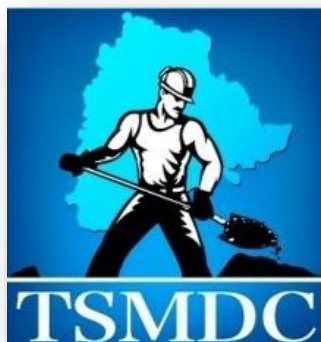




GEOLOGICAL REPORT ON PRELIMINARY EXPLORATION (G-3 STAGE) FOR MANGANESE IN PIMPERKUNTA BLOCK, BHEEMPUR MANDAL, ADILABAD DISTRICT, TELANGANA STATE

(Part-A: Geological Report)

[Prepared as per Minerals (Evidence of Mineral Contents) Amendment Rules, 2021]



by

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Part-A: Geological Report

Geological Report on Preliminary Exploration (G-3 stage) for Manganese in Pimperkunta Block, Bheempur Mandal, Adilabad District, Telangana State

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Executive Summary

Adilabad district of Telangana State is well known for low phosphorus manganese ore deposits. This ore is in great demand due to its low phosphorus content. Manganese Ore Occurrences/ deposits in Adilabad district are distributed over 40 km linear belt from Gullughat ($19^{\circ} 48' : 78^{\circ} 27'$) in the WNW to MesalaKhurd ($19^{\circ} 40':76^{\circ} 45'$) in the ENE. The present exploration Pimperkunta block falls within this 40 km linear belt. It comprises an area of about 0.50Sq km (50 ha) zcovering parts of Survey of India Toposheet No. 56 I/6. Pimperkunta block is located approximately 1.21 km east of Pimperkunta village and 2.45 Km northwest of Ghotkuri village in the Bheempur Mandal of Adilabad District. In this block preliminary exploration (G-3 stage) was carried out by officers of TSMDC with outsourcing of survey, geophysical survey, drilling & chemical analysis components. The exploration was approved and funded by technical-Cum-Cost Committee of National Mineral Exploration Trust and funded. The work component involved detailed topographical and geological mapping on 1:1000 scale, excavating 102 cu m through 33 pits, drilling of 15 boreholes involving 285 m and collection of 11numbers of bed rock, 93 numbers of core and 39nos of pit samples for chemical analysis and other laboratory studies. Regionally, the Penganga Group have a predominant WNE-ESE regional strike with gentle north-westerly dip (less than 10°). Minor changes in the strike direction and amount of dips are noticed where the beds form antiformal or synformal rolls or where the beds are affected by major faults.

The Pimperkunta block area comprises rocks of lower limestone with interbedded manganese+jasper+chert bands and upper shaly limestone belonging to Goatkur Formation of Penganga Group. There is no exposure of basement rock seen anywhere in the block. The block area shows sub horizontal to shallow dipping disposition of the limestone sequence indicating that the area has not undergone any major tectonic disturbance. Limestone exposed in the block trend in NNW-SSE direction with sub-horizontal dip of 5° to 15° towards east. In the southwestern part of the block area the strike locally swerves to WNW-ESE with moderate dip (7° to 12°) towards south.

Surface indication of manganese mineralization in the block is present in the form of partly exposed thin manganese ore bands within limestone and scattered dumps of manganiferous soil locally called as Chillies. Mineralization is patchy and shows pinch & swell nature along strike. It is characterized by jasper-chert-manganese inter-bands occurring as two curvilinear, lensoidal disjointed bands trending in NNW-SSE with sub-horizontal easterly dips. These manganiferous bands can be categorized into Western and Eastern bands respectively. The Western band can be traced for an average strike length of 625m with average exposed width of 43m. Similarly, the Eastern band can be traced for an average strike length of 600m with an average exposed width of 70m. The manganiferous thin bands occurs at shallow depth have been quarried at number of places and the dumps of the quarries are scattered. The open cast quarries appears to reach to a depth of maximum 3m. The samples collected from quarries yielded low to medium grade manganese ore. Geophysical surveys in the block interpreted shallow persistence of manganese mineralization restricted within 20-35 m of depth.

Out of the total mapped area of 50 Ha mineralized area is approximately 7.70 ha (**Eastern=4.20, western=3.5 Ha**). The mineralized zone and non- mineralized zone has been calculated considering the surface geological features, abandoned quarry / trail pits manifestations, dumps, land use pattern and litho-units exposed. A total of 15 boreholes were drilled in two bands of manganese body. Some boreholes intersected thin band of manganese (Average thickness m). Heavy core loss in general and particularly in manganese intersected zone and in expected manganese zones hampered correlation of the zones along strike and dip direction to establish its strike and depth continuity. Borehole (PBH-2) drilled to trace dip-ward extension did not intersect Mn mineralized zone at expected depth thus indicating that there is no dip-ward extension of mineralized zone, may be due to patchy pinch and swell nature of mineralization.

Boreholes which intersected thin manganese body having more than 10% Mn content were considered for estimating resources. The manganese ore resource of this block was estimated on the basis of area of influence method around positive boreholes. The total net manganese ore resource estimated in Eastern band is 5908 Metric tonnes with average grade of 18.05%

Mn whereas in the Western band total resources is 53498 Metric tonnes with average Mn grade of 12.62%Mn. **Thus the total resource estimated in both the band is 59406** Metric Tonnes with average grade of **13.16%**Mn.

The estimated manganese resources is mostly of low grade, fine variety and are classified under inferred mineral resource category (333) as per UNFC 1996/ MEMC (Amended) Rule 2021.

Considering patchy, pinch & swell nature along strike, heavy core loss in manganese ore zone and inability of geophysical survey to trace the manganese bands along strike and dip extension, further exploration on G-2 stage was not considered in the block.

CHAPTER - I

INTRODUCTION

1.10 Background Information: Manganese is often used as important raw material in the iron and steel industry and for various other industries. Manganese in alloy form is an essential input in steel making and steel is one of the most important key indicators in the industrial economy of any country. So far, there is no technology which can substitute Manganese in steel making. It imparts numerous beneficial mechanical properties viz., hardness, toughness and workability to steel in addition to improve its strength, making it irreplaceable in steel making.

India is bestowed with large resource of manganese ore that occurs in different geological formations across the peninsular area. In India manganese deposits mainly occur as metamorphosed bedded sedimentary deposits associated with Gondite Series of Madhya Pradesh (Balaghat, Chhindwara & Jhabua districts), Maharashtra (Bhandara & Nagpur districts), Gujarat (Panchmah district) Odisha (Sundargarh district) and Kodurite Series (Archaeans) of Odisha (Ganjam & Koraput districts) and Andhra Pradesh (Srikakulam & Vishakhapatnam districts). It also occurs associated with limestone in Penganga basin.

Though India is bestowed with large resources of manganese, to meet the ever increasing demand of manganese which is also becoming critical mineral for India, Govt. of India is giving high priority for exploration of manganese ore. The Adilabad district of Telangana State is well known for low phosphorus manganese ore deposits. This ore is in great demand due to its low phosphorus content. In view of this TSMDC being an NEA, proposed an item to NMET for approval for G-3/G-2 level of exploration for assessing the manganese mineralization in Pimperkunta block in Bheempur Mandal, Adilabad district of Telangana. Technical-Cum-Cost Committee of NMET in 16th meeting approved Mineral Exploration Project of Manganese of TSMDC through letter number No.6/2/2015-NMET dated 30th March 2020 for G-3/ G-2 stage exploration at an expenditure cost of 157.22 lakhs. Committee suggested to initially carrying out Preliminary exploration (G-3 level) and on getting positive results simultaneously next stage of exploration (G-2 level) shall be decided after review by the TCC on completion of G-3 level of exploration. TSMDC initiated the G-3 level of exploration work in the Pimperkunta block from first week of April 2020.

The present report focuses on the preliminary exploration (G-3 stage) which carried out by officers of TSMDC with outsourcing of survey, geophysical survey, drilling & chemical analysis components. Exploration was carried out on 1:1,000 scale covering an area of approximately 0.50 sq.km (50 ha) with the following objectives:

- a) To carry out Geological Mapping on 1:1000 scale
- b) To delineate manganese mineralized zone in the block and
- c) Assess the quantity & quality of Manganese Resource in the block.

1.20 Details of the Exploration Agency and period of prospecting

Exploration agency: Telangana Mineral Development Corporation Limited

Address of Exploration Agency:

6-2-915, HMWSSB Premises, Rear Block, 3rd floor, Khairatabad, Hyderabad – 500004

E mail address: tsmdcltd@gmail.com

Telephone Number: 040 23323150

Personal & Agencies associated with Exploration Work:

Personal/ agencies involved in the different component of Exploration work is given in table 1.1 below:

Table 1.1: Personal & Agencies associated with Exploration Work & their work Component

Sl No.	Personal/ Agencies Involved	Task / work component
1.	TSMDC Officers Team	Geological Mapping, Pitting, surface bed rock sampling, core logging, core sampling, data acquisition, interpretation & preparation of reports
2.	Ahome Consultants Private Limited; G-10, Emerald Apartments, Panjagutta, Hyderabad-82	Survey work, Establishing Block corner coordinates and Topographical Map and Geophysical Survey work
3.	M/S Ravengo Rock Diamond Core Drilling; H.No E/419, Hill Colony, Nagarjuna Sagar dam, Nalgonda, Telangana State. Pin: 508202	Drilling of 15 boreholes involving 314m drilling
4.	M/s Lucid Laboratories Pvt. Ltd., Plot No 3, IDA, Balanagar, Hyderabad, Telangana State. Pin: 500037	Laboratory work involving chemical analysis, petro graphical studies & specific gravity determination

Details of period of Prospecting

Date of approval of Item by NMET: 30-03-2020

Date of Commencement: April 2020

Date of completion: Field Days (June 2022) (Completion delayed due to COVID Pandemic)

1.30 Details of the Block Area under Study

Location:

Village / Town:- Pimperkunta

Mandal: Bheempur

District: Adilabad

State: Telangana State.

Survey of India Toposheet No: 56 I/16

Co-ordinates of the block area and the area is bounded by the following geo coordinates given in the table 1.2

Table 1.2: Pimperkunta Block corner Geo-coordinates

POINT-ID	LATTITUDE (N)	LONGITUDE (E)
PPKT-1	19°44'40.900'N	78°29'03.900'E
PPKT-2	19°44'44.900'N	78°29'02.100'E
PPKT-3	19°44'48.400'N	78°28'58.800'E
PPKT-4	19°44'45.500'N	78°28'57.700'E
PPKT-5	19°44'33.600'N	78°28'56.100'E
PPKT-6	19°44'32.100'N	78°28'50.100'E
PPKT-7	19°44'25.700'N	78°28'47.800'E
PPKT-8	19°44'23.200'N	78°28'58.900'E
PPKT-9	19°44'27.000'N	78°29'04.700'E
PPKT-10	19°44'18.600'N	78°29'22.200'E
PPKT-11	19°44'26.900'N	78°29'24.300'E
PPKT-12	19°44'29.100'N	78°29'19.100'E
PPKT-13	19°44'34.900'N	78°29'14.200'E
PPKT-14	19°44'44.800'N	78°29'09.700'E

Cadastral details:

Block area is made up of Private land.

Accessibility:

Pimperkunta block is approximately 1.21 km east of Pimperkunta village and 2.45 Km North west of Ghotkuri village in the Bheempur Mandal of Adilabad District, Telangana State. The block can be approached from District Headquarter Adilabad town through Pimperkunta and Ghotkuri, located in the west and south-east of the study block. Adilabad town is about 20 km from Pimperkunta village. Adilabad town lies by the side of National Highway No. 7 (Chennai-Delhi) connecting Hyderabad with Nagpur. Block is 20 km from National Highway number 7. The State capital Hyderabad is at a distance of 380 kms by road from Adilabad. The nearest railway station is Mudkhed Junction located on the Secunderabad-Manmad line of South Central Railway. The nearest Airport is Dr. Baba saheb Ambedkar Airport at Nagpur which is 280 km and Rajeev Gandhi International Airport at Hyderabad which is about 340 km.

**Fig-1 : INDEX MAP OF PIMPERKUNTA MANGANESE BLOCK,
BHEEMPUR MANDAL, ADILABAD DISTRICT, TELANGANA STATE**

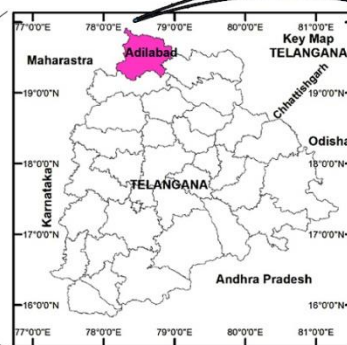
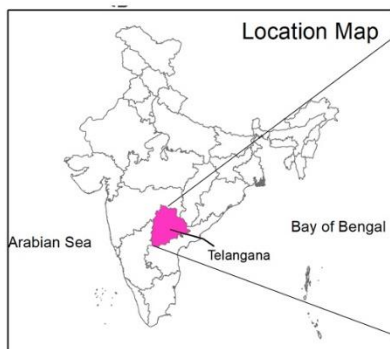
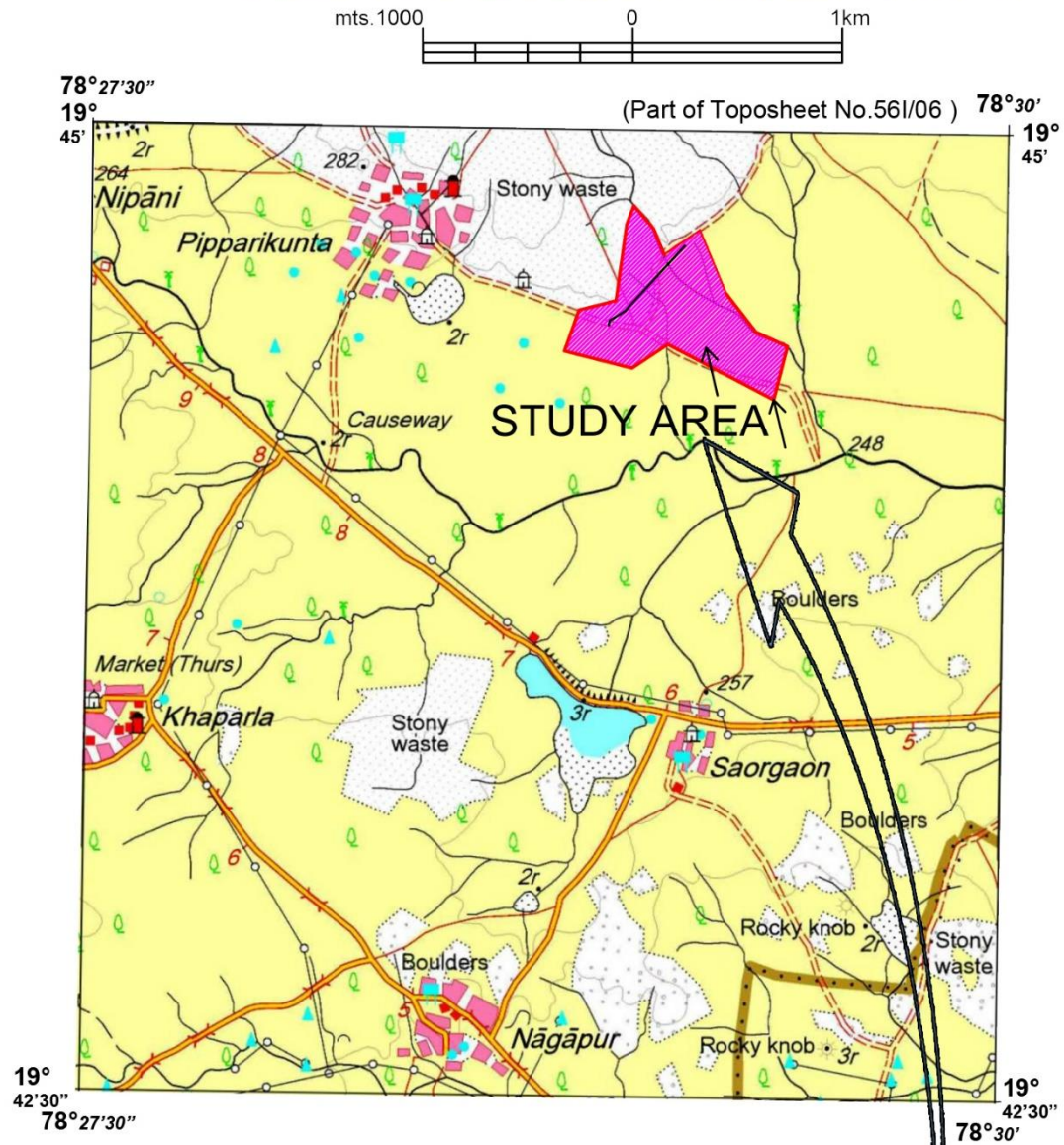
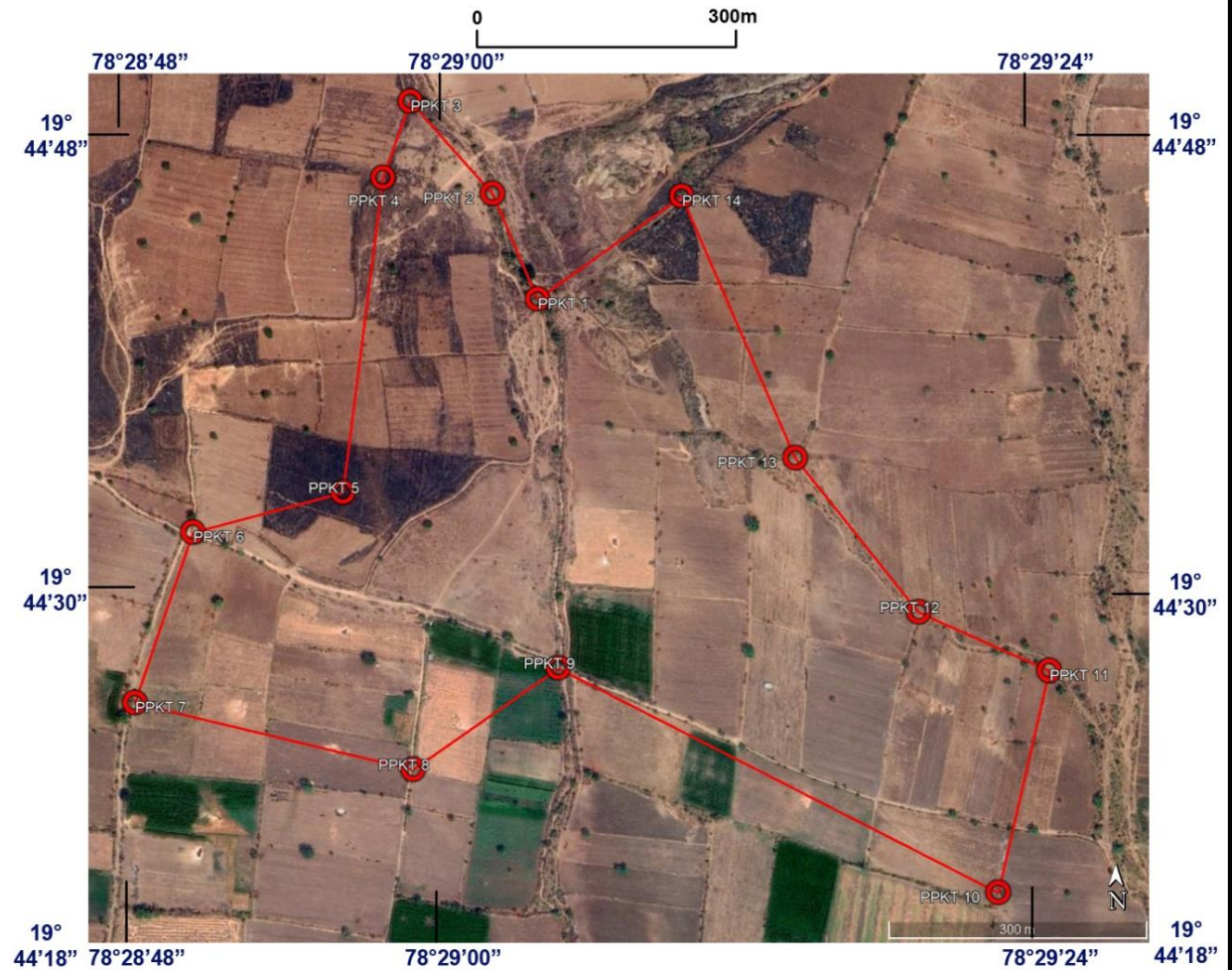


Figure-2: Map Showing Pimperkunta Block area on Google Earth Map



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Pimperkunta mining block

Co-ordinates of the Pimperkunta Block Boudary		
POINT-ID	LATITUDE (N)	LONGITUDE (E)
PPKT-1	19°44'40.900'N	78°29'03.900'E
PPKT-2	19°44'44.900'N	78°29'02.100'E
PPKT-3	19°44'48.400'N	78°28'58.800'E
PPKT-4	19°44'45.500'N	78°28'57.700'E
PPKT-5	19°44'33.600'N	78°28'56.100'E
PPKT-6	19°44'32.100'N	78°28'50.100'E
PPKT-7	19°44'25.700'N	78°28'47.800'E
PPKT-8	19°44'23.200'N	78°28'58.900'E
PPKT-9	19°44'27.000'N	78°29'04.700'E
PPKT-10	19°44'18.600'N	78°29'22.200'E
PPKT-11	19°44'26.900'N	78°29'24.300'E
PPKT-12	19°44'29.100'N	78°29'19.100'E
PPKT-13	19°44'34.900'N	78°29'14.200'E
PPKT-14	19°44'44.800'N	78°29'09.700'E

Infrastructure:

The infrastructure/ basic facilities, services and installations needed for the functioning of a community or society or development of an industry/ mining industry, such as transportation and communications systems, water and power lines and public institutions including schools and post offices are present.

1.40 Physiography, drainage, Land use, Climate and Flora and Fauna**Physiography:**

The terrain of the study area is generally represented by plain to undulatory topography along with isolated clusters of medium to high hills, and mounds. Hills are present elevated up to 200 meters elevation from the ground level (the ground level or plain areas are 190 meter to 200 meters from MSL).

Regionally, in Adilabad district the Deccan Traps form plateaus and sloping hills with escarpments. Structural/ denudational, residual hills, butte and valley fills and plains are developed in the Proterozoic. Archaean to Paleo-Proterozoic gneiss and the Proterozoic sediments near Adilabad form the pediment/ Pediplain zones. Depositional landforms such as flood plain (active/ paleo) are confined to the course of Penganga River.

Drainage:

Penganga River is perennial river which flows from west to east in northern part of area. On regional scale area is drained by number of small seasonal streams representing a dendritic pattern. All these streams joins the main stream which flows towards east direction and finally meets the Penganga River. Numerous seasonal streams control the drainage pattern of the area. Many water bodies and ponds are built across nalas, which serves the irrigation during the dry season along with tube-wells. The drainage pattern is sub parallel, dendritic to sub dendritic.

Land use/ Land cover:

The major part of the block area is utilized for agricultural activity and lion share of the working population depend on agriculture. Two cropping seasons are mainly Khariff and Rabi. Cotton is the main commercial crop. The other crops like green gram, black gram, Bengal gram, ground

nut and Jowar etc., are extensively cultivated. Paddy is cultivated in the low-lying areas close to banks of river, canals and tanks. At places vegetables like tomato, lady's finger, Brinjal and curry leaves etc., are also cultivated.

Climate:

Block area falls in semi-arid area and has a predominantly hot and dry climate. Rain season is from June to September and the normal Annual rainfall is around 1045 mm. Summer start from the month of March, and peak in May with average high temperatures of 42° C (108 °F). Winter start from the month of November and temperatures during this time range from 22 to 23 °C.

Flora & Fauna:

Densely forested areas are mainly absent; however, trees and plants mainly includes Neem (Axadivachtuindica), babul (Vachellianilotica), mango (Mangiferaindica), ber (Ziziphusmauritiana), tamarind (Tamarindusindica) and thorny bushes and shrubs (xerophytes) etc.

Some of the wild animals found in block area are wild pig, wild dogs etc. In addition to these monkeys, rabbits, mongoose, fox, snakes, lizards, scorpions are also common. The domestic fauna includes cows, buffalos, goats, sheeps and dogs. Besides above, the peacocks, peahens, water ducks, partridge, red jungle fowls, kingfishers, bulbuls, doves, crows, mynas, sparrow and common pigeons etc. are the fauna seen in the area

1.50 Previous work

T.W.H.Hughes (1877), W.King (1881), A.M.Heron (1949), P.V.Rao (1951) and D.S.Deshmukh (1952) surveyed parts of the area. Their study mainly dealt with regional geology and correlation of rock formations in the area. No reference to the occurrence of manganese ore is found in their work from 1866 onwards. Mining activity by private entrepreneurs in the area started in 1962 which brought to light manganese occurrences near Goatkur, Guda, Jamadpur and Pimperkunta (Pitarikunta). Subsequently, J.S.R.Krishna Rao (1967) of Andhra University recorded some of the occurrences of manganese in the area and carried out ore-petrologic studies on the manganese ore samples for sedimentary origin of the manganese. C.N.Rao &

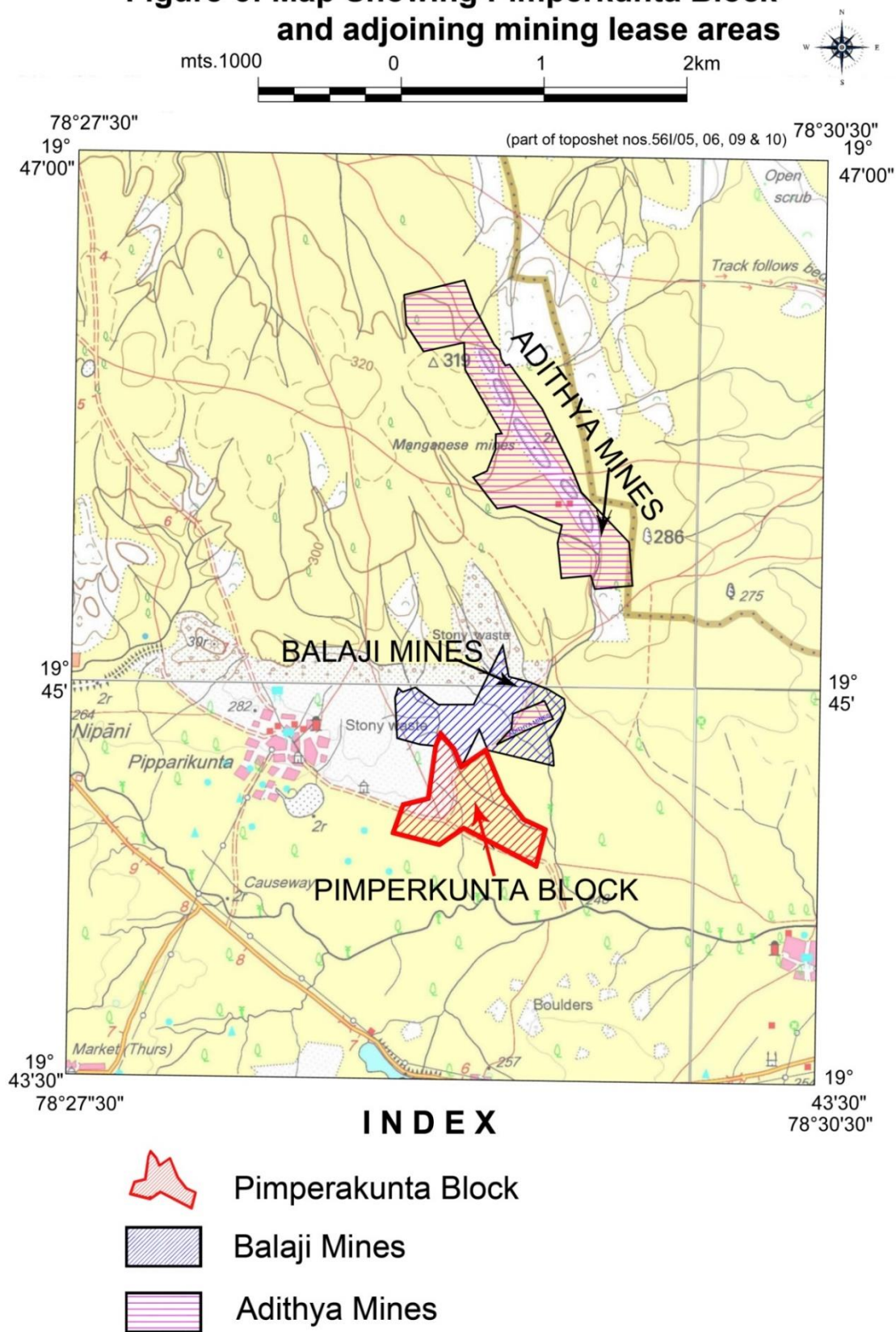
M.G.Rao (1969) examined some of the occurrences during course of investigation for flux grade limestone in the northern part of Adilabad district.

Shri.T.S.S.Sarma (1973-74) during mapping brought to light few more occurrences of manganese near Masela, Buzurg, Gaulighat etc., shri V.Natarajan & B.S.R.Reddy (1975) carried out geological mapping on 1:63360 scale in the area and along with it also carried out detailed mapping on 1:2500 & 1:1000 scale in manganese occurring area of Goatkur-Guda area & Pittarikunta area respectively and established that most of the occurrences belong to a regionally persistent manganese ore jasper horizon within the second limestone bed of the Penganga Group of rocks that rest over the Peninsular Gneisses. They also assessed the available indicated reserves of 1,50,000 tonnes of manganese ore up to a limit of 100m along the dip direction, in the occurrence of Goatkur-Guda, Tamsi, Gaulighat and Pimperkunta mines. They also indicated that in Pittarikunta mine cumulative strike length in the two limbs of the synformal manganese ore body is nearly 0.5 km and has total indicated reserve of 3750 tonnes out of which 375 tonnes has been worked for an average distance of 5m along the dip direction. They recommended geological and geophysical surveys to establish further continuity of manganese horizon in soil covered. Raghupathi.C et al. (2017-2018) carried out G-4 stage exploration for manganese in the Pranahita-Godavari basin in Adilabad district in two blocks: Guda-Rampur Block and Kanpa-Junapani Block and established a total Reconnaissance resources (334)of 2.514 million tonnes for manganese and 77.16 million tonnes of Cement grade limestone in Guda-Rampur block. In Kanpa-Junapani block no resources for manganese could be established but established reconnaissance resource of 33.76 million tonnes of cement grade limestone.

1.60 Present Work

The Pimperkunta block area falls in the vicinity of old Manganese Mining areas. M/s Balaji mines and M/s Aditya Minerals Pvt Ltd lease area falls in the adjoining areas situated north and north-east of the present block area(Figure-3). Mining activity details with respects to, thickness of Mn ore, mining depth, quality and quantity of ore of the adjoining mines are not available.

Figure-3: Map Showing Pimperkunta Block and adjoining mining lease areas



It was proposed to carry out G-3 stage (preliminary Exploration) followed by G-2 stage exploration in the block area to gather all necessary information required to reassess the quantity & quality of available manganese resources in the Block. The work component involved in exploration is shown in table-1.3.

Table: 1.3. Table showing nature of work, quantum and achievement

Nature of work	Units	Total Target	Target achieved
1. Block corner coordinates establishing and Topographic mapping (1:1000)	Sq. Km	0.50	0.50
2. Detailed mapping Scale (1:1000)	Sq. Km	0.50	0.50
3. Pitting	Cu m	100	102
4. Drilling (G-3 stage exploration was carried out)	M	600	285 (15 BH's)
2. Sampling (Nos.)& Chemical Analysis			
(i) Bed Rock sample	Nos	No target	11
(ii) Pit sample	Nos	No target	39
(iii) Core Sample	Nos	No target	274
Total collected samples	Nos	No target	324
Total samples sent for primary & Check chemical analysis	Nos	155	131
External check samples	Nos	5	Not analyzed
Composite samples	Nos	5	5
Physical Analysis			
XRD studies	Nos	5	6
Specific gravity determination	Nos	4	4
Petrographic studies	Nos	No target	1
Beneficiation studies	Nos	2	Not analyzed

Acknowledgment

The authors express sincere gratitude to Dr. G. Malsur, Managing Director & Vice Chairman, Telangana Mineral Development Corporation Ltd for providing logistic and technical support along with vital suggestions in finalizing the report. Sincere thanks to Shri M.S.Jairam, Tech. Advisor, for his mentorship, able guidance and encouragement throughout the investigation period. The key observation and suggestions extended by him in the field as well as at headquarters are of immense help in smooth completion of project and in finalization of the report.

Chapter II:

REGIONAL GEOLOGY

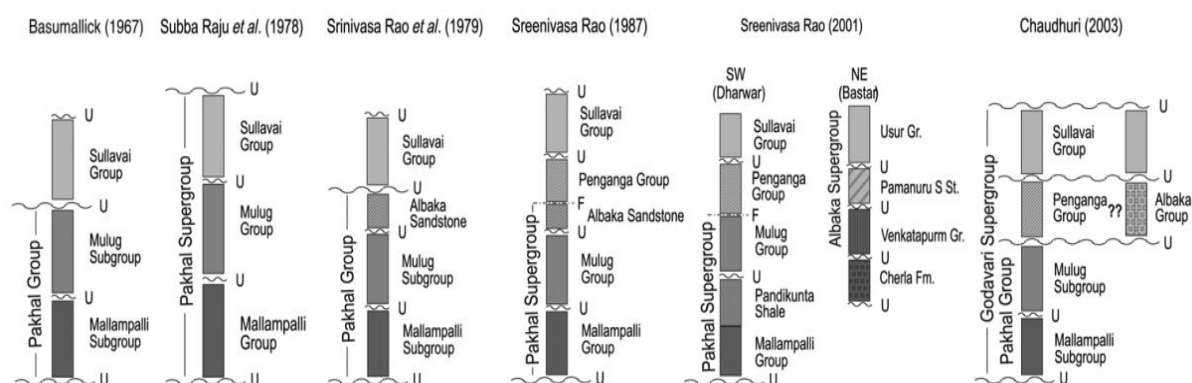
2.10 Geological setup of Penganga Basin:

Pimperkunta block which is in Adilabad district comprises sediments belonging to Penganga Group. Penganga sediments occurs to the immediate north and east of Adilabad town in Adilabad district of Telangana. Regionally, Adilabad District area forms part of the Eastern Dharwar Craton (EDC). The Eastern Dharwar Craton is bounded in the east by Eastern Ghat Mobile Belt (EGMB), in south by the Southern Granulite Belt (SGT), in the north-west by the Deccan traps, whereas in the north-east, EDC and Bastar Craton are juxtaposed along the NW–SE trending linear belt well known as Pranhita–Godavari rift basin (Pranhita-Godavari Valley). The PG Valley runs NW–SE, covering parts of Telangana, Maharashtra and the Bastar region of Chhattisgarh, along the possible join between the Dharwar and Bastar cratons following the general orientation of the river valley. The Purana rocks of the Pranhita– Godavari Valley (PG Valley) represent almost a complete succession between the Archaean granitic basement and the Palaeozoic to Mesozoic Gondwana rocks. Pranhita-Godavari valley comprises a thick sequence of sediments ranging in age from Proterozoic to late Cretaceous age. The Proterozoic sedimentary successions of Indian cratonic basins are traditionally known as the ‘Puranas’. The Purana rocks of Pranhita-Godavari valley crop out in two NW– SE-trending linear belts along the SW margin (western belt) and NE margin (eastern belt) of the valley. The SW margin of the western belt is bounded by granites and granulites of the Karimnagar Granulite Belt whereas the NE margin of the eastern belt is delineated by the Bhopalpatnam Granulite Belt. The Purana outcrop belts, in turn, are separated by the younger Gondwana rocks. A linear, faulted-up inlier of the Puranas within the Gondwana outcrops along the axial part of the valley attests to the continuity of Purana rocks beneath the cover of Gondwana rocks from the western to the eastern belt.

The Proterozoic sediments (Puranas) of the Pranhita-Godavari valley in Telangana are divisible broadly into the Pakhal Supergroup, Penganga Group and the Sullavai Group in that ascending order, each separated from the older unit by an angular unconformity. The extension of Penganga into the area south of Godavari as a separate entity occurring between the Pakhal

and Sullavai. Penganga sediments represent a separate depositional episode distinctly different from underlying Pakhal and overlying Sullavai, thus entitled for the status of a separate group. The Penganga succession covered by Neo Proterozoic sedimentary rocks mainly occurs in the northwestern part of the PG valley between Adilabad and Mancheri, to the north of Godavari River. The development of the Penganga Group is restricted to the area around Ramagundam and the Penganga River in Karimnagar and Adilabad districts. The main lithological difference between the Pakhal and the Penganga rocks is that the carbonate component in the former is represented by dolomite and in the latter by limestone. The contact of the Penganga sediments with the older Pakhal is all along a faulted one. The Penganga Group is considered to be a stratigraphic equivalent of the Kurnool Group. The Penganga Group non-conformably overlies the Peninsular Gneissic Complex-II (PGCII). Granites, granodiorite belonging to TGA suite of rocks occupy major portion of the PGC-II which are intruded by basic dykes, quartz and pegmatites. Proterozoic sediments in turn are overlain by Deccan basalts.

The stratigraphy of Pre-Cambrian sedimentary formation in the area and their precise correlation with their equivalents in the Godavari valley has been worked by many workers. Although several workers have studied the succession for more than a century, an unequivocally accepted lithostratigraphy for the whole basin has not yet been achieved. A review of different schemes suggests that the purpose of classification of the Puranas of the PG Valley is nearly lost in a maze of conflicting concepts that also hinders reconstruction of stratigraphic and tectonic evolution models of the basin. Major controversies thus hinge on the status of the Pakhal subdivision and on the stratigraphic position of the Penganga Group vis-à-vis other groups. Several of the problems are directly related to the nature of sedimentation processes, procedures of integrating smaller-order units into higher-order units, and even the concept of the basin itself. Figure below (after Chaudhuri et. al.2014) shows schematic summary diagram of conflicting schemes of stratigraphic classification by different workers.



Schematic summary diagram of conflicting schemes of stratigraphic classification by different workers.

2.20 Stratigraphy of Penganga Group:

The 'Pern beds' comprising of limestones and shales were first noticed by W.T. Blanford (1866). Houghes.T.W.H (1877) grouped limestone & shale in the Adilabad district under Vindhya's. King (1881) laid the foundation of Purana stratigraphy of the valley, wherein he classified the pre-Gondwana succession in two major unconformity-bound units, the Upper Transition Series and the overlying Sullavai Series. The Upper Transition Series was divided into the lower Pakhal subdivision, and the upper Albaka subdivision. All of the mixed siliciclastic-carbonate rock associations occurring throughout the valley were included in the Pakhal subdivision, whereas the extensive siliciclastic succession of the Albaka Plateau was classified as the Albaka subdivision. The sandy and conglomeratic red beds straddling the western and eastern belts as well as the inliers were classified as the Sullavai Series. A.M. Heron (1949) coined the term 'Penganga series' for the Pern beds occurring between the river Penganga in the north and Godavari river in the south, when he undertook their examination during the years 1940-46 as Special Officer, Geological survey Dept., Hyderabad State of H.E.H the Nizam. The Penganga Group extends across the river into the territory of Maharashtra to its north. Later Heron (1949) pointed out that all of the limestone outcrops of the Pranhita- Godavari Valley (PG Valley) did not belong to the 'Pakhal subdivision'. He grouped the limestone-bearing successions occurring around Mancherla and in the ridges parallel to the Kaddam Fault, north of the Godavari river as the Penganga Series, who further described it as a facies equivalent of the 'Sullavai Series'. Deshmukh.D.S. (1952) grouped the formations under 'Pengangas'. This view was supported by Sreenivasa Rao (1985, 1987) and Chaudhuri et al. (1989), who had

modified the latter as the Penganga Group. However, the correlation of the Penganga and Sullavai series as facies equivalents (Heron 1949) has been rejected by subsequent workers, because of the unconformable relation between the two. Sambasivasarma.T (1969) while carrying out systematic mapping in Adilabad District for the first time, gave detailed lithostratigraphic scheme of the Penganga Group. He divided Penganga Group sediments into two subgroups, lower Yapalagudem subgroup comprising Bhimsari Sandstone, Jamaldri limestone, Toyanguda Shale Formations and upper Jainath Subgroup comprising Goatkur Limestone, Bela Shale Formation. Later Sreenivasa Rao (1985, 1987) identified the 'Penganga Series' rocks as the Taklapalli Arkose–Putnur limestone succession in the Kaddam Ridge, south of the Godavari River. Identification of the Taklapalli Arkose–Putnur limestone succession in a ridge along the Kaddam Fault, near Basantnagar, led Sreenivasa Rao (1985) to conclude that the Penganga Group rocks were disposed structurally above the Mulug Group. Subsequently, the Penganga succession was redefined as the Penganga Group from the area around Adilabad, where the succession rests unconformably above the basement gneisses (Chaudhuri et al. 1985). It comprises mature quartzose sandstone, the Pranhita sandstone, a thick succession of lithographic limestone, the Chanda limestone, and a thick succession of red shale, the Sat Nala shale in ascending order.

Two stratigraphic subdivision of Penganga is given in the below tables which is followed by Geological Survey of India. The earlier accepted stratigraphic sub-divisions and nomenclature given in Table-2.1 was accepted after the "Workshop on standardization of stratigraphic nomenclature of the Precambrian Rock Formations of south India" held at Bangalore in Oct '78 under the Joint auspices of the Geological Society of India and G.S.I. based on the work carried out up to that date. Geological Survey of India after studying classifications given by various workers have come out recently with a stratigraphy of Penganga Group In table-2.2, which is incorporated in the Regional Stratigraphic Index of entire Telangana in 2022.

Table-2.1: Earlier Regional stratigraphy of the Penganga Group in Adilabad area

Lithology	Formation	Sub Group	Group	Age
Black cotton soil, Soil, calcrete & alluvium,				Recent
Pebbly cross bedded Sandstone	Satnala	-	-	Quaternary
Basalts, Trap	Infra-trappean conglomerate/ Sandstone		Deccan Traps	Eocene to Cretaceous
--Uncomformity--				
Grey limestone with interbedded dark grey dolostone	Mangurda Limestone	-	Penganga	Upper Precambrian
-----Fault, Disconformity-----				
Red and green laminated shale	Bela Shale		Penganga	
Grey massive limestone, traversed by quartz veins Light grey limestone with inter bedded chert-jasper(+ manganese) horizons and intra-formational flat pebble boulder conglomerates Red, green, grey limestone/granite- limestone mixtite Pale red flaggy limestone Glauconitic and felspathic sand stone Saorgaon laminated limestone Saorgaon red shale/mudstone	Goatkur Limestone	Jainath		
-----Over step fault-----				
Red and green laminated shale	Toyanguda Shale			Upper Precambrian
Grey flaggy limestone Grey massive limestone with bands of white chert at the bottom Pale red limestone with lenticles of red chert in the middle and bands of white ribbon chert towards top; with intra-formational	Jamaldri Limestone	Yapalagudem		

conglomerates. Yellow and red shale, pyritous at the base				
Sandstone, gritty towards base with rare conglomeratic patches. Pine grained towards top and interbedded with the overlying shale	Bhimsari Sandstone			
-----Non Conformity-----				
Dolerite dyke Pink and grey granite Banded ferruginous quartzite Gneiss-migmatite Enclaves of basic granulite and crystalline megnetite - quartz roc	Peninsular Gneissic Complex – II	-	Peninsular Gneissic Complex	Archaean

Table-2.2:Regional Stratigraphic Classification of Penganga Groupin Adilabad (after GSI, 2022)

Lithology	Formation	Group	Age
Black cotton soil, Soil & alluvium, conglomerate			Recent to Quaternary
Basalts	Trap, Infra-trappean conglomerate/sandstone	Deccan Traps	Eocene to Cretaceous
--Uncomformity--			
Limestone	Putnur	Penganga	Neoproterozoic
Arkose sandstone/ shale	Takallapalli		
Sandstone	Bhimsari		
Limestone	Jamaldhari		
Limestone	Goatkur		
Shale	Toyaguda		
-----Uncomformity----			
Granite and Granodiorite (TGA suite) traversed by quartz/pegmatite veins	Peninsular Gneissic Complex(PGCII)	Basement	Archaean

Thus, geologically, the Adilabad area is occupied by granite and gneiss traversed by quartz/pegmatite veins belonging to Peninsular Gneissic Complex-II (PGCII), arenite, argillite with interbedded carbonate sequence comprising of Penganga Group and basalt flows with infra-trappearns of Deccan Trap. The unmetamorphosed sedimentary beds of Penganga Group

rest non-conformably on the crystalline rocks of PGC-II. Commencing 2 km. to the north of Adilabad, the Penganga strata extend NW-SE as laid bare by the head ward receding limit of Deccan Trap volcanic flows in the valley of the Penganga River The infra-trappean conglomerate and sandstone separates the basalt flows of Deccan Trap from the underlying PGC-II and Penganga Group.

The Penganga Group is considered to be a stratigraphic equivalent of the Kurnool Group. The Penganga Group is essentially an alternate sequence of shale/sandstone and limestone sequence which is divisible broadly into six Formations, namely from bottom up i.) Toyaguda shale ii). Goatkur limestone iii). Jamaldhari limestone iv.) Bhimsari Sandstone v.) Takkallapalli Arkosic sandstone and vi) Putnur Limestone. The manganese ore is invariably associated with Goatkur Limestone Formation. Out of the several jasper horizons distributed throughout the light grey limestone of the Goatkur Limestone formation, only the lowest contains intercalations of manganese. Manganese is considered strata bound with clear stratigraphic control of its occurrence towards the base of the Goatkur limestone. Its occurrence has been established over a strike length of 35 km in the north-eastern limb of the Gauligatbrachyline and its extension in Sheoghat Δ 1067 homocline.

Deccan Trap flows occur over the Penganga beds in the east and the west. Infra-Trappean conglomerate and sandstone are found separating Traps and underlying Penganga limestone and shale. Conglomerates of Quaternary age are found along the river terraces.

2.30 Regional Structure:

The Penganga Formations have a predominant WNE-ESE regional strike with gentle north-north easterly dip (less than 10°). Minor changes in the strike direction and amount of dips are noticed where the beds form antiformal or synformal rolls or where the beds are affected by major faults. Near Gaulighat, Tamsi, Pitarikunta (Pipperkunta), Kanpa-Mangorla the beds show antiformal and synformal rolls. Rolling nature of beds is also seen north of Jamdapur.

The area has been affected by several major and minor faults, causing dislocations and changes in the attitudes of the beds. The fault zones are recognized mainly by features such as breccia zone sand drag-effects etc. Most of the faults are of normal type, and have a general NW-SE or WNW-ESE strike with steep northeasterly hade. Some of the major faults in the areas are

i.)Dhanura-Pitarikunta fault ii.)Chanda-Ramapuram fault and iii.)Kamta-Jamnifault. Effect of faults are seen in the eastern part of Pitarikunta mines; 2 km North of Bheempur; in the area south and south west of Pitarikunta; 1km southwest of Jamdapur; south and east of Chanda in Bheemsari nala; 1 km southwest of Kombajiri and Sheoghat and several other locations. Apart from the above faults several minor N-S, E-W, NW-SE trending normal faults affect the beds in the Goatkur-Guda, Pittarikunta, Jamdapur, Kombajiri and Mangorla areas.

CHAPTER III:

EXPLORATION UNDERTAKEN DURING CURRENT INVESTIGATION

The exploration for manganese ore in Pimperkunta block was carried out by Preliminary Exploration (G-3 stage) over an area of 0.50sq km. Exploration was carried out by way of topographical survey & detailed geological mapping on 1:1000 scale, geophysical survey, pitting, drilling, sampling along with allied laboratory studies with an objective to identify a manganese mineralization which will be the target for further exploration. It will also help in understanding the geometry of the ore body. Exploration was discontinued after G-3 stage as the results obtained did not indicate very encouraging result. Resource for manganese were estimated with data obtained after G-3 exploration. The details of exploration carried out are as under.

3.10 Topographical Survey:

The Pimperkunta block area comprises an area of 0.50sq km or 50 hectares and falls in Survey of India Toposheet No. 56 I/6. Establishment of block corner coordinates by DGPS and preparation of Topographical map of the block was carried out by A Home Consultants Private Limited. The block has been demarcated with the help of **Leica Viva GS14 DGPS**. The base line was fixed parallel to the trend of the exposed manganese old quarry and considering the topographical features. The entire block was surveyed with the help of DGPS instrument using the UTM co-ordinates of the block. Readings were taken on the lease boundary and the RL's were taken on 100 X 100 meters grid. The features like drainage and road were delineated. The data was processed with the help of built-in software. The surface Contour plan of 1: 1000 scale has been prepared. Block coordinates are given along with contour in topographical map in figure-4. The detailed report titled "DGPS Survey Report " prepared by Ahome Consultants Pvt. Ltd, Hyderabad is appended with this report in Appendix-1.

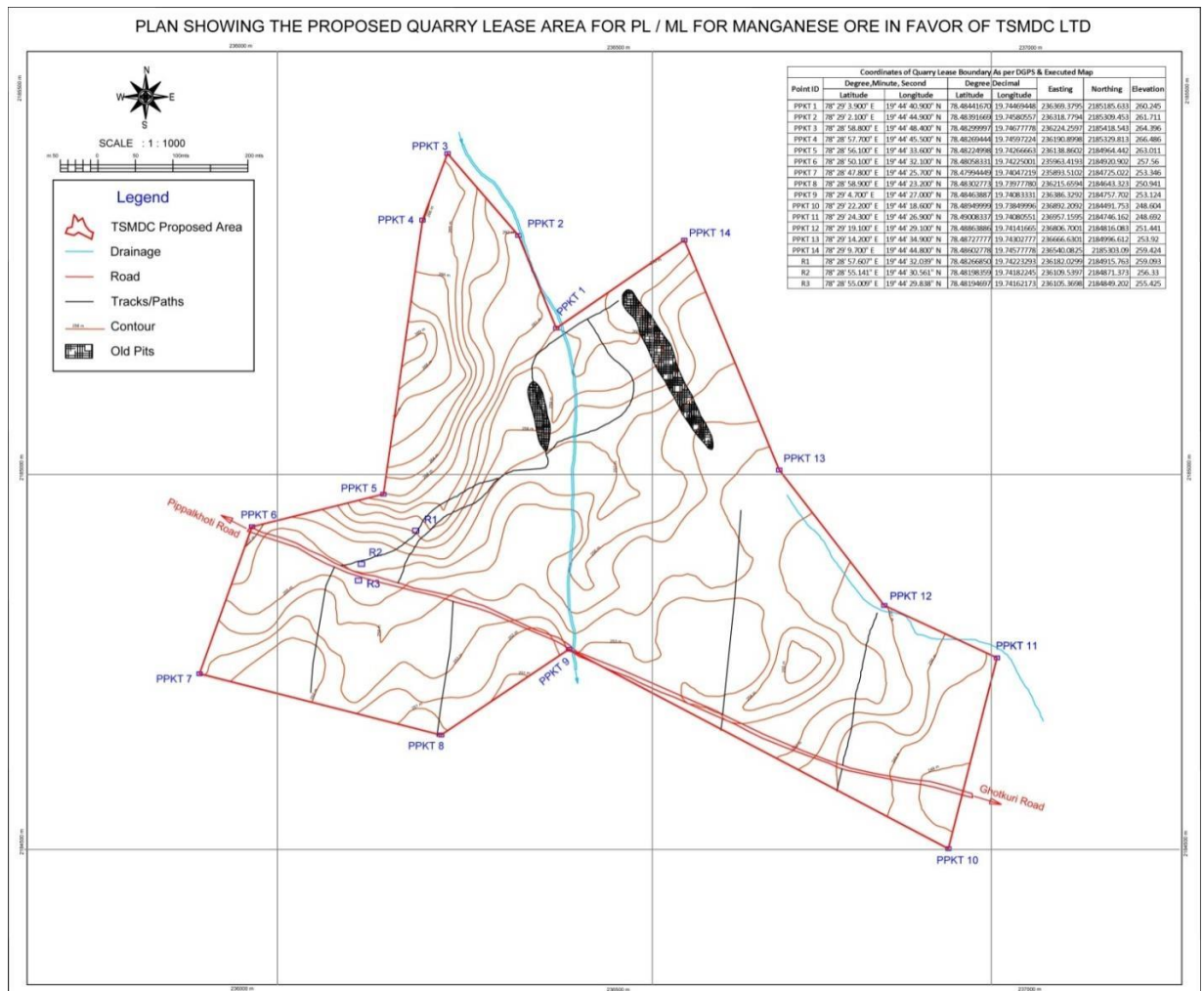


Figure-4: The Surface Contour plan of Pimperkunta Block on 1:1000 scale

3.20 Geology of the Pimperkunta Block

Detailed geological mapping of the Pimperkunta block was carried out on 1: 1,000 scale over an area of 50 Ha.. The base line was fixed parallel to the trend of the exposed manganese old quarry and considering the topographical features. The entire block was surveyed with the help of DGPS instrument using the UTM co-ordinates of the block and hand held GPS. Geological traverses were taken in close interval and outcrops exposed were studied in detail for delineating the manganese mineralized bands. The prepared geological map is shown in Figure-5.

Figure-5A

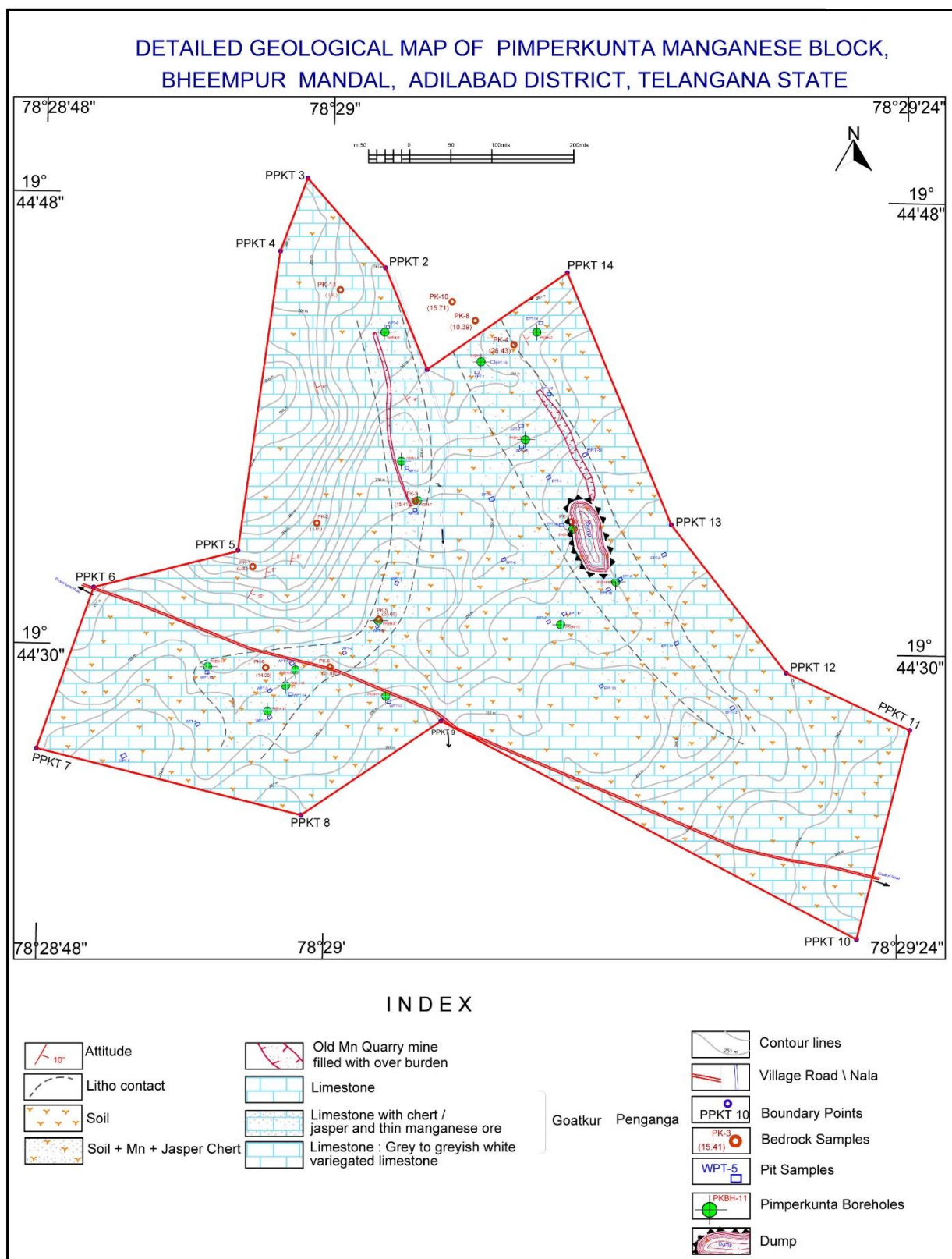
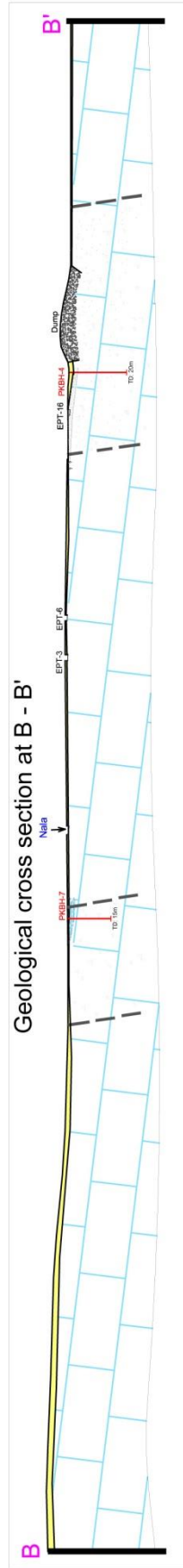
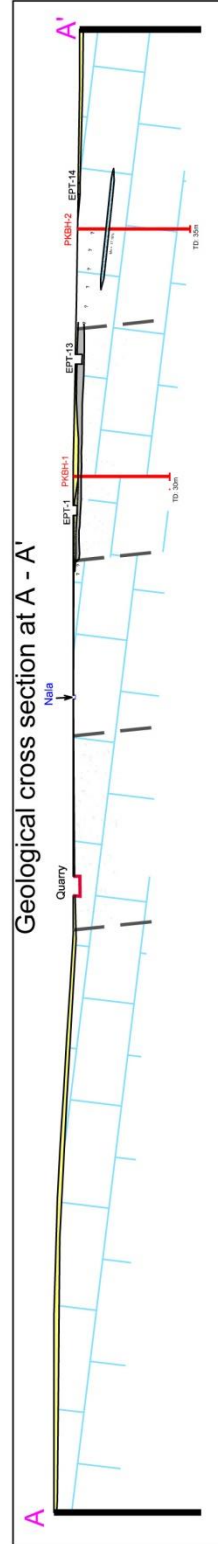


Figure-5B



INDEX

	Soil + Mn + Jasper Chert		Limestone	
	Old Mn Quarry mine filled with over burden		Limestone with chert / jasper and thin manganese ore	
			Limestone : Grey to greyish white variegated limestone	
			Goatkur	Penganga

Most part of the block area is soil covered having scanty outcrop of mostly massive to flaggy limestone, abandoned quarry and quarry dumps of manganese. Siliceous limestone and interbedded two thin manganese body belonging to Goatkur Formation of Penganga Group are the only lithounits encountered in the area. The sub horizontal to shallow dipping disposition of the limestone sequence in the area of investigation indicates that the area has not undergone any major tectonic disturbance. Among the primary sedimentary structures, bedding planes and laminations are common. The secondary structures observed in the area are joints. The generalized strike of the strata is NW-SE with dips varying 4°-9° towards north east to south west. In the southwestern part of the block area limestone along with western manganese band swerves locally to WNW-ESE with moderate dip (7° to 12°) towards south (SSW). In the area the changes in the strike maybe due to synformal rolls in the bed.

The tentative local stratigraphic succession of the area inferred from the exposures during detailed geological mapping and borehole data is given in Table-3.1.

Table-3.1: Local Stratigraphy of the Block area

Age	Group	Formation	Lithology
Recent			Soil/ Alluvium Cover
Neoproterozoic	Penganga	Goatkur	Limestone
			Limestone with chert/jasper and thin manganese body
			Limestone: Grey to greyish white variegated limestone
Basement not seen			

Soil: Most part of the block area is having soil and sporadic dumps of manganese. It occurs as loose cover over limestone with varying depth from 0.00 to 3.00m. It is fine to medium grained, grey to black, clayey at places. The soil occurring in the area is product of weathering of parent rock underneath. The soil near out crop area of manganese ore body is dark grey coloured because of the manganese ore particles.

Limestone: The limestone exposed in the area is light grey to buff colored, fine grained, massive, and compact in nature. It is siliceous and as such may be called siliceous limestone. Strata bound sedimentary low-phosphorus manganese body occurs towards the base of the Goatkur limestone Formation. It is characterized by jasper-chert inter-bands. Manganese bands within limestone is worked opencast by manually at number of places. The ore is in general

steel grey to dull grey in colour and is soft, friable / powdery in nature. The Goatkur limestone has two curvilinear bands of manganese (Eastern and Western bands).

If we observe the geological sections prepared along A-A' and B-B' (Plate-I and Figure-5 B) and interpreted along with the surface, pit and borehole data, it clearly indicates that there are two linear thin manganese mineralized bands of limited strike length and width at shallow depth occurring within limestone unit belonging to Goatkur Formation. There is no indication of the mineralized zone extending along dip also.

3.30 Geophysical Survey

The geophysical magnetic and resistivity surveys have been conducted for identifying manganese ore /mineralization in the Pimperkunta block. The Survey were carried out by Ahome consultants Pvt. Ltd (Ahome), Hyderabad. The Geophysical magnetic and resistivity methods are used to get the detailed information on lithology and structures in the area. Magnetic survey was carried out in entire block area and based on the result resistivity survey was carried out in mostly soil covered south and southeastern part of the area to see the two manganese bands strike and dip extension. The magnetic traverses are taken both in E-W and N-S direction. The resistivity profiling and the soundings are carried out in N-S direction. The detailed report for magnetic survey titled "Magnetic Survey Report for area" and report for resistivity survey titled "Report on Geophysical surveys for Manganese exploration, Adilabad, Telangana " were prepared by A home Consultants Pvt. Ltd., Hyderabad is appended with this report in Appendix- 2.

The magnetic survey is the best method which can provide the information of lateral extents (X & Y) and of third dimension (Z), the depth. Hence, the entire study area is covered by magnetic method in two directions East - West and North - South as the strike trend is not clear. After getting the magnetic survey results it was planned to cover some important portion by Resistivity profiling surveys across the strike and the Vertical Electrical Resistivity sounding at important locations. This Resistivity profiling survey results, not only corroborate the magnetic data, but also provide important locations for Vertical Electrical Resistivity soundings (VES) for obtaining the depth information at those locations. After the integrated interpretation of both magnetic and resistivity survey results that lead to map the possible mineralization for further drilling. For proper interpretation the Resistivity map is overlaid on Magnetic Vertical derivative Map as shown below (Figure-6).

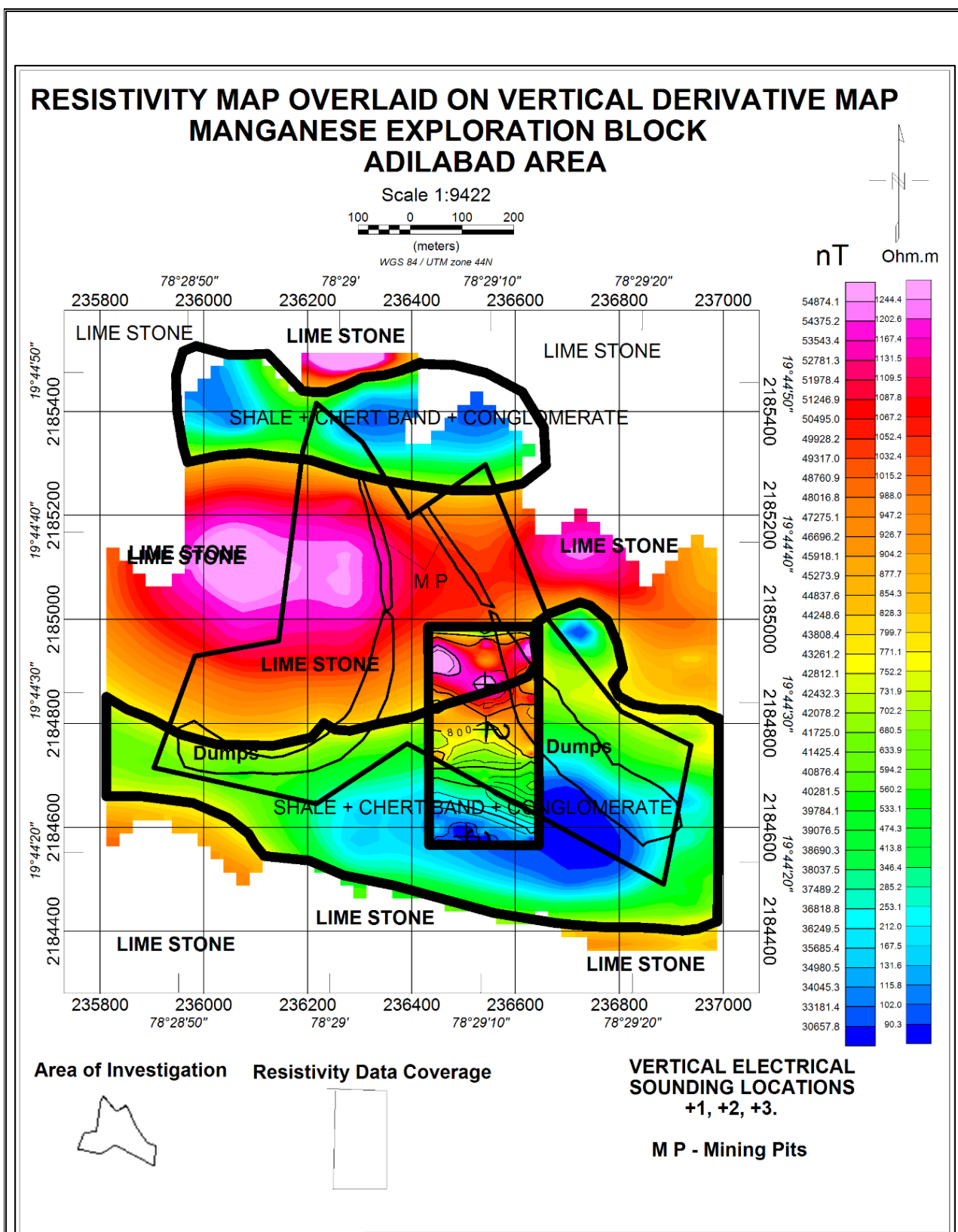


Figure-6 : Resistivity map overlaid on Magnetic Vertical derivative Map

The Resistivity map is corroborating the information inferred from Vertical Derivative Map; It is showing presence of two formations, Limestone and Shale in the study area. The resistivity is high for limestone when compared to shale. This is not only providing the lithological characters, but suggestive for conducting three vertical electrical soundings (VES), one in limestone, one at the contact of limestone and shale and one in shale. Hence three places were selected for VES and shown in the map. The depths at three locations interpreted and tabulated below and compared with standard values (References provided).

The geological interpretation is given below for each formation:

Formation	Thick	Depth
	M	M
Soil, Weathered & Semi-weathered	4.6	4.6
Compact Lime stone	15.1	19.6
very soft layer-shale	3.7	23.4
Moderately Hard Layer-Grey shale	6.5	29.9
Hard layer-Chert Band	3.4	33.3
Moderately Hard Layer-Conglomerate	6.7	40
Compact Lime stone - Band 1	28	68
Compact Lime stone - Band 2	18.8	86.7
Hard layer-Chert Band		

Conclusions and Recommendations:

The recommendations made after the geophysical survey in the blocks are:

1. This area shows of overlapping and repeated sedimentary sequence comprising of limestone and shale.
2. The strike trend is East - West with gentle dips due south.
3. Their lateral extents were mapped using magnetic and resistivity profiling methods and depth estimates were derived using mainly the Vertical Electrical Soundings and also supported by magnetic data.
4. Not only the lateral extents, but also general depth parameters were also derived for all the formations.

5. It appears that the shale is manganiferous, hosting the manganese mineralisation pockets.
6. These surveys have brought out a depth of more than 20 m for shale.
7. Hence, drilling can be taken up at the desired locations up to a depth of 35-40 m as evidenced from VES data. Initially Core drilling may be taken up in the area and the location of drill points should spread all over the formations and at their contacts to establish Mn mineralization in the area.

3.40: Surface Bed rock sampling and Pitting

The block area at many places are covered by manganiferous soil and dumps from earlier quarries/trial pits for winning manganese ore. To get more information for exposed two discontinuous manganese bodies (Eastern and Western bands) within limestone, both surface bed rock sampling and pitting excavation were carried out to know about its strike length and width extension in the block area. Figure-7 & 8 shows surface bed rock sample and Pit locations on geological map.

Bed rock sampling

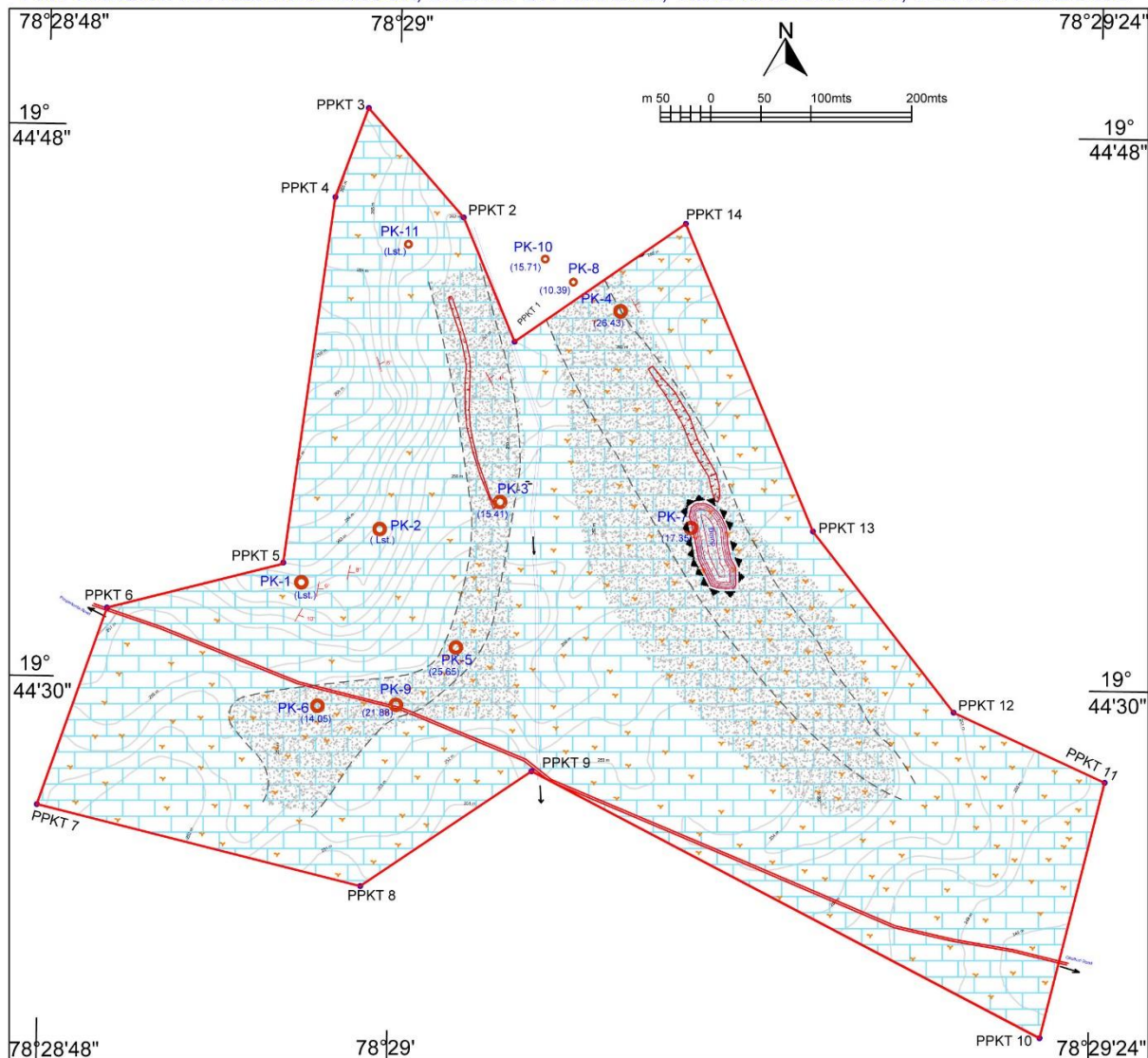
A total of 11 numbers of bed rock samples were collected during detailed mapping for laboratory studies. The details of bed rock samples location along with its analytical results are enclosed in annexure-II.

Pitting

A total of 102 cu. m. of excavation with the help of 33 pits were made based on favorable surface indications. Total of 39 nos. of samples were collected from the pit walls by making a groove. The details of pitting along with its locations, pit log and number of samples collected are given in the table-3.2. The Pit sections are shown in Plate III and Pit samples Location and Chemical Analysis Results are given in annexure-III

**GEOLOGICAL MAP SHOWING THE BED ROCK SAMPLES AT
PIMPERKUNTA MANGANESE BLOCK, BHEEMPUR MANDAL, ADILABAD DISTRICT, TELANGANA STATE**

Figure : 7



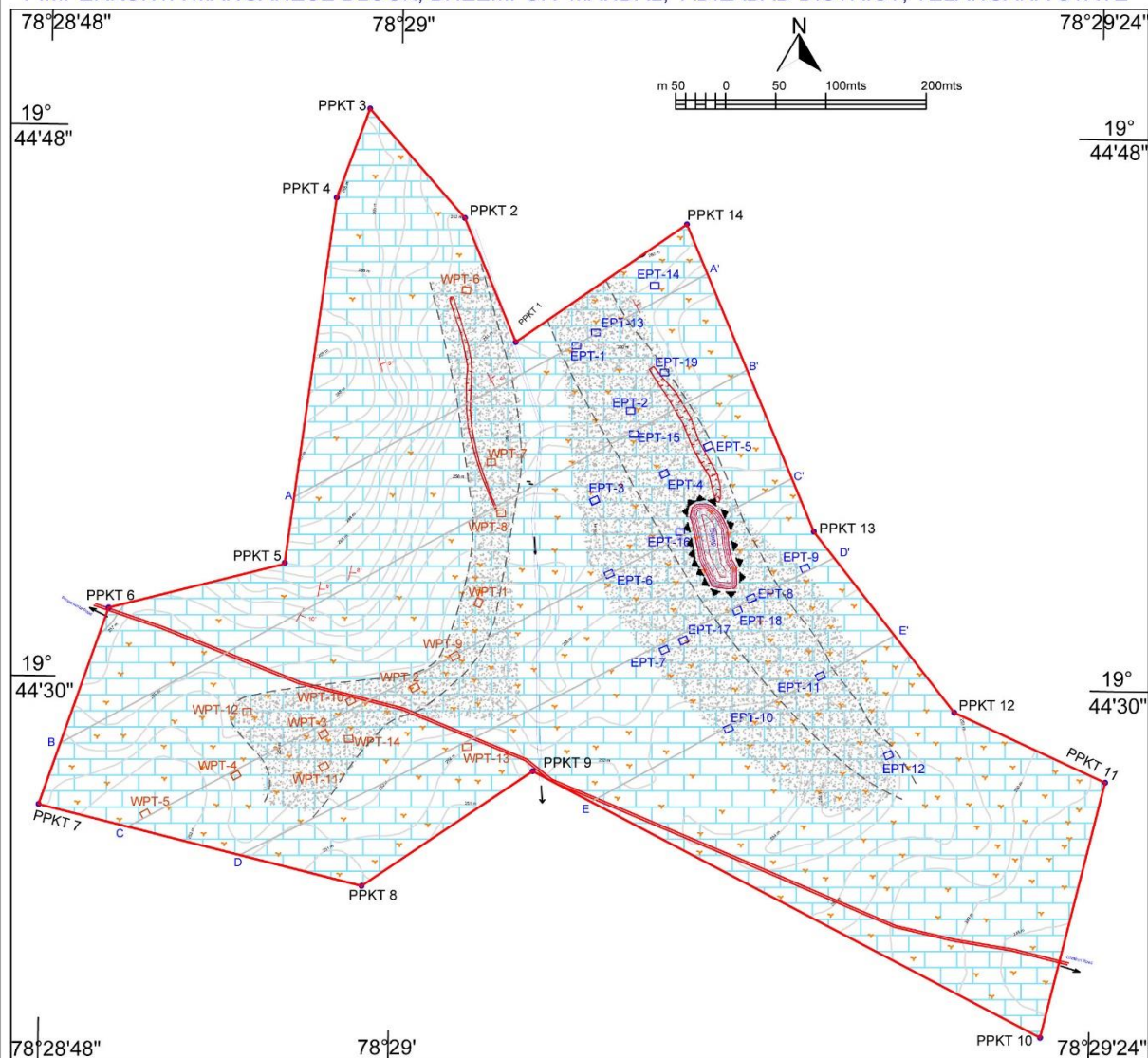
Sample No	Latitude	Longitude
PK-1	19°44'33.00"	78°28'56.73"
PK-2	19°44'34.76"	78°28'59.38"
PK-3	19°44'35.70"	78°29'03.48"
PK-4	19°44'41.97"	78°29'07.50"
PK-5	19°44'30.97"	78°29'02.05"
PK-6	19°44'29.08"	78°28'57.34"
PK-7	19°44'34.95"	78°29'10.02"
PK-8	19°44'42.85"	78°29'05.88"
PK-9	19°44'27.60"	78°28'58.80"
PK-10	19°44'43.59"	78°29'04.90"
PK-11	19°44'43.98"	78°29'02.00"

INDEX

	Soil		Nala
	Soil + Mn + Jasper Chert		Litho contact
	Old Mn Quarry mine filled with over burden		Contour lines
	Limestone		Village Road
	Limestone with chert / jasper and thin manganese ore		Bedrock Samples with Mn. value
			Dump

**GEOLOGICAL MAP SHOWING THE PIT LOCATIONS AT
PIMPERKUNTA MANGANESE BLOCK, BHEEMPUR MANDAL, ADILABAD DISTRICT, TELANGANA STATE**

Figure : 8



INDEX

	Soil		Nala
	Soil + Mn + Jasper Chert		Litho contact
	Old Mn Quarry mine filled with overburden		Contour lines
	Limestone		Village Road
	Limestone with chert / jasper and thin manganese ore		Pit Sample (Eastern side)
			Pit Sample (Western side)
			Dump

Table No.3.2:Pit Location, Pit log and Pit samples collected in Pimperkunta Block

Sl No	Pit No	Location		Dimension		Sample	Logging
		Latitude	Longitude	(LXBXD)	Cu m	Nos	
1	EPT-1	19°44'40.81"	78°29'05.98"	3.5x3.5x1	12.25	1	0 – 0.20m Soil (Manganese soil),
						1	0.20m – 1.0 m Chert+Jasper+Mn bands with limestone
2	EPT-2	19°44'38.72"	78°29'07.86"	3.5x3.5x1	12.25	1	0 – 0.40 Manganese Soil,
						1	0.40m-1.0m Limestone Manganese bands
3	EPT-3	19°44'35.88"	78°29'06.74"	1 x 1 x .9	0.90	1	0 -0.65 m boulders with soil
						1	0.65m-0.90m Limestone with Manganese bands
4	EPT-4	19°44'36.75"	78°29'09.03"	1 x 1 x .8	0.80	-	0-0.60m Soil with limestone boulders
						1	0.60-0.80m Limestone with Manganese bands
5	EPT-5	19°44'37.68"	78°29'10.56"	1 x 1 x 1	1.0	-	0-0.20m Black cotton soil
						1	0.20 -1.00m Limestone
6	EPT-6	19°44'33.48"	78°29'07.19'	1 x 1 x .75	0.75	-	0-0.35m Black cotton soil with limestone boulders
						1	0.35-0.75m Limestone
7	EPT-7	19°44'31.03"	78°29'09.15"	1 x 1 x .85	0.85	-	0-0.30m brownish Soil with boulders
						1	0.30-0.85m Limestone
8	EPT-8	19°44'32.77"	78°29'12.11"	1 x 1 x 1	1.0	-	0-0.50m brownish Soil with boulders
						1	0.50-1.00m Limestone
9	EPT-9	19°44'33.77"	78°29'13.88"	1 x 1 x .80	0.80	-	0-0.35m black cotton soil with Limestone boulders
						1	0.35-0.80m Limestone
10	EPT-10	19°44'28.53"	78°29'11.39"	1 x 1x 1	1.0	-	0-0.60m Brownish soil with boulders
						1	0.60-1.00m Limestone
11	EPT-11	19°44'30.26"	78°29'14.49"	1 x 1 x .50	0.50	-	0-0.35m soil Manganese+ Jasper
						1	0.35-0.50m Limestone
12	EPT-12	19°44'27.76"	78°29'16.83"	1 x 2 x .80	1.60	1	0-0.80m soil+ Manganese+ Jasper
13	EPT-13	19°44'41.17"	78°29'06.25"	3.5x3.5x1	12.25	1	0-0.50m Manganese soil(Sludge) with Manganese+ Jasper
						1	0.50m – 1.00m Manganese+ Jasper
14	EPT-14	19°44'42.53"	78°29'08.29"	3 x 2.5x.6	4.5	1	0-0.60m Black cotton soil+ Lst
15	EPT-15	19°44'38.04"	78°29'08.18"	1 x1.5 x.70	1.05	-	0-0.40m Soil
						1	0.40-0.70m Limestone
16	EPT-16	19°44'34.79"	78°29'10.12"	2 x 1 x .55	1.10	-	0-0.10m Manganese soil

						1	0.10-0.55 Manganese
17	EPT-17	19°44'31.28"	78°29'09.81"	1.5x3x1	4.5	-	0-0.50m Soil
						1	0.50-1.0m Limestone
18	EPT-18	19°44'32.28"	78°29'11.61"	2x1.5x1	3.0	-	0-0.50m Soil
						1	0.50-1.0m Limestone
19	EPT-19	19°44'39.90"	78°29'08.81"	2 x 3 x 1.5	9.0	1	0-1.50m Limestone With Manganese
20	WPT-1	19°44'32.47"	78°29'02.74"	2 x 3 x .75	4.5	-	0-0.40m black cotton soil and Limestone boulders
						1	0.40-0.0.75m Limestone bedrock
21	WPT-2	19°44'29.65"	78°29'0.66"	1 x 1 x 1	1.0	-	0.-0.45m Soil with Manganese+ Jasper
						1	0.45-1.00m Limestone
22	WPT-3	19°44'28.11"	78°28'57.59"	1 x 1 x 1	1.0	-	0-0.40m Black Cotton Soil
						1	0.40-1.00m Limestone?
23	WPT-4	19°44'26.73"	78°28'54.56"	1 x 1 x 1	1.0	-	0-0.55m Black cotton soil
						1	0.55-1.00m Black cotton soil with Manganese+ Jasper
24	WPT-5	19°44'25.45"	78°28'51.49"	1 x 1 x 1	1.0	1	0-1.00m Limestone boulders with black cotton soil
25	WPT-6	19°44'42.31"	78°29'02.18"	1.5 x3 x 1	4.5	-	0-0.20 soil
						1	0.20-1.0m Soil and Limestone with Manganese
26	WPT-7	19°44'36.96"	78°29'03.12"	2 x1.5x 1	3.0	-	0-0.30m Soil
						1	0.30-1.00m Manganese
27	WPT-8	19°44'35.70"	78°29'03.59"	1 x 1.5 x 1	1.50	-	0-0.30m Soil
						1	0.30-1.0m Manganese
28	WPT-9	19°44'38.01"	78°29'08.05"	2 x 1.5 x 1	3.0	-	0-0.20m soil+ Manganese+ Jasper 0.20-0.60m Soil with Limestone
						1	0.60-1.00m Limestone bed rock with Manganese bands
29	WPT-10	19°44'28.93"	78°28'58.58"	1.5 x 3 x 1	4.5	-	0-0.20m Black soil
						1	0.20-1.0m Limestone
30	WPT-11	19°44'27.29"	78°28'57.43"	1 x 1 x .7	0.7	-	0-0.40m Black cotton soil
						1	0.40-0.70 Limestone
31	WPT-12	19°44'29.01"	78°28'54.90"	1 x 1 x .7	0.7	-	0-0.30m Black cotton soil
						1	0.30-0.70 m Manganese
32	WPT-13	19°44'27.73"	78°29'02.41"	1.5 x 3 x 1	4.5	-	0-0.30m Black cotton soil
						1	0.30-1.0m Limestone
33	WPT-14	19°44'27.96"	78°28'58.257'	2x1.5 x .55	1.65	-	0-0.40m Black cotton soil
						1	0.40-0.55m Limestone
				Total	102	39	

3.50: Drilling (Borehole planning, core logging, core sampling)

Borehole planning

The boreholes were planned to intersect two manganese bands (western and eastern bands) taking into consideration the surface indications of manganese occurrences, surface bed rock samples results, pit samples results and geophysical survey results and keeping in mind the density of boreholes to be planned for G-3 stage exploration as per norms of MEMC Rule 2015. Linear quarry is seen from which **manganese band** might have been mined out. **Further east beyond quarry dump, no manganese zone could be seen and limestone exposures are present.** Geophysical survey indicated presence of limestone and shaly horizon in the entire block and further indicated that the shaly horizons seen at the depth of 3.7 to 29.9m can be manganiferous. Geophysical survey could not trace the strike and depth extension of the two manganese bands particularly in south and central part of the area where no surface indications for extension of two manganese band could be seen. As the ore body is tabular in nature having sub horizontal rolling dip, vertical boreholes were drilled.

All together 15 vertical boreholes (7 in Eastern Band and 8 in Western band) were drilled in Pimperkunta block drilled mostly along the strike direction at 60 to 130m interval to prove the strike, dip and depth continuity of the manganese mineralized zone. First borehole PKBH-1 was planned in eastern band in the northern most end of block area and after intersection of manganese mineralized zone, to see the dip-ward extension of mineralized zone borehole PKBH-2 was planned beyond the quarry dump but no manganese zones of significance could be intersected at desired depth. After studying the regional disposition of manganese mineralization in the area and in the adjoining block it was found that the manganese mineralization is confined along strike only for limited width and no dip ward extension of mineralized zone was seen. Hence, no further boreholes were planned to see the dip ward extension and all the boreholes were planned in the two manganese bands to see its strike extension. At the depth where manganese ore was expected to be intersected heavy core loss was seen thus it could not be confirmed whether it is due to washing of soft manganese ore or due to cavity. No sludge could also be collected. Attempt to stop core loss by drilling firm could not succeed.

Boreholes were closed by considering the following assumptions.

- (i) By considering intersection/ completion of mineralized zone in the boreholes.

- (ii) When it has intersected few meters of limestone at such a depth which is correlatable with the footwall rock.

Spacing of bore holes varied from 60m to 130m and depth of boreholes drilled varied from 15m to 35m. The borehole locations are shown in the geological map of the Pimperkunta Block (Figure-9). Details of boreholes drilled in Pimperkunta block are given in table 3.3.

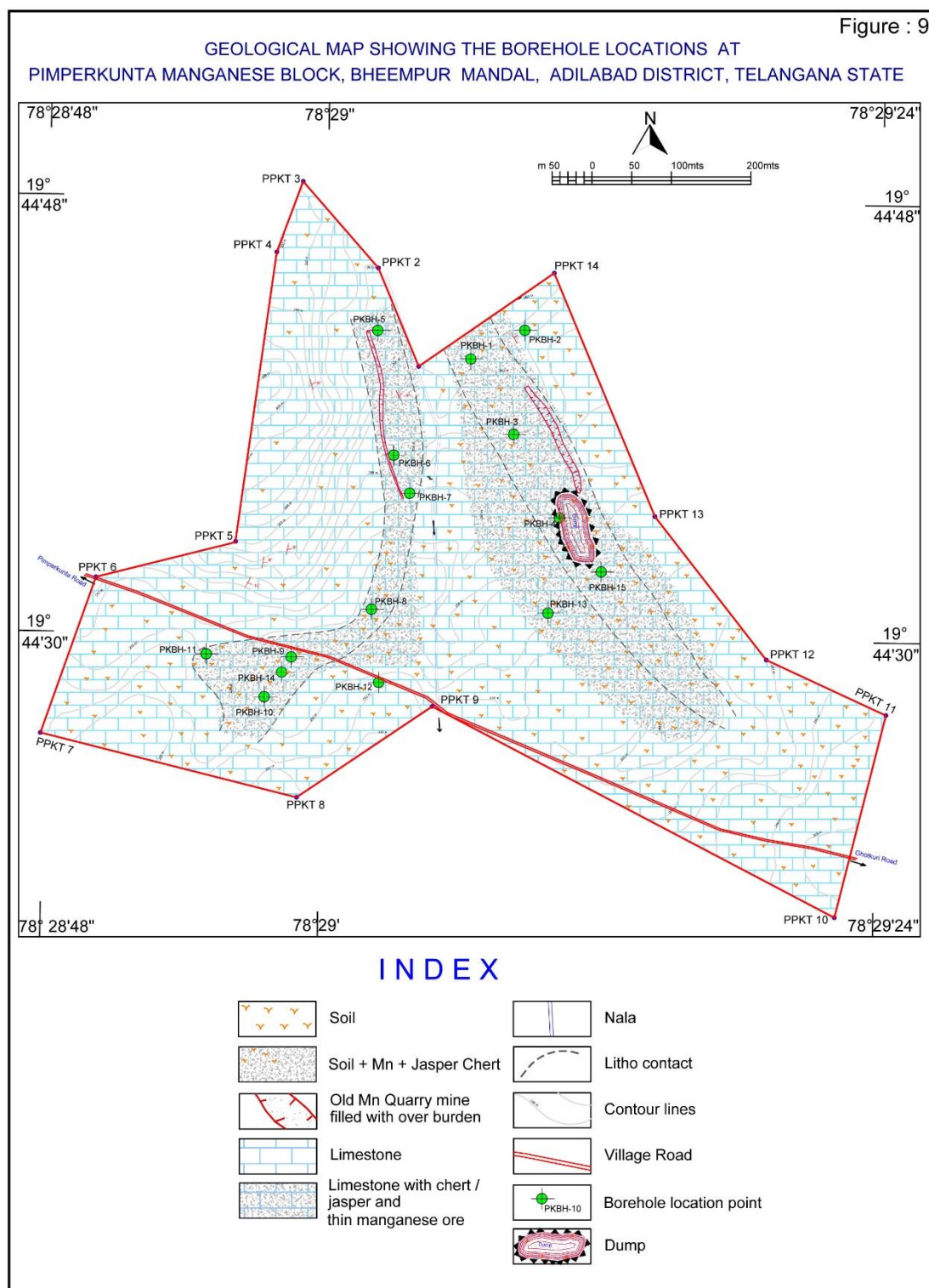


Table-3.3: Details of Borehole drilled in Pimperkunta Block

Sl. No	Borehole No	Location (by GPS)		R.L. of Collar	Azimuth	Type of drill & Core size	Total Depth
		Latitude	Longitude	(m)			(m)
1	PKBH-1	19°44'41.23"N	78°29'06.14"E	261	Vertical	Diamond, NX	30
2	PKBH-2	19°44'42.23"N	78°29'08.46"E	259	Vertical	Diamond, NX	35
3	PKBH-3	19°44'38.17"N	78°29'08.04"E	259	Vertical	Diamond, NX	20
4	PKBH-4	19°44'34.78"N	78°29'10.05"E	257	Vertical	Diamond, NX	20
5	PKBH-5	19°44'42.34"N	78°29'02.11"E	262	Vertical	Diamond, NX	15
6	PKBH-6	19°44'37.25"N	78°29'02.87"E	260	Vertical	Diamond, NX	15
7	PKBH-7	19°44'35.70"N	78°29'03.59"E	259	Vertical	Diamond, NX	15
8	PKBH-8	19°44'30.93"N	78°29'02.01"E	257	Vertical	Diamond, NX	15
9	PKBH-9	19°44'28.93"N	78°28'58.58"E	256	Vertical	Diamond, NX	15
10	PKBH-10	19°44'27.29"N	78°28'57.43"E	255	Vertical	Diamond, NX	16
11	PKBH-11	19°44'29.01"N	78°28'54.90"E	256	Vertical	Diamond, NX	15
12	PKBH-12	19°44'27.95"N	78°29'02.37"E	255	Vertical	Diamond, NX	15
13	PKBH-13	19°44'30.88"N	78°29'09.64"E	256	Vertical	Diamond, NX	30
14	PKBH-14	19°44'28.31"N	78°28'58.17"E	256	Vertical	Diamond, NX	14
15	PKBH-15	19°44'32.60"N	78°29'11.91"E	256	Vertical	Diamond, NX	15
						Total	285

Core Preservation: The core recovered after each run is cleaned thoroughly and were kept in GI core boxes in “Book Pattern” (Photograph -1). Depth of each run was shown with a Marker (Gutka) and arrow was drawn on the cores with marker pen indicating arrow head towards bottom of depth. Core boxes were also labeled indicating the borehole number and depth of cores which were kept in core box. The duplicate half split core after sampling are preserved in the core box. A total of 46 nos. of core boxes are kept at TSMDC Office, Hyderabad



Photograph 1: Photograph showing core box with core kept in “Book pattern”.

Borehole logging

The entire core recovered by drilling was logged systematically in detail describing different lithological units. Depth marking and labeling on the drill-cores were done after each run. Standardized format was used for geological logging. All the boreholes were logged in the field itself and noted down the observations by noting lithological description, percentage of core recovery, colour, or any other notable feature in single drill run.

The summarized lithologs of the boreholes drilled and mineralized zone intersected in different boreholes are given in Annexure- 1 and its graphic lithologs on 1cm= 1m scale with Zone details (Thickness and weighted average grades on the basis of Assay Values) have been given in Plate-IV A to Plate-IV O.

Core recovery percentage:

Core recovery was mostly poor, particularly in manganese mineralized zones and in suspected manganese mineralized zones. Wet drilling with diamond impregnated bit were used. Recovery is often very poor maybe due to heavy water loss and friable soft nature of thin manganese ore. Drilling crew could not control the core loss. The overall core recovery % in each borehole along with the core recovery % in intersected manganese zone and Mn value is provided in table 3.4.

Table-3.4: Overall core recovery % in each borehole along with the core recovery % in intersected manganese zones and Mn Value

BH Number	Total Length	Core recovered	Recovery	Manganese Zone (m)		Thickness	Core length	Recovery	Mn
	(m)	(m)	(%)	From	To	(m)	(m)	(%)	(%)
Eastern Band									
PKBH-1	30	22.85	76.16	0.00	1.50	1.50	Sludge	-	13.32
	30	22.85	76.16	1.50	2.40	0.90	0.55	61	18.05
PKBH-2	35	30.42	86.91	4.40	4.90	0.50	0.35	70	17.16
PKBH-3	20	16.01	80.05	0.00	0.90	0.90	Sludge	-	0.58
PKBH-4	15	11.79	58.95	0.00	1.50	1.50	Sludge	-	10.75
	15	11.79	58.95	1.50	3.00	1.50	1.06	70.66	2.28
PKBH-12	15	08.07	53.80	0.00	0.50	0.50	Sludge	-	0.42
PKBH-13	30	25.65	85.50	0.00	0.50	0.50	Sludge	-	0.42
PKBH-15	15	08.93	52.86	0.00	1.00	1.00	Sludge	-	0.55
	15	08.93	52.86	6.00	7.53	1.53	0.70	45.75	0.76
Western Band									
PKBH-5	15	07.24	48.26	0.00	1.00	1.00	Sludge	-	2.22
	15	07.24	48.26	1.00	2.60	1.60	1.10	69	12.88
PKBH-6	15	12.15	81.00	0.00	0.30	0.30	Sludge	-	2.57
	15	12.15	81.00	0.30	3.00	2.70	2.12	79	11.39
PKBH-7	15	08.31	55.40	0.00	0.50	0.50	Sludge	-	4.22
	15	08.31	55.40	0.50	2.15	1.65	0.75	45.45	3.59
PKBH-8	15	05.82	38.80	0.00	1.50	1.50	Sludge	-	3.47
PKBH-9	15	08.31	55.40	0.00	1.00	1.00	Sludge	-	5.83
	15	08.31	55.40	4.80	6.30	1.50	0.90	60	16.18
PKBH-11	15	08.25	55.00	0.00	0.50	0.50	Sludge	-	5.88
	15	08.25	55.00	0.50	1.50	1.00	0.57	57	1.25
PKBH-14	14	08.76	62.57	0.00	0.50	0.50	Sludge	-	1.12

Borehole deviation test and methodology:

As all the boreholes drilled in the present block were vertical, and are less than 35m depth and the chance of deviation is very less, no deviation test was carried out to determine the deviation of boreholes.

Results of drilling

A total of 15 nos of boreholes were drilled in the Pimperkunta block in the two manganese bands. Out of these only six boreholes showed positive intersections of manganese mineralized bodies.

Eastern Manganese Band: In the Eastern Manganese band a total of seven boreholes (PKBH-1 to 4, PKBH-12, 13 and 15) were planned. Out of 7 boreholes, 3 boreholes (PKBH-1, 2 & PBH-4) have shown positive intersections. Borehole wise intersection details are given below:

Borehole PKBH-1: Borehole was located in the northernmost end of the eastern manganese band. It was planned near to bed rock sample no. (Pk-4) and pit EPT-13/1 to see the depth extension of the manganese mineralization which has given Mn values of 26.43% and 33.74% respectively. It intersected limestone and manganese bands belonging to Goatkur Formation of Penganga Group. It intersected soil/manganiferrous soil (locally called as Chilies) weathered pieces of limestone from 00.00m to 01.50m, manganese band from 01.50m to 2.40m and limestone from 2.40m to 30m depth. The Limestone is light to dark grey in colour, fine to medium grained and massive. The borehole was closed at 30m depth in limestone. Core recovery of entire borehole is 76.16% and in the mineralized zone it is 61%.

Borehole PKBH-2: Borehole was located at 77 m east of PKBH-1 and was planned to see dip-ward extension of manganese mineralization. Pits excavated near PKBH-2 exposed only limestone. Borehole PKBH-2 did not intersect the manganese zone intersected in borehole PKBH-1 at expected depth of 2.0 to 3.50m but intersected limestone traversed by manganese veinlets thus indicating that there is no dip ward extension of manganese mineralization. Borehole intersected mostly limestone. A thin band of light pink coloured manganese+ limestone was intersected from 4.40 to 4.90m. The Limestone is light to dark grey in colour,

fine to medium grained and massive. The borehole was closed at 35m depth in limestone. Core recovery of entire borehole is 86.91% and in the mineralized zone is 70%.

Borehole PKBH-3: Borehole was located at 109m south of PKBH-1 and was planned to see strike-ward extension of manganese mineralization. Pit EPT-2 excavated near the borehole gave manganese value of 2.59%. East of the borehole linear quarry is seen from which manganese band might have been mined out. Further east beyond quarry dump, no manganese zone could be seen and limestone exposures are present. Borehole intersected mostly limestone and no manganese mineralized zone was intersected. It intersected soil, weathered pieces of limestone and manganiferous soil locally called as Chillies from 00.00m to 0.90m and limestone from 0.90m to 20m depth. The Limestone is light to dark grey in colour, fine to medium grained. No manganese mineralization (band) was intersected at expected depth of 1.5 to 3.0 m. Core recovery from 0 to 3.0m depth was 55% and from 3 to 6m, 71%. The borehole was closed at 20m depth in limestone. Core recovery of entire borehole is 80.05%.

Borehole PKBH-4: Borehole was located at 120m further south-south east of PKBH-3 and was planned to see strike-ward extension of manganese mineralization. In Pit EPT-16 excavated near borehole and surface bed rock sample PK-7 gave 16.72% and 17.35% Mn values respectively. East of borehole linear quarry dump is seen from which the Mn might have been mined out. Borehole intersected limestone and limestone with manganese veins. It intersected soil/ manganiferous soil and weathered pieces of limestone from 00.00m to 01.50m, limestone with manganese veins from 01.50m to 3.0m and again limestone from 3.0m to 20m depth. The Limestone is light to dark grey in colour, fine to medium grained and massive. The borehole was closed at 20m depth in limestone. Core recovery of entire borehole is 58.95% and in the mineralized zone it is 70.60%.

Borehole PKBH-12: Borehole was located at 250m SSW of PKBH-4 and 130m SSW of PKBH 14. Based on the Mn value of 1.17% obtained in pit WPT-13 this borehole was planned to see any swing in strike ward extension of manganese mineralization of east band towards SSW and also to see possibility of any connection with western manganese band. The point was also suggested by geophysicist after geophysical survey. Borehole mainly intersected limestone

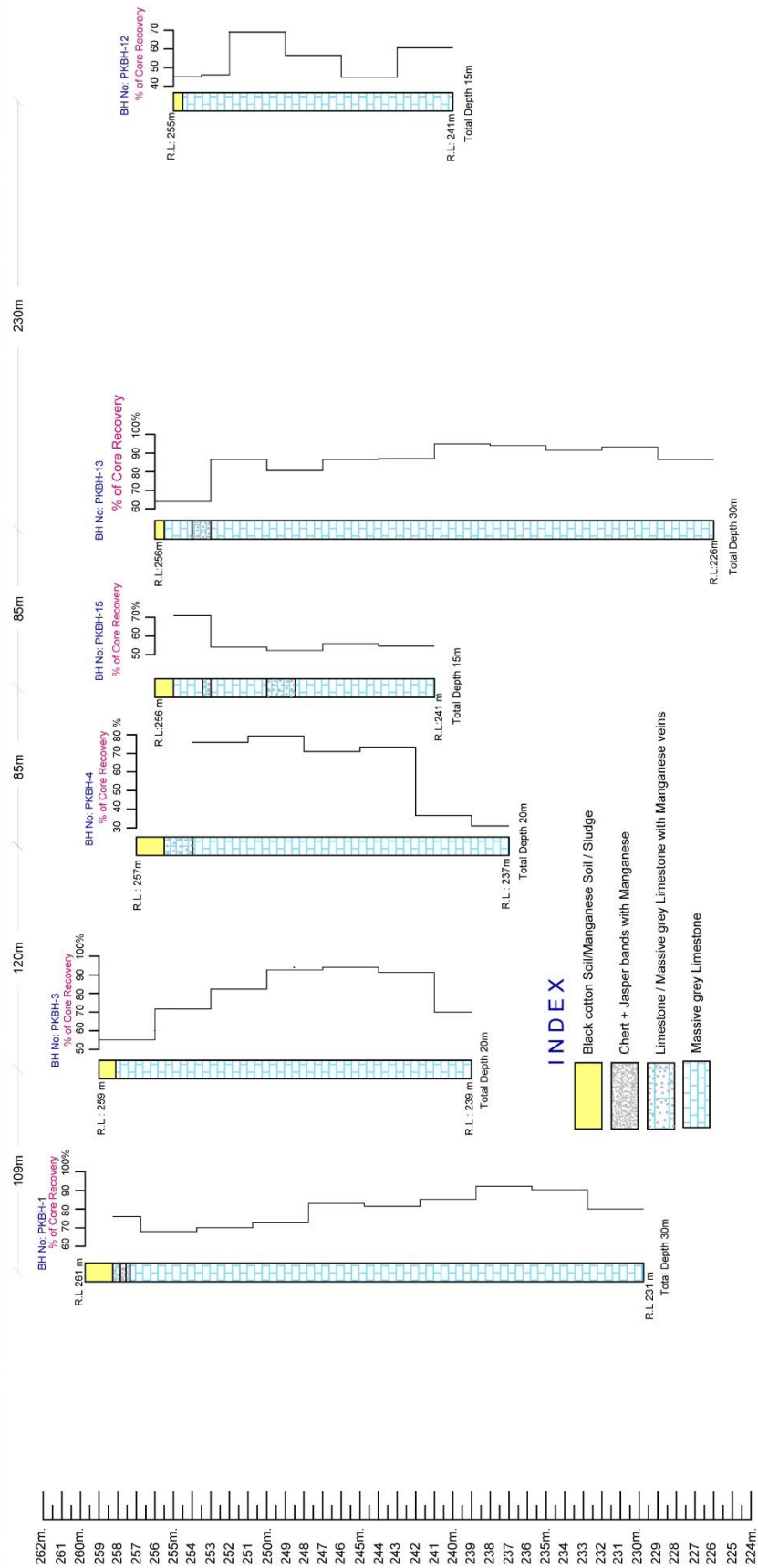
belonging to Goatkur Formation of Penganga Group. It intersected soil, weathered pieces of limestone and manganiferrous soil from 00.00m to 0.50m and limestone from 0.50 to 15m depth. The Limestone is light to dark grey in colour, fine to medium grained and massive. No manganese band was intersected but at the expected depth of manganese intersection between 0.5m to 6m due to core loss the connection could not be established. The borehole was closed at 15m depth in Goatkur Formation. Core recovery of entire borehole is 53.8%

Borehole PKBH-13: Borehole was located at about 120mSSW of PKBH-4 and was planned to see strike-ward extension of manganese mineralization and to check whether any swing in the strike of manganese band is occurring towards SSW, as also suggested by geophysicist after geophysical survey. Borehole limestone intersected soil, weathered pieces of limestone and manganiferrous soil from 00.00m to 0.50m and limestone from 0.50 to 30m depth. The Limestone is light to dark grey in colour, fine to medium grained and massive. No manganese band was intersected but at expected depth of manganese zone between 0.5 and 6m core recovery was 76.3%. The borehole was closed at 30m depth in limestone. Core recovery of entire borehole is 85.50%.

Borehole PKBH-15: Borehole was located at about 85m SSE of PKBH-4 and was planned to see strike-ward extension of manganese mineralization. It intersected mainly limestone It intersected weathered pieces of limestone and manganifeorous soil from 00.00m to 01.00m and limestone from 1.0m to 15m. The Limestone is light to dark grey in colour, fine to medium grained. Borehole did not intersect manganese bands of significance at expected depth of 3m to 9m where core recovery was about 53.16%. Limestone with manganese veins was intersect from 6.0m to 7.53m where core recovery 45.75%. The borehole was closed at 15m depth in limestone. Core recovery of entire borehole is 52.86%.

Telangana State Mineral Development Corporation Limited

GRAPHICAL LITHOLOG OF THE BOREHOLES DRILLED IN EASTERN BAND OF PIMPERAKUNTA BLOCK, BHEEMPUR MANDAL, ADILABAD DISTRICT, TELANGANA STATE



Western Manganese Band: In the western Manganese band a total of eight boreholes PKBH-5 to 11 and 14 were planned. Out of 8 boreholes, 4 boreholes have shown positive intersections. Borehole wise intersection details are given below:

Borehole PKBH-5: Borehole was located in the northernmost end of the western manganese band and intersected limestone with manganese band. Borehole intersected soil, weathered pieces of limestone and manganiferrous soil (locally called as Chillies) from 00.00m to 01.00m, manganese band from 01.00m to 2.60m and again limestone from 2.60m to 15m depth. The Limestone is light to dark grey in colour, fine to medium grained and massive. The borehole was closed at 15m depth in limestone. The manganese zone was intersected from 1.00 to 2.60m depth. Core recovery of entire borehole is 48.26%.

Borehole PKBH-6: Borehole was located 120m south of PKBH-5 to see the southward strike extension of manganese mineralization. Pit WPT-7 excavated near borehole gave Mn value of 9.98%. Borehole intersected weathered pieces of limestone and manganifeorous soil (locally called as Chillies) from 00.00m to 0.30m, manganese band from 0.30m to 3.00m and again limestone from 3.00m to 15m depth. The Limestone is light to dark grey in colour, fine to medium grained and massive. The borehole was closed at 15m depth in limestone Formation. The manganese zone was intersected from 0.30 to 3.00m depth. Core recovery of entire borehole is 81% and in the mineralized zone it is 79%.

Borehole PKBH-7: Borehole was located 120m south of PKBH-6 planned to see the southward strike extension of manganese mineralization. Bed rock sample PK-3 and Pit WPT-8 excavated near borehole gave Mn values of 15.41% and 18.29% respectively. Borehole intersected weathered pieces of limestone and manganiferrous soil (locally called as Chillies) from 00.00m to 00.50m, limestone with manganese veins from 00.50m to 2.15m and again limestone from 2.15m to 15m depth. The Limestone is light to dark grey in colour, fine to medium grained and massive. The borehole was closed at 15m depth in limestone. The manganese zone was intersected from 0.50 to 2.15m depth. Core recovery of entire borehole is 55.40% and in the mineralized zone it is 45.45%.

Borehole PKBH-8: Borehole was located 120m SSW of PKBH-7 to see the west-southward strike extension of manganese mineralization. Bed rock sample PK-5 and Pit WPT-9 excavated near borehole gave Mn values 25.65% and 5.42% respectively. Borehole intersected weathered pieces of limestone and manganiferrous soil (locally called as Chillies) from 00.00m to 01.50 m and limestone from 1.50m to 15m depth. The Limestone is light to dark grey in colour, fine to medium grained and massive. The borehole was closed at 15m depth in limestone. No manganese zone was intersected at expected depth. Core recovery of entire borehole 38.80%.

Borehole PKBH-9: Borehole was located 120m SSW of PKBH-8 to see the west-southward strike extension of manganese mineralization. Bed rock sample PK-6 and PK-9 and Pit WPT-2/1 excavated near borehole gave Mn values 14.05%, 21.88% and 14.69% respectively. Borehole intersected weathered pieces of limestone and manganiferrous soil (locally called as Chillies) from 00.00m to 01.00m, limestone from 1.00m to 4.80m and manganese zone from 04.80m to 6.30m and again limestone from 6.30m to 15m depth. The Limestone is light to dark grey in colour, fine to medium grained and massive. The borehole was closed at 15m depth in limestone. In the manganese zone core recovery was 60% whereas in entire borehole it was 55.4%.

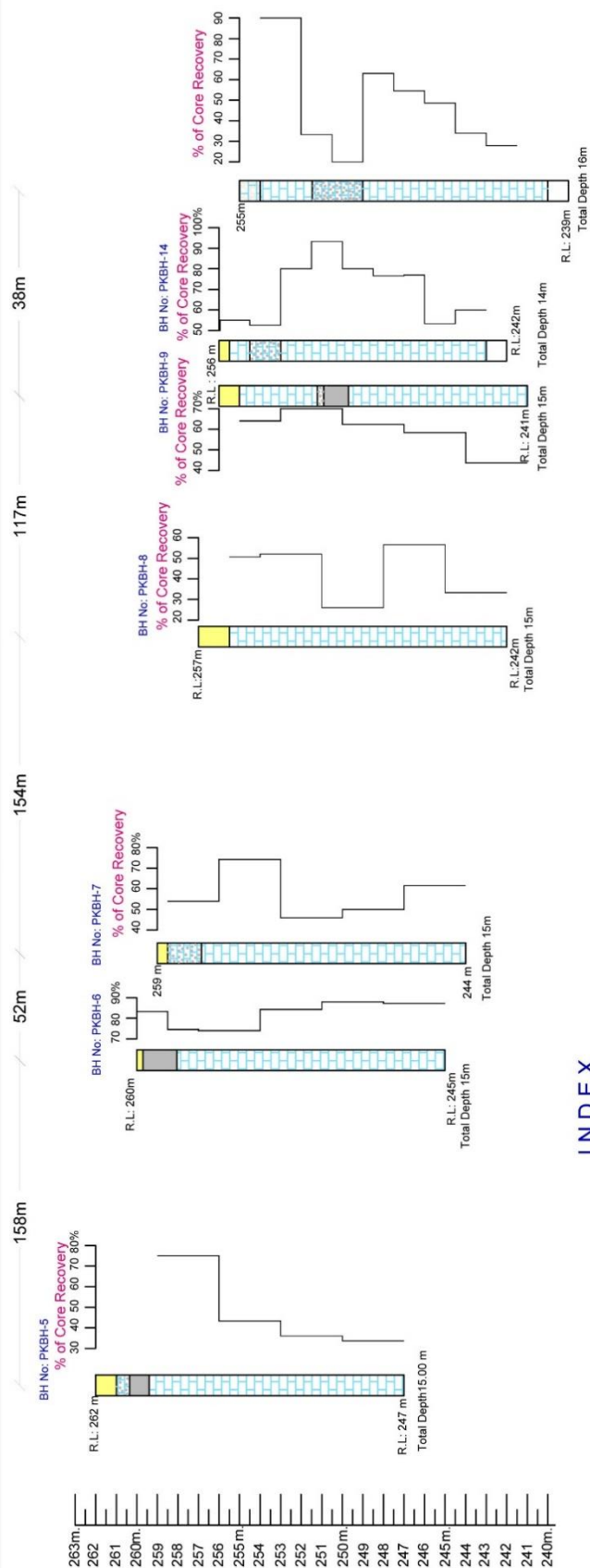
Borehole PKBH-10: Borehole was located 60m south of PKBH-9 to see the strike-ward extension of manganese mineralization southward. It intersected weathered pieces of limestone with manganiferrous soil (locally called as Chillies) from 00.00m to 01.00m, limestone with manganese veinlets from 1.0m to 6.0m and limestone from 6.00m to 16m depth. Manganese mineralized zone expected to intersect at around 4.0m to 6.5m in the borehole could not be intersected. The Limestone is light to dark grey in colour, fine to medium grained and massive. The borehole was closed at 15m depth in limestone. Core recovery of entire borehole was 37.68%.

Borehole PKBH-11: Borehole was located 100m west of PKBH-9 planned to see the width extension of swell zone towards west. Pit WPT-12 excavated near the borehole gave Mn value of 12.71%. Borehole intersected mostly limestone. It intersected weathered pieces of limestone

and manganiferous soil (locally called as Chillies) from 00.00m to 00.50m, limestone with manganese veins/veinlets from 0.50m to 1.50m and limestone from 1.50m to 15m depth. Limestone is light to dark grey in colour, fine to medium grained and massive. The borehole was closed at 15m depth in limestone. Core recovery of entire borehole is 55%.

Borehole PKBH-14: Borehole was located 22m south of PKBH-9 and 38m North of PKBH-10 planned to see the strike-ward extension of manganese mineralization southward. Borehole was planned as core loss in borehole PKBH-10 was more and no manganese mineralized zone intersected in PKBH-9 could be intersected. It intersected weathered pieces of limestone with manganiferous soil (locally called as Chillies) from 00.00m to 0.50m, limestone with manganese veinlets from 0.50m to 3.00m and again limestone from 3.00m to 14m depth. Manganese mineralized zone expected to intersect at around 4.0m to 6.5m in the borehole could not be intersected. The Limestone is light to dark grey in colour, fine to medium grained and massive. The borehole was closed at 14m depth in limestone. Core recovery of entire borehole was 62.57% and in expected mineralized zone it was 53.6%.

GRAPHICAL LITHOLOG OF THE BOREHOLES DRILLED IN WESTERN BAND OF PIMPERAKUNTA BLOCK,
BHEEMPUR MANDAL, ADILABAD DISTRICT, TELANGANA STATE



INDEX

- Black cotton Soil/Manganese Soil / Sludge
- Limestone with Manganese Chert + Jasper bands
- Lime stone with boulders
- Limestone with thin Manganese bands
- Manganese
- Massive grey Limestone

Core Sampling: Initially the suspected manganese mineralized zones were delineated in each drilled borehole cores. These delineated cores were split by using core cutting machine (Photograph -2) to divide the cores longitudinally into two equal halves and one half is preserved for record in the GI core boxes and other half is used for processing the sample. Similarly, one half of the soft ore is taken for processing by dividing it manually. Length of the sample depends upon the changes in the lithology. The sampling length was reduced or increased based on the factors like core recovery in ore zones, total length of ore zones and boundary of ore zones etc.



Photograph -2 : Photograph showing Core cutting machine in operation at field.

3.60 Laboratory Studies

Sample preparation

The samples (Bed rock, pit and core samples) were pulverized to -100 mesh size and three sets of primary samples generated by coning and quartering. One set (Primary sample) was submitted for primary chemical analysis to determine grade of ore. The second set (Duplicate sample) was used for check analysis and preparing composite samples. The third set was preserved at office as reserve for record. Details of samples are recorded in registered. After receipt of the analytical results 10 number of samples from primary samples were selected for conducting check analysis and from samples having Mn value above 10% in the drilled borehole composite samples were collected from the powdered duplicate samples of zones having +10% Mn value.

Chemical analysis

The bed rock, pit and core samples selected from collected samples were chemically analyzed at NABL accredited LUCID laboratory (Annexure-VII) at Hyderabad by IS method. In the present investigation, 11 bed rock, 39 pit, 93 primary core, 10 check core and 5 composite samples were collected and analyzed chemically by IS method in the LUCID laboratory. Certified reference material NMLCRM:66.2B has been used to check precision and accuracy of the analysis (Annexure- VIII). Details of the IS method used for analyzing the radicals are provided in Table-3.5.

Table 3.5: IS method used for the chemical analysis

Sl. NO.	Radicals	IS Method	Instrument used
1	SiO ₂	IS1473	ICP-OES.
2	Mn	IS1473	ICP-OES.
3	Fe ₂ O ₃	IS1473	ICP-OES.
4	P ₂ O ₅	IS1473	ICP-OES.
5	MnO ₂	IS1473	ICP-OES.
6	Insolubles	-	ICP-OES.
7	Specific gravity	IS-1448(P-32)	

Precision of analysis: To check the precision of analysis Mn-1 sample was taken as a test case. 0.2g homogenized samples from Mn-1 were taken in six sets, for the study of precision of the

analysis. The acid digestion treatment was given and each element was analysed in six sets of samples. Besides, Certified Bank Material (CBM) agent is introduced to know the effect of re agents used on analytical signal on the analyzed elements. Standard Deviation & RSD's were calculated for both the Mn-1 sample and for Blanks.

The results were as follows:

Sample Mn-1

Total Mn		Fe ₂ O ₃		P ₂ O ₅		SiO ₂	
1	21.92	1	3.16	1	0.35	1	20.02
2	21.88	2	2.74	2	0.38	2	20.35
3	22.04	3	2.65	3	0.31	3	19.65
4	21.98	4	3.08	4	0.36	4	20.32
5	21.92	5	3.12	5	0.41	5	19.85
6	22.05	6	2.89	6	0.39	6	20.43
Average	21.97	Average	2.94	Average	0.37	Average	20.10
Std Dev	0.0698	Std Dev	0.2131	Std Dev	0.0350	Std Dev	0.3134
Rel Std Dev	0.3	Rel Std Dev	7.2	Rel Std Dev	9.6	Rel Std Dev	1.6

Blanks

Total Mn		Fe ₂ O ₃		P ₂ O ₅		SiO ₂	
1	0.0001	1	0.004	1	0.001	1	0.010
2	0.0003	2	0.002	2	0.001	2	0.005
3	0.0002	3	0.001	3	0.002	3	0.012
4	0.0001	4	0.003	4	0.001	4	0.008
5	0	5	0.001	5	0.001	5	0.006
6	0	6	0.001	6	0.002	6	0.009
Average	0.00	Average	0.002	Average	0.00	Average	0.01
Std Dev	0.0001	Std Dev	0.0013	Std Dev	0.0005	Std Dev	0.0026
Rel Std Dev	100.0	Rel Std Dev	63.2	Rel Std Dev	38.7	Rel Std Dev	31.0

The different samples collected were analyzed for following radicals:

- Primary samples for 6 radicals i.e. Mn, SiO₂, P₂O₅ Fe₂O₃, MnO₂ and Insoluble
- Check samples (10% of Primary) for 6 radicals i.e. Mn, SiO₂, P₂O₅ Fe₂O₃, MnO₂ and Insoluble
- External Check sample (5 %of Primary) for analysis of 6 radicals i.e Mn, SiO₂, P₂O₅ Fe₂O₃, MnO₂ and Insoluble (No analysis carried out)
- Composite Samples for 6 radicals i.e. Mn, SiO₂, P₂O₅ Fe₂O₃, MnO₂ and Insoluble

The received chemical analytical results of the bed rock/pit/core samples are given in Annexure-II, III and IV.

Reliability of Chemical Analysis:

A total of 10 nos of check samples were analyzed. The check samples of cores show a variation of 0.01 to 4.76 in the value of Mn. Out of 10 check samples, 68% samples show difference of less than 1.0, 22% samples show differences between 1.0 to 2.0 and remaining 10% samples show differences from 2.0 to 4.76% in the value of Mn. As chemical variations of primary to check samples analysed at LUCID lab are found to be within the permissible limits, the chemical analysis of primary limestone samples can be taken as reliable for the purpose of calculation of grade of manganese.

The chemical analytical results of primary and the check samples are given in the Table-3.6.

Table-3.6: Primary and Check samples analysis results from Pimperkunta Block

Sample ID	Check Samples						Primary Samples					
	SiO ₂	Mn	MnO ₂	P ₂ O ₅	Fe ₂ O ₃	Insol	SiO ₂	Mn	MnO ₂	P ₂ O ₅	Fe ₂ O ₃	Insol
Mn-1	20.02	22.06	35.07	0.42	3.17	21.67	19.62	21.88	34.27	0.30	2.69	20.82
Mn-2	37.17	18.63	25.11	0.19	2.36	44.76	37.87	18.29	24.77	0.24	2.54	45.49
Mn-3	29.06	33.48	45.86	0.35	3.46	31.92	29.41	33.74	46.23	0.36	3.77	32.58
Mn-4	25.75	24.08	39.17	0.16	1.63	55.11	24.90	23.71	38.61	0.14	1.33	54.00
Mn-5	21.86	24.26	37.26	0.15	1.34	51.04	21.74	24.04	37.51	0.18	1.37	51.24
Mn-6	20.74	25.39	40.86	0.18	1.62	47.68	21.12	26.01	41.23	0.18	1.62	48.15
Mn-7	33.91	24.80	39.27	0.17	2.76	55.83	34.77	25.36	39.01	0.16	2.53	54.91
Mn-8	52.49	11.13	13.87	0.24	6.43	61.66	51.71	10.75	14.08	0.24	6.39	61.19
Mn-9	49.39	13.47	17.39	0.15	5.73	57.84	49.31	13.32	17.33	0.19	6.11	58.19
Mn-10	29.67	26.83	41.82	0.29	1.12	31.72	NA	26.43	42.02	0.26	0.97	31.07

Composite Samples:

A total of 5 numbers of composite samples were collected from primary powdered duplicate core samples. Based on primary samples analytical results first weighted average grade of the mineralized zones analyzing +10% Mn cut-off value was determined from the primary samples chemical analytical results. Once the +10% mineralized zones were identified, composite zones of these zones were prepared from primary duplicate core samples and analyzed. Once the

analytical results of composite samples were received than it was compared with the weighted average grade determined for the zone.

from the delineated above 10% Mn value manganese mineralized zones in the drilled borehole. For the same thickness from where composite sample was collected weighted average grade of the zone from primary samples analytical results values was also estimated to compare it with results of composite samples chemical analysis results.

Comparison of weighted average grade and composite sample analytical results of manganese zones is shown in table-3.7:

Table-3.7: Comparison of weighted average grade and composite sample analytical results of manganese zones

BH. No.	Composite Sample No.	Depth		Composite Samples Result					Weighted average grade				
		From (m)	To (m)	SiO ₂	Mn	MnO ₂	P ₂ O ₅	Fe ₂ O ₃	SiO ₂	Mn	MnO ₂	P ₂ O ₅	Fe ₂ O ₃
PBH-1	PKBH/1/C/1	1.50	2.40	30.90	19.06	29.00	0.19	1.90	29.26	18.05	27.68	0.20	0.96
PBH-5	PKBH/5/C/1	1.00	2.60	36.00	17.91	26.57	0.18	1.17	37.89	12.88	19.78	0.12	0.93
PBH-6	PKBH/6/C/1	0.30	3.00	26.04	18.55	28.34	0.30	2.18	20.19	11.39	13.52	0.09	1.05
PBH-7	PKBH/7/C/1	0.50	2.15	44.17	2.89	4.07	0.15	1.24	41.42	2.17	1.42	0.19	0.53
PBH-9	PKBH/9/C/1	4.80	6.30	44.24	16.40	24.82	0.29	7.27	42.25	16.18	24.26	0.20	6.40

The comparison of weighted average grade estimated and composite samples values are found to mostly comparable and hence the weighted average grade estimated from primary samples values were taken as correct for estimating average grade during resources estimation.

Specific Gravity Determination

Specific Gravity determination for 4 number of core samples on dried air basis has been carried out in NABL accredited LUCID laboratory. The average specific gravity of manganese ore of block is 2.88. Table-3.8 below gives specific gravity values for 4 manganese ore samples. No

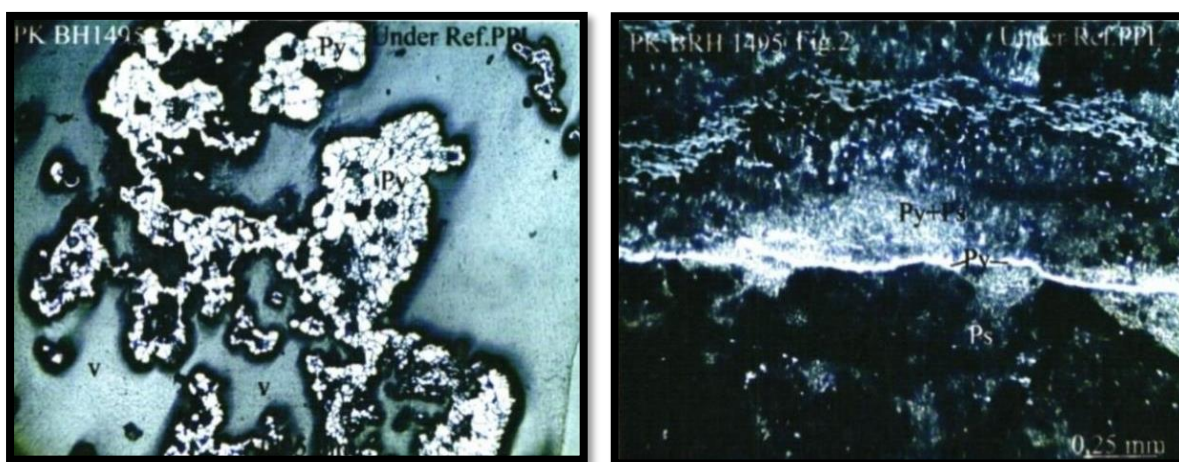
specific test has been done to determine the bulk density of different types and grades of manganese ore.

Table-3.8: specific gravity values for 4 manganese core samples

Sl. No	Sample ID	Specific gravity @30°C
1	PKBH-SPG-1/2	2.95
2	PKBH-SPG-5/4	2.84
3	PKBH-SPG-6/4	3.04
4	PKBH-SPG-9/10	2.72

Petrographic Studies

Petrographical study was carried out for one number of mineralized core sample at Lucid laboratory. In hand specimen the core sample is very fine grained, aphanitic, earthy, with dull luster and soils the hand. Under the microscope it is very fine grained and is essentially made up of fine psilomelane (Ps) grains and some pyrolusite (Py) minerals and fine gangue material, some of which may be carbonate (Photo-.3). The rock is very fine grained to identify other minerals - if any. The core sample is identified as that of a manganese ore.



Photograph 3 : Micro photograph of the Petrographic Study

XRD Studies

Petrographical studies carried out in one sample indicated that host rock of manganese mineralization limestone is very fine grained to identify other minerals and hence X-ray studies to identify individual phases were carried out. A total of 6 powdered core samples sent for primary chemical analysis from boreholes PKBH-1,2,5,7 and 9 were analyzed using XRD at Lucid laboratory, Hyderabad. The mineralogical constituents is shown in table-3.9. Since host rock for manganese mineralization is limestone the mineralogical constituents suggest a typical carbonate rock assemblage of carbonate minerals along with quartz. Less numbers of manganese peaks suggest low abundance manganese minerals.

Over all in all samples tested for X-ray Diffraction contains quartz & calcite major minerals. Ankerite as kutnohorite (Calcium Manganese Carbonate) is present in appreciable quantity (almost as major mineral) in the sample Nos. 7523-1,7523-3, 7523-4 & 7523-5 whereas in the sample No.7523-2 it is present in minor quantity. Psilomelane (Ps) grains and some pyrolusite (Py) manganese minerals identified in petrographical study could not be identified in XRD analysis. The Rutile, Ilmenite & Magnetite minerals are present in minor, traces of all the sample studied. The sample No 7523-6 contains Quartz is the Major Mineral in very high quantity with minor levels of ankerite & magnetite minerals are present. Presence of high quartz in ore indicates manganese ore is siliceous.

Table-3.9: XRD Samples Results

Sl. No.	Sample No/ Ref. No	Bore hole No	Depth (m)	Lithology	Mineralogy			
					Major >30%	Minor 10 to 30%	Traces <10%	Negligible
1	PBH-1/3 7523-1	PKBH-1	1.90-2.0	Powdered core sample of limestone & Manganese	Quartz Calcite, Ankerite (Kutnohorite)	-	Dolomite, Baryte, Ilmenite Rutile, Magnetite, phosphorite	Berlinite
2	PBH-1/3 7523-2	PKBH-1	2.20-2.40	Powdered core sample of limestone & Manganese + chert + jasper	Quartz, Calcite	Ankerite (Kutnohorite), Baryte	Dolomite, Ilmenite Rutile, Magnetite, phosphorite	Berlinite

3	PBH-2/6 7523-3	PKBH-2	4.40- 4.90	Powdered core sample of limestone &+ Manganese	Quartz Ankerite (Kutnohorite)	Calcite, Baryte	Dolomite, Ilmenite Rutile, Magnetite, phosphorite	Berlinite
4	PBH-5/3 7523-4	PKBH-5	1.65- 2.10	Powdered core sample of limestone &Manganese	Quartz Calcite, Ankerite (Kutnohorite)	Baryte, Magnetite	Dolomite, Ilmenite Rutile, phosphorite	Berlinite
5	PBH-9/ 10 7523-5	PKBH-9		Powdered core sample of limestone &Manganese	Quartz Calcite, Ankerite (Kutnohorite)	Magnetite	Dolomite, Baryte, Ilmenite Rutile, phosphorite	Berlinite
6	PBH-7/3 7523-6	PKBH-7	5.50- 6.0	Powdered core sample of limestone &Manganese	Quartz,	Calcite, Ankerite (Kutnohorite) , Magnetite	Dolomite, Baryte, Ilmenite Rutile, phosphorite	Berlinite

CHAPTER- IV:

PIMPERKUNTA MANGANESE MINERALIZATION

4.10: Surface indication of mineralization

Surface indication of manganese mineralization in the block is present in the form of abandoned linear quarries over partly exposed manganese ore bands within limestone, scattered dumps from quarries and manganiferrous soil (locally called as Chillies). The open cast quarries on these bands appears to reach to a depth of maximum 3m. Further the quarries appears to be not continued along dip due to petering out of manganese band. The Pimperkunta block is located S-SW of the Balaji Mines lease area (Fig-3) .

4.20: Mode of occurrence

The manganese ore/ manganiferrous zones occurs as two numbers of curvilinear, lensoidal disjointed bands trending NNW-SSE with sub-horizontal easterly dips. These manganiferrous bands are designated as Western and Eastern bands separated by about 300 m (Avg . distance). The Western band can be traced for an average strike length of 625m with average exposed width of 43m. Similarly, the Eastern band can be traced for an average strike length of 600m with an average exposed width of 70m. Two surface bed rock samples PK-8 & PK-10 taken in the northern strike extension of eastern band outside block boundary gave Mn values 10.39% and 15.71% respectively indicating that the eastern band is extending northwards beyond Pimperkunta block boundary. Thickness persistence of these manganese ores is low and are confined to shallow level in the present explored block, maybe due to the broad antiformal and synformal folds. During mapping, it was noticed that the mineralized manganese areas have been quarried at number of places in linear trenches/pits leaving behind manmade depressions/pits filled with non-mineralized dump material. Samples taken from walls of quarries gave low to medium values for manganese. The mineralized area is approximately 7.70 ha. and non-mineralized area is 42.3ha. The exposed limestone litho-units in the adjoining areas of quarries do not host show any indication of manganese mineralization and based on which the non-mineralized area was deduced.

4.30: Nature and control of Mineralization:

Mineralization of the manganese ore is controlled mainly by stratigraphy and partly by structure. Stratiform manganese ore/mineralization of sedimentary origin occurs interstratified in mostly limestone with or without chert+ jasper bands units belonging to Goatkur Formation of Penganga Group of Neoproterozoic age. Structurally, the disposition is mainly depicted by pinch and swells along the strike. No dip ward extension for considerable length could be traced. Thin manganese ore/ manganiferrous zones occurs as two numbers of curvilinear, lensoidal disjointed bands within limestone unit at shallow depth. It is also characterized by jasper-chert-manganese inter bands. Manganese mineralization is un-metamorphosed and unaltered retaining its original syngenetic characters.

4.40: Mineralogy of Ore zone:

Megascopically manganese ore zone predominantly comprises grey to dark grey, soft and friable powdery manganese ore. It is very fine grained, aphanitic, with dull luster and soils the hand. Under the microscope the manganese ore is very fine grained and is essentially made up of fine psilomelane (Ps) grains and some pyrolusite (Py) minerals and fine gangue material (Photograph No. 3) some of which may be carbonate. The rock is very fine grained to identify other minerals.

XRD studies of 6 powdered core samples shows that since host rock for manganese mineralization is limestone the mineralogical constituents suggest a typical carbonate rock assemblage of carbonate minerals along with quartz. Less numbers of manganese peaks suggest low abundance of manganese minerals. Over all in all Samples tested for X-ray Diffraction Contains Quartz & Calcite as major minerals. Ankerite as Kutnohorite (Calcium Manganese Carbonate) is found in appreciable quantity. Psilomelane (Ps) grains and some pyrolusite (Py) manganese minerals identified in petrographical study could not be identified in XRD analysis. The Rutile, Ilmenite& Magnetite minerals are present in minor or as traces in all the sample studied.

4.50: Details of ore zones intersected and its Correlation

The details of the manganese mineralization intersected in the boreholes along with core loss is given in Table-4.1.

Table-4.1: Details of the manganese mineralization intersected in the boreholes along with core loss

BH Number	Total Length	Core recovered	Recovery	Manganese Zone (m)		Thickness	Core length	Recovery	Mn
	(m)	(m)	(%)	From	To	(m)	(m)	(%)	(%)
Eastern Band									
PKBH-1	30	22.85	76.16	0.00	1.50	1.50	Sludge	-	13.32
	30	22.85	76.16	1.50	2.40	0.90	0.55	61	18.05
PKBH-2	35	30.42	86.91	4.40	4.90	0.50	0.35	70	17.16
PKBH-3	20	16.01	80.05	0.00	0.90	0.90	Sludge	-	0.58
PKBH-4	15	11.79	58.95	0.00	1.50	1.50	Sludge	-	10.75
	15	11.79	58.95	1.50	3.00	1.50	1.06	70.66	2.28
PKBH-12	15	08.07	53.80	0.00	0.50	0.50	Sludge	-	0.42
PKBH-13	30	25.65	85.50	0.00	0.50	0.50	Sludge	-	0.42
PKBH-15	15	08.93	52.86	0.00	1.00	1.00	Sludge	-	0.55
	15	08.93	52.86	6.00	7.53	1.53	0.70	45.75	0.76
Western Band									
PKBH-5	15	07.24	48.26	0.00	1.00	1.00	Sludge	-	2.22
	15	07.24	48.26	1.00	2.60	1.60	1.10	69	12.88
PKBH-6	15	12.15	81.00	0.00	0.30	0.30	Sludge	-	2.57
	15	12.15	81.00	0.30	3.00	2.70	2.12	79	11.39
PKBH-7	15	08.31	55.40	0.00	0.50	0.50	Sludge	-	4.22
	15	08.31	55.40	0.50	2.15	1.65	0.75	45.45	3.59
PKBH-8	15	05.82	38.80	0.00	1.50	1.50	Sludge	-	3.47
PKBH-9	15	08.31	55.40	0.00	1.00	1.00	Sludge	-	5.83
	15	08.31	55.40	4.80	6.30	1.50	0.90	60	16.18
								-	
PKBH-11	15	08.25	55.00	0.00	0.50	0.50	Sludge	-	5.88
	15	08.25	55.00	0.50	1.50	1.00	0.57	57	1.25
PKBH-14	14	08.76	62.57	0.00	0.50	0.50	Sludge	-	1.12

Correlation: The correlation of boreholes along strike and dip for western and eastern manganese bands has been attempted from the available borehole data which are shown in graphical lithologs in Plate No-IV -. The basis of certain assumptions for correlations are given below.

1. The geology intersected in boreholes continues to adjacent boreholes.
2. The manganese zones intersected in two successive boreholes along strike are correlatable zones

3. The core loss encountered in boreholes at the anticipated manganese intersection depths in adjacent boreholes are considered as continuity of the manganese zones

The manganese (ore) zones intersected in one borehole is not intersected in the other adjoining borehole in strike direction, though the lithology or host rock is correlatable. This may be due to considerable core loss seen at these expected depth of ore zone intersection

Delineation of Mn Mineralized zone above 10% for Resources Estimation purpose:

Resource has been estimated for all positive boreholes in which delineated manganese mineralized zones are above threshold value which is >10% Mn. The weighted average method are followed to obtain the average grade of manganese zone.

Weighted average calculation method: Overall grade of manganese mineralized zone above 10% Mn intersected in each borehole is determined from primary sample analytical results values by weighted average method. In this method, the length of each sample, generated from a particular manganese zone is multiplied with corresponding percentage (%) value of Mn taken from primary chemical analysis results. Then, sum of all the products is divided by the total length of all the samples from the mineralized zone to arrive at weighted average of that particular zone using the formula given below:

$$\frac{(A \times X \text{ Mn\%}) + (B \times Y \text{ Mn\%}) + (C \times Z \text{ Mn\%})}{A+B+C}$$

Where A, B, C = Length of individual sample and X, Y, Z = Value of Mn% of respective samples. The mineralized zones in boreholes which are above threshold values along with its weighted average grade are given in Table No. 4.2

Table No. 4.2. Details of the +10% Mn Zones intersected in boreholes in the Pimperkunta Block

Sl. no	Borehole Number	Mn Mineralized Zone (m)		Thickness (m)	Core Recovery (%)	Weighted Avg. Grade (Mn%)
		From	To			
Eastern Manganese Band						
1	PKBH-1	1.50	2.40	0.90	61	18.05
Western Manganese Band						
1	PKBH-5	1.00	2.60	1.60	69	12.88
2	PKBH-6	0.30	3.00	2.70	79	11.39
3	PKBH-9	4.80	6.30	1.50	60	16.18

CHAPTER- V :

RESOURCE ESTIMATION AND REPORTING OF RESOURCES

Resource has been estimated for all positive boreholes which intersected manganese mineralized zones above Threshold value for manganese notified by IBM.

Sufficiency of Data: In Pimperkunta block manganese is of bedded stratiform and tabular type deposit of irregular habit. Boreholes were drilled at 80m to 100m interval along strike which is in conformity with the boreholes to be drilled in G-3 stage investigation as per MEMC Rule (amended) 2021. Thus the data available is sufficient for estimating resources as per G-3 stage of exploration. The strike and depth extension of ore zone is considered from the direct intersection of ore zone in boreholes drilled and appropriate correlation of the ore zones along strike and dip for the calculation of resource.

Assumptions and Parameters Considered for Resource Estimation:

With a view to estimate the resource of the manganese deposit the following main assumptions and parameters were considered.

- a. Cut off consideration: Resources have been calculated for the ore with manganese values of +10% Mn. Threshold value specifications notified by IBM is taken as cut off which is 10% minimum Mn.
- b. Values with less than 10% Mn but occurring continuously with richer zones have also been included in the calculations wherever possible provided the overall weighted average of the combined zone is above 10% Mn.
- c. For resource estimation area of influence method was used.
- d. The rule of gradual change or law of linear function has been applied along with the rule of nearest points for application of influence of halfway between successive boreholes.
- e. The boreholes which did not intersect any mineralisation have been considered as negative boreholes and completely eliminated from reserve and resource estimation.

- f. As the block boundary is irregular in outline, the area near to the boundary where the influence of the boreholes is beyond the permissible limit is excluded from the resource calculation.
- g. The thickness and grade of Mn measured in each borehole as per the borehole intersection has been considered to be uniform throughout the area of influence of the particular borehole panel.
- h. The manganese mineralization is considered to be of uniform characteristics throughout the volume of a particular grade.
- i. Average specific gravity is taken as 2.88, as estimated from the borehole cores
- j. Recovery Factor: The ore bearing horizons intersected in the drill holes are seldom with 100% recoverable ore and was always less than 60%. Very often thin lenses of ore zones are inter-banded with thin shale, chert and jasper etc. The percentage of the recoverable ore from the total thickness of the ore column is the % "Recovery factor" or "Mineralization factor" which is used to compute the quantity of the recoverable ore for the deposit. The average core recovery percentage in the positive boreholes for which block panel is prepared and resource estimated is taken as Recovery factor.

Method of Resources Estimation

Borehole Influence Method

In view of bedded, sub horizontal, discontinuous lensoid nature of manganese mineralization and with no evidence of dip-ward extension of manganese mineralization the resource estimation of manganese resource in Pimperkunta block area was carried out only by borehole influence area method in respect of the areas explored by drilling. The influence area for resource estimation has been considered in accordance with the drilled borehole locations.

Preparation of Block Panels:

For purpose of resource estimation by borehole influence area method was used. Block panels were prepared keeping the positive holes at the center of the block with influence on all sides as per the intersection in next borehole. Lateral influence of the panel is up to the Pimperkunta block boundary or to the midway of the manganese mineralization seen in adjoining boreholes or in excavated pits along the strike and width. If adjoining borehole is negative borehole,

about 25m of influence is taken for drawing the block panel (Figure-10). After drawing the block boundary, the area of each block was estimated by computer using AUTOCAD software. A total of 4 panel blocks were prepared around positive boreholes giving more than 10% MnO grade – one panel around borehole PKBH-1 (area 3737 sq m) in Eastern band and three panels around boreholes PKBH-5 (area 5191 sq m) , PKBH-6 (area 4612 sq m) , PKBH-9 (area 3343 sq m) in western band.

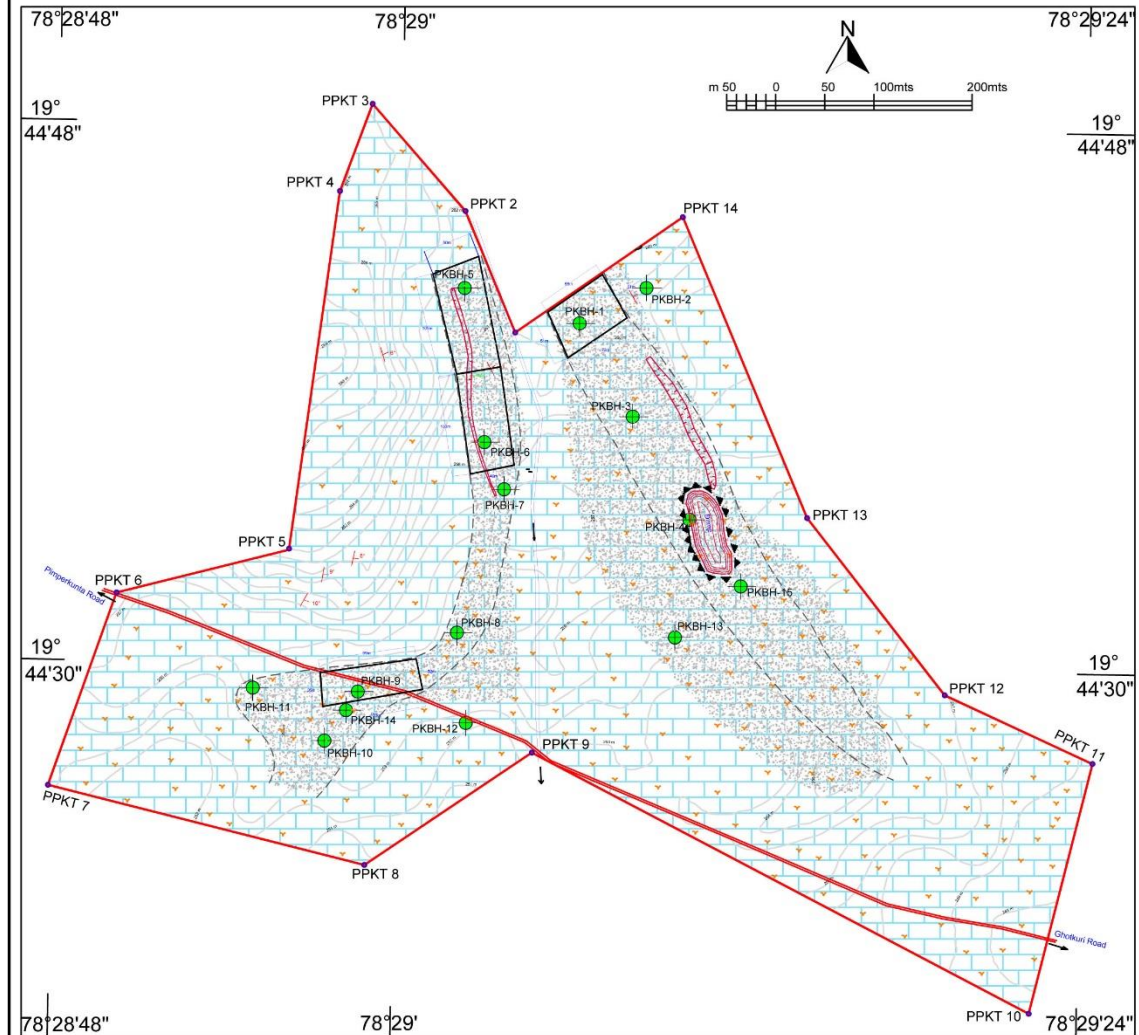
Details of Panel dimension around each borehole for which Resource is estimated are provided in Table-5.1

Table No.5.1 Details of Panel dimension around each borehole for which Resource is estimated

BH No	Panel No	Panel dimensions		Panel area (sq m)
		Length (L)	Width(W)	
PKBH-1	A	52	71.87	3737
PKBH-5	B	110	47.19	5191
PKBH-6	C	102	45.22	4612
PKBH-9	D	101	33.10	3343

BOREHOLE INFLUENCE MAP OF PIMPERKUNTA MANGANESE BLOCK,
BHEEMPUR MANDAL, ADILABAD DISTRICT, TELANGANA STATE

Figure : 10



INDEX

	Soil		Nala		Borehole location point
	Soil + Mn + Jasper Chert		Litho contact		Borehole influence area
	Old Mn Quarry mine filled with overburden		Contour lines		
	Limestone		Village Road		
	Limestone with chert / jasper and thin manganese ore		Dump		

Formula used or borehole influence method:

In this method also, the volume of the panel area has been calculated by considering the assumption given above. Volume of panel= S x T, Where S = Area of panel, T= Thickness of manganese zone intersected in borehole. Resources have been estimated by the formula Resource of one panel $R = V \times Bd \times Sp.gr \times R.F. = S \times T \times Sp.gr. \times R.F.$ Where Sp. Gr.= Specific Gravity, R.F.= Recovery Factor, R = Resource of one Panel, Resource of total panel = RE = R1 + R2 + R3Rn. The Table No. 5.2 gives details of resource estimation chart by Borehole Influence Method in Pimperkunta Block.

Table No. 5.2 :Resource Estimation Chart by Borehole Influence Method in Pimperkunta Block

BH No	Panel Block	Mineralized Zone (m)		Thick ness	Panel Area	Volume	Sp. Gr	Gross Resources	R.F.	Net Resources
	No	From	To	(m)	(Sq m)	(Cu m)		(Tonnes)	(%)	(Tonnes)
Eastern Band										
PKBH-1	A	1.50	2.40	0.90	3737	3363	2.88	9686	61	5908
								Σ = 9686		Σ =5908
Western Band										
PKBH-5	B	1.00	2.60	1.60	5191	8305	2.88	23918	69	16503
PKBH-6	C	0.30	3.00	2.70	4612	12452	2.88	35862	79	28331
PKBH-9	D	4.80	6.30	1.50	3343	5014	2.88	14440	60	8664
								Σ = 74220		Σ =53498
						Total Net Resources in block= 59406tonnes				

Thus total net resources in both the manganese band in Pimperkunta Block is 59,406 tonnes.

Average Grade Calculation:

Average grade of Manganese of each mineralized zone in the block is estimated by multiplying the weighted average grade of borehole of each panel with its resources and then by summing it and then dividing it with sum of estimated resources of each panel. The table No. 5.3 gives details of average grade estimation chart for Pimperkunta Block.

[Formula: Average Grade= $\sum (\text{Net Resources} \times \text{wt. Av. Gr}) / \sum (\text{Net Resources})$]

Table No. 5.3: Average Grade estimation chart for Pimperkunta Block

Panel block no	Borehole No	Net Resources (Tonnes)	Wt. Average Grade (Mn%)	Resources x wt. Av. Gr
Eastern Band				
A	PKBH-1	5908	18.05%	106639
		$\Sigma = 5908$		$\Sigma = 106639$
		Average Grade of Eastern Band = $106639 / 5908 = 18.05\% \text{Mn}$		
Western Band				
B	PKBH-5	16503	12.88 %	212559
C	PKBH-6	28331	11.39 %	322691
D	PKBH-9	8664	16.18 %	140183
		$\Sigma = 53498$		$\Sigma = 675433$
		Average Grade of Western Band = $675433 / 53498 = 12.62\% \text{Mn}$		
		Total Average grade of two bands = 13.16% Mn		

Table No. 5.4. Table Showing average grade of SiO₂, CaO, MgO, P₂O₅, Fe₂O₃ and Insolubles in the zones manganese zones for which resources is estimated

Sl. no	Borehole Number	Mn Mineralized Zone (m)		Thick ness (m)	SiO ₂ %	CaO %	MgO %	P ₂ O ₅ %	Fe ₂ O ₃ %	Insolub les %
		From	To							
Eastern Manganese Band										
1	PKBH-1	1.50	2.40	0.90	29.26	-	-	0.16	1.23	51.44
Western Manganese Band										
1	PKBH-5	1.00	2.60	1.60	37.89	-	-	0.12	1.58	52.45
2	PKBH-6	0.30	3.00	2.70	29.28	-	-	0.27	1.05	40.95
3	PKBH-9	4.80	6.30	1.50	42.26	-	-	0.20	8.01	62.98

Reporting of resources

Considering the technological inputs discussed above and the data obtained after carrying out G-3 stage of exploration, the resource estimated above may be categorized as of inferred resources (333) as per MEMC Rules 2015/2021/ UNFC 1996. Thus total inferred resources of manganese ore in both the manganese band is 59406tonnes with an average grade of 13.16%.

[Limitations: The estimation of the resource is dependent on the Possibility of creeping errors in the final adjustment of core thickness in case of poor recovery.]

CHAPTER –VI :

CONCLUSION AND RECOMMENDATION

1. Preliminary exploration (G-3 stage) in the block was carried out to examine the extension of manganese mineralization along strike and dip.
2. Geologically, the Pimperkunta block area comprise of sediments of Goatkur Formation belonging to Penganga Group. Goatkur Formation comprises lower limestone unit interbedded with manganese, manganese+jasper+chert bands and upper limestone and shaly limestone. Basement rock are not exposed in the block.
3. The sub horizontal to shallow dipping disposition of the limestone sequence in the area of investigation indicates that the area has not undergone any major tectonic disturbance. Limestone exposed in the block trend in NNW-SSE direction with sub-horizontal dip of 5° to 15° towards east. In the southwestern part of the block area the strike locally swerves to WNW-ESE with moderate dip (7° to 12°) towards south.
4. Surface indication of manganese mineralization in the block is present in the form of partly exposed thin manganese bands within limestone and scattered dumps of manganiferous soil locally called as Chillies. Thin manganese zone within limestone is characterized by jasper+chert+manganese inter-bands occurring as two curvilinear, lensoidal disjointed bands trending in NNW-SSE with sub-horizontal easterly dips. Manganese mineralization shows patchy pinch & swell nature along strike.
5. These manganiferous bands are categorized into Western and Eastern bands respectively. The Western band can be traced for an average strike length of 625m with average exposed width of 43m. Similarly, the Eastern band can be traced for an average strike length of 600m with an average exposed width of 70m. Thin manganiferous bands occur at shallow depth with limited depth extension. The manganiferous bands have been quarried at number of places and the dumps of the quarries are scattered. The open cast quarries appears to reach to a depth of maximum 3m and quarrying was stopped due to petering out of manganese band. The samples collected from quarries yielded low to medium grade manganese ore.

6. Out of the total block area of 50 Ha, the mineralized area is 7.7 Ha and non-mineralized area is 42.3 Ha.
7. A total of 15 boreholes were drilled in two bands of manganese body. Heavy core loss in general and particularly in manganese intersected zones and at expected depth of intersection of the Mn zone hampered correlation of the zones along strike and dip direction to establish its strike and depth continuity. Boreholes drilled to trace dip-ward extension could not intersect any Mn mineralized zone thus indicating that there is no dip-ward extension of mineralized zone.
8. The resources was estimated for the positive boreholes which intersected manganese mineralization zones having more than 10% Mn. Boreholes having less than 10% Mn zones were not considered for calculation of resources.
9. The manganese ore resource of Pimperkunta block was estimated on the basis of area of influence method around positive boreholes. The total resource estimated in Eastern-band is 5908 Metric Tonnes with 18.05% average Mn grade whereas the total resources in Western band is 53498 Metric tonnes with average Mn grade of 12.62%. **The total resource estimated in both the bands is 59,406 Metric Tonnes** with 13.16%, where specific gravity of the mineralized zone is considered as 2.88.
10. The estimated manganese resources is mostly of low grade, fine variety and can be classified under inferred mineral resource category (333) as per UNFC 1996/ MEMC (Amended) Rule 2021.
11. Considering patchy pinch & swell nature along strike, heavy core loss in manganese ore zone and inability of geophysical survey to trace the manganese bands along strike and depth extension, further exploration on G-2 stage was not considered in the block.

Recommendation

Keeping in view, that the manganese mineralization in the Pimperkunta block shows patchy pinch & swell nature along strike, occur at shallow depth having limited depth extension, intersections of low grade manganese mineralization, extensive core loss in mineralized zone and inability of geophysical survey to trace the manganese bands along strike and dip extension, no further work in the area is suggested.

LOCALITY INDEX

Locality	Latitude	Longitude	Toposheet no
1 Adilabad	19°40' 30"	78°32' 15"	56 I/10
2 Bhimpur	19°46' 30"	78°25' 25"	56 I/05
3 Bhimsari	19°42' 00"	78°31' 50"	56 I/10
4 Chanda	19°42' 33"	78°32' 51"	56 I/10
5 Gaulighat (Gollaghat)	19°48' 30"	78°26' 50"	56 I/05
6 Goatkur	19°44' 00"	78°30' 30"	56 I/10
7 Guda	19°45' 34"	78°30' 51"	56 I/09
8 Jainath	19°44' 00"	78°38' 35"	56 I/10
9 Jamdapur	19°43' 25"	78°31' 30"	56 I/10
10 Jamaldari	19°37' 45"	78°38' 30"	56 I/10
11 Kanpa	19°38' 50"	78°39' 25"	56 I/10
12 Kottaguda	19°37' 30"	78°40' 45"	56 I/10
13 MesalaBhurz	19°41' 03"	78°43' 49"	56 I/10
14 MesalaKhurd	19°39' 37"	78°43' 41"	56 I/10
15 Pardi	19°40' 00"	78°38' 00"	56 I/10
16 Pitarikunta (Pimparikunta)	19°44' 40"	78°28' 25"	56 I/06
17 Ramapuram	19°40' 00"	78°38' 00"	56 I/10
18 Sheoghat	19°43' 00"	78°29' 00"	56 I/06
19 Tamsi	19°48' 00"	78°28' 00"	56 I/05
20 Toyaguda	19°38' 00"	78°42' 00"	56 I/05
21 Yapalguda	19°39' 30"	78°36' 05"	56 I/10

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Summarized litho log of Boreholes drilled at G-3 stage in Pimperkunta Manganese block

Borehole No: PKBH-1

1. Location: - 19°44'41.23"N; 78°29'06.14"E
 2. Unit No: - New Holland
 3. Nature of BH: - Vertical
 4. R.L of BH: -261 meters

5. Date of starting: - 11.02.2022
 6. Date of closing :- 15.02.2022
 7. Closing of depth :-30.00 meters

Depth in (m)		Length of run (m)	Length of core (m)	% of core recovery	Depth (m)		Thickness (m)	Length of core recovered (m)	Core recovery (%)	Lithology / Mineralisation
From	To				From	to				
0.00	1.50	1.50	Sludge	-	0.00	1.50	1.50	Sludge	-	Manganese Soil
1.50	3.00	1.50	1.15	76.66	1.50	1.90	0.40	0.30	75	Limestone with manganese bands
					1.90	2.20	0.30	0.20	66.67	Chert + Jasper bands with Manganese
					2.20	2.40	0.20	0.05	25	Massive grey Limestone with Mn vein
					2.40	3.00	0.60	0.60	100	Massive grey Limestone
3.00	6.00	3.00	2.04	68	3.00	3.75	0.75	0.35	46.67	Massive grey Limestone
					3.75	4.50	0.75	0.45	60	Massive grey Limestone
					4.50	5.05	0.55	0.50	90.91	Massive grey Limestone
					5.05	6.00	0.95	0.74	77.89	Massive grey Limestone
6.00	9.00	3.00	2.10	70	6.00	7.55	1.55	1.15	74.19	Massive grey Limestone
					7.55	9.00	1.45	0.95	65.52	Massive grey Limestone
9.00	12.00	3.00	2.18	72.66	9.00	10.94	1.94	1.32	68.04	Massive grey Limestone
					10.94	12.00	1.06	0.86	81.13	Massive grey Limestone
12.00	15.00	3.00	2.49	83	12.00	13.95	1.95	1.64	84.10	Massive grey Limestone
					13.95	15.00	1.05	0.85	80.95	Massive grey Limestone
15.00	18.00	3.00	2.45	81.66	15.00	16.40	1.40	1.15	82.14	Massive grey Limestone
					16.40	18.00	1.60	1.30	81.25	Massive grey Limestone
18.00	21.00	3.00	2.56	85.33	18.00	19.76	1.76	1.56	88.64	Massive grey Limestone
					19.76	21.00	1.24	1.00	80.65	Massive grey Limestone
21.00	24.00	3.00	2.77	92.30	21.00	24.00	3.00	2.77	92.33	Massive grey Limestone
24.00	27.00	3.00	2.71	90.30	24.00	27.00	3.00	2.71	90.33	Massive grey Limestone
27.00	30.00	3.00	2.40	80	27.00	30.00	3.00	2.40	80.00	Massive grey Limestone

Summarized litholog of Boreholes drilled at G-3 stage in Pimperkunta Manganese block

Borehole No: PKBH-2

1. Location: -19°44'42.23"N; 78°29'08.46"E
2. Unit No: - New Holland
3. Nature of BH: - Vertical
4. R.L of BH: -259 meters

5. Date of starting:- 17.02.2022
6. Date of closing:- 20.02.2022
7. Closing of depth:-35.00 meters

Depth in (m)		Length of run (m)	Length of core (m)	% of recovery	Depth (m)		Thickness (m)	Length of core recovered (m)	Core recovery (%)	Lithology / Mineralisation
From	To				From	To				
0.00	3.00	3.00	2.26	75.33	0.00	0.40	0.40	0.20	50	Massive grey Limestone
					0.40	0.95	0.55	0.40	72.72	Massive grey Limestone
					0.95	2.00	1.05	0.80	76.19	Massive grey Limestone
					2.00	3.00	1.00	0.86	86	Massive grey Limestone
3.00	6.00	3.00	2.51	83.66	3.00	4.40	1.40	1.30	92.86	Massive grey Limestone
					4.40	4.90	0.50	0.35	70	Pink colour Manganese veins + Limestone
					4.90	5.45	0.55	0.45	81.82	Massive grey Limestone
					5.45	6.00	0.55	0.41	74.55	Massive grey Limestone
6.00	9.00	3.00	2.12	70.66	6.00	7.50	1.5	1.00	66.67	Massive grey Limestone
					7.50	9.00	1.5	1.12	74.67	Massive grey Limestone
9.00	12.00	3.00	2.42	80.66	9.00	10.70	1.7	1.32	77.65	Massive grey Limestone
					10.70	12.00	1.3	1.10	84.62	Massive grey Limestone
12.00	15.00	3.00	2.51	83.66	12.00	13.92	1.92	1.62	84.38	Massive grey Limestone
					13.92	15.00	1.08	0.89	82.41	Massive grey Limestone
15.00	18.00	3.00	2.70	90	15.00	18.00	3.00	2.70	90.00	Massive grey Limestone
18.00	21.00	3.00	2.67	89	18.00	21.00	3.00	2.67	89.00	Massive grey Limestone
21.00	24.00	3.00	2.75	91.66	21.00	24.00	3.00	2.75	91.67	Massive grey Limestone
24.00	27.00	3.00	2.85	95	24.00	27.00	3.00	2.85	95.00	Massive grey Limestone
27.00	30.00	3.00	2.92	97.33	27.00	30.00	3.00	2.92	97.33	Massive grey Limestone
30.00	33.00	3.00	2.86	95.33	30.00	33.00	3.00	2.86	95.33	Massive grey Limestone
33.00	35.00	2.00	1.85	92.50	33.00	35.00	2.00	1.85	92.50	Massive grey Limestone

Summarized litholog of Boreholes drilled at G-3 stage in Pimperkunta Manganese block

Borehole No: PKBH-3

1. Location: - 19°44'38.17"N; 78°29'08.04"E
 2. Unit No: - New Holland
 3. Nature of BH: - Vertical
 4. R.L of BH: -259 meters

5. Date of starting:- 21.02.2022
 6. Date of closing:- 23.02.2022
 7. Closing of depth:-20.00 meters

Depth in (m)		Length of run (m)	Length of core (m)	% of recovery	Depth (m)		Thickness (m)	Length of core recovered (m)	Core recovery (%)	Lithology / Mineralisation
From	To				From	To				
0.00	3.00	3.00	1.65	55	0.00	0.90	0.90	0.45	50	Massive grey Limestone with Mn vein
					0.90	1.95	1.05	0.65	61.90	Massive grey Limestone
					1.95	3.00	1.05	0.55	52.38	Massive grey Limestone
3.00	6.00	3.00	2.15	71.66	3.00	4.50	1.50	0.90	60.00	Massive grey Limestone
					4.50	6.00	1.50	1.25	83.33	Massive grey Limestone
6.00	9.00	3.00	2.47	82.33	6.00	7.75	1.75	1.42	81.14	Massive grey Limestone
					7.75	9.00	1.25	1.05	84.00	Massive grey Limestone
9.00	12.00	3.00	2.78	92.66	9.00	10.24	1.24	1.09	87.90	Massive grey Limestone
					10.24	12.00	1.76	1.69	96.02	Massive grey Limestone
12.00	15.00	3.00	2.82	94	12.00	15.00	3.00	2.82	94.00	Massive grey Limestone
15.00	18.00	3.00	2.74	91.33	15.00	16.60	1.60	1.54	96.25	Massive grey Limestone
					16.60	18.00	1.40	1.20	85.71	Massive grey Limestone
18.00	20.00	2.00	1.40	70	18.00	20.00	2.00	1.40	70.00	Massive grey Limestone

Summarized litholog of Boreholes drilled at G-3 stage in Pimperkunta Manganese block

Borehole No: PKBH-4

1. Location: - 19°44'34.78"N; 78°29'10.05"E
 2. Unit No: - New Holland
 3. Nature of BH: - Vertical
 4. R.L of BH: -257 meters

5. Date of starting:- 24.02.2022
 6. Date of closing:- 28.02.2022
 7. Closing of depth:-20.00 meters

Depth in (m)		Length of run (m)	Length of core (m)	% of recovery	Depth (m)		Thickness (m)	Length of core recovered (m)	Core recovery (%)	Lithology / Mineralisation
From	To				From	To				
0.00	1.50	1.50	Sludge	-	0.00	1.50	1.50	Sludge	-	Manganese black soil
1.50	3.00	1.50	1.06	70.66	1.50	2.35	0.85	0.66	77.65	Limestone with Thin Manganese vein
					2.35	3.00	0.65	0.40	61.54	Limestone with Thin Manganese vein
3.00	6.00	3.00	2.30	76.66	3.00	3.70	0.70	0.40	57.14	Massive grey Limestone
					3.70	4.55	0.85	0.65	76.47	Massive grey Limestone
					4.55	5.15	0.60	0.50	83.33	Massive grey Limestone
					5.15	5.60	0.45	0.35	77.78	Massive grey Limestone
					5.60	6.00	0.40	0.40	100	Massive grey Limestone
6.00	9.00	3.00	2.38	79.33	6.00	6.80	0.80	0.70	87.50	Massive grey Limestone
					6.80	8.05	1.25	1.03	82.40	Massive grey Limestone
					8.05	9.00	0.95	0.65	68.42	Massive grey Limestone
9.00	12.00	3.00	2.13	71	9.00	10.75	1.75	1.58	90.29	Massive grey Limestone
					10.75	12.00	1.25	0.55	44.00	Massive grey Limestone
12.00	15.00	3.00	2.20	73.33	12.00	13.50	1.50	0.20	80.00	Massive grey Limestone
					13.50	15.00	1.50	1.00	66.67	Massive grey Limestone
15.00	18.00	3.00	1.10	36.66	15.00	16.56	1.56	0.66	42.31	Massive grey Limestone
					16.56	18.00	1.44	0.44	30.56	Massive grey Limestone
18.00	20.00	2.00	0.62	31	18.00	18.95	1.95	0.35	36.84	Massive grey Limestone
					18.95	20.00	1.05	0.27	25.71	Massive grey Limestone

Summarized litholog of Boreholes drilled at G-3 stage in Pimperkunta Manganese block

Borehole No: PKBH-5

1. Location: - 19°44'42.34"N; 78°29'02.11"E
 2. Unit No: - New Holland
 3. Nature of BH : - Vertical
 4. R.L of BH : -262 meters

5. Date of starting:- 28.02.2022
 6. Date of closing :- 02.03.2022
 7. Closing of depth:-15.00 meters

Depth in (m)		Length of run (m)	Length of core (m)	% of recovery	Depth (m)		Thickness (m)	Length of core recovered (m)	Core recovery (%)	Lithology / Mineralisation
From	To				From	To				
0.00	1.00	1.00	Sludge	-	0.00	1.00	1.00	Sludge	-	Manganese black soil
1.00	3.00	2.00	1.50	75	1.00	1.65	0.65	0.45	69.23	Limestone with Manganese band
					1.65	2.10	0.45	0.35	77.78	Manganese
					2.10	2.60	0.50	0.30	60.00	Manganese
					2.60	3.00	0.40	0.40	100	Massive grey Limestone
3.00	6.00	3.00	2.35	78.33	3.00	3.70	0.70	0.50	71.43	Massive grey Limestone
					3.70	4.30	0.60	0.50	83.33	Massive grey Limestone
					4.30	4.80	0.50	0.35	70.00	Massive grey Limestone
					4.80	5.40	0.60	0.50	83.33	Massive grey Limestone
					5.40	6.00	0.60	0.50	83.33	Massive grey Limestone
6.00	9.00	3.00	1.30	43.33	6.00	7.15	1.15	0.35	30.43	Massive grey Limestone
					7.15	8.15	1.00	0.40	40.00	Massive grey Limestone
					8.15	9.00	0.85	0.55	64.71	Massive grey Limestone
9.00	12.00	3.00	1.08	36	9.00	10.08	1.08	0.39	36.11	Massive grey Limestone
					10.08	11.02	0.94	0.44	46.81	Massive grey Limestone
					11.02	12.00	0.98	0.25	25.51	Massive grey Limestone
12.00	15.00	3.00	1.01	33.66	12.00	12.50	0.50	0.15	30.00	Massive grey Limestone
					12.50	13.64	1.14	0.34	29.82	Massive grey Limestone
					13.64	15.00	1.36	0.52	38.24	Massive grey Limestone

Summarized litholog of Boreholes drilled at G-3 stage in Pimperkunta Manganese block

Borehole No: PKBH-6

1. Location: - 19°44'37.25"N; 78°29'02.87"E
 2. Unit No: - New Holland
 3. Nature of BH: - Vertical
 4. R.L of BH: -260 meters

5. Date of starting:- 03.03.2022
 6. Date of closing:- 05.03.2022
 7. Closing of depth:-15.00 meters

Depth in (m)		Length of run (m)	Length of core (m)	% of recovery	Depth (m)		Thickness (m)	Length of core recovered (m)	Core recovery (%)	Lithology / Mineralisation
From	To				From	To				
0.00	0.30	0.30	Sludge	-	0.00	0.30	0.30	Sludge	-	Manganese black soil
0.30	1.50	1.20	1.00	83.33	0.30	0.75	0.45	0.35	77.78	Manganese band
					0.75	1.15	0.40	0.35	87.50	Manganese band
					1.15	1.50	0.35	0.30	85.71	Manganese band
1.50	3.00	1.50	1.14	76	1.50	1.95	0.45	0.32	71.11	Manganese band
					1.95	2.45	0.50	0.40	80.00	Massive grey Limestone
					2.45	3.00	0.55	0.42	76.36	Massive grey Limestone
3.00	6.00	3.00	2.22	74	3.00	3.65	0.65	0.45	69.23	Massive Limestone
					3.65	4.10	0.45	0.37	82.22	Massive grey Limestone
					4.10	4.90	0.80	0.60	75.00	Massive grey Limestone
					4.90	6.00	1.10	0.80	72.73	Massive grey Limestone
6.00	9.00	3.00	2.53	84.33	6.00	6.15	0.15	0.10	66.67	Massive Limestone
					6.15	7.15	1.00	0.90	90.00	Massive grey Limestone
					7.15	8.30	1.15	1.05	91.30	Massive grey Limestone
					8.30	9.00	0.70	0.48	68.57	Massive grey Limestone
9.00	12.00	3.00	2.64	88	9.00	9.40	0.40	0.30	75.00	Massive Limestone
					9.40	10.35	0.95	0.90	94.74	Massive Limestone
					10.35	11.35	1.00	0.90	90.00	Massive grey Limestone
					11.35	12.00	0.65	0.54	83.08	Massive grey Limestone
12.00	15.00	3.00	2.62	87.33	12.00	12.70	0.70	0.60	85.71	Massive grey Limestone
					12.70	13.80	1.10	0.97	88.18	Massive grey Limestone
					13.80	14.60	1.80	0.75	93.75	Massive grey Limestone
					14.60	15.00	0.40	0.30	75.00	Massive grey Limestone

Summarized litholog of Boreholes drilled at G-3 stage in Pimperkunta Manganese block

Borehole No: PKBH-7

1. Location: - 19°44'35.70"N; 78°29'03.59"E
2. Unit No: - New Holland
3. Nature of BH : - Vertical
4. R.L of BH : -259 meters

5. Date of starting:- 05.03.2022
6. Date of closing:- 06.03.2022
7. Closing of depth:-15.00 meters

Depth in (m)		Length of run (m)	Length of core (m)	% of recovery	Depth (m)		Thickness (m)	Length of core recovered (m)	Core recovery (%)	Lithology / Mineralisation
From	To				From	To				
0.00	0.50	0.50	Sludge	-	0.00	0.50	0.50	Sludge	-	Manganese black soil
0.50	3.00	2.50	1.35	54	0.50	1.50	1.00	0.30	30	Limestone with thin Manganese vein
					1.50	1.60	1.10	0.10	100	Limestone with thin Manganese vein
					1.60	2.15	0.55	0.35	63.64	Limestone with thin Manganese vein
					2.15	2.75	0.60	0.40	66.67	Massive grey Limestone
					2.75	3.00	0.25	0.20	80	Massive grey Limestone
3.00	6.00	3.00	2.23	74.33	3.00	3.45	0.45	0.40	88.89	Massive Limestone
					3.45	4.03	0.58	0.53	91.38	Massive Limestone
					4.03	4.63	0.60	0.40	66.67	Massive Limestone
					4.63	5.15	0.52	0.30	57.69	Massive Limestone
					5.15	6.00	0.85	0.60	70.59	Massive grey Limestone
6.00	9.00	3.00	1.38	46	6.00	6.55	0.55	0.35	63.64	Massive grey Limestone
					6.55	7.20	0.65	0.25	38.46	Massive grey Limestone
					7.20	7.90	0.70	0.25	35.71	Massive grey Limestone
					7.90	8.50	0.60	0.20	33.33	Massive grey Limestone
					8.50	9.00	0.50	0.33	66	Massive grey Limestone
9.00	12.00	3.00	1.50	50	9.00	9.45	0.45	0.35	77.78	Massive grey Limestone
					9.45	10.50	1.05	0.75	71.43	Massive grey Limestone
					10.50	11.00	0.60	0.10	16.67	Massive grey Limestone
					11.00	11.75	0.65	0.15	23.08	Massive grey Limestone
					11.75	12.00	0.25	0.15	60	Massive grey Limestone
12.00	15.00	3.00	1.85	61.66	12.00	12.70	0.70	0.50	71.43	Massive grey Limestone
					12.70	13.30	0.60	0.20	33.33	Massive grey Limestone
					13.30	13.95	0.65	0.45	69.23	Massive grey Limestone
					13.95	14.65	0.70	0.50	71.43	Massive grey Limestone
					14.65	15.00	0.35	0.20	57.14	Massive grey Limestone

Summarized litholog of Boreholes drilled at G-3 stage in Pimperkunta Manganese block

Borehole No: PKBH-8

1. Location: - 19°44'30.93"N; 78°29'02.01"E
 2. Unit No: - New Holland
 3. Nature of BH : - Vertical
 4. R.L of BH : -257 Meters

5. Date of starting:- 07.03.2022
 6. Date of closing:- 09.03.2022
 7. Closing of depth:-15.00 meters

Depth in (m)		Length of run (m)	Length of core (m)	% of recovery	Depth (m)		Thickness (m)	Length of core recovered (m)	Core recovery (%)	Lithology / Mineralisation
From	To				From	To				
0.00	1.50	1.50	Sludge	-	0.00	1.50	1.50	Sludge	-	Manganese black soil
1.50	3.00	1.50	0.76	50.66	1.50	2.20	0.70	0.35	50	Massive Limestone
					2.20	3.00	0.80	0.41	51.25	Massive Limestone
3.00	6.00	3.00	1.56	52	3.00	4.00	1.00	0.60	60	Massive Limestone
					4.00	5.00	1.00	0.55	55	Massive Limestone
					5.00	6.00	1.00	0.41	41	Massive Limestone
6.00	9.00	3.00	0.80	26.66	6.00	7.00	1.00	0.20	20	Massive Limestone
					7.00	8.00	1.00	0.30	30	Massive Limestone
					8.00	9.00	1.00	0.30	30	Massive Limestone
9.00	12.00	3.00	1.70	56.66	9.00	10.20	1.20	0.90	75	Massive Limestone
					10.20	11.00	0.80	0.35	43.75	Massive Limestone
					11.00	12.00	1.00	0.45	45	Massive Limestone
12.00	15.00	3.00	1.00	33.33	12.00	13.50	1.50	0.55	36.67	Massive Limestone
					13.50	15.00	1.50	0.45	30	Massive Limestone

Summarized litholog of Boreholes drilled at G-3 stage in Pimperkunta Manganese block

Borehole No: PKBH-9

1. Location: - 19°44'28.93"N; 78°28'58.58"E
 2. Unit No: - New Holland
 3. Nature of BH : - Vertical
 4. R.L of BH : -256 Meters

5. Date of starting:- 10.03.2022
 6. Date of closing:- 12.03.2022
 7. Closing of depth:-15.00 meters

Depth in (m)		Length of run (m)	Length of core (m)	% of recovery	Depth (m)		Thickness (m)	Length of core recovered (m)	Core recovery (%)	Lithology / Mineralisation
From	To				From	To				
0.00	1.00	1.00	Sludge	-	0.00	1.00	1.00	Sludge	-	Manganese black soil
1.00	3.00	2.00	1.28	64	1.00	1.70	0.70	0.50	71.43	Massive Limestone
					1.70	2.08	0.38	0.28	73.68	Massive Limestone
					2.08	2.60	0.52	0.30	57.69	Massive Limestone
					2.60	3.00	0.40	0.20	50	Massive Limestone
3.00	6.00	3.00	2.10	70	3.00	3.95	0.95	0.70	73.68	Massive Limestone
					3.95	4.80	0.85	0.60	70.59	Massive Limestone
					4.80	5.10	0.30	0.20	66.67	Manganese band
					5.10	5.50	0.40	0.25	62.50	Manganese band
					5.50	6.00	0.50	0.35	70	Manganese band
6.00	9.00	3.00	1.87	62.33	6.00	6.30	0.30	0.10	33.33	Manganese band
					6.30	7.55	1.25	0.92	73.60	Massive Limestone
					7.55	8.20	0.65	0.40	61.54	Massive Limestone
					8.20	9.00	0.80	0.45	56.25	Massive Limestone
9.00	12.00	3.00	1.75	58.33	9.00	9.80	0.80	0.50	62.50	Massive Limestone
					9.80	10.80	1.00	0.55	55	Massive Limestone
					10.80	12.00	1.20	0.70	58.33	Massive Limestone
12.00	15.00	3.00	1.31	43.66	12.00	13.10	1.10	0.70	63.64	Massive Limestone
					13.10	13.80	0.70	0.20	38.57	Massive Limestone
					13.80	15.00	1.20	0.41	34.17	Massive Limestone

Summarized litho log of Boreholes drilled at G-3 stage in Pimperkunta Manganese block

Borehole No: PKBH-10

1. Location: - 19°44'27.29"N; 78°28'57.43"E
 2. Unit No: - New Holland
 3. Nature of BH : - Vertical
 4. R.L of BH : -255 meters

5. Date of starting:- 13.03.2022
 6. Date of closing:- 14.03.2022
 7. Closing of depth:-16.00 meters

Depth in (m)		Length of run (m)	Length of core (m)	% of recovery	Depth (m)		Thickness (m)	Length of core recovered (m)	Core recovery (%)	Lithology / Mineralisation
From	To				From	To				
0.00	1.00	1.00	Sludge	-	0.00	1.00	1.00	Sludge	-	Limestone pieces/ boulders
1.00	3.00	2.00	1.80	90	1.00	2.40	1.40	1.25	89.28	Limestone with Mn veinlets
					2.40	3.00	0.60	0.55	91.66	Limestone with Mn veinlets
3.00	4.50	1.50	0.50	33.33	3.00	3.50	0.50	0.10	20	Limestone with Mn veinlets
					3.50	4.50	1.00	0.40	40	Limestone with Mn veinlets
4.50	6.00	1.50	0.30	20	4.50	5.20	0.70	0.14	20	Limestone with Mn veinlets
					5.20	6.00	0.80	0.16	20	Limestone with Mn veinlets
6.00	7.50	1.50	0.95	63.33	6.00	6.75	0.75	0.60	80	Massive Limestone
					6.75	7.50	0.75	0.35	46.66	Massive Limestone
7.50	9.00	1.50	0.82	54.60	7.50	9.00	1.50	0.82	54.66	Massive Limestone
9.00	10.50	1.50	0.73	48.66	9.00	9.90	0.90	0.35	38.89	Massive Limestone
					9.90	10.50	0.60	0.38	63.33	Massive Limestone
10.50	12.00	1.50	0.51	34	10.50	11.55	1.05	0.30	28.57	Massive Limestone
					11.55	12.00	0.45	0.21	46.67	Massive Limestone
12.00	13.50	1.50	0.42	28	12.00	12.45	0.45	0.25	55.56	Massive Limestone
					12.45	13.50	1.05	0.17	16.19	Massive Limestone
13.50	15.00	1.50	-	0	13.50	15.00	1.50	0.00	0	Limestone cavity
15.00	16.00	1.00	-	0	15.00	16.00	1.00	0.00	0	Limestone cavity

Summarized litho log of Boreholes drilled at G-3 stage in Pimperkunta Manganese block

Borehole No: PKBH-11

1. Location: - 19°44'29.01"N; 78°28'54.90"E
 2. Unit No: - New Holland
 3. Nature of BH: - Vertical
 4. R.L of BH: -256

5. Date of starting:- 14.03.2022
 6. Date of closing:- 15.03.2022
 7. Closing of depth:-15.00 meters

Depth in (m)		Length of run (m)	Length of core (m)	% of recovery	Depth (m)		Thickness (m)	Length of core recovered (m)	Core recovery (%)	Lithology / Mineralisation
From	To				From	To				
0.00	0.50	0.50	Sludge	-	0.00	0.50	0.50	Sludge	-	Manganese soil
0.50	1.50	1.00	0.57	57	0.50	1.50	1.00	0.57	57	Limestone with Mn veinlets
1.50	3.00	1.50	1.04	69.30	1.50	3.00	1.50	1.04	69.33	Massive Limestone
3.00	4.50	1.50	1.03	68.66	3.00	3.75	0.75	0.43	57.33	Massive Limestone
					3.75	4.50	0.75	0.60	80	Massive Limestone
4.50	6.00	1.50	1.17	78	4.50	5.50	1.00	0.80	80	Massive Limestone
					5.50	6.00	0.50	0.37	74	Massive Limestone
6.00	7.50	1.50	0.70	46.66	6.00	6.50	0.50	0.25	50	Massive Limestone
					6.50	7.50	1.00	0.45	45	Massive Limestone
7.50	9.00	1.50	0.70	46.66	7.50	9.00	1.00	0.70	70	Massive Limestone
9.00	10.50	1.50	0.95	63.33	9.00	9.80	0.80	0.58	72.50	Massive Limestone
					9.80	10.50	0.70	0.37	52.86	Massive Limestone
10.50	12.00	1.50	0.53	35.30	10.50	12.00	1.50	0.53	35.33	Massive Limestone
12.00	13.50	1.50	1.12	74.66	12.00	12.80	0.80	0.60	75	Massive Limestone
					12.80	13.50	0.70	0.52	74.29	Massive Limestone
13.50	15.00	1.50	0.44	29.33	13.50	15.00	1.50	0.44	29.33	Massive Limestone

Summarized litho log of Boreholes drilled at G-3 stage in Pimperkunta Manganese block

Borehole No: PKBH-12

1. Location: - 19°44'27.95"N; 78°29'02.37"E
 2. Unit No: - New Holland
 3. Nature of BH : - Vertical
 4. R.L of BH: -255

5. Date of starting:- 16.03.2022
 6. Date of closing:- 17.03.2022
 7. Closing of depth:-15.00 meters

Depth in (m)		Length of run (m)	Length of core (m)	% of recovery	Depth (m)		Thickness (m)	Length of core recovered (m)	Core recovery (%)	Lithology / Mineralisation
From	To				From	To				
0.00	0.50	0.50	Sludge	-	0.00	0.50	0.50	Sludge	-	Black cotton Soil /Manganese soil
0.50	1.50	1.00	0.45	45	0.50	1.50	1.00	0.45	45	Massive Limestone
1.50	3.00	1.50	0.69	46	1.50	2.00	0.50	0.20	40	Massive Limestone
					2.00	3.00	1.00	0.49	49	Massive Limestone
3.00	6.00	3.00	2.07	69	3.00	3.15	0.15	0.07	46.67	Massive Limestone
					3.15	4.15	1.00	1.00	100	Massive Limestone
					4.15	4.95	0.80	0.80	100	Massive Limestone
					4.95	6.00	1.05	0.20	19.05	Massive Limestone
6.00	9.00	3.00	1.70	56.66	6.00	7.50	1.50	0.80	53.33	Massive Limestone
					7.50	9.00	1.50	0.90	60	Massive Limestone
9.00	12.00	3.00	1.34	44.66	9.00	10.50	1.50	0.80	53.33	Massive Limestone
					10.50	12.00	1.50	0.54	36	Massive Limestone
12.00	15.00	3.00	1.82	60.66	12.00	13.50	1.50	0.92	61.33	Massive Limestone
					13.50	15.00	1.50	0.90	60	Massive Limestone

Summarized litholog of Boreholes drilled at G-3 stage in Pimperkunta Manganese block

Borehole No: PKBH-13

1. Location: - 19°44'30.88"N; 78°29'09.64"E
 2. Unit No: - New Holland
 3. Nature of BH : - Vertical
 4. R.L of BH : -256 Meters

5. Date of starting:- 19.03.2022
 6. Date of closing:- 22.03.2022
 7. Closing of depth:-30.00 meters

Depth in (m)		Length of run (m)	Length of core (m)	% of recovery	Depth (m)		Thickness (m)	Length of core recovered (m)	Length of core recovered (%)	Lithology / Mineralisation
From	To				From	To				
0.00	0.50	0.50	Sludge	-	0.00	0.50	0.50	Sludge	-	Black cotton soil/Manganese soil
0.50	3.00	2.50	1.60	64	0.50	2.00	1.50	0.88	58.67	Massive Limestone
					2.00	3.00	1.00	0.72	72	Massive Limestone
3.00	6.00	3.00	2.60	86.66	3.00	4.00	1.00	0.90	90	Massive Limestone
					4.00	5.30	1.30	1.10	84.62	Massive Limestone
					5.30	6.00	0.70	0.60	85.71	Massive Limestone
6.00	9.00	3.00	2.42	80.66	6.00	7.50	1.50	1.37	91.33	Massive Limestone
					7.50	9.00	1.50	1.05	70	Massive Limestone
9.00	12.00	3.00	2.60	86.66	9.00	10.50	1.50	1.50	100	Massive Limestone
					10.50	12.00	1.50	1.10	73.33	Massive Limestone
12.00	15.00	3.00	2.61	87	12.00	13.50	1.50	1.45	96.67	Massive Limestone
					13.50	15.00	1.50	1.16	77.33	Massive Limestone
15.00	18.00	3.00	2.85	95	15.00	16.50	1.50	1.40	93.33	Massive Limestone
					16.50	18.00	1.50	1.45	96.67	Massive Limestone
18.00	21.00	3.00	2.82	94	18.00	19.50	1.50	1.45	96.67	Massive Limestone
					19.50	21.00	1.50	1.37	91.33	Massive Limestone
21.00	24.00	3.00	2.75	91.66	21.00	22.50	1.50	1.35	90	Massive Limestone
					22.50	24.00	1.50	1.40	93.33	Massive Limestone
24.00	27.00	3.00	2.80	93.33	24.00	25.50	1.50	1.44	96	Massive Limestone
					25.50	27.00	1.50	1.36	90.67	Massive Limestone
27.00	30.00	3.00	2.60	86.66	27.00	28.50	1.50	1.40	93.33	Massive Limestone
					28.50	30.00	1.50	1.20	80	Massive Limestone

Summarized litholog of Boreholes drilled at G-3 stage in Pimperkunta Manganese block

Borehole No: PKBH-14

1. Location: - 19°44'28.31"N; 78°28'58.17"E
 2. Unit No: - New Holland
 3. Nature of BH: - Vertical
 4. R.L of BH: -256 Meters

5. Date of starting:-28.03.2022
 6. Date of closing:- 30.03.2022
 7. Closing of depth:-14.00 meters

Depth in (m)		Length of run (m)	Length of core (m)	% of recovery	Depth (m)		Thickness (m)	Length of core recovered (m)	Core recovery (%)	Lithology / Mineralisation
From	To				From	To				
0.00	0.50	0.50	Sludge	-	0.00	0.50	0.50	Sludge	-	Manganese Soil
0.50	1.50	1.00	0.55	55	0.50	1.50	1.00	0.55	55	Limestone with Mn veinlets
1.50	3.00	1.50	0.79	52.66	1.50	3.00	1.50	0.79	52.67	Limestone with Mn veinlets
3.00	4.50	1.50	1.20	80	3.00	3.80	0.80	0.70	87.50	Massive Limestone
					3.80	4.50	0.70	0.50	71.43	Massive Limestone
4.50	6.00	1.50	1.40	93.33	4.50	4.90	0.40	0.35	87.50	Massive Limestone
					4.90	6.00	1.10	1.05	95.45	Massive Limestone
6.00	7.50	1.50	1.20	80	6.00	6.80	0.80	0.70	87.50	Massive Limestone
					6.80	7.50	0.70	0.50	71.43	Massive Limestone
7.50	9.00	1.50	1.15	76.66	7.50	8.37	0.87	0.62	71.26	Massive Limestone
					8.37	9.00	0.63	0.53	84.13	Massive Limestone
9.00	10.00	1.00	0.77	77	9.00	10.00	1.00	0.77	77	Massive Limestone
10.00	11.50	1.50	0.80	53.33	10.00	10.75	0.75	0.35	46.67	Massive Limestone
					10.75	11.50	0.75	0.45	60	Massive Limestone
11.50	13.00	1.50	0.90	60	11.50	12.40	0.90	0.50	55.56	Massive Limestone
					12.40	13.00	0.60	0.40	66.67	Massive Limestone
13.00	14.00	1.00	Nil	-	NIL	NIL	NIL	NIL	NIL	(drilling bit struck & Core is not coming out side)

Summarized litholog of Boreholes drilled at G-3 stage in Pimperkunta Manganese block

Borehole No: PKBH-15

1. Location: - 19°44'32.60"N; 78°29'11.91"E
 2. Unit No: - New Holland
 3. Nature of BH: - Vertical
 4. R.L of BH : -256 Meters

5. Date of starting:- 05.04.2022
 6. Date of closing:-06.04.2022
 7. Closing of depth:-15.00 meters

Depth in (m)		Length of run (m)	Length of core (m)	% of recovery	Depth (m)		Thickness (m)	Length of core recovered (m)	Core recovery (%)	Lithology / Mineralisation
From	To				From	To				
0.00	1.00	1.00	Sludge	-	0.00	1.00	1.00	Sludge	-	Black cotton soil/Manganese Soil
1.00	3.00	2.00	1.42	71	1.00	2.55	1.55	1.10	70.97	Massive Limestone
					2.55	3.00	0.45	0.32	71.11	Massive Limestone
3.00	6.00	3.00	1.62	54	3.00	4.78	1.78	0.80	44.94	Massive Limestone
					4.78	6.00	1.22	0.82	67.21	Massive Limestone
6.00	9.00	3.00	1.57	52.33	6.00	7.53	1.53	0.70	45.75	Limestone with Mn vein
					7.53	9.00	1.47	0.87	59.18	Massive Limestone
9.00	12.00	3.00	1.68	56	9.00	10.62	1.62	0.90	55.56	Massive Limestone
					10.62	12.00	1.38	0.78	56.52	Massive Limestone
12.00	15.00	3.00	1.64	54.66	12.00	13.50	1.50	0.80	53.33	Massive Limestone
					13.50	15.00	1.50	0.84	56	Massive Limestone

ANNEXURE-II

SURFACE BED ROCK SAMPLES LOCATION AND CHEMICAL ANALYSIS RESULTS OF PIMPERKUNTA MANGANESE BLOCK

Sl. No	Sample No	Latitude	Longitude	Rock Type	SiO ₂	Mn	MnO ₂	CaO	MgO	P ₂ O ₅	Al ₂ O ₃	Fe ₂ O ₃	Insolubles	LOI
1	PK-1	19°44'33.00"	78°28'56.73"	Limestone	31.74	-	-	36.60	0.42	-	1.18	0.79	-	27.73
2	PK-2	19°44'34.76"	78°28'59.38"	Limestone	34.43	-	-	33.74	0.72	-	2.26	1.18	-	25.32
3	PK-3	19°44'35.70"	78°29'03.48"	Manganese	-	15.41	24.50	-	-	0.22	-	1.47	56.72	-
4	PK-4	19°44'41.97"	78°29'07.50"	Manganese	-	26.43	42.02	-	-	0.26	-	0.97	31.07	-
5	PK-5	19°44'30.97"	78°29'02.05"	Manganese	-	25.65	40.76	-	-	0.40	-	2.14	23.65	-
6	PK-6	19°44'29.08"	78°28'57.34"	Manganese	-	14.05	22.34	-	-	0.08	-	1.48	56.51	-
7	PK-7	19°44'34.95"	78°29'10.02"	Manganese	-	17.35	27.59	-	-	0.28	-	1.97	41.04	-
8	PK-8	19°44'42.85"	78°29'05.88"	Manganese	56.04	10.39	16.02	-	-	1.00	-	6.42	60.22	-
9	PK-9	19°44'27.60"	78°28'58.80"	Manganese	19.62	21.88	34.27	-	-	0.30	-	2.69	20.82	-
10	PK-10	19°44'43.59"	78°29'04.90"	Manganese	42.78	15.71	24.65	-	-	0.44	-	3.06	44.54	-
11	PKS-11	19°44'42.30"	78°28'31.90"	Limestone	-	-	-	-	-	0.46	-	-	-	-

ANNEXURE-III
PIT SAMPLES LOCATION AND CHEMICAL ANALYSIS RESULTS OF PIMPERKUNTA MANGANESE BLOCK

Sl. No	Sample ID	Latitude	Longitude	Rock Type	SiO ₂ (% by mass)	Mn (% by mass)	MnO ₂ (% by mass)	Fe ₂ O ₃ (% by mass)	P ₂ O ₅ (% by mass)	Insolubles (% by mass)
1	EPT-1/1	19°44'40.81"	78°29'05.98"	Limestone with Manganese band	84.80	0.26	0.41	2.08	0.75	87.02
2	EPT-1/2	19°44'40.81"	78°29'05.98"	Limestone with Manganese band	88.04	0.35	0.55	2.34	0.90	90.69
3	EPT-2/1	19°44'38.72"	78°29'07.86"	Manganese	68.20	10.96	16.93	5.44	0.53	72.62
4	EPT-2/2	19°44'38.72"	78°29'07.86"	Limestone with Manganese band	36.82	2.59	3.82	1.85	0.84	37.26
5	EPT-3/2	19°44'35.88"	78°29'06.74"	Limestone with Manganese band	17.83	0.79	1.54	1.01	0.47	19.54
6	EPT-4	19°44'36.75"	78°29'09.03"	Limestone with Manganese band	35.00	1.23	4.16	0.56	0.17	36.79
7	EPT-6/1	19°44'33.48"	78°29'07.19"	Limestone with Manganese band	76.74	0.78	1.54	2.11	0.50	80.86
8	EPT-12	19°44'27.76"	78°29'16.83"	Limestone with Manganese band	40.24	4.16	7.24	3.48	0.04	44.65
9	EPT-13/1	19°44'41.17"	78°29'06.25"	Manganese	29.41	33.74	46.23	3.77	0.36	32.58
10	EPT-16	19°44'34.79"	78°29'10.12"	Manganese	53.79	16.72	26.11	3.68	0.10	63.55
11	EPT-19	19°44'39.90"	78°29'08.81"	Manganese	37.93	18.68	24.34	1.88	0.17	43.97
12	WPT-2/1	19°44'29.65"	78°29'0.66"	Manganese	55.75	14.69	18.65	3.21	0.08	60.58
13	WPT-7	19°44'36.96"	78°29'03.12"	Manganese	66.65	9.98	12.49	2.34	0.06	70.67
14	WPT-8	19°44'35.70"	78°29'03.59"	Manganese	37.87	18.29	24.71	2.54	0.24	45.49
15	WPT-9	19°44'38.01"	78°29'08.05"	Manganese	47.65	5.42	5.68	13.02	0.13	57.95
16	WPT-12	19°44'29.01"	78°28'54.90"	Manganese	41.79	12.71	16.84	9.12	0.13	55.50
17	WPT-13	19°44'27.73"	78°29'02.41"	Limestone with Manganese band	20.75	1.17	3.07	0.94	0.35	22.28

Annexure -IV

CORE SAMPLES CHEMICAL ANALYSIS RESULTS OF PIMPERKUNTA MANGANESE BLOCK

Sl. No.	Sampling No.	Rock Type	Depth in meters		Thickness (m)	SiO ₂ (% by mass)	Mn (% by mass)	MnO ₂ (% by mass)	CaO (% by mass)	MgO (% by mass)	P ₂ O ₅ (% by mass)	Fe ₂ O ₃ (% by mass)	Insolubles (% by mass)
			From	To									
1	PKBH-1/1	Sludge/Mn soil	0.00	1.50	1.50	49.31	13.32	17.33	-	-	0.19	6.11	58.19
2	PKBH-1/2	Manganese	1.50	1.90	0.40	23.38	22.41	33.32	-	-	0.17	1.16	48.24
3	PKBH-1/3	Manganese	1.90	2.20	0.30	24.90	23.71	38.61	-	-	0.14	1.33	54.00
4	PKBH-1/4	Limestone with thin Mn veins	2.20	2.40	0.20	47.57	0.86	-	26.27	0.47	0.35	-	50.43
5	PKBH-1/5	Limestone	2.40	3.00	0.60	19.29	0.06	-	42.82	0.44	0.29	-	20.22
6	PKBH-1/6	Limestone	3.00	3.75	1.50	35.35	0.02	-	33.57	0.47	0.32	-	39.00
	PKBH-1/7	Limestone	3.75	4.50									
7	PKBH-1/8	Limestone	4.50	5.05	1.50	23.89	0.04	-	39.16	0.65	1.26	-	29.02
	PKBH-1/9	Limestone	5.05	6.00									
8	PKBH-1/12	Limestone	9.00	10.94	1.94	28.78	0.03	-	36.07	0.76	0.52	-	33.68
9	PKBH-1/13	Limestone	10.94	12.00	1.06	31.21	0.03	-	35.22	0.78	0.68	-	35.22
10	PKBH-1/22	Limestone	27.00	30.00	3.00	29.82	0.03	-	36.37	0.64	0.60	-	32.10
11	PKBH-2/1	Limestone	0.00	0.40	0.95	15.69	0.07	-	44.78	0.79	0.06	-	16.80
	PKBH-2/2	Limestone	0.40	0.95									
12	PKBH-2/3	Limestone	0.95	2.00	2.05	15.24	0.07	-	45.05	0.71	0.11	-	16.06
	PKBH-2/4	Limestone	2.00	3.00									
13	PKBH-2/5	Limestone	3.00	4.40	1.40	35.02	0.02	-	33.01	0.60	0.06	-	27.16
14	PKBH-2/6	Manganese	4.40	4.90	0.50	41.30	17.16	-	10.07	1.62	0.11	-	44.64
15	PKBH-2/7	Limestone	4.90	5.45	1.10	36.32	0.02	-	32.72	0.45	0.36	-	39.70
	PKBH-2/8	Limestone	5.45	6.00									
16	PKBH-2/9	Limestone	6.00	7.50	1.50	22.27	0.05	-	41.37	0.47	0.34	-	23.60
17	PKBH-2/10	Limestone	7.50	9.00	1.50	20.89	0.05	-	42.00	0.56	0.45	-	23.42
18	PKBH-3/1	Limestone with Mn vein	0.00	0.90	0.90	32.16	0.58	-	36.66	0.34	0.30	-	32.92
19	PKBH-3/2	Limestone	0.90	1.95	2.10	32.63	0.03	-	34.99	0.44	0.27	-	36.96
	PKBH-3/3	Limestone	1.95	3.00									
20	PKBH-3/4	Limestone	3.00	4.50	1.50	26.16	0.04	-	36.06	0.68	0.65	-	27.86
21	PKBH-3/5	Limestone	4.50	6.00	1.50	30.56	0.03	-	35.78	0.66	0.50	-	33.92
22	PKBH-3/13	Limestone	18.00	20.00	2.00	35.45	0.02	-	32.71	0.82	0.72	-	37.74
23	PKBH-4/1	Sludge/Mn soil	0.00	1.50	1.50	51.71	10.75	14.08	-	-	0.24	6.39	61.19

24	PKBH-4/2	Limestone with Mn band	1.50	2.35	1.50	23.73	2.28	-	38.90	0.60	0.37	-	24.94
	PKBH-4/3	Limestone with Mn band	2.35	3.00		-	-	-	-	-	-	-	-
25	PKBH-4/12	Limestone	9.00	10.75	3.00	31.69	0.03	-	34.71	0.89	0.68	-	33.90
	PKBH-4/13	Limestone	10.75	12.00									
26	PKBH-4/18	Limestone	18.00	18.95	2.00	29.17	0.03	-	36.37	0.93	0.65	-	20.22
	PKBH-4/19	Limestone	18.95	20.00									
27	PKBH-5/1	Sludge/Mn soil	0.00	1.00	1.00	45.19	2.22	1.74	-	-	0.16	4.86	53.74
28	PKBH-5/2	Limestone with Mn vein	1.00	1.65	0.65	52.41	0.67	-	24.60	0.42	0.04	-	53.28
29	PKBH-5/3	Manganese	1.65	2.10	0.45	34.87	18.12	28.66	-	-	0.17	1.80	52.61
30	PKBH-5/4	Manganese	2.10	2.60	0.50	21.74	24.04	37.51	-	-	0.18	1.37	51.24
31	PKBH-5/11	Limestone	6.00	7.15	1.15	20.00	0.05	-	42.25	0.53	0.60	-	39.00
32	PKBH-5/12	Limestone	7.15	8.15	1.85	25.45	0.04	-	39.15	0.52	0.46	-	27.02
	PKBH-5/13	Limestone	8.15	9.00									
33	PKBH-6/1	Sludge/Mn soil	0.00	0.30	0.30	60.77	2.57	1.95	-	-	0.13	8.32	72.60
34	PKBH-6/2	Manganese	0.30	0.75	0.85	44.81	12.52	19.29	-	-	0.10	1.93	57.28
	PKBH-6/3	Manganese	0.75	1.15									
35	PKBH-6/4	Manganese	1.15	1.50	0.35	19.74	24.04	36.66	-	-	0.23	1.33	36.24
36	PKBH-6/5	Manganese	1.50	1.95	0.45	21.12	26.01	41.23	-	-	0.18	1.62	48.15
37	PKBH-6/6	Limestone	1.95	2.45	1.05	23.41	0.04	-	39.98	0.52	0.47	-	26.40
	PKBH-6/7	Limestone	2.45	3.00									
38	PKBH-6/8	Limestone	3.00	3.65	1.10	23.78	0.04	-	39.97	0.48	0.33	-	25.94
	PKBH-6/9	Limestone	3.65	4.10									
39	PKBH-6/10	Limestone	4.10	4.90	1.90	26.16	0.04	-	38.90	0.50	0.43	-	27.98
	PKBH-6/11	Limestone	4.90	6.00									
40	PKBH-7/1	Sludge/Mn soil	0.00	0.50	0.50	69.28	4.22	4.77	4.77		0.36	4.90	77.91
41	PKBH-7/2	Limestone with Mnband	0.50	1.50	1.00	44.60	2.63	1.52			0.09	0.76	47.93
42	PKBH-7/3	Manganese	1.50	1.60	0.10	62.61	5.27	8.23			0.07	1.15	67.80
43	PKBH-7/4	Limestone with Mn band	1.60	2.15	0.55	31.80	0.78	-	35.54	0.46	0.40	-	32.24
44	PKBH-7/5	Limestone	2.15	2.75	1.85	21.37	0.05	-	41.69	0.62	0.50	-	26.98
	PKBH-7/6	Limestone	2.75	3.00									
45	PKBH-7/12	Limestone	6.00	6.55	1.20	25.81	0.04	-	38.88	0.67	0.45	-	30.08
	PKBH-7/13	Limestone	6.55	7.20									
46	PKBH-7/14	Limestone	7.20	7.90	1.80	26.53	0.04	-	38.62	0.55	0.46	-	29.77
	PKBH-7/15	Limestone	7.90	8.50									
	PKBH-7/16	Limestone	8.50	9.00									

47	PKBH-8/1	Sludge/Mn soil	0.00	1.50	1.50	51.35	3.47	4.16	-	-	0.26	8.21	63.11
48	PKBH-8/2	Limestone	1.50	2.20	1.50	16.90	0.07	-	44.92	0.51	0.13	-	17.90
	PKBH-8/3	Limestone	2.20	3.00									
49	PKBH-8/7	Limestone	6.00	7.00	2.00	31.18	0.03		36.95	0.42	0.35		31.90
	PKBH-8/8	Limestone	7.00	8.00									
50	PKBH-8/9	Limestone	8.00	9.00	1.00	33.01	0.03	-	36.09	0.42	0.35	-	35.00
51	PKBH-9/1	Sludge/Mn soil	0.00	1.00	1.00	38.19	5.83	7.27	-	-	0.14	9.63	51.61
52	PKBH-9/2	Limestone	1.00	1.70	2.00	19.47	0.06	-	43.92	0.42	0.05	-	21.50
	PKBH-9/3	Limestone	1.70	2.08									
	PKBH-9/4	Limestone	2.08	2.60									
	PKBH-9/5	Limestone	2.60	3.00									
53	PKBH-9/6	Limestone	3.00	3.95	1.80	15.37	0.07	-	45.02	0.54	0.05	-	16.98
	PKBH-9/7	Limestone	3.95	4.80									
54	PKBH-9/8	Limestone with Mn band	4.80	5.10	0.30	30.65	2.59	-	35.27	0.46	0.27	-	32.61
55	PKBH-9/9	Manganese	5.10	5.50	0.40	39.88	19.11	30.34	-	-	0.24	19.54	82.30
56	PKBH-9/10	Manganese	5.50	6.00	0.50	34.77	25.36	39.01	-	-	0.16	2.53	54.91
57	PKBH-9/11	Manganese	6.00	6.30	0.30	69.50	10.54	15.83	-	-	0.15	1.74	81.06
58	PKBH-9/18	Limestone	12.00	13.10	1.80	26.82	0.04	-	38.57	0.36	0.31	-	29.96
	PKBH-9/19	Limestone	13.10	13.80									
59	PKBH-9/20	Limestone	13.80	15.00	1.20	21.64	0.05	-	41.97	0.42	0.33	-	24.54
60	PKBH-10/1	Sludge/Limestone boulders	0.00	1.00	3.00	15.54	0.07	-	45.34	0.54	0.05	-	14.92
	PKBH-10/2	Limestone	1.00	2.40									
	PKBH-10/3	Limestone	2.40	3.00									
61	PKBH-10/4	Limestone	3.00	3.50	0.50	21.18	0.05	-	40.02	0.63	0.06	-	23.80
62	PKBH-10/5	Limestone with Mn band	3.50	4.50	1.00	21.00	0.30	-	37.48	0.88	0.09	-	27.14
63	PKBH-10/6	Limestone with Mn band	4.50	5.20	1.50	6.11	0.17	-	50.04	0.84	0.07	-	7.90
	PKBH-10/7	Limestone with Mn band	5.20	6.00									
64	PKBH-10/13	Limestone	10.50	11.55	1.50	20.68	0.05	-	41.68	0.61	0.05	-	22.14
	PKBH-10/14	Limestone	11.55	12.00									
65	PKBH-10/15	Limestone	12.00	12.45	1.50	9.77	0.12	-	48.38	0.81	0.04	-	10.78
	PKBH-10/16	Limestone	12.45	13.50									
66	PKBH-11/1	Sludge/Mn soil	0.00	0.50	0.50	54.45	5.88	7.72	-	-	0.23	5.93	61.42
67	PKBH-11/2	Limestone with Mn band	0.50	1.50	1.00	18.13	1.25	-	43.04	0.64	0.70	-	19.73
68	PKBH-11/3	Limestone	1.50	3.00	1.50	27.45	0.03	-	38.02	0.34	0.30	-	29.16

69	PKBH-11/4	Limestone	3.00	3.75	1.50	23.86	0.04	-	40.32	0.30	0.36	-	26.40
	PKBH-11/5	Limestone	3.75	4.50									
70	PKBH-11/8	Limestone	6.00	6.50	1.50	25.13	0.04	-	38.90	0.77	0.45	--	28.48
	PKBH-11/9	Limestone	6.50	7.50									
71	PKBH-11/10	Limestone	7.50	9.00	1.50	17.29	0.06	-	43.94	0.51	0.47	--	19.26
72	PKBH-11/13	Limestone	10.50	12.00	1.50	27.87	0.03	-	37.45	0.52	0.50	-	31.88
73	PKBH-12/1	Sludge/Mn soil	0.00	0.50	0.50	45.57	0.42	<0.20	-	-	0.36	6.74	56.95
74	PKBH-12/2	Limestone	0.50	1.50	2.50	40.69	0.02	-	31.60	0.27	0.24	-	40.54
	PKBH-12/3	Limestone	1.50	2.10									
	PKBH-12/4	Limestone	2.10	3.00									
75	PKBH-12/12	Limestone	10.50	12.00	1.50	16.26	0.07	-	45.07	0.42	0.50	-	18.68
76	PKBH-13/1	Sludge/Mn soil	0.00	0.50	0.50	60.36	0.42	<0.20	-	-	0.32	7.03	70.77
77	PKBH-13/2	Limestone	0.50	2.00	1.50	18.75	0.06	-	43.65	0.44	0.04	-	22.22
78	PKBH-13/3	Limestone with Mn vein	2.00	3.00	1.00	31.00	0.18	-	36.37	0.88	1.00	-	33.37
79	PKBH-13/7	Limestone	6.00	7.50	1.50	30.90	0.03	-	36.10	0.60	0.43	-	32.28
80	PKBH-13/8	Limestone	7.50	9.00	1.50	33.66	0.03	-	35.80	0.43	0.41	-	35.88
81	PKBH-13/19	Limestone	24.00	25.50	1.50	26.47	0.06	-	38.01	0.58	0.60	-	30.21
82	PKBH-13/21	Limestone	27.00	28.50	3.00	30.73	0.03	-	36.91	0.47	0.52	-	33.14
	PKBH-13/22	Limestone	28.50	30.00									
83	PKBH-14/1	Sludge/Mn soil	0.00	0.50	0.50	42.09	1.12	0.88	-	-	0.16	7.35	55.08
84	PKBH-14/2	Limestone	0.50	1.50	1.00	17.62	0.06	-	43.88	0.51	0.36	-	20.60
85	PKBH-14/3	Limestone	1.50	3.00	1.50	21.57	0.24	-	42.49	0.49	0.08	-	23.00
86	PKBH-14/12	Limestone	9.00	10.00	1.00	28.68	0.03	-	36.95	0.58	0.05	-	32.66
87	PKBH-14/13	Limestone	10.00	10.75	1.50	27.13	0.04	-	38.61	0.29	0.08	-	29.02
	PKBH-14/14	Limestone	10.75	11.50									
88	PKBH-15/1	Sludge/Mn soil	0.00	1.00	1.00	62.98	0.55	<0.20	-	-	0.30	8.22	76.70
89	PKBH-15/2	Limestone	1.00	2.55	1.55	19.46	0.06	-	43.08	0.46	0.42	-	22.04
90	PKBH-15/3	Limestone	2.55	3.00	0.45	9.64	0.30	-	49.48	0.52	0.13	-	11.52
91	PKBH-15/4	Limestone	3.00	4.78	3.00	21.32	0.05	-	42.53	0.45	0.03	-	23.18
	PKBH-15/5	Limestone	4.78	6.00									
92	PKBH-15/6	Limestone	6.00	7.53	1.53	31.86	0.76	-	36.66	0.32	0.15	-	32.97
93	PKBH-15/7	Limestone	7.53	9.00	1.47	37.76	0.02	-	32.47	0.24	0.23	-	39.04

COMPLIANCE STATUS ON PEER REVIEWERS COMMENTS FOR THE 'GEOLOGICAL REPORT ON PRELIMINARY EXPLORATION (G-3 STAGE) FOR MANGANESE IN PIMPERKUNTA BLOCK, BHEEMPUR Mandal, ADILABAD DISTRICT, TELANANA STATE'

Please find below the compliance status or modification carried out on basis of following Peer reviewer Shri K.Shashidharan, DDG (retd), G.S.I observations by the author for the above GR

Sl.No	PEER REVIEW COMMENTS	Compliance Status
1	The NMET format for submission of G3 report may be strictly followed.	Followed format suggested in Minerals (Evidence & Mineral contents) Amended Rule 2021
2	A geological cross section of the detailed map may be prepared based on field observation and available drilling data.	Prepared and inserted in the Detailed Geological Map
3	The lithological and structural findings may be explained in detail. Structural description is almost missing in the report. Good field photographs of important features should be included at relevant places.	Complied, to the extent possible with the data collected.
4	Spacing of boreholes and reasons for opting such spacings may be clearly explained based on the mode of occurrence and controls of mineralization.	Complied, to the extent possible.
5	Too much repetition is noticed in the individual borehole description, which may be modified properly. The borehole numbers also may be correctly given in text, figures and Tables.	Modified to avoid repetition.
6	The distance and directions between different boreholes are mentioned approximately everywhere. Accurate figures are required to be given.	Modified by removing the word approximately. It is way of expression, given distance is accurate measured in Autocad
7	NABL accreditation certificate of the LUCID laboratory, where all samples were analyzed, required to be attached in Annexures with reference.	Complied.
8	Agreement between primary and check analysis of duplicate samples, needs to be indicated. Reliability of chemical analysis being an important factor in grade and resource estimation, statistical analysis of the same along with graphical representation of various agreements/correlation through scatter diagram are required to be shown, mentioning the correlation coefficient.	Complied, to the extent possible with the data collected.
9	QAQC methods followed during every stage of	Complied to the extent possible.

	exploration, mapping, sampling, chemical analysis, and resource estimation etc. needs to be elaborated. Certified Reference Materials (CRMs) and Certified Blank Material (CBM) provide direct information on the quality and confidence or reliability of the obtained analytical results and constitute integral parts of QA/QC tools. In Chapter 3, source of CRM used in the analysis and the Certified limits of CRM and blanks need to be given.	
10	Psilomelane and pyrolusite are identified as the main manganese minerals in the block. But the XRD studies show only Mn carbonate mineral Kutnohorite. It appears samples are only from Mn within limestone	Psilomelane and pyrolusite grains are identified in polished section but powdered samples of manganese with limestone sent for chemical analysis as studied in XRD which showed only Kutnohorite.
11	No discussion on RQD parameters of the block is made in the report. Brief mention of the same may be made at relevant place. RQD rock mass classification based on RQD Index (%) in to worse/Very Poor ($\leq 25\%$), poor ($\geq 25-50\%$), Fair ($\geq 50-75\%$), Good ($\geq 75-90\%$) and excellent ($\geq 90-100\%$) by Deer & Deer 1989 or Abzalov 2016 may be attempted on the cores of the block.	RQD study do not form part of sanctioned exploration program
12	Relation of silica, alumina, Fe and P with Mn may be discussed briefly, with the aid of scatter diagrams.	Complied to the extent possible
13	Illegible maps are appended in the Appendix II, on Geophysical exploration. Digitized version of the same may be prepared and attached in all figures.	Complied to the extent possible (The geophysical maps are produced in a geo software and output maps are presented. These maps have colour codes based as which these maps are interpreted. In digitization, the out lines can be traced but not the colour variations. Hence, these soft copies of the maps are presented)
14	The corrections and modifications suggested in the text, figures, tables, maps, plates and appendix may be attended.	Complied to the extent possible

**Ministry of Mines
National Mineral Exploration Trust**

Minutes of the 23rd Technical-cum-Cost Committee (TCC) NMET meeting held on 12th and 13th February, 2020 at ICAR Conference Hall, Office Block, National Agriculture Science Centre (NASC) Complex, New Delhi

The 23rd meeting of Technical-Cum-Cost Committee (TCC) of National Mineral Exploration Trust (NMET) was held under the chairmanship of Shri D. Mohan Raj, Addl. Director General & Head, National Mission-II, GSI, Nagpur on 12th and 13th February, 2020 at ICAR Conference Hall, Office Block, National Agriculture Science Centre (NASC) Complex, New Delhi. The list of participants is in **annexure-1**.

Shri Manoj Kumar, Director & Member Secretary, TCC-NMET, welcomed Shri D. Mohan Raj, Additional Director General, National Mission-II, GSI & Chairman, TCC and all the Members of the TCC and participants representing various Notified Exploration Agencies (NEAs). He informed that due to official engagement, Shri Vinay Pal, Assistant Cost Accounts Officer could not attend the meeting and Shri Shashi Kant, Assistant Cost Accounts Officer, NMET would be attending the meeting in his place. The Chairman TCC granted leave of absence to Shri Vinay Pal.

Dr. L. P. Singh, Director & HoD, NMET welcomed all the participants and he emphasised in his opening remarks the need to prioritize the exploration activities of the critical and strategic minerals. He requested NEAs to submit more projects for mineral commodities in which the country is totally dependent on import. He also stressed that the NEAs should make their budgetary projections for NMET funded projects in a more realistic way as NMET's budgetary projection depends on that of NEAs.

Shri D. Mohan Raj, Addl. Director General & Head, National Mission-II, GSI and Chairman of TCC welcomed all the participants and expressed the need to give more emphasis on exploration of concealed and deep-seated minerals. He added that India has sufficient resources cum reserve base of bulk minerals (iron ore, bauxite and limestone) and hence more emphasis is needed for taking up exploration of other deficient minerals to make the country self-sufficient for those commodities also.

The chairman asked all the Notified Exploration Agencies to submit the project proposals only when the exploration block area is free of forest, no Local Law and Order problem, having all statutory clearance so that the project may be technically evaluated for recommendation for approval of EC.

The Chairman TCC, NMET informed that for all the G2 level projects, a certificate should be submitted by State Directorate of Mining and Geology, stating that the block will be put to e-auction after successful completion of exploration work.

The agenda-wise discussion followed.

23.1: Discussion on the Action Taken Report (ATR) of the minutes of 22nd TCC Meeting held on 13th and 14th November, 2019

The Member Secretary, TCC, NMET presented the ATR of the 22nd TCC meeting held on 13th and 14th November, 2019 at NALCO (HRD Centre for Excellence), NALCO Nagar, Bhubaneswar, Odisha. ATR of various agenda points are annexed in **annexure-2**.

Manoj Kumar
13/02/2020

D. Mohan Raj
13/02/xx

0.86 sq. km on 1 : 4,000 scale with a contour interval of 2m within a time schedule of 8 months for completion of the proposed work.

- iii. The area of influence along the block boundary is to be taken into consideration for deciding the borehole locations and it is suggested to keep the boreholes 200m away from the boundary.
- iv. The committee suggested that drill cores of one selected borehole of limestone blocks to be submitted to National Drill Core Library, GSI, Southern Region, Hyderabad and all other cores to be submitted to DGM, Tamilnadu. The DGM Tamil Nadu preserve these cores till the successful completion of e-auction of the blocks.
- v. The NMET Secretariat must ensure that the approval of the EC may be conveyed only after the receipt of a certificate from the Directorate of Mining and Geology, Tamil Nadu stating that the block will be put to e-auction after successful completion of exploration work.

The Committee recommended the proposal for approval of General Exploration (G2) for Limestone in Reddipalayam amalgamated Limestone Block-2, District- Ariyalur, Tamil Nadu at estimated cost of Rs. 154.60 Lakhs including GST in time schedule of 8 months for carrying out the proposed work and submission of report as per Annexure-7A and 7B.

23.2.8: General Exploration for Limestone and shale block, District- Solan, Himachal Pradesh. (G2)

- i. DGM, Himachal Pradesh proposed General Exploration (G2) for Limestone and shale Block, District- Solan, Himachal Pradesh. It was informed that block area is under forest cover and hence the State DGM was advised to submit the proposal after obtaining forest clearance.

The Committee suggested State DGM to submit the project proposal after obtaining forest clearance for NMET funding.

23.2.9: General Exploration for manganese ore in Pimperkunta block, Bheempur mandal, District- Adilabad, Telangana. (G2)

- i. TSMDM proposed General Exploration (G2) for manganese ore in Pimperkunta block, Bheempur mandal, District- Adilabad, Telangana.
- ii. The objective of the project is to assess the quantity and quality of Manganese Resource in the block and classify the resources as per UNFC and Minerals (Evidence and Mineral Contents) Rule, 2015 norms.
- iii. The Committee suggested to carry out Geological mapping on 1:2000 scale in block area of 0.50 sq. km. A total of 600m drilling was recommended with depth of each borehole to a maximum of 30 m. Initial boreholes may be given following the guideline of spacing of G3 stage of exploration. If the boreholes intersect the mineralized zone with persistent thickness, then the infilling boreholes may be planned following the guidelines of G2 stage of investigation. Further, the committee recommended that behavior of ore mineralization at depth to be traced by giving some deeper boreholes (60m depth).
- iv. The progress of the work done would be reviewed before start of the drilling work.
- v. The NMET Secretariat must ensure that the approval of the EC may be conveyed only after the receipt of a certificate from the Directorate of Mining and Geology, Telangana stating that the block will be put to e-auction after successful completion of exploration work.

[Signature]
13/02/2020

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13/02/xx

The Committee recommended the proposal for approval of General Exploration (G2) for manganese ore in Pimperkunta block, Bheempur mandal, District- Adilabad, Telangana at estimated cost of Rs. 157.22 Lakhs including GST in time schedule of 12 months for carrying out the proposed work and submission of report as per Annexure-8A and 8B.

23.2.10: Reconnaissance Survey for Prospect Evaluation of the sporadic occurrences of Molybdenite, South of Karimnagar (56 N/4), District- Siddipet and Karimnagar, Telangana. (G4)

- i. TSMDC proposed Reconnaissance Survey (G4) for Prospect Evaluation of the sporadic occurrences of Molybdenite, South of Karimnagar (56 N/4), District- Siddipet and Karimnagar, Telangana.
- ii. The satellite imagery studies to be carried out for full toposheet (56 N/4) followed by hyperspectral studies to delineate the alteration zone, especially the potassic alteration zones.
- iii. Carry out large scale mapping on 1:12,500 scale covering an area of 175 sq. km as many pit as possible.
- iv. Since there are scanty outcrops in the proposed area, pitting and trenching is recommended.
- v. The Committee suggested to carry out radiometric survey and IP survey in alteration zone.
- vi. Committee also advised to drill few boreholes (maximum 5 nos.) with 500m drilling, if analytical results and result of geophysical survey are encouraging.

The Committee recommended the proposal for approval of Reconnaissance Survey (G4) for Prospect Evaluation of the sporadic occurrences of Molybdenite, South of Karimnagar (56 N/4), District- Siddipet and Karimnagar, Telangana with estimated cost of Rs. 173.17 Lakhs including GST in time schedule of 12 months for carrying out the proposed work and submission of report as per Annexure-9A and 9B

23.2.11: Reconnaissance Survey for Iron Ore after amalgamating all the 8 blocks of North Bailadila block, District-Raigarh, Hurtarai Block, District-Kanker, Rowghat Block, District- Kanker, Dallirajhara Block, District-Balod, Salhewara Block, District- Rajnandgaon, Narayanapur Block, District- Narayanapur, Kanker notified Area Block, District- Kanker, Aturbada Area Block, District- Kanker, Chhattisgarh. (G4)

- i. DGM, Chhattisgarh proposed Reconnaissance Survey (G4) for Iron Ore after considering all the 8 blocks in one proposal as a single programme. Name of the blocks are North Bailadila Area block, District-Raigarh, Hurtarai Area Block, District-Kanker, Rowghat Block, District- Kanker, Dallirajhara Block, District- Balod, Salhewara Block, District- Rajnandgaon, Narayanapur Block, District- Narayanapur, Kanker notified Area Block, District- Kanker, Aturbada Area Block, District- Kanker, Chhattisgarh.
- ii. DGM, Chhattisgarh informed that out of 8 blocks, one block (Salhewara Block, District- Rajnandgaon) has been dropped due to forest area.
- iii. The Committee suggested to propose a single programme of G4 stage taking into consideration all the blocks and a single costsheet with all the work components. The geological mapping and sampling in all the blocks to be carried out followed by one scout borehole in each block.

The Committee asked to submit the proposed work components and cost sheet for recommendation to EC for approval.

23.2.12: Review of the Geological Reports of Preliminary Survey (G3) for the bauxite in Dumarguda, Dandkesra North Area, Parpatia Area blocks District- Surguja, Chhattisgarh and upgradation of all the blocks to General Exploration (G2).

[Signature]
13/02/2020

[Signature]
13/02/2020

Annexure- 8A

General Exploration (G2) for manganese ore in Pimperkunta block, Bheempur mandal, District- Adilabad, Telangana.

S.No.	Item of Work	Unit	Base Rate as on 01-04-1990	Financial Year (2019-20)		
				Escalated Rate	Quantity	Amount (Rs)
A	DRILLING					
1	Surface Drilling (1 Rig)	M	1,714	10,910	600	65,46,000
2	Transportation	km	9	35	700	24,500
3	Accommodation	One time/ Drill	1,85,925	7,33,958	1	7,33,958
4	Camp Mobilisation/ Demobilisation	Drill/month	68,606	2,70,829	1	2,70,829
5	Road Making (Flat Terrain)	Km	5,200	20,528	10	2,05,280
6	Pitting & Trenching	Cu. M	395	1,856	100	1,85,600
	Sub Total A					79,66,167
B	GEOLOGICAL WORK					
1	Survey Party Days (1 party)	day	1,180	6,445	60	3,86,700
2	Geologist Party days (1 party)	day	1,541	8,590	120	10,30,800
3	Surface geophysical survey	day	1,541	8,590	40	3,43,600
4	Fluxgate magnetic measurements	Per station	107	498	40	19,920
5	Electrical resistivity (profiling with station interval of 200 mts)	Per Line km	3,473	15,762	20	3,15,240
	Sub Total B					20,96,260
C	LABORATORY STUDIES					
a	Chemical Analysis					
1	Primary + Check Samples					
	i) for 6 radicals i.e. Mn, SiO ₂ , P ₂ O ₅ Fe ₂ O ₃ , MnO ₂ and Insolubles	Nos	642 '(110+76x5)	2,832	155	4,38,960
	ii) External Check (NABL) samples for analysis of for 6 radicals i.e. CaO, MgO, Al ₂ O ₃ , SiO ₂ , Fe ₂ O ₃ and LOI	Nos	642 '(110+76x12)	2,832	5	14,160
2	Composite Samples					-
	i) for 6 radicals i.e. CaO, MgO, Al ₂ O ₃ , SiO ₂ , Fe ₂ O ₃ and LOI	Nos	642 '(110+76x12)	2,832	5	14,160
b	Physical Analysis					-
1	XRD studies	Nos	1,137	6,187	5	30,935
2	Specific Gravity determination	Nos	64	410	4	1,640
	Sub Total C					4,99,855
	Total A+B+C					1,05,62,282
D	EXPLORATION REPORT - 1% of (A+B+C+D) or Rs. 1,75,000 whichever is more					1,75,000
E	External Peer Review of Geological Report					10,000
F	Environmental Studies					
	Satellite Imagery Study	Scene	99,697	509,013	1	5,09,013
	Base line Data Collection	(10 km radius area)	151,273	772,339	1	7,72,339
	Chemical Analysis	Nos	257400**	6,66,331**	1	6,66,331
	Environmental Report	Nos	50,000	50,000	1	50,000
	Sub Total F					19,97,683
G	Beneficiation Studies	Nos	2,89,387	2,89,387	2	5,78,774
	GRAND TOTAL A to G					1,33,23,739
	GST 18%					23,98,273
	Grand Total : with GST 18%					1,57,22,012

For J. Kumar
13/04/2020

	Say 157.22 Lakh
NOTE	
1	Revised Rates of Promotional Work done by MECL on behalf of Govt. of India Vide letter No. 37(I) /2006-M.I. dated- 02-07-2014 and based on actual escalation as per RBI indices as on 31-03-2018.
2	Procurement of Aerogeophysical maps, Data, Fees & Levies on actuals to be reimbursed

Annexure- 8B

S. No.	Activities	Unit	Months (2020-2021)											
			Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
1	Camp Mobilisation	Month												
2	Surface Drilling (1 rig)	m.												
3	Survey Party days (1 Party)	day												
4	Geologist Party days (1 Party)	day												
5	Core Sampling (1 party)	day												
6	Laboratory Studies	Nos.												
7	Camp Demobilisation	Month												
8	Environmental Studies	Month												
9	Geological Report Writing	Month												

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 may be additional to above time line subject to the approval of time line by EC.

Am-5 Km
13/02/2020



National Accreditation Board for
Testing and Calibration Laboratories

CERTIFICATE OF ACCREDITATION

LUCID LABORATORIES PVT. LTD.

has been assessed and accredited in accordance with the standard

ISO/IEC 17025:2017

**"General Requirements for the Competence of Testing &
Calibration Laboratories"**

for its facilities at

PLOT NO.3, IDA, BALANAGAR, HYDERABAD, MEDCHAL-MALKAJGIRI, TELANGANA, INDIA

in the field of

TESTING

Certificate Number: TC-5918

Issue Date: 24/04/2019

Valid Until: 23/04/2021*

*The validity is extended for one year up to 23.04.2022

This certificate remains valid for the Scope of Accreditation as specified in the annexure subject to continued satisfactory compliance to the above standard & the relevant requirements of NABL.

(To see the scope of accreditation of this laboratory, you may also visit NABL website www.nabl-india.org)

Name of Legal Identity : LUCID LABORATORIES PVT. LTD.

Signed for and on behalf of NABL



N. Venkateswaran
Chief Executive Officer

Subject **Extension of accreditation validity**
From Amit Kumar <amitk@nabl.qcin.org>
To Lucid Laboratories <info@lucidlabsindia.com>
Date 27/05/2022 3:51 pm



Dear Sir/Madam,

Lucid Laboratories Pvt. Ltd., Hyderabad (Lab ID- T-1024)

This is in reference to your Re-assessment audit conducted on NABL portal for Biological, Chemical, Electrical, Mechanical testing dated 23-24 Apr and 07-08 May 2022.

We are pleased to inform that NABL has decided to extend the validity of accreditation from the date of expiry i.e. from 23 Apr 2022 to 23 Aug 2022 (for four months) or till the decision on renewal of accreditation, whichever is earlier to the CAB for the existing scope of accreditation for the discipline of Biological, Chemical, Electrical, Mechanical testing having accreditation **Certificate no. TC-5918**, Issue date- 24.04.2019 valid till 23.04.2022.

Laboratory may continue to issue testing reports with NABL symbol for the existing Biological, Chemical, Electrical, Mechanical testing scope.

Being an accredited laboratory of NABL, you must fulfill all the Terms and Conditions laid down in our document NABL-131. You are requested to follow latest NABL-133 for using NABL symbol.

Thanks & Regards,

Amit Kumar
Assistant Director

National Accreditation Board for Testing and Calibration Laboratories
(A constituent Board of Quality Council of India)

(राष्ट्रीय परिक्षण और अंशशोधन प्रयोगशाला प्रत्यायन बोर्ड)

NABL House, Plot- 45, Sector 44,

Gurgaon - 122002, Haryana

Tel. no.: 91-124-4679771

Mob: 9810229205

E mail : amitk@nabl.qcin.org





National Accreditation Board for
Testing and Calibration Laboratories

CERTIFICATE OF ACCREDITATION

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in the field of

TESTING

Certificate Number: TC-5918

Issue Date: 24/04/2022

Valid Until: 23/04/2024

This certificate remains valid for the Scope of Accreditation as specified in the annexure subject to continued satisfactory compliance to the above standard & the relevant requirements of NABL.
(To see the scope of accreditation of this laboratory, you may also visit NABL website www.nabl-india.org)

Name of Legal Identity : LUCID LABORATORIES PVT. LTD.

Signed for and on behalf of NABL



N. Venkateswaran
Chief Executive Officer



CSIR-NATIONAL METALLURGICAL LABORATORY
Jamshedpur - 831 007, India

Certified Reference Material

NML CRM : 66.2B

MANGANESE ORE



ISO 9001 : 2008

Certificate of Analysis

NML CRM 66.2B Elemental Analysis			
Element	Percentage (w/w)		Number of accepted results
	Certified Value ¹	Uncertainty ²	
SiO ₂ (%)	2.91	± 0.78	8 out of 9
Al ₂ O ₃ (%)	3.45	± 0.58	8 out of 9
Fe (%)	19.42	± 0.6	7 out of 9
Mn (%)	38.93	± 0.7	8 out of 9
CaO (%)	0.060	± 0.014	6 out of 9
P (%)	0.104	± 0.024	8 out of 9
MgO (%)	0.042	± 0.016	5 out of 9
K ₂ O (%)	1.23	± 0.12	5 out of 9
Na ₂ O (%)	0.062	± 0.02	6 out of 9
¹ The unweighted mean of the means of accepted results. ² Uncertainties taken at 95% confidence level of the defined mean.			

Sample description :

The Sample is prepared from available Manganese Ore and Homogenised. The sample is in the form of powder.

Instruction for use :

This is a reference material to be used for validating and assessing analytical procedure by destructive analytical technique. The sample should be taken as it is and analysed by recommended methods of analysis to obtain the certificate values.

S. Srikanth

S. Srikanth
Director
CSIR-NML, Jamshedpur

S. Chakravarty

S. Chakravarty
Scientist
CSIR-NML, Jamshedpur

K. K. Gupta

K. K. Gupta
HOD, ANC
CSIR-NML, Jamshedpur

Date : June 2011





F-01-MSP7.8-TRP

Plot No. 3, IDA, Balanagar,
Hyderabad - 500 037, Telangana.
Ph: 040-6904 2222/10 Lines
E-mail: info@lucidlabsindia.com
Web: www.lucidlabsindia.com

TEST REPORT

Issued to:

Telangana State Mineral Development Corporation Ltd,
#6-2-915, HMWSSB Premises, Rear Block
3rd Floor, Khairabad.
Hyderabad-500004
Kind Attn.: Mr. P. Uppendar, 9491144275

Report No.: LL/ 21-22/006878

Issue Date: 06th Nov, 2021,Customer Ref : TSMDC/GM(M)/Mn
/2021-22/682Ref. Date: 17th Oct, 2021.

Sample Particulars: Limestone

Qty: 1Kg X 02 Nos. Packing: Polythene Cover.

Tests Req'd: Silica as SiO₂, Iron as Fe₂O₃, Aluminum as Al₂O₃, Calcium as CaO, Magnesium as MgO, Loss on Ignition (LOI)Dt. of Receipt of analysis : 27th Oct, 2021,Dt. of starting of analysis : 30th Oct, 2021,Dt. of completion of analysis : 05th Nov, 2021


TEST RESULTS

S.No	Parameters	UOM	PK-1	PK-2
1	Silica as SiO ₂	% by mass	31.74	34.43
2	Iron as Fe ₂ O ₃	% by mass	0.79	1.18
3	Aluminum as Al ₂ O ₃	% by mass	1.18	2.26
4	Calcium as CaO	% by mass	36.60	33.74
5	Magnesium as MgO	% by mass	0.42	0.72
6	Loss on Ignition (LOI)	% by mass	27.73	25.32

Test method: IS-1917 & Instrument Used: ICP-OES.

Note: The above results are as on dry basis.

Page 1 of 1


A.L. Kanta Rao
Authorized Signatory

Note: This report is subject to the terms and conditions mentioned overleaf

071958



Testing to the Core

F-01-MSP7.8-TRP

Plot No. 3, IDA, Balanagar,
Hyderabad - 500 037, Telangana.
Ph: 040-6904 2222/10 Lines
E-mail: info@lucidlabsindia.com
Web: www.lucidlabsindia.com

TEST REPORT

Issued to:

Telangana State Mineral Development Corporation Ltd,
#6-2-915, HMWSSB Premises, Rear Block
3rd Floor, Khairabad.
Hyderabad-500004
Kind Attn.: Mr. P. Uppendar, 9491144275

Report No.: LL/ 21-22/005482

Issue Date: 25th Sep, 2021,

Customer Ref: TSMDC/GM(M)/Mn
/2020-21/546

Ref. Date: 17th Sep, 2021.

Sample Particulars: Manganese Ore.

Qty: 1Kg X 04 Nos. Packing: Polythene Cover.

Tests Reqd: Insolubles, Manganese as Mn, Manganese as MnO₂, Phosphorus P₂O₅, Iron as Fe₂O₃

Dt. of Receipt of analysis : 18th Sep, 2021,

Dt. of starting of analysis : 20th Sep, 2021,

Dt. of completion of analysis : 25th Sep, 2021,

TEST RESULTS

Sl. No	Sample ID	Insolubles (% by mass)	Manganese as Mn (% by mass)	Manganese as MnO ₂ (% by mass)	Phosphorus as P ₂ O ₅ (% by mass)	Iron as Fe ₂ O ₃ (% by mass)
1	PK-3	56.72	15.41	24.50	0.22	1.47
2	PK-4	31.07	26.43	42.02	0.26	0.97
3	PK-5	23.65	25.65	40.76	0.40	2.14
4	PK-6	56.51	14.05	22.34	0.08	1.48
5	PK-7	41.04	17.35	27.59	0.28	1.97

Test method: IS-1473 & **Instrument Used:** ICP-OES.

Note: The above results are as on dry basis.

Page 1 of 1

A.L. Kanta Rao
Authorized Signatory

Note: This report is subject to the terms and conditions mentioned overleaf

071959

TEST REPORT

Issued to:

Telangana State Mineral Development Corporation Ltd,
#6-2-915, HMWSSB Premises, Rear Block
3rd Floor, Khairabad.
Hyderabad-500004
Kind Attn.: Mr. P. Upendar, 9491144275

Report No.: LL/ 21-22/006877

Issue Date: 06th Nov, 2021,

Customer Ref : TSMDC/GM(M)/Mn
/2021-22/682

Ref. Date: 22th Oct, 2021.

Sample Particulars: Manganese Ore.

Qty: 1Kg X 07 Nos. Packing: Polythene Cover.

Tests Reqd: Insolubles, Silica as SiO₂, Manganese as Mn, Manganese as MnO₂, Phosphorus P₂O₅, Iron as Fe₂O₃

Dt. of Receipt of analysis : 27th Oct, 2021,

Dt. of starting of analysis : 30th Oct, 2021,

Dt. of completion of analysis : 05th Nov, 2021,

TEST RESULTS

Sl. No	Sample ID	Insolubles (% by mass)	Silica as SiO ₂ (% by mass)	Manganese as Mn (% by mass)	Manganese as MnO ₂ (% by mass)	Phosphorus as P ₂ O ₅ (% by mass)	Iron as Fe ₂ O ₃ (% by mass)
1	PK-8	60.22	56.04	10.39	16.02	1.00	6.42
2	PK-9	20.82	19.62	21.88	34.27	0.30	2.69
3	PK-10	44.54	42.78	15.71	24.65	0.44	3.06
4	EPT-1/1	87.02	84.80	0.26	0.41	0.79	2.08
5	EPT-1/2	90.69	88.04	0.35	0.55	0.90	2.34
6	EPT-2/1	72.62	68.20	10.96	16.93	0.53	5.44
7	EPT-2/2	37.26	36.82	2.59	3.82	0.84	1.85

Test method: IS-1473 & **Instrument Used:** ICP-OES.

Note: The above results are as on dry basis.



F-01-MSP7.8-TRP

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TEST REPORT

Issued to:

Telangana State Mineral Development Corporation Ltd

#6-2-915, HMWSSB Premises, Rear Block

3 rd Floor, Khairatabad

Hyderabad-500004

Kind Attn.: Mr. K. Rajasekhara Reddy,

Report No. : LL/22-23/003054

Issue Date : 24/06/2022

Customer Ref.: TSMDC/GM(M)/Mn/2021-22/268

Ref. Date : 14/06/2022

Sample Particulars : Limestone (Pimperkunta Manganese Block)

Sample Description: Core sample details at Pimperkunta Manganese block, Pimperkunta Village, Bheempur Mandal, Adilabad district Telangana State

Sample Qty : 1 No Polythene cover

Sample ID : PK-11

Test Parameters : Phosphorus as P₂O₅

Date of Receipt of Sample : 14/06/2022

Date of Starting of Analysis : 15/06/2022

Date of completion of analysis : 24/06/2022

SAMPLE TESTED AS RECEIVED

TEST RESULTS

S.No.	Parameters	Units	Results
1	Phosphorus as P ₂ O ₅	% by mass	0.46

Test method: ASTM C 1301 (ICP-OES)

NOTE : This report and results relate only to the sample / items tested.

A.L. Kanta Rao

Authorized Signatory

Page No. 1/1

Note: This report is subject to the terms and conditions mentioned overleaf

071963



Testing to the Core

F-01-MSP7.8-TRP

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TEST REPORT

Issued to:

Telangana State Mineral Development Corporation Ltd,
#6-2-915, HMWSSB Premises, Rear Block
3rd Floor, Khairabad.
Hyderabad-500004
Kind Attn.: Mr. P. Uppendar, 9491144275

Report No.: LL/ 22-23/000579
Issue Date: 20th May, 2022,
Customer Ref : TSMDC/GM(M)/Mn
/2021-22/44
Ref. Date: 13th April, 2022.

Sample Particulars: Manganese Ore (PITS Samples)

Qty: ~1 X 13 Nos. Packing: Polythene Cover

Tests Reqd.: Manganese as Mn, Silica as SiO₂, Phosphorus as P₂O₅, Iron as Fe₂O₃, Manganese as MnO₂ & Insolubles

Dt. of Receipt of analysis : 13th April, 2022,

Dt. of starting of analysis : 18th April, 2022,

Dt. of completion of analysis : 20th May, 2022,

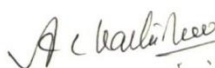
TEST RESULTS

Sl. No	Lab ID	(% by mass)						
		Sample ID	SiO ₂	Mn	MnO ₂	Fe ₂ O ₃	P ₂ O ₅	Insolubles
1	579/1	EPT-3/2	17.83	0.79	1.54	1.01	0.47	19.54
2	579/2	EPT-4	35.00	1.23	4.16	0.56	0.17	36.79
3	579/3	EPT-6/1	76.74	0.78	1.54	2.11	0.50	80.86
4	579/4	EPT-12	40.24	4.16	7.24	3.48	0.04	44.65
5	579/5	EPT-13/1	29.41	33.74	46.23	3.77	0.36	32.58
6	579/6	EPT-16	53.79	16.72	26.11	3.68	0.10	63.55
7	579/7	EPT-19	37.93	18.68	24.34	1.88	0.17	43.97
8	579/8	WPT-2/1	55.75	14.69	18.65	3.21	0.08	60.58
9	579/9	WPT-7	66.65	9.98	12.49	2.34	0.06	70.67
10	579/10	WPT-8	37.87	18.29	24.71	2.54	0.24	45.49
11	579/11	WPT-9	47.65	5.42	5.68	13.02	0.13	57.95
12	579/12	WPT-12	41.79	12.71	16.84	9.12	0.13	55.50
13	579/13	WPT-13	20.75	1.17	3.07	0.94	0.35	22.28

Test Method : IS 1473 & **Instrument Used :** ICP-OES

Note: The above results are expressed on dry basis.

Note: This report and results relate only to the sample / items tested.


A.L. Kanta Rao
Authorized Signatory

Page 1 of 1

Note: This report is subject to the terms and conditions mentioned overleaf

071964



Testing to the Core

F-01-MSP7.8-TRP

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TEST REPORT

Issued to:

Telangana State Mineral Development Corporation Ltd,
#6-2-915, HMWSSB Premises, Rear Block
3rd Floor, Khairabad.
Hyderabad-500004
Kind Attn.: Mr. P. Upendar, 9491144275

Report No.: LL/ 22-23/000577
Issue Date: 20th May, 2022,
Customer Ref.: TSMDC/GM(M)/Mn
/2021-22/44
Ref. Date: 13th April, 2022.

Sample Particulars: Manganese Ore (CORE Samples)

Qty: ~1 X 12 Nos. Packing: Polythene Cover

Tests Reqd.: Manganese as Mn, Silica as SiO₂, Phosphorus as P₂O₅, Iron as Fe₂O₃, Manganese as MnO₂ & Insolubles

Dt. of Receipt of analysis : 13th April, 2022,

Dt. of starting of analysis : 18th April, 2022,

Dt. of completion of analysis : 20th May, 2022,

TEST RESULTS

Sl. No	Lab ID	Sample ID	Meterage(m)		(% by mass)					
			From	To	SiO ₂	Mn	MnO ₂	Fe ₂ O ₃	P ₂ O ₅	Insolubles
1	577/1	PKBH-1/2	1.50	1.90	23.38	22.41	33.32	1.16	0.17	48.24
2	577/2	PKBH-1/3	1.90	2.20	24.90	23.71	38.61	1.33	0.14	54.00
3	577/3	PKBH-5/3	1.65	2.10	34.87	18.12	28.66	1.80	0.17	52.61
4	577/4	PKBH-5/4	2.10	2.60	21.74	24.04	37.51	1.37	0.18	51.24
5	577/5	PKBH-6/2&3	0.30	1.15	44.81	12.52	19.29	1.93	0.10	57.28
6	577/6	PKBH-6/4	1.15	1.50	19.74	24.04	36.66	1.33	0.23	36.24
7	577/7	PKBH-6/5	1.50	1.95	21.12	26.01	41.23	1.62	0.18	48.15
8	577/8	PKBH-7/2	0.50	1.50	44.60	2.63	1.52	0.76	0.09	47.93
9	577/9	PKBH-7/3	1.50	1.60	62.61	5.27	8.23	1.15	0.07	67.80
10	577/10	PKBH-9/9	5.10	5.50	39.88	19.11	30.34	19.54	0.24	82.30
11	577/11	PKBH-9/10	5.50	6.00	34.77	25.36	39.01	2.53	0.16	54.91
12	577/12	PKBH-9/11	6.00	6.30	69.50	10.54	15.83	1.74	0.15	81.06

Test Method : IS 1473 & **Instrument Used :** ICP-OES

Note: The above results are expressed on dry basis.

Note: This report and results relate only to the sample / items tested.

A.L. Kanta Rao
Authorized Signatory

Page 1 of 1

Note: This report is subject to the terms and conditions mentioned overleaf

071966



Testing to the Core

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TEST REPORT

Issued to:

Telangana State Mineral Development Corporation Ltd,
#6-2-915, HMWSSB Premises, Rear Block
3rd Floor, Khairabad.
Hyderabad-500004
Kind Attn.: Mr. P. Uppendar, 9491144275

Report No.: LL/ 22-23/000578
Issue Date: 20th May, 2022,
Customer Ref : TSMDC/GM(M)/Mn
/2021-22/44
Ref. Date: 13th April, 2022.

Sample Particulars: Manganese Ore (Sludge Samples)

Qty: ~1 X 12 Nos. Packing: Polythene Cover

Tests Reqd.: Manganese as Mn, Silica as SiO₂, Phosphorus as P₂O₅, Iron as Fe₂O₃, Manganese as MnO₂ & Insolubles

Dt. of Receipt of analysis : 13th April, 2022,

Dt. of starting of analysis : 18th April, 2022,

Dt. of completion of analysis : 20th May, 2022,

TEST RESULTS

Sl. No	Lab ID	Sample I D	Meterage (m)		(% by mass)					
			From	To	SiO ₂	Mn	MnO ₂	Fe ₂ O ₃	P ₂ O ₅	Insolubles
1	578/1	PKBH-1/1	0.00	1.50	49.31	13.32	17.33	6.11	0.19	58.19
2	578/2	PKBH-4/1	0.00	1.50	51.71	10.75	14.08	6.39	0.24	61.19
3	578/3	PKBH-5/1	0.00	1.00	45.19	2.22	1.74	4.86	0.16	53.74
4	578/4	PKBH-6/1	0.00	0.30	60.77	2.57	1.95	8.32	0.13	72.60
5	578/5	PKBH-7/1	0.00	0.50	69.28	4.22	4.77	4.90	0.36	77.91
6	578/6	PKBH-8/1	0.00	1.50	51.35	3.47	4.16	8.21	0.26	63.11
7	578/7	PKBH-9/1	0.00	1.00	38.19	5.83	7.27	9.63	0.14	51.61
8	578/8	PKBH-11/1	0.00	0.50	54.45	5.88	7.72	5.93	0.23	61.42
9	578/9	PKBH-12/1	0.00	0.50	45.57	0.42	<0.20	6.74	0.36	56.95
10	578/10	PKBH-13/1	0.00	0.50	60.36	0.42	<0.20	7.03	0.32	70.77
11	578/11	PKBH-14/1	0.00	0.50	42.09	1.12	0.88	7.35	0.16	55.08
12	578/12	PKBH-15/1	0.00	1.00	62.98	0.55	<0.20	8.22	0.30	76.70

Test Method : IS 1473 & **Instrument Used :** ICP-OES

Note: The above results are expressed on dry basis.

Note: This report and results relate only to the sample / items tested.


A.L. Kanta Rao
Authorized Signatory

Page 1 of 1

Note: This report is subject to the terms and conditions mentioned overleaf

071965



Testing to the Core

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TEST REPORT

Issued to:

Telangana State Mineral Development Corporation Ltd,
#6-2-915, HMWSSB Premises, Rear Block
3rd Floor, Khairatabad.
Hyderabad-500004
Kind Attn.: Mr. P. Upendar, 9491144275

Report No.: LL/ 22-23/003053
Issue Date: 24th June, 2022,
Customer Ref : TSMDC/GM(M)/Mn
/2021-22/268
Ref. Date: 14th June, 2022.

Sample Particulars: Limestone with Manganese (Pimperkunta Manganese block, Pimperkunta Village, Bheempur Mandal, Adilabad district Telangana State)

Qty: ~1 X 15 Nos. Packing: Polythene Cover

Tests Reqd.: Silica as SiO₂, Calcium as CaO, Magnesium as MgO, Manganese as Mn, Phosphorus as P₂O₅, Insolubles

Dt. of Receipt of analysis : 14th June, 2022,

Dt. of starting of analysis : 15th June, 2022

Dt. of completion of analysis : 23th June, 2022

TEST RESULTS

Sl. No	Sample ID	Meterage(m)		(% by mass)					
		From	To	Silica as SiO ₂	Calcium as CaO	Magnesium as MgO	Manganese as Mn	Phosphorus as P ₂ O ₅	Insolubles
1	PKBH-1/4	2.20	2.40	47.57	26.27	0.47	0.86	0.35	50.43
2	PKBH-2/6	4.40	4.90	41.30	10.07	1.62	17.16	0.11	44.64
3	PKBH-3/1	0.00	0.90	32.16	36.66	0.34	0.58	0.30	32.92
4	PKBH-4/2&3	1.50	3.00	23.73	38.90	0.60	2.28	0.37	24.94
5	PKBH-5/2	1.00	1.65	52.41	24.60	0.42	0.67	0.04	53.28
6	PKBH-7/4	1.60	2.15	31.80	35.54	0.46	0.78	0.40	32.24
7	PKBH-9/8	4.80	5.10	30.65	35.27	0.46	2.59	0.27	32.61
8	PKBH-10/5	3.50	4.50	21.00	37.48	0.88	0.30	0.09	27.14
9	PKBH-10/6&7	4.50	6.00	6.11	50.04	0.84	0.17	0.07	7.90
10	PKBH-11/2	0.50	1.50	18.13	43.04	0.64	1.25	0.70	19.73
11	PKBH-13/3	2.00	3.00	31.00	36.37	0.88	0.18	1.00	33.37
12	PKBH-13/19	24.00	25.50	26.47	38.01	0.58	0.06	0.60	30.21
13	PKBH-14/3	1.50	3.00	21.57	42.49	0.49	0.24	0.08	23.00
14	PKBH-15/3	2.55	3.00	9.64	49.48	0.52	0.30	0.13	11.52
15	PKBH-15/6	6.00	7.53	31.86	36.66	0.32	0.76	0.15	32.97

Test Method : IS 1760 & **Instrument Used :** ICP-OES

Note: The above results are expressed on dry basis.

Note: This report and results relate only to the sample / items tested.


A.L. Kanta Rao
Authorized Signatory

TEST REPORT

Issued to:

Telangana State Mineral Development Corporation Ltd,
#6-2-915, HMWSSB Premises, Rear Block
3rd Floor, Khairabad.
Kind Attn.: Mr. P. Upendar, 9491144275

Report No.: LL/ 21-22/005347

Issue Date: 18.08.2022

Ref No: TSMDC/GM(M)/MN/2021-21/428

Ref. Date: 11.08.2022.

Sample Particulars: Manganese Block Core Samples

Qty: 1 Kg X 54 Nos. **Packing:** Polythene Cover.
Tests Required: SiO₂, Cao, Mgo, Mn, P₂O₅, %Insolubles.
Dt. of Receipt of analysis : 12.08.2022,
Dt. of starting of analysis : 16.08.2022,
Dt. of completion of analysis : 18.08.2022,

TEST RESULTS

S.No	Lab.No	Sender's No	From	To	SiO ₂	Cao	Mgo	Mn	P ₂ O ₅	%Insolubles
1	5347/1	PKBH-1/5	2.40	3.00	19.29	42.82	0.44	0.06	0.29	20.22
2	5347/2	PKBH-1/6&7	3.00	4.50	35.35	33.57	0.47	0.02	0.32	39.00
3	5347/3	PKBH-1/8&9	4.50	6.00	23.89	39.16	0.65	0.04	1.26	29.02
4	5347/4	PKBH-1/12	9.00	10.94	28.78	36.07	0.76	0.03	0.52	33.68
5	5347/5	PKBH-1/13	10.94	12.00	31.21	35.22	0.78	0.03	0.68	35.22
6	5347/6	PKBH-1/22	27.00	30.00	29.82	36.37	0.64	0.03	0.60	32.10
7	5347/7	PKBH-2/1&2	0.00	0.95	15.69	44.78	0.79	0.07	0.06	16.80
8	5347/8	PKBH-2/3&4	0.95	3.00	15.24	45.05	0.71	0.07	0.11	16.06
9	5347/9	PKBH-2/5	3.00	4.40	35.02	33.01	0.60	0.02	0.06	27.16
10	5347/10	PKBH-2/7&8	4.90	6.00	36.32	32.72	0.45	0.02	0.36	39.70
11	5347/11	PKBH-2/9	6.00	7.50	22.27	41.37	0.47	0.05	0.34	23.60
12	5347/12	PKBH-2/10	7.50	9.00	20.89	42.00	0.56	0.05	0.45	23.42
13	5347/13	PKBH-3/2&3	0.90	3.00	32.63	34.99	0.44	0.03	0.27	36.96
14	5347/14	PKBH-3/4	3.00	4.50	26.16	38.06	0.68	0.04	0.65	27.86
15	5347/15	PKBH-3/5	4.50	6.00	30.56	35.78	0.66	0.03	0.50	33.92
16	5347/16	PKBH-3/13	18.00	20.00	35.45	32.71	0.82	0.02	0.72	37.74
17	5347/17	PKBH-4/12&13	9.00	12.00	31.69	34.71	0.89	0.03	0.68	33.90
18	5347/18	PKBH-4/18&19	18.00	20.00	29.17	36.37	0.93	0.03	0.65	20.22
19	5347/19	PKBH-5/11	6.00	7.15	20.00	42.25	0.53	0.05	0.60	39.00

Test Method: IS 1760.

Note: The above results are as on dry basis.



Testing to the Core

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TEST REPORT

Issued to:

Telangana State Mineral Development Corporation Ltd,
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3rd Floor, Khairabad.
Kind Attn.: Mr. P. Upendar, 9491144275

Report No.: LL/ 21-22/005347
Issue Date: 18.08.2022
Ref No: TSMDC/GM(M)/MN/2021-21/428
Ref. Date: 11.08. 2022.

Sample Particulars: Manganese Block Core Samples

Qty: 1Kg X 54 Nos. **Packing:** Polythene Cover.
Tests Required: SiO₂, Cao, Mgo, Mn, P₂O₅, %Insolubles.
Dt. of Receipt of analysis : 12.08.2022,
Dt. of starting of analysis : 16.08.2022,
Dt. of completion of analysis : 18.08.2022,

TEST RESULTS

S.No	Lab.No	Sender's No	From	To	SiO ₂	Cao	Mgo	Mn	P ₂ O ₅	%Insolubles
20	5347/20	PKBH-5/12&13	7.15	9.00	25.45	39.15	0.52	0.04	0.46	27.02
21	5347/21	PKBH-6/6&7	1.95	3.00	23.41	39.98	0.52	0.04	0.47	26.40
22	5347/22	PKBH-6/8&9	3.00	4.10	23.78	39.97	0.48	0.04	0.33	25.94
23	5347/23	PKBH-6/10&11	4.10	6.00	26.16	38.90	0.50	0.04	0.43	27.98
24	5347/24	PKBH-7/5&6	2.15	3.00	21.37	41.69	0.62	0.05	0.50	26.98
25	5347/25	PKBH-7/12&13	6.00	7.20	25.81	38.88	0.67	0.04	0.45	30.08
26	5347/26	PKBH-7/14,15&16	7.20	9.00	26.53	38.62	0.55	0.04	0.46	29.77
27	5347/27	PKBH-8/2&3	1.50	3.00	16.90	44.22	0.51	0.07	0.13	17.90
28	5347/28	PKBH-8/7&8	6.00	8.00	31.18	36.95	0.42	0.03	0.35	31.90
29	5347/29	PKBH-8/9	8.00	9.00	33.01	36.09	0.42	0.03	0.35	35.00
30	5347/30	PKBH-9/2,3,4&5	1.00	3.00	19.47	43.92	0.42	0.06	0.05	21.50
31	5347/31	PKBH-9/6&7	3.00	4.80	15.37	45.02	0.54	0.07	0.05	16.98
32	5347/32	PKBH-9/18&19	12.00	13.80	26.82	38.57	0.36	0.04	0.31	29.96
33	5347/33	PKBH-9/20	13.80	15.00	21.64	41.97	0.42	0.05	0.33	24.54
34	5347/34	PKBH-10/1,2&3	0.00	3.00	15.54	45.34	0.54	0.07	0.05	14.92
35	5347/35	PKBH-10/4	3.00	3.50	21.18	40.02	0.63	0.05	0.06	23.80
36	5347/36	PKBH-10/13&14	10.50	12.00	20.68	41.68	0.61	0.05	0.05	22.14
37	5347/37	PKBH-10/15&16	12.00	13.50	9.77	48.38	0.81	0.12	0.04	10.78
38	5347/38	PKBH-11/3	1.50	3.00	27.45	38.02	0.34	0.03	0.30	29.16

Test Method: IS 1760

Note: The above results are as on dry basis

Page 2 of 3


A.L. Kanta Rao
Authorized Signatory

Note: This report is subject to the terms and conditions mentioned overleaf

071960



Testing to the Core

F-01-MSP7.8-TRP

Plot No. 3, IDA, Balanagar,
Hyderabad - 500 037, Telangana.
Ph: 040-6904 2222/10 Lines
E-mail: info@lucidlabsindia.com
Web: www.lucidlabsindia.com

TEST REPORT

Issued to:

Telangana State Mineral Development Corporation Ltd,
#6-2-915, HMWSSB Premises, Rear Block
3rd Floor, Khairabad.
Kind Attn.: Mr. P. Upendar, 9491144275

Report No.: LL/ 21-22/005347
Issue Date: 18.08.2022
Ref No: TSMDC/GM(M)/MN/2021-21/428
Ref. Date: 11.08. 2022.

Sample Particulars: Manganese Block Core Samples

Qty: 1Kg X 54 Nos. Packing: Polythene Cover.
Tests Required: SiO₂, Cao, Mgo, Mn, P₂O₅, %Insolubles.
Dt. of Receipt of analysis : 12.08.2022,
Dt. of starting of analysis : 16.08.2022,
Dt. of completion of analysis : 18.08.2022,

TEST RESULTS

S.No	Lab.No	Sender's No	From	To	SiO ₂	Cao	Mgo	Mn	P ₂ O ₅	%Insolubles
39	5347/3	PKBH-11/4&5	3.00	4.50	23.86	40.32	0.30	0.04	0.36	26.40
40	5347/4	PKBH-11/8&9	6.00	7.50	25.13	38.90	0.77	0.04	0.45	28.48
41	5347/4	PKBH-11/10	7.50	9.00	17.29	43.94	0.51	0.06	0.47	19.26
42	5347/4	PKBH-11/13	10.50	12.00	27.87	37.45	0.52	0.03	0.50	31.88
43	5347/4	PKBH-12/2,3&4	0.50	3.00	40.69	31.60	0.27	0.02	0.24	40.54
44	5347/4	PKBH-12/12	10.50	12.00	16.26	45.07	0.42	0.07	0.50	18.68
45	5347/4	PKBH-13/2	0.50	2.00	18.75	43.65	0.44	0.06	0.04	22.22
46	5347/4	PKBH-13/7	6.00	7.50	30.90	36.10	0.60	0.03	0.43	32.28
47	5347/4	PKBH-13/8	7.50	9.00	33.66	35.80	0.43	0.03	0.41	35.88
48	5347/4	PKBH-13/21&22	27.00	30.00	30.73	36.91	0.47	0.03	0.52	33.14
49	5347/4	PKBH-14/2	0.50	1.50	17.62	43.88	0.51	0.06	0.36	20.60
50	5347/5	PKBH-14/12	9.00	10.00	28.68	36.95	0.58	0.03	0.05	32.66
51	5347/5	PKBH-14/13&14	10.00	11.50	27.13	38.61	0.29	0.04	0.08	29.02
52	5347/5	PKBH-15/2	1.00	2.55	19.46	43.08	0.46	0.06	0.42	22.04
53	5347/5	PKBH-15/4&5	3.00	6.00	21.32	42.53	0.45	0.05	0.03	23.18
54	5347/5	PKBH-15/7	7.53	9.00	37.76	32.47	0.24	0.02	0.23	39.04

Test Method: IS 1760

Note: The above results are as on dry basis.

Page 3 of 3


A.L. Kanta Rao
Authorized Signatory

Note: This report is subject to the terms and conditions mentioned overleaf

071961

TEST REPORT

Issued to:

Telangana State Mineral Development Corporation Ltd,
 #6-2-915, HMWSSB Premises, Rear Block
 3rd Floor, Khairabad,
 Hyderabad-500004
 Kind: Attn.: Mr. P. Upendar. 9491144275

Report No.: LL/ 22-23/0005953

Issue Date : 30.08.2022,

Customer Ref : TSMDC/GM(M)/M
 /2021-22/455

Ref. Date : 24.08.2022.

Sample Particulars: Manganese Samples

Qty: ~1 X 12 Nos. Packing: Polythene Cover

Tests Reqd.: Manganese as Mn, Silica as SiO₂, Phosphorus as P₂O₅, Iron as Fe₂O₃, Manganese as MnO₂ & Insolubles

Dt. of Receipt of analysis : 27.08.2022.

Dt. of starting of analysis : 27.08.2022.

Dt. of completion of analysis : 30.08.2022.

Sl. No	Lab ID	Sample ID	(% by mass)					
			SiO ₂	Mn	MnO ₂	Fe ₂ O ₃	P ₂ O ₅	Insolubles
1	5953/1	Mn-1	20.02	22.06	35.07	3.17	0.42	21.67
2	5953/2	Mn-2	37.17	18.63	25.11	2.36	0.19	44.76
3	5953/3	Mn-3	29.06	33.48	45.86	3.46	0.35	31.92
4	5953/4	Mn-4	25.75	24.08	39.17	1.63	0.16	55.11
5	5953/5	Mn-5	21.86	24.26	37.26	1.34	0.15	51.04
6	5953/6	Mn-6	20.74	25.39	40.86	1.62	0.18	47.68
7	5953/7	Mn-7	33.91	24.80	39.27	2.76	0.17	55.83
8	5953/8	Mn-8	52.49	11.13	13.87	6.43	0.24	61.66
9	5953/9	Mn-9	49.39	13.47	17.39	5.73	0.15	57.84
10	5953/10	Mn-10	29.67	26.83	41.82	1.12	0.29	31.72

Test Method : IS 1473 & Instrument Used : ICP-OES

Note: The above results are expressed on dry basis.

Note: This report and results relate only to the sample / items tested.



A.L. Kanta Rao
 Authorized Signatory

TEST REPORT

Issued to:

Telangana State Mineral Development Corporation Ltd,
 #6-2-915, HMWSSB Premises, Rear Block
 3rd Floor, Khairabad.
 Hyderabad-500004
 Kind Attn.: Mr. P. Upendar, 9491144275

Report No.: LL/ 22-23/007522
 Issue Date: 27th Oct, 2022,
 Customer Ref : TSMDC/GM(M)/Mn
 /2021-22/565
 Ref. Date: 03rd Oct, 2022.

Sample Particulars: Manganese Ore (Composite Samples)

Qty: ~1 X 5 Nos. Packing: Polythene Cover

Tests Reqd: Silica as SiO₂, Calcium as CaO, Manganese as Mn, Manganese as MnO₂, Iron as Fe₂O₃, Phosphorus as P₂O₅, Aluminium as Al₂O₃ & LOI

Dt. of Receipt of analysis : 13th Oct, 2022,

Dt. of starting of analysis : 14th Oct, 2022,

Dt. of completion of analysis : 26th Oct, 2022.

TEST RESULTS

Sl. No	Lab ID	Borehole No	Composite sample No	Meterage (m)		(% by mass)								
				From	To	Silica as SiO ₂	Calcium as CaO	Magnesium as MgO	Manganese as Mn	Manganese as MnO ₂	Iron as Fe ₂ O ₃	Phosphorous as P ₂ O ₅	Aluminium as Al ₂ O ₃	Loss On Ignition
1	7522/1	PKBH-1	PKBH/1/C/1	1.50	2.40	30.90	25.97	0.71	19.06	29.00	1.90	0.19	1.09	19.31
2	7522/2	PKBH-5	PKBH/5/C/1	1.00	2.60	36.22	24.14	0.48	17.91	26.57	1.17	0.18	1.30	18.83
3	7522/3	PKBH-6	PKBH/6/C/1	0.30	3.00	26.04	25.71	0.61	18.85	28.34	2.18	0.30	1.77	22.17
4	7522/4	PKBH-7	PKBH/7/C/1	0.50	2.15	44.17	25.06	0.55	2.89	4.07	1.24	0.15	0.84	23.32
5	7522/5	PKBH-9	PKBH/9/C/1	4.80	6.30	44.24	16.47	0.49	16.40	24.82	7.27	0.29	0.75	13.98

Test Method : IS 1473

Note: The above results are expressed on dry basis.

Note: This report and results relate only to the sample / items tested.


 A.L. Kanta Rao
 Authorized Signatory

Receipt NO/1574554/22



Testing to the Core

F-01-MSP7.8-TRP

Plot No. 3, IDA, Balanagar,
Hyderabad - 500 037, Telangana.
Ph: +91-40 2372 0678, 680, 681
Fax: +91-40 2372 0406
E-mail: info@lucidlabsindia.com
Web: www.lucidlabsindia.com

TEST REPORT

Issued to:

Telangana State Mineral Development Corporation Ltd,
#6-2-915, HMWSSB Premises, Rear Block
3rd Floor, Khairabad.
Hyderabad-500004
Kind Attn.: Mr. P. Uppendar, 9491144275

Report No.: LL/ 22-23/000580

Issue Date: 20th May, 2022,

Customer Ref: TSMDC/GM(M)/Mn
/2021-22/44

Ref. Date: 13th April, 2022.

Sample Particulars: Manganese Ore (CORE Samples)

Qty: ~1 X 4 Nos. Packing: Polythene Cover
Tests Req'd: Specific gravity,
Dt. of Receipt of analysis : 13th April, 2022,
Dt. of starting of analysis : 18th April, 2022,
Dt. of completion of analysis : 20th May, 2022,

TEST RESULTS

Sl. No	Lab ID	Sample ID	Meterage(m) From To	Specific gravity @ 30°C
1	580/1	PKBH - 1/2	1.50 - 1.90	2.9514
2	580/2	PKBH - 5/4	2.10 - 2.60	2.8472
3	580/3	PKBH - 6/4	1.15 - 1.50	3.0482
4	580/4	PKBH - 9/10	5.50 - 6.00	2.7279

Test method: IS-1448(P-32)

Note: This report and results relate only to the sample / items tested.



A.L. Kanta Rao
Authorized Signatory

Note: This report is subject to the terms and conditions mentioned overleaf

065421

TEST REPORT

Issued to:
Telangana State Mineral Development Corporation Limited,
Department of Industries & Commerce
Government of Telangana,
#6-2-915, HMWSSB premises, Rear Block,
3rd Floor, Khairatabad, Hyderabad – 500 004, TS, INDIA.

Report No.: LL/22-23/1495
Issue Date: 21/06/2022
C.Ref.: TSMDC/GM(M)/Mn/
2021-22/119
Ref.Date: 05/05/2022

Sample Particulars: **MANGANESE (CORE SAMPLE)**

Source of the sample : Pimperkunta Manganese Block in Adilabad District of Telangana State.

Depth in Meters: 1.50-1.90

Quantity: 1 No. Packing: Packed in a Nylon Bag.

Tests Required : Petrographic Examination

Date of Receipt of sample : 09th May 2022.

Date of starting of analysis : 10th May 2022.

Date of completion of analysis : 21st June 2022.

TEST RESULTS

Sl.No.	Description	Results
1	Petrographic Examination PKBH-1/2	In hand specimen the core sample is very fine grained, aphanitic, earthy, with dull lustre and soils the hand. Under the microscope it is very fine grained and is essentially made up of fine psilomelane (Ps) grains and some pyrolusite (Py) minerals and fine gangue material (Figs.1 & 2) some of which may be carbonate. The rock is very fine grained to identify other minerals – if any and it is suggested to go for X-ray studies to identify individual phases such as presence of cryptomelane, if any. The whole rock chemistry may indicate the MnO content. The core sample is that of a manganese ore.

Page 1 of 2

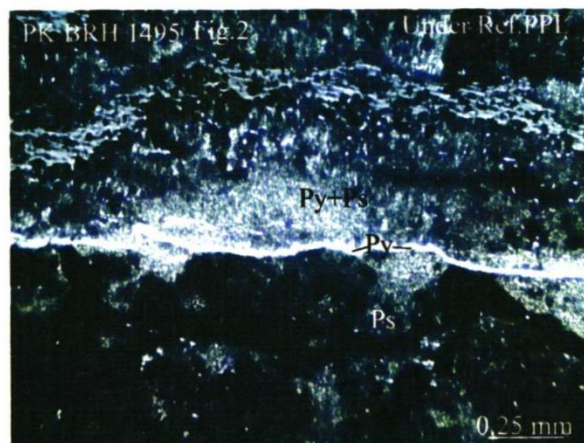
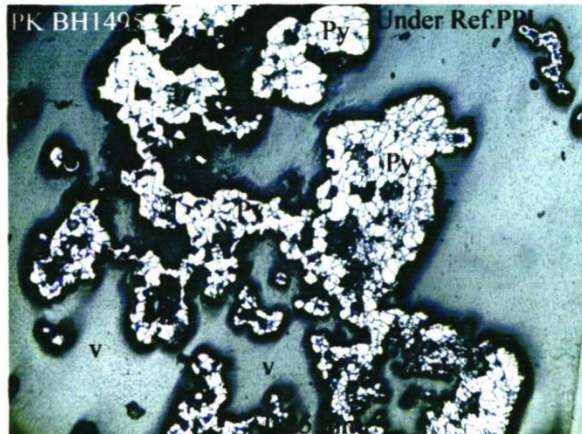

R. KRISHNA MOORTHY
AUTHORISED SIGNATORY

Note: This report is subject to the terms and conditions mentioned overleaf


066614

Report No.: LL/22-23/1495

Issue Date: 21/06/2022



Note : The report and results relate only to the samples/items tested.


R. KRISHNA MOORTHY
AUTHORISED SIGNATORY



Testing to the Core

F-01-MSP7.8-TRP

Plot No. 3, IDA, Balanagar,
Hyderabad - 500 037, Telangana.
Ph: 040-6904 2222/10 Lines
E-mail: info@lucidlabsindia.com
Web: www.lucidlabsindia.com

TEST REPORT

Issued to:

Telangana State Mineral Development Corporation Ltd,
#6-2-915, HMWSSB Premises, Rear Block
3rd Floor, Khairabad.
Hyderabad-500004
Kind Attn.: Mr. P. Uppendar, 9491144275

Report No.: LL/ 22-23/007523
Issue Date: 27th Oct, 2022,
Customer Ref: TSMDC/GM(M)/Mn
/2021-22/565
Ref. Date: 03rd Oct, 2022.

Sample Particulars: Manganese Ore

Qty: 1 No

Tests Reqd: XRD

Dt. of Receipt of analysis : 13th Oct, 2022,

Dt. of starting of analysis : 14th Oct, 2022,

Dt. of completion of analysis : 26th Oct, 2022,

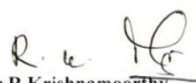
TEST RESULTS

Sample No:	Ref No:	Quartz	Dolomite	Calcite	Ankerite as (Kutnohorite)	Baryte	Berlinite	Ilmenite	Rutile	Magnetite	Phosphorite
7523-1	PKBH-1/3	Major	Traces	Major	Major	Traces	Negligible	Traces	Traces	Traces	Traces
7523-2	PKBH-1/4	Major	Traces	Major	Minor	Minor	Negligible	Traces	Traces	Traces	Traces
7523-3	PKBH-2/6	Major	Traces	Minor	Major	Minor	Negligible	Traces	Traces	Traces	Traces
7523-4	PKBH-5/3	Major	Traces	Major	Major	Minor	Negligible	Traces	Traces	Minor	Traces
7523-5	PKBH-9/10	Major	Traces	Major	Major	Trace	Negligible	Traces	Traces	Minor	Traces
7523-6	PKBH-7/3	Major (Very high)	Traces	Minor	Minor	Trace	Negligible	Traces	Traces	Minor	Traces

Note: Over all in all Samples Tested for X-Ray Diffraction Contains Quartz & Calcite Major Minerals. Ankerite as Kutnohorite (Calcium Manganese Carbonate) is Rich (appreciable quantity) in the Sample Nos 7523/1, 7523/3, 7523/4, & 7523/5 almost Considered as major mineral where as in the Sample No 7523/2, in minor quantity. The Rutile, Ilmenite & Magnetite minerals are Present in minor, traces of all the Samples Studied. The Sample No 7523/6 Contains Quartz is the Major Mineral In very high quantity with minor levels of Ankerite & Magnetite minerals are Present.

Test Method : XRD

Note: This report and results relate only to the sample / items tested.


Dr. R. Krishnamoorthy
Authorized Signatory

Page 1 of 1

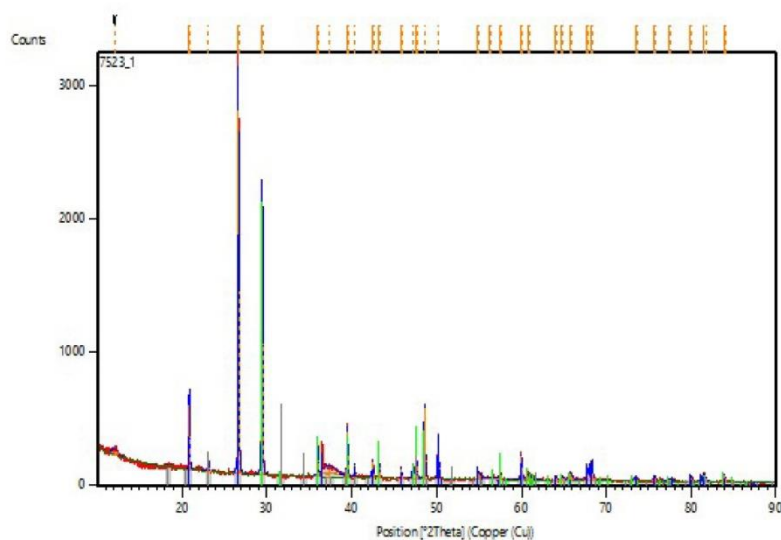
Note: This report is subject to the terms and conditions mentioned overleaf

073325

Anchor Scan Parameters

Dataset Name:	7523_1
File name:	G:\XRD\November-2022\7523_1.xrdml
Sample Identification:	7523_1
Measurement Date / Time:	10/26/2022 3:38:13 PM
Operator:	User-1
Raw Data Origin:	XRD measurement (*.XRDML)
Scan Axis:	Gonio
Start Position [$^{\circ}2\theta$.]:	10.0016
End Position [$^{\circ}2\theta$.]:	90.0166
Step Size [$^{\circ}2\theta$.]:	0.0130
Scan Step Time [s]:	83.8950
Scan Type:	Continuous
PSD Mode:	Scanning
PSD Length [$^{\circ}2\theta$.]:	3.35
Offset [$^{\circ}2\theta$.]:	0.0000
Divergence Slit Type:	Fixed
Divergence Slit Size [$^{\circ}$]:	0.5000
Specimen Length [mm]:	10.00
Measurement Temperature [$^{\circ}\text{C}$]:	25.00
Anode Material:	Cu
K-Alpha1 [\AA]:	1.54060
K-Alpha2 [\AA]:	1.54443
K-Beta [\AA]:	1.39225
K-A2 / K-A1 Ratio:	0.50000
Generator Settings:	40 mA, 45 kV
Diffractionmeter Type:	0000000011135814
Diffractionmeter Number:	0
Goniometer Radius [mm]:	240.00
Dist. Focus-Diverg. Slit [mm]:	100.00
Incident Beam Monochromator:	No
Spinning:	No

Graphics



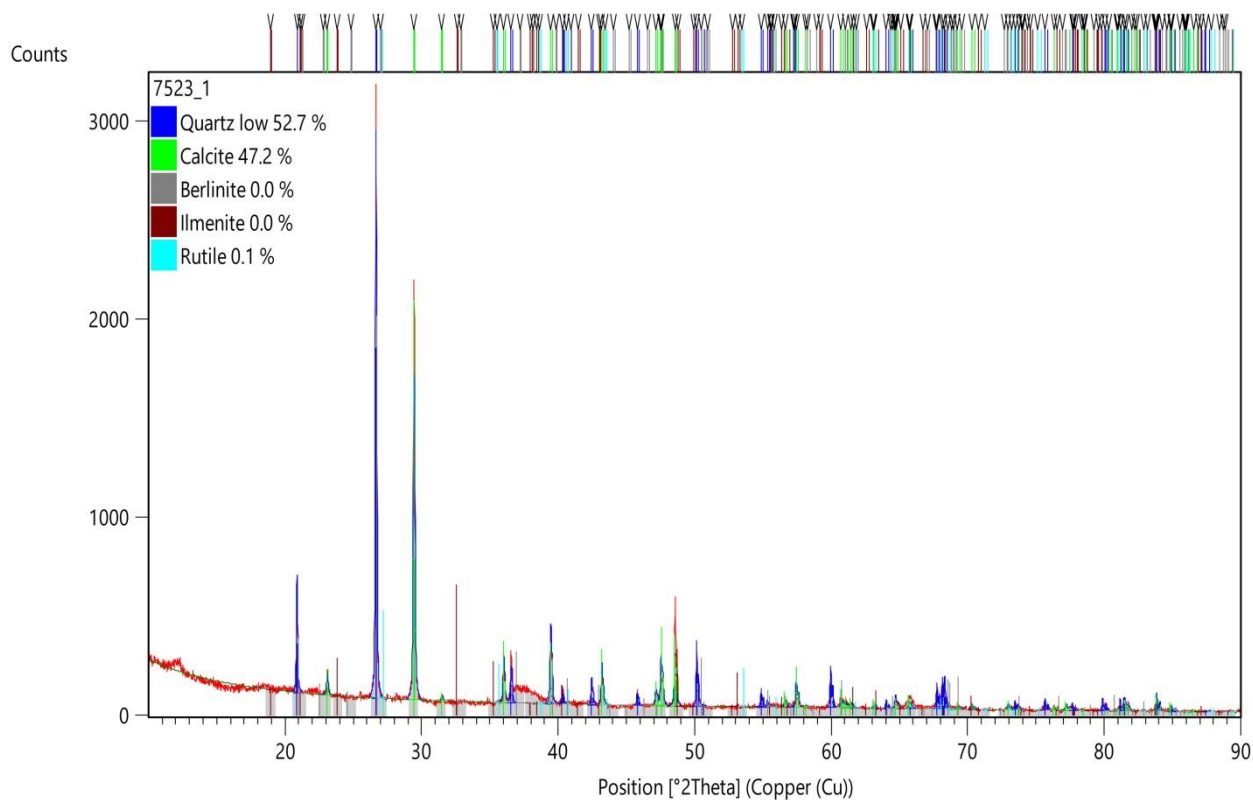
Pattern List

Visible	Ref.Code	Score	Compound Name	Displ.[°2Th]	Scale Fac.	Chem. Formula
*	98-001-8172	68	Quartz low	-0.023	0.554	O2 Si1
*	98-015-8257	63	Calcite	0.049	0.633	C1 Ca1 O3
*	98-009-1655	9	Ilmenite	-0.297	0.169	Fe1 O3 Ti1

Date: 11/1/2022 Time: 11:37:25 AM

File: 7523_1

User: Home

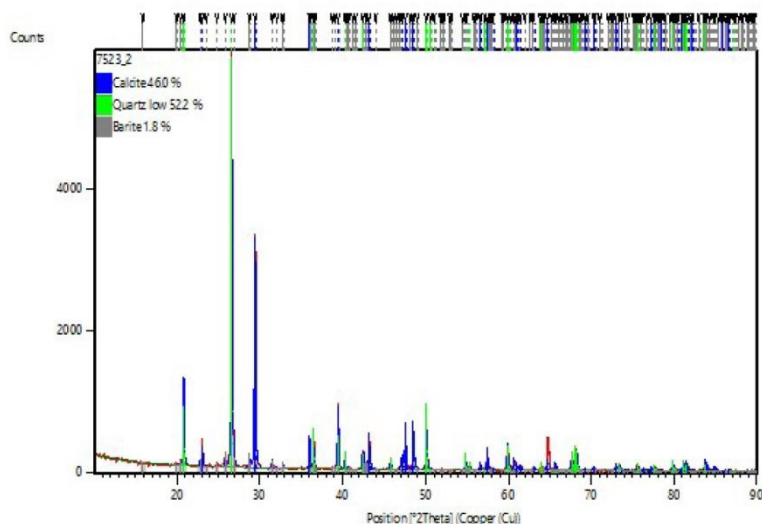


Page: 1 of 1

Anchor Scan Parameters

Dataset Name:	7523_2
File name:	G:\XRD\November-2022\7523_2.xrdml
Sample Identification:	7523_2
Measurement Date / Time:	10/26/2022 4:19:59 PM
Operator:	User-1
Raw Data Origin:	XRD measurement (*.XRDML)
Scan Axis:	Gonio
Start Position [°2Th.]:	10.0016
End Position [°2Th.]:	90.0166
Step Size [°2Th.]:	0.0130
Scan Step Time [s]:	83.8950
Scan Type:	Continuous
PSD Mode:	Scanning
PSD Length [°2Th.]:	3.35
Offset [°2Th.]:	0.0000
Divergence Slit Type:	Fixed
Divergence Slit Size [°]:	0.5000
Specimen Length [mm]:	10.00
Measurement Temperature [°C]:	25.00
Anode Material:	Cu
K-Alpha1 [Å]:	1.54060
K-Alpha2 [Å]:	1.54443
K-Beta [Å]:	1.39225
K-A2 / K-A1 Ratio:	0.50000
Generator Settings:	40 mA, 45 kV
Diffractometer Type:	0000000011135814
Diffractometer Number:	0
Goniometer Radius [mm]:	240.00
Dist. Focus-Diverg. Slit [mm]:	100.00
Incident Beam Monochromator:	No
Spinning:	No

Graphics



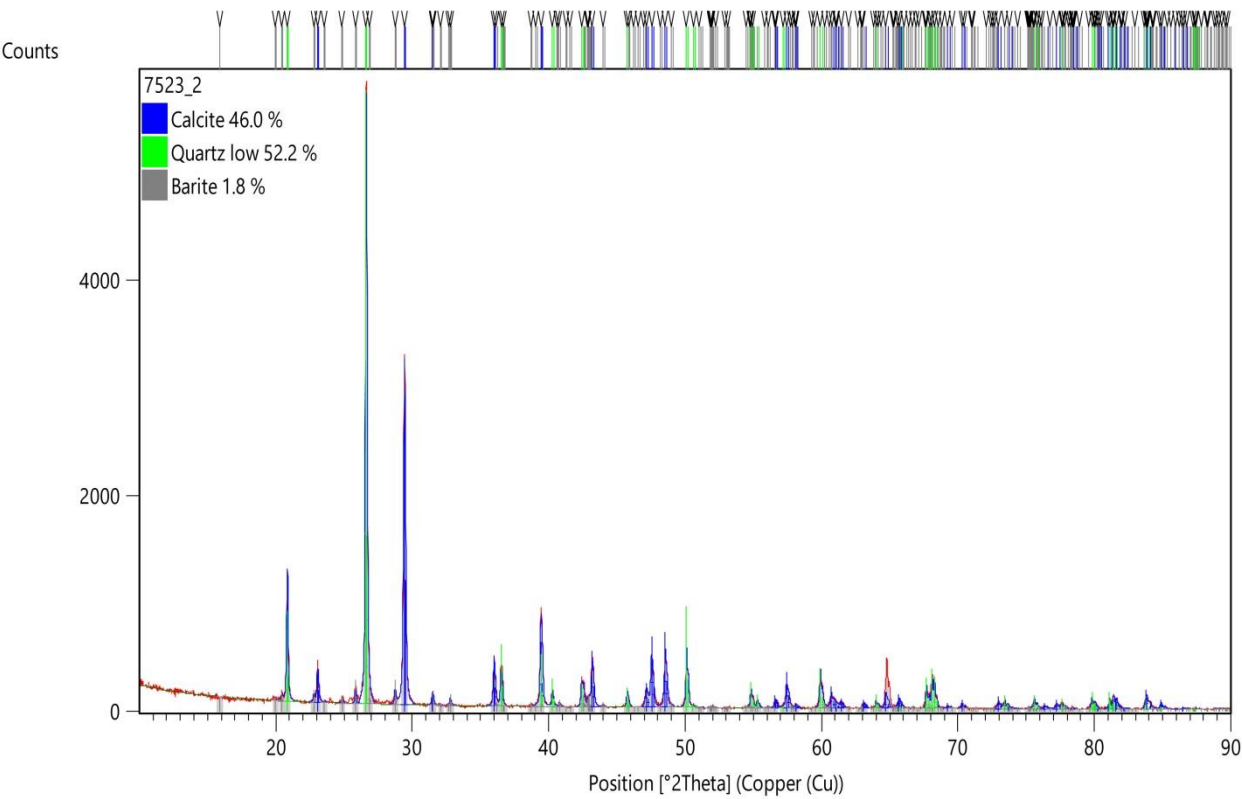
Pattern List

Visible	Ref.Code	Score	Compound Name	Displ.[°2Th]	Scale Fac.	Chem. Formula
*	98-007-9674	74	Calcite	0.015	0.547	C1 Ca1 O3
*	98-009-0145	73	Quartz low	-0.008	0.973	O2 Si1
*	98-010-0623	29	Barite	0.005	0.038	Ba1 O4 S1

Date: 11/1/2022 Time: 11:40:22 AM

File: 7523_2

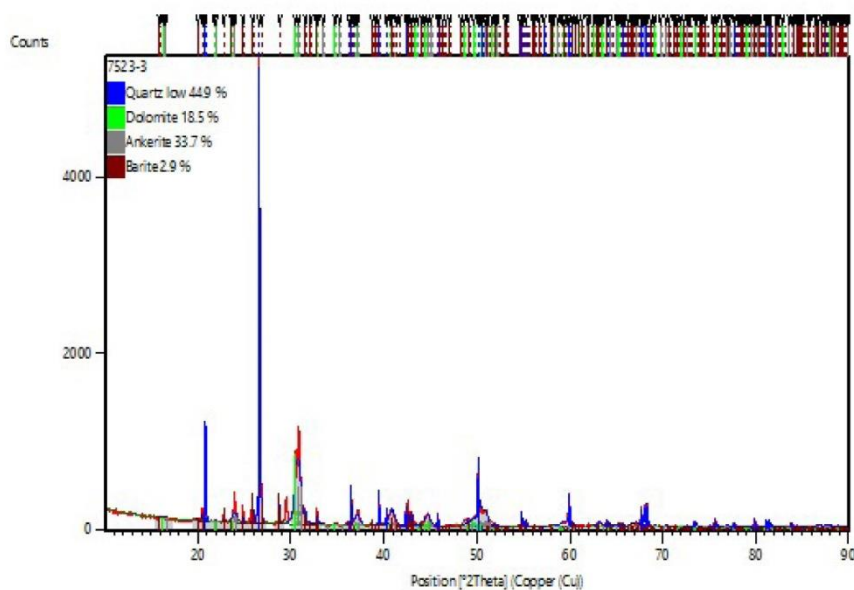
User: Home



Anchor Scan Parameters

Dataset Name:	7523-3
File name:	G:\XRD\November-2022\7523-3.xrdml
Sample Identification:	7523-3
Measurement Date / Time:	10/27/2022 3:07:53 PM
Operator:	User-1
Raw Data Origin:	XRD measurement (*.XRDML)
Scan Axis:	Gonio
Start Position [$^{\circ}$ 2Th.]:	10.0016
End Position [$^{\circ}$ 2Th.]:	90.0166
Step Size [$^{\circ}$ 2Th.]:	0.0130
Scan Step Time [s]:	83.8950
Scan Type:	Continuous
PSD Mode:	Scanning
PSD Length [$^{\circ}$ 2Th.]:	3.35
Offset [$^{\circ}$ 2Th.]:	0.0000
Divergence Slit Type:	Fixed
Divergence Slit Size [$^{\circ}$]:	0.5000
Specimen Length [mm]:	10.00
Measurement Temperature [$^{\circ}$ C]:	25.00
Anode Material:	Cu
K-Alpha1 [\AA]:	1.54060
K-Alpha2 [\AA]:	1.54443
K-Beta [\AA]:	1.39225
K-A2 / K-A1 Ratio:	0.50000
Generator Settings:	40 mA, 45 kV
Diffractionmeter Type:	0000000011135814
Diffractionmeter Number:	0
Goniometer Radius [mm]:	240.00
Dist. Focus-Diverg. Slit [mm]:	100.00
Incident Beam Monochromator:	No
Spinning:	No

Graphics



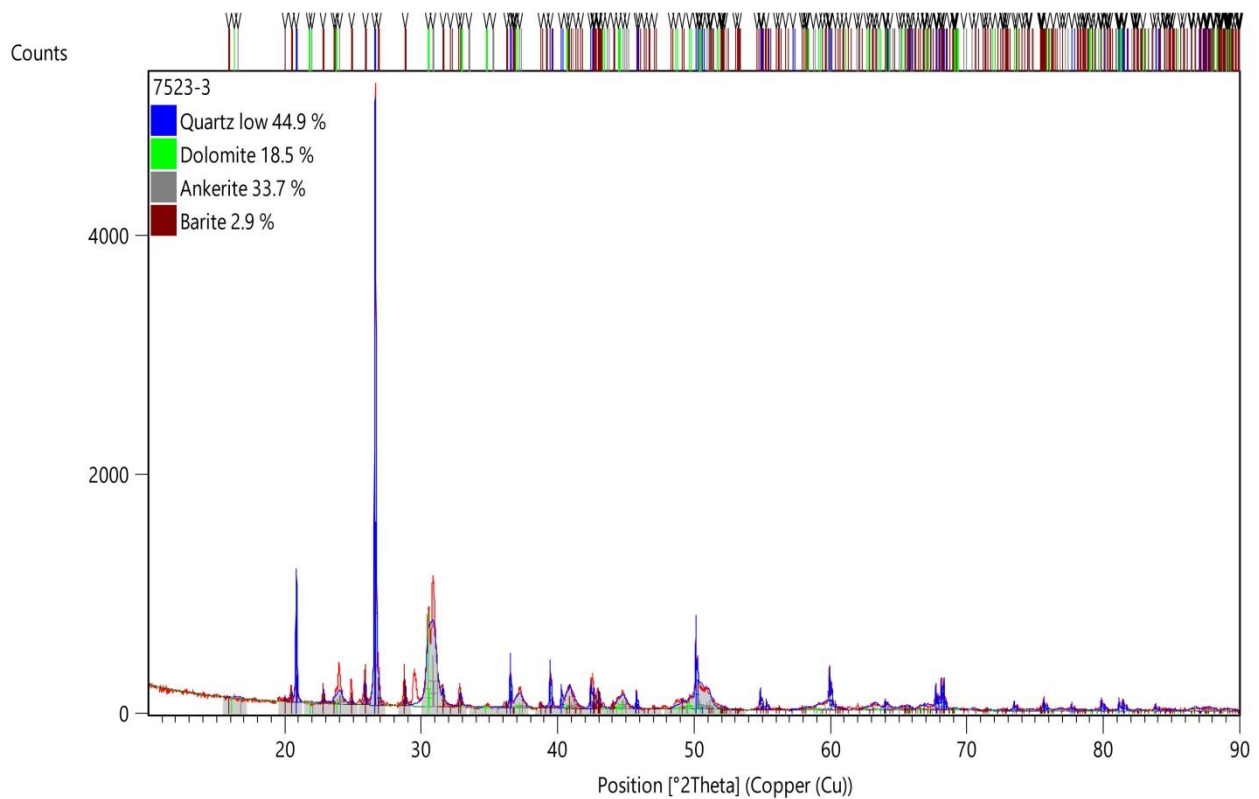
Pattern List

Visible	Ref.Code	Score	Compound Name	Displ. [°2Th]	Scale Fac.	Chem. Formula
*	98-008-3849	69	Quartz low	-0.030	0.930	O2 Si1
*	98-017-1530	39	Dolomite	-0.153	0.151	C2 Ca1 Mg1 O6
*	98-006-6341	34	Ankerite	-0.068	0.082	C2 Ca0.997
Fe0.676..						
*	98-018-0337	35	Barite	-0.042	0.066	Ba1 O4 S1

Date: 11/1/2022 Time: 11:45:16 AM

File: 7523-3

User: Home

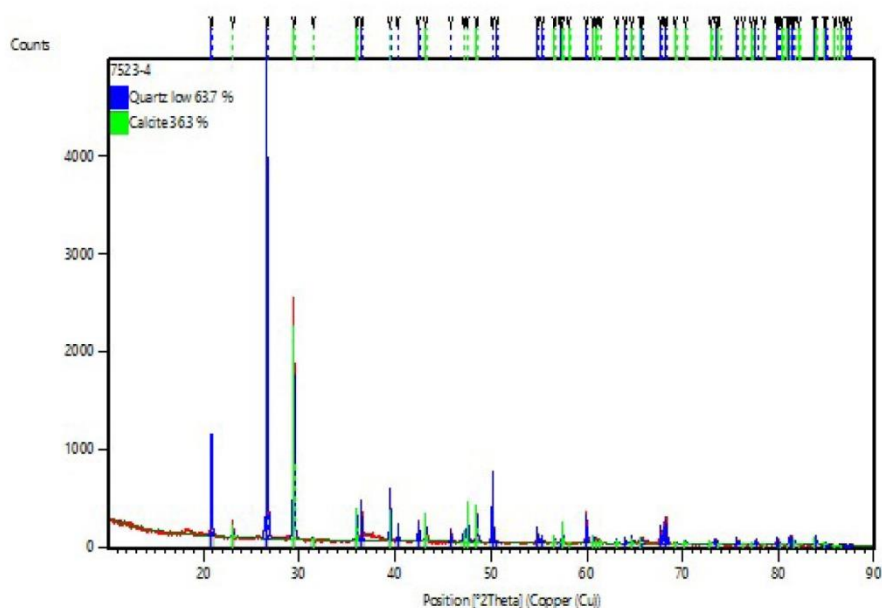


Page: 1 of 1

Anchor Scan Parameters

Dataset Name:	7523-4
File name:	G:\XRD\November-2022\7523-4.xrdml
Sample Identification:	7523-4
Measurement Date / Time:	10/27/2022 4:00:02 PM
Operator:	User-1
Raw Data Origin:	XRD measurement (*.XRDML)
Scan Axis:	Gonio
Start Position [$^{\circ}$ 2Th.]:	10.0016
End Position [$^{\circ}$ 2Th.]:	90.0166
Step Size [$^{\circ}$ 2Th.]:	0.0130
Scan Step Time [s]:	83.8950
Scan Type:	Continuous
PSD Mode:	Scanning
PSD Length [$^{\circ}$ 2Th.]:	3.35
Offset [$^{\circ}$ 2Th.]:	0.0000
Divergence Slit Type:	Fixed
Divergence Slit Size [$^{\circ}$]:	0.5000
Specimen Length [mm]:	10.00
Measurement Temperature [$^{\circ}$ C]:	25.00
Anode Material:	Cu
K-Alpha1 [\AA]:	1.54060
K-Alpha2 [\AA]:	1.54443
K-Beta [\AA]:	1.39225
K-A2 / K-A1 Ratio:	0.50000
Generator Settings:	40 mA, 45 kV
Diffractionmeter Type:	0000000011135814
Diffractionmeter Number:	0
Goniometer Radius [mm]:	240.00
Dist. Focus-Diverg. Slit [mm]:	100.00
Incident Beam Monochromator:	No
Spinning:	No

Graphics



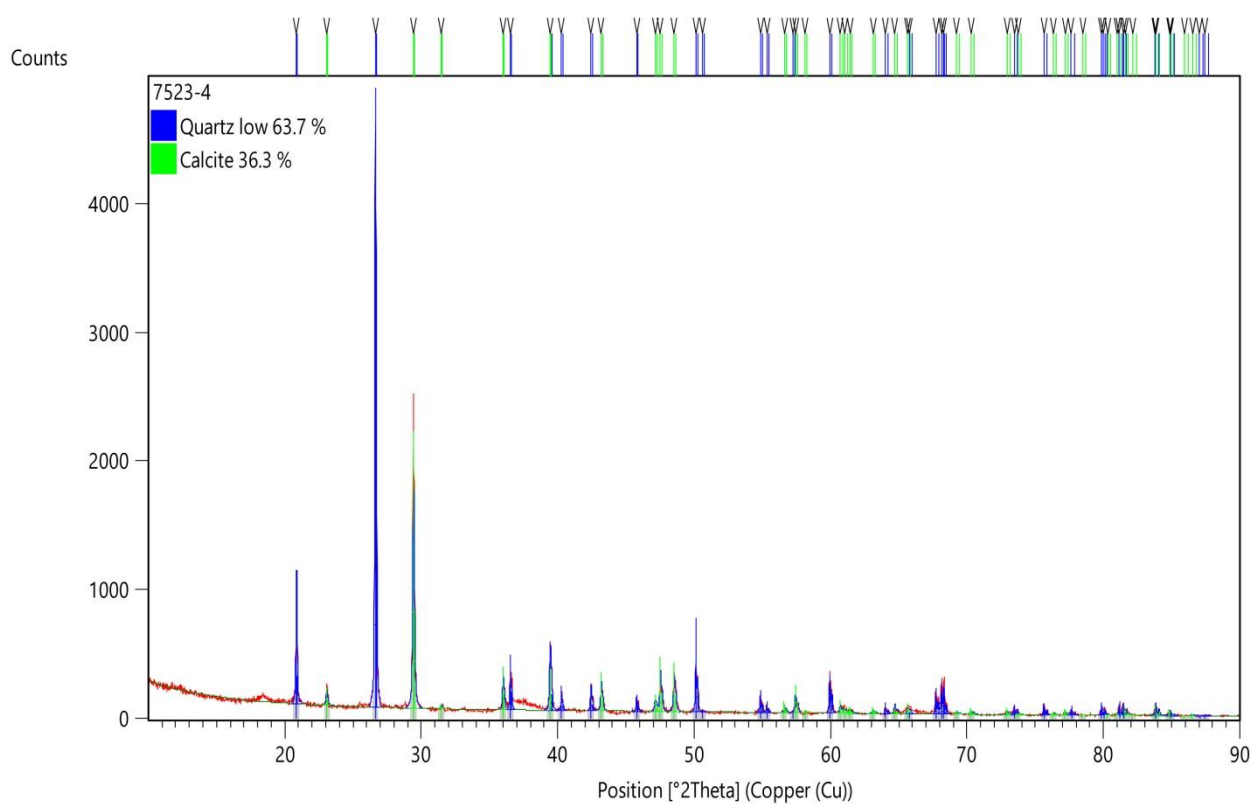
Pattern List

Visible	Ref.Code	Score	Compound Name	Displ. [°2Th]	Scale Fac.	Chem. Formula
*	98-008-3849	76	Quartz low	-0.018	0.928	O2 Si1
*	98-015-8257	66	Calcite	0.041	0.438	Cl1 Ca1 O3

Date: 11/1/2022 Time: 11:51:17 AM

File: 7523-4

User: Home

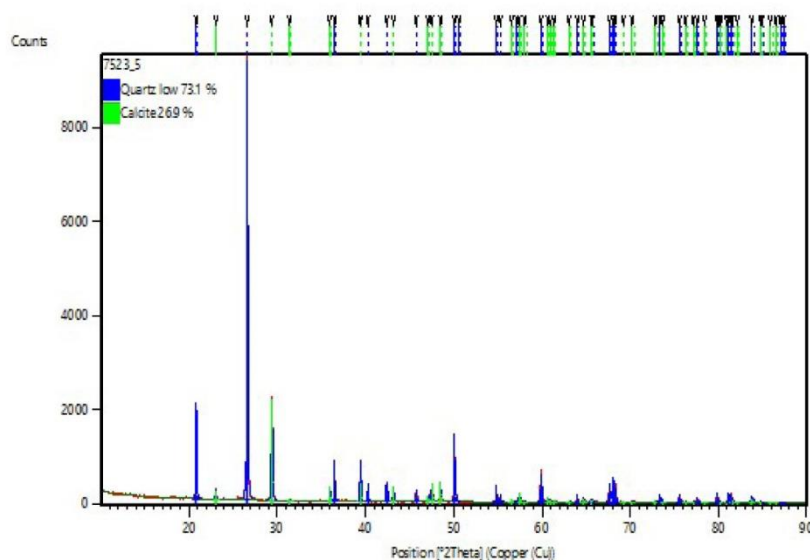


Page: 1 of 1

Anchor Scan Parameters

Dataset Name:	7523_5
File name:	G:\XRD\November-2022\7523_5.xrdml
Sample Identification:	7523_5
Measurement Date / Time:	10/28/2022 3:49:07 PM
Operator:	User-1
Raw Data Origin:	XRD measurement (*.XRDML)
Scan Axis:	Gonio
Start Position [$^{\circ}$ 2Th.]:	10.0016
End Position [$^{\circ}$ 2Th.]:	90.0166
Step Size [$^{\circ}$ 2Th.]:	0.0130
Scan Step Time [s]:	83.8950
Scan Type:	Continuous
PSD Mode:	Scanning
PSD Length [$^{\circ}$ 2Th.]:	3.35
Offset [$^{\circ}$ 2Th.]:	0.0000
Divergence Slit Type:	Fixed
Divergence Slit Size [$^{\circ}$]:	0.5000
Specimen Length [mm]:	10.00
Measurement Temperature [$^{\circ}$ C]:	25.00
Anode Material:	Cu
K-Alpha1 [\AA]:	1.54060
K-Alpha2 [\AA]:	1.54443
K-Beta [\AA]:	1.39225
K-A2 / K-A1 Ratio:	0.50000
Generator Settings:	40 mA, 45 kV
Diffractometer Type:	0000000011135814
Diffractometer Number:	0
Goniometer Radius [mm]:	240.00
Dist. Focus-Diverg. Slit [mm]:	100.00
Incident Beam Monochromator:	No
Spinning:	No

Graphics



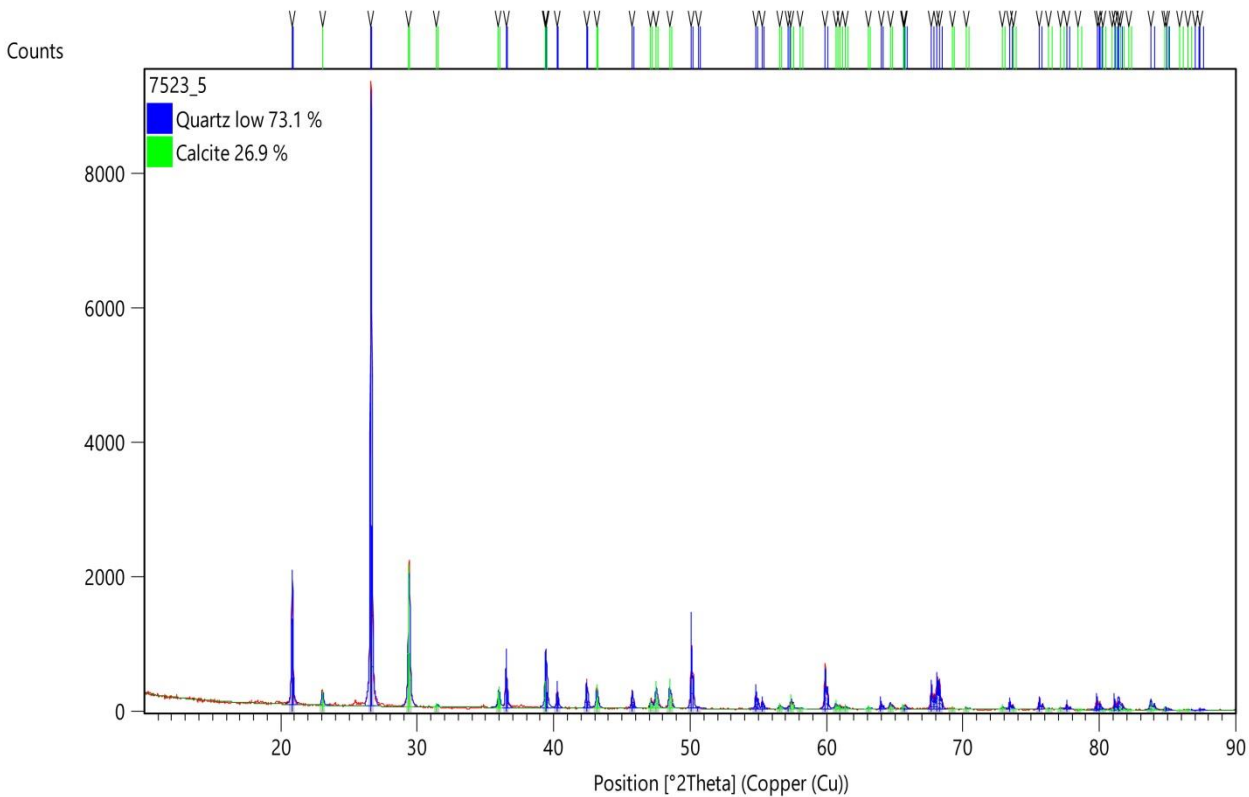
Pattern List

Visible	Ref. Code	Score	Compound Name	Displ. [°2Th]	Scale Fac.	Chem. Formula
*	98-009-0145	78	Quartz low	-0.018	0.929	O2 Si1
*	98-004-0107	72	Calcite	-0.014	0.226	C1 Ca1 O3

Date: 11/1/2022 Time: 11:54:31 AM

File: 7523_5

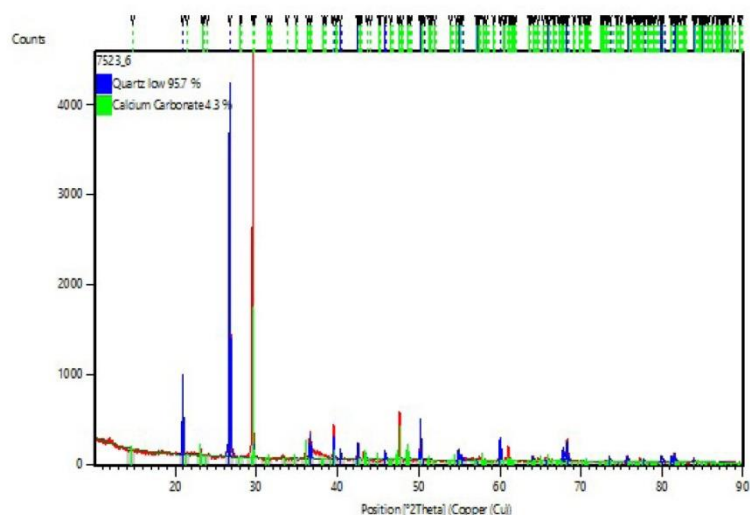
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Anchor Scan Parameters

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File name:	G:\XRD\November-2022\7523_6.xrdml
Sample Identification:	7523_6
Measurement Date / Time:	10/28/2022 4:31:13 PM
Operator:	User-1
Raw Data Origin:	XRD measurement (*.XRDML)
Scan Axis:	Gonio
Start Position [$^{\circ}2\theta$.]:	10.0016
End Position [$^{\circ}2\theta$.]:	90.0166
Step Size [$^{\circ}2\theta$.]:	0.0130
Scan Step Time [s]:	83.8950
Scan Type:	Continuous
PSD Mode:	Scanning
PSD Length [$^{\circ}2\theta$.]:	3.35
Offset [$^{\circ}2\theta$.]:	0.0000
Divergence Slit Type:	Fixed
Divergence Slit Size [$^{\circ}$]:	0.5000
Specimen Length [mm]:	10.00
Measurement Temperature [$^{\circ}\text{C}$]:	25.00
Anode Material:	Cu
K-Alpha1 [\AA]:	1.54060
K-Alpha2 [\AA]:	1.54443
K-Beta [\AA]:	1.39225
K-A2 / K-A1 Ratio:	0.50000
Generator Settings:	40 mA, 45 kV
Diffractionmeter Type:	0000000011135814
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Goniometer Radius [mm]:	240.00
Dist. Focus-Diverg. Slit [mm]:	100.00
Incident Beam Monochromator:	No
Spinning:	No

Graphics



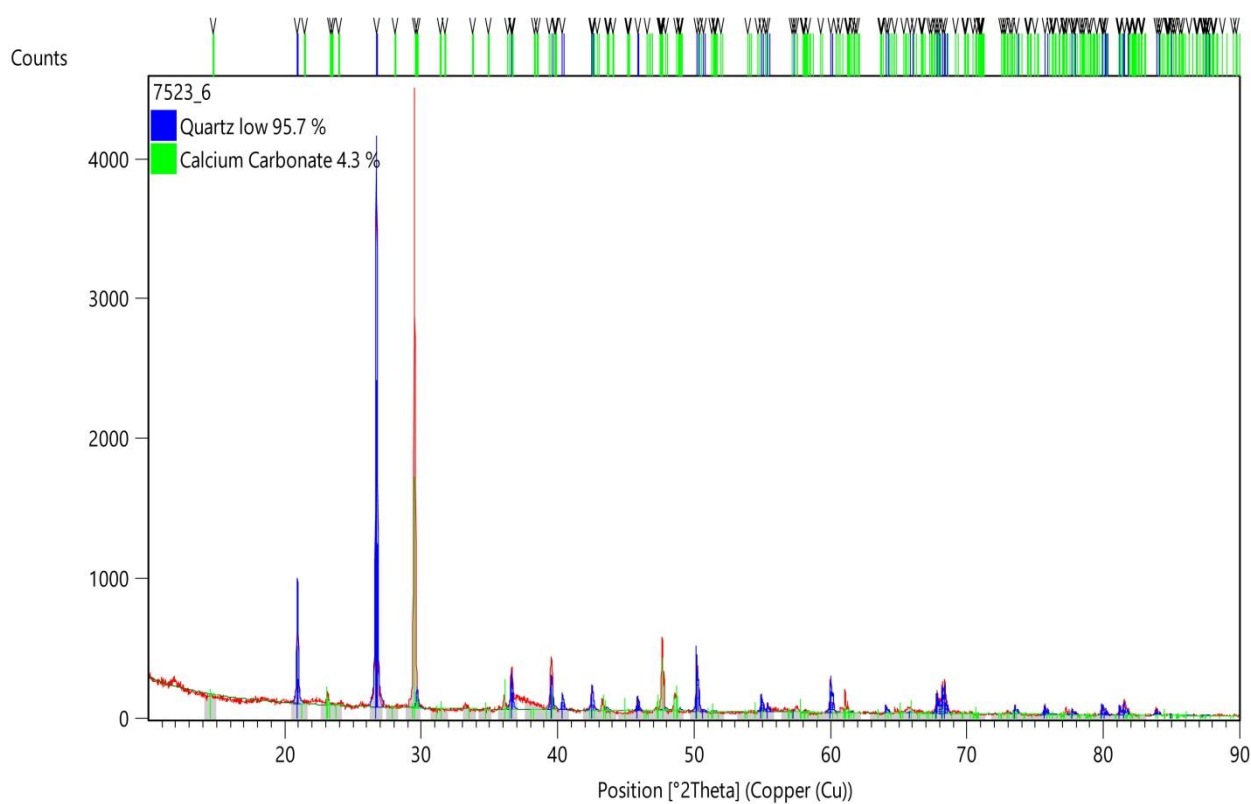
Pattern List

Visible	Ref.Code	Score	Compound Name	Displ.[°2Th]	Scale Fac.	Chem. Formula
*	98-009-0145	74	Quartz low	0.051	0.624	O2 Si1
*	98-000-0150	38	Calcium Carbonate	-0.153	0.366	C1 Ca1 O3

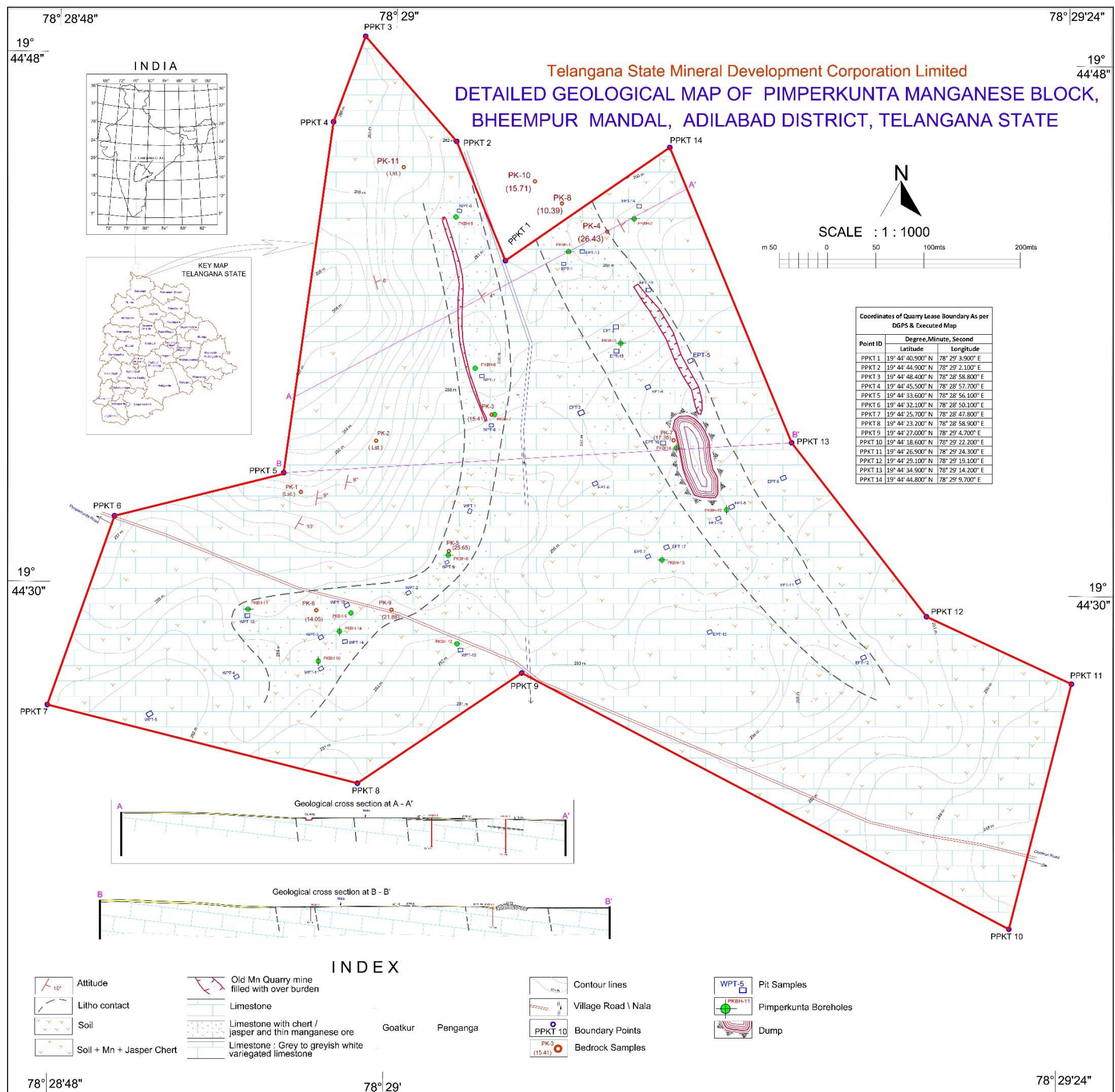
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File: 7523_6

User: Home



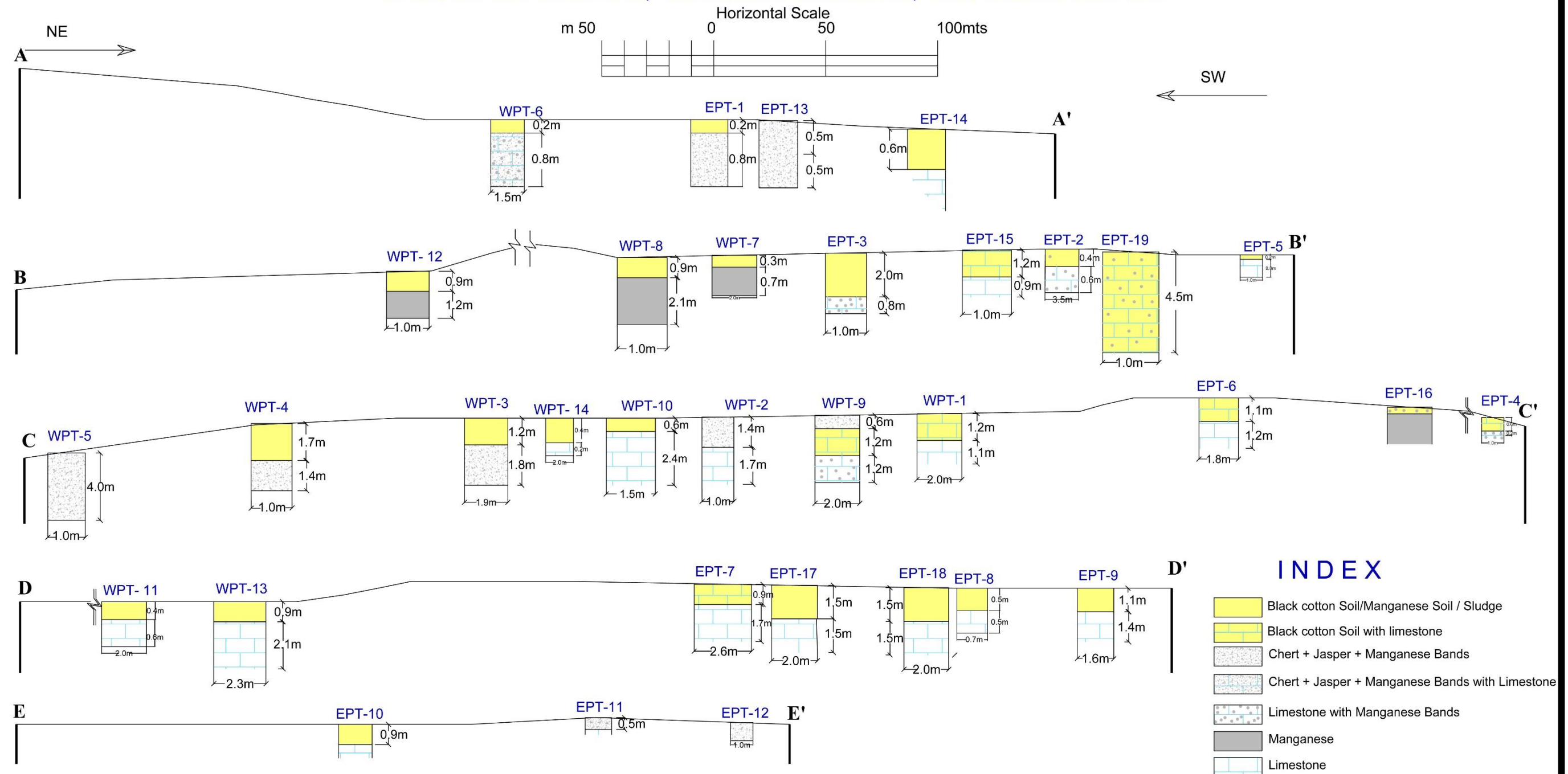
Page: 1 of 1



Telangana State Mineral Development Corporation Limited

PIT SECTION LITHOLOGS ALONG SECTION LINES OF PIMPERAKUNTA BLOCK, BHEEMPUR MANDAL, ADILABAD DISTRICT, TELANGANA STATE

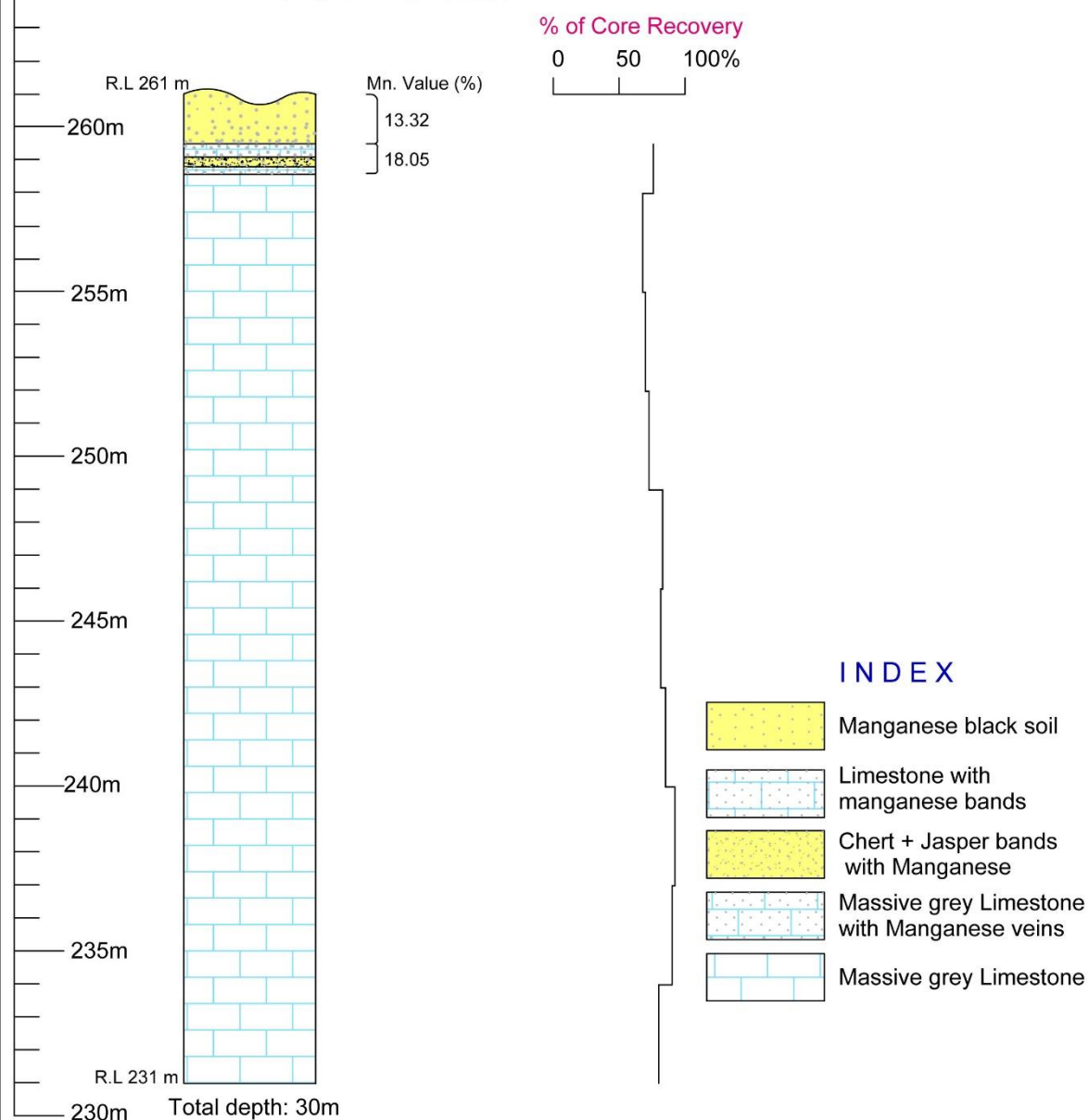
Plate - II



Telangana State Mineral Development Corporation Limited

**GRAPHICAL LITHOLOG OF THE BOREHOLE IN PIMPERAKUNTA BLOCK,
BHEEMPUR MANDAL, ADILABAD DISTRICT, TELANGANA STATE**
Borehole No: PKBH-1

- | | |
|---------------------------------------------|-----------------------------------|
| 1. Location: - 19°44'41.23"N; 78°29'06.14"E | 5. Date of starting:- 11.02.2022 |
| 2. Unit No: - New Holland | 6. Date of closing:- 15.02.2022 |
| 3. Nature of BH : -Vertical | 7. Closing of depth:-30.00 meters |
| 4. R.L of BH : -261 meters | |

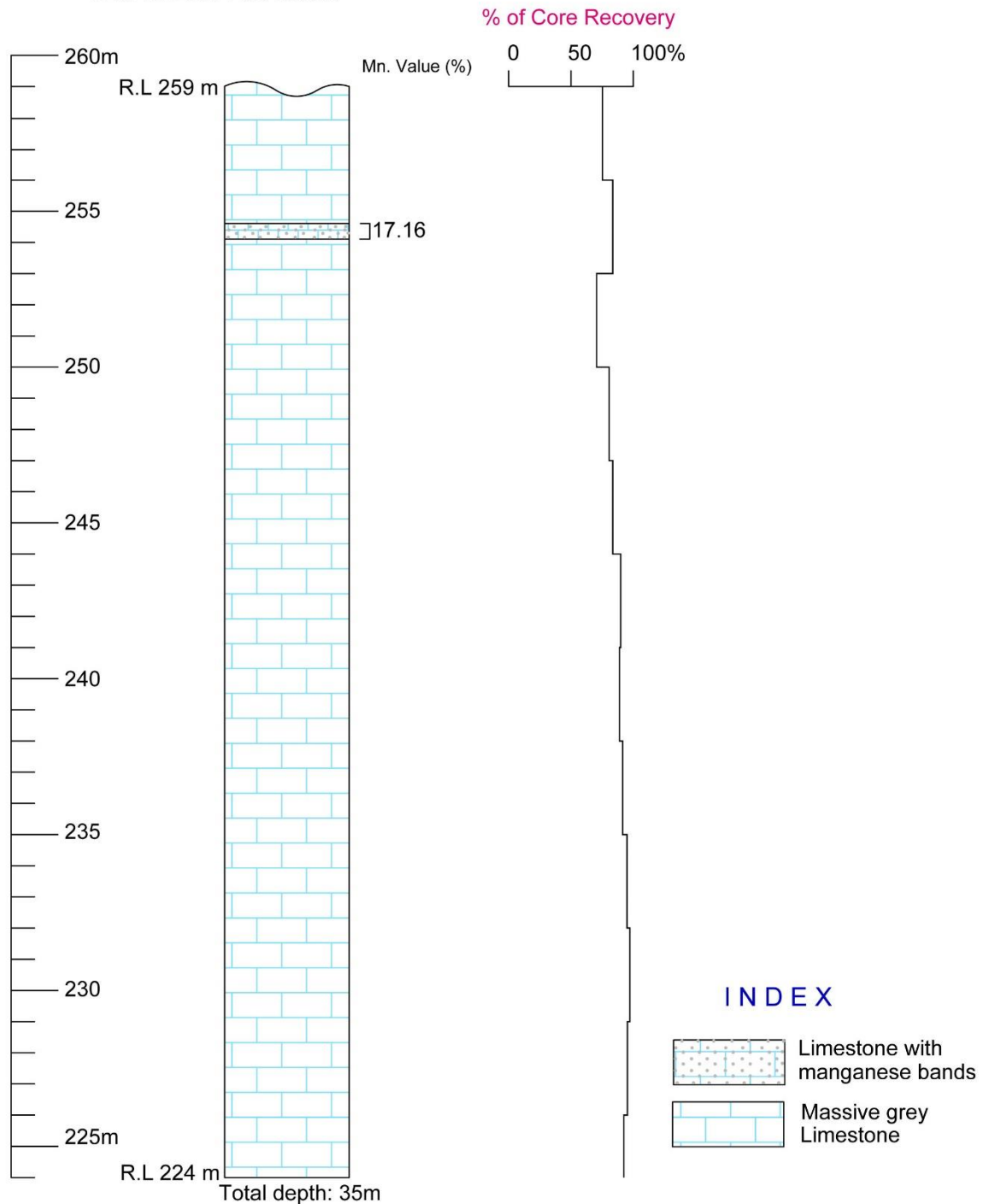


Telangana State Mineral Development Corporation Limited

**GRAPHICAL LITHOLOG OF THE BOREHOLE IN PIMPERAKUNTA BLOCK,
BHEEMPUR MANDAL, ADILABAD DISTRICT, TELANGANA STATE**

Borehole No: PKBH-2

- | | |
|---------------------------------------------|-----------------------------------|
| 1. Location: - 19°44'42.23"N; 78°29'08.46"E | 5. Date of starting:- 17.02.2022 |
| 2. Unit No: - New Holland | 6. Date of closing:- 20.02.2022 |
| 3. Nature of BH : -Vertical | 7. Closing of depth:-35.00 meters |
| 4. R.L of BH : -259 meters | |

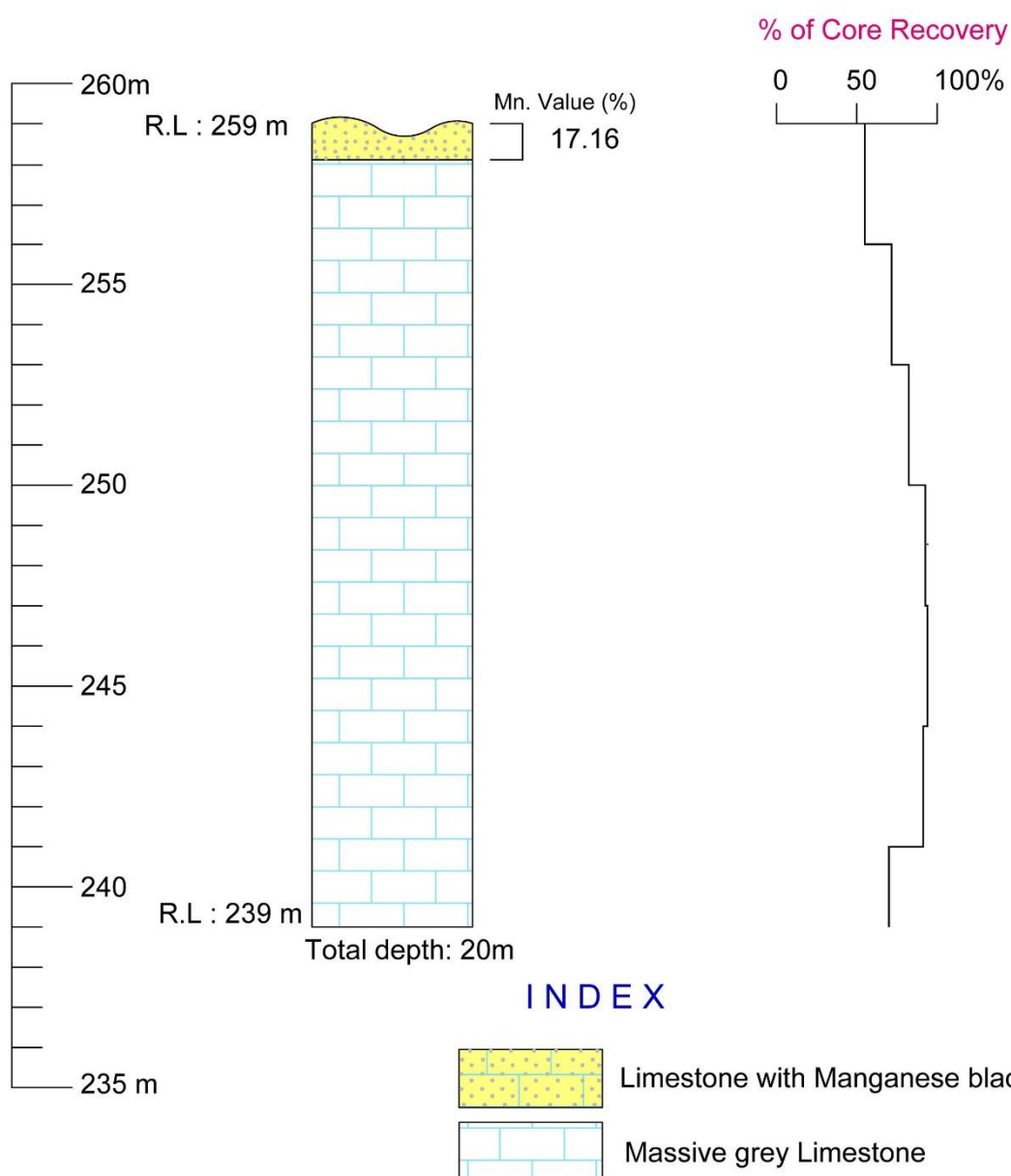


Telangana State Mineral Development Corporation Limited

**GRAPHICAL LITHOLOG OF THE BOREHOLE IN PIMPERAKUNTA BLOCK,
BHEEMPUR MANDAL, ADILABAD DISTRICT, TELANGANA STATE**

Borehole No: PKBH-3

- | | |
|---------------------------------------------|-----------------------------------|
| 1. Location: - 19°44'38.17"N; 78°29'08.04"E | 5. Date of starting:- 21.02.2022 |
| 2. Unit No: - New Holland | 6. Date of closing:- 23.02.2022 |
| 3. Nature of BH : -Vertical | 7. Closing of depth:-20.00 meters |
| 4. R.L of BH : -259 meters | |

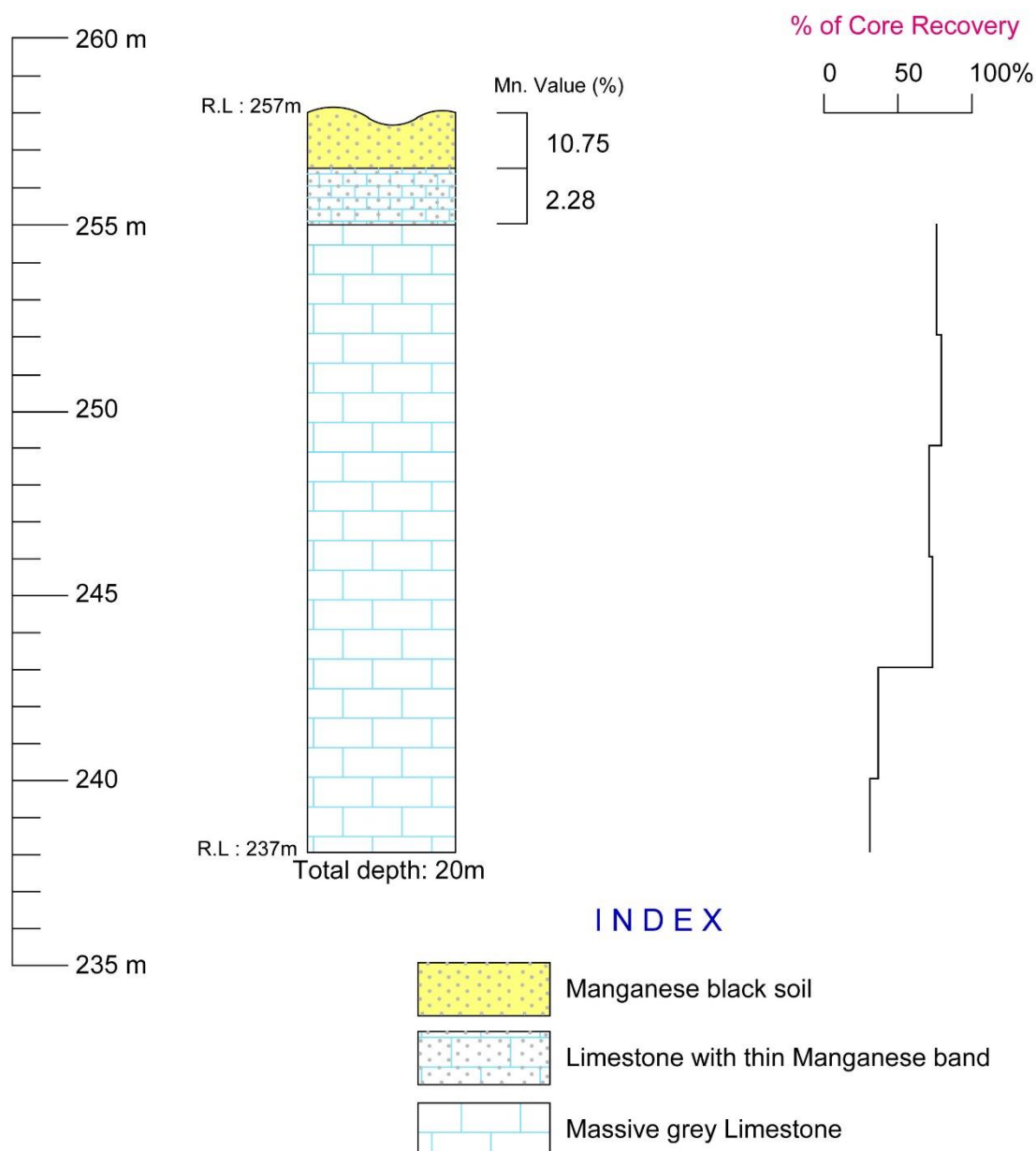


Telangana State Mineral Development Corporation Limited

**GRAPHICAL LITHOLOG OF THE BOREHOLE IN PIMPERAKUNTA BLOCK,
BHEEMPUR MANDAL, ADILABAD DISTRICT, TELANGANA STATE**

Borehole No: PKBH-4

- | | |
|---------------------------------------------|-----------------------------------|
| 1. Location: - 19°44'34.78"N; 78°29'10.05"E | 5. Date of starting:- 24.02.2022 |
| 2. Unit No: - New Holland | 6. Date of closing:- 28.02.2022 |
| 3. Nature of BH : -Vertical | 7. Closing of depth:-20.00 meters |
| 4. R.L of BH : - 257 meters | |

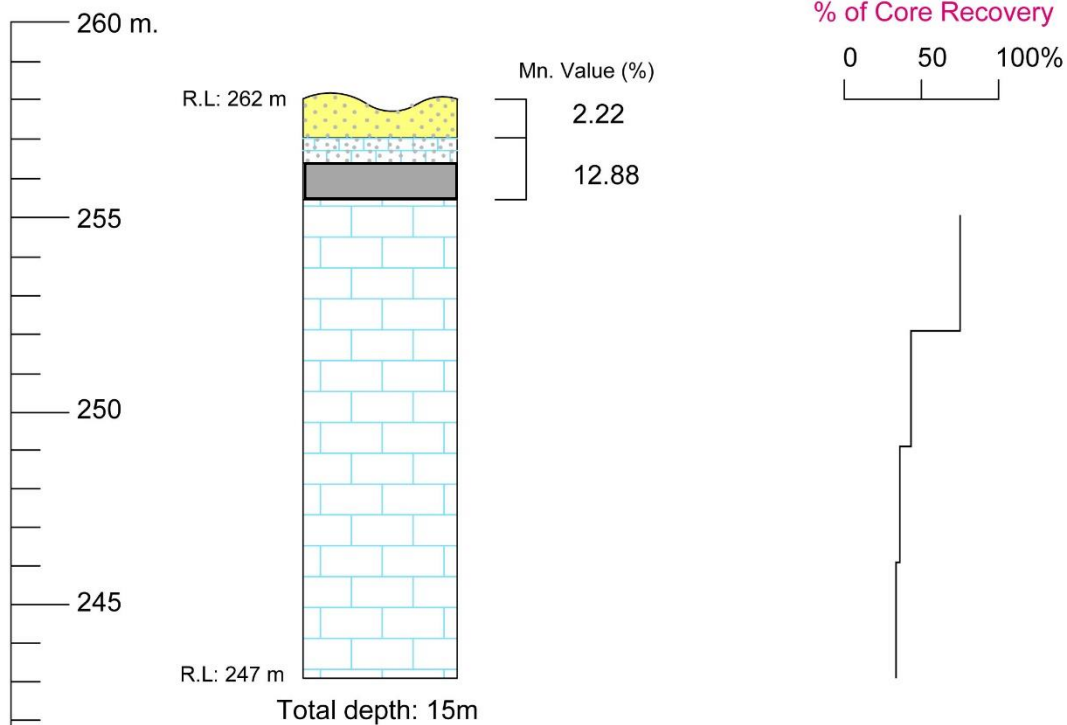


Telangana State Mineral Development Corporation Limited

**GRAPHICAL LITHOLOG OF THE BOREHOLE IN PIMPERAKUNTA BLOCK,
BHEEMPUR MANDAL, ADILABAD DISTRICT, TELANGANA STATE**

Borehole No: PKBH-5

- | | |
|---------------------------------------------|-----------------------------------|
| 1. Location: - 19°44'42.34"N; 78°29'02.11"E | 5. Date of starting:- 28.02.2022 |
| 2. Unit No: - New Holland | 6. Date of closing:- 02.03.2022 |
| 3. Nature of BH : -Vertical | 7. Closing of depth:-15.00 meters |
| 4. R.L of BH : - 262 meters | |



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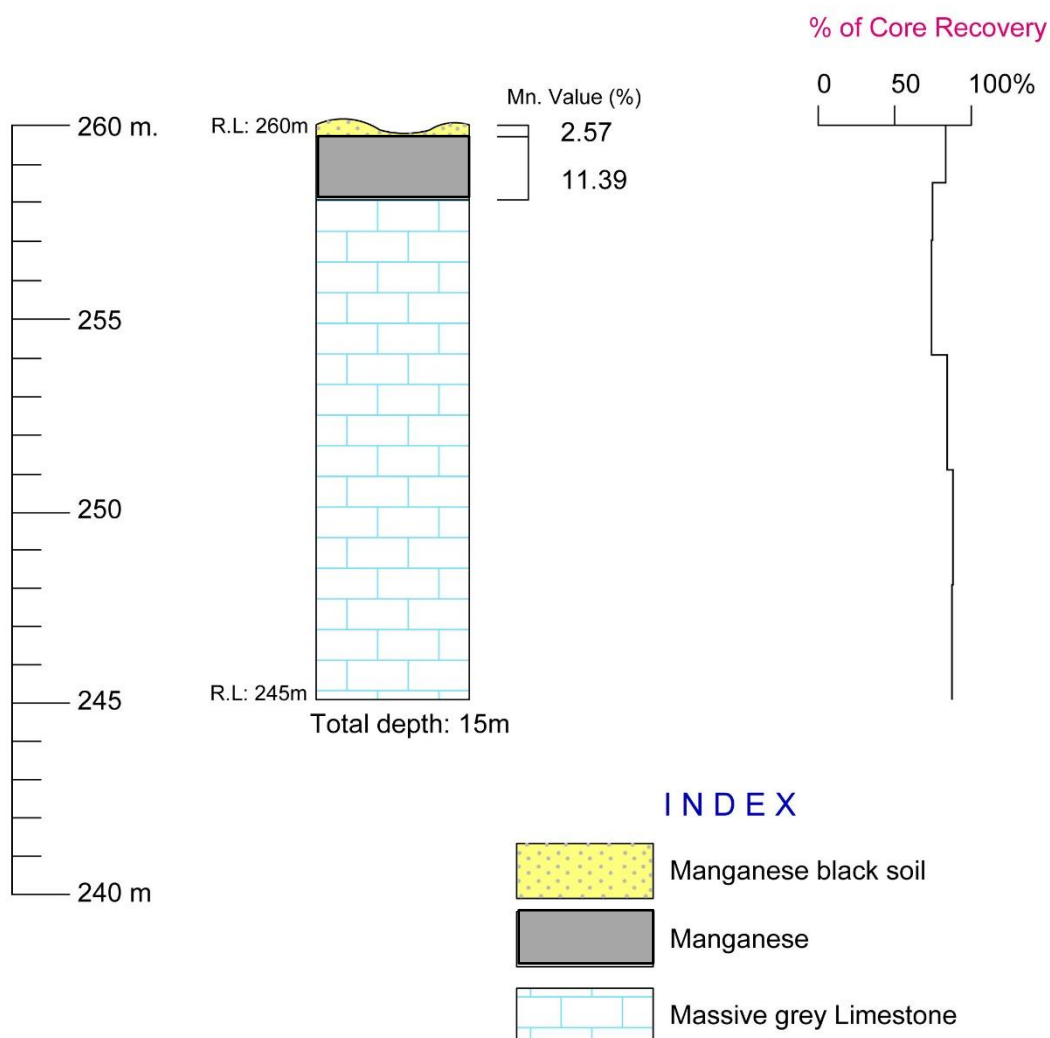
- | | |
|--|-------------------------------------|
| | Manganese black soil |
| | Limestone with thin Manganese bands |
| | Manganese |
| | Massive grey Limestone |

Telangana State Mineral Development Corporation Limited

**GRAPHICAL LITHOLOG OF THE BOREHOLE IN PIMPERAKUNTA BLOCK,
BHEEMPUR MANDAL, ADILABAD DISTRICT, TELANGANA STATE**

Borehole No: PKBH-6

- | | |
|---------------------------------------------|-----------------------------------|
| 1. Location: - 19°44'37.25"N; 78°29'02.87"E | 5. Date of starting:- 03.03.2022 |
| 2. Unit No: - New Holland | 6. Date of closing:- 05.03.2022 |
| 3. Nature of BH : -Vertical | 7. Closing of depth:-15.00 meters |
| 4. R.L of BH : - 260 meters | |

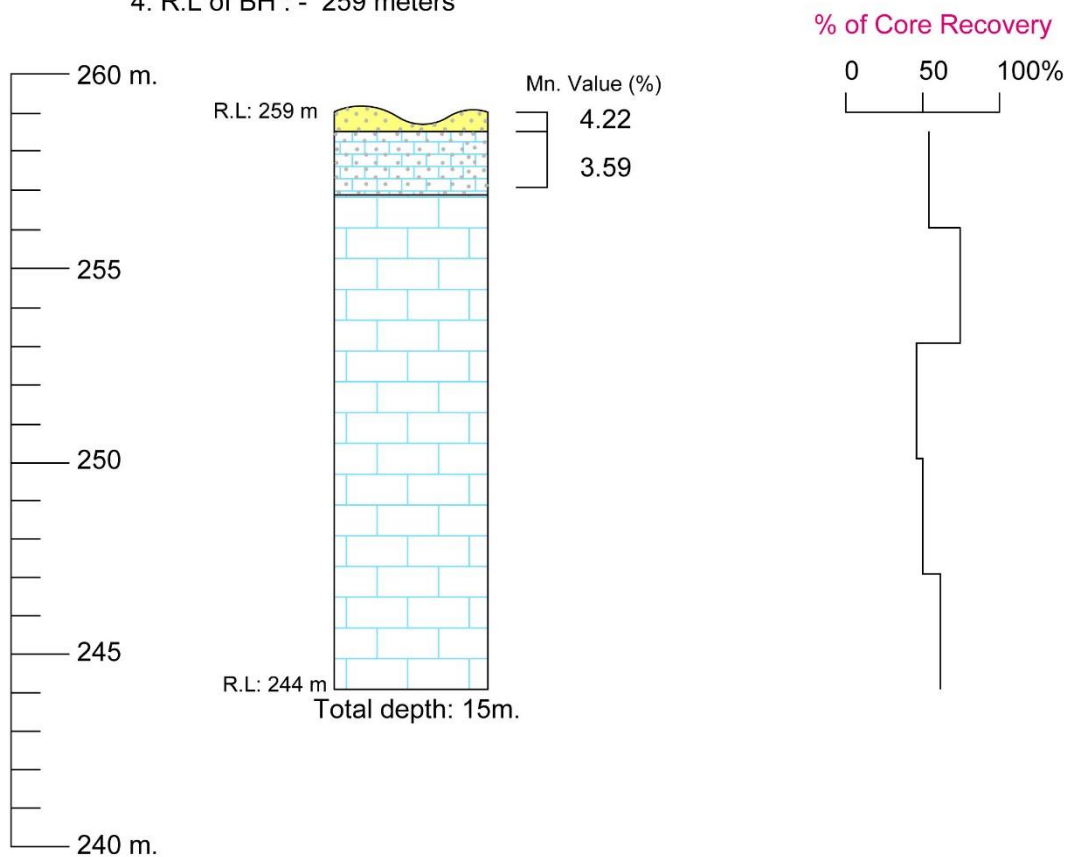


Telangana State Mineral Development Corporation Limited

**GRAPHICAL LITHOLOG OF THE BOREHOLE IN PIMPERAKUNTA BLOCK,
BHEEMPUR MANDAL, ADILABAD DISTRICT, TELANGANA STATE**

Borehole No: PKBH-7

- | | |
|---------------------------------------------|-----------------------------------|
| 1. Location: - 19°44'35.70"N; 78°29'03.59"E | 5. Date of starting:- 05.03.2022 |
| 2. Unit No: - New Holland | 6. Date of closing:- 06.03.2022 |
| 3. Nature of BH : -Vertical | 7. Closing of depth:-15.00 meters |
| 4. R.L of BH : - 259 meters | |



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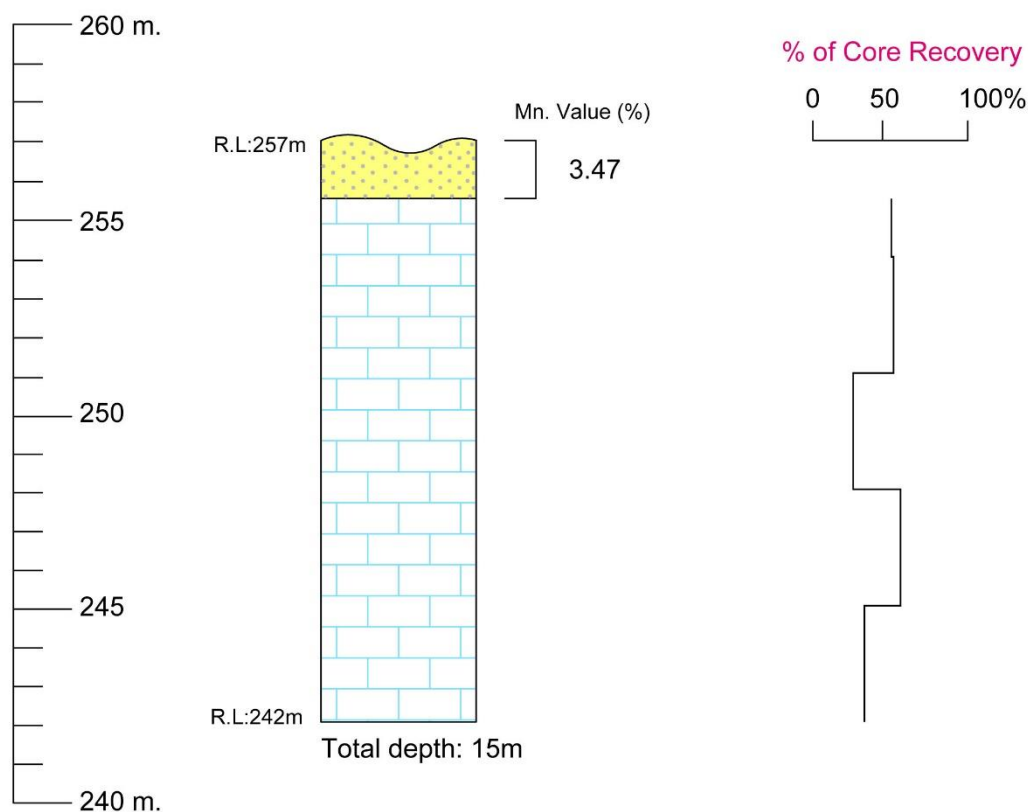
- | | |
|--|-------------------------------------|
| | Manganese black soil |
| | Limestone with thin Manganese bands |
| | Massive grey Limestone |

Telangana State Mineral Development Corporation Limited

**GRAPHICAL LITHOLOG OF THE BOREHOLE IN PIMPERAKUNTA BLOCK,
BHEEMPUR MANDAL, ADILABAD DISTRICT, TELANGANA STATE**

Borehole No: PKBH-8

- | | |
|---------------------------------------------|-----------------------------------|
| 1. Location: - 19°44'30.93"N; 78°29'02.01"E | 5. Date of starting:- 07.03.2022 |
| 2. Unit No: - New Holland | 6. Date of closing:- 09.03.2022 |
| 3. Nature of BH : -Vertical | 7. Closing of depth:-15.00 meters |
| 4. R.L of BH : - 257 meters | |



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- | | |
|-------------------------------------------------------------------------------------|----------------------|
|  | Manganese black soil |
|  | Massive Limestone |

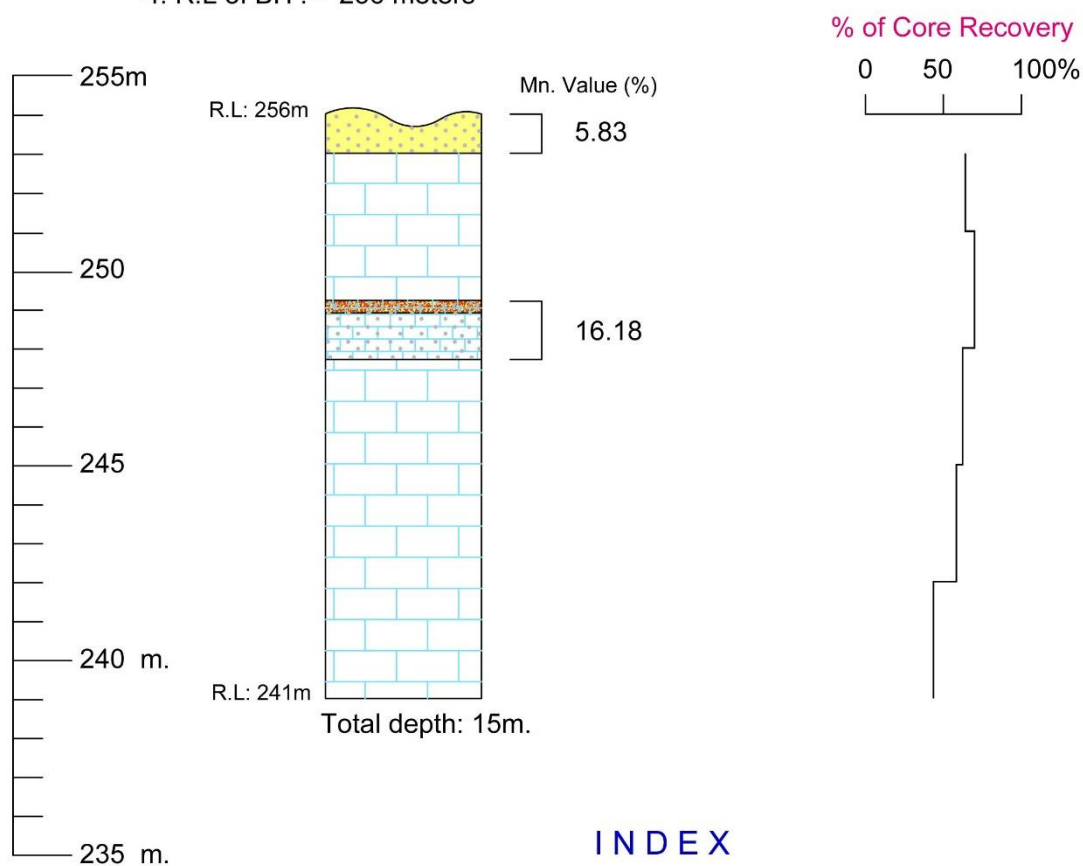
Plate-III I

Telangana State Mineral Development Corporation Limited

GRAPHICAL LITHOLOG OF THE BOREHOLE IN PIMPERAKUNTA BLOCK, BHEEMPUR MANDAL, ADILABAD DISTRICT, TELANGANA STATE

Borehole No: PKBH-9

- | | |
|---------------------------------------------|-----------------------------------|
| 1. Location: - 19°44'28.93"N; 78°28'58.58"E | 5. Date of starting:- 10.03.2022 |
| 2. Unit No: - New Holland | 6. Date of closing:- 12.03.2022 |
| 3. Nature of BH : -Vertical | 7. Closing of depth:-15.00 meters |
| 4. R.L of BH : - 256 meters | |



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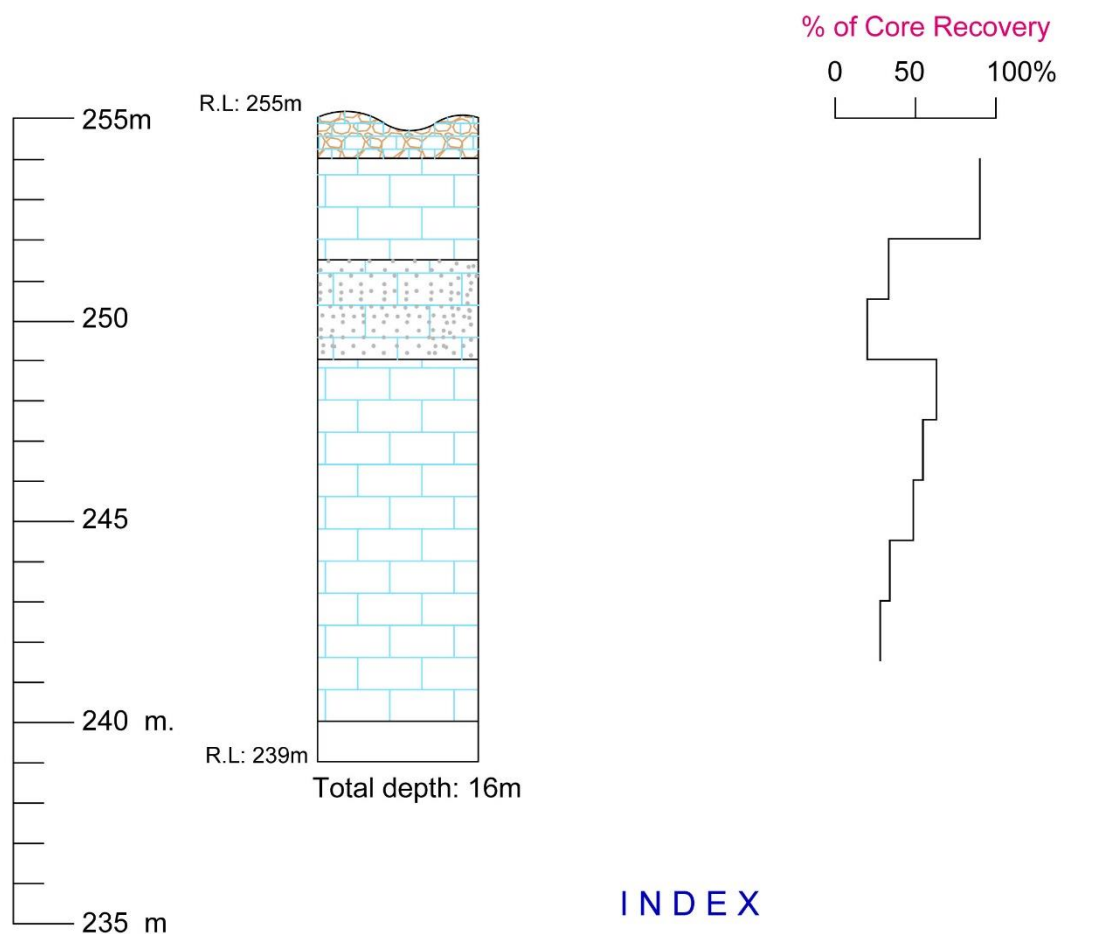
- | | |
|--|-----------------------------------------------|
| | Manganese black soil |
| | Limestone with Manganese Chert + Jasper bands |
| | Limestone with thin Manganese bands |
| | Massive Limestone |

Telangana State Mineral Development Corporation Limited

**GRAPHICAL LITHOLOG OF THE BOREHOLE IN PIMPERAKUNTA BLOCK,
BHEEMPUR MANDAL, ADILABAD DISTRICT, TELANGANA STATE**

Borehole No: PKBH-10

- | | |
|---------------------------------------------|-----------------------------------|
| 1. Location: - 19°44'27.29"N; 78°28'57.43"E | 5. Date of starting:- 13.03.2022 |
| 2. Unit No: - New Holland | 6. Date of closing:- 14.03.2022 |
| 3. Nature of BH : -Vertical | 7. Closing of depth:-16.00 meters |
| 4. R.L of BH : - 255 meters | |



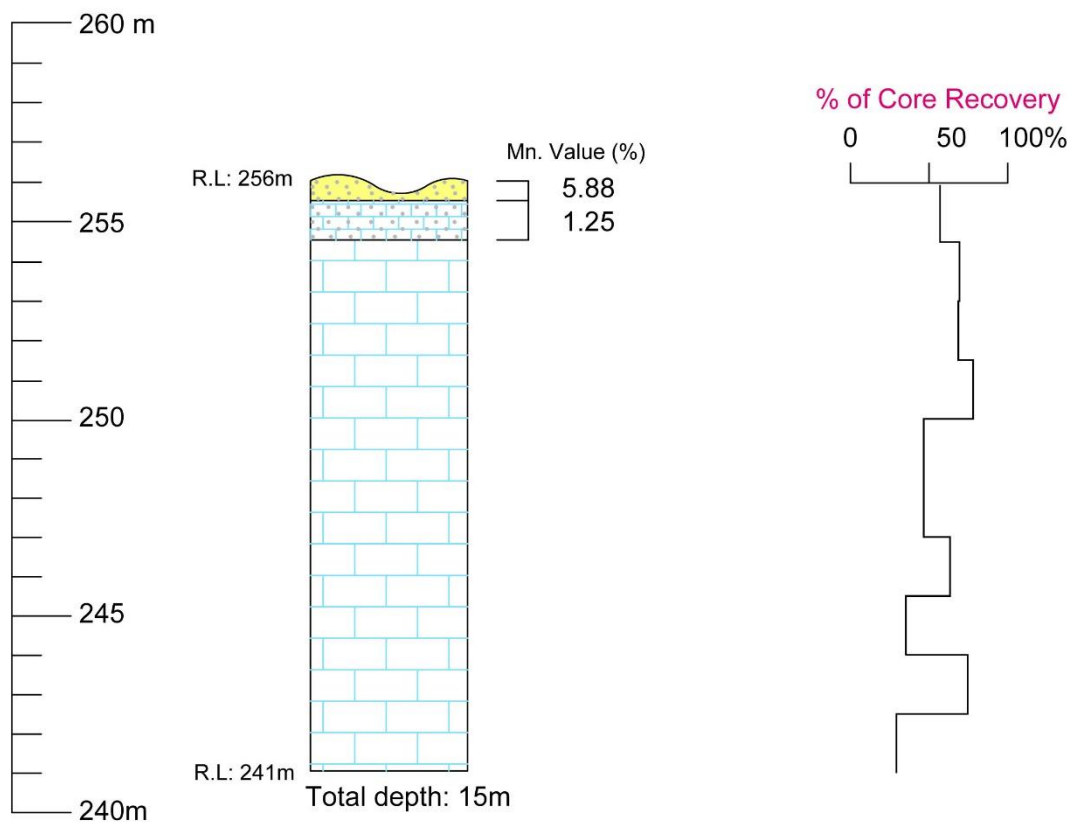
I N D E X

- | | |
|--|-------------------------------------|
| | Limestone with boulders |
| | Limestone with thin Manganese bands |
| | Massive Limestone |

Telangana State Mineral Development Corporation Limited
**GRAPHICAL LITHOLOG OF THE BOREHOLE IN PIMPERAKUNTA BLOCK,
 BHEEMPUR MANDAL, ADILABAD DISTRICT, TELANGANA STATE**

Borehole No: PKBH-11

- | | |
|---------------------------------------------|-----------------------------------|
| 1. Location: - 19°44'29.01"N; 78°28'54.90"E | 5. Date of starting:- 14.03.2022 |
| 2. Unit No: - New Holland | 6. Date of closing:- 15.03.2022 |
| 3. Nature of BH : -Vertical | 7. Closing of depth:-15.00 meters |
| 4. R.L of BH : - 256 meters | |



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- | | |
|-------------------------------------------------------------------------------------|-------------------------------------|
|  | Manganese soil |
|  | Limestone with thin Manganese bands |
|  | Massive Limestone |

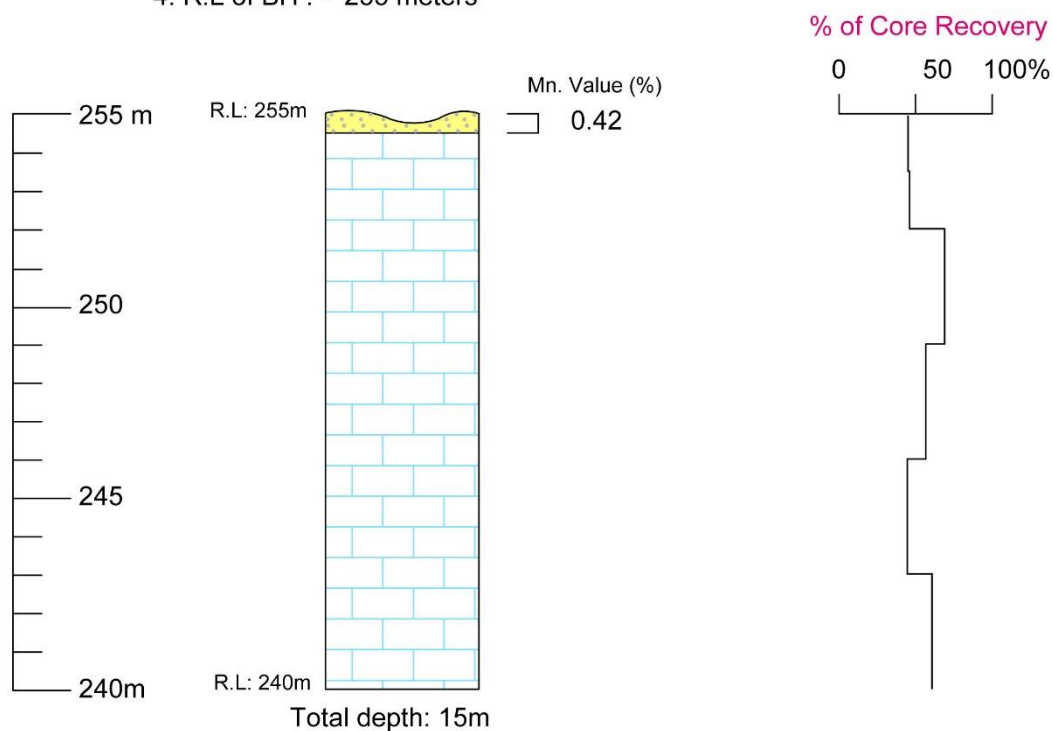
Plate-III L

Telangana State Mineral Development Corporation Limited



**GRAPHICAL LITHOLOG OF THE BOREHOLE IN PIMPERAKUNTA BLOCK,
BHEEMPUR MANDAL, ADILABAD DISTRICT, TELANGANA STATE**

Borehole No: PKBH-12

- | | |
|---------------------------------------------|-----------------------------------|
| 1. Location: - 19°44'27.95"N; 78°29'02.37"E | 5. Date of starting:- 16.03.2022 |
| 2. Unit No: - New Holland | 6. Date of closing:- 17.03.2022 |
| 3. Nature of BH : -Vertical | 7. Closing of depth:-15.00 meters |
| 4. R.L of BH : - 255 meters | |



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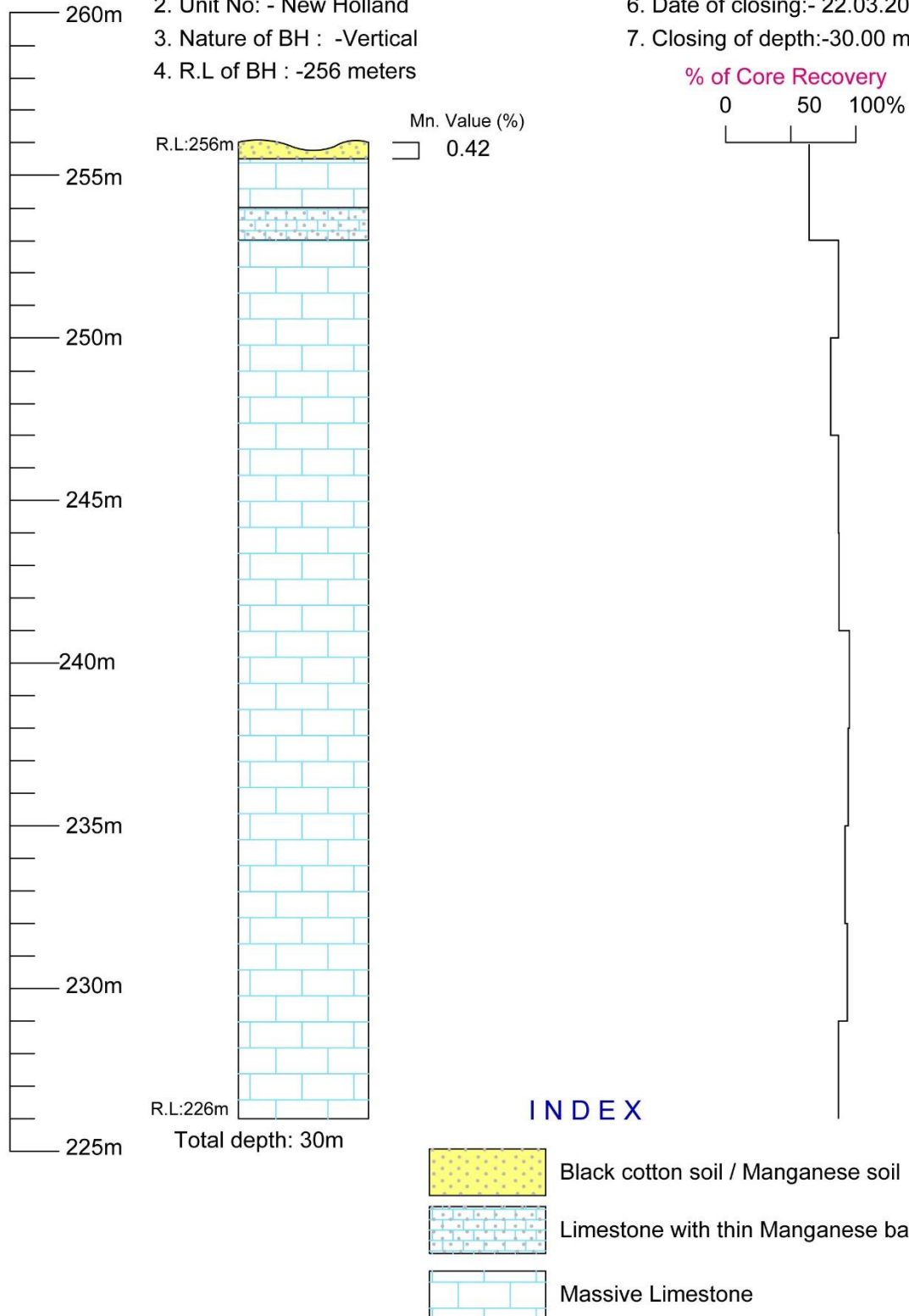
- | | |
|-------------------------------------------------------------------------------------|-----------------------------------|
|  | Black cotton Soil /Manganese soil |
|  | Massive Limestone |

**GRAPHICAL LITHOLOG OF THE BOREHOLE IN PIMPERAKUNTA BLOCK,
BHEEMPUR MANDAL, ADILABAD DISTRICT, TELANGANA STATE**

Borehole No: PKBH-13

1. Location: - 19°44'30.88"N; 78°29'09.64"E
2. Unit No: - New Holland
3. Nature of BH : -Vertical
4. R.L of BH : -256 meters

5. Date of starting:- 19.03.2022
6. Date of closing:- 22.03.2022
7. Closing of depth:-30.00 meters

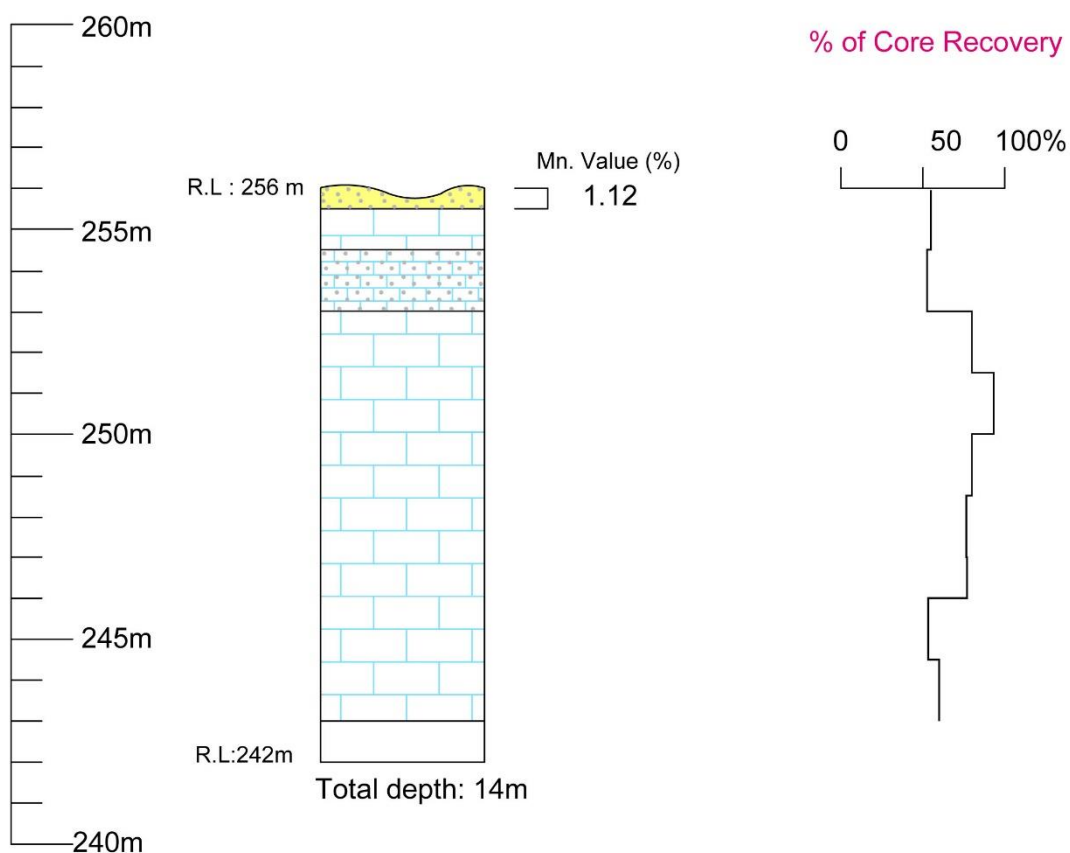


Telangana State Mineral Development Corporation Limited




**GRAPHICAL LITHOLOG OF THE BOREHOLE IN PIMPERAKUNTA BLOCK,
BHEEMPUR MANDAL, ADILABAD DISTRICT, TELANGANA STATE**

Borehole No: PKBH-14

- | | |
|---------------------------------------------|-----------------------------------|
| 1. Location: - 19°44'28.31"N; 78°28'58.17"E | 5. Date of starting:- 28.03.2022 |
| 2. Unit No: - New Holland | 6. Date of closing:- 30.03.2022 |
| 3. Nature of BH : -Vertical | 7. Closing of depth:-14.00 meters |
| 4. R.L of BH : - 256 meters | |



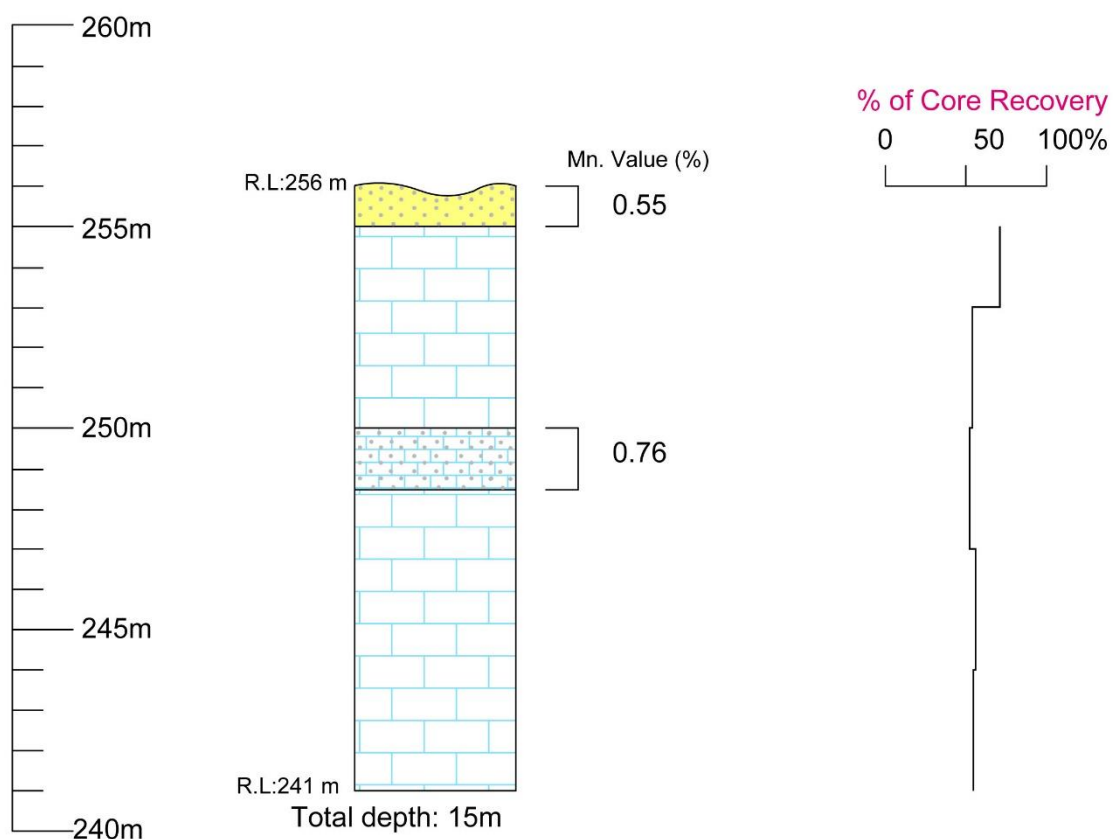
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- | | |
|-------------------------------------------------------------------------------------|-------------------------------------|
|  | Manganese Soil |
|  | Limestone with thin Manganese bands |
|  | Massive grey Limestone |




Telangana State Mineral Development Corporation Limited
**GRAPHICAL LITHOLOG OF THE BOREHOLE IN PIMPERAKUNTA BLOCK,
 BHEEMPUR MANDAL, ADILABAD DISTRICT, TELANGANA STATE**

Borehole No: PKBH-15

- | | |
|--------------------------------------------|-----------------------------------|
| 1. Location: -19°44'32.60"N; 78°29'11.91"E | 5. Date of starting:- 05.04.2022 |
| 2. Unit No: - New Holland | 6. Date of closing:- 06.04.2022 |
| 3. Nature of BH : -Vertical | 7. Closing of depth:-15.00 meters |
| 4. R.L of BH : - 256 meters | |

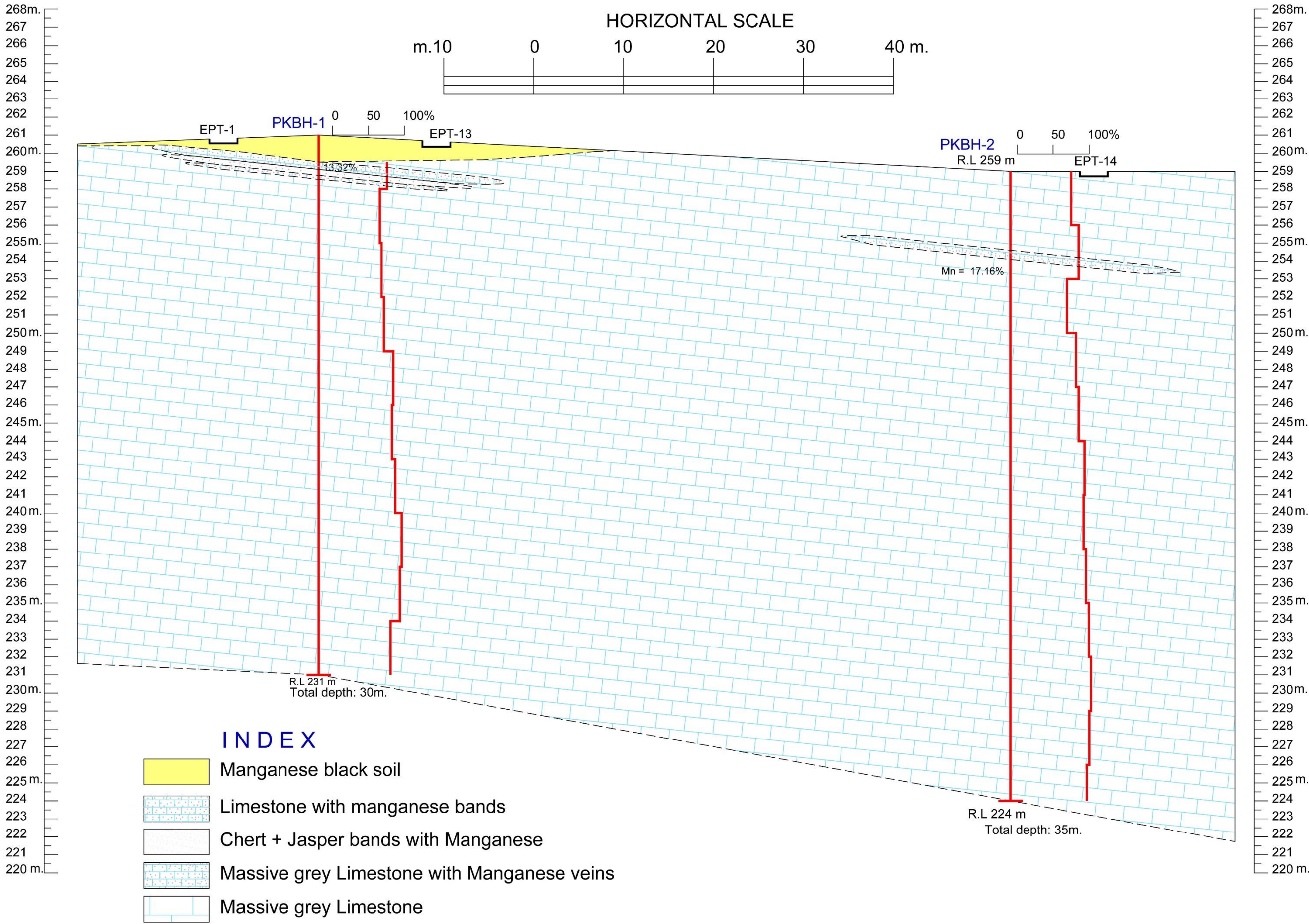


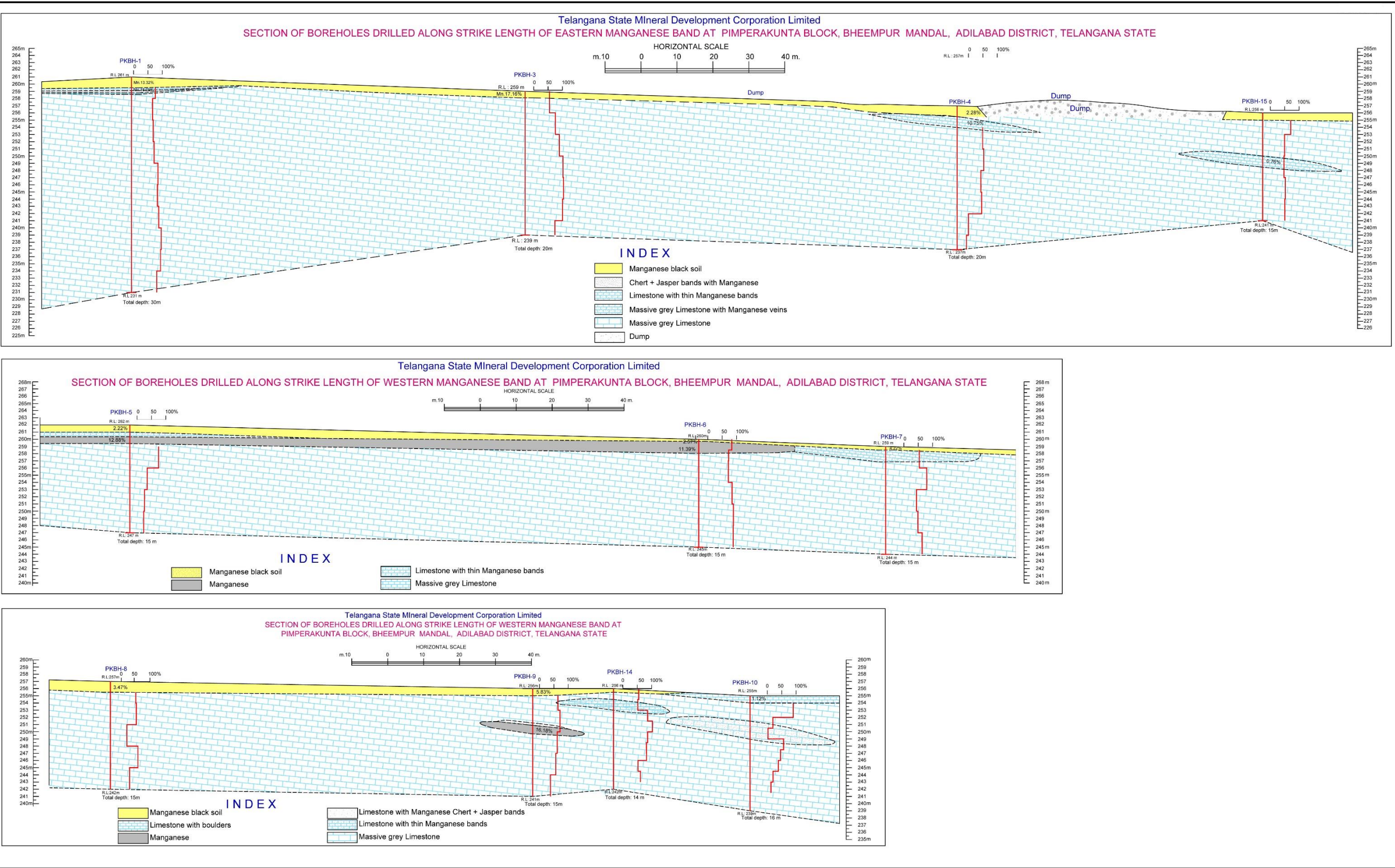
INDEX

- | | |
|-------------------------------------------------------------------------------------|-------------------------------------|
|  | Black cotton soil / Manganese Soil |
|  | Limestone with thin Manganese bands |
|  | Massive Limestone |

Telangana State Mineral Development Corporation Limited

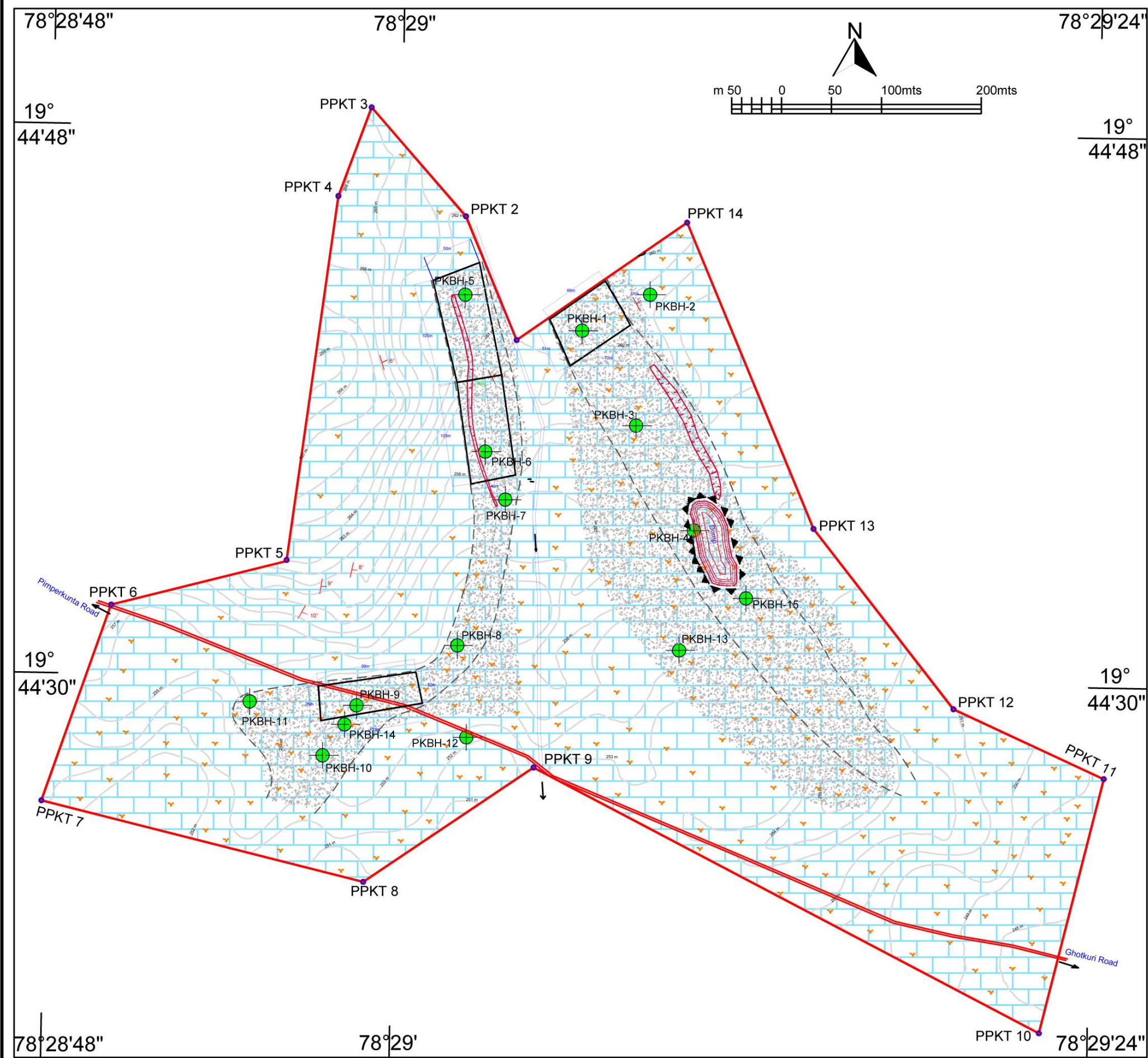
SECTION OF BOREHOLES DRILLED ALONG DIP DIRECTION OF EASTERN MANGANESE BAND AT
PIMPERAKUNTA BLOCK, BHEEMPUR MANDAL, ADILABAD DISTRICT, TELANGANA STATE



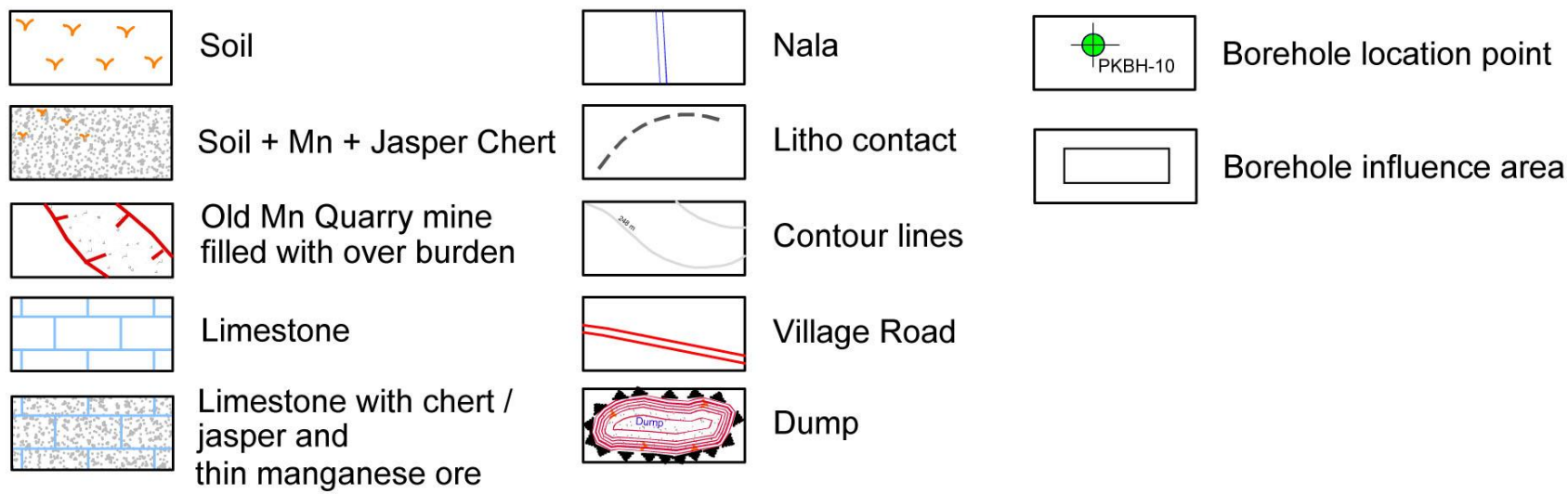


BOREHOLE INFLUENCE MAP OF PIMPERKUNTA MANGANESE BLOCK,
BHEEMPUR MANDAL, ADILABAD DISTRICT, TELANGANA STATE

Plate - VI



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DGPS SURVEY REPORT



Ahome Consultants Private Limited
Hyderabad, India



DGPS SURVEY REPORT

Introduction: The DGPS survey has been carried out in the TSMDC Manganese block area of 0.50 Sq.kms to fix the boundaries of the lease area including 1 m contour generation in Pimperkunta Block, Bheempur Mandal Adilabad District, Telangana State.

Differential Global Positioning System (DGPS): It is a relatively simple technique to improve positional accuracy and integrity. This technique was developed in the early 1980s, and it is widely used in various forms. DGPS is a method of improving the accuracy of receiver by adding a local reference station to augment the information available from the satellites. It also improves the integrity of the whole GPS system by identifying certain errors.

Fig.1. Communication Satellite Image for DGPS Survey



Differential GPS uses one unit at a known location and a rover. The stationary unit compares its calculated GPS location with the actual location and computes the error and the rover data is adjusted for the error. The underlying premise of differential GPS (DGPS) is that any two receivers that are relatively close together will experience similar atmospheric errors.

DGPS requires that a GPS receiver be set up on a precisely known location. This GPS receiver is the base or reference station. The base station receiver calculates its position based on satellite signals and compares this location to the known location.

The difference is applied to the GPS data recorded by the second GPS receiver, which is known as the roving receiver. The corrected information can be applied to data from the roving receiver in real time in the field using radio signals or through post-processing after data capture using special processing software

Error possibilities in GPS

- The receiver is not synchronized with the atomic clock in the satellite.
- The estimate of the position of the satellite.
- Speed of light is only constant in vacuum.
- "Multi path errors": Ghost signals from reflected radio waves.
- "Selective availability (SA)": Added noise from department of defense.
- Not free sight to many enough satellites.
- Noise in the receiver

The above possible errors are minimized by keeping base station for more than half an hour at each point.

With the help of **Leica Viva GS14 DGPS** readings were taken on the lease boundary and the RL's were taken in 100 X 100 meters grid and in total 41 points observations are made. Demarcated the topographical and contoured features like drainage and road. The data was processed with the help of built-in software. The surface Contour plan on 1: 1000 scale has been prepared, coordinates are given along with contour map in figure 2. The soft copies in Auto Cad and hard copies are submitted to TSMDC.

PHOTOGRAPHS







PLAN SHOWING THE PROPOSED QUARRY LEASE AREA FOR PL/ML FOR MANGANESE ORE IN FAVOR OF TSMDC LTD.

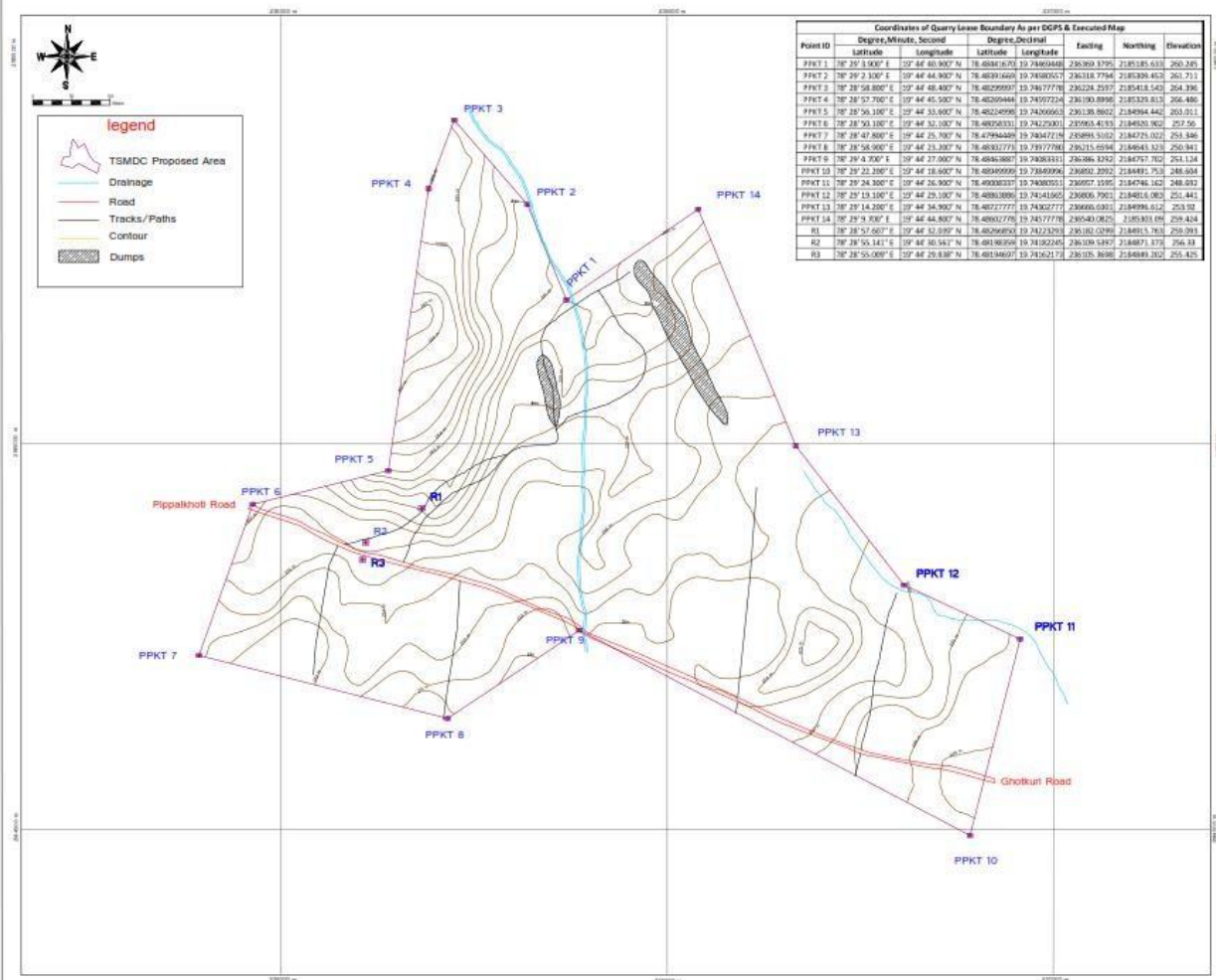


Fig.2. The surface Contourplanon1:1000 scale

REPORT ON GEOPHYSICAL SURVEYS FOR MANGANESE EXPLORATION**ADILABAD, TELANGANA****INTRODUCTION**

The geophysical magnetic and resistivity survey has been conducted for manganese mineral exploration at Adilabad. With the objective of aiding the manganese exploration and mapping the ore geometry in Adilabad district of TS, geophysical surveys comprising of Magnetic and Resistivity methods were employed in the detailed stages of exploration. These surveys are expected to bring out both lithological and structural controls of mineralization in this area besides mapping the extent of ore body both laterally and vertically.

In mineral exploration detailed mapping, verification of subsurface lithology, structure, and host rock and its vertical and lateral extents, identify the existence or continuance of the mineralized zones in the depth. Hence, geophysical surveys are aimed at subsurface mapping the **lithological and structural controls that host any Mn mineralization in the area.**

As the drilling is a very costly, tedious and time consuming, the geophysical surveys are able to suggest boreholes locations, required depth, angle and azimuth.

GEOLOGY: In general, the study area is soil covered, and at places show thin bedded limestone and shale that are highly fractured and jointed. Nearby to this study area there are some of the open pits having a depth of less than 10m, where thin manganiferous shale bands were found, sandwiched between limestones. The fractured limestone bands are showing varying strike trends, which are not consistent. It was found that the geomorphology of the terrain is providing clues due the presence of cuesta structures, implying that the area is comprised of gently dipping strata. But the cuestas are showing dip in various directions and are not consistent reflecting a high variation in the strike trend.

The study area of study is shown as a polygon overlain on the regional geological map (Fig.1) and comprises of Bela Shale (Jainath Sub Group) in the lower part (Southern side) and Jamaladari Lime Stone (Yopalagudem Sub Group) of 'Penganga Group' of upper Precambrian age. Shale is younger than Limestone. The contact between the Upper Shale and the Lower Lime stone is faulted. The strike and dip trends are highly variable. There are many more Fault structures in NW-SE direction in the area.

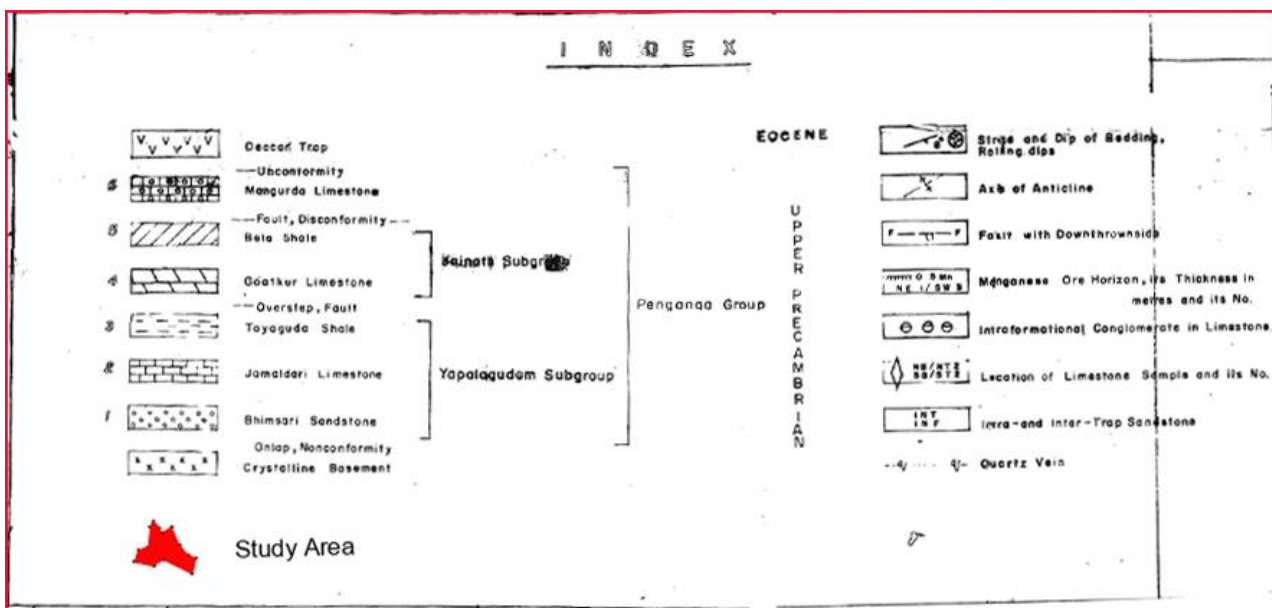


Fig:-1 Geological Map (Source from Geology of the penganga group Adilabad Taluk, Adilabad district, Andhra Pradesh progress report for the field season 1973-74 By T. SAMBASIVASARMA, Senior Geologist)

GEOPHYSICAL SURVEYS PLANNING, DATA COLLECTION, PROCESSING AND INTERPPRETATION

The Geophysical surveys comprising of Magnetic and Electrical resistivity methods are deployed in this area to get the detailed information on lithology and structures in the area.

The magnetic survey is the best most often deployed geophysical method which can provide the disposition of lithological and structural features and their lateral extents (X & Y) and also provide information on their disposition in the third dimension i.e. the depth (Z). Based on the interpretation of magnetic data, extracted the geological inputs on the strike and dip of the formations.

As per the attitude of the magnetic anomalies, prioritized areas are to be covered with Resistivity profiling surveys across the strike and the Vertical Electrical Resistivity sounding (VES) at important locations for obtaining the information in the third dimension at those locations.

After the integrated interpretation of both magnetic and resistivity survey results some areas are identified as target zones for further exploration.

The geophysical data collected in this area is interpreted to map the geological units and to bring out the controls of the mineralization so that these results would aid the drilling program in terms of deciding the better locations and the angle to intersect the mineralized bodies.

Methodology adopted: The geophysical surveys were planned as three stages of exploration to achieve the objectives.

1st step : Magnetic Surveys

A). Planning:

As the strike NNW-SSE has been identified as the formations strike is not clear, magnetic surveys are orientated to bring out the local trend of the geological formations. Accordingly, the entire study area is covered with magnetic surveys in two directions; East - West and North - South, in crisscrossed manner.

Magnetic surveys are conducted by crisscrossing the area with 11 traverses at an approximate interval of 100 m and station interval of 10 m (mostly) or 15-20 m where ever it was not possible for 10 m as shown in Figure 1. Out of 11 traverses 5 are E-W traverses and 6 are N-S traverses.

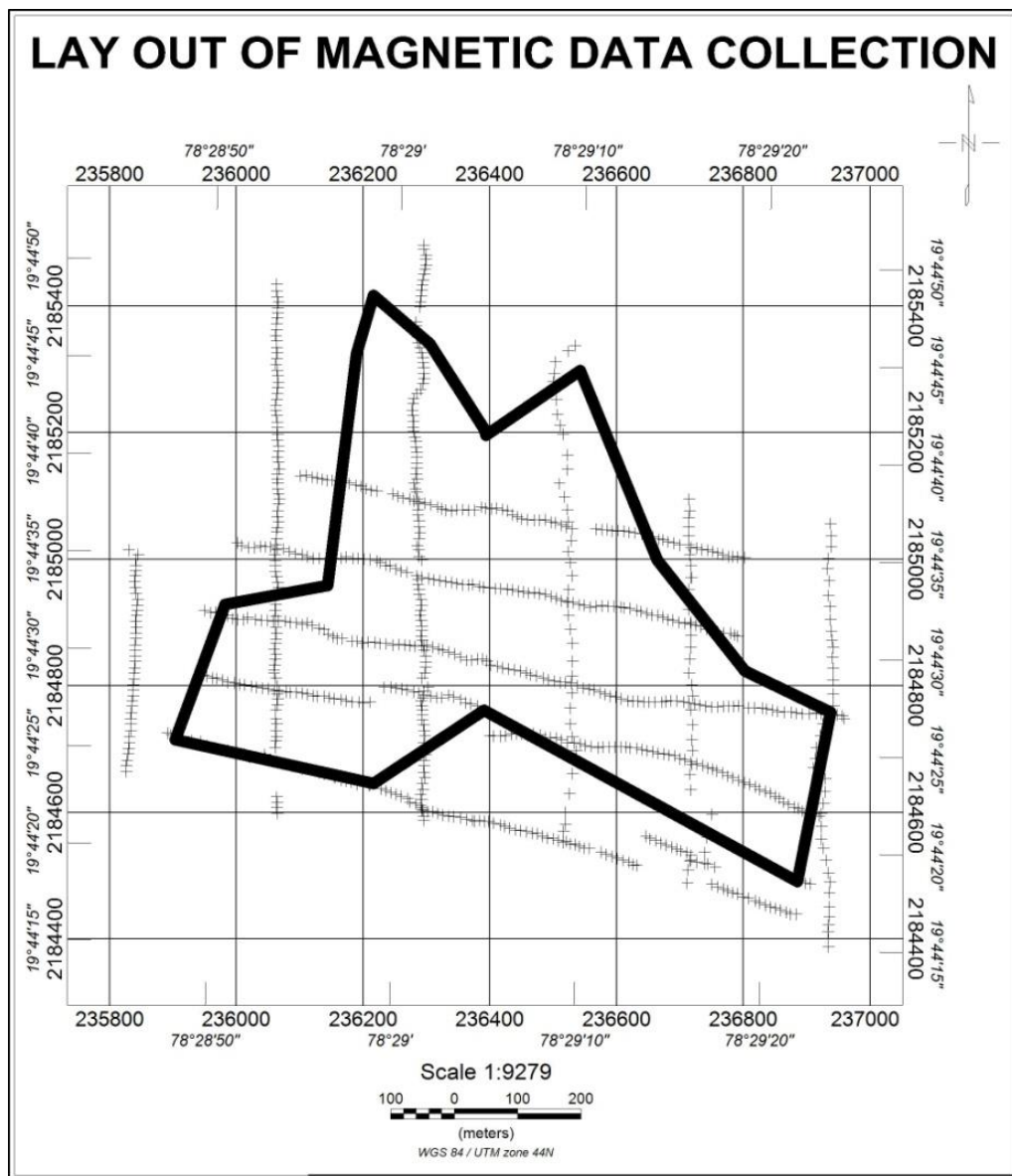


Fig.1: Layout map of Magnetic Survey.

B). Processing:

Initially, the magnetic profile data was contoured and processed to characterize the area into different domains of reliable geological responses. This procedure initially has provided the geometry and orientation of the sedimentary sequences by inferring the strike and dip of the formation in X and Y directions (Lateral) along with attitude of these sequences in the third dimension (depth) with the help of different processed maps. This has helped in identification of stratigraphic, lithological and structural controls controlling the mineralization in this area.

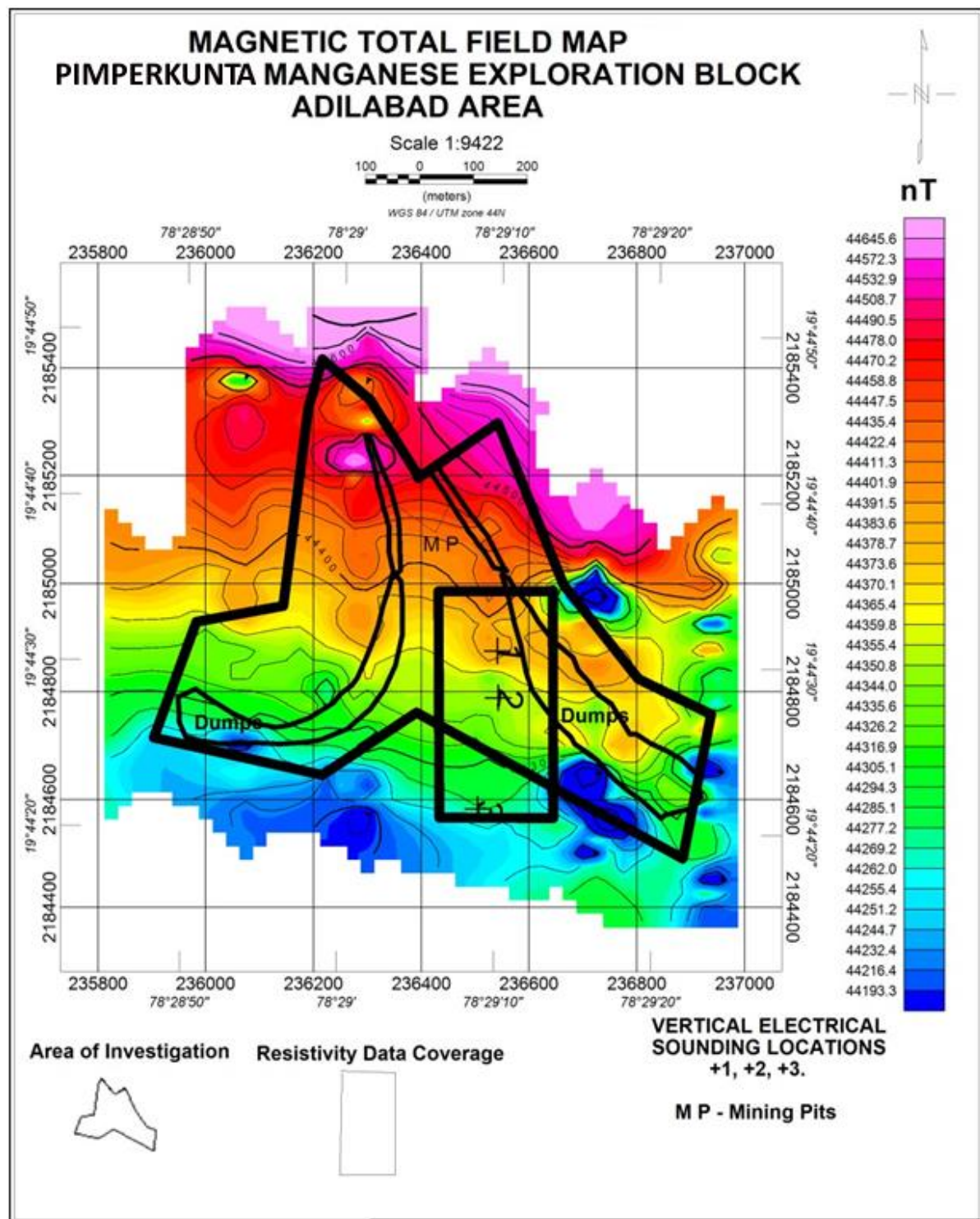


Fig.2: Magnetic Total Field Map. In this map different features like mining pits and dumps are also given along with the boundary of the study area.

C). Interpretation:

After collecting the data, the data was processed and the 1st output was the **Total Field map** of the area. It shows both the regional and residual components together as shown below (Fig.2).

Magnetic anomaly map is prepared after applying the corrections. The anomaly map shows total variation of about 450 nT (values ranging for 7 to 451 nT) and contours are prepared with 20 nT interval. This map suggests that the general strike of the formations in this area could be E-W. It is generally observed that there is progressive rise in magnetic values from south to north. These features are transected with orthogonal features in N-S directions with discrete closures suggesting minor folding. The Mn mineralization is probably localized along these features.

To suppress the noise and to bring out the geological and structural variations of the area, magnetic anomalies are further processed by applying low pass filter. Wave length of the filter is chosen based on the spectral analysis of the anomalies and a radius of 1000 m is chosen.

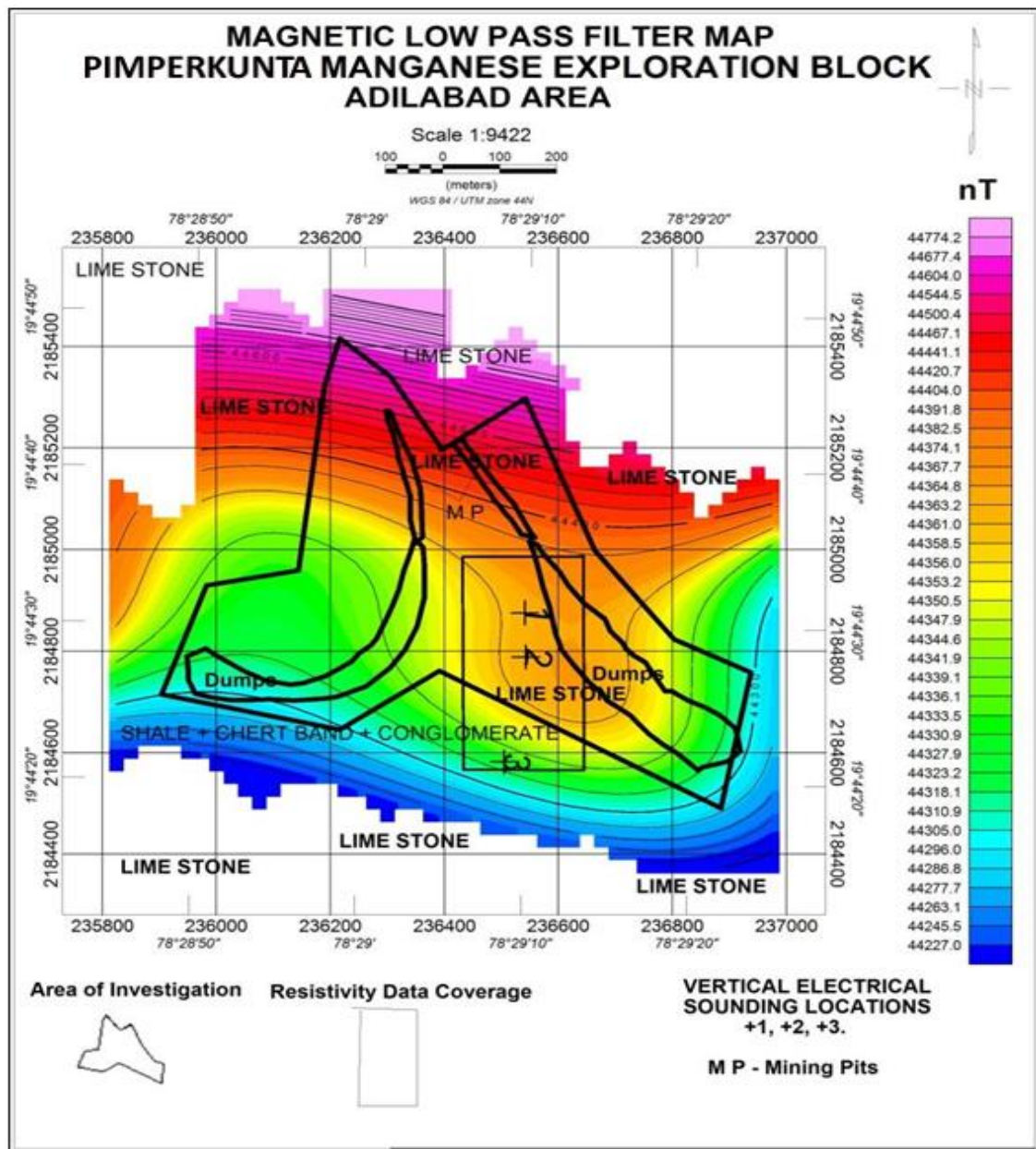


Fig. 3: Low pass Filtered Magnetic Map.

The Low pass filter map (Fig.3) shows deeper features of the formations. This map also suggests that the general strike of the formations in this area could be E-W. It is generally observed that there is progressive rise in magnetic values from south to north. The E-W trending limestone shows southward extension/ closure in the central part of the area. This could be the manifestation of NE-SW and NW-SE structures features. The contour interval is 20 nT. Limestone shows the magnetic intensity range of 44360 nT - 44480 nT whereas shale band shows a variation of 44360 nT - 44200 nT.

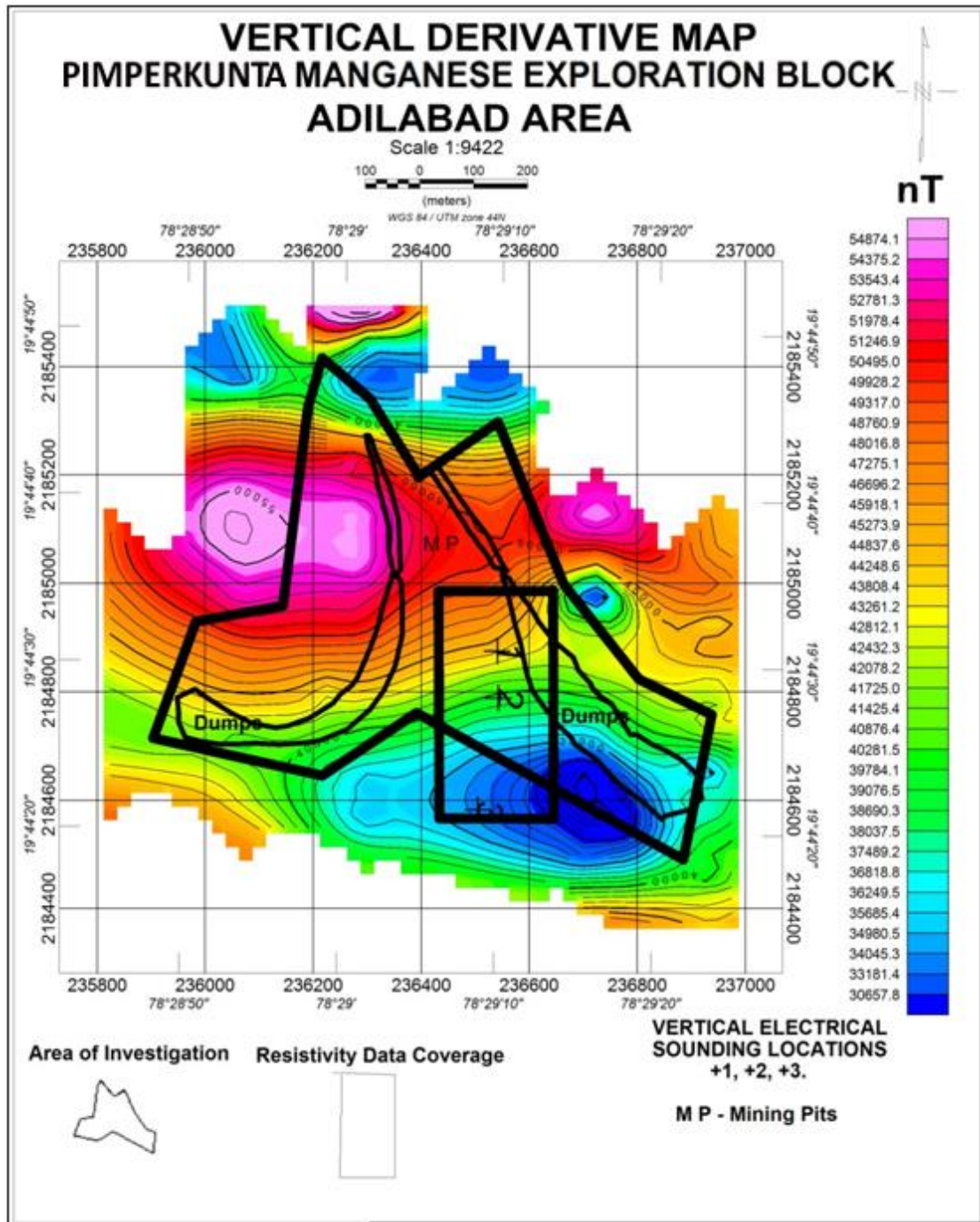


Fig.4: Vertical Derivative Map

The Vertical Derivative map (Fig.4) has resolved the different formations and their contacts and also shows that this might be a repeated sequence. From the above maps it is observed that there are five parallel sequence beds. This VD map has eliminated the regional field influence and brought out the contact of different formations. Since the study area is mostly soil covered, the Vertical Derivative Map is interpreted with contextual information and found that it is showing the overlapping nature of sedimentary sequence and the different beds are identified (Fig.5 and Fig.6). The steep gradients on south of each anomaly might probably indicate very gently dipping strata towards south.

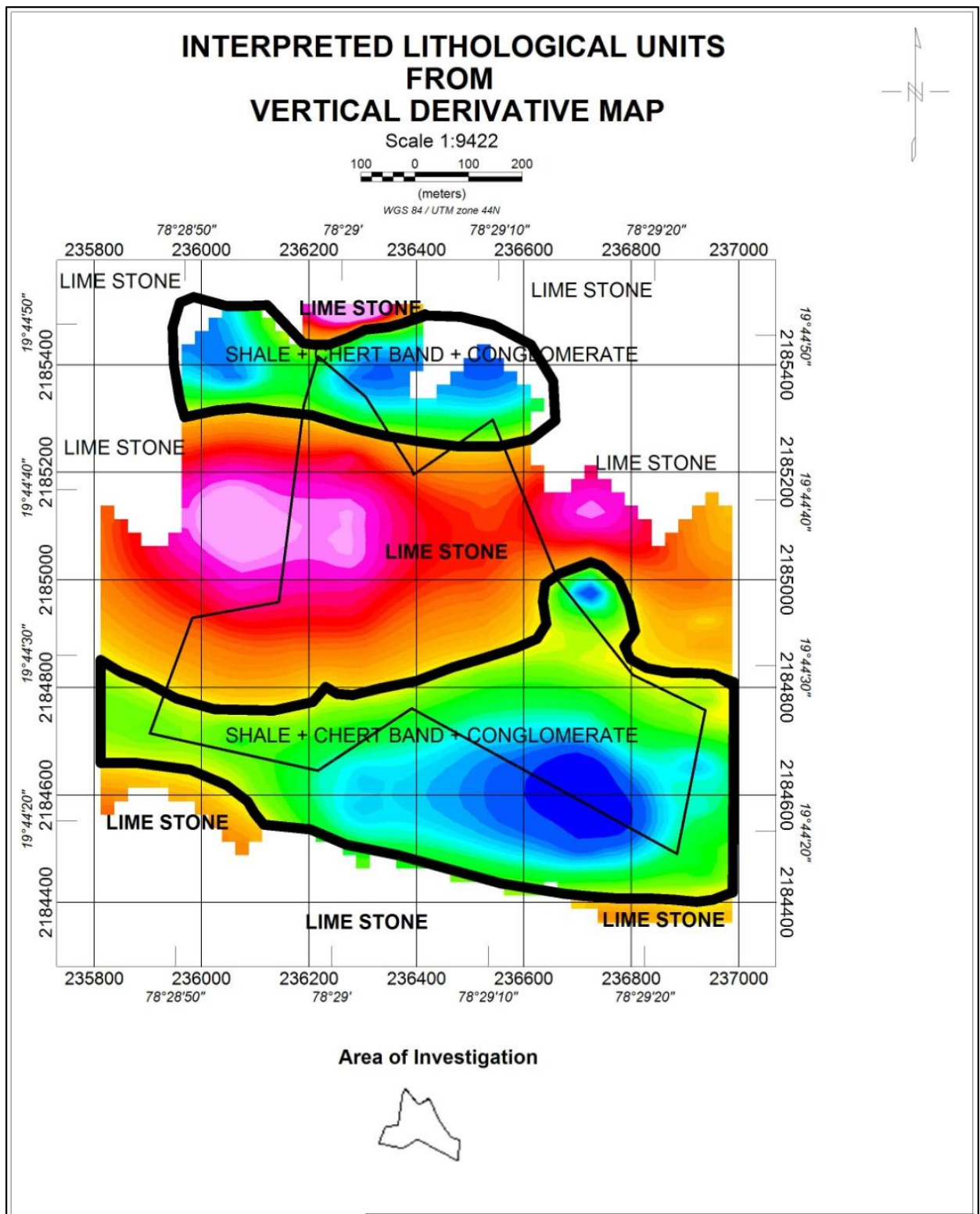


Fig 5: Interpreted Vertical Derivative Map.

The schematic Geological Map interpreted from the Magnetic maps is shown below (Fig.6).

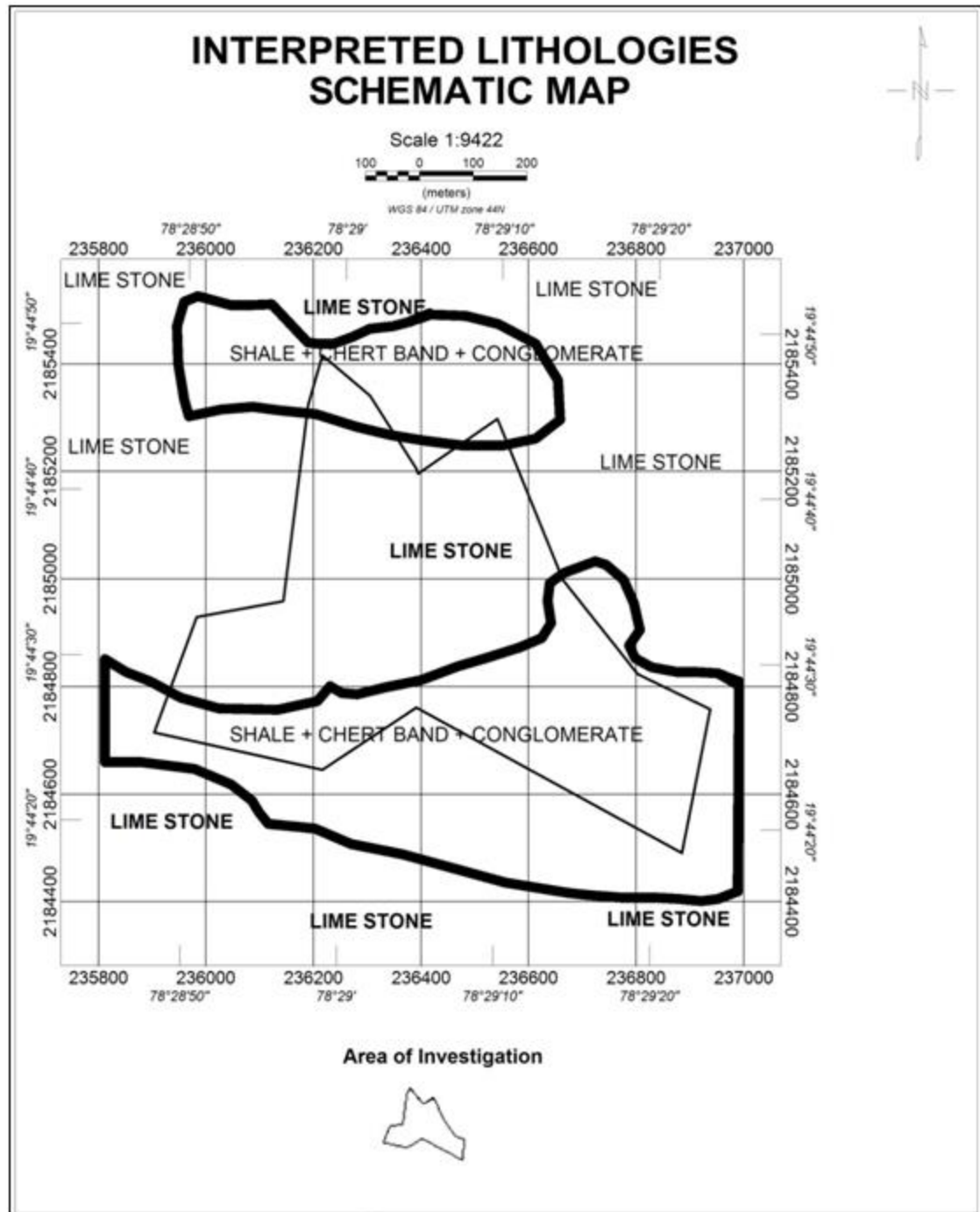


Fig.6: schematic Geological Map.

2nd step: Resistivity Profiling Surveys:

Based on the information derived from magnetic data a part of the area covering the shale as well limestone portion was selected for conducting Resistivity profiling surveys (across the strike of the rock formations) which are aimed getting not only corroborative information with magnetic data, but also provide suitable locations for conducting Vertical electrical soundings (VES) for obtaining the depth parameters of different beds. The resistivity profiling has established the lithology and structures. A few areas are prioritized from the above surveys for Resistivity Soundings to know the persistence of mineralization.

The portion covered by Resistivity Surveys is shown below (Fig.7).

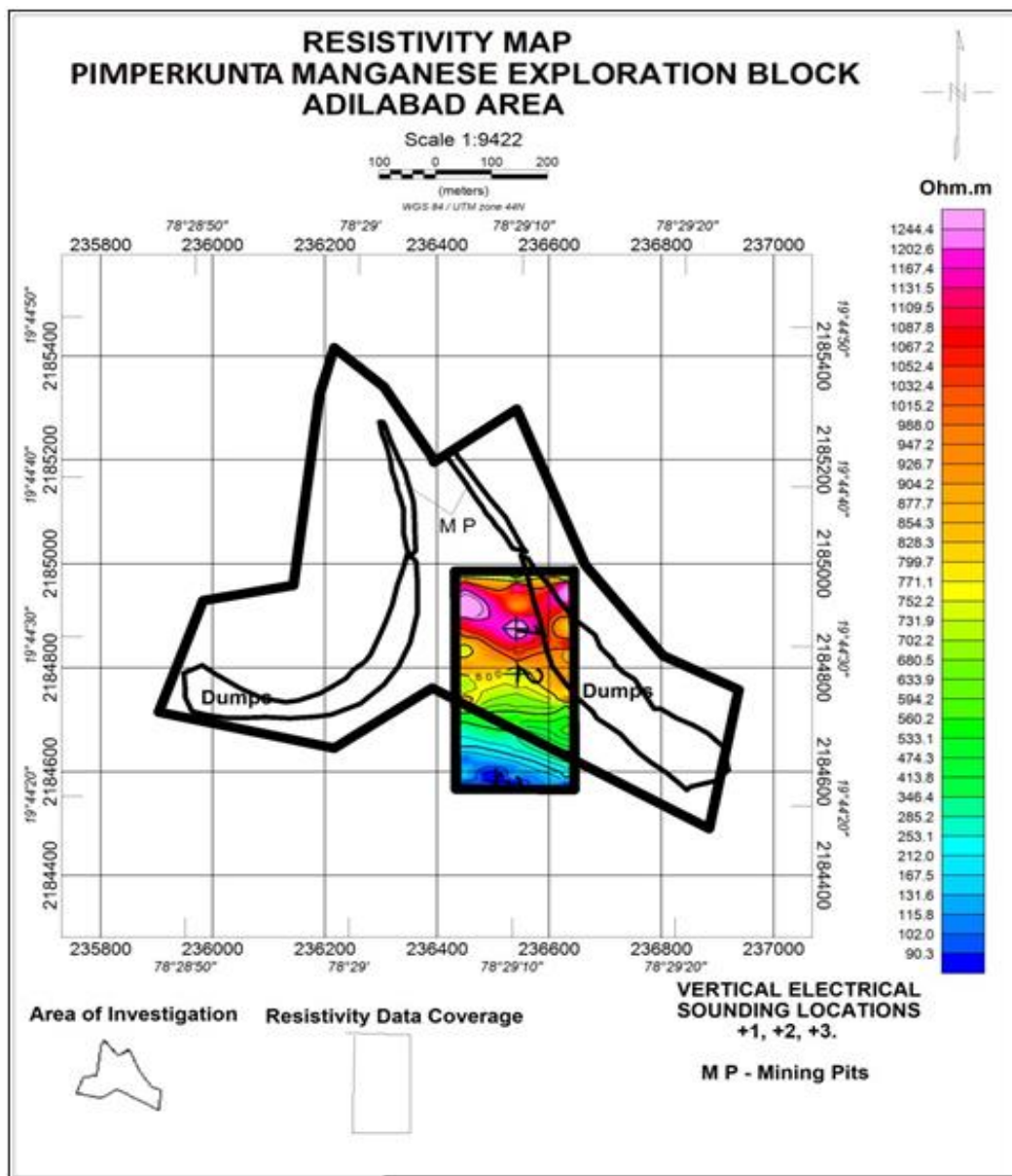


Fig.7: Resistivity map coverage.

The Resistivity Profile surveys were carried out by employing Gradient method, in which the two current electrodes were kept at 600 m apart (C1C2=600m) along the central line, and another two offset lines at 90 meters distance on either side of central line. All the lines are N-S oriented, cutting across the strike of formations. The lay out for data collection is shown below (Fig.8).

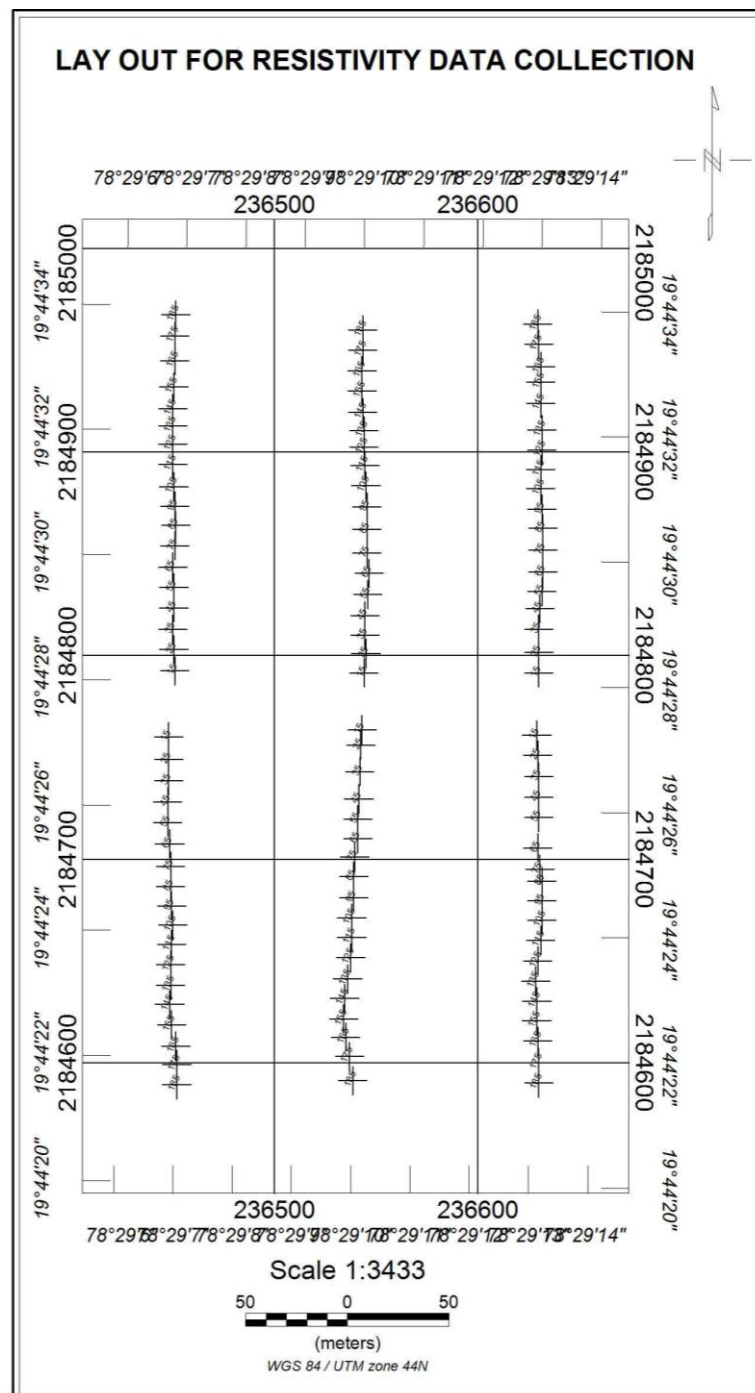


Fig.8: Layout for Resistivity Profiling Surveys.

After the data collection and processing, the result is shown in the below map (Fig.9).

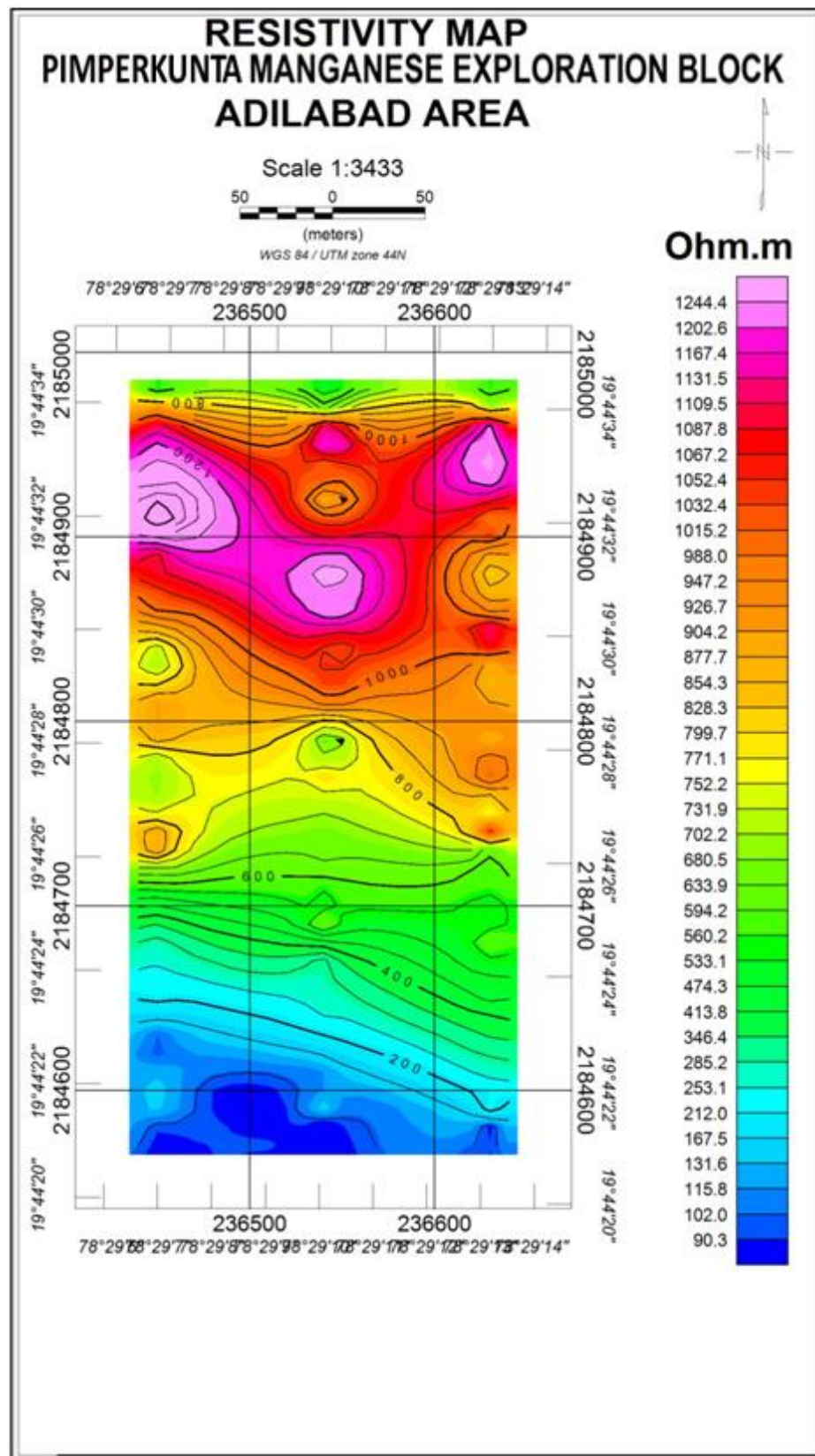


Fig.9: Resistivity Map

For proper interpretation the Resistivity map is overlaid on Magnetic Vertical derivative Map as shown below (Fig.10).

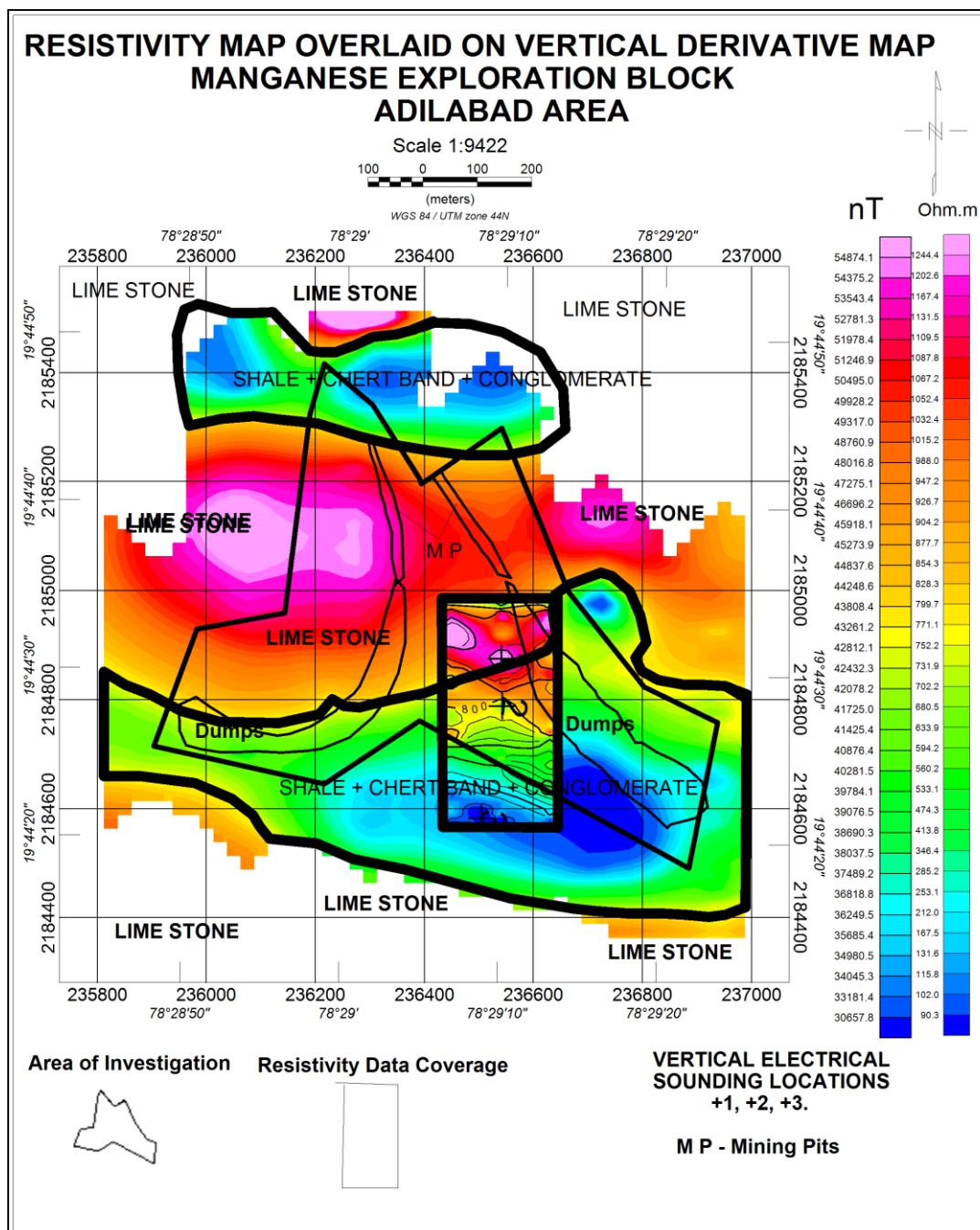


Fig.10: Resistivity Map overlaid on magnetic Vertical Derivative Map.

The Resistivity map is corroborating the information inferred from Vertical Derivative Map; It is showing two formations that is Limestone and Shale in the study area. The resistivity is high for limestone when compared to shale. This is not only providing the lithological characters, but suggestive for conducting three vertical electrical soundings (VES), one in limestone, one at the contact of limestone and shale and one in shale. Hence three places were selected for VES and shown in the map.

3rd step: Vertical Electrical Soundings (VES):

Vertical Electrical Sounding were conducted at three locations to know the persistence of mineralization in prioritized areas. The locations are shown as +1, +2 & +3 in the map (+1: X-236541, Y-2184875, +2: X-236543, Y-2184788, +3: X-236505, Y-2184582).

Three E - W (C1-C2 maximum 200 m) soundings were conducted at different locations as shown in the above maps (Fig. 11) and interpreted using inverse slope method as shown below.

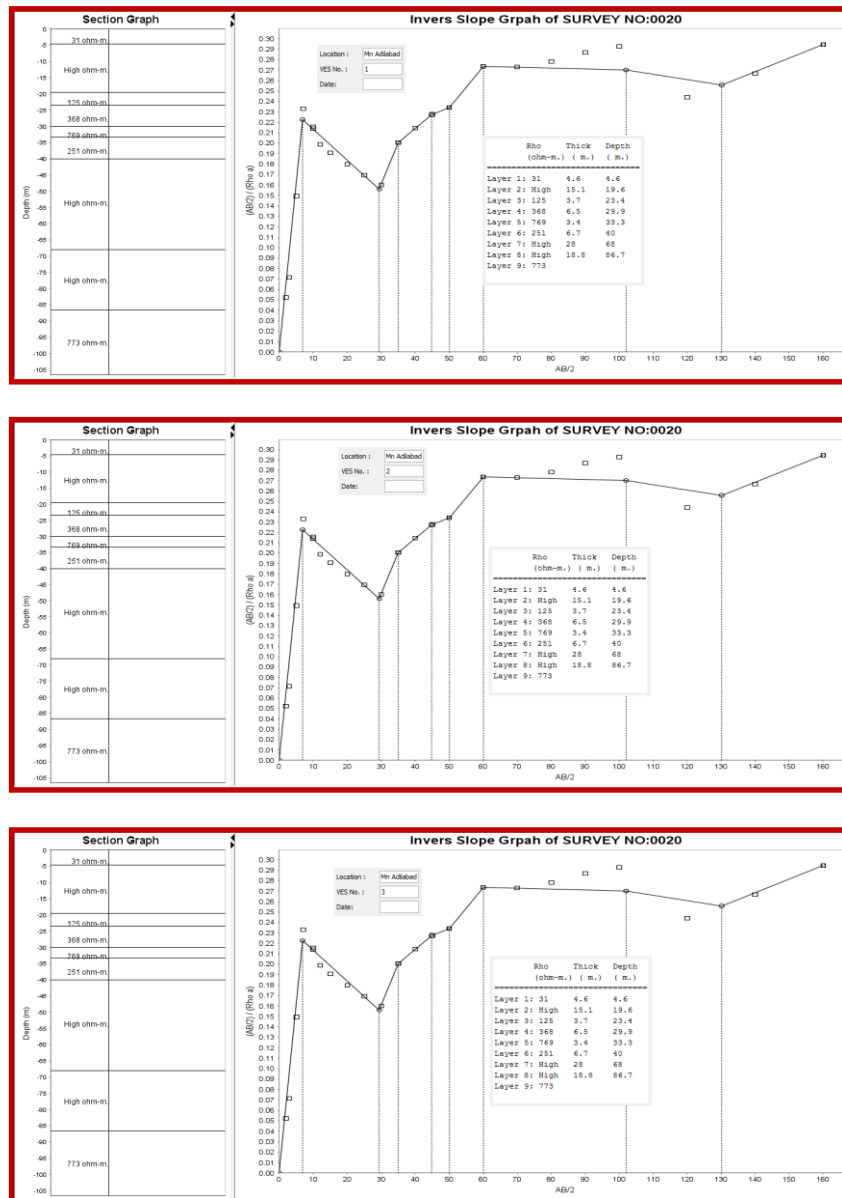
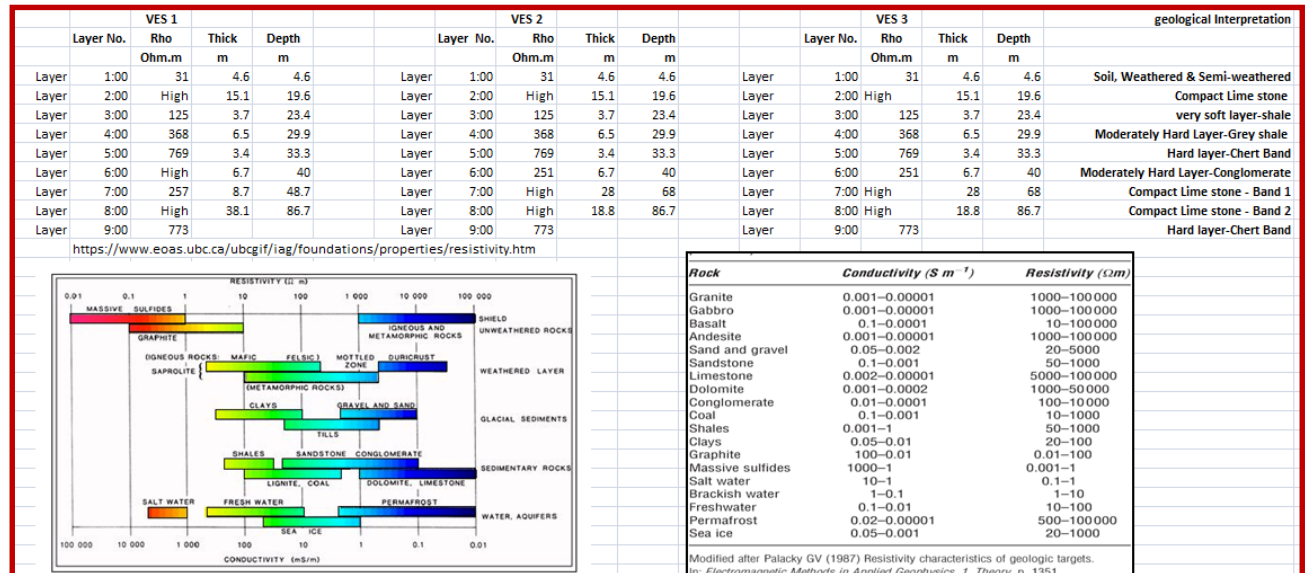


Fig.11: Vertical Electrical Soundings curves.

The depths at three locations interpreted and tabulated below and compared with standard values (References provided).



The geological interpretation is given below for each formation:

Formation	Thick m	Depth m
Soil, Weathered & Semi-weathered	4.6	4.6
Compact Lime stone	15.1	19.7
very soft layer-shale	3.7	23.4
Moderately Hard Layer-Grey shale	6.5	29.9
Hard layer-Chert Band	3.4	33.3
Moderately Hard Layer-Conglomerate	6.7	40
Compact Lime stone - Band 1	28	68
Compact Lime stone - Band 2	18.8	86.7
Hard layer-Chert Band		

6. Conclusions:

1. This area shows of overlapping and repeated sedimentary sequence comprising of limestone and shale.
2. The strike trend is near East - West with gentle dips due south.
3. Their lateral extents were mapped using magnetic and resistivity profiling methods and depth estimated were derived using mainly the Vertical electrical Soundings, supported by magnetic data.
4. Not only the lateral extents, but also general depth parameters were also derived for all the formations.
5. It appears that the shale is manganiferrous, hosting the manganese mineralization pockets.
6. These surveys have brought out a depth of more than 20 m for shale.
8. Hence, drilling can be taken up at the desired locations up to a depth of 35-40 m as evidenced from VES data.

7. Recommendations:

Initially Core drilling may taken up in the area and the location of drill points should spread all over the formations and at their contacts to establish Mn mineralization in the area.

Correlation of geophysical magnetic and resistivity surveys with existing regional geological map:

The geological information derived from magnetic and resistivity surveys are plotted on this map for better understanding of the area. The derived lateral or X and Y information prominently from magnetic as well as from resistivity surveys. Now let the information may also be correlated with the available geological map. To carry out this analysis, image processing software is used in order to over lay different geophysical out puts on geological map as shown below.

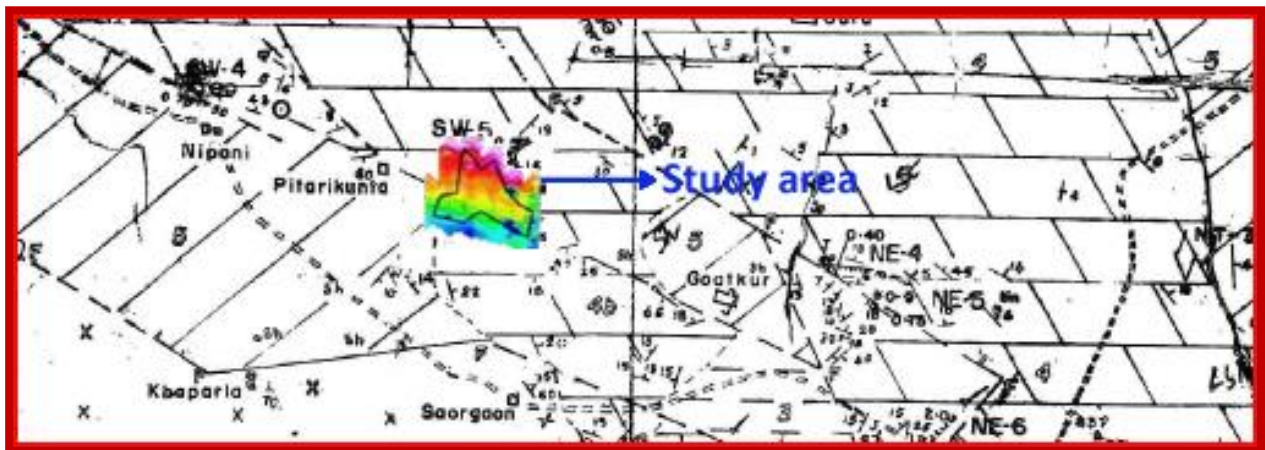


Fig.12: Magnetic Total Field map overlaid on geological map.

The above figure shows clearly the contact between the shale and limestone are matching in both geophysical and geological maps.

Then an attempt is made to see how is the Low Pass filtered Map which indicated the deeper level subsurface information is corrected with the regional map

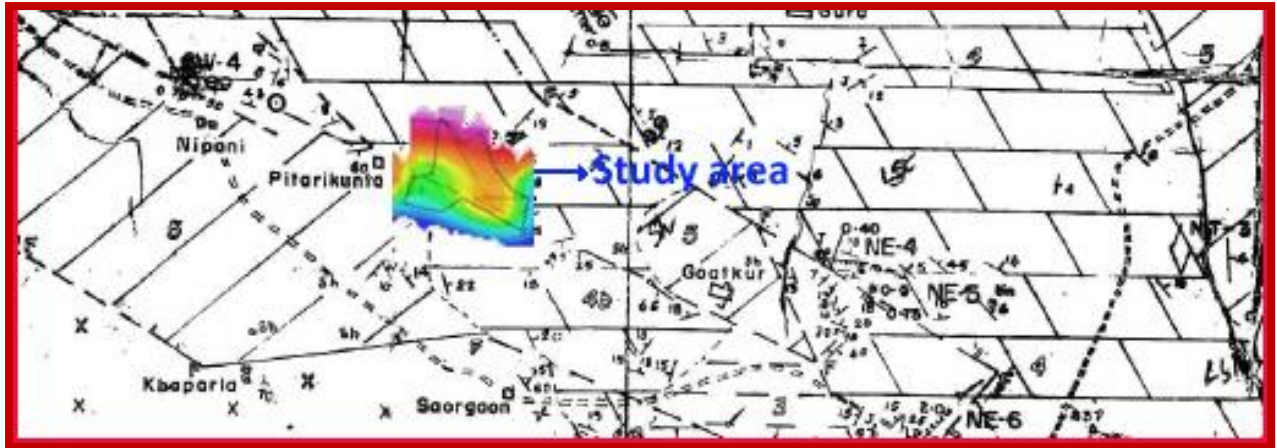


Fig.13: Low Pass Filter map overlaid on geological map .

This figure shows that influence of sub surface structural features in displacing the Limestone towards south in central part. The clear influence of NE-SW and NW-SE trending structural features on the disposition of Limestone and Shale formations at depth, can be interpreted.

Then Vertical Derivative map is overlaid on geological map (Fig.14)as shown below.

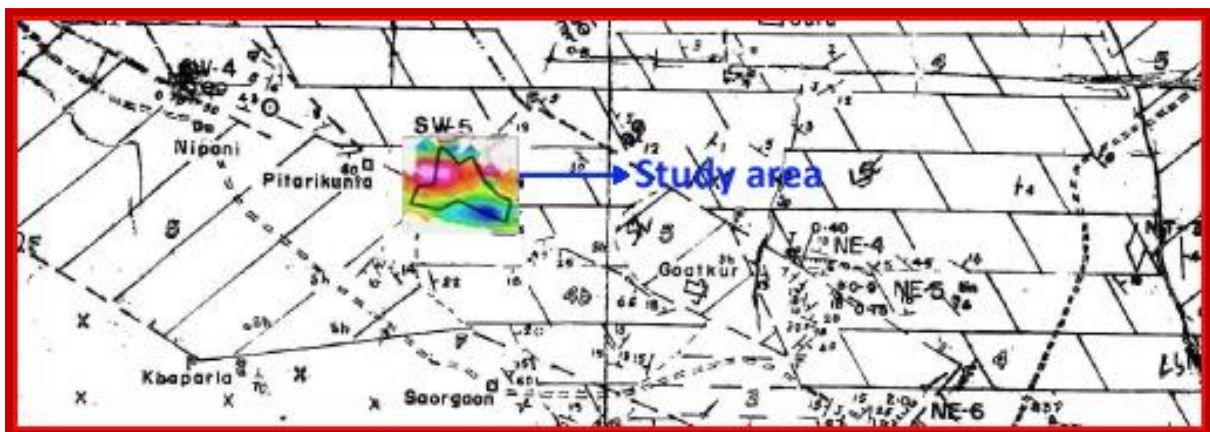


Fig.14: Vertical Derivative Map overlaid on geological map.

The above figure shows a more perfect correlation of Vertical derivative Map with Geological map suggesting the contact could be a structural one also.