

Regional Exploration Proposal (G-4 level) for Diamond in Chelima Block, (Block-ID SR-AP-01), District: Kurnool & Prakasham (Andhra Pradesh)

1.0.0 Introduction:

- 1.1.1 Diamond being one of the highly priced gems has lured the mankind since time immemorial, with the development of the nation at economic front, now the general population has also risen to the affordability of Diamond Jewelry. Due to the affordability the demand of diamonds got increased drastically. India though is a centre for Diamond cutting industry but majority of rough diamond are exported. The increasing demand of Diamonds has been accorded high priority in the XIIth Plan document.
- 1.1.2 Since last century, no large diamond deposit has been discovered in India. However, the possibility of working of small mineral bodies in proximity to each other, through technological advances and increased operational efficiency, cannot be ruled out. Therefore, it is necessary to locate and explore such small size deposits in clusters.
- 1.1.3 In view of the MMDR amendments act – 2015, Mineral (Evidence of Mineral Contents) Rule 2015 and Mineral Auction Rule – 2015, Ministry of Mines, GSI identified the block for exploration & MECL decided to take up the block for G-4 level of exploration under NMET funding. MECL requested Ministry of Mines, Government of India to reserve the block to carry regional exploration.

1.2.0 Location of the Block:

- 1.2.1 The block is located 100 Km approximately from the district township south-easterly. A rail route of south-central railway passes through the block area. The block area is traversed by few road and motorable tracts due to hilly terrain, the block is highly inaccessible. The block is located in Survey of India Toposheet No. 57 I/10, 57I/11 and 57 I/15. The Co-ordinates of the corner points of the block is given below and covers an area of 702 sq km.

A) 15⁰ 21' 15" N and 78⁰ 39' 09"E B) 15⁰ 36' 25" N and 78⁰ 39' 09"E
C) 15⁰ 36' 25" N and 78⁰ 52' 23"E D) 15⁰ 21' 15" N and 78⁰ 52' 23"E

1.3.0 Physiology and Drainage:

- 1.3.1 The block area is highly hilly terrain covered by Reserve Forest, the highest peak is 866 m from mean sea level in the North-eastern part of the block area. The general ground level is about 300 m from mean sea level. The parallel ridges are trending NNE-SSW with valley portion between them.
- 1.3.2 The streams of the block show dendritic drainage pattern in the western and southern portion the streams are forming various Nalas and forms tributary system of Paleru River and Gandaleru River respectively, where as in the North-eastern portion they form tributary system of Gundlakamma River.

2.0.0 Previous work:

- 2.1.1 Old workings for Diamond in the form of trenches are seen one km Southwest of Chelima and Dongabhavi within the shales, which are well documented in various older geological references of King (1872), Ball (1887) etc. The area falls in Kurnool and Prakasham district and forms a part of Dharwar craton known for emplacements of several kimberlite pipes and lamproite dykes. Lamproite field, the Ramaduga Lamproite field and the Nallamalai Lamproites.
- 2.1.2 Recently De Beers Company located a number of Lamproite dykes in Banagapalli and Aliabad areas in Kurnool district. They have similarity not only in the field setting and petrology with the Nallamalai lamproites but also intrude into the Meso-Proterozoic Tadapatri formation of lower Cuddapah super group. Earlier, these lamproites distributed in the eastern part of Cuddapah Basin are referred to as minette, Kimberlite and / or carbonatite (review by Scott Smith 1989). However, the absence of Clinopyroxene precludes these rocks from being minette and the mineral Chemistry of the phlogopite is consistent with their classification as lamproite. The lamproites are of hypabasal facies in which olivine is completely altered and replaced by ferron dolomite and rare serpentine.
- 2.1.3 Chelima prospect for Pb-Zn mineralisation S15°W of Chelima village, Co-ordinate 15°30'N and 78 °40'E, has been mapped on 1:1000 scale in 0.75 sq.km. area. 5 boreholes involving 470 m drilling in Chelima and 11 boreholes involving 986.65 m in 11 boreholes have been drilled in Chelima South block. Mineralisation is found mostly in the zone of brecciation and dolomite & extends over 1 km strike length, the zone of mineralisation is 10 m trending East-West. Pb and Zn recorded 2.15 - 6.96; 6.36-8.32 respectively but 5 boreholes drilled in Chelima did not intersect any mineralization of significance.

3.0.0 Geology and Structure:

- 3.1.0 Regional Geology and structure of the area.
- 3.1.1 The lithounits exposed in and around the area are of Nallamalai group of rocks belonging to the Cuddapah super group of middle proterozoic age intruded by lamproite, the lithounits of Kurnool group of upper proterozoic age overlie the lithounits of Nallamalai group of rocks.
- 3.1.2 The lithounits in the area are trending NNE-SSW. In the area there are number of faults, Antiform & Synforms, all trending NNE-SSW. Diamonds have been reported mostly in the southern part of the area in near proximity. The regional Stratigraphic Sequence of lithounits exposed is given below (after GSI, District Resource map).

Regional Stratigraphic Sequence of the lithounits of the Area (after GSI)			
Age	Super Group	Group	Lithounits
Recent			Alluvium, Gravel
Upper Proterozoic		Kurnool	Shale, Limestone
	Intrusives.		Lamproite
Middle Proterozoic	Cuddapah	Nallamalai	Shale with Phyllite, Dolomite / Limestone Quartzite

			Quartzite
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3.2.0 Geology and Structure of the Block:

- 3.2.1 The lithounits exposed in the block are Nallamalai group of rocks belonging to Cuddapah super group of middle proterozoic age intruded by lamproite. The shales of Kurnool group belonging to upper proterozoic age overlie the formations of Nallamalai group of rocks.
- 3.2.2 There is one fault passing through the North-western Corner portion of the block trending NNE-SSW, the other on cut across this fault in the Southern extension of the fault trending ENE-WSW dipping southerly. There are number of plunging northerly and southerly with axial planes trending NNE-SSW. Diamond occurrence has been reported in the South-western portion of the block. The Stratigraphic Sequence of the lithounits exposed in the block (after GSI) is given below.

Stratigraphic Sequence of Lithounits exposed in the Block area (after GSI)			
Age	Super Group	Group	Lithounits
Recent			Alluvium, Gravel
Upper Proterozoic		Kurnool	Shale
	Intrusives.		Lamproite
Middle Proterozoic	Cuddapah	Nallamalai	Shale with Phyllite, Dolomite / Limestone Quartzite
			Quartzite

4.0.0 Objective of the proposed exploration programme:

- 4.1.1 The basic Geoscience data provided by GSI has been studied and evaluated. Based on the evaluation the present exploration programme has been formulated to fulfill the following objectives
- To carry out geological mapping on 1:12,500 scale and demarcate the rock types of Diamond bearing formations with the structural features to identify the surface manifestations and lateral disposition of the probable ore body.
 - To collect surface samples to separate and analyze them for heavy minerals picroilmenite, chrome-diopside, chrome-spinals, pyrope garnet by their weight percentage, plotting them on maps demarcating anomaly zone and associated elements will decide further course of exploration programme.
 - In case, surface samples give positive results supported by Remote sensing studies for mineral targeting and Geophysical survey giving sub-surface positive details for the extension of the ore body then 5 no's scout boreholes shall be drilled in the Chelima blocks and other mineralized patches in the 671 sq.km. area which in turn will decide the future course of exploration programme at G-3/G-2 category of UNFC.
 - To estimate reconnaissance resources of Diamond bearing formations elements as per UNFC norms and minerals (Evidence of Mineral Contents) Rule-2015 at G-4 level.

5.0.0 Proposed scheme of Exploration:

5.0.1 In accordance to the objective set for the block, the exploration programme is proposed. The exploration shall be carried out as per minerals (Evidence of Mineral Content) Rule-2015. Accordingly, the following scheme of exploration is formulated in order to achieve the objective. The details of different activities to be carried out are presented in subsequent paragraphs.

5.1.0 Remote Sensing:

5.1.1 The entire 702 sq. km. area will be subjected for remote sensing studies to identify the lineaments and other structural features and the mineral potential zones by mineral targeting process.

5.2.0 Geological Mapping:

5.2.1 Geological Mapping will be done on 1:12,500 scales. Rock types, their contact, structural features will be mapped. Surface manifestations of the ore bodies available along with their surface disposition will be marked on map. Surface samples of various litho-units for petrological studies and from probable ore bodies for heavy mineral analysis with accessory minerals will be taken during the course of geological mapping.

5.3.0 Geochemical Sampling

5.3.1 **Surface sampling:** During the course of Geological mapping the Bed rock and Soil samples shall be collected from the out crops and soil covered area respectively. A total of 100 no's bed rock samples and 800 no's soil samples shall be collected, prepared and analyzed for heavy mineral analysis.

5.3.2 Stream Sediment Sampling:

The stream sediment samples shall be collected from the entire study area of 702 sq. km. The samples shall be collected depending upon the Forest cover and accessibility of the area. A total of 900 stream sediment samples shall be collected from the study area.

5.4.0 Surveying:

5.4.1 The block boundary will be surveyed by DGPS and total station in WGS-84 datum for demarcation of block boundary points. Survey party will be associated with stream sediment sample and Bed rock sample collection by taking up the points and plotting its location on map for proper interpretation of the sample data. Survey party will also be associated with Geological Mapping will be observed during Geological mapping and the Litho-contacts will be plotted for finalization of Geological map on 1:12,500 scale. During drilling scout borehole fixation and determination of reduced level and Co-ordinates of the boreholes only will be undertaken. If mineralized zones are identified, contouring of the surrounding areas of ore bodies would be done on 2 m contour intervals along with survey of surface features.

5.5.0 Geophysical Survey:

5.5.1 The area of the block is nearly 702sq.km. the lithounits hosting mineralization are Lamproite and Kimberlite will be occupying valley portion or the slope of hills covered

mostly by rubble & Soil. Hence, to assess the strike of the sub-surface ore body continuation need of Geophysical survey is felt. 5 km split in smaller areas. Magnetic and Gravity survey will be carried out in 50 m grid.

5.6.0 Core Drilling:

5.6.1 The remote sensing studies and Geophysical survey will be helpful in adding new area in the block for Lamproite & Kimberlite. Hence 5 scout boreholes involving 600 m of drilling will be undertaken for upper level of intersection.

5.7.0 Drill Core Logging:

5.7.1 The drill core will be logged for rock types, structural features, textures, intersection of ore zones, type of mineralization and occurrence of various heavy minerals. The logging for determining the Rock quality determination will also be undertaken.

5.8.0 Drill core sampling:

5.8.1 During the geological logging of drill core, samples in Kimberlite, Lamproite will be marked 200 no's of samples (primary) will be analyzed for Heavy mineral analysis, 5% primary samples will be given for check.

5.9.0 Petrological Studies:

5.9.1 During the course of core logging & mapping 50 samples from various lithounits intersected will be studied for petrography.

5.10.0 Whole Rock Analysis:

5.10.1 10 samples shall be subjected whole rock analysis to check the rock types, their variation in chemical composition for. SiO_2 , Al_2O_3 , Fe_2O_3 , TiO_2 , MnO , CaO , Na_2O , $\text{K}_2\text{O}+\text{H}_2\text{O}$, MgO , P_2O_5 , CO_2 , & S.

5.11.0 Specific gravity Determination:

5.11.1 For the specific gravity determination 20 samples from the mineralized zones intersected in the boreholes will be sent to lab.

5.12.0 Quantum of Work Proposed

5.12.1 The details of proposed quantum of work is given in the table below:

Regional Exploration Proposal (G-4 level) for Diamond in Chelima Block (Block-ID SR-AP-01), District: Kurnool & Prakasham, Andhra Pradesh			
Sl. No.	Item of work	Unit (m)	Proposed Quantum of Work
1	Remote Sensing (Structural Mapping) & Reconnaissance Mapping (on 1: 50000 Scale)	Scene	1 Scene 702 sq km
2	Geological Mapping (on 1:12,500 Scale)	Sq. Km	702 sq.km
3	Topographical Survey (on 1:12,500 Scale in potential Zone Areas)	Sq. Km	As per requirement
	Bore Hole Fixation (Scout Boreholes)	Nos	5 Nos
	& Coordinate Determination	Nos	5 Nos
4	Geochemical Sampling (Will be carried out in anomalous areas)		
	a) Bed Rock Sampling	Nos.	100 Nos
	b) Soil Sampling	Nos	800 Nos
	c) Stream Sediment Sampling	Nos	900 Nos
5	Ground Geophysical Survey (Will be carried out in anomalous areas)		
	a) Magnetic Survey	No of Sts.	2100 Nos
	b) Gravity Survey	No of Sts.	2100 Nos
6	Drilling (coring)	m	600m (5 Bhs)
7	Geological work		
	a) Geological Core Logging, Sample Preparation etc.	m	600m (5 Bhs.)
8	Laboratory Studies (To be carried out on samples collected from anomalous areas)		
	i) Surface Sampling (Primary samples)		
	i) Bed Rock samples		
	a) Heavy Mineral analysis	Nos	100 Nos
	ii)) Soil Samples		
	a) Heavy Mineral analysis	Nos	800 Nos
	iii) Stream Sediment Samples		
	a) Heavy Mineral analysis	Nos	900 Nos
	iv) Check Samples (Bed Rock / Soil/ Stream sediment)		
	a) Heavy Mineral analysis	Nos	50 Nos
	v) Drill Core Primary Samples		
	a) Heavy Mineral analysis	Nos	120 Nos
9	Petrological Samples (Surface & Bh Core Samples)		
	a) Preparation of Thin Section	Nos	50 Nos
	b) Study of Thin Section	Nos	50 Nos
10	Whole Rock Analysis -		
	SiO ₂ , Al ₂ O ₃ , Fe ₂ O ₃ , TiO ₂ , MnO, CaO, Na ₂ O, K ₂ O+H ₂ O, MgO, P ₂ O ₅ , CO ₂ , & S.	Nos	10 Nos
11	Specific gravity Determination	Nos.	20 Nos
12	Report Preparation [As per Mineral (Evidence of Mineral Contents) Rule-2015]	Nos	1

6.0.0 Time schedule and cost Estimate:

6.1.0 Time schedule

6.1.1 The proposed block area is nearly of 702 sq. km. there is possibility of getting sub-surface extension of the Lamproite body already recognized in the South-western part of the block and some new prospective areas. The details are indicated in bar chart given below.

Time schedule (in months) for Exploration Programme in Chelima Block, District: Kurnool and Prakasham, (Andhra Pradesh)

Item of Work	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Remote Sensing with Ground Check	←			→										
Remote sensing report					←	→								
Stream Sediment Samplings	←				→									
Geological Mapping (4 Party Days)	←					→								
Bed Rock Sampling/ Soil Sampling	←				→									
Surveying (2 Party Days) for Sampling etc	←				→									
Sample Preparation Soil/Bed Rock/Stream (2 Party Days)			←			→								
Analytical Work				←			→							
Geophysical Survey						←		→						
Geophysical Report									←	→				
Surveying in Geophysical Survey (2 Party's)						←		→						
Drilling (600 m)									←	→				
Surveying (1 Party) for drilling, contouring and surface features									←		→			
Sample Preparation (Drill Core) (1 Party)										←	→			
Geologist Party days for Drilling pitti and Sampling work & report work (1 Party)									←		→			
Analytical Work Drill Core Samples											←		→	
Camp winding											←	→		

Cost Estimate for G-4 Level of Exploration for Diamond in Chelima Block (Block-ID SR-AP-01) District: Kurnool & Prakasham, Andhra Pradesh					
Sl. No	Item of Work	Unit	Rates (2016-17)	Qty.	Amount
A	REMOTE SENSING & REPORT (1 BLOCK)	Nos	2,000,000.00	1	2000000.00
B	GEOLOGICAL WORK				
1	Survey Party days				
	a) Survey Party days (2party) For Sampling etc	days	6,146.00	300	1843800.00
	b) Survey Party days (2 party) For Geophysical Survey etc	days	6,146.00	180	1106280.00
	b) Survey Party days (1party) For Drilling	days	6,146.00	180	1106280.00
2	Geologist Party days				
	a) Geological Party days (4 Party) For Geological Mapping etc	days	8,021.00	720	5775120.00
	b) Geological Party days (1 Party) For Drilling, Core Sampling	days	8,021.00	90	721890.00
3	Sampling Party days	day			
	a) Sample Preparation for Bed Rock, Soil , Stream samples (4 Partys)	days	2,945.00	240	706800.00
	b) Sample Preparation Drill Cores (1 Party)	days	2,945.00	60	176700.00
4	Transportation (Light Vehicles, 3 nos)	day	1,500.00	540	810000.00
	Sub-Total B				12246870.00
C	GEOPHYSICAL SURVEY & REPORT				
	Magnetic Stations	Nos.	482.00	2100	1012200.00
	Gravity Stations	Nos.	482.00	2100	1012200.00
4	Transportation (Light Vehicles, 2 nos)	day	1,500.00	180	270000.00
	Sub-Total C				2294400.00
D	CORE DRILLING (5 BH)				
1	Surface Drilling (2 rigs)	m	7,268.00	600	4360800.00
2	Transportations (2 Rigs)	Km	34.00	4000	136000.00
3	Accommodation (One time/ Drill)	Nos	7,28,250.00	2	1456500.00
4	Camp Setting / Winding	Nos	2,68,723.00	2	537446.00
5	Road Making (Hilly Terrain)	Km	30,552.00	30	916560.00
6	GI Core Boxes	Nos	2,000.00	150	300000.00
7	Transportation Charges of Core Boxes	Km	34.00	500	17000.00
	Sub Total D				7724306.00
E	LABORATORY STUDIES				

1	<u>Chemical Analysis</u>				
	<i>i) Surface sampling (Bed Rock Samples)</i>				
	Heavy Mineral Analysis	Nos.	1,900.00	100	190000.00
	<i>ii) Soil Samples</i>				
	Heavy Mineral Analysis	Nos	1,900.00	800	1520000.00
	<i>iii) Stream Sediment Samples</i>				
	Heavy Mineral Analysis	Nos	1,900.00	900	1710000.00
	a) Check Samples (Bed rock/ soil/ stream)	Nos	1,900.00	50	95000.00
	<i>ii) BH Core Sampling, Primary & Check samples</i>				
	Heavy Mineral Analysis	Nos.	1,900.00	120	228000.00
2	<u>Physical Analysis</u>				
	i) Petrographic Studies (BH core + Surface Samples)				
	a) Preparation of thin section	Nos	545.00	50	27250.00
	b) Study of thin section	Nos	1,495.00	50	74750.00
	ii) Whole rock analysis	Nos	6,386.00	10	63860.00
	iii) Specific Gravity Determination (BH)	Nos	198.00	20	3960.00
	Sub-Total E				3912820.00
	Total (A+B+C+D+E)				28178396.00
F	EXPLORATION REPORT - 1% of (A+B+C+D+E)				281784.00
	GRAND TOTAL (A+B+C+D+E+F)				28460180.00
					Say Rs. 2.85 crores
No te	Rates of Goel Committee based on actual escalation as per RBI indices as on 31.3.16 and provisional escalation of @15% points for drilling and 25% points for Geological & Laboratory Studies for subsequent year.				

Cost Estimate for G-4 Level of Exploration for Diamond in Chelima Block (Block-ID SR-AP-01) District: Kurnool & Prakasham, Andhra Pradesh						
Sl. No.	Item of Work	Unit	Base Rate	Rates	Qty.	Amount
			01-04-1990	(2016-17)		
A	REMOTE SENSING Using ASTER / HYPERSPECTRAL data (1 BLOCK)	Nos		20,00,000	1	2000000
B	GEOLOGICAL WORK					
1	Geologist Party days					
	a) Geological Party days (2 Party) For Geological Mapping etc	days	1541	8,021	300	2406300
2	Sampling Party days	day				
	a) Sample Preparation for Stream samples (1 Partys)	days	525	2,945	300	883500
3	Transportation (Light Vehicles, 1 nos)	day	Lumpsum	1,500	300	450000
	Sub-Total B					3739800
C	LABORATORY STUDIES					
1	Chemical Analysis					
	i) Stream Sediment Samples					
	Heavy Mineral / Indicator Minerals (1 sample / 25 sq km)	Nos	220	1,286	30	38580
	Total (A+B+C)					5778380
D	EXPLORATION REPORT -Lumpsum					200000
	GRAND TOTAL (A+B+C+D)					5978380
					Say Rs. 59.78 Lakhs	
Note	Revised rate of promotional work by MECL on behalf of Govt. of India vide letter no. 37(I)/2006-MI dated 02.07.2014 and based on actual escalation as per RBI indices as on 31.3.16 and provisional escalation of @15% points for drilling and 25% points for Geological & Laboratory Studies for subsequent year.					