PRELIMINARY EXPLORATION (G-3 STAGE) FOR GRAPHITE AND ASSOCIATED MINERALISATION IN CHIKHLAR BLOCK, BETUL DISTRICT, MADHYA PRADESH

PRELIMINARY EXPLORATION
(UNFC: G-3 STAGE)
NMEDT FUNDED

COMMODITY:
GRAPHITE AND ASSOCIATED MINERALS

BY

VARDAN ENVIRONET LLP
PLOT NO 82A, SECTOR-5 IMT MANESAR, GURGAON, HARYANA

PLACE:-GURUGRAM
DATE:-15.05.2026

Block Summary

General Information about the block

Table-1.1 Summary of the Chikhlar Block, Betul District, Madhya Pradesh

S. No.	Features	Details
	Block ID	ME/IN/G3/MP/P/25-26/010
	Exploration Agency	Vardan Environet LLP
	Commodity	Graphite and associated mineralization
	Mineral Belt	Betul Belt
	Completion Period with entire Time schedule to complete the project	12 Months
	Objective	The Present Exploration Program (G-3) is formulated based on G-4 exploration work carried out by GSI in FS 2012-13 as mentioned in the report titled **INVESTIGATION FOR GRAPHITE IN TIKARI, GAUTHANA, CHIKLAR AND SURROUNDING AREAS, BETUL DISTRICT M.P (G-4 stage).** Objectives of the current exploration proposal are as follows 1) To carry out Detailed mapping on 1:2000 scale of the block (Area: 1.35 Sq.km) to delineate various litho-units and their linear/planar structural features with special attention to identify potential host rocks of Graphite and associated mineralization. 2) To carry out systematic grab/channel/grove sampling of bed rocks from the potential mineralized zones. 3) XRD, XRF, proximate analysis for graphite (i.e., moisture content, volatile matter, ash, and fixed carbon) and ICP-MS analysis of major and Trace elements of selected samples. 4) Petrographic and ore microscopic studies of possible host rock. 5) Pitting-trenching to know the continuity of host rock of selected zones and sampling. 6) Geophysical studies are to identify drilling targets

		based on preliminary reconnaissance studies and an understanding of the area's structural and lithological characteristics using Ground Magnetic, Electrical Resistivity Imaging, SP and Resistivity surveys. 7) Diamond Core Drilling at strike interval as prescribed in MEMC rule for G3 level of exploration recommendation of lenticular ore bodies, Drill Core Logging and Drill Core Sampling 8) Specific Gravity Determination of selected core samples from the mineralized zones intersected in the boreholes. 9) To assess G3 category (333) resource if any, in the Block, as per UNFC norms and Minerals (Evidence of Mineral Contents) Rules (IBM, 2003).

	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	The Detailed geological mapping (1:2000 scale), pitting, trenching, location of boreholes, core logging, sampling and report writing will be carried out by Vardan Environet LLP. However, the Vardan Environet LLP would outsource some of specialized works viz. Geophysical work, topographic survey will be outsourced. 1. Chemical analysis, petrological work and geotechnical studies will be out sourced as company has MOUs with Shiva analytic Lab, Bengaluru, and GSI chemical lab Western region, Jaipur, Rajasthan. 2. Drilling work will be out sourced.
	Name/ Number of Geoscientists	3 (2 Geologist, 1 Geophysicist)
	Expected Field days (Geology) Geological Party Days	Geologist: 120 man days Total man days for surveyor- 30 man days

1.	**Location**	
	Latitude (N)	21°57'0.91"N
	Longitude (E)	77°54'53.87"E
	Localities	Chikhlar
	Tehsil/ Taluk	Betul
	District	Betul
	State/UT	Madhya Pradesh
2.	**Area (hectares/ square kilometers)**	
	Block Area	1.35 sq. km.
	Forest Area	≈0.75 Sq Km Protected Forest
	Government Land Area	Not Specified
	Private Land Area	Not Specified
3.	**Accessibility**	
	Nearest Rail Head	Betul Railway Station (BZU)
	Road	SH 19B
	Airport	Domestic airport Bhopal
4.	**Hydrography**	
	Local Surface Drainage Pattern	Dendritic
	Rivers/ Streams	Ampani and Bhatkal
5.	**Climate**	
	Mean Annual Rainfall	1085 mm
	Temperatures	Min Temperature (December): 11˚C Max Temperature (June) : 41˚C
6.	**Topography**	
	Toposheet Number	55G/13
	Morphology of the Area	Northern part of the block area is represented by rugged terrain with strike ridges and valleys trending NE- SW, whereas southern part of the block area is peneplained
7.	**Availability of baseline geoscience data**	
	Geological Map (1:50K/25K)	Included
	Geochemical Map	Included

	Geophysical Map (Aeromagnetic, ground geophysical, Regional/local scale GP maps)	Included
8.	Justification for taking up reconnaissance survey / Regional Exploration	1. The old workings for graphite from the area north of Betul, Tikari – Gauthana and Chikhlar were first reported by J. Narayanmurthy (1958). The occurrence of graphite schist is confined within a narrow belt of muscovite-quartz schist, which is about 2 miles (3.2 km) x 100 ft (30 to 35 m). 2. During FS 2012-13 prospecting for graphite was carried out in Tikari – Gauthana, and Chikhlar areas and it was found that the graphite mineralisation is exposed discontinuously in the form of 3 lenticular bands disposed in en-echelon pattern over a strike length of more than 3.5 km trending ENE- WSW to NNE-SSW (Lenka. B & Ahmad. S A, 2012-13). 3. Large scale mapping followed by detailed mapping in parts of Chikhlar, Gauthana and Tikari areas in FS 2012-13 by Lenka B and Ahmad S.A. (GSI), graphite bands for a cumulative strike length of 3.5 km were delineated and the bands were divided into three segments viz, the southern (1450 m strike length), the central (500 m strike length) and the northern band (1300 m strike length). 4. Further, Lenka B (FS 2013-14) has carried out exploration by drilling in the above said area by means of 07 boreholes in the area covering parts of the southern and central graphite bands, proving the 1.25 km strike length and estimated graphite resource of 4.73 MT. **5.** Proposed Chikhlar block covers the northern graphite band as reported in UNFC G4 stage exploration for Graphite carried out by B. Lenka & S.A. Ahmed in Tikari, Gauthana, Chikhlar and surrounding areas, **and its**

		southern part that is central band has already been explored by GSI to G-3 stage. **6.** **Northern band**. **Strike length**-1300.0 m, **Width**-5 to 20 m and **Grade** - 2 to 15% FC as reported in GSI G-4 stage work. **7.** There are number of old workings within the southern band, most of the old workings are confined to the northern part of the band i.e. within the proposed block. **An old working is also located within the northern band where graphite is bordered by thick quartz veins.** **8.** GSI Recommendations: The graphite mineralization of Betul district, Madhya Pradesh is recommended for further detailed exploration of G3 stage to know the depth persistence and assessment of total resource. **9.** Three samples collected from the extended part of the earlier exposed band by Vardan Environet analyse **3.46 -15% FC**.

Detailed Description of the block

1. Block Summary

1.1 PHYSIOGRAPHY

The area represents part of Satpura Plateau touching southwestern margin of Satpura ranges which gradually acquire greater heights in the adjoining north-eastern part. The entire area, barring north central part, is represented by rugged terrain with strike ridges and valleys trending ENE-WSW to E-W. The area in the immediate vicinity of Betul town is by and large plain with some hummocks of granite/granite gneisses. The area to the north, NE & NW of Betul town is under reserve forest. The highest elevation of the study area is above 800 m near Jamukhodar village (Fig.1.1). A NE-SW trending steep linear quartzite ridge known as Sonaghati ridge forms the most prominent physiographic feature in the area. It is flanked on both sides by low lying areas with quartz-mica schist, amphibolites and gneisses. Ampani and Bhatkal are the main streams draining the area of investigation. These are tributaries of Narmada River. The drainage is mostly dendritic.

1.2 CLIMATE

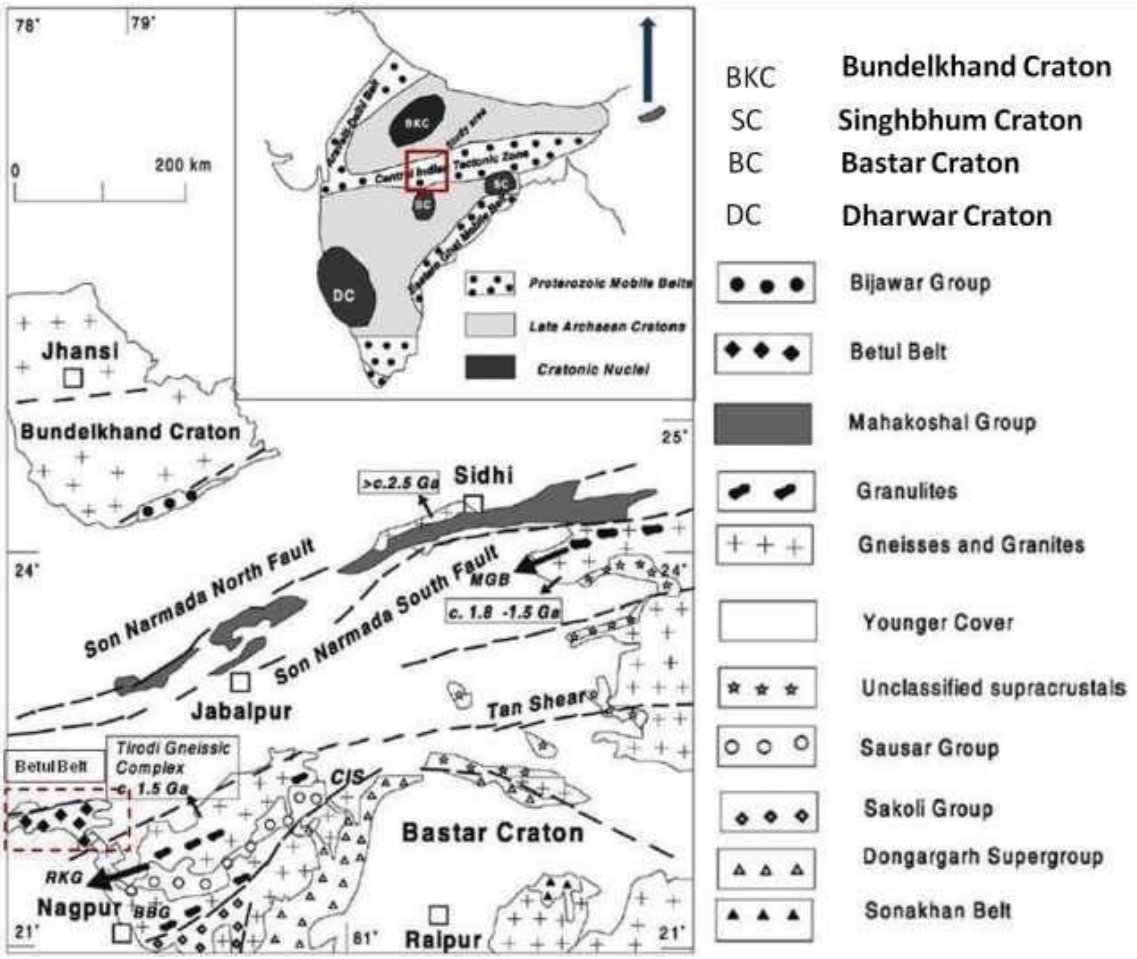
The climate of Betul is fairly good. Its height above the plains and the neighbourhood of extensive forests moderates the heat and render pleasant temperature most part of the year. The area experiences a dry and temperate climate except during the south-west monsoon which sets in June and continues up to September. The summer is between March and June with maximum temperature rising up to 41˚C with May and June being the hottest months. The nights in the hot season are comparatively cool and pleasant. The average rainfall in the area is 1085 mm with heavy rain in July and August. The winter prevails from November to February with fairly cold weather with maximum temperature of 27˚C and minimum 11˚C. December and January are the coldest months when sometimes at nights mercury dips below the minimum temperature.

1.3 BACKGROUND GEOLOGY:-

1.3.1 REGIONAL GEOLOGY

The proposed Chikhlar block is located in the Betul-Chhindwara belt, which extends from Chhindwara in the east to Chicholi in the west in the ENE-WSW direction. The Betul belt forms a part of Central Indian Tectonic Zone (CITZ), and represents a Proterozoic mobile belt (Roy and Prasad, 2001). The Betul belt is of late Archean to Neo Proterozoic age which is bounded by two scale fault/ductile shear zones-the Son-Narmada South Fault (SNSF) in the north and Goviligarh Tan shear zone in the south. The ENE-WSW trending Betul supracrustal belt forms a conspicuous litho-tectonic unit lying between Mahakoshal belt in the north and Sausar supracrustal belt in the south, (Fig-1.2).

Fig. 1.2. Geological map showing different components of CITZ. Bundelkhand and Bastar Craton and geological setup within and near CITZ, Data from various published geological maps, after Roy et al. 2002.

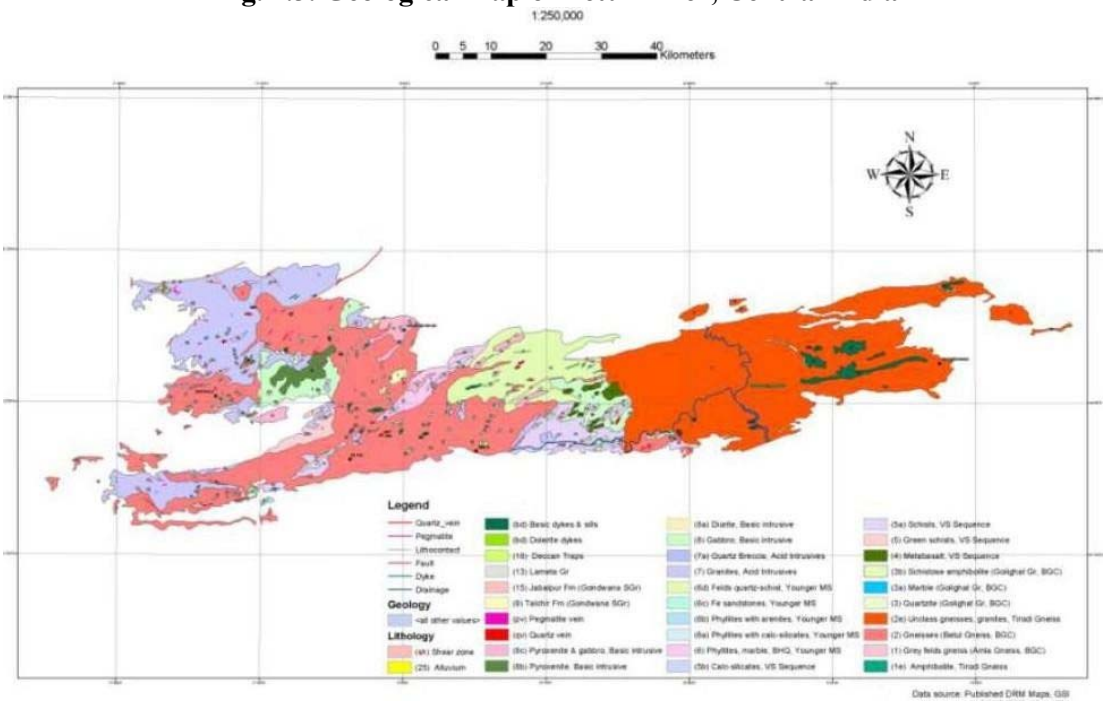


This belt extends for a length of about 135 km with an average width of 15 km from Chhindwara town in the east to Chicholi village in Betul district in the west and is composed of volcano-sedimentary rocks, intruded by mafic-ultramafic and granitic suite of rocks in that order (Srivastava and Chellani, 1995). Lithologically, the belt is more similar to the Mahakoshal supracrustals in having large volume of volcanic rocks than to the volcanic free Sausar belt. The Betul belt is surrounded by younger Gondwana sediments and Deccan Trap from three directions and through a narrow NW-SE trending corridor along Kanhan. The gneissic complex of Betul belt shows tectonic contact with the gneisses of Sausar Belt of Chhindwara district.

The litho-assemblage of the Betul belt comprises three distinct suite of rocks namely, **1) supracrustal rocks,** which include quartzites, metapelite, bimodal volcanics (basalt-rhyolite) metaexalhites, calc-silicates and BIF which show evidence for shallow water sedimentation. **2) ultramafic- mafic suite**, represented by pyroxenite– hornblende, pyroxenite – gabbro – diorite

quartz diorite association and 3**) syn to post tectonic granitic suites (Fig. 1.3).** The supracrustals are hosted within the gneissic complex considered to be the basement. Due to shearing and copious granite magmatism the supracrustal rocks are disposed as disturbed sequence. The Betul belt presents a unique lithopackage in CITZ containing bimodal volcanics in general and abundant felsic volcanics in particular. The belt is traversed by a number of ENE-WSW ductile shear zones having sub vertical to steep dips towards north which were developed during deformation and shows low to medium grade metamorphism.

Fig. 1.3. Geological map of Betul Inlier, Central India



The metasedimentary / supracrustal litho association dominate the western and north western part of the belt around Sonaghati and Chicholi areas whereas the volcano sedimentary sequence dominates the eastern and central parts. The mafic-ultramafic complex crops out mainly in the western and north western part of the belt around Padhar and in the eastern part of the belt around Mordongri where it occurs in association with bimodal volcanics. Apart from these mafic-ultramafic complexes, there are several other mapable units of gabbro, pyroxenite and hornblendite which also occur in association with bimodal volcanics. Granitoids show both intrusive and tectonic contact relationship with the supracrustals and mafic-ultramafics. Several ENE-WSW trending ductile shear zones have often served as avenues for emplacement of granitic rocks.

The Palaeo-Proterozoic older metasediments/supracrustals comprising graphite schist, marble, calc- silicates, tremolite- actinolite schist and quartzites are seen only in the western and north-western part of the belt around Sonaghati and Chicholi forming high ridges. These rocks are very well foliated and occur as enclaves within older granite gneisses. Older metasediments show

intense shearing and mesoscopic fold closures with axial planes trending ENE-WSW. Granite gneisses are seen around west of Betul, Amla and Morkha. Morkha granite gneiss has been dated as 1550 ± 50 Ma by Rb-Sr method (Barganje, AMD, Nagpur-personnel communication quoted by Mahakhud et al., 2001a).

ENE-WSW trending bimodal volcano-sedimentary sequence is very well exposed in the central and eastern part of the belt stretching from Kherli Bazar in the WSW to east of Bhuyari in the ENE. In the bimodal suite of volcanics, the felsic volcanics are proportionately much more abundant than their basic counterpart. Impersistent bands of metasediments interlayered with siliceous and lithic tuff occur within these felsic volcanics. Basic volcanics in the area are represented by pillowed and non-pillowed, vesicular and amygdular metalavas.

Younger metasediments comprising phyllites, quartz-mica schist, ferruginous quartzite and banded haematite quartzite are confined in the northwestern part of the belt around Bhopali, Ranipur, Ghodadongri etc. Mafic and ultramafic suite of rocks of possible Neo- Proterozoic age occurs in the western part of Betul Belt around Padhar which comprises gabbro, pyroxenite, dunite, peridotite, serpentinite etc. The lower to middle Proterozoic metasediments have developed on a sparse scale in the area and are represented by quartzites and schist. The metasedimentaries include quartzites, calcareous quartzites, quartz mica schist, graphite schist, carbon phyllite and marble. These metasedimentaries occur as enclaves within the granite gneisses and are continuous litho units in the northern and western part of the Sonaghati ridge.

The older metasedimentaries are confined to the western part of the belt around Betul town. The granite gneiss is exposed to the west of Betul town around Amla and Morkha. The volcano-sedimentary sequence comprising bimodal volcanics and intercalations of impersistent metasediments are mainly found in Kherli Bazar-Bargaon-Banskhapa areas in central and eastern parts of the Betul belt. Younger metasediments are formed near Ghoradongri. Mafic and acid intrusives comprising gabbro/pyroxinite and granites are found throughout the belt. Younger granites from Navegaon area have been dated 850±15 ma by Rb-Sr method (Barganje, AMD, Nagpur-personnel communication quoted by Mahakhud et al., 2001 a).

Deccan Traps are exposed towards south and east, while Gondwanas border the Precambrian inliers towards west and north. Later on, the basis of the litho assemblage Chaturvedi (2001) has proposed a tectno lithostratigraphic succession of Betul belt (Table 1.2). It is as follows.

Table. 1.1. Stratigraphic succession of Betul belt (after Mahakud et al., 2000)

	Formation	Lithology
Cretaceous	Deccan Traps	Basaltic flows
Late Proterozoic	Basic intrusive/Ultrabasic	Hornbiendite/gabbro/pyroxenite
	Acid intrusives	Granites/aplite/pegmatite/quartz vein
Middle Proterozoic	Younger meta sediments	Phyllites/quartz-mica schist, ferruginous quartzite/BHQ
	Volcano sedimentary Sequence	Acid volcanics, meta rhyolite, tuff with intercalation of meta sediments like anthophyllite schist, calc silicate etc.
		Basic volcanics, pillowed and non-pillowed meta basalt
Early Proterozoic	Granitoid complex	Granite gneiss, porphyritic gneiss, pillowed meta basalt
	Older meta sediments	Graphite schist, marble, calc silicate, tremolite-actinolite schist and quartzite.
Basement not seen		

The argillaceous and arenaceous metasedimentary sequence termed as “Golighat group” which has three distinct lithological packages, i.e., the Kosmi Formation which comprises quratz mica schist, garnetiferous mica schist and interbands of actinolite tremolite-chlorite dominated basic schist and amphibolites, with a regional spread. The Temni Formation includes impure marble and calc silicates which occur as small lensoid bodies and the Sonaghati Formation representing linear ENE-WSW trending arenaceous rocks which passes through Sonaghati, 4 Km north of Betul. The rocks of Golighat Group are seen only in the western and northern part of the Betul belt around Sonaghati and Chhicholi forming high ridges.

A sequence in the Kherli Bazar area comprising metabasalt, pillow lava, komatiite, acid volcanics, rare ultramafics, intercalated thin lenses of metasediments including gamet-staurolite-fibrolite/sillimanite-gahnite bearing schist and micro granite has been termed as the Bargaon Group by Shrivastava and Chellani, 1995. Pillow lava, is best exposed between Bargaon and Tarora. Geochemically and petrographically the basic rocks are theolitic attaining spilitic character in altered zones. The acid volcanics have a sheeted appearance and occur as distinct bands. They are highly recrystallized and are massive.

In the volcaniclastics large grains of amphiboles, garnets and staurolites developed locally. At Bhawra Tekra and other places, the acid volcanics are intimately associated with anthophyllite bearing schist, which host massive lead-zinc mineralisation. The dominant metasediment is quartz-mica schist with or without garnet and staurolite. These rocks have

been intruded by hornblende rich granite, pyroxinite/gabbro, dolerite bodies occurring as sills and dykes, pegmatites and quartz veins.

Table 1.2 Tectano-litho stratigraphy of Betul belt (after Chaturvedi 2001)

DECCAN TRAPS	Basaltic lava flows and dolerite dykes
GONDWANA SUPERGROUP	Mainly sandstone, shale and conglomerates with coal seams in some areas.
Tectonic /Unconformable	
INTRUSIVES	Quartz veins, quartzofelspathic veins, Pegmatite veins. Aplitic veins pink and grey granite
PADHAR MAFIC COMPLEX	Pyroxinite, gabbro and metabasics
BHOPALI GROUP	Dolomitic limestone, Phyllitic/calc-phyllites Frruginous quartzite
INTRUSIVES	Crudely foliated granite Porphyroblastic/augen gneiss
BARGAON GROUP	Pillowed lava, basalt/apillitic/Komatite Chert rhyolite and associated volcano-clastics
GOLIGHAT GROUP	Kosmi Formation-quartz mica schist, actinolite-tremolite-chlorite schist, garnetiferrous mica schist and linear bands of graphite schist Temni Formation-Lenses of calcsilicate, marble and carbonates Sonaghati Formation- quartz calcarious quartzite, micaceous quartizites
BETUL GNEISSIC COMPLEX	Amla gneiss with interbands of schists and amphibolites representing basement

The low- grad e metasediments of the Bhopali Group comprising of phyllites, dolomitic limestone, banded hematite quartzite, have a tectonic contact with Golighat Group towards south and Gondwana Supergroup towards north. The rocks of the Bhopali Group are very well exposed in Bhopali, Ranipur and Khamalpur (Raut and Mahakud, 2004). The Padhar Mafic Complex mainly comprises olivine websterite, clinopyroxenite, peridotite, norite, gabbro and varying quartz diorite with pyroxenite, being the dominant constituent.

The central and eastern part of the Betul belt, consists of a typical bimodal volcanosedimentary sequence, which includes acid and basic volcanic and impersistent metasedimentary intercalations comprising anthophyllite-cummingtonite-talc schist, calc silicates and garnetiferrous biotite-chlorite-gahnite-staurolite schist and hosts base metal minerlization

(Mahakhud 2001). However, some later workers (Praveen et.al, 2005, 2007) interpreted these metasedimentary bands as metamorphosed hydrothermally altered zones in felsic volcanic rocks. Chakraborthy et al (2009) provides a tectnostratigraphic succession of Betul belt and is as follows (Table 1.3).

According to Chakraborthy et al (2009), the basement of Betul belt is occupied by banded migmatitic gneisses termed as Amla gneiss that extends from east of Betul through Kosmi and Bhadus towards further west, along Betul-Ranipur road and south of Sonaghati ridge. They have proposed a three-fold lithostratigraphic subdivision of the Betul supracrustal rocks. The basal sequence of calc-arenite, marble, B.I.F. phyllite, metabasalt and carbonaceous phyllite being best exposed in Ranipur and Bhopali areas is termed as "Ranipur Formation". These rocks have undergone low degree of regional metamorphism with development of low-grade metamorphic minerals. This litho-assemblage, earlier shown as "Bhopali Group" as younger metasediments (Chaturvedi, 2001), was in fact exposed continuously towards WSW in Sonaghati ridge area and forms the basal sequence.

The southern margin of the basal supracrustal sequence (i.e. in the area south of Sonaghati ridge) is marked by the presence of calcareous, gritty, feldspathic quartzite (earlier termed as Temni Formation of „Golighat Group" by Chaturvedi" 2001) which is highly tectonised and is in juxtaposition with the basement migmatitic gneiss, thereby indicating the tectonised unconformity. The migmatitic gneiss occurring as basement to the supracrustals of the Betul Group is termed as "Amla gneiss". Unconformable basement - cover relation is best exposed in the Machna River sections, NW of Bhadus. Here, the basal calcareous gritty quartzite preserve well developed graded bedding and cross-stratification, suggesting shallow water sedimentation on a sialic crust basement. The contact between Ranipur Formation and the basement gneiss is unconformable at places and faulted at other.

The lithounits of the basal "Ranipur Formation" are co-folded together and conformably overlained by the interbanded sequence of micaceous ferruginous quartzite + magnetite and quartz-mica schist/ phyllite and graphitic schist and is being termed as "Sonaghati Formation". In rest of the area, basement migmatitic gneiss i.e. Amla gneiss is having a tectonic contact with different litho units of Betul supracrustal sequence. Due to intense tectonism and profuse granitic activity along the prominent shear zones, it is difficult to work out the original lithostratigraphic succession of the Betul belt.

Table-1.3: Tectonostratigraphic succession of Betul belt

(modified after *Chakraborty et al., 2009)*

DECCAN TRAPS	Basaltic lava flows and dolerite dykes	
Intrusive contact / Disconformity		
GONDWANA SUPERGROUP	Conglomerate, sandstones, and shales	
Unconformable / Tectonic Contact		
BETUL GROUP	INTRUSIVES	Basic dykes, pegmatites, quartz veins, homophanous amphibole-mica granite, porphyritic granite
	Intrusive / Tectonic contact	
	PADHAR MAFIC – ULTRAMAFIC SUITE	Diorite, epidiorite, gabbro, norite, pyroxenite, hornblendite, websterite, harzburgite, anorthosite, diorite, talc – serpentinite rock, quartz – epidote rock
	Intrusive / Tectonic contact	
	SONAGHATI FORMATION	Intercalated sequence of quartzite, quartz-mica schist and graphite schist
	Conformable / Tectonic contact	
	BARGAON FORMATION	Meta-sediments (mica schists), meta-rhyolite and felsic metatuff, metabasalt and amphibole – chlorite schist
	Conformable / Tectonic contact	
	RANIPUR FORMATION	Phyllite, banded hematite / magnetite quartzite, BIF, granulite, meta-basalt, amphibolites, carbonaceous phyllites, calcareous quartzite, calc-silicates, marble
Un-conformable / Tectonic contact		
AMLA GNEISS	BASEMENT ROCK	Banded migmatite gneiss, quartzofeldspathic mica schist /gneiss

In the central part of Betul Belt around Bargaon, Muariya and Kherlibazar, bimodal volcanosedimentary lithoassemblage of meta-rhyollite and meta basalt as volcanic components with minor intercalations of meta tuff and metapelite known as "Bargaon Formation" are exposed. The litho-assemblage of Bargaon Formation is not in contact with the lithounits of Ranipur Formation and Sonaghati Formation but are separated from each other by syn to post kinematic intrusive granites along prominent ductile shear zones. They have tentatively kept the stratigraphic position of Bargaon Formaton in between the Ranipur Formation and Sonaghati Formation. The impersistent intercalations of metafelsic and metabasic tuff along with the metapelites are noted within the bimodal litho-assemblage of Bargaon Formation. Metamorphic minerals like garnet, staurolite, andalusite and sillimanite are also developed in metafelsic tuff. Amphibole and garnet bearing rocks in the mineralised zone is interpreted as metamorphosed exhalites. It is presumed that zinc-copper mineralization in this belt is syngenetic exhalative

type. Basic volcanics in the area are represented by pillowed and non-pillowed, vesicular and amygdular metabasalt and the acid volcanic rocks are represented by metarhyolite and felsic metatuff. In addition, metasediments are also associated with the Bargaon Formation. Metabasalt occurs as elliptical outcrops, often standing out as ridges with the long axis of the ellipse parallel to the direction of dominant foliation of the area.

The metabasalt shows well developed pillow structure at several locations but best developed in the hill near Tarora. The pillows have semicircular to elliptical cross section and are stacked one above the other. Megascopically, the acid volcanic rocks are medium grained, intensely deformed and metamorphosed. The dominant constituent minerals are quartz, feldspar, muscovite and occasionally garnet. The rock is generally massive but with the increase of muscovite, it becomes schistose at places. Pyroclastic material of varying sizes is often noticed in the acid volcanics. The bimodal volcano- sedimentary sequence is traversed by intrusives viz, quartz- vein, gabbro and amphibolite dykes.

The Sonaghati Formation extends as a linear ridge in NE-SW direction from SW of Pangra via Sonaghati towards Ranipur. Another major outcrop of the formation extends in a NNE direction from east of Padhar through south of Arjongondi. Isolated outcrops are also seen as patches resting over the basement Amla gneiss. The continuation of these has been disrupted at places by a major fault occurring in the area. Quartzite being a resistant and dominant rock forms a prominent strike ridge all along.

Apart from these major metasedimentary litho units, several small detached exposures of granulitic B.I.F., calc-silicate marble and amphibolite (possibly belonging to the basal Ranipur Formation) along with basement migmatitic gneiss occur as enclaves in the mafic-ultramafic complex and intrusive granites.

Large intrusive bodies of pyroxenite, gabbro, diorite and foliated mafic-ultramafics exposed around Padhar, Gajpur and at several places within the Betul belt have been termed as Padhar Mafic Complex. The mafic-Ultramafic complex, which covers an area of about 160 sq.km, occurs in the western and north western parts of the Betul belt (Roy and Chakraborti, 2008). A number of amphibolites to granulite facies supracrustal enclaves are recorded within the complex. Another mafic-ultramafic complex is also seen within the bimodal litho-assemblage of Bargaon Formation in the eastern part of the Betul belt. The mafic-ultramafic complex outcrop in an area of nearly 5 X 4 km towards south of Mordongri village. Several dykes related to this complex are also found towards west. Besides these, small exposures of gabbro,

pyroxenite and hornblendite are also seen within the bimodal lithoassemblage of Bargaon Formation.

Granitoid rocks in the area show both intrusive as well as tectonic contact relationship with the basement gneiss, supracrustal rocks and the mafic-ultramafic rocks. Syn-to post tectonic, prophyritic to homophanous granites were emplaced along several ENE-WSW trending ductile shear zones. Due to intense shearing and copious granitic magmatism, the supracrustal litho-assemblage of Betul belt occur as dismembered sequences within the granitic host. Two major varieties of granitoid rocks are recognized viz., coarsely crystalline porphyritic granite which is mostly porphyroclastic, strongly foliated and mylonitic along the shear zones and homophanous amphibole mica granite (± garnet ± allanite). Apart from these granitoids, tourmaline mica pegmatite, quartz veins and dolerites of different generations intrudes almost all the rock types of Betul belt.

1.3.2 GEOLOGY & PETROLOGY OF PROPOSED BLOCK

Large scale mapping of 75 sq.km on 1:12,500 scale, in and around Chikhlar, Gauthana, Tikari, Betul bazar and surrounding areas falling in B1, B2, C1 and C2 quadrants of parts of 55G/13 toposheet was carried out by Geological Survey of India in FS 2012-13 in order to search for any new bands of graphite mineralisation and assess the potentiality. The mapping has revealed presence of rocks of Golighat Group and Betul gneiss that are intruded by diorite/dolerite dykes, quartz and pegmatite bodies of various dimensions and amphibolites spanning a long geological period. During the course of mapping, it was found that the general trend of the rocks is ENE-WSW with dip towards northwest in the northern part and south east in the southern part. The major rock types exposed in the area comprise gneisses, including both older as well as younger remelted/ porphyroblastic gneisses, metasedimentaries which are traversed by quartz veins, pegmatite, quartrzo-feldspathic veins, alkali syenite veins, The metasedimentaries include quartz mica schist, biotite schist, quartzite, amphibolite and calc-si1icate rocks occurring as enclaves within the gneisses. These rocks have been grouped as Golighat Group, after the name of the locality (toposheet no. 55G/09) where they are best exposed.

Stratigraphy of the area

Early Proterozoic		Low grade metasediments including phyllites, calc silicates, etc
----------Erosional/ Tectonic contact----------		
Early proterozoic to late Archean (BGC)	Betul Gneisses	Granite gneisses, prophyroblastic/Augen gneisses with associated amphibolites and

		other acid and basic intrusives
	Golighat Group: Kosmi Formation	Remnants of earlier metasediments including schist, amphibolites and quartzite, etc within crystalline
Basement not seen		

1.4.0 MINERAL POTENTIALITY OF THE BLOCK

The graphite mineralization examined in the present area is within the well-known Proterozoic Betul belt. Surface manifestations of mineralization occur in the form of few old pits and mine dumps. Old slag heaps scattered at NW of Chikhlar village and NW of Gauthana village along the north western slope of the Sonaghati ridge is indicative of ancient mining activity in the area. The graphite mineralisation occurs in the graphite bearing schist in the area from Tikari in the southwest to Chikhlar as three lenticular bodies disposed in en-echelon pattern named as southern, northern & central graphite band and exposed discontinuously over a strike length of 3.5 km with a trend of NNE-SSW. Graphite occurs in the form of bands (containing rich dissemination), veins and lensoid bodies within the graphite bearing quartz mica schist. The mineralised bands are mostly parallel to the foliation in the host rock. Graphite occurs as amorphous- to flake-type, reflecting the thermal effects of low to high-grade metamorphism on organic-rich, carbonaceous sedimentary and carbonate rock.

The proposed block envelopes the northern graphite band. The band almost trend in N40° E to N65° E for a strike length of 1300 m with exposed width ranging between 5 m to 20 m. The band exhibits bifurcation into two separate bands each having thickness of 5 m -8 m and 12 m -20 m respectively. Although the band is continuous throughout its strike length, it pinches and swells at places resulting in variation of thickness with exposed width ranging from less than 5 m at N-20 to a maximum of 20 m.

The reconnoitre field work for two days has been carried out in the proposed block area by Vardan Environet LLP. The litho units observed in the area are Gneiss, Quartz Mica Schist, Graphite Schist, Quartzite, Pegmatite. Bed rock samples from graphite schist were collected. Collected bed rock samples were submitted to Shiva Analytics, Bengaluru, for chemical analysis. The results are tabulated below.

(Proximate Analysis)						
Sample Details			Characteristics			
SI.No.	Sample ID	Method	IS 1350 (P.1): 2025	IS 1350 (P.1): 2025	IS 1350 (P.1): 2025	IS 1350 (P.1): 2025
		Units	%	%	%	%
		Lab ID	Analysis Sample Moisture (IM, adb)	Ash (adb)	Volatile Matter (VM, adb)	Fixed Carbon (FC, adb)
1	N-BRS-CHK-1	G4438-1	0.11	94.83	1.77	3.29
2	N-BRS-CHK-2	G4438-2	0.23	92.93	3.16	3.67
3	N-BRS-CHK-3	G4438-3	0.43	73.15	11.11	15.31

1.4.1. SCOPE OF THE PRESENT EXPLORATION: -

Phase I (Approximately 1 to 4 months):

Detailed Mapping (Scale: 1:2000)

Aim of the detailed mapping will be identification of: lithological units (graphite schist, quartzite, etc.) Structural features (folds, faults, shear zones) Mapping of visible graphite mineralization zones

Sub surface Prospecting

Pitting & trenching will be conducted across the graphite-bearing zones to expose of subsurface continuity, trenches will be mapped thoroughly & also channel samples will be collected from trenches.

Ground geophysical survey

Ground geophysical survey namely I.P. cum S.P, resistivity, magnetic, will be conducted at 200m line interval amounting to 10 Line km covering whole block area to identify subsurface conductive zones.

Phase II (Approximately 4 to 10 months):

This phase will consist of core drilling and thereafter the chemical and petrographic analysis of the core samples. Core drilling will help to identify and characterize potential mineralized zones/ore bodies.

Phase III (Approximately 4 to 10 months):

This phase will consist of data compilation & report writing.

Decision points:

The exploration strategy incorporates the GO-NO GO milestones to be collaboratively decided between the Vardan Environet LLP, State of Rajasthan and the NMET based on the results of the

on-going phases. Total duration of the work plan is 12 months. The exploration plan incorporates one decision point.

2. PREVIOUS WORK

The occurrence of Graphite dated back to 1958 but no subsequent prospecting/exploration was ever planned till Shri Lenka B. and S. A. Ahmad carried out prospecting for Graphite in Chiklar-Gauthana-Tikari areas, Betul district, M.P. The prospecting work has revealed the presence of significant mineralisation of Graphite contained in the supra crustal rocks of proterozoic age. P.K. Raut and Meherotra (FS 1991-92) has reported the presence of graphite in the supracrustal of Betul belt in Golighat and Junewani area. Based on the reported occurrence, Lenka while carrying out the G2 stage investigation for graphite has carried out recconoitery traverse in Golighat and Junewani area for generation of G4 stage proposal. The surface manifestations of graphite mineralization in the area are in the form of few old pits and mine dumps. It has also been observed that graphite being hosted within the quartz mica schist has a contrast in the appearance of soil colour than the surrounding areas. In Golighat area, the surface manifestation occurs only in the form of few insect burrowings with limited surface exposures and blackening of the surface soil.

GSI had carried out G4 stage of exploration for Graphite in Chiklar-Gauthana-Tikari areas, Betul district, M.P in FS 2012-13 and reported occurrence three graphite band named as the southern, central & norther band disposed in en-echelon pattern for cumulative length of 3.5km.The proposed block area envelopes the northern band as reported in the G4 exploration work.

3. BLOCK DESCRIPTION WITH BOUNDARY COORDINATES / FIELD VISIT LOCATIONS WITH COORDINATES

Table-3.1. Block boundary coordinates

CARDINAL POINTS	LATITUDE	LONGITUDE
A	21°56'53.83"N	77°54'17.07"E
B	21°57'26.93"N	77°55'01.70"E
C	21°57'01.08"N	77°55'14.97"E
D	21°56'30.78"N	77°54'34.76"E

4. PLANNED METHODOLOGY AND EXPLORATION TASK FLOW

The proposed exploration program is meticulously designed in accordance with the objectives outlined for Preliminary exploration (G-3) as stipulated in the Minerals (Evidence of Mineral Contents) Rule-2015 and Minerals (Evidence of Mineral Contents) Amendment Rules-2021. This

comprehensive methodology encompasses several interrelated components; each aimed at establishing a detailed understanding of the geological and mineral potential of the area under investigation.

4.1.0 Detailed Geological Mapping

Geological mapping is a foundational need of any exploration program. Mapping will be conducted over a specified area of 1.35 km² on 1:2000 scale. The detailed mapping will involve:

Litho-unit Identification: The identification and characterization of various litho-units present in the area will be a key focus. This will include noting their mineralogical composition, physical properties, and distribution patterns.

Contact Relationships: The relationships between different litho-units, including their contacts and interactions, will be meticulously documented. Understanding these relationships is crucial for assessing mineralization potential.

Textural and Structural Analysis: The textural characteristics (e.g., grain size, shape, and arrangement) and structural features (e.g., folding, faulting) of the geological formations will be mapped. These elements are significant in understanding the geological history and potential for mineral deposits.

Surface Manifestations: Any visible surface manifestations of mineralization, such as veins, outcrops, and other geological indicators, will be carefully marked on the geological map. Their spatial disposition and distribution patterns will be analysed to identify prospective areas for further investigation.

4.2.0 Sampling and Analysis

4.2.1 Bed Rock:

During the geological mapping phase, a targeted approach will be employed to collect bed rock samples from outcrops that exhibit signs of mineralization. Key indicators include the presence of metal-oxides/sulphides, shearing, brecciation, oxidation, silicification, ferruginization, and other alteration features. Samples analyzed for assay of Graphite and associated mineralization in the area. Bock samples of the sanctioned number will be collected systematically from identified locations using chip, groove or channel sampling techniques. These samples will be prepared for laboratory analysis for **Graphite and associated mineralization** in the area. Additionally, to ensure the reliability and accuracy of the results, 10% of the primary samples will be analyzed as check samples.

4.2.2 Trench/Pit Sampling:

To further investigate the mineralized zones, the sanctioned volumes of trenching and pitting, strategically located within the identified mineralized areas, will be executed. From this trenching & pitting, Graphite samples will be generated and sanctioned number of samples will be analyzed, which is well-established for determining mineral content. To bolster the reliability of these results, 10% of the samples will be designated as check samples.

4.2.3 Core Sampling:

Core samples (1 m length) will be collected from mineralized part from drilled boreholes. Number of samples as sanctioned by the TCC will be sent for Proximate analysis, whole rock analysis i.e. major oxides by WD-XRF & analysis through ICP-MS for rare earth elements & rare metals.

4.3.0 Surveying:

The block boundary will be surveyed by DGPS and total station in WGS-84 datum for demarcation of proposed area boundary points. Survey party will also carry out surface features, contouring in the proposed area and associated with Geological/Geophysical activities for taking up locations of Geophysical station/line marking, outcrop, Pitting/ Trenching, channel sample collection for taking up the location of sample points and plotting it on the map for proper interpretation of the sample data. Further, during the drilling programme, the survey party will carry out borehole fixation and determination of reduced level and co-ordinates of the boreholes.

4.4.0 <u>Ground Geophysical Survey:</u>

A comprehensive ground geophysical survey comprising Induced Polarization (IP) coupled with Self Potential (SP), resistivity, and magnetic methods will be carried out across the entire block area. The survey will be executed along systematically laid profiles at 200-meter line intervals, covering a total of approximately 10 line kilometers. This integrated geophysical approach is aimed at delineating subsurface conductive zones, which may be indicative of graphite mineralization, and will aid in identifying prospective targets for subsequent detailed exploration activities..

4.5.0 <u>Core drilling:</u>

To find out the continuity of mineralized zones in strike & dip direction and to assess the attitude of the subsurface disposition of the Graphite bodies, based on the results of surface exploration such as geological mapping, geophysical & geochemical survey and pitting/ trenching in an area of 1.35 sq.km., 27 number of inclined boreholes at 200meters of strike interval shall be drilled in the targeted mineralized zone. Out of the total 27 proposed boreholes, 13 are planned as first-level

inclined boreholes, designed to intersect the graphite mineralized bodies at an approximate vertical depth of approximately 45meters, 12 boreholes are proposed as second-level inclined boreholes, intended to intersect the graphite bodies at a vertical depth of approximately 90meters & also 2 third level scout boreholes of 300m each, thereby enabling assessment of the continuity and grade of mineralization at greater depths.

4.6.0. Petrological Studies

Petrological studies are integral to understanding the mineralogical characteristics of the litho-units. During the geological mapping phase:

- A total of 5 samples will be selected from various litho-units for detailed petrographic analysis. This will involve examining thin sections under a microscope to ascertain the mineral composition and texture.

- Additionally, 5 samples will undergo polished section analysis (Mineralographic studies) to explore the assemblages of metal oxide/sulphide minerals present. The focus will be on understanding their distribution, alteration processes, and potential for economic mineralization.

4.8.0. Final Report Submission

Upon completion of the exploration activities, a detailed final report will be compiled, encompassing the following key components:

- **Identification of Targets for G2 Stage**: The report will outline specific targets for further exploration at the G2 stage, focusing on additional ore bodies that show potential for economic viability. -

Comprehensive Data Analysis: A thorough analysis and interpretation of the geochemical, geological, and petrological data collected during the survey will be presented, highlighting significant findings and implications.

- **Recommendations for Further Exploration**: Based on the findings, the report will provide actionable recommendations for subsequent exploration phases, ensuring a strategic approach to resource assessment and potential development.

This structured and multifaceted methodology aims to ensure a comprehensive understanding of the mineral potential of the area, paving the way for informed decision-making in future exploration and development initiatives.

Fig.-4. Planned Methodology and Exploration task flow

1. Detailed Mapping (1:2,000), Sampling, Mineralogy, Geochemistry

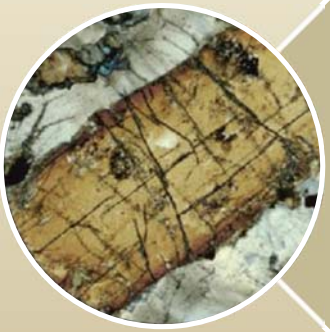
Outcome:- Identification of Mineralisation, Structural framework study, Lithology and Ore Minerals and zeroing down the area for detailed Geophysical studies.

2. Geophysical Survey [SP, Magnetic, IP & Imaging]

Outcome:- Identification of prospective zones for detail studies, defining drilling targets.

3. Drilling, Core Sampling, Metal assay

Outcome:- Identification Of Mineralized Zone, evaluation of mineral resources



4. Petrography and Whole rock and Trace Element Assay

Outcome: -

- 1.Vector to additional target.
- 2. Identification Mineralisation Zone
- 3. Characterisation of Mineralised zones and Report with recommendation

5. MANPOWER DEPLOYMENT

A table containing the manpower deployment table is given in chapter-9, Timeline.

6. SUMMARY EXPENDITURE

The summary expenditure for each phase is given in Annexure I.

7. BREAKUP OF EXPENDITURE

The breakup expenditure for each phase is given in Annexure II.

8. TIMELINE

Annexure 4B

Timeline - Preliminary Exploration (G3) for Graphite and associated mineralization in Chiklar Block, Betul District, Madhya Pradesh

S.N.	Activities	Months												
		1	2	3	4	5	REVIEW	6	7	8	9	10	REVIEW	11	12
1	LITERATURE SURVEY														
2	DETAILED MAPPING														
3	PITTING/TRENCHING														
4	GROUND GEOPHYSICAL SURVEY														
5	CORE DRILLING & ASSOCIATED WORKS														
6	SAMPLING														
7	GEOCHEMICAL STUDIES														
8	PETROGRAPHIC STUDIES														
9	PEER REVIEW														
10	REPORT WRITING & SUBMISSION OF FINAL REPORT														

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ANNEXURE -I

Preliminary exploration (G-3 Stage) for Graphite & associated mineralisation in Chikhlar Block, Betul District, Madhya Pradesh, 12 months, Review after 5 & 10 months.

Annexure 4A

Cost Estimate for Preliminary exploration (G-3) for Graphite and associated mineralisation in Chiklar Block, Betul District, Madhya Pradesh, Area - 1.35 sq.km. Drilling: 2000 m, Timeline: 12 months, Review after 5 & 10 months.

Sl. No.	Nature of Components	Unit	SoC Item No	Rate as per NMEDT SoC	Quantum of Component	Cost of Component	Remarks
1	Detailed Geological Mapping Other Geological						
a	Detailed Mapping (1:2000)	per sq. Km	1.1	18300	1.35	24,705.00	
b	Charges for 2 Geologist per day (Field) for Geological mapping & Trenching work, drilling activity (without labour)	Per Day	1.2.1a(b)	14500	120	17,40,000.00	
c	Labours charges; Base rate (for 2 labours per geologists)	Per Day	5.8	556	240	1,33,440.00	
d	Charges for Geologist per day (HQ)	Per Day	1.2.1a(a)	10500	30	3,15,000.00	
	Sub Total 1					**22,13,145.00**	
2	Survey work- Outsou						
a	Charges for one qualified surveyor (Topographic survey, surface contouring at specific interval)- outsource	Per Day	1.3.1	10500	30	3,15,000.00	

b	DGPS Survey for BH fixation and Cardinal Points of block- outsource	Per Point of observation of observation	1.3.2	24000	24	5,76,000.00	20 BHs & 4 Corner Points
Sub Total 2						**8,91,000.00**	
3	**Geophysical survey- Outsource**						
a	SP(8-10 L km)	10 L km	3.3a	62140	10	6,21,400.00	
Sub Total 3						**6,21,400.00**	
4	**Diamond Core Drilling & allied work- Outsource**						
a	Systematic Drilling of First level BH & Second Level Borehole as per MEMC (Hard rock)	Per m	2.2.1.1 d	10000	2000	2,00,00,000.00	Drilling quantum to be revised after first level (13 BHs with average depth of 70 m) drilling
b	Borehole deviation by multi shot camera	Per Shot	2.2.5	330	333	1,09,890.00	
c	Drillcore Preservation	Per m	5.3	1590	500	7,95,000.00	
d	Land/Crop Compensation	Per borehole	5.6	30000	20	6,00,000.00	As per actuals as certified by local authorities subject to a maximum of 30000 per borehole.
e	Administrative charges for getting forest clearance	As per actual	5.7			-	As per actuals
Sub Total 4						**2,15,04,890.00**	
5	**Charges for Sampling Party**						
a	Charges for one Sampler per day	one sampler per day	1.2.1b	7850	48	3,76,800.00	
b	Charges labour engaged in sampling work (4	Per Day	5.8	556	192	1,06,752.00	

	labour per sampler)						
Sub Total 5						4,83,552.00	
6	Geochemical Study						
a	Proximate Analysis of graphite bearing samples **(primary sample)**	Per Sample	4.1.18	3614	300	10,84,200.00	
b	Proximate Analysis of graphite bearing samples **(check sample)**	Per Sample	4.1.18	3614	30	1,08,420.00	
c	Major oxides by WD-XRF (whole rock analysis) (Oxides + traces) (primary samples)	Per Sample	4.1.17a	4200	15	63,000.00	5 BRS + 10 CORE SAMPLE
d	Major oxides by WD- XRF (whole rock analysis) (Oxides + traces) (Check samples)	Per Sample	4.1.17a	4200	2	8,400.00	10% of Primary Samples
e	REE by ICP-MS (14 REE + 9 Trace elements including uranium) (primary sample)	Per Sample	4.1.15	7400	15	11,000.00	5 BRS + 10 CORE SAMPLE
f	REE by ICP-MS (14 REE + 9 Trace elements) (check sample)	Per Sample	4.1.15	7400	2	14,800.00	10% of Primary Samples

g	XRD analysis for identification of minerals	Per Sample	4.5.2	4000	10	40,000.00	
h	Bulk Density	Per Sample	4.8.3	2500	10	25,000.00	
	Sub Total 6					**14,54,820.00**	
7	**Physical & Petrological/mineragraphic Studies**						
a	Preparation of Standard thin section of rock	Per Sample	4.3.1	500	5	2,500.00	
b	Preparation of polished thin section of rock/wafer	Per Sample	4.3.2	800	5	4,000.00	
c	Complete petrographic/ ore microscopic study/ mineragraphic report of rock sample (along with 5 nos. digital photomicrographs)	Per Sample	4.3.4	2800	10	28,000.00	
	Sub Total 7					34,500.00	
	Out Source Cost					2,16,22,290.00	
8	Technical Supervision Cost	Lumpsum	6			20,00,000.00	
	Sub Total 8					**20,00,000.00**	
	Total (1 to 8)					**2,92,03,307.00**	
9	**Tendering Process Cost**	One time in case of outsourced components of project work	5.9			**4,32,445.80**	

10	Geological Report Preparation	5 Hard copies with a soft copy	5.2(iii)	750000	1	7,50,000.00	
11	Peer review charges	As per EC decision		30000	1	30,000.00	
12	Preparation of Exploration Proposal	lumpsum	5.1	500000	1	5,00,000.00	
13	Total Cost Without GST					3,09,15,752.80	
14	Provision for GST (18%)					55,64,835.50	
15	Total Cost With GST					3,64,80,588.30	
In Lakhs						364.81	
Note:							
1	Strict adherence to the Ministry of Finance's and GFR guidelines is mandatory. Every transaction must adhere to GFR rule 21.						
2	In case of delay/non- performance, the appropriate action will be taken by competent authority against delinquent agency as per prevailing govt. of India rules/guidelines on procurement.						
3	If any part of the project is outsourced, the amount will be reimbursed as per the Paragraph 3 of NMEDT SoC and Item no. 6 of NMEDT SoC.						
4	Necessary efforts should be made to minimize any adverse impact on the environment during exploration activities.						
5	Any item of work not mentioned above shall be added as per SoC.						
6	All the Geological Reports and data are to be uploaded on NGDR as per MERT template by the agency.						

ANNEXURE -II

SHIVA
Part of the Cotecno Group

SHIVA ANALYTICALS INDIA PRIVATE LIMITED

Plot No. 24D [P] & 34 D, KIADB Industrial Area, Hoskote,
Bangalore – 562 114. Phone No: 080 -2801 -5333,
Website: www.shivaanalyticals.com

TEST REPORT

Customer Name	**Vardan Environet LLP Plot No. 82A, Sec-5, IMT Manesar, Gurugram-122051 (Hr), India**
Discipline & Group	**Chemical & Ores and Minerals.**
Customer Ref.	**Samples Received by Courier**
Commodity	**Geological Rock Samples**
Lab ID	**G4438**
Sample Receipt Date	**21-Mar-26**
Analysis Completion Date	**30-Mar-26**
Date of Reporting	**30-Mar-26**
Sample Count	**4**

(Proximate Analysis)

Sample Details			Characteristics			
		Method	**IS 1350 (P.1): 2025**	**IS 1350 (P.1): 2025**	**IS 1350 (P.1): 2025**	**IS 1350 (P.1): 2025**
		Units	**%**	**%**	**%**	**%**
Sl.No.	**Sample ID**	**Lab ID**	**Analysis Sample Moisture (IM, adb)**	**Ash (adb)**	**Volatile Matter (VM, adb)**	**Fixed Carbon (FC, adb)**
1	N-BRS-CHK-1	G4438-1	0.11	94.83	1.77	3.29
2	N-BRS-CHK-2	G4438-2	0.23	92.93	3.16	3.67
3	N-BRS-CHK-3	G4438-3	0.43	73.15	11.11	15.31
4	S-BRS-MARJ-2	G4438-4	0.17	87.90	4.68	7.25

PLATE-I

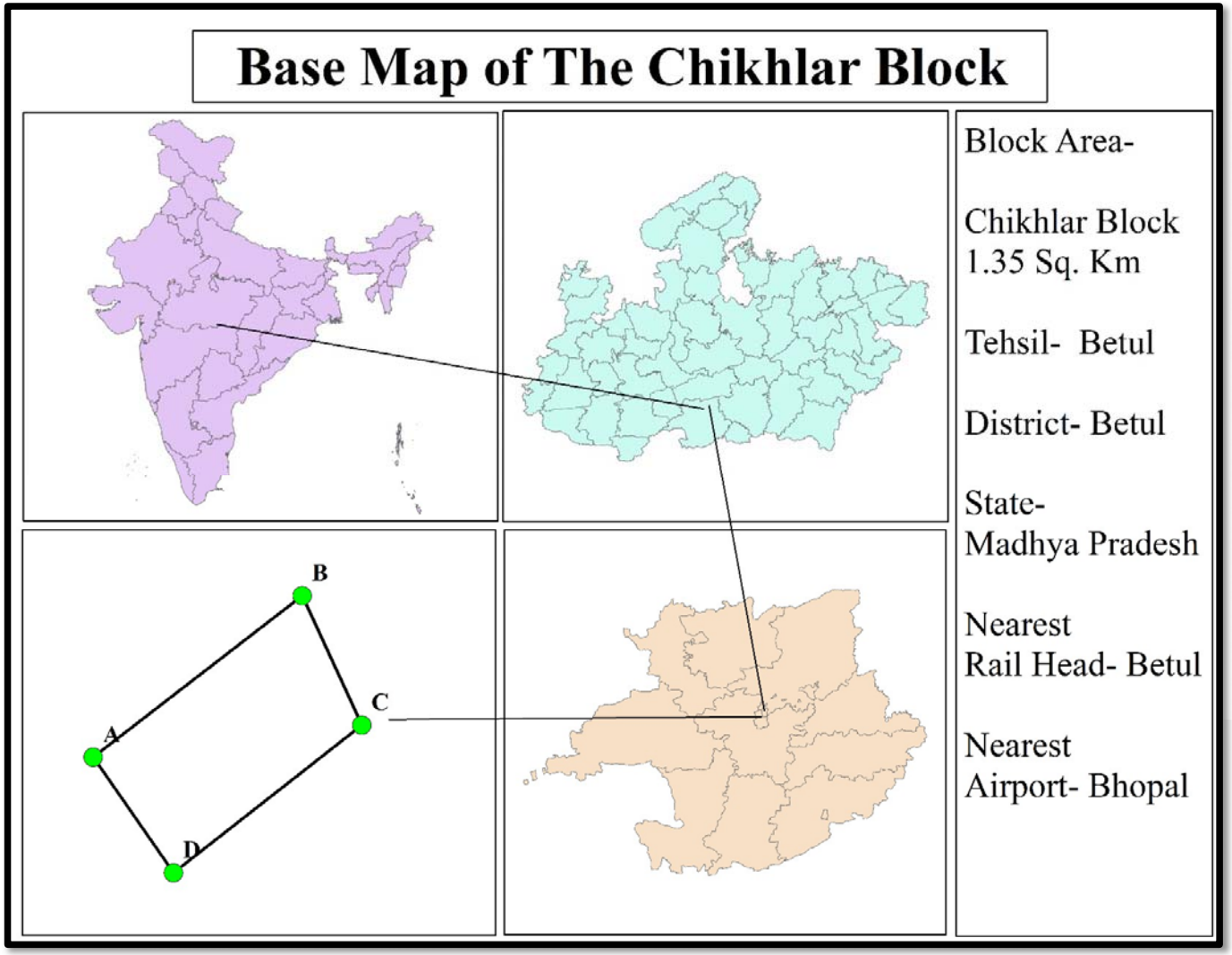
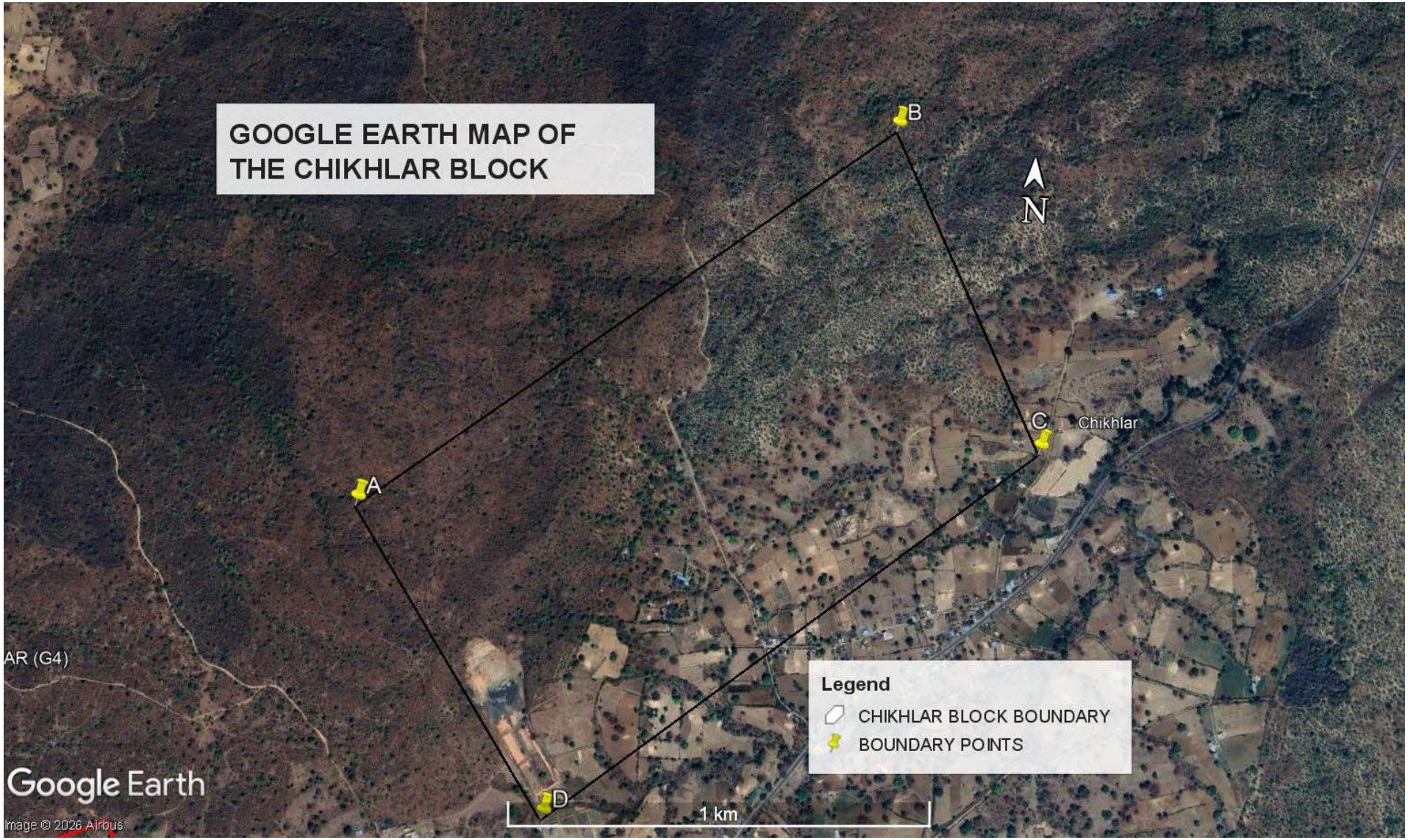

Base Map of The Chikhlar Block
Block Area-
Chikhlar Block
1.35 Sq. Km
Tehsil- Betul
District- Betul
State-
Madhya Pradesh
Nearest
Rail Head- Betul
Nearest
Airport- Bhopal
A
B
C
D

PLATE-II


GOOGLE EARTH MAP OF
THE CHIKHLAR BLOCK
B
N
C
Chikhlar
A
D
AR (G4)
Legend
CHIKHLAR BLOCK BOUNDARY
BOUNDARY POINTS
1 km
Google Earth
Image © 2026 Airbus

CHIKHLAR (G3) BLOCK ON SOI TS: 55G/13

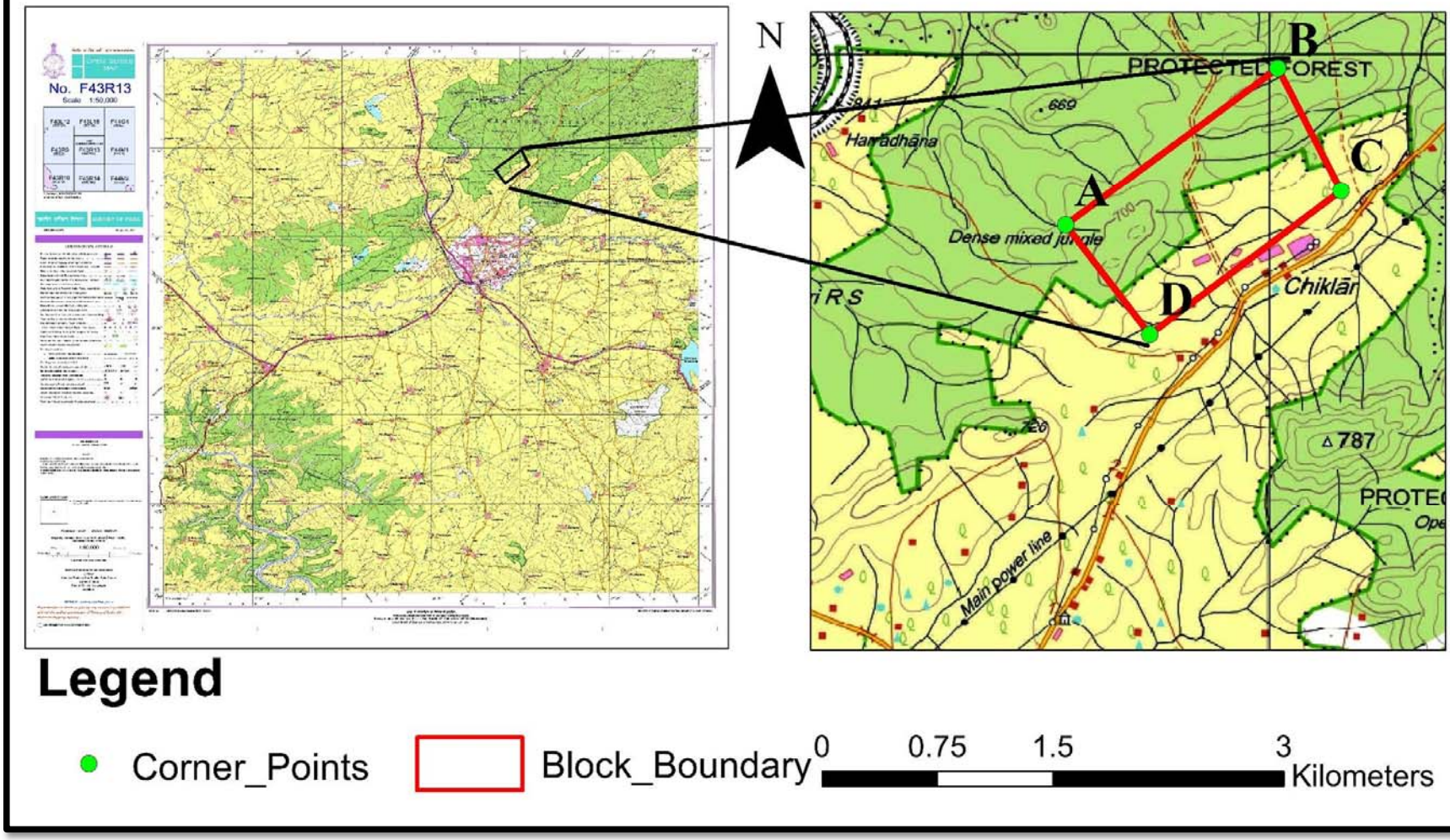


PLATE-IV

LOCATION OF CHIKHLAR BLOCK ON LARGE SCALE GEOLOGICAL MAP

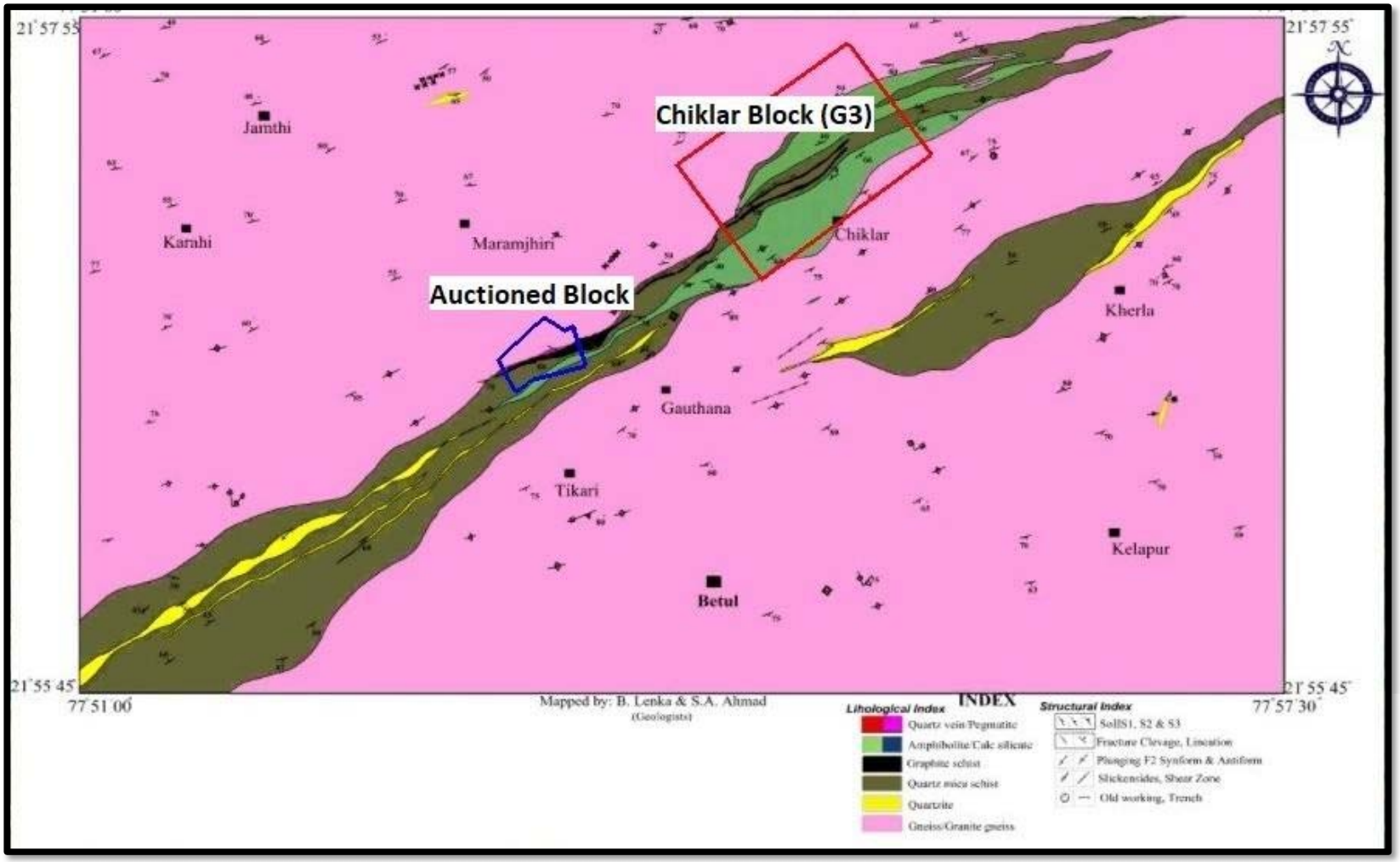
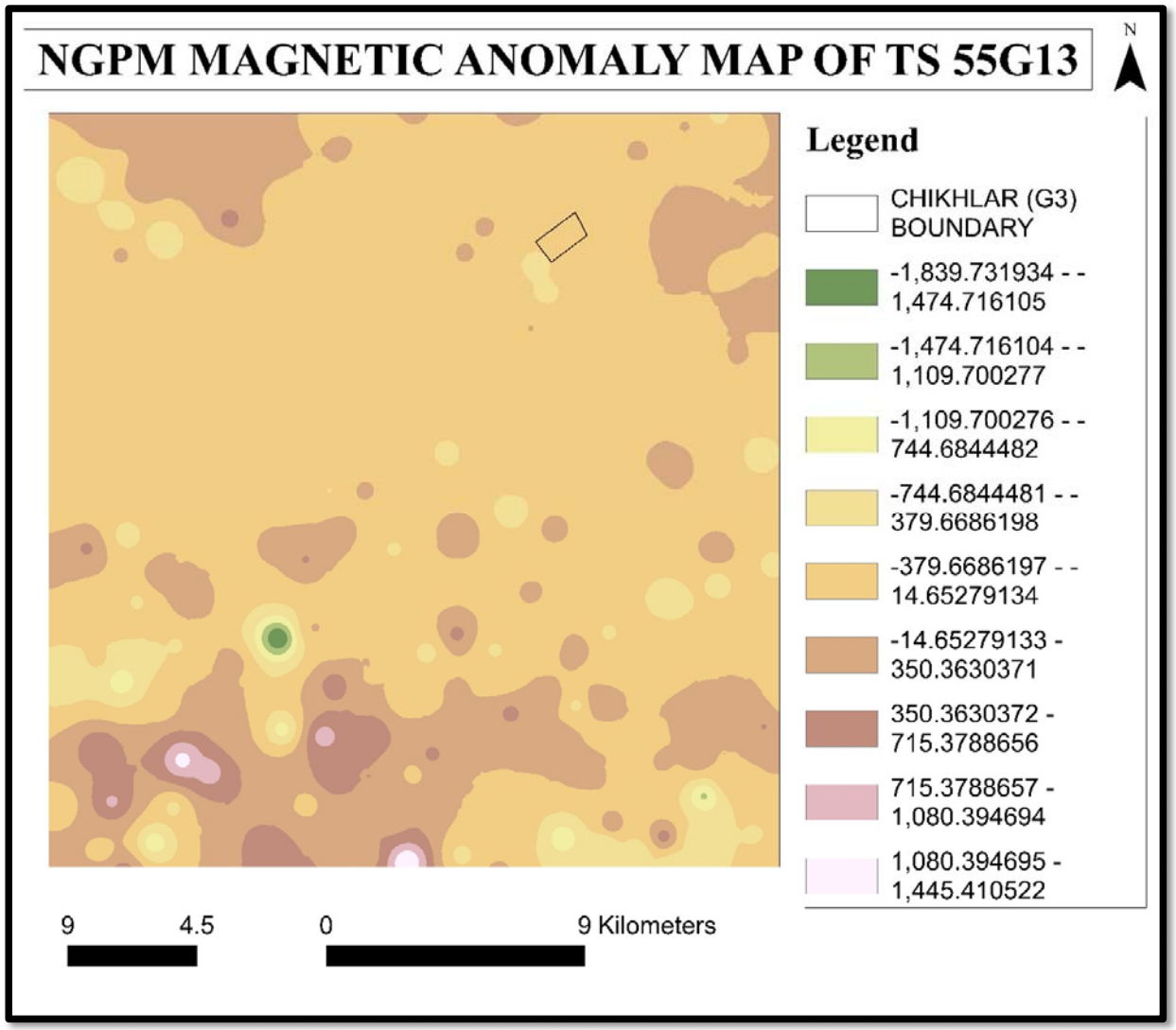


PLATE-V


NGPM MAGNETIC ANOMALY MAP OF TS 55G13
N
Legend
CHIKHLAR (G3) BOUNDARY
-1,839.731934 - -1,474.716105
-1,474.716104 - -1,109.700277
-1,109.700276 - -744.6844482
-744.6844481 - -379.6686198
-379.6686197 - -14.65279134
-14.65279133 - 350.3630371
350.3630372 - 715.3788656
715.3788657 - 1,080.394694
1,080.394695 - 1,445.410522
9 4.5 0 9 Kilometers

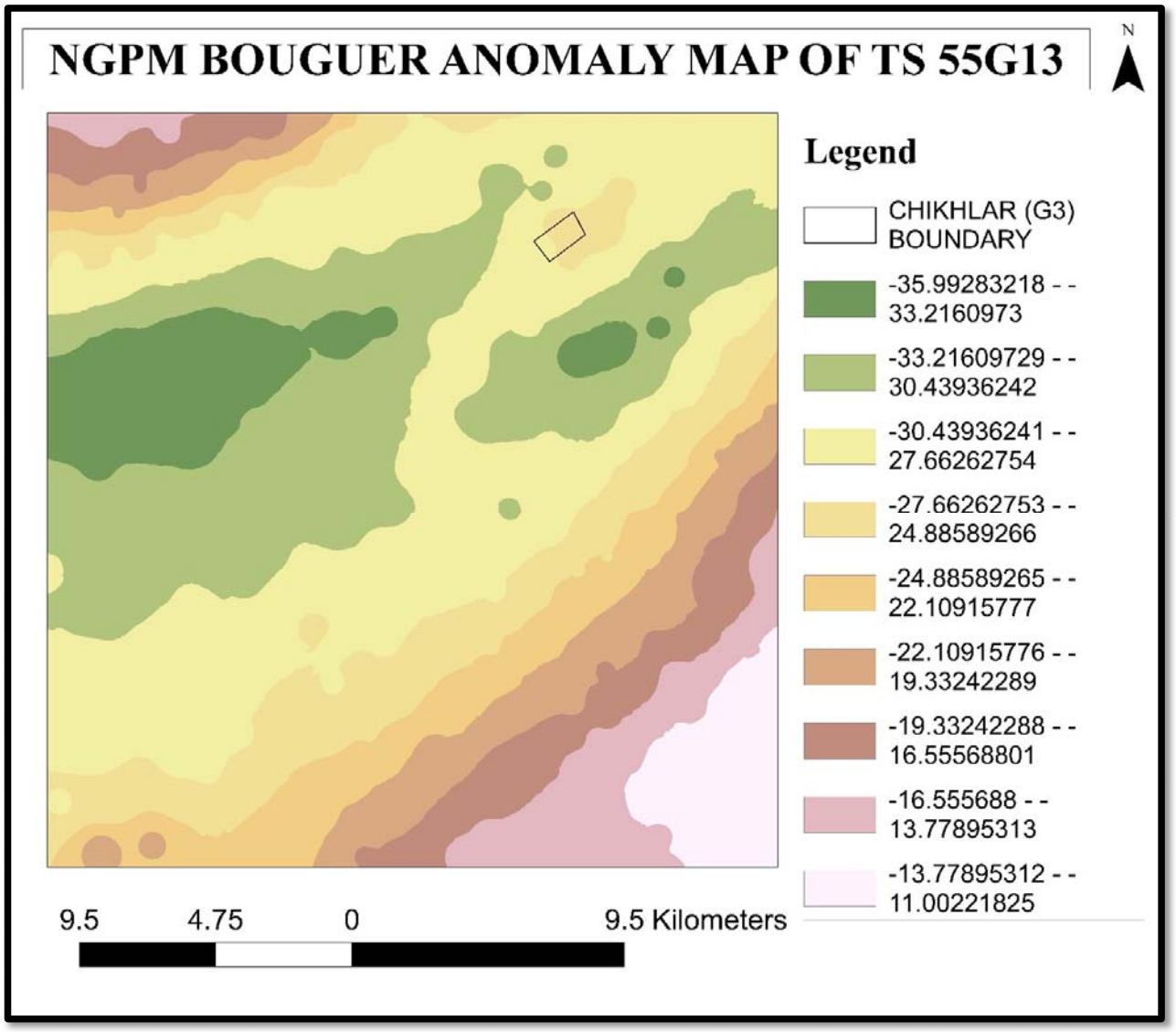

NGPM BOUGUER ANOMALY MAP OF TS 55G13
N
Legend
CHIKHLAR (G3) BOUNDARY
-35.99283218 - - 33.2160973
-33.21609729 - - 30.43936242
-30.43936241 - - 27.66262754
-27.66262753 - - 24.88589266
-24.88589265 - - 22.10915777
-22.10915776 - - 19.33242289
-19.33242288 - - 16.55568801
-16.555688 - - 13.77895313
-13.77895312 - - 11.00221825
9.5 4.75 0 9.5 Kilometers

PLATE-VII

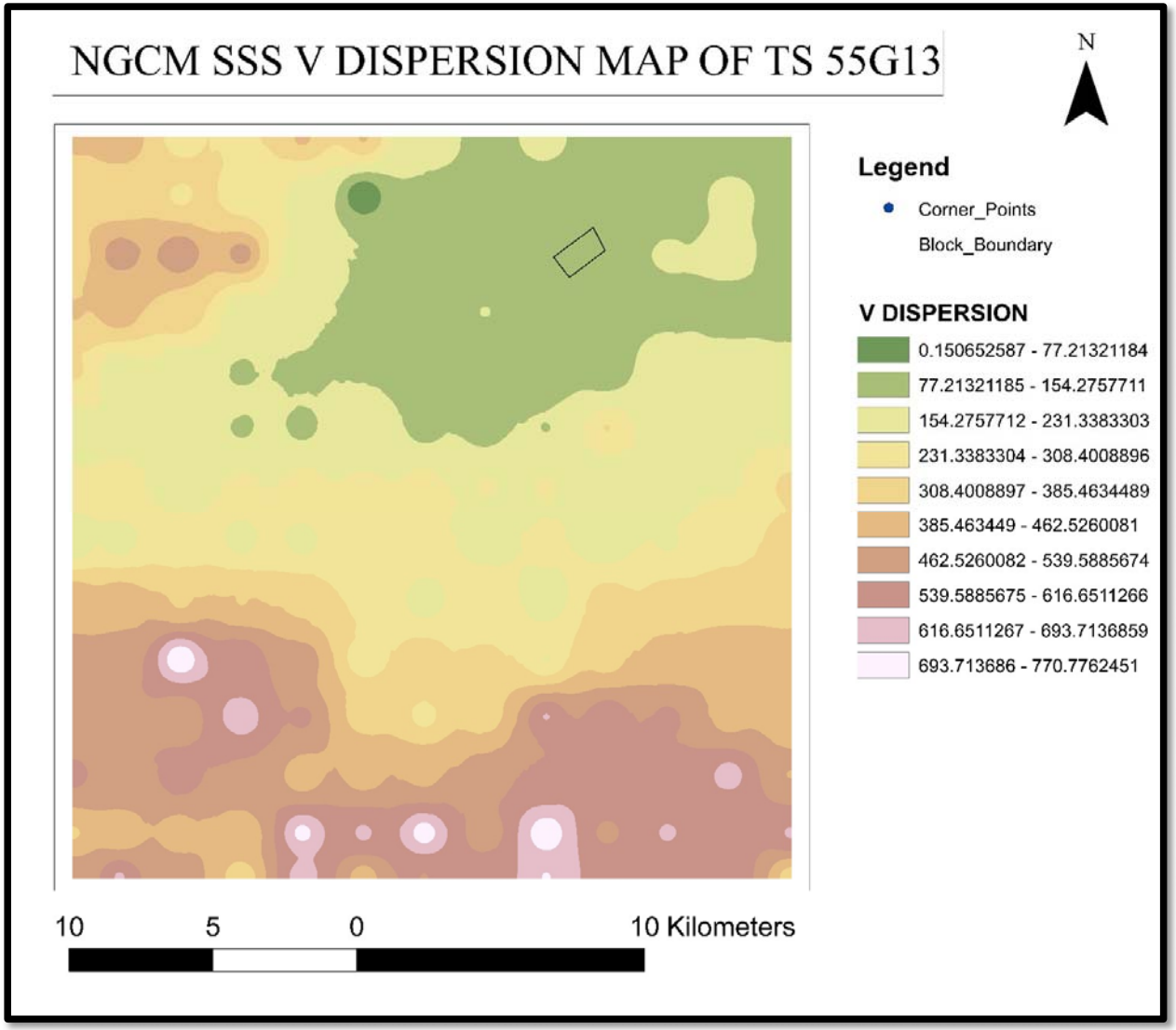

NGCM SSS V DISPERSION MAP OF TS 55G13
N
Legend
Corner_Points
Block_Boundary
V DISPERSION
0.150652587 - 77.21321184
77.21321185 - 154.2757711
154.2757712 - 231.3383303
231.3383304 - 308.4008896
308.4008897 - 385.4634489
385.463449 - 462.5260081
462.5260082 - 539.5885674
539.5885675 - 616.6511266
616.6511267 - 693.7136859
693.713686 - 770.7762451
10 5 0 10 Kilometers

PLATE-VIII

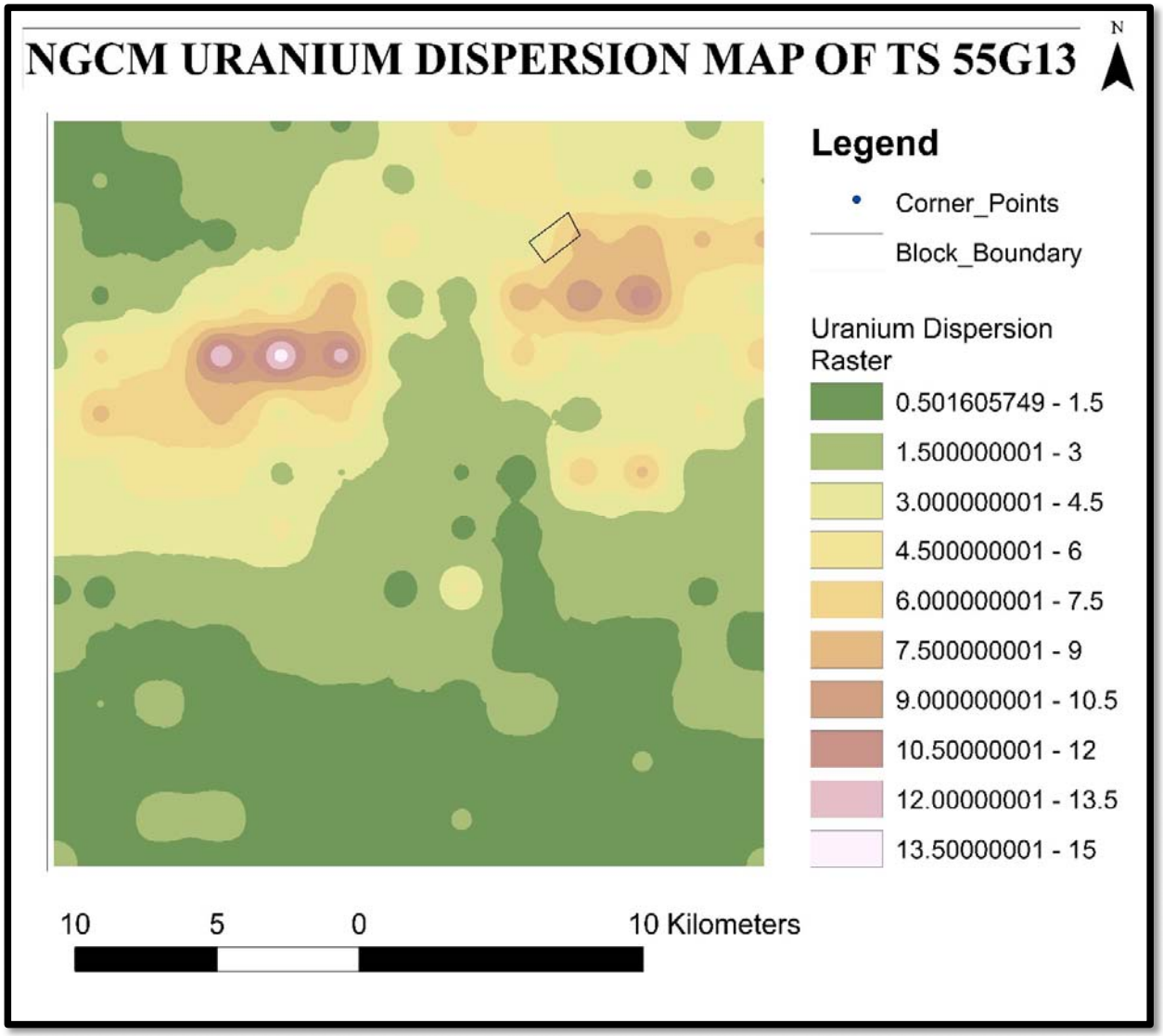

NGCM URANIUM DISPERSION MAP OF TS 55G13
N
Legend
Corner_Points
Block_Boundary
Uranium Dispersion Raster
0.501605749 - 1.5
1.500000001 - 3
3.000000001 - 4.5
4.500000001 - 6
6.000000001 - 7.5
7.500000001 - 9
9.000000001 - 10.5
10.50000001 - 12
12.00000001 - 13.5
13.50000001 - 15
10
5
0
10 Kilometers

PLATE-IX

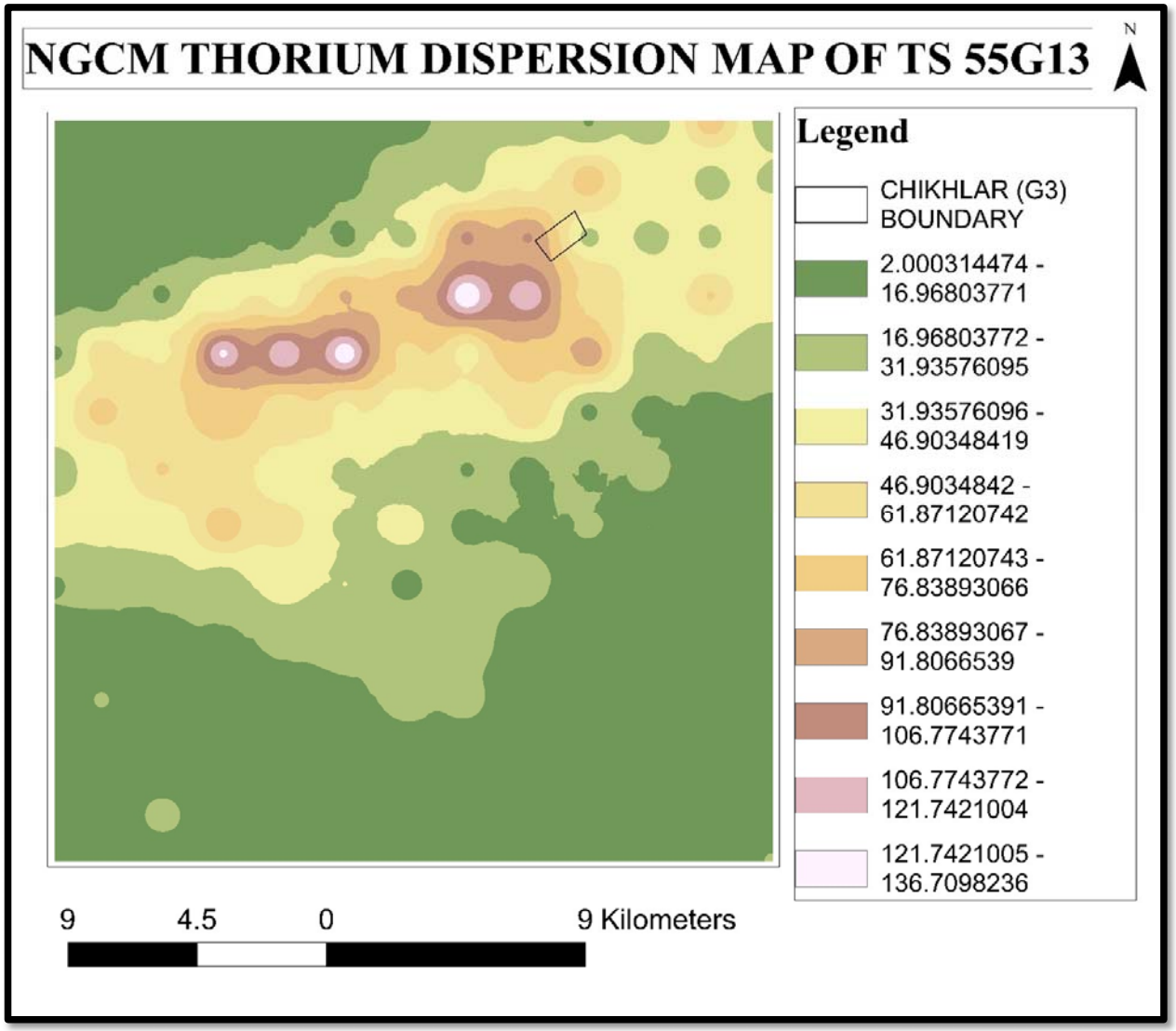

NGCM THORIUM DISPERSION MAP OF TS 55G13
N
Legend
CHIKHLAR (G3) BOUNDARY
2.000314474 - 16.96803771
16.96803772 - 31.93576095
31.93576096 - 46.90348419
46.9034842 - 61.87120742
61.87120743 - 76.83893066
76.83893067 - 91.8066539
91.80665391 - 106.7743771
106.7743772 - 121.7421004
121.7421005 - 136.7098236
9 4.5 0 9 Kilometers

PLATE-X

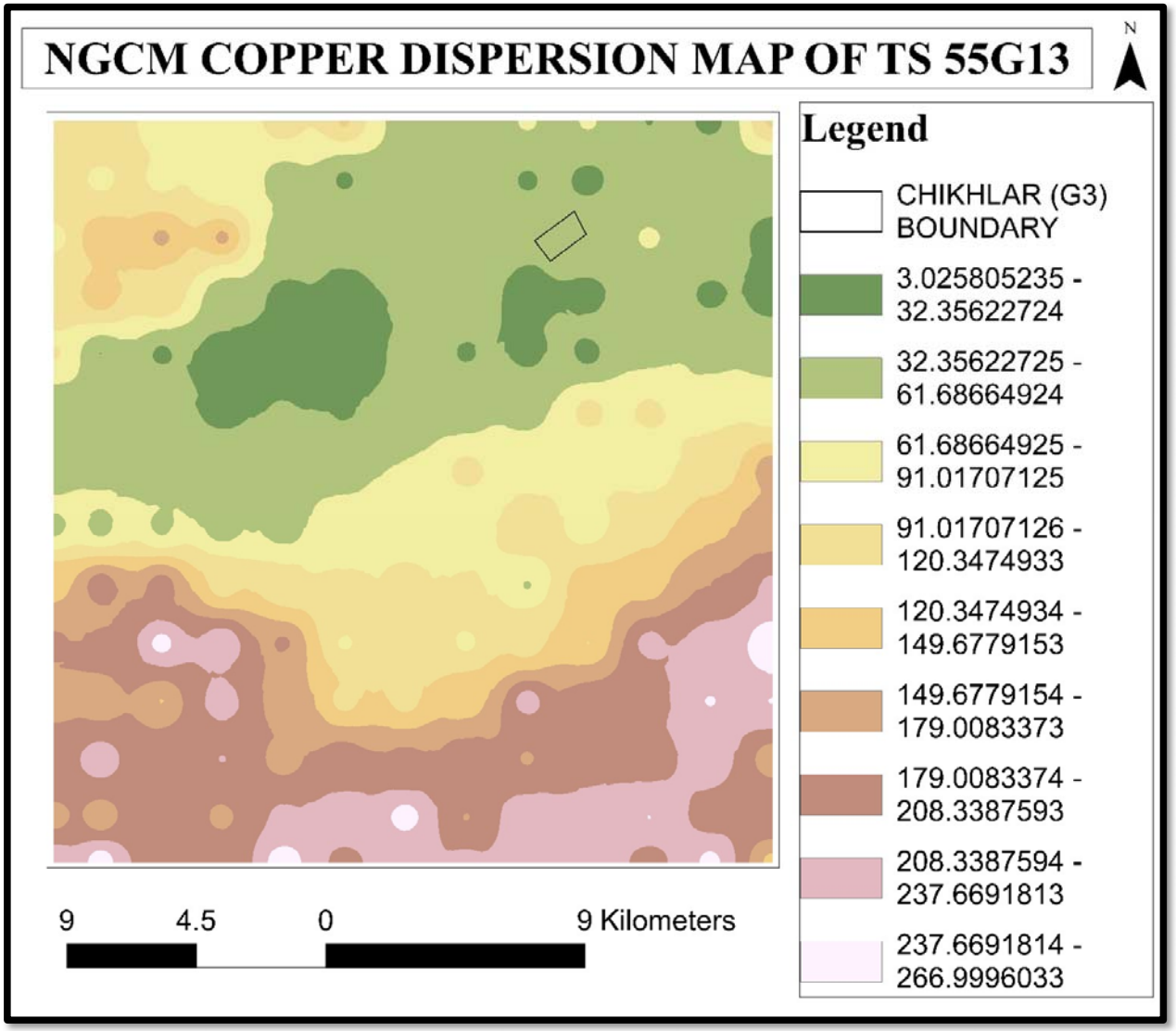

NGCM COPPER DISPERSION MAP OF TS 55G13
N
Legend
CHIKHLAR (G3) BOUNDARY
3.025805235 - 32.35622724
32.35622725 - 61.68664924
61.68664925 - 91.01707125
91.01707126 - 120.3474933
120.3474934 - 149.6779153
149.6779154 - 179.0083373
179.0083374 - 208.3387593
208.3387594 - 237.6691813
237.6691814 - 266.9996033
9 4.5 0 9 Kilometers

PLATE-XI

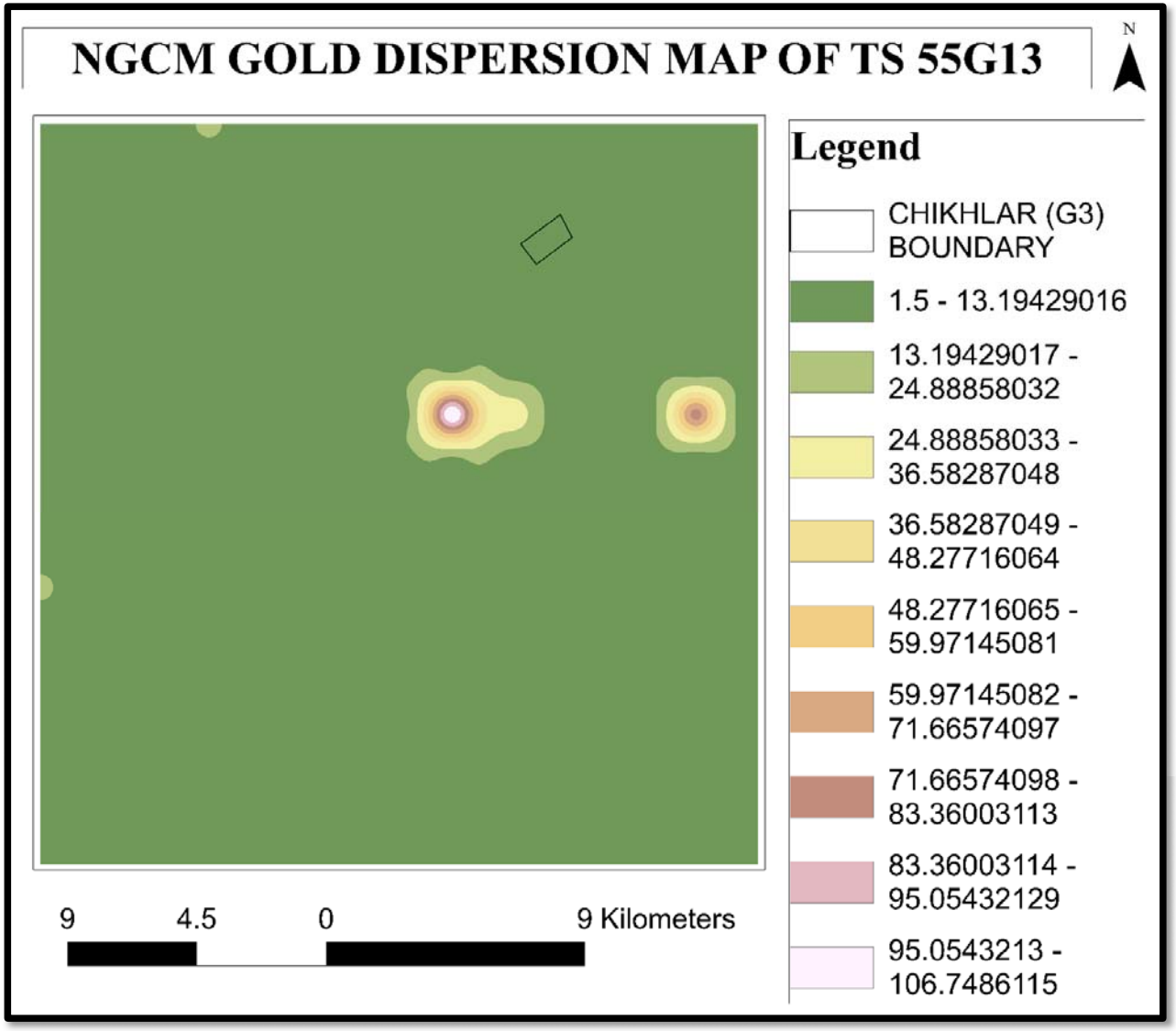

NGCM GOLD DISPERSION MAP OF TS 55G13
N
Legend
CHIKHLAR (G3) BOUNDARY
1.5 - 13.19429016
13.19429017 - 24.88858032
24.88858033 - 36.58287048
36.58287049 - 48.27716064
48.27716065 - 59.97145081
59.97145082 - 71.66574097
71.66574098 - 83.36003113
83.36003114 - 95.05432129
95.0543213 - 106.7486115
9 4.5 0 9 Kilometers

PLATE-XII

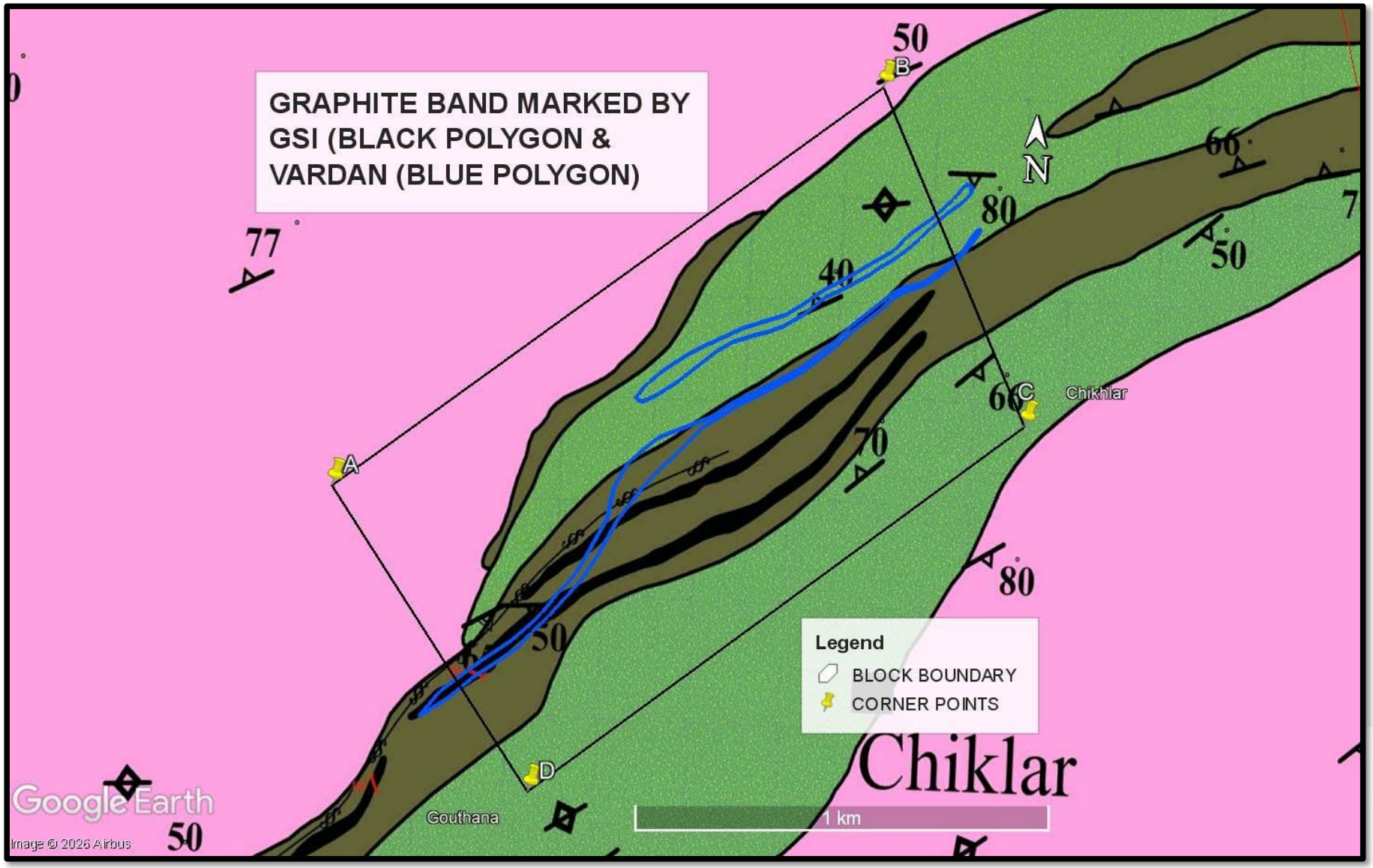
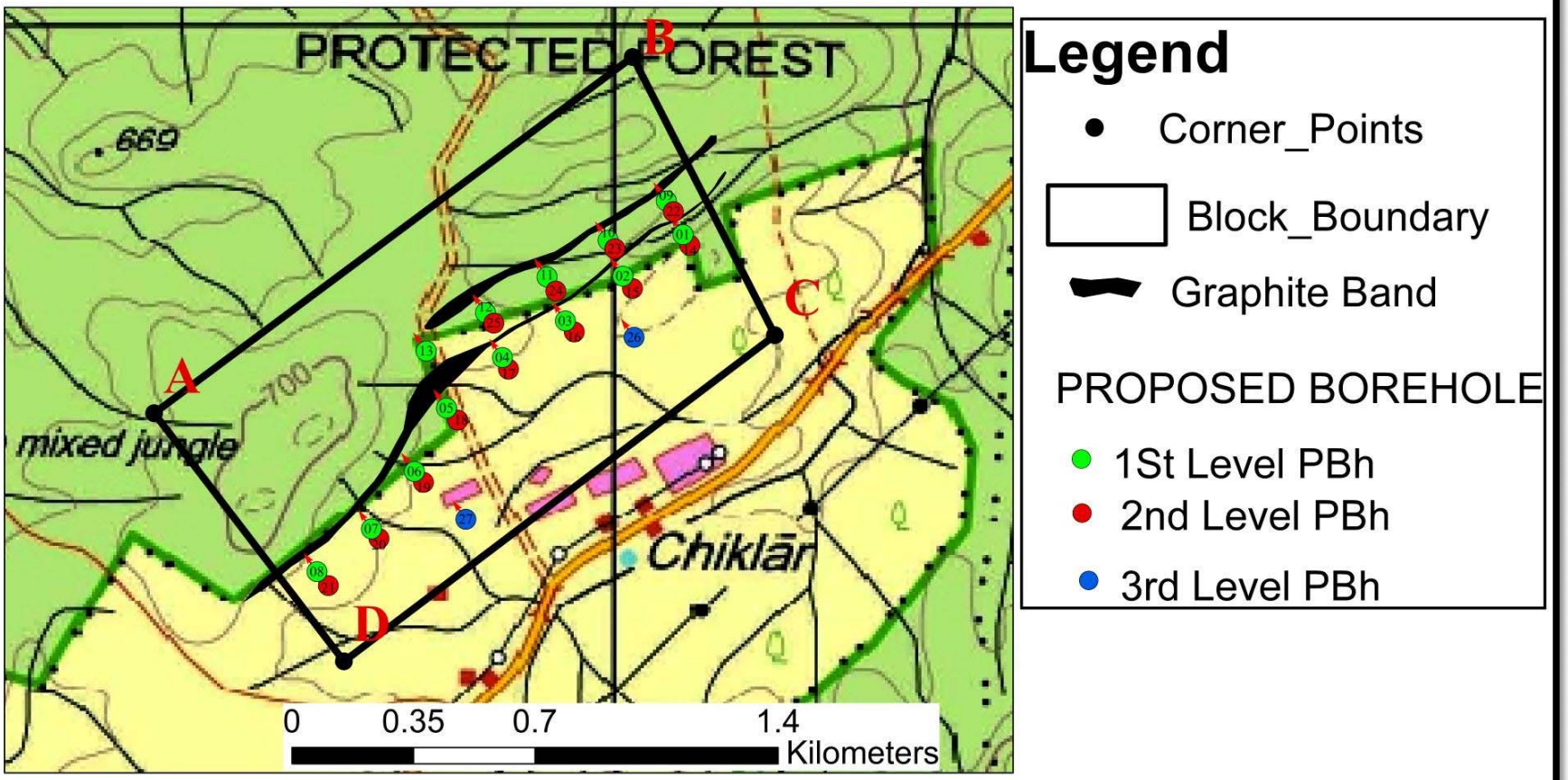

GRAPHITE BAND MARKED BY GSI (BLACK POLYGON & VARDAN (BLUE POLYGON)
A
B
C
D
Chikhlar
Gouthana
Chiklar
Legend
BLOCK BOUNDARY
CORNER POINTS
1 km
Google Earth
Image © 2026 Airbus
N

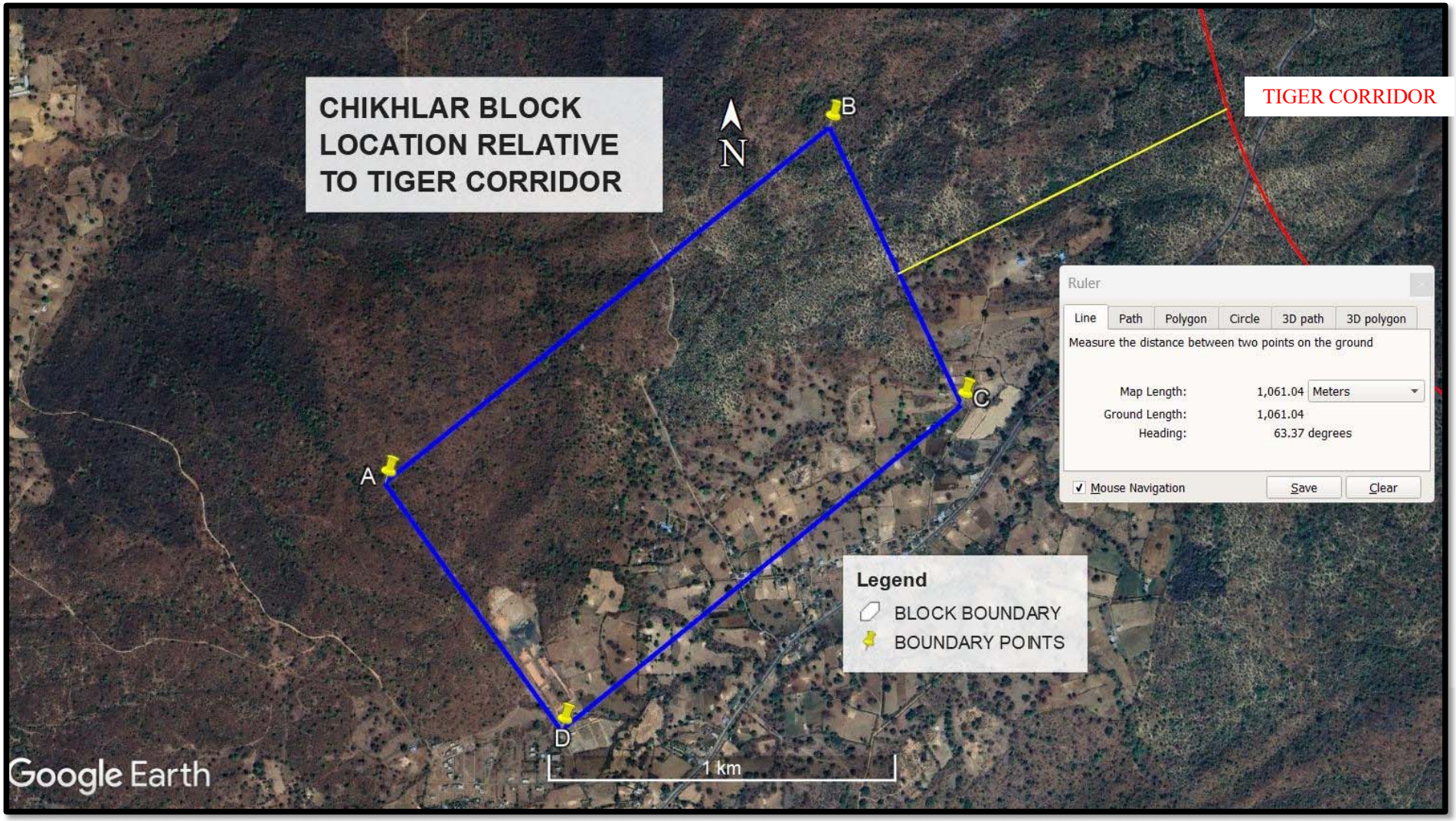
PLATE-XIII

SURVEY OF INDIA TOPOSHEET MAP SHOWING PROPOSED BOREHOLE LOCATIONS IN CHIKHLAR BLOCK



All boreholes will be inclined at 45° and have general azimuth towards north-west direction.

PLATE-XIV


CHIKHLAR BLOCK
LOCATION RELATIVE
TO TIGER CORRIDOR
TIGER CORRIDOR
N
A
B
C
D
Ruler
Line
Path
Polygon
Circle
3D path
3D polygon
Measure the distance between two points on the ground
Map Length: 1,061.04 Meters
Ground Length: 1,061.04
Heading: 63.37 degrees
Mouse Navigation
Save
Clear
Legend
BLOCK BOUNDARY
BOUNDARY POINTS
1 km
Google Earth

CHECKLIST FOR EXPLORATION AGENCIES FOR SUBMISSION OF EXPLORATION PROJECT PROPOSALS

Name of Project/Block: **GRAPHITE AND ASSOCIATED MINERALISATION (G-3 STAGE) IN CHIKHLAR BLOCK, BETUL DISTRICT, MADHYA PRADESH**

Agency: **VARDAN ENVIRONET LLP**

Nodal Personnel (Agency): **Mr. Anshul Yadav**

Date: **23.04.2026**

Sl. No.	Items to be Verified by Agency	Yes/No	Page Number in submitted Document
1	Geospatial scrutiny completed using KML/coordinate dataset and AOI assessed (including exploration activities, mining areas, eco zones, dependencies).	NO	
2	Total Forest area in proposed block - with pic from PM Gatishakti portal. Type of forest (RF/PF/Sanctuary/National Reserve forest) to be mentioned.	NO	
3	Overlap study of previous exploration work carried out in any exploration agencies/departments, or ongoing/proposed exploration work by any agencies/departments done	NO	
3	Baseline data availability (NGCM, NGPM, Geological Maps, Airborne geophysical data etc) on NGDR confirmed and reflected in comments.	Yes	5
4	Processing of Baseline Geoscience data (NGCM, NGPM, Geological Maps, Airborne geophysical data etc), legacy exploration data of proposed area, integration, analysis and interpretation presented in the project proposal/DPR	Yes	PAGE NO. 42 to 48
5	Existing leases (ML/CL/EL etc.) in and around project area verified through NGDR/State DGM/Ministry of Mines	NO	
6	Whether the area falling within the buffer zone of International Boundary, Wildlife sanctuary, no-go zone, Biodiversity Park etc.	NO	
7	Literature review and previous findings submitted by agency verified and reflected in DPR/In-principle *(Page number of the particular to be mentioned in Reference / Bibliography)*	Yes	PAGE NO. 19
8	Whether the agency has carried out field work in the proposed area, collected samples and presented their findings with analytical data in project proposal/DPR	Yes	PAGE NO. 17 & 18

9	Justification for proposed commodities and details of previous work included in DPR/In-principle. Reference to NMEDT's ongoing/completed projects verified and included in comments.	Yes	PAGE NO. 5,6

Other Information

Accreditation of Agency:

Date: 08.10.2024 Valid Upto: 07.10.2027

Notification of Agency:

Date: 26.11.2024 Valid Upto: 25.11.2027

Personnel Deployed

As per QCI NABET - Mr. R.S. Yadav, Dr.R.k. Sharma, Mr. B.B. Sharma, Dr.R.K Jain, R.K. Singh, Prashant Yadav, Saloni Sharma, Kamal Kumar Sharma, Tejeswar Barik, Yogesh Sharma, Sagar Ranjan Satpathy, Priyanshu Kumar, Dishant.

Current strength - 13

Total no. of Projects funded by NMEDT:

Approved - 2

Completed - 0

Ongoing - 2

Comments of Nodal Personnel (Agency), if any:

Certification

I hereby certify that the above checklist has been duly completed and all verifications have been carried out as per the guidelines.

Signature of Nodal Personnel (Agency): 

Name: Mr. Anshul Yadav

Designation: Managing Partner

Date: 23 APRIL 2026