Proposal for Reconnaissance Survey (G4) for identification of Lithium and associated minerals in Great Rann of Kachchh

Commodity: Strategic and Critical Mineral

By

Commissioner of Geology and Mining
Gujarat

Place: Gandhinagar **Date: 14/11/2024**

Block Id: CGM/NMET/Lithium/10/2024-25
Commissioner of Geology and Mining, Gujarat

Summary of the Block for Reconnaissance Survey (G4 Stage)

	Features	Details		
	Block ID	CGM/NMET/Lithium/10-2024-25		
	Exploration Agency	Commissioner of Geology and Mining		
	Commodity	Lithium mineralization		
	Completion Period with entire Time schedule to complete the project	12 months		
	Objectives	To carry out G4 level exploration for Lithium mineral		
	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	Desktop study, Previous Literature study, DGPS and Topographic survey, Geological and Geochemical mapping, Sampling and Laboratory studies will be carried out by Gujarat Mineral Research & Development Society (GMRDS)- a technical arm of CGM-Gujarat		
	Name/ Number of Geoscientists	02 Field Geologist + 02 HQ Geologist		
	Expected Field days (Geology) Geological Party Days	120 days		
1.	**Location**			
	Block corner point (Latitude and Longitude)	Block Corner points	Latitude	Longitude
		A	23°59'39.85"N	71°10'3.48"E
		B	23°58'33.00"N	71° 8'8.79"E
		C	23°57'29.87"N	71° 5'55.69"E
		D	23°57'29.89"N	71°14'44.88"E
		E	23°59'39.85"N	71°14'44.88"E
	Proposed Block Area	The Great Rann of Kachchh		
	District	Kachchh		
	State	Gujarat		

2.	**Area (hectares/ square kilometers)**	
	Block Area	45 sq.km.
	Forest Area	Nil
	Government Land Area	45 sq.km.
	Private Land Area	-
3.	**Accessibility**	
	Nearest Rail Head	Samakhiali Railway station (95 km.)
	Road	Amritsar-Jamnagar Expy (10 km.)
	Airport	Bhuj Airport (165 km approx.)
4.	**Hydrography**	
	Local Surface Drainage Pattern (Channels)	Only palaeo channels
	Rivers/ Streams	-
5.	**Climate**	
	Mean Annual Rainfall	150-300 mm
	Temperatures (December) (Minimum) Temperatures (June) (Maximum)	8° C to 50° C
6.	**Topography**	
	Toposheet Number	41M/01
	Morphology of the Area	Palaeo mudflat / rann surface
7	**Availability of baseline geoscience data**	
	Geological Map (1:50K/ 25K)	**Available**
	Geochemical Map	**Available**
	Geophysical Map (Aeromagnetic, ground geophysical, Regional as well as local scale GP maps)	**Not Available**

8.	**Justification for taking up Reconnaissance Survey / Regional Exploration**	• Surface Distribution of Geochemical data shows promising results for Li in soil variability (NGCM data value for Lithium : 8.55 to 90.47 ppm) • The source of palaeo channels (Eastern Great Rann of Kachchh is derived from the alkali rocks of Aravalli and Thar desserts. • The similar Li deposit around the world (Peru, Bolivia, Chile) are found in similar SALAR (sand flat sediment) with marshy saline environment ~ like the ran environment. • Li deposits enriched in brine, evaporate environment have been reporting world over

1. Block Summary

Physiography

The Kachchh region is tectonically-controlled landscapes where the landforms are the manifestations of earth movements along tectonic lineaments of the Pre-Mesozoic basin configuration that was produced by the primordial fault pattern in the Precambrian basement (Biswas, 1971, 1974). Taking into consideration the factors of altitude, slope and ruggedness of relief, Kachchh is divided into the Ranns, the low-lying Banni Plain, the Hilly Region and the Southern Coastal Plain.

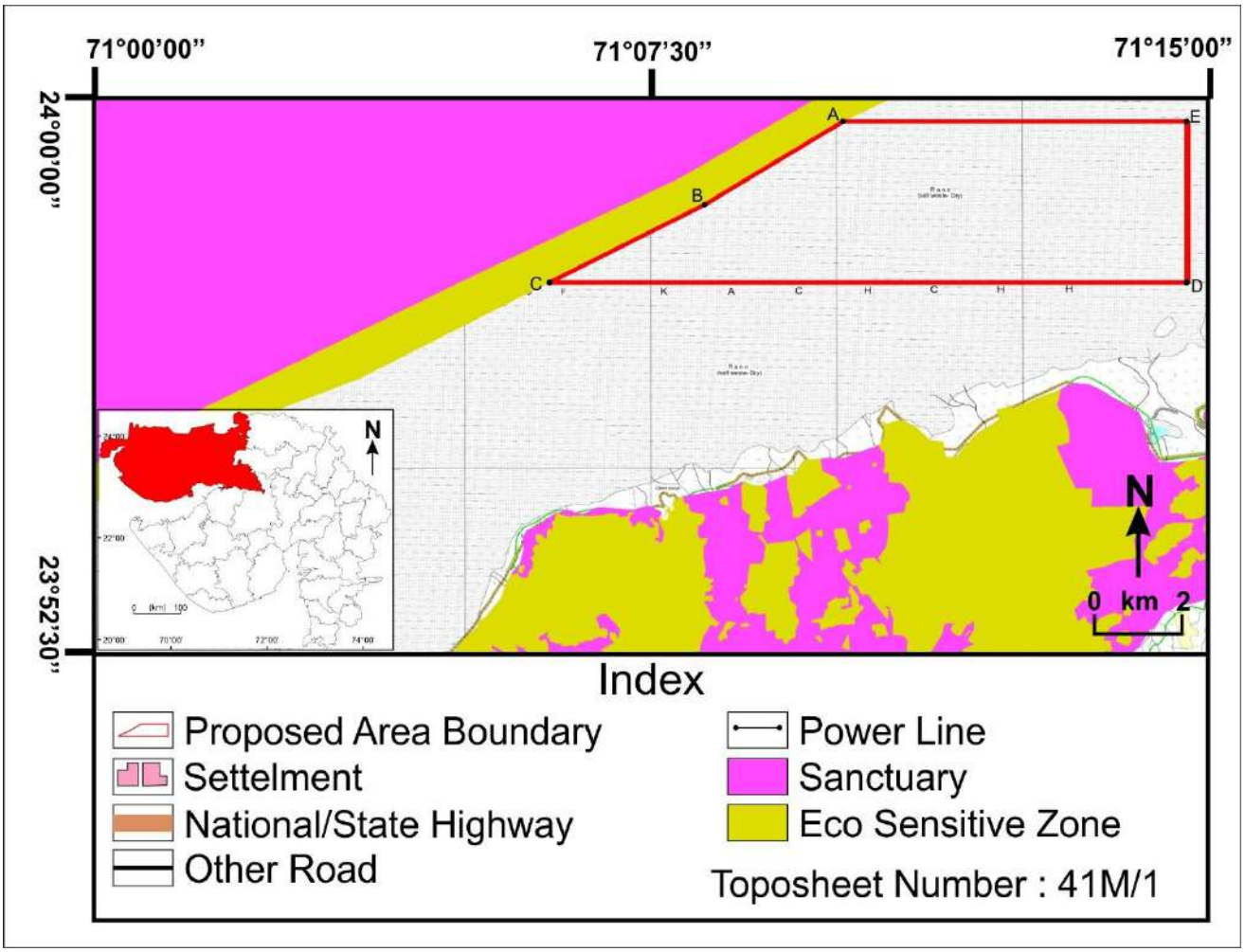

Figure 1: Proposed block on topographic sheet 41M/01

The terrain of Great Rann of Kachchh is a monotonous flat and gently sloping terrain with occasional outcrops in form of bets (islands) of rocky origin due to varied tectonic framework. The region is 2-12 m above mean sea level from west to east. The proposed block lies in the flat paleo mudflat of eastern Rann of Kachchh in the eastern fringe in topographic sheet 41 M/01 (Fig 1).

Background Geology (Regional Geology, Geology of the Block).

The Kachchh landscape comprises an array of tectonogenic geomorphic elements in the form of uplifts and residual depressions. Elevated landforms are occupied by Mesozoic and Tertiary rocks, whereas the residual depressions or low-lying regions between the uplifts consist of Quaternary sediment successions marked alluvial river terraces in the rocky mainland and the mud-flats and salt pans in the Great and Little Ranns and Banni Plains. The general forms of the uplifts are marked by domes and asymmetric anticlines. All major uplifts are bounded, at least on one side, by a fault or a sharp monoclinal flexure, and on the other side by gently dipping peripheral plains, the strata (Tertiary) in which dip gently into the surrounding residual depression (Biswas, 1993).

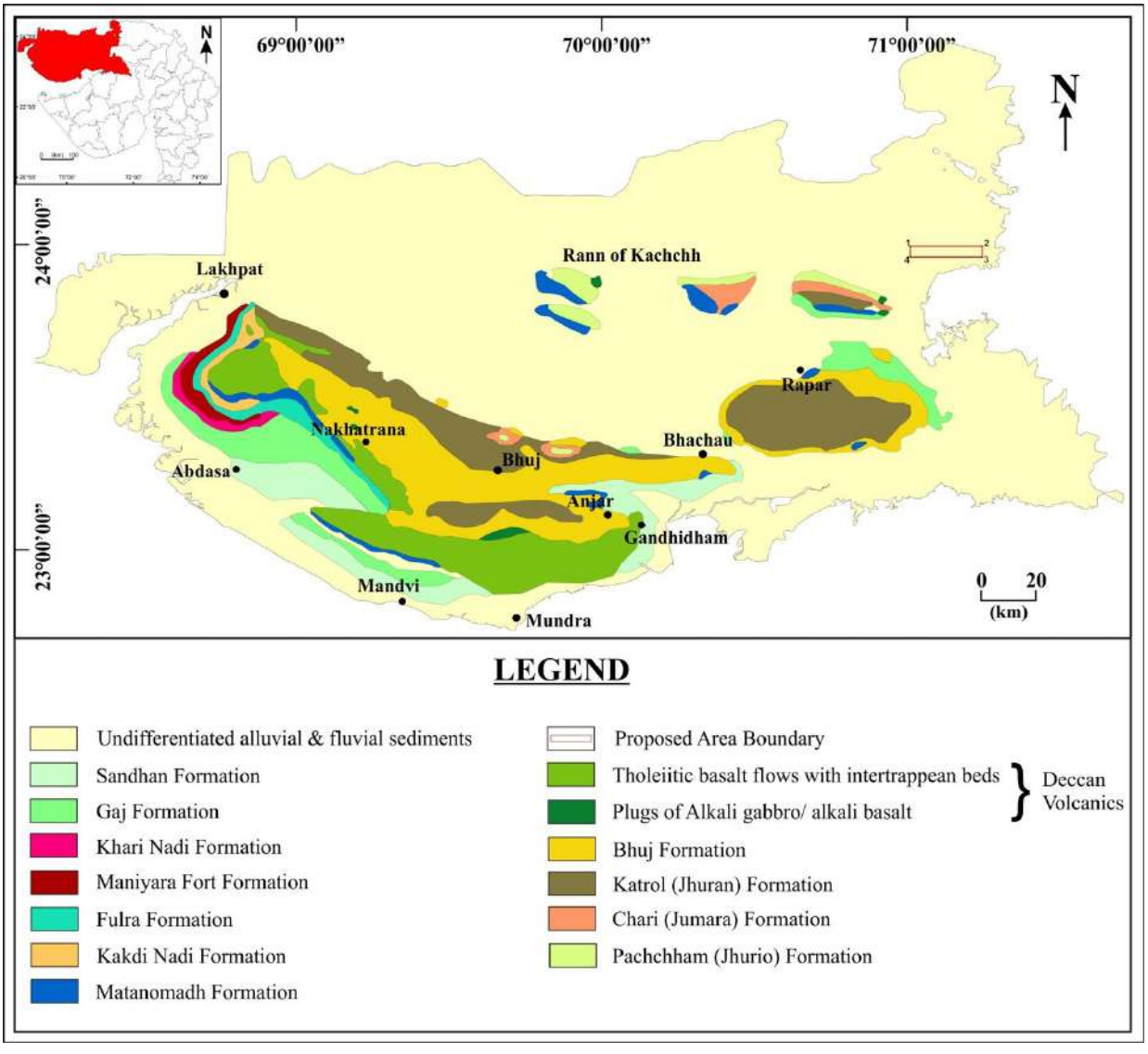

Figure 2: Regional geology of the block and site location marked in red box

Mesozoic rocks of Kachchh region are exposed in three chains of east-west trending ridges. The 2000 m thick succession of marine sedimentary rocks represent a phase of transgression of sea along the west coast during Jurassic-Early Cretaceous times. The succession has been intruded

by various sills and dikes and overlain by Deccan Traps of same age. Mesozoic rocks of Kachchh region are grouped into several formations as follows. Paccham Formation marks the beginning of Jurassic marine transgression in Kachchh. It consists of 300 m thick succession of limestone, marl and shale and has yielded pelecypods, corals and ammonites. Chari Formation consists of 400 m thick succession of limestone, marl and shale. It contains fossil remains of ammonites and gastropods. Katrol Formation is a 750 m thick succession of shale, limestone and sandstone deposited during Late Jurassic. The Katrol Formation has yielded fossils. Umia Formation is about 550 m thick succession of sandstone, sandy shale and marl. This formation is characterized by presence of ammonite fossils like. Bhuj Formation comprises of sandstone and shale and is characterized by presence of plant fossils.

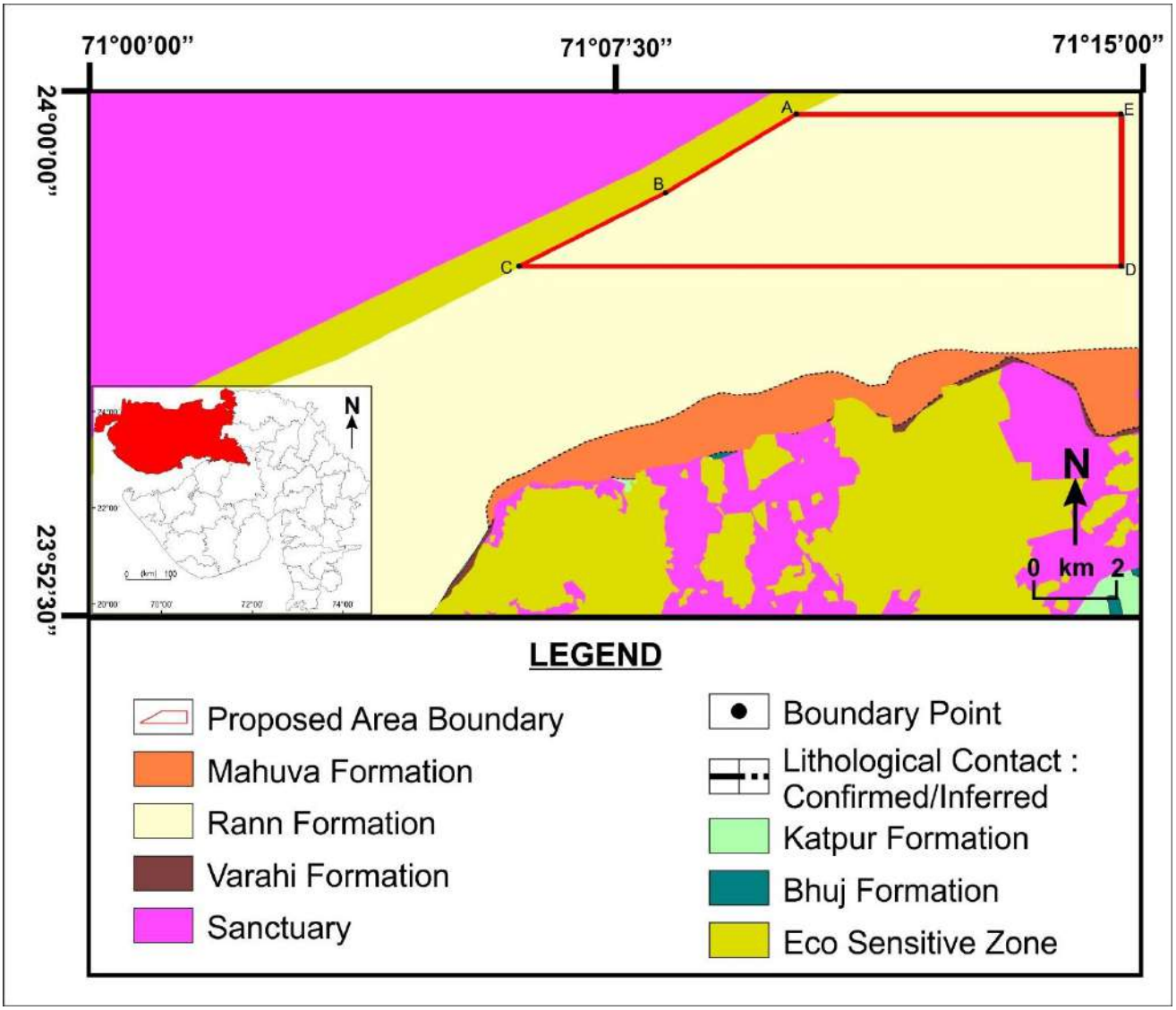

Figure 3: Geology of proposed block

The Great Rann of Kachchh is bounded by the Nagar Parkar Ranges in its north which are hosting various igneous complex, and Northern Hill Range of Kachchh Mainland in its South which are made of igneous intrusive and sedimentaries of Mesozoic age (Biswas, 1993). The parts of northern fringe of Great Rann of Kachchh also exposes small outcrop of Syenite rocks of Nagar Parkar Range which is considered as basement to Kachchh basin (Biswas, 1993). The rann sediments derive their provenance from the palaeochannels and present-day active channel of rivers which drain through the Thar dessert in eastern side and Himalayan rivers (present and palaeo tributaries of Indus) into the north. The Luni is an ephemeral river which originates at the foothills of the Aravalli ranges and flows westward into the Great Rann of Kachchh. Another The most enigmatic landscape of the western India is probably the Thar Desert which is the easternmost extension of the great Sahara-Arabian sand sea. The proposed block falls in eastern margin of Great Rann of Kachchh (Fig 3).

Mineral potentiality based on geology, geophysics, ground geochemistry etc.

Lithium brine deposits are accumulations of saline groundwater that are enriched in dissolved lithium. These sediments have formed as 'evaporites' or 'precipitates', affiliated with the deposition of sediments. These sediments are often authigenic (formed in situ) and dominant in clay minerals.

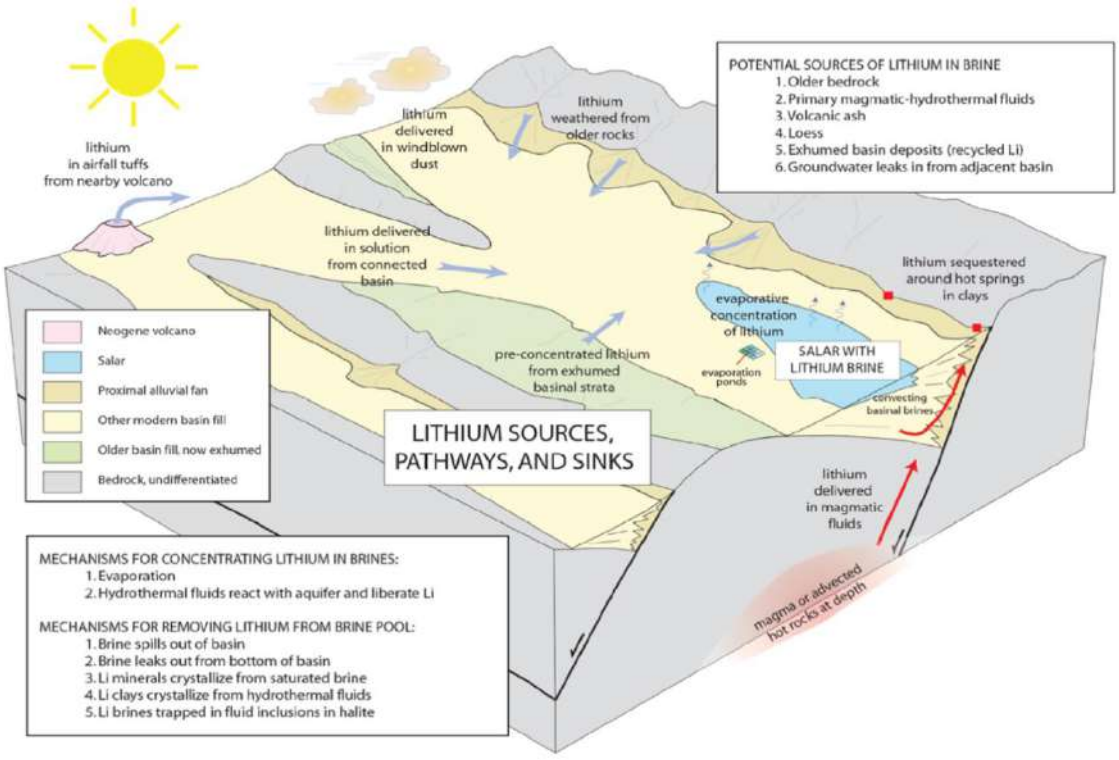

Fig 4: Schematic deposit model for lithium brines showing part of a closed-basin system consisting of interconnected subbasins (After USGS 2013-1006)

All producing lithium brine deposits share several first-order characteristics:

- arid climate
- closed basin containing a playa or salar (salt flat)
- tectonically driven subsidence
- suitable lithium source-rocks
- one or more adequate aquifers
- sufficient time to concentrate a brine.

All of whom are offered by the sediments of the Great Rann of Kachchh, Western India.

Figure 4 shows schematic picture of Lithium brine evolution in salar like subbasin. The arid / hyper arid basins due to high evaporization rate, are more favourable for enrichment of Li in sediments due to evaporite processes. Tectonic setting which facilitates subsidence leading to creation of accommodation space, is observed in all Li producing basins.

The Great Rann of Kachchh is tectonically active and while deposition of rann sediments has remained a basin for thick accumulation of Quaternary deposits (Merh, 1995). The rivers draining from the aravallis, thar dessert etc have been speculated to be sources of sediments to the rann sediments, which are known to be rich in rare earths and Li-K-Mg deposits.

Scope for proposed exploration.

The Reconnaissance survey at G4 stage exploration program proposed compromises, Large Scale Geological mapping (1:10,000 scale), Surface sampling wherein brine layer and sedimentary horizons above, trenching, pitting with associated survey, chemical analysis and geological report preparation., The collected samples would be analyzed for Li and other rare earth enrichments in XRF, ICPMS and XRD. The study would incorporate assessing evolution of brine formation and provenance of the sediments during this period to envision palaeo environment as well as brine depositional processes in the proposed block. The study would enable us to assess presence/enrichment of Li and other rare earth elements in the rann sediments and assess its scope for future extraction. In addition to exploration of scope of Li deposits in brines of Great Rann of Kachchh, study also aims to explore and assess environmental conditions and evolution of the deposit, which would be proved inform of a scientific publication.

Objective of Exploration

The current exploration project has been proposed to achieve the following objectives based on an assessment of the geological data that is now available:

1. To identify the Li bearing formation with the stratigraphic features to determine the surface manifestation and lateral disposition of the mineralization. This will be done using remote sensing analysis, geological mapping, and topographic mapping at a 1:10,000 scale.
2. To collect samples of the brine salt, surface soil, and host horizon & water analysis them for Li and other REEs to determine the next steps in the exploration program.
3. Pitting and trenching should be carried out wherever feasible if the analytical results of the surface samples show promise and are backed by evidence of the sub-surface extension of the mineralized ore body. This will determine the future exploration path, or the G3/G2 category of UNFC.
4. To estimate reconnaissance resources of Li and other REE minerals as per UNFC norms and MEMC Rules – 2015 at G4 level mineral exploration.

2. Previous Work

Previous Exploration in adjoining area (Regional area); All the sample (bed rock/trench/ groove/soil), borehole location should be plotted on the geological map and analytical data should be discussed briefly

National Geochemical Mapping Project (NGCM) under this region is also covered. This part is covered under the Kachchh Geochemical Mapping Project (KGCMP). So, Toposheet no. 41 M/01 in total 93 Stream Sediment samples were collected and all samples were analyzed. In this particular toposheet Li value is vary from 8.55 to 90.47 ppm.

CGM/ GMRDS officials has also carried out field in current year survey of the proposed area and taken surface samples/Soil Samples 05 Nos and done the chemical analysis of that samples. So chemical analysis show Lithium element result in range 41.750 to 58.610 ppm. So, sampling of the area recommended to more sampling of the area. Chemical analysis data is given as per Annexure-3.

3. Block description

Block Corner points Cardinal Points	Latitude	Longitude
A	23°59'39.85"N	71°10'3.48"E
B	23°58'33.00"N	71° 8'8.79"E
C	23°57'29.87"N	71° 5'55.69"E
D	23°57'29.89"N	71°14'44.88"E
E	23°59'39.85"N	71°14'44.88"E

4. Planned Methodology

The exploration program is proposed in accordance to the objective set for reconnaissance survey (G4) of the block. The Exploration shall be carried out as per Minerals (Evidence of Mineral Contents) Rule – 2015. Accordingly, the following scheme of exploration is formulated in order to achieve the objectives. The more details are as followed:

Literature & Remote Sensing data studies

Literature studies includes all data Previous Geological and Geochemical data, Old Lithium related literature review of probable source area of the region. Remote sensing study shall be carried out in the entire 45 sq. km. area to identification of palaeo channel and the mineral potential zones through mineral targeting process.

Survey

The block boundary will be surveyed by DGPS and Total station in WGS 84 datum for demarcation of block boundary points and also take survey of the area and prepared a topographic map on scale of 1:25,000 with contour interval of 01 to 03 mts.

Geological Mapping

Geological mapping will be carried out in the entire block area of 45 sq. km. on 1: 10,000 scale. Surface manifestations of the mineralization available along with their surface disposition will be marked on map. Grab sampling will be carried out during the Geological traverse work and will be

analyzed further for petrographic study.

Geochemical Sampling

During the course of geochemical sampling, the systematic sampling on grid interval of 500x500 mts. will be carried out along with collection of stream samples. A total of 180 nos. of surface samples shall be collected for Laboratory analysis.

Pitting

Shallow pitting shall be carried out in the potential zones identified based on the results of geological mapping and geochemical sampling. A provision for shallow trenching/pitting on mineralized zones (if any) (1m X 1-1.5m deep). The pitting number shall be about 40 Nos. Locations of trenches/pitting on ground will be decided by field geologist based on positive outcome of the sampling. A provision of 200 no. primary pitting/trenches/channel samples each is kept for analysis for REE & Li.

Laboratory Studies

All taken samples from systematic sampling and pitting samples will be analyzed by XRF, ICP-MS and XRD.

5. Nature Quantum and Target

Components	G4 Stage
Aerial reconnaissance	Remote sensing
Geological Survey	i) Geological mapping-1:10000 ii) Assessment of lithology, structure, surface mineralisation and analysis of old history of mining, if any.
Geochemical Survey	i) Regional Stream Sediment / Soil Sampling ii) Recording of broad geomorphology, drainage, etc.
Pitting/ Trenching	40 pits to expose mineralized zone. The location of Pitting and trenching will be judiciously planned to cover the entire mineralized body. Samples to be collected from top of brine, below brine and brine layer.

Grab and Chip Sampling, Surface Samples	180 Nos (Systematic Samples on grid interval of 500 x 500 mts)
Water Samples	03 Nos
Core sample	Samples to be collected from top of brine, below brine and brine layer.
Petrographic and minerographic studies	Mineral assemblage, identification of minerals of interest, source and pathway of Lithium-brine formation. Scientific investigation into Brine formation of Great Rann of Kachchh region ~ expected output – **Publication in scientific journal**
Synthesis of all available data	i) Integration of regional geophysical, geological and geochemical data. ii) Synthesis of all available data and Report writing

6. Manpower deployment

Sr. No.	Task	Target Period (Days)	No. of Man-days				Remarks
			Surveyor	Geologist (Field)	Geologist (HQ)	Labour	
01	Desktop Study	30	-	-	02 Geologist * 30= 60 days	-	Study of Previous Geological and Geochemical data, Old Lithium related literature review of probable source area, application of Remote Sensing for identification of Palaeo channel
02	DGPS and Topographic survey	60	02 Surveyor * 60 = 120 days	-	-	08 Labour * 60 = 480 days	Survey Scale- 1:25,000 Contour interval- 01 to 03 mts.
03	Geological Mapping/ Geochemical Sampling/ Pitting	120	-	02 Geologist * 120= 240 days	-	02 Labour * 240 = 480 days	Sampling : At grid interval of 500 x 500 mts interval Pitting: 40 Nos.
04	Laboratory Analysis	150	-	-	-	-	Including Sample Preparation
05	Draft Report writing Geological report	45	-	-	45 days	-	-
06	Peer Review	30	-	-	-	-	
07	Final Geological report	15	-	-	15 days	-	Incorporating with peer reviewer comments/suggestions

7. Break-up of expenditure

Tentative cost has been estimated based on actual schedule of rates mandated in the circular OM F. No. 61/1/2018/NMET dated 31st March 2020 for NMET funded projects. The total estimated cost is Rs. 143.64 lakhs. The Summary of cost estimates for Reconnaissance Survey (G4) level is given below and details of cost estimates is given in Annexure-1.

SL. NO.	Item	Estimated Cost (Rs.)
1	Survey Work	1246560
2	Geological Mapping and other Geological work & Surveying	4833120
3	Pitting/Trenching	152000
4	Laboratory Studies	5116516
	Sub Total (1 to 3)	**11348196**
5	Geological Report Writing	567410
6	Proposal Preparation	226964
7	Peer review	30000
	Total	**12172570**
	GST 18%	2191063
	Grand Total (including GST)	**14363632**
	Say Rs. In Lakhs	**143.64 Lakhs**

8. References

1. Biswas, S K. Note on the geology of Kachchh: Quat. Jour. Geol. Min. Met. Soc. India; 43: 223-236 (1971)
2. Biswas, S K. Landscape of Kachchh – A morphotectonic analysis. Indian Journal of Earth Science, 1(2): 177-190 (1974)
3. Biswas, S K. Geology of Kachchh. K.D.M.Institute of Petroleum Exploration, Dehradun, 450 p (1993)
4. Bradley D, Munk L, Jochens H, Hynek S, and Keith L. A Preliminary Deposit Model for Lithium Brines, U. S. Department of the Interior & U. S. Geological Survey, Virginia (2013)
5. Khan S, Dar S A, Khan K F, Mohd S. Rare earth element signatures of Paleoproterozoic Sallopat phosphorites of Aravalli Basin, India: implications for diagenetic effects and depositional environment, Acta Geochim (2023) 42:726–738
6. Sarvothaman H. Target Areas for Exploration of Critical Elements—K, Li and Mg—in Indian Terrain for Fertilizer, Storage Battery and Strategic Needs. Journal of Applied Geochemistry (2024)
7. Merh, S S. Geology of Gujarat (1995)
8. Strategic plans for enhancing REE exploration in India. Geological Survey of India & Atomic Mineral Directorate for Exploration and Research Department of Atomic Energy
9. The Minerals (Evidence of Mineral Contents) Rules, 2015. (As amended up to 14th December, 2021). Ministry of Mines, Government of India

List of Annexure

List of Plates

Annexure-1 : Detailed Cost Sheet

Estimated cost sheet for Reconnaissance Survey (G4) for identification of Lithium and associated minerals in Great Rann of Kachchh, Area: 45 sq. km., Scheduled Timeline: 12 months							
S. No.	**Item of Work**	**Unit**	**Rates as per NMET SoC 2020-21**		**Estimated Cost of the Proposal**		**Remarks**
			SoC-Item -Sl No.	**Rates as per SoC**	**Qty.**	**Total Amount (Rs)**	
A	**Geological Mapping Other Geological Work & Surveying**						
	Geological mapping, (1:10,000 scale) & Trenching , drilling work						
i	a. Charges for Geologist per day (Field) for geological mapping & trenching work, drilling work	day	1.2	11,000	240	26,40,000	
ii	b. Labours Charges (2 Nos)	day	5.7	522	480	2,50,560	Amount will be reimbursed as per the notified rates by the Central Labour Commissioner or respective State Govt. whichever is higher
	c. Charges for Geologist per day (HQ)	day	1.2	9,000	120	10,80,000	
	d. Charges for one Sampler per day (1 Party)	one sampler per day	1.5.2	5,100	120	6,12,000	
	e. Labours (4 Nos)	day	5.7	522	480	2,50,560	
	Sub Total- A					**48,33,120**	
B	**Ground Geophysical Survey**						
1	IP. Induced Polarization (I.P) cum Resistivity S.P and Magnetic (30 Lkm)	8-10 Line Km					
3	Geophysicist party days (Field)	per day					
4	c. Labours Charges	day					
5	Geophysicist party days (HQ)	per day					
	Sub Total- B					**-**	
C	**Survey work**						
a	DGPS Survey for BH fixation & RL determination	Per Point of observation					
b	Charges of Surveyor (1 party) for Geophysical survey layout work & Block boundary demarcation	one surveyor per day	1.6.1a	8,300	120	996000	Topographic map on scale - 1:25000 Contour Interval- 01 to 03 mts
c	Labours Charges for survey work;	day	5.7	522	480	250560	
	Sub-Total C					**12,46,560**	
D	**Trenching/Pitting**						
	a) Excavation of Trenches/pitting	per cu.m	2.1.2	3,800	40	**1,52,000**	
E	**DRILLING (after review)**						
1	Drilling up to 300m (Hard Rock)	m					
2	Borehole deviation Survey by Multishot Camera	m					
3	Land / Crop Compansation (in case the BH falls in agricultural Land)	per BH					
4	Construction of concrete Pillar (12"x12"x30")	per borehole					
5	Transportation of Drill Rig & Truck associated per drill (2 rigs)	Km					
6	Monthly Accomodation Charges for drilling Camp (up to 2 Rigs)	month					
7	Drilling Camp Setting Cost	Nos					
8	Drilling Camp Winding up Cost	Nos					
9	Road Making (Flat Terrain)	Km					
10	Drill Core Preservation	per m					
	Sub Total E						
F	**Borehole Geophysical Logging**	5 Bhs of 350m each					
G	**LABORATORY STUDIES**						
1	**Chemical Analysis**						
i)	**Geochemical Sampling-Surface samples (Bedrock/Channel /Soil/Stream sediment)**						Sampling on Grid interval of 500x500 mts- 180 Nos.
	a. analysis of sample for determination of a package by 34 elements by ICPMS	Nos	4.1.14	7,731	180	13,91,580	
	b. Rapid Geochemical analysis by AAS method for first Five radicals	Nos	4.1.7a	2,506	180	4,51,080	
	c. Rapid Geochemical analysis by AAS method for other 5 radicals (Li, Cs, Au, Ag, Cd)	Nos	4.1.7b	1,675	180	3,01,500	
ii)	**Surface Check samples (10% External)**						
	a. analysis of sample for determination of a package by 34 elements by ICPMS	Nos	4.1.14	7,731	18	1,39,158	
	b. Rapid Geochemical analysis by AAS method for first Five radicals	Nos	4.1.7a	2,506	18	45,108	
	c. Rapid Geochemical analysis by AAS method for other 5 radicals (Li, Cs, Au, Ag, Cd)	Nos	4.1.7b	1,675	18	30,150	

S. No.	Item of Work	Unit	Rates as per NMET SoC 2020-21		Estimated Cost of the Proposal		Remarks
			SoC-Item -Sl No.	Rates as per SoC	Qty.	Total Amount (Rs)	
iii)	**Pitting/ Trench & Check Samples**						
	Pitting/Trench samples						
	a. analysis of sample for determination of a package by 34 elements by ICPMS	Nos	4.1.14	7,731	200	15,46,200	Per pit total 05 samples will be taken
	b. Rapid Geochemical analysis by AAS method for first Five radicals	Nos	4.1.7a	2,506	200	5,01,200	
	c. Rapid Geochemical analysis by AAS method for other 5 radicals (Li, Cs, Au, Ag, Cd)	Nos	4.1.7b	1,675	200	3,35,000	
iv)	**Pitting/Trench Check samples (10% External)**						
	a. analysis of sample for determination of a package by 34 elements by ICPMS	Nos	4.1.14	7,731	20	1,54,620	
	b. Rapid Geochemical analysis by AAS method for first Five radicals	Nos	4.1.7a	2,506	20	50,120	
	c. Rapid Geochemical analysis by AAS method for other 5 radicals (Li, Cs, Au, Ag, Cd)	Nos	4.1.7b	1,675	20	33,500	
v)	**BH Core samples**						
	a. Au by Fire Assay	Nos					
	b. For Ag, Ni, Co, Cr, Cu, Pb, Zn, V, Ti by ICPMS-34 elements	Nos					
	c. For PGE	Nos					
vi)	**BH Core samples (10%External)**						
	a. Au by Fire Assay	Nos					
	b. For Ag, Ni, Co, Cr, Cu, Pb, Zn, V, Ti by AAS Method	Nos					
	c. For PGE	Nos					
2	**Physical & Petrological Studies**						
i	Preparation of thin section	Nos	4.3.1	2,353	20	47,060	
ii	Study of thin section	Nos	4.3.4	4,232	20	84,640	
iii	Preparation of polish section	Nos					
iv	study of polished section	Nos					
v	Digital Photographs	Nos	4.3.7	280	20	5,600	
vi	Whole Rock Analysis	Nos					
vii	Sp. Gravity	Nos					
	SEM Studies	per hour					
viii	EPMA studies	per hour					
						51,16,516	
H	**Total A to H**					**1,13,48,196**	
I	**Geological Report Preparation**	**5 Hard copies with a soft copy**	**5.2**	Exploration cost exceeding 50 lakh but less than 150 lakh: A Minimum of ₹2.5 lakh or 5% of the work whichever is more		**5,67,410**	Reimbursement will be made after submission of the final Geological Report in Hard Copies (5 Nos) and the soft copy to NMET.
J	**Peer review Charges**		**As per EC decision**			**30,000**	
K	**Preparation of Exploration Proposal (5 Hard copies with a soft copy)**	**5 Hard copies with a soft copy**	**5.1**	2% of the Cost or Rs. 5.0 Lakhs whichever is less		**2,26,964**	EA will be reimbursed after submission of the Hard Copies and the soft copy of the final proposal along with Maps and Plan as suggested by the TCC-NMET in its meeting while clearing the proposal.
L	**Total Estimated Cost without GST**					**1,21,72,570**	
M	**Provision for GST (18% of L)**					**21,91,062.55**	GST will be reimburse as per actual and as per notified prescribed rate
N	**Total Estimated Cost with GST**					**1,43,63,632**	
				or Say Rs. In Lakhs		**143.64**	
Note:							
1	If any part of the project is outsourced, the amount will be reimbursed as per the Paragraph 3 of NMET SoC and Item no. 6 of NMET SoC. In case of execusion of the project by NEA on its own, a Certifiate regarding non outsourcing of any component/project is required.						

Annexure - 2: Time Schedule/ Action plan

Time Schedule/ Action plan of Reconnaissance Survey (G4) for identification of Lithium and associated minerals in Great Rann of Kachchh

Sl. No.	Activities	Unit	MONTHS											
			1	2	3	4	5	6	7	8	9	10	11	12
1	Desktop Studies	Month												
2	Camp setting	m.												
3	Survey Party days (2 Party)	day												
4	Geologist Party days in field (2 Party)	day												
5	Pitting/Trenching/ Geochemical Sampling	Nos.												
6	Sampling Party days (1 party)	day												
7	Laboratory Studies	Nos.												
8	Camp Winding	Month												
9	Geologist Party days in HQ (1 Party)	day												
10	Geological Report Writing with Peer Review	Month												
11	Peer review	Month												

Note: 1. Commencement of project may be reckoned from the day the exploration acreage is available along with all statutory clearances.

2. Time loss on account of monsoon/agricultural activity/forest clearance/local law & order problem may be additional to above time line.

Block Id: CGM/NMET/Lithium/10/2024-25
Commissioner of Geology and Mining, Gujarat

Annexure-3: Chemical Analysis Result of Sample collection

Petrography and Mineral Chemistry Laboratory

ICP-MS ANALYSIS RESULTS

Instrument Name: Agilent 7700

Sr.No		Sr.No.	1	2	3	4	5	6	7
		Sample No.	GSD-9	GSD-9 *	1	2	3	4	5
		Lab Ref. No.	(STD.)		C/D/24-25/1490	C/D/24-25/1491	C/D/24-25/1492	C/D/24-25/1493	C/D/24-25/1494
		Latitude			23°59'30"N	23°59'03"N	23°59'09"N	23°59'49"N	23°59'40"N
		Longitude			71°14'24" E	71°15'01" E	71°14'36" E	71°14'34" E	71°14'33" E
		Element Name	Conc. [ppm]						
1	45	Sc	11.1±0.6	22.264	14.792	11.744	12.409	15.383	12.991
2	89	Y	27±2	22.307	33.754	23.318	30.789	31.677	28.478
3	139	La	40±3	37.436	35.941	24.554	30.477	36.024	32.308
4	140	Ce	78±6	73.785	71.736	49.823	61.034	73.048	64.356
5	141	Pr	9.2± 0.8	9.109	8.485	7.131	7.455	19.624	7.510
6	146	Nd	34±2	33.895	31.176	24.963	26.683	66.767	28.077
7	147	Sm	6.3±0.4	6.160	5.487	4.485	5.086	5.993	5.306
8	153	Eu	1.33±0.06	1.421	1.455	1.182	1.304	1.771	1.568
9	157	Gd	5.5±0.6	7.555	5.692	4.078	5.082	6.214	5.062
10	159	Tb	0.87±0.09	0.894	1.045	0.819	0.871	1.128	0.847
11	163	Dy	5.1±0.3	4.529	5.031	3.588	4.709	6.140	4.381
12	165	Ho	0.96±0.07	0.896	1.026	0.672	1.028	0.956	0.833
13	166	Er	2.8±0.3	2.718	2.940	2.239	2.827	2.791	2.542
14	169	Tm	0.44±0.07	0.376	0.426	0.373	0.412	0.411	0.389
15	172	Yb	2.8±0.3	2.467	2.396	1.880	2.291	2.653	2.286
16	175	Lu	0.45± 0.03	0.438	0.468	0.309	0.444	0.441	0.390
17	232	Th	12.4±0.7	12.570	12.964	7.970	10.096	14.327	10.009

* Note: Instrumental Analysis results.

AAS ANALYSIS RESULTS (Lithium)

Sr.No.	1	2	3	4	5
Sample No.	1	2	3	4	5
Lab Ref. No.	C/D/24-25/1490	C/D/24-25/1491	C/D/24-25/1492	C/D/24-25/1493	C/D/24-25/1494
Conc. (PPM)	58.610	46.790	41.750	53.620	48.790

12/11/2024

Chemist (I/C)
Petrography & Mineral Chemistry Laboratory
Gandhinagar

Plate-1: Geological map

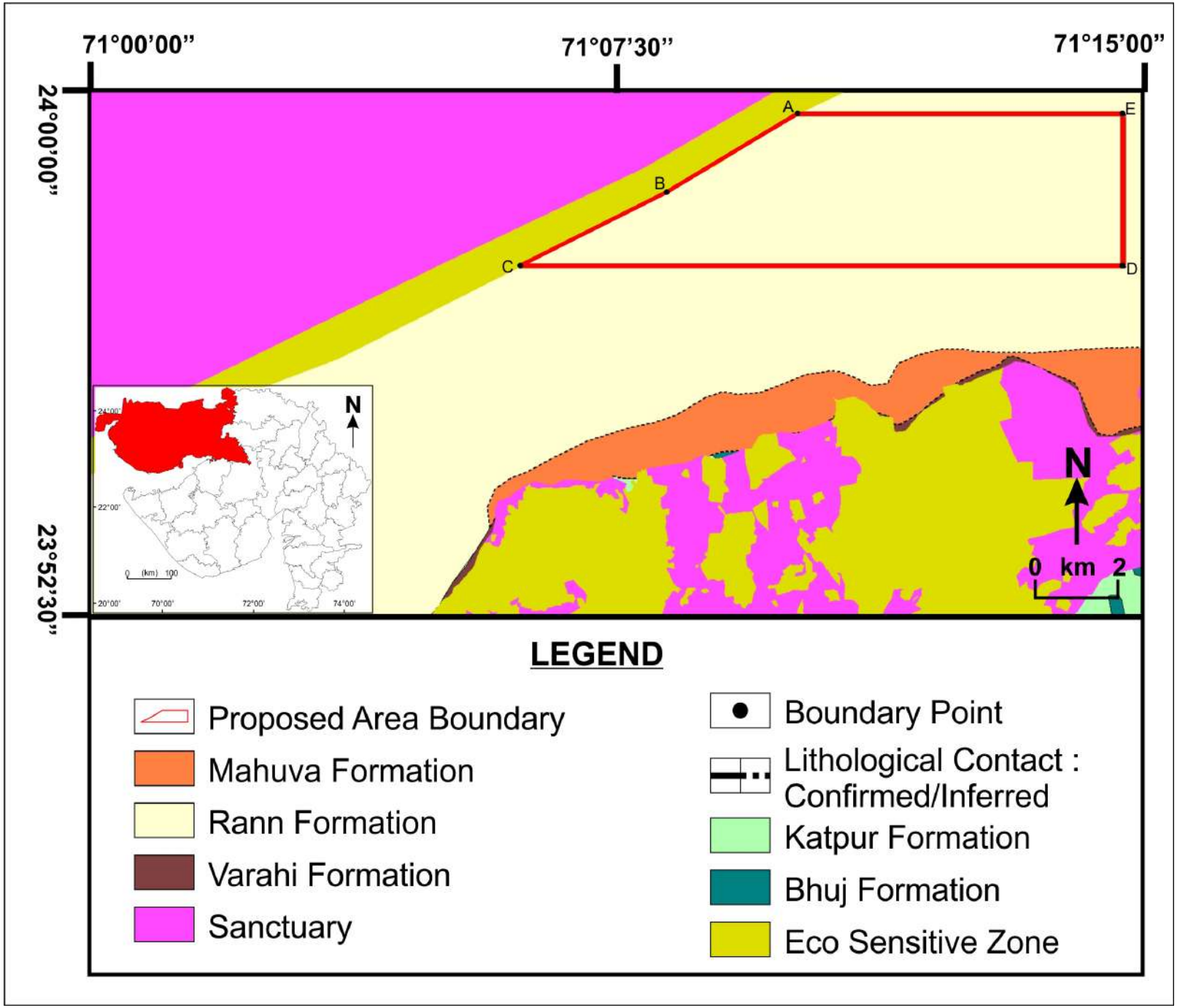

Plate 2: Regional geology Map

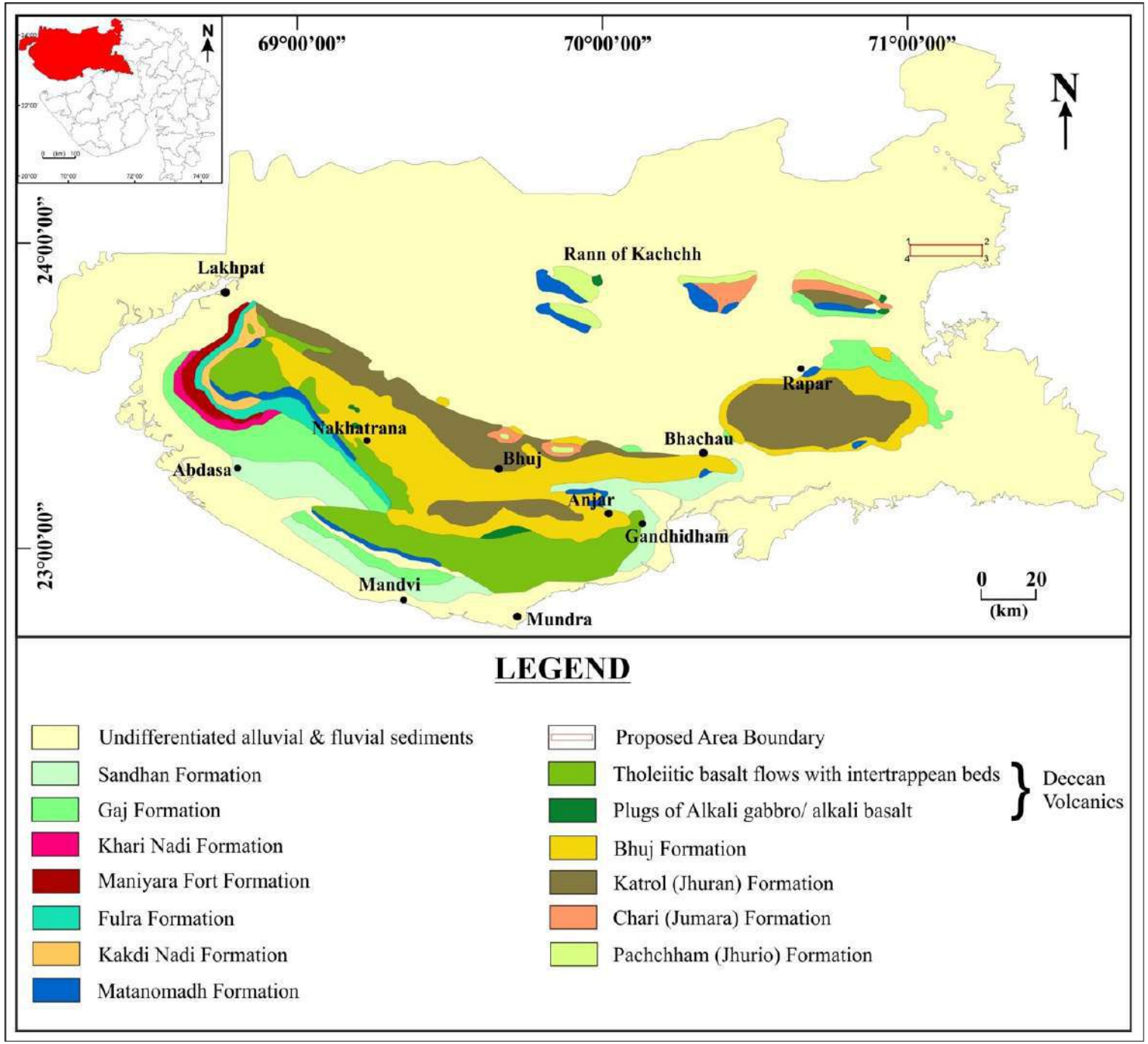

Plate-3: Proposed block boundary over topographic map