

COMMODITY: POTASH & HALITE

**Preliminary exploration for potash in Makkasar west block, Satipura
sub-basin, Nagaur-Ganganagar Evaporate Basin, Hanumangarh
District, Rajasthan, G3 Stage.**

BY

**GEOLOGICAL SURVEY OF INDIA
STATE UNIT: RAJASTHAN**

**PLACE: JAIPUR
DATE: JULY 2026**

Summary of the Block for G3 Level Exploration
GENERAL INFORMATION ABOUT THE BLOCK

Feature	Details
Block ID	MAKKASAR WEST BLOCK
Exploration Agency	Geological Survey of India, Western Region, State Unit: Rajasthan
Commodity	Potash & Halite
Mineral Belt / Geological Domain	Satipura sub basin, Nagaur- Ganganagar Evaporate Basin, Hanumangarh
Block Area	4.15 sq. km
Completion Period	One year
Objectives	To evaluate the potentiality of potash and halite mineralisation
Projected Outcome	Preliminary exploration data for resource appraisal and further advancement of the block.
Personnel	Two geoscientists
Expected Field Days	Officer-1: 100 days; Officer-2: 50 days; Supervisory Officer: 7 days
Toposheet / Degree Sheet	44K02
District / State	Hanumangarh, Rajasthan

1. Location

Cardinal Points	Latitude (N)	Longitude (E)
A	29° 36' 12.22" N	74° 12' 04.31" E
B	29° 36' 12.19" N	74° 14' 18.57" E
C	29°35'45.48"N	74°14'18.27"E
D	29°36'3.45"N	74°14'2.13"E
E	29°35'20.19"N	74°12'54.61"E
F	29°35'19.57"N	74°12'3.44"E
Tehsil / Taluk	Hanumangarh	
District	Hanumangarh	
State	Rajasthan	

2. Area

Block Area	4.15 sq. km
Forest Area	NIL
Government Land Area	Data not available
Private Land Area	Data not available

3. Accessibility

Nearest village	Makkasar, about 2.5 km NW of the block
Nearest town	Hanumangarh town, about 10 km.
District headquarters	Hanmangarh
Nearest Rail head	Hanumangarh Junction
Nearest Airport	Jaipur International airport, about 450 km

4. Hydrography: Ephemeral streams

5. Climate: Semi-arid to arid, with hot summers and a short monsoonal rainy season.

6. Topography: Quaternary sand and soil cover.

7. Availability of baseline geoscience data

Geological map	Regional geological maps and geological mapping of the Nagaur–Ganganagar Evaporite Basin and earlier G4, G3 & G2 investigations by GSI in and around the proposed block.
Geochemical data	Chemical analytical data of potash, sylvite, polyhalite, halite, lithium, strontium and associated major, minor and trace elements from drill-core samples and intervening zones.
Geophysical data	Regional geophysical survey data used for delineation of evaporite sub-basins and potash-bearing horizons.

8. Justification for taking up G3 level exploration

1. The proposed Makkasar West Block is located to the south of Bawriyanwali Dhani SE Block & North West of Makkasar block which have been explored in G-3 stage during FS- 2021-22.
2. In Bawriyanwali Dhani SE Block, the total inferred resource (UNFC-333) of potash without considering stoping width, estimated are **48.50** million tonne at 2% cut off with an average grade of 4.973% K (5.993% K₂O), **14.54** million tonne at 5% cut off with an average grade of 8.349% K (10.061% K₂O) and **4.03** million tonne at 8% cut off with an average grade of 11.928% K (14.374% K₂O). The total inferred resource (UNFC-333) of potash with 1.00m stoping width, estimated are **42.15** million tonne at 2% cut off with an average grade of 4.924% K (5.934% K₂O), **10.126** million tonne at 5% cut off with an average grade of 8.303% K (10.006% K₂O) and **1.868** million tonne at 8% cut off with an average grade of 12.695% K (15.299% K₂O) (Sethy et al 2022).
3. In Makkasar block, the total inferred resource (UNFC-333) of potash without considering stoping width estimated are 100.77 million tonne of potash at 2% cut off with an average grade of 2.67% K (3.20% K₂O), 15.53 million tonne at 5% cut off with an average grade of 8.41% K (10.10% K₂O) and 7.61 million tonne at 8% cut off with an average grade of 12.83% K (15.40% K₂O). The total inferred resource (UNFC-333) of potash with 1.00m stoping width, estimated are 97.07 million tonne at 2% cut off with an average grade of 2.62% K (3.14% K₂O), 9.60 million tonne at 5% cut off with an average grade of 7.54% K (9.05% K₂O) and 2.01 million tonne at 8% cut off with an average grade of 16.10% K (19.32% K₂O) (Ansari et al 2022).

FOR PRELIMINARY (G-3) EXPLORATION FOR POTASH MINERALISATION IN THE MAKKASAR WEST BLOCK, HANUMANGARH DISTRICT, RAJASTHAN

1.1.0 INTRODUCTION

The growing world population is expected to reach 9.7 billion by 2050 (UN, 2019), which will increase the present demand for food by ~ 70%. Consequently, to boost agrarian production and achieve food security, within limited arable land, the effective use of fertilizers becomes critical. However, the economic efficiency of mineral fertilizers has fallen dramatically as the price hike in fertilizers became dearer than food.

It is observed since the last century that the production of fertilizer minerals has risen almost constantly; however, consumption varied greatly from one region to another. It remained constant or declined in Western Europe and North America, but increased rapidly in East and South Asia especially in China and India. The Asian share of global fertilizer consumption is more than 60% and growing rapidly (Kirtikumar et al., 2021).

To meet the ever-increasing demand in the country, the search for fertilizer minerals in the vicinity of Nagaur Ganganagar Evaporite Basin was initiated by different workers of the Geological Survey of India in 1971.

2.1.0 BACKGROUND INFORMATION

Regional Geology. The Nagaur- Ganganagar basin is an intra-cratonic basin in which fluvial/marine sediments of the Marwar Supergroup were deposited on the basement rocks of the Malani Igneous suite and/or Delhi metamorphites. The Marwar Supergroup, comprising Jodhpur Group, Hanseran Evaporite Group and Nagaur Group, is covered by thick sequences of Quaternary and/or Tertiary sediments. The Hanseran Evaporite Group (HEG) comprises cyclic deposits of halite. The halite cycle contains polyhalite, sylvite, sylvinitic, langbeinite and carnallite, as potash minerals. The intervening zone comprises anhydrite, clay, dolomite, and magnesite (Virendra Kumar and Ram Chandra. 2005).

Potash investigation in Nagaur- Ganganagar evaporite basin was carried out by drilling of 70 boreholes over an area of 50,000 km² in the northern part of the basin out of a total area of about 1,00,000 km² during the year 1974 to 1991 by GSI (Kumar et al 1993). Based on the results of drilling data and geophysical surveys eight sub-basins of potash mineralization containing over 2% K were identified in parts of Rajasthan namely Lakhasar, Bikaner, Gharsisar, Hanseran, Arjunsar, Jaitpura, Bharusari and Satipura.

3.1.0 LOCATION AND ACCESSIBILITY

The Makkasar West block lies in Hanumangarh district, Rajasthan, in toposheet no. 44K/02, within the Satipura sub basin of Nagaur-Ganganagar evaporate basin. The block lies about 2.5 km from Makkasar village, which in turn lies about 10 km South-West of Hanumangarh town. The proposed block area is 4.15 sq. km. The nearest rail head and district headquarters is Hanumangarh, and the nearest airport is Jaipur International airport (about 450 km).

4.1.0 PHYSIOGRAPHY, DRAINAGE AND CLIMATE

The area experiences an extreme climate with temperature varying from near to freezing point during winter (up to 1°C to 2°C) months to as high as 48°C during summer months. Dust storms are quite common in the summer months from March to July. Rainfall is scanty and averages from less than 10 cm to 30 cm annually and is mainly received during the month of July-August (IMD).

5.1.0 PREVIOUS WORK

Potash investigation in Nagaur- Ganganagar evaporite basin was carried out by drilling of 70 boreholes over an area of 50,000 km² in the northern part of the basin out of a total area of about 1,00,000 km² during the year 1974 to 1991 by GSI (Kumar et al 1993). Based on the results of drilling data and geophysical surveys eight sub-basins of potash mineralization containing over 2% K were identified in parts of Rajasthan namely Lakhasar, Bikaner, Gharsisar, Hanseran, Arjunsar, Jaitpura, Bharusari and Satipura. During FS 2016-17 to 2023-24, GSI has carried out a total 09 nos. of G3 stage and 01 no. G-2 stage exploration in Satipura sub-basin, covering 64.55 sq. km and carried out nearly 67500 m drilling through 88 Nos. of vertical boreholes. Apart from this GSI has carried out G4 stage exploration in Hanseran, Jaitpura and Bharusari sub-basin. In Satipura sub-basin significant inferred resources (333) of potash has been established in 09 G3 blocks namely Satipura, Jhandawali North, Jhandawali South, Jorkian South, Khunja NW, Makkasar, Nai Basti, Makkasar north and Bawrinwalli dhani SE blocks. In the listed blocks total 1017.504 MT resources has been estimated at 2% cut-off grade with average grade of 3.868 % K₂O, total 192 MT resource has been estimated at 5% cut-off grade with average grade of 9.698 % K₂O and total 94.986 MT resource has been estimated at 8% cut-off grade with average grade of 14.351 % K₂O. In these nine blocks, the gross inferred resource of halite is 18993 million tonne at 31.47% cut-off grade (equivalent to 80% NaCl) with an average grade of 35.90% Na.

The proposed Makkasar West Block is located to the south of Bawriyanwali Dhani SE Block & North West of Makkasar block which have been explored in G-3 stage during FS- 2021-22.

In Bawriyanwali Dhani SE Block, the total inferred resource (UNFC-333) of potash without considering stoping width, estimated are 48.50 million tonne at 2% cut off with an average grade of 4.973% K (5.993% K₂O), 14.54 million tonne at 5% cut off with an average grade of 8.349% K (10.061% K₂O) and 4.03 million tonne at 8% cut off with an average grade of 11.928% K (14.374% K₂O). The total inferred resource (UNFC-333) of potash with 1.00m stoping width, estimated are 42.15 million tonne at 2% cut off with an average grade of 4.924% K (5.934% K₂O), 10.126 million tonne at 5% cut off with an average grade of 8.303% K (10.006% K₂O) and 1.868 million tonne at 8% cut off with an average grade of 12.695% K (15.299% K₂O) (Sethy et al 2022).

In Makkasar block, the total inferred resource (UNFC-333) of potash without considering stoping width estimated are 100.77 million tonne of potash at 2% cut off with an average grade of 2.67% K (3.20% K₂O), 15.53 million tonne at 5% cut off with an average grade of 8.41% K (10.10% K₂O) and 7.61 million tonne at 8% cut off with an average grade of 12.83% K (15.40% K₂O). The total inferred resource (UNFC-333) of potash with 1.00m stoping width, estimated are 97.07 million tonne at 2% cut off with an average

grade of 2.62% K (3.14% K₂O), 9.60 million tonne at 5% cut off with an average grade of 7.54% K (9.05% K₂O) and 2.01 million tonne at 8% cut off with an average grade of 16.10% K (19.32% K₂O) (Ansari et al 2022).

6.1.0 GEOLOGY OF THE AREA

The Nagaur-Ganganagar Evaporite Basin is an intracratonic basin in which marine sediments of the Marwar Supergroup were deposited on the rocks of the Malani Igneous Suite and/or Delhi metamorphite (Kumar et al, 1993).

Nagaur-Ganganagar basin, covering over 1,00,000 sq km lies in parts of Ganganagar, Hanumangarh, Churu, Bikaner, Nagaur, Jodhpur, Jaisalmer, and Pali districts of Rajasthan, Sirsa District of Haryana and Faridkot and Bhatinda districts of Punjab.

The Makkasar block area is devoid of any outcrop as the area is masked by the thick blanket of Quaternary sediments.

7.1.0 OBJECTIVES OF THE PROPOSED EXPLORATION PROGRAMME

To evaluate the potentiality of potash and halite mineralisation.

8.1.0 PROPOSED SCHEME OF EXPLORATION

The proposed G3 exploration programme comprises detailed geological mapping, systematic drilling, borehole geophysical logging, sample processing and laboratory studies. Detailed mapping on 1:5,000 scale will be carried out over 4.15 sq. km.

The depth continuity, grade and thickness of these zones will be checked by drilling around 6 inclined boreholes of roughly 775 m depth at 800 m spacing, for a total sanctioned drilling of 4600 m. Geophysical Borehole logging (2,800 m), core sampling and laboratory analyses will support interpretation and preliminary resource appraisal. Selected samples will also be subjected to XRD studies.

9.1.0 QUANTUM OF WORK

Item of Work	Unit	Proposed Quantum
Detailed geological mapping (1:2,000)	sq. km	4.15
Subsurface exploration: drilling	m	4600
Borehole geophysical logging	m	2800
Samples for Isotope studies	nos.	5
PCS	nos.	20
Core samples (CS)	nos.	840
PS	nos.	10
XRD	nos.	20
Fluid Inclusion	nos.	3
Chemical analyses (incl. 100 check samples)	nos.	860

10.1.0 COST

Summary of the Cost estimates (NMEDT-funded components costed on the Revised Schedule of Charges effective 15.12.2025, as modified on 10.02.2026). Detailed line-item computation is provided in the accompanying cost sheet.

Sl. No.	Item	Total Estimated Cost (Rs.)	Funding
1	Geology and Survey	0	
2	Drilling	35200000	NMEDT
3	Survey work	0	
4	Laboratory studies	0	
5	Geologist at HQ	0	
	Sub Total (1 to 4)	35200000	NMEDT
6	Exploration Report Preparation	0	
7	Proposal Preparation	0	
8	Peer review charges	0	
	Sub Total (1 to 8)	35200000	NMEDT
9	GST 18%	6336000	NMEDT
	Total:	41536000	NMEDT
	Say Rs. In Lakh	415.36	NMEDT

PROPOSAL FOR Preliminary exploration for potash in Makkasar West Block, Satipura sub-basin, Nagaur-Ganganagar Evaporite Basin, Hanumangarh District, Rajasthan (G3).

Item of Work			Unit	SoC-Item - SI No. NMED T	Rates as per NMEDT SoC 2025 (w.e.f. 15.12.2025, incl. 10.02.2026 modification)	Rates of GSI for NMED T work		Estimated Cost		Remarks	
								Qty.	Total Amount (Rs)		
D. DRILLING - OUTSOURCED											
18. b		Drilling in Hard rock / Strata: HQ size borehole up to 400m depth and NQ beyond 400m; rate decreases 20% if NQ before 400m	m	2.2.1.1d		10000	-	-	2800	28000000	6 Vertical Boreholes. All boreholes are planned to a depth of 770-800 m, which exceeds 400 m. Therefore, HQ core size will be maintained from the 300m to borehole completion, with no reduction to NQ size.
		Non coring drilling	m	2.2.4		4,000.00			1800	7200000	Each borehole non coring drilling will be carried out up to 300m
19	DRILLING RELATED EXPENDITURE HEADS	Borehole Deviation Survey by Multishot survey tool (interval 6m; azimuth and inclination to be recorded)	per shot	2.2.5		330	-	-	0	0	
20		Land / Crop Compensation (in case the BH falls in agricultural land)	per BH	5.6		30000	-		0	0	
21		Construction of concrete Pillar (12"x12"x30")	per borehole	2.2.7		2000	-	-	0	0	
22		Borehole plugging with	per borehole	2.2.8		10000	-	-	0	0	

		cement									
23		Miscellaneous Charges (Transportation of Drilling Rig, Drill Camp accommodation, camp setting & winding, approach road)	Lumpsum	2.2.9		NOT INCLUDED	-	-	0	0	
24		Drill Core Preservation - one complete BH plus mineralised cores of all BHs preserved in GI core boxes and transported to notified core repository	per m	X (5.2)		1590	-	-	0	0	
Total Cost D - outsourced										35200000	
Total										35200000	
GST 18%										6336000	
TOTAL (including 18% GST)										41536000	
Say Rs. in Lakh										415.36	

11.1.0 TIME SCHEDULE

The work programme is proposed for FS 2026-27. Detailed Mapping, drilling, logging, core sampling and associated geological and laboratory work are completed within about 10 months, with report writing over 3 months (2 months overlapping laboratory analysis). Thus, the total duration of the project for completion of the above exploration will be 12 months from the date of commencement of the project.

Activities	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR
Detailed Mapping (1:4,000)												
Laboratory studies												
Core drilling												
Geophysical borehole logging												
Core sampling												
Report writing / Peer review												

***Time loss on account of monsoon / agricultural activity / forest clearance / local law & order problems will be in addition to the above time line.**

FIGURES

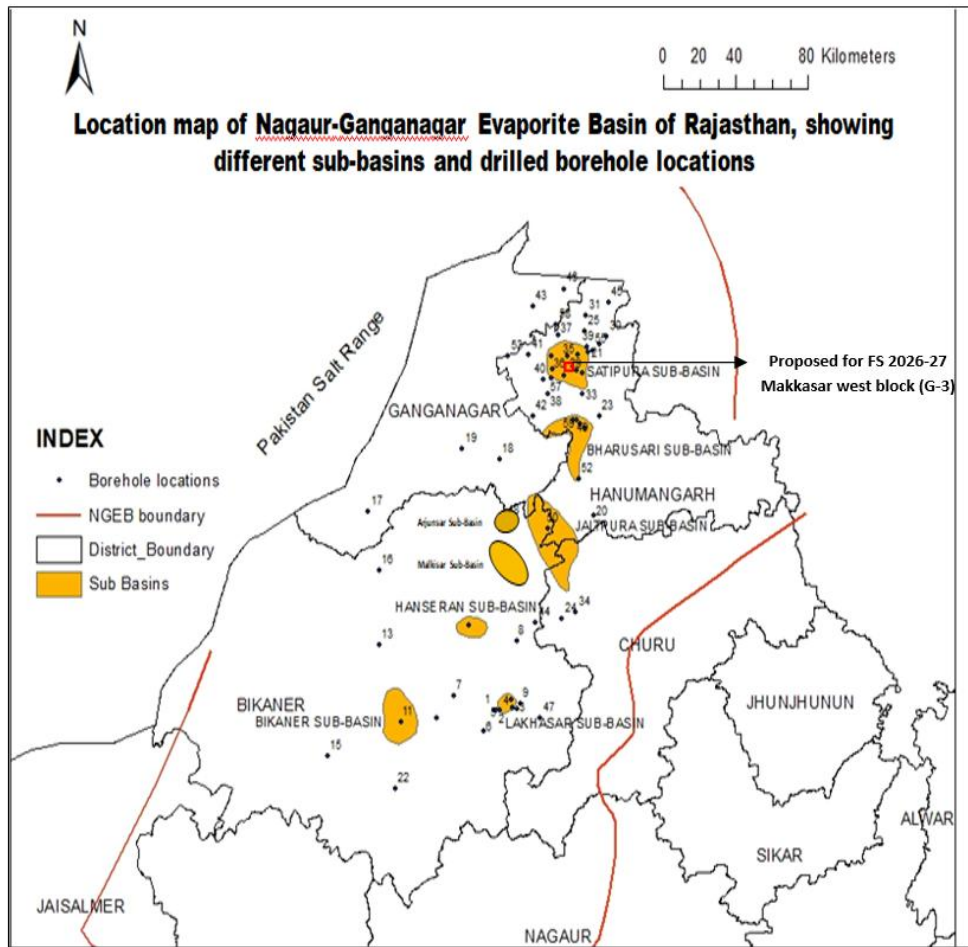


Fig. 1: Location map Nagaur-Ganganagar Evaporite basin of Rajasthan.

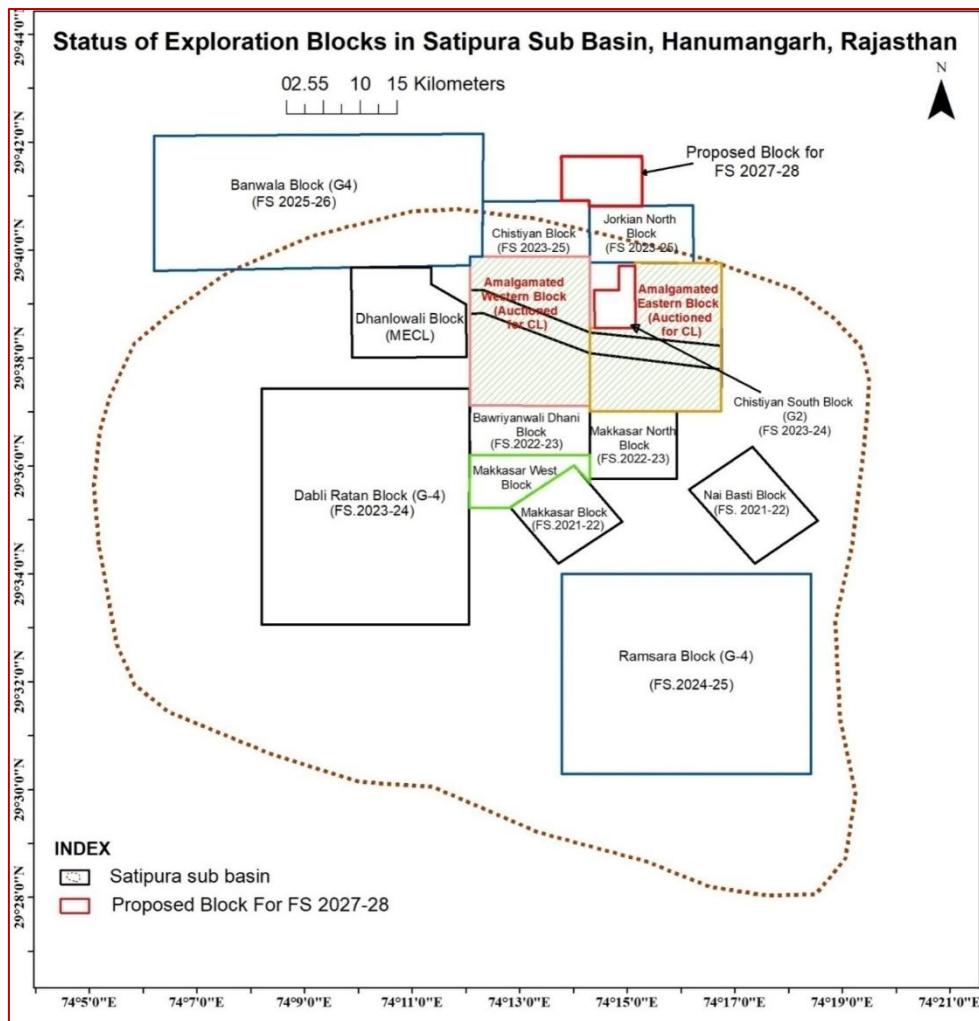


Fig. 2: Proposed Makkasar West Block G-3 (Green) on the with the other completed block G3, G4 and G2 blocks.

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