

Proposal for
Prospecting scale work (G3) for REE and associated Rare Metals in the NB 16 block of the northern part of the Siwana Ring Complex, Balotra district, Rajasthan

(REE and associated rare metals)

By

Hindmetal Exploration Service Pvt. Ltd.

Place: Udaipur

Date: 19th February 2026

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| Features | Details |
|---|---|
| Block Name | NB16 Block, Siwana Ring Complex |
| Exploration Agency | Hindmetal Exploration Services Pvt. Ltd. |
| Commodity | REE and associated rare metals |
| Mineral Belt | Siwana Ring Complex |
| Completion Period with entire Time schedule to complete the project | 4+8=12 months(Phase-1 +Phase2) |
| Objectives | To explore REE and associated rare metal in Siwana ring complex. |
| 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 | <p>M/s. HESPL would carry out major work based on in-house capabilities. Inhouse and outsource work details will be provided in budget sheet.</p> |
| Name/ Number of Geoscientists | 3-Geologist, 1-Geophysicist and 1-consultant |
| Expected Field days | Geologist: ~ HQ-60 man-days, Field~180 man days Geophysicist: ~ 30 (HQ + Field) |



| | | |
|-----------|--|--|
| | (Geology) Geological Party Days | Geological Party Days: Approximately 07 months |
| 1. | Location | Dist. Balotra, Rajasthan |
| | Latitude (N) | 25.725869° to 25.751952° |
| | Longitude (E) | 72.344841° to 72.354640° |
| | Localities | Siwana Town |
| | Tehsil/ Taluk | Siwana |
| | District | Balotra |
| | State | Rajasthan |
| 2. | Area (hectares/ square kilometers) | 2 Sq.km. |
| | Block Area | 2 Sq.km. |
| | Forest Area | NA |
| | Nearest Rail Head | Baltar |
| | Road | NH-325 |
| | Airport | Jodhpur |
| 4. | Hydrography | |
| | Local Surface Drainage Pattern (Channels) | |
| | Rivers/ Streams | |
| | Mean Annual Rainfall | 280mm |



| | | |
|-----------|--|---|
| | Temperatures | Minimum (December): 20-29 °C Maximum (June): 46-51°C |
| 6. | Topography | Topographically, the area is plain, agriculture land & linear hill exposures. |
| | Toposheet Number | 45 C/05, 45C/06 |
| | Morphology of the Area | Mostly flat and elevated ridges |
| 7. | Availability of baseline geoscience data | Geological map (1: 50000), Geochemistry (soil and stream) Geophysics (Regional Airborne Mag) and Radiometrics |
| | Geological Map (1:50K/ 25K) | 1:50,000 scale after GSI |
| | Geochemical Map | NGCM data available (NGCM, GSI, 2*2 km grid) |
| | Geophysical Map (Aeromagnetic, ground geophysical, Regional/ local scale GP maps) | Regional Airborne Magnetic, Airborne Radiometrics |
| 8. | Justification for taking up reconnaissance survey / Regional Exploration | REE and associated rare metal <ul style="list-style-type: none"> • Continuity of regional of magnetic units. • Spectrometric anomalies • Geochemical analysis of samples • LREE/HREE ratio |

Block Summary

This block falls in Survey of India Toposheet no. 45C/05 and 45C/06 of Balotra district, Rajasthan. The nearest railway station is at Mokalsar and Balotra is situated at 35km northwest from study area. The field area is approachable from Jaipur and Jodhpur by train and bus up to Balotra. Further Balotra to study area is connected by roadways and local bus and auto services. Metalled, un-metalled road & Dirt connects the different villages of study area. However, township, high settlement areas are mostly accessible by metalled road Topographically, the area is plain, agriculture land & linear hill exposures. Geologically, the area is a part of Siwana Ring Complex (SRC) of Malani Igneous Suite (MIS). Location Map is given in Figure.1.

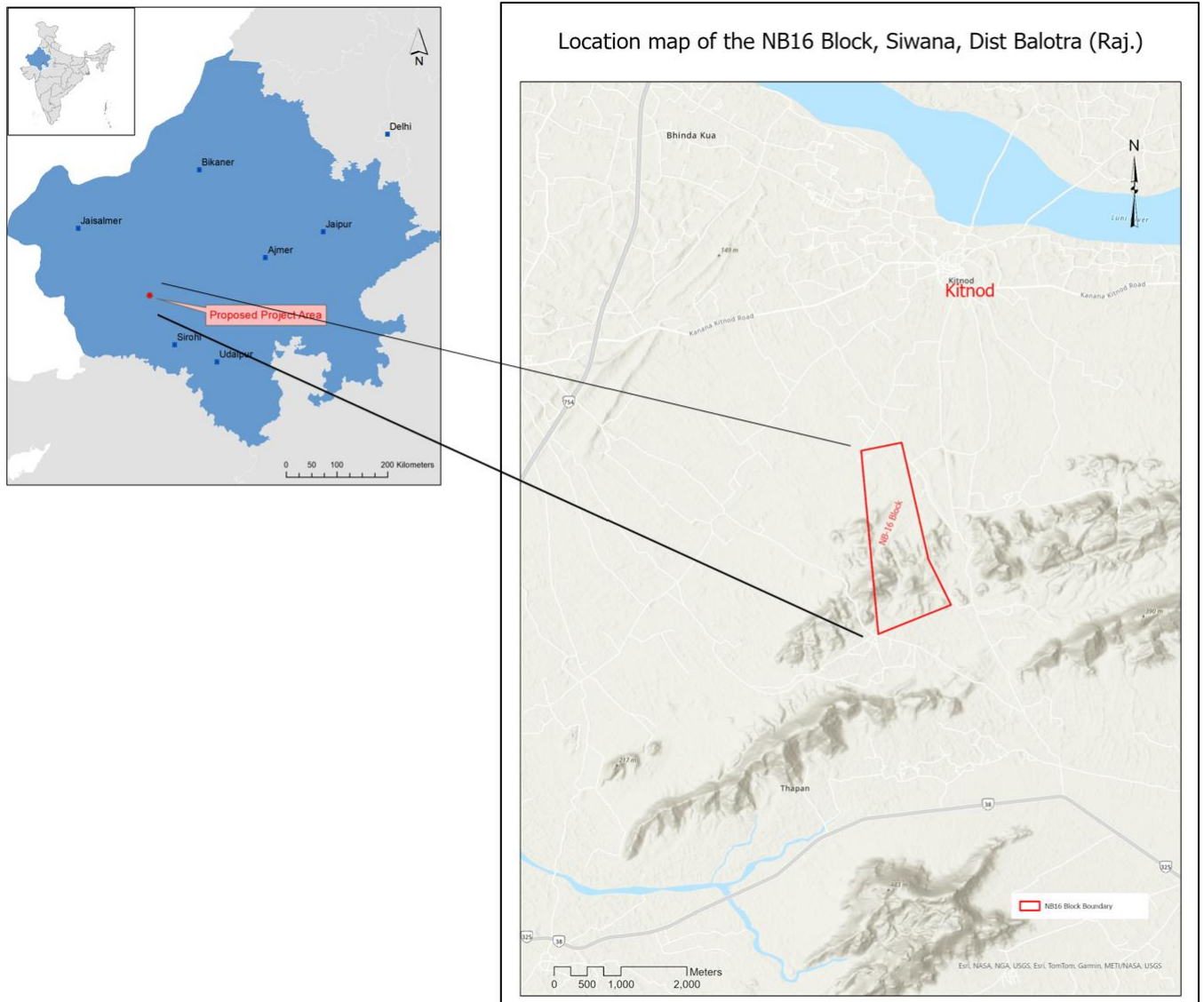


Figure 1: Location Map of the NB-16 Block

Physiography & Climate

The area is plain, undulated and rugged in places. Barmer district is situated in Thar Desert with an average rainfall 277 mm per annum and represents arid climatic conditions. The climate is characterized by low rainfall with erratic distribution, extremes of diurnal and annual ranges of temperatures, low humidity and high wind velocity. The arid climate has marked variations in diurnal and seasonal ranges of temperature, characteristic of warm-dry continental climates. During summer (March to June), the maximum temperature generally varies between 46 and 51 ° C. Night temperatures decrease considerably to 20-29 ° C. January is the coldest month. During winter (December to February), minimum temperatures may fall to 0 ° C at night.

Background Geology (Regional Geology, Geology of the Block)

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).

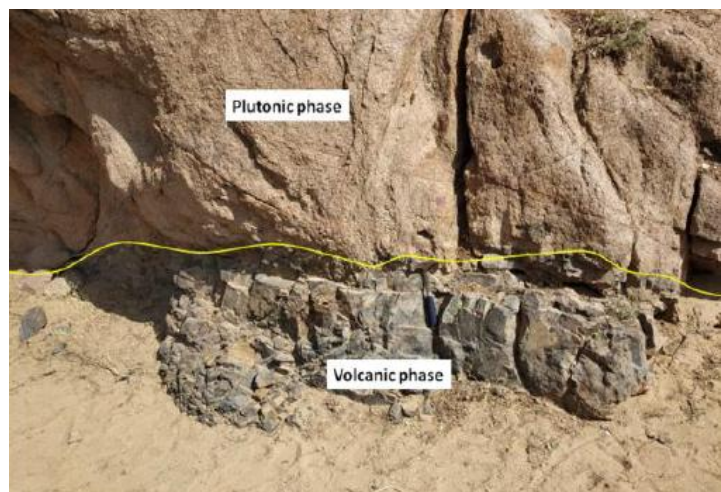
In the Western Indian Craton of Rajasthan, basement rocks and overlying supracrustal belts of Aravalli and Delhi Supergroups have witnessed magmatic events of volcanics and granitoids of Palaeo- to Neo-Proterozoic ages. Granitoids of different ages (~ 1.8 Ga, ~1.7 Ga, ~1.4 Ga, ~ 1.1Ga and 850-750 Ma) 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 co-genetic 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 are 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).

| Super group | | Age in Ma. |
|--|---|----------------|
| Marwar Supergroup | | 550 – 500 Ma |
| Upper Vindhyan Supergroup (Jodhpur Sandstone) | | ~700 – 600 Ma |
| Malani Igneous Suite | Siwana, Jalore, Tusham, Jhunjhunu (India), Kirana Hills (Pakistan) | 732 Ma |
| Erinpura Granite | | 900 Ma |
| Delhi Supergroup | | 1600 – 900 Ma |
| -----Unconformity----- | | |
| Aravalli Supergroup | | 2200 – 1800 Ma |
| -----Unconformity----- | | |
| Bhilwara Supergroup | | 2900 – 2600 Ma |
| Mewar Gneiss | | 3300 – 3000 Ma |

Table- 5.1: Generalized Precambrian Tectono-Stratigraphy of Aravalli Craton, India. (Stratigraphy after Roy,



Geology of the Block area:

The mapped area, in northern half, is mainly constituted by linear ridges of predominantly acidic flows interlayered with few basic flows. In general, flow trends show elliptical pattern sloping gently towards core of the ellipse, supporting ring structure. The rhyolite country rock is later intruded by both felsic and basic dykes, which show arcuate and radial pattern with respect to ring structure. These cross-cutting dykes are observed around Nimle-Kerli- Ramdev and around Sainji-ki-Beri, SE of Meli and Muthli area. Peralkaline aegirine-arfvedsonite bearing Siwana granite is exposed and occupies southern, eastern and western periphery of SRC. In northern half, the granite is exposed around north-eastern part around NNE of Meli; in eastern part around Mawri and in western part around Indrana respectively. The southern half

of SRC is constituted by granite ridges forming Chhappan-ka-Pahar comprising maximum width of about six km. South of Chhappan-ka-Pahar, a mass of felsic-volcanic flows are exposed widespread from Dhiran in east to Kundal, Ghor Mera Pani and Siner in the west. In general, the slope of the flows is gently towards north. Depending upon rock types and field observations in the area, the present authors suggest that there are broadly two phases of igneous activities. **Phase I** is comprising of ‘**Flow phase**’ which is followed by ‘**Dyke phase**’ within flows, while **Phase II** is represented by intrusive ‘**Granite phase**’ and later intrusive **Microgranite phase**.

Geological map of the NB16 Block, Siwana, Dist Balotra (Raj.)

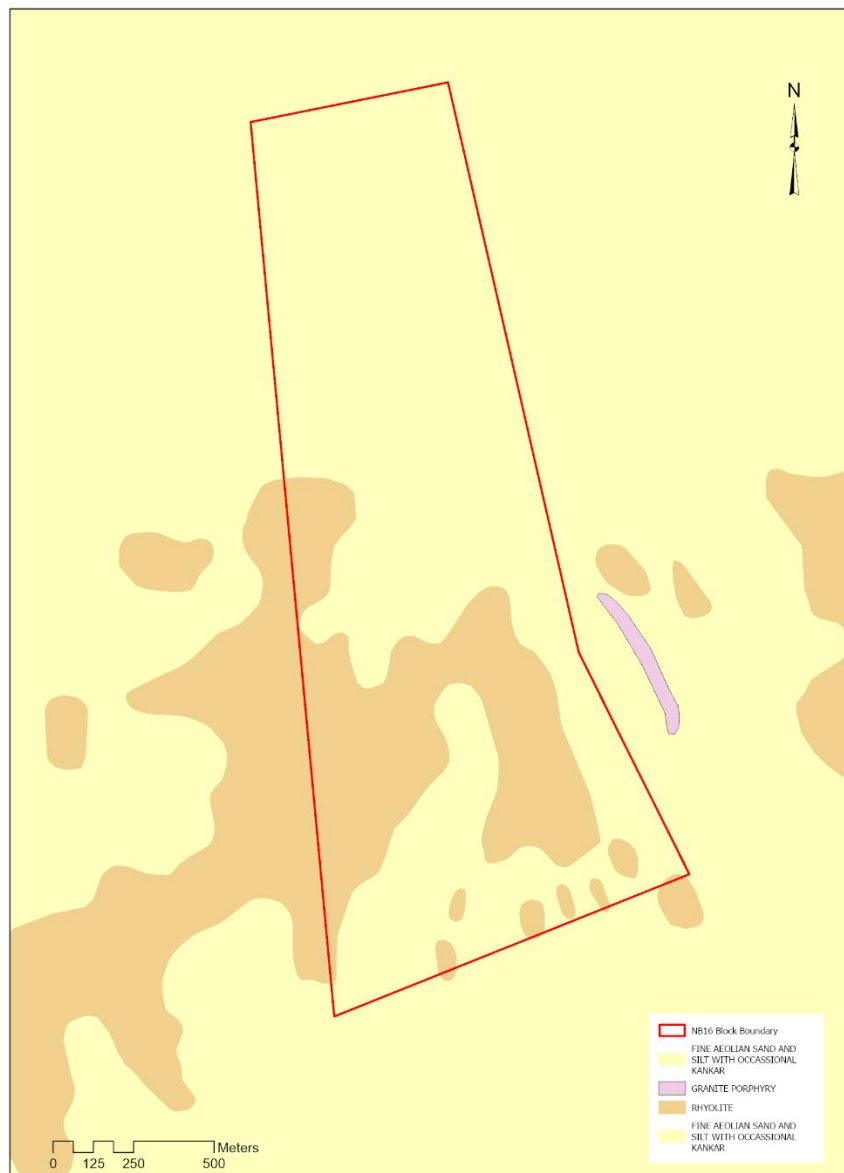


Fig.2: Geological map of NB-16 Block for G3 level work

Regional Geophysics:

1. Magnetic Survey:

Regional magnetic surveys show circular to arcuate magnetic anomalies, reflecting the ring-dyke structure of the complex. High magnetic signatures are associated with mafic dykes and syenitic intrusions, while low magnetic zones correspond to peralkaline granites and carbonatites, which are favourable hosts for rare earth element (REE) and niobium (Nb) mineralization.

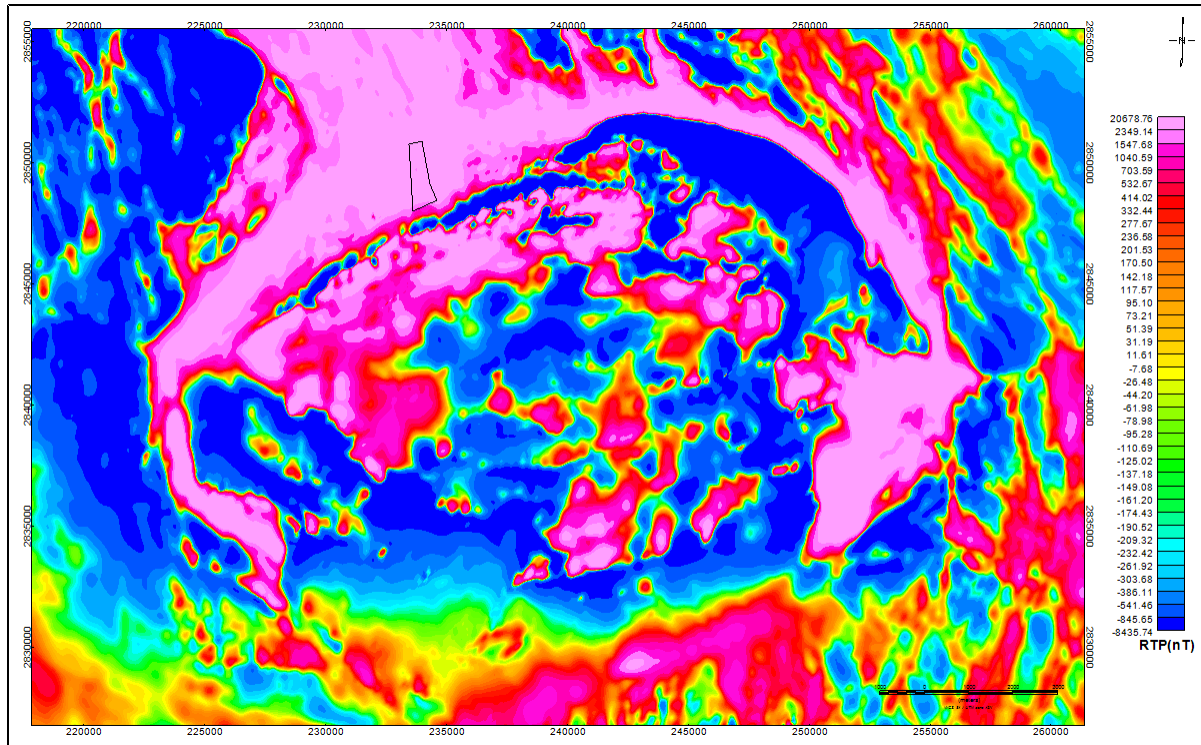


Figure 3: Airborne RTP Magnetic Map around NB-1 Block (black polygon)

2. Radiometric Survey:

Airborne radiometric surveys over the Siwana Ring Complex (SRC), Western Rajasthan reveal strong thorium, uranium, and potassium anomalies that coincide with peralkaline granites, syenites, and carbonatites. These results confirm the complex's high potential for rare earth element (REE) and niobium (Nb) mineralization. High thorium (Th) and uranium (U) counts were recorded, especially along the southern and central parts of the ring complex. Potassium (K) anomalies correlate with feldspar-rich peralkaline granites. These anomalies are spatially linked to REE-bearing minerals such as bastnäsite, monazite, and zircon.

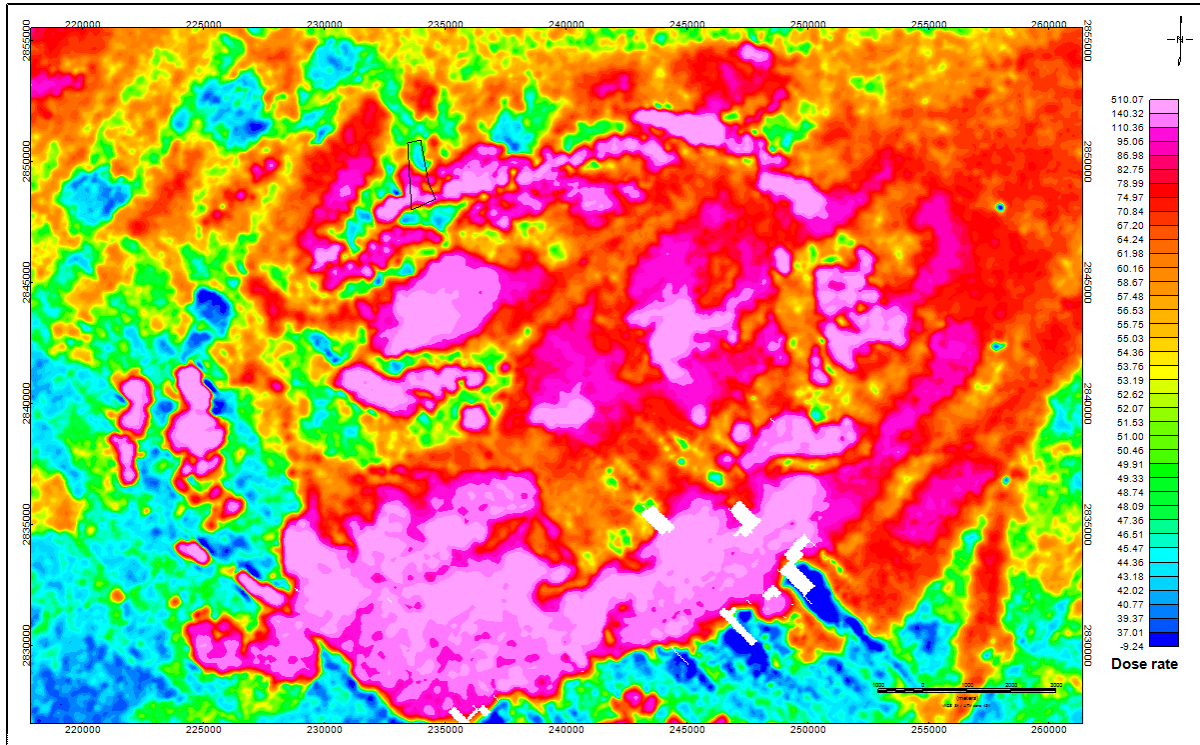


Figure 4: Airborne Radiometric Map around NB-1 Block (black polygon)

Previous work in Block:

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 Σ REE ranging from 1334 to 3319ppm Σ REE (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 lithounits 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) Σ REE+Y = 0.015%-0.96% and v) Enclave/Restite (n=19) Σ 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 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.

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 Σ REE+Y values ranging from 91.76ppm to 9764.68ppm, with average value of 1844.84ppm. Σ HREE/ Σ LREE ratio of the same is 0.15. 22 BRS samples from felsic/rhyolite dykes yielded Σ REE+Y values ranging from 144.77ppm to 7678.75ppm, with average value of 1400.14ppm. Σ REE+Y value in channel samples ranging from 261.73 to 6224.81ppm, with Σ HREE/ Σ LREE ratio of 0.19. Flow no. 14 and 15 are highly enriched REE flow of rhyolite in the area. In the proposed block Σ REE+Y in flow no. 15 ranges between 2213.43ppm to 8027.71ppm with maximum value of LREE 5079.52ppm and maximum value of HREE 992.05ppm. In flow no. 14, Σ REE+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. Spectrometric maps of potassium and thorium further suggest that the proposed area possesses good potential for rare earth element (REE) mineralization in exposed area.

Mineral potentiality of the block:

- Anomalous REE values with Σ REE ranging from 1334 ppm to 3319 ppm after GSI, 2013-14.
- Potential lithology and younger granites which are the host for REE and associated metals
- Aeromagnetic and spectrometer anomalies

Scope of the present exploration:

Proposed exploration program will focus on detailed geological and geophysical work over allotted area to upgrade the block from G4 to G3 stage. Preliminary Drilling will also be executed based on quality targets identified in block.



The exploration task flow is proposed to be done in two phases, each having distinct tasks and milestone. A summary of activities for both phases of the proposed exploration is given below:

Phase I (Approximately 4 months):

For the total block area (2 sq.km.) initial assessment will be performed by litho-structural mapping (1:2,000 scale) and geochemical survey. After geological mapping and sampling results within area, geophysical survey (ground magnetic, radiometric) will be carried out to identify anomalous mineralised targets.

This phase will consist of 800 m core drilling in 05 boreholes and thereafter the chemical and petrographic analysis of the core samples will be carried out. Core drilling will help to identify and characterise potential mineralized zones.

Interpretation, report preparation and final submission of project.

Phase II (Approximately 8 months):

Based on exploration results of Phase -I, data will be presented and peer reviewed for execution of drilling of 2200 (Phase-II).

Exploration program timelines are given in table.1 below.

Timeline:

| Time schedule for Preliminary Exploration (G3) for REE and associated Rare Metals in the NB 1 block (2.00 sq. km.) in the northern part of the Siwana Ring Complex, Balotra district, Rajasthan. | | | | | | | | | | | | | |
|--|--|--------|---|---|---|---|---|---|---|---|----|----|----|
| SN | Nature of work | Months | | | | | | | | | | | |
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 1 | Desktop study and reinterpretation of existing geophysical data (including obtaining necessary clearances etc) | ■ | | | | | | | | | | | |
| 2 | Camp setting | | ■ | | | | | | | | | | |
| 2 | Geophysical Survey-Magnetic | | ■ | ■ | | | | | | | | | |
| 3 | Geological Mapping (DM, 1 :2000) | | ■ | ■ | | | | | | | | | |
| 4 | Topographic Survey and contouring (1 :2000 scale) | | | ■ | | | | | | | | | |
| 5 | Trenching/Channel/ Bedrock Sampling | | | ■ | | | | | | | | | |
| 7 | Drilling | | | | ■ | ■ | ■ | | | | | | |
| 8 | Sample Preparation | | | | ■ | ■ | ■ | | | | | | |
| 9 | Laboratory Studies | | | | | | ■ | | | | | | |
| 10 | Petrographic Studies / XRD / EPMA | | | | | | | | | | | ■ | |
| 11 | Geological Report Preparation & submission to NMEDT | | | | | | | | | | | ■ | ■ |

Table.1: Timeline for execution of exploration Program



Budget:

Exploration budget for execution of exploration program is given below in table.2. This budget has been proposed for phase-1 exploration program. Based on success of exploration results, separate budget will be presented for approval for phase-2 program.

| Preliminary Exploration (G3) for REE and associated Rare Metals in the NB 16 block of the northern part of the Siwana Ring Complex, Balotra district, Rajasthan. | | | | | | | |
|--|--|-------------|--|----------------------------|--------------------------------|-------------------|----------|
| Block area- 2.0sq. km; Nos. of Boreholes-24 Nos.; Borehole depth range: 125m each ; Total Drilling: 3000 m; Schedule timeline- 12 months (Phase 1 to be completed in 4 months and Phase 2 be completed in 8 months). Review after: 3rd, 6th and 9th months | | | | | | | |
| S. No. | Job Description | Unit | Rates will be as per revised NMEDT SoC | | Estimated Cost of the Proposal | | |
| | | | SoC-Item -SI | Rates as per SoC (2025-26) | Qty. | Total Amount (Rs) | |
| Phase I | | | | | | | |
| A | Geo Physical Survey (Phase I) (Reinterpretation of existing ground and airborne database, characterize the GP signals with the rock types | | | | | | |
| i | Geophysicist: at HQ | Mandays | 3.18a | 10500 | 30 | 315000 | |
| ii | Magnetic Survey (10-30 lkm) | Per station | 3.2a(i) | 1800 | 650 | 1170000 | |
| | Sub Total A | | | | | 1,485,000 | |
| B | Geological Mapping (DM) (1:2000) with contouring (1st Phase) | | | | | | |
| | Sub Total B | | | | | 36,600 | |
| C | Pitting/Trenching | | | | | | |
| | Sun Total C | | | | | 206,250 | |
| D | Other Charges Related to 1st Phase Work | | | | | | |
| | Sub Total D | | | | | 3,320,070 | |
| E | Drilling (1st Phase) Outsourced | | | | | | |
| | Sub Total E | | | | | 8,210,000 | |
| F | Laboratory Studies | | | | | | |
| | Physical & Petrological Studies | | | | | | |
| | Sub Total F | | | | | 3,261,000 | |
| | Total A+B+C+D+E | | | | | 16,518,920 | |
| Phase II | | | | | | | |
| G | GP Investigation (2nd Phase) (Prior to 2nd phase of Drilling) | | | | | | |
| | Sub Total G | | | | | 0 | |
| H | Geological Work (Mainly Core Logging) | | | | | | |
| | Sub Total H | | | | | 3099312 | |
| I | Drilling (II nd Phase) | | | | | | |
| | Sub Total I | | | | | 22798000 | |
| I | Total Drilling cost of Phase-I +Phase II (Outsourced) | | | | | | 30000000 |
| J | Laboratory Studies | | | | | | |
| | Physical & Petrological Studies | | | | | | |
| | Sub Total J | | | | | 8188500 | |
| | Total A+B+C+D+E+F+G+H+I+J | | | | | 50604732 | |
| | Total outsourced component (if any) | | | | | 30000000 | |
| K | In case of outsourcing of work, the technical supervision cost shall be 10% of the sum of all outsourced work compensation with a maximum cap of 20 lacs | | 6 | | | 2000000 | |
| L | Total cost | | | | | | 52604732 |
| O | Project Cost without GST | | | | | | 53384732 |
| P | GST - 18% | | | | | | 9609252 |
| Q | Total Project Cost(With GST) | | | | | | 62993984 |
| | Rs. In Lacs | | | | | | 629.94 |

Table.2: Summary of proposed cost for execution of exploration Program (Phase-1 & Phase2)

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