G3 LEVEL MINERAL EXPLORATION REPORT FOR LIMESTONE

at

JEWARGI AMALGAMATED LIMESTONE BLOCK

(Block ID: KIOCL_23_KA_KLB 11)

SoI TOPOSHEET No.56D/13, KALBURGI (Dist.), KARNATAKA

KUDREMUKH

KIOCL Ltd

Notified Exploration Agency

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COVER PHOTO: LIMESTONE OUTCROP

G3 LEVEL MINERAL EXPLORATION REPORT FOR LIMESTONE at JEWARGI AMALGAMATED LIMESTONE BLOCK (Block ID: KIOCL_23_KA_KLB 11) SoI TOPOSHEET No.56D/13, KALBURGI (Dist.), KARNATAKA

2024

Preliminary Exploration (G3 Stage) for Limestone (Sedam) Kalburgi, Jevargi Taluk, Kalburgi district, Karnataka

Block ID: KIOCL_23_KA_KLB 11

Jevargi (Taluk), Kalburgi (Dist), Karnataka

by

KIOCL Limited

(Notified Exploration Agency)

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1. EXECUTIVE SUMMARY

The area of present exploration forms a part of Bhima Basin in Karnataka, which is the power house for the limestone deposit, contributing and serving many cement industries for a long time and still continuing.

Dept of Mines and Geology (DMG), Govt. of Karnataka (GoK) vide proceedings of 56th meeting of Karnataka State Geological Programming Board (SGPB) (recorded @ 56.03.06) informed KIOCL to take up exploration works of limestone block under NMET funding. Allocated 4 limestone blocks (amalgamated) collectively covering an area of 20 Sq. Km (@ 5skm per block) for exploration and to augment the resources of Limestone falls in the Bhima Basin.

Among the 4 limestone blocks, the current report refers to Block ID KLB-23 with 5sqkm situated in sedam member of Shahabad formation. Kalburgi Limestone Block KLB-23 covering an area of 5 Sq. Km is exclusively falling over part of Sedam Limestone Member of Shahabad Formation. The sedimentary formations of Bhima Group unconformably overlie the granitoids in the eastern and southern parts of the basin. A huge pile of volcanics cover the basin in its north and western parts. Massive stretch of granite hills at Shahapur and some inliers of granite mounds probably provided a linear narrow palaeoslopes for sedimentation of the Bhima basin (Hans and Sundaram (1986)). The basin witnessed initially the deposition of arenaceous sediments and a thick pile of calcareous sediments which represents the Shahabad Formation, is important as for as economic minerals like limestone is concerned. The Shahabad Formation has 5 members of variegated limestones members viz., from base to top as Ravoor, Wadi, Sedam, Gudur and Mulkod limestone members. All these members are conformable and show gradational contact with overlying and underlying member without any break. Among which the middle member being the Sedam Limestone, is targeted for exploration, suitability to Cement Industry and to augment the resource of limestone in the block.

As for as the structure is concerned the sediments of Bhima Group are practically horizontally bedded, and the beds with little up to a maximum of 5° are seen dipping towards west. However, the beds mostly of Shahabad limestone formation show an E-W

trend with dips up to 2° to 3° towards west along a linear section in the basins. The basin in fact, is affected by faults and joints, there are no such faults or joints in the area of KLB-23 block.

Area is falling on the Shahabad limestone, covering an area of 5 Sq. Km. The area is extensively covered by vegetation / agricultural activities, because of the calcareous and black cotton soil which is conducive for growth of vegetation. Amid the agricultural land there are good exposures / outcrops in the area which has aided the bedrock sampling while mapping the area. There are 9 bedrock samples collected in the area shows the CaO varies from minimum of 33.98% and maximum of 46.04%.

The study was taken up in the area with Detailed Geological Mapping on 1: 4,000 scale using total stations to pick up the geological exposures traced and mapped as the outcrop geological map and DGPS survey to prepare the contour map on 1m interval. The area constitutes a plane land with maximum elevation of 429m in the northern part of the block, gradually sloping towards southwest and southeast with minimum of 401m. Geological mapping was carried out to trace Lithounit contacts, abandoned dug well, nala/canal; roads, quarry section, quarry dump and settlements were recorded during mapping. While mapping, wherever outcrops are available on surface, bed rock sampling of limestone was collected for chemical analysis and petrographic studies. Drilling as per the norms of the NMET funded projects maximum of 5 boreholes can be drilled with a maximum depth of 45m in an area of 5 Sq. Km. Accordingly, 5 boreholes were drilled. Drilling was carried out to know the depth persistence of the potential horizons of limestone.

As the name itself suggests, Sedam is the type area and the reference section for this member, which otherwise is popularly known as variegated limestone. It is the thickest member (60m) in the whole of Bhima Group and also occupy the largest areal extent of all the other members. Fertile black clayey soil of more than 2m to 3m thickness drapes these beds throughout the area of exploration. Petrographically, the limestone shows micrite and microsparites with cryptocrystalline chert and amorphous silica.

Based on intersection and correlation of different lithology in the boreholes drilled in the area, the deposit is classified as bedded sedimentary deposit with regular habit. Resource

is estimated by Polygon Method. The resources have been estimated based on the area of influence and other parameters of UNFC as Inferred Mineral Resources (333) and Reconnaissance Mineral Resource (334) category as per the norms of Mineral (Evidence of Mineral Content) Rule 2015.

Cumulative Resources of 523.28 million tonnes (334 & 333) and Net Resource (334 & 333) of 497.11 million tonnes with weighted average CaO% of 37.98 is estimated in the Block.

1. सारांश

वर्तमान अन्वेषण का क्षेत्र कर्नाटक में भीम बेसिन का एक हिस्सा है, जो चूना पत्थर जमा के लिए बिजली घर है, जो लंबे समय से कई सीमेंट उद्योगों को योगदान और सेवा दे रहा है और अभी भी जारी है।

खान एवं भूविज्ञान विभाग (डीएमजी), सरकार। कर्नाटक सरकार (जीओके) ने कर्नाटक राज्य भूवैज्ञानिक प्रोग्रामिंग बोर्ड (एसजीपीबी) की 56वीं बैठक की कार्यवाही (56.03.06 @ दर्ज) के माध्यम से एनएमईटी फंडिंग के तहत चूना पत्थर ब्लॉक के अन्वेषण कार्यों को शुरू करने के लिए केआईओसीएल को सूचित किया। सामूहिक रूप से 20 वर्ग के क्षेत्र को कवर करने वाले 4 चूना पत्थर ब्लॉक (समामेलित) आवंटित किए गए। भीमा बेसिन में चूना पत्थर गिरने के अन्वेषण और संसाधनों को बढ़ाने के लिए किमी (@ 5skm प्रति ब्लॉक)।

4 चूना पत्थर ब्लॉकों में से, वर्तमान रिपोर्ट ब्लॉक आईडी KLB-23 को संदर्भित करती है, जिसका 5 वर्ग किमी हिस्सा शाहाबाद संरचना के सेडम सदस्य में स्थित है। कलबुर्गी चूना पत्थर ब्लॉक KLB-23, 5 वर्ग के क्षेत्र को कवर करता है। किमी विशेष रूप से शाहाबाद संरचना के सेदम चूना पत्थर सदस्य के हिस्से पर गिर रहा है। भीमा समूह की तलछटी संरचनाएं बेसिन के पूर्वी और दक्षिणी हिस्सों में ग्रैनिटोइड्स पर असंगत रूप से फैली हुई हैं। ज्वालामुखी का एक विशाल ढेर इसके उत्तरी और पश्चिमी हिस्सों में बेसिन को कवर करता है। शाहपुर में ग्रेनाइट पहाड़ियों के विशाल विस्तार और ग्रेनाइट टीलों के कुछ अंदरूनी हिस्सों ने संभवतः भीमा बेसिन (हंस और सुंदरम (1986)) के अवसादन के लिए एक रैखिक संकीर्ण पुरापाषाण प्रदान किया। बेसिन में शुरू में खट्टी तलछटों का जमाव और कैलकेरियस तलछटों का एक मोटा ढेर देखा गया, जो शाहबाद संरचना का प्रतिनिधित्व करता है, जहां तक चूना पत्थर जैसे आर्थिक खनिजों का

संबंध है, यह महत्वपूर्ण है। शाहाबाद संरचना में विभिन्न प्रकार के चूना पत्थर के सदस्यों के 5 सदस्य हैं, अर्थात् आधार से ऊपर तक रावूर, वाडी, सेदम, गुडुर और मुलकोड चूना पत्थर के सदस्य हैं। ये सभी सदस्य अनुरूप हैं और बिना किसी रुकावट के ऊपरी और अंतर्निहित सदस्य के साथ क्रमिक संपर्क दिखाते हैं। जिनमें से मध्य सदस्य सेडम चूना पत्थर है, जिसका लक्ष्य अन्वेषण, सीमेंट उद्योग के लिए उपयुक्तता और ब्लॉक में चूना पत्थर के संसाधन को बढ़ाना है।

जहां तक संरचना का सवाल है, भीमा समूह की तलछटें व्यावहारिक रूप से क्षैतिज रूप से बिछी हुई हैं, और अधिकतम 50 तक की तलछटें पश्चिम की ओर झुकती हुई दिखाई देती हैं। हालाँकि, ज्यादातर शाहाबाद चूना पत्थर संरचना के तल बेसिन में एक रैखिक खंड के साथ पश्चिम की ओर 2° से 3° तक की गिरावट के साथ एक ई-डब्ल्यू प्रवृत्ति दिखाते हैं। वास्तव में, बेसिन दोषों और जोड़ों से प्रभावित होता है, केएलबी-23 ब्लॉक के क्षेत्र में ऐसे कोई दोष या जोड़ नहीं हैं।

शाहाबाद चूना पत्थर पर 5 वर्ग मीटर का क्षेत्र पड़ता है। किमी. यह क्षेत्र बड़े पैमाने पर वनस्पति/कृषि गतिविधियों से आच्छादित है, क्योंकि यहां की शांत और काली कपास मिट्टी वनस्पति की वृद्धि के लिए अनुकूल है। कृषि भूमि के बीच क्षेत्र में अच्छे एक्सपोज़र/आउटक्रॉप्स हैं जिससे क्षेत्र का मानचित्रण करते समय आधारशिला के नमूने लेने में सहायता मिली है। क्षेत्र में एकत्र किए गए 9 आधारीय नमूनों से पता चलता है कि CaO न्यूनतम 33.98% और अधिकतम 46.04% के बीच भिन्न है।

1:4,000 पैमाने पर विस्तृत भूवैज्ञानिक मानचित्रण के साथ क्षेत्र में अध्ययन शुरू किया गया था, जिसमें कुल स्टेशनों का उपयोग करके भूवैज्ञानिक जोखिमों का पता लगाया गया था और 1 मीटर के अंतराल पर समोच्च मानचित्र तैयार करने के लिए आउटक्रॉप भूवैज्ञानिक मानचित्र और डीजीपीएस सर्वेक्षण के रूप में मैप किया गया था। यह क्षेत्र ब्लॉक के उत्तरी भाग में 429 मीटर की अधिकतम ऊंचाई के साथ एक समतल भूमि का गठन करता है, जो धीरे-धीरे दक्षिण-पश्चिम और दक्षिण-पूर्व की ओर न्यूनतम 401 मीटर के साथ ढलान पर है। लिथौनाइट संपर्कों, परित्यक्त खोदे गए कुएं, नाला/नहर का पता लगाने के लिए भूवैज्ञानिक मानचित्रण किया गया; मैपिंग के दौरान सड़कों, खदान अनुभाग, खदान डंप और बस्तियों को दर्ज किया गया। मानचित्रण करते समय, जहां भी सतह पर आउटक्रॉप्स उपलब्ध हैं, रासायनिक विश्लेषण और पेट्रोग्राफिक अध्ययन के लिए चूना पत्थर के बेड रॉक नमूने एकत्र किए गए थे। एनएमईटी वित्त पोषित परियोजनाओं के मानदंडों के अनुसार ड्रिलिंग, 5 वर्ग के क्षेत्र में 45 मीटर की अधिकतम गहराई

के साथ अधिकतम 5 बोरहोल ड्रिल किए जा सकते हैं। किमी. तदनुसार, 5 बोरहोल ड्रिल किए गए। चूना पत्थर के संभावित क्षितिज की गहराई की दृढ़ता जानने के लिए ड्रिलिंग की गई।

जैसा कि नाम से ही पता चलता है, सेदम इस सदस्य के लिए प्रकार क्षेत्र और संदर्भ अनुभाग है, जिसे अन्यथा विभिन्न प्रकार के चूना पत्थर के रूप में जाना जाता है। यह पूरे भीम समूह में सबसे मोटा सदस्य (60 मीटर) है और अन्य सभी सदस्यों की तुलना में सबसे बड़े क्षेत्रफल पर भी कब्जा करता है। 2 मीटर से 3 मीटर से अधिक मोटाई की उपजाऊ काली मिट्टी मिट्टी अन्वेषण के पूरे क्षेत्र में इन बिस्तरों को ढक देती है। पेट्रोग्राफिक रूप से, चूना पत्थर क्रिप्टोक्रिस्टलाइन चर्ट और अनाकार सिलिका के साथ माइक्राइट और माइक्रोस्पाराइट्स को दर्शाता है।

क्षेत्र में ड्रिल किए गए बोरहोल में विभिन्न लिथोलॉजी के प्रतिच्छेदन और सहसंबंध के आधार पर, जमा को नियमित आदत के साथ बिस्तरयुक्त तलछटी जमा के रूप में वर्गीकृत किया गया है। संसाधन का अनुमान बहुभुज विधि द्वारा लगाया जाता है। खनिज (खनिज सामग्री के साक्ष्य) नियम 2015 के मानदंडों के अनुसार अनुमानित खनिज संसाधन (333) और टोही खनिज संसाधन (334) श्रेणी के रूप में यूएनएफसी के प्रभाव क्षेत्र और अन्य मापदंडों के आधार पर संसाधनों का अनुमान लगाया गया है।

ब्लॉक में 523.28 मिलियन टन (334 और 333) का संचयी संसाधन और 37.98 के भारित औसत CaO% के साथ 497.11 मिलियन टन का शुद्ध संसाधन (334 और 333) अनुमानित है।

2. INTRODUCTION

2.1. DETAILS OF THE PROJECT

Department of Mining and Geology (DMG), Govt. of Karnataka (GoK) vide proceedings of 56th meeting of Karnataka State Geological Programming Board (SGPB) (recorded @ 56.03.06) held on 29th Sept 2022 informed KIOCL to take up mineral exploration works of limestone block under NMET funding.

Vide email dtd. 24th Jan 2023 KIOCL has submitted Mineral Exploration Project Proposal (MEPP) for undertaking G4 level of Reconnaissance Survey for Amalgamated Limestone Blocks (4 Blocks with 20sqkm) to Technical Cum Cost Committee (TCC), National Mineral Exploration Trust (NMET).

50th meeting of TCC-NMET held on 02nd -3rd Mar 2023, reviewed the proposal and vide sanction order no F.No 23/335/2023-NMET/08 Dtd 3rd April 2023, TCC-NMET allotted G3 stage of Mineral Exploration (ME) works for Limestone in Jevargi Taluk, Kalburgi Dist, Karnataka" .The allotted amalgamated block includes total extent of 20sqkm in 4 blocks (@ 5sqkm per Block). Details of the Blocks and key map are provided below;

Table 01: Detail of Amalgamated Blocks

Sl. No.	Block	Extent in ha
1	KIOCL 20 KA KLB 07	5.00
2	KIOCL 21 KA KLB 08	5.00
3	KIOCL 25 KA KLB 13	5.00
4	KIOCL 23 KA KLB 11	5.00
	Total	**20.00**

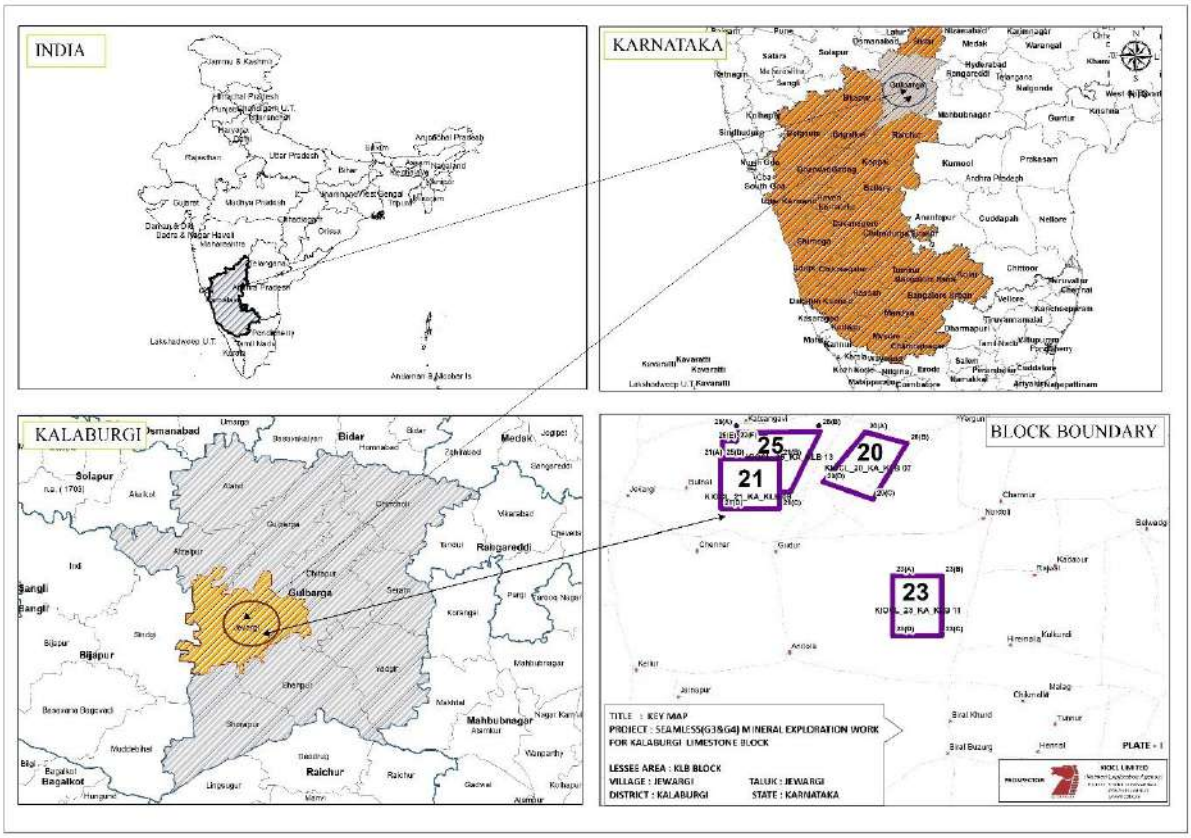

Figure 01: Key Map of Amalgamated Limestone Blocks

As the 04 blocks are geographically and geologically contiguous, these were considered as a single amalgamated block with nomenclature of Kalburgi (Jewargi) Amalgamated Limestone Block (KLB) Kalburgi (Dist) Karnataka.

The current Geological Report refers to Block 23 which is situated in South eastern part and is indicated with Block ID KIOCL_**23**_KA_KLB11.

After completion of G3 level of Mineral exploration works, the progress was reviewed in 60th meeting of TCC- NMET held on 27th Dec 2023. TCC- NMET reviewed the works carried out by KIOCL including resources estimated and consented for submission of Geological Report.

2.2. INVESTIGATING AGENCY

M/s KIOCL Limited
(A Govt. of India Enterprise under Ministry of Steel, GoI),
Block II, Koramangala, Sarjapura Road,
Bengaluru 560 034, Karnataka-India, Website: ***www.kioclltd.in***

Notified Exploration Agency under Second provision of Sub Section (1) of Section-4 of the Mines and Minerals (Development and Regulation) Act 1957 vide Ministry of Mines (MoM), Govt of India notification no. 16/08/2015-MVI dated 16.02.2015,

Represented by:

The Director (Production and Projects)
KIOCL Limited, Bengaluru 560 034,
Karnataka-India
e-Mail: ***dpp@kioclltd.in; bmed@kioclltd.in;***

2.3. OBJECTIVES OF INVESTIGATION

Present investigation aims at carrying out mineral exploration (ME) as per Minerals (Evidence of Mineral Contents) Rule-2015, Minerals (Evidence of Mineral Contents) Amendment Rule-2021, Mineral (Auction) Rules-2015 and MMDR Amendment Act-2015 in turn to facilitate the Govt. of Karnataka in auctioning of the block. The work done includes;

a) Detailed Geological Mapping on 1:4000 scale over an extent of 5 sqkm.
b) Topographic Survey works on 1:4000 scale with 1 m contour interval.
c) Drilling 5 boreholes with total 225 m of drilling (@ 45m per borehole) as per the norms of NMET, to augment the resources.
d) Chemical Analysis of Samples (Bed Rock and drill core samples).
e) In situ Bulk Density studies.
f) Petrographic Studies
g) Demarcate zones of various grades of limestone and estimation of grade wise reserves in the block as per MEMC Rule 2015.

Details of nature and quantum of work envisaged vs achieved and Chronology of events are provided below;

Table 02: Chronology of G2 Level Exploration

Sl. No.	Details of Work	Timeline	
		TCC- approved	**Executed**
1	Camp setting	April 2023	April 2023
2	Detailed Geological Mapping on 1:4000 scale	May – Aug 2023 (4 months)	May – July 2023 (3 months)
3	Sub surface exploration by drilling (5 boreholes)	Sept 2023 – Jan 2024 (5 months)	Aug 2023 to Oct 2023 (3 months)
4	Topography survey on 1:4,000 scale	Sept 2023 – Jan 2024 (5 months)	May – July 2023 (3 months)
5	Chemical Analysis of BRS and borehole samples	Oct 2023 – Feb 2024 (5 months)	June - Nov 2023
6	Camp winding	Mar 2024	Dec 2024
7	Synthesis and collation of all the data and drafting of Report and Finalisation of the Report.	Mar 2024	Jan 2024

Table 03: Details and nature and quantum of work proposed vs achievement

Sl	Work components		Unit	KIOCL_23_KA_KLB11	
				TCC approved Qty	**Executed Qty**
1	Detailed Geological Mapping (1:4,000)		sqkm	5	5
2	Survey works	Topographic Survey works (1: 4000 scale with 1m contour interval)	sqkm	5	5
3		DGPS Survey works of Base point, Boundary point and Borehole points	nos	10	10
4	Drilling works	No of Boreholes	nos	5	5
5		Core Drilling (NQ series @ 45 m per borehole X 5 Bhs per Block)	m	225	225
6		Detailed core logging works	m	225	225
		Borehole Core Sampling	m	225	219

7		Drill core preservation (@ 1 borehole per block)		m	45	45
8	Chemical Analysis for 9 radicals (CaO, MgO, Al_2O_3, SiO_2, Fe_2O_3, SO_3, P_2O_5, K_2O and LOI)	Primary Analysis	BRS	nos	-	9
9			Drill Core	nos	225	219
10		Internal Check sample analysis (5%)	Drill Core	nos	-	23
11		External Check sample analysis (10%)	Drill Core	nos	23	23
12	Determination of Bulk density			nos	1	1
13	Determination of Lab scale density tests			nos	-	3
14	Petrological studies	Preparation of Standard Thin section		nos	1	1
15		Complete Petrographic Report		nos	1	1
16	Peer review of report			nos	1	1
17	Report preparation			nos	1	1

2.4. BASIS FOR TAKING UP INVESTIGATION

Shahabad formation of Bhima Basin is exclusively chemically precipitated micrites. Both in the areal extent and vertical thickness, they occupy a prominent position, covering 60% of the total exposed area of the basin. Limestones of five varieties each with varying commercial value are observed in Bhima basin.

Large number of abandoned/under utilized mini cement plants of indigenous Vertical Shaft Klin (VS K) technology are observed in Gulbarga – Jewargi road.

Major part of the limestone formation of the Bhima basin is not explored for augmenting the resources. Considering the current demand and gap in the supply of raw material for the cement industry. It is worth taking up exploration in the Shahabad formation of Bhima Basin where the Sedam Limestone is having 60m thickness to augment the resources.

In order to meet the growing demand of limestone by the construction industries and to facilitate transparent auctioning process by DMG, GoK the current exploration program was carried.

2.5. PERSONNEL INVOLVED

Table 04: Details of personnel involved

Sl. No.	NAME (S/Sri)	EXPERIENCE
1	Shiva Kumar M, Sr. Manager (ME)	❖ >22 years in mining and mineral management.
2	D Mohan raj, Rtd ADG GSI Consultant (ME)	❖ >33 years in Geological mapping and mineral exploration in GSI
3	Palani Murugan A, Sr. Manager (ME)	❖ >20 years in mining and mineral management.
4	Ramakrishna Konari, Sr. Manager (ME) ***Project In-Charge***	❖ >20 years in mining and mineral management.
5	Noor Asgar Hussain Geologist (Exploration),	❖ >05 years of experience in Mineral Exploration.
6	Raju Asst Geologist (Exploration),	❖ >05 years of experience in Mineral Exploration.
7	Narayan T. Assistant Manager (Survey)	❖ >05 years of experience in Mines Surveying.
8	Shreekanth Asst Surveyor	❖ >03 Years of Experience in Surveying.
9	Vipin Kumar Asst Geologist (Exploration),	❖ >05 years of experience in Mineral Exploration.
10	Kavana S K Junior Geologist (Exploration),	❖ >01 years of experience in Mineral Exploration.

2.6. MODE OF EXECUTION OF DIFFERENT WORK COMPONENTS

The entire scope of work was executed with inhouse capacities / infrastructure, except for the following works which were carried out under the supervision of KIOCL Ltd with assistance of external agencies,

a. Sub surface Exploration by Drilling– Geotech Exploration (GeM Work Order No: GEMC 511687742076643 dtd 03.07.2023).
b. External Check Sample Analysis - M/s. Superintendence Company of India Private Limited, NABL accredited Laboratory. (Work Order No: KIOCL/TS/F-757/C-190/1327)

3. PROPERTY DESCRIPTION

3.1. LOCATION

Block comes under, Jevargi Taluk, Kalburgi Dist., Karnataka. Block is situated approx. 16 km from Jevargi, which is a town and headquarters of the Jevargi Taluk. The schematic diagram of block demarcated on the District / State / India map is provided below;

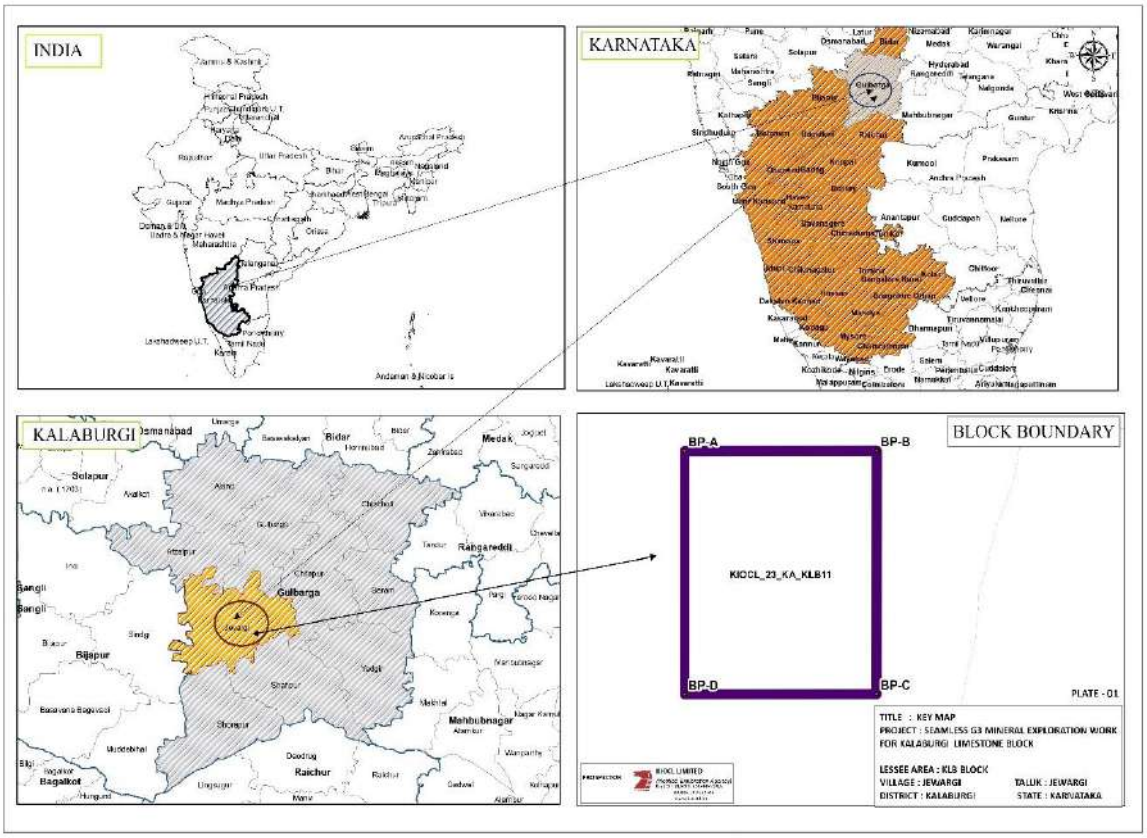

Figure 02: Key Map of the Block

Block is situated in the south-eastern of the Survey of India (SoI) Toposheet No. 56D/13 of Kalburgi, Karnataka. Geo-coordinates of the block are provided below, and the block boundary marked on SoI toposheet of 1:50,000 scale is enclosed as Plate 02 (Topo Map).

Table 05: Geo-Coordinates of Boundary Points of the Block

CORNER PILLAR No	Map Datum– WGS84	
	EASTING	NORTHING
BLOCK-23 AREA: 5.00 sqkm		
23BP-A	700218.918	1878520.772
23BP-B	702245.916	1878523.088
23BP-C	702244.622	1876053.987
23BP-D	700218.827	1876053.594

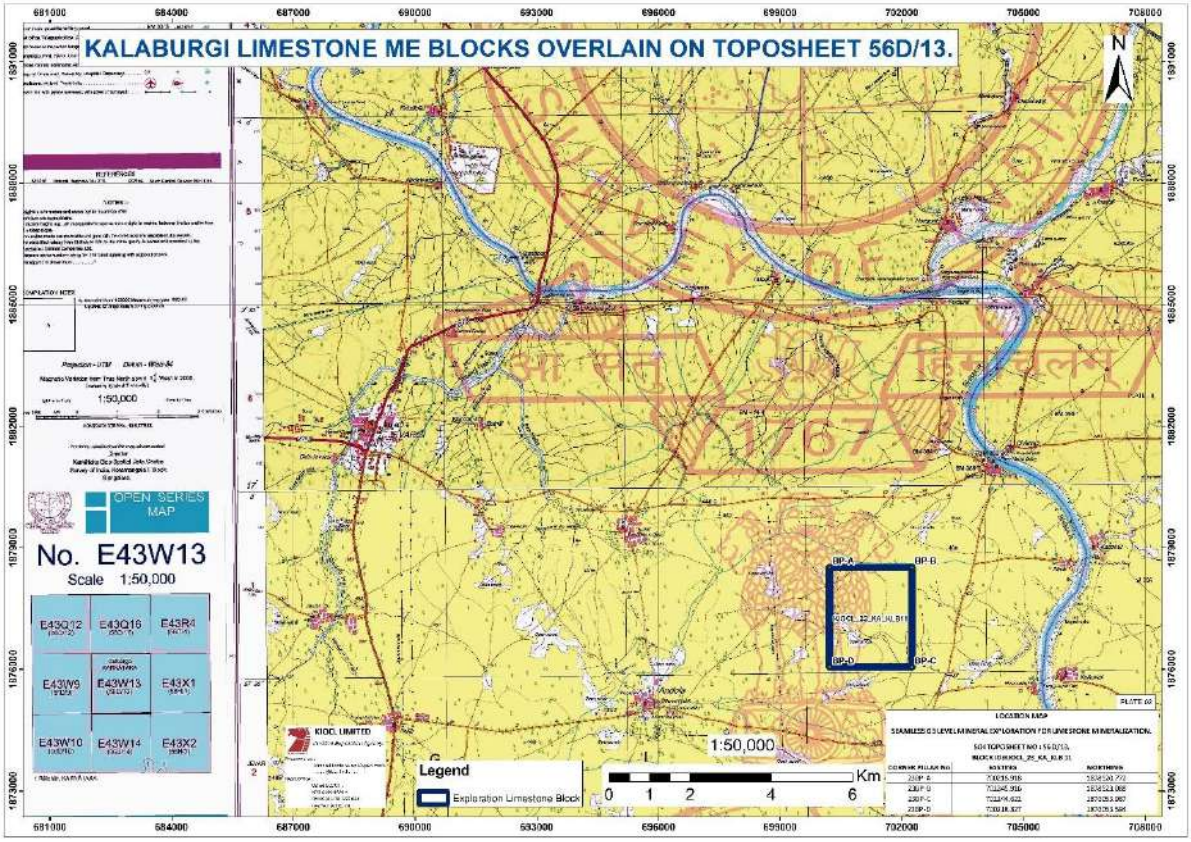

Figure 03: Block marked on SoI Topo Map

3.2. ACCESSIBILITY

Block area can be accessible through Karnataka State highway no 50 between Kalburgi to Jewargi route. Interior part of the area can be accessed by metal and mud roads. The block situated approx. 16 km from Jevargi. Kalburgi is the nearest railway station, which is situated at a distance of around 55 Km from the block. The nearest airport is Kalaburagi which is located at a distance of approx. 65 km.

3.3. LAND USE/COVER

Kalaburagi has land utilization of 3% for the forest, 83% for cultivation, and 14% for others. (Figure 02).

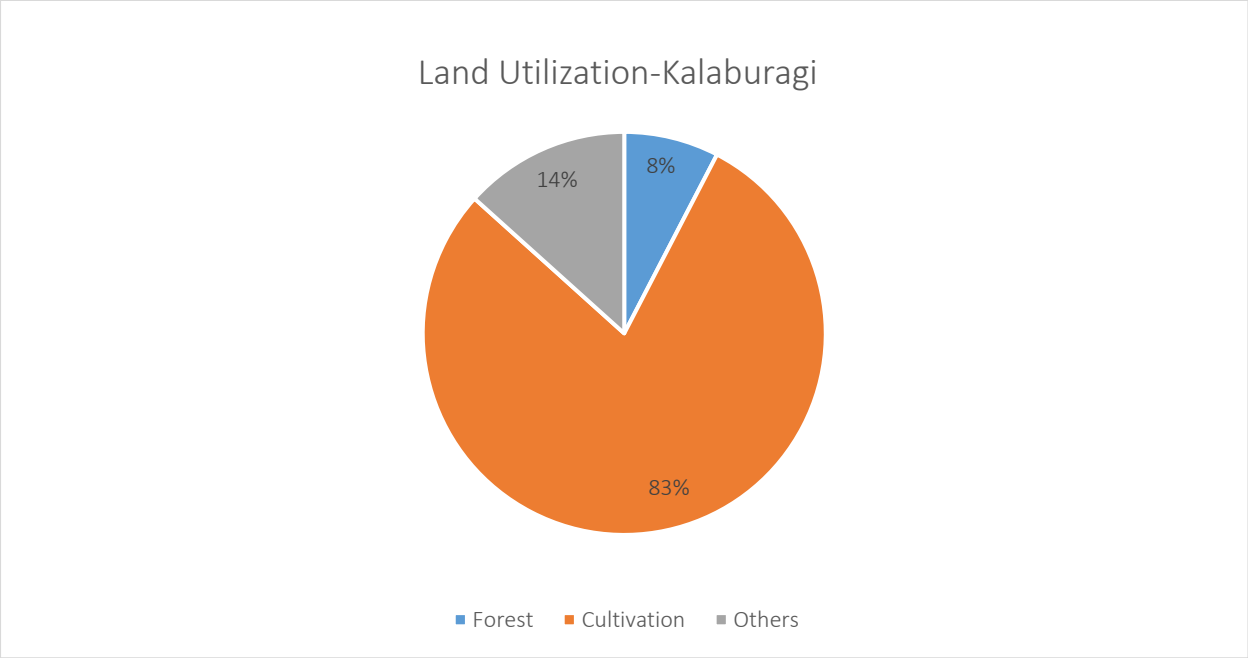

Figure 04: Land Utilization-Kalaburagi

3.4. FREE HOLD/LEASE HOLD DETAILS

Block is falling in agricultural lands.

3.5. CLIMATE

Kalburgi has a hot semi-arid climate (BSh) bordering on a tropical wet and dry climate (Aw). The climate of the district is generally dry, with temperatures ranging from 8 °C to 45 °C and an annual rainfall of about 750 mm. The year in Kalburgi is divided into three main seasons. The summer lasts from late February to May. It is followed by the southwest monsoon, which lasts from late June to late October. This is then followed by dry winter weather from late November until February.

3.6. FLORA and FAUNA

Kalaburagi district is situated in the dry-climate belt and is devoid of lofty ranges of hills. Consequently, the flora and fauna of the district are not luxuriant and lush owing to the arid country and scanty rainfall. The forest area constitutes a meager 3.2 % of the total geographical area. Forests are of two types, Deciduous in the north-east zone with a dense

tree growth and the scrub type on the south-east. The forest-flora is scattered in small bits except in Chincholi taluk where dense growth of trees are present, other taluks have patches of forest mostly the scrub type, yielding no timber at all. In the absence of thick evergreen forests in the district, wildlife is almost nonexistent. The deciduous forests have a few varieties of langoors and monkeys. Beasts of prey belonging to the carnivore class are seen occasionally. The tiger is almost extinct, and few panthers are seen very rarely. Bears are found in some areas in Chincholi taluk and cause menace to farmers. The hyena, wolves, wild dogs, spotted deer, sambar, black buck, Indian fox and jackals are seen in various parts of the district.

3.7. GEOMORPHOLOGY

Jevargi Taluk is exhibiting an undulating topography with tablelands characteristics of basaltic lava flows in North, which represents “Deccan peneplain.” The central and southern parts exhibit moderate to gently “undulating terrain” having sparsely distributed knolls and tors. The remaining part of the Taluk is in general a “plateau area”. The elevation in the plains varies from 402 m in the North western part to 502m MSL in the Southern part of the Taluk. This has its bearing on the regional slope which is towards North. The differential altitude is significant because, it is likely to cause irregular ground water flow patterns on the micro scale. Topography is dominantly controlled by geological structures. The entire Jevargi Taluk drained by Bhima River which is tributary of Krishna River. The Drainage pattern is dendritic to sub-dendritic. The drainage density ranges from 0.80 to 1.81 km/km2.

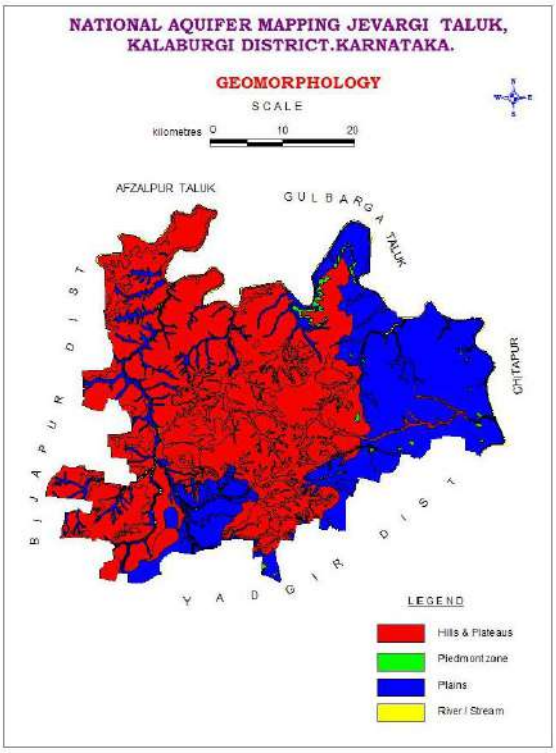

Figure 05: Geomorphology Map-Jevargi Taluk *(Source: CGWB,Gov of India)*

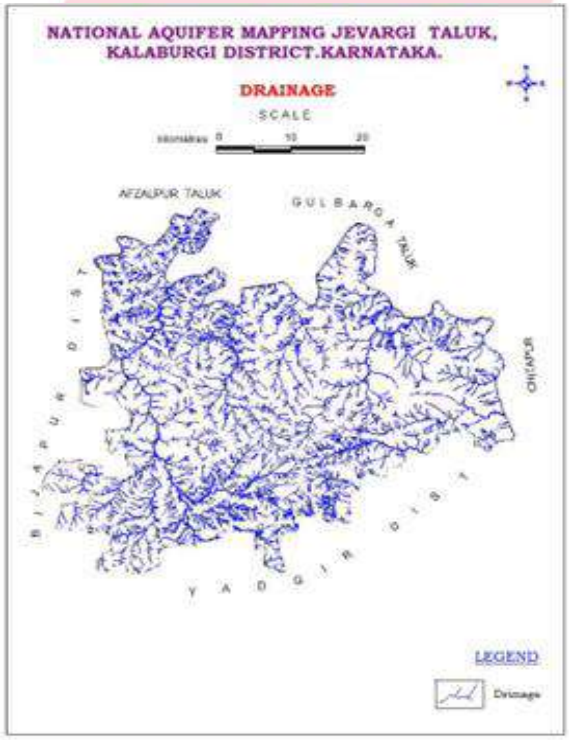

Figure 06: Drainage Map-Jevargi Taluk *(Source: CGWB,Gov of India)*

3.8. LOCAL INFRASTRUCTURE

The district has eight hospitals and 62 Primary Health Centre and 8 Community health centres with sixty-two Private nursing Homes/Hospitals/Clinics. There are thirty-two degree colleges graduate level education, (governmental and private educational institutes) functioning in the district. Similarly, four engineering colleges, four medical colleges, two dental colleges, fourteen Polytechnic colleges, functional in the area. There are twenty-eight ITI colleges providing diploma in various trades within the district. Public, private and co-operative banks operating in the district.

3.9. POPULATION

The total population as per Census 2011 was 25,64,892 in which the contribution of the male population was 13,07,061 and the female population was 12,57,831. The population in 2021 is estimated to be 30,26,111.

Table 06: Population of Kalaburagi

Population of Kalaburagi	
Total Population	25,64,892
Male Population	13,07,061
Female Population	12,57,831

3.10. ARCHEOLOGICAL/HISTORICAL SITES

Kalaburagi, one of the largest districts in Karnataka, is a land where the past blends with the present. There are many ancient monuments in the city. In the eastern quarter are the tombs of the Bahmanī kings. The most-notable building is a mosque modeled on that of Córdoba in Spain. Colleges of arts, commerce, engineering, law, medicine, and science and a women's college are affiliated with Gulbarga University (established 1980). It is noted for its long historical and cultural heritage spanning many centuries. This historically rich region of the Deccan has been part of a number of kingdoms. Ruled by dynasties such as the Shatavahanas, the Chalukyas of Badami, the Rashtrakutas, the Chalukyas of Kalyana, the Kalachuris, Bahman Shahis and the Adil Shahis of Bijapur

respectively. Having a glorious cultural past, this region was also famous as a centre of Buddhism in Sannati. But Sannati came into further prominence by the chance discovery of Major Rock Edicts of Ashoka; which was the first such discovery in south India. A treasure-house of architectural delights, Kalaburagi is justly famous for the grandeur of the many Indo-Saracenic monuments that dot the landscape, making it a destination that takes one back through the pages of history.

There are no archeological/ historical sites within the block or in immediate surroundings.

3.11. NATIONAL PARKS/ ENVIRONMENTS

Chincholi Wildlife Sanctuary is located in the Kalaburagi district of Karnataka. It is a dry land Wildlife Sanctuary in South India. It has dry deciduous forest with major plantations of Acacia and teak plantations. Chincholi Wildlife Sanctuary is located at a distance of 150km from the Block.

There is no National Park/ Protected area within the Block.

4. PREVIOUS WORK

4.1. PREVIOUS WORK ON GEOLOGY

The NE trending irregularly sinuous Bhima basin consisting of Arenaceous, argillaceous dominantly of Calcareous (limestone) covers an area of 5,200 sq.km and is situated to the northwest of Cuddapah basin and northeast of Kaladgi basin. It overlies the granitic basement of Eastern Dharwar craton with a profound unconformity and has faulted contacts at many places. Deccan Trap overlies Bhima basin in the north. The sediments have an aggregate thickness of about 270m. The basin is well known for its large reserves of limestone and the newly discovered uranium occurrence near Gogi.

Bhima basin is having an extent of 5,200 sq.km covering parts of Gulberga, Yadgir and Bijapur Districts in Karnataka, parts of Mahbubnagar districts in Telangana, wherein, limestones alone form more than 60% of both its vertical thickness and areal extent. Apart from Limestones, Barytes, Phosphorites and recently discovered uranium minerals are present in Bhima basin.

Earlier workers like William King (1872), Bruce Foote (1876) categorized these lithounits as Bhima Series. In 1947, three-fold classification was proposed by Mahadevan (Lower – Rabanapalli Fm; Shahabad Fm; Younger series -Katamadevarahalli Fm and Hulkal Shale). Janardhana Rao et al (1975) revised lithostratigraphy by King and Foote with respect to Code of Stratigraphic Nomenclature of India proposing the nomenclature of Bhima Group. Further subdivision and revision were carried out by Mishra et al (1987). In 1989, GSI remapped the Bhima Basin and accordingly new lithostratigraphy was proposed by Sundaram and Hans (1989). The entire sequence was divided into two formations by Kale and Peshwa (1995). A V Jayaprakash (1976), classified Bhima group into five formations wherein the lowermost Rabanapalli Formation is represented by coarse rudaceous to fine argillaceous clasts. Shahabad Formation is chemical precipitates of calcium carbonate with common impurities in varying quantities. Shahabad Formation has five members. Ravoor Limestone (10m) Flaggy limestone with prominent fissility. Wadi Limestone (15m) which is thickly bedded stylolitic relatively superior cement grade limestone. Sedam Limestone (60m) is variegated, medium to thickly bedded siliceous limestone. Gudur Limestone (20m) similar to Wadi, yet slightly inferior in

chemical composition. Mulkod Limestone (10m) is deep grey to black coloured flaggy limestone. The other three Formations are defined by single lithounits i.e., Hulkal Formation- Shale, Katamdevarahalli Formation - Limestone (flaggy) and Harwal Formation- Shale.

Department of Mines and Geology has caried out extensive studies in Bhima basin to estimate the limestone resources, since 1960's especially in Gulberga district. Under the Limestone scheme, the department has undertaken outcrop mapping and diamond core drilling.

B G Channappa (1970), in Wadi area estimated 232.4 million tonnes limestone with CaO content varying between 47.7%-48.8%. In 1996, N R Pattabhi Ramaiah estimated limestone reserves of 116 million tonnes with average CaO content of 39.28% in Nagai area of Chittapur Taluk. Kembhavi-Malur Regions of Shorapur Taluk has an inferred resource of 1448 million tonnes with CaO content of 40-45% was estimated. During 1997, in areas south of Sedam Town, estimated limestone resources from Shahabad Formation at 685 million tonnes, with CaO content of 46.1% having an average thickness of 45m. He also, established a measured reserve of 727.62 million tonnes of cement grade limestone having CaO content of 43.28% in Nidagunda area, Chincholi Taluk, Gulberga Dist.

N R Pattabhi Ramaiah (2001), carried out works in southwestern parts of Bhima basin i.e., Salgundi, Kolihal and Navadgi area of Shorapur Taluk, Gulberga Dist., and revealed indicated reserves of 588 million tonnes limestone with CaO content of 43.51% having an average thickness of 50m. In his publication (ISBN 81-85867-56-9) of 2003, random limestone samples collected from Jevargi town has reported CaO content varying between 38%-42%.

Table 07: Stratigraphy of Bhima Basin after A V Jayaprakash

Eon/ Epoch	Group	Formation	Member	Lithology
Cretaceous to Eocene	Deccan Trap			Basaltic flows with inter trappean sedimentaries
		Harwal (45m)		Brown pink to Vermillon coloured
		Kattamadevarahalli (40m)		Deep Grey, Ocassionally

Neo Proterozoic	Bhima Group			Stylolitic flaggy limestone
		Hulkal (30m)		Grey, blackish buff, dull and pale pink coloured shale; occasionally with fine grained thin silty beds at the base.
		Shahabad (115m)	Mulkod Limestone (10m)	Deep grey to black coloured flaggy limestone.
			Gudur Limestone (20m)	Akin to Wadi, yet slightly inferior in chemical composition.
			Sedam Limestone (60m)	Variegated medium to thickly bedded siliceous limestone
			Wadi Limestone (15m)	Thickly bedded stylolitic relatively superior cement grade limestone.
			Ravoor Limestone (10m)	Flaggy limestone with prominent fissility (Shahabad Slabs)
		Rabanapalli (67m)	Korla Shale (50m)	Fine silty base, grades into green shale, followed by chocolate brown shale with prominent parting.
			Kundarapalle Sandstone (15m)	Fine grained quartz arenite, sub feldspathic arenite ferruginous cemented medium grained quartz arenite.
			Meddebihal Conglomerate (2m)	Pebbly orthoconglomerate; locally or at the top matrix supported and also granular
Archean	------Angular Unconformity------			
	Basement Rocks		Younger Granitoids Eastern Block Greenstone Belts Peninsular Gneisses	

4.2. PREVIOUS WORK ON GEOPHYSICS

There is no previous work on geophysics

4.2.1. Aero geophysical

Bhima Basin is known for limestone deposit, and other reported occurrence of minor amount phosphorite, barites etc. which are not having economic significance. The aero geophysical data will not help in targeting these minerals and allotted work components are included with Aero/ Ground Geophysical work components.

4.2.2. Ground geophysical:

No data wrt ground geophysical survey is available in GSI portal and Ground geophysical data is not having any significance as the commodity being explored is limestone.

4.3. GEOCHEMISTRY

N R Pattabhi Ramaiah (2001), carried out works in southwestern parts of Bhima basin. In his publication (ISBN 81-85867-56-9) of 2003, random limestone samples collected from Jevargi town has reported CaO content varying between 38%-42%.

4.4. DETAILS OF PREVIOUS EXPLORATION/INVESTIGATION CARRIED OUT BY OTHER AGENCIES/PARTIES.

Details of works carried out by GSI is explained in Section 4.1.

5. REGIONAL GEOLOGY

The area falling in parts of toposheet Nos. 56 D/13 mainly comprises Peninsular Gneisses, Eastern Block Greenstone Belts and Younger Granitoids of Archean age forming the basement, overlain by Bhima Group of rocks. Bhima Group of rocks is further divided into Rabanapalli, Shahabad, Hulkal, Katamadevarahalli and Harwal Formations. Major part of the area is covered by Limestone.

5.1. Basements Rocks

The Bhima basin is in contact with rocks of granodioritic composition having granitoidal fabric (Krishnaswamy 1981). The suite of rocks is referred to as Younger Gneissic Complex of PGC lineage in 3000-2600 m.y. This segment of PGC is a zone of activation and remobilisation during the Early Proterozoic period with abundant addition of juvenile granitic material (Radhakrishna and Vaidyanathan 1997). These potassic rich granites are pink to grey coloured, medium to fine grained and poor in mafic constituents; at places enrichment in alkali feldspar accompanied by a low silica content make them syenites.

5.2. Bhima Group

On the denuded and peneplaned surfaces of the basement gneisses and granitoids, shelf facies platformal type of sediments were deposited in a linear receptacle called Bhima basin – a configuration attained due to a set of fault planes. Presently the faulted southern boundary is the only periphery remaining unmasked by flood basalts. In this segment, the lowermost bed of basal conglomerate is in contact with the uneven, weathered basement crystallines demarcating the Eparchean Unconformity, a prolonged event of non-deposition exceeding as much as 200 m.y. (Pascoe 1965).

5.3. Shahabad Formation

Referred as Talikot beds by Foote and Middle Bhima by Mahadevan, Shahabad Formation is exclusively chemically precipitated micrites. Both in the areal extent and vertical

thickness, they occupy a pre-eminent position, covering 60% of the total exposed area of the basin. Limestones of five varieties each with varying commercial value were identified and given the status of member owing to their economic importance. Shahabad Formation sub divided into five members. They are Ravoor Limestone, Wadi Limestone, Sedam Limestone, Gudur Limestone and Mulkod Limestone. The current explored block completely falls in Sedam member of Shahabad formation and details of the Sedam limestone formation is provided below;

- **Sedam Limestone**: Sedam is the type area and this member is popularly known as variegated limestone. It is the thickest member (60m) in the whole of Bhima Group; and also occupy the largest areal extent of all the other members. Also referred as siliceous limestone, this unit carries cherts as their laminations, small lenticular to irregular shaped bodies. Relatively it is splintery, brittle hard rock in which individual beds show medium thickness. i.e., around 30 cm to 10 cm with occasional thin flags. Presence of siliceous matter and R2O3 components impart a variety of shades ranging from green, blue, pink, and yellow to this unit. In the upper horizons thin chert bands with pinch and swells are common. Weathered powdery yellow material seen typically on the bedding surfaces of these limestones are the remnant clayey matter with hydrous iron released during the removal of calcium carbonate by solution. These beds generally analyse more than 20% of acid insoluble and Ca less than 40%. Excepting a few nala sections such as east of Sedam and Kardal, north of Narboli and Talikota, this Member crops out rarely, more so their contact zones with the overlying and underlying units. Fertile black clayey soil of more than 2m thickness drapes these beds throughout the basin.

5.4. REGIONAL GEOLOGICAL SET UP OF THE AREA WITH STRATIGRAPHY

It was first time in the country, the Bhima rocks were studied by Capt. Newbold (1842-45) He was the first to refer to Talikota limestone and Muddebihal sandstone, of Bhima basin rocks which were compared to Kurnools, of Andhra Pradesh. Carten (1854) related the limestones at Firozabad to Katara shales. Taylor (1862-63) opined a possible granitic intrusion into limestone at Tirth and Rajan Kollur. William King first surveyed the area during early 1870's, and suggested a two-fold classification and assigned the name Bhima (after the river Bhima which flows through the centre of the basin) to the sediments of the area. Bruce Foote (1876) followed the classification suggested by King and described in detail, the geology of the basin. Mukherjee (1941) described geology of Bhima series in parts of Sorapur and Shahapur taluks of Gulbarga district. After a long gap of more than seventy years, Mahadevan proposed another classification in (1947). Based on his traverses and mapping, he presented more details on the field characters of the rocks. In his three-fold classification, Lower series comprised clastics, chemical precipitates form Middle series and the Upper series is constituted of sandstone, shale and limestone units. He was of the opinion that a shallow thrust rooted at Varchanahalli resulted in the repetition of the upper strata of Shahabad Formation and Hulkal Shale in the western part. Since then, the rocks of the area have been classified into three-fold classification by different workers. Krishnan (1956) preferred threefold classification of Mahadevan to the two-fold classification of Foote. Pascoe (1968) supported the Foote's classification. Janardhan Rao (1971) and Janardhan Rao et.al., (1975) suggested the lithostratigraphic classification of the Bhima sediments and divided them into five Formations and included the conglomerate and sandstone unit of Gugi-Hotpet area at the base of the middle mudstone formation. Mathur (1977), while accepting the fivefold classification of Janardhana Rao, suggested different geographic names to the formations. He expressed that the binomial nomenclature applied to the formations by Janardhana Rao, with similar phonetics may lead to confusion, and desired different geographic nomenclature such as Gogi shale instead of Harwal shale; Kurkunta limestone instead of Shahabad, as it is likely to be misconstrued for formations in the well-known district of Shahabad in Bihar. He expressed his reservation in naming the Rabanapalli Formation as the conglomerate and sandstone are not developed here. Sagar (1981-82) brought out the younger limestone unit demarcating further the western margin of the basin. Mishra et

al (1987) attempted a fairly good and thorough revision in the nomenclature accompanied by further sub divisions perhaps partly supported by selected traverses in critical sections. Sundaram and Hans (1989) following the above lithostratigraphic classification, suggested the conglomerate and sandstone unit of Gugi-Hotpet area as the youngest of the Bhima Formations. Field checks undertaken by Sundaram and Hans (1989) and later by Jayaprakash (1990) have contested the classification suggested by Mahadevan based on their studies and they did not show evidences for thrust. Shahabad, Hulkal, Katamdevarahalli and Harwal Formations in gradational sequences are seen in this sector. Presence of two limestone Formations and younger Harwal Shales are clear in Devan Tegnur.

King (1872) Classification of Bhima Basin

Table 08: Succession in the central part of the basin.

BHIMA SERIES	UPPER	g	Red calcareous shales of Muduwal (Moodoowal) - Buzurg	30'-40'
		f	Flaggy limestone beds of Jewargi or Fadarki (Mudurki)	
		e	Buff shales of Gugi	18 '-20'
		d	Quartzites (Sandstones) and conglomerates of Hottapatti	200'-300'
		c2	Blue thick bedded splitery limestone brecciated in part	200'
	LOWER	c1	Thin bedded and flaggy limestone with chert of the eastern Durga, Gogi and of Shahabad(?)	200'
		c	Blue and grey splitery limestones with occasional breccia beds...200' ''Shahabad' beds - Talikota beds	200
		b	Purple and red and dirty green shales of Nalwar	110
		a	Thin bedded "rice grain" quartzites gneiss	06" - 2'

Table 09: Bruce Foote (1876)

BHIMA SERIES	**UPPER**	g	Red shales
		f	Flaggy limestones
		e	Buff shales
		d	Quartzites (local)
	LOWER	c	Limestones - 'Talikot' beds
		b	Red, purple and green shales and shaley sandstones
		a	Quartzites, grits and sandstones

Table 10: Sundaram and Hans (1986)

Group	Formation	Member
BHIMA	Hotpet	17 Sandstone
		16 Gugi Conglomerate
	----Unconformity----	
	Harwal	15 Shalae
	Katamadevarahalli	14 Limestone
	Halkal	13 Andola Buff Shale
		12 Gangurti Grey and Black Shale
		11 Dandutti earthy shale
	Shahabad	10 Mulkod (flaggy) limestone
		09 Malkhai Rd (Dark grey) Limestone
		08 Wadi (variegated Limestone
		07 Chitapur (flaggy) Limestone
		06 Korla (purple) Shale
		05 Inchagal Sandstone
		04 Bankur (green) Shale
		03 Gopanpalli Siltstone
		02 Basarakod Sandstone
		01 Miryan Conglomerate

Jayaprakash. A.V (GSI Memoire 129, 2007) attempted to present a classification of the Stratigraphic succession by collating the data from the works carried out by GSI during various period and for various reasons till 2007 was taken into account and due importance and recognition given to the earlier works, which has taken care many of such improvements and expected to have wider acceptability.

Table 11: Stratigraphy of Bhima Basin after A V Jayaprakash

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Eon/ E p o c h	Group	Formation	Member	Lithology
Cretaceous to Eocene	Deccan Trap			Basaltic flows with intertrapprean sedimentaries
		Harwal (45m)		Brown pink to Vermillion coloured fissile shale
		Katamdevarahalli (40m)		Deep grey, occasionally stylolitic flaggy limeston
		Hulkal (30m)		Grey, blackish buff, dull and pale pink coloured shale; occasionally with

Neo Proterozoic	Bhima Group (297m)			fine grained think silty beds at the base.
		Shahabad (115m)	Mulkod Limestone (10m)	Deep grey to black cloured faggy lime stone
			Gudur Limestone (20m)	Akin to Wadi, yet slightly inferior in chemical composition
			Sedam Limestone (60m)	Variegated medium to thickly bedded siliceous limestone
			Wadi Limestone (15m)	Thickly bedded stylolitic relatively superior cement grade limestone.
			Ravoor Limestone (10m)	Flaggy limestone with prominent fissility (Shabad slabs)
		Rabanpalli (67m)	Korla Shale (50m)	Fine silty base, grades into green shale, followed by chocolate brown shale with prominent parting
			Kundarapalle Sandstone (15m)	Fine grained quartz arenite, sub-feldspathic arenite, ferruginous cemented medium grained quartz arenite
			Muddebihal Conglomerate (2m)	Pebbly orthoconglomerate; locally or at the top matrix supported and also granular
------ Angular Unconformity---				
Archaean	Basement rocks		Younger granitoids Eastern Block Greenstone Belts Peninsular Gneisses-I	

From time-to-time various geological studies in the Bhima basin were carried out to resolve either for the sedimentological studies, stratigraphy studies, basin configuration etc., they have proposed various two- or three-fold classifications, a few of them has brought out above.

However, in this report the classification proposed by Jayaprakash (2007) in his GSI Memoire 129 was taken into account, being latest and at the same time he has given adequate credentials to previous workers while updating the above stratigraphic succession to arrive.

The Bhima Basin trends in a northeast-southwest direction from the western edge of Ranga Reddy district, Andhra Pradesh in the northeast to eastern portion of Bijapur district, Karnataka, through Gulbarga district. The Basin extends for a distance of 160 km and has a maximum width of about 40 km in its central part in Gulbarga district. Over three-fourths of the basin occurs in the Gulbarga district. The sediments of Bhima Group comprise an alternating sequence of clastic and non-clastic sediments with a maximum cumulative thickness of about 300 m spread over an area of 5000 sq km. Non clastic sediments dominate over the clastic and fine clastic (mudstone) dominate over the coarse clastic conglomerate and methodology. A large part of the area is soil covered (Stephen George 1994).

The sedimentary formations of Bhima Group unconformably overlie the granitoids in the eastern and southern parts of the basin. A huge pile of volcanic cover the basin in its north and western parts. Massive stretch of granite hills at Shahapur and some inliers of granite mounds probably provided a linear narrow palaeoslopes for sedimentation of the Bhima basin. The basin witnessed initially the deposition of arenaceous sediments and a thick pile of calcareous sediments. This was followed by an alternate sequence of argillaceous and calcareous sediments. The gradational nature of contact is observed amongst the members of formations of Bhima Group of sediments. The sediments show gradational contact with the underlying as well as overlying members. The sediments are classified as Bhima Group comprising five formations, as no evidence for break in sedimentation could be noticed. The formations are made on the basis of clastic sediments and chemical precipitates. The mechanical and chemogenic process alternate with each other Hans and Sundaram (1986).

5.5. Structure

The sediments of Bhima Group are practically horizontally bedded, and the beds with little up to a maximum of 5° are seen. However, the beds mostly of Shahabad limestone formation show an E-W trend with dips up to 4° to 5° towards north and south along a linear section in the basins. The basin in fact, is affected by faults and joints.

5.6. Regional Structure:

The general trend of all formations is North - South. The rectilinear East - West (EW) to North West (NW) - South East (SE) trending boundaries are faulted while the N-S and NNE-SSW linear trends show unconformable relation with the underlying gneisses.

Sediments of Bhima Group are structurally least disturbed and preserve their horizontal bedded character originally impressed at the time of deposition. Deformation is observed only in the vicinity of faults. The faults encountered have continued into the basement that has exercised control upon the basin configuration.

The basin is well known for its huge reserves of limestone and the newly discovered Uranium occurrence near Gogi.

5.7. Metamorphism

Degree of metamorphism as evidenced through grade, facies or index minerals may form yet another clue for correlative studies. Caution may however have to be exercised about its reliability factor as radically different ages of rocks have exhibited identical metamorphic impress depending upon the P&T conditions. Sandstones altering to quartzites is the only sign of metamorphism seen common in the three basins. (Sundaram and Hans 1989)

5.8. Surface indication of mineralization

Details of limestone outcrops exposed are explained in the subsequent chapter.

6. GEOSCIENTIFIC INVESTIGATION

6.1. GEOLOGICAL MAPPING

6.1.1. Detailed Geological Mapping (DGM)

The study was taken up in the area with detailed geological mapping on 1: 4,000 scale over an extent of 5 sqkm. While mapping wherever outcrops are exposed, bed rock sampling of limestone was collected for chemical analysis and petrographic studies.

Detailed Geological mapping was carried out using Total Station /GPS/ Brunton Compass and DGPS to pick up the geological exposures / outcrops with a team of geoscientists and surveyors of KIOCL. The area constitutes a plane land with maximum elevation of 429m in the northern part of the block, gradually sloping towards southwest and southeast with minimum of 401m.

During the detailed mapping the contacts, abandoned dug well, nala/canal, roads, quarry section, and settlements were recorded and presented in the map.

Major part of the area of the Block is observed to be covered with black cotton soil and regolith, exposures are noticed mostly in nala cuttings and these were traced, demarcated and mapped. Traverse details conducted during Detailed Geological Mapping (DGM) works are shown below.

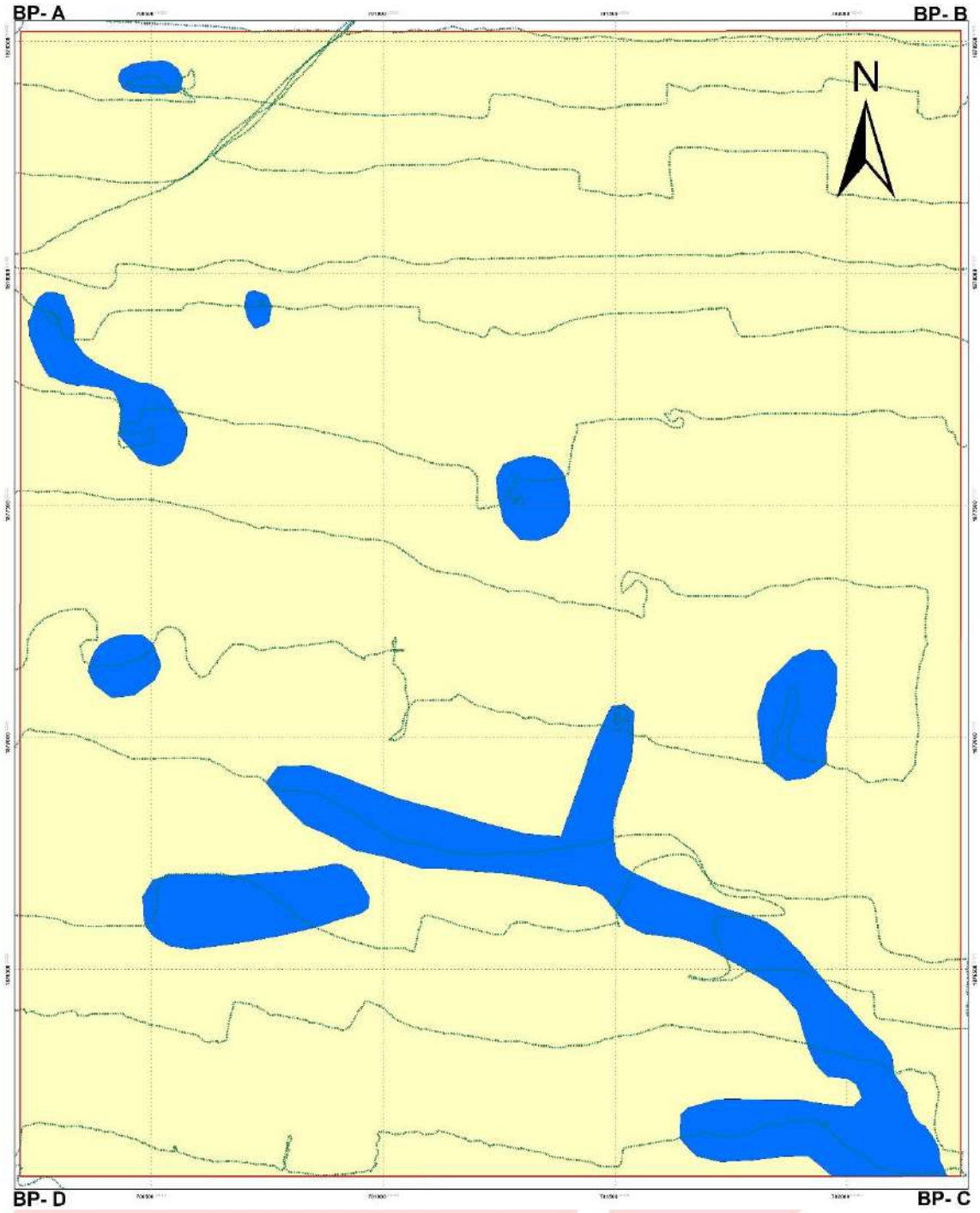


Figure 07: Traverse Map of KIOCL_23_KA_KLB 11

The lithounits of the Bhima Basin represented in the area is Sedam Limestone member of Shahabad Formation only. The limestone bed is almost sub horizontal to a maximum 3° dipping towards west. Details of lithounits identified while carrying out detailed mapping are described in the subsequent section under the head description of rock types. Block marked on GSI base map is provided below;

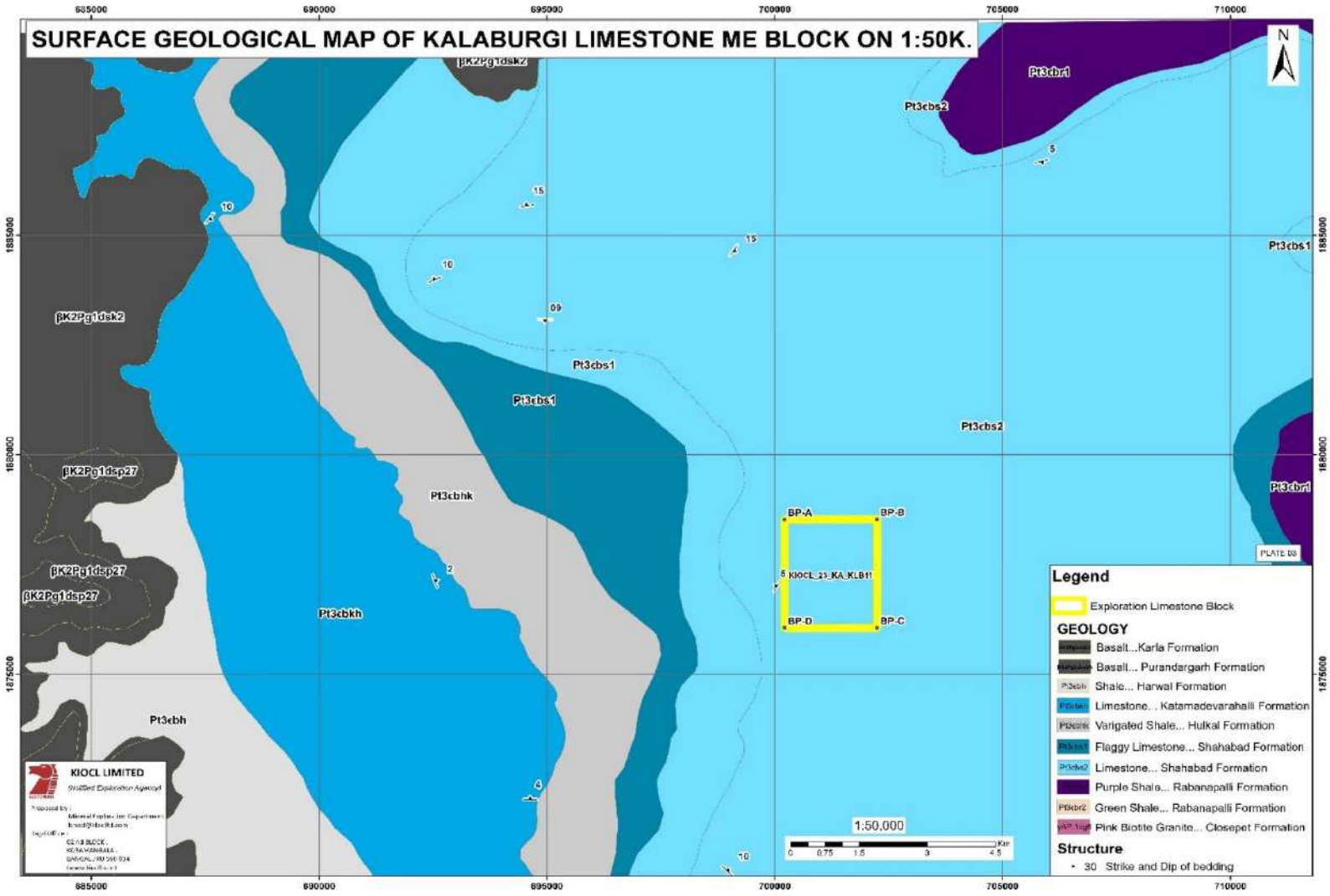


Figure 08: Surface Geological Map of Kalaburgi Limestone 1:50,000 Scale showing exploration block

While carrying out the geological mapping in the area, 9 numbers of bed rock samples (BRS) were collected and are analysed for CaO, MgO, SiO2, K_2O, SO_3, P_2O_5, Al2O3, Fe2O3, and LOI (09 radicals). Average content of CaO in outcrop is 40.61% and MgO is 1.05%. Details of BRS collected and respective lithounits along with the chemical analysis are provided in Annexure 01 & 02.

The outcrop exposures are limited to around 0.46 sq.km, @9 % of the total exploration area. Remaining area is covered by cultivated land consisting of black cotton soil. Tentative lithostratigraphy of the area is established based on the field observations and their structural disposition during detailed geological mapping and drilling.

Shahabad formation has 5 different members of various limestone members viz., the lower most member is Ravoor limestone (10m), followed up successively by Wadi Limestone (15m), Sedam Limestone (60m), Gudur Limestone (20m) and Mulkod limestone (10m) at the top with gradational contact with each other. In the current block KLB-23 only the Sedam member is exposed and continued below upto a depth of 60m (Jayaprakash). The member which is targeted for exploration and augment the resources of limestone in the current exploration is Sedam Limestone which is having thickness of 60m. Regional Geological map is provided as Plate no 3.

6.1.2. Description of Rock Types

It is necessary to present certain details of the Shahabad formation in which the Sedam limestone member is the area of interest of exploration. The earlier workers have referred them as Talikota beds by Foote (1876) and Middle Bhima by Mahadevan (1947), later workers have designated them as Shahabad formation. The Shahabad formation is exclusively chemically precipitated micrites. Both in the areal extent and vertical thickness, they occupy a prominent position, covering 60% of the total exposed area of the basin. Limestones of five varieties each with varying commercial value were identified and given the status of member owing to their economic importance (Jayaprakash 2007). Out of the 5 variegated limestones members of the Shahabad formation, the Sedam limestone which is the middle member of the formation is being targeted for exploration and augmented the resources which is dealt in the foregoing chapter.

Detailed Geological Mapping and collection of Bed Rock Samples (BRS) have brought out various surface lithounits like Massive Limestone and Soil Cover. Most of the area is covered by block colour cotton soil, exposures in general are scanty and noticed in nala cutting area.

The gradational nature of contact between members of this formation is noticed. Flaggy limestone on top is seen exposed on the surface and below which the massive limestone is lying and the contact is seen gradational.

- **Sedam Limestone:**

As the name itself suggests, Sedam is the type area and the reference section for this member, which otherwise is popularly known as variegated limestone. It is the thickest member (60m) in the whole of Bhima Group and also occupy the largest areal extent of all the other members. The limestone horizon is horizonal to sub horizontal, light grey to cream to black in colour, fine grained compact and massive at places. Also referred as siliceous limestone, this unit carries cherts along their laminations at places, small lenticular to irregular shaped bodies. Relatively it is splintery, brittle hard rock in which individual beds shows medium thickness. Fertile black clayey soil of more than 2m thickness drapes these beds throughout the area of exploration.

Limestone outcrop noticed in the southern part of block with average length of approx. 1766m and average width of 140m. Additionally, 7 more small patches of limestone outcrop observed in the block with different length and width.

Petrographically, the limestone shows micrite and microsparites with cryptocrystalline chert and amorphous silica.

- **Black Cotton Soil Cover**

The area of exploration is predominantly draped by black cotton soil, black in colour, fine to silty in grade, as it is clayey in nature it is sticky when wet, identified by the term "Regur". It is rich in clayey matter with organic debris with good moisture retention capacity. The black cotton soils cover with thickness varying from 0.3m to as much as 5m at places. Thickness of black cotton soil is derived based on litho data of boreholes.

Geological map of the Block is enclosed as Plate 05

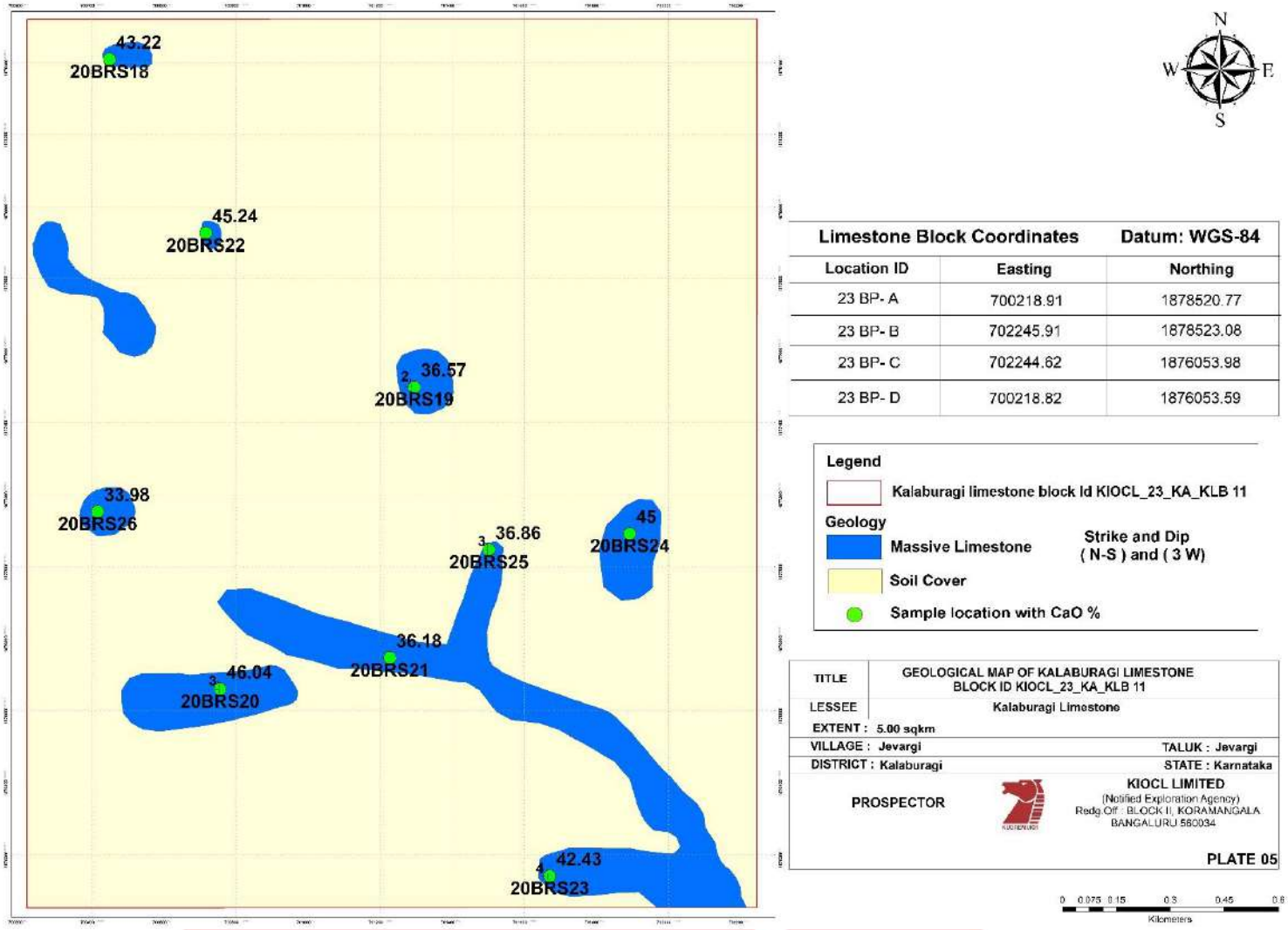


Figure 09: Geological Map of the Block

6.1.3. Petrological, petrochemical studies (SEM-EDX, EPMA)

As the block (ID KIOCL_23_KA_KLB_11) is part of the 4 amalgamated limestone block, 5 nos of drill core samples from all 4 blocks were subjected to Petrological studies at IIT, Bombay. Details of the drill core samples subjected to petrological studies are provided below;

Table 12: Details of Petrology samples

Sl No	Block ID	Sample No	Lithology
1	KIOCL_20_KA_KLB 07	20BH/04/6 (Sample from BH-04 and core run meter from 6 to 5m)	Limestone
2	KIOCL_21_KA_KLB 08	21BH/01/33 (Sample from BH-01 and core run meter from 33 to 34m) 21BH/02/12 (Sample from BH-02 and core run meter from 12 to 13m)	Limestone
3	**KIOCL_23_KA_KLB 11**	**23BH/04/11** (Sample from BH-04 and core run meter from 11 to 12m)	**Limestone (Current Block)**
4	KIOCL_25_KA_KLB 13	25BH/02/13 (Sample from BH-02 and core run meter from 13 to 14m)	Limestone

Petrological study report is enclosed at Annexure 13. Abstract details of the petrology study report is provided below;

The color of rocks varies from light to dark grey. Rock sample of this block dominantly comprised micritic calcite therefore preserve the pristine signature of formation. Besides, the sample also shows neomorphism where micritic calcite is recrystallized and increased in grain size. Samples of this block are comprised of minor quantity of goethite. The minerology of rock sample showing 99% micritic calcite. The rocks have undergone diagenesis and compaction that is evidence by the presence of stylolites parallel to bedding and calcite vein perpendicular to the bedding. The minerals along the stylolites are possibly detrital clay. Calcites in the vein might have been formed by dissolution-reprecipitation mechanism during compaction and stylolite formation. The calcite veins and stylolite is observed in sample 23BH/04/11. Based on mineralogy the rocks are classified as micritic limestone and textural observation indicates preservation of the pristine signature of rock formation. Since the textural depositional features are not recognizable therefore considering Dunham's classification of carbonate rocks these rocks can be described as 'crystalline carbonate'. At the same time, considering Wright's

classification of limestone and size of micrite less than 10 μm these rocks can be classified as 'microspar stone'.

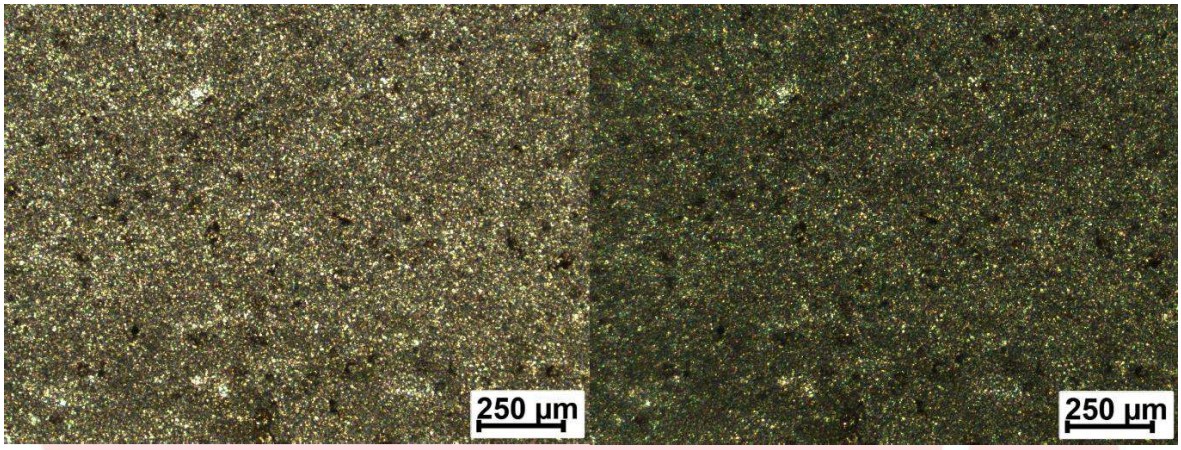


Figure 10: photograph showing micritic nature of limestone

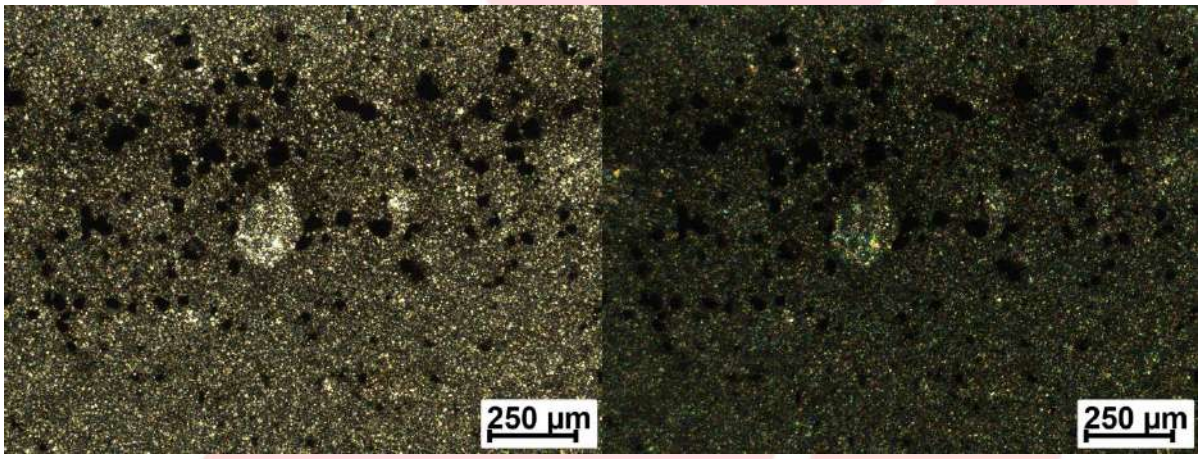


Figure 11: Photographs showing neomorphism

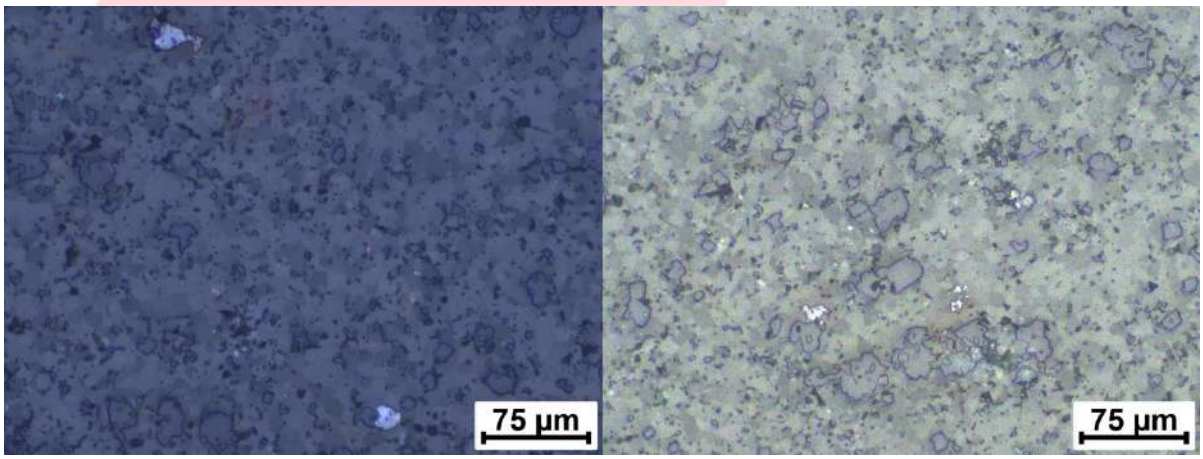


Figure 12: Photograph showing disseminated goethite

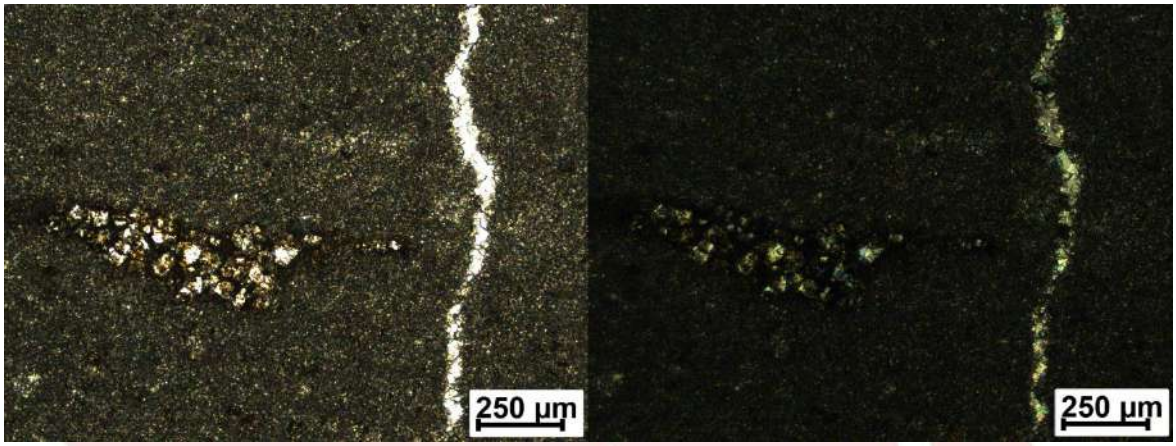


Figure 13: calcite veins are observed in Sample

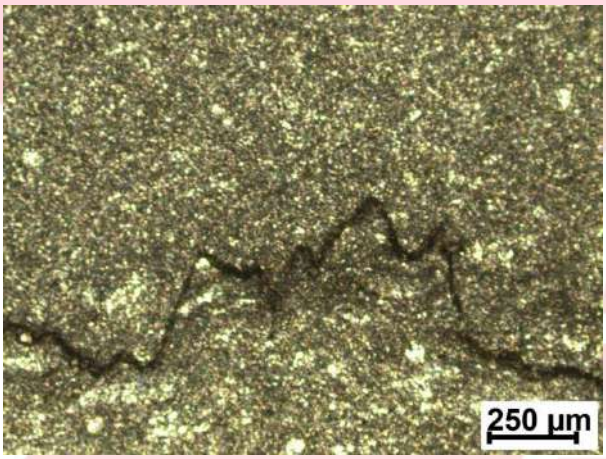


Figure 14: Stylolite is observed

6.1.4. Whole rock and trace element analysis

Approved Work component does not include Whole rock and trace element analysis.

6.1.5. Structure

The sediments of Bhima Group are structurally least disturbed and preserve their horizontal bedded character originally deposited at the time of deposition. Deformation is observed only in the vicinity of faults, and there is no fault noticed in the current block.

6.1.6. Detailed Structural deposition in the area

The major structural features observed in the area is only the bedding, fine laminations and stratifications. The beds are horizontal in nature as the beds are practically undisturbed and with very low dipping of 2^{o} to 3^{o} toward west.

6.1.7. Metamorphism

The terrain is sedimentary in nature and the rocks are tectonically undisturbed and have not been subjected to any metamorphic transformations.

6.1.8. Minerology of the ore zones and ore textures

The exploration is for limestone, being a bulk commodity, The beds are horizontal and seen by naked eye. As such the ore zones are not applicable here, as the entire bed of 40m thick is limestone only with varying in CaO content.

6.1.9. Pitting and Trenching

Since the area is bedded in nature and are undisturbed, The area shows scanty exposures, and horizontally bedded nature with regular habit and entire area of exploration is under active cultivation with standing crops. Hence, no pitting or trenching is carried out.

6.1.10. Sampling

9 numbers of bed rock samples (BRS) were collected based on lithology, physical appearance of the rocks and subjected to geochemical analysis. Sample preparation and analysis works are carried out at Mineral Exploration Laboratory, BFU, KIOCL Ltd., Panambur, Mangalore.

Fresh Bed Rock (chip) samples weighing about 1-2 kg each were collected in polythene bags. Samples of various lithounits were collected from the block covering almost all the

gird blocks. Details of samples collected are provided as Annexure 1. Work flow chart of chemical analysis for BRS and Drill core samples are provided below;

6.1.11. Sample Preparation

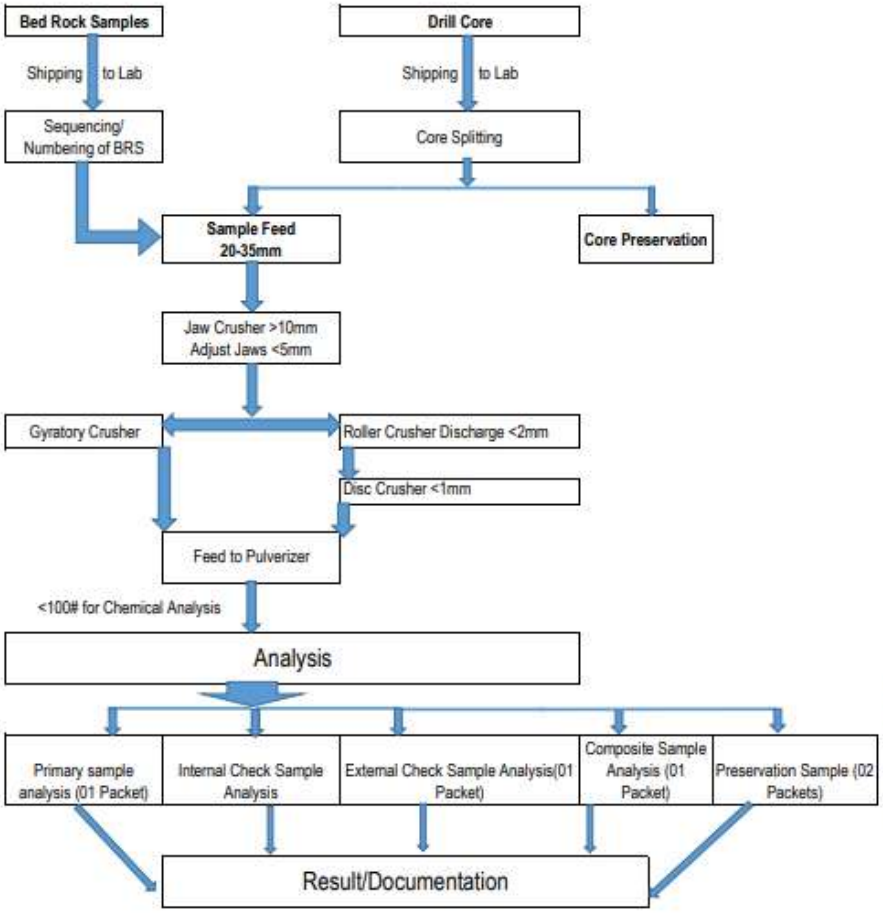
Sample size was reduced by crushing in a jaw crusher up to 05mm size and then pulverized to -100#. A representative sample, each of about 100g was made from this by coning and quartering method.

6.1.12. Procedure of Sample Preparation

- Lump ores with sizes ranging from 20mm to 35mm were reduced to 05mm with jaw crusher.
- Samples are further ground in roller crusher and vibratory cup mill (pulverizer) to reduce the samples to less than 150 microns (-100# mesh) size for analytical procedures.
- Each sample was prepared in 05 packets of 100 gram each.

Table 13: Details of Sample (Packet Distribution)

Sl. No.	Details	No of packets
1	Primary Sample analysis	01
2	Internal Check Sample analysis	01
3	External Check Sample analysis (External NABL Lab)	01
4	Preservation Sample	02
5	Total	05



★ 5% of primary samples analysed -13radicals
★ 5% of primary samples analysed as Internal Check sample analysis

★ 10% of primary samples analysed as External Check (NABL) samples for *13 radicals.

★ 10% of primary samples analysed as Composite sample analysis
13 radicals(CaO, MgO, R_2O_3 (Al_2O_3, Cr_2O_3 and Fe_2O_3), SiO_2, LOI, SO_3, P_2O_5,TiO_2, K_2O, Na_2O and AI)

Figure 15: Work Flow Chart in Sampling

6.1.13. Procedure of Sample Analysis

- Primary analysis for *9 radicals.
- 5% of primary samples were analysed as Internal Check sample analysis for *9 radicals.
- 5% of primary samples were analysed as External Check (NABL) samples for *9 radicals.

*9 radicals - (CaO, MgO, Al_2O_3, Fe_2O_3, SiO_2, SO_3, P_2O_5, K_2O, and LOI).

6.1.14. Details of IS Standard Adopted for Chemical Analysis

Table 14: Details of IS Standard Adopted

SL. No.	Radicals	IS standards
1	CaO	IS:1760 (Part-3) - 1991
2	MgO	IS:1760 (Part-3) - 1991
3	AL2O3	IS:1760 (Part-3) - 1991
4	Fe2O3	IS:1760 (Part-3) - 1991
5	SiO2	IS:1760 (Part-2) - 1991
6	SO3	IS:3204-1978 (A-3)
7	P2O5	IS:3204-1978 (A-4)
8	K2O	IS:9497-1980
9	LOI	IS:1760 (Part-1) - 1991

6.1.15. Discussion

Detailed geological mapping in the area has brought out only 0.43% of the area showing the outcrop and rest of the area covered by the calcareous clayey soil. The rocks are not disturbed in the area and are still maintaining the horizontal nature. Out of 9 nos of Bed Rock Samples collected from the limited outcrop present in the area, 8 samples indicate CaO % more than IBM threshold value. 1 BRS (20BRS26) collected from the Isolated patch present in western part of the block indicates CaO % less than IBM Threshold value. Chemical analysis report of BRS is provided in Annexure 02 and Lithounit wise chemical analysis of Bed Rock Samples (BRS) is provided in Annexure 03.

6.1.16. Details of interpreted ore zones on the basis of geological investigation

Not applicable

6.1.17. Geophysical Exploration:

Not applicable

6.1.18. Geochemical exploration

9 nos of Bedrock samples (Grab samples) were collected from limited outcrop present in the block.

Statistical analysis of Bed Rock samples are provided below;

Table 15: Statistical analysis of Bed Rock Samples

Statistical Parameters	CaO %	MgO %	LOI %	SiO2	Al2O3	Fe2O3
Mean	40.61	1.04	33.8	19.24	1.49	1.26
Median	42.43	1.11	35.54	15.62	1.61	1.31
Standard Deviation	4.66	0.13	4.26	8.31	0.87	0.15
Minimum	33.98	0.81	27.66	10.21	0.45	0.98
Maximum	46.04	1.2	38.51	31.44	2.49	1.43
Count	9	9	9	9	9	9
Confidence Level (95.0%)	3.58	0.10	3.27	6.38	0.67	0.11

As the limestones deposits are bedded in nature and in the current block limestone is showing strike in North – South direction with low dip amount of 3°towards west, No interpretation of anomalous zones is applicable.

Pedogeochemical sampling on grid pattern and soil sampling with orientation survey is not applicable.

6.1.19. SURVEY WORKS OF THE BLOCK

- Survey works are carried out by KIOCL by transferring GCP data of Survey of India (SoI) situated in site base point at roof top of Regional Office building of M/s KSMC Ltd., Bagalkote.
- Site Base point at M/s KSMC Ltd., Bagalkote was established by transferring data from Primary Ground Control Point (established by Survey of India) located at Jogimatti RF, Chitradurga, Karnataka with 6 hrs. of observations. SOI-BLR-10 (SoI control point: Kumaraswamy Temple), Sandur to Camp office, KIOCL, Sandur, Karnataka.

- 3 nos of block base stations CHP-1, JWG- Base and TBM 4 were established at site from KSMC Ltd., Bagalkote and survey activities (Topo survey and DGPS survey of Boundary point and drill hole points) were carried out.

Table 16: DGPS survey details of Ground Control points and Bench mark points.

Sl. No	Block Base Station	X	Y	Z (Elevation in m)	Hours of observations
1	CHP-1	722003.77	1894665.55	435.43	05:02:27
2	JWG-Base	688799.40	1881000.88	437.73	02:01:58
3	TBM 4	701010.65	1878628.31	431.49	02:12:25

Table 17: DGPS survey details of Block Boundary points.

Sl. No	Boundary points	X	Y	Z (Elevation in m)	Hours of observations
1	23BP-A	700218.91	1878520.77	427.94	02:03:51
2	23BP-B	702245.91	1878523.08	425.10	02:05:11
3	23BP-C	702244.62	1876053.98	401.45	02:12:25
4	23BP-D	700218.82	1876053.59	428.21	02:00:51

Table 18: DGPS survey details of Borehole points.

Sl. No	Borehole points	X	Y	Z (Elevation in m)	Hours of observations
1	23BH-01	700571.35	1878156.82	424.73	02:14:53
2	23BH-02	701852.55	1878116.79	424.91	02:02:36
3	23BH-03	701890.38	1876584.83	405.58	02:01:08
4	23BH-04	700685.05	1876434.57	419.68	02:02:56
5	23BH-05	701232.63	1877287.50	416.96	01:53:54

- Boundary point survey was conducted by using DGPS rover by PPK method. GS-16 rover (01 no), GS-18 rover (02 nos) and CS – 20 Controllers (03 nos) of Leica make. DGPS Survey Report is enclosed as Annexure 14.
- KIOCL has carried out topographic survey works in 20sqkm. Spot levels are taken from for every 10 to 20m using DGPS rover by RTK method. GS – 16 rover (01 no),

GS – 18 rover (02 nos) and cs – 20 controllers (03 nos) of Leica make. Surface plan is enclosed as Plate 04.

7. Integration of Geology, Geophysics (with available aero geophysical data) and geochemical exploration data and the interpretation:(Not required for bedded and stratiform type deposit. Ex. Limestone, bauxite, iron ore etc.)

Not applicable for current exploration program (limestone)

8. Mineral prospect

8.1. SURFACE INDICATION

The area of exploration block KLB-23, is situated in Sedam limestone member of Shahabad formation. The terrain is mostly covered with 0-5m thick black cotton soil, which supports extensive agriculture activities abundant cultivation in the area.

As the area is undisturbed tectonically, and the horizontal limestone beds are mostly covered with black soil, finding an out crop for the exploration purpose was very difficult. Therefore, bedrock samples were collected from the nallah sections, or canal cuttings where we could see the outcrops. In these locations the bedrock samples are collected for understanding the nature and grade of the limestone. Otherwise, also the Bhima Basin is known for its limestone deposits and many cement industries are existing in the area.

The commodity targeted for exploration and quantification was limestone.

8.2. MODE OF OCCURRENCE

Amid the cultivated land and in the nala section, the limestone occurs as horizontal to sub horizontal bed (with minor laminations) and are traced with striking along north south and dipping very low with 2° to 3° towards west. Historically, the area is known for its cement grade limestone from the Shahabad Formation – which is a chemical precipitate with 5 variegated limestone horizons /members. Hence, it is known that the Bhima Group rocks of Shahabad formation is limestone bearing. In the borehole cores, the limestones are noticed as massive types and are horizontal in nature as seen on the surface. Limestone occurs as stratified bedded deposit with regular habit and is having a thickness varying from 5m to 45m.

8.3. STRIKE LENGTH AND WIDTH OF ANOMALIES IDENTIFIED ON THE BASIS OF GEOLOGY, GEOCHEMICAL, GEOPHYSICAL EXPLORATION.

Limestone outcrop noticed in the southern part of block with average length of approx. 1766m and average width of 140m. Additionally, 7 more small patches of limestone outcrop observed in a block with different length and width.

8.4. ALTERATION ZONES

Since the terrain is undisturbed and unmetamorphosed and terrain is sedimentary in nature, No alteration zones are present.

8.5. GENESIS OF MINERALIZATION

Shahabad limestone exhibiting micritic texture coupled with the absence of sedimentary structure is indicative of its deposition under quiet water and low energy condition below base. Extensive precipitation of carbonate lead to the prevalence of warm temperature, absence of clastic supply, chemical weathering in the provenance and removal of carbon-dioxide from sea water. Homogeneity of chemical/lithological characters reflect the uniform condition or stability of the basin for a long time. Thick sequence of carbonate rocks may denote gradual sinking of the basin concomitant with sedimentation. The presence of pyrite clasts shows the existence of the euxinic condition, low Eh and pH condition (Sundaram and Hans 1989).

8.6. Mineralization in the block

The terrain under study is regarded as a source of limestone and meeting the growing requirements of cement industries in the area. The limited exposure makes it too hard to study the megascopic features, they are massive in the sub surface and immediately below the soil cover it is flaggy in nature. There are 8 out crops traced in the area of exploration and collected BRS for chemical analysis, the CaO content varies from minimum of 33.98% and maximum of 46.04%. There are outcrops outside the block around the hills and old workings indicate that the flaggy limestone having a thickness of 10m and massive limestone is having much thicker in the area. Five boreholes have been drilled to estimate the resources, in all the boreholes the massive limestone is continuing beyond the drilled depth of 45m. As per the stratigraphy established by Jayaprakash (GSI Memoire 129, 2007) the thickness of the Sedam Limestone is 60m, and the whole succession of the Shahabad Formation is 115m containing variegated limestone members only, that means these limestones are formed of chemical precipitation. Based on the chemical analysis of the BRS, Lithological factors seen in the field, and boreholes drilled in the area, the entire block of 5 Sq. Km area is covered with limestone upto the drilled depth. The cover on the top varies from 0m to 5m (soil cover) depending on the slope of the area, and weathering, as it is sloping towards northeast.

9. Sub surface Exploration by Drilling

The area of exploration comprises Sedam Limestone member of Shahabad Formation, the limestone is exposed in limited area (Plate no 06 Borehole location map) have been sampled for petrological and chemical analysis. However, major part of the area is covered by soil and regolith over the limestone at varying depth between 1 and 3m depending on the slope factor of the terrain.

As per the norms fixed by the NMET for exploration of bulk minerals in an area of 5 sq. km, 5 boreholes are drilled to a maximum depth of 45m. Desktop studies, coupled with field data, 5 boreholes were planned, where 4 boreholes are fixed at the 4 corners of the block leaving 400m inside the block boundary as area of influence for G3 stage for stratified bedded deposit of regular habit. The fifth borehole was planned at the centre of the block, using the triangulation method for estimation of the resources.

While fixing the boreholes on the ground there were some practical issues, as major part of the area is under cultivation with standing crops. After negotiating with the land owners, the boreholes points are fixed with slight difference from the planned location.

The first borehole was fixed and drilled to the north western corner of the block boundary which has intersected the limestone horizon at 5m and continued upto the depth of 45m. The second borehole was fixed and drilled at the north eastern corner of the block and encountered the limestone beds at 4m depth and continued till the closure of the borehole at 45m. Similarly, the 3rd and 4th boreholes were fixed at southeastern and south western block boundaries respectively and intersected the limestone horizons as expected. The last borehole was fixed at the centre of the block. The limestone beds and its variation encountered in different boreholes are correlatable with each other. All the boreholes are closed at 45m depth within the limestone horizon itself.

9.1. SPACING OF BOREHOLES SHOULD BE AS PER MEMC,2015

As per the norms fixed by the NMET for exploration of bulk minerals of the category – Stratified bedded nature with regular habit in an area of 5 sq. km, 5 boreholes with total drilling meterage of 225m are drilled to a maximum depth of 45m. Boreholes are fixed in accordance with the size and shape of the block. 4 Boreholes are fixed at the corners

of the block leaving a buffer zone of 400m and the last borehole is fixed at the centre of the block. All the 5 boreholes are falling in agricultural lands and drilling was executed after obtaining consent from land owners with marginal deviation as per the site condition.

9.2. METHODOLOGY and TYPE of DRILLING

Systematic diamond core drilling program with the aid of 5 boreholes to recover NQ size core was planned. Core size was maintained for the entire length of the borehole. Two rigs of rock drill make with Hydrostatic diamond core drilling technology were deployed. Double tube core barrel was used to ensure good core recovery.

9.3. BOREHOLE PLANNING

The entire exploration block extent is of 5 sqkm. The total extent of exploration area is covered by clastic sediments, cultivated land with thin to thick black soil.

The limestone beds were assumed and extrapolated to the block based on available data from the local geological mapping and study of limited outcrops. The nature of the terrain and subsurface disposition of limestone beds have been taken into consideration for planning the boreholes. Bedding trends are observed in the limestone outcrops, which show sub horizontal in nature with 2° to 3° of dipping towards west. The strike of bedding of the rocks is N –S direction with gentle 2^0 to 3^0 westerly dips.

The borehole locations were laid across the strike direction of the deposit (N-S). all the boreholes were drilled vertically in order to intersect limestone and to delineate the litho succession. In all 5 boreholes were drilled to assess the thickness, extent, quality and depth persistence of limestone zone. Profiles were drawn across the strike directions in A-A'', B-B', and C-C' section lines respectively.

Out of 5 boreholes, 4 boreholes are drilled in each 4 corners of the block leaving 400m buffer zone from the boundary of the block and 1 borehole is drilled at center of the Block. Pictorial representation of the location of the boreholes with distances are provided below;

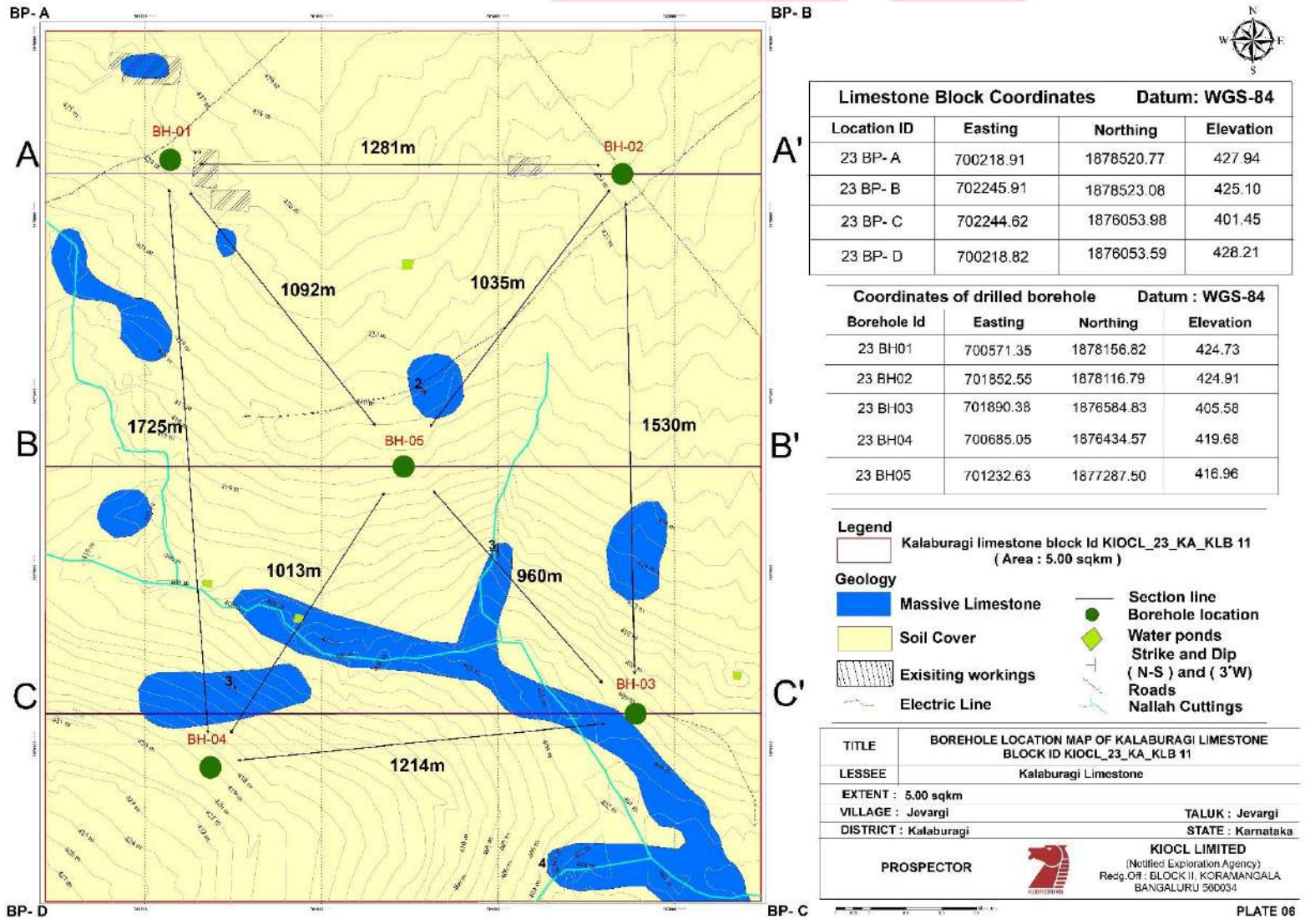


Figure 16: Diagram indicating the distance between the boreholes

Details of geo coordinates of the boreholes established through DGPS survey and parameters of the borehole with top RL, drilling depth, are provided below and DGPS survey processing Report is enclosed in Annexure 14. Details of the borehole points are provided below;

Table 19: Details of boreholes.

Sl	Borehole No.	Easting	Northing	Inclination Angle	Total drilling depth (m)	RL of BH collar (m)
1	23BH-01	700571.35	1878156.82	90	45	424.73
2	23BH-02	701852.55	1878116.79	90	45	424.91
3	23BH-03	701890.38	1876584.83	90	45	405.58
4	23BH-04	700685.05	1876434.57	90	45	419.68
5	23BH-05	701232.63	1877287.50	90	45	416.96

All the 5 boreholes, were drilled in the planned location.

Figure 17: Inauguration of detailed drilling Exploration works.

Figure 18: Hydrostatic diamond core drilling rig installed in borehole KALB 23BH-01 exploration block.

Figure 19: Grey color Limestone noticed

Figure 20: Detailed lithological core logging in borehole KALB 23BH-01 at site.

9.4. BOREHOLE CORE LOGGING

Core logging was carried out as per the standard logging format provided under Exploratory Drilling Guidelines for NMET funded Projects, May 2018, Ministry of Mines, Govt of India.

The drilled cores were kept in G.I. sheet core boxes in book pattern starting from left to right with arrow marking and showing top and bottom of the core. Each box was loaded with 05 m of core samples. Steel pegs were placed between each run with the nomenclature of the Boreholes. Systematic core logging was done run wise in each borehole.

Before logging, the cores were cleaned by water to get a clear core manifestation. Detailed information like variation in lithology, texture and mineralogical details, structural features like bedding plane, angle, fracture plane, angle lamination, cleavage, fracture, joints, minor folds/faults and intersection of these planar structures with core axis were recorded, systematically, run wise. Quartz vein, carbonate (calcite) vein, argillite/clay partings and cavity filling calcites, quartz, and fossils are recorded. The natures of core like broken, fractured, weathered, powdery and the nature of mineralization eg.

Stringers, specks, dissemination of Mica group minerals (Muscovite, biotite) and grain size of textural fine, medium, coarse-grained variation were also recorded. Size of bit and core recovery in percentage was invariably mentioned.

The detailed and summarized litholog of boreholes BH-01 to BH-05 are given in Annexure 11 (G3). After detailed core logging, the sampling of the mineralized zones was carried out.

Important lithounits intersected in various boreholes, in general, beneath top Black soil, are \Silty Soil, Calcareous Sludge and Massive limestone. All 5 boreholes (BH-01 to BH-05) have been systematically logged, with utmost care and attention to record characteristic features like lithology, colour, weathering, structure, texture, solution/voids, core angle, core recovery, rock quality designation (RQD), core dip measurements and mineralization details etc.

Figure 21: Drill cores of borehole KALB 23BH-01 and KALB 23BH-05 stored in G.I. Core boxes and the drilled cores kept in book pattern style

Abstract findings of lithology of 5 boreholes are provided below.

- **Borehole KALB 23BH01 (G3)**
  - Total depth of drilling : 45.00m
  - 0.00 to 1m is black soil overburden.
  - 1 to 3.5m is calcareous material and 3 to 5 is silty soil.
  - 5 to 45 is massive limestone of Shahabad Formation and the avg percentage of CaO in Borehole is 39.09 with mineralized and non mineralized zone .

- **Borehole KALB 23BH02 (G3)**
  - Total depth of drilling : 45.00m
  - 0.00 to 2m is black soil.
  - 2 to 4m is silty soil.
  - 4 to 45m is massive limestone of Shahabad Formation and the avg percentage of CaO in Borehole is 36.47 with mineralized and non mineralized zone.
  - In between the complete run from 9 to 10 is calcareous sludge is having a 36.04% pf CaO.
- **Borehole KALB 23BH03(G3)**
  - Total depth of drilling : 45.00m
  - 0.0 to 0.4 is massive limestone and from 0.40 to 1.00m is black soil overburden.
  - 1 to 45 is massive limestone of Shahabad Formation and the avg percentage of CaO in Borehole is 36.59 with mineralized and non mineralized zone .
  - In between the complete run from 2.3 to 3.3 , 10 to 11, 13 to 14, 16 to 17 is calcareous sludge is having a avg 30.08% CaO.
- **Borehole KALB 20BH04 (G3)**
  - Total depth of drilling : 45.00m
  - 0.00 to 0.3m is black soil overburden.
  - 0.3 to 45 is massive limestone of Shahabad Formation and the avg percentage of CaO in Borehole is 41.13 with mineralized and non mineralized zone .
  - In between the complete run from 2.3 to 4 is silty Soil , 7 to 8, 11 to 12, calcareous sludge is having a avg 28.86% CaO.
- **Borehole KALB 20BH05 (G3)**
  - Total depth of drilling : 45.00 m
  - 0 to 1m is black soil overburden.
  - 1 to 45 is massive limestone of Shahabad Formation and the avg percentage of CaO in Borehole is 37.06 with mineralized and non mineralized zone .

Figure 22: Cream coloured, fine grained, hard, and massive limestone. KALB 23BH01(G3).

Figure 23: Light grey coloured, fine grained, hard, and massive limestone with thin intercalations of shale noticed. KALB 23BH01(G3).

Figure 24: Cream coloured, fine grained, hard, and massive limestone. KALB 23BH02(G3).

Figure 25: Light grey coloured, fine grained, hard, and massive limestone with thin intercalations of shale noticed. KALB 23BH02(G3).

Figure 26: Light grey coloured, fine grained, hard, and massive limestone with thin intercalations of shale noticed. KALB 23BH03(G3).

Figure 27: Light grey coloured, fine grained, hard, and massive limestone with thin intercalations of shale noticed. KALB 23BH03(G3).

Figure 28: Cream to light gray coloured, fine grained, hard, and massive limestone. KALB 23BH04(G2).

Figure 29: Light grey coloured, fine grained, hard, and massive limestone with thin intercalations of shale noticed. KALB 23BH04(G3).

Figure 30: Light grey to cream coloured, fine grained, hard, and massive limestone with thin intercalations of shale. KALB 23BH05(G3).

Figure 31: Light grey coloured, fine grained, hard, and massive limestone with calcite vein KALB 23BH05(G3).

As per Memoirs of the Geological Survey of India volume 129 (2007) , Purana basins of Karnataka and 'All India Phosphorite Scheme' for phosphorite in Bhima Basin carried out by NK SOOD and A SYAMALA RAO, GSI during FS 1983 – 84, Phosphorites in the Bhima Basin are strata bound and are confined to Hulkal shales and are mostly found in the middle of the formation. Samples have analysed from thin phosporite horizons have indicated P2O5 values ranging from 6.38 to 12.86%.

With the above back ground, the logged drillcores are subjected for shapiro's kit test. The intermittent partitions of the borehole cores are observed with irregular / serrated

partings. All along the partings phophorite zones of 1 to 2mm are identified by Shapiro's kit test. These bands are observed to be of academic in nature without any economic significance. Litholog data sheet indicating results of Shapiro's kit test are provided as Annexures 11. Photographs of Shapiro's kit test performed on drillcore samples are provied below :

Figure 32: Thin band of Phosphorite observed in the drill core samples

Figure 33: Shapiro's kit test showing positive result on drill core sample.

Each drillcore meter are analysed for P2O5 and the maximum value of P2O5 observed in drill core sample is 0.802 %.

9.5. CORE RECOVERY PERCENTAGE

The drilling in the block was carried out using NQ core bits in hydrostatic diamond core tube barrels, to obtain maximum core recovery. The core recovery was poor in the soil horizon and fracture zones. The Massive limestone with less fracture has given good recovery of >94.91%.

Details of the borehole wise average core recovery are provided below;

Table 20: Average core recovery of Boreholes

Sl. No.	Borehole	Average core recovery (%)
1	KALB 23BH-01 (G3)	93.33
2	KALB 23BH-02 (G3)	95.8
3	KALB 23BH-03 (G3)	92.42
4	KALB 23BH-04 (G3)	93.91
5	KALB 23BH-05 (G3)	97.53
	Average	94.91

9.6. GP LOGGING

Not Applicable

9.7. MINERALOGY OF THE ORE ZONE

Five boreholes were drilled within the KIOCL_23_KA_KLB 11 block. Despite the absence of surface exposures, the boreholes were drilled in 4 corners of the block and the 5th borehole in center of the Block. It was observed that the limestones were bedded with a N-S trend having low dips towards west.

5 boreholes drilled in the area have intersected the limestone horizon at depths varying from 0.3 to 5m and continued till the closure of the borehole at 45m. The intersected thickness of the limestones in all the boreholes are around 40m. As per the stratigraphic classification of GSI the Sedam limestone is 60m thick, and boreholes drilled by KIOCL has established limestone thickness upto 45m. Considering the stratigraphic depth and KIOCL's proven depth, 15m thickness of limestone is anticipated to be still lying below the proven depth by KIOCL.

- ***Massive Limestone***

Massive limestone is seen as hard and compact fine grained light grey, grey, pink and cream colour beds with an individual bed thickness of 0.25m to 0.5m. Limestone is a blanket type of deposit; it is exposed in isolated scanty outcrops. Most of the area is covered by soil. The thickness of this massive limestone variety is about 40m. It breaks as thick blocks along the bedding planes and jointed fractures. It is occasionally traversed by thin veins of calcite and quartz. Vertical joints are frequently seen in this variety. It is dominantly grey to light grey in colour and breaks with sharp edges.

Systematic representation of ore zone encountered in each borehole is provided below;

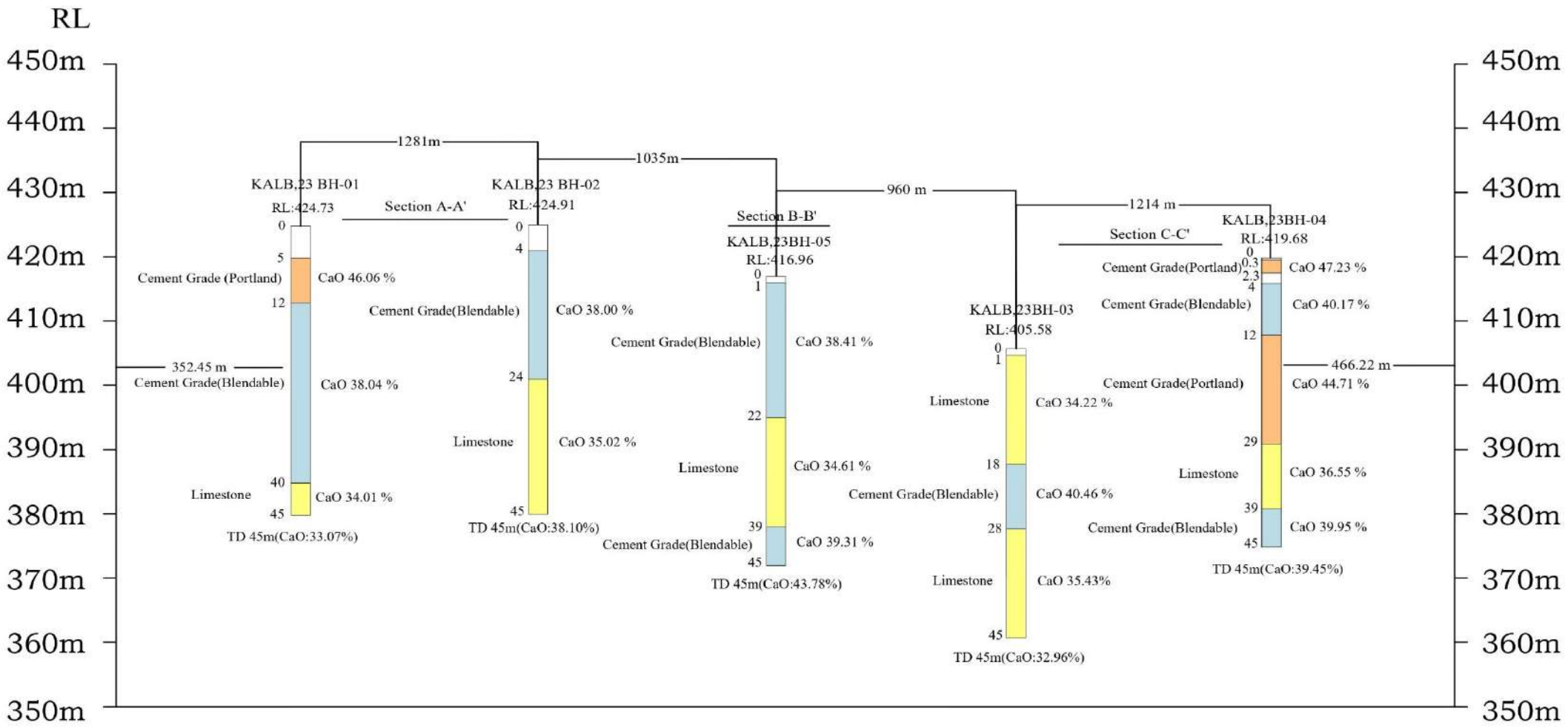


Figure 34: Litholog of boreholes with Limestone Zones schematically arranged as per RL

9.8. BOREHOLE DEVIATION TEST AND METHODOLOGY

Not applicable

9.9. METHODOLOGY OF ORE ZONE SAMPLING AND SAMPLE PREPARATION

Every run meter of the drill core were subjected to sampling. No sampling is carried out for Top soil/ black cotton soil.

9.10. CHEMICAL ANALYSIS AND LABORATORY PROCEDURES

All the primary sample analyses were carried out at Mineral Exploration Laboratory, KIOCL Ltd., Mangalore. NABL certificate of Mineral Exploration Laboratory of KIOCL Ltd. is enclosed in Annexure 09.

Against the cumulative drilling of 225 m, in all 219 nos. (G3) samples were prepared and analyzed primarily for 9 radicals i.e. CaO, MgO, Al_2O_3, Fe_2O_3, SiO_2, SO_3, P_2O_5, K_2O, and LOI). The details of the same is provided in Annexure 04.

9.11. CHECK SAMPLES AT LEST 10% MAY BE ANALYSED FROM THIRD PARTY NABL ACCERDITED LABS

- **Internal Check Sample Analysis**

23 nos. of internal check sample analysis @10% were carried for 09 radicals. Internal check sample analysis report is provided as Annexure 05. Comparison of primary sample vs internal check sample analysis is provided as Annexure 06.

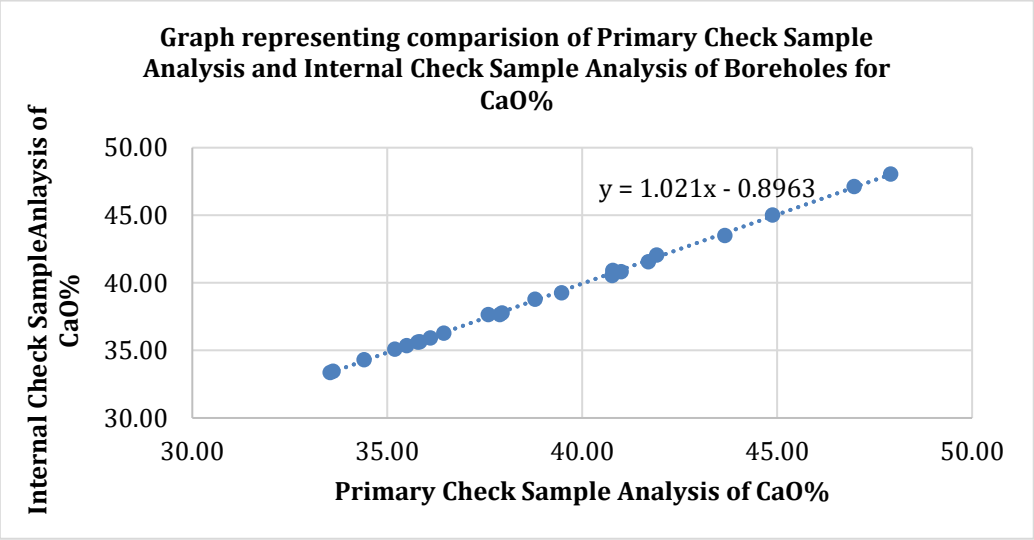


Figure 35: Graph showing comparison of Primary and Internal Check sample analysis of borehole samples for CaO%.

Statistical analysis to establish the agreement between primary and check sample analyses of CaO % are provided below.

Table 21: Comparison of Primary Vs Internal check sample analysis of borehole for CaO

CaO%	PRI	INT	DIFF	% OF DIFF
Mean	39.03	38.96	-0.08	-0.20
Median	37.95	37.77		
Standard Deviation	4.11	4.20		
Minimum	33.54	33.38		
Maximum	47.91	48.06		
Count	23.00	23.00		

CaO weight percentages of all samples are falling within the best fit curve with a slope of 1.021.

Statistical analysis of CaO shows mean difference of -0.20% and concentration of primary samples shows a positive correlation with internal check samples, with a correlation coefficient of 0.99 for CaO.

- **External Check Sample Analysis**

23 nos. of external check sample analysis @10% were carried for 09 radicals at M/s. Superintendence Company of India Private Limited., Kolkata.

NABL certificate is enclosed at Annexure 10.

External check sample analysis report is provided as Annexure 07.

Comparison of primary sample vs external check sample analysis is provided as Annexure 08.

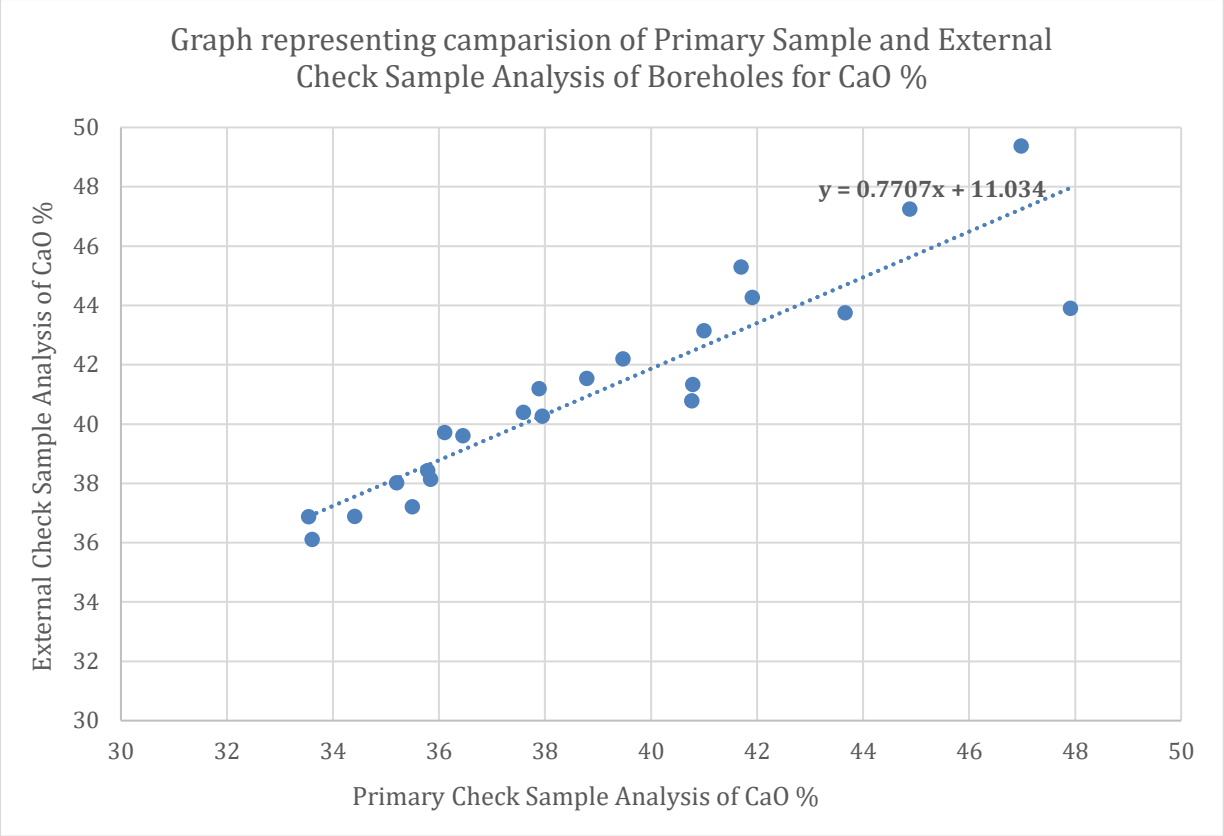


Figure 36: Graph showing comparison of Primary and External Check sample analysis of borehole samples for CaO%.

Statistical analysis to establish the agreement between primary and check sample analyses of CaO % is provided below.

Table 22: Comparison of Primary Vs Internal check sample analysis of borehole for CaO

CaO%	PRI	EXT	DIFF	% OF DIFF
Mean	39.03	41.11	2.08	5.33
Median	37.95	10.78		
Standard Deviation	4.11	3.44		
Minimum	33.54	36.11		
Maximum	47.91	49.38		
Count	23.00	23.00		

CaO weight percentages of all samples are falling within the best fit curve with a slope of 0.7707 respectively.

Statistical analysis of CaO shows mean difference of 5.33% and concentration of primary samples shows a positive correlation with external check samples, with a correlation coefficient of 0.91 for CaO.

9.12. DETAILS OF INTERSECTED ORE ZONES OF THE BOREHOLES AND THEIR CORRELATION

All the 5 boreholes drilled, yielded limestone ore zones belonging to Shahabad formation. The details of orezones are explained in the subsiquent chapter.

9.13. DEPTH OF THE GROUND WATER CONDITION SHOULD BE ASCERTAINED AND REPORTED.

Not Applicable

10. GEOTECHNICAL STUDIES ON BOREHOLE CORE SAMPLES OF MINERALISED ZONES

10.1. POROSITY

Not applicable

10.2. MOISTURE CONTENT/WATER ABSORPTION

Not applicable

10.3. UNIAXIAL COMPRESSIVE STRENGTH

Not applicable

10.4. UNIAXIAL TENSILE STRENGTH

Not applicable

10.5. TRIAXIAL STRENGTH

Not applicable

10.6. YOUNG'S MODULOUS

Not applicable

10.7. SLAKE DURABILITY INDEX

Not applicable

10.8. POISSON RATIO

Not applicable

10.9. RQD (ROCK QUALITY DESIGNATION STUDIES)

RQD is found to be a more sensitive and consistent indicator of general rock quality compared to the gross recovery percentage. This classification is based on a modified core recovery procedure, which in turn, is based indirectly on the number of fractures and the amount of softening or alteration in the rock mass as observed in the rock cores from a drill hole. RQD is a modified core recovery percentage in which all the pieces of sound core over 10cm long are counted as recovery, and their cumulative length is expressed as a percentage of the length drilled. The smaller pieces resulting from closer jointing, faulting, or weathering are discounted. As per IS code 11315 Part 11 (1985) RQD percentage between 50% and 75% is considered as "Fair". The average RQD of 5 boreholes is 44.98%.

Table 23: Borehole wise RQD

Sl No	Borehole	Average RQD
1	KALB 23BH-01 (G3)	47.24
2	KALB 23BH-02 (G3)	53.79
3	KALB 23BH-03 (G3)	38.81
4	KALB 23BH-04 (G3)	36.67
5	KALB 23BH-05 (G3)	48.41
	Average	44.98

The details of core recovery and RQD percentage of each borehole are provided in Annexure 12 (G3).

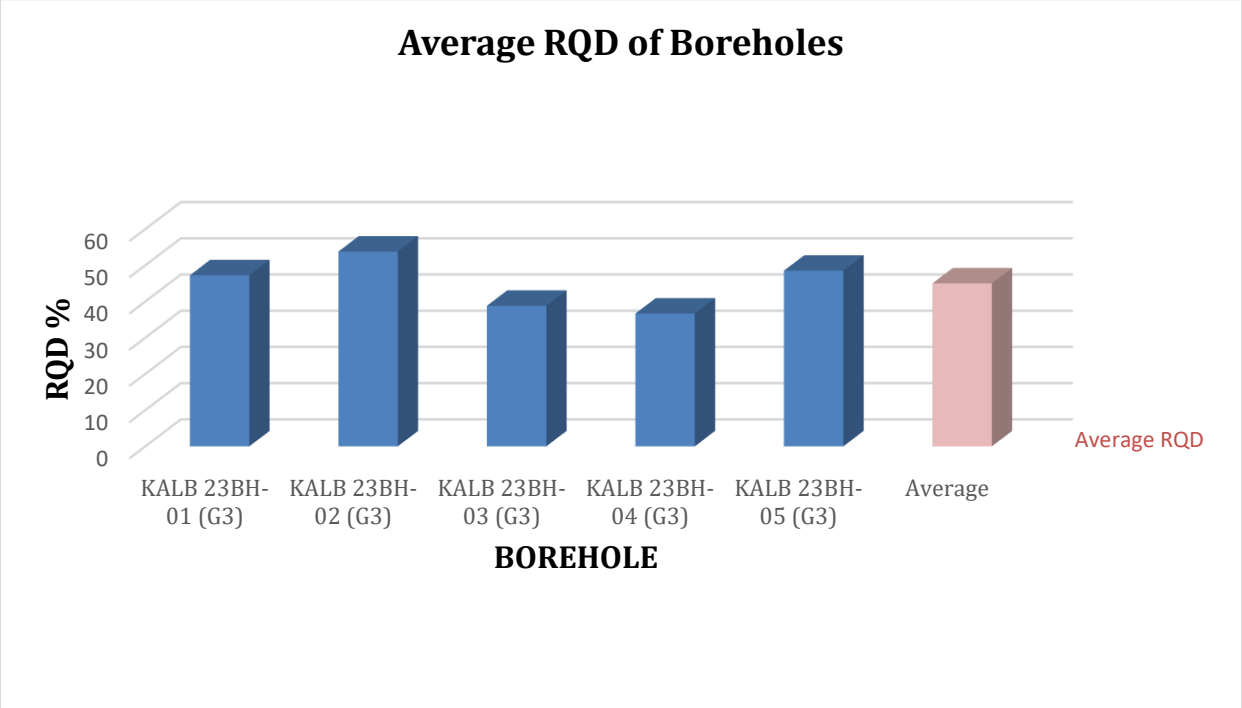


Figure 37: Average RQD of Boreholes

11. RESOUCE ESTIMATION

11.1. DETAILS OF ORE ZONE IN BOREHOLES

Details of the ore zones established through G3 stage of drilling works are provided below;

KALB 23BH-01 (G3)

- The borehole is drilled on the Limestone Shahabad formation on the northern part of the block.
- The borehole was drilled up to vertical depth 45 m.
- Based on the chemical analysis and considering the threshold values as suggested by IBM for limestone, borehole run 5 m to 45 m is having the thickness of 39 m and mean CaO, mean MgO values of 38.94 % and 0.74% respectively.

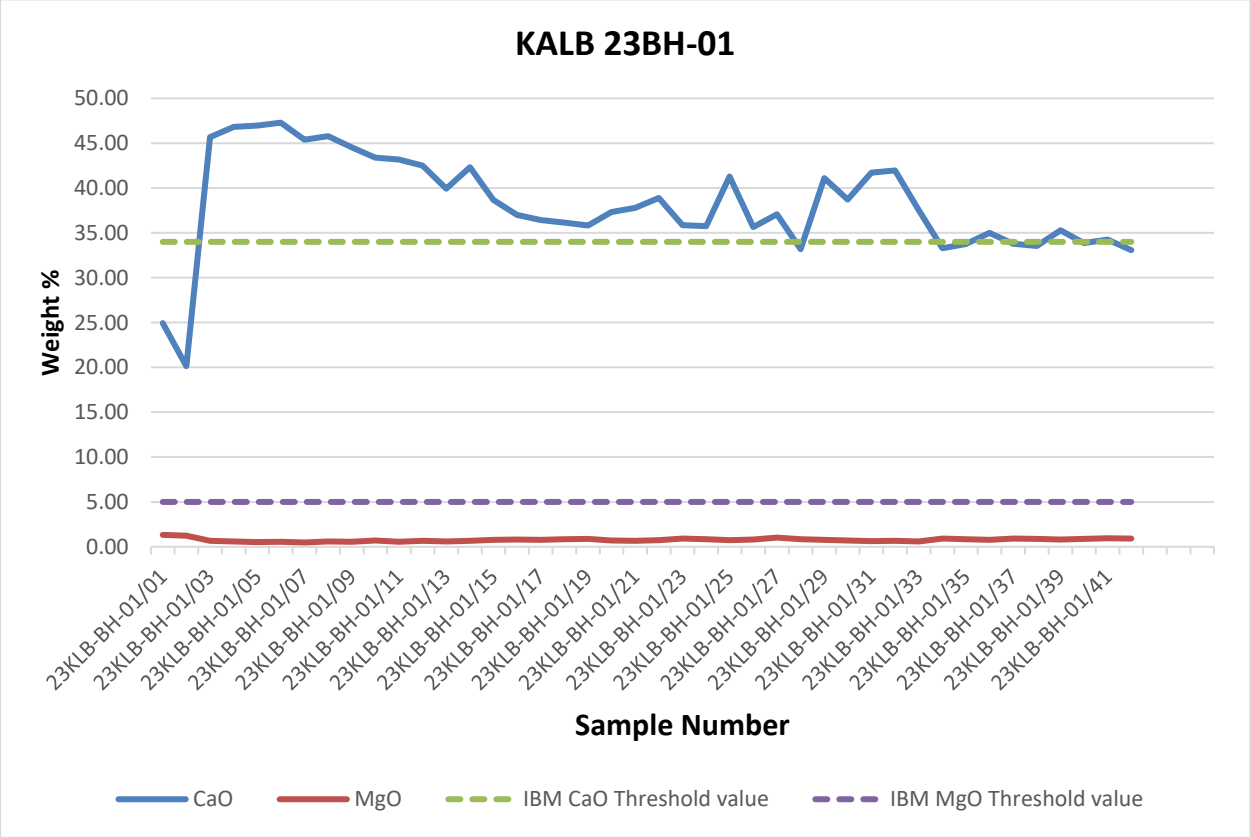


Figure 38: Line graph showing plotted results of borehole KALB 23BH-01 (CaO and MgO vs sample number)

Table 24: Statistical Parameters of CaO and MgO results of KALB 23BH -01

Statistical Parameters	CaO %	MgO %
Mean	38.15	0.76
Median	37.73	0.76
Standard Deviation	5.63	0.17
Minimum	20.14	0.48
Maximum	47.29	1.33
Count	42	42
Confidence Level (95.0%)	1.75	5

KALB 23BH-02 (G3)

- The borehole is drilled on the Limestone of Shahabad Formation on the northern part of the block.
- The borehole was drilled up to vertical depth 45 m.
- Considering the threshold values as suggested by IBM for limestone, Borehole run 4 m to 45 m is considered to be the is having the thickness of 41 m and mean CaO, mean MgO values of 36.47% and 0.76% respectively.

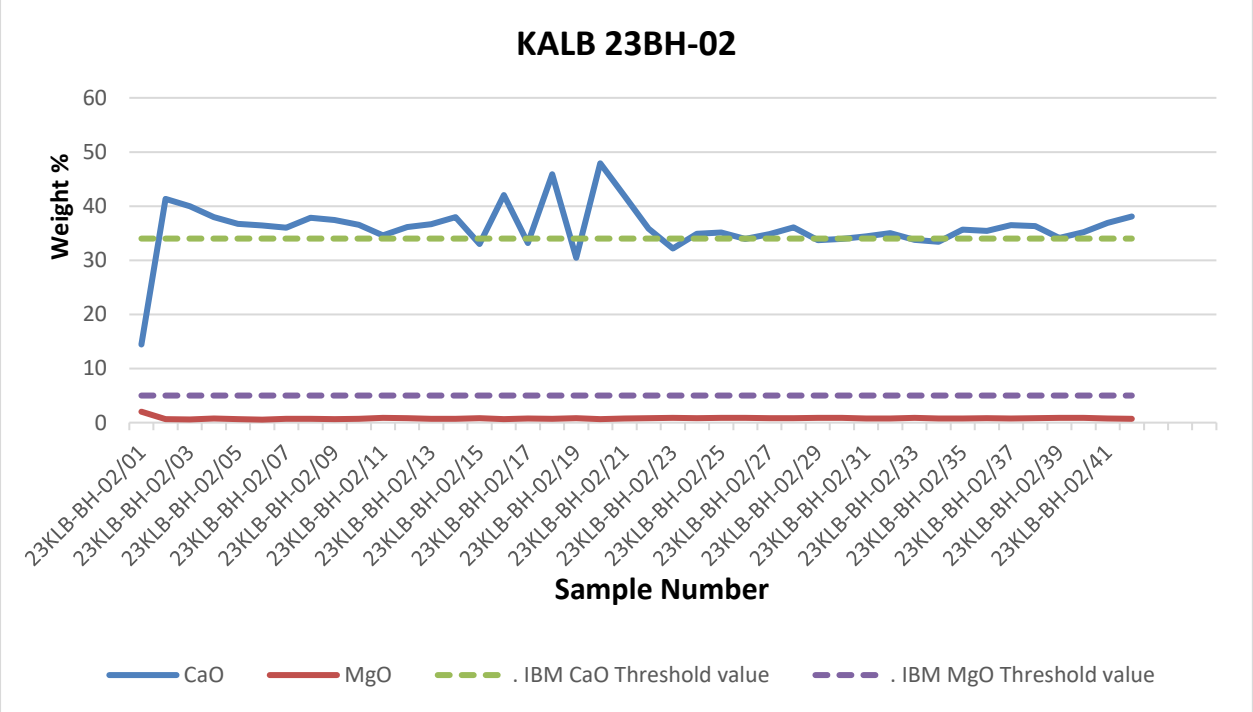


Figure 39: Line graph showing plotted results of borehole KALB 23BH-02 (CaO and MgO vs sample number)

Table 25: Statistical Parameters of CaO and MgO results of KALB 23BH -02

Statistical Parameters	CaO %	MgO %
Mean	35.94	0.79
Median	35.92	0.78
Standard Deviation	4.78	0.21
Minimum	14.43	0.55
Maximum	47.91	2.02
Count	42	42
Confidence Level (95.0%)	1.49	0.06

KALB 23BH-3 (G3)

- The borehole is drilled on the Limestone of Shahabad Formation.
- The borehole was drilled up to vertical depth 45 m.
- Considering the threshold values as suggested by IBM for limestone, borehole run 1 m to 39 m is considered to be the ore zone is having the thickness of 38 m and mean CaO, mean MgO values of 36.59% and 0.67% respectively.

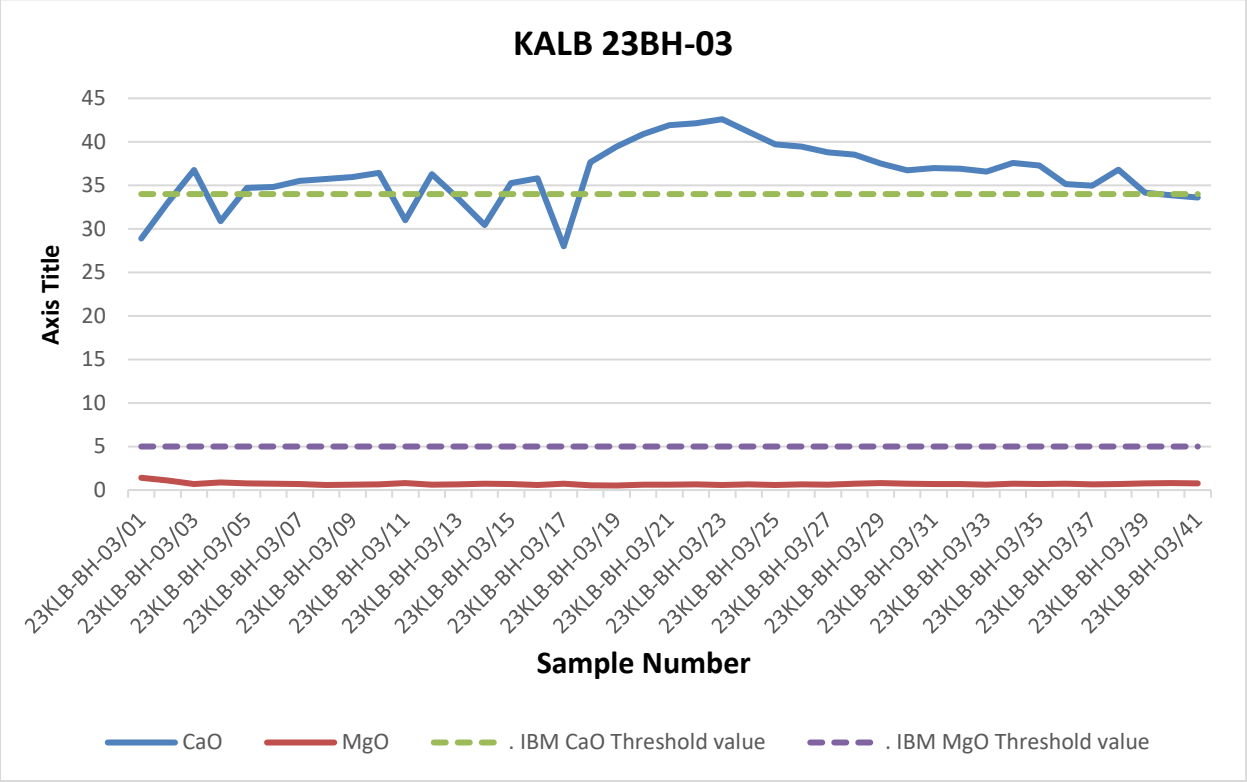


Figure 40: Line graph showing plotted results of borehole KALB 23BH-03 (CaO and MgO vs sample number)

Table 26: Statistical Parameters of CaO and MgO results of KALB 23BH-03

Statistical Parameters	CaO %	MgO %
Mean	35.94	0.71
Median	35.94	0.71
Standard Deviation	3.32	0.14
Minimum	28	0.52
Maximum	42.6	1.41
Count	45	45
Confidence Level (95.0%)	0.99	0.04

KALB 23BH-4 (G3)

- The borehole is drilled on the Limestone of Shahabad Formation.
- The borehole was drilled up to vertical depth 45 m.
- Considering the threshold values as suggested by IBM for limestone, borehole run 0.3 m to 45 m is considered to be the ore zone is having the thickness of 44.7 m and mean CaO, mean MgO values of 41.3% and 0.95% respectively.

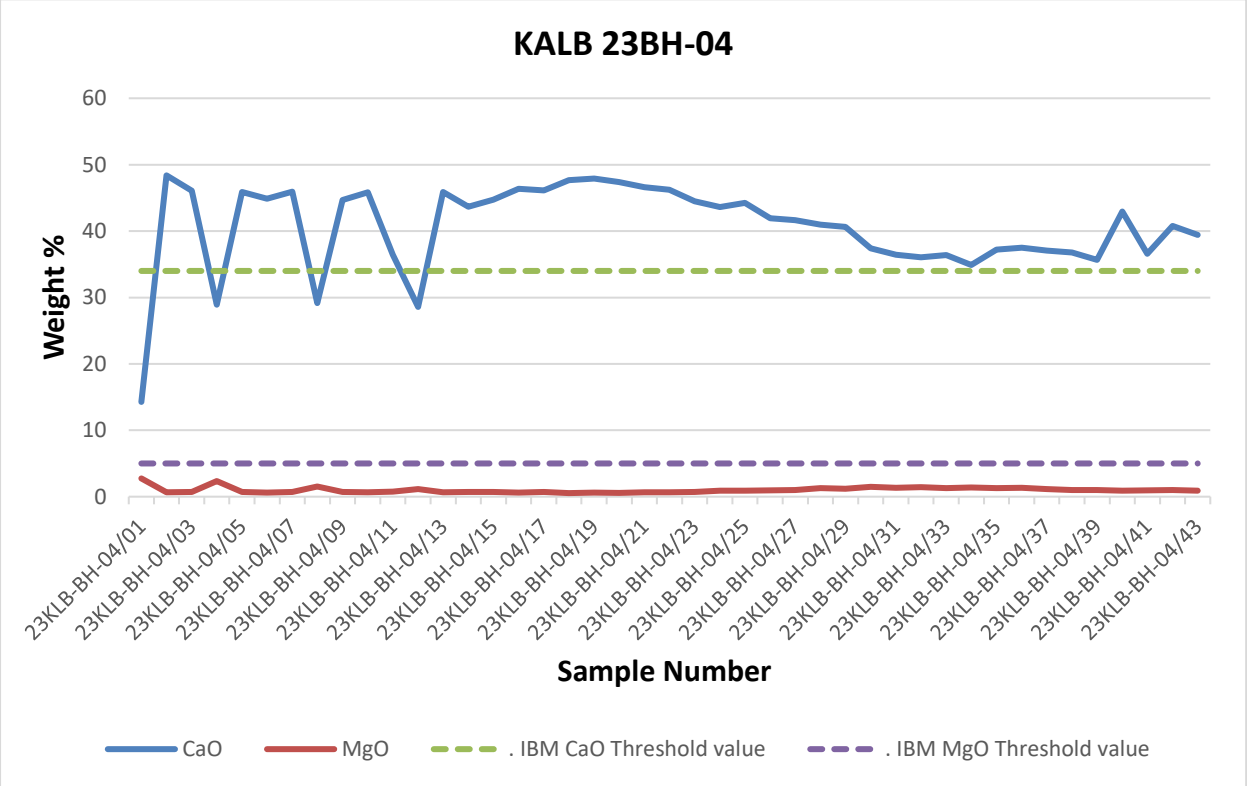


Figure 41: Line graph showing plotted results of borehole KALB 23BH 04 (CaO and MgO vs sample number)

Table 27: Statistical Parameters of CaO and MgO results of KALB 23BH 04

Statistical Parameters	CaO %	MgO %
Mean	40.53	0.99
Median	41.65	0.9
Standard Deviation	6.57	0.44
Minimum	14.27	0.54
Maximum	48.39	2.75
Count	45	45
Confidence Level (95.0%)	1.97	0.13

KALB 23BH-5 (G3)

- The borehole is drilled on the Limestone of Shahabad Formation situated in center part of the Block.
- The borehole was drilled up to vertical depth 45 m.
- Considering the threshold values as suggested by IBM for limestone, borehole run 1 m to 45m is considered to be the ore zone is having the thickness of 44 m and mean CaO, mean MgO values of 37.06% and 0.76% respectively.

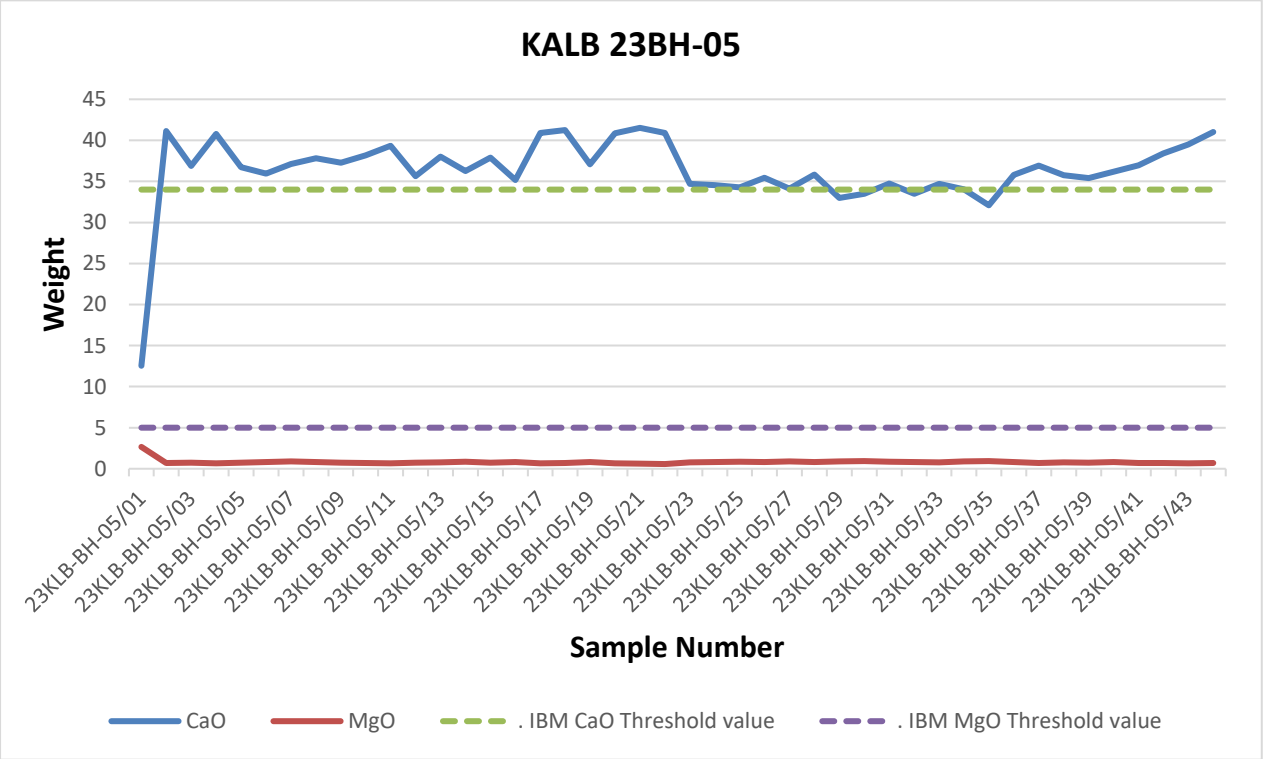


Figure 42: Line graph showing plotted results of borehole KALB 23BH 05 (CaO and MgO vs sample number)

Table 28: Statistical Parameters of CaO and MgO results of KALB 23BH 05

Statistical Parameters	CaO %	MgO %
Mean	36.52	0.80
Median	36.71	0.78
Standard Deviation	4.54	0.29
Minimum	12.54	0.57
Maximum	43.78	2.66
Count	45	45
Confidence Level (95.0%)	1.36	0.08

Considering the IBM threshold values, drilling meterage of 212 meters from 5 boreholes at the rate of 94.2 % of total drilled meterage (225 m) is observed to be mineralized with weighted average CaO value of 37.98. The weighted average of CaO is calculated considering the thickness of limestone zones encountered in each borehole. Details of ore zone intersected in each borehole along with the weighted average of CaO is provided below;

Sl No	Borehole No	Depth of BH drilled (m)	From (m)	To (m)	Thickness of Ore Zone (m)	True thickness of Ore zone considering average 3⁰ dip amount	Avg CaO%	Avg MgO%	Avg SiO2 %	Avg Fe2O3%	Avg Al2O3%
(a)	(b)	(c)	(d)	(e)	(f)= (e)-(d)	(g)=(f)*0.998	(h)	(i)	(j)	(k)	(l)
1	KALB 23BH-01 (G3)	45	5	12	7	6.99	46.06	0.57	12.57	0.45	0.85
			12	40	28	27.96	38.04	0.76	25.67	0.72	1.32
			40	45	5	4.99	34.01	0.89	32.04	0.93	1.97
2	KALB 23BH-02 (G3)	45	4	24	20	19.97	38.00	0.71	26.01	0.92	1.26
			24	45	21	20.97	35.02	0.81	30.85	0.84	1.63
3	KALB 23BH-03 (G3)	45	1	18	17	16.98	34.22	0.71	32.21	1.08	1.53
			18	28	10	9.99	40.46	0.62	22.54	0.61	1.19
			28	45	17	16.98	35.43	0.73	30.31	0.93	1.61
4	KALB 23BH-04 (G3)	45	0.3	2.3	2	2.00	47.23	0.70	10.55	0.58	0.81
			4	12	8	7.99	40.17	0.86	19.99	1.89	2.42
			12	29	17	16.98	44.71	0.78	14.99	0.62	0.89
			29	39	10	9.99	36.55	1.27	27.87	0.64	1.35
			39	45	6	5.99	39.95	0.92	22.62	0.69	1.30
5	KALB 23BH-05 (G3)	45	1	22	21	20.97	38.41	0.73	25.92	0.71	1.15
			22	39	17	16.98	34.61	0.83	31.77	0.93	1.55
			39	45	6	5.99	39.31	0.69	24.51	0.74	1.20
6	**Total /Avg**	**225**			**212**	**211.71**	**37.98**	**0.78**	**26.00**	**0.83**	**1.38**

Table 29: Details of mineralized ore zones of borehole

11.2. CUT OFF GRADE AND MINIMUM STOPING WIDTH CONSIDERATIONS

Following threshold values as declared by IBM are considered for resource estimation.

Table 30: Threshold values of Limestone as per IBM.

Sl	Grade	Radicals	Threshold values	IBM notification reference
1	Threshold	CaO	34%(min)	IBM notification dtd.25th Apr 2018
2		MgO	5%(max)	
3	Cement (Blendable/Beneficiable)	CaO	38 to 44 %	End use grade classification by IBM dtd. 25th May 2015
4		MgO	5% (max)	
5	Cement (Portland)	CaO	44 to 52 %	
6		MgO	3.5 % (max)	

As per IBM norms 2018, CaO % > 34 is considered as limestone resources and as per IBM norms 2015 limestone with CaO % ranging from 38 onwards are to be classified as Blendable/ Beneficiable or Portland grade. By utilizing the above 2 norms limestone with CaO % ranging from 34 to 38 are considered as Threshold/ Blendable grade and resource is estimated.

NO stopping width is considered, due to occurrence of qualifying ore zones in 5 boreholes at depth varying from 0.3m to 45m as a seamless simple bed.

11.3. DESCRIPTION AND CORRELATION OF LODES

Since the deposit is of sedimentary limestone formation, the details of intersected zones of limestone are tabulated in Table 29.

11.4. PREPARATION OF LV SECTION AND LEVEL PLAN

LV sections and level plans were not prepared as the commodity under study is limestone. Fence diagram of the block prepared considering the qualified ore zone data of boreholes is presented below;

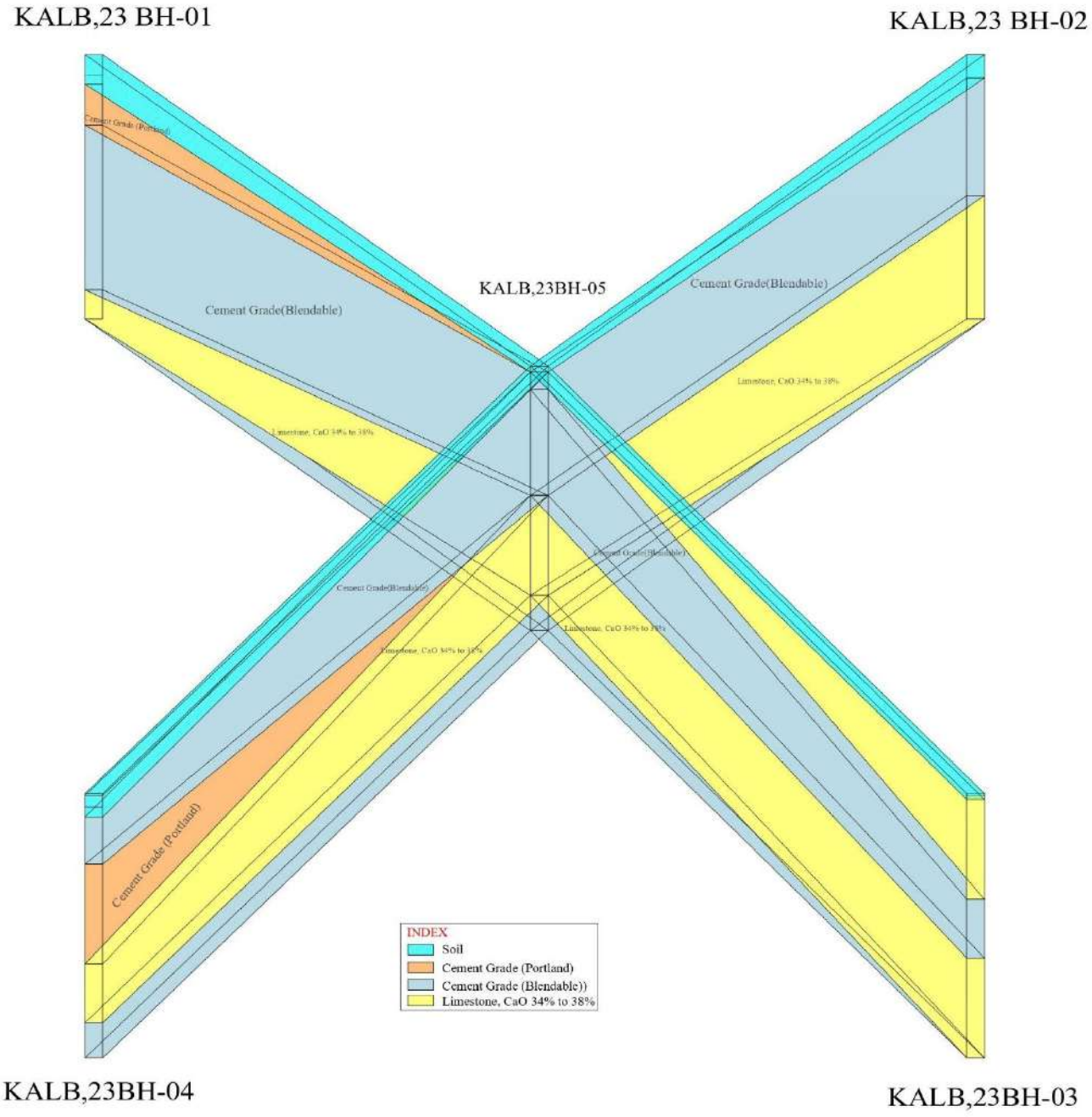


Figure 43: Fence Diagram of the Block

11.5. SPECIFIC GRAVITY and BULK DENSITY CALCULATION

Totally 01 no of bulk density test for in situ and 3 nos. for lab scale were carried out. In situ bulk density test was carried out on limestone outcrop and lab scale density test was done on drill core sample.

In situ bulk density test was carried out as per Cubical Opening (pit) method. In this method, a cubical pit of 0.5 (length) x 0.5 (width) x 0.5 (depth) was dug manually on the exposed surface. The pit was made smooth to the possible extent from all sides and care was taken to prevent any caving of material from the walls. The entire excavated material was stored in an empty container and retaining the natural moisture of the excavated material ensuring that no loss of recovered material from the pit. Then, all the material was weighed carefully and the respective weight was recorded. The weight-volume ratio is recorded as in-situ bulk density.

Details of the in-situ bulk density test and lab scale specific gravity tests are provided below;

Table 31: Results of Insitu Bulk Density test of limestone

Coordinated			Dimension			Volume m^3	Weight in tonnes	In-situ Bulk Density (Tonnes/ Cum)
Easting	Northing	Elevation	Length	Breadth	Height			
701721	1876143	391	0.5	0.5	0.5	0.125	0.3078	**2.46**

Table 32: Results of Specific Gravity tests of Core samples

Sl	Borehole No.	Sample no.	Depth		Thickness	Dry weight	Vol displaced	Specific Gravity
			From	To		gms	cc	gm/cc
1	23KLB-BH-01	23KLB-BH-01/10	12.0	13.0	1	197.64	80	2.47
2	23KLB-BH-03	23KLB-BH-03/08	7.0	8.0	1	144.12	50	2.88
3	23KLB-BH-04	23KLB-BH-04/23	22.0	23.0	1	178.10	70	2.54
Average								**2.63**

For resource estimation average of both tests (Insitu bulk density test and Specific gravity test) with value of 2.54 tonnes/cum is considered.

Lab scale Specific Gravity test report is enclosed as Annexure 16.

Figure 44: In situ bulk density test photos

11.6. ASSUMPTION OF RESOURCE ESTIMATION

a. The strike direction of the ore body in the block is N-S and is with average dip amount of 3^0 W.

b. Considering the above structural parameter of the block and locations of the boreholes drilled, 03 numbers of horizontal cross sections are drawn along the dip of the ore body with section interval as indicated below;

Table 33: Distance between section lines

Section line	Distance in m
A – A' to B- B'	829.77
B-B' to C-C'	700.81

Geological Cross sections are presented as Plate 07.

c. The boreholes which are not falling on the sectional lines are projected on the nearest section line.

d. Resource estimation is done based on Polygon Method. Polygon blocks are constructed by perpendicular bisectrix method of the triangle. The height of each polygon is the thickness of the ore body with a polygonal base. The entire outlined ore body is divided into number of polygonal prism of different height i.e thickness. The Grade intersected in the opening is the grade of entire polygonal prism.

   Volume of the polygon = S X T (Where S is the surface area of the polygon and T is the Thickness of polygon of ore body). (Ref: New Insights on Mineral Exploration Concepts and Guidelines, Published by Govt of India, Ministry of Mines, Geological Survey of India, Natural Resource Assessment, (M-II), Nagpur.)

e. In the current Block 5 nos of polygon were created by perpendicular bisectrix of the triangles. Circular Area of influence of 400m from each borehole point is drawn and area falling within 400m circle is qualified for G3 level of resources and the area falling outside the 400m circle within respective polygon are considered towards G4 level of resources. Diagram indicating polygons formed by perpendicular bisectrix method and surface area of influence for G3 and G4 are provided below;

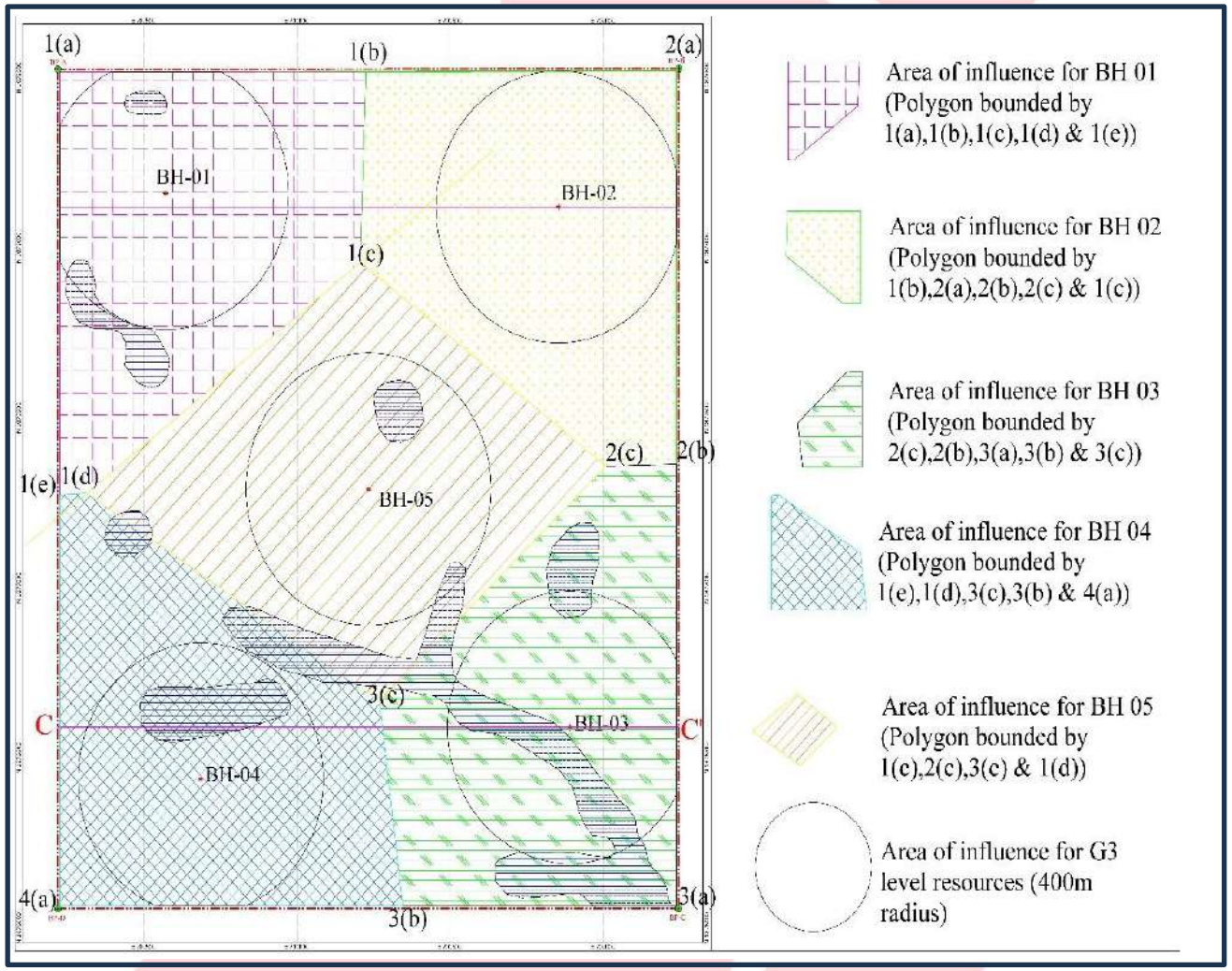


Figure 45: Diagram indicating polygons and surface area of influence for G3 and G4 level resources.

f. Considering the IBM threshold values, heights of limestone zones based on grades (Cement grade/ Beneficiable or Blendable / Threshold) in each borehole are derived.

g. True thickness of the limestone zones based on grades (Cement grade/ Beneficiable or Blendable / Threshold) in each borehole are derived considering the average dip amount of 3°.

h. Based on the lab scale tests and in situ density tests carried out, average density of limestone is considered as 2.54 tonnes/cum for resource estimation.

i. Based on intersection and correlation of different lithologs of the boreholes, the deposit is classified as bedded sedimentary with regular habit.

j. Resource is estimated by Polygon Method using the formula, Resource = Surface area X Thickness of limestone (Grade wise) X Density and expressed in million tonnes.

k. A deduction of 5% from the estimated resources has been made to arrive the net reserves, considering geological factors such as slope factor, solution cavities, caverns etc.

l. Surface geological plan are developed using ArcMap 10.8.1 software and Horizontal Cross sections using AutoCAD 2021 software.

11.7. Category of resources as per MEMC, 2015 along with UNFC classification.

a. Resources have been kept under Inferred Mineral Resources (333) and Reconnaissance Mineral Resource (334) category as per the norms of Mineral (Evidence of Mineral Content) Rule 2015.

b. Cumulative Resources of 523.28 million tonnes (334 & 333) and Net Resource (334 & 333) of 497.11 million tonnes with weighted average CaO% of 37.98 is estimated in the Block. Abstract details of calculation is provided below and the Resource estimation calculation sheet is enclosed as Annexure 17.

Grade	Inferred Mineral Resources (333)			Reconnaissance Mineral Resource (334)			Cumulative			Net Resources (after deducting 5%)		
	Qty	CaO	MgO	Qty	CaO	MgO	Qty	CaO	MgO	Qty	CaO	MgO
Cement Grade	31.94	45.26	0.72	31.29	45.24	0.72	63.23	45.25	0.72	60.06	45.25	0.72
Cement (Blendable/ Beneficiable)	121.81	38.72	0.74	122.77	38.75	0.74	244.58	38.73	0.74	232.35	38.73	0.74
Limestone with CaO from 34% to 38%	107.41	34.98	0.84	108.07	34.97	0.84	215.48	34.98	0.84	204.70	34.98	0.84
Total	**261.15**	**37.98**	**0.78**	**262.12**	**37.97**	**0.78**	**523.28**	**37.98**	**0.78**	**497.11**	**37.98**	**0.78**

Table 34: Net resource calculation

12. Core preservation

Drill cores are preserved as per the standards of NMET circulated vide "Exploratory Drilling Guidelines for NMET funded projects – 2018".

Half split drill cores samples of mineralized and non-mineralized zones are preserved in the core boxes. The core boxes are made up of galvanized iron (GI) sheet or standard PVC core boxes. Boxes of galvanized iron sheet (about 22-gauge thickness) having 90cm length, 30 cm width and 10 cm height with three adjustable partitions dividing the box longitudinally in five compartments.

The depth of the core is written on the GI sheet separators (gutkas) between each run of cores preserved in the core boxes. Each core pieces are marked to indicate the top side

Borehole number, depth of the core samples and box numbers are written on the GI sheet core boxes.

As per the procedure of NMET, logged drill core sample of 1 borehole will be archived in National Drill Core Library.

Core box photographs are enclosed as Annexure 15.

13. CONCLUSION AND RECOMMENDATION

An area of 5 Sq. Km was covered by Detailed Geological Mapping on 1:4,000 scale to aid the understanding of the geological disposition. Surface bed rock samples were collected for chemical analytical studies. 1m contour interval map was prepared to know the slope and terrain condition.

The geomorphology of the mapped area has plane country, major portion of the area is occupied by the cultivated land. The elevation in the area towards north of the block is 429m and the minimum elevation in the southeast and southwestern part of the block is 401m MSL.

The mapped area consists of Sedam Limestone member of the Shahabad formation of Bhima Group. Among all the other members of the Shahabad formation, Sedam Limestone member represents 60m thick and of good quality limestone.

As per the guidelines of NMET especially for the bulk mineral commodities is 5 boreholes are to be drilled for the estimation of the resources, where the stratified bedded nature with regular habit of the formation.

The explored area KLB-23 block is exactly fitting into the above norms, and 5 boreholes are fixed in the block. Out of 5 boreholes 4 (23BH-01 to 23BH-04) are fixed at the four corners of the block clockwise from northwestern corner to the southwestern corner of the block, leaving 400m has area of influence. The last borehole drilled in the center of the block. The space between borehole 23BH-01 to 23BH-02 is 1281m, 23BH-02 to 23BH-03 is 1530m, 23BH-03 to 23BH-04 is 1214m and 23BH-04 to 23BH-01 is 1725m. From 23BH-01 to 23BH-05 is 1092m, 23BH-02 to 23BH-05 is 1035m, 23BH-03 to 23BH-05 is 960m and 23BH-04 to 23BH-05 1013m.

All the 5 boreholes are drilled to a depth of 45m, and are closed within the limestone horizon itself, meaning the limestone is continuing further below the 45m depth. Thickness of the limestone encountered across all the boreholes varies from 41 to 42m thick.

CaO content and the MgO of the limestone from core samples qualified for resource estimation are varying from 47.23% to 34.01% and 0.57to 1.27% respectively.

Cumulative Resources of 523.28 million tonnes (334 and 333 category) and Net Resource of 497.11 million tonnes (334 and 333 category) with weighted average CaO% of 37.98 is estimated in the Block.

Recommendations

i. The only recommendation for this block is that the limestone is continuing beyond the drilled depth of 45m. As per the previous work carried out by GSI for the geological, stratigraphic and other related studies it is estimated that the Sedam limestone member is the thickest member having 60m thick limestone horizon. Hence, further 15m more of limestone is still existing below the drilled depth.

ii. Out of total extent of 5 sqkm, extent of 2.46 sqkm is estimated with the Inferred Mineral Resources (333) of 261.15 million tonnes considering the area of influence of 400m from Borehole points and Reconnaissance Mineral Resource (334) of 262.12 million tonnes is estimated from the remaining extent of 2.54 sqkm outside the borehole influence.

iii. It is recommended to carryout infilling boreholes in 2.54 sqkm in order to upgrade the reconnaissance Mineral Resource (334) of 262.12 million tonnes to Inferred 333 category.

14. Expenditure

The project was executed with the total project cost of Rs 43,63,558/- (including GST).

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16. ACKNOWLEDGEMENTS

KIOCL Limited, Bangalore wish to place on record our gratefulness to

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- Technical Cum Cost Committee of National Mineral Exploration Trust, Ministry of Mines, Govt of Karnataka for the valuable technical guidance and encouragement for the Project.
- Office of the Deputy Commissioner, Kalburgi (Dist), Karnataka.
- Office of Deputy Director, Dept of Mines and Geology, Kalburgi, Karnataka.

17. LOCAL INDEX

Sl	Locality	Latitude	Longitude
1	Ganwar	16°54'34.55"N	76°49'17.30"E
2	Biral	16°54'55.61"N	76°54'18.45"E
3	Andola	16°57'7.26"N	76°50'11.96"E
4	Chamnoor	17° 0'28.98"N	76°55'20.83"E
5	Rajwal	16°58'58.29"N	76°56'4.34"E
6	Gudur S.Andola	16°59'26.94"N	76°50'0.81"E
7	Kulkunda	16°57'31.89"N	76°56'6.63"E
8	Jainapur	16°56'11.08"N	76°47'50.08"E
9	Balwadgi	16°59'55.92"N	76°58'39.91"E
10	Sugur N	16°55'10.33"N	77° 0'8.36"E
11	Kundanoor	17° 2'13.08"N	76°56'5.09"E
12	Channur	16°58'56.51"N	76°48'25.86"E
13	Shakapur	16°59'0.37"N	76°44'16.39"E
14	Kellur	16°56'52.71"N	76°46'42.07"E
15	Halgalda	16°56'44.60"N	76°44'27.27"E
16	Aurad	16°58'9.67"N	76°45'51.02"E
17	Aralahalli	16°47'18.99"N	76°47'55.42"E
18	Maddarki	16°48'11.36"N	76°46'32.26"E
19	Laknapur	16°50'11.23"N	76°46'57.10"E
20	Saladpur	16°47'4.26"N	76°50'40.14"E
21	Yalwar	16°53'39.42"N	76°44'42.30"E
22	Chigaralli	16°54'33.41"N	76°46'44.58"E
23	Sirwal	16°48'35.71"N	76°53'25.10"E
24	Butnal	17° 0'50.76"N	76°48'0.39"E
25	Gounahalli	17° 2'52.38"N	76°44'19.52"E
26	Janiwar	17° 2'14.36"N	76°43'8.71"E
27	Ravnoor	16°59'40.35"N	76°42'30.44"E

Annexure 01

Details of Bed Rock Samples (BRS) Collected During Detailed Geological Mapping (DGM)

Sl. No	Sample Nos	Easting	Northing	RL	Lithology
1	23BRS18	700448	1878410	417	Limestone Outcrop
2	23BRS22	700715	1877928	421	Limestone Outcrop
3	23BRS23	701294	1877500	421	Limestone Outcrop
4	23BRS19	701670	1876142	399	Limestone Outcrop
5	23BRS20	700755	1876661	410	Limestone Outcrop
6	23BRS21	701226	1876748	410	Limestone Outcrop
7	23BRS24	701892	1877093	407	Limestone Outcrop
8	23BRS25	701501	1877048	402	Limestone Outcrop
9	23BRS26	700412	1877154	417	Limestone Outcrop

ANNEXURE 02

CHEMICAL ANALYSIS REPORT OF BED ROCK SAMPLES (BRS)

KIOCL LIMITED

Mineral Exploration Laboratory

BFU, Panambur, Mangalore.

Ph: 0824 2403449, Email: bfupc@kioclltd.in

Sample : Kalburgi Limestone samples - 20BRS

Total no. of samples: 09

Sample received on : 16/06/2023

Block ID KIOCL_23_KA_KLB 11

Sample	LOI	CaO	MgO	SiO_2	Al_2O_3	Fe_2O_3	Na_2O	K_2O	P_2O_5
20BRS 18	35.54	43.22	1.16	15.62	0.86	1.31	0.062	0.046	0.108
20BRS 19	30.10	36.57	1.11	26.58	1.61	1.31	0.033	0.049	0.206
20BRS 20	38.23	46.04	1.20	10.21	0.45	1.40	0.010	0.039	0.131
20BRS 21	29.82	36.18	0.87	27.13	2.39	1.23	0.062	0.046	0.169
20BRS 22	38.51	45.24	0.99	10.37	0.63	1.43	0.033	0.048	0.087
20BRS 23	38.13	42.43	1.13	12.58	0.55	1.38	0.006	0.052	0.055
20BRS 24	35.75	45.00	0.81	13.72	2.06	1.07	0.022	0.042	0.185
20BRS 25	30.52	36.86	1.11	25.52	2.49	0.98	0.036	0.050	0.220
20BRS 26	27.66	33.98	1.06	31.44	2.40	1.29	0.024	0.069	0.112

Date: 05/01/2024

(Ravindra Babu)
Manager(PT)
रविन्द्र बाबु एम / RAVINDRA BABU M
प्रबंधक (पीटी) / Manager (PT)
केआईओसीएल लिमिटेड / KIOCL Limited
पणंबूर, मंगलूरु / Panambur, Mangaluru

KUDREMUKH

ANNEXURE 03

LITHOUNITWISE CHEMICAL ANALYSIS OF BED ROCK SAMPLES (BRS)

Sl. No.	Zone	Sample	Easting	Northing	Elevation	LOI	CaO	MgO	SiO_2	Al_2O_3	Fe_2O_3
1	**Out crop present in the Southern part of the block**	20BRS 21	701226	1876748	410	29.82	36.18	0.87	27.13	2.39	1.23
2		20BRS 23	701294	1877500	421	38.13	42.43	1.13	12.58	0.55	1.38
3		20BRS 25	701501	1877048	402	30.52	36.86	1.11	25.52	2.49	0.98
Average						**32.82**	**38.49**	**1.04**	**21.74**	**1.81**	**1.20**
4	**Isolated patches**	20BRS 18	700448	1878410	417	35.54	43.22	1.16	15.62	0.86	1.31
5		20BRS 19	701670	1876142	399	30.1	36.57	1.11	26.58	1.61	1.31
6		20BRS 20	700755	1876661	410	38.23	46.04	1.2	10.21	0.45	1.4
7		20BRS 22	700715	1877928	421	38.51	45.24	0.99	10.37	0.63	1.43
8		20BRS 24	701892	1877093	407	35.75	45	0.81	13.72	2.06	1.07
9		20BRS 26	700412	1877154	417	27.66	33.98	1.06	31.44	2.4	1.29
Average						**34.30**	41.68	1.06	17.99	1.34	1.30

KUDREMUKH

ANNEXURE 04

CHEMICAL ANALYSIS REPORT OF BOREHOLES SAMPLES

KIOCL Limited, Mineral Exploration Laboratory, BFU, Mangalore.

KALBURGI AMALGAMATED LIMESTONE BLOCK, 23BH-01 (42 Samples)

Meters		Lithology	Sample No.	Fe_2O_3	LOI	SiO_2	Al_2O_3	CaO	MgO	K_2O	SO_3	P_2O_5
1	3.5	Calcareous Material	23KLB-BH-01/01	7.86	24.51	32.46	7.19	24.95	1.33	0.290	0.023	0.252
3.5	5	Silty Soil	23KLB-BH-01/02	9.90	21.59	37.68	7.42	20.14	1.22	0.330	0.018	0.321
5	6	Massive Limestone	23KLB-BH-01/03	0.49	37.00	13.23	0.96	45.69	0.66	0.200	0.028	0.641
6	7	Massive Limestone	23KLB-BH-01/04	0.45	38.15	11.15	0.77	46.81	0.60	0.160	0.028	0.802
7	8	Massive Limestone	23KLB-BH-01/05	0.42	38.38	10.59	0.85	46.98	0.52	0.280	0.020	0.692
8	9	Massive Limestone	23KLB-BH-01/06	0.45	38.18	11.00	0.80	47.29	0.56	0.160	0.018	0.334
9	10	Calcareous Sludge	23KLB-BH-01/07	0.35	37.82	13.59	0.75	45.38	0.48	0.190	0.020	0.437
10	11	Massive Limestone	23KLB-BH-01/08	0.49	37.86	12.83	0.88	45.78	0.61	0.090	0.015	0.325
11	12	Massive Limestone	23KLB-BH-01/09	0.51	36.43	15.62	0.91	44.52	0.55	0.120	0.023	0.275
12	13	Massive Limestone	23KLB-BH-01/10	0.42	35.35	17.69	0.79	43.38	0.69	0.160	0.025	0.252
13	14	Massive Limestone	23KLB-BH-01/11	0.44	35.18	18.20	0.82	43.18	0.55	0.200	0.018	0.311
14	15	Massive Limestone	23KLB-BH-01/12	0.50	34.79	18.84	0.92	42.50	0.68	0.330	0.023	0.220
15	16	Massive Limestone	23KLB-BH-01/13	0.46	32.29	24.05	1.12	39.93	0.61	0.190	0.023	0.192
16	17	Massive Limestone	23KLB-BH-01/14	0.55	34.40	19.21	1.09	42.31	0.66	0.400	0.020	0.140
17	18	Massive Limestone	23KLB-BH-01/15	0.56	32.77	24.12	1.32	38.67	0.76	0.420	0.023	0.101
18	19	Massive Limestone	23KLB-BH-01/16	0.54	30.29	29.71	0.15	37.00	0.81	0.190	0.020	0.179
19	20	Massive Limestone	23KLB-BH-01/17	0.59	30.88	28.55	1.25	36.45	0.76	0.130	0.015	0.346
20	21	Massive Limestone	23KLB-BH-01/18	0.62	30.83	28.76	1.22	36.14	0.84	0.100	0.030	0.270
21	22	Massive Limestone	23KLB-BH-01/19	0.67	30.69	28.80	1.33	35.84	0.87	0.190	0.028	0.378
22	23	Massive Limestone	23KLB-BH-01/20	0.63	31.41	26.86	1.40	37.33	0.69	0.150	0.035	0.325
23	24	Massive Limestone	23KLB-BH-01/21	0.68	31.71	25.97	1.51	37.80	0.65	0.210	0.023	0.309
24	25	Massive Limestone	23KLB-BH-01/22	0.72	32.06	24.32	1.36	38.91	0.74	0.330	0.025	0.277
25	26	Massive Limestone	23KLB-BH-01/23	0.89	30.43	28.92	1.45	35.86	0.90	0.250	0.018	0.325
26	27	Massive Limestone	23KLB-BH-01/24	0.82	30.42	29.24	1.25	35.75	0.85	0.140	0.013	0.256
27	28	Massive Limestone	23KLB-BH-01/25	0.89	34.70	19.39	1.34	41.29	0.72	0.190	0.023	0.309
28	29	Massive Limestone	23KLB-BH-01/26	0.84	30.88	28.64	1.46	35.66	0.81	0.240	0.030	0.224
29	30	Massive Limestone	23KLB-BH-01/27	0.86	31.77	25.81	1.72	37.09	1.02	0.310	0.025	0.252
30	31	Massive Limestone	23KLB-BH-01/28	0.75	27.65	34.26	1.42	33.20	0.85	0.390	0.025	0.234
31	32	Massive Limestone	23KLB-BH-01/29	0.68	34.07	20.14	1.23	41.10	0.79	0.440	0.020	0.218
32	33	Massive Limestone	23KLB-BH-01/30	0.62	32.11	24.70	1.09	38.71	0.71	0.520	0.015	0.302
33	34	Massive Limestone	23KLB-BH-01/31	0.67	34.40	19.54	1.22	41.70	0.62	0.190	0.023	0.348
34	35	Massive Limestone	23KLB-BH-01/32	0.72	34.61	19.40	0.92	41.95	0.67	0.150	0.020	0.346
35	36	Massive Limestone	23KLB-BH-01/33	0.82	31.64	26.34	1.51	37.53	0.58	0.120	0.020	0.277
36	37	Massive Limestone	23KLB-BH-01/34	0.90	27.78	33.81	1.63	33.28	0.92	0.220	0.025	0.202
37	38	Massive Limestone	23KLB-BH-01/35	1.16	28.29	31.70	2.34	33.75	0.86	0.110	0.033	0.440
38	39	Massive Limestone	23KLB-BH-01/36	1.05	29.47	30.14	1.97	35.00	0.78	0.080	0.028	0.284
39	40	Massive Limestone	23KLB-BH-01/37	1.21	28.48	31.75	2.16	33.80	0.91	0.270	0.020	0.270
40	41	Massive Limestone	23KLB-BH-01/38	0.90	28.03	33.00	1.93	33.54	0.88	0.220	0.020	0.284
41	42	Massive Limestone	23KLB-BH-01/39	0.75	29.80	29.84	1.82	35.29	0.81	0.150	0.018	0.286
42	43	Massive Limestone	23KLB-BH-01/40	0.83	28.24	32.59	1.91	33.88	0.89	0.310	0.023	0.195
43	44	Massive Limestone	23KLB-BH-01/41	1.12	28.67	31.40	2.15	34.25	0.94	0.260	0.023	0.147
44	45	Massive Limestone	23KLB-BH-01/42	1.06	27.98	33.35	2.05	33.07	0.91	0.140	0.028	0.240

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ANNEXURE 04

CHEMICAL ANALYSIS REPORT OF BOREHOLES SAMPLES

KALBURGI AMALGAMATED LIMESTONE BLOCK, 23BH-02 (42 Samples)												
Meters		Lithology	Sample No.	Fe_2O_3	LOI	SiO_2	Al_2O_3	CaO	MgO	K_2O	SO_3	P_2O_5
2	4	Silty Soil	23KLB-BH-02/01	6.54	15.99	56.42	2.14	14.43	2.02	0.430	0.028	0.595
4	5	Masssive Limestone	23KLB-BH-02/02	2.44	33.42	19.30	0.92	41.35	0.63	0.290	0.023	0.275
5	6	Masssive Limestone	23KLB-BH-02/03	1.51	32.95	22.38	1.10	40.00	0.59	0.110	0.023	0.197
6	7	Masssive Limestone	23KLB-BH-02/04	0.89	31.57	26.19	1.25	37.95	0.74	0.140	0.025	0.220
7	8	Masssive Limestone	23KLB-BH-02/05	0.92	30.25	28.73	1.14	36.74	0.66	0.090	0.020	0.197
8	9	Masssive Limestone	23KLB-BH-02/06	0.86	30.60	28.91	1.18	36.43	0.55	0.200	0.023	0.181
9	10	Calcareous Sludge	23KLB-BH-02/07	0.96	29.90	29.64	1.23	36.04	0.71	0.290	0.025	0.211
10	11	Masssive Limestone	23KLB-BH-02/08	0.76	31.76	26.35	1.11	37.83	0.69	0.320	0.023	0.195
11	12	Masssive Limestone	23KLB-BH-02/09	0.70	31.69	26.92	1.18	37.45	0.63	0.140	0.030	0.197
12	13	Masssive Limestone	23KLB-BH-02/10	0.81	31.53	27.81	1.06	36.55	0.72	0.120	0.028	0.183
13	14	Masssive Limestone	23KLB-BH-02/11	0.90	28.96	32.00	1.22	34.62	0.91	0.190	0.028	0.190
14	15	Masssive Limestone	23KLB-BH-02/12	0.84	30.10	29.31	1.33	36.11	0.80	0.230	0.018	0.222
15	16	Masssive Limestone	23KLB-BH-02/13	0.72	30.76	28.35	1.42	36.67	0.71	0.200	0.020	0.211
16	17	Masssive Limestone	23KLB-BH-02/14	0.68	31.50	26.40	1.29	37.96	0.68	0.250	0.020	0.215
17	18	Masssive Limestone	23KLB-BH-02/15	0.97	27.71	34.29	1.47	33.02	0.84	0.300	0.025	0.252
18	19	Masssive Limestone	23KLB-BH-02/16	0.60	34.80	19.00	1.40	42.05	0.67	0.250	0.025	0.229
19	20	Masssive Limestone	23KLB-BH-02/17	1.02	27.96	33.92	1.40	33.16	0.79	0.300	0.018	0.208
20	21	Masssive Limestone	23KLB-BH-02/18	0.61	37.65	12.20	1.50	45.86	0.69	0.190	0.023	0.183
21	22	Masssive Limestone	23KLB-BH-02/19	0.96	25.22	39.51	1.52	30.45	0.81	0.250	0.020	0.158
22	23	Masssive Limestone	23KLB-BH-02/20	0.58	39.04	9.15	1.37	47.91	0.64	0.120	0.020	0.181
23	24	Masssive Limestone	23KLB-BH-02/21	0.67	34.33	19.75	1.16	41.84	0.74	0.060	0.023	0.252
24	25	Masssive Limestone	23KLB-BH-02/22	0.74	30.08	29.33	1.55	35.81	0.80	0.310	0.018	0.284
25	26	Masssive Limestone	23KLB-BH-02/23	0.86	27.18	34.65	2.22	32.19	0.88	0.720	0.030	0.252
26	27	Masssive Limestone	23KLB-BH-02/24	0.81	29.15	30.86	1.76	34.90	0.81	0.420	0.025	0.218
27	28	Masssive Limestone	23KLB-BH-02/25	0.80	29.37	30.45	1.84	35.10	0.90	0.390	0.020	0.202
28	29	Masssive Limestone	23KLB-BH-02/26	0.93	28.51	32.15	1.88	33.97	0.86	0.290	0.020	0.179
29	30	Masssive Limestone	23KLB-BH-02/27	0.83	29.06	30.95	1.84	34.85	0.85	0.310	0.013	0.252
30	31	Masssive Limestone	23KLB-BH-02/28	0.79	30.01	28.73	1.90	36.05	0.80	0.300	0.023	0.275
31	32	Masssive Limestone	23KLB-BH-02/29	1.00	28.41	32.24	1.93	33.72	0.89	0.350	0.028	0.252
32	33	Masssive Limestone	23KLB-BH-02/30	0.96	28.56	32.00	2.00	33.96	0.87	0.300	0.025	0.224
33	34	Masssive Limestone	23KLB-BH-02/31	0.92	28.70	31.64	1.96	34.41	0.77	0.290	0.023	0.229
34	35	Masssive Limestone	23KLB-BH-02/32	0.85	29.07	31.10	1.88	35.00	0.75	0.180	0.028	0.218
35	36	Masssive Limestone	23KLB-BH-02/33	0.90	28.39	33.24	1.36	33.75	0.86	0.110	0.023	0.208
36	37	Masssive Limestone	23KLB-BH-02/34	0.97	28.18	33.91	1.32	33.42	0.79	0.090	0.023	0.195
37	38	Masssive Limestone	23KLB-BH-02/35	0.76	29.64	30.19	1.42	35.67	0.74	0.120	0.020	0.275
38	39	Masssive Limestone	23KLB-BH-02/36	0.83	29.51	30.62	1.28	35.42	0.80	0.180	0.023	0.252
39	40	Masssive Limestone	23KLB-BH-02/37	0.70	30.09	29.15	1.34	36.51	0.75	0.160	0.015	0.252
40	41	Masssive Limestone	23KLB-BH-02/38	0.77	30.04	29.34	1.40	36.30	0.81	0.210	0.020	0.204
41	42	Masssive Limestone	23KLB-BH-02/39	0.91	28.77	32.49	1.36	34.13	0.87	0.220	0.028	0.156
42	43	Masssive Limestone	23KLB-BH-02/40	0.85	29.28	30.60	1.50	35.20	0.86	0.290	0.023	0.252
43	44	Masssive Limestone	23KLB-BH-02/41	0.76	30.80	28.00	1.29	36.90	0.74	0.160	0.023	0.211
44	45	Masssive Limestone	23KLB-BH-02/42	0.69	31.55	26.30	1.22	38.10	0.68	0.140	0.020	0.213

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ANNEXURE 04

CHEMICAL ANALYSIS REPORT OF BOREHOLES SAMPLES

KALBURGI AMALGAMATED LIMESTONE BLOCK, 23BH-03 (45 Samples)												
Meters		Lithology	Sample No.	Fe_2O_3	LOI	SiO_2	Al_2O_3	CaO	MgO	K_2O	SO_3	P_2O_5
0	0.4	Massive Limestone	23KLB-BH-03/01	4.68	25.35	32.79	5.00	28.91	1.41	0.370	0.020	0.197
0.4	1	Silty Soil	23KLB-BH-03/02	2.55	28.91	29.40	3.45	33.00	1.10	0.220	0.023	0.208
1	2.3	Massive Limestone	23KLB-BH-03/03	0.63	30.71	28.61	1.37	36.77	0.68	0.082	0.025	0.183
2.3	3.3	Calcareous Sludge	23KLB-BH-03/04	2.05	28.65	34.89	1.29	30.89	0.89	0.091	0.028	0.156
3.3	5	Massive Limestone	23KLB-BH-03/05	0.69	28.92	32.05	1.56	34.69	0.78	0.110	0.073	0.124
5	6	Massive Limestone	23KLB-BH-03/06	0.72	28.95	32.10	1.36	34.82	0.71	0.120	0.028	0.163
6	7	Massive Limestone	23KLB-BH-03/07	0.65	29.41	31.15	1.42	35.50	0.69	0.036	0.028	0.192
7	8	Massive Limestone	23KLB-BH-03/08	0.58	29.35	30.67	1.35	35.75	0.59	0.380	0.023	0.220
8	9	Massive Limestone	23KLB-BH-03/09	0.56	29.45	30.79	1.28	35.94	0.63	0.057	0.028	0.252
9	10	Massive Limestone	23KLB-BH-03/10	0.58	30.12	29.30	1.44	36.42	0.66	0.120	0.030	0.202
10	11	Calcareous Sludge	23KLB-BH-03/11	1.96	27.33	35.78	1.73	31.00	0.81	0.150	0.028	0.179
11	12	Massive Limestone	23KLB-BH-03/12	0.71	29.98	29.69	1.29	36.28	0.60	0.100	0.025	0.158
12	13	Massive Limestone	23KLB-BH-03/13	0.58	27.82	34.90	1.12	33.51	0.65	0.120	0.020	0.128
13	14	Calcareous Sludge	23KLB-BH-03/14	1.86	27.47	36.89	1.15	30.45	0.71	0.140	0.018	0.140
14	15	Massive Limestone	23KLB-BH-03/15	0.58	29.06	31.72	1.20	35.26	0.69	0.170	0.020	0.096
15	16	Massive Limestone	23KLB-BH-03/16	0.63	29.55	30.87	1.05	35.82	0.59	0.140	0.023	0.222
16	17	Calcareous Sludge	23KLB-BH-03/17	2.48	23.25	41.11	2.80	28.00	0.74	0.220	0.025	0.229
17	18	Massive Limestone	23KLB-BH-03/18	0.59	31.04	27.65	1.10	37.66	0.55	0.190	0.025	0.229
18	19	Massive Limestone	23KLB-BH-03/19	0.55	32.36	24.65	1.12	39.47	0.52	0.076	0.020	0.197
19	20	Massive Limestone	23KLB-BH-03/20	0.58	33.69	21.55	1.20	40.87	0.63	0.120	0.023	0.202
20	21	Massive Limestone	23KLB-BH-03/21	0.54	34.35	20.22	1.10	41.90	0.60	0.076	0.020	0.165
21	22	Massive Limestone	23KLB-BH-03/22	0.52	34.57	19.66	1.02	42.15	0.65	0.092	0.023	0.213
22	23	Massive Limestone	23KLB-BH-03/23	0.52	34.88	18.70	1.10	42.60	0.59	0.120	0.023	0.275
23	24	Massive Limestone	23KLB-BH-03/24	0.60	33.63	21.63	1.00	41.15	0.66	0.092	0.030	0.252
24	25	Massive Limestone	23KLB-BH-03/25	0.71	32.38	23.80	1.38	39.70	0.58	0.062	0.023	0.378
25	26	Massive Limestone	23KLB-BH-03/26	0.67	32.03	24.67	1.26	39.45	0.64	0.130	0.028	0.275
26	27	Massive Limestone	23KLB-BH-03/27	0.70	31.96	25.13	1.30	38.79	0.60	0.150	0.023	0.252
27	28	Massive Limestone	23KLB-BH-03/28	0.72	31.77	25.40	1.41	38.55	0.72	0.096	0.025	0.321
28	29	Massive Limestone	23KLB-BH-03/29	0.90	31.08	26.68	1.50	37.50	0.80	0.190	0.023	0.325
29	30	Massive Limestone	23KLB-BH-03/30	0.80	30.31	28.58	1.38	36.72	0.71	0.280	0.015	0.275
30	31	Massive Limestone	23KLB-BH-03/31	0.85	30.89	27.40	1.40	37.00	0.68	0.210	0.020	0.298
31	32	Massive Limestone	23KLB-BH-03/32	0.89	30.57	28.12	1.44	36.91	0.70	0.130	0.023	0.252
32	33	Massive Limestone	23KLB-BH-03/33	0.95	30.23	28.66	1.50	36.59	0.60	0.100	0.025	0.218
33	34	Massive Limestone	23KLB-BH-03/34	0.89	31.23	26.54	1.56	37.59	0.72	0.220	0.018	0.206
34	35	Massive Limestone	23KLB-BH-03/35	0.83	31.24	26.85	1.68	37.30	0.68	0.085	0.023	0.197
35	36	Massive Limestone	23KLB-BH-03/36	0.88	29.25	30.94	1.60	35.15	0.72	0.120	0.028	0.229
36	37	Massive Limestone	23KLB-BH-03/37	0.97	29.13	30.88	1.80	34.97	0.65	0.110	0.030	0.275
37	38	Massive Limestone	23KLB-BH-03/38	0.92	30.45	27.86	1.73	36.81	0.69	0.180	0.028	0.275
38	39	Massive Limestone	23KLB-BH-03/39	1.03	28.28	32.50	1.70	34.14	0.75	0.210	0.023	0.220
39	40	Massive Limestone	23KLB-BH-03/40	1.00	28.22	32.94	1.70	33.87	0.80	0.160	0.028	0.185
40	41	Massive Limestone	23KLB-BH-03/41	0.89	28.07	33.41	1.62	33.61	0.78	0.230	0.023	0.204
41	42	Massive Limestone	23KLB-BH-03/42	0.91	28.09	33.22	1.59	33.80	0.81	0.200	0.025	0.165
42	43	Massive Limestone	23KLB-BH-03/43	0.97	28.69	32.30	1.63	34.11	0.75	0.200	0.025	0.147
43	44	Massive Limestone	23KLB-BH-03/44	1.02	27.88	33.75	1.70	33.36	0.71	0.180	0.023	0.220
44	45	Massive Limestone	23KLB-BH-03/45	1.06	27.23	34.68	1.81	32.96	0.80	0.190	0.023	0.229

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ANNEXURE 04

CHEMICAL ANALYSIS REPORT OF BOREHOLES SAMPLES

KALBURGI AMALGAMATED LIMESTONE BLOCK, 23BH-04 (45 Samples)												
Meters		Lithology	Sample No.	Fe_2O_3	LOI	SiO_2	Al_2O_3	CaO	MgO	K_2O	SO_3	P_2O_5
0	0.3	Black Soil	23KLB-BH-04/01	12.97	15.05	41.36	11.27	14.27	2.75	0.650	0.015	0.595
0.3	1	Massive Limestone	23KLB-BH-04/02	0.60	39.56	8.27	0.82	48.39	0.66	0.140	0.025	0.481
1	2.3	Massive Limestone	23KLB-BH-04/03	0.55	37.49	12.82	0.80	46.07	0.73	0.140	0.025	0.378
2.3	4	Silty Soil	23KLB-BH-04/04	8.72	28.54	20.16	9.27	28.91	2.36	0.450	0.018	0.458
4	5	Massive Limestone	23KLB-BH-04/05	0.64	37.30	12.88	0.76	45.90	0.69	0.360	0.023	0.252
5	6	Massive Limestone	23KLB-BH-04/06	0.60	36.68	14.77	0.83	44.88	0.62	0.120	0.023	0.412
6	7	Massive Limestone	23KLB-BH-04/07	0.70	37.21	13.20	0.78	45.92	0.70	0.140	0.020	0.275
7	8	Calcareous Sludge	23KLB-BH-04/08	5.99	25.09	29.00	7.54	29.14	1.53	0.210	0.020	0.325
8	9	Massive Limestone	23KLB-BH-04/09	0.54	36.57	15.06	0.81	44.67	0.72	0.180	0.015	0.300
9	10	Massive Limestone	23KLB-BH-04/10	0.53	37.04	13.52	0.75	45.84	0.68	0.110	0.020	0.437
10	11	Massive Limestone	23KLB-BH-04/11	0.59	30.27	29.64	0.68	36.44	0.78	0.130	0.023	0.332
11	12	Calcareous Sludge	23KLB-BH-04/12	5.54	24.22	31.86	7.22	28.59	1.14	0.140	0.020	0.286
12	13	Massive Limestone	23KLB-BH-04/13	0.50	36.44	14.18	0.75	45.90	0.65	0.130	0.023	0.311
13	14	Massive Limestone	23KLB-BH-04/14	0.55	35.91	16.58	0.82	43.66	0.69	0.098	0.025	0.447
14	15	Massive Limestone	23KLB-BH-04/15	0.49	36.51	15.20	0.85	44.72	0.71	0.039	0.030	0.414
15	16	Massive Limestone	23KLB-BH-04/16	0.59	37.85	12.05	0.72	46.37	0.62	0.100	0.038	0.481
16	17	Massive Limestone	23KLB-BH-04/17	0.61	37.65	12.39	0.77	46.11	0.70	0.140	0.028	0.504
17	18	Massive Limestone	23KLB-BH-04/18	0.66	38.19	10.55	0.81	47.66	0.54	0.100	0.025	0.458
18	19	Massive Limestone	23KLB-BH-04/19	0.68	38.47	10.09	0.76	47.90	0.60	0.120	0.025	0.417
19	20	Massive Limestone	23KLB-BH-04/20	0.58	38.31	10.77	0.85	47.40	0.58	0.071	0.025	0.412
20	21	Massive Limestone	23KLB-BH-04/21	0.72	37.74	11.85	0.83	46.59	0.67	0.081	0.028	0.353
21	22	Massive Limestone	23KLB-BH-04/22	0.64	37.72	12.60	0.77	46.24	0.65	0.038	0.028	0.366
22	23	Massive Limestone	23KLB-BH-04/23	0.60	36.00	15.78	0.89	44.50	0.70	0.045	0.025	0.344
23	24	Massive Limestone	23KLB-BH-04/24	0.71	35.86	16.48	0.92	43.62	0.92	0.034	0.023	0.376
24	25	Massive Limestone	23KLB-BH-04/25	0.61	36.22	15.60	1.00	44.26	0.88	0.050	0.028	0.275
25	26	Massive Limestone	23KLB-BH-04/26	0.56	34.70	19.55	0.94	41.91	0.94	0.029	0.035	0.208
26	27	Massive Limestone	23KLB-BH-04/27	0.66	34.57	19.74	1.02	41.65	0.99	0.100	0.028	0.206
27	28	Massive Limestone	23KLB-BH-04/28	0.70	34.18	20.12	1.28	40.95	1.28	0.150	0.035	0.197
28	29	Massive Limestone	23KLB-BH-04/29	0.64	33.78	21.28	1.15	40.62	1.19	0.130	0.030	0.185
29	30	Massive Limestone	23KLB-BH-04/30	0.61	31.68	25.89	1.47	37.40	1.50	0.190	0.020	0.172
30	31	Massive Limestone	23KLB-BH-04/31	0.60	30.40	28.30	1.33	36.45	1.33	0.250	0.023	0.218
31	32	Massive Limestone	23KLB-BH-04/32	0.69	30.40	28.65	1.40	36.05	1.42	0.071	0.023	0.252
32	33	Massive Limestone	23KLB-BH-04/33	0.58	30.40	28.45	1.29	36.40	1.29	0.160	0.020	0.252
33	34	Massive Limestone	23KLB-BH-04/34	0.62	29.91	30.19	1.40	34.91	1.38	0.240	0.020	0.277
34	35	Massive Limestone	23KLB-BH-04/35	0.72	31.37	26.41	1.34	37.23	1.30	0.190	0.018	0.298
35	36	Massive Limestone	23KLB-BH-04/36	0.63	31.68	26.00	1.34	37.50	1.34	0.220	0.020	0.252
36	37	Massive Limestone	23KLB-BH-04/37	0.74	31.37	26.73	1.29	37.08	1.13	0.270	0.023	0.275
37	38	Massive Limestone	23KLB-BH-04/38	0.63	30.80	27.66	1.41	36.79	1.01	0.180	0.023	0.227
38	39	Massive Limestone	23KLB-BH-04/39	0.55	29.72	30.37	1.18	35.65	0.98	0.120	0.025	0.252
39	40	Massive Limestone	23KLB-BH-04/40	0.78	35.59	17.12	1.29	42.94	0.88	0.110	0.028	0.211
40	41	Massive Limestone	23KLB-BH-04/41	0.81	30.31	28.60	1.22	36.56	0.95	0.110	0.025	0.275
41	42	Massive Limestone	23KLB-BH-04/42	0.65	33.71	21.09	1.31	40.77	1.00	0.140	0.020	0.229
42	43	Massive Limestone	23KLB-BH-04/43	0.59	32.43	23.70	1.40	39.41	0.92	0.190	0.023	0.298
43	44	Massive Limestone	23KLB-BH-04/44	0.60	33.30	21.63	1.30	40.56	0.85	0.210	0.020	0.325
44	45	Massive Limestone	23KLB-BH-04/45	0.72	32.58	23.60	1.27	39.45	0.90	0.130	0.023	0.252

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ANNEXURE 04

CHEMICAL ANALYSIS REPORT OF BOREHOLES SAMPLES

KALBURGI AMALGAMATED LIMESTONE BLOCK, 23BH-05 (45 Samples)												
Meters		Lithology	Sample No.	Fe_2O_3	LOI	SiO_2	Al_2O_3	CaO	MgO	K_2O	SO_3	P_2O_5
0	1	Black Soil	23KLB-BH-05/01	14.31	14.82	40.28	13.05	12.54	2.66	0.610	0.018	0.550
1	2	Massive Limestone	23KLB-BH-05/02	0.48	33.51	21.93	0.96	41.15	0.69	0.061	0.025	0.252
2	3	Massive Limestone	23KLB-BH-05/03	0.58	30.20	29.31	0.95	36.88	0.72	0.012	0.028	0.172
3	4	Massive Limestone	23KLB-BH-05/04	0.60	33.34	22.35	0.90	40.79	0.67	0.110	0.023	0.149
4	5	Massive Limestone	23KLB-BH-05/05	0.65	30.26	29.20	0.95	36.71	0.73	0.220	0.030	0.252
5	6	Massive Limestone	23KLB-BH-05/06	0.71	29.84	30.15	1.00	35.93	0.83	0.077	0.020	0.252
6	7	Massive Limestone	23KLB-BH-05/07	0.75	30.99	27.80	1.05	37.13	0.88	0.110	0.023	0.208
7	8	Massive Limestone	23KLB-BH-05/08	0.70	31.00	27.15	0.97	37.83	0.80	0.100	0.025	0.275
8	9	Massive Limestone	23KLB-BH-05/09	0.75	30.79	28.05	0.93	37.29	0.75	0.230	0.030	0.252
9	10	Massive Limestone	23KLB-BH-05/10	0.89	31.38	26.44	1.12	38.17	0.68	0.160	0.045	0.229
10	11	Massive Limestone	23KLB-BH-05/11	0.69	32.07	24.70	1.15	39.33	0.65	0.170	0.023	0.204
11	12	Massive Limestone	23KLB-BH-05/12	0.70	29.51	30.92	1.12	35.62	0.73	0.120	0.025	0.167
12	13	Massive Limestone	23KLB-BH-05/13	0.57	31.12	26.86	1.28	38.00	0.78	0.088	0.023	0.149
13	14	Massive Limestone	23KLB-BH-05/14	0.64	30.02	29.48	1.22	36.26	0.84	0.120	0.023	0.229
14	15	Massive Limestone	23KLB-BH-05/15	0.70	31.34	26.71	1.25	37.89	0.72	0.100	0.035	0.275
15	16	Massive Limestone	23KLB-BH-05/16	0.73	29.86	30.70	1.31	35.17	0.80	0.190	0.028	0.275
16	17	Massive Limestone	23KLB-BH-05/17	0.80	33.65	21.00	1.28	40.90	0.66	0.180	0.040	0.366
17	18	Massive Limestone	23KLB-BH-05/18	0.74	33.61	21.10	1.15	41.26	0.70	0.230	0.030	0.229
18	19	Massive Limestone	23KLB-BH-05/19	0.85	30.74	27.71	1.23	37.08	0.80	0.310	0.028	0.256
19	20	Massive Limestone	23KLB-BH-05/20	0.81	33.25	21.00	1.61	40.86	0.65	0.400	0.043	0.321
20	21	Massive Limestone	23KLB-BH-05/21	0.77	33.95	20.10	1.44	41.52	0.60	0.290	0.038	0.252
21	22	Massive Limestone	23KLB-BH-05/22	0.73	33.37	21.65	1.20	40.88	0.57	0.180	0.040	0.275
22	23	Massive Limestone	23KLB-BH-05/23	0.94	28.89	31.60	1.57	34.69	0.79	0.350	0.028	0.183
23	24	Massive Limestone	23KLB-BH-05/24	1.06	28.81	31.25	1.82	34.55	0.81	0.610	0.038	0.080
24	25	Massive Limestone	23KLB-BH-05/25	1.00	28.43	32.00	1.69	34.28	0.85	0.450	0.023	0.140
25	26	Massive Limestone	23KLB-BH-05/26	0.90	29.43	30.05	1.65	35.45	0.83	0.400	0.025	0.165
26	27	Massive Limestone	23KLB-BH-05/27	0.94	28.26	32.75	1.58	34.12	0.88	0.330	0.020	0.160
27	28	Massive Limestone	23KLB-BH-05/28	0.85	29.69	29.47	1.60	35.84	0.80	0.420	0.023	0.188
28	29	Massive Limestone	23KLB-BH-05/29	1.08	27.54	34.05	1.79	33.00	0.90	0.360	0.015	0.195
29	30	Massive Limestone	23KLB-BH-05/30	1.00	28.01	32.96	2.00	33.50	0.93	0.430	0.020	0.174
30	31	Massive Limestone	23KLB-BH-05/31	0.95	28.90	31.00	1.90	34.75	0.86	0.450	0.023	0.135
31	32	Massive Limestone	23KLB-BH-05/32	1.20	27.84	33.12	1.81	33.50	0.81	0.520	0.035	0.103
32	33	Massive Limestone	23KLB-BH-05/33	0.90	28.83	31.56	1.66	34.69	0.78	0.260	0.025	0.137
33	34	Massive Limestone	23KLB-BH-05/34	0.95	28.06	32.95	1.54	34.05	0.89	0.200	0.028	0.149
34	35	Massive Limestone	23KLB-BH-05/35	1.14	26.87	36.15	1.22	32.09	0.93	0.140	0.025	0.185
35	36	Massive Limestone	23KLB-BH-05/36	0.76	29.63	30.43	1.12	35.79	0.80	0.100	0.020	0.160
36	37	Massive Limestone	23KLB-BH-05/37	0.70	30.42	28.64	1.14	36.94	0.71	0.100	0.020	0.213
37	38	Massive Limestone	23KLB-BH-05/38	0.71	29.50	30.72	1.20	35.75	0.78	0.092	0.018	0.151
38	39	Massive Limestone	23KLB-BH-05/39	0.78	29.05	31.45	1.12	35.40	0.72	0.120	0.023	0.188
39	40	Massive Limestone	23KLB-BH-05/40	0.71	29.80	29.66	1.43	36.20	0.80	0.170	0.023	0.220
40	41	Massive Limestone	23KLB-BH-05/41	0.66	30.25	28.58	1.29	36.95	0.71	0.280	0.030	0.218
41	42	Massive Limestone	23KLB-BH-05/42	1.10	31.66	25.70	1.17	38.42	0.69	0.140	0.025	0.163
42	43	Massive Limestone	23KLB-BH-05/43	0.70	32.24	24.35	1.09	39.50	0.66	0.200	0.020	0.151
43	44	Massive Limestone	23KLB-BH-05/44	0.68	33.34	21.84	1.15	41.00	0.68	0.110	0.020	0.190
44	45	Massive Limestone	23KLB-BH-05/45	0.61	35.55	16.95	1.06	43.78	0.59	0.140	0.023	0.215

Date: 3.1.24

KIOCL Limited * KUDREMUKH * Laboratory

(Ravindra Babu B)
Manager(PT)

ANNEXURE 05

INTERNAL CHECK SAMPLE ANALYSIS REPORT OF BOREHOLES SAMPLES

KIOCL Limited, Mineral Exploration Laboratory, BFU, Mangalore.

Internal Check Sample Analysis Results - KALB

Block No. 23

SL No.	Sample No.	Fe_2O_3	LOI	SiO_2	Al_2O_3	CaO	MgO	K_2O	P_2O_5	SO_3
1	23KLB-BH-01/05	0.46	38.27	10.42	0.80	47.14	0.56	0.300	0.710	0.015
2	23KLB-BH-01/17	0.64	30.92	28.66	1.18	36.28	0.80	0.140	0.366	0.020
3	23KLB-BH-01/31	0.69	34.24	19.42	1.26	41.58	0.60	0.200	0.366	0.020
4	23KLB-BH-01/38	0.95	28.23	32.77	2.00	33.38	0.90	0.240	0.275	0.015
5	23KLB-BH-02/04	0.88	31.64	26.08	1.20	37.77	0.76	0.160	0.229	0.020
6	23KLB-BH-02/12	0.86	29.94	29.55	1.30	35.92	0.84	0.240	0.252	0.020
7	23KLB-BH-02/20	0.54	38.88	9.20	1.32	48.06	0.66	0.100	0.206	0.025
8	23KLB-BH-02/31	0.98	28.82	31.46	1.88	34.32	0.80	0.320	0.275	0.025
9	23KLB-BH-02/40	0.80	29.38	30.48	1.56	35.11	0.84	0.320	0.275	0.028
10	23KLB-BH-03/07	0.60	29.54	31.28	1.46	35.36	0.75	0.040	0.137	0.035
11	23KLB-BH-03/19	0.58	32.48	24.77	1.10	39.28	0.48	0.080	0.137	0.023
12	23KLB-BH-03/27	0.68	32.11	25.28	1.26	38.80	0.60	0.160	0.321	0.023
13	23KLB-BH-03/34	0.80	31.05	26.66	1.60	37.66	0.76	0.220	0.229	0.020
14	23KLB-BH-03/41	0.78	27.88	33.28	1.60	33.46	0.80	0.240	0.229	0.028
15	23KLB-BH-04/06	0.62	36.51	14.61	0.78	45.02	0.66	0.140	0.458	0.030
16	23KLB-BH-04/14	0.56	35.78	16.50	1.80	43.52	0.66	0.100	0.504	0.030
17	23KLB-BH-04/26	0.50	34.82	19.52	0.96	42.06	0.88	0.030	0.275	0.030
18	23KLB-BH-04/42	0.62	33.85	21.20	1.28	40.56	0.94	0.120	0.252	0.023
19	23KLB-BH-05/04	0.58	33.42	22.32	0.88	40.92	0.66	0.120	0.183	0.015
20	23KLB-BH-05/15	0.75	31.44	26.60	1.32	37.66	0.70	0.100	0.321	0.025
21	23KLB-BH-05/28	0.88	29.76	29.60	1.55	35.65	0.74	0.460	0.229	0.015
22	23KLB-BH-05/36	0.80	29.83	30.30	1.15	35.62	0.80	0.120	0.206	0.020
23	23KLB-BH-05/44	0.66	33.25	21.98	1.10	40.84	0.66	0.100	0.229	0.025

Date: 3.1.24

(Ravindra Babu)
Manager(PT)

KIOCL Limited KUDREMUKH Laboratory

ANNEXURE 06

KUDREMUKH

COMPARISION OF PRIMARY CHECK SAMPLES AND INTERNAL CHECK SAMPLES ANALYSIS OF BOREHOLES

Sl No	Sample No	CaO			MgO			SiO2			Al2O3			Fe2O3			K2O			LOI			P2O5			SO3		
		PRI	INT	DIFF	PRI	INT	DIFF	PRI	INT	DIFF	PRI	INT	DIFF	PRI	INT	DIFF	PRI	INT	DIFF	PRI	INT	DIFF	PRI	INT	DIFF	PRI	INT	DIFF
1	23KLB-BH-01/05	46.98	47.14	0.16	0.52	0.56	0.04	10.59	10.42	-0.17	0.85	0.80	-0.05	0.42	0.46	0.04	0.28	0.30	0.02	38.38	38.27	-0.11	0.69	0.71	0.02	0.02	0.02	-0.01
2	23KLB-BH-01/17	36.45	36.28	-0.17	0.76	0.80	0.04	28.55	28.66	0.11	1.25	1.18	-0.07	0.59	0.64	0.05	0.13	0.14	0.01	30.88	30.92	0.04	0.35	0.37	0.02	0.02	0.02	0.01
3	23KLB-BH-01/31	41.70	41.58	-0.12	0.62	0.60	-0.02	19.54	19.42	-0.12	1.22	1.26	0.04	0.67	0.69	0.02	0.19	0.20	0.01	34.40	34.24	-0.16	0.35	0.37	0.02	0.02	0.02	0.00
4	23KLB-BH-01/38	33.54	33.38	-0.16	0.88	0.90	0.02	33.00	32.77	-0.23	1.93	2.00	0.07	0.90	0.95	0.05	0.22	0.24	0.02	28.03	28.23	0.20	0.28	0.27	-0.01	0.02	0.02	-0.01
5	23KLB-BH-02/04	37.95	37.77	-0.18	0.74	0.76	0.02	26.19	26.08	-0.11	1.25	1.20	-0.05	0.89	0.88	-0.01	0.14	0.16	0.02	31.57	31.64	0.07	0.22	0.23	0.01	0.03	0.02	-0.01
6	23KLB-BH-02/12	36.11	35.92	-0.19	0.80	0.84	0.04	29.31	29.55	0.24	1.33	1.30	-0.03	0.84	0.86	0.02	0.23	0.24	0.01	30.10	29.94	-0.16	0.22	0.25	0.03	0.02	0.02	0.00
7	23KLB-BH-02/20	47.91	48.06	0.15	0.64	0.66	0.02	9.15	9.20	0.05	1.37	1.32	-0.05	0.58	0.54	-0.04	0.12	0.10	-0.02	39.04	38.88	-0.16	0.18	0.21	0.03	0.02	0.03	0.01
8	23KLB-BH-02/31	34.41	34.32	-0.09	0.77	0.80	0.03	31.64	31.46	-0.18	1.96	1.88	-0.08	0.92	0.98	0.06	0.29	0.32	0.03	28.70	28.82	0.12	0.23	0.27	0.05	0.02	0.03	0.00
9	23KLB-BH-02/40	35.20	35.11	-0.09	0.86	0.84	-0.02	30.60	30.48	-0.12	1.50	1.56	0.06	0.85	0.80	-0.05	0.29	0.32	0.03	29.28	29.38	0.10	0.25	0.27	0.02	0.02	0.03	0.01
10	23KLB-BH-03/07	35.50	35.36	-0.14	0.69	0.75	0.06	31.15	31.28	0.13	1.42	1.46	0.04	0.65	0.60	-0.05	0.04	0.04	0.00	29.41	29.54	0.13	0.19	0.14	-0.05	0.03	0.04	0.01
11	23KLB-BH-03/19	39.47	39.28	-0.19	0.52	0.48	-0.04	24.65	24.77	0.12	1.12	1.10	-0.02	0.55	0.58	0.03	0.08	0.08	0.00	32.36	32.48	0.12	0.20	0.14	-0.06	0.02	0.02	0.00
12	23KLB-BH-03/27	38.79	38.80	0.01	0.60	0.60	0.00	25.13	25.28	0.15	1.30	1.26	-0.04	0.70	0.68	-0.02	0.15	0.16	0.01	31.96	32.11	0.15	0.25	0.32	0.07	0.02	0.02	0.00
13	23KLB-BH-03/34	37.59	37.66	0.07	0.72	0.76	0.04	26.54	26.66	0.12	1.56	1.60	0.04	0.89	0.80	-0.09	0.22	0.22	0.00	31.23	31.05	-0.18	0.21	0.23	0.02	0.02	0.02	0.00
14	23KLB-BH-03/41	33.61	33.46	-0.15	0.78	0.80	0.02	33.41	33.28	-0.13	1.62	1.60	-0.02	0.89	0.78	-0.11	0.23	0.24	0.01	28.07	27.88	-0.19	0.20	0.23	0.03	0.02	0.03	0.01
15	23KLB-BH-04/06	44.88	45.02	0.14	0.62	0.66	0.04	14.77	14.61	-0.16	0.83	0.78	-0.05	0.60	0.62	0.02	0.12	0.14	0.02	36.68	36.51	-0.17	0.41	0.46	0.05	0.02	0.03	0.01
16	23KLB-BH-04/14	43.66	43.52	-0.14	0.69	0.66	-0.03	16.58	16.50	-0.08	0.82	1.80	0.98	0.55	0.56	0.01	0.10	0.10	0.00	35.91	35.78	-0.13	0.45	0.50	0.06	0.03	0.03	0.01
17	23KLB-BH-04/26	41.91	42.06	0.15	0.94	0.88	-0.06	19.55	19.52	-0.03	0.94	0.96	0.02	0.56	0.50	-0.06	0.03	0.03	0.00	34.70	34.82	0.12	0.21	0.27	0.07	0.04	0.03	-0.01
18	23KLB-BH-04/42	40.77	40.56	-0.21	1.00	0.94	-0.06	21.09	21.20	0.11	1.31	1.28	-0.03	0.65	0.62	-0.03	0.14	0.12	-0.02	33.71	33.85	0.14	0.23	0.25	0.02	0.02	0.02	0.00
19	23KLB-BH-05/04	40.79	40.92	0.13	0.67	0.66	-0.01	22.35	22.32	-0.03	0.90	0.88	-0.02	0.60	0.58	-0.02	0.11	0.12	0.01	33.34	33.42	0.08	0.15	0.18	0.03	0.02	0.02	-0.01
20	23KLB-BH-05/15	37.89	37.66	-0.23	0.72	0.70	-0.02	26.71	26.60	-0.11	1.25	1.32	0.07	0.70	0.75	0.05	0.10	0.10	0.00	31.34	31.44	0.10	0.27	0.32	0.05	0.04	0.03	-0.01
21	23KLB-BH-05/28	35.84	35.65	-0.19	0.80	0.74	-0.06	29.47	29.60	0.13	1.60	1.55	-0.05	0.85	0.88	0.03	0.42	0.46	0.04	29.69	29.76	0.07	0.19	0.23	0.04	0.02	0.02	-0.01
22	23KLB-BH-05/36	35.79	35.62	-0.17	0.80	0.80	0.00	30.43	30.30	-0.13	1.12	1.15	0.03	0.76	0.80	0.04	0.10	0.12	0.02	29.63	29.83	0.20	0.16	0.21	0.05	0.02	0.02	0.00
23	23KLB-BH-05/44	41.00	40.84	-0.16	0.68	0.66	-0.02	21.84	21.98	0.14	1.15	1.10	-0.05	0.68	0.66	-0.02	0.11	0.10	-0.01	33.34	33.25	-0.09	0.19	0.23	0.04	0.02	0.03	0.01

KUDREMUKH

ANNEXURE 07

EXTERNAL CHECK SAMPLE ANALYSIS REPORT OF BOREHOLES

SUPERINTENDENCE COMPANY OF INDIA PRIVATE LIMITED

A NAME IN QUALITY CONTROL

LABORATORY :

PLOT NO. Y-23, BLOCK-EP, SECTOR-V, SALT LAKE CITY, KOLKATA-700 091

✆ : (033) 2357-4671/ 4681 / 5039 / 5042 • Fax : (033) 2357- 4806

E-mail : supind2019@gmail.com / supind50@yahoo.co.in

Website : www.superintendencecoindia.com

GSTIN : 19AAECS3740C2ZJ

(An ISO 9001 : 2015 Certified)

TC-8066

TEST REPORT

Form No.: SUP/T/7.8/F1
Issue date: 06.02.2019
Amend – 1 dt. 02.05.2019

Name & Address of Customer : KIOCL LIMITED
II Block, Koramangala, Bengaluru – 560 034

Sample forwarding letter No. & Date : KIOCL/TS/F-757/C-910/1327 dt.01.07.2023
Date of receipt of sample : 22.12.2023
Test performed on : 22.12.2023 to 03.01.2024
Material: : Lime Stone

ULR-TC806624000000002F

Test Report No: N-1036 dated: 03.01.2024

I. Chemical Testing

1. Ores & Minerals

Sl. No.	Specific Test Performed	Test Method Specification against which tests are performed	Test Result					
			23KLB-BH-01/05	23KLB-BH-01/17	23KLB-BH-01/31	23KLB-BH-01/38	23KLB-BH-02/04	23KLB-BH-02/12
		IS: 1760	16	17	18	19	20	21
1.	SiO_2%	(P-II)/1991, RA-2017	9.72	25.70	16.04	27.54	23.67	25.60
2.	CaO%	(P-III)/1992, RA-2017	49.38	39.61	45.29	36.88	40.26	39.71
3.	MgO%		0.10	0.40	0.20	0.60	0.70	0.10
4.	Fe_2O_3%		0.54	1.23	0.72	1.47	0.44	0.54
5.	Al_2O_3%		0.91	1.11	1.51	3.11	1.23	1.23
6.	K_2O%	IS: 9497/1980 RA-2015	0.112	0.195	0.314	0.544	0.305	0.291
7.	Na_2O%		0.235	0.304	0.389	0.404	0.304	0.305
8.	L.O.I%	IS: 1760 (P-I)/1991 RA-2017	38.67	30.96	34.74	28.22	31.85	31.11

Tested by:
Z. Haque, D. S. Ghosh, P. Sen

Authorised Signatory
S. Akuli
(Technical Manager)

Continued in page-------06

Note : 1) This report refers to the values obtained at the time of testing and results relate to the items tested.
2) This Report shall not be reproduced in part or full without written permission of the management.
3) Liability for return of samples ceases after 15 days from the date of test report.

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ANNEXURE 07

EXTERNAL CHECK SAMPLE ANALYSIS REPORT OF BOREHOLES

SUPERINTENDENCE COMPANY OF INDIA PRIVATE LIMITED

A NAME IN QUALITY CONTROL

LABORATORY :

PLOT NO. Y-23, BLOCK-EP, SECTOR-V, SALT LAKE CITY, KOLKATA-700 091

✆ : (033) 2357-4671/ 4681 / 5039 / 5042 • Fax : (033) 2357- 4806

E-mail : supind2019@gmail.com / supind50@yahoo.co.in

Website : www.superintendencecoindia.com

GSTIN : 19AAECS3740C2ZJ

(An ISO 9001 : 2015 Certified)

TC-8066

Form No.: SUP/T/7.8/F1
Issue date: 06.02.2019
Amend – 1 dt. 02.05.2019

TEST REPORT

Name & Address of Customer : KIOCL LIMITED
II Block, Koramangala, Bengaluru – 560 034

Sample forwarding letter No. & Date : KIOCL/TS/F-757/C-910/1327 dt.01.07.2023
Date of receipt of sample : 22.12.2023
Test performed on : 22.12.2023 to 03.01.2024
Material: : Lime Stone

ULR-TC806624000000002F

Test Report No: N-1036 dated: 03.01.2024

I. Chemical Testing

1. Ores & Minerals

Sl. No.	Specific Test Performed	Test Method Specification against which tests are performed IS: 1760	Test Result					
			23KLB-BH-02/20	23KLB-BH-02/31	23KLB-BH-02/40	23KLB-BH-03/07	23KLB-BH-03/19	23KLB-BH-03/27
			22	23	24	25	26	27
1.	SiO_2%	(P-II)/1991, RA-2017	17.41	28.38	27.59	29.12	21.61	19.08
2.	CaO%	(P-III)/1992, RA-2017	43.90	36.89	38.02	37.21	42.20	41.54
3.	MgO%		0.10	0.40	0.30	0.40	0.33	2.88
4.	Fe_2O_3%		0.75	0.89	0.86	0.62	0.54	0.63
5.	Al_2O_3%		2.15	2.67	1.68	1.66	1.24	1.03
6.	K_2O%	IS: 9497/1980 RA-2015	0.343	0.510	0.369	0.347	0.202	0.278
7.	Na_2O%		0.363	0.370	0.328	0.270	0.167	0.220
8.	L.O.I%	IS: 1760 (P-I)/1991 RA-2017	33.92	28.82	30.08	29.57	33.25	33.76

Tested by:

Z. Haque, D. S. Ghosh, P. Sen

Authorised Signatory

S. Akuli
(Technical Manager)

Continued in page------08

Note : 1) This report refers to the values obtained at the time of testing and results relate to the items tested.
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SUPIND
A NAME IN QUALITY CONTROL

SUPERINTENDENCE COMPANY OF INDIA PRIVATE LIMITED

LABORATORY :
PLOT NO. Y-23, BLOCK-EP, SECTOR V, SALT LAKE CITY, KOLKATA-700 091
✆ : (033) 2357-4671/ 4681 / 5039 / 5042 • Fax : (033) 2357- 4806
E-mail : supind2019@gmail.com / supind50@yahoo.co.in
Website : www.superintendencecoindia.com
GSTIN : 19AAECS3740C2ZJ

TC-8066

URS UKAS
(An ISO 9001 : 2015 Certified)

TEST REPORT

Form No.: SUP/T/7.8/F1
Issue date: 06.02.2019
Amend – 1 dt. 02.05.2019

Name & Address of Customer : KIOCL LIMITED
II Block, Koramangala, Bengaluru – 560 034

Sample forwarding letter No. & Date : KIOCL/TS/F-757/C-910/1327 dt.01.07.2023
Date of receipt of sample : 22.12.2023
Test performed on : 22.12.2023 to 03.01.2024
Material: : Lime Stone

ULR-TC806624000000002F

Test Report No: N-1036 dated: 03.01.2024

I. Chemical Testing

1. Ores & Minerals

Sl. No.	Specific Test Performed	Test Method Specification against which tests are performed IS: 1760	Test Result					
			23KLB-BH-03/34	23KLB-BH-03/41	23KLB-BH-04/06	23KLB-BH-04/14	23KLB-BH-04/26	23KLB-BH-04/42
			28	29	30	31	32	33
1.	SiO_2%	(P-II)/1991, RA-2017	24.00	29.32	12.76	14.63	17.85	20.85
2.	CaO%	(P-III)/1992, RA-2017	40.39	36.11	47.25	43.75	44.27	40.78
3.	MgO%		0.60	1.20	0.20	0.40	0.30	1.01
4.	Fe_2O_3%		0.68	0.89	0.50	0.54	0.68	1.26
5.	Al_2O_3%		1.51	2.11	1.15	1.50	1.16	2.24
6.	K_2O%	IS: 9497/1980 RA-2015	0.319	0.448	0.151	0.284	0.279	0.306
7.	Na_2O%		0.232	0.245	0.190	0.210	0.224	0.242
8.	L.O.I%	IS: 1760 (P-I)/1991 RA-2017	31.53	29.05	37.46	37.08	34.84	32.62

Tested by:
Z. Haque, D. S. Ghosh, P. Sen

Authorised Signatory
S. Akuli
(Technical Manager)

Continued in page------10

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ANNEXURE 07

EXTERNAL CHECK SAMPLE ANALYSIS REPORT OF BOREHOLES

SUPERINTENDENCE COMPANY OF INDIA PRIVATE LIMITED
A NAME IN QUALITY CONTROL
LABORATORY :
PLOT NO. Y-23, BLOCK-EP, SECTOR-V, SALT LAKE CITY, KOLKATA-700 091
✆ : (033) 2357-4671/ 4681 / 5039 / 5042 • Fax : (033) 2357- 4806
E-mail : supind2019@gmail.com / supind50@yahoo.co.in
Website : www.superintendencecoindia.com
GSTIN : 19AAECS3740C2ZJ
TC-8066
(An ISO 9001 : 2015 Certified)

TEST REPORT

Form No.: SUP/T/7.8/F1
Issue date: 06.02.2019
Amend – 1 dt. 02.05.2019

Name & Address of Customer : KIOCL LIMITED
II Block, Koramangala, Bengaluru – 560 034

Sample forwarding letter No. & Date : KIOCL/TS/F-757/C-910/1327 dt.01.07.2023
Date of receipt of sample : 22.12.2023
Test performed on : 22.12.2023 to 03.01.2024
Material: : Lime Stone

ULR-TC806624000000002F

Test Report No: N-1036 dated: 03.01.2024

I. Chemical Testing

1. Ores & Minerals

Sl. No.	Specific Test Performed	Test Method Specification against which tests are performed IS: 1760	Test Result				
			23KLB-BH-05/04	23KLB-BH-05/15	23KLB-BH-05/28	23KLB-BH-05/36	23KLB-BH-05/44
			34	35	36	37	38
1.	SiO_2%	(P-II)/1991, RA-2017	21.38	33.21	27.27	27.95	19.92
2.	CaO%	(P-III)/1992, RA-2017	41.33	41.19	38.14	38.43	43.15
3.	MgO%		0.60	0.20	0.50	0.10	0.20
4.	Fe_2O_3%		0.68	0.62	0.75	0.68	0.58
5.	Al_2O_3%		1.12	1.64	1.81	1.14	1.37
6.	K_2O%	IS: 9497/1980 RA-2015	0.214	0.306	0.341	0.334	0.249
7.	Na_2O%		0.183	0.252	0.301	0.304	0.208
8.	L.O.I%	IS: 1760 (P-I)/1991 RA-2017	33.79	31.90	30.10	30.23	33.63

Tested by:
Z. Haque, D. S. Ghosh, P. Sen

Authorised Signatory
S. Akuli
(Technical Manager)

Continued in page ——12

Note : 1) This report refers to the values obtained at the time of testing and results relate to the items tested.
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ANNEXURE 08

COMPARISION OF PRIMARY CHECK SAMPLES AND EXTERNAL CHECK SAMPLES ANALYSIS OF BOREHOLES

Sl.No	Sample No.	Fe_2O_3			LOI			SiO_2			Al_2O_3			CaO			MgO			K_2O			SO_3			P_2O_5		
		PRI	EXT	DIFF	PRI	EXT	DIFF	PRI	EXT	DIFF	PRI	EXT	DIFF	PRI	EXT	DIFF	PRI	EXT	DIFF	PRI	EXT	DIFF	PRI	EXT	DIFF	PRI	EXT	DIFF
1	23KLB-BH-01/05	0.42	0.54	0.12	38.38	38.67	0.29	10.59	9.72	-0.87	0.85	0.91	0.06	46.98	49.38	2.4	0.52	0.1	-0.42	0.280	0.112	-0.168	0.020	0.143	0.123	0.692	0.055	-0.637
2	23KLB-BH-01/17	0.59	1.23	0.64	30.88	30.96	0.08	28.55	25.7	-2.85	1.25	1.11	-0.14	36.45	39.61	3.16	0.76	0.4	-0.36	0.130	0.195	0.065	0.015	0.208	0.193	0.346	0.051	-0.295
3	23KLB-BH-01/31	0.67	0.72	0.05	34.40	34.74	0.34	19.54	16.04	-3.5	1.22	1.51	0.29	41.70	45.29	3.59	0.62	0.2	-0.42	0.190	0.314	0.124	0.023	0.218	0.196	0.348	0.032	-0.316
4	23KLB-BH-01/38	0.90	1.47	0.57	28.03	28.22	0.19	33.00	27.54	-5.46	1.93	3.11	1.18	33.54	36.88	3.34	0.88	0.6	-0.28	0.220	0.544	0.324	0.020	0.354	0.334	0.284	0.031	-0.253
5	23KLB-BH-02/04	0.89	0.44	-0.45	31.57	31.85	0.28	26.19	23.67	-2.52	1.25	1.23	-0.02	37.95	40.26	2.31	0.74	0.70	-0.04	0.140	0.305	0.165	0.025	0.060	0.035	0.220	0.046	-0.174
6	23KLB-BH-02/12	0.84	0.54	-0.3	30.10	31.11	1.01	29.31	25.6	-3.71	1.33	1.23	-0.1	36.11	39.71	3.6	0.80	0.10	-0.7	0.230	0.291	0.061	0.018	0.490	0.473	0.222	0.044	-0.178
7	23KLB-BH-02/20	0.58	0.75	0.17	39.04	33.92	-5.12	9.15	17.41	8.26	1.37	2.15	0.78	47.91	43.9	-4.01	0.64	0.1	-0.54	0.120	0.343	0.223	0.020	0.330	0.310	0.181	0.034	-0.147
8	23KLB-BH-02/31	0.92	0.89	-0.03	28.70	28.82	0.12	31.64	28.38	-3.26	1.96	2.67	0.71	34.41	36.89	2.48	0.77	0.4	-0.37	0.290	0.510	0.220	0.023	0.333	0.311	0.229	0.053	-0.176
9	23KLB-BH-02/40	0.85	0.86	0.01	29.28	30.08	0.80	30.60	27.59	-3.01	1.50	1.68	0.18	35.20	38.02	2.82	0.86	0.3	-0.56	0.290	0.369	0.079	0.023	0.243	0.221	0.252	0.054	-0.198
10	23KLB-BH-03/07	0.65	0.62	-0.03	29.41	29.57	0.16	31.15	29.12	-2.03	1.42	1.66	0.24	35.50	37.21	1.71	0.69	0.4	-0.29	0.036	0.347	0.311	0.028	0.330	0.303	0.192	0.058	-0.134
11	23KLB-BH-03/19	0.55	0.54	-0.01	32.36	33.25	0.89	24.65	21.61	-3.04	1.12	1.24	0.12	39.47	42.20	2.73	0.52	0.33	-0.19	0.076	0.202	0.126	0.020	0.250	0.230	0.197	0.031	-0.166
12	23KLB-BH-03/27	0.70	0.63	-0.07	31.96	33.76	1.80	25.13	19.08	-6.05	1.30	1.03	-0.27	38.79	41.54	2.75	0.60	2.88	2.28	0.150	0.278	0.128	0.023	0.260	0.238	0.252	0.03	-0.222
13	23KLB-BH-03/34	0.89	0.68	-0.21	31.23	31.53	0.30	26.54	24	-2.54	1.56	1.51	-0.05	37.59	40.39	2.8	0.72	0.6	-0.12	0.220	0.319	0.099	0.018	0.310	0.293	0.206	0.034	-0.172
14	23KLB-BH-03/41	0.89	0.89	0	28.07	29.05	0.98	33.41	29.32	-4.09	1.62	2.11	0.49	33.61	36.11	2.5	0.78	1.2	0.42	0.230	0.448	0.218	0.023	0.183	0.161	0.204	0.083	-0.121
15	23KLB-BH-04/06	0.60	0.50	-0.1	36.68	37.46	0.78	14.77	12.76	-2.01	0.83	1.15	0.32	44.88	47.25	2.37	0.62	0.2	-0.42	0.120	0.151	0.031	0.023	0.170	0.148	0.412	0.022	-0.390
16	23KLB-BH-04/14	0.55	0.54	-0.01	35.91	37.08	1.17	16.58	14.63	-1.95	0.82	1.5	0.68	43.66	43.75	0.09	0.69	0.40	-0.29	0.098	0.284	0.186	0.025	0.190	0.165	0.447	0.023	-0.424
17	23KLB-BH-04/26	0.56	0.68	0.12	34.70	34.84	0.14	19.55	17.85	-1.7	0.94	1.16	0.22	41.91	44.27	2.36	0.94	0.3	-0.64	0.029	0.279	0.250	0.035	0.130	0.095	0.208	0.059	-0.149
18	23KLB-BH-04/42	0.65	1.26	0.61	33.71	32.62	-1.09	21.09	20.85	-0.24	1.31	2.24	0.93	40.77	40.78	0.01	1.00	1.01	0.01	0.140	0.306	0.166	0.020	0.333	0.313	0.229	0.067	-0.162
19	23KLB-BH-05/04	0.60	0.68	0.08	33.34	33.79	0.45	22.35	21.38	-0.97	0.90	1.12	0.22	40.79	41.33	0.54	0.67	0.6	-0.07	0.110	0.214	0.104	0.023	0.137	0.115	0.149	0.067	-0.082
20	23KLB-BH-05/15	0.70	0.62	-0.08	31.34	31.90	0.56	26.71	33.21	6.5	1.25	1.64	0.39	37.89	41.19	3.3	0.72	0.20	-0.52	0.100	0.306	0.206	0.035	0.193	0.158	0.275	0.031	-0.244
21	23KLB-BH-05/28	0.85	0.75	-0.1	29.69	30.10	0.41	29.47	27.27	-2.2	1.60	1.81	0.21	35.84	38.14	2.3	0.80	0.50	-0.3	0.420	0.341	-0.079	0.023	0.369	0.347	0.188	0.025	-0.163
22	23KLB-BH-05/36	0.76	0.68	-0.08	29.63	30.23	0.60	30.43	27.95	-2.48	1.12	1.14	0.02	35.79	38.43	2.64	0.80	0.10	-0.7	0.100	0.334	0.234	0.020	0.356	0.336	0.160	0.082	-0.078
23	23KLB-BH-05/44	0.68	0.58	-0.1	33.34	33.63	0.29	21.84	19.92	-1.92	1.15	1.37	0.22	41.00	43.15	2.15	0.68	0.2	-0.48	0.110	0.249	0.139	0.020	0.393	0.373	0.190	0.033	-0.157

ANNEXURE 09

NABL certificate of Mineral Exploration Laboratory of KIOCL Ltd.

National Accreditation Board for Testing and Calibration Laboratories

NABL

CERTIFICATE OF ACCREDITATION

KIOCL LIMITED - PROCESS CONTROL LABORATORY

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

PANAMBUR, MANGALORE, DAKSHIN KANNAD, KARNATAKA, INDIA

in the field of

TESTING

Certificate Number: TC-10525

Issue Date: 13/04/2022 **Valid Until:** 12/04/2024

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 : KIOCL Limited

Signed for and on behalf of NABL

N. Venkateswaran
Chief Executive Officer

ANNEXURE 09

NABL certificate of Mineral Exploration Laboratory of KIOCL Ltd.

National Accreditation Board for Testing and Calibration Laboratories

SCOPE OF ACCREDITATION

Laboratory Name :	KIOCL LIMITED - PROCESS CONTROL LABORATORY, PANAMBUR, MANGALORE, DAKSHIN KANNAD, KARNATAKA, INDIA		
Accreditation Standard	ISO/IEC 17025:2017		
Certificate Number	TC-10525	**Page No**	1 of 2
Validity	13/04/2022 to 12/04/2024	**Last Amended on**	-

S.No	Discipline / Group	Materials or Products tested	Component, parameter or characteristic tested / Specific Test Performed / Tests or type of tests performed	Test Method Specification against which tests are performed and / or the techniques / equipment used
Permanent Facility				
1	CHEMICAL- ORES & MINERALS	Alumino Silicate Refractory material	Potassium as K2O	IS 12107 (Part 9): 1987 RA: 2017
2	CHEMICAL- ORES & MINERALS	Alumino Silicate Refractory material	Sodium as Na2O	IS 12107 (Part 9): 1987 RA: 2017
3	CHEMICAL- ORES & MINERALS	Alumino Silicate Refractory material	Alumina as Al2O3	IS 12107(Part 3)
4	CHEMICAL- ORES & MINERALS	Alumino Silicate Refractory material	Ferric Oxide as Fe2O3	IS 12107 (Part 6): 1987 RA: 2017
5	CHEMICAL- ORES & MINERALS	Alumino Silicate Refractory material	Loss on Ignition as LOI	IS 12107 (Part 1): 1987 RA: 2017
6	CHEMICAL- ORES & MINERALS	Alumino Silicate Refractory material	Silica as SiO2	IS 12107 (Part 2): 1987 RA: 2017
7	CHEMICAL- ORES & MINERALS	Alumino Silicate Refractory material	Titanium as TiO2	IS 12107 (Part 5): 1987 RA: 2017
8	CHEMICAL- ORES & MINERALS	Bauxite Ore	Alumina as Al2O3	IS 2000 (Part 3): 1985 RA: 2017
9	CHEMICAL- ORES & MINERALS	Bauxite Ore	Ferric Oxide as Fe2O3	IS 2000 (Part 4): 1985 RA: 2017
10	CHEMICAL- ORES & MINERALS	Bauxite ore	Loss Of Ignition as LOI	IS 2000 (Part 1): 1985 RA: 2017
11	CHEMICAL- ORES & MINERALS	Bauxite Ore	Silica as SiO2	IS 2000 (Part 2): 1985 RA: 2017
12	CHEMICAL- ORES & MINERALS	Bauxite Ore	Titanium as TiO2	IS 2000 (Part 5): 1985 RA: 2017
13	CHEMICAL- ORES & MINERALS	Dolomite	Alumina as Al2O3	IS 1760 (Part 3): 1992 RA: 2017
14	CHEMICAL- ORES & MINERALS	Dolomite	Calcium as CaO	IS 1760 (Part 3): 1992 RA: 2017
15	CHEMICAL- ORES & MINERALS	Dolomite	Ferric Oxide as Fe2O3	IS 1760 (Part 3): 1992 RA: 2017
16	CHEMICAL- ORES & MINERALS	Dolomite	Loss on Ignition as LOI	IS 1760 (Part 1): 1991 RA: 2017
17	CHEMICAL- ORES & MINERALS	Dolomite	Magnesium as MgO	IS 1760 (Part 3): 1992 RA: 2017
18	CHEMICAL- ORES & MINERALS	Dolomite	Silica as SiO2	IS 1760 (Part 2): 1991 RA: 2017

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ANNEXURE 09

NABL certificate of Mineral Exploration Laboratory of KIOCL Ltd.

National Accreditation Board for Testing and Calibration Laboratories

SCOPE OF ACCREDITATION

Laboratory Name :	KIOCL LIMITED - PROCESS CONTROL LABORATORY, PANAMBUR, MANGALORE, DAKSHIN KANNAD, KARNATAKA, INDIA		
Accreditation Standard	ISO/IEC 17025:2017		
Certificate Number	TC-10525	**Page No**	2 of 2
Validity	13/04/2022 to 12/04/2024	**Last Amended on**	-

S.No	Discipline / Group	Materials or Products tested	Component, parameter or characteristic tested / Specific Test Performed / Tests or type of tests performed	Test Method Specification against which tests are performed and / or the techniques / equipment used
19	CHEMICAL- ORES & MINERALS	Iron Ore	Alumina as Al2O3	IS 1493 (Part 1): 1981 RA: 2021
20	CHEMICAL- ORES & MINERALS	Iron Ore	Loss on Ignition	ISO 11536
21	CHEMICAL- ORES & MINERALS	Iron Ore	Phosphorous as P2O5	IS 1493 (Part 1): 1981 RA: 2021
22	CHEMICAL- ORES & MINERALS	Iron Ore	Silica as SiO2	IS 1493 (Part 1): 1981 RA: 2021
23	CHEMICAL- ORES & MINERALS	Iron Ore	Sulphur as S	ASTM E1019
24	CHEMICAL- ORES & MINERALS	Iron Ore	Total Iron (as Fe)	IS 1493 (Part 1): 1981 RA: 2021
25	CHEMICAL- ORES & MINERALS	Limestone	Alumina as Al2O3	IS 1760 (Part 3): 1992 RA: 2017
26	CHEMICAL- ORES & MINERALS	Limestone	Calcium as CaO	IS 1760 (Part 3): 1992 RA: 2017
27	CHEMICAL- ORES & MINERALS	Limestone	Ferric Oxide as Fe2O3	IS 1760 (Part 3): 1992 RA: 2017
28	CHEMICAL- ORES & MINERALS	Limestone	Loss on Ignition as LOI	IS 1760 (Part 1): 1991 RA: 2017
29	CHEMICAL- ORES & MINERALS	Limestone	Magnesium as MgO	IS 1760 (Part 3): 1992 RA: 2017
30	CHEMICAL- ORES & MINERALS	Limestone	Silica as SiO2	IS 1760 (Part 2): 1991 RA: 2017
31	CHEMICAL- ORES & MINERALS	Manganese Ore	Alumina as Al2O3	IS 1473
32	CHEMICAL- ORES & MINERALS	Manganese Ore	Iron as Fe	IS:1473
33	CHEMICAL- ORES & MINERALS	Manganese Ore	Manganese as Mn	IS:1473
34	CHEMICAL- ORES & MINERALS	Manganese Ore	Phosphorous as P2O5	IS: 1473
35	CHEMICAL- ORES & MINERALS	Manganese Ore	Silica as SiO2	IS:1473
36	CHEMICAL- ORES & MINERALS	Manganese Ore	Sulphur as S	ASTM E1019

ANNEXURE 10

NABL certificate of Ms M/s. Superintendence Company of India Private Limited

Gmail — SUPERINTENDENCE COMPANY OF INDIA PRIVATE LIMITED <supind2019@gmail.com>

Extension letter for Superintendence Company Of India Private Limited, Testing Laboratories
2 messages

Naman Sharma <naman@nabl.qcin.org> — 21 September 2023 at 09:47
To: "supind2019@gmail.com" <supind2019@gmail.com>

Dear Sir,

This has reference to the application for Renewal of Accreditation submitted by your laboratory.

As per your request, NABL has decided to extend the validity period of the laboratory's current accreditation vide certificate No. TC-8066 for 3 months or till the decision on renewal of accreditation is taken, whichever is earlier.

This extension in validity is applicable only to the Accreditation scope issued vide accreditation certificate No. TC-8066 , with validity 22.09.2021 to 21.09.2023 and extended validity till 21.12.2023.

The accreditation is now valid till 21.12.2023 or till the decision on renewal of accreditation is taken, whichever is earlier.

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

Laboratory may continue to issue testing reports with NABL symbol for the existing scope.

Regards,
Naman S.
Accreditation Officer (NABL), Quality Council of India
NABL India| NABL House, Plot No. - 45, Sector - 44,
Gurugram - 122002 (Haryana), India
Contact: *+91-124-4594849, +91-8595592387*
www.nabl-india.org

Please consider Environment before printing this Email.

SUPERINTENDENCE COMPANY OF INDIA PRIVATE LIMITED <supind2019@gmail.com> — 21 September 2023 at 11:20
To: jnbera@yahoo.co.in

[Quoted text hidden]

2 attachments

Outlook-jekafklc.png
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16K

ANNEXURE 10

NABL certificate of Ms M/s. Superintendence Company of India Private Limited

National Accreditation Board for Testing and Calibration Laboratories

NABL

CERTIFICATE OF ACCREDITATION

SUPERINTENDENCE COMPANY OF INDIA PRIVATE LIMITED, TESTING LABORATORIES

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 Y-23, BLOCK-EP, SECTOR-V, SALT LAKE CITY, KOLKATA, WEST BENGAL, INDIA

in the field of

TESTING

Certificate Number: TC-8066

Issue Date: 22/09/2021 Valid Until: 21/09/2023

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 : SUPERINTENDENCE COMPANY OF INDIA PRIVATE LIMITED

Signed for and on behalf of NABL

N. Venkateswaran
Chief Executive Officer

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ANNEXURE 10

NABL certificate of Ms M/s. Superintendence Company of India Private Limited

National Accreditation Board for Testing and Calibration Laboratories

NABL

SCOPE OF ACCREDITATION

aboratory Name :	SUPERINTENDENCE COMPANY OF INDIA PRIVATE LIMITED, TESTING LABORATORIES, PLOT Y-23, BLOCK-EP, SECTOR-V, SALT LAKE CITY, KOLKATA, WEST BENGAL, INDIA		
creditation Standard	ISO/IEC 17025:2017		
rtificate Number	TC-8066	Page No	4 of 17
alidity	22/09/2021 to 21/09/2023	Last Amended on	-

S.No	Discipline / Group	Materials or Products tested	Component, parameter or characteristic tested / Specific Test Performed / Tests or type of tests performed	Test Method Specification against which tests are performed and / or the techniques / equipment used
	CHEMICAL- METALS & ALLOYS	Mild Steel & Carbon Steel	Sulphur	IS 228, Part IX
	CHEMICAL- ORES & MINERALS	Bauxite	Aluminium Oxide	IS 2000, Part III
	CHEMICAL- ORES & MINERALS	Bauxite	Bulk Density	IS 5842
	CHEMICAL- ORES & MINERALS	Bauxite	Ferric Oxide	IS 2000, Part IV
	CHEMICAL- ORES & MINERALS	Bauxite	Loss on Ignition	IS 2000, Part I
	CHEMICAL- ORES & MINERALS	Bauxite	Phosphorous Pentaoxide	IS 2000, Part VII
	CHEMICAL- ORES & MINERALS	Bauxite	Silica	IS 2000, Part II
	CHEMICAL- ORES & MINERALS	Bauxite	Titania (TiO2)	IS 2000, Part V
	CHEMICAL- ORES & MINERALS	Chrome Ore	Bulk Density	IS 5842
	CHEMICAL- ORES & MINERALS	Chrome Ore	Chromium Oxide	IS 4737
	CHEMICAL- ORES & MINERALS	Chrome Ore	Iron Oxide	IS 4737
	CHEMICAL- ORES & MINERALS	Chrome Ore	Silica	IS 4737
	CHEMICAL- ORES & MINERALS	Iron Ore	Alumina	IS 1493, Part I
	CHEMICAL- ORES & MINERALS	Iron Ore	Bulk Density	IS 5842
	CHEMICAL- ORES & MINERALS	Iron Ore	Calcium Oxide	IS 1493
	CHEMICAL- ORES & MINERALS	Iron Ore	Magnesium Oxide	IS 1493
	CHEMICAL- ORES & MINERALS	Iron Ore	Moisture%	IS 1493, P-1
	CHEMICAL- ORES & MINERALS	Iron Ore	Phosphorous	IS 1493, Part I
	CHEMICAL- ORES & MINERALS	Iron Ore	Potassium Oxide	IS 1493, Part VI

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ANNEXURE 10

NABL certificate of Ms M/s. Superintendence Company of India Private Limited

National Accreditation Board for Testing and Calibration Laboratories

SCOPE OF ACCREDITATION

Laboratory Name :	SUPERINTENDENCE COMPANY OF INDIA PRIVATE LIMITED, TESTING LABORATORIES, PLOT Y-23, BLOCK-EP, SECTOR-V, SALT LAKE CITY, KOLKATA, WEST BENGAL, INDIA		
Accreditation Standard	ISO/IEC 17025:2017		
Certificate Number	TC-8066	**Page No**	5 of 17
Validity	22/09/2021 to 21/09/2023	**Last Amended on**	-

S.No	Discipline / Group	Materials or Products tested	Component, parameter or characteristic tested / Specific Test Performed / Tests or type of tests performed	Test Method Specification against which tests are performed and / or the techniques / equipment used
76	CHEMICAL- ORES & MINERALS	Iron Ore	Sodium Oxide	IS 1493, Part VI
77	CHEMICAL- ORES & MINERALS	Iron Ore	Sulphur	IS 1493
78	CHEMICAL- ORES & MINERALS	Iron Ore	Total Iron	IS 1493, Part I
79	CHEMICAL- ORES & MINERALS	Iron Ores	Loss on Ignition	IBM, Nagpur
80	CHEMICAL- ORES & MINERALS	Iron Ores	Silica	IS 1493, Part I
81	CHEMICAL- ORES & MINERALS	Limestone & Dolomite	Alumina	IS 1760, Part III
82	CHEMICAL- ORES & MINERALS	Limestone & Dolomite	Calcium Oxide	IS 1760, Part III
83	CHEMICAL- ORES & MINERALS	Limestone & Dolomite	Ferric Oxide	IS 1760, Part III
84	CHEMICAL- ORES & MINERALS	Limestone & Dolomite	Loss on Ignition	IS 1760, Part I
85	CHEMICAL- ORES & MINERALS	Limestone & Dolomite	Magnesium Oxide	IS1760, Part III
86	CHEMICAL- ORES & MINERALS	Limestone & Dolomite	Potassium Oxide	IS 9497
87	CHEMICAL- ORES & MINERALS	Limestone & Dolomite	Silica	IS 1760, Part II
88	CHEMICAL- ORES & MINERALS	Limestone & Dolomite	Sodium Oxide	IS 9497
89	CHEMICAL- ORES & MINERALS	Manganese Ore	Alumina	IS 1473
90	CHEMICAL- ORES & MINERALS	Manganese Ore	Bulk Density	IS 5842
91	CHEMICAL- ORES & MINERALS	Manganese Ore	Calcium Oxide	IS 1473
92	CHEMICAL- ORES & MINERALS	Manganese ore	Iron	IS 1473
93	CHEMICAL- ORES & MINERALS	Manganese Ore	Magnesium Oxide	IS 1473
94	CHEMICAL- ORES & MINERALS	Manganese Ore	Manganese	IS 1473

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ANNEXURE 10

NABL certificate of Ms M/s. Superintendence Company of India Private Limited

National Accreditation Board for Testing and Calibration Laboratories

NABL

SCOPE OF ACCREDITATION

Laboratory Name : SUPERINTENDENCE COMPANY OF INDIA PRIVATE LIMITED, TESTING LABORATORIES, PLOT Y-23, BLOCK-EP, SECTOR-V, SALT LAKE CITY, KOLKATA, WEST BENGAL, INDIA

Accreditation Standard ISO/IEC 17025:2017

Certificate Number TC-8066 **Page No** 6 of 17

Validity 22/09/2021 to 21/09/2023 **Last Amended on** -

S.No	Discipline / Group	Materials or Products tested	Component, parameter or characteristic tested / Specific Test Performed / Tests or type of tests performed	Test Method Specification against which tests are performed and / or the techniques / equipment used
95	CHEMICAL- ORES & MINERALS	Manganese Ore	Manganese Dioxide	IS 1473
96	CHEMICAL- ORES & MINERALS	Manganese Ore	Phosphorous	IS 1473
97	CHEMICAL- ORES & MINERALS	Manganese Ore	Potassium Oxide	IS 9497
98	CHEMICAL- ORES & MINERALS	Manganese Ore	Silica	IS 1473
99	CHEMICAL- ORES & MINERALS	Manganese Ore	Sodium Oxide	IS 9497
100	CHEMICAL- ORES & MINERALS	Manganese Ore	Sulphur	IS 1473
101	CHEMICAL- ORES & MINERALS	Rock Phosphate	Aluminium oxide	IS 11224
102	CHEMICAL- ORES & MINERALS	Rock Phosphate	Calcium Oxide	IS 9386
103	CHEMICAL- ORES & MINERALS	Rock Phosphate	Iron Oxide	IS 11224
104	CHEMICAL- ORES & MINERALS	Rock Phosphate	Loss on Ignition	IS 11224
105	CHEMICAL- ORES & MINERALS	Rock Phosphate	Magnesium Oxide	IS 11224
106	CHEMICAL- ORES & MINERALS	Rock Phosphate	Silica	IS 11224
107	CHEMICAL- ORES & MINERALS	Rock Phosphate	Total Phosphate as P2O5	IS 9386
108	CHEMICAL- POLLUTION & ENVIRONMENT	Waste Water	Manganese	APHA 23rd edition, 3111 B
109	CHEMICAL- POLLUTION & ENVIRONMENT	Waste Water including Effluents	Potassium as K	APHA, 23rd Edition, 3500 K B
110	CHEMICAL- POLLUTION & ENVIRONMENT	Waste Water	COD	APHA,23 Edition 5220 B
111	CHEMICAL- POLLUTION & ENVIRONMENT	Waste Water	Mercury as Hg	IS 3025, P-48
112	CHEMICAL- POLLUTION & ENVIRONMENT	Waste Water & Effluents	Cyanide as CN	APHA, 23rd Edition, 4500 E
113	CHEMICAL- POLLUTION & ENVIRONMENT	Waste Water & Effluents	Oil & Grease	IS 3025, Part 39

ANNEXURE 11

LITHOLOG DATA SHEET OF BOREHOLES

PROPOSED BORE HOLE NO.	**11 PBH01**	**NAME OF PROSPECT**	**KALB**		
DATE OF STARTING	**25-08-2023**	**BH ID**	**23 BH01**		
DATE OF CLOSING	**28-08-2023**	**EASTING**	**700569**		
AZIMUTH	**-**	**NORTHING**	**1878148**		
ANGLE	**VERTICAL**	**RL (m)**	**436**		
AVG RQD %	**47.24%**	**DEPTH (m)**	**45.00Mtr**		
RECOVERY%	**93.33%**				
BH ID	**FROM**	**TO**	**LITHOLOGY DESCRIPTION**	**ROCK TYPE**	**P2O5 Test (Shapiro's Kit)**
	0.00	1.00	Black cotton soil.	Black soil	No Reaction
	1.00	3.50	Redish brown coloured, silty soil with calcrete material.	Silty soil	No Reaction
	3.50	5.00	Brown coloured, sandy soil with calcrete material.	Sandy soil	No Reaction
	5.00	7.00	Cream coloured, fine grained, hard and massive limestone. Broken/fractured core of limestone at depth from 6.50 to 6.60.00m.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given low yellow coloured effervescence and along the partings strongly yellow coloured effervescence.
	7.00	10.00	Cream coloured, fine grained, hard and massive limestone.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given low yellow coloured effervescence and along the partings strongly yellow coloured effervescence.

ANNEXURE 11

LITHOLOG DATA SHEET OF BOREHOLES

PROPOSED BORE HOLE NO.	**11 PBH01**	**NAME OF PROSPECT**	**KALB**		
DATE OF STARTING	**25-08-2023**	**BH ID**	**23 BH01**		
DATE OF CLOSING	**28-08-2023**	**EASTING**	**700569**		
AZIMUTH	**-**	**NORTHING**	**1878148**		
ANGLE	**VERTICAL**	**RL (m)**	**436**		
AVG RQD %	**47.24%**	**DEPTH (m)**	**45.00Mtr**		
RECOVERY%	**93.33%**				
BH ID	**FROM**	**TO**	**LITHOLOGY DESCRIPTION**	**ROCK TYPE**	**P2O5 Test (Shapiro's Kit)**
	10.00	13.00	Cream coloured, fine grained, hard and massive limestone.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given low yellow coloured effervescence and along the partings strongly yellow coloured effervescence.
	13.00	16.00	Cream coloured, fine grained, hard and massive limestone. Broken/fractured core of limestone at depth from 13.80 to 13.90, 15.10 - 15.20m.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given low yellow coloured effervescence and along the partings strongly yellow coloured effervescence.
	16.00	19.00	Cream coloured, fine grained, hard and massive limestone with thin intercalations of shale noticed.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given low yellow coloured effervescence and along the partings strongly yellow coloured effervescence.

ANNEXURE 11

LITHOLOG DATA SHEET OF BOREHOLES

PROPOSED BORE HOLE NO.	**11 PBH01**	**NAME OF PROSPECT**	**KALB**		
DATE OF STARTING	**25-08-2023**	**BH ID**	**23 BH01**		
DATE OF CLOSING	**28-08-2023**	**EASTING**	**700569**		
AZIMUTH	**-**	**NORTHING**	**1878148**		
ANGLE	**VERTICAL**	**RL (m)**	**436**		
AVG RQD %	**47.24%**	**DEPTH (m)**	**45.00Mtr**		
RECOVERY%	**93.33%**				
BH ID	**FROM**	**TO**	**LITHOLOGY DESCRIPTION**	**ROCK TYPE**	**P2O5 Test (Shapiro's Kit)**
23 BH01	19.00	22.00	Cream coloured, fine grained, hard and massive limestone with thin intercalations of shale noticed.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given strongly yellow coloured effervescence.
	22.00	25.00	Light grey to cream coloured, fine grained, hard and massive limestone with thin intercalations of shale noticed.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given strongly yellow coloured effervescence.
	25.00	28.00	Light grey coloured, fine grained, hard and massive limestone with thin intercalations of shale noticed. Limestone with thin pyrite vein noticed at depth of 27.55m.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given strongly yellow coloured effervescence.

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ANNEXURE 11

LITHOLOG DATA SHEET OF BOREHOLES

PROPOSED BORE HOLE NO.	**11 PBH01**	**NAME OF PROSPECT**	**KALB**		
DATE OF STARTING	**25-08-2023**	**BH ID**	**23 BH01**		
DATE OF CLOSING	**28-08-2023**	**EASTING**	**700569**		
AZIMUTH	**-**	**NORTHING**	**1878148**		
ANGLE	**VERTICAL**	**RL (m)**	**436**		
AVG RQD %	**47.24%**	**DEPTH (m)**	**45.00Mtr**		
RECOVERY%	**93.33%**				
BH ID	**FROM**	**TO**	**LITHOLOGY DESCRIPTION**	**ROCK TYPE**	**P2O5 Test (Shapiro's Kit)**
	28.00	31.00	Light grey coloured, fine grained, hard and massive limestone with thin intercalations of shale (1cm thick) noticed.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given strongly yellow coloured effervescence.
	31.00	34.00	Light grey coloured, fine grained, hard and massive limestone with thin intercalations of shale noticed.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given strongly yellow coloured effervescence.
	34.00	37.00	Light grey coloured, fine grained, hard and massive limestone with thin intercalations of shale noticed. Limestone with thin pyrite vein noticed at depth of 36.50m.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given strongly yellow coloured effervescence.

ANNEXURE 11

LITHOLOG DATA SHEET OF BOREHOLES

PROPOSED BORE HOLE NO.	**11 PBH01**	**NAME OF PROSPECT**	**KALB**		
DATE OF STARTING	**25-08-2023**	**BH ID**	**23 BH01**		
DATE OF CLOSING	**28-08-2023**	**EASTING**	**700569**		
AZIMUTH	**-**	**NORTHING**	**1878148**		
ANGLE	**VERTICAL**	**RL (m)**	**436**		
AVG RQD %	**47.24%**	**DEPTH (m)**	**45.00Mtr**		
RECOVERY%	**93.33%**				
BH ID	**FROM**	**TO**	**LITHOLOGY DESCRIPTION**	**ROCK TYPE**	**P2O5 Test (Shapiro's Kit)**
	37.00	40.00	Light grey coloured, fine grained, hard and massive limestone with thin intercalations of shale noticed.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given strongly yellow coloured effervescence.
	40.00	43.00	Light grey coloured, fine grained, hard and massive limestone with thin intercalations of shale noticed. Fracture along the core axis at depth from 41.10 - 41.30m.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given strongly yellow coloured effervescence.
	43.00	45.00	Light grey coloured, fine grained, hard and massive limestone with thin intercalations of shale noticed. Core angle measured (2-30)at depth of 43.90m.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given strongly yellow coloured effervescence.

ANNEXURE 11

LITHOLOG DATA SHEET OF BOREHOLES

PROPOSED BORE HOLE NO.	**11 PBH02**	**NAME OF PROSPECT**	**KALB**		
DATE OF STARTING	**23-08-2023**	**BH ID**	**23 BH02**		
DATE OF CLOSING	**27-08-2023**	**EASTING**	**701852**		
AZIMUTH	**-**	**NORTHING**	**1878117**		
ANGLE	**VERTICAL**	**RL (m)**	**432**		
AVG RQD %	**53.79%**	**DEPTH (m)**	**45.00Mtr**		
RECOVERY%	**95.80%**				
BH ID	**FROM**	**TO**	**LITHOLOGY DESCRIPTION**	**ROCK TYPE**	**P2O5 Test (Shapiro's Kit)**
	0.00	2.00	Black cotton soil.	Black Soil	No Reaction
	2.00	4.00	Brown coloured, silty soil with calcareous material.	Silty soil	No Reaction
	4.00	7.00	Cream coloured, fine grained, hard and massive limestone.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given low yellow coloured effervescence and along the partings strongly yellow coloured effervescence.
	7.00	10.00	Cream coloured, fine grained, hard and massive limestone.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given strongly yellow coloured effervescence.
	10.00	13.00	Cream coloured, fine grained, hard and massive limestone.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given strongly yellow coloured effervescence.

ANNEXURE 11

LITHOLOG DATA SHEET OF BOREHOLES

PROPOSED BORE HOLE NO.	**11 PBH02**	**NAME OF PROSPECT**	**KALB**		
DATE OF STARTING	**23-08-2023**	**BH ID**	**23 BH02**		
DATE OF CLOSING	**27-08-2023**	**EASTING**	**701852**		
AZIMUTH	**-**	**NORTHING**	**1878117**		
ANGLE	**VERTICAL**	**RL (m)**	**432**		
AVG RQD %	**53.79%**	**DEPTH (m)**	**45.00Mtr**		
RECOVERY%	**95.80%**				
BH ID	**FROM**	**TO**	**LITHOLOGY DESCRIPTION**	**ROCK TYPE**	**P2O5 Test (Shapiro's Kit)**
	13.00	16.00	Cream coloured, fine grained, hard and massive limestone.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given strongly yellow coloured effervescence.
	16.00	19.00	Cream coloured, fine grained, hard and massive limestone with thin intercalations of shale noticed. Broken/fractured core of limestone at depth from 17.40 to 17.50m	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given strongly yellow coloured effervescence.
	19.00	22.00	Light grey to cream coloured, fine grained, hard and massive limestone with thin intercalations of shale(1cm thick) noticed at depth of 21.85m .	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given strongly yellow coloured effervescence.

ANNEXURE 11

LITHOLOG DATA SHEET OF BOREHOLES

PROPOSED BORE HOLE NO.	**11 PBH02**	**NAME OF PROSPECT**	**KALB**		
DATE OF STARTING	**23-08-2023**	**BH ID**	**23 BH02**		
DATE OF CLOSING	**27-08-2023**	**EASTING**	**701852**		
AZIMUTH	**-**	**NORTHING**	**1878117**		
ANGLE	**VERTICAL**	**RL (m)**	**432**		
AVG RQD %	**53.79%**	**DEPTH (m)**	**45.00Mtr**		
RECOVERY%	**95.80%**				
BH ID	**FROM**	**TO**	**LITHOLOGY DESCRIPTION**	**ROCK TYPE**	**P2O5 Test (Shapiro's Kit)**
23 BH02	22.00	25.00	Light grey coloured, fine grained, hard and massive limestone with thin intercalations of shale noticed.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given strongly yellow coloured effervescence.
	25.00	28.00	Light grey to cream coloured, fine grained, hard and massive limestone with thin intercalations of shale noticed.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given strongly yellow coloured effervescence.
	28.00	31.00	Light grey to cream coloured, fine grained, hard and massive limestone with thin intercalations of shale(1cm thick) noticed at depth of 28.40m.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given strongly yellow coloured effervescence.

ANNEXURE 11

LITHOLOG DATA SHEET OF BOREHOLES

PROPOSED BORE HOLE NO.	**11 PBH02**	**NAME OF PROSPECT**	**KALB**		
DATE OF STARTING	**23-08-2023**	**BH ID**	**23 BH02**		
DATE OF CLOSING	**27-08-2023**	**EASTING**	**701852**		
AZIMUTH	**-**	**NORTHING**	**1878117**		
ANGLE	**VERTICAL**	**RL (m)**	**432**		
AVG RQD %	**53.79%**	**DEPTH (m)**	**45.00Mtr**		
RECOVERY%	**95.80%**				
BH ID	**FROM**	**TO**	**LITHOLOGY DESCRIPTION**	**ROCK TYPE**	**P2O5 Test (Shapiro's Kit)**
	31.00	34.00	Light grey coloured, fine grained, hard and massive limestone with thin intercalations of shale noticed.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given strongly yellow coloured effervescence.
	34.00	37.00	Light grey coloured, fine grained, hard and massive limestone with thin intercalations of shale noticed.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given strongly yellow coloured effervescence.
	37.00	40.00	Light grey coloured, fine grained, hard and massive limestone with thin intercalations of shale noticed. Fracture along the core axis at depth from 39.20 - 39.30m.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given strongly yellow coloured effervescence.

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ANNEXURE 11

LITHOLOG DATA SHEET OF BOREHOLES

PROPOSED BORE HOLE NO.	**11 PBH02**	**NAME OF PROSPECT**	**KALB**		
DATE OF STARTING	**23-08-2023**	**BH ID**	**23 BH02**		
DATE OF CLOSING	**27-08-2023**	**EASTING**	**701852**		
AZIMUTH	**-**	**NORTHING**	**1878117**		
ANGLE	**VERTICAL**	**RL (m)**	**432**		
AVG RQD %	**53.79%**	**DEPTH (m)**	**45.00Mtr**		
RECOVERY%	**95.80%**				
BH ID	**FROM**	**TO**	**LITHOLOGY DESCRIPTION**	**ROCK TYPE**	**P2O5 Test (Shapiro's Kit)**
	40.00	43.00	Light grey coloured, fine grained, hard and massive limestone with thin intercalations of shale noticed. Fracture along the core axis at depth from 41.50 - 41.60m.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given strongly yellow coloured effervescence.
	43.00	45.00	Light grey coloured, fine grained, hard and massive limestone with thin intercalations of shale noticed.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given strongly yellow coloured effervescence.

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ANNEXURE 11

LITHOLOG DATA SHEET OF BOREHOLES

PROPOSED BORE HOLE NO.	**11 PBH03**	**NAME OF PROSPECT**	**KALB**		
DATE OF STARTING	**29-08-2023**	**BH ID**	**23 BH03**		
DATE OF CLOSING	**02-09-2023**	**EASTING**	**701889**		
AZIMUTH	**-**	**NORTHING**	**1876585**		
ANGLE	**VERTICAL**	**RL (m)**	**420**		
AVG RQD %	**38.81%**	**DEPTH (m)**	**45.00Mtr**		
RECOVERY%	**92.42%**				
BH ID	**FROM**	**TO**	**LITHOLOGY DESCRIPTION**	**ROCK TYPE**	**P2O5 Test (Shapiro's Kit)**
	0.00	0.40	Cream to pink coloured, fine grained, hard and massive limestone.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given medium yellow coloured effervescence and along the partings strongly yellow coloured effervescence.
	0.40	1.00	Brown coloured, silty soil with calcareous material.	Silty soil	No Reaction
	1.00	2.30	Light gray to pink coloured, fine grained, hard and massive limestone.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given medium yellow coloured effervescence and along the partings strongly yellow coloured effervescence.
	2.30	3.30	White to yellow coloured, calcareous sludge with silty soil.	Calcareous sludge	No Reaction
	3.30	5.00	Light gray to pink coloured, fine grained, hard and massive limestone with thin pyrite vein noticed at depth of 4.60m.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given medium yellow coloured effervescence and along the partings strongly yellow coloured effervescence.
	5.00	7.00	Light gray to pink coloured, fine grained, hard and massive limestone with thin calcite vein noticed at depth of 5.95m.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given medium yellow coloured effervescence and along the partings strongly yellow coloured effervescence.

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ANNEXURE 11

LITHOLOG DATA SHEET OF BOREHOLES

PROPOSED BORE HOLE NO.	**11 PBH03**	**NAME OF PROSPECT**	**KALB**		
DATE OF STARTING	**29-08-2023**	**BH ID**	**23 BH03**		
DATE OF CLOSING	**02-09-2023**	**EASTING**	**701889**		
AZIMUTH	**-**	**NORTHING**	**1876585**		
ANGLE	**VERTICAL**	**RL (m)**	**420**		
AVG RQD %	**38.81%**	**DEPTH (m)**	**45.00Mtr**		
RECOVERY%	**92.42%**				
BH ID	**FROM**	**TO**	**LITHOLOGY DESCRIPTION**	**ROCK TYPE**	**P2O5 Test (Shapiro's Kit)**
	7.00	9.70	Cream to light gray coloured, fine grained, hard and massive limestone with thin pyrite vein noticed at depth of 8.10m.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given medium yellow coloured effervescence and along the partings strongly yellow coloured effervescence.
	9.70	11.30	White to yellow coloured, calcareous sludge with silty soil.	Calcareous sludge.	No Reaction
	11.30	13.00	Cream to light gray coloured, fine grained, hard and massive limestone.Broken/fracture core of limestone with Chert band noticed at depth from 11.30 - 11.45m.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given medium yellow coloured effervescence and along the partings strongly yellow coloured effervescence.
	13.00	14.00	Yellow coloured, calcareous sludge with silty soil.	Calcareous sludge	No Reaction

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ANNEXURE 11

LITHOLOG DATA SHEET OF BOREHOLES

PROPOSED BORE HOLE NO.	**11 PBH03**	**NAME OF PROSPECT**	**KALB**		
DATE OF STARTING	**29-08-2023**	**BH ID**	**23 BH03**		
DATE OF CLOSING	**02-09-2023**	**EASTING**	**701889**		
AZIMUTH	**-**	**NORTHING**	**1876585**		
ANGLE	**VERTICAL**	**RL (m)**	**420**		
AVG RQD %	**38.81%**	**DEPTH (m)**	**45.00Mtr**		
RECOVERY%	**92.42%**				
BH ID	**FROM**	**TO**	**LITHOLOGY DESCRIPTION**	**ROCK TYPE**	**P2O5 Test (Shapiro's Kit)**
23 BH03	14.00	15.80	Cream coloured, fine grained, hard and massive limestone with Chert band (2cm thick) noticed at depth from 15.10 - 15.25m.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given medium yellow coloured effervescence and along the partings strongly yellow coloured effervescence.
	15.80	17.00	Yellowish coloured, calcareous sludge.	Calcareous sludge.	No Reaction
	17.00	19.00	Cream coloured, fine grained, hard and massive limestone.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given medium yellow coloured effervescence and along the partings strongly yellow coloured effervescence.
	19.00	22.00	Light gray coloured, fine grained, hard and massive limestone with thin intercalations of shale noticed.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given strongly yellow coloured effervescence.
	22.00	25.00	Light grey coloured, fine grained, hard and massive limestone with thin intercalations of shale noticed.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given strongly yellow coloured effervescence.

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LITHOLOG DATA SHEET OF BOREHOLES

PROPOSED BORE HOLE NO.	**11 PBH03**	**NAME OF PROSPECT**	**KALB**		
DATE OF STARTING	**29-08-2023**	**BH ID**	**23 BH03**		
DATE OF CLOSING	**02-09-2023**	**EASTING**	**701889**		
AZIMUTH	**-**	**NORTHING**	**1876585**		
ANGLE	**VERTICAL**	**RL (m)**	**420**		
AVG RQD %	**38.81%**	**DEPTH (m)**	**45.00Mtr**		
RECOVERY%	**92.42%**				
BH ID	**FROM**	**TO**	**LITHOLOGY DESCRIPTION**	**ROCK TYPE**	**P2O5 Test (Shapiro's Kit)**
	25.00	28.00	Light grey coloured, fine grained, hard and massive limestone with thin intercalations of shale noticed.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given strongly yellow coloured effervescence.
	28.00	31.00	Light grey coloured, fine grained, hard and massive limestone with thin intercalations of shale noticed.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given strongly yellow coloured effervescence.
	31.00	34.00	Light grey coloured, fine grained, hard and massive limestone with thin intercalations of shale noticed.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given strongly yellow coloured effervescence.
	34.00	37.00	Light grey coloured, fine grained, hard and massive limestone with thin intercalations of shale noticed.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given strongly yellow coloured effervescence.
	37.00	40.00	Light grey coloured, fine grained, hard and massive limestone with thin (1cm thick) intercalations of shale noticed at depth of 39.70m	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given strongly yellow coloured effervescence.

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ANNEXURE 11

LITHOLOG DATA SHEET OF BOREHOLES

PROPOSED BORE HOLE NO.	**11 PBH03**	**NAME OF PROSPECT**	**KALB**		
DATE OF STARTING	**29-08-2023**	**BH ID**	**23 BH03**		
DATE OF CLOSING	**02-09-2023**	**EASTING**	**701889**		
AZIMUTH	**-**	**NORTHING**	**1876585**		
ANGLE	**VERTICAL**	**RL (m)**	**420**		
AVG RQD %	**38.81%**	**DEPTH (m)**	**45.00Mtr**		
RECOVERY%	**92.42%**				
BH ID	**FROM**	**TO**	**LITHOLOGY DESCRIPTION**	**ROCK TYPE**	**P2O5 Test (Shapiro's Kit)**
	40.00	43.00	Light grey coloured, fine grained, hard and massive limestone with thin intercalations of shale noticed.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given strongly yellow coloured effervescence.
	43.00	45.00	Light grey coloured, fine grained, hard and massive limestone with thin intercalations of shale noticed.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given strongly yellow coloured effervescence.

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ANNEXURE 11

LITHOLOG DATA SHEET OF BOREHOLES

PROPOSED BORE HOLE NO.	**11 PBH04**	**NAME OF PROSPECT**	**KALB**		
DATE OF STARTING	**19-09-2023**	**BH ID**	**23 BH04**		
DATE OF CLOSING	**28-09-2023**	**EASTING**	**700690**		
AZIMUTH	**-**	**NORTHING**	**1876434**		
ANGLE	**VERTICAL**	**RL (m)**	**418**		
AVG RQD %	**36.67%**	**DEPTH (m)**	**45.00Mtr**		
RECOVERY%	**93.91%**				

BH ID	FROM	TO	LITHOLOGY DESCRIPTION	ROCK TYPE	P2O5 Test (Shapiro's Kit)
	0.00	0.30	Black cotton soil	Black cotton soil	No Reaction
	0.30	2.30	Cream coloured, fine grained, hard and massive limestone. Broken/fractured core of limestone at depth from 1.15 to 1.40m.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given low yellow coloured effervescence.
	2.30	4.00	Brown coloured, silty soil with Calcareous sludge.	Silty soil	No Reaction
	4.00	5.00	Cream coloured, fine grained, hard and massive limestone..	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given low yellow coloured effervescence and along the partings medium yellow coloured effervescence.
	5.00	7.00	Cream coloured, fine grained, hard and massive limestone. Broken/fractured core of limestone at depth from 6.80 to 7.00m.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given low yellow coloured effervescence and along the partings strongly yellow coloured effervescence.

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ANNEXURE 11

LITHOLOG DATA SHEET OF BOREHOLES

PROPOSED BORE HOLE NO.	**11 PBH04**	**NAME OF PROSPECT**	**KALB**		
DATE OF STARTING	**19-09-2023**	**BH ID**	**23 BH04**		
DATE OF CLOSING	**28-09-2023**	**EASTING**	**700690**		
AZIMUTH	**-**	**NORTHING**	**1876434**		
ANGLE	**VERTICAL**	**RL (m)**	**418**		
AVG RQD %	**36.67%**	**DEPTH (m)**	**45.00Mtr**		
RECOVERY%	**93.91%**				

BH ID	FROM	TO	LITHOLOGY DESCRIPTION	ROCK TYPE	P2O5 Test (Shapiro's Kit)
	7.00	7.70	Yellow to brown coloured, calcareous sludge with silty soil.	Calcareous sludge.	No Reaction
	7.70	10.00	Cream coloured, fine grained, hard and massive limestone..	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given low yellow coloured effervescence and along the partings strongly yellow coloured effervescence.
	10.00	11.10	Cream coloured, fine grained, hard and massive limestone..	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given low yellow coloured effervescence and along the partings strongly yellow coloured effervescence.
	11.10	12.00	Yellow coloured, Calcareous Sludge with silty soil.	Calcareous Sludge.	No Reaction
	12.00	13.00	Cream coloured, fine grained, hard and massive limestone..	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given low yellow coloured effervescence and along the partings strongly yellow coloured effervescence.

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LITHOLOG DATA SHEET OF BOREHOLES

PROPOSED BORE HOLE NO.	**11 PBH04**	**NAME OF PROSPECT**	**KALB**		
DATE OF STARTING	**19-09-2023**	**BH ID**	**23 BH04**		
DATE OF CLOSING	**28-09-2023**	**EASTING**	**700690**		
AZIMUTH	**-**	**NORTHING**	**1876434**		
ANGLE	**VERTICAL**	**RL (m)**	**418**		
AVG RQD %	**36.67%**	**DEPTH (m)**	**45.00Mtr**		
RECOVERY%	**93.91%**				
BH ID	**FROM**	**TO**	**LITHOLOGY DESCRIPTION**	**ROCK TYPE**	**P2O5 Test (Shapiro's Kit)**
23 BH04	13.00	16.00	Cream coloured, fine grained, hard and massive limestone..	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given medium yellow coloured effervescence and along the partings strongly yellow coloured effervescence.
	16.00	19.00	Cream to light gray coloured, fine grained, hard and massive limestone..	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given medium yellow coloured effervescence and along the partings strongly yellow coloured effervescence.
	19.00	22.00	Light gray coloured, fine grained, hard and massive limestone.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given strongly yellow coloured effervescence.
	22.00	25.00	Light gray coloured, fine grained, hard and massive limestone.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given low yellow coloured effervescence and along the partings strongly yellow coloured effervescence.

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LITHOLOG DATA SHEET OF BOREHOLES

PROPOSED BORE HOLE NO.	**11 PBH04**	**NAME OF PROSPECT**	**KALB**		
DATE OF STARTING	**19-09-2023**	**BH ID**	**23 BH04**		
DATE OF CLOSING	**28-09-2023**	**EASTING**	**700690**		
AZIMUTH	**-**	**NORTHING**	**1876434**		
ANGLE	**VERTICAL**	**RL (m)**	**418**		
AVG RQD %	**36.67%**	**DEPTH (m)**	**45.00Mtr**		
RECOVERY%	**93.91%**				
BH ID	**FROM**	**TO**	**LITHOLOGY DESCRIPTION**	**ROCK TYPE**	**P2O5 Test (Shapiro's Kit)**
	25.00	28.00	Light grey coloured, fine grained, hard and massive limestone with thin intercalations of shale noticed.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given medium yellow coloured effervescence.
	28.00	31.00	Light grey coloured, fine grained, hard and massive limestone with thin intercalations of shale noticed. Broken/fractured core of limestone at depth from 29.70 to 29.80m.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given low yellow coloured effervescence and along the partings medium yellow coloured effervescence.
	31.00	34.00	Light grey coloured, fine grained, hard and massive limestone with thin intercalations of shale noticed.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given strongly yellow coloured effervescence.
	34.00	37.00	Light grey coloured, fine grained, hard and massive limestone with thin intercalations of shale noticed.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given medium yellow coloured effervescence.

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ANNEXURE 11

LITHOLOG DATA SHEET OF BOREHOLES

PROPOSED BORE HOLE NO.	**11 PBH04**	**NAME OF PROSPECT**	**KALB**		
DATE OF STARTING	**19-09-2023**	**BH ID**	**23 BH04**		
DATE OF CLOSING	**28-09-2023**	**EASTING**	**700690**		
AZIMUTH	**-**	**NORTHING**	**1876434**		
ANGLE	**VERTICAL**	**RL (m)**	**418**		
AVG RQD %	**36.67%**	**DEPTH (m)**	**45.00Mtr**		
RECOVERY%	**93.91%**				
BH ID	**FROM**	**TO**	**LITHOLOGY DESCRIPTION**	**ROCK TYPE**	**P2O5 Test (Shapiro's Kit)**
	37.00	40.00	Light grey coloured, fine grained, hard and massive limestone with thin intercalations of shale (thick 0.2 - 0.5cm)noticed. Broken/fractured core of limestone at depth from 39.30 to 39.40m.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given strongly yellow coloured effervescence.
	40.00	40.80	Light grey coloured, fine grained, hard and massive limestone with thin intercalations of shale noticed.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given low yellow coloured effervescence and along the partings medium yellow coloured effervescence.
	40.80	41.40	Yellow coloured, Weathered Broken/fractured Calcareous limestone	Calcareous limestone	No Reaction
	41.40	43.00	Light grey coloured, fine grained, hard and massive limestone with thin intercalations of shale noticed.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given low yellow coloured effervescence and along the partings strongly yellow coloured effervescence.

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ANNEXURE 11

LITHOLOG DATA SHEET OF BOREHOLES

PROPOSED BORE HOLE NO.	**11 PBH04**	**NAME OF PROSPECT**	**KALB**		
DATE OF STARTING	**19-09-2023**	**BH ID**	**23 BH04**		
DATE OF CLOSING	**28-09-2023**	**EASTING**	**700690**		
AZIMUTH	**-**	**NORTHING**	**1876434**		
ANGLE	**VERTICAL**	**RL (m)**	**418**		
AVG RQD %	**36.67%**	**DEPTH (m)**	**45.00Mtr**		
RECOVERY%	**93.91%**				
BH ID	**FROM**	**TO**	**LITHOLOGY DESCRIPTION**	**ROCK TYPE**	**P2O5 Test (Shapiro's Kit)**
	43.00	45.00	Light grey coloured, fine grained, hard and massive limestone with thin intercalations of shale noticed.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given low yellow coloured effervescence and along the partings strongly yellow coloured effervescence.

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ANNEXURE 11

LITHOLOG DATA SHEET OF BOREHOLES

PROPOSED BORE HOLE NO.	**11 PBH05**	**NAME OF PROSPECT**	**KALB**		
DATE OF STARTING	**02-09-2023**	**BH ID**	**23 BH05**		
DATE OF CLOSING	**30-09-2023**	**EASTING**	**701231**		
AZIMUTH	**-**	**NORTHING**	**1877287**		
ANGLE	**VERTICAL**	**RL (m)**	**429**		
AVG RQD %	**48.51%**	**DEPTH (m)**	**45.00Mtr**		
RECOVERY%	**97.53%**				
BH ID	**FROM**	**TO**	**LITHOLOGY DESCRIPTION**	**ROCK TYPE**	**P2O5 Test (Shapiro's Kit)**
	0.00	1.00	Black cotton soil	Black Soil	No Reaction
	1.00	2.00	Cream coloured, fine grained, hard and massive limestone. Broken/fractured core of limestone at depth from 1.90 to 2.00m.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given low yellow coloured effervescence.
	2.00	3.00	Cream coloured, fine grained, hard and massive limestone. Broken/fractured core of limestone at depth from 2.00 to 2.20m.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given low yellow coloured effervescence.
	3.00	5.00	Cream coloured, fine grained, hard and massive limestone.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given medium yellow coloured effervescence.

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LITHOLOG DATA SHEET OF BOREHOLES

PROPOSED BORE HOLE NO.	**11 PBH05**	**NAME OF PROSPECT**	**KALB**		
DATE OF STARTING	**02-09-2023**	**BH ID**	**23 BH05**		
DATE OF CLOSING	**30-09-2023**	**EASTING**	**701231**		
AZIMUTH	**-**	**NORTHING**	**1877287**		
ANGLE	**VERTICAL**	**RL (m)**	**429**		
AVG RQD %	**48.51%**	**DEPTH (m)**	**45.00Mtr**		
RECOVERY%	**97.53%**				
BH ID	**FROM**	**TO**	**LITHOLOGY DESCRIPTION**	**ROCK TYPE**	**P2O5 Test (Shapiro's Kit)**
	5.00	7.00	Cream coloured, fine grained, hard and massive limestone. Broken/fractured core of limestone at depth from 6.00 to 6.20m.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given medium yellow coloured effervescence and along the partings strongly yellow coloured effervescence.
	7.00	10.00	Cream coloured, fine grained, hard and massive limestone.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given medium yellow coloured effervescence and along the partings strongly yellow coloured effervescence.
	10.00	13.00	Light grey to cream coloured, fine grained, hard and massive limestone with thin intercalations of shale observed	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given low yellow coloured effervescence and along the partings medium yellow coloured effervescence.

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ANNEXURE 11

LITHOLOG DATA SHEET OF BOREHOLES

PROPOSED BORE HOLE NO.	**11 PBH05**	**NAME OF PROSPECT**	**KALB**		
DATE OF STARTING	**02-09-2023**	**BH ID**	**23 BH05**		
DATE OF CLOSING	**30-09-2023**	**EASTING**	**701231**		
AZIMUTH	**-**	**NORTHING**	**1877287**		
ANGLE	**VERTICAL**	**RL (m)**	**429**		
AVG RQD %	**48.51%**	**DEPTH (m)**	**45.00Mtr**		
RECOVERY%	**97.53%**				
BH ID	**FROM**	**TO**	**LITHOLOGY DESCRIPTION**	**ROCK TYPE**	**P2O5 Test (Shapiro's Kit)**
	13.00	16.00	Light grey coloured, fine grained, hard and massive limestone with thin intercalations of shale(1cm thick) noticed at depth of 13.70m .	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given medium yellow coloured effervescence and along the partings strongly yellow coloured effervescence.
	16.00	19.00	Light grey coloured, fine grained, hard and massive limestone with thin intercalations of shale noticed.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given low yellow coloured effervescence and along the partings medium yellow coloured effervescence.
	19.00	22.00	Light grey coloured, fine grained, hard and massive limestone with thin intercalations of shale noticed.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given low yellow coloured effervescence and along the partings strongly yellow coloured effervescence.

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ANNEXURE 11

LITHOLOG DATA SHEET OF BOREHOLES

PROPOSED BORE HOLE NO.	**11 PBH05**	**NAME OF PROSPECT**	**KALB**		
DATE OF STARTING	**02-09-2023**	**BH ID**	**23 BH05**		
DATE OF CLOSING	**30-09-2023**	**EASTING**	**701231**		
AZIMUTH	**-**	**NORTHING**	**1877287**		
ANGLE	**VERTICAL**	**RL (m)**	**429**		
AVG RQD %	**48.51%**	**DEPTH (m)**	**45.00Mtr**		
RECOVERY%	**97.53%**				
BH ID	**FROM**	**TO**	**LITHOLOGY DESCRIPTION**	**ROCK TYPE**	**P2O5 Test (Shapiro's Kit)**
23 BH05	22.00	25.00	Light grey coloured, fine grained, hard and massive limestone with thin intercalations of shale(1cm thick) noticed at depth of 23.50m.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given low yellow coloured effervescence and along the partings strongly yellow coloured effervescence.
	25.00	28.00	Light grey coloured, fine grained, hard and massive limestone with thin intercalations of shale noticed.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given medium yellow coloured effervescence and along the partings strongly yellow coloured effervescence.

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ANNEXURE 11

LITHOLOG DATA SHEET OF BOREHOLES

PROPOSED BORE HOLE NO.	**11 PBH05**	**NAME OF PROSPECT**	**KALB**		
DATE OF STARTING	**02-09-2023**	**BH ID**	**23 BH05**		
DATE OF CLOSING	**30-09-2023**	**EASTING**	**701231**		
AZIMUTH	**-**	**NORTHING**	**1877287**		
ANGLE	**VERTICAL**	**RL (m)**	**429**		
AVG RQD %	**48.51%**	**DEPTH (m)**	**45.00Mtr**		
RECOVERY%	**97.53%**				
BH ID	**FROM**	**TO**	**LITHOLOGY DESCRIPTION**	**ROCK TYPE**	**P2O5 Test (Shapiro's Kit)**
	28.00	31.00	Light grey coloured, fine grained, hard and massive limestone with thin intercalations of shale noticed. Fracture along the core axis at depth from 30.80 - 31.00m.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given strongly yellow coloured effervescence.
	31.00	34.00	Light grey coloured, fine grained, hard and massive limestone with thin intercalations of shale noticed. Broken/fractured core of limestone at depth from 31.00 to 31.20m.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given medium yellow coloured effervescence and along the partings strongly yellow coloured effervescence.

KUDREMUKH

ANNEXURE 11

LITHOLOG DATA SHEET OF BOREHOLES

PROPOSED BORE HOLE NO.	**11 PBH05**	**NAME OF PROSPECT**	**KALB**		
DATE OF STARTING	**02-09-2023**	**BH ID**	**23 BH05**		
DATE OF CLOSING	**30-09-2023**	**EASTING**	**701231**		
AZIMUTH	**-**	**NORTHING**	**1877287**		
ANGLE	**VERTICAL**	**RL (m)**	**429**		
AVG RQD %	**48.51%**	**DEPTH (m)**	**45.00Mtr**		
RECOVERY%	**97.53%**				
BH ID	**FROM**	**TO**	**LITHOLOGY DESCRIPTION**	**ROCK TYPE**	**P2O5 Test (Shapiro's Kit)**
	34.00	37.00	Light grey coloured, fine grained, hard and massive limestone with thin intercalations of shale noticed.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given medium yellow coloured effervescence and along the partings strongly yellow coloured effervescence.
	37.00	40.00	Light grey coloured, fine grained, hard and massive limestone with thin intercalations of shale noticed.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given medium yellow coloured effervescence and along the partings strongly yellow coloured effervescence.

KUDREMUKH

ANNEXURE 11

LITHOLOG DATA SHEET OF BOREHOLES

PROPOSED BORE HOLE NO.	**11 PBH05**	**NAME OF PROSPECT**	**KALB**		
DATE OF STARTING	**02-09-2023**	**BH ID**	**23 BH05**		
DATE OF CLOSING	**30-09-2023**	**EASTING**	**701231**		
AZIMUTH	**-**	**NORTHING**	**1877287**		
ANGLE	**VERTICAL**	**RL (m)**	**429**		
AVG RQD %	**48.51%**	**DEPTH (m)**	**45.00Mtr**		
RECOVERY%	**97.53%**				
BH ID	**FROM**	**TO**	**LITHOLOGY DESCRIPTION**	**ROCK TYPE**	**P2O5 Test (Shapiro's Kit)**
	40.00	43.00	Light grey coloured, fine grained, hard and massive limestone with thin intercalations of shale noticed. Fracture along the core axis at depth from 40.90 - 41.30m.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given medium yellow coloured effervescence.
	43.00	45.00	Light grey coloured, fine grained, hard and massive limestone with calcite vein (thick 1.00-2.00cm) noticed at depth from 43.15 - 45.00m.	Massive limestone	Phosphorate test done with shapiro's kit on limestone core, it's given medium yellow coloured effervescence.

ANNEXURE 12

GEOTECHNICAL LOG DATA SHEETS OF BOREHOLES

KIOCL-23-KA-KLB 11			
DATE OF STARTING	25-08-2023	NAME OF PROSPECT	KALB
DATE OF CLOSING	28-08-2023	BH ID	23 BH01
AZIMUTH	-		
ANGLE	Vertical	EASTING	700569
PROPOSED DEPTH	45.00mtr	NORTHING	1878148
AVG RQD%	47.24%	RL_m	436
Recovery%	93.33%	FINAL Depth	45.00mtr

RQD% - (Total Length Core Recovered as solid Cylinder greater than 100mm in length/Drill Run)*100

DATE/SHIFT	RUN NO.	FROM	TO	RUN LENGTH	RECOVERY	RECOVERY %	LENGTH OF PIECES > 10 cm													TOTAL LENGTH OF PIECES >10cm	RQD %	WEATHERING INDEX*	ROCK STRENGTH INDEX*	DISCONTINUITY INDEX*	RQD REMARKS	Remark
25-08-2023	1	0.00	1.00	1.00	0.65	65.00	0													0	0.00		R1		VERY POOR	
	2	1.00	3.50	2.50	1.30	52.00	0													0	0.00		R1		VERY POOR	
	3	3.50	5.00	1.50	0.90	60.00	0													0	0.00	CW	R1	CR	VERY POOR	
	4	5.00	7.00	2.00	1.85	92.50	10	14	11	10	12									57	28.50	SW	R3	LF	POOR	
	5	7.00	10.00	3.00	2.93	97.67	20	13	11	10	15	15	12	14	15	11	11	10	12	169	56.33	UW	R4	MS	FAIR	
	6	10.00	13.00	3.00	2.96	98.67	10	16	10	20	15	12	10	10	10					113	37.67	UW	R3+R4	MS	POOR	
	7	13.00	16.00	3.00	2.90	96.67	18	14	16	10	11	18	10							97	32.33	UW	R3+R4	MS	POOR	
26-08-2023	8	16.00	19.00	3.00	2.95	98.33	10	11	13	13	38	15	16	25						141	47.00	UW	R4	MS	POOR	
	9	19.00	22.00	3.00	2.93	97.67	19	15	16	16	19	15	21	10	35					166	55.33	UW	R4	MS	FAIR	
	10	22.00	25.00	3.00	2.95	98.33	25	11	10	30	16	20	12	15	13	15	14	25		206	68.67	UW	R4	MS	FAIR	
	11	25.00	28.00	3.00	2.95	98.33	12	15	21	18	11	39	15	26	13	16	16	17	43	20	282	94.00	UW	R4	MS	EXCELLENT	
	12	28.00	31.00	3.00	2.96	98.67	19	12	14	11	15	13	16	14	18	14	11				157	52.33	UW	R4	MS	FAIR	
27-08-2023	13	31.00	34.00	3.00	2.95	98.33	22	14	14	12	10	14	16	21	15	10	30				178	59.33	UW	R4	MS	FAIR	
	14	34.00	37.00	3.00	2.95	98.33	22	15	12	13	11	12	17	11	24	15	11	16	10		189	63.00	UW	R4	MS	FAIR	
	15	37.00	40.00	3.00	2.96	98.67	28	28	18	11	14	10	21	22	15	12	48	14			241	80.33	UW	R4	MS	GOOD	
28-08-2023	16	40.00	43.00	3.00	2.95	98.33	14	36	40	10	23	25	26	11							185	61.67	UW	R4	MS	FAIR	
	17	43.00	45.00	2.00	1.96	98.00	10	14	26	11	60	12									133	66.50	UW	R4	MS	FAIR	
					42.00																	**47.2**					
			Recovery%		**93.33**																						

ANNEXURE 12

GEOTECHNICAL LOG DATA SHEETS OF BOREHOLES

KIOCL-23-KA-KLB 11			
DATE OF STARTING	23-08-2023	NAME OF PROSPECT	KALB
DATE OF CLOSING	27-08-2023	BHID	23 BH02
AZIMUTH	-		
ANGLE	Vertical	EASTING	701852
PROPOSED DEPTH	45.00mtr	NORTHING	1878117
AVG RQD%	53.79%	RL_m	432
Recovery%	95.80%	FINAL Depth	45.00mtr

RQD% - (Total Length Core Recovered as solid Cylinder greater than 100mm in length/Drill Run)*100

DATE/SHIFT	RUN NO.	FROM	TO	RUN LENGTH	RECOVERY	RECOVERY %	LENGTH OF PIECES > 10 cm											TOTAL LENGTH OF PIECES >10cm	RQD %	WEATHERING INDEX*	ROCK STRENGTH INDEX*	DISCONTINUITY INDEX*	RQD REMARKS	Remark
23-08-2023	1	0.00	2.00	2.00	1.50	75.00	0											0	0.00		R1		VERY POOR	
24-08-2023	2	2.00	4.00	2.00	1.50	75.00	0											0	0.00	CW	R1	CR	VERY POOR	
	3	4.00	7.00	3.00	2.85	95.00	12	13	12	20	11	29	15	17	25	10		164	54.67	SW	R3+R4	LF	FAIR	
	4	7.00	10.00	3.00	2.98	99.33	33	14	16	25	17	10	20	26	15			176	58.67	UW	R4	MS	FAIR	
	5	10.00	13.00	3.00	2.96	98.67	11	10	10	24	11	12	12	10	17	12	10	33	172	57.33	UW	R4	MS	FAIR	
25-08-2023	6	13.00	16.00	3.00	2.90	96.67	20	26	27	20	12	19	12	15	16	11	21		199	66.33	UW	R4	MS	FAIR	
	7	16.00	19.00	3.00	2.95	98.33	20	21	10	14	11	12	10	10	12				120	40.00	UW	R4	MS	POOR	
	8	19.00	22.00	3.00	2.93	97.67	15	10	20	20	13	17	23	11					129	43.00	UW	R4	MS	POOR	
	9	22.00	25.00	3.00	2.96	98.67	12	13	10	12	12	23	14	23	26	10	12	26	193	64.33	UW	R4	MS	FAIR	
26-08-2023	10	25.00	28.00	3.00	2.90	96.67	23	21	20	11	23	21	30	18	11				178	59.33	UW	R4	MS	FAIR	
	11	28.00	31.00	3.00	2.96	98.67	31	15	25	54	11	10	30	29	29				234	78.00	UW	R4	MS	GOOD	
	12	31.00	34.00	3.00	2.95	98.33	14	26	47	11	27	49							174	58.00	UW	R4	MS	FAIR	
	13	34.00	37.00	3.00	2.95	98.33	28	22	12	23	17	10	16	30	23	10	30		221	73.67	UW	R4	MS	FAIR	
27-08-2023	14	37.00	40.00	3.00	2.90	96.67	16	18	10	10	12	14	16	12	11	22	44		185	61.67	UW	R4	MS	FAIR	
	15	40.00	43.00	3.00	2.96	98.67	35	10	19	21	19	15	18	23	34				194	64.67	UW	R4	MS	FAIR	
	16	43.00	45.00	2.00	1.96	98.00	34	10	36	23	14	18	14	13					162	81.00	UW	R4	MS	GOOD	
					43.11															53.79					
			Recovery%		95.8																				

ANNEXURE 12

GEOTECHNICAL LOG DATA SHEETS OF BOREHOLES

KIOCL-23-KA-KLB 11

DATE OF STARTING	29-08-2023	NAME OF PROSPECT	KALB
DATE OF CLOSING	02-09-2023	BH ID	23 BH03
AZIMUTH	-		
ANGLE	Vertical	EASTING	701889
PROPOSED DEPTH	45.00mtr	NORTHING	1876585
AVG RQD %	38.81%	RL_m	
RECOVERY %	92.42%	FINAL Depth	45.00mtr

RQD% - (Total Length Core Recovered as solid Cylinder greater than 100mm in length/Drill Run)*100

DATE/SHIFT	RUN NO	FROM	TO	RUN LENGTH	RECOVERY	RECOVERY %	LENGTH OF PIECES > 10 cm													TOTAL LENGTH OF PIECES >10cm	RQD %	WEATHERING INDEX*	ROCK STRENGTH INDEX*	DISCONTINUITY INDEX*	RQD REMARKS	Remark
29-08-2023	1	0.00	0.40	0.40	0.35	87.50	0													0	0.00	SW	R3	FR	VERY POOR	
	2	0.40	1.00	0.60	0.30	50.00	0													0	0.00	CW	R1	CR	VERY POOR	
30-08-2023	3	1.00	2.30	1.30	1.25	96.15	26	13												39	30.00	SW	R3+R4	LF	POOR	
	4	2.30	3.30	1.00	0.55	55.00														0	0.00	CW	R1	CR	VERY POOR	
	5	3.30	5.00	1.70	1.62	95.29	15	18	14	20										67	39.41	SW	R3+R4	LF	POOR	
	6	5.00	7.00	2.00	1.95	97.50	39	21	22	20										102	51.00	SW	R3+R4	LF	FAIR	
31-08-2023	7	7.00	9.70	2.70	2.65	98.15	29	12	17	22	15	10	13							118	43.70	SW	R3+R4	LF	POOR	
	8	9.70	11.30	1.60	0.90	56.25														0	0.00	CW	R1	CR	VERY POOR	
	9	11.30	13.00	1.70	1.60	94.12	10	13	21	22	25									91	53.53	SW	R4	MS	FAIR	
	10	13.00	14.00	1.00	0.55	55.00														0	0.00	CW	R1	CR	VERY POOR	
	11	14.00	15.80	1.80	1.70	94.44	20	20	16	13	11									80	44.44	SW	R3	MS	POOR	
	12	15.80	17.00	1.20	0.60	50.00														0	0.00	CW	R1	CR	VERY POOR	
01-09-2023	13	17.00	19.00	2.00	1.95	97.50	15	15	13	10	11	13	10	10	18					115	57.50	UW	R4	MS	FAIR	
	14	19.00	22.00	3.00	2.95	98.33	12	10	17	10	15	13	19							96	32.00	UW	R4	MS	POOR	
	15	22.00	25.00	3.00	2.96	98.67	11	30	23	13	10	26	14							127	42.33	UW	R4	MS	POOR	
	16	25.00	28.00	3.00	2.95	98.33	11	22	16	16	26	18	11	12	23					155	51.67	UW	R4	MS	FAIR	
	17	28.00	31.00	3.00	2.95	98.33	15	13	11	10	15	10	10	19	11	14	18	11		157	52.33	UW	R4	MS	FAIR	
	13	31.00	34.00	3.00	2.98	99.33	16	21	26	14	13	16	11	11	11	14	25	12	14	204	68.00	UW	R4	MS	FAIR	
02-09-2023	14	34.00	37.00	3.00	2.95	98.33	17	15	16	16	13	18	10	18	19	13				155	51.67	UW	R4	MS	FAIR	
	15	37.00	40.00	3.00	2.95	98.33	10	15	16	16	10	21	11	13	15	23	18	29	19	17	233	77.67	UW	R4	MS	GOOD	
	16	40.00	43.00	3.00	2.95	98.33	17	30	26	27	16	30	14	25	36	13					234	78.00	UW	R4	MS	GOOD	
	17	43.00	45.00	2.00	1.98	99.00	21	13	15	17	11	24	25	25	10						161	80.50	UW	R4	MS	GOOD	
					41.59																38.8					
			Recovery%		92.42																					

ANNEXURE 12

GEOTECHNICAL LOG DATA SHEETS OF BOREHOLES

KIOCL-23-KA-KLB 11			
DATE OF STARTING	19-09-2023	NAME OF PROSPECT	KALB
DATE OF CLOSING	28-09-2023	BH ID	23 BH04
AZIMUTH	-		
ANGLE	Vertical	EASTING	700690
PROPOSED DEPTH	45.00mtr	NORTHING	1876434
AVG RQD %	36.67%	RL_m	418
RECOVERY %	93.91%	FINAL Depth	45.00mtr

RQD% - (Total Length Core Recovered as solid Cylinder greater than 100mm in length/Drill Run)*100

DATE/SHIFT	RUN NO	FROM	TO	RUN LENGTH	RECOVERY	RECOVERY %	LENGTH OF PIECES > 10 cm											TOTAL LENGTH OF PIECES >10cm	RQD %	WEATHERING INDEX*	ROCK STRENGTH INDEX*	DISCONTINUITY INDEX*	RQD REMARKS	Remark
19-09-2023	1	0.00	0.30	0.30	0.20	66.67	0											0	0.00		R1		VERY POOR	
	2	0.30	2.30	2.00	1.85	92.50	10	12	13	10	10							55	27.50	UW	R4	LF	POOR	
	3	2.30	4.00	1.70	0.80	47.06												0	0.00	CW	R1	CR	VERY POOR	
	4	4.00	5.00	1.00	0.90	90.00	11	13	14	14								52	52.00	UW	R4	MS	FAIR	
20-09-2023	5	5.00	7.00	2.00	1.94	97.00	13	18	10	11	13	10	10					85	42.50	UW	R4	MS	POOR	
	6	7.00	7.70	0.70	0.40	57.14												0	0.00	CW	R1	CR	VERY POOR	
31-08-2023	7	7.70	10.00	2.30	2.25	97.83	13	19	12	17	13							74	32.17	UW	R4	MS	POOR	
	8	10.00	11.10	1.10	1.05	95.45	15	10										25	22.73	UW	R4	MS	VERY POOR	
	9	11.10	12.00	0.90	0.55	61.11												0	0.00	CW	R1	CR	VERY POOR	
	10	12.00	13.00	1.00	0.95	95.00	10	14	16	11								51	51.00	UW	R4	MS	FAIR	
	11	13.00	16.00	3.00	2.96	98.67	10	10	13	14	12	16	13	10				98	32.67	UW	R4	MS	POOR	
	12	16.00	19.00	3.00	2.97	99.00	15	13	22	15	17	20	12	12	10	14		150	50.00	UW	R4	MS	POOR	
21-09-2023	13	19.00	22.00	3.00	2.97	99.00	10	16	12	10	19	15	12	17	12	17	13	153	51.00	UW	R4	MS	FAIR	
	14	22.00	25.00	3.00	2.97	99.00	11	19	15	18	12	11	10	31	17	15		159	53.00	UW	R4	MS	FAIR	
	15	25.00	28.00	3.00	2.96	98.67	10	10	18	16	12	14	15	11	10	12		128	42.67	UW	R4	MS	POOR	
	16	28.00	31.00	3.00	2.95	98.33	15	10	16	23	10	25	17	19	24	21	15	195	65.00	UW	R4	MS	FAIR	
	17	31.00	34.00	3.00	2.96	98.67	17	17	21	13	17	30	10	34	24	14		197	65.67	UW	R4	MS	FAIR	

ANNEXURE 12

GEOTECHNICAL LOG DATA SHEETS OF BOREHOLES

KIOCL-23-KA-KLB 11			
DATE OF STARTING	19-09-2023	NAME OF PROSPECT	KALB
DATE OF CLOSING	28-09-2023	BH ID	23 BH04
AZIMUTH	-		
ANGLE	Vertical	EASTING	700690
PROPOSED DEPTH	45.00mtr	NORTHING	1876434
AVG RQD %	36.67%	RL_m	418
RECOVERY %	93.91%	FINAL Depth	45.00mtr

RQD% - (Total Length Core Recovered as solid Cylinder greater than 100mm in length/Drill Run)*100

DATE/SHIFT	RUN NO	FROM	TO	RUN LENGTH	RECOVERY	RECOVERY %	LENGTH OF PIECES > 10 cm											TOTAL LENGTH OF PIECES >10cm	RQD %	WEATHERING INDEX*	ROCK STRENGTH INDEX*	DISCONTINUITY INDEX*	RQD REMARKS	Remark
28-09-2023	13	34.00	37.00	3.00	2.97	99.00	12	10	25	12	13	25	16	12	12	32	12	19	200	66.67	UW	R4	MS	FAIR	
	14	37.00	40.00	3.00	2.95	98.33	24	12	18	11	21	19	10	15	17	15	23	11	196	65.33	UW	R4	MS	FAIR	
	15	40.00	40.80	0.80	0.78	97.50	20	10											30	37.50	UW	R4	MS	POOR	
	16	40.80	41.40	0.60	0.40	66.67													0	0.00	CW	R1	CR	VERY POOR	
	17	41.40	43.00	1.60	1.55	96.87	19	17											36	22.50	UW	R4	MS	VERY POOR	
	17	43.00	45.00	2.00	1.98	99.00	20	11	12	15	12	10	16	10	21				127	63.50	UW	R4	MS	FAIR	
					42.26															36.7					
			Recovery%		93.91																				

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ANNEXURE 12

GEOTECHNICAL LOG DATA SHEETS OF BOREHOLES

KIOCL-23-KA-KLB 11				
DATE OF STARTING	02-09-2023	NAME OF PROSPECT	KALB	RQD% - (Total Length Core Recovered as solid Cylinder greater than 100mm in length/Drill Run)*100
DATE OF CLOSING	30-09-2023	BHID	23 BH05	
AZIMUTH	-			
ANGLE	Vertical	EASTING	701231	
PROPOSED DEPTH	45.00mtr	NORTHING	1877287	
AVG RQD%	48.51%	RL_m	429	
Recovery%	97.53%	FINAL Depth	45.00mtr	

DATE/SHIFT	RUN NO.	FROM	TO	RUN LENGTH	RECOVERY	RECOVERY %	LENGTH OF PIECES > 10 cm												TOTAL LENGTH OF PIECES >10cm	RQD %	WEATHERING INDEX*	ROCK STRENGTH INDEX*	DISCONTINUITY INDEX*	RQD REMARKS	Remark
02-09-2023	1	0.00	1.00	1.00	0.70	70.00	0												0	0.00		R1		VERY POOR	
	2	1.00	2.00	1.00	0.95	95.00	11												11	11.00	SW	R3	LF	VERY POOR	
	3	2.00	3.00	1.00	0.85	85.00													0	0.00	SW	R3+R4	FR	VERY POOR	
	4	3.00	5.00	2.00	1.96	98.00	13	29	14	19	24								99	49.50	UW	R4	MS	POOR	
07-09-2023	5	5.00	7.00	2.00	1.90	95.00	19	13	13	16	25	16							102	51.00	UW	R4	MS	FAIR	
	6	7.00	10.00	3.00	2.95	98.33	22	11	11	11	22	10	33						120	40.00	UW	R4	MS	FAIR	
17-09-2023	7	10.00	13.00	3.00	2.98	99.33	13	18	10	10	10	34	20	18	11	11	12	18	25	210	70.00	UW	R4	MS	FAIR	
	8	13.00	16.00	3.00	2.97	99.00	16	15	17	26	32	11	15	11	11					154	51.33	UW	R4	MS	FAIR	
	9	16.00	19.00	3.00	2.96	98.67	12	24	11	14	17	11	10	14	12	29	15	14		183	61.00	UW	R4	MS	FAIR	
18-09-2023	10	19.00	22.00	3.00	2.97	99.00	26	21	10	10	16	24	12	12	13	13	22			179	59.67	UW	R4	MS	FAIR	
	11	22.00	25.00	3.00	2.96	98.67	10	19	12	10	38	34	29	10	11					173	57.67	UW	R4	MS	FAIR	
19-09-2023	12	25.00	28.00	3.00	2.96	98.67	14	15	19	21	30	44	10							153	51.00	UW	R4	MS	FAIR	
	13	28.00	31.00	3.00	2.95	98.33	20	29	23	12	16	15	57							172	57.33	UW	R4	MS	FAIR	
	14	31.00	34.00	3.00	2.97	99.00	48	34	11	18	25	10	35	10						191	63.67	UW	R4	MS	FAIR	
30-09-2023	15	34.00	37.00	3.00	2.96	98.67	17	11	22	23	28	23	11	22						157	52.33	UW	R4	MS	FAIR	
	16	37.00	40.00	3.00	2.97	99.00	34	23	17	12	29	20	11	14	23					183	61.00	UW	R4	MS	FAIR	
	17	40.00	43.00	3.00	2.95	98.33	33	26	28	10	14	12	14	12	20					169	56.33	UW	R4	MS	FAIR	
	18	43.00	45.00	2.00	1.98	99.00	19	12	22	16	32	16	30	10						157	78.50	UW	R4	MS	GOOD	
					43.89																				
			Recovery%		**97.53**															**48.5**					

KUDREMUKH

ANNEXURE 13

PETROGRAPHIC REPORTS

भू विज्ञान विभाग
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Department of Earth Sciences
Indian Institute of Technology Bombay
Powai, Mumbai - 400 076, India

Tel. : (+91-22) 2576 7251, 2576 7252
EPABX : (+91-22) 2572 2545. Extn.: 7251, 7252
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IIT Bombay

Dr. Sakthi Saravanan Chinnasamy
Associate Professor

To: **30th Dec 2023**

DNYANESHWAR GAONKAR
Deputy Manager (ME)
Mineral Exploration Department
KIOCL Limited, II Block, Koramangala
Bangalore 560034
Karnataka

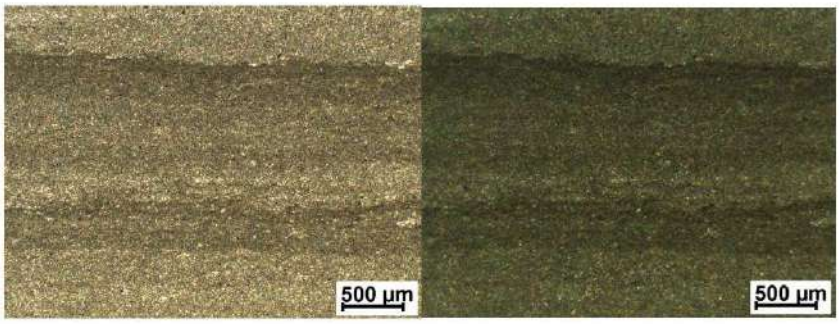
Petrographical and Mineralogical Report

The color of rocks varies from light to dark grey. It comprises indistinguishable lamellae except sample 25BH/02/13 showing strong lamination and sample 21BH/01/33 showing weakly lamination. All of the five rock samples are dominantly comprised of micritic calcite therefore preserve the pristine signature of formation. Besides, all the samples also show neomorphism where micritic calcite is recrystallized and increased in grain size. Presence of framboidal pyrites are also observed in sample 25BH/02/13 and 21BH/01/33 only whereas samples 20BH/04/6 and 23BH/04/11 are comprised of minor quantity of goethite. Sample 20BH/04/6 is enriched in goethite compared to sample 23BH/04/11 and shows a linear array of goethite parallel to the bedding. In comparison to above there is complete absence of any opaque mineral phase in sample 21BH/02/12. Besides chemical sediments, quartz is also observed as detrital grains only in the sample 25BH/02/13 that is along the dark colored lamellae representing possibly presence of clay minerals in it. Overall, the mineralogy of all the rock samples are 99 % micritic calcite except sample 25BH/02/13 that comprises more than 5 % detrital quartz and clay minerals. The rocks have undergone diagenesis and compaction that is evidence by the presence of stylolites parallel to bedding and calcite vein perpendicular to the bedding. The minerals along the stylolites are possibly detrital clay. Calcites in the vein might have been formed by dissolution-reprecipitation mechanism during compaction and stylolite

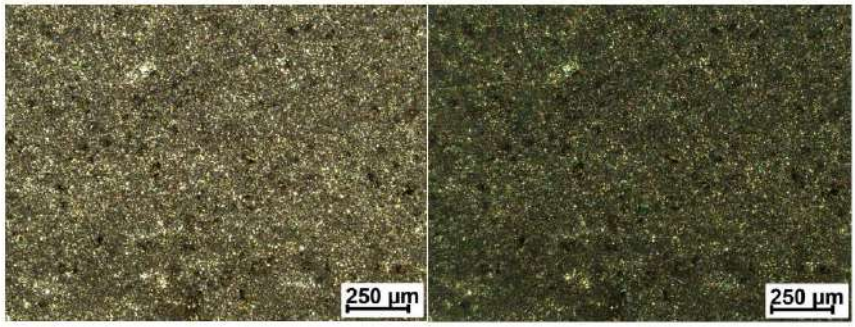
formation. The calcite veins are observed only in samples 20BH/04/6 and 23BH/04/11 whereas stylolite is observed only in sample 23BH/04/11.

Based on mineralogy the rocks are classified as micritic limestone and textural observation indicates preservation of the pristine signature of rock formation. Since the textural depositional features are not recognizable therefore considering Dunham's classification of carbonate rocks these rocks can be described as 'crystalline carbonate'. At the same time, considering Wright's classification of limestone and size of micrite less than 10 µm these rocks can be classified as 'microspar stone'.

Sample 25BH/02/13 showing strong lamination, photomicrographs in PPL and XPL respectively.

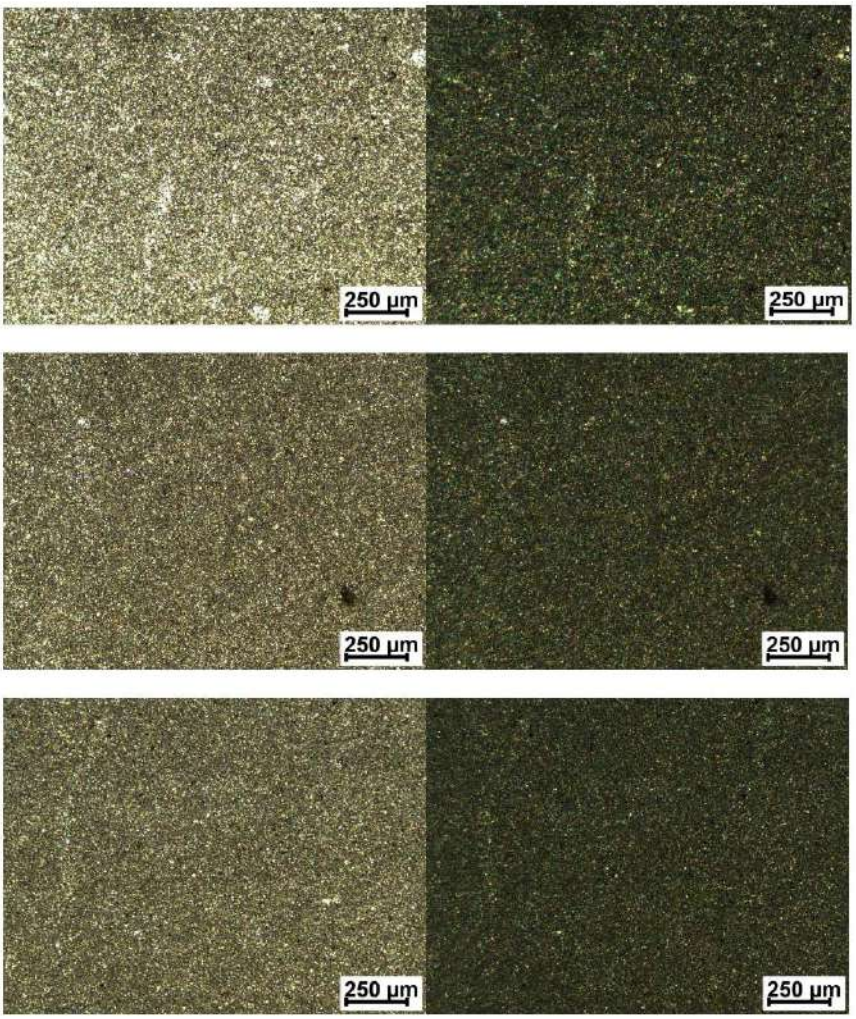


Samples 20BH/04/6, 23BH/04/11, 21BH/02/12, 25BH/02/13 and 21BH/01/33 showing micritic nature of limestone, photomicrographs in PPL and XPL respectively for individual samples.

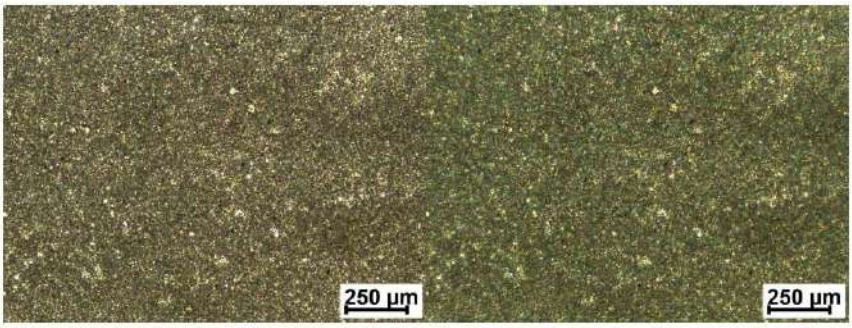


ANNEXURE 13

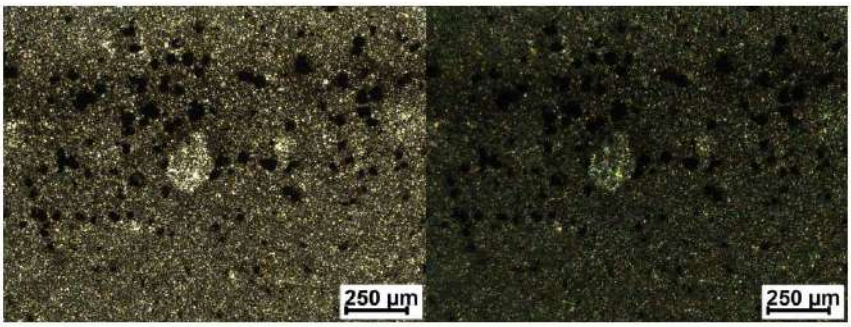
PETROGRAPHIC REPORTS

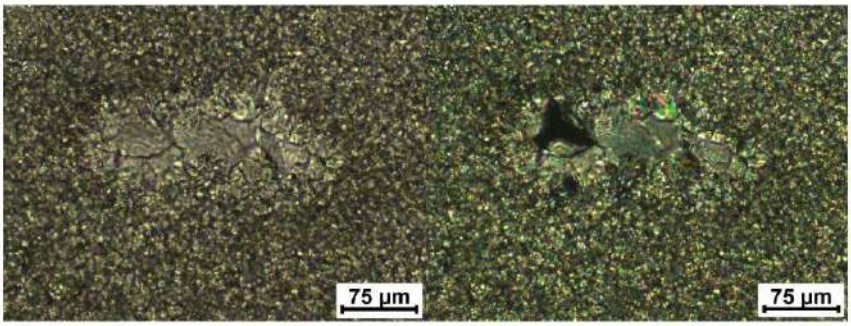


PETROGRAPHIC REPORTS

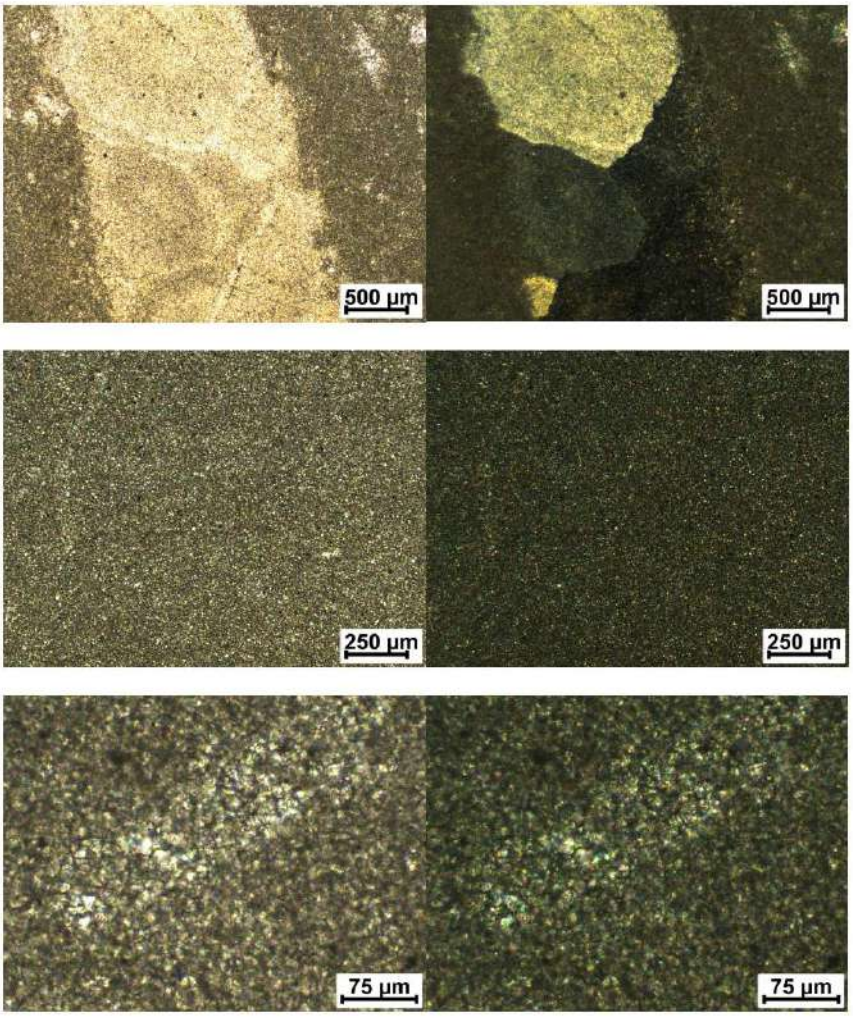


Samples 20BH/04/6, 23BH/04/11, 21BH/02/12, 25BH/02/13 and 21BH/01/33 showing neomomorphism, photomicrographs in PPL and XPL respectively for individual samples.

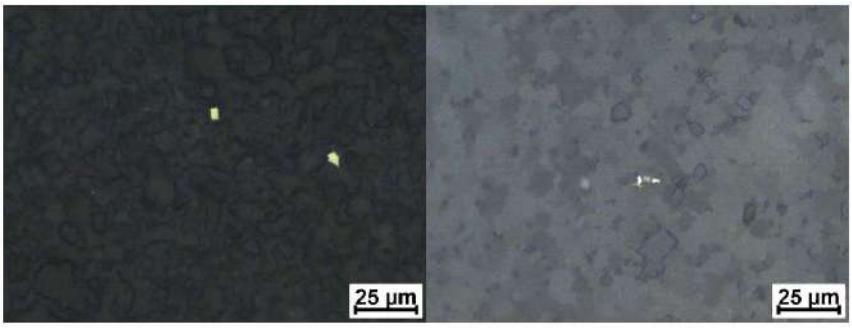




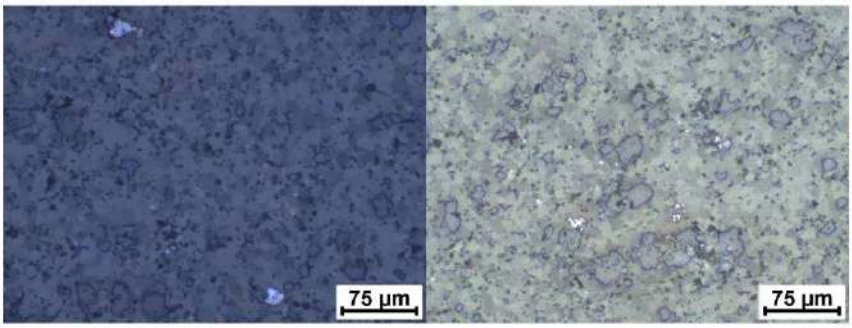
PETROGRAPHIC REPORTS



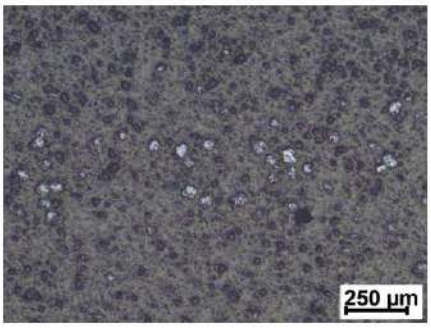
Samples 25BH/02/13 and 21BH/01/33 showing framboidal pyrite, photomicrographs in PPL only for individual samples.



Samples 20BH/04/6 and 23BH/04/11 showing disseminated goethite, photomicrographs in PPL only for individual samples.

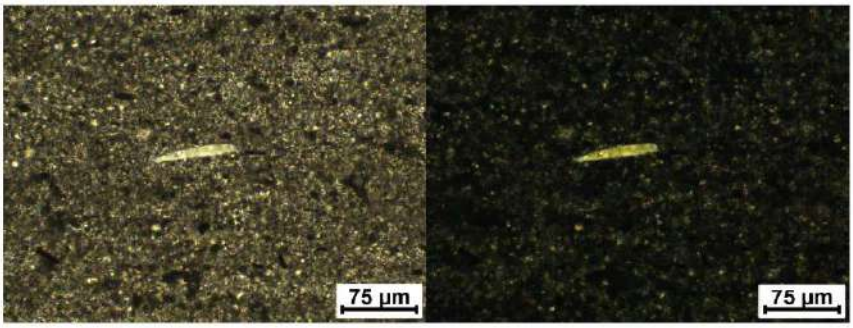


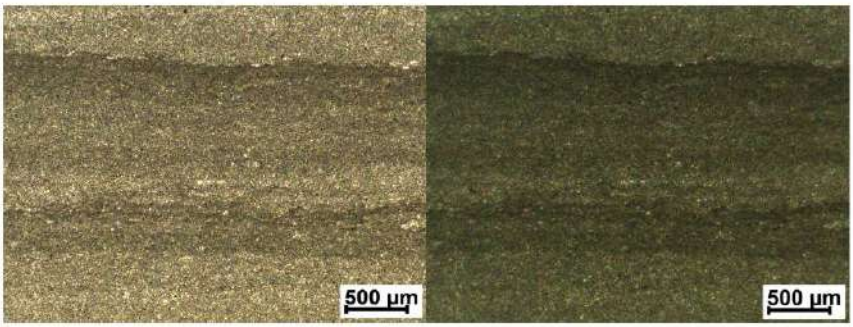
Sample 20BH/04/6 shows a linear array of goethite parallel to bedding, photomicrographs in PPL only.



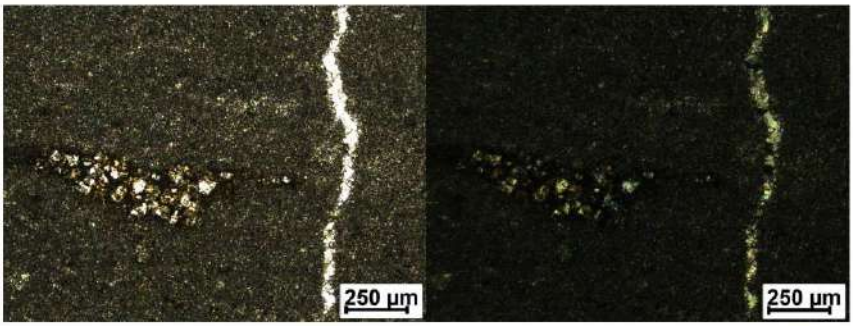
PETROGRAPHIC REPORTS

Sample 25BH/02/13 shows presence of detrital quartz and clay mineral interlayering, photomicrographs in PPL and XPL.

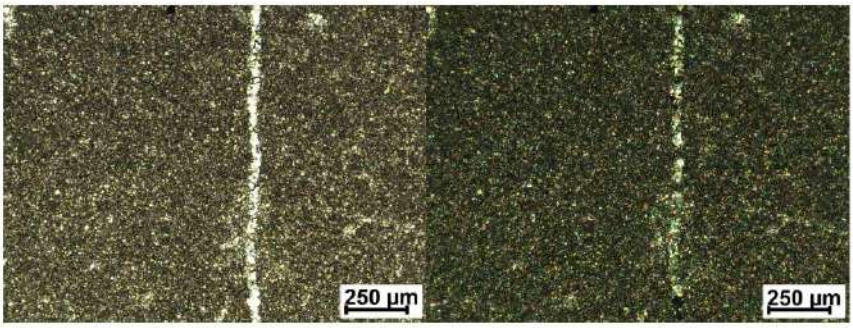




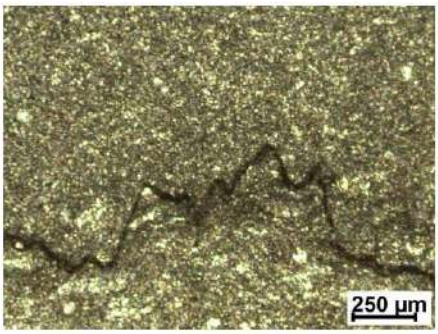
The calcite veins are observed only in samples 20BH/04/6 and 23BH/04/11, photomicrographs in PPL and XPL for individual samples.



PETROGRAPHIC REPORTS



Stylolite is observed only in sample 23BH/04/11, photomicrographs in PPL only.



Yours faithfully,

C. Sakthi Saravanan

*(**Sakthi Saravanan Chinnasamy** PhD)*

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- when it has to be right

Leica Geosystems

GNSS Processing Report

Report created: 27-11-2023 18:34:41

Project Details

General

Project Name:	CHITTAPUR TO JEVARGI BASE TRANSFER
Owner:	-
Lead Surveyor:	-
Date Created:	27-11-2023 18:27:04
Last Accessed:	27-11-2023 18:27:05
Application Software:	Infinity 3.3.2

Customer Details

Customer Name:	-
Contact Person:	-
Number:	-
Email:	-
Skype:	-
Website:	-

Master Coordinate System

Coordinate System Name:	UTM43N
Transformation Type:	Classical 3D
Residual Distribution:	None
Ellipsoid:	WGS 1984
Projection Type:	UTM
Geoid Model:	egm08_0N-90N_0E-180E_5x5
CSCS Model:	-

Path:	E:\JEVARGI BLOCKS\CHITTAPUR TO JEVARGI BASE TRANSFER\CHITTAPUR TO JEVARGI BASE TRANSFER.iprj
Size:	92.4 MB
Comments:	-

Baseline CHP-1 - JWG-BASE

Processing Parameters (27-11-2023 10:19:07 - 27-11-2023 15:21:35)

Data	Selected	Used	Comments
Cut-Off Angle:	10°	10°	
Frequency:	Automatic	L1/E1/B1/L2/B2/L5/E5a/E5b/E5a+b	
Sampling Rate:	Use All	1.00 sec	
Satellite System:	GPS/GLONASS/Galileo/Beidou	GPS/GLONASS/Galileo/Beidou	
Ephemeris Type:	Broadcast	Broadcast	
Antenna Calibration Set:	NGS Absolute	NGS Absolute	

Processing Strategy

Solution Type:	Phase Fixed	Phase Fixed
Solution Optimisation:	Automatic	Iono Minimised
Frequency to use in IonoMinimised:		Automatic
		L1/E1/B1/L2/B2/L5/E5a/E5b/E5a+b
Tropospheric Model:	VMF with GPT2 model	VMF with GPT2 model
Ionospheric Model:	Automatic	Computed
Allow Widelane Fix:	Automatic	Automatic

General Settings

Min. Distance for IonoMinimised:	15 km
Possible Ambiguities Fixup to:	300 km
Min. Duration for FloatSolution (static):	00:05:00

Time Settings

Time Format:	HH:mm:ss
Time System:	Local Time

Leap Seconds: 18

Results Baseline: CHP-1 - JWG-BASE

Acquisition

Boundary Point and Borehole Points DGPS Survey Report.

Start Time - End Time: 27-11-2023 10:19:08 - 27-11-2023 15:21:35
Duration: 05:02:27

Antennas

	Reference - CHP-1	Rover - JWG-BASE
Receiver Name / SN:	LEICA GS16 / 3707963	LEICA GS18 / 3606815
Antenna Name / SN:	LEIGS16 / -	LEIGS18 / -
Carrier Offset:	0.360 m	0.360 m
Height Reading:	0.447 m	0.216 m
Antenna Height:	0.807 m	0.576 m

Phase Center Offset

	Reference - LEIGS16		Rover - LEIGS18	
GPS	**L1**	**L2**	**L1**	**L2**
East	0.000 m	0.000 m	0.000 m	0.002 m
North	0.000 m	0.002 m	-0.001 m	0.000 m
Up	0.089 m	0.089 m	0.100 m	0.107 m

GLONASS	**L1**	**L2**	**L1**	**L2**
East	0.000 m	0.000 m	0.000 m	0.002 m
North	0.000 m	0.002 m	-0.001 m	0.000 m
Up	0.089 m	0.089 m	0.100 m	0.107 m

Coordinates

	Reference - CHP-1	Rover - JWG-BASE		Reference - CHP-1	Rover - JWG-BASE
Point Role:	Control	Fixed PP			
WGS84 Latitude:	-	17° 00' 19.2348" N	Easting:	722,003.771 m	688,799.408 m
WGS84 Longitude:	-	76° 46' 24.6851" E	Northing:	1,894,665.559 m	1,881,000.882 m
WGS84 Ellip. Height:	-	358.715 m	Ortho. Height:	435.436 m	437.735 m
WGS84 Cartesian X:	-	1,395,995.387 m			
WGS84 Cartesian Y:	-	5,939,509.756 m			
WGS84 Cartesian Z:	-	1,853,503.780 m			

Baseline Vector and Quality - WGS84

ΔLatitude:	-0° 07' 13.7430"	SD ΔLatitude:	0.000 m
ΔLongitude:	-0° 18' 47.3191"	SD ΔLongitude:	0.000 m
ΔHeight:	1.853 m	SD ΔHeight:	0.000 m
ΔX:	33,357.394 m	SD ΔX:	0.000 m
ΔY:	-3,724.875 m	SD ΔY:	0.000 m
ΔZ:	-12,747.050 m	SD ΔZ:	0.000 m
Slope Dist.:	35,903.729 m	SD Slope Dist.:	0.000 m

M0:	0.240 m	CQ 1D:	0.000 m
Q11:	0.00000004	CQ 2D:	0.000 m
Q12:	0.00000003	CQ 3D:	0.000 m
Q22:	0.00000017		
Q13:	0.00000001		
Q23:	0.00000005		
Q33:	0.00000004		

Results Baseline: JWG-BASE - TBM-4

Boundary Point and Borehole Points DGPS Survey Report.

Acquisition

Start Time - End Time:	28-11-2023 15:14:16 - 28-11-2023 17:16:14
Duration:	02:01:58

Antennas

	Reference - JWG-BASE	Rover - TBM-4
Receiver Name / SN:	LEICA GS16 / 3707963	LEICA GS18 / 3603617
Antenna Name / SN:	LEIGS16 / -	LEIGS18 / -
Carrier Offset:	0.360 m	0.360 m
Height Reading:	0.185 m	0.605 m
Antenna Height:	0.545 m	0.965 m

Phase Center Offset

	Reference - LEIGS16		Rover - LEIGS18	
GPS	**L1**	**L2**	**L1**	**L2**
East	0.000 m	0.000 m	0.000 m	0.002 m
North	0.000 m	0.002 m	-0.001 m	0.000 m
Up	0.089 m	0.089 m	0.100 m	0.107 m

GLONASS	**L1**	**L2**	**L1**	**L2**
East	0.000 m	0.000 m	0.000 m	0.002 m
North	0.000 m	0.002 m	-0.001 m	0.000 m
Up	0.089 m	0.089 m	0.100 m	0.107 m

Coordinates

	Reference - JWG-BASE	Rover - TBM-4		Reference - JWG-BASE	Rover - TBM-4
Point Role:	Control	Fixed PP			
WGS84 Latitude:	-	16° 58' 58.3548" N	Easting:	688,799.408 m	701,010.658 m
WGS84 Longitude:	-	76° 53' 16.7057" E	Northing:	1,881,000.882 m	1,878,628.311 m
WGS84 Ellip. Height:	-	352.245 m	Ortho. Height:	437.735 m	431.497 m
WGS84 Cartesian X:	-	1,384,291.709 m			
WGS84 Cartesian Y:	-	5,942,988.216 m			
WGS84 Cartesian Z:	-	1,851,123.956 m			

Baseline Vector and Quality - WGS84

Start Time - End Time:	05-12-2023 08:58:27 - 05-12-2023 11:02:18
Duration:	02:03:51

Antennas

Boundary Point and Borehole Points DGPS Survey Report.

	Reference - TBM-4	Rover - BP 23A
Receiver Name / SN:	LEICA GS16 / 3707963	LEICA GS18 / 3606815
Antenna Name / SN:	LEIGS16 / -	LEIGS18 / -
Carrier Offset:	0.360 m	0.000 m
Height Reading:	0.610 m	1.800 m
Antenna Height:	0.970 m	1.800 m

Phase Center Offset

	Reference - LEIGS16		Rover - LEIGS18	
GPS	**L1**	**L2**	**L1**	**L2**
East	0.000 m	0.000 m	0.000 m	0.002 m
North	0.000 m	0.002 m	-0.001 m	0.000 m
Up	0.089 m	0.089 m	0.100 m	0.107 m

GLONASS	**L1**	**L2**	**L1**	**L2**
East	0.000 m	0.000 m	0.000 m	0.002 m
North	0.000 m	0.002 m	-0.001 m	0.000 m
Up	0.089 m	0.089 m	0.100 m	0.107 m

Coordinates

	Reference - TBM-4	Rover - BP 23A		Reference - TBM-4	Rover - BP 23A
Point Role:	Control	Fixed PP			
WGS84 Latitude:	-	16° 58' 55.1046" N	Easting:	701,010.658 m	700,218.918 m
WGS84 Longitude:	-	76° 52' 49.9105" E	Northing:	1,878,628.311 m	1,878,520.772 m
WGS84 Ellip. Height:	-	348.700 m	Ortho. Height:	431.497 m	427.949 m
WGS84 Cartesian X:	-	1,385,069.586 m			
WGS84 Cartesian Y:	-	5,942,833.459 m			
WGS84 Cartesian Z:	-	1,851,027.356 m			

Baseline Vector and Quality - WGS84

ΔLatitude:	-0° 00' 03.2502"	SD ΔLatitude:	0.000 m
ΔLongitude:	-0° 00' 26.7952"	SD ΔLongitude:	0.000 m
ΔHeight:	-3.545 m	SD ΔHeight:	0.000 m
ΔX:	777.878 m	SD ΔX:	0.000 m
ΔY:	-154.757 m	SD ΔY:	0.000 m
ΔZ:	-96.600 m	SD ΔZ:	0.000 m
Slope Dist.:	798.984 m	SD Slope Dist.:	0.000 m

M0:	0.362 m	CQ 1D:	0.000 m
Q11:	0.00000000	CQ 2D:	0.000 m
Q12:	0.00000000	CQ 3D:	0.000 m
Q22:	0.00000002		
Q13:	0.00000000		
Q23:	0.00000001		
Q33:	0.00000000		

Frequency:	L1/E1/B1/L2/B2/L5/E5a/E5b/E5a+b	GDOP:	1.4 - 2.0	GPS SVs:	10/10
Solution Optimisation:	None	PDOP:	0.8 - 1.2	GLONASS SVs:	8/9
Solution Type:	Phase Fixed	HDOP:	0.4 - 0.5	Beidou SVs:	11/14
		VDOP:	0.7 - 1.1	Galileo SVs:	8/8
				QZSS SVs:	-

Ephemeris Type:

Results Baseline: TBM-4 - BP23B

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Annexure 14

Boundary Point and Borehole Points DGPS Survey Report.

Acquisition

Start Time - End Time:	05-12-2023 09:34:57 - 05 12-2023 11:40:08
Duration:	02:05:11

Antennas

	Reference - TBM-4	Rover - BP23B
Receiver Name / SN:	LEICA GS16 / 3707963	LEICA GS18 / 3603617
Antenna Name / SN:	LEIGS16 / -	LEIGS18 / -
Carrier Offset:	0.360 m	0.360 m
Height Reading:	0.610 m	1.800 m
Antenna Height:	0.970 m	2.160 m

Phase Center Offset

	Reference - LEIGS16		Rover - LEIGS18	
GPS	**L1**	**L2**	**L1**	**L2**
East	0.000 m	0.000 m	0.000 m	0.002 m
North	0.000 m	0.002 m	-0.001 m	0.000 m
Up	0.089 m	0.089 m	0.100 m	0.107 m

GLONASS	**L1**	**L2**	**L1**	**L2**
East	0.000 m	0.000 m	0.000 m	0.002 m
North	0.000 m	0.002 m	-0.001 m	0.000 m
Up	0.089 m	0.089 m	0.100 m	0.107 m

Coordinates

	Reference - TBM-4	Rover - BP23B		Reference - TBM-4	Rover - BP23B
Point Role:	Control	Fixed PP			
WGS84 Latitude:	-	16° 58' 54.5445" N	Easting:	701,010.658 m	702,245.916 m
WGS84 Longitude:	-	76° 53' 58.4220" E	Northing:	1,878,628.311 m	1,878,523.088 m
WGS84 Ellip. Height:	-	345.839 m	Ortho. Height:	431.497 m	425.106 m
WGS84 Cartesian X:	-	1,383,096.100 m			
WGS84 Cartesian Y:	-	5,943,295.418 m			
WGS84 Cartesian Z:	-	1,851,010.052 m			

Baseline Vector and Quality - WGS84

Start Time - End Time:	06-12-2023 09:45:31 - 06-12-2023 11:57:56
Duration:	02:12:25

Antennas

	Reference - TBM-4	Rover - 23BP-C
Receiver Name / SN:	LEICA GS16 / 3707963	LEICA GS18 / 3606815
Antenna Name / SN:	LEIGS16 / -	LEIGS18 / -
Carrier Offset:	0.360 m	0.360 m
Height Reading:	0.585 m	2.000 m
Antenna Height:	0.945 m	2.360 m

Phase Center Offset

KUDREMUKH

Annexure 14

Boundary Point and Borehole Points DGPS Survey Report.

	Reference - LEIGS16		Rover - LEIGS18	
GPS	**L1**	**L2**	**L1**	**L2**
East	0.000 m	0.000 m	0.000 m	0.002 m
North	0.000 m	0.002 m	-0.001 m	0.000 m
Up	0.089 m	0.089 m	0.100 m	0.107 m

GLONASS	**L1**	**L2**	**L1**	**L2**
East	0.000 m	0.000 m	0.000 m	0.002 m
North	0.000 m	0.002 m	-0.001 m	0.000 m
Up	0.089 m	0.089 m	0.100 m	0.107 m

Coordinates

	Reference - TBM-4	Rover - 23BP-C		Reference - TBM-4	Rover - 23BP-C
Point Role:	Control	Fixed PP			
WGS84 Latitude:	-	16° 57' 34.23869" N	Easting:	701,010.658 m	702,244.622 m
WGS84 Longitude:	-	76° 53' 57.57044" E	Northing:	1,878,628.311 m	1,876,053.987 m
WGS84 Ellip. Height:	-	322.094 m	Ortho. Height:	431.497 m	401.456 m
WGS84 Cartesian X:	-	1,383,278.823 m			
WGS84 Cartesian Y:	-	5,943,969.444 m			
WGS84 Cartesian Z:	-	1,848,641.787 m			

Baseline Vector and Quality - WGS84

ΔLatitude:	-0° 01' 24.11616"	SD ΔLatitude:	0.000 m
ΔLongitude:	0° 00' 40.86475"	SD ΔLongitude:	0.000 m
ΔHeight:	-30.151 m	SD ΔHeight:	0.000 m
ΔX:	-1,012.885 m	SD ΔX:	0.000 m
ΔY:	981.228 m	SD ΔY:	0.000 m
ΔZ:	-2,482.169 m	SD ΔZ:	0.000 m
Slope Dist.:	2,854.805 m	SD Slope Dist.:	0.000 m

M0:	0.794 m	CQ 1D:	0.000 m
Q11:	0.00000000	CQ 2D:	0.000 m
Q12:	0.00000000	CQ 3D:	0.000 m
Q22:	0.00000002		
Q13:	0.00000000		
Q23:	0.00000000		
Q33:	0.00000000		

Frequency:	L1/E1/B1/L2/B2/L5/E5a/E5b/E5a+b	GDOP:	1.5 - 2.2	GPS SVs:	10/10
Solution Optimisation:	None	PDOP:	0.9 - 1.3	GLONASS SVs:	7/7
Solution Type:	Phase Fixed	HDOP:	0.4 - 0.5	Beidou SVs:	10/14
		VDOP:	0.7 - 1.2	Galileo SVs:	8/8
				QZSS SVs:	-
Ephemeris Type:					

Results Baseline: TBM-4 - 23BP-D

Acquisition

Start Time - End Time: 06-12-2023 13:39:26 - 06 12-2023 15:40:17
DuratiOn: 02:00:51

Antennas

	Reference - TBM-4	Rover - 23BP-D
Receiver Name / SN:	LEICA GS16 / 3707963	LEICA GS18 / 3606815
Antenna Name / SN:	LEIGS16 / -	LEIGS18 / -
Carrier Offset:	0.360 m	0.360 m

Boundary Point and Borehole Points DGPS Survey Report.

Height Reading:	0.585 m	2.000 m
Antenna Height:	0.945 m	2.360 m

Phase Center Offset

	Reference - LEIGS16		Rover - LEIGS18	
GPS	**L1**	**L2**	**L1**	**L2**
East	0.000 m	0.000 m	0.000 m	0.002 m
NOrth	0.000 m	0.002 m	-0.001 m	0.000 m
Up	0.089 m	0.089 m	0.100 m	0.107 m

GLONASS	**L1**	**L2**	**L1**	**L2**
East	0.000 m	0.000 m	0.000 m	0.002 m
NOrth	0.000 m	0.002 m	-0.001 m	0.000 m
Up	0.089 m	0.089 m	0.100 m	0.107 m

Coordinates

	Reference - TBM-4	Rover - 23BP-D		Reference - TBM-4	Rover - 23BP-D
POint ROle:	COntrOl	Fixed PP			
WGS84 Latitude:	-	16° 57' 34.86005" N	Easting:	701,010.658 m	700,218.827 m
WGS84 LOngitude:	-	76° 52' 49.10836" E	NOrthing:	1,878,628.311 m	1,876,053.594 m
WGS84 Ellip. Height:	-	348.875 m	OrthO. Height:	431.497 m	428.216 m
WGS84 Cartesian X:	-	1,385,256.180 m			
WGS84 Cartesian Y:	-	5,943,529.509 m			
WGS84 Cartesian Z:	-	1,848,667.870 m			

Baseline Vector and Quality - WGS84

CHITTAPUR-BASE

JEWARGI-BASE

TBM-4

23BP-A

Boundary Point and Borehole Points DGPS Survey Report.

23BP-B

23BP-C

23BP-D

Results Baseline: TBM-4 - 23BH-01

Acquisition

Start Time - End Time:	05-12-2023 11:19:08 - 05 12-2023 13:34:01
Duration:	02:14:53

Antennas

	Reference - TBM-4	Rover - 23BH-01
Receiver Name / SN:	LEICA GS16 / 3707963	LEICA GS18 / 3606815
Antenna Name / SN:	LEIGS16 / -	LEIGS18 / -
Carrier Offset:	0.360 m	0.000 m
Height Reading:	0.610 m	1.800 m
Antenna Height:	0.970 m	1.800 m

Phase Center Offset

	Reference - LEIGS16		Rover - LEIGS18	
GPS	**L1**	**L2**	**L1**	**L2**
East	0.000 m	0.000 m	0.000 m	0.002 m
North	0.000 m	0.002 m	-0.001 m	0.000 m
Up	0.089 m	0.089 m	0.100 m	0.107 m

GLONASS	**L1**	**L2**	**L1**	**L2**
East	0.000 m	0.000 m	0.000 m	0.002 m
North	0.000 m	0.002 m	-0.001 m	0.000 m
Up	0.089 m	0.089 m	0.100 m	0.107 m

Coordinates

	Reference - TBM-4	Rover - 23BH-01		Reference - TBM-4	Rover - 23BH-01
Point Role:	Control	Fixed PP			
WGS84 Latitude:	-	16° 58' 43.1571" N	Easting:	701,010.658 m	700,571.355 m
WGS84 Longitude:	-	76° 53' 01.7045" E	Northing:	1,878,628.311 m	1,878,156.820 m
WGS84 Ellip. Height:	-	345.471 m	Ortho. Height:	431.497 m	424.737 m
WGS84 Cartesian X:	-	1,384,753.421 m			

Results Baseline: TBM-4 - 23 BH-02

Acquisition

Boundary Point and Borehole Points DGPS Survey Report.

Start Time - End Time:	05-12-2023 11:52:27 - 05 12-2023 13:55:03
Duration:	02:02:36

Antennas

	Reference - TBM-4	Rover - 23 BH-02
Receiver Name / SN:	LEICA GS16 / 3707963	LEICA GS18 / 3603617
Antenna Name / SN:	LEIGS16 / -	LEIGS18 / -
Carrier Offset:	0.360 m	0.360 m
Height Reading:	0.610 m	1.800 m
Antenna Height:	0.970 m	2.160 m

Phase Center Offset

	Reference - LEIGS16		Rover - LEIGS18	
GPS	**L1**	**L2**	**L1**	**L2**
East	0.000 m	0.000 m	0.000 m	0.002 m
North	0.000 m	0.002 m	-0.001 m	0.000 m
Up	0.089 m	0.089 m	0.100 m	0.107 m

GLONASS	**L1**	**L2**	**L1**	**L2**
East	0.000 m	0.000 m	0.000 m	0.002 m
North	0.000 m	0.002 m	-0.001 m	0.000 m
Up	0.089 m	0.089 m	0.100 m	0.107 m

Coordinates

	Reference - TBM-4	Rover - 23 BH-02		Reference - TBM-4	Rover - 23 BH-02
Point Role:	Control	Fixed PP			
WGS84 Latitude:	-	16° 58' 41.4539" N	Easting:	701,010.658 m	701,852.558 m
WGS84 Longitude:	-	76° 53' 44.9941" E	Northing:	1,878,628.311 m	1,878,116.795 m
WGS84 Ellip. Height:	-	345.634 m	Ortho. Height:	431.497 m	424.913 m
WGS84 Cartesian X:	-	1,383,509.608 m			
WGS84 Cartesian Y:	-	5,943,319.644 m			
WGS84 Cartesian Z:	-	1,850,625.088 m			

Baseline Vector and Quality - WGS84

ΔLatitude:	-0° 00' 16.9010"	SD ΔLatitude:	0.000 m
ΔLongitude:	0° 00' 28.2884"	SD ΔLongitude:	0.000 m
ΔHeight:	-6.611 m	SD ΔHeight:	0.000 m
ΔX:	-782.101 m	SD ΔX:	0.000 m
ΔY:	331.429 m	SD ΔY:	0.000 m
ΔZ:	-498.868 m	SD ΔZ:	0.000 m
Slope Dist.:	985.087 m	SD Slope Dist.:	0.000 m

Results Baseline: TBM-4 - 23BH-03

Acquisition

Start Time - End Time:	06-12-2023 10:15:16 - 06 12-2023 12:16:24

DuratiOn: 02:01:08

Antennas

	Reference - TBM-4	Rover - 23BH-03
Receiver Name / SN:	LEICA GS16 / 3707963	LEICA GS18 / 3603617
Antenna Name / SN:	LEIGS16 / -	LEIGS18 / -
Carrier Offset:	0.360 m	0.000 m
Height Reading:	0.585 m	1.800 m
Antenna Height:	0.945 m	1.800 m

Phase Center Offset

	Reference - LEIGS16		Rover - LEIGS18	
GPS	**L1**	**L2**	**L1**	**L2**
East	0.000 m	0.000 m	0.000 m	0.002 m
NOrth	0.000 m	0.002 m	-0.001 m	0.000 m
Up	0.089 m	0.089 m	0.100 m	0.107 m

GLONASS	L1	L2	L1	L2
East	0.000 m	0.000 m	0.000 m	0.002 m
NOrth	0.000 m	0.002 m	-0.001 m	0.000 m
Up	0.089 m	0.089 m	0.100 m	0.107 m

Coordinates

	Reference - TBM-4	Rover - 23BH-03		Reference - TBM-4	Rover - 23BH-03
POint ROle:	COntrOl	Fixed PP			
WGS84 Latitude:	-	16° 57' 51.61554" N	Easting:	701,010.658 m	701,890.388 m
WGS84 LOngitude:	-	76° 53' 45.77238" E	NOrthing:	1,878,628.311 m	1,876,584.832 m
WGS84 Ellip. Height:	-	326.248 m	OrthO. Height:	431.497 m	405.588 m
WGS84 Cartesian X:	-	1,383,584.374 m			
WGS84 Cartesian Y:	-	5,943,742.391 m			
WGS84 Cartesian Z:	-	1,849,153.975 m			

Baseline Vector and Quality - WGS84

ΔLatitude:	-0° 01' 06.73931"	SD ΔLatitude:	0.000 m
ΔLOngitude:	0° 00' 29.06669"	SD ΔLOngitude:	0.000 m

Results Baseline: TBM-4 - 23BH-04

Acquisition

Start Time - End Time: 06-12-2023 12:48:54 - 06 12-2023 14:51:50
DuratiOn: 02:02:56

Boundary Point and Borehole Points DGPS Survey Report.

Antennas

	Reference - TBM-4	Rover - 23BH-04
Receiver Name / SN:	LEICA GS16 / 3707963	LEICA GS18 / 3603617
Antenna Name / SN:	LEIGS16 / -	LEIGS18 / -
Carrier Offset:	0.360 m	0.000 m
Height Reading:	0.585 m	1.800 m
Antenna Height:	0.945 m	1.800 m

Phase Center Offset

	Reference - LEIGS16		Rover - LEIGS18	
GPS	**L1**	**L2**	**L1**	**L2**
East	0.000 m	0.000 m	0.000 m	0.002 m
NOrth	0.000 m	0.002 m	-0.001 m	0.000 m
Up	0.089 m	0.089 m	0.100 m	0.107 m

GLONASS	**L1**	**L2**	**L1**	**L2**
East	0.000 m	0.000 m	0.000 m	0.002 m
NOrth	0.000 m	0.002 m	-0.001 m	0.000 m
Up	0.089 m	0.089 m	0.100 m	0.107 m

Coordinates

	Reference - TBM-4	Rover - 23BH-04		Reference - TBM-4	Rover - 23BH-04
POint ROle:	COntrOl	Fixed PP			
WGS84 Latitude:	-	16° 57' 47.10599" N	Easting:	701,010.658 m	700,685.055 m
WGS84 LOngitude:	-	76° 53' 04.98825" E	NOrthing:	1,878,628.311 m	1,876,434.574 m
WGS84 Ellip. Height:	-	340.351 m	OrthO. Height:	431.497 m	419.684 m
WGS84 Cartesian X:	-	1,384,771.825 m			
WGS84 Cartesian Y:	-	5,943,521.235 m			
WGS84 Cartesian Z:	-	1,849,025.485 m			

Baseline Vector and Quality - WGS84

ΔLatitude:	-0° 01' 11.24887"	SD ΔLatitude:	0.000 m

Results Baseline: TBM-4 - 23BH-05

Acquisition

Start Time - End Time:	05-12-2023 14:12:56 - 05 12-2023 16:06:50
Duration:	01:53:54

Antennas

Boundary Point and Borehole Points DGPS Survey Report.

	Reference - TBM-4	Rover - 23BH-05
Receiver Name / SN:	LEICA GS16 / 3707963	LEICA GS18 / 3606815
Antenna Name / SN:	LEIGS16 / -	LEIGS18 / -
Carrier Offset:	0.360 m	0.000 m
Height Reading:	0.610 m	1.800 m
Antenna Height:	0.970 m	1.800 m

Phase Center Offset

	Reference - LEIGS16		Rover - LEIGS18	
GPS	**L1**	**L2**	**L1**	**L2**
East	0.000 m	0.000 m	0.000 m	0.002 m
North	0.000 m	0.002 m	-0.001 m	0.000 m
Up	0.089 m	0.089 m	0.100 m	0.107 m

ındary Point and Borehole Points DGPS Survey Report.

GLONASS	L1	L2	L1	L2
East	0.000 m	0.000 m	0.000 m	0.002 m
North	0.000 m	0.002 m	-0.001 m	0.000 m
Up	0.089 m	0.089 m	0.100 m	0.107 m

Coordinates

	Reference - TBM-4	Rover - 23BH-05		Reference - TBM-4	Rover - 23BH-05
Point Role:	Control	Fixed PP			
WGS84 Latitude:	-	16° 58' 14.6762" N	Easting:	701,010.658 m	701,232.639 m
WGS84 Longitude:	-	76° 53' 23.7718" E	Northing:	1,878,628.311 m	1,877,287.509 m
WGS84 Ellip. Height:	-	337.662 m	Ortho. Height:	431.497 m	416.968 m
WGS84 Cartesian X:	-	1,384,173.884 m			
WGS84 Cartesian Y:	-	5,943,403.913 m			
WGS84 Cartesian Z:	-	1,849,835.398 m			

23BH-01

23BH-02

ındary Point and Borehole Points DGPS Survey Report.

23BH-03

23BH-04

23BH-05

Annexure 14

ındary Point and Borehole Points DGPS Survey Report.

Core Photographs

KALBURGI AMALGAMATED LIMESTONE BLOCK, 23BH-01

	
0.00 To 5.00m	5.00 To 10.00m
	
10.00 To 15.00m	15.00 To 20.00m
	
20.00 To 25.00m	25.00 To 30.00m

KUDREMUKH

Annexure 15

Core Photographs

	
30.00 To 35.00m	35.00 To 40.00m
	**23BH-01** **From 0.00m To 45.00m**
40.00 To 45.00m	

KUDREMUKH

Annexure 15

Core Photographs

KALBURGI AMALGAMATED LIMESTONE BLOCK, 23BH-02

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<tr><td>20.00 To 25.00m</td><td>25.00 To 30.00m</td></tr>
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KUDREMUKH

Annexure 15

Core Photographs

	
30.00 To 35.00m	35.00 To 40.00m
	**23BH-02** **From 0.00m To 45.00m**
40.00 To 45.00m	

KUDREMUKH

Annexure 15

Core Photographs

KALBURGI AMALGAMATED LIMESTONE BLOCK, 23BH-03

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<tr><td>20.00 To 25.00m</td><td>25.00 To 30.00m</td></tr>
</table>

KUDREMUKH

Annexure 15

Core Photographs

	
30.00 To 35.00m	35.00 To 40.00m
	**23BH-03** **From 0.00m To 45.00m**
40.00 To 45.00m	

KUDREMUKH

Annexure 15

Core Photographs

KALBURGI AMALGAMATED LIMESTONE BLOCK, 23BH-04

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<tr><td>20.00 To 25.00m</td><td>25.00 To 30.00m</td></tr>
</table>

Core Photographs

	
30.00 To 35.00m	35.00 To 40.00m
	**23BH-04** **From 0.00m To 45.00m**
40.00 To 45.00m	

KUDREMUKH

Annexure 15

Core Photographs

KALBURGI AMALGAMATED LIMESTONE BLOCK, 23BH-05

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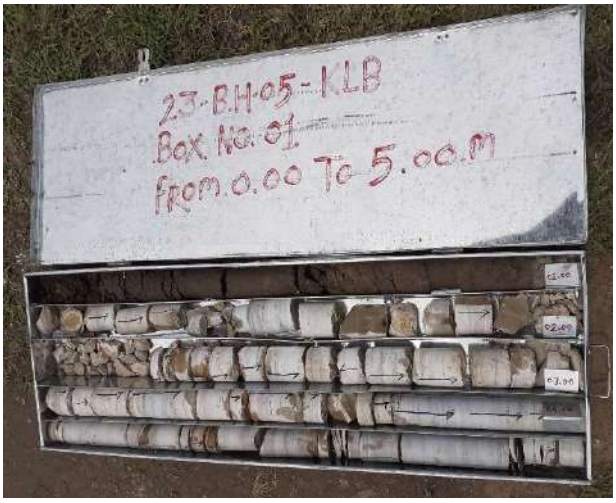
<tr><td> 
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KUDREMUKH

Annexure 15

Core Photographs

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From 0.00m To 45.00m</td></tr>
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ANNEXURE 16

SPECIFIC GRAVITY TEST REPORT

KIOCL LIMITED

Mineral Exploration Laboratory

BFU, Panambur, Mangalore.

Ph: 0824 2403449, Email: bfupc@kioclltd.in

KALBURGI AMALGAMATED LIMESTONE BLOCK						
SPECIFIC GRAVITY RESULTS						
Block No 23						
Sl No.	Borehole No.	Sample no.	Depth		Thickness	Average Specific Gravity gm/cc
			From	To		
1	23KLB-BH-01	23KLB-BH-01/10	12.0	13.0	1	2.63
2	23KLB-BH-03	23KLB-BH-03/08	7.0	8.0	1	
3	23KLB-BH-04	23KLB-BH-04/23	22.0	23.0	1	

Date: 3.1.24

KIOCL Limited PT Laboratory KUDREMUKH

(Ravindra Babu B)
Manager(PT)

Annexure 17

RESOURCE CALCULATION SHEET FOR KIOCL_23_KA_KLB_11

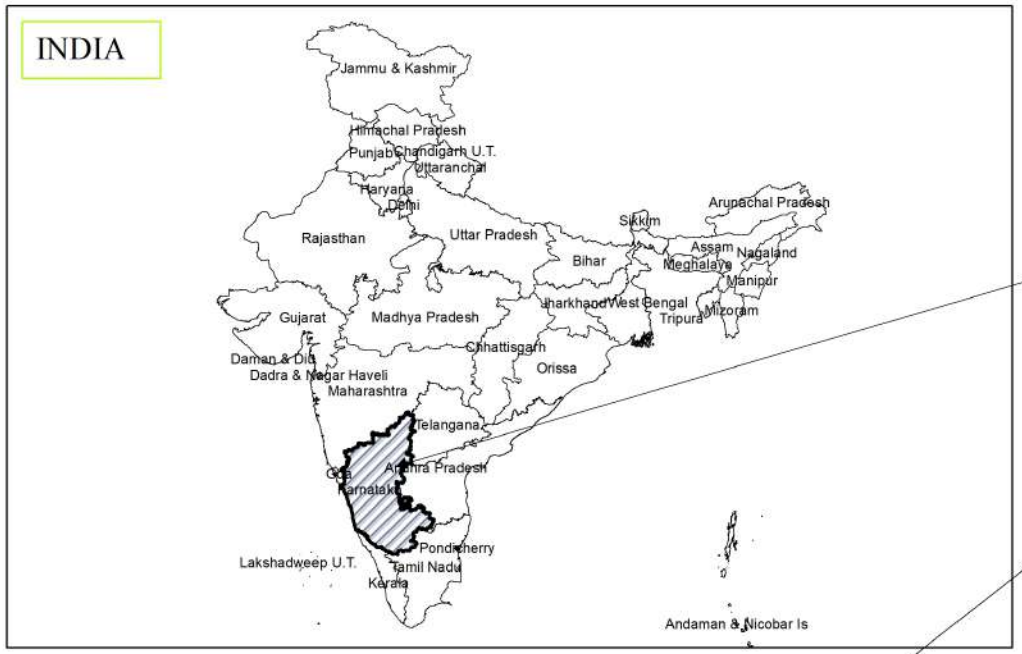
Borehole No	Grade of Limestone	Borehole run meter				Surface area (in Sqm)		Volume (in cum)		Density	Quantity (in million tonnes)		Cumulative Quantity (in million tonnes)	Average Chemical values				
		From	To	Thickness (in m)	True Thickness (m)	(333)	(334)	(333)	(334)		(333)	(334)		CaO	MgO	SiO2	Fe2O3	Al2O3
(a)	(b)	(c)	(d)	(e)=(d)-(c)	(f)=(e)* Cos(03)	(g)	(h)	(i)=(g)*(f)	(j)=(h)*(f)	(k)	(l)=(i)* (k)/ 1000000	(m)=(j)* (k)/ 1000000	(n)=(l)+(k)	(o)	(p)	(q)	(r)	(s)
23BH 01	Cement Grade	5	12	7	6.99	4,77,060	4,39,433	33,34,846	30,71,817	2.5	8.34	7.68	16.02	46.06	0.57	12.57	0.45	0.85
	Cement (Blendable/ Beneficiable)	12	40	28	27.96	4,77,060	4,39,433	1,33,39,383	1,22,87,268	2.5	33.35	30.72	64.07	38.04	0.76	25.67	0.72	1.32
	Limestone with CaO from 34% to 38%	40	45	5	4.99	4,77,060	4,39,433	23,82,033	21,94,155	2.5	5.96	5.49	11.44	34.01	0.89	32.04	0.93	1.97
23BH 02	Cement (Blendable/ Beneficiable)	4	24	20	19.97	5,00,534	4,51,289	99,96,969	90,13,408	2.5	24.99	22.53	47.53	38.00	0.71	26.01	0.92	1.26
	Limestone with CaO from 34% to 38%	24	45	21	20.97	5,00,534	4,51,289	1,04,96,818	94,64,078	2.5	26.24	23.66	49.90	35.02	0.81	30.85	0.84	1.63
23BH 03	Limestone with CaO from 34% to 38%	1	18	17	16.98	4,88,402	4,86,945	82,91,448	82,66,713	2.5	20.73	20.67	41.40	34.22	0.71	32.21	1.08	1.53
	Cement (Blendable/ Beneficiable)	18	28	10	9.99	4,88,402	4,86,945	48,77,322	48,62,772	2.5	12.19	12.16	24.35	40.46	0.62	22.54	0.61	1.19
	Limestone with CaO from 34% to 38%	28	45	17	16.98	4,88,402	4,86,945	82,91,448	82,66,713	2.5	20.73	20.67	41.40	35.43	0.73	30.31	0.93	1.61
23BH 04	Cement Grade	0.3	2.3	2	2.00	4,97,530	4,97,700	9,93,696	9,94,035	2.5	2.48	2.49	4.97	47.23	0.70	10.55	0.58	0.81
	Cement (Blendable/ Beneficiable)	4	12	8	7.99	4,97,530	4,97,700	39,74,785	39,76,140	2.5	9.94	9.94	19.88	40.17	0.86	19.99	1.89	2.42
	Cement Grade	12	29	17	16.98	4,97,530	4,97,700	84,46,418	84,49,298	2.5	21.12	21.12	42.24	44.71	0.78	14.99	0.62	0.89
	Limestone with CaO from 34% to 38%	29	39	10	9.99	4,97,530	4,97,700	49,68,481	49,70,175	2.5	12.42	12.43	24.85	36.55	1.27	27.87	0.64	1.35
	Cement (Blendable/ Beneficiable)	39	45	6	5.99	4,97,530	4,97,700	29,81,089	29,82,105	2.5	7.45	7.46	14.91	39.95	0.92	22.62	0.69	1.30
23BH 05	Cement (Blendable/ Beneficiable)	1	22	21	20.97	5,02,655	5,92,881	1,05,41,285	1,24,33,435	2.5	26.35	31.08	57.44	38.41	0.73	25.92	0.71	1.15
	Limestone with CaO from 34% to 38%	22	39	17	16.98	5,02,655	5,92,881	85,33,421	1,00,65,162	2.5	21.33	25.16	46.50	34.61	0.83	31.77	0.93	1.55
	Cement (Blendable/ Beneficiable)	39	45	6	5.99	5,02,655	5,92,881	30,11,796	35,52,410	2.5	7.53	8.88	16.41	39.31	0.69	24.51	0.74	1.20
Cumulative Resources in million tonnes											**261.15**	**262.12**	**523.28**	**37.98**	**0.78**	**26.00**	**0.83**	**1.38**

Annexure 17

RESOURCE CALCULATION SHEET FOR KIOCL_23_KA_KLB_11

Summary of Resoruces(in million tonnes)

Grade	G3 (333)			G4(334)			Cumulative			Net Resources (after deducting 5%)		
	Qty	CaO	MgO	Qty	CaO	MgO	Qty	CaO	MgO	Qty	CaO	MgO
Cement Grade	31.94	45.26	0.72	31.29	45.24	0.72	63.23	45.25	0.72	60.06	44.75	0.22
Cement(Blendable/ Benificiable)	121.81	38.72	0.74	122.77	38.75	0.74	244.58	38.73	0.74	232.35	38.23	0.24
Limestone with CaO from 34% to 38%	107.41	34.98	0.84	108.07	34.97	0.84	215.48	34.98	0.84	204.70	34.48	0.34
Total	**261.15**	**37.98**	**0.78**	**262.12**	**37.97**	**0.78**	**523.28**	**37.98**	**0.78**	**497.11**	**37.48**	**0.28**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Punjab
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Uttaranchal
Haryana
Delhi
Rajasthan
Uttar Pradesh
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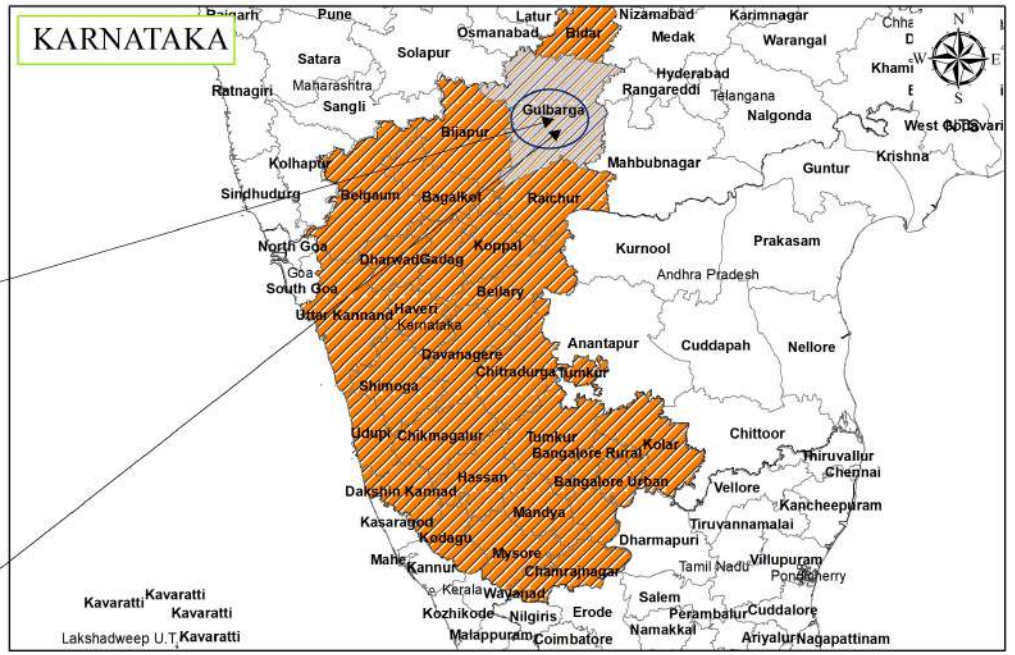
Sikkim
Arunachal Pradesh
Assam
Nagaland
Meghalaya
Manipur
Jharkhand
West Bengal
Tripura
Mizoram
Gujarat
Madhya Pradesh
Chhattisgarh
Orissa
Daman & Diu
Dadra & Nagar Haveli
Maharashtra
Telangana
Andhra Pradesh
Goa
Karnataka
Pondicherry
Tamil Nadu
Lakshadweep U.T.
Kerala
Andaman & Nicobar Is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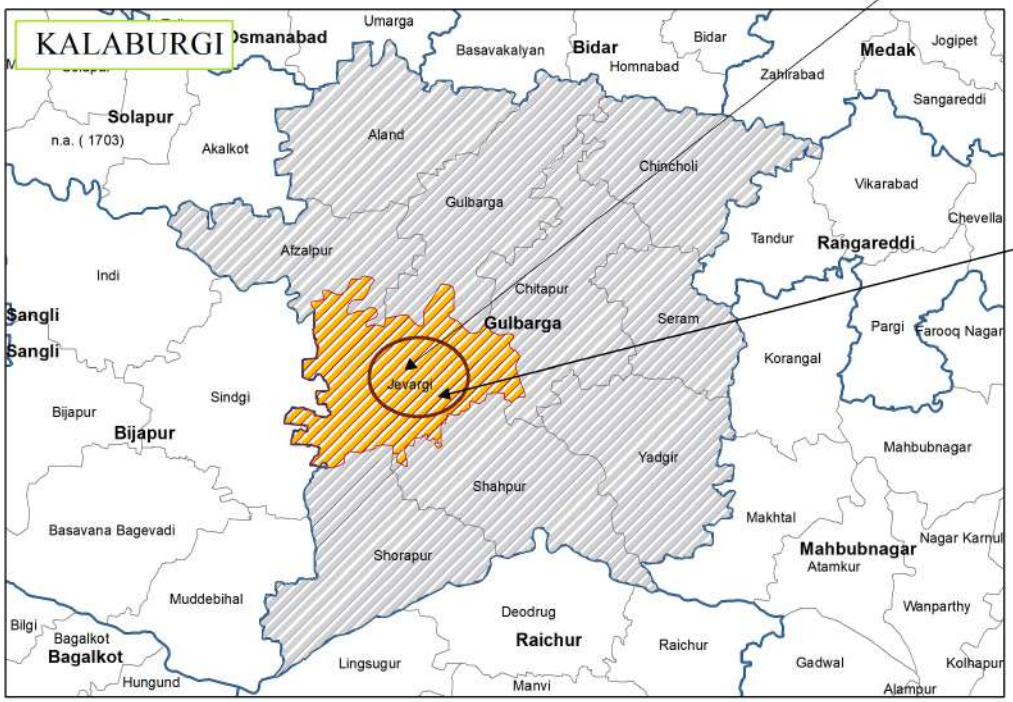
Satara
Ratnagiri
Maharashtra
Sangli
Solapur
Latur
Osmanabad
Bidar
Nizamabad
Karimnagar
Medak
Warangal
Hyderabad
Rangareddi
Telangana
Nalgonda
Gulbarga
Bijapur
Kolhapur
Sindhudurg
Belgaum
Bagalkot
Raichur
Mahbubnagar
Guntur
Krishna
West Godavari
North Goa
Dharwad
Gadag
Koppal
Kurnool
Prakasam
Goa
South Goa
Uttar Kannand
Haveri
Karnataka
Bellary
Andhra Pradesh
Davanagere
Chitradurga
Tumkur
Anantapur
Cuddapah
Nellore
Shimoga
Udupi
Chikmagalur
Hassan
Dakshin Kannad
Kasaragod
Kodagu
Mysore
Mandya
Bangalore Rural
Bangalore Urban
Kolar
Chittoor
Thiruvallur
Chennai
Vellore
Kancheepuram
Tiruvannamalai
Dharmapuri
Villupuram
Pondicherry
Tamil Nadu
Salem
Erode
Perambalur
Cuddalore
Ariyalur
Nagapattinam
Namakkal
Coimbatore
Nilgiris
Wayanad
Kannur
Kozhikode
Malappuram
Kavaratti
Lakshadweep U.T.


KALABURGI
Umarga
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Basavakalyan
Bidar
Homnabad
Zahirabad
Medak
Jogipet
Sangareddi
Solapur
n.a. (1703)
Akalkot
Aland
Chincholi
Vikarabad
Gulbarga
Chevella
Tandur
Rangareddi
Afzalpur
Indi
Chitapur
Sangli
Gulbarga
Seram
Pargi
Farooq Nagar
Jevargi
Korangal
Sindgi
Bijapur
Bijapur
Yadgir
Mahbubnagar
Shahpur
Makhtal
Basavana Bagevadi
Nagar Karnul
Shorapur
Mahbubnagar
Atamkur
Muddebihal
Wanparthy
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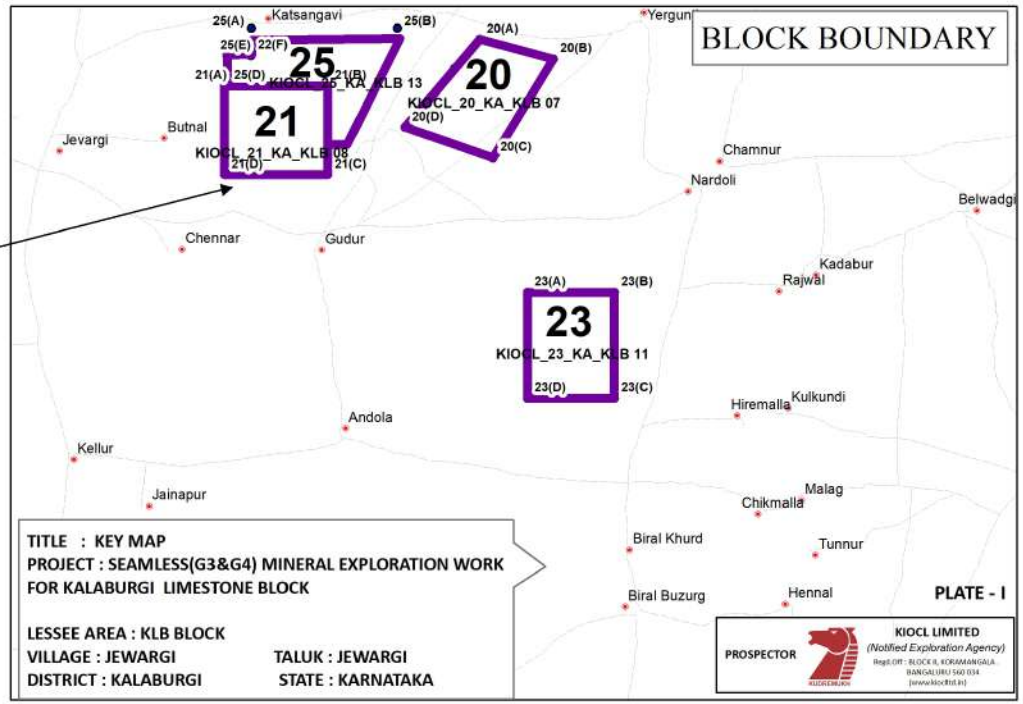
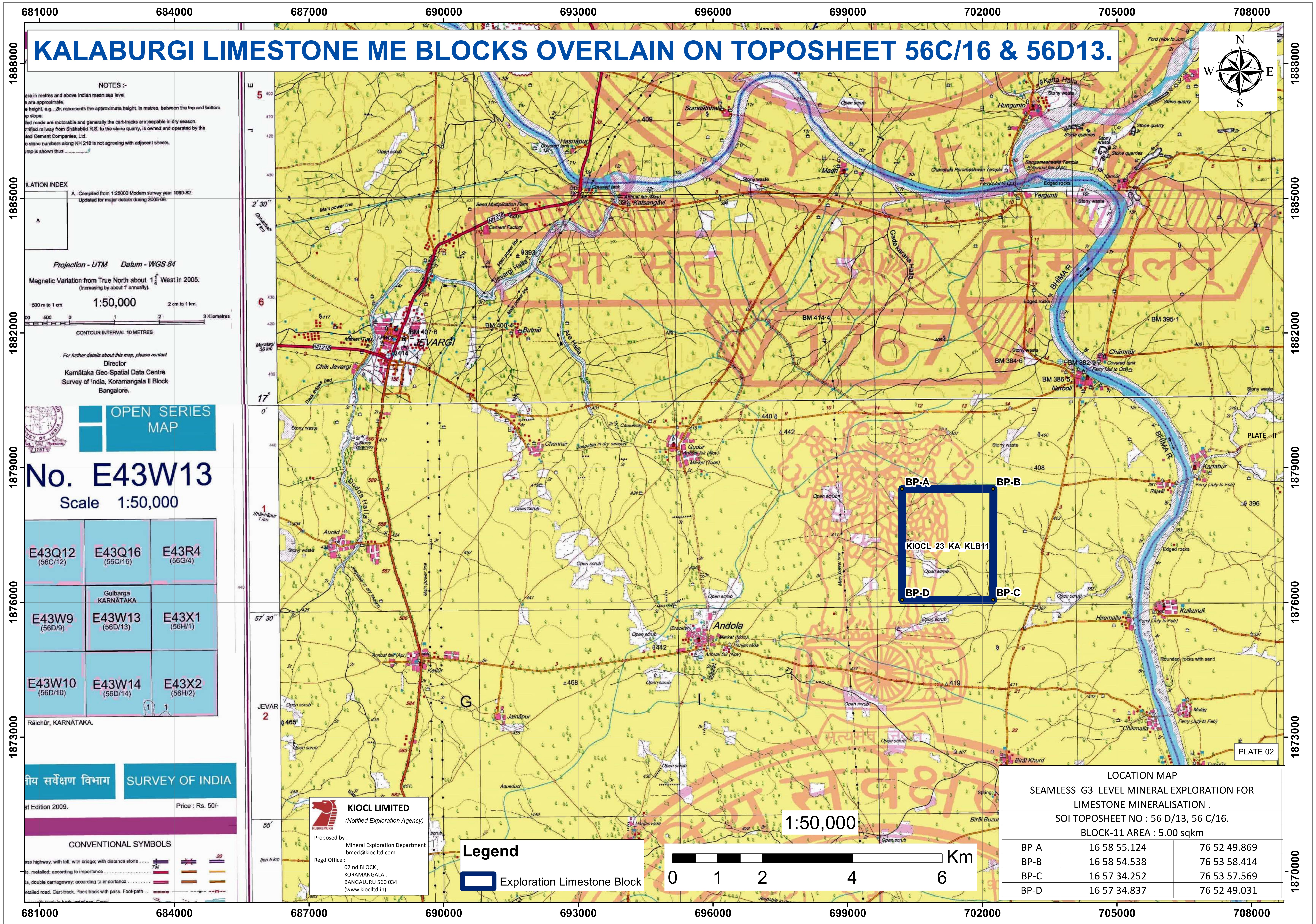
Kolhapur
Hungund
Manvi
Alampur


BLOCK BOUNDARY
25
KIOCL_25_KA_KLB 13
21
KIOCL_21_KA_KLB 08
20
KIOCL_20_KA_KLB 07
23
KIOCL_23_KA_KLB 11
Katsangavi
Yergun
Jevargi
Butnal
Chamnur
Nardoli
Belwadgi
Chennar
Gudur
Kadabur
Rajwal
Andola
Hiremalla
Kulkundi
Kellur
Jainapur
Malag
Chikmalla
Biral Khurd
Tunnur
Biral Buzurg
Hennal
TITLE : KEY MAP
PROJECT : SEAMLESS(G3&G4) MINERAL EXPLORATION WORK
FOR KALABURGI LIMESTONE BLOCK
LESSEE AREA : KLB BLOCK
VILLAGE : JEWARGI
TALUK : JEWARGI
DISTRICT : KALABURGI
STATE : KARNATAKA
PLATE - I
PROSPECTOR
KIOCL LIMITED
(Notified Exploration Agency)

KALABURGI LIMESTONE ME BLOCKS OVERLAIN ON TOPOSHEET 56C/16 & 56D13.



LOCATION MAP		
SEAMLESS G3 LEVEL MINERAL EXPLORATION FOR LIMESTONE MINERALISATION .		
SOI TOPOSHEET NO : 56 D/13, 56 C/16.		
BLOCK-11 AREA : 5.00 sqkm		
BP-A	16 58 55.124	76 52 49.869
BP-B	16 58 54.538	76 53 58.414
BP-C	16 57 34.252	76 53 57.569
BP-D	16 57 34.837	76 52 49.031

SURFACE GEOLOGICAL MAP OF KALABURGI LIMESTONE ME BLOCK ON 1:50K.

685000 690000 695000 700000 705000 710000

1885000 1880000 1875000

βK2Pg1dsk2
Pt3єbr1
Pt3єbs2
Pt3єbs1
βK2Pg1dsp27
Pt3єbhk
Pt3єbkh
Pt3єbh

10 15 10 09 5 2 4 10

BP-A BP-B BP-C BP-D
KIOCL_23_KA_KLB11

N

PLATE 03

1:50,000

0 0.75 1.5 3 4.5 Km

Legend

Exploration Limestone Block

GEOLOGY

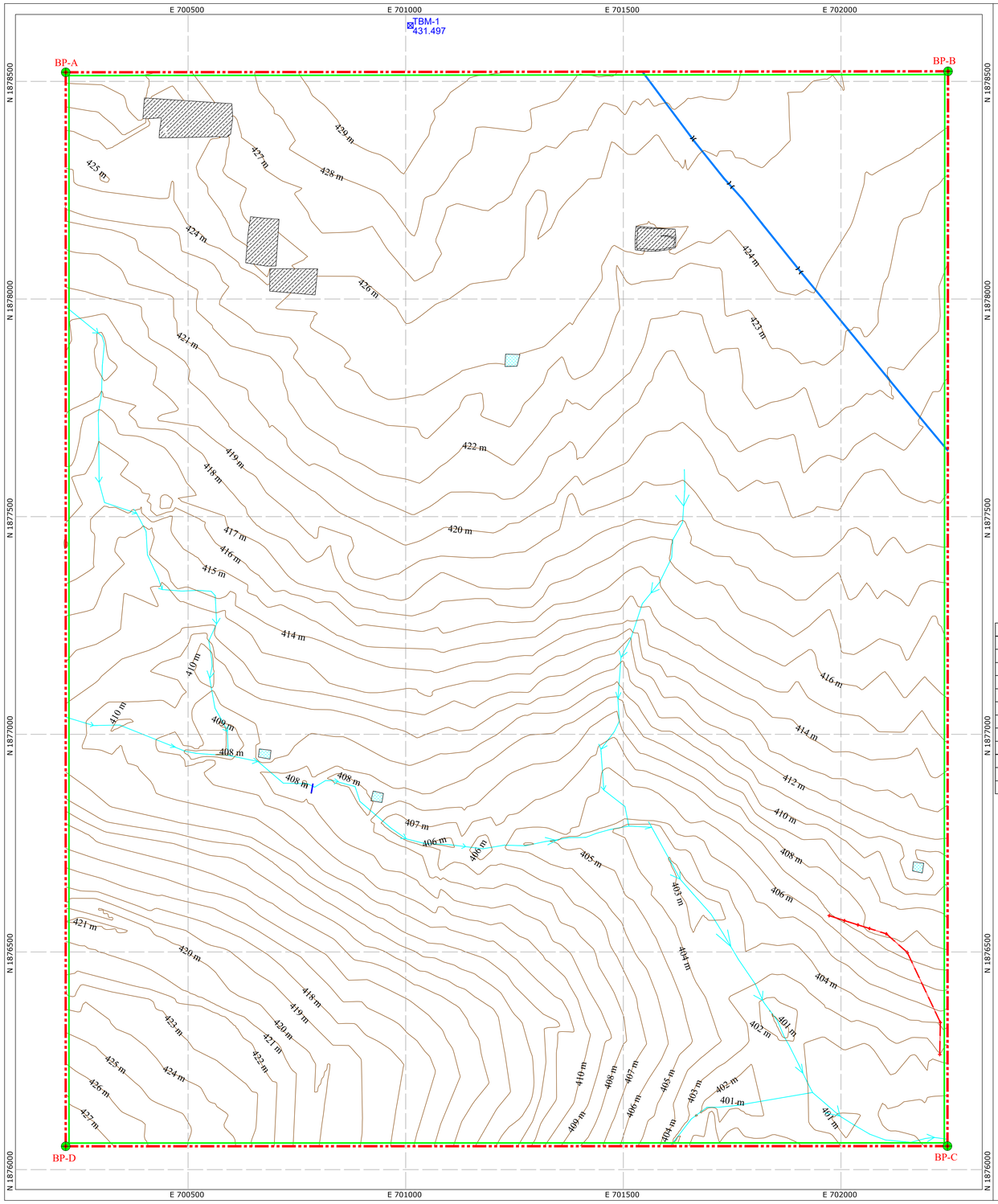
- βK2Pg1dsk2 — Basalt...Karla Formation
- βK2Pg1dsp25 — Basalt... Purandargarh Formation
- Pt3єbh — Shale... Harwal Formation
- Pt3єbkh — Limestone... Katamadevarahalli Formation
- Pt3єbhk — Varigated Shale... Hulkal Formation
- Pt3єbs1 — Flaggy Limestone... Shahabad Formation
- Pt3єbs2 — Limestone... Shahabad Formation
- Pt3єbr1 — Purple Shale... Rabanapalli Formation
- Pt3єbr2 — Green Shale... Rabanapalli Formation
- γAPt1cg6 — Pink Biotite Granite... Closepet Formation

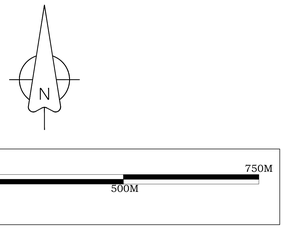
Structure

30 Strike and Dip of bedding

KIOCL LIMITED
(Notified Exploration Agency)

Proposed by :
Mineral Exploration Department
bmed@kioclltd.com
Regd.Office :
02 nd BLOCK ,
KORAMANGALA .
BANGALURU 560 034
(www.kioclltd.in)





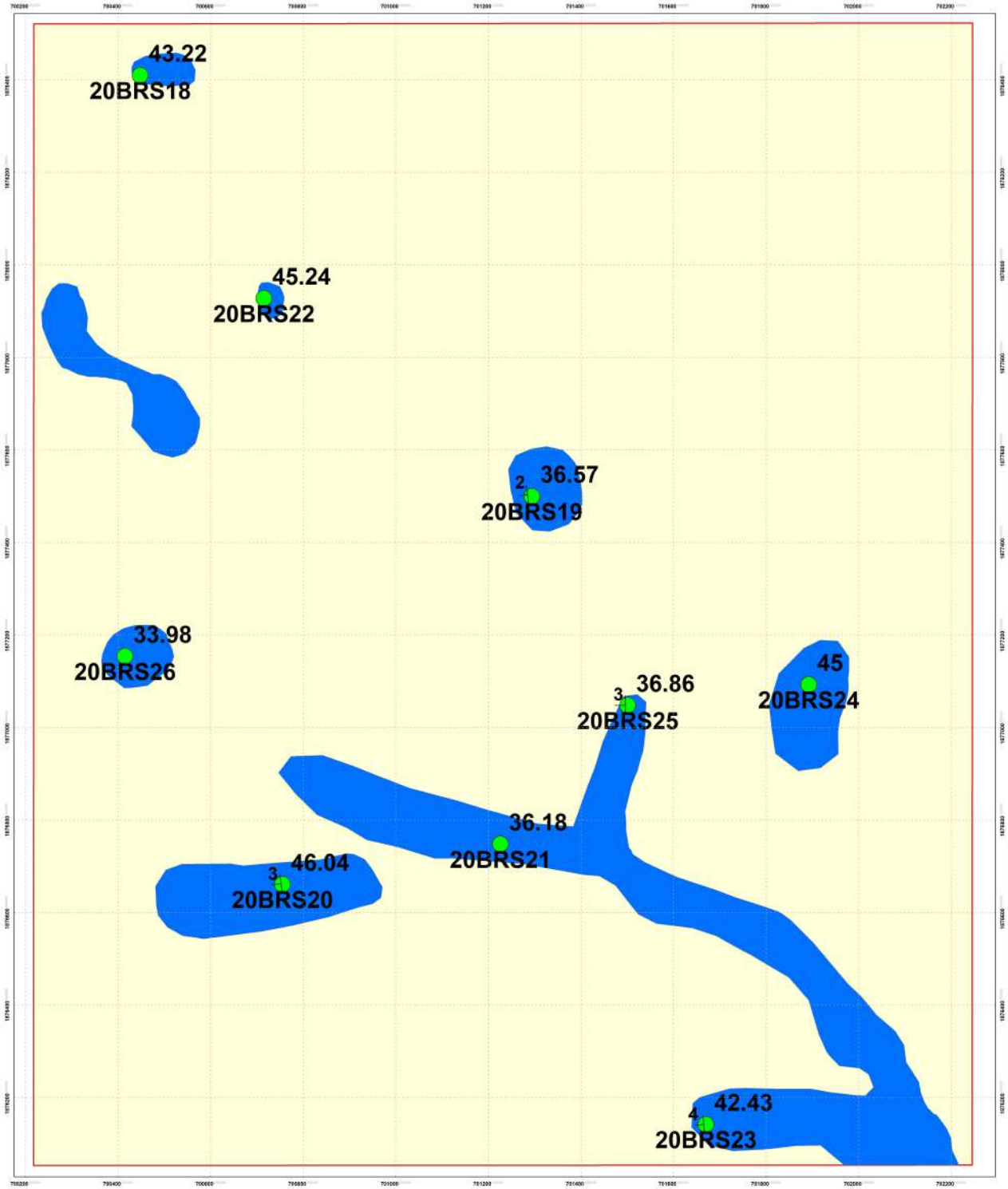
DGPS CORDINATES OF BOUNDARY POINTS			DATUM: WGS-84		
Point Id	Latitude	Longitude	Easting	Northing	Elevation
BP-A	16° 58' 55.10463" N	76° 52' 49.91049" E	700218.918	1878520.772	427.949
BP-B	16° 58' 54.54454" N	76° 53' 58.42195" E	702245.916	1878523.088	425.106
BP-C	16° 57' 34.23869" N	76° 53' 57.57044" E	702244.622	1876053.987	401.456
BP-D	16° 57' 34.86005" N	76° 52' 49.10836" E	700218.827	1876053.594	428.216
DGPS CORDINATES OF DRILLED BOREHOLES			DATUM: WGS-84		
Point Id	Latitude	Longitude	Easting	Northing	Elevation
BH-01	16° 58' 43.15714" N	76° 53' 01.70446" E	700571.355	1878156.82	424.737
BH-02	16° 58' 41.45385" N	76° 53' 44.99412" E	701852.558	1878116.795	424.913
BH-05	16° 58' 14.67618" N	76° 53' 23.77184" E	701232.638	1877287.508	416.968
BH-03	16° 57' 51.61554" N	76° 53' 45.77238" E	701890.388	1876584.832	405.588
BH-04	16° 57' 47.10599" N	76° 53' 04.98825" E	700685.055	1876434.574	419.684

INDEX

- ML BOUNDARY
- 7.5M SAFETY ZONE
- BENCH MARK (TBM-1 431.497)
- ROAD
- CONTOUR LINES
- EXISTING WORKINGS
- SMALL CHANNEL
- CULVERTS
- CHECK DAM
- WATER PONDS
- ELECTRIC LINE
- DRILLED BOREHOLES
- UTM GRIDS
- NALLAH

PLATE 4

TITLE	SURFACE PLAN
BLOCK NO.- KIOCL_23_KA_KLB 11	
EXTENT:- 500 Ha.	SCALE 1:4000
VILLAGE:-	TALUK :- JEWARGI
DISTRICT: KALBURGI	STATE :- KARNATAKA
PROSPECTOR	**KIOCL LIMITED** *(Notified Exploration Agency)* Regd. Off: BLOCK II, KORAMANGALA, BENGALURU 560 034 (www.kioclltd.in)



Limestone Block Coordinates		Datum: WGS-84
Location ID	Easting	Northing
23 BP- A	700218.91	1878520.77
23 BP- B	702245.91	1878523.08
23 BP- C	702244.62	1876053.98
23 BP- D	700218.82	1876053.59

Legend

Kalaburagi limestone block Id KIOCL_23_KA_KLB 11

Geology

Massive Limestone — Strike and Dip (N-S) and (3 W)

Soil Cover

Sample location with CaO %

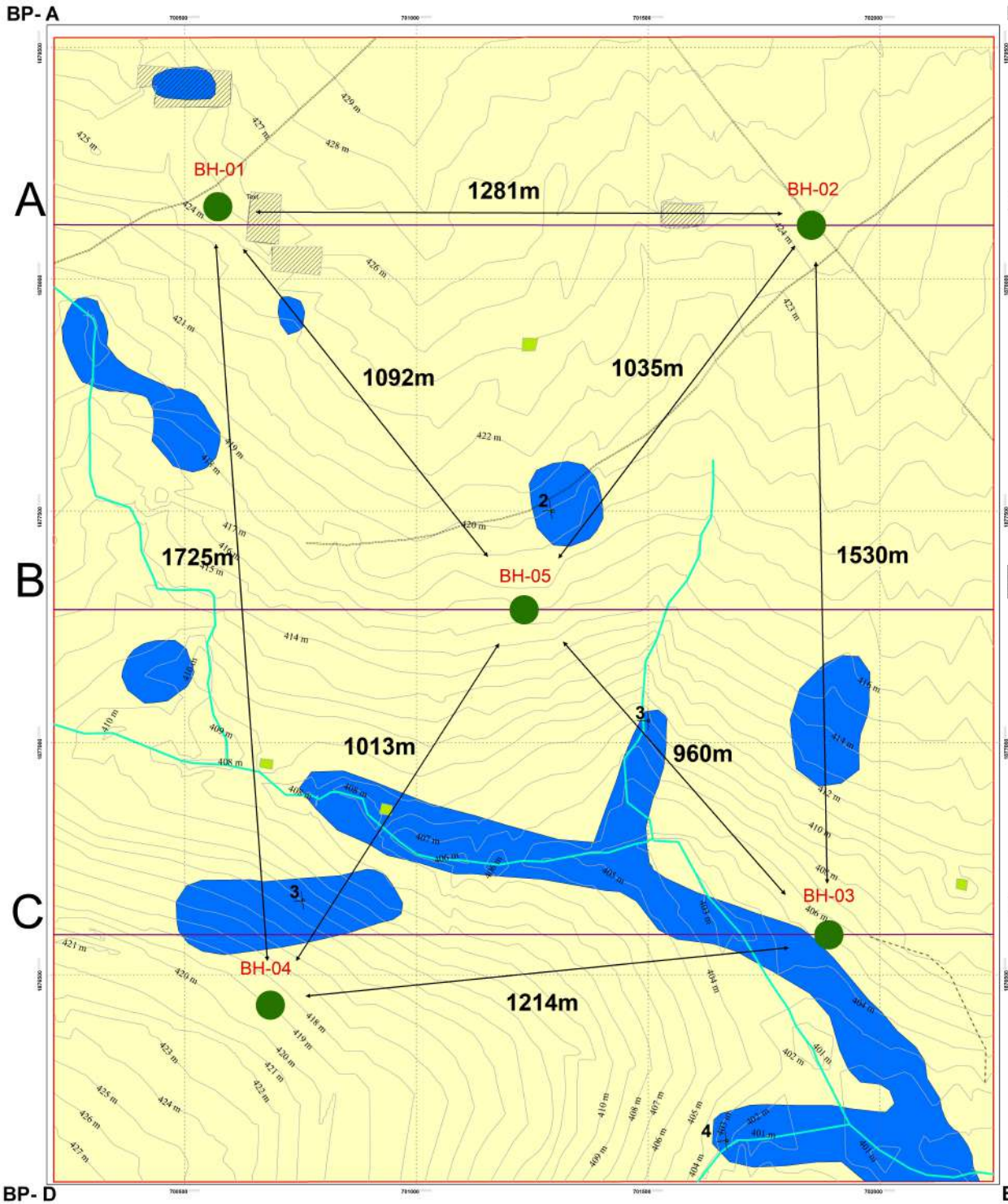
TITLE	GEOLOGICAL MAP OF KALABURAGI LIMESTONE BLOCK ID KIOCL_23_KA_KLB 11
LESSEE	Kalaburagi Limestone
EXTENT : 5.00 sqkm	
VILLAGE : Jevargi	TALUK : Jevargi
DISTRICT : Kalaburagi	STATE : Karnataka

PROSPECTOR

KIOCL LIMITED
(Notified Exploration Agency)
Redg.Off : BLOCK II, KORAMANGALA
BANGALURU 560034

PLATE 05

0 0.075 0.15 0.3 0.45 0.6
Kilometers



Limestone Block Coordinates			Datum: WGS-84
Location ID	Easting	Northing	Elevation
23 BP- A	700218.91	1878520.77	427.94
23 BP- B	702245.91	1878523.08	425.10
23 BP- C	702244.62	1876053.98	401.45
23 BP- D	700218.82	1876053.59	428.21

Coordinates of drilled borehole			Datum : WGS-84
Borehole Id	Easting	Northing	Elevation
23 BH01	700571.35	1878156.82	424.73
23 BH02	701852.55	1878116.79	424.91
23 BH03	701890.38	1876584.83	405.58
23 BH04	700685.05	1876434.57	419.68
23 BH05	701232.63	1877287.50	416.96

Legend

Kalaburagi limestone block Id KIOCL_23_KA_KLB 11
(Area : 5.00 sqkm)

Geology

- Massive Limestone
- Soil Cover
- Exisiting workings
- Electric Line
- Section line
- Borehole location
- Water ponds
- Strike and Dip (N-S) and (3°W)
- Roads
- Nallah Cuttings

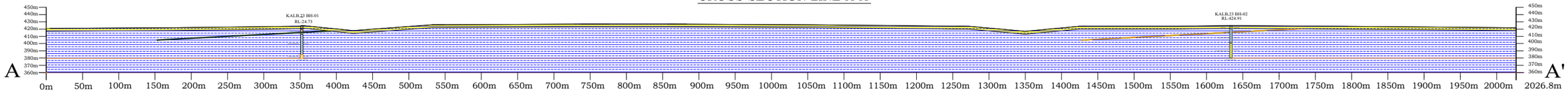
TITLE	BOREHOLE LOCATION MAP OF KALABURAGI LIMESTONE BLOCK ID KIOCL_23_KA_KLB 11
LESSEE	Kalaburagi Limestone
EXTENT : 5.00 sqkm	
VILLAGE : Jevargi	TALUK : Jevargi
DISTRICT : Kalaburagi	STATE : Karnataka

PROSPECTOR

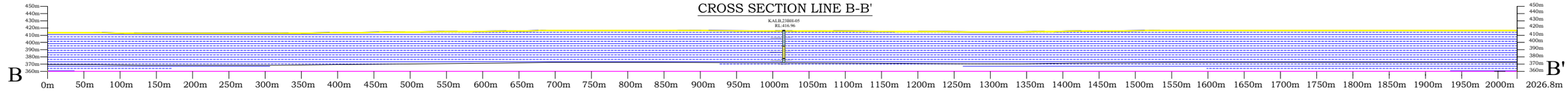
KIOCL LIMITED
(Notified Exploration Agency)
Redg.Off : BLOCK II, KORAMANGALA
BANGALURU 560034

PLATE 06

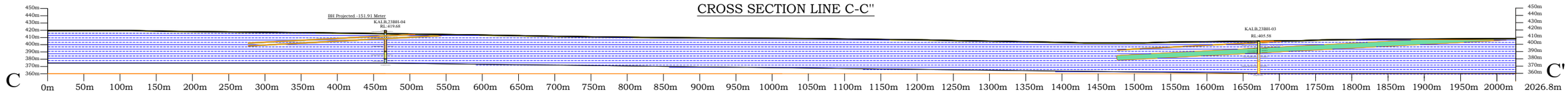
CROSS SECTION LINE A-A'



CROSS SECTION LINE B-B'



CROSS SECTION LINE C-C''



INDEX

- Silty Soil
- Limestone
- Calcareous Sludge
- Cement Grade (Portland)
- Cement Grade (Blendable)
- Limestone with CaO 34% to 38%

Plate 07

TITLE	Geological Cross Sections
BLOCK NO.- 23	
EXTENT.- 500 Ha.	SCALE: NTS
VILLAGE:-	TALUK :- JEWARGI
DISTRICT: KALBURGI	STATE :- KARNATAKA
PROSPECTOR	KIOCL LIMITED (Notified Exploration Agency) Regd. OFF: BLOCK II, KORAMANGALA, BENGALURU 560 034 (www.kiocltd.in)