PRELIMINARY EXPLORATION (G3 LEVEL) FOR REE & ASSOCIATED RARE METALS IN THE SB-3 BLOCK OF THE SOUTHERN PART OF THE SIWANA RING COMPLEX, BALOTRA DISTRICT, RAJASTHAN UNDER NMEDT FUNDING

Commodity – REE & Associated Rare Metals (RM)

Prepared by

MTCS
INTELLIGENT MINING SOLUTIONS

MINING TECH CONSULTANCY SERVICES LTD

www.mtcspl.com

Email- info@mtcspl.com

Place: Ahmedabad

Date: February 20, 2026

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Summary of the Block for G3 stage exploration

	Features	Details
	Block ID	MTCS/NMEDT-009/2026/RJ/Siwana-SB-3
	Current Exploration Agency	Mining Tech Consultancy Services Limited (MTCS), Ahmedabad
	Previous Exploration Agency	Geological Survey of India – G3 Level
	G4 stage Geological Report (Previous stage Geological Report)	1. 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). 2. In the proposed block SB-3, mostly the rhyolite is exposed. **In Koiliyasar ka pahar area,** analytical results of rhyolite indicate ΣREE+Y ranging from 231.24 to 4295.33 ppm and tuff yielded ΣREE+Y ranging from 309.66 to 9103.41 ppm and samples collected from rhyolite located near Indrana and Guranal village indicate ΣREE+Y ranging from 1076.69 to 3908.11 ppm. 3. **In Bhimgoda ka pahar area** analytical results of rhyolite indicate ΣREE+Y ranging from 215.86 to 4938.30 ppm and tuff yielded ΣREE+Y ranging from 129.92 to 3793.72 ppm. 4. LREE dominates over HREE with **LREE:HREE ratio ~4:1**, 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). 5. REE-bearing minerals such as **monazite and perisite** identified in both plutonic and volcanic phases; accessory minerals include **zircon, ilmenite, haematite**. 6. Remote sensing and aeromagnetic surveys confirmed **continuity of favorable lithounits** and **potassium-thorium anomalies**, indicating subsurface mineralization potential. These results strongly justify **upgrading SB-3 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 SB3 REE-RM block has been formulated with the following objectives:** 1. Preparation of detailed geological map on 1:2000 scale.

<table>
<tr><th></th><th>Features</th><th>Details</th></tr>
<tr><td></td><td></td><td>2. To collect Bedrock samples for analysis of REE & RM for identification of mineralization and host rock.
3. Ground geophysical survey to understand the subsurface extension of mineralized rocks.
4. Trenching within the selected locations during mapping.
5. Drilling of boreholes to determine the subsurface occurrence of host rock and mineralized zones.
6. 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°37'45.04"N</td><td>72°22'7.05"E</td></tr>
<tr><td>B</td><td>25°37'50.721"N</td><td>72°23'16.691"E</td></tr>
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<tr><td>D</td><td>25°37'12.104"N</td><td>72°22'8.133"E</td></tr>
</table></td></tr>
<tr><td></td><td>Villages</td><td>Gudavida</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>Available ~ 30%</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, 43.7 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>
</table>

	Features	Details
	Airport	Jodhpur (94 km) in NE direction from the block
4.	**Hydrography**	
	Local Surface Drainage Pattern (Channels)	Only perennial Nalas are present inside the block. Flows towards North direction
	Rivers/ Streams	The drainage system of the proposed area part of Luni River watershed
5.	**Climate**	
	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 ° and 51 °C. Night temperature decreases considerably to 20° –29 °C. January is the coldest month. During winter (December to February), minimum temperatures may fall to 2 °C at night.
6.	**Topography**	
	Toposheet Number	Part of SoI Topo sheet no. 45C/06.
	Morphology of the Area	The area has a hilly topography with RL varying from 197m to 226m. 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 (SB-3) lies in the southern part of the Siwana Ring Complex, part of the Malani Igneous Suite, which is known for REE and rare metal mineralization. 2. Most of the area is covered by aeolian sand with outcrops of rhyolites & granites. 3. Previous chemical analyses show ΣREE+Y values range from 182.77 ppm to 8611.11 ppm and the average being 2006.95 ppm (count=84) as reported in granites. 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. The block is recommended for G3 stage exploration with a work plan including geological mapping, drilling and mineralogical studies.

PROPOSAL FOR PRELIMINRY EXPLORATION (G3 LEVEL) FOR REE AND ASSOCIATED RARE METALS IN SB 3 BLOCK OF THE SOUTHERN PART OF THE SIWANA RING COMPLEX, BALOTRA DISTRICT, RAJASTHAN

1 INTRODUCTION

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, defence, 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, defence 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 SB 3 BLOCK OF THE SOUTHERN PART OF THE SIWANA RING COMPLEX, BALOTRA DISTRICT, RAJASTHAN'*** has been officially allotted to MTCS during the 6th Joint Meeting of Technical Cum-Cost Committees (TCC-I & TCC-II) of National Mineral Exploration and Development Trust (NMEDT), held on 6th February, 2026 in hybrid mode. The meeting aimed to allocate 06 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.

3 DETAILS OF THE BLOCK

3.1 Location & Accessibility

The SB-3 block lies ~7 km WSW of Siwana town, while Siwana itself is ~132 km east of Barmer and ~35 km south-east of Balotra. The block falls within parts of Survey of India Toposheet No. 45C/06. State Highway 325 connecting Siwana to Thapan passes along the northern margin of the proposed block. The nearest railway station (as used operationally for access) is Balotra Junction (BLT), ~43.7 km from the block, and the nearest airport is Jodhpur (JDH), ~99 km NE of the block.

3.2 Physiography & Drainage

The area exhibits a hilly terrain, with elevation (RL) ranging from 197m to 226m. 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 three 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 these belts. MIS magmatism occurred during Neoproterozoic age and comprises 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).

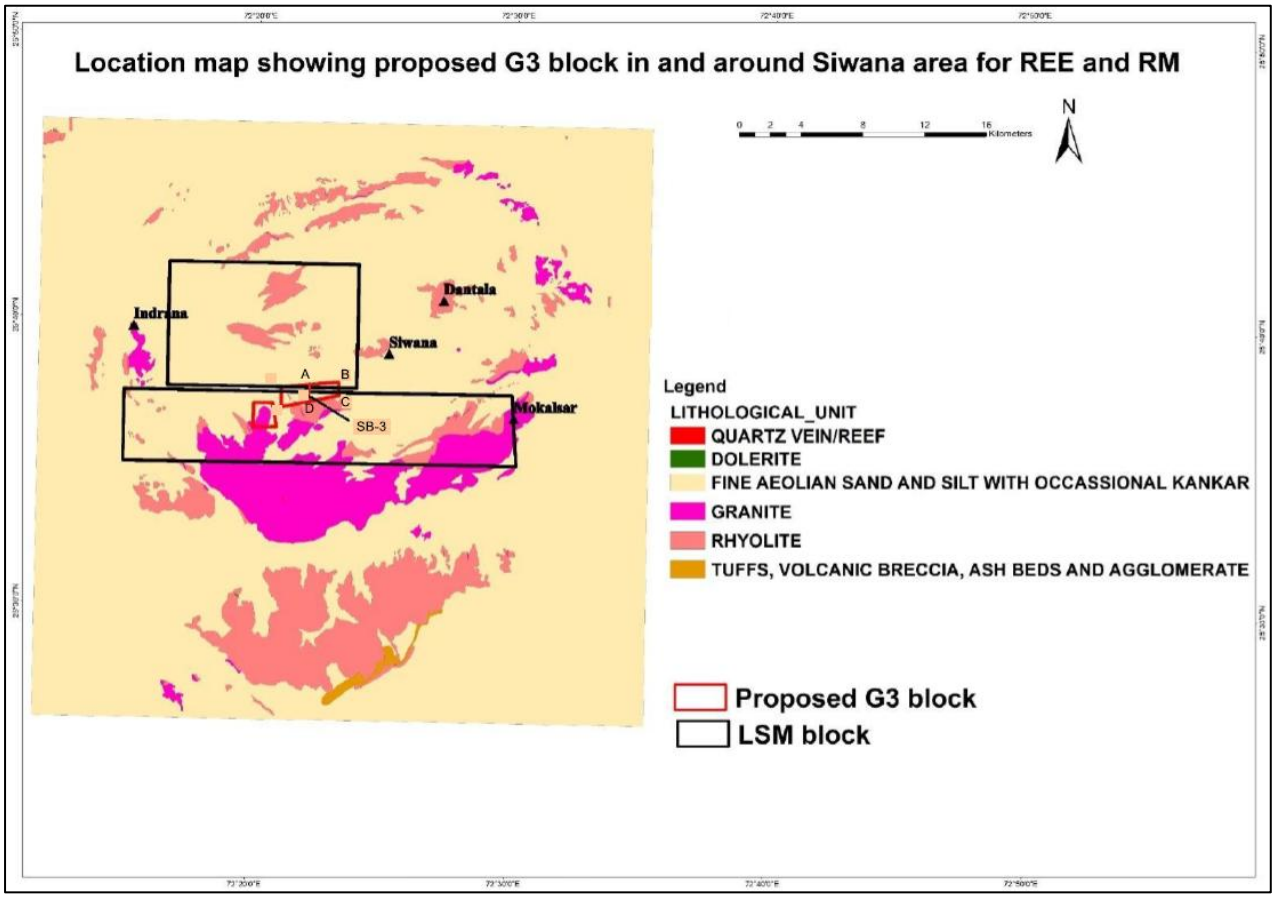

Figure 3-1: Proposed SB 3 block shown on the Geological map of Siwana Ring Complex

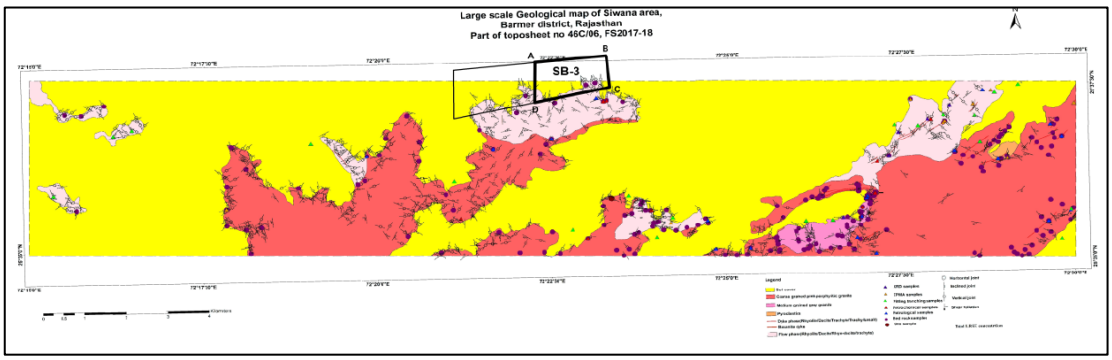

Figure 3-2: Proposed SB-3 block shown in black on the LSM (Siwana G-4 block, FS 2017-18).

The regional stratigraphic succession is given in Table 3-1.

Table 3-1: 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 Earth Element & Rare Metals (REE-RM) 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 Σ REE+Y ranges in various lithiounits are i) Plagioclase rich granite (n=79) Σ REE+Y = 0.029%-0.70%. ii) K-feldspar rich granite (n=116) Σ REE+Y= 0.047%-0.66%. iii) Younger Intrusives (n=146) Σ REE+Y= 0.019%-2.66%. iv) Felsic volcanic (n=43) ΣREE+Y = 0.015%-0.96% and v) Enclave/Restite (n=19) ΣREE+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).

Das, Gantait and Panda, (2015) has carried out an Investigation for REE and other rare metals in Siwana area, Barmer district, Rajasthan and reported the occurrence of REE mineralization in felsites dykes of Siwana Eastern block in Phulan area. The Siwana Central block is represented by bimodal volcanism of rhylolite and basalt. samples were collected from rhyolite and tuff in

Bhimgoda ka pahar, Koiliyasar ka pahar, Indrana and Guranal area. In Bhimgoda ka pahar area analytical results of rhyolite indicate ΣREE+Y ranging from 215.86 to 4938.30 ppm and tuff yielded ΣREE+Y ranging from 129.92 to 3793.72 ppm. In Koiliyasar ka pahar, analytical results of rhyolite indicate ΣREE+Y ranging from 231.24 to 4295.33 ppm and tuff yielded ΣREE+Y ranging from 309.66 to 9103.41 ppm and samples collected from rhyolite located near Indrana and Guranal village indicate ΣREE+Y ranging from 1076.69 to 3908.11 ppm. They suggested that the peralkaline granite of Siwana Ring Complex (SRC) is enriched with REE and the later intrusive dykes intruding the granite and rhyolite at the periphery of Siwana Ring Complex are even more enriched with REE potential.

Barman and Neog, 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.

In the proposed block SB-3, mostly the rhyolite is exposed. The Total REE values in 2 samples collected from rhyolites in the nearby SB-02 block shows TREE value of 1777.11 ppm to 1975.19 ppm. In neighboring areas also similar values are present. A river /nala is present in the northern periphery of the block. High-resolution aeromagnetic survey in Siwana area Siwana Ring Complex was 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. Spectrometric maps of potassium and thorium further suggest that the proposed area possesses good potential for rare earth element (REE) mineralization in exposed area.

Based on these chemical data and the Remote Sensing and Aerial Survey maps SB-3 block is recommended for G3 stage exploration. The SB-3 block is situated in the southern part of the toposheet no. 45C/06. The block lies about 4 km SW of Siwana town. Siwana is located 132km east of Barmer and 35 south east of Balotra.

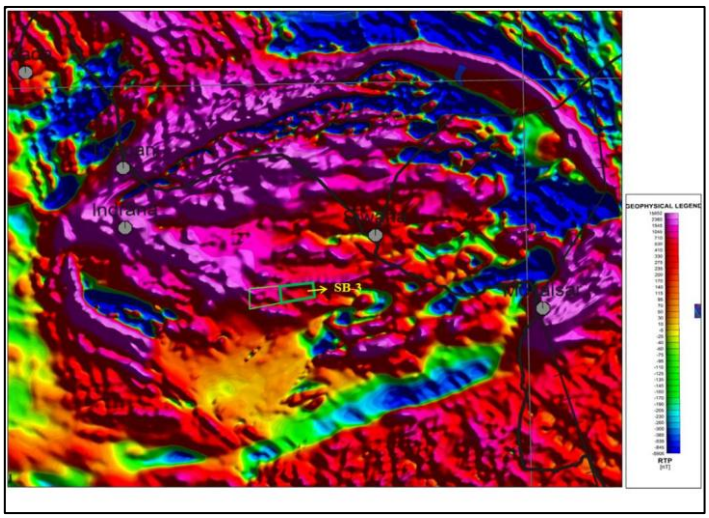

Figure 3-3: Proposed block SB-3 shown on aeromag (Reduction to the Pole (RTP) map of residual magnetic intensity derived from aeromagnetic survey data

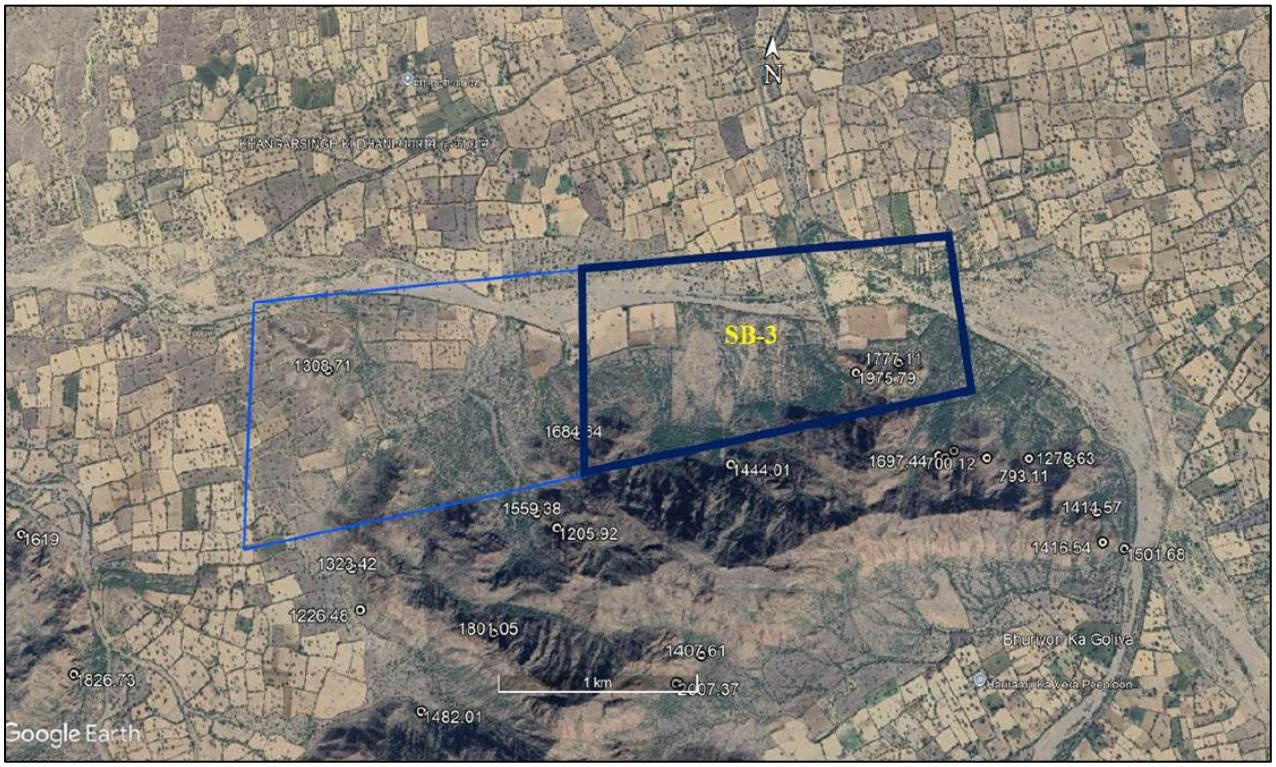

Figure 3-4: Proposed block SB-3 and TREE concentration in surface samples plotted on google earth image

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, SB-3 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/06. The co-ordinates of cardinal points of the block are given in Table 4-1.

Table 4-1: Cardinal points of SB-3 Block

Block corner points / Cardinal Points	Latitude	Longitude
A	25°37'45.04"N	72°22'7.05"E
B	25°37'50.721"N	72°23'16.691"E
C	25°37'23.521"N	72°23'18.484"E
D	25°37'12.104"N	72°22'8.133" E

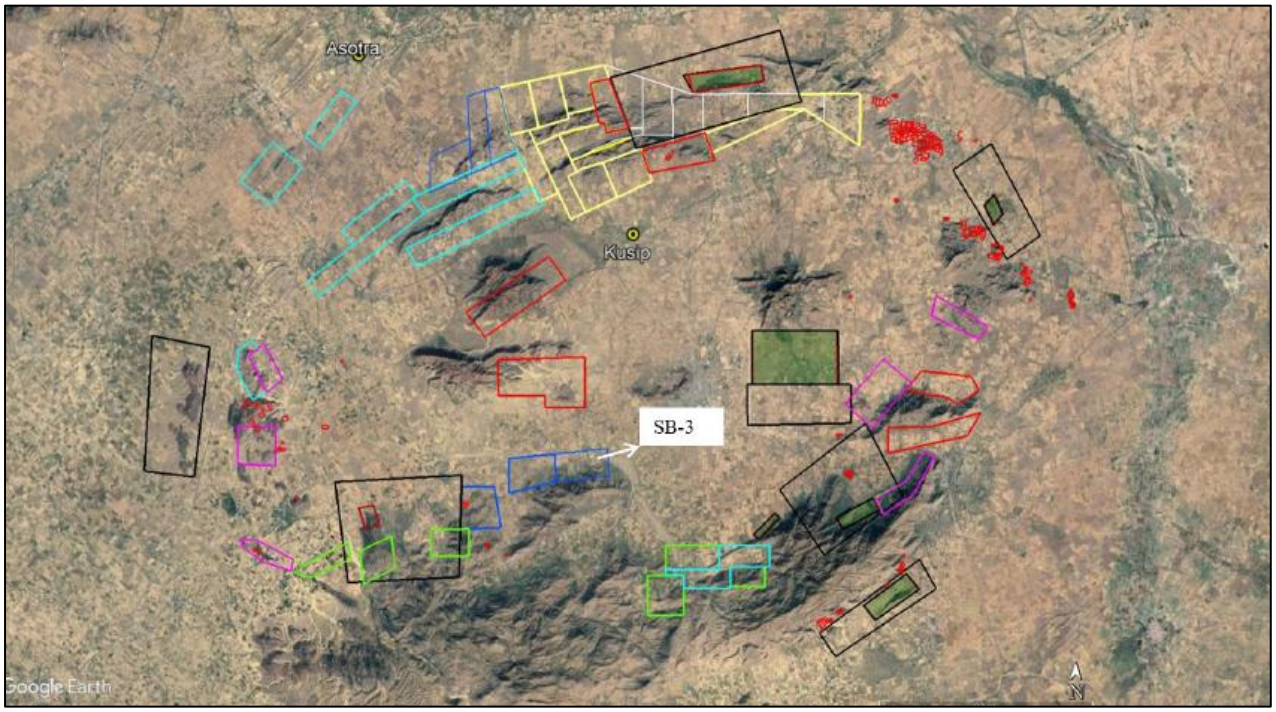

Figure 4-1: Proposed SB 3 block shown on Google Image.

5 PROPOSAL OF EXPLORATION WORK

A desktop study had been conducted by MTCS based on the geoscience data available on NGDR Portal.

Based on the recommendations of the previous works of GSI and current field study, MTCS has formulated a two phased G3 stage exploration proposal for REE and associated Rare Metals in Siwana SB 3 block to meet the following objectives:

i. In Phase I, reinterpretation of existing ground and airborne database will be done including characterization of the GP signals with the rock types and host lithology by overlay analysis.
ii. Detailed mapping of 2.0 sqkm area (on 1:2,000) is to be carried out with collection of surface samples to delineate REE & RM mineralised zones.
iii. As the block area is mostly covered by sand, ground magnetic & gravity survey to be conducted to understand the sub-surface extension of mineralized rocks.
iv. Trenching at the potential zones derived from geological mapping & geophysical survey works will be carried out.
v. The depth continuity, grade and thickness of these zones will be checked by drilling about 24 vertical boreholes of 125m depth on a grid of 400m x 200m.
vi. As most of the REE minerals are not identified by study of thin sections, 5 samples for XRD and 5 samples for EPMA studies are also proposed to identify the REE mineral phases.
vii. Initially 4 to 5 boreholes will be drilled, and respective core samples will be tested for REE and associated RM concentrations.
viii. If the results of Phase I are encouraging the remaining drilling and core sampling will be done in the 2nd phase (Phase II).
ix. Estimation of ore resources at G3 Level as per UNFC norms and Minerals (Evidence of Mineral Contents) Rules 2015 will also be carried out.

x. Finally, preparation of geological report will be done 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 SB-3 block is given below table (Table 6-1).

Table 6-1: Work quantum

S.N	Nature of work	Unit	Quantum	Remarks
Phase I				
A	**Geophysical Survey Data Interpretation Reinterpretation of existing ground and airborne database, characterize the GP signals with the rock types and host lithology by overlay analysis**			
1	Data integration & interpretation	sqkm	2.00	
B	**Geological Mapping & Associated Activities**			
1	Geological Mapping (1:2000 scale)	sqkm	2.00	
2	Bedrock Sampling (Channel samples)	No	100	
C	**SURVEY**			
1	Drone Topographic Survey (1:2000 scale)	sqkm	2.00	2m contour interval
2	DGPS Survey of Block Boundary Points & Boreholes	No	28	
D	**GROUND GEOPHYSICAL SURVEY**			
1	Magnetic & Gravity Survey	station	250	5 LKm, 2.5 LKm per sqkm area with a line spacing 200m, Station interval: 20m, 25 station per profile line, 25*5= 125 stations per LKm.
E	**PITTING/TRENCHING**			
1	Trenching (2m depth)	cum	50	Dimension: 5m x 1m x 2m
F	**Exploration Drilling**			
1	Exploration Drilling	m	800	5 Bhs in 200mx400m grid, depth range: 125m to 150m
G	**Laboratory Studies**			
1	**Analysis of Bedrock & Trench samples** (ICP-MS Method: REE & Trace Elements)			
a	Primary Samples	No	150	BRS: 100, TS: 50
b	Check Samples of BRS+TS	No	15	
2	**Analysis of Core samples** (ICP-MS Method: REE & Trace Elements)			
a	Primary Samples	No	250	50 samples each BH

S.N	Nature of work	Unit	Quantum	Remarks
b	Check Samples of Drill Core	No	25	
3	**XRF Analysis (Major Oxides & Trace) - 24 elements**			
a	Primary Samples	No	50	
b	Check Samples	No	5	
4	**XRD Analysis**	No	5	
5	**Physical & Petrological Studies**			
a	Preparation & Study of thin polished section (with 5 digital photographs)	No	15	
7	**EPMA Study**	Hour	15	5 samples
Phase II				
H	**Exploration Drilling**			
1	Exploration Drilling	m	2200	Approx. 19 BHs in 200m x 400m grid
I	**BH GEOPHYSICAL LOGGING**			
1	BH Logging	m	1000	
J	**Laboratory Studies of BRS/TS**			
1	**Analysis of Core sampssles** (ICP-MS Method: REE & Trace Elements)			
a	Primary Samples	No	1000	50 samples each BH
b	Check Samples of Drill Core	No	100	
2	**Physical & Petrological Studies**			
a	Preparation & Study of thin polished section (with 5 digital photographs)	No	10	
3	**Specific Gravity**	No	5	
K	**Geological Report Preparation**			
1	Geological Report Preparation	No	1	5 Hard copies with a soft copy

7 TIME SCHEDULE AND COST ESTIMATES

7.1 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. 7-1.

Table 7-1: Time Schedule

Activity	Months													
	1	2	3	Review	4	5	6	Review	7	8	9	Review	10	11	12
Desktop study & reinterpretation of existing geophysical data (including obtaining clearances etc)															
Camp setting															
Geological Mapping (DM 1:2000 scale)															
Topography Survey & Contouring (1:2000 scale)															
Trenching/Channel/Bedrock Sampling															
Geophysical Survey															
Drilling															
BH Geophysical Survey															
Sample Preparation															
Laboratory Studies															
Petrographic Studies/ XRD/ EPMA															
Geological Report Preparation & submission to NMET															

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.

7.2 Cost estimates

Based on the Schedule of Charges (SoC) of projects funded by National Mineral Exploration & Development Trust (NMEDT) w.e.f. 15.12.2025 tentative cost has been estimated for this project. The total estimated cost is Rs. 661 Lakhs. The summary of cost estimates for Preliminary Exploration (G-3 Level) is given in Table No. 7-2 and details of cost estimates are given in Table No. 9-1

Table 7-2: Summary of Cost estimates

Sl. No	Item	Estimated Cost	
		INR	INR, Cr
Phase I			
A	Geophysical Survey Work	315,000	0.03
B	Geological Mapping & Asso. Works	36,600	0.004
C	Pitting & Trenching	206,250	0.02
D	Other charges	3,333,430	0.33
E	Ground Geophysical Survey	1,440,000	0.14
F	Drilling (1st Phase)	8,210,000	0.82
G	Laboratory Studies	3,718,000	0.37
Phase II			
H	Geological Works for Drilling	3,099,312	0.31
I	Drilling (2nd Phase)	22,798,000	2.28
J	Miscellaneous Charges for Drilling	2,500,000	0.25
K	BH Geophysical Survey	1,403,941	0.14
L	Laboratory Studies	8,188,500	0.82
M	Geological report preparation	750,000	0.08

Sl. No	Item	Estimated Cost	
		INR	INR, Cr
N	Report Peer Review	30,000	0.003
O	GST (18%)	10,085,316	1.01
	Grand Total	**66,114,849**	**6.61**

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 SB 3 block over an area of 2.00 sq. km. is given in Table 9-1.

Table 9-1: Cost Estimate for Preliminary Exploration (G-3 Level) Proposal for REE & Rare Metals in Siwana SB-3 Block, Balotra, Rajasthan

Title of Project – Siwana SB-3 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 – 3, 6 & 9 months							
Sl. No.	**Item of work**	**Unit**	**Rates as per SoC 2025-26**		**Estimated Cost of the Proposal**		**Remarks**
			SoC-Item -Sl No.	**Rates per Unit as per SOC (Rs)**	**Quantum**	**Total Amount (Rs)**	
	Phase I						
A	***GEOPHYSICAL SURVEY DATA INTERPRETATION*** ***Reinterpretation of existing ground and airborne database, characterize the GP signals with the rock types and host lithology by overlay analysis***						
1	Geophysicist (HQ)	Mandays	3.18a	10,500	30	315,000	
					Sub-*Total* A	**315,000**	
B	***GEOLOGICAL MAPPING & ASSOCIATED ACTIVITIES***						
1	Detailed Mapping (1:2000 scale)	sqkm	1.1	18,300	2	36,600	
					Sub-*Total* B	**36,600**	
C	***PITTING & TRENCHING***						
1	Trenching	cubic meter	2.1.1	4,125	50	206,250	
					Sub-*Total* C	**206,250**	
D	***OTHER CHARGES***						
1	Geologist (Field)	Mandays	1.2.1a	14,500	90	1,305,000	
2	Geologist (HQ)	Mandays	1.2.1a	10,500	30	315,000	
3	Labor (Field) - 2 No per Geologist	Mandays	5.8	541	180	97,380	As per rates prescribed by Central Labor Commission or respective State Govt. whichever is higher
4	Sampler - 1 No	Mandays	1.2.1b	7,850	55	431,750	

Sl. No.	Item of work	Unit	Rates as per SoC 2025-26		Estimated Cost of the Proposal		Remarks
			SoC-Item -Sl No.	Rates per Unit as per SOC (Rs)	Quantum	Total Amount (Rs)	
5	Labor (Sampling) - 4 Nos	Mandays	5.8	541	220	119,020	As per rates prescribed by Central Labor Commission or respective State Govt. whichever is higher
6	Surveyor (mapping)	Mandays	1.3.1	10,500	20	210,000	
7	Labor (Survey) - 4 Nos	Mandays	5.8	541	120	43,280	As per rates prescribed by Central Labor Commission or respective State Govt. whichever is higher
8	Drone Topographic Survey (1:2000 scale)	Per sqkm	7b	70,000	2	140,000	
9	DGPS Survey of Block Boundary Points & Boreholes	Per point	1.3.2	24,000	28	672,000	
					Sub-Total D	**3,333,430**	
E	***GROUND GEOPHYSICAL SURVEY WORK***						
1	Gravity-Magnetic Survey	Station	3.1b	4,500	250	1,125,000	
2	Geophysicist (HQ)	Mandays	3.18a	10,500	30	315,000	
					Sub-Total E	**1,440,000**	
F	***DRILLING (1st Phase)***						
1	Drilling (Hard Rock) (HQ)	m	2.2.1.1d	10,000	800	8,000,000	
2	Land Compensation	per BH	5.6	30,000	5	150,000	As per actuals as certified by local authorities subject to a maximum of 30,000 per BH
3	Construction of concrete Pillar (12"x12"x30")	per BH	2.2.7	2,000	5	10,000	
4	Borehole Plugging by Cement	per BH	2.2.8	10,000	5	50,000	
					Sub-Total F	**8,210,000**	
G	***LABORATORY STUDIES***						
1	**Analysis of Bedrock & Trench Samples (ICP-MS Method) (REE & Trace Elements)**						
a	Primary Samples	No	4.1.16f	7,400	150	1,110,000	
b	Check samples (BRS+TS)	No	4.1.16f	7,400	15	111,000	

Sl. No.	Item of work	Unit	Rates as per SoC 2025-26		Estimated Cost of the Proposal		Remarks
			SoC-Item -Sl No.	Rates per Unit as per SOC (Rs)	Quantum	Total Amount (Rs)	
2	**Analysis of Core Samples (ICP-MS Method) (REE & Trace Elements)**						
a	Core Samples	No	4.1.16f	7,400	250	1,850,000	
b	Core samples: Check	No	4.1.16f	7,400	25	185,000	
3	**XRF Analysis (Major Oxides & Trace)**						
a	Primary Samples	No	4.1.17a	4,200	50	210,000	
b	Check samples	No	4.1.17a	4,200	5	21,000	
4	***XRD Analysis***	No	4.5.3	4,000	5	20,000	
5	**Physical & Petrological Studies**						
a	Preparation of thin polished section	No	4.3.2	800	10	8,000	
b	Study of thin polished section (with 5 Photographs)	No	4.3.4	2,800	10	28,000	
6	***EPMA Study***	Hour	4.4.1	10,500	15	157,500	5 samples considered
					Sub-Total G	**3,718,500**	
					Sub-Total of Phase I	**17,259,780**	
	Phase II						
H	***GEOLOGICAL WORK (Mainly Core Logging)***						
1	Geologist (Field - Core Logging)	Mandays	1.2.1a	14,500	90	1,305,000	
2	Labour charges (for sample collection, packaging, carrying, 2 Nos)	Mandays	5.8	541	180	97,380	As per rates prescribed by Central Labor Commission or respective State Govt. whichever is higher

Sl. No.	Item of work	Unit	Rates as per SoC 2025-26		Estimated Cost of the Proposal		Remarks
			SoC-Item -Sl No.	Rates per Unit as per SOC (Rs)	Quantum	Total Amount (Rs)	
3	Geologist (HQ)	Mandays	1.2.1a	10,500	30	315,000	
4	Sampler - 1 No	Mandays	1.2.1b	7,850	138	1,083,300	
5	Labor (Sampling) - 4 Nos	Mandays	5.8	541	552	298,632	As per rates prescribed by Central Labor Commission or respective State Govt. whichever is higher
					Sub-Total H	**3,099,312**	
I	***DRILLING (2nd Phase)***						
1	Drilling (Hard Rock) (HQ)	m	2.2.1.1d	10,000	2200	22,000,000	
2	Land Compensation	per BH	5.6	30,000	19	570,000	As per actuals as certified by local authorities subject to a maximum of 30,000 per BH
3	Construction of concrete Pillar (12"x12"x30")	per BH	2.2.7	2,000	19	38,000	
4	Borehole Plugging by Cement	per BH	2.2.8	10,000	19	190,000	
					Sub-Total I	**22,798,000**	
J	***MISCELLANEOUS CHARGES FOR DRILLING (Phase I + II)***						
1	Drill Rig Transportation (To & Fro)	Lumpsum	2.2.9(4)			2,500,000	
2	Drilling Camp Setting Cost						
3	Drilling Camp Winding Cost						
4	Monthly Accommodation Charges						
5	Approach Road to Drill site						
6	Drill Core preservation (1500m core to be preserved, 1 complete BH and skeletonized mineralized zones from each BH)						
					Sub-Total J	**2,500,000**	
K	***BH GEOPHYSICAL SURVEY***						
1	BH Geophysical Survey	LS	3.1			1,088,941	For 1000m logging

Sl. No.	Item of work	Unit	Rates as per SoC 2025-26		Estimated Cost of the Proposal		Remarks
			SoC-Item -Sl No.	Rates per Unit as per SOC (Rs)	Quantum	Total Amount (Rs)	
2	Geophysicist (HQ)	Mandays	3.18a	10,500	30	315,000	
					Sub-Total K	**1,403,941**	
L	***LABORATORY STUDIES***						
1	**Analysis of Core Samples (ICP-MS Method) (REE & Trace Elements)**						
a	Core Samples	Per sample	4.1.16f	7,400	1000	7,400,000	
b	Check Samples of Drill Core	Per sample	4.1.16f	7,400	100	740,000	
2	**Physical & Petrological Studies**						
a	Preparation of thin polished section	Per sample	4.3.2	800	10	8,000	
b	Study of thin polished section (with 5 Photographs)	Per sample	4.3.4	2,800	10	28,000	
3	***Specific Gravity Determination***	Per sample	4.8.1	2,500	5	12,500	
					Sub-Total L	**8,188,500**	
					Sub-Total for Phase II	**37,989,753**	
					Sub-Total for Phase I + II	**55,249,533**	
M	***GEOLOGICAL REPORT PREPARATION***						
1	Geological Report Preparation charge	Lumpsum	5.2(iii)	Total cost of the project exceeding than 150 lakhs		750,000	As per SoC
					Sub-Total M	**750,000**	

Sl. No.	Item of work	Unit	Rates as per SoC 2025-26		Estimated Cost of the Proposal		Remarks
			SoC-Item -Sl No.	Rates per Unit as per SOC (Rs)	Quantum	Total Amount (Rs)	
N	***PEER REVIEW***						
1	Report Peer Review by External Expert	Lumpsum	As per EC decision	30,000	1	30,000	
					Sub-Total N	**30,000**	
					PROJECT COST WITHOUT GST	**56,029,533**	
					18% GST	**10,085,316**	
					TOTAL PROJECT COST	**66,114,849**	

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