BLOCK SUMMARY OF PROPOSAL FOR PGE, VANADIUM AND ASSOCIATED MINERALIZATION IN BHURSADONGARI - MURUM BLOCK (123 SQ KM), BALAGHAT DISTRICT, MADHYA PRADESH FOR RECONNAISSANCE SURVEY (G-4 STAGE) UNDER NMET

COMMODITY: PGE, VANADIUM & ASSOCIATED MINERALS

BY

GEMCOKATI EXPLORATION PRIVATE LIMITED
PLOT NO-34, POSTAL COLONY, BAPAT NAGAR, CHANDRAPUR-442401, MAHARASHTRA.

PLACE: CHANDRAPUR
DATE: 20TH FEBRUARY 2024

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Summary of the Block for Reconnaissance Survey (G-4 Stage)
GENERAL INFORMATION ABOUT THE BLOCK

PGE, VANADIUM AND ASSOCIATED MINERALIZATION IN BHURSADONGARI - MURUM BLOCK (123 SQ KM), DISTRICT – BALAGHAT, MADHYA PRADESH FOR RECONNAISSANCE SURVEY (G-4 STAGE) UNDER NMET (Toposheet No. 64 C/11)		
	Features	**Details**
	Block ID	**BHURSADONGARI - MURUM BLOCK**
	Exploration Agency	**GEMCOKATI EXPLORATION PRIVATE LIMITED.**
	Commodity	**PGE, VANADIUM AND ASSOCIATED MINERALIZATION**
	Mineral Belt	Dongargarh Supergroup represents Palaeo-Proterozoic and Mesoproterozoic Volcano-sedimentary sequences. Clastic sediments and metavolcanics of Mesoproterozoic metamorphic sequences are known to be hosts of gold-bearing quartz veins, disseminated gold, and anomalous concentrations of PGE & REE in structurally favourable settings.
	Completion Period with entire Time schedule to complete the project	8 Months.
	Objectives	The Present Exploration Programme (G-4) is formulated based on available regional geological data on the work carried out in area; the programme has the following objectives vis-a-vis proposed field components. 1) To carry out Geological and structural mapping on 1:12,500 scale of the block (123 sq km) to delineate various litho-units and their linear / planar structural features like shear zones, fracture zones and lineaments with special attention to record potential host rocks to gold, PGE and REE mineralization / concentration. 2) To carry out systematic grab/channel/grove sampling of bed rocks from the potential mineralized zones. 3) NiS Fire Assay for PGE samples; XRF and ICP analysis of major and Trace elements of selected samples. 4) Petrographic studies of possible host rock. 5) Pitting-trenching of selected zones and sampling. 6) To assess G4 category (334) PGE, Vanadium & associated mineralization, if any, in the Block, as per UNFC norms and Minerals (Evidence of Mineral Contents) Rules.

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	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. Not applicable.
	Name/ Number of Geoscientists	Two (2) Geologists
	Expected Field days (Geology) Geological Party Days	Geologist - 120 days

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1.	Location							
	Co-ordinates of the proposed block	BHURSADONGARI - MURUM BLOCK						
			LATITUDE			LONGITUDE		
		#	D	M	S	D	M	S
		A	21	27	44.05	80	30	4.99
		B	21	27	44.08	80	40	3.82
		C	21	29	54.97	80	40	3.92
		D	21	29	56.81	80	43	40.38
		E	21	27	31.57	80	44	0.99
		F	21	25	50.45	80	42	12.22
		G	21	24	7.80	80	41	59.65
		H	21	24	9.15	80	36	9.64
		I	21	26	37.01	80	36	9.71
		J	21	26	33.76	80	30	4.79
	Villages	Bisoni, Saheki, Kalimati, Pitewani, Khandaphari Bori, Dhiri, Murum, Katiparkhud.						
	Tehsil/ Taluk	Lanji Tehsil.						
	District	Balaghat.						
	State	Madhya Pradesh.						
2.	**Area (hectares/ sq km)**							
	Block Area	123 sq km.						
	Forest Area	Nearly 85% of the area is within Protected Forest limits.						
	Government Land Area	-						
	Private Land Area	-						
3.	**Accessibility**							
	Nearest Rail Head	Darekasa and Salekasa railway stations are situated to the SSW & SW of the block at about 30km from the center of the block. The railway line is connected with Mumbai–Howrah rail zone in South East Central Railway zone.						
	Road	The block is accessed from the south, from Sitapala village on the Lanji – Khairagarh Road and from north through a road from Lanji to Khursitola.						
	Airport	Lanji town (which is about 15km to the NW from the center of the block) is about 53km from Gondiya Airport; Nagpur Airport is at about 205km and Jabalpur Airport at about 300km.						
4.	**Hydrography**							
	Local Surface Drainage Pattern (Channels)	A series of NE-SW trending ridges and valleys in the block has resulted in a trellis pattern of drainage.						
	Rivers/ Streams	1st, 2nd and 3rd order streams from the hill ranges, flow towards a general SW direction, ultimately joining Bagh River which flows eastwards at about 9km from the southern margin of the block.						

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5.	**Climate**	
	Mean Annual Rainfall	1633mm - Balaghat district; ~ 800m - Lanji Tehsil
	Temperatures (December / January) (Minimum) Temperatures (May)(Maximum)	15°C 44°C
6.	**Topography**	
	Toposheet Number	64C/11
	Morphology of the Area	NE-SW trending parallel ridge and valley morphology
7	**Availability of baseline geoscience data**	
	Geological Map (1:50K/ 25K)	**Available.**
	Geochemical Map	**-**
	Geophysical Map (Aeromagnetic, ground geophysical, Regional as well as local scale GP maps)	**-**

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8.	**Justification for taking up ReconnaissanceSurvey / Regional Exploration**	(1) Reconnaissance field traverses resulted in discovery of a ~340m NNE-SSW trending linear zone with anomalous PGE values ranging from 50ppb to 488ppb. As a result of this discovery, an NMET-sanctioned project has been mounted in the area. (2) The presently proposed block is the northern strike extension of the above zone. (3) Study of available NAGMP maps of Magnetic and spectrometric maps has corroborated with field observations. (4) Field traverses and grab sampling from the proposed blocks have yielded anomalous values of PGE in 21 samples (24ppb to 320ppb) and V2O5 in 11 samples (0.07 to 0.14%) (5) Therefore, a G4 exploration programme for PGE, Vanadium and associated mineralization is being proposed in this block.
9.	**List of documents enclosed with the application**	(1) Proposed Block area on Google Earth image. (2) Location of the proposed block demarcated on Survey of India (SOI) Toposheet 64 C/11.

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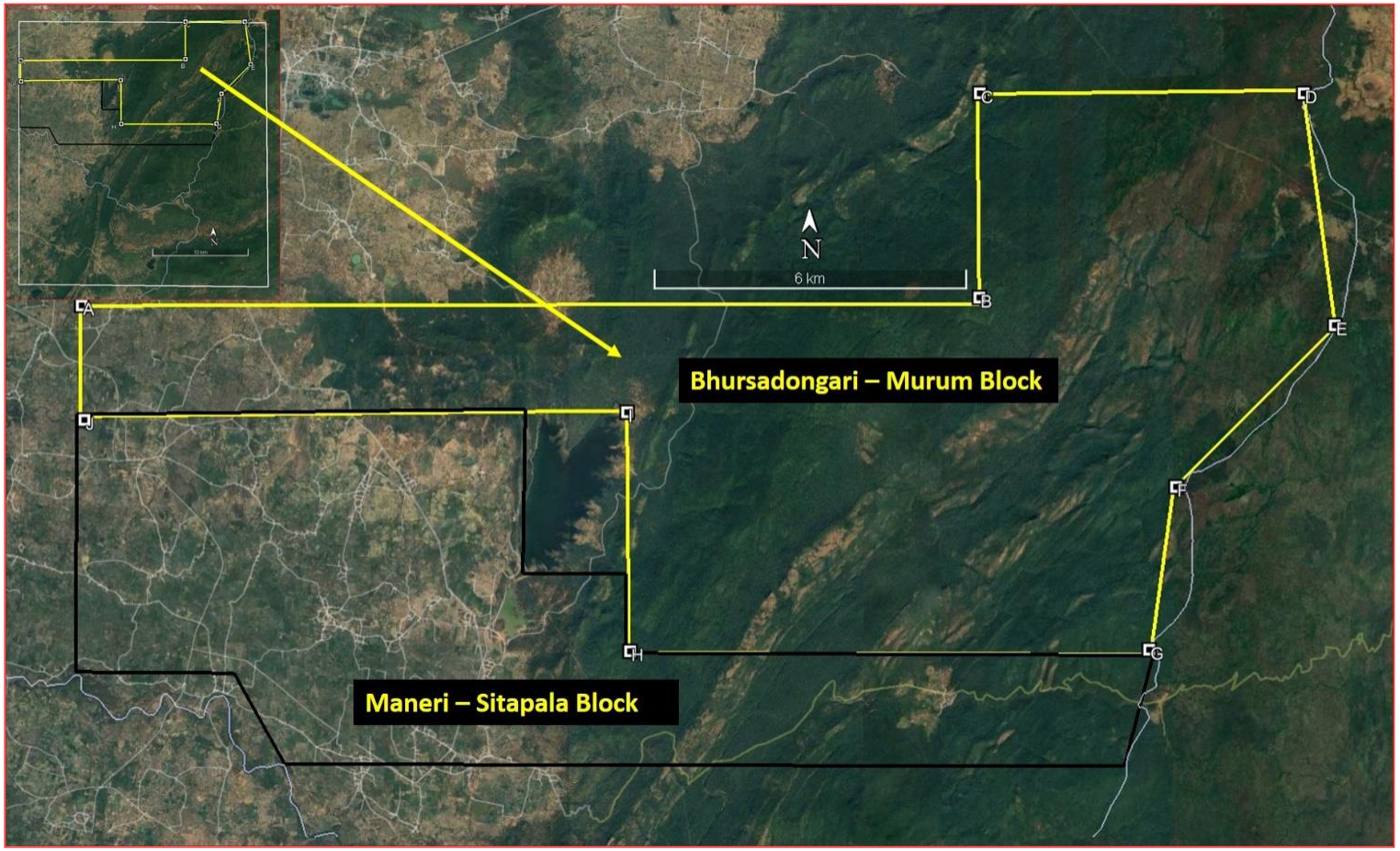

Fig. – 1: Proposed Block area on Google Earth image. Maneri – Sitapala on-going NMET project block is shown for reference.

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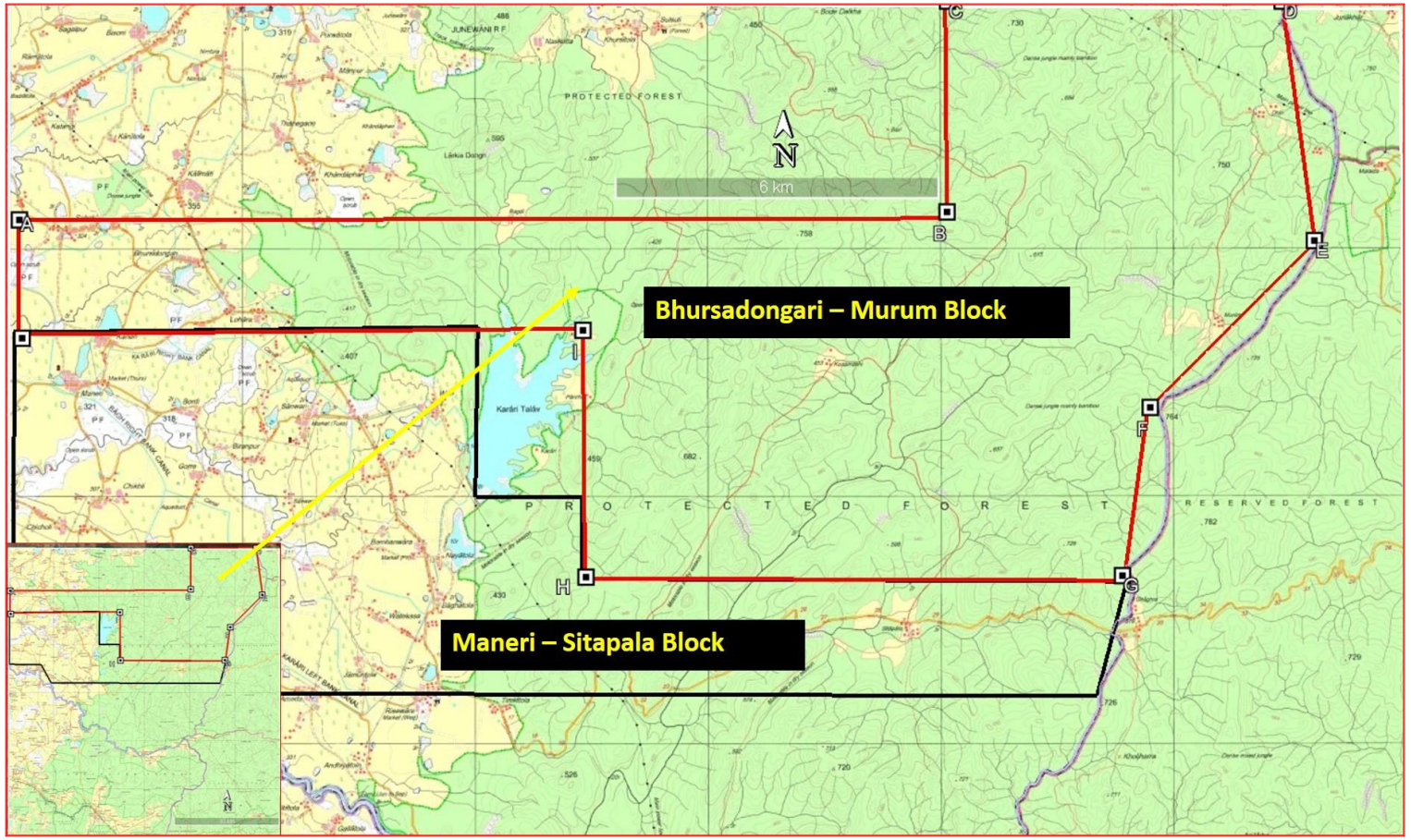

Fig. – 2: Location of the proposed block demarcated on SOI Toposheet 64 C/11. Maneri – Sitapala on-going NMET project block is shown for reference.

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DETAILED PROJECT REPORT
PROPOSAL FOR RECONNAISSANCE SURVEY (G – 4) FOR PGE, VANADIUM & ASSOCIATED MINERALS IN BHURSADONGARI - MURUM BLOCK (123 SQ KM), BALAGHAT DISTRICT, MADHYA PRADESH

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DETAILED PROJECT REPORT: PROPOSAL FOR RECONNAISSANCE SURVEY (G – 4) FOR PGE, VANADIUM & ASSOCIATED MINERALS IN BHURSADONGARI - MURUM BLOCK (123 SQ KM), BALAGHAT DISTRICT, MADHYA PRADESH

1. Block Summary

1.1 Preamble

1.1.0 Introduction of National Mineral Policy, 2016 and the series of amendments to the Mines and Minerals (Development & Regulation) [MMDR] Act since 2015, has received the much-needed impetus to the exploration of mineral commodities in the country. These amendments also paved way for participation of Notified Private Exploration Agencies in Mineral Exploration activities to catalyze the search for various mineral commodities, much needed for the Atmanirbhar Bharat.

1.1.1 Subsequently in 2020, the Geological Survey of India (GSI), being the premiere organization entrusted for the baseline data acquisition, processing and interpretation of non-fuel mineral commodities, has rolled out geological potential maps for a host of non-energy mineral commodities in the form of Atlas of Geological Potential Areas of Non-fuel Minerals in India.

1.1.2 The Atlas of Obvious Geological Potential Areas for mineralization of different non-energy mineral commodities, thus formed the starting point in recognizing potential areas for Reconnaissance Survey (G-4) for specific commodities of interest. Then identifying the gap areas wherein, the State and Central Exploration agencies have not yet carried out such exploration activities has resulted in the carving out of a block for the Reconnaissance Survey (G-4) in the present proposal.

1.1.3 The National Airborne Geophysical Mapping Programme - Phase I (NAGMP) which planned to acquire uniform aero-geophysical data initially over Obvious Geological Potential (OGP), completed data acquisition and interpretation of multi-sensor data over 5 blocks, of which the presently proposed project area is covered under Block – 4. The available data has been consulted while finalizing the present proposal.

1.1.4 Although, as per the Geological Potential Atlas, a major part of the proposed block falls in area marked as OGP-Gold, principles of Metallogenic Epochs have been applied to envisage mineralization as a result of Palaeo-Proterozoic Volcanism which include PGE, vanadiferous titanomagnetites and associated mineralization.

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2. Regional Geology

Rocks belonging to Archean Gneissic complex and Dongargarh Supergroup are exposed in the region. The figure below shows the geological map of the toposheet 64C/11 in which the presently proposed block is located.

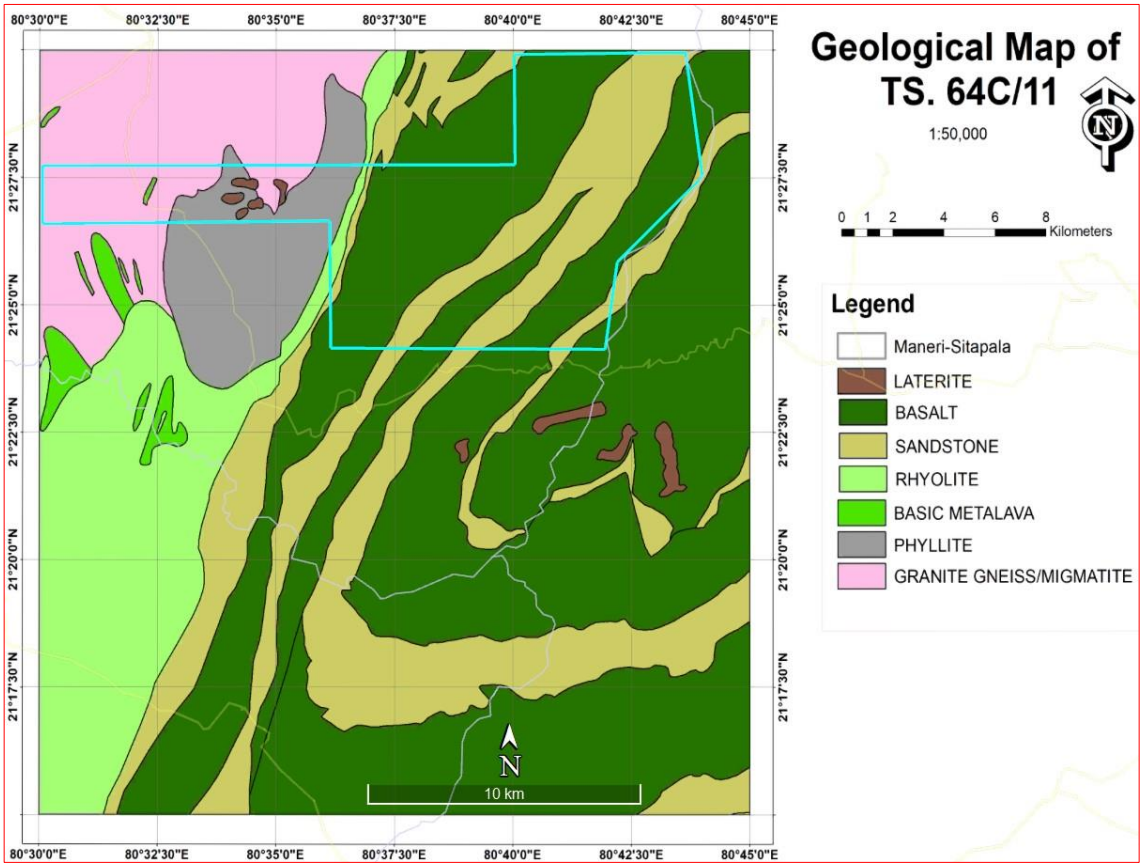

Fig. - 1 - Regional Geology of Toposheet 64C/11 (modified after Bhukosh 1:50,000 Map)

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The Stratigraphic Sequence of the lithological formations exposed in the region is presented in the table below:

Regional Stratigraphy of Toposheet 64C/11			
Age	**Supergroup**	**Group**	**Formation**
Palaeo-Proterozoic - Mesoproterozoic	**Dongargarh Supergroup**	Khairagarh Group	Kotima Basalt
			Ghogra Sandstone
			Mangikhuta Basalt
			Karutola Sandstone
			Sitagota Basalt
			Bortalao Sandstone
Palaeo-Proterozoic		Nandgaon Group	Bijli Rhyolites
Archaean	**Amgaon Gneissic Complex**	Amgaon Group	Amgaon Gneiss
			Phyllites
			Metalava enclaves

Table – 1: Regional Stratigraphy and Lithology

2.1 Description of stratigraphic units

The Amgaon Gneissic Complex consisting of Basement gneisses and supracrustals - phyllites and enclaves of meta-lava, Nandgaon Group represented by Bijli Rhyolites and Khairagarh Group represented by alternating sequence of Sandstones and basalts make up the lithopackage present in the block area.

Amgaon granitic gneiss / migmatite:

Amgaon granitic gneiss is usually medium to coarse-grained rock with well-developed foliation. The granitic rock after a prolonged compressive stress has converted to gneiss. The texture is granoblastic, equigranular to inequigranular; gneissic foliation is defined by sub-parallel alignment of biotite flakes, elongated quartz and feldspar crystals; colour varies from light grey to pinkish grey (Pradeep Mawar, 2012 – STM in contiguous toposheets).

Meta-lava / metabasalt / amphibolite enclaves:

In the western parts of the block where-in rocks of Amgaon gneissic complex are present, occur a few enclaves of fine-grained massive metabasalt and medium to fine-grained amphibolite. However, extensive cultivation activities overall several decades in this part of the block, have obliterated many such enclaves shown on the Bhukosh geological map.

Bijli Rhyolite:

The rhyolites are hard, generally pink- and grey-coloured rocks. In the block area where outcrops were encountered, they are porphyritic texture with phenocrysts of quartz and elongated feldspar set in medium to fine grained matrix.

Basalt:

Basalts occupy the valley portions in the eastern part of the block. They are greenish grey in general and show a wide variety of textures – from hard compact fine-grained rocks to amygdular basaltic (and pitted texture where amygdales are dislodged) to porphyritic textures with phenocrysts of glassy material set in fine matrix.

Sandstone:

The sandstones form the high ridges in the eastern part of the block area. They are grey to off-white to pale pink coloured hard, compact rocks. They show primary bedding and cross lamination features at places.

Intrusive Gabbro:

One spinel-bearing peridotitic intrusive body is present in the basalt in the eastern part of the block.

Laterite:

Several laterite occurrences have been recorded in the toposheet are located outside the block area. However, there appears to be many more laterite patches which have not been recorded on the available geological map. These laterites have developed over the Archean supracrustals as well as Paleo- and Mesoproterozoic volcanic rocks.

Clay:

Several clay pockets have developed in the supracrustal-occupied areas but all of them are located outside this block area.

3. Block description

3.1 Location and Boundary Coordinates

The boundary co-ordinates of the proposed block are tabulated below; the location of the proposed block is shown in Fig.- 2.

#	Latitude			Longitude		
	D	M	S	D	M	S
A	21	27	44.05	80	30	4.99
B	21	27	44.08	80	40	3.82
C	21	29	54.97	80	40	3.92
D	21	29	56.81	80	43	40.38
E	21	27	31.57	80	44	0.99
F	21	25	50.45	80	42	12.22
G	21	24	7.80	80	41	59.65
H	21	24	9.15	80	36	9.64
I	21	26	37.01	80	36	9.71
J	21	26	33.76	80	30	4.79

Table – 2: Boundary Coordinates of Bhursadongari – Murum Block

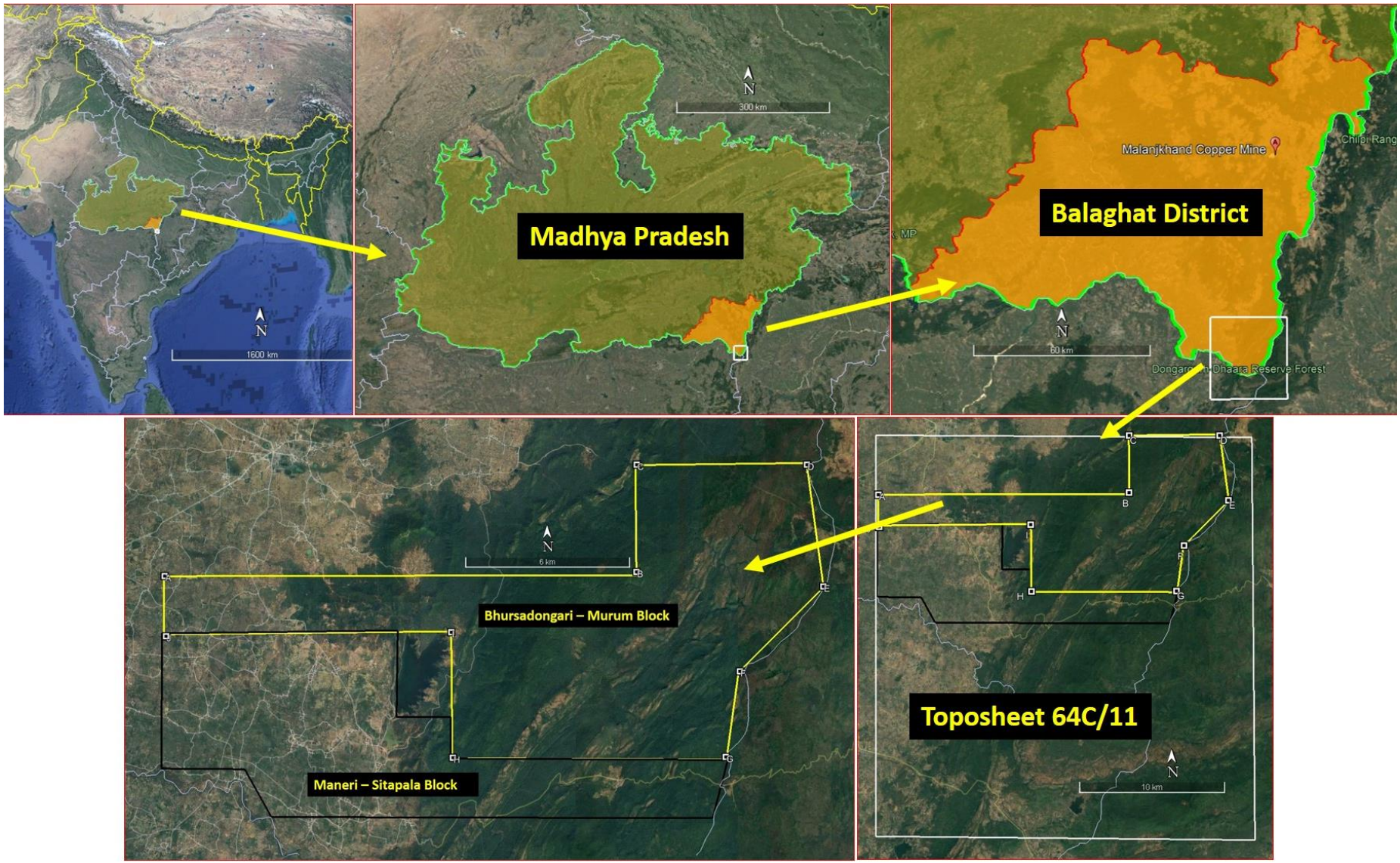

Fig. – 2: Location of Bhursadongari – Murum Block

3.2 Accessibility

The proposed block area is approached through Nagpur to Amgaon-Lanji road; from Amgaon, the block is easily accessed from the north, from Lanji town which is tehsil HQ on the Gondiya- Lanji-Khairagarh Road.

The block is about 20km from Amgaon and 10km from Lanji town. Darekasa and Salekasa railway stations are situated to the S & SW of the block at about 15km from the center of the block. The railway line is connected with Mumbai–Howrah rail zone in South East Central Railway zone.

Lanji which is located to the north of the block is about 50km from Gondiya Airport; Nagpur Airport is at about 195km and Jabalpur Airport at about 315km.

3.3 Physiography

The western part of the block is relatively flat-lying soil covered area; along a representative E-W profile, the minimum and maximum elevation in this part of the block is 340m and 462m respectively. Several villages and agricultural lands occupy this part of the block.

On the other hand, the eastern part of block represents a ridge and valley topography with minimum and maximum elevation being 382m and 751m respectively. It is occupied by thick forest and outcrop-rich NNE – SSW trending ridges and valleys. The Fig. 3 shows a clear picture of the contrasting topographies of the two parts of the block along a representative E-W profile path. proposed area is an undulating country with high ridges towards east with laterite capping, thickly forested with intervening valleys.

Higher order streams originating in the higher elevations of the block ultimately drain in to eastward flowing Bagh River which is located to the south of the block. Fig. – 3 below shows the block, with an elevation profile along a representative E – W line.

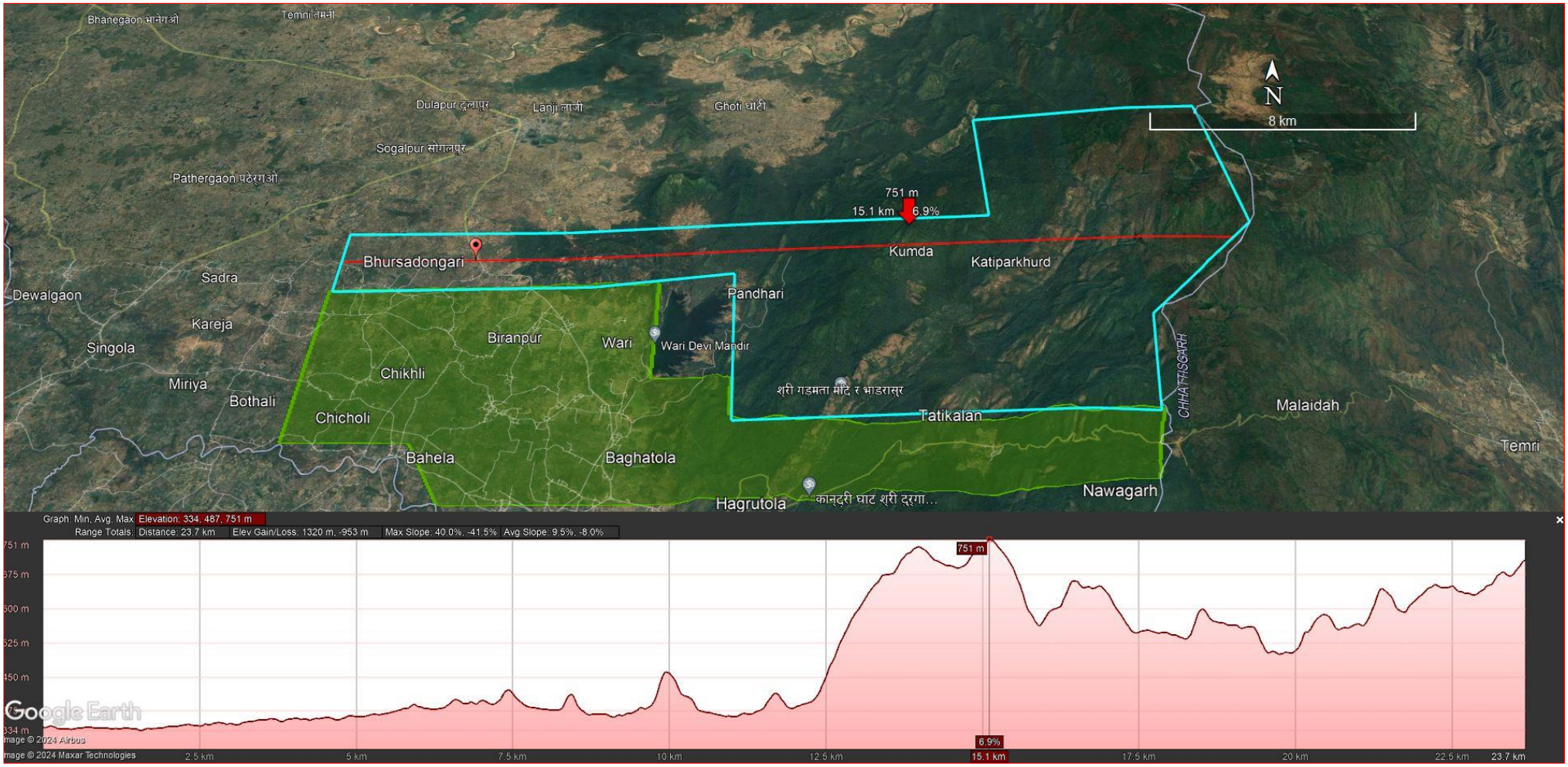

Fig. – 3: Bhursadongari – Murum Block with elevation profile along a E-W profile.

3. Mineral potential based on Regional Geology, previous work and on-going NMET project south of the proposed block

3.1 Previous work

Based on the reported occurrences of Pyroxinitic / gabbroic / peridotitic intrusive phases in the Khairagarh Volcano-sediments by S.N. Sarkar (1949), a search for chromite was launched in by R.K. Sharma & Harbans Kumar (1968); however, no such occurrences were found.

Stream sediment sampling carried out in the western part of Toposheet no. 64C/11(V.D. Mahajan, 1977), where metagabbro dykes, Bijali rhyolites and tuffs, Pitepani metabasalt belonging to Dongargarh supergroup are exposed, did not bring out significant basemetal anomalies. However, one sample from stream draining over rhyolite intruded by aplite vein showed anomalous value for copper and **two samples** from streams originating from a small raised area **where metagabbro is exposed** showed low anomaly for nickel.

These were considered as spot anomalies of no economic significance. Therefore, no further follow-up work was recommended in this area.

Listed below are the relevant historical work, referred to in this proposal:

1. Mapping by Dr. S.N. Sarkar (1949-50);
2. Search for chromite by R.K. Sharma & Harbans Kumar (1968);
3. Regional Integrated Surveys by V.D. Mahajan (1977) and
4. Search for Dimension Stones by A.K Dawande, S.D. Pimprikar, J.K. Srivastava. A.A. Dharwadkar and D.V. Ganvir (1997).
5. STM by Pradeep Mawar (2012) in adjacent toposheets.

3.2 Present Work for PGE Investigations

It is a well-established fact that the gabbroic intrusive phases associated with Meso-Proterozoic Volcanics do have affinity towards chalcophile elements (Ni, Co, Cu, Cr) and magnetite-bearing volcano-plutonic phases can have significant PGE anomaly up to 0.1%, as reported elsewhere in the world. Couple of important references are cited at the end of this document.

This proposal was conceived based on extensive literature survey on mineralization potential of Palaeo- and Meso-Proterozoic volcanic provinces. It is found that such volcanic provinces do have significant PGE concentrations in similar stratigraphic settings.

Accordingly, subsequent to the desktop studies on the available literature on Meso-Proterozoic volcanics, the focus of reconnaissance fieldwork was to look for gabbroic phases within the basaltic terrain.

Further, the available NAGMP high resolution magnetic data was analyzed and interpreted to generate exploration targets based on the already identified magnetite / spinel zone with PGE anomaly (Figs. 4 and 5 below).

Reconnaissance traverses in the Maneri – Sitapala block which lies to the south the presently proposed block had resulted in a ~340m long NNE-SSW block with magnetite / spinel bearing zone with total-PGE values ranging from 50ppb to 488ppb. As a result, a Maneri – Sitapala block was sanctioned by NMET for a G-4 investigation. The first phase of mapping in that block indicated that the spinel bearing NNE-SSW zone extends both towards north and south of the Maneri – Sitapala block.

Incidentally, the above magnetite / spinel zone is corroborated by the anomaly zones picked up by magnetic survey maps (Figs. 4 and 5 below).

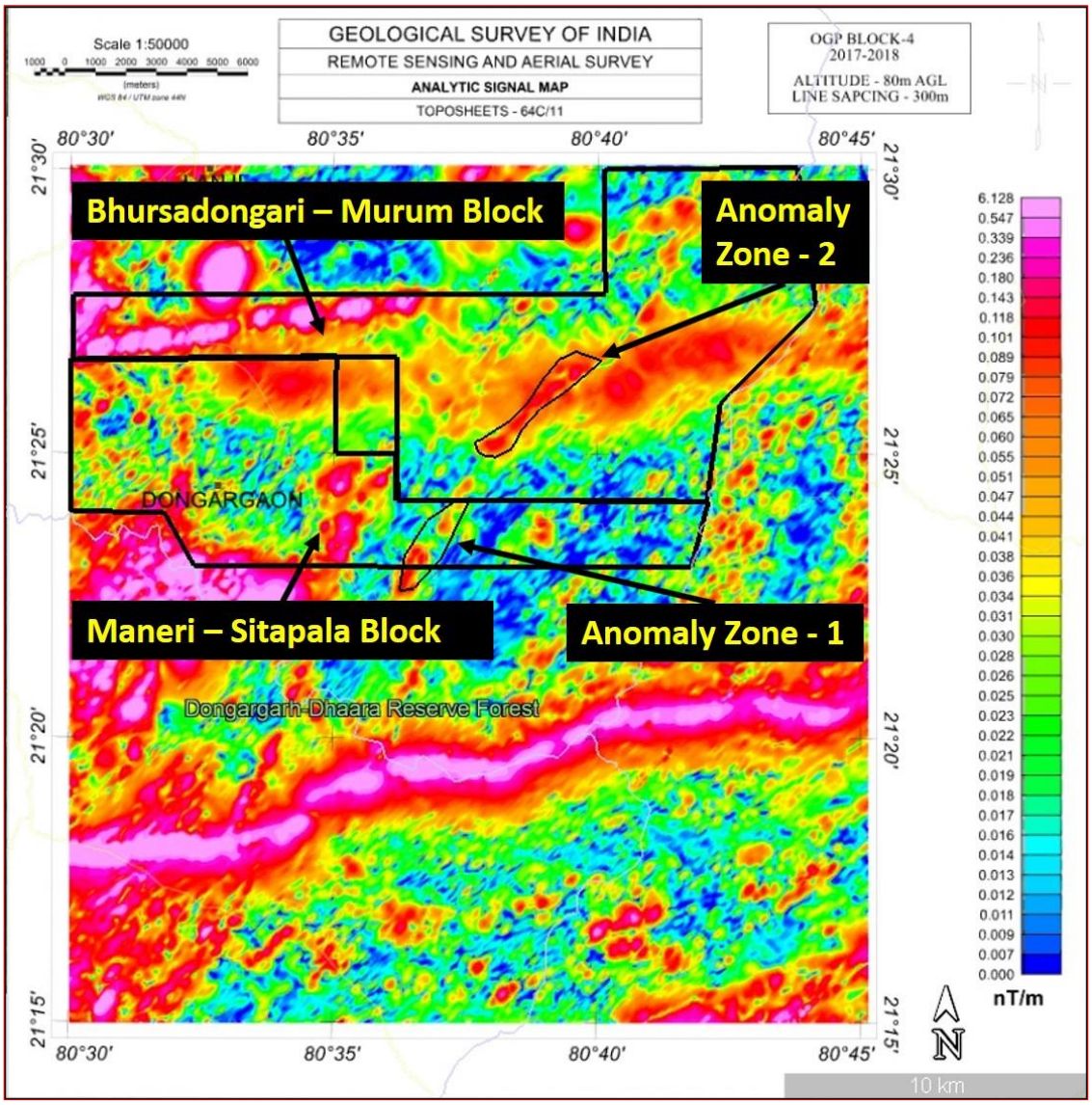

Fig. - 4 – NAGMP – Magnetic Survey – Analytical Signals map with on- going Maneri - Sitapala Block (for reference), the proposed Bhursadongari – Murum Block and Gemcokati-interpreted anomaly zones 1 & 2; it may be noted that the magnetite / spinel zone in the Maneri Sitapala block picked up during the reconnaissance traverses, occurs within Anomaly Zone – 1.

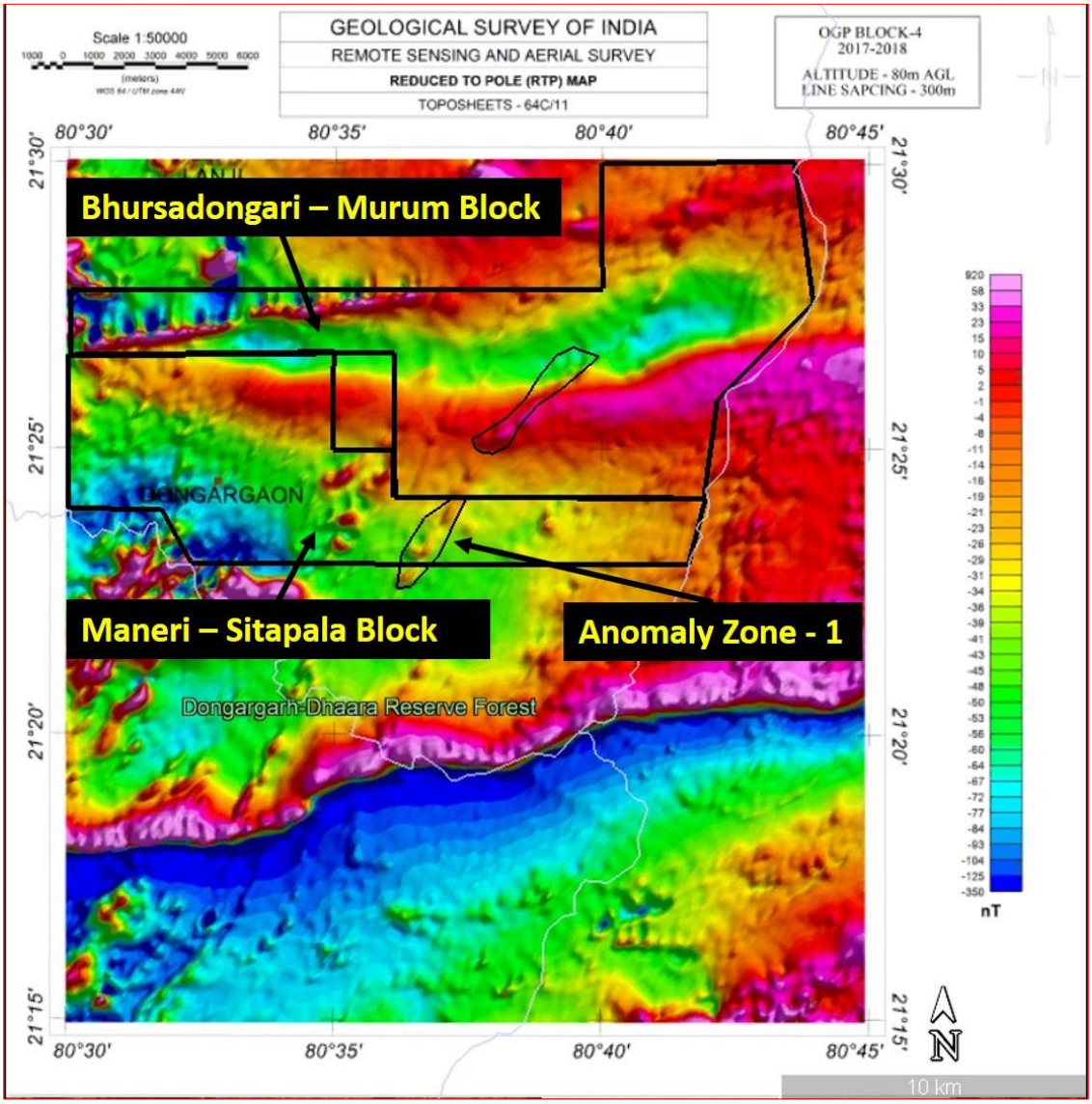

Fig. - 5 – NAGMP – Magnetic Survey – Reduced to Pole map with on- going Maneri - Sitapala Block (for reference), the proposed Bhursadongari – Murum Block and Gemcokati-interpreted anomaly zones 1 & 2; it may be noted that the magnetite / spinel zone in the Maneri Sitapala block picked up during the reconnaissance traverses, occurs within Anomaly Zone – 1.

Subsequently, two reconnaissance field traverses were taken 25th Nov. 2023 and 24th Jan. 2024 and in all 21 samples were collected from the magnetite / spinel bearing anomaly zone in the presently proposed block. The samples were analyzed for PGE by NiS Fire Assay method at Shiva Analytical Labs, Bengaluru. The sample locations are shown in Fig. 6; the results are tabulated in the table below. As can be seen, the total-PGE values range from 24ppb to 320 ppb.

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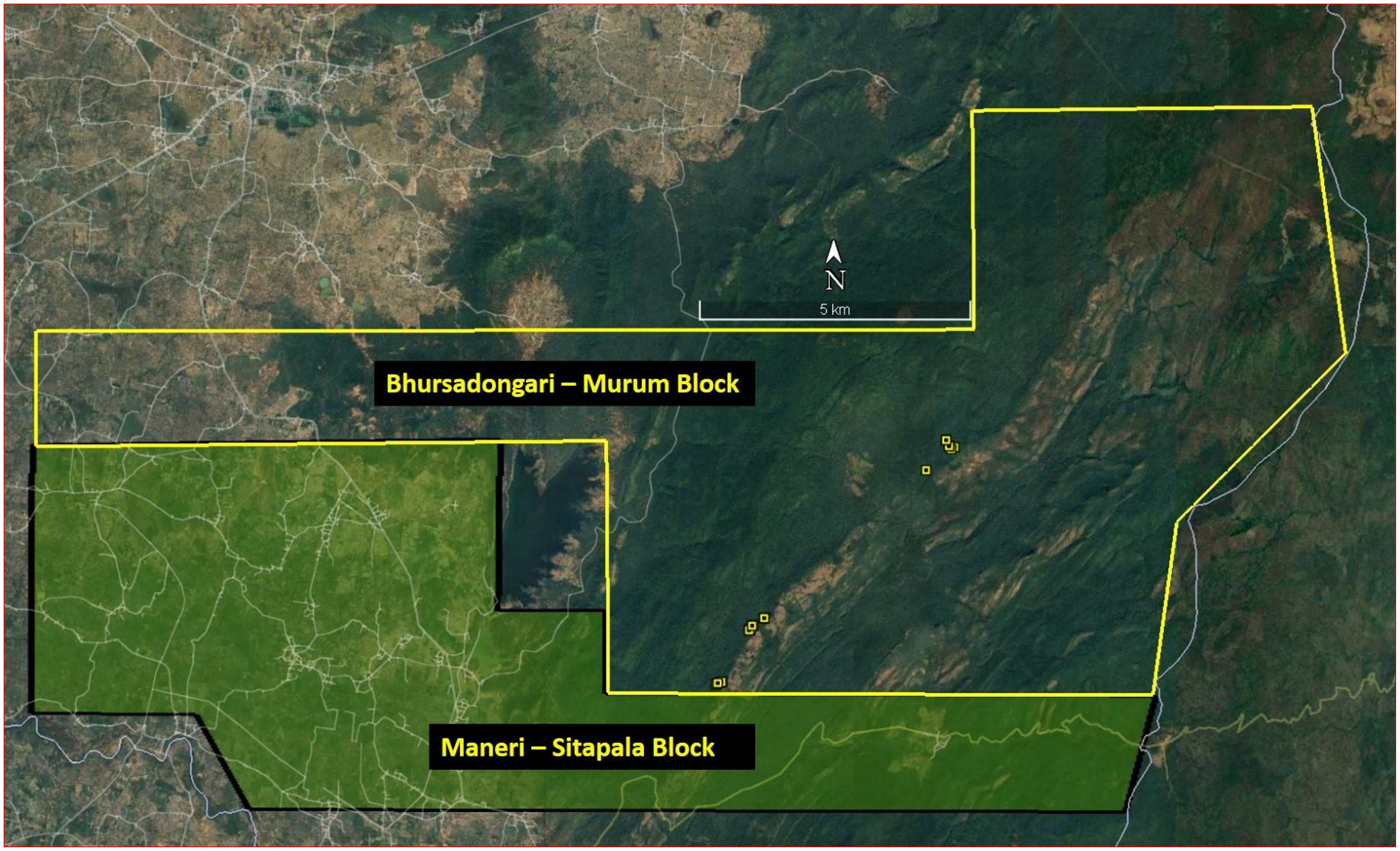

Fig. – 6: Sampling locations from PGE anomaly zone in Bhursadongari – Murum Block. The on-going Maneri – Sitapala Block is shown for reference

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Sl. No.	Customer Code	METHOD	SOP/OM /055	SOP/OM /055	SOP/OM/ 055	SOP/OM /055	SOP/OM/ 055	SOP/OM /055	TOTAL PGE			TOTAL PGE (sorted)
		UNITS	PPM (mg/kg)	PPM (mg/kg)	PPM (mg/kg)	PPM (mg/kg)	PPM (mg/kg)	PPM (mg/kg)				
		DL	0.005	0.005	0.005	0.005	0.005	0.005				
		Lab ID	Pt	Pd	Ru	Rh	Ir	Os	ppm	ppb		ppb
1	231125-02	G7371-1	0.012	0.004	0.021	0.008	0.011	0.004	0.060	60		320
2	231125-03	G7371-2	0.008	0.005	0.020	0.009	0.005	0.004	0.052	52		101
3	231125-04	G7371-3	0.004	0.004	0.004	0.004	0.004	0.004	0.024	24		88
4	231125-05	G7371-4	0.018	0.007	0.017	0.010	0.007	0.004	0.064	64		82
5	231125-06	G7371-5	0.009	0.004	0.013	0.014	0.007	0.004	0.051	51		77
6	240119-02	G7801-31	0.021	0.004	0.004	0.004	0.007	0.004	0.044	44		72
7	240119-02a	G7801-32	0.028	0.004	0.020	0.004	0.012	0.004	0.072	72		68
8	240119-05	G7801-33	0.025	0.004	0.010	0.004	0.004	0.004	0.051	51		64
9	240119-05A	G7801-34	0.039	0.006	0.020	0.008	0.010	0.004	0.088	88		60
10	240119-07	G7801-35	0.037	0.004	0.020	0.006	0.007	0.004	0.077	77		60
11	240119-13	G7801-36	0.018	0.004	0.021	0.004	0.004	0.004	0.055	55		57
12	240120-02	G7801-37	0.029	0.004	0.034	0.007	0.004	0.004	0.082	82		55
13	240124-01	G7801-39	0.011	0.004	0.028	0.006	0.004	0.004	0.057	57		52
14	240124-01a	G7801-40	0.029	0.004	0.022	0.004	0.004	0.004	0.068	68		51
15	240124-01'	G7801-41	0.010	0.004	0.010	0.004	0.004	0.004	0.036	36		51
16	240124-02	G7801-42	0.020	0.004	0.010	0.004	0.012	0.004	0.054	54		46
17	240124-03	G7801-43	0.010	0.004	0.020	0.004	0.004	0.004	0.046	46		44
18	240124-03A	G7801-44	0.004	0.004	0.040	0.004	0.004	0.004	0.060	60		40
19	240124-04	G7801-45	0.042	0.004	0.040	0.007	0.004	0.004	0.101	101		36
20	240124-06	G7801-46	0.004	0.004	0.020	0.004	0.004	0.004	0.040	40		24
21	240124-05	G7801-47	0.270	0.004	0.030	0.008	0.004	0.004	0.320	320		24

Table - 3: Analytical results of PGE samples by NiS Fire Assay Method in Bhursadongari – Murum Block.

3.3 Present Work for Vanadiferous Laterite Investigations

In the western part of the block, extensive laterites have developed over Amgaon Phyllites. In the eastern part of the block, laterite development is seen capping the Kotima Basalt – the youngest volcanic sequence of the Khairagarh group. The figure below shows the broad location and extent of such laterite capping. The Fig. - 7 below shows the two laterite zones occurring in the presently proposed block.

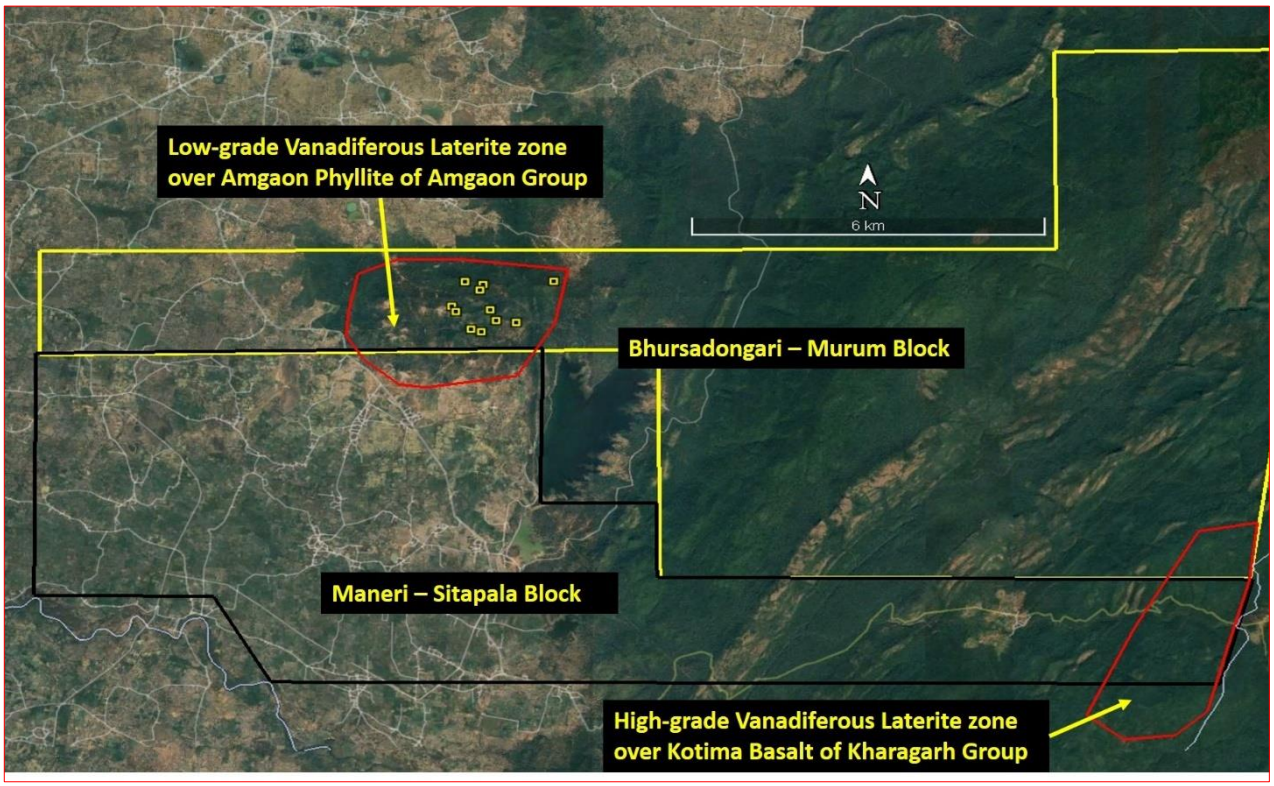

Fig. – 7: Sampling locations from Low-grade Vanadiferous Laterite capping on Amgaon Phyllite in Bhursadongari – Murum Block. The on-going Maneri – Sitapala Block is shown for reference

During the reconnaissance traverses, grab samples of Laterite capping on Amgaon phyllite were collected. A total of 11 samples were collected from this zone and were analyzed by XRF at Shiva Analyticals Labs, at Bengaluru. The results are tabulated in the table below. It is seen that the V2O5 values range from 0.07% to 0.14%. IBM Cut-0off for V2O5 is 0.1%.

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TEST REPORT											
Sl. No.	Customer Code	METHOD	SOP/OM/105	SOP/OM/105	SOP/OM/105	SOP/OM/105	SOP/OM/105	SOP/OM/105	SOP/OM/105	SOP/OM/105	SOP/OM/105
		UNITS	%	%	%	%	%	%	%	%	%
		DL	0.01	0.05	0.05	0.01	0.01	0.05	0.05	0.05	0.05
		Lab ID	Fe	SiO2	Al2O3	S	P	MnO	P2O5	TiO2	MgO
1	231127-02	G7371-12	34.01	18.66	19.28	0.02	0.12	<0.05	0.28	0.98	0.10
2	231127-03	G7371-13	32.76	20.95	19.18	<0.01	0.10	<0.05	0.22	1.32	0.09
3	231127-06	G7371-14	25.77	23.60	23.66	<0.01	0.11	<0.05	0.26	1.17	0.17
4	231127-07	G7371-15	31.11	19.61	20.24	<0.01	0.36	<0.05	0.82	1.13	0.12
5	231127-08	G7371-16	33.10	20.83	19.64	<0.01	0.12	<0.05	0.27	0.83	0.24
6	231127-11	G7371-17	29.95	22.44	21.31	<0.01	0.06	<0.05	0.13	0.93	0.13
7	231127-12	G7371-18	29.94	22.62	20.92	<0.01	0.04	<0.05	0.10	0.91	0.13
8	231127-15	G7371-19	44.77	10.67	11.56	<0.01	0.20	<0.05	0.47	0.43	0.09
9	231127-16	G7371-20	33.72	19.40	19.29	<0.01	0.10	<0.05	0.23	0.84	0.14
10	231127-17	G7371-21	41.98	23.64	9.87	<0.01	0.26	0.06	0.60	0.45	1.70
11	231127-18	G7371-22	34.74	18.99	17.29	<0.01	0.19	<0.05	0.44	1.03	0.18
Sl. No.	Customer Code	METHOD	SOP/OM/105	SOP/OM/105	SOP/OM/105	SOP/OM/105	SOP/OM/105	SOP/OM/105	SOP/OM/105	SOP/OM/103	
		UNITS	%	%	%	%	%	%	%	%	
		DL	0.05	0.05	0.05	0.05	0.05	0.05	0.08	0.1	
		Lab ID	CaO	K2O	Fe2O3	SO3	BaO	V2O5	Na2O	LOI	
1	231127-02	G7371-12	<0.05	0.17	48.62	0.05	0.08	0.14	<0.08	11.53	
2	231127-03	G7371-13	<0.05	0.06	46.83	<0.05	0.09	0.14	<0.08	10.98	
3	231127-06	G7371-14	0.06	0.38	36.85	<0.05	0.14	0.11	<0.08	13.46	
4	231127-07	G7371-15	0.06	0.25	44.48	<0.05	0.12	0.09	<0.08	12.99	
5	231127-08	G7371-16	0.11	1.10	47.33	<0.05	0.11	0.07	<0.08	9.39	
6	231127-11	G7371-17	<0.05	0.51	42.83	<0.05	0.11	0.10	<0.08	11.43	
7	231127-12	G7371-18	<0.05	0.43	42.80	<0.05	0.09	0.10	<0.08	11.77	
8	231127-15	G7371-19	<0.05	0.45	64.00	<0.05	0.08	0.08	<0.08	12.08	
9	231127-16	G7371-20	<0.05	0.74	48.20	<0.05	0.11	0.09	<0.08	10.89	
10	231127-17	G7371-21	2.12	1.32	60.01	<0.05	<0.05	0.10	<0.08	<0.1	
11	231127-18	G7371-22	<0.05	0.83	49.66	<0.05	0.07	0.08	<0.08	11.34	

Abbreviations — Accuracy and precision matrix, method and instrument dependent.

SOP/OM/103-- Loss On Ignition followed by Gravimetry

SOP/OM/105-- Fusion bead followed by WDXRF

DL--Detection Limit.

Table - 4: Analytical results of samples of Laterite developed over Amgaon phyllites by XRF in Bhursadongari – Murum Block; the green row represents a sample from slag dump of historical artisanal mining in the area.

Laterite samples could not be collected from the high grade zones of Kotima basalt due to logistic constraints. However 17 samples collected from contiguous locations during mapping in Maneri – Sitapala block, have analysed V2O5 values ranging from 0.1% to 0.34%.

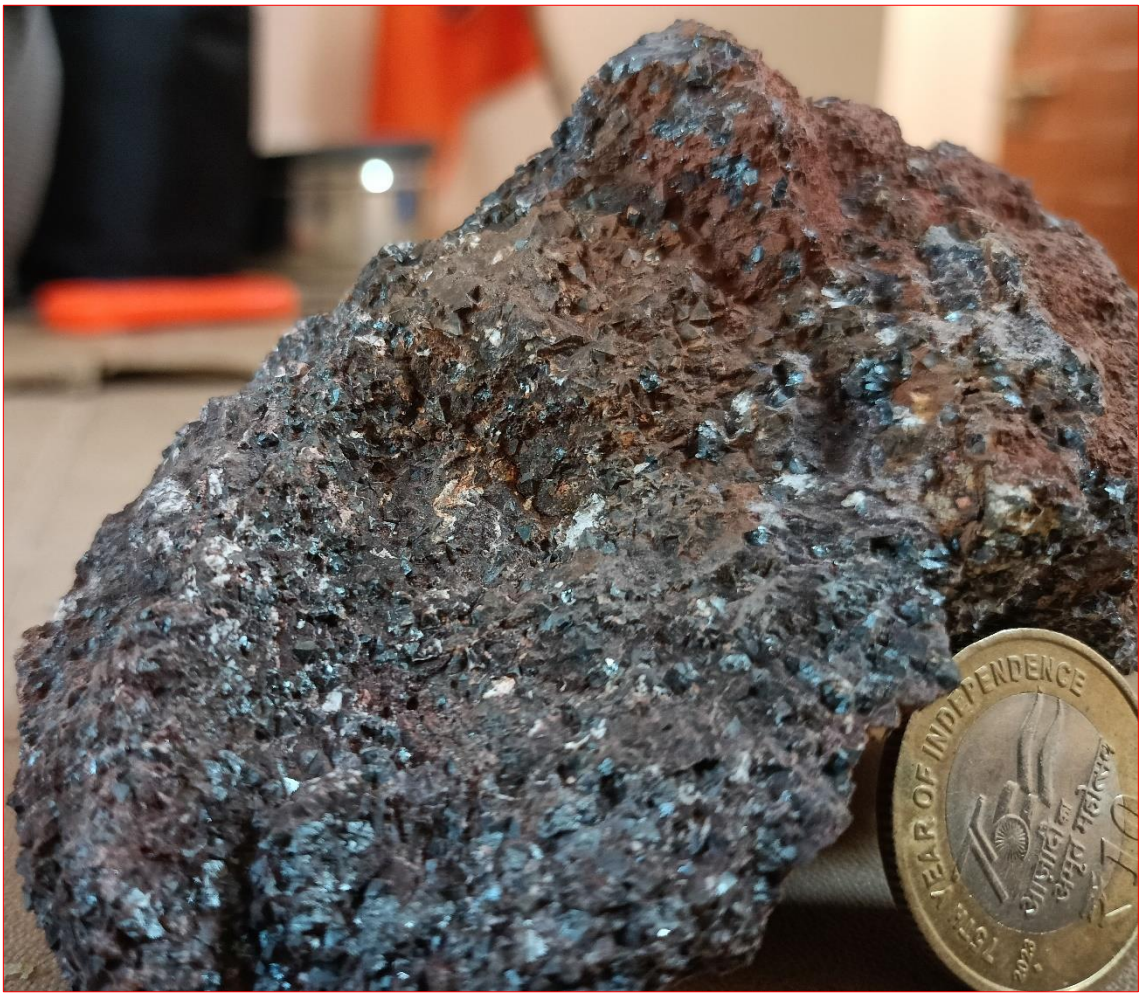

Fig. – 8: Magnetite / spinel-bearing Sample No. 240119-07 from PGE anomaly zone in Bhursadongari – Murum Block; This sample returned 77ppb total PGE

In view of the above field observations and analytical results for PGE and Vanadium, it is proposed that the Bhursadongari – Murum Block is to be taken up for G-4 exploration to delineate the magnetite / spinel bearing PGE zone and Vanadiferous Laterite zones developed extensively over Amgaon Phyllites and over Kotima Basalt of Khairagarh Group.

Based on the analytical results of samples collected during the field visit, a G-4 stage Reconnaissance Survey with following objectives is proposed for the block.

1. Detailed Mapping of the proposed block on 1:12,500 scale.
2. Delineation of Magnetite / Spinel-bearing PGE Anomaly zone and Vanadiferous Laterite zones.
3. Systematic sampling through Pitting / Trenching in the delineated mineralized zones.
4. Mineral characterization petrography and geochemical studies.
5. Comprehensive Report of G - 4 exploration.

4. Planned Methodology

The exploration program is proposed in accordance to the objective set for reconnaissance survey (G-4) as per Minerals (Evidence of Mineral Contents) Rule-2015. The objectives stated above shall be met by executing the project on similar lines of the on-going NMET-approved Maneri – Sitapala Block PGE investigations project.

4.1 Geological Mapping

Geological mapping of 123 sq. Km area of the block would be carried out on 1:12,500 scale. Various litho-units, their contact relationship, textural characters and structural features will be mapped. Surface manifestations of any mineralization available along with their surface disposition will be marked on map.

4.2 Geochemical Sampling and Analysis

4.2.1. Bed Rock / Pit Sampling:

During the course of geological mapping the bed rock samples shall be collected from the basalt / gabbro outcrops exhibiting indications of mineralization for any metal-oxide / sulphide minerals, shearing, brecciation, oxidation, silicification, ferruginization and alteration.

A total **300 nos. bed rock samples** from targeted location would be collected by chip, groove or channel samplingin pits, trenches and outcrops for analysis for PGE, Vanadium and various other Trace elements & REE.Total **30 nos. check** samples (internal + External) will be analyzed as well.

4.2.2 Trench Sampling:

A total of 200 cu.m of trenching from about 10 - 15 trenches (10m-15m x 1m x 1m) along magnetite / spinel-bearing PGE anomaly zone. A total of 150 samples may get generated and will be analyzed for PGE by NiS Fire Assay method. About 15 samples will be analyzed as check samples. So in all, there may be a maximum of 160 nos. of samples for PGE by NiS Fire Assay. The XRF analysis for whole rock is included in the total 300 samples of 4.2.1.

4.2.3 Pit Sampling:

A Total of 20 cu.m of pitting from 10 pits (2m x 1m x 1m) are planned from both laterite cap areas over Amgaon phyllites and Kotima Basalt areas where samples have returned anomalous values of V2O5. Total 40 samples (40 samples from pits plus another 4 check samples) will be analyzed by XRF for Total Fe and V2O5 apart from other elements in the package; this XRF

analysis for whole rock is included in the total 300 samples of 4.2.1.

4.3 Petrological & Mineragraphic Studies

During the course of Geological mapping 50 nos. of samples from various litho-units from outcrop will be studied for petrography and 30 number will be studied in polished sections (Mineragraphic studies) for the metal oxide / sulphide mineral assemblages in metalliferous gabbro for their distribution, alteration, enrichment etc.

4.4 EPMA Studies

Twenty (20) samples will be studied by EPMA for identification, textural characterization and paragenesis of metal oxide / sulphide minerals.

5. Quantum of Work

The following Table shows the Nature & Quantum of Work to be carried out and summary of cost estimate for the proposed G – 4 Reconnaissance survey

5.1 Quantum of Work

Sl.	Item of Work	Unit	Target
1	**Geological Mapping** (on 1:12,500 Scale)	Sq km	123
	a) Charges for two Geologist per day at HQ	Days	60
	b) Charges for two Geologist per day in Field	Days	120
2	**Geochemical Sampling**	Nos.	
	a) Bed Rock Sampling		300
	b) Trench Sampling for PGR by NiS Fire Assay		150
	c) Pit Sampling for Vanadiferous laterite		40
6	**Laboratory Studies**		
	a) Bed rock / pit / trench samples (XRF)	Nos	300
	b) Trench Sampling (For PGE by NiS Fire Assay)		150
	c) Analysis for Gold by Fire assay		15
	d) REE & Trace elements by ICP		15
	e) Check Samples (Internal + External) of the above		~48
7	**Physical Studies**		
	a) EPMA studies	Nos.	20
8	**Petrological Samples (Surface Samples)**		
	Preparation and Study of Thin Sections	Nos	50
9	**Mineragraphic Studies (Surface Samples)**		
	Preparation and study of Polished Section	Nos	30
10	Report Preparation (5 Hard copies with a soft copy)	Nos.	1
11	Preparation of Exploration Proposal (5 Hard copies with asoft copy)	Nos.	1

Table - 5: Quantum of proposed Reconnaissance Survey (G-4 Level) Exploration in Bhursadongari - Murum Block

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5.2 Summary of Cost Estimate

Sl. No.	Item	Total Estimated Cost (Rs.)
1	Mapping (LSM), Other Geological/Geophysical Work	**36,19,120**
2	Laboratory Studies	**45,73,745**
3	Geologist at HQ	**10,80,000**
4	Sub Total (1 to 3)	**92,72,865**
5	Exploration Report Preparation	**4,63,643**
6	Proposal Preparation	**1,85,457**
7	Peer review charges	**30,000**
8	Sub Total (1 to 7)	**99,51,965**
9	GST 18%	**17,91,354**
10	**Total:**	**1,17,43,319**
	Say Rs. In Lakh	**117**

Table – 6: Summary of Cost Estimates for Reconnaissance Survey (G-4 Level) Exploration

5.3 Detailed NQT

Table – 7: Summary of Cost Estimates for Reconnaissance Survey (G-4 Level) Exploration

Estimated cost for Reconnaissance Survey (G-4) for PGE,Vanadium & associated mineralization in Bhursadongari - Murum Block, Balaghat District, MP. Total block area- 123 sq km; Completion Time- 8 Months							
Sl no.	Item of Work	Unit	Rates as per NMET SoC 2020-21		Estimated Cost of the Proposal	Total Amount (Rs)	Remarks
			SoC- Item Sl No.	Rates asper SoC	Qty.		
1	**Large scale (LSM) Geological mapping/Trenching.**						
1.1	Geologist man days (2 No) for Large scale (LSM) Geological mappin/Trenching	2 Geologists per day	1.2b	11,000	120	26,40,000	
1.2	Geologist man days (2 No) for Geological mappin & Report (HQ)	2 Geologists per day	1.2a	9,000	60	10,80,000	
1.3	Labour (field) for (Total 4 Nos i.e. 2 workers per one geologist)	per worker	5.7	494	240	2,37,120	Amount will be reimbursed as per the notified rates by the Central Labour Commissioner (Rs. 477/- per day) or respective State Govt. whichever is higher
	Sub-Total (1)					**39,57,120**	
2	**Trenching (PT)**						
2.1	Trenching	cu.m.	2.1.1	3330	200	6,66,000	
2.2	Pitting	cu.m.	2.1.2	3800	20	76,000	
	Sub-Total (2)					**7,42,000**	
3	**Laboratory Studies**						
3.1	Major Oxides by XRF (Laterite Analysis for Vanadium)	per sample	4.1.15a	4200	300	1260000	
	QAQ samples	per sample	4.1.15a	4200	30	126000	
3.2	Gold by Fire Assay	per sample	4.1.5a	2,380	15	35700	
3.3	REE by ICP in Magnetite bearing Gabbroic sample	per sample	4.1.13	7731	15	115965	
3.4	PGE by NIS fire assay in magnetic nearing gabbroic sample	per sample	4.1.5d	11,800	150	1770000	
	QAQ samples	per sample	4.1.5d	11,800	15	177000	
	Sub-Total 3					**34,84,665**	
4	**XRD Studies for identification of minerals**	per sample	4.5.1	4,000	15	**60,000**	

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7.3 Detailed NQT (contd….)

Table – 7 (contd…): Summary of Cost Estimates for Reconnaissance Survey (G-4 Level) Exploration

Estimated cost for Reconnaissance Survey (G-4) for PGE,Vanadium & associated mineralization in Bhursadongari - Murum Block, Balaghat District, MP. Total block area- 123 sq km; Completion Time- 8 Months							
Sl no.	Item of Work	Unit	Rates as per NMET SoC 2020-21		Estimated Cost of the Proposal	Total Amount (Rs)	Remarks
			SoC- Item Sl No.	Rates asper SoC	Qty.		
5	EPMA	per hour	4.4.1	8,540	60	5,12,400	
6	Pertrological/Mineralographic studies						
6.1	a) Prepration of thin section	per sample	4.3.1	2353	50	1,17,650	
6.2	b) Study of thin sectiion for petrography	per sample	4.3.4	4232	50	2,11,600	
6.3	c) prepration of polished section	per sample	4.3.0	1549	30	46,470	
6.4	d) Study of thin polished section for mineragraphy	per sample	4.3.4	4232	30	1,26,960	
6.5	e) Digital photomicrograph of thin polished section	per photo	4.3.7	280	50	14,000	
	Sub- Total (6)					5,16,680	
7	Total (1 to 6)					92,72,865	
8	Geological Report Preparation	Nos	5.2		1	4,63,643	For the projects having cost up to exceeding Rs.50 Lakhs Minimum of Rs. 1.5 lakhs + 1000/- per additional copy.
9	Preparation of Exploration Proposal	Nos	5.1	380000	1	1,85,457	2% of approved project cost or 3.8L whichever is lower
10	Report Peer Review Charges	lumpsum	As per Ecdecision	30000	1	30,000	
11	Total					6,79,101	
12	Total Estimated Cost without GST (7+11)					99,51,966	
13	Provision for GST (18%)					17,91,354	GST will be reimbursed as per actual and as per notified prescribed rate
14	Total Estimated Cost with GST					1,17,43,319	
					Say, in Lakhs	~117	

Table - 8: Tentative Time schedule/action plan for proposed Reconnaissance Survey (G-4) for PGE, Vanadium & associated Mineralization investigation in Bhursadongari - Murum block.

#	Activities	Tentative Time Line							
		Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8
		1	2	3	4	5	6	7	8
1	Geological mapping and sampling								
2	Pitting, Trenching								
3	Sample preparation								
4	Analytical work								
5	Report Preparation								
6	Peer Review & Final Report Submission								

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