

**PROPOSAL FOR RECONNAISSANCE SURVEY (G-4) FOR PHOSPHORITE,
GOLD AND ASSOCIATED MINERALS IN JALKIA- RAM KA MUNNA BLOCK
(110.53 Sq. Km), TEHSIL-BAGIDORA, DISTRICT- BANSWARA, RAJASTHAN**

**COMMODITY: PHOSPHORITE, GOLD AND ASSOCIATED
MINERALS**

**BY
MINERAL EXPLORATION & CONSULTANCY LIMITED
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SEMINARY HILLS
NAGPUR, MAHARASHTRA**

PLACE: NAGPUR

DATE:14.11.2022

Summary of the Block for Reconnaissance Survey (G-4)

GENERAL INFORMATION ABOUT THE BLOCK

	Features	Details
	Block ID	Jalkia-Ram Ka Munna Block
	Exploration Agency	Mineral Exploration & Consultancy Limited (MECL)
	Commodity	Phosphorite, Gold and Associated Minerals
	Mineral Belt	Aravalli Supergroup
	Completion period with entire Time schedule to complete the project	18 months
	Objectives	The objectives of current program would be: 1. Preparation of Geological map at 1:12,500 Scale. 2. To prove the mineralized zones by sampling from outcrops and trenches. 3. To estimate resources as per UNFC norms. Phosphorite resources up to 30m BGL and gold & associated minerals up to 60m BGL at higher confidence level as per UNFC norms Minerals (Evidence of Mineral Contents) Rules 2015 and Minerals (Evidence of Mineral Contents) Amendment Rules 2021. 4. To upgrade the block in G-3 and facilitate the state govt. for auctioning of the block.
	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	Work will be carried out by the proposed agency.

	Name/Number of Geoscientists	Two nos. Geoscientist																										
	Expected Field days (Geology, surveyor)	Geologist Field days: 240 days																										
1.	Location	The proposed block area for G-4 falls under the majorly under Survey of India Top sheet number 46I/4 and 46I/8. The prominent places in the area are Khunta, Lakai, Khundini Hala, Ram Ka Munna, Handi etc. of Bagidora tehsil of Banswara district, Rajasthan. Jhalod is an important township of the Panchmahals District which falls within Gujrat state and located about 20 km southeast of proposed block. Jhalod can be approached from Godhra City through Limkheda and Limdi by state highway. It is also connected to Godhra through Santarampur. Dahod city is an important railway station on Vadodara - Ratlam section of Western Railways, which is located south of the investigated area. Bhukhia gold prospect of Banswara District is located about 80 km north of proposed block.																										
	Latitude and Longitude	<table><tr><th>BB POINTS</th><th>LONGITUDE</th><th>LATITUDE</th></tr><tr><td>A</td><td>74° 08' 09.4896" E</td><td>23° 14' 58.9256" N</td></tr><tr><td>B</td><td>74° 16' 58.9693" E</td><td>23° 15' 00.0928" N</td></tr><tr><td>C</td><td>74° 16' 58.4992" E</td><td>23° 10' 36.1145" N</td></tr><tr><td>D</td><td>74° 14' 35.7964" E</td><td>23° 10' 36.2129" N</td></tr><tr><td>E</td><td>74° 12' 03.6684" E</td><td>23° 11' 19.9584" N</td></tr><tr><td>F</td><td>74° 08' 07.0701" E</td><td>23° 11' 19.9584" N</td></tr><tr><td colspan="3">Boundary line between Point No. D to E along the Rajasthan and Gujrat State Boundary</td></tr></table>	BB POINTS	LONGITUDE	LATITUDE	A	74° 08' 09.4896" E	23° 14' 58.9256" N	B	74° 16' 58.9693" E	23° 15' 00.0928" N	C	74° 16' 58.4992" E	23° 10' 36.1145" N	D	74° 14' 35.7964" E	23° 10' 36.2129" N	E	74° 12' 03.6684" E	23° 11' 19.9584" N	F	74° 08' 07.0701" E	23° 11' 19.9584" N	Boundary line between Point No. D to E along the Rajasthan and Gujrat State Boundary				
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	Villages	Khunta, Lakai, Khundini Hala, Ram Ka Munna, Handi etc.																										
	Tehsil/Taluk	Bagidora																										
	District	Banswara																										
	State	Rajasthan																										
2.	Area (hectares/ square kilometres)																											
	Block Area	110.53 sq.km																										
	Forest Area	Protected Forest falls in the Block area																										
	Government Land Area (Bilanam)	Data not available																										

	Charagaha	Data not available
	Private Land Area	Data not available
3.	Accessibility	
	Nearest Rail Head	Dahod is the nearest railway station from 50km SW of proposed block and 190km away from Vadodara airport
	Road	The Dahod-Banswara state highway via Jhalod SH-56 passes through the block. Motorable/ metaled roads are available in the area.
	Airport	Vadodara is the nearest airport from 190km south of the block.
4.	Hydrography	
	Local Surface Drainage Pattern (Channels)	Anas is the main river flowing along the N-S trending tectonic fabric and at south merges with Mahi River System. Dendritic drainage pattern is the common character of the area. However, radial drainage pattern has also been noticed around Rohnia Village where granites are exposed. Machhan and Kali River are the tributaries to Anas.
	Rivers/ Streams	Anas River.
5.	Climate	
	Mean Annual Rainfall	The climate of the area is tropical with average rainfall of 690mm per year and most of the rainfall received during the monsoon (from July to October) and very rarely during winter.
	Temperatures (December) (Minimum) Temperatures (June) (Maximum)	Minimum temperatures up to 16 ⁰ C (Jan) Maximum temperatures up to 46 ⁰ C (May) The summer season starts from March and continue up to Mid-June until rain starts and temperature ranges from 35° to 45°C and in hottest days the temperature goes up to 46°C (approx.). During the month of May and June hot wind blows throughout the day. Winter season starts from mid October and continue up to February with its vertex in January with temperature ranging between 20°C to 10°C.

6.	Topography	
	Toposheet Number	46I/04 and 46I/08
	Morphology of the Area	Study area is represented by Precambrian meta-sedimentaries and Godhra Granites. These lithounits are generally forming rolling topography ranging from 129m to 274m R.L Phyllites form low lying gentle flat topography while dolomitic formations are represented by raised smooth grounds as well as low linear ridges. Quartzites generally form high curvilinear ridges and domal structures. Configuration of the hill ranges are structurally controlled by intricate folds, faults and lineament systems. Younger formations of Cretaceous age are represented by dinosaurs bearing Lameta Formations and Deccan Traps which are occurring at north, south and western part of the area and form flat to table top plateau ranging height from 305 to 349m R.L.
7.	Availability of baseline geoscience data	
	Geological Map (1:50K/25K)	Bhukosh
	Geochemical Map	Bhukosh
	Geophysical Map (Aeromagnetic, ground geophysical, Regional as well as local scale GP maps)	Not available
8.	Justification for taking up Reconnaissance Survey/ Regional Exploration	i) Mehra and Biswas, 1969 reported Occurrences of phosphorite have been located at Ram-Ka-Munna and Jher moti area. Phosphate occurs in the form of thin, bluish-grey stringers near Ramka Munna. The phosphatic horizon can be traced for a distance of 120 metres. True thickness of the phosphatic zone varies between 2 and 3 meters. P₂O₅ content varies from 5 to 15% and the phosphate is admixed with dolomite. In Jher Moti area phosphatic horizon can be traced for a distance of 630 metres to 1 km. P₂O₅ varies from 5 to 15%. They also reported quarries for manganese - ore have been found 4 kms. N.N.E. of Sallopat just south of Jhanjarwa Mota manganese minerals occur as thin

	stringers and veins along the vertically dipping foliation planes of phyllites. ii) P.K. Chaurasia, 2000 (F.S. 1996-97) geochemical signature and anomaly for gold and silver around Lakai, Pipli-Khundini, and Jher-Hadia has been demarcated during the course of exploration work. One sample indicating rich Pb-Cu-Ag-Au mineralisation is noticed near Hadia village. He opined that host rocks in these areas are limonitised sheared dolomite, BIF and phyllites. The contact zones around granites require further detailed close spaced sampling of bed rock and soil samples on grid pattern. Trenching and pitting is required to evaluate the significance of the geochemical anomalies obtained by the prospecting work. He also suggested Quartz - Pebble-Conglomerate of the area requires to be investigated for gold mineralisation. The brief details of the reported prospective areas are given below: Gossan associated at Lakai area contains deep red, brown, yellow, purplish colour oxidised minerals including malachite and azurite, chalcopyrite, pyrite and arsenopyrite are also visible at places. In bed rock samples geochemical values for gold ranging from 50ppb to 350ppb. At Jher area 3 old working having 1 to 3 metre diameters have been reported. Depth of the old working appears to be 5 to 10 m deep. These pits, are scattered in about 25 m area in silicified dolomite. Oxidised (red spot); limonitised, gossanised patches perhaps developed after pyrite and pyrrhotite which may contain Au and Ag mineralisation. Anomalous bed rocks values have been reported for gold (<50-250 ppb), silver (2 to 70 ppm). Old working, having about 2 m diameter has been reported at Pipli. Over the roof wall and side wall of the old working contain fine oxidised material occurring as red disseminations and associated with the dolomite/jasperoid zone. Dolomite samples have indicated Au varying from <50ppb to 200 ppb. iii) Presence of old workings indicates the past mining
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		activities in the area and geochemical samples showing anomalous results for phosphorite, gold and base metals. Hence the proposed area warrant for detailed study for phosphorite, gold and associated minerals.. iv) Hence, the proposed exploration would be helpful to revealed mineralized ore zones in the area, if any. v) MECL is proposing Reconnaissance survey (G-4 level) in area of Jalkia-Ram Ka Munna Block through geochemical sampling and mapping to establish the disposition of ore body. Based on results, scout drilling will be planned in the area later on.
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**PROPOSAL FOR RECONNAISSANCE SURVEY (G-4) FOR PHOSPHORITE,
GOLD AND BASE METALS IN JALKIA-RAM KA MUNNA BLOCK, TEHSIL-
BAGIDORA, DISTRICT- BANSWARA, RAJASTHAN**

1.0.0. Preamble

Agriculture, including its allied sector, is the largest source of income in India. The agricultural sector's success largely depends on the fertilizer industry, which manufactures some of the most important raw materials required for production of crops. Phosphate rock is processed to produce phosphorous, which is one of the three main nutrients most commonly used in fertilizers (the other two are nitrogen and potassium). India's dependency on import at present is to the extent of 90% in case of phosphates either as raw material or finished fertilizers. The increasing demand of phosphorus in the country could be eased with the exploration of new phosphorus deposits of economic importance.

Gold in its purest form is a bright, slightly reddish yellow, dense, soft malleable and ductile metal. It is one of the least reactive chemical elements and is solid under standard conditions. Gold is a relatively scarce metal in the world and a scarce commodity in India. The domestic demand is mainly met through imports. As per NMI data, based on UNFC system, as on 1.4.2015, the total reserves/resources of gold ore in the country have been estimated at 501.84 million tonnes. Out of these, 17.22 million tonnes were placed under Reserves category and the remaining 484.61 million tonnes under Remaining Resources category.

There is no substitute for phosphorus in agriculture. The reserves/resources of chemical and fertilizer grades apatite and rock phosphate in India are very limited. Till the domestic resources of these two minerals are improved, the country has no alternative but to depend on imports. Only about 10-15% requirement of raw material for phosphate fertilizer production is met through indigenous sources. The remaining requirement is met through imports in the form of rock phosphate, phosphoric acid and direct fertilizers. Demand for phosphatic fertilizer is expected to increase gradually in tandem with the growth in population and corresponding increase in food requirements.

India aims to be self-reliant in overall fertiliser production by 2023 as the government is constructing new manufacturing units to reduce dependency on imports. “India to explore indigenous deposits of phosphatic rock, a step towards becoming Aatma Nirbhar in fertilizer production,” informed Minister of Chemicals and Fertilizers, Mansukh Mandaviya in the Parliament on Monday, July 26. In addition, the government is likely to spend Rs. 1.19 trillion (US\$ 15.97 billion) in FY2021 in the form of subsidy components to the farmers for the fertilizers.

1.1.0 Background

- 1.1.1 The production of phosphorite/ rock phosphate in India was reported from four State Public Sector mines. Of these, Chhatarpur, Sagar and Jhabua districts of Madhya Pradesh have one mine each, while Udaipur district of Rajasthan has the fourth mine. Rajasthan continued to be the principal producing State

contributing 92% of the total production and the remaining 8% share was contributed by Madhya Pradesh. Of the total reserves/ resources, 34% are in Jharkhand, 31% in Rajasthan, 19% in Madhya Pradesh, 8% each in Uttar Pradesh & Uttarakhand, respectively. (Indian Minerals Yearbook 2019).

1.1.2 Gold is a relatively scarce metal in the world and a scarce commodity in India. The domestic demand is mainly met through imports. The total reserves/resources of gold (primary), in terms of metal stood at 654.74 tonnes. Out of these, 70.09 tonnes were placed under Reserves category and 584.65 tonnes under Remaining Resources category. By States, resources in terms of gold ore (primary) are located Rajasthan (25%) followed by Karnataka (21%), West Bengal (3%), Andhra Pradesh (3%) and Jharkhand (2%).

1.2.3 In order to improve the availability of phosphatic fertilisers, gold and to reduce the dependence on imports by making India truly Aatma nirbhar in fertilisers and gold, MECL prepared a proposal of the Jalkia-Ram Ka Munna block for G-4 level of exploration and put up to the upcoming 47th meeting of TCC, NMET for technical evaluation. Hence the proposal is being put up for reconnaissance survey, which may facilitate state government for auctioning of the block.

2.0.0. Introduction

2.1.0. Block Description

The Jalkia-Ram Ka Munna Block area falls in Survey of India Toposheet No. 46I/4 and 46I/8 and covers an area of 110.53 sq.km in and around villages Borkunda, Khunta, Lakai, Khundinin, Jalkia, Jher Moti, Jhanjarwa Mota, Ram Ka Munna of district Banswara, state Rajasthan. The block location in toposheet is given in PLATE-I. The Co-ordinates of the corner points of the block area both geodetic and UTM are given in Table No:2.1.

Table 2.1

Co-ordinates of Corner Points of Jalkia-Ram Ka Munna Block.

BB POINTS	LONGITUDE	LATITUDE
A	74° 08' 09.4896" E	23° 14' 58.9256" N
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Boundary line between Point No. D to E along the Rajasthan and Gujrat State Boundary		

2.2.0 Location and Accessibility

2.2.1 The proposed block area for G-4 falls under the majorly under Survey of India Topo sheet number 46I/4 and 46I/8. The prominent places in the area are Borkunda, Khunta, Lakai, Khundinin, Jalkia, Jher Moti, Jhanjarwa Mota, Ram Ka Munna of Banswara District. Jhalod town is located around 15km South of the block and connected through the Dahod-Banswara state highway (SH-56) and could be approached by all weathered metalled roads from Banswara in the north and Dahod in the south. Dahod is the nearest railway station is about 50 km and Vadodara is the nearest airport about 190km away from the proposed block.

2.3.0 Physiography and Drainage

2.3.1 Proposed area is represented by Precambrian meta-sedimentaries and Godhra Granites. These lithounits are generally forming rolling topography ranging from 210m to 358m R.L Phyllites form low lying gentle flat topography while dolomitic formations are represented by raised smooth grounds as well as low linear ridges. Quartzites generally form high curvilinear ridges and domal structures. Configuration of the hill ranges are structurally controlled by intricate folds, faults and lineament systems. Anas is the main river flowing along the N-S trending tectonic fabric and at south merges with Mahi River System. Dendritic drainage pattern is the common character of the area. However, radial drainage pattern has also been noticed around Rohnia Village where granites are exposed. Younger formations of Cretaceous age are represented by dinosaurs bearing Lameta Formations.

2.4.0 Climate

The climate of the area is tropical with average rainfall of 690mm per year and most of the rainfall received during the monsoon (from July to October) and very rarely during winter. The average temperature during winter is 16⁰ C while in summers it is around 46⁰.

2.5.0. Flora & Fauna

2.5.1. Vegetation in this area is patchy. Plain areas covered by phyllite are mainly cultivated for grams (*Cicer arietinum*), wheat (*Triticum*), pigeon pea (*Cajanus cajan*) and different kinds of vegetables. Soil derived from Deccan basalt are also extensively used for the cultivation of maize (*Zea mays*), wheat (*Triticum*), grams (*Cicer arietinum*), cotton (*Gossypium*) and rice (*Oryza sativa*). The area is rich in flora and fauna. About 25% of the area is occupied by the forest. Teaks (*Tectona grandis*) are mainly found in the forest areas. Other valuable trees are Sal (*Shorea robusta*), Neem (*Azadirachta indica*), Mango (*Mangifera indica*) and Custard Apple (*Annona reticulata*).

2.5.2 A large variety of animals are also found which include Chinkara (*Gazella bennettii*), wild bor (*Sus scrofa*), squirrel (*Sciuridae*), four horn antelopes (*artiodactyla*), snakes (*Serpentes*). Panthers (*Panthera pardus*) are rarely seen in the area. Some variety of birds also present which include partridge (*Perdix perdix*), owl (*Strigiformes*), wood pecker (*Picidae*), jungle crow (*Corvus macrorhynchos*), parrot (*Psittaciformes*) and common myna (*Acridotheres tristis*).

3.0.0 Regional Geology

3.1.0 The Aravalli Craton occupies the northwestern part of Indian shield which contains a record of varied geological processes and tectonic events since 3500 Ma. The Aravalli craton is bounded by the Himalayas in the north, the Phanerozoic Cambay graben in the south-west, the Proterozoic Vindhyan basin and much younger Deccan Traps in the east, and generally covered by recent alluvium to the west. The rocks of this craton are exposed in the NNE-SSW trending Aravalli range of hills and in the peneplains to the east and west occupying the state of Rajasthan with sporadic occurrences in the states of Haryana, Delhi in the north and Gujarat, Madhya Pradesh in the south and

southwest. Three major fundamental geological units constitute the Aravalli craton. The oldest and lithologically diverse unit is termed as Banded Gneissic Complex (BGC) which constitutes the Archean nucleus of this craton and includes various types of gneisses, migmatites, high grade schist and meta basic rocks. Two successive Proterozoic fold belts evolved around the BGC, represented by the Aravalli Supergroup and Delhi Supergroup of rocks (Heron, 1953). During Proterozoic, this craton experienced repeated phases of crustal rifting, development of rift basins, generation of oceanic troughs, and deposition of various sedimentary facies in different tectonic settings and emplacement of various kinds of acid and basic igneous rocks. These led to events which were associated with multiple deformation and poly phase metamorphism of the rock sequences. This craton is a classical example of 'resurgent tectonics'. The principal fold belts in the Aravalli craton are Paleo- to Meso-Proterozoic Aravalli Fold Belt (AFB) and Meso to Neo-Proterozoic Delhi Fold Belt (DFB). The basement to these fold belts is the BGC.

3.2.0 The present proposed area which is covering parts of Banswara District of Rajasthan, exposes mainly rocks of Aravalli Supergroup and Deccan Traps. The oldest rocks exposed in the area are phyllite, quartzite, mica-schist, meta subgreywacke and grouped under Kalinjara Formation of Lunavada Group of Aravalli Supergroup. Lunavada Group is represented by the rocks of Kalinjara Formation. Major part of the area is occupied by the Aravalli Supergroup of rocks which is mainly overlain by Deccan traps. The Aravallis are mainly composed of schist, phyllite, marble, dolomite, quartz vein in the study area. Basalt forms prominent flat topped hills and step like topography. Low lying areas are mainly occupied by the phyllite forming valley portion.

The Aravalli Supergroup is represented by the Lunavada Group and Kalinjara and Wagidora Formations. The Kalinjara Formation is mainly characterized by phyllite, meta subgreywacke, mica schist, quartzite, dolomite, meta-conglomerate. The overlying Wagidora Formation is represented by meta-subgreywacke, phyllite and mica schist. Phyllite is best exposed in the Anas River section.

Another well exposed rocks of Kalinjara Formation is quartzite. Later intrusive granites are also exposed. These granites are intruded in phyllite and a thick

quartz vein is continuing along with granite. Conglomerate belongs to Bagh. Another prominent rock type of the area is basalt which mainly belongs to Deccan Trap of Malwa Group. This basalt concealed the Archaean rocks and forming steep ridges.

3.2.1 **Aravalli Supergroup:** The rocks belong to Aravalli Supergroup (Paleoproterozoic) in the study area are phyllite, marble, meta-subgerywacke, mica schist and marble. These rocks are grouped under Kalinjara Formation of Lunavada Group.

- a. **Phyllite:** This is a prominent rock of the area which is brown to greenish grey, medium to fine grained and moderately compacted. At places the degree of metamorphism is increased and converted phyllite into schist. Numerous small quartz veins are also observed. Most of the areas occupied by phyllite are related to released silica which are along the foliation plane.
- b. **Quartzite:** Mainly occurring in southern most part of the area in Jhabua District of Madhya Pradesh. The common colour of quartzite is light brown to grey with pinkish tint, compact in nature and hard. Bedding can be observed on the basis of colour variation. Contact between phyllite and quartzite is sharp.
- c. **Quartz Veins:** Quartz vein are mainly concentrated in phyllite.

3.2.2 **Intrusive:**

Granite: Occurrence of granite intruded in phyllites is observed in study area. These intrusions are not so common in the area but near Kumblapara village it can be observed very well. These are fine to coarse grained and pink in colour. Plagioclase, orthoclase, quartz and biotite are the main minerals observed in hand specimen.

3.2.3 **Bagh Formation:**

Quartz-Pebble-Conglomerate: It belongs to Bagh formation. Conglomerate is clast supported. Clast ranges from 2 mm to 5 cm in size. The clasts are mainly of quartzite, phyllite and some schistose rock. Groundmass or matrix is made up of mica, quartz and feldspar.

3.2.4 **Deccan Trap:**

Basalt: One of the most common rock after phyllite in the area is basalt. It is undeformed, massive and compact that is why it can be easily identified in the field. It forms flat topped topography. Its weathering pattern and topographical appearance help in identification. Basalt in the study area is black to greyish green tint, fine grained, melanocratic. Spheroidal weathering is a common phenomenon in basalt as observed in the study area. It is difficult to identify how many flows are there. One flow can be distinguished from another flow by the presence of vesicular basalt and zeolite red bole layer which separates one flow to another. According to Bowen's reaction series, zeolite forms in the end stages of crystallisation and that is why it might be on the top of the exposed sections. Grain size variation is not so common in one flow to another. For the flow count detailed study is required.

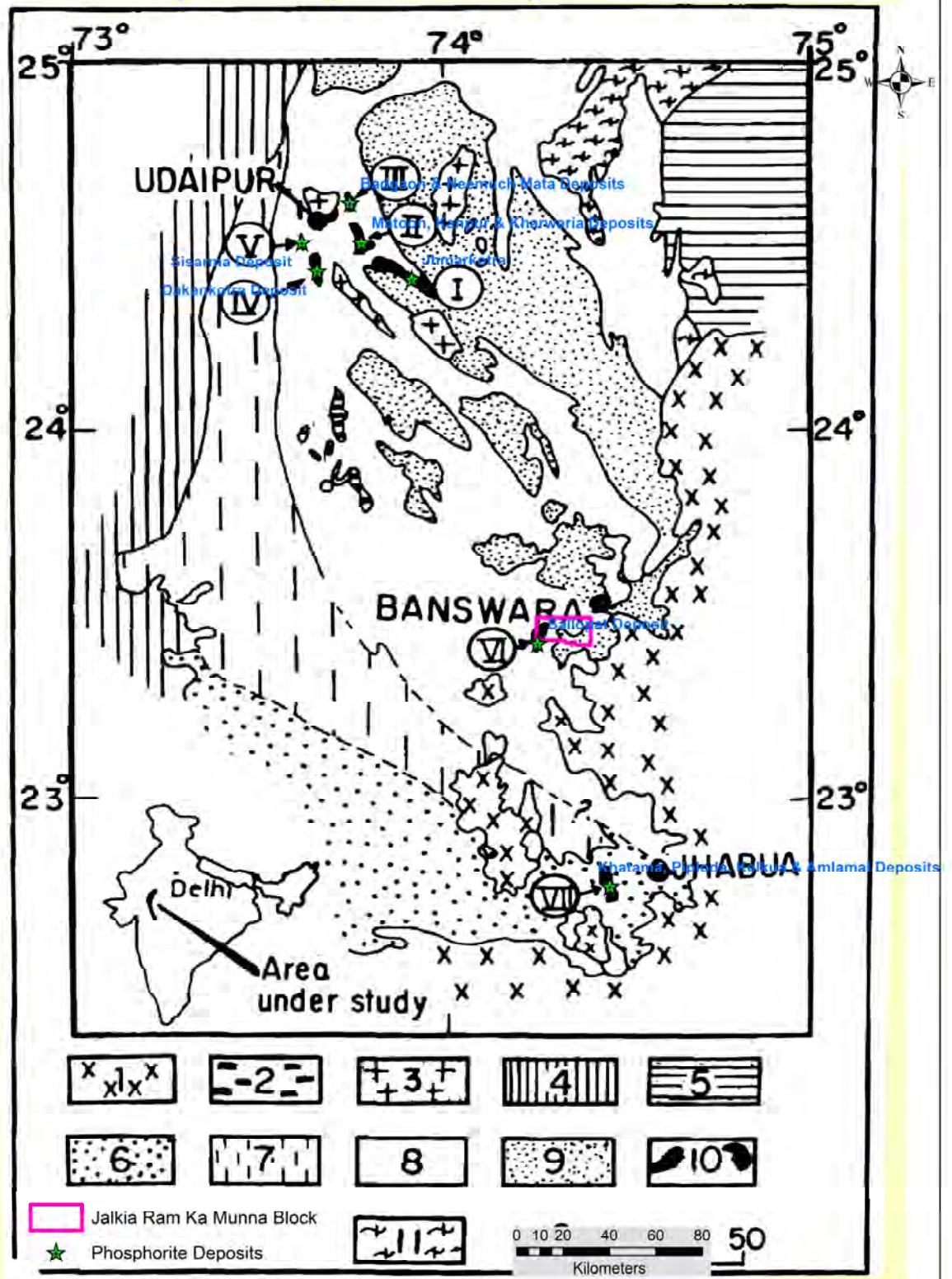
Table- 1.1: Litho-stratigraphic classification of Jalkia-Ram Ka Munna Block (After GSI).

Age	Super group	Group	Formation	Lithology
Recent	Alluvium			
Upper cretaceous to Paleocene	Decan Trap	Malwa	Indor	Basalt Flow
			Kankariya Pirukheri	Basalt Flow
			Intertrappean (Kalisindh)	Cherty Limestone, Siltstone, Clay Stone fossiliferous
			Kalisindh	Basalt
			Intertrappean (Mandaleshar)	Cherty siltstone, Claystone, conglomerate.
			Mandaleshwar	Unclassified basalt flow.
Upper Cretaceous	Aravalli		Bagh	a. Conglomerate and sandstone b. Limestone and nodular limestone
Paleo-			Intrusive	Granite

proterozoic		Lunavada	Wagidora	Meta-subgreywacke, phyllite and mica schis
			Kalinjara	Phyllite, meta- sub greywacke and mica schist Quartzite Dolomite Meta-conglomerate Manganiferous phyllite. Marble biotite gneiss

3.3.0 The Precambrian (probably late Proterozoic) phosphorite deposits of the Aravalli Supergroup were first discovered by the personnel of the Geological Survey of India in early 1967. A number of other deposits were later discovered in the same lithotectonic setting in and around Udaipur City of south-central Rajasthan, Banswara in southern Rajasthan, and Jhabua in northwestern Madhya Pradesh (Fig. 1). Of these only the deposits around Jhamarkotra, Matoon, and Jhabua are being commercially exploited. Figure 1 is a generalized stratigraphic presentation of the lithologies containing phosphorite deposits and their tectonic relationships with the younger and older lithological units exposed in the area. The distribution pattern indicates the occurrence of phosphorite either on the margins of the early Precambrian crystalline basement or on the fringes of epicontinental sedimentary basins demarcated by a basal conglomerate-quartz arenite-dolomite lithology. The present proposed area is very close and situated in the north Sallopat phosphorite deposit. The rocks of the Sallopat phosphorites area constitute the youngest Lunavada Group comprising a variety of metasediments that form shelf sequence of the Aravalli Supergroup. The Aravalli Supergroup (2500 to 3300 Ma) is overlying the Archaean basement of gneisses and granites (Banded Gneissic Complex) with an intense unconformity. The Kalinjara formation of Lunavada Group in descending order is composed of phyllite-subgreywacke, dolomitic limestone, orthoquartzite, stromatolitic phosphorite, arkosic dolomitic limestone, meta-conglomerate and manganiferous phyllites. The eastern and western parts are covered by high flat hills of deccan traps. The exposed metasediments of Sallopat area are folded, sheared and represented by meta-arkose, conglomerate, schist, quartzite, dolomite, calc-schist and predominant phyllites.

Regional Geological Map of the Precambrian Aravalli Phosphorite Deposits of Udaipur-Jhabua Belt



Source: Banerjee et. al., 1980, Economic Geology

Fig. 1: Regional Geological Map of Precambrian Aravalli Phosphorite Deposits (Banerjee et. al., 1980)

4.0.0. Geology of the Block

4.1.1 Aravalli Supergroup of rocks in the area is intruded in the northwest by the granitic rocks. The Aravalli metasediments are exposed in the area north of Jhalod to Banswara road and the litho assemblage comprising talc -chlorite schist with minor dissemination of pyrite, crystalline dolomite and banded magnetite quartzite, gritty arkosic conglomerate, quartzite, phyllites and intercalation of quartzite. Dolomite, thinly laminated rhythmites with associated volcanics and impersistent bands of polymictic conglomerates.

Tentative Lithological Succession of the Block (After GSI)

Age	Group/ Formation	Lithology
Lowe Eocene to Upper cretaceous	Decan Trap	Basaltic flow
Upper Cretaceous	Bagh	Calcareous sandstone and conglomerate with occasional Dinosaur egg fossil
-----Unconformity-----		
Upper Proterozoic	Aravalli Supergroup	Granite, aplite, quartz veins,
Lower to Middle Proterozoic		Dolomite, Ferruginous rock, Conglomerate Chlorite schist with pyrite, Crystalline dolomite, Banded magnetite quartzite and jasparoid.

4.0.1 Structure

Bedding and foliations is developed extensively on phyllites. Bedding is well defined by compositional layering and colour banding. Trend of the bedding varies from NNW to WNW with 10° to 70° dips towards ENE to NNE directions. Sudden swing in trend of the bedding is also noted at short distances because of the presence of localized folds. Foliation has been developed on phyllites in the form of flow cleavage and fracture cleavage. General trend of BIF, dolomite, talc chlorite schist etc. arc NNW-SSE direction with similar dip with that of the phyllites. The prominent fault trend is

also NW-SE. Some of the NW trending shears are also noticed in dolomitic formations. E-W to NE-SW trending shear zones is fairly mylonitised and pulverised. There are no macroscopic fold pattern noticed in this area. However, a small ESE plunging anticline south of Jher - Moti has been reported by U.B.V Krishna Rao (1976). Numerous minor folds have been reported from phyllites. Prominent folds are plunging 10° to 30° towards NNW and SSE. Some of the minor folds plunges NNE to NE direction at low angles. Roychowdhury, M (1995-96) has reported four generations of folds in this area. The first-generation folds (f1) occur as rootless folds and are very rare. Pervasive axial planar schistosity has been developed during first deformation. The second-generation folds (f2) are near recumbent and are noticed in rhythmities. These two sets are co-axial. The refolding of axial trace of second fold produced (f3) third generation folds. The last phase of deformation produced broad open warps (f4).

5.0.0. Previous Work / Background information

5.1.0 The earliest account of the area was given by Gupta et al. (1939). These workers have broadly classified the rock types into the Archaeans, the Lametas and the Deccan Traps. The south-western parts of the area in Gujarat State was mapped by Rao (1969). He has demarcated phyllites, quartzite, dolomitic limestone and grouped them within the Archaeans. Part of area in the east and southeast was mapped by Munshi in detail (1973). As a result of mapping, the dolomitic limestone-chert bands exposed between Udaipur and Jhabua were found to contain economically significant phosphorite deposits at Jhamarkotra, Matoon, Kelkua, Khatamba and Piploda. Phosphorite in these localities occurs mainly within the stromatolitic cherts and dolomitic limestone. Non-stromatolitic cherts also contain significant amount of phosphorite. A preliminary study of the deposits by Munshi et al (1973) indicated about 7 million tons of rock phosphate containing 30% P_2O_5 up to an anticipated depth of 60 metres. The individual phosphatic band was seen to continue along strike for about 1.25 km and with width varying from 5 to 100 metres. The P_2O_5 content in the phosphatic rock ranges between 15% and 37%. Similar phosphorite occurrence, though of less economic significance, is known from Sallopat in the Banswara district of Rajasthan. (Mehra, et al 1969). Rao U.B.V.K. 1976 mapped the area on 1:50000 scale and reported impure dolomitic limestones containing traces of phosphorite in Aravalli Supergroup of rocks. Kathiara, et. al. (1975)

investigated the area for rock phosphate. Roychowdhury, M. (1995- 96) has carried out elucidation of structure and stratigraphy of Aravalli Supergroup of rocks in toposheets 46I/4 and I/8.

5.1.1 The phosphorite occurrences in Aravalli supergroup were mapped in 1:50000 scale by S.L. Mehra and C. Biswas (1969). They have taken many traverses in connection with the search for phosphorites, from Salumbar in Udaipur district southwards upto the southernmost border of Banswara district, a deposit of stromatolite-bearing. phosphorite was located one kilometre south-west of Sallopat and also identified a number of lenses of phosphorite of different sizes and grades occurring associated with dolomite, chert and calcareous quartzite. The phosphatic zone is traceable over a strike length of 1.2 kms with a width of 120 to 280. On the basis of colorimetric tests, these lenses of phosphorites were grouped into four different grades. Occurrences of phosphorite have also been located at Ram-Ka-Munna and Jher moti area which are falls within the proposed area. The P_2O_5 content varies from 5 to 15% and the phosphate is admired with dolomite.

5.1.2 P.K. Chourasia, 2000 carried out geochemical prospecting for basemetal and associated mineralisation covering Aravalli Supergroup of rocks exposed in parts of toposheets 46I/4 and I/8 around Jhalod -Anas areas of Panchmahals and Banswara Districts. Main objects of, the geochemical investigation has been to assess the possibilities of basemetal and associated mineralisation potential in Aravalli Supergroup of rocks. The Geochemical study reveals the anomaly for associated elements gold and silver have been picked up around the areas viz. Lakai block, Pipli-Khundini and Jher-Hadia during the course of his work around Jhalod-Anas area. One sample indicating rich Pb-Cu-Ag-Au mineralisation is noticed near Hadia village. The host rocks in these areas are limonitised sheared dolomite, BIF and phyllites. The contact zones around granites require further detailed close spaced sampling of bed rock and soil samples on grid pattern. Trenching and pitting is required to evaluate the significance of the geochemical anomalies obtained by the present prospecting work. He recommended that Similar set up comprising dolomite, BIF and Mn bearing sediment of M.P, Rajasthan and Gujarat deserve investigation for gold

and silver mineralisation. Quartz - Pebble-Conglomerate of the area requires to be investigated for gold mineralisation.

4.2.0 Observation and recommendations of previous work

4.2.1 The present area is known for its phosphorite occurrences and very near Sallopat area. The Sallopat is located just outside of south western corner of the proposed block and under PL concession of FAGMIL, Rajasthan. S.L. Mehra and C. Biswas, 1969 carried out geological mapping in and around the area and identified phosphorite occurrences around Sallopat, Jher Moti and Ramka Munna area. The Sallopat area is widely explored by GSI in recent past. But rest of the areas not explored in such details. The brief description on occurrences of phosphorite around Ram Ka Munna and Jher Moti area according to S.L. Mehra and C. Biswas, 1969 is given below:

Ram Ka Munna: The occurrence is located about 210 metres south of Ram-ka-Munna. A number of hillocks of dolomite, at places interbedded with quartzites and chert, occur to the north of the village over a strike length of 8 kms. in an east-west direction. The strike of this phosphatic dolomite is northsouth with a dip of 40 degrees towards east. Phosphate occurs in the form of thin, bluish-grey stringers and the horizon can be traced for a distance of 120 metres. The P_2O_5 content varies from 5 to 15% and the phosphate is admired with dolomite.

Jher Moti: An occurrence of phosphatic dolomite is located just west of 54 kilometre-stone on Banswara-Dohad road in a small dolomite hillock. The strike of the phosphate-bearing dolomite as N.W.-S.E. with a north-easterly dip of 45 degrees. Phosphate occurs in the form of occasional, thin, bluish-grey streaks and films over a distance of 630 metres. P_2O_5 varies from 5 to 15%. Another occurrence of phosphatic dolomite is seen to the west of Jher Moti in a small dolomite hillock. The strike of dolomite is east-west with a dip of 48 degrees towards north. Phosphate occurs in the form of thin, bluish-grey streaks and films and can be traced intermittently over a strike length of 1 km. Phosphate form this zone analyses on an average than 10% P_2O_5 .

4.2.2 P.K. Chourasia, 2000 carried out geochemical prospecting for basemetal and associated mineralisation covering Aravalli Supergroup of rocks exposed in

parts of toposheets 46I/4 and I/8 around Jhalod -Anas areas of Panchmahal and Banswara Districts. Main objects of, the geochemical investigation has been to assess the possibilities of basemetal and associated mineralisation potential in Aravalli Supergroup of rocks. He describes the Indication of base metal mineralisation in the forms of specks, grains, dissemination, blebs, of galena, chalcopyrite, pyrite, arsenopyrite. Manganese ore - pyrolucite, and iron ore - magnetite have been recorded at Jher, Lakai, Pipli areas. Gossan, box works, oxidised ore, goethite/botryoidal feature with sulphides and golden colour coating/flakes, limonitisation, jasperoidation and brecciation, mylonitisation along fault zones have been noticed. The Geochemical study reveals the anomaly for associated elements gold and silver have been picked up around the areas viz. Lakai, Pipli-Khundini and Jher-Hadia during the course of his work around Jhalod-Anas area. The brief details about gold bearing prospective locations are given below:

Pipli-Khundini area: It is located north of Anas bridge and trends along NE direction. Black shale and sheared dolomite are the main lithology of Pipli-Khundini block. Dolomite is mostly sheared, gossanised, oxidised and faulted. Flowage fold has also been noticed in dolomite. Goethite and botryoidal feature are noticed having coating of golden shining/gold flakes along with sulphides. Old working, having about 2 m diameter noticed at Pipli along the fault zone. This same old working has bifurcated pits. Over the roof wall and side wall of the old working contain fine oxidised material occurring as red disseminations and associated with the dolomite/jasperoid zone. Dolomite samples have indicated Au varying from <50 ppb to 200ppb.

Pipli-Ghora-Khundini Area (Geochemical Analysis of Bed rock samples)									
Cu	Pb	Zn	Co	Mn	Cd	Ag	Au	Mo	As
15 to 315 ppm	40 to 80 ppm	50-800 ppm	25-160 ppm	480 ppm – 1.5%	2-3 ppm	<2-3 ppm	<50-200 ppb	25-1500ppm	<500 ppm

Lakai Area: Lakai prospect is located about 2 km west of Jher-Hadia prospect. Lithology of the area is dominated by BIF laminated tuff, and calc-silicate. All these formations are oxidised, limonitised and gossanised. Few old working/quarry possibly iron ore has been seen for about 100 m length and 50

m wide area. Individual pit is about 10 x 10 m diameter. Same characters continued for about 1000 m length in western side. Gossan associated at Lakai area contains deep red, brown, yellow, purplish colour oxidised minerals including malachite and azurite, chalcopyrite, pyrite and arsenopyrite are also visible at places golden colour coating of golden coloured material were also noticed. Anomaly for gold in bed rock samples have been analysed from <50-350ppb.

Lakai Area (Geochemical Analysis of Bed rock samples)									
Cu	Pb	Zn	Co	Mn	Cd	Ag	Au	Mo	As
25-60 ppm	40 to 1.95%	30-90 ppm	25-165 ppm	140-2800 ppm	<22 ppm	<2ppm	<50-350 ppb	15-100 ppm	<500 ppm

Jher-Hadia Area: Jher-Hadia area is located south of Anas River. Jher-Hadia area is represented by mainly dolomite unit at places which is silicified, gossanised and sheared. At Hadia veins/layer of galena mineralisation has been noticed which has analysed Rich value of about Pb, Zn, Cu, Au. Ag in one sample, in many other samples anomolous values for Au, Ag have been obtained, at Jher 3 old working having 1 to 3 metre diameters have been identified. Now the pits have been filled by debris by the local people so as to stop falling to animal in it. Depth of the old working appears to be 5 to 10 m deep. These pits, are scattered in about 25 m area in silicified dolomite. Oxidised (red spot); limonitised, gossanised patches perhaps developed after pyrite and pyrotite which may contain Au and Ag mineralisation. Anomalous stream sediment and bed rocks values of gold (50-250 ppb), silver (2 to 70 ppm).

Jher-Hadia Area (Geochemical Analysis of Bed rock samples)									
Cu	Pb	Zn	Co	Mn	Cd	Ag	Au	Mo	As
200-1400 ppm	150-400 ppm	50-60 ppm	85-170 ppm	380-2700 ppm	2-4 ppm	2-70 ppm	50-250 ppb	250-350 ppm	-

4.4.0. Justification

- 4.4.1 Rich phosphorite deposit has been proved at Sallopat area just situated south of the proposed block. Rock phosphate intimately associated with stromatolites occurs in the dolomitic limestones of the Aravalli Supergroup. The phosphorite mineralisation in the proposed area is expected to be associated with the Dolomite. However, the phosphate values recorded by S.L. Mehra and C. Biswas, 1969 in their report ranging from 5 to 15% in and around Ram Ka Munna and Jher Moti villages. Dolomite of grey/grayish blue type are mostly stromatolitic bearing and phosphatic in nature. Stromatolites of columnar, lensoidal, fragmentary, bedded and fragmentary varieties are present.
- 4.4.2 Geochemical signature and anomaly for associated elements gold and silver have been picked up around Lakai, Pipli-Khundini and Jher-Hadia has been demarcated during the course of exploration work carried out by P.K. Chourasia, 2000. He suggested the host rocks in these areas are limonitised sheared dolomite, BIF and phyllites. As per author indication of base metal mineralisation in the forms of specks, grains, dissemination, blebs, of galena, chalcopyrite, pyrite, arsenopyrite. Manganese ore - pyrolucite, and iron ore - magnetite have been recorded at Jher, Lakai Pipli, Khundina areas. Gossan, box works, oxidised ore, goethite/botryoidal feature with sulphides and golden colour coating/flakes, limonitisation, jasperoidation and brecciation, mylonitisation along fault zones have been noticed.
- 4.4.3 Considering the anomalous values of the samples and similar geological settings warrant that the area may be taken up for further level of exploration (geochemical sampling and scout drilling etc.) in the area. The Exploration will be helpful in estimation of reconnaissance resources of Phosphorite, Gold and associated minerals in the block area.

4.5.0. Objective:

The exploration is proposed with the following objectives:

- a) Preparation of Geological map at 1:12,500 Scale.
- b) To identify the mineralised zone and test by scout drilling.
- c) To estimate resources as per UNFC norms, if any.
- d) To facilitate the state govt. for auctioning of the block.

5.0.0 Proposed Exploration Scheme

5.1.0 In accordance to the objective set for Jalkia-Ram Ka Munna Block, the following scheme of exploration has been formulated. The details of different activities to be carried out are presented in subsequent paragraphs.

5.3.0 Geological Map

The geological map (1:12,500 scale) will be prepared based on structural data, surface samples, borehole locations, trenches etc. carried out during G4 stage. This map will be used as base map for future work.

5.4.0 Surface Samples (BRS/Channel Samples):

During the large-scale mapping 80 nos. of bed rock/channel samples will be collected from phosphorite bearing rocks and 100 nos. samples collected from the cherty band of dolomite, phyllite and quartz veins to locate gold and 50 nos. samples will be collected for Base metals. A total of 20 nos. of samples to be collected from the manganiferous phyllite zone for Manganese.

5.5.0 Exploratory Mining (Trenching)

After surface mapping a provision of shallow trenching of 300 cubic meters has been kept at suitable location to establish the strike continuity of the mineralized zone for phosphorite and Gold & base metals. Locations of trenches on ground will be decided by field geologist based on field observations. On the basis of encouraging results, boreholes will be planned and drilled in higher stage of exploration. Trenching shall be done for correlation of mineralized zone on surface up to a depth of 1-2 m after removal of soil/weathered column in the area. A provision of 201 nos. of primary & check (5% Internal +10% External) trench samples is kept for analysis of P_2O_5 (75 nos.) and Gold & Base metals (100 nos.).

5.6.0 Surface Drilling

The present exploration scheme is prepared by proposing total core drilling of 500 m depends on analytical results of trench and BRS/Channel samples. A total 120m will be drilled for phosphorite in 4 boreholes are planned to establish resources below 30m of ground level and rest of the 380m inclined boreholes are planned to establish resources of gold and associated minerals below 60m of ground level. Boreholes are to be planned on the basis of initial mapping and sampling data.

5.7.0 Drill Core Logging and Sampling

5.7.1 Geological core logging will be carried out systematically by recording carefully the minute details and physical/lithological characters of the rock formations including colour, core recovery, grain size, weathered zone, texture, banding, mineralogical composition, micro-structural/structural details, lithological variations along with visual estimate in case of P_2O_5 content encountered in boreholes. “A SHAPIRO SOLUTION” will be used at field for identification of Phosphorite bearing zones in the drill cores during logging. Rock quality designation (RQD) shall also be carried out, while logging drill cores.

5.8.0 Core Sampling:

5.8.1 Entire drill core of one of the boreholes is proposed to be sampled at 1 m length in order to demarcate Phosphorite bearing horizons. In the remaining boreholes, samples will be restricted to Phosphorite zones demarcated based on Shapiro’s solution results. The samples will be drawn at 1 m interval depending upon the change in lithology and core recovery.

5.8.2 Suspected mineralized zone of drill core of the boreholes is proposed to be sampled at 1 m length in order to demarcate gold and associated minerals bearing horizons. The samples will be drawn at 1 m interval depending upon the change in lithology and core recovery.

5.8.2 Drill cores will be split in to two equal halves in case of wet drilling for collection and preparation of primary samples. The other half portion of the sample will be kept as duplicate half for specific gravity determination, petrographic/mineragraphic studies and for future reference. The whole quantity of half portion of the sample as marked while logging will be crushed to (-) 120 mesh and 500gm representative sample of (-)120 mesh will be drawn by coning and quartering method of gradual reduction. Two samples weighing 100gm each will be drawn, one of which will be sent to MECL, Chemical Laboratory, Nagpur for Primary Chemical analysis for 5 radicals and the other will be kept for the purpose of check analysis. The remaining 300gm will be kept for preparation of Composite samples.

5.8.3 Each sample should be marked at every 1m length in case of continuance of similar mineralogical composition down the borehole and no sample length should

exceed 1m. The sample length towards the floor marked by non-ore zone needs also to be adjusted as per variations of the litho-units. Even if the floor is distinctly differentiated by the presence of non-mineralized zone, at least two nos. samples after the Phosphorite zone and gold zones need to be drawn to mark the floor decisively.

5.9.0. Laboratory Studies

Chemical Analysis:

i) **Primary Samples-** 130 nos. of primary (80nos. surface samples & 50 nos. drill core samples) and check samples (20 nos. around 5% internal and 10% external samples) will be analyzed for 5 radicals i.e., $P_2O_5\%$, $SiO_2\%$, $Al_2O_3\%$, $Fe_2O_3\%$ & $LOI\%$. External sample will be sent to NABL accredited laboratory as external check samples for analysis of 5 radicals i.e., $P_2O_5\%$, $SiO_2\%$, $Al_2O_3\%$, $Fe_2O_3\%$ & $LOI\%$.

140 nos. of primary (100nos. surface samples & 40 nos. drill core samples) and check samples (21 Nos. around 5% internal and 10% external samples) will be analyzed for gold and silver by fire assay. Another 50 nos. of primary surface samples will be analyzed for Cu, Pb, Zn, Co and Mo and 40 nos of drill core samples will be analysed for Cu, Pb, Zn, Co and Mo also.

Moreover 20 nos. of surface samples will be collected for (3 Nos. around 5% internal and 10% external samples) analysis for 6 radicals Mn, SiO_2 , P_2O_5 , Fe_2O_3 , MnO_2 and Insolubles.

ii) **Composite samples-** Around 10 nos. composite samples will be analyzed for 14 radicals i.e., $P_2O_5\%$, $SiO_2\%$, $Al_2O_3\%$, $Fe_2O_3\%$ & $LOI\%$, $CaO\%$, $MgO\%$, $TiO_2\%$, $Na_2O\%$, $K_2O\%$, $F\%$, $Cl\%$, $V_2O_5\%$ and organic carbon% and 10nos. of composite samples for gold & silver by fire assay.

iii) **ICP-MS studies** will be done on 10 nos of composite samples to know the presence of trace elements.

5.10.0. Petrological Studies: Petrological studies will be done on around 20 nos. of BRS/drill core specimens.

5.11.0. Mineragraphic Studies: Mineragraphic studies will be done on around 20 nos. of BRS/drill core specimens.

5.12.0. Whole Rock Analysis: Whole Rock Analysis will be done on around 10 nos. of Surface Samples.

5.13.0. Quantum of Work

The details of quantum of work block in Jalkia-Ram Ka Munna Block have been furnished below:

Proposed Quantum of Work for Preliminary Exploration (G-3) for Phosphorite, Gold and Associated Minerals in Jalkia- Ram Ka Munna Block District: Banswara, Rajasthan			
Sl. No.	Item of Work	Unit	Proposed Quantum of work
1	Geological Mapping (on 1:12,500 Scale)	Sq. km	110.53
2	Geochemical Sampling	Nos.	80
	Bed rock sampling/channel sampling for Phosphorite		
	Bed rock sampling/channel sampling for Gold		
	Bed rock sampling/channel sampling for Base Metals		
	Bed rock sampling/channel sampling for Manganese		
3	Exploratory Mining		
	Excavation (Trenching)	Cu. m.	300 (150 Cu.m.- Phosphorite & 150 Cu.m.- Gold & Base Metals)
4	Drilling	m.	500
5	Laboratory Studies		
	A. Surface samples (Bed rock sampling/channel sampling)		
	i) Chemical Analysis; Primary for 5 radicals i.e., P ₂ O ₅ , SiO ₂ , Al ₂ O ₃ , Fe ₂ O ₃ and LOI	Nos.	80
	ii) Internal Check samples (5% of Primary samples) for analysis of 5 radicals i.e., P ₂ O ₅ , SiO ₂ , Al ₂ O ₃ , Fe ₂ O ₃ and LOI	Nos.	4
	iii) External Check sample (10 %of Primary samples) for analysis of 5 radicals i.e., P ₂ O ₅ , SiO ₂ , Al ₂ O ₃ , Fe ₂ O ₃ and LOI	Nos.	8
	iv) Chemical Analysis; Primary for Gold & Silver by fire assay	Nos.	100
	v) Internal Check samples (5% of Primary samples) for Gold & Silver by fire assay	Nos.	5
	vi) External Check sample (10 %of Primary samples) for Gold & Silver by fire assay	Nos.	10
	vii) Chemical Analysis; Primary for 5 radicals i.e., Cu, Pb, Zn, Co and Mo	Nos.	50
	viii) Internal Check samples (5% of Primary samples) for analysis of 5 radicals i.e., Cu, Pb, Zn, Co and Mo	Nos.	3

Proposed Quantum of Work for Preliminary Exploration (G-3) for Phosphorite, Gold and Associated Minerals in Jalkia- Ram Ka Munna Block District: Banswara, Rajasthan			
	ix) External Check sample (10 %of Primary samples) for analysis of 5 radicals i.e., Cu, Pb, Zn, Co and Mo	Nos.	5
	x) Chemical Analysis; Primary for 6 radicals i.e., Mn, SiO ₂ , P ₂ O ₅ , Fe ₂ O ₃ , MnO ₂ and Insolubles	Nos.	20
	xi) Internal Check samples (5% of Primary samples) for analysis of 6 radicals i.e., Mn, SiO ₂ , P ₂ O ₅ , Fe ₂ O ₃ , MnO ₂ and Insolubles	Nos.	1
	xii) External Check sample (10 %of Primary samples) for analysis of 6 radicals i.e., Mn, SiO ₂ , P ₂ O ₅ , Fe ₂ O ₃ , MnO ₂ and Insolubles	Nos.	2
	B. Trench samples		
	i) Chemical Analysis; Primary for 5 radicals i.e., P ₂ O ₅ , SiO ₂ , Al ₂ O ₃ , Fe ₂ O ₃ and LOI	Nos.	100
	ii) Internal Check samples (5% of Primary samples) for analysis of 5 radicals i.e., P ₂ O ₅ , SiO ₂ , Al ₂ O ₃ , Fe ₂ O ₃ and LOI	Nos.	5
	iii) External Check sample (10 %of Primary samples) for analysis of 5 radicals i.e., P ₂ O ₅ , SiO ₂ , Al ₂ O ₃ , Fe ₂ O ₃ and LOI	Nos.	10
	iv) Chemical Analysis; Primary for Gold & Silver	Nos.	75
	v) Internal Check samples (5% of Primary samples) for Gold & Silver	Nos.	4
	vi) External Check sample (10 %of Primary samples) for Gold & Silver	Nos.	8
	vii) Chemical Analysis; Primary for 5 radicals i.e., Cu, Pb, Zn, Co and Mo	Nos.	25
	viii) Internal Check samples (5% of Primary samples) for analysis of 5 radicals i.e., Cu, Pb, Zn, Co and Mo	Nos.	1
	ix) External Check sample (10 %of Primary samples) for analysis of 5 radicals i.e., Cu, Pb, Zn, Co and Mo	Nos.	3
	C. Drill Core		
	i) Chemical Analysis; Primary core for 5 radicals i.e., P ₂ O ₅ , SiO ₂ , Al ₂ O ₃ , Fe ₂ O ₃ and LOI	Nos.	50
	ii) Internal Check samples of core (5% of Primary samples) for analysis of 5 radicals i.e., P ₂ O ₅ , SiO ₂ , Al ₂ O ₃ , Fe ₂ O ₃ and LOI	Nos.	3
	iii) External Check sample of core (10 %of Primary samples) for analysis of 5 radicals i.e., P ₂ O ₅ , SiO ₂ , Al ₂ O ₃ , Fe ₂ O ₃ and LOI	Nos.	5
	iv) Chemical Analysis; Primary core samples for Gold & Silver by fire assay	Nos.	40
	v) Internal Check samples of core (5% of Primary samples) for Gold & Silver by fire assay	Nos.	2
	vi) External Check sample of core (10 %of Primary samples) for Gold & Silver by fire assay	Nos.	4
	vii) Chemical Analysis; Primary core for 5 radicals i.e., Cu, Pb, Zn, Co and Mo	Nos.	40

Proposed Quantum of Work for Preliminary Exploration (G-3) for Phosphorite, Gold and Associated Minerals in Jalkia- Ram Ka Munna Block District: Banswara, Rajasthan			
	viii) Internal Check samples of core (5% of Primary samples) for analysis of 5 radicals i.e., Cu, Pb, Zn, Co and Mo	Nos.	2
	ix) External Check sample of core (10 %of Primary samples) for analysis of 5 radicals i.e., Cu, Pb, Zn, Co and Mo	Nos.	4
	Composite Samples for 14 radicals	Nos.	10
	Composite Samples for gold	Nos.	10
	Trace element study by ICPMS	Nos	10
6	Physical Studies		
7	Petrographic Studies	Nos	20
8	Mineragraphic Study	Nos	20
9	Whole rock analysis	Nos.	10
10	Report Preparation (Digital format)	Nos.	1 No.

7.0.0 Cost Estimate

Cost has been estimated based on actual schedule of rates mandated in the circular OM No. 61/1/2018/NMET dated 31st March 2020 for NMET Funded Projects. The total estimated cost is Rs. **219.51** Lakhs. The summary and details of cost estimates is given below:

SUMMARY OF COST ESTIMATED		
Sl. No.	Item	Estimated Cost (Rs.)
1	Geology Work	3,906,240
2	Laboratory	4,675,586
3	Excavation	999,000
4	Survey	172,800
5	Drilling	7,724,400
	Sub Total (1 to 5)	17,478,026
6	Exploration Report	750,000
7	Exploration Proposal	364,561
8	Peer Reviewer Charges	10,000
	Grand Total	18,602,587
7	GST 18%	3,348,466
	Total:	21,951,052
	Say Rs. in Lakhs	219.51

7.1.0 Timeline

The proposed exploration programme envisages geological mapping, surface sampling, trenching, scout drilling, sample preparation and laboratory studies, which will be completed within 15 months, geological report preparation with

peer review will take 4 months with 1 months overlapping with lab works. Therefore, a total of **18 months** is planned for completion of the entire proposed programme. Tentative Time schedule/action plan for proposed Reconnaissance Survey (G-4) for Phosphorite, Gold and Associated Minerals is given in **Table No.- 2**.

8.0.0 References:

Bhukosh website, Hosted by GSI, Ministry of mines, Government of India

Chourasia, P.K., 2000: Geochemical Prospecting for basemetal and associated mineralisation in parts of Panchmahals district of Gujarat and Banswara district of Rajasthan. (Toposheets no. 461/8 & 1/4), (Progress Report for the Field Season (1996-97), GSI

Gupta, B. C. and Mukherjee, P.N. (1938). The Geology of Gujarat and Southern Rajputana, Rec. GSI, Vol. 73, No.2.

Kathiara, et. al. (1975). A report on Reconnoitry search for Phosphate in eastern parts of Panchmahals district, Gujarat and Southern parts of Banaswara district, Rajasthan, Unpub. GSI Report.

Mehra, S.L and Biswas, C. 1969: Report on the Investigation for Phosphorite in Parts of Udaipur, Dungarpur and Banswara Districts, Rajasthan. GSI

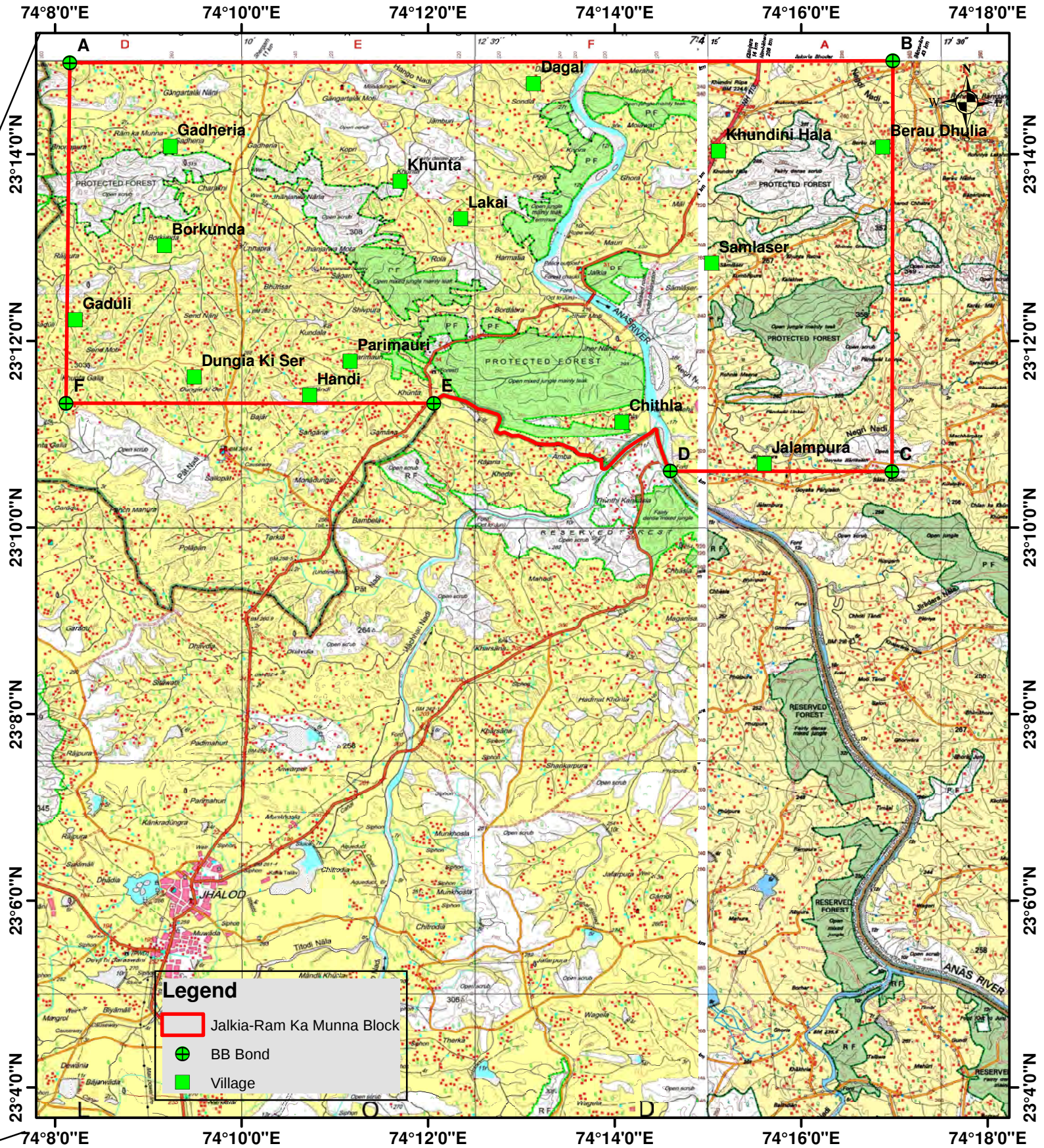
Roychowdhury, M. (1998). Elucidation of structures and stratigraphy of Aravalli supergroup of rocks in Gujarat and search for phosphorite, Unpub. GSI Report.

Rao, U.B.V.K. (1976). Geology of Panchmahals district, Gujarat, Jhabua district, MP. and Banaswara district, Rajasthan, Unpub. GSI Report.

List of Plates:

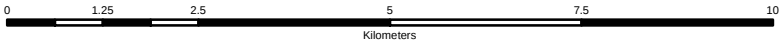
- 1. Location map of Jalkia-Ram Ka Munna Block, Tehsil-Bagidora, District-Banswara, Rajasthan.**
- 2. Regional Geological map of Jalkia-Ram Ka Munna Block, Tehsil-Bagidora, District-Banswara, Rajasthan (Source: Bhukosh).**

LOCATION MAP OF JALKIA-RAM KA MUNNA BLOCK, BANSWARA DISTRICT, RAJASTHAN (AREA: 110.53 SQ. KM)



BB POINTS	LONGITUDE	LATITUDE
A	74° 08' 09.4896" E	23° 14' 58.9256" N
B	74° 16' 58.9693" E	23° 15' 00.0928" N
C	74° 16' 58.4992" E	23° 10' 36.1145" N
D	74° 14' 35.7964" E	23° 10' 36.2129" N
E	74° 12' 03.6684" E	23° 11' 19.9584" N
F	74° 08' 07.0701" E	23° 11' 19.9584" N

Boundary line between Point No. D to E along the Rajasthan and Gujrat State Boundary



74°5'0"E

74°10'0"E

74°15'0"E

74°20'0"E

REGIONAL GEOLOGICAL MAP

23°15'0"N

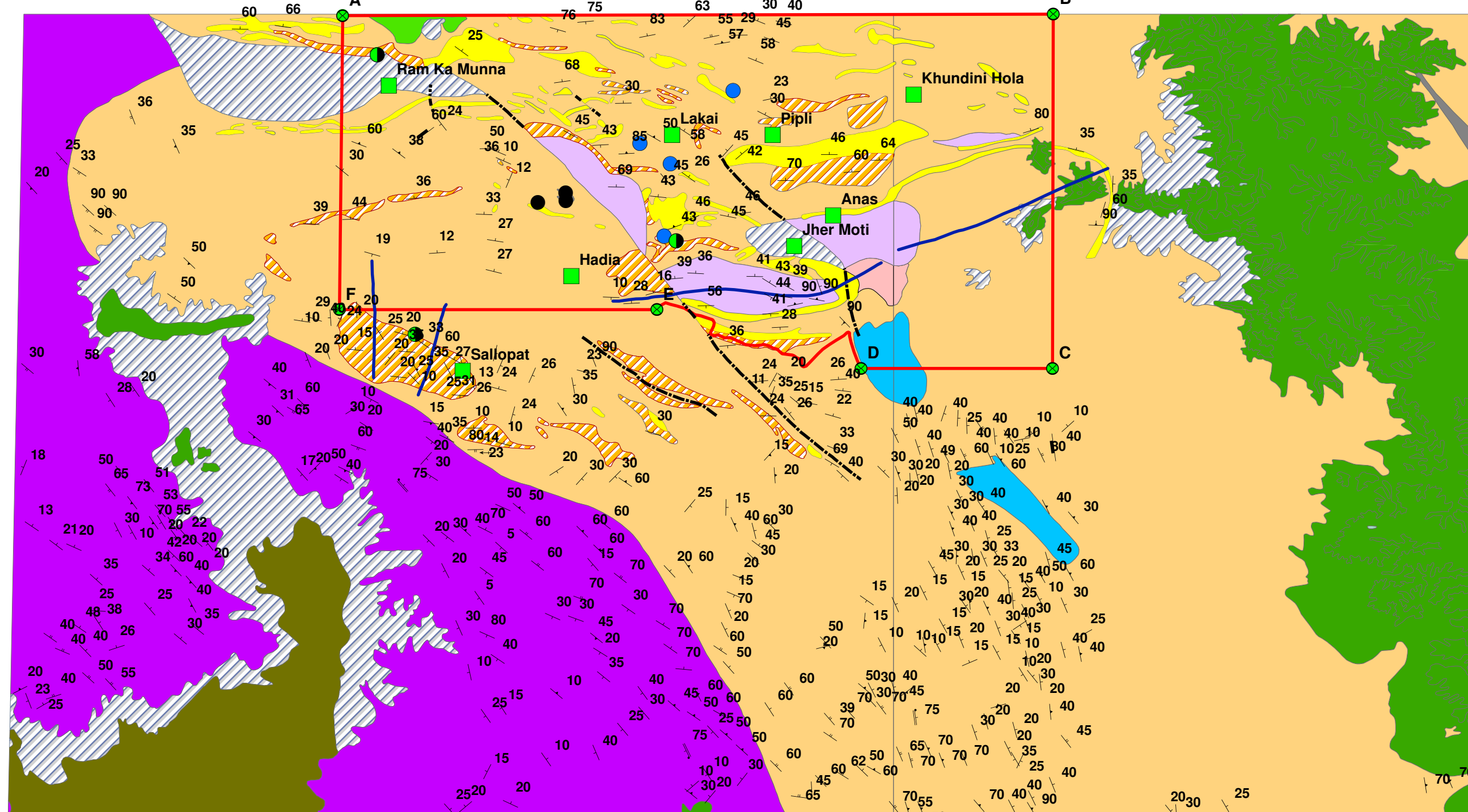
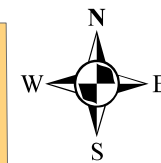
23°10'0"N

23°5'0"N

23°15'0"N

23°10'0"N

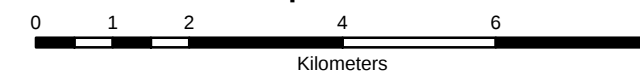
23°5'0"N



Source: Bhukosh

Plate-I

Part of Toposheet No. 46I/4 & 46I/8



Legend

Jalkia Ramka Munna Block

BB Bond

BASALT

BASALT FLOW

CHERTY, SILTSTONE, CLAYSTONE, CONGLOMERATE

CONGLOMERATE AND SANDSTONE

DOLOMITE

GRANITE

LIMESTONE AND NODULAR LIMESTONE

MANGANIFEROUS PHYLLITE

META-CONGLOMERATE

META-SUBGRAYWACKE, PHYLLITE AND MICA SCHIST

PHYLLITE, META-SUBGRAYWACKE AND MICA SCHIST

QUARTZITE

UNCLASSIFIED BASALT FLOW

Imp_Villages_Mineralisation

Old Working_Phosphorite

Old Working_Manganese

Old working_Copper

Fold

Fault

BEDDING

CLEAVAGE/FOLIATION/SCHISTOSITY (S1)

CLEAVAGE/FOLIATION/SCHISTOSITY (S2)

CLEAVAGE/FOLIATION/SCHISTOSITY (S3)

CLEAVAGE/FOLIATION/SCHISTOSITY (S4)

JOINT

LINEATION

Manganese

MINERAL EXPLORATION AND CONSULTANCY LTD.
(Formerly Mineral Exploration Corporation Ltd.)
Govt of India Enterprise, A Miniratna PSE

COST SHEET FOR RECONNAISSANCE SURVEY (G-4) FOR PHOSPHORITE, GOLD AND ASSOCIATED MINERALS IN JALKIA-RAM KA MUNNA BLOCK							
DISTRICT: BANSWARA, RAJASTHAN							
Total Area - 110.53 Sq Km; Bh No. 7 to 8 Completion Time - 18 Months							
S.N	Item of Work	Unit	Rates as per NMET SoC 2020-21		Estimated Cost of the Proposal for		Remarks
			SoC-Item -SI No.	Rates as per SoC	Qty.	Total Amount (Rs)	
A	GEOLOGICAL WORK						
1	Mapping (1:10,000),Borhole logging,sampling & report writing						
a	Charges for one Geologist per day at HQ for monitoring, data processing etc.	day	1.3	9,000	60	5,40,000	
b	Charges for Geologist per day at field for mapping, channel sampling and logging.	day	1.3	11,000	240	26,40,000	Calculated on the basis of 2 Geologist Party Mapping- 2.5 months (2 Partys), trenching- 30 days (1 Party) & drilling- 60 days (1 party)
c	Labour Charges(4 Nos) for two Geologist; Base rate - Rs. 443/ per day	day	5.7	443	480	2,12,640	Amount will be reimburse as per the notified rates by the Central Labour Commissioner or respective State Govt. whichever is higher Calculated on the basis of 2 partys
d	Charges for Sampler (1 party)	one sampler per day	1.5.2	5,100	75	3,82,500	
e	Labour Charges (4 Nos)for Sampling Work; Base rate - Rs. 437/ per day	day	5.7	437	300	1,31,100	Amount will be reimburse as per the notified rates by the Central Labour Commissioner or respective State Govt. whichever is higher
	Total - A					39,06,240	
B	EXCAVATION						
1	Trenching	per Cu.m	2.1.1	3,330	300	9,99,000	
	Total - B					9,99,000	
C	Survey (1:10,000)						
a	Bore Hole Fixation and determination of co ordinates & Reduced Level of the boreholes and boundary points and base station by DGPS	Per Point of observation	1.6.2	19,200	9	1,72,800	8 Bhs & 1 Base station
	Total - C					1,72,800	
D	DRILLING						
1	Drilling up to 300m (Hard rock)	m	2.2.1.4a	11,500	500	57,50,000	
2	Borehole deviation Survey by multishot camera	m	2.2.6	330	380	1,25,400	
3	Land / Crop Compansation (in case the BH falls in agreecultural Land)	per BH	5.6	20,000	8	1,60,000	
4	Construction of concrete Pillar (12"x12"x30")	per borehole	2.2.7a	2,000	8	16,000	
5	Transportation of Drill Rig & Truck associated per drill (2 rig)	Km	2.2.8	36	3,000	1,08,000	
6	Monthly Accomodation Charges for drilling Camp (2 Rigs)	month	2.2.9	50,000	3	1,50,000	
7	Drilling Camp Setting Cost	Nos	2.2.9a	2,50,000	2	5,00,000	
8	Drilling Camp Winding up Cost	Nos	2.2.9b	2,50,000	2	5,00,000	
9	Road Making Hilly Terrain)	Km	2.2.10b	32,200	4	1,28,800	
10	Drill Core Preservation	per m	5.3	1,590	180	2,86,200	
	Total - D					77,24,400	
E	LABORATORY STUDIES						
1	Chemical Analysis						
i)	Primary samples (BRS/Channel)						
	a. For 5 radicals i.e. P2O5, SiO2, Al2O3, Fe2O3 and LOI	Nos	4.1.3	9,805	80	7,84,400	
	Check samples Internal (5%) and External(10%)						
	a. For 5 radicals i.e. P2O5, SiO2, Al2O3, Fe2O3 and LOI	Nos	4.1.3	9,805	12	1,17,660	
ii)	Primary samples (BRS/Channel)						
	a. For Gold & Silver by Fire Assay	Nos	4.1.5a	4,760	100	4,76,000	
	Check samples Internal (5%) and External(10%)						
	a. For Gold & Silver by Fire Assay	Nos	4.1.5a	4,760	15	71,400	
iii)	Primary samples (BRS/Channel)						
	a. For 5 radicals i.e. Cu, Pb, Zn, Co & Mo	Nos	4.1.7a	2,506	50	1,25,300	
	Check samples Internal (5%) and External(10%)						
	a. For 5 radicals i.e. Cu, Pb, Zn, Co & Mo	Nos	4.1.7a	2,506	8	20,048	
iv)	Primary samples (BRS/Channel)						
	a. For 6 radicals i.e. Mn, SiO2, P2O5, Fe2O3, MnO2 and Insolubles	Nos	4.1.7a & 7b	2,841	20	56,820	
	Check samples Internal (5%) and External(10%)						
	a. For 6 radicals i.e. Mn, SiO2, P2O5, Fe2O3, MnO2 and Insolubles	Nos	4.1.7a & 7b	2,841	3	8,523	
v)	Primary samples (Trench)						
	a. For 5 radicals i.e. P2O5, SiO2, Al2O3, Fe2O3 and LOI	Nos	4.1.3	9,805	100	9,80,500	
	Check samples Internal (5%) and External(10%)						
	a. For 5 radicals i.e. P2O5, SiO2, Al2O3, Fe2O3 and LOI	Nos	4.1.3	9,805	15	1,47,075	
vi)	Primary samples (Trench)						
	a. For Gold & Silver by Fire Assay	Nos	4.1.5a	4,760	75	3,57,000	
	Check samples Internal (5%) and External(10%)						
	a. For Gold & Silver by Fire Assay	Nos	4.1.5a	4,760	12	57,120	
vii)	Primary samples (Trench)						
	a. For 5 radicals i.e. Cu, Pb, Zn, Co & Mo	Nos	4.1.7a	2,506	25	62,650	
	Check samples Internal (5%) and External(10%)						
	a. For 5 radicals i.e. Cu, Pb, Zn, Co & Mo	Nos	4.1.7a	2,506	4	10,024	

S.N	Item of Work	Unit	Rates as per NMET SoC 2020-21		Estimated Cost of the Proposal for		Remarks
			SoC-Item -SI No.	Rates as per SoC	Qty.	Total Amount (Rs)	
viii)	Primary samples (Bh core)						
	a. For 5 radicals i.e. P2O5, SiO2, Al2O3, Fe2O3 and LOI	Nos	4.1.3	9,805	50	4,90,250	
	Check samples Internal (5%) and External(10%)						
	a. For 5 radicals i.e. P2O5, SiO2, Al2O3, Fe2O3 and LOI	Nos	4.1.3	9,805	8	78,440	
ix)	Primary samples (Bh core)						
	a. For Gold & Silver by Fire Assay	Nos	4.1.5a	4,760	40	1,90,400	
	Check samples Internal (5%) and External(10%)						
	a. For Gold & Silver by Fire Assay	Nos	4.1.5a	4,760	6	28,560	
x)	Primary samples (Trench)						
	a. For 5 radicals i.e. Cu, Pb, Zn, Co & Mo	Nos	4.1.7a	2,506	40	1,00,240	
	Check samples Internal (5%) and External(10%)						
	a. For 5 radicals i.e. Cu, Pb, Zn, Co & Mo	Nos	4.1.7a	2,506	6	15,036	
xi)	Composite Samples						
	a. composite samples will be analyzed for 14 radicals i.e. P2O5, SiO2, Al2O3, Fe2O3, LOI, CaO, MgO, TiO2, Na2O, K2O, F, Cl, V2O5 and organic carbon	Nos	4.1.3	9,805	10	98,050	
	a. composite samples will be analyzed for 5 radicals i.e. Cu, Pb, Zn, Co & Mo	Nos	4.1.7a	2,506	10	25,060	
	c. Trace element study by ICP-MS (34 elements) Ti, V, Cr, Ni, Ga, Cr, Co, Cu, Pb, Zn, Ba, Sr, Rb, Zr, Y, Nb, Ce, Nd, Ta Cd, Sb, Sc, As, Th, U etc.	Nos	4.1.14	7,731	10	77,310	
xii)	Petrographic Study						
	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	
xiii)	Mineragraphic Study	Nos					
	i Preparation of polished section	Nos	4.3.3	1,549	20	30,980	
	ii Study of polished section	Nos	4.3.4	4,232	20	84,640	
xiv)	Digital Photographs	Nos	4.3.7	280	30	8,400	
xv)	Whole rock analysis (Major oxides)	No.	4.1.15a	4,200	10	42,000	
	TOTAL - E					46,75,586	
F	Sub Total (A to E)					1,74,78,026	
G	Geological Report Preparation		5.2	For the projects exceeding Rs. 150 Lakhs but less than 300 lakhs : A Minimum of Rs. 7.5 lakhs or 3% of the work whichever is more	1	7,50,000	EA has to submit the final Geological Report in Hard Copies (5 Nos) and the soft copy to NMET.
H	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. 3.8 Lakhs whichever is lower	1	3,64,561	EA has to submit 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.
I	Peer review Charges		As per EC decision			10,000	
J	Total Estimated Cost without GST					1,86,02,587	
K	Provision for GST (18% of GST)	%				33,48,466	GST will be reimburse as per actual and as per notified prescribed rate
L	Total Estimated Cost with GST					2,19,51,052	
				or Say Rs. In Lakhs		219.51	

Note - 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 Certifiате regarding non outsourcing of any component/project is required.

Table: 2 Schedule timeline for Reconnaissance Survey (G-4) for Phosphorite, Gold and Associated Minerals in Jalkia-Ram Ka Munna Block, District: Banswara, Rajasthan

[illegible]

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.