PROPOSAL FOR PRELIMINARY EXPLORATION FOR BAUXITE, TITANIUM AND ASSOCIATED MINERALS

(G-3 STAGE)

ANVRA PAT BLOCK

NMET FUNDED PROJECT

DISTRICT– LOHARDAGA, JHARKHAND

By

MINERAL EXPLORATION AND COSULTANCY LIMITED
DR. BABASAHAB AMBEDKAR BHAWAN
SEMINARY HILLS NAGPUR

Summary of the Block for Preliminary Exploration (G-3)

GENERAL INFORMATION ABOUT THE BLOCK

	Features	Details
	Block ID	Anvra Pat Block (0.55 sq km)
	Exploration Agency	Mineral Exploration & Consultancy Limited (MECL)
	Commodity	Bauxite, Titanium & Associated Minerals
	Mineral Belt	Chhattisgarh-Jharkhand belt (Chhota Nagpur Granite Gneiss)
	Completion period with entire Time schedule to complete the project	08 Months (240 working days actively)
	Objectives	The present exploration program at G3 stage has been formulated to fulfil the following objectives: i) Preparation of Geological map and topographical survey at 1:2,000 Scale. ii) To prove the Bauxite occurrence up to a vertical depth of 30m below ground level. iii) Two boreholes will be drilled up to the basement or 50m depth (whichever is earlier). iv) To assess the quality and the thickness of Bauxite horizons in order to estimate the Bauxite resources at G-3 (333) level in the block as per UNFC norms. v) Along with Bauxite, resources of Titanium and Associated Minerals will be also reported if encouraging values are encountered. iv) To carry out exploration as per Minerals (Evidence of Mineral Contents) Rules, 2015, Mineral Auction Rule ï 2015 and MMDR Act ï 2015 as to facilitate the Government of Jharkhand for auctioning of the Bauxite Block.
	Whether the work will be carried out by the proposed agency or through outsourcing and details thereof. Components to be outsourced and name of the outsource agency	Work will be carried out by MECL.
	Name/Number of Geoscientists	Two nos. Geoscientist (Field + HQ)
	Expected Field days (Geology, surveyor)	Geologist Party days:180 days
		Surveyor Party days: 60 days
1.	**Location**	The Anvra Pat Block area falls in Survey of India Toposheet No. 73A/10 and covers total area of 0.55sq.km. The block area falls in and around the villages

		Buchitanrtoli, Pakhar, Tehsil-Kisko, Dist- Lohardaga, Jharkhand.
	Latitude and Longitude	**Corner cardinal points of Anvra Pat G3 Block (0.55 sq.km)**

Cordinal Point	(WGS-84, Degree Decimal)		(UTM, Zone-45Q)	
	Latitude	Longitude	Easting	Northing
A1	23.55960668	84.58121399	253102.5	2607554.1
A2	23.56053809	84.58256320	253242.0	2607655.0
A3	23.56242716	84.58293864	253283.9	2607863.6
A4	23.56340619	84.58355855	253349.0	2607971.0
A5	23.56394494	84.58396910	253391.9	2608030.0
A6	23.56495091	84.58433493	253431.2	2608140.8
A7	23.56516186	84.58552162	253552.7	2608162.1
A8	23.56450236	84.58671145	253673.0	2608087.0
A9	23.56360326	84.58560028	253557.9	2607989.3
A10	23.56223400	84.58422633	253479.0	2607857.0
A11	23.56162130	84.58401971	253411	2607766
A12	23.56043077	84.58378927	253385.0	2607645.0
A13	23.56006602	84.58297335	253283.0	2607602.0
A14	23.55954292	84.58294101	253278.7	2607544.1
A15	23.55905501	84.58413760	253400.0	2607488.0
A16	23.55906655	84.58508158	253496.4	2607487.7
A17	23.55955369	84.58519834	253509.3	2607541.4
A18	23.55939879	84.58564708	253554.8	2607523.5
A19	23.56072226	84.58524394	253495	2607707
A20	23.56003643	84.58605234	253597.4	2607593.4
A21	23.55958494	84.58686987	253680.0	2607542.0
A22	23.55992600	84.58732390	253727.0	2607579.0
A23	23.56116923	84.58774187	253772.0	2607716.0
A24	23.562058	84.587412	253740.0	2607815.0
A25	23.562952	84.587445	253745.0	2607914.0
A26	23.56405	84.587787	253782.0	2608035.0
A27	23.565116	84.587288	253733.0	2608154.0
A28	23.565872	84.585991	253602.0	2608240.0
A29	23.566418	84.584493	253450.0	2608303.0
A30	23.566519	84.583423	253341.0	2608316.0
A31	23.567346	84.583242	253324.0	2608408.0
A32	23.567731	84.584185	253421.0	2608449.0
A33	23.567708	84.585605	253566.0	2608444.0
A34	23.567363	84.587208	253729.0	2608403.0
A35	23.566947	84.588312	253841.0	2608355.0
A36	23.564473	84.589444	253952.0	2608079.0
A37	23.563631	84.588706	253875.0	2607987.0
A38	23.561955	84.589529	253956.0	2607800.0
A39	23.560316	84.590343	254036.0	2607617.0
A40	23.55773454	84.58922537	253917.1	2607333.0

		A41 23.55619503 84.58876396 253867.1 2607163.2 A42 23.55595391 84.58801463 253790.1 2607137.8 A43 23.55628900 84.58760523 253748.9 2607175.6 A44 23.55665726 84.58564188 253549.1 2607219.8 A45 23.55721350 84.58483092 253467.4 2607282.8 A46 23.55732803 84.58411632 253394.6 2607296.7 A47 23.55790076 84.58365299 253307 2607373.0 A48 23.55824019 84.58285436 253216 2607458 A49 23.55875732 84.58234694 253164 2607496
	Villages	Binduatoli, Pakhar
	Tehsil/Taluk	Kisko
	District	Lohardaga
	State	Jharkhand
2.	**Area (hectares/ sq. km)**	
	Block Area	0.55 sq.km (55.00 Ha)
	Forest Area	Open jungle, mainly Sal occupies in part of block. (Partly Forest & Partly non-forest)
	Government Land Area (Bilanam)	Data not available
	Charagaha	Data not available
	Private Land Area	Data not available
3.	**Accessibility**	
	Nearest Rail Head	Lohardaga Railway Station (30 Kms), Ranchi Railway Station (84 Kms.)
	Road	The national highway NH-39 passes around 30 km east of the block. Motorable/ metaled roads are available in the area.
	Airport	Ranchi around 84 km from the block.
4.	**Hydrography**	
	Local Surface Drainage Pattern (Channels)	Lohardaga district is drained by the tributaries of three major river of the state viz. North Koel, South Koel and Damodar. The plateau region in west of Lohardaga town is the major water divide for north and south Koel River. The plateau region of the district is highly dissected by down cutting of the tributaries of these rivers. A few natural springs are noted in the area.
	Rivers/ Streams	No major river exists in the area.
5.	**Climate**	
	Mean Annual Rainfall	Average annual rainfall is 1137 mm.
	Temperatures (December) (Minimum) Temperatures (June) (Maximum)	Minimum temperatures $4^{O}C$ (Nov-Jan) Maximum temperatures up to $42^{O}C$ (March-June)
6.	**Topography**	
	Toposheet Number	73 A/10

	Morphology of the Area	Anvra Pat Plateau is tableland located over the Chota Nagpur plateau forming the watershed between the North and South Koel rivers. The Bauxite deposit under reference is characterized by the extensive blanket of plateau laterite on an almost flat topography, locally known as ñPatò The flatness of the plateau together with well-defined steep scarp faces gives distinct feature to the topography of the deposits with gentle slope towards south-west. The range of elevation of the varies approximately between 980 and 1080 m from MSL in plateau region.
7.	**Availability of baseline geoscience data**	
	Geological Map (1:50K/25K)	Regional geological map sourced from Bhukosh (1:50K) available.
	Geochemical Map	Not applicable.
	Geophysical Map (Aeromagnetic, ground geophysical, Regional as well as local scale GP maps)	Not applicable.
8.	**Justification for taking up Preliminary Exploration**	1. The proposed Anvra Pat (G3) block area lies in the Bauxite bearing plateaus of Chhattisgarh-Jharkhand belt forming a part of the Pre-Cambrian shield of the Indian Peninsula. They consist mainly of Chhotanagpur Granite Gneiss. 2. Preliminary geological work has been carried out by GSI as well as DMG, Jharkhand in the area. MECL & CMPDI has also carried out exploration (G3/G2) in around the adjoining areas which has established occurrence of Bauxite with thickness varying from 4 to 10 m 3. The MECL team visited the Anvra Pat bock and nearby mine areas. The pits in the existing mines have bauxite occurrences up to 25m depth. The outcrops of Bauxite are observed in the field and the exposed pits in the proposed block have confirmation of the Laterite / Bauxite profile in the Anvra Pat block. 4. Bauxite samples were collected from the block showing encouraging results of high Alumina (Al_2O_3) and Titanium (TiO_2) with low Silica (SiO_2) in the range of 48-55%, 8-13% and 1-2%. respectively. 5. Considering similar geological setup with known deposits, available literature and previous workerôs recommendations, the area hold potential to explore in detail with holistic exploration approach. Hence, preliminary exploration at G3 stage in the proposed area to be taken up to ascertain the exact potentiality of the prospect for Laterite/Bauxite. 6. Existing running Pakhar Bauxite Mine by M/s Hindalco Industries Ltd lying in the south of the proposed block. 7. After discussion with State Government, MECL decided to take up the exploration work of Bauxite Titanium & Associated minerals in the Anvra

		pat Block, District ï Lohardaga, Jharkhand through NMET funding. The positive outcome of the present exploration would be helpful and facilitate the Govt. for auctioning of the block.

PROPOSAL FOR G3 LEVEL EXPLORATION FOR BAUXITE, TITANIUM & ASSOCIATED MINERALS IN THE ANVRA PAT PLATEAU DISTRICT - LOHARDAGA, JHARKHAND

1.0.0 Introduction

1.1.1 The importance of Bauxite is well known in the production of Alumina (Al_2O_3) and also in other industries viz. abrasives, refractory, chemical and cement. The properties like lightness of metal aluminium, its high resistance to atmospheric corrosion and good electrical conductivity make it a popular metal and is being used for making household utensils and therefore known as ópoor manôs goldô The aluminium metal being a good substitute for non-ferrous metals like copper, zinc which are scarce and costly metals has further necessitated development of aluminium industry throughout the world.

1.1.2 Reserves/Resources of Bauxite in the country as on 1.4.2015, as per NMI database, based on UNFC system have been placed at 3,896 million tonnes. These resources include 656 million tonnes Reserves and 3,240 million tonnes Remaining Resources. By grades, about 77% resources are of Metallurgical grade. The resources of Refractory and Chemical grades are limited and together account for about 4%. By States, Odisha alone accounts for 51% of country's resources of Bauxite followed by Andhra Pradesh (16%), Gujarat (9%), Jharkhand (6%), Maharashtra (5%) and MadhyaPradesh & Chhattisgarh (4% each).

1.1.3 On enactment of MMDR Amendment Act-2015, Minerals (Evidence of Mineral Contents) Rule-2015 and Mineral Auction Rule-2015, Govt. of India directed State Governments to speed up exploration work for different Mineral Commodities in the respective states for auctioning of the blocks.

1.1.4 MECL requested DMG, Govt. of Jharkhand for providing consent required for preparation of exploration proposal pertaining to Anvra Pat Block, Distt. Lohardaga, Jharkhand vide letter No.: MECL/EXPL/File/DMG JH./2023-24/241 Dated: 06.06.2024.

1.1.5 The exploration in the block is to be carried out in G-3 stage. Boreholes will be drilled at 250m x 250m grid interval so that the resources can be estimated at G-3 level. Then the block can be ready for auctioning by Government of Jharkhand.

2.0.0 Location and Communication

2.1.0 The Anvra Pat block falls in Survey of India Topo-sheet No.73 A/10 and is bounded by the following Co-ordinates under Anvra Pat plateau which is located in Lohardaga district of Jharkhand.

Table: 2.1

Anvrapat proposed Block Boundary Coordinates

Cordinal Point	(WGS-84, Degree Decimal)		(UTM, Zone-45Q)	
	Latitude	Longitude	Easting	Northing
A1	23.55960668	84.58121399	253102.5	2607554.1
A2	23.56053809	84.58256320	253242.0	2607655.0
A3	23.56242716	84.58293864	253283.9	2607863.6
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A6	23.56495091	84.58433493	253431.2	2608140.8
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A8	23.56450236	84.58671145	253673.0	2608087.0
A9	23.56360326	84.58560028	253557.9	2607989.3
A10	23.56223400	84.58422633	253479.0	2607857.0
A11	23.56162130	84.58401971	253411	2607766
A12	23.56043077	84.58378927	253385.0	2607645.0
A13	23.56006602	84.58297335	253283.0	2607602.0
A14	23.55954292	84.58294101	253278.7	2607544.1
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A23	23.56116923	84.58774187	253772.0	2607716.0
A24	23.562058	84.587412	253740.0	2607815.0
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A26	23.56405	84.587787	253782.0	2608035.0
A27	23.565116	84.587288	253733.0	2608154.0
A28	23.565872	84.585991	253602.0	2608240.0
A29	23.566418	84.584493	253450.0	2608303.0
A30	23.566519	84.583423	253341.0	2608316.0
A31	23.567346	84.583242	253324.0	2608408.0
A32	23.567731	84.584185	253421.0	2608449.0
A33	23.567708	84.585605	253566.0	2608444.0
A34	23.567363	84.587208	253729.0	2608403.0
A35	23.566947	84.588312	253841.0	2608355.0
A36	23.564473	84.589444	253952.0	2608079.0
A37	23.563631	84.588706	253875.0	2607987.0
A38	23.561955	84.589529	253956.0	2607800.0
A39	23.560316	84.590343	254036.0	2607617.0
A40	23.55773454	84.58922537	253917.1	2607333.0
A41	23.55619503	84.58876396	253867.1	2607163.2

A42	23.55595391	84.58801463	253790.1	2607137.8
A43	23.55628900	84.58760523	253748.9	2607175.6
A44	23.55665726	84.58564188	253549.1	2607219.8
A45	23.55721350	84.58483092	253467.4	2607282.8
A46	23.55732803	84.58411632	253394.6	2607296.7
A47	23.55790076	84.58365299	253307	2607373.0
A48	23.55824019	84.58285436	253216	2607458
A49	23.55875732	84.58234694	253164	2607496

The Anvra Pat plateau is located at a distance of 15 kms from Kisko block office. Kisko is connected to Lohardaga district HQ with metal road of about 10 kms. The distance from Lohardaga town to Ranchi the state capital is 55 km, connected by an all-weather metalled road. Thus, Anvra Pat plateau is located at a distance of about 84 km from Ranchi. The nearest railway station is Lohardaga, located at a distance of 30 km from the plateau.

2.2.0 Physiography & Drainage

2.2.1 Anvra Pat Plateau is tableland located in Chota Nagpur plateau forming the watershed between the North and South Koel rivers. The Bauxite deposit under reference is characterized by the extensive blanket of plateau laterite on an almost flat topography, locally known as ñPatò The flatness of the plateau together with well-defined steep scarp faces gives distinct feature to the topography of the deposits with gentle slope towards south-west.

2.2.2 The Lohardaga district covers the south-western part of Chota Nagpur plateau. The range of elevation of the district varies approximately between 980 to 1080m from MSL in plateau region. The topography of the district is undulating and rugged. Lohardaga district is drained by the tributaries of three major river of the state viz. North Koel, South Koel and Damodar. The plateau region in west of Lohardaga town is the major water divide for north and south Koel River. The plateau region of the district is highly dissected by down cutting of the tributaries of these rivers.

2.3.0 Climate & Rainfall

2.3.1 Climate

The district experience warm humid climate with three well defined seasons i.e. Summer, Winter and Monsoon. The winters commence from middle November and extend up to middle of March. December is the coldest month. During winter the temperature goes down to 4^0C. Summer starts from middle of March and continues up to middle of June, when the temperature shoots up to 42^0C.

2.3.2 Rainfall

The monsoon sets in by the middle of June and continues till the middle of October. The annual normal rainfall in the district is 1137 mm. 83.5% of total rainfall occurs during the monsoon months only.

3.0.0 Previous Work

3.1.0 The first account of the Bauxite and the aluminous laterite of India were given by Sir C.S. Fox in 1923 (Mem. Geol. Survey of India, XLIX,1923). The discovery of a large number of Bauxite deposits in erstwhile Bihar, now Jharkhand came to light in 1943-47 as a result of the field work carried out by Dr. M.K. Roy Chowdhury of G.S.I. Subsequently, Dr. Roy Chowdhury (1958, 1965) presented a detailed account of the geology and the economic aspect of the individual deposits of Bauxite of Jharkhand and M.P. The results of his work are well documented in the Memoirs of the Geological Survey of India, Volume-85, published in 1958.

Bauxite deposits of the area around Lohardaga, Jharkhand erstwhile Bihar, were investigated during the field-season 1961-62 by N. Majumdar of GSI and report titled ñReport on the Bauxite Deposits near Lohardaga Area Ranchi District, Biharò was published in 1963.

Existing running Pakhar Bauxite Mine by M/s Hindalco Industries Ltd lying in the south of the proposed block.

4.0.0 Regional Geology

4.1.0 The Bauxite bearing plateaus of Chhattisgarh and Jharkhand belt form a part of the pre-cambrian shield of the Indian peninsula. They consist mainly of Chhotanagpur Granite Gneiss. Inclusions of quartzite and older basic rocks belonging to the Older Metamorphic Group occasionally occur in the area. The western part of the Ranchi upland is occupied by a raised tract which is senso stricto form dissected plateau (locally called ñpatò) varying in heights from 980 to 1080m above mean sea level (M.S. L). These dissected plateaus are invariably capped with Laterite and Bauxite.

4.1.1 The Gondwana coalfields of the Damodar and Auranga basins lie to the north of the Ranchi upland. The pre-cambrian rocks of Singhbhum lie in the south; the Purulia sub-plains in the east and the Bauxite bearing plateaus are located in the western part of Ranchi plateau. The laterite profiles on the ópatôare underlain by clayey and ferruginous sediments of Upper Gondwana Age (?). The regional succession of the area after Roy Chowdhury (1958) is as given in table below.

Table 4.1

Age		**Formation**
Recent		Alluvium, conglomerate and carbonaceous shale
Tertiary to Recent		Laterite, Bauxite and lithomarge
Upper Cretaceous	Deccan Trap Infra Trappean (Lameta)	Basaltic lavas
		Calcified ï silicified rocks
		Grit
		Impure limestone
Cuddapah or earlier (?)		Newer dolerites

ARCHAEAN	Chhotanagpur Granite Gneiss		Vein rocks, pegmatite or graphic granite, aplite, quartz veins and quartz / tourmaline rocks
			(?) Pseudo-diorite, granites and gneisses
			(?) Diorite
			(?) Ultra-basic igneous rocks
	D H A R W A R	Iron Ore Series or Older Metamorphics	Phyllite, mica-schist, quartzite, lime-silicate rocks and basic rocks

4.2.0 **Block Geology**

The Anvra Pat plateau is a part of great tableland of Chhotanagpur Granite Gneiss. The Bauxite /laterite profile could be seen along the ghat section leading to the hill top of Anvra Pat Plateau. The reported major basal rocks of the area are metamorphic comprising quartzite, phyllite, mica-schist etc. Presence of traps and /or Upper Gondwana sediments at the base of laterite profile may be thin and patchy.

4.2.1 **Occurrence of Bauxite in the Area**

The occurrence of Bauxite in the lateritic sequence are mainly boulder/pocket type, consists of Bauxite cobbles, boulders and pebbles with interbinding material of ferruginous laterite, morrum and clays. Closed spaced Bauxite boulders are also seen spreading over a short distance. Lensoidal, pinch & swell types of structures are observed in the cross section nearby Serendag west block, Lohardaga district and as such there is no significant pattern found in occurrence of Bauxite boulder within the zone of bauxitization. Narrow and impersistent bands and patches of non-ore intervene the Bauxite zone. Hence, occurrence of Bauxite in the area is erratic in nature. Anvra plateau is the south extension of Pakhar Pat. In old abandoned pits 2m ï 4m of Bauxite has been observed.

4.2.1 The general geologic sequence of the Lohardaga after Roy (1973) is given below in the table: -

Table 4.2

Age	**Formation**
Recent	Soil and/or alluvium
Late Tertiary	Upper (Ferruginous) laterite Bauxite
Upper Gondwana (?) (Mahadeva Series)	Sedimentary clay and clayey sandstone with intercalated bands of ferruginous sandstone, shale and mudstone.
----------Unconformity----------	
Pre-Cambrian	Chhotanagpur Granite Gneiss Older Metamorphics including mafic rock.

5.0.0 Proposed Exploration Programme

5.1.0 Objectives

Preliminary exploration (G3) of Bauxite, Titanium and Associated Minerals in the Anvra Pat block is to be carried out:

1. Preparation of Geological map and topographical survey at 1:2,000 Scale.
2. To check the Bauxite occurrence up to the vertical depth of 30m below ground level.
3. Two boreholes will be drilled up to the basement or 50m depth (whichever is earlier).
4. To assess the quality and the thickness of Bauxite horizons to estimate the Bauxite resources at G-3 (333) level in the block both quantitatively and qualitatively.
5. Along with Bauxite, resources of Titanium and Associated Minerals will be also reported if encouraging values are encountered.
6. To carry out exploration as per Minerals (Evidence of Mineral Contents) Rules, 2015, Mineral Auction Rule ï 2015 and MMDR Act ï 2015 as to facilitate the Department of Mines & Geology (DMG), Government of Jharkhand for auctioning of the Bauxite block.

5.2.0 Exploration Scheme

5.2.1 Topographic Survey:

The area under investigation i.e. Bauxite plateau around Anvra Pat Plateau measuring about 0.55 Sq. Km. will be surveyed with triangulation network. The length of the block in the longer axis is 1.32 km and the maximum width of block is 0.94 km. The block will be tied up with survey network by triangulation station. Contouring is to be carried out at 2m interval. Reduced level of the boreholes and survey stations are to be determined with reference to the Survey of India Bench Mark as available at the plateau top. All the boreholes, important surface features, survey stations & Pits are to be marked and tied with the survey network. The block boundary and the borehole points will be surveyed by DGPS & Total Station in WGS-84 datum.

5.2.2 Detailed Geological Mapping:

The total study area of 0.55 Sq. km. will be mapped on 1:2000 scale with the exposures of laterite, Bauxite etc. as available at the top of the plateau along with the structural details marked on a plan before going for activities like drilling, sampling, pitting etc. A geological plan with topographical contours, borehole points, pits, surface features etc. on 1:2000 scales is to be prepared and finalized before finally leaving the worksite after completion of all exploratory activities.

5.2.3 Drilling:

Twelve (12) vertical boreholes (coring) at 200m x 200m grid are proposed for G3 stage of exploration. The shape of the proposed Anvra Pat block is erratic & irregular. In order to establish the continuity of ore body, taking into account the boulder/pocket nature of deposit, boreholes have been proposed to have better control on resource estimation. The boreholes will be drilled by core drilling methods up to lithomarge to estimate G3 level Bauxite resources. As the floor of the Bauxite zone is not known and targeting minimum 5m intersection of lithomarge in order to check the possibility

of REE concentration, the average depth of the boreholes is considered to be 30 m. Out of 12 boreholes, 02 boreholes is proposed to be drilled up to 50m or basement (whichever is earlier). Total 400.00 m of drilling is involved in the proposed G3 stage of exploration. The details of proposed boreholes are given the table no 5.1.

TABLE NO. 5.1		
DETAILS OF PROPOSED BOREHOLE (CORE DRILLING) G-3 LEVEL OF EXPLORATION		
SL NO	**Proposed Borehole no.**	**Proposed Depth To be Drilled (m)**
1	P-1	50.00
2	P-2	30.00
3	P-3	30.00
4	P-4	30.00
5	P-5	30.00
6	P-6	30.00
7	P-7	30.00
8	P-8	30.00
9	P-9	30.00
10	P-10	30.00
11	P-11	30.00
12	P-12	50.00
	TOTAL	**400.00**
Grand Total 12 Boreholes: 400 m *		

Note: *The location and depth of the proposed boreholes is tentative and may subject to change as per actual geological and field conditions.

5.2.4 **Geological Core Logging:**

Geological core logging will be carried out carefully by recording minute details and lithological characters of the rock formations including colour, texture, mineralogical composition, structural details, lithological variations along with visual estimate in respect of Al_2O_3 content encountered in the boreholes. At this stage, the overburden, the roof and floor of the Laterite/Bauxite zones are to be marked as the deposit is of high alumina and low silica Bauxite type.

5.2.5 **Core Sampling:**

Borehole cuttings, the material which will be obtained by dry drilling, will be dried in sunlight and sampled for a uniform length of 1.00m so that each sample falls between fixed reduced levels in all the boreholes. But the top and the bottom samples will usually be less than 1.00m length as the R.L of the collar of the borehole and the floor of Bauxite zone will be in fraction of whole number. Later, keeping in view the boulder/ pocket nature of the deposit, the sampling will be carried out according to lithological changes. In Bauxite zone, the sample length will be reduced from 1m to 0.50m if required, while in the transition zone / Laterite and clay zone the length of sample may increase. Each sample thus obtained, will be crushed to (-) 60 mesh size and its quantity will be further reduced to 500 grams by coning and quartering. The material will be further crushed to (-) 120 mesh size. Two

representative samples weighing about 100 grams each will be taken from this, one of which will be sent for primary analysis for five radicals, i.e., Al_2O_3, SiO_2, Fe_2O_3, TiO_2 & LOI and others samples needs to be kept for the purpose of check analysis. The remaining 300 grams sample will be kept for preparation of composite samples for analysis of spectroscopic, XRD, total available alumina and reactive silica, other elements and REE, etc.

5.2.6 **Check Samples:**

10% of the total primary samples shall be analysed from other NABL accredited laboratory as external checks to test the reliability of sampling and analytical data.

5.2.7 **Analysis for Reactive Silica and "Total Available Alumina" Content:**

24 Nos of composite samples will be analysed for "Total available alumina" and Reactive Silica content. The samples should be selected in such a manner that the entire Bauxite bearing areas are represented by them.

5.2.8 **Pitting for Bulk Density:**

Bulk density will be determined in field by putting 1m X 1m X 1m pit. Three pits will be taken up for determination of bulk density.

5.2.9 **Spectroscopic Studies:**

The drill core samples need to be studied for 34 elements distribution by Emission Spectroscope. Semi-quantitative analysis for sample package i.e. 16 other elements viz. Li, Ga, In, Be, Ge, Mo, Cr, Ta, W, Ba, Co, Rb, Sr, Zr, Nb, Ni ;18 REE viz. La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Sc, Y; 02 Actinides viz. U, Th, needs to be carried out by mass spectroscopic studies ICP-AES/ICP-MS (sequential technique).

5.2.10 **Mineragraphic and Petrographic Studies:**

To know about the mineralogical composition and interrelation among the constituent minerals 12 rock specimens from the area will be taken up for Petrographic studies. 12 nos. of ore specimens from the Bauxite zones will also be studied in polished section to know about the constituent ore minerals, their mode of occurrence, textures and other mineragraphic characteristics of Bauxite.

5.2.11 **X-Ray Diffraction Studies:**

A total of 12 Nos Bauxite samples representing the Anvra Pat deposit will be subjected to X-Ray Diffraction studies to know about the general distribution pattern of the constituent minerals of the ore. The samples should be selected from the borehole composite samples in a pattern to represent the Bauxite ore of the Anvra Pat deposit.

5.2.12 Quantum of Work:

The proposed quantum of exploratory work (G3) in the Anvra Pat block is furnished in Table-5.2.

Table 5.2: Proposed Quantum of Work, G3 stage Exploration in Anvra Pat Block			
S. No	**Item details**	**Unit**	**Quantum**
1	Topographic Survey (Contour interval 2m) & Geological Mapping (1:2000 scale)	Sq. Km.	0.55
2	Bore Hole Fixation and determination of co-ordinates & Reduced Level (RL) of the boreholes and demarcation of lease hold boundary points by DGPS	Nos.	61
3	Core drilling (200m x 200 grid) 12 boreholes. Out of 12 BHs,10 BHs of 30 m depth to be drilled up to lithomarge and 02 borehole are proposed to be drilled up to 50m or basement (whichever is earlier)	m	400
4	Pitting for determination of Bulk density (1mX1mX1m) ï 3Nos.	C .um	3
5	Sampling & Chemical Analysis		
	Primary samples to be analysed for 5 radicals		
	viz. Al_2O_3, SiO_2, Fe_2O_3, TiO_2 & LOI		
a)	Borehole Core samples	Nos.	360
b)	Check samples (10% external)	Nos.	36
6	Total available alumina and Reactive Silica content	Nos.	24
7	Physical Studies		
a)	ICP-AES/ICPMS (sequential technique) for 34 elements i.e. 16 other elements viz. Li, Ga, In, Be, Ge, Mo, Ni, Cr, Ta, W, Ba, Co, Rb, Sr, Zr, Nb ;18 REE viz. La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Sc, Y; 02 Actinides viz. U, Th.	Nos.	60
b)	XRD studies	Nos.	12
8	Petrographic Studies	Nos.	12
9	Mineragraphic Studies	Nos.	12
10	Thin section study	Nos.	12
11	Preparation of Polished Thin Section	Nos.	12
12	In-situ Bulk Density	Nos.	3
13	Geological Report Preparation {As per Mineral (Evidence of mineral contents) Rule-2015}	Nos.	1

6.0.0 Time Schedule and Cost Estimates

6.1.0 **Time Schedule:**

The field work will take 06 months for completion due to dry drilling and other field problems. The laboratory studies will take additional 02 months from the date of completion of field work. Preparation of Geological Report will take 03 months with one month overlapping period with laboratory studies. Thus, the total duration of the project will be of 08 months.

TIME SCHEDULE/ACTION PLAN FOR PRILIMINARY EXPLORATION (G-3) FOR BAUXITE, TITANIUM & ASSOCIATED MINERALS IN ANVRA PAT BLOCK, DISTRICT- LOHARDAGA, JHARKHAND.

Sl. No.	Activities	Unit	MONTHS								
			1	2	3		4	5	6	7	8
1	Camp Setting	Nos.									
2	Geologist Party days in Field (1 Party)	day									
3	Survey Party days (1 Party)	day									
4	Core Drilling (2 rig)	m.									
5	Sampling Party days, Core Sampling	day									
6	Camp Winding	Nos.									
7	Laboratory Studies	Nos.									
8	Geologist Party days in HQ (1 Party)	day									
9	Report Writing & Peer review	day									
NOTE:											
1	**Commencement of project may be reckoned from the day the exploration acreage is available along with all statutory clearances.**										
2	**Time loss on account of monsoon/agricultural activity/forest clearance/local law & order problem/ lockdown etc. will be additional to above time line.**										

REVIEW

6.2.0 **Cost Estimates:**

Tentative cost has been estimated based on Schedule of Charges (SoC) of projects funded by National Exploration Trust (NMET).

The total cost estimate of **Rs. 153.46 Lakhs** is being proposed for completion of exploratory work up to G3 level. Activity wise break-ups of the same are furnished below:

Table: 6.2

Summary of Activity wise Cost Estimates		
Sl. No.	**Activities**	**Estimated Cost (Rs.) - G3 level**
1	**Geological work**	**41,05,080**
2	**Mineral Investigation (Drilling & Pitting-Trenching)**	**54,24,400**
3	**Laboratory studies (Chemical Analysis,Physical & Petrological Studies & Geotech. Lab)**	**25,96,440**
Sub-Total		**1,21,25,920**
4	**Proposal Preparation**	**2,42,518**
5	**Geological Report Preparation**	**6,06,296**
6	**Peer review charges**	**30,000**
Total		**1,30,04,734**
7	**GST (18%)**	**23,40,852**
Total Cost including 18% GST		**1,53,45,587**
SAY IN LAKHS		**153.46**

7.0.0 Justifications

7.1.0 Preliminary geological work has been carried out by GSI as well as DMG, Jharkhand in the area. MECL & CMPDI has also carried out exploration in around the adjoining area which has established occurrence of Bauxite with thickness varying from 4 to 6 m. The outcrops of Bauxite are observed in the field and the exposed pits in the proposed area have confirmation of the Laterite / Bauxite profile in the block. The above fact signifies that the plateau is potential Bauxite bearing and may have a good prospect to be explored to G3 level.

The MECL team visited the Anvra Pat block and nearby mine areas. The pits in the existing mines have bauxite occurrences upto 25m depth. The outcrops of Bauxite are observed in the field and the exposed pits in the proposed block have confirmation of the Laterite / Bauxite profile in the Anvra Pat block. Team collected Bauxite samples from the block showing encouraging results of high Alumina (Al2O3) and Titanium (TiO2) with low Silica (SiO2) in the range of 48-55%, 8-13% and 1-2%. respectively. Results are given below for the reference:

SL.NO.	SAMPLE ID	Al_2O_3%	SiO_2%	Fe_2O_3%	TiO_2%	LOI %
1	FS-01	50.12	1.45	11.14	9.00	27.80
2	FS-02	54.52	1.47	4.48	12.50	26.62
3	FS-03	50.57	2.22	9.27	9.82	27.79
4	FS-04	54.10	1.38	4.62	10.99	28.64
5	FS-05	47.58	1.62	10.63	7.73	32.12
6	FS-06	54.58	1.47	4.31	10.43	28.93

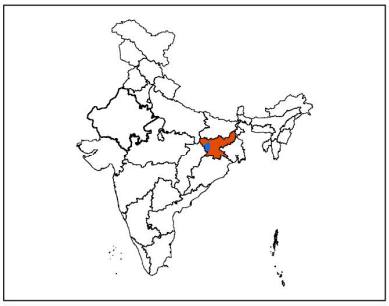
7.2.0 DMG, Government of Jharkhand discussed with MECL to take up exploration work of Bauxite blocks in the Lohardaga districts of Jharkhand for up gradation of the area as per the MMDR Amendment Act and Mineral Auction Rule, 2015 to enable the state government for auctioning of the Bauxite blocks. On discussion with Jharkhand Government, MECL decided to take up the exploration work of Bauxite for G3 level and accordingly prepared the proposal for G3 Level exploration in the Anvra Pat Block, District ï Lohardaga, Jharkhand through NMET funding.

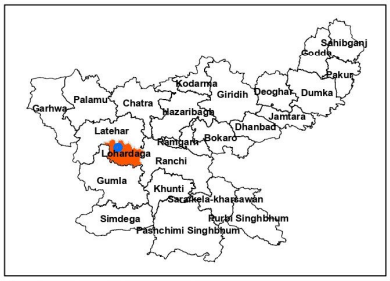
List of Plates:

1. Location Plan.
2. Regional Geological Map.
3. Proposed Borehole Location Plan

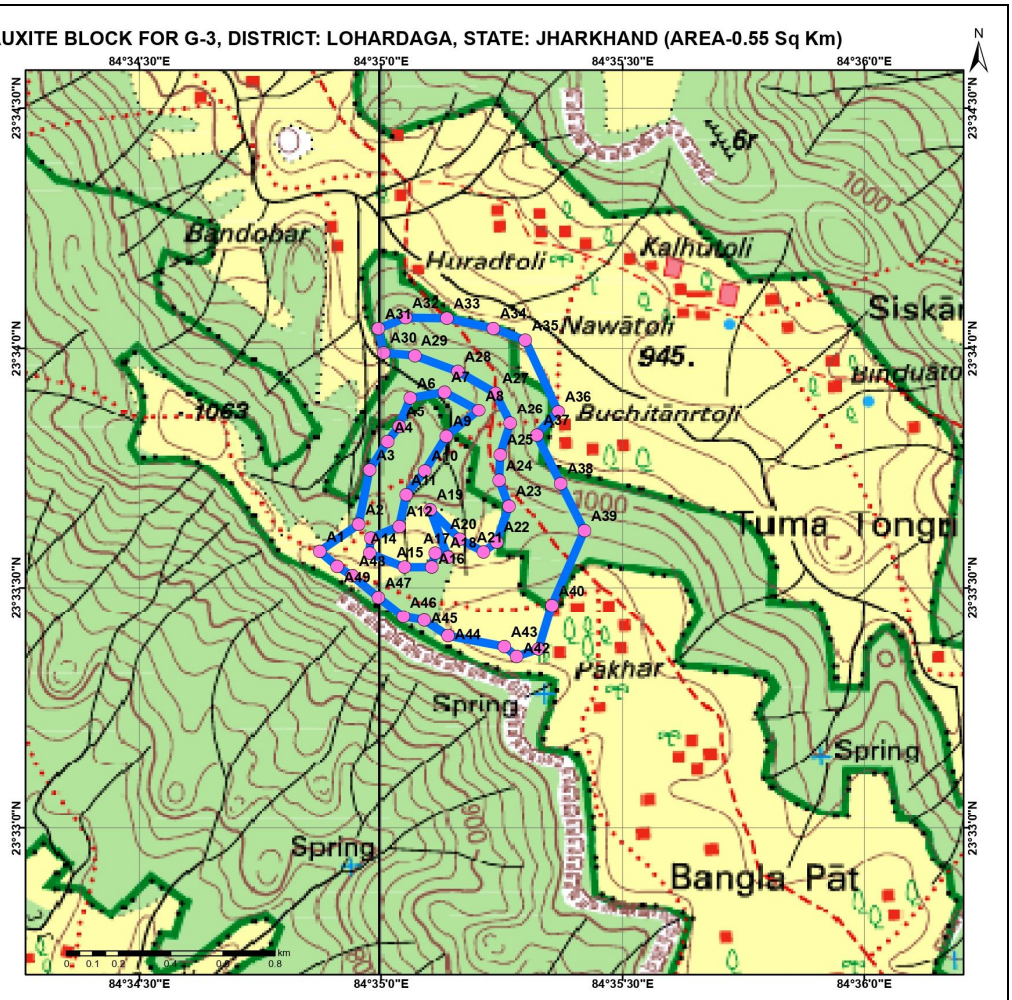
LOCATION MAP

LOCATION MAP OF ANVRA PAT BAUXITE BLOCK FOR G-3, DISTRICT: LOHARDAGA, STATE: JHARKHAND (AREA-0.55 Sq Km)





Cordinal Point	Latitude	Longitude	Easting	Northing	Cordinal Point	Latitude	Longitude	Easting	Northing
A1	23.55960688	84.58121399	253102.5	2607554.1	A26	23.56405	84.587787	253782.0	2608055.0
A2	23.56053809	84.58256320	253242.0	2607655.0	A27	23.565116	84.587288	253735.0	2608154.0
A3	23.56242716	84.58293864	253283.9	2607863.6	A28	23.565872	84.585951	253602.0	2608240.0
A4	23.56340639	84.58353855	253349.0	2607971.0	A29	23.566418	84.584493	253450.0	2608303.0
A5	23.56394941	84.58398910	253391.9	2608020.0	A30	23.566519	84.583423	253341.0	2608316.0
A6	23.56485091	84.58433498	253431.2	2608140.8	A31	23.567346	84.583242	253324.0	2608408.0
A7	23.56516186	84.58052162	253552.2	2608162.1	A32	23.567731	84.584185	253421.0	2608449.0
A8	23.56402636	84.58071145	253673.0	2608087.0	A33	23.567708	84.585605	253546.0	2608444.0
A9	23.56360526	84.58960028	253557.9	2607989.3	A34	23.567363	84.587208	253729.0	2608403.0
A10	23.56223400	84.58423633	253479.0	2607857.0	A35	23.566947	84.588312	253841.0	2608355.0
A11	23.56362130	84.58403971	253411	2607796	A36	23.564473	84.589444	253952.0	2608079.0
A12	23.56043077	84.58378927	253385.0	2607645.0	A37	23.563631	84.588706	253875.0	2607987.0
A13	23.56004602	84.58297335	253283.0	2607602.0	A38	23.563955	84.589529	253956.0	2607800.0
A14	23.55954292	84.58294101	253278.7	2607544.1	A39	23.560816	84.590548	254036.0	2607617.0
A15	23.55905501	84.58413760	253400.0	2607488.0	A40	23.55773454	84.58922537	253917.1	2607353.0
A16	23.55906935	84.58500158	253496.4	2607487.7	A41	23.55619503	84.58787696	253867.1	2607163.2
A17	23.55955989	84.58513834	253509.3	2607541.4	A42	23.55595391	84.58801463	253781.1	2607137.8
A18	23.55939879	84.58564708	253554.8	2607523.5	A43	23.55628900	84.58769523	253748.9	2607175.6
A19	23.56072228	84.58524394	253495	2607707	A44	23.55669726	84.58564188	253548.1	2607218.8
A20	23.56003643	84.58605234	253597.4	2607593.4	A45	23.55721350	84.58483092	253467.4	2607282.8
A21	23.55958494	84.58688987	253680.0	2607542.0	A46	23.55732803	84.58411632	253396.6	2607296.7
A22	23.55982603	84.58763590	253727.0	2607579.0	A47	23.55790276	84.58585269	253837	2607373.0
A23	23.56116923	84.58774187	253772.0	2607716.0	A48	23.55824019	84.58285486	253216	2607458
A24	23.562058	84.587412	253740.0	2607815.0	A49	23.55875792	84.58234694	253164	2607496
A25	23.562952	84.587445	253765.0	2607914.0					



Legend

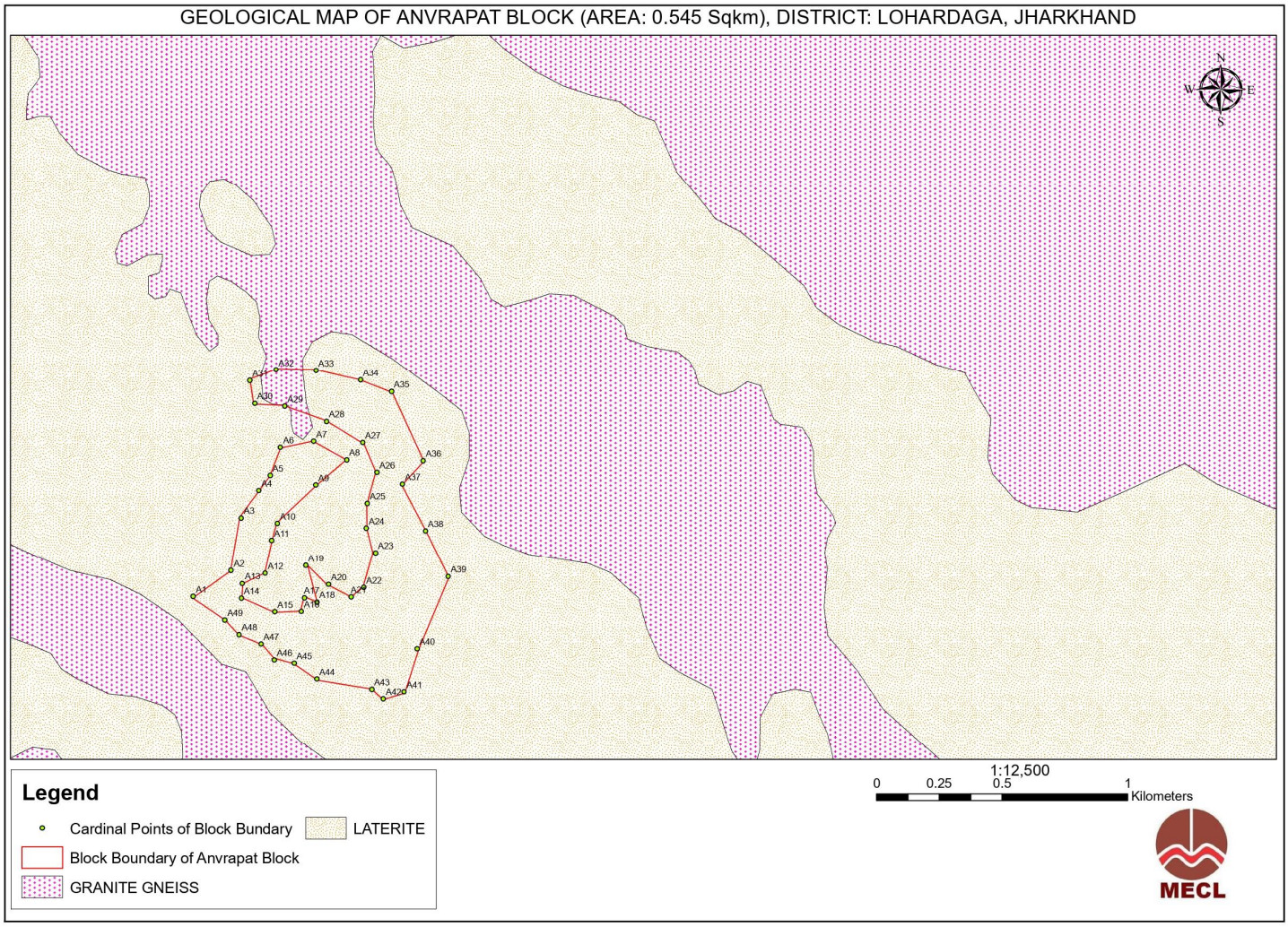
Corner Points

Anvara Block

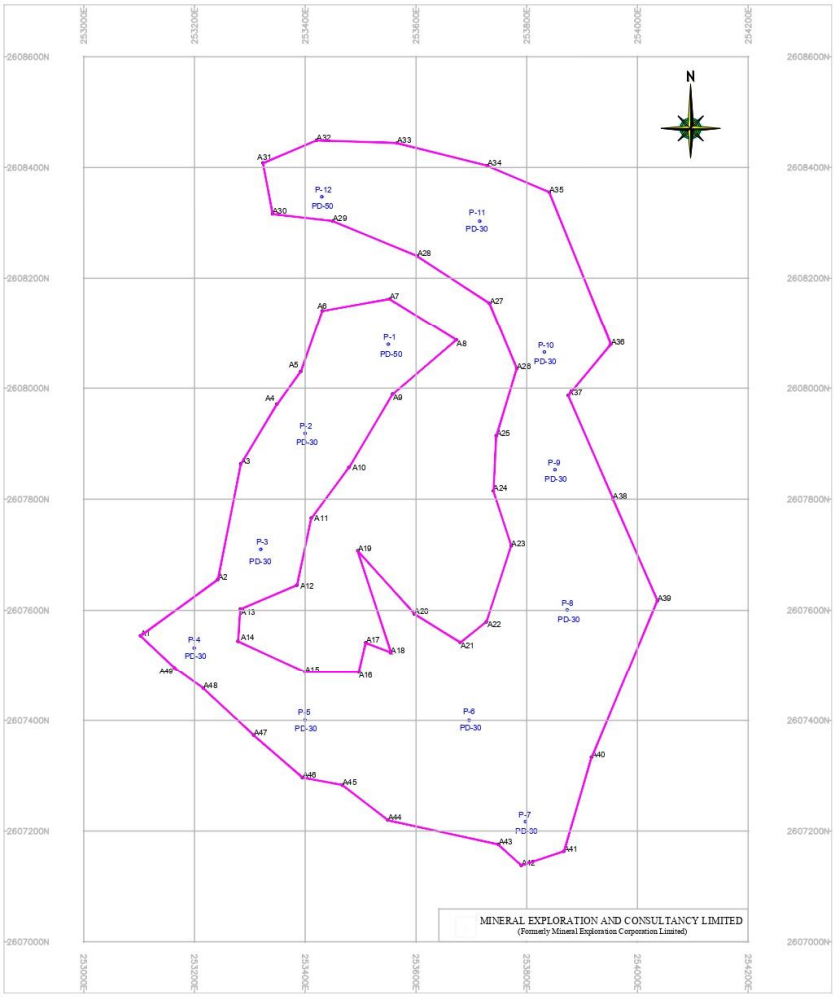
MECL

MINERAL EXPLORATION AND CONSULTANCY LTD.

REGIONAL GEOLOGICAL MAP



PROPOSED BOREHOLE LOCATION PLAN OF ANVRA PAT BLOCK



ANVRA PAT BLOCK FOR G-3 (AREA-0.55 Sq Km)				
PROPOSED BH POINTS				
SL. NO	PBH NO.	EASTING (M)	NORTHING (M)	PROP DEPTH (M)
1	P-1	253550.04	2608078.99	50
2	P-2	253399.95	2607918.43	30
3	P-3	253319.78	2607709.72	30
4	P-4	253199.81	2607531.77	30
5	P-5	253399.96	2607400.44	30
6	P-6	253696.20	2607400.02	30
7	P-7	253798.00	2607217.00	30
8	P-8	253873.24	2607600.45	30
9	P-9	253851.00	2607853.00	30
10	P-10	253832.00	2608065.00	30
11	P-11	253715.09	2608302.74	30
12	P-12	253430.00	2608347.00	50
TOTAL METERAGE (M)				400

COST ESTIMATE FOR PRILIMINARY EXPLORATION (G-3) FOR BAUXITE,TITANIUM & ASSOCIATED MINERALS IN ANVRA PAT BLOCK
DISTRICT- LOHARDAGA, STATE- JHARKHAND
Total Area - 0.55 sq km; Nos. of Boreholes - 12 ; Completion Time - 08 Months; Review- After 04 Months

Sl.No.	Item of Work	Unit	Rates as per NMET SoC 2020-21		Estimated Cost of the Proposal		Remarks
			SoC-Item -Sl No.	Rates as per SoC	Qty.	Total Amount (Rs)	
A	**GEOLOGICAL WORK**						
1	**Geological mapping,Borehole logging & Sampling & Report writing**						
a	Charges for one Geologist per day at HQ	day	1.3	9,000	30	2,70,000	
b	Charges for Geologist party per day at field	day	1.3	11,000	180	19,80,000	
c	1 party Labour (2 Nos each party)	day	5.7	522	360	1,87,920	Amount will be reimbursed as per the notified rates by the Central Labour Commissioner or respective State Govt. whichever is higher
d	Charges for one Sampler per day (1 Party)	one sampler per day	1.5.2	5,100	30	1,53,000	
e	Labours (4 Nos)	day	5.7	522	120	62,640	Amount will be reimbursed as per the notified rates by the Central Labour Commissioner or respective State Govt. whichever is higher
2	**Survey (on 1:2000 Scale)**						
a	Topographical survey & surface contouring at 2m interval	day	1.6.1a	8,300	30	2,49,000	
b	Bore Hole Fixation and determination of co-ordinates & Reduced Level (RL) of the boreholes and demarcation of lease hold boundary points by DGPS	Per Point of observation	1.6.2	19,200	61	11,71,200	12 BH point & 49 Boundary points
c	2 party Labour (2 Nos each party)	day	5.7	522	60	31,320	Amount will be reimbursed as per the notified rates by the Central Labour Commissioner or respective State Govt. whichever is higher
	SUB-TOTAL A					**41,05,080**	
B	**MINERAL INVESTIGATION**						
1	**Pitting &Trenching**						
a	Pitting for determination of bulk density (1mx1mx1m)-3 nos.	per cu. m	2.1.2	3800	3	11,400	
2	**DRILLING**						
a	Dry Core Drilling up to 30-50 m (05 BHs, NQ size)	m	2.2.1.1b	7,168	400	28,67,200	Out of 12 BHs,10 BHs of 30 m depth to be drilled up to lithomarge and 02 borehole are proposed to be drilled upto 50m or basement (whichever is earlier)
b	Land / Crop Compensation (in case the BH falls in agricultural Land)	per borehole	5.6	20,000	12	2,40,000	Amount will be reimbursed as per actuals or max. Rs. 20000 per BH with certification from local authorities.
c	Construction of concrete Pillar (12"x12"x30")	per point	2.2.7a	2,000	61	1,22,000	12 BH points, 49 Boundary points.
d	Transportation of Drill Rig & Truck associated per drill	Km	2.2.8	36	3,400	1,22,400	2 Rigs
e	Monthly Accommodation Charges for drilling Camp	month	2.2.9	50,000	4	2,00,000	
f	Drilling Camp Setting Cost	Nos	2.2.9a	2,50,000	2	5,00,000	
g	Drilling Camp Winding up Cost	Nos	2.2.9b	2,50,000	2	5,00,000	
h	Road Making (Rugged/Hilly Terrain)	per km	2.2.10b	32,200	7	2,25,400	Road Making will be considered as per the requirement and Road Making Charges will be reimbursed accordingly.
i	Drill Core Preservation	per m	5.3	1,590	400	6,36,000	
	SUB-TOTAL B					**54,24,400**	
C	**LABORATORY STUDIES**						
1	**Chemical Analysis**						
i)	**Primary samples**						
a	Analysis for 5 radicals i.e. Al2O3, SiO2, Fe2O3, TiO2 & LOI	Nos	4.1.15a	4,200	360	15,12,000	
ii)	**Check samples External (10%)**						
a.	Analysis for 5 radicals i.e. Al2O3, SiO2, Fe2O3, TiO2 & LOI	Nos	4.1.15a	4,200	36	1,51,200	
iii)	**Composite samples**						
a.	Analysis for 7 radicals, viz. Al_2O_3 , SiO_2 , Fe_2O_3, TiO_2, V_2O_5, P_2O_5 & LOI	Nos.	4.1.15a	4,200			
b.	Analysis for 14 radicals, viz. Al_2O_3, SiO_2, Fe_2O_3, TiO_2, V_2O_5, P_2O_5, LOI, MnO, CaO, MgO, K_2O, Na_2O, SO_3 & Organic carbon.	Nos.	4.1.15a	4,200			
iv)	**Analysis for Bauxite**						
a.	Combined determination of Tri hydrate Alumina (THA-40°c) and Mono hydrate Amumina (MHA- 240°c) & Reactive Silica	Nos.	4.1.17a	6,700	24	1,60,800	
	Sub-Total -1					**18,24,000**	
2	**Physical & Petrological Studies**						
i)	Specific Gravity & Porosity determination	**Nos.**	4.8.1	1,605			
ii)	XRD studies for identification of minerals (Random)	Nos.	4.5.1	4,000	12	48,000	
iii)	ICP-AES/ICP-MS (sequential technique) sample package for 34 elements i.e. 16 other elements viz. Li,Ga,In,Be,Ge,Mo,Cr,Ta,W,Ba,Co,Rb,Sr,Zr,Nb,Ni ;18 REE viz. La,Ce, Pr,Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu,Sc,Y; 02 Actinides viz. U,Th.	Nos.	4.1.14	7,731	60	4,63,860	
iv)	Preparation of thin section	Nos.	4.3.1	2,353	12	28,236	
v)	Study of thin section	Nos.	4.3.4	4,232	12	50,784	

Sl.No.	Item of Work	Unit	Rates as per NMET SoC 2020-21		Estimated Cost of the Proposal		Remarks
			SoC-Item -Sl No.	Rates as per SoC	Qty.	Total Amount (Rs)	
vi)	Complete Petrographic Studies	Nos.	4.3.4	4,232	12	50,784	
vii)	Preparation of polished section	Nos.	4.3.2	1,549	12	18,588	
viii)	Study of polished section	Nos.	4.3.4	4,232	12	50,784	
ix)	Complete Minerographic Studies	Nos.	4.3.4	4,232	12	50,784	
	Sub-Total -2					**7,61,820**	
3	**Geotechnical Laboratory**						
i.	In-situ Bulk Density Determination	No.	4.1.0	3,540	3	10,620	
	Sub Total- 3					**10,620**	
	SUB-TOTAL C					**25,96,440**	
D	**Total - A to C**					**1,21,25,920**	
E	**MISCELLANEOUS CHARGES**						
1	**Preparation of Exploration Proposal (5 Hard copies with a soft copy)**	5 Hard copies with a soft copy	5.1	2% of the approved project cost or Rs. 5.0 Lakhs whichever is lower		**2,42,518**	EA has to submit the Hard Copies and the soft copy of the final proposal along with Maps and plan as suggested by the TCC-NMET in its meeting while clearing the proposal
2	**Geological Report Preparation**		5.2	For the projects having cost more than ₹50 lakh but less than 150 lakh: A Minimum of ₹2.5 lakh or 5% of the work whichever is more.		**6,06,296**	EA has to submit the final Geological Report in Hard Copies (5 Nos) and the soft copy to NMET
3	**Peer review Charges**		As per EC decision			**30,000**	
	Total Estimated Cost without GST					**1,30,04,734**	
	Provision for GST (18%)					**23,40,852**	GST will be reimbursed as per actual and as per notified prescribed rate
	Total Estimated Cost with GST					**1,53,45,587**	
	Say in Lakhs (Rs.)					***153.46***	

Note - If any part of the project is outsourced, the amount will be reimbursed as per the Paragraph 3 of NMET SoC and Item no. 6 of NMET SoC. In case of execution of the project by NEA on its own, a Certificate regarding non-outsourcing of any component/ project is required.