DPR OF JHALAUTHAR PHOSPHORITE (ROCK PHOSPHATE) BLOCK, IN BADA MALEHRA TALUKA, CHHATARPUR DISTRICT (M.P.) FOR PROPOSAL OF G-3 STAGE EXPLORATION UNDER NMET

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DETAILED PROJECT (PROPOSAL) REPORT OF JHALAUTHAR PHOSPHORITE (ROCK PHOSPHATE) BLOCK, IN BADA MALEHRA TALUKA, CHHATARPUR DISTRICT (M.P.) FOR PROPOSAL OF G3 STAGE EXPLORATION UNDER NMET

1.0 Executive Summary:

M/s Engeotech Consultant is leading mining geological consultancy organization in the country having multiple facilities related to mining geology. The company has clients from major corporate groups of the country. Engeotech Consultant has been at the forefront of providing consultancy and techno-analytical services under one roof. These include Mineral Exploration, Petrography and Ore Microscopy, Satellite Imagery and a wide array of surveys such as TST Survey, GPS Survey, DGPS Survey, Drone Survey etc. Our team comprises of skilled professionals dedicated to each field within our scope, ensuring reliable and high-quality assistance for every project. The company has six geologists, two surveyors, four AutoCAD professionals and ample technical staff to execute exploration project on its own. Major highlights include-

1. NABET Accredited Exploration Agency.
2. Individual Mining Geological unit.
3. Independent Drilling Unit
4. Surveying unit which is equipped with TST, GPS, DGPS, Drone etc.
5. MOU with an NABL accredited chemical testing lab BSS Lab Pvt. Ltd. which is also a sister concern to Engeotech Consultant and is equipped with modern equipment like AAS, spectrophotometer, BOD, etc. and is situated in the same premises.

M/s Engeotech Consultant has been notified by Ministry of Mines as A-Category Private Exploration Agency vide Govt. of India Gazette Notification Dated 31st August 2023 for carrying out exploration projects of: a) Bedded Stratiform & Tabular Deposits b) Lenticular Composite Vein c) Gem Stone and Rare metal Pegmatite, reef and veins/pipes d) Float & Placer Deposits e) Deep seated deposits. In view of above M/s Engeotech Consultant has made proposal for G3 Stage of exploration under Minerals (Evidence of Mineral Contents) Rules-2015 in Jhalauthar Phosphorite Block in Bada Malehra Taluka District Chhatarpur (M.P.) under NMET.

G3 Stage of Exploration Proposals in Jhalauthar Phosphorite Block in district Chhatarpur under NMET has been made. This task will involves deputing two geologists each having 60 field days and 60 HQ days along with two surveyors and two drillers.

2.0 About NMET

Government of India vide its Gazette Notification dated 27/03/2015 made certain Amendments in MM(D&R) 1957 and the act was called as Mines and Minerals (Development and Regulation) Amendment Act 2015. In this Act following amendments have been made:

1. The Central Government shall, by notification, establish a Trust, as a non-profit body, to be called the National Mineral Exploration Trust.
2. The object of the Trust shall be to use the funds accrued to the Trust for the purposes of regional and detailed exploration in such manner as may be prescribed by the Central Government.
3. The composition and functions of the Trust shall be such as may be prescribed by the Central Government.
4. The holder of a mining lease or a prospecting license-cum-mining lease shall pay to the Trust, a sum equivalent to two per cent. of the royalty paid in terms of the Second Schedule, in such manner as may be prescribed by the Central Government.

Accordingly, the board of NMET was constituted vide Govt. of India Gazette Notification dated 27 march 2015, Extraordinary, Part II Section I dated 27/03/2015. Present Exploration proposals have been submitted under Sub rule 9(f) of above-mentioned rule.

3.0 General Information about the area

The Rock Phosphate deposit of proposed exploration block belongs to Category I-Bedded, Stratiform and Tabular Deposits of Regular Habit of Minerals (Evidence of Mineral Contents) Rules 2015. Litho units belongs to Hirapur Phosphorite Formation of Bijawar Group having Paleo-Proterozoic Age. Present exploration has been proposed under G3 Stage of Minerals (Evidence of Mineral Contents) Rules 2015

Block Details: Present exploration project i.e., Jhalauthar Phosphorite Block lies in the Survey of India Topo Sheet No. 54 P/03 having Geographical extent between Latitude 24° 28’ 50.053’’ to 24° 29’ 21.601’’ and Longitude 79° 08’ 57.596’’ to 790° 10’ 27.78’’ having an area of 228 Ha or 2.28 sq. km. with highest RL of 458m and lowest RL of 360m.

Location and Accessibility: The present proposed block is located 20km SE of Ghuwara the nearest town. Damoh Station - on Katni –Damoh (70km) and Sagar(80Km) of Central Railway Madhya Pradesh. NH-539 (Old NH-12A) passes nearby the area.

GEOGRAPHICAL COORDINATES OF THE JHALAUTHAR BLOCK

Block corner points / Cardinal Points	Longitude	Latitude	Easting	Northing
A	79° 9' 5.738" E	24° 29' 14.834" N	312690.0894	2709448.816
B	79° 9' 22.907" E	24° 29' 21.601" N	313176.2623	2709650.561
C	79° 10' 27.723" E	24° 29' 23.463" N	315001.8909	2709683.634
D	79° 10' 27.787" E	24° 28' 51.365" N	314990.6461	2708696.075
E	79° 8' 57.596" E	24° 28' 50.053" N	312450.641	2708689.46

4.0 Regional Geology

Litho-units belonging to Bijawar Group having Meso-Proterozoic age are exposed in the proposed exploration block. In the area the Bijawar sequence rests unconformably on uneven surface of Bundelkhand Granite Gneiss and is unconformably overlained by Vindhyan Group of rocks. The Vindhyan rocks forms the ENE-WSW trending sharp escarpment at the southern extremity of the exposed Bijawar basin. At the eastern and western extremities, the Vindhyan rocks were found to directly overlie the Bundelkhand Gneiss which surrounds the Bijawar basin from north (Binod Kumar et al. 1984-85). The unconformity between Bundelkhand granitic rocks and Bijawar sequence represents the oldest shore line recognizable in India (Pascoe-1973). The Bijawar sequence has been divided in to two subgroup and six formations by Binod Kumar et.al. (1984-85) as shown below:

B I J A W A R	SEMRI GROUP (Vindhyans)	
	----------Unconformity----------	
	Gangau Sub Group	a) Kurri Ferruginous Formation
		b) Hirapur Phosphorite Formation
	----------Unconformity----------	
	Moli Sub Group	a) Dargawan Intrusive Formation
		b) Bajno Dolomite Formation
		i) Chert member
		ii) Dolomite member
		c) Malehra chert breccia Formation
		i) Raidaspura Member
		ii) Sendhpa Member
		d) Kawar Volcanic Formation
	----------Unconformity----------	
	BUNDELKHAND GRANITE AND GNEISS	

5.0 Local Geology

In and around Jhalauthar Block Bijawar sequence rests unconformably on an uneven surface of Bundelkhand granite and gneiss and is unconformably overlained by Vindhyan Supergroup of rocks to the south. The basement is exposed on the north and west of Bijawar basin. The Local geological Succession of the area is given below-

- Ferruginous Chert Breccia
- Hirapur Phosphorite Formation (with rich Phosphorite Lenses.)
- Bundelkhand Granite/Gneiss

6.0 Initial Work -

The Bijawar basin attracted large no. of Geologists since 18th Century. Medlicott (1859) had proposed the name Bijawar Series for the sediments found above the Bundelkhand granite and below the lower Vindhyan beds. Subsequently Wilson (1877), Kedar Narain (1954), Mathur (1960), Mani (1970), Halder and Ghosh (1978) and Binod Kumar et. a1. (1985) have carried out systematic geological mapping of the Bijawar rocks. During the year 1976 the Atomic Minerals Division had reported the presence of phosphorite while carrying out investigation for uranium mineralization around Hirapur area. Preliminary appraisal of the phosphorite deposit in the area was done by N. Subramaniam of GSI in early 1977. The detailed exploration was carried out by A. Sonakia and Binod Kumar during 1978 to 1984 and they established a total insitu reserve of 18.66 million tonnes of 23% P2O5 and 22 million tonnes of 7% to 10% P2O5 around Hirapur-Mardeora areas Binod Kumar, (1984). R.K. Shrivastava (1987) had carried out detailed mapping on 1:25000 scale in the area adjoining Hirapur Phosphorite deposit, with a view to reassess the potentiality of other phosphorite occurrences located in the area adjoining Hirapur deposit. He had collected 95 no of surface grab samples from Devpur, Manakpura prospects, 20 km NW of Hirapur. Surface samples had indicated up to 37% P2O5 values in these blocks. Phosphatic horizon had been traced along over a strike distance of 14 km within which richer pockets of phosphorite are seen at Machheri, Jhalauthar, Devpur-Manakpura blocks. He had recommended further large-scale mapping and test drilling to prove the extent and grade of Phosphorite mineralization at depth in these pockets.

7.0 Previous Exploration

This deposit was previously explored by GSI from 1/12/1987 to 28/2/1990 by Shri P.K. Chourasia Sr. Geologist and Shri H.S. Shrivastava Sr. Geologist. Manakpura phosphorite investigation was carried out around Manakpura-Devpur, Jhalauthar and Machheri blocks, District Chhatarpur, MP. Detailed geological mapping, geochemical sampling and drilling have been carried out to assess and demarcate the physical continuity, its grade and reserves in the above phosphorite blocks. About 2 sq km area was mapped in detail in 1:1000, 1:2000 and 1:5000 scales in these blocks and 155 numbers of surface channel and drill core samples have been analyzed. A total of 504.45m drilling has been carried out in nine boreholes. At Manakpura, Devpur, Jhalauthar and Machheri phosphorite was found associated with Hirapur Phosphorite Formation of Bijawar Group. This zone of phosphorite mineralization is in the same horizon as the 18.66 million tonnes of high grade phosphorite deposit of Hirapur, Mardeora and Basai blocks presently being mined by MP State Mining Corporation.

Jhalauthar Block-

Jhalauthar block is situated about 4 km NW of Manakpura. In Jhalauthar hill, phosphorite occurrences are exposed discontinuously for 1 km strike distance. Continuous phosphorite bands are exposed at three sectors each is about 200m in length and are 20m in thickness. Surface channel sampling along four traverses showed the following results

- 12.80m x 24.52% P_2O_5
- 5.50m x 7.13% P_2O_5
- 4.00m x 12.08%. P_2O_5
- 5.00m x 4.80% P_2O_5

Four vertical boreholes were drilled at strike intervals of 200m to 500m to make a regional assessment of the phosphorite zones present in the block. Only poor mineralisation was intersected in the boreholes.

- JBH-1: 1.00m x 4.25P% P_2O_5
- JBH-2: 5.00m x 6.51% P_2O_5
- JBH-3: Several thin zones of poor P_2O_5 content intersected.
- JSH/1: No Phosphorite zone intersected.

8.0 Conclusion & Recommendations by GSI-

Rich phosphorite deposit has been proved at Hirapur in Sagar District, MP. This phosphorite deposit is associated with Hirapur Phosphorite Formation of Bijawar Group of rocks. Additional occurrences of phosphorite mineralisation were located at Devpur, Manakpur, Jhalauthar and Macheri NW of Hirapur with the same geological setting. Considering the poor results at Devpur, Manakpur, Jhalauthar and Macheri blocks, no further exploration need be taken up, especially since the area is under dense forest cover. However, phosphorite horizon continues further east in the Bijawar basin and search should be continued to locate phosphorite horizons specially where the possibility of enrichment through leaching through fault and shear planes exists.

9.0 Current Sampling by Engeotech-

- Sample-1: $P_2O_5$18.4%
- Sample-2: $P_2O_5$16.20%

10.0 Justification for taking up current exploration-

Earlier exploration carried out by GSI is inadequate as GSI had drilled only 4 boreholes under G4 stage which is inadequate and not as per UNFC-1997 and Minerals (Evidence of Mineral Contents) Rules 2015. The exploration was terminated by the GSI with the comments that there are poor results of exploration, hence no further exploration need be taken up, especially since the area is under dense forest cover. But now demand and supply pattern of phosphate mineral have changed drastically and there is a huge gap between demand and supply of the Rock phosphate. Unfortunately, our Country fulfills only 16% demand of phosphatic minerals. Rest demand is fulfilled by import of the mineral from Rock phosphate producing Countries such as Jorden, Morocco, Uzbekistan etc.

Beside above at Tigora, Hirapur, Mardeora and Luhani area in Hirapur Rock Phosphate belt active mining of Phosphorite is going on. These mines are located in same belt as Jhalauthar Block. Beside above M/s BSS Lab. is carrying out chemical analysis of exploration work being carried out in Sonrai Phosphorite Block in Lalitpur district (U.P.). This block is continuation of Bijawar Phosphorite block. In this area results of chemical analysis are very promising.

The Country is deficient in Phosphatic Minerals Reserves and Resources of Rock phosphate are very limited. Therefore, detailed exploration is necessary for conversion of remaining resources into reserves. The Country has no alternative but to depends on import of mineral specially from Jorden, Uzbekistan, Morocco etc.

As per Indian Mineral Year Book 2020-21, the consumption and supply figures of Rock Phosphate including apatite is given below-

- Demand/domestic Consumption 9236,000 Tonnes
- Supply/Domestic Supply 1456,000 Tonnes
- Order of Self Sufficiency 16% only

From indigenous sources only 10-15% requirement of raw material is met.

Other figures are given below-

- 311.25 million tonnes total reserves/resources of rock phosphate have been established as on 1st April 2020.
- 1,456,000, production of Phosphate/rock phosphate have been reported in 2020-21.
- 778,000 Tonnes of Rock Phosphate was imported in 2020-21.

In view of above, G4 exploration carried out by the GSI needs to be reviewed. Therefore, in the present proposal exploration of G3 Stage has been proposed along with related investigations. Objective of present proposal is to know quality and quantity of Phosphorite. Current exploration proposal involves geological mapping at 1:5000 Scale, Area of mapping 2.28 km2, Collection of 600 Nos. of samples including 400 no's core drilling samples and 200 no's of surface samples, thin section study, preparation of various plans and sections, Reserve/Resource estimation etc.

At last, preparation of Exploration Report followed by peer review and final submission will be done within a projected timeframe of about 24 months. After completion of G3 stage of exploration if exploration results are positive then further exploration will be proposed under G2 Stage.

The present exploration proposals include drilling 6 nos. of core boreholes under G3 stage of exploration so that the resources/reserves can be calculated as per Minerals Evidence of Mineral Contents Rules 2015 guidelines.

11.0 Objective and scope of work-

The block area falls in the vicinity of several Phosphorite blocks in and around area in Bijawar basin of Paleo -Proterozoic age. Presence of supporting lithology for Phosphorite mineralization i.e., Hirapur Phosphorite Formation and Kurri Ferruginous Formation, preliminary work by GSI in and around the area under proposal encourages to take up G3 Exploration in the area. In evaluation of previous work in and around the area, GSI has indicated occurrence of Phosphorite in and around the proposed block. On the basis of these evidences of mineralization, the present exploration program has been formulated to fulfill the following objectives-

1. To carry out Geological mapping on 1:5,000 scale for demarcation of Phosphorite bearing host rock for this mineralization with the structural features to identify the surface manifestations and lateral disposition of the mineralized zones.
2. Demarcation of various type Phosphorite bands in the area for estimation of its Quality and Quantity.
3. To collect bed rock samples and to analyze for Phosphorite and associated minerals for further course of Exploration program.
4. To collect samples from old pits, trenches, cuttings etc. to know the quality of the mineral.
5. To know the depth wise and lateral continuity of the mineralization about 06 Nos. of Core boreholes shall be drilled as per Norm of G3 Stage of exploration under Minerals (Evidence of Mineral Contents) Rules 2015.
6. Assessment of tentative resource in G3 stage of investigation and Grade of deposit of Phosphorite and associated minerals if any.
7. Attempt to delineate a block or more than one block to upgrade investigations in G3 stage.

12.00 - Planned Methodology for G3 stage of exploration

In accordance to the objective set for the block, the exploration program is proposed in phase wise manner. The Exploration shall be carried out as per Minerals (Evidence of Mineral Contents) Rules 2015. Accordingly, the following preliminary Exploration (G3 Stage) scheme has been formulated, which comprises of Geological Mapping (1:5,000 scale). About 200 Nos. of surface sampling (Soil Sample/bed rock) will be collected out during the initial stage over the Geological targets.

On the basis of positive outcomes of surface geochemical samples and Geological mapping a total of 6 boreholes involving about 600m of drilling and 400 core samples will be analyzed. The drill core analysis will be for all major phosphate radicals will be done.

13.00 - Phase wise exploration activity

1. **Geological Mapping** - Entire area of proposed exploration block will be mapped at 1:5,000 Scale. Total 2.28 Km^2 area will be covered under such activity. Various type of Geological Details such as different types of rock types, their contacts, structural features, cuttings, pits trench etc. will be mapped. Surface manifestation of the various types of phosphorites available along with their disposition will be marked on the Geological map.
2. **Surface sampling** (Bed Rock/Stream sediments/Soil samples)- During Geological Mapping, the bed rock sample (Grab Samples) from the outcrops and soil samples from suitable sites shall be collected. 10Nos. of bed rock samples will be analyzed for whole rock analysis. A total of 200 soil/bedrock samples will be collected during the field work. The samples will be analyzed for important radicles such as SiO2, P2O5, LOI, Fe2O3, Al2O3 etc. at BSS Lab, a sister concern situated in same premises.
3. **Surveying -** The bore holes fixation and determination of reduced level and Co-ordinates of the bore holes only will be undertaken by DGPS at the time of extended G3 level of exploration.
4. **Exploration drilling** (NQ size): Based on Geological mapping and Geochemical sampling (Soil, bed rock etc.) results, the potentially viable zones will be marked. To find out the disposition of potential Phosphorite zones in strike and dip direction exploratory bore holes involving of about 600m drilling will be carried out in 6 Nos. of borehole for intersection of mineralized zone. The exploratory drilling would generate about 400 Nos. of core samples. Meter wise chemical analysis of all Phosphorite will be done.
5. **Petrological and Minerographic Studies** - Petrological and Minerographic study of all Litho units available in the area will be done along with Petrological and Minerographic study of different type of Phosphorite will also be done.10 Nos. of Thin Sections will made. Further two polished sections will be made and studied.
6. **Specific Gravity determination:** For study of Specific Gravity one sample from every Phosphorite zone will be collected. Further Specific Gravity of different type of minerals will be conducted.

14.0 References-

- Chourasia P.K.- Report on detailed investigation for Phosphorite around Manakpura Area, Chhatarpur District M.P. Unpublished Report. field Season 1987-89. Available on GSI website.
- DRM Map of Chhatarpur district.

Proposal time line for different work components of Jhalauthar Rock Phosphate Block, Chhatarpur district, M.P. (G3 stage) 2.28 Sq. kms area.

Items	Months																								
	1*	2	3	4	5	6		7	8	9	10	11	12	13	14		15	16	17	18	19	20	21	22	23	24
Geological Mapping (1:,5000) with BRS collection							REVIEW									REVIEW										
Pitting & Sampling																										
Drilling																										
Chemical analysis of sample																										
Petrographic Study																										
Preparation of Geological report & its submission																										

Estimated Cost along with Manpower deployment of Jhalauthar Rock Phosphate Block in Chhatarpur District under G3 Stage of Exploration over an Area of 2.28 km2 / 228 Ha

Sr. No.	Description	Item of work	Unit	SoC-Item Sl No	Rates as per SoC	Qty.	Nos	Total	Remarks
1	Geological Mapping 1:5000	Charges for 2 Geologists in Field	Per day per Geologist	1.2.b	₹ 11,000.00	60	2	₹ 13,20,000.00	Charges for 2 geologists for 60 days in field
2		Charges for 2 Geologists in HQ	Per day per Geologist	1.2.a	₹ 9,000.00	60	2	₹ 10,80,000.00	Charges for 2 geologists for 60 days in HQ
3	Other Geological Activity	Geochemical sampling	Per day per Geologist	1.5.1a	₹ 11,000.00	60	1	₹ 6,60,000.00	Charges for 1 geologist for 60 days in field
4	Survey Work	Charges for 2 surveyors in field	per day per surveyor	1.6.1a	₹ 8,300.00	60	2	₹ 9,96,000.00	Charges for 2 surveyors for 60 days in field
5		Charges for 2 surveyors in HQ	per day per surveyor	1.6.1a	₹ 8,300.00	30	2	₹ 4,98,000.00	Charges for 2 surveyors for 30 days in HQ
6		Demarcation of lease boundary, Fixing of BH, Co-ordinate, RL etc.	Per point	1.6.2	₹ 19,200.00	40	1	₹ 7,68,000.00	40 points including boreholes and block boundary
7	Drilling Work	Drilling	per meter	2.2.1.4a	₹ 11,500.00	600	1	₹ 69,00,000.00	60 boreholes x 100 m each
8		Construction of concrete pillar	Per borehole	2.2.7a	₹ 2,000.00	6	1	₹ 12,000.00	Charges for 6 boreholes pillaring
9		Transportation of Drill Rig	Per km	2.2.8	₹ 36.00	1000	2	₹ 72,000.00	1000 kms to and fro per drill rig x 2 rigs
10		Drilling camp setting cost	Per drill	2.2.9a	₹ 2,50,000.00	1	2	₹ 5,00,000.00	For 2 drill rigs
11		Drilling camp winding cost	Per drill	2.2.9b	₹ 2,50,000.00	1	2	₹ 5,00,000.00	For 2 drill rigs
12		Monthly accommodation charges for drilling camp	Per month	2.2.9	₹ 50,000.00	7	2	₹ 7,00,000.00	For 2 drill rigs for 7 months
13		Drill core preservation	Per meter	5.3	₹ 1,590.00	600	1	₹ 9,54,000.00	60 boreholes x 100 m each
14		Approach road making to drill site	Per km	2.2.10a	₹ 22,020.00	5	1	₹ 1,10,100.00	Charges for 5 kms
15		Sample processing, core splitting, crushing, powdering, etc.	one sampler per day	1.5.2	₹ 5,100.00	60	1	₹ 3,06,000.00	Charges for 1 sampler per day for 60 days
16	Laboratory Studies	Chemical Analysis for 6 radicals	per sample	4.1.3	₹ 9,805.00	600	1	₹ 58,83,000.00	Charges for 600 samples (400 core + 200 surface)
19		Analysis for associated REE	per sample	4.1.14	₹ 5,380.00	5	1	₹ 26,900.00	Charges for 5 samples
20	Petrological Studies	Preparation of thin sections	Per sample	4.3.1	₹ 2,353.00	5	1	₹ 11,765.00	Charges for 5 samples
21		Study of thin sections	Per sample	4.3.4	₹ 4,232.00	5	1	₹ 21,160.00	Charges for 5 samples
22		Digital photomicrograph	Per Sample	4.3.7	₹ 280.00	10	1	₹ 2,800.00	Charges for 10 photographs
23	Geotechnical studies	Specific Gravity determination	Per Sample	4.8.1	₹ 1,605.00	5	1	₹ 8,025.00	Charges for 5 samples
24	Miscellaneous	Base line data collection	-	5.5.1.b	₹ 5,94,570.00	1	1	₹ 5,94,570.00	Geology, Geomorphology, Soil Meterology 10 km radius
25		Air Water Noise Analysis	-	5.5.1.c	₹ 7,72,329.00	1	1	₹ 7,72,329.00	10 km radius
26		Environmental Report Preparation	-	5.5.1.d	₹ 75,000.00	1	1	₹ 75,000.00	5 hard copy & 1 soft copy
27		Labour	per day	5.7	₹ 700.00	60	11	₹ 4,62,000.00	4 labour per surveyor for 2 surveyors and 1 labour per geologist for 3 geologists
28		Preparation of Exploration Proposal	Lump sum	5.1	₹ 3,80,000.00	1	1	₹ 3,80,000.00	
29		Geological report preparation	5 hard copy & 1 soft copy	5.2	₹ 2,50,000.00	1	1	₹ 2,50,000.00	5% of exploration cost or 2.5 lakhs whichever is more
30		Peer Review	Lump sum		₹ 10,000.00	1	1	₹ 10,000.00	
							Sub Total	₹ 2,38,73,649.00	
							GST	₹ 42,97,256.82	
							Grand Total	₹ 2,81,70,905.82	