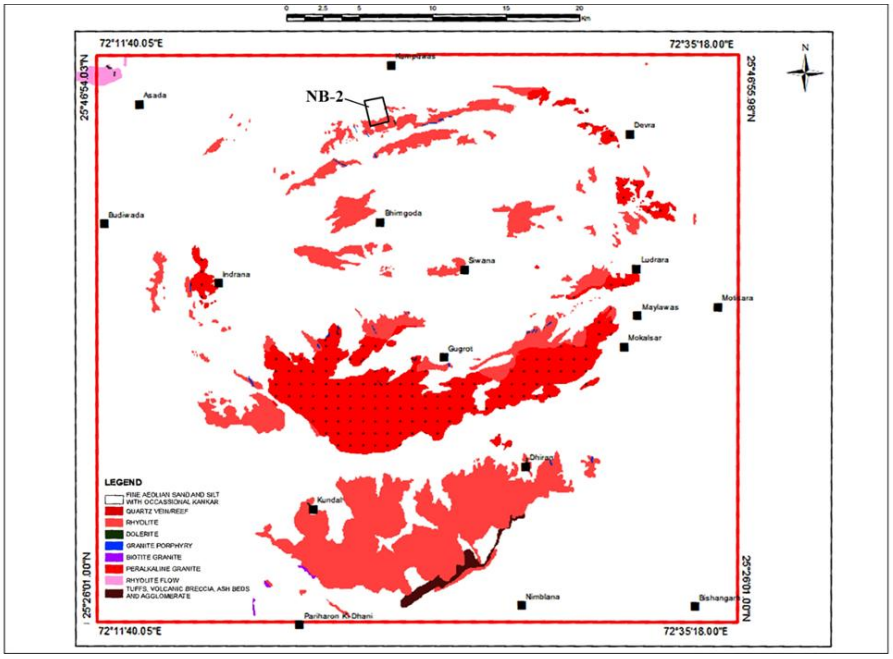
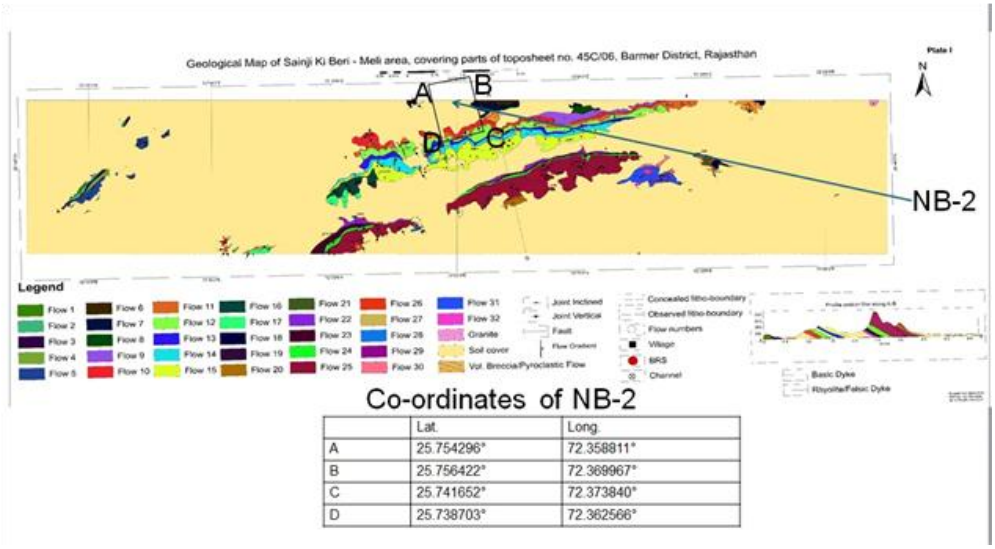


Fig 2: Proposed NB-2 block shown on the Geological map of Siwana Ring Complex.



	Lat.	Long.
A	25.754296°	72.358811°
B	25.756422°	72.369967°
C	25.741652°	72.373840°
D	25.738703°	72.362566°

Fig 3: Proposed NB 2 block shown in black on the LSM (Sainji ki beri-Meli G-4 block, FS 2021-22).

The regional stratigraphic succession is given in Table-I.

Generalized classification of Malani Igneous suite (after Bhushan and Chandrasekaran, 2002) is given below

Group/Supergroup	Age	Rock Types
MarwarSupergroup (Jodhpur Group)	Vendian to Lower Cambrian	Maroon and golden sandstone, siltstone and shale
	.....Unconformity.....	
Pokharan Boulder Bed	Vendian	Scattered boulders and pebbles of glacial origin
	.....Unconformity.....	
Malani Igneous Suite	Neo-proterozoic	Bimodal volcanics, granites and dyke swarm
	.....Unconformity.....	
Delhi Supergroup (Basement)	Meso- to Neo-proterozoic	Abu and Erinpura Granite; Metasediments of Sirohi and Pali area. Unspecified gneisses of Balewa-Harsani area (ArchaeanSupracrustals?)

3.4. Mineralization:

Rare Metal and Rare Earth Element (RM-REE) mineralization has been reported within the peralkaline felsic rocks of the Siwana Ring Complex, primarily associated with nepheline syenite and related intrusive phases.

3.5. Previous Work

Preliminary sampling of the rhyolites and associated tuffs of Siwana Ring Complex, Balotra district, carried out by GSI during 2013-14, indicated anomalous REE values with

ΣREE ranging from 1334 to 3319ppm ΣREE (**Rastogi & Mukherjee**, 2015).

Bidwai et al., 2014, reported the presence of high LREE, Zr, Nb, Th and U along with Ag in surface samples in the Siwana Ring Complex.

Das et al., 2015, carried G4 investigation in Siwana eastern and central block.

Kumar and Sharma, 2020, carried out G-4 investigation and reported ∑ REE+Y ranges in various lithiounits are i) Plagioclase rich granite (n=79) ∑ REE+Y = 0.029%-0.70%. ii) K-feldspar rich granite (n=116) ∑ REE+Y= 0.047%-0.66%. iii) Younger Intrusives (n=146) ∑ REE+Y= 0.019%-2.66%. iv) Felsic volcanic (n=43) ∑REE+Y = 0.015%-0.96% and v) Enclave/Restite (n=19) ∑REE+Y = 0.022%-1.27%. LREE/HREE ratio indicates that LREE>>HREE in the area and LREE values ranges between 86.45ppm to 1.93%, however, HREE values ranges between 23.94ppm to 0.26%. LREE:HREE ratio in Siwana area is 4:1 approximately. Apart from REE, rare metals and some trace elements also indicate very encouraging results, Zr (0.1% to 1.1%), Nb (2.5ppm to 1039ppm), Ba (25ppm to 3948ppm), Zn (120ppm to 1258ppm), U (0.61ppm to 124ppm), Th (2ppm to 481ppm) and Hf (4.52ppm to 828.18ppm).

Barman and Neogi, 2018 mapped the peralkaline – peraluminous granite (A type) and in the Siwana area extending from Mokalsar in the east to Siner in the west through Mawri, Gugrot, Piplun, Goliyan Bhairan and Kalur Ka Danta area. REE bearing carbonates (perisite) and phosphates (monazite) were identified in both plutonic and volcanic rock types. In addition to REE bearing mineral phases, haematite, ilmenite and zircon are also identified from both plutonic and volcanic phases. The granite recorded values ranging from 182.77 ppm to 8611.11 ppm and the average being 2006.95 ppm (count=84). The volcanic recorded values ranging from 142.3 ppm to 8502.50 ppm, average value being 2008.03 ppm (count=116). Sukleswar Ka Mandir (G3) block yields tREE upto 2901ppm in microgranite dyke, 2121 ppm in alkali feldspar granite and 2996ppm in andesite.

Lal and Ghosh, 2021 carried out large scale geological mapping (1:12500 scale) at the northern periphery of the Siwana Ring Complex, stretching from Sainji ki Beri to Meli area. They marked 32 nos. of rhyolitic flows along with several felsic dykes in the area. Several flows are found to be highly enriched in tREE concentration. Chemical analysis data from rhyolite samples of study area yielded ΣREE+Y values ranging from 91.76ppm to 9764.68ppm, with average value of 1844.84ppm. ΣHREE/ΣLREE ratio of the same is 0.15. 22 BRS samples from felsic/rhyolite dykes yielded ΣREE+Y values ranging from 144.77ppm to 7678.75ppm, with average value of 1400.14ppm. ΣREE+Y value in channel samples ranging from 261.73 to 6224.81ppm, with ΣHREE/ΣLREE ratio of 0.19. Flow no. 14 and 15 are highly enriched REE flow of rhyolite in the area.

In the proposed block ΣREE+Y in flow no. 15 ranges between 2213.43 ppm to 8027.71ppm with maximum value of LREE 5079.52ppm and maximum value of HREE 992.05ppm. In flow no. 14, ΣREE+Y ranges between 6944.16ppm to 7528.11ppm with maximum LREE 4848.19ppm and maximum HREE 941.11ppm.

Remote Sensing and Aerial Survey for toposheet no. 45C/06 and 45C/10 were carried out by RSAS Division, GSI, Bangalore, during FS. 2017-18. Aeromagnetic maps help in delineating the regional continuity of magnetically susceptible lithounits of Siwana Ring Complex even under soil-covered terrain.

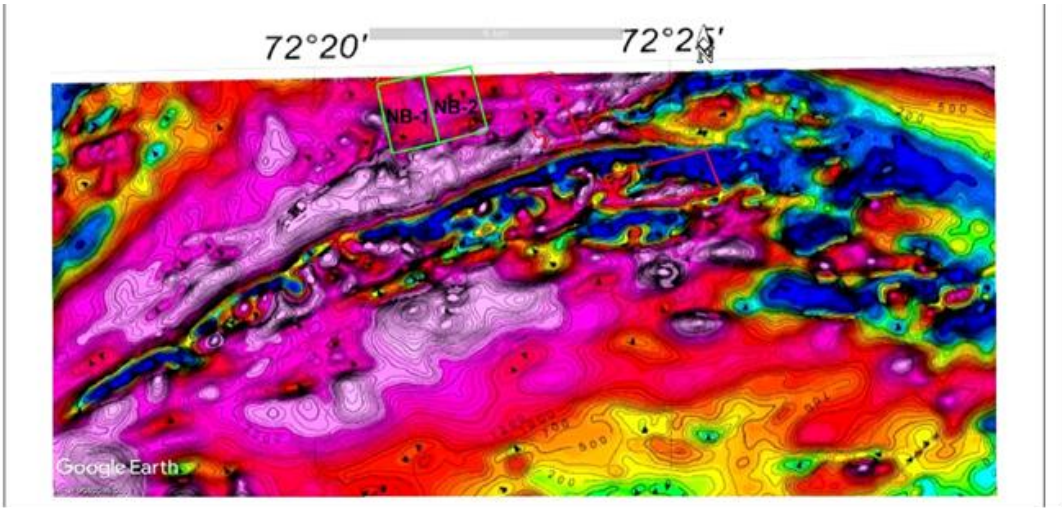


Figure 4: Proposed block NB-2 shown on aeromag

Spectrometric maps of potassium and thorium further suggest that the proposed area possesses good potential for rare earth element (REE) mineralization in exposed areas.

3.6. Conclusion & Recommendations of previous works:

Based on the geological mapping, geochemical data analysis and Remote Sensing & Aerial Survey, NB-2 block seems to have potential for REE & Rare Metals (RM) and is recommended for G3 stage exploration.

4. PROPOSED BLOCK DESCRIPTION

The proposed block falls within the Survey of India Toposheet no. 45C/5 & 45C/6. The co-ordinates of cardinal points of the block are given in Table II.

Table II: Cardinal points of NB-2 Block

Block corner points / Cardinal Points	WGS-84	
	Latitude	Longitude
A	25.754296	72.358811
B	25.756422	72.369967
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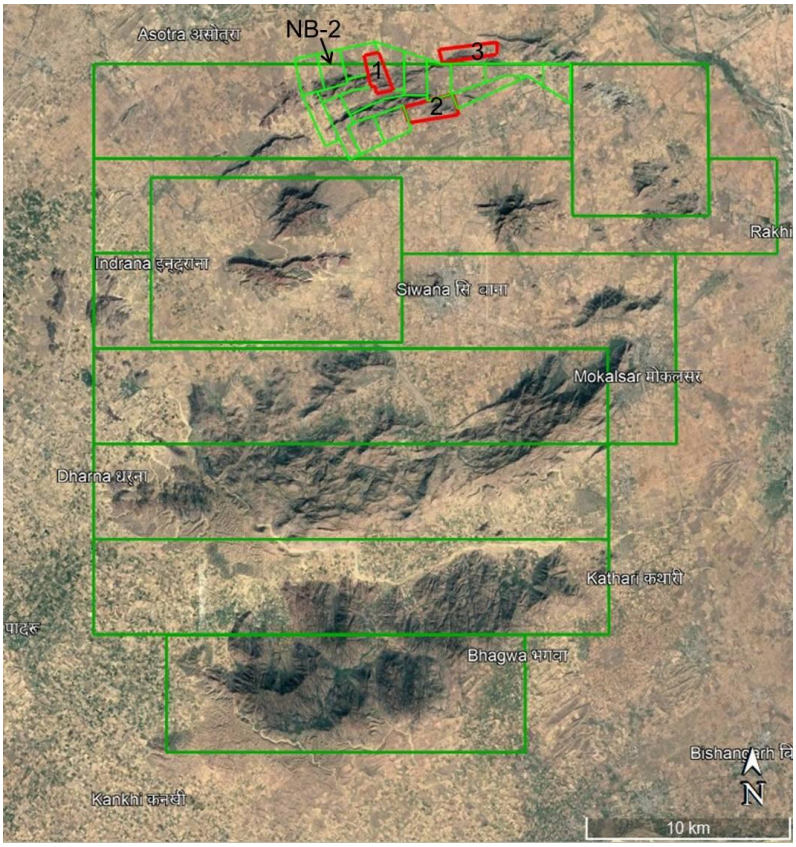


Fig 3: Proposed NB 2 block shown on Google Image. Blocks in red are NPEA blocks (1 & 2 nos.) approved by TCC of NMEDT and Bhatikhera G2 block (3 no.) of AMD.

5. PRESENT WORK

A desktop study had been conducted by MTCS based on the geoscience data available on NGDR and Bhukosh portal. A site visit was conducted by MTCS team during 23rd Nov 2025 in order to access the study area and understand the geology including collection of samples for analysis.

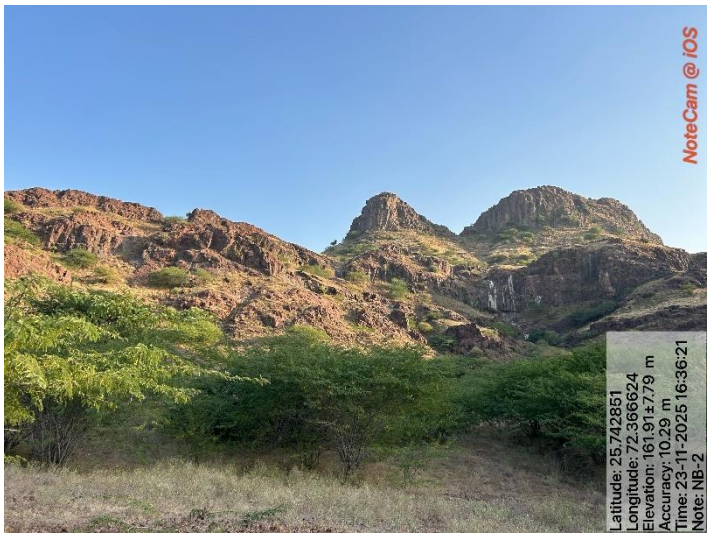
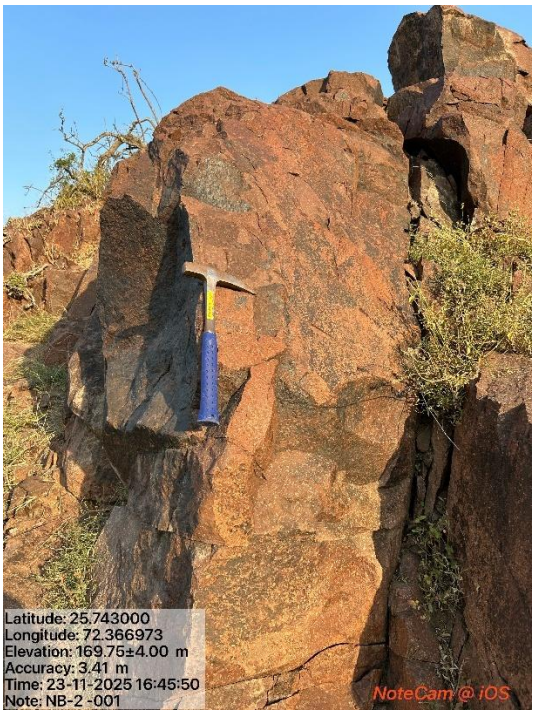


Fig 4: Photograph showing landscape of the study area



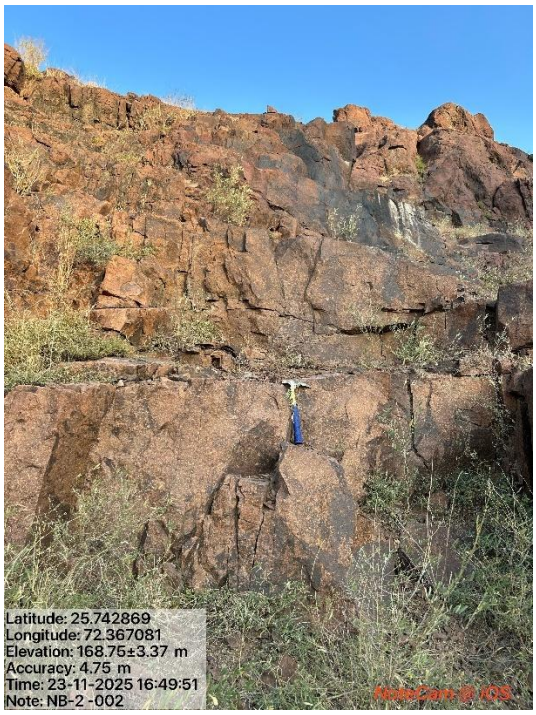


Fig 5 & 6: Photographs showing Porphyritic Rhyolite

While conducting site visit, MTCS team has collected few rock chip samples from various parts of the study area. The samples have been submitted to NABL accredited laboratory for analysis of various elements which has been collected from various litho-units.

Based on the recommendations of the previous works of GSI and current field study, MTCS has formulated a G3 stage exploration proposal for REE and associated Rare Metals in Siwana NB 2 block to meet the following objectives:

i. Detailed mapping of 2.00 sqkm area (on 1:2,000) is to be carried out with collection of bedrock samples (channel samples) to delineate REE & RM mineralized zones.
ii. To carry out trenching & pitting in the potential zones derived from geological mapping work.
iii. The depth continuity, grade and thickness of these zones will be checked by drilling of 24 vertical/inclined boreholes of 125m depth on a grid of 400m x 200m. Initially 4 to 5 boreholes will be drilled and respective core samples will be tested for REE and RM concentrations. If encouraging results are received, the remaining drilling and core sampling will be done simultaneously.
iv. As most of the REE minerals may not be identified by study of thin sections, 5 samples for EPMA and 5 samples for XRD studies are proposed to identify the REE mineral phases.
v. Estimation of ore resources at G3 Level as per UNFC norms and Minerals (Evidence of Mineral Contents) Rules 2015.
vi. Preparation of geological report in compliance with G3 level as per MEMC Rules and suggestions for follow up work to upgrade the project, if deemed necessary.

6. QUANTUM OF WORK

Quantum of work proposed by MTCS in NB-2 block is given below table (Table III).

Table III: Work quantum

S.N	Nature of work	Unit	Quantum	Remarks
A	**Geological Mapping & Associated Activities**			
1	Geological Mapping (1:2000 scale)	sqkm	2.00	
2	Bedrock Sampling (Channel samples)	No	100	
B	**SURVEY**			
1	Topography Survey	sqkm	2.00	2m contour interval
C	**PITTING/TRENCHING**			
1	Pitting (2m depth)	cum	10	Dimension: 1m x 1m x 2m
2	Trenching (2m depth)	cum	40	Dimension: 5m x 1m x 2m
D	**Exploration Drilling**			
1	Exploration Drilling	m	3000	BH depth: 125m
2	Borehole Deviation Survey	m	3000	
3	Borehole Collar DGPS Survey	No	24	
E	**BOREHOLE GEOPHYSICAL LOGGING**			
1	Borehole Geophysical Logging	m	1000	
F	**Laboratory Studies of BRS/TS**			
1	**Analysis of Bedrock samples** (ICP-MS Method: REE, Y, Hf, Zr, Nb, Ta)			
a	Primary Samples	No	100	
b	Check Samples of BRS	No	10	
2	**Analysis of Pit+Trench samples** (ICP-MS Method: REE, Y, Hf, Zr, Nb, Ta)			
a	Primary Samples	No	50	Pit Sample: 10 Trench Sample: 40
b	Check Samples of Pit+TS	No	5	
3	**Analysis of Core samples** (ICP-MS Method: REE, Y, Hf, Zr, Nb, Ta)			
a	Primary Samples	No	800	

S.N	Nature of work	Unit	Quantum	Remarks
b	Check Samples of Drill Core	No	80	
4	**Whole Rock Analysis**			
a	XRF Analysis for Major Oxides	No	15	BRS - 10, Core samples - 5
b	Analysis for Minor, Trace & REE	No	15	BRS - 10, Core samples - 5
5	**Samples for Petrological Studies**			
a	Preparation & Study of thin polished section	No	15	BRS - 10, Core samples - 5
b	Digital Photograph of thin polished section	No	15	BRS - 10, Core samples - 5
6	**XRD Analysis**	No	5	
7	**EPMA Study**	Hour	15	5 samples
8	**Specific Gravity Determination**	No	5	
G	**Geological Report Preparation**			
1	Geological Report Preparation	No	1	5 Hard copies with a soft copy

7. TIME SCHEDULE AND COST ESTIMATES

8.1. Time schedule

The proposed exploration program is planned to complete all activities like geological mapping, geochemical sampling, geophysical survey, drilling & associated works along with laboratory studies within 10 months; report writing will be done in another 2 months. Thus, the total duration of the project shall be 12 months from the date of commencement. The bar chart showing activity-wise time schedule is placed in Table No. IV.

Table IV: Tentative Time schedule/action plan for proposed Preliminary Exploration (G-3)

Activity	Type of Job	Months												
		1	2	3	4	5	6	Review	7	8	9	10	Review	11	12
Desktop study (including obtaining clearances etc.)	HQ														
Camp setting	Field														
Geological Mapping (including bedrock sampling, pitting & trenching)	Field														
Topography Survey	Field														
Drill Rig mobilization	Field														
Drilling	Field														
Borehole Geophysical Logging	Field														
Camp winding up	Field														
Laboratory Studies	Lab														
Geological Report Preparation & submission to NMET	HQ														

Note: Time loss on account of any natural calamity /agricultural activity/forest clearance / local law & order problem/ lockdown etc. will be additional to the above timeline.

8.2. Cost estimates

Based on the Schedule of Charges (SoC) of projects funded by National Mineral Exploration Trust (NMET) w.e.f. 01.04.2020 tentative cost has been estimated for this project. The total estimated cost is Rs. 680 Lakhs. The summary of cost estimates for Preliminary Exploration (G-3 Level) is given in Table No. V and details of cost estimates are given in Table No. VI.

Table V - Summary of Cost estimates

Sl. No	Item	Estimated Cost	
		INR	INR, Cr
A	Geological Mapping & Asso. Works	35,86,440	0.36
B	Survey Work	7,74,720	0.08
C	Pitting & Trenching	1,70,000	0.02
D	Drilling	4,18,04,960	4.18
E	Borehole Geophysical Logging	6,22,000	0.06
F	Laboratory Studies	85,16,960	0.85
G	Geological report preparation	16,64,252	0.17
H	Exploration Proposal Preparation	5,00,000	0.05
I	Report Peer Review	30,000	0.003
J	GST (18%)	1,03,80,480	1.04
	Grand Total	**6,80,49,812**	**6.80**

8. MANPOWER DEPLOYMENT

Manpower deployment List shall be provided prior to the commencement of work.

9. BREAK-UP OF EXPENDITURE

Detailed estimated cost for G-3 level exploration in Siwana NB 2 block over an area of 2.00 sq. km. is given in Table VI.

Table - VI: Cost Estimate for Preliminary Exploration (G-3 Level) Proposal for REE & Rare Metals in Siwana NB-2 Block, Balotra, Rajasthan

Title of Project – Siwana NB-2 REE & Rare Metals Block
Name of the Exploration Agency - Mining Tech Consultancy Services Ltd (MTCS)
Total Area – 2.00 sqkm; No. of Boreholes – 24; Drilling – 3000m; Completion Time – 12 months; Review – 6 & 10 months

Sl. No.	Item of work	Unit	Rates as per NMET SoC 2020-21		Estimated Cost of the Proposal		Remarks
			SoC-Item -Sl No.	Rates per Unit as per SOC (Rs)	Quantum	Total Amount (Rs)	
A	***GEOLOGICAL MAPPING & ASSOCIATED ACTIVITIES***						
1	Geologist (Field) - geological mapping, pitting & geochemical sampling, drilling & core logging	day	1.2	11,000	180	1,980,000	
2	Labor (Field) - 2 No per Geologist	day	5.7	541	360	194,760	Amount will be reimbursed as per the notified rates by the Central Labor Commission or respective State Govt. whichever is higher
3	Sampler - 1 No	day	1.5.2	5,100	120	612,000	
4	Labor (Sampling) - 4 No	day	5.7	541	480	259,680	Amount will be reimbursed as per the notified rates by the Central Labor Commission or respective State Govt. whichever is higher
5	Geologist (HQ)	day	1.2	9,000	60	540,000	
					Sub-*Total* A	**3,586,440**	
B	***SURVEY WORK***						
1	Bore Hole Fixation and determination of co-ordinates & Reduced Level of the boreholes by DGPS	per point of observation	1.6.2	19,200	24	460,800	
2	Topographical Survey (on 1:2000 Scale)	day	1.6.1a	8,300	30	249,000	
3	Labor (Field) - 4 No for Survey work	day	5.7	541	120	64,920	Amount will be reimbursed as per the notified rates by the Central Labor Commission or respective State Govt. whichever is higher
					Sub-Total C	**774,720**	
C	***PITTING & TRENCHING***						
1	Pitting	cubic meter	2.1.2	3,800	10	38,000	
1	Trenching	cubic meter	2.1.1	3,300	40	132,000	

Sl. No.	Item of work	Unit	Rates as per NMET SoC 2020-21		Estimated Cost of the Proposal		Remarks
			SoC-Item -Sl No.	Rates per Unit as per SOC (Rs)	Quantum	Total Amount (Rs)	
					Sub-Total C	**170,000**	
D	***DRILLING***						
1	Drilling upto 300m (Very Hard Rock)	m	2.2.1.5a	12,650	3,000	37,950,000	
2	BH deviation survey by multishot camera	per m	2.2.6	330	3,000	990,000	
3	Land / Crop Compensation (in case the BH falls in agricultural Land)	per BH	5.6	20,000	10	200,000	As per actuals
4	Construction of concrete Pillar (12"x12"x30")	per BH	2.2.7a	2,000	24	48,000	
5	Transportation of Drill Rig & Truck associated per drill	km	2.2.8	36	2800	100,800	Transportation of 1 drill rig from Raipur, Chhattisgarh to Siwana NB 2 block
6	Accommodation Charges for drilling Camp (1 Rig)	month	2.2.9	50,000	5	250,000	5 months considered
7	Drilling Camp Setting Cost	No	2.2.9a	250,000	1	250,000	1 drill rig considered
8	Drilling Camp Winding up Cost	No	2.2.9b	250,000	1	250,000	1 drill rig considered
9	Road Making (Flat Terrain)	km	2.2.10a	22,020	8	176,160	
10	Drill Core Preservation	m	5.3	1,590	1,000	1,590,000	
					Sub-Total D	**41,804,960**	
E	***BOREHOLE GEOPHYSICAL LOGGING***						
1	Borehole Geophysical Logging	m	3.12	622	1,000	622,000	
					Sub-Total E	**622,000**	
F	***LABORATORY STUDIES***						
1	**Chemical Analysis of Bedrock Samples (ICP-MS Method) (REE, Y, Hf, Zr, Nb, Ta)**						
a	Bedrock Samples	No	4.1.14	7,731	100	773,100	
b	Check samples (BRS)	No	4.1.14	7,731	10	77,310	
2	**Chemical Analysis of Pit + Trench Samples (ICP-MS Method) (REE, Y, Hf, Zr, Nb, Ta)**						
a	Pit + Trench Samples	No	4.1.14	7,731	50	386,550	
b	Check samples (Pit+Trench)	No	4.1.14	7,731	5	38,655	

Sl. No.	Item of work	Unit	Rates as per NMET SoC 2020-21		Estimated Cost of the Proposal		Remarks
			SoC-Item -Sl No.	Rates per Unit as per SOC (Rs)	Quantum	Total Amount (Rs)	
3	**Chemical Analysis of Core Samples (ICP-MS Method) (REE, Y, Hf, Zr, Nb, Ta)**						
a	Core Samples	No	4.1.14	7.731	800	6,184,800	
b	Core samples: Check	No	4.1.14	7.731	80	618,480	
4	**Whole Rock Analysis**						
a	XRF Analysis for Major Oxides	No	4.1.5a	4,200	15	63,000	BRS - 10, Core samples - 5
b	Analysis for Minor Elements (ICP-MS for 34-Elements)	No	4.1.14	7.731	15	115,965	BRS - 10, Core samples - 5
5	**Physical & Petrological Studies**						
a	***Petrographic Studies***						
i	Preparation of thin polished section	No	4.3.1	2,353	15	35,295	BRS - 10, Core samples - 5
ii	Study of thin polished section	No	4.3.4	4,232	15	63,480	BRS - 10, Core samples - 5
b	***Digital Photographs***	No	4.3.7	280	15	4,200	
c	***XRD Analysis***	No	4.5.1	4,000	5	20,000	
d	***EPMA Study***	Hour	4.4.1	8.540	15	128,100	5 samples considered
e	***Specific Gravity Determination***	No	4.8.1	1,605	5	8,025	
					Sub-Total F	**8,516,960**	
					Sub-Total of A to F	**55,475,080**	
G	***GEOLOGICAL REPORT PREPARATION***						

Sl. No.	Item of work	Unit	Rates as per NMET SoC 2020-21		Estimated Cost of the Proposal		Remarks
			SoC-Item -Sl No.	Rates per Unit as per SOC (Rs)	Quantum	Total Amount (Rs)	
1	Geological Report Preparation charge (5 Hard copies with a soft copy)	Lumpsum	5.2	For the projects having cost more than 300 lakhs - A minimum of Rs 9 lakhs or 3% of the value of work whichever is more		1,666,556	
					Sub-Total I	**1,664,252**	
H	***PEER REVIEW***						
1	Report Peer Review	Lumpsum	As per EC decision	30,000	1	30,000	
					Sub-Total J	**30,000**	
I	***EXPLORATION PROPOSAL PREPARATION***						
1	Preparation of Exploration Proposal (5 Hard copies with a soft copy)	Lumpsum	5.1	2% of the Cost or Rs. 5 Lakhs whichever is lower	1	500,000	
					Sub-Total K	**500,000**	
					PROJECT COST WITHOUT GST	**57,669,332**	
					18% GST	**10,380,480**	
					TOTAL PROJECT COST	**68,049,812**	

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