ಕರ್ನಾಟಕ ಸರ್ಕಾರ

GOVERNMENT OF KARNATAKA

ಪ್ರಧಾನ ಮುಖ್ಯ ಅರಣ್ಯ ಸಂರಕ್ಷಣಾಧಿಕಾರಿ
(ಅರಣ್ಯ ಪಡೆ ಮುಖ್ಯಸ್ಥರು) ರವರ ಕಚೇರಿ
Office of the
Principal Chief Conservator of Forests
(Head of Forest Force)

ಅರಣ್ಯ ಭವನ, 18ನೇ ಅಡ್ಡರಸ್ತೆ
ಮಲ್ಲೇಶ್ವರಂ, ಬೆಂಗಳೂರು -560 003
AranyaBhavan, 18th Cross
Malleshwaram, Bengaluru-560 003
Telephone: 080 2334 6472
Email: apccffc@gmail.com

E-Office File No. KFD/HOFF/A5-1(MNG)/12/2018-FC **E-62505**

Dated: As per signature

To,

The Additional Chief Secretary to Government
Department of Forest, Ecology and Environment
M. S. Building, Bengaluru

Sir,

Sub: Diversion of 19.3044 ha of forest land in North Eastern (NE) Block, Sandur North Range, Sandur Taluk, Ballari District for pipeline Conveyor Belt at Thimmappanagudi Iron Ore Mine, ML No.2605 in favour of M/s Karnataka State Minerals Corporation Limited *[erstwhile M/s Mysore Minerals Limited]*, Bengaluru
Proposal No. FP/KA/MIN/47146/2020 [FORM-A]

Ref:
1. This office letter of even number letter dated 07-06-2022 & 22-05-2025 *[submission of Stage-I proposal to GoK]* and 15-11-2025 *[EDS communication]*
2. Government of Karnataka letter No. FEE/48/FLL/2020 (e) dated 17-09-2025 *[proposal to Gok]* and 05-11-2025 [communication of EDS query raised by GoI]
3. Government of India, Ministry of Environment, Forests & Climate Change, Regional Office, Koramangala, Bengaluru letter F.No.4-KRC1521/2025-BAN dated 23-10-2025 *[sought additional information]*
4. M/s. Karnataka State Mineral Corporation Limited, Toranagallu letter dated 20-02-2026 *[reply to the EDS query raised by GoI]*
5. The Deputy Conservator of Forests, Ballari Division letter No. M1/MNG/KSPCL/ML No.2605/2020-21/33 dated 06-03-2026 *[reply to the EDS query raised by GoI]*
6. The Chief Conservator of Forests, Ballari Circle letter No. .M1:MNG/KSMCL/Conveyor/CR-15/2021-22/1895 dated 13-03-2026 (received on 22-04-2026) *[reply to the EDS query raised by GoI]*

In response to the proposal submitted by this office vide Ref (1) to the Government of Karnataka and by the State Government vide Ref (2) to the Government of India. The Government of India, Ministry of Environment, Forest & Climate Change (RO), Bangalore vide Ref (3) has requested to furnish some documents/clarification/ information for further processing of the proposal. The Government of Karnataka on 05-11-2025 has forwarded to this office. The same has been forwarded by this office vide letter dated 15-11-2025 to the DCF Ballari Division to submit the details / information / documents / clarification.

In this regard, the reply to the query raised by the Government of India is furnished by the Use Agency, the Deputy Conservator of Forests, Ballari Division and the Conservator of Forests, Ballari Circle vide Ref (4), (5) and (6) to this office which is as below.

Sl. No.	Information sought	Information submitted
i.	The State Government is requested to submit the recommendation of PSC as per rule 9 (5) of Van (Sanrakshan Evam Samvardhan) Rules 2023	The said proposal has been discussed and have been approved in 48th Project Screening Committee Meeting conducted on 10-01-2025. Copy of the MoM is enclosed as **Annexure-1.**
ii.	The cost : benefit ratio has not been calculated as per the parameters/format provided in comprehensive guideline issued under the Van (Samrakshan Evam Samvardhan) Rule 2023. It is requested to furnish the revised C:B ratio considering the parameters/format given in the comprehensive guideline issued under the Van (Samrakshan Evam Samvardhan) Rule 2023.	The User Agency has submitted the revised cost benefit ratio and same has been enclosed as **Annexure-2.**
iii.	The State Government is requested to submit the CA suitability certificate of the CA land identified.	CA suitability certificate of the CA land identified is enclosed as **Annexure-3.**
iv.	Number of trees enumerated for felling is on the higher side. In this regard the State Govt. is requested to explore the possibilities to reduce the number of trees to be felled.	As per the DCF Ballari Division letter dated 06-03-2026, the area proposed for Conveyor corridor and the number trees required to cut are bare minimum and unavoidable.

v.	The details of the alternatives examined is not provided. Therefore, the State Govt. is requested to submit the alternatives examined and the reason for its rejection.	Alternative alignment for the installation of Conveyor belt have been examined and the shorter route with the lease forest area has been selected as per the terrain of the location. The map showing the alternative along with detailed have been attached as **Annexure-4.**
vi.	The State Government is requested to submit the justification for proposing the stock yard in the forest land. Further State Govt, is also requested to explore the possibilities to shift the stockyard to a non-forest land.	As the information submitted by the user agency, *"the stock yard has been proposed in the forest area only because it is adjacent to the proposed railway siding as shared by the RITES. The railway network for transportation of Iron ore through conveyor belt as per the Hon'ble Supreme Court order dated :07.12.2017 is a site-specific project and therefore the stock yard cannot be shifted".*
vii.	It has been informed by the DCF in Form A part-II, that the area proposed for diversion is situated on a ridge, the proposed area is having steep slope. Hence, Soil erosion could be an issue. Therefore, User Agency may be suggested to take necessary steps to prevent soil erosion. In this regard, the user agency is requested to submit the SMC plan approved from the component authority.	The User Agency has submitted the Soil and Moisture Conservation Plan vide letter dated. 10.02.2026, which is under consideration with the DCF Ballari Division.
viii.	It has been informed by the DCF in Form A, Part-II, that the area proposed for diversion have rare, endangered, or unique species of flora and fauna. In view of this, the State Government is requested to obtain and submit specific comments from the Chief Wildlife Warden (CWLW) regarding the potential impact of the proposed project on these species. Further, a site-specific Wildlife Mitigation Plan may be	The User Agency has submitted the Wildlife Mitigation Plan vide letter dated. 10.02.2026, which is under consideration with the DCF Ballari Division.

	prepared and submitted with the approval of the CWLW.	

In view of the above, **it is requested to move the matter with the Government of India, Ministry of Environment, Forests & Climate Change, New Delhi for further consideration of the proposal for according the In-principle Stage-I approval.**

Yours Faithfully,

Digitally signed by
MAHESH BASAVARAJ SHIRUR
Date: 07-05-2026 16:52:36

Principal Chief Conservator of Forests
(Forest Conservation) AND Nodal Officer (FCA)

Copy to the:

1. Chief Conservator of Forests, Ballari Circle, Ballari for information.
2. Deputy Conservator of Forests, Ballari Division, Ballari for information.
3. M/s Karnataka State Minerals Corporation Limited (Erstwhile Mysore Minerals Limited) TTMC "A" Block, 5th Floor, BMTC Building, KH Road, Shanthinagar, Bengaluru – 560 002 for information.

Annexure-01

सत्यमेव जयते

Government of Karnataka
Project Screening Committee
Agenda

Agenda ID	FC/AGENDA/PSC/955991/2025
Title of Meeting	48th PSC Meeting
Meeting Venue	3rd Floor, FC Wing, Aranya Bhavan, Malleshwaram, Bengaluru
Meeting Link	https://meet.google.com/pca-wpsb-xpa
Meeting Mode	Hybrid
Agenda Creation Date	07/01/2025
Meeting Dates & Time	Start Date : 10/01/2025 End Date : 10/01/2025

No. of days	Meeting Date	Meeting Mode	Start Time	End Time
Day 1	10/01/2025	Hybrid	12:00 PM	01:30 PM

Proposals to be discussed:

S. No.	Proposal No.	Division	Project Name	Project Category	Forest Land Area(ha)	Form Type
1	FP/KA/WATER/514934/2024	Shimoga Division	Drinking Water Supply Scheme to Mulubagilu and other 1616 habitations in Thirthahalli Taluk, Shivamogga District under Jal Jeevan Mission	Drinking Water	6.2169	Form-A (Part-I): Diversion of Forest Land
2	FP/KA/ROAD/421293/2023	Sagar Division	Construction Of ROB's In Lieu Of Lc110(Hosuru) At Km 108.525 And Lc152(Talaguppa) At Km 73.250 On Nh-69 (Old Nh-206) Honnavara - Chittoor Section In The State Of Karnataka Under NH (O) On Epc Mode Under Annual Plan 2022-23	Construction / Widening of Road including approach road to roadside establishments including bridges	13.21	Form-A (Part-I): Diversion of Forest Land
3	FP/KA/OT	Kudre	Development, Operation and Maintenance of Rope way from Kollur to Kodachadri Hills, in Udupi Dist	Others (please specify)	11.4641	Form-A (Par

S. No.	Proposal No.	Division	Project Name	Project Category	Forest Land Area(ha)	Form Type
	HERS/511542/2024	mukh Division	rict in the State of Karnataka.			t-I): Diversion of Forest Land
4	FP/KA/ROAD/440457/2023	Belgaum Division	Construction of 4/6 Lane Belagavi Ring Road (NH 848R) design Chainage from Km 46.253 to Km 57.427 (Design Length 11.174 km) in the state of Karnataka	Construction / Widening of Road including approach road to roadside establishments including bridges	27.267	Form-A (Part-I): Diversion of Forest Land
5	FP/KA/RAIL/510312/2024	Bellary Division	DIVERSION OF 5.0394 HA OF FOREST LAND IN NORTH EASTREN BLOCK OF SANDUR NORTH RANGE IN SANDUR (T), BALLARI (D) FOR CONSTRUCTION / SETTING OF SUSHEEL NAGAR GCT, NEAR SUSHEELNAGAR VILLAGE & RAILWAY SUB-LINE FROM SUSHEELNAGAR TO SANDUR GCT IN SANDUR TALUK, BALLARI DISTRICT IN FAVOUR OF MD, KMERC, BENGALURU,	Railway	5.0394	Form-A (Part-I): Diversion of Forest Land
6	FP/KA/WATER/456606/2023	Tumkur Division	Yettinahole Integrated Drinking Water Project	Drinking Water	187.3042	Form-A (Part-I): Diversion of Forest Land
7	FP/KA/MIN/QRY/515714/2024	Bellary Division	Additional FC Area for Mining	Mining / Quarrying	53.16	Form-A (Part-I): Diversion of Forest Land
8	FP/KA/REHAB/407429/2022	Ramanagara Division	Construction of 240 (G+1) Houses at Doddamannugudde Village Ramanagara Taluk & District Karnataka State under Jnurm-HSDP project/scheme.	Rehabilitation from Protected Area	12.5391	Form-A (Part-I): Diversion of Forest Land

S. No.	Proposal No.	Division	Project Name	Project Category	Forest Land Area(ha)	Form Type
9	FP/KA/WATER/5152277/2024	Sagar Division	Diversion of Forest Land for Providing Drinking Water supply Facilities to Anjanapura & others 198 Habitations of Shikaripura Taluk in Shimogga District, Karanataka through Design, Build, Operate and Transfer (DBOT) mode under "Jal Jeevan Mission" Detail	Drinking Water	6.9975	Form-A (Part-I): Diversion of Forest Land

Other Item Details:

S.No.	Remarks	Document
1	As per the MoEF guidelines dt: 25-10-2024 & GoI EDS dt: 26-11-2024, the instant PARIVESH 1.0 Proposal no. FP/KA/MIN/48923/2020----Diversion of 22.2887 hectares (Revised from 23.863Ha.) of forest land in Swamymalai Block, Sandur South Range, Sandur Taluka, Ballari District for pipeline Conveyor belt at Subbarayanahalli Iron Ore Mine M.L.No. 2629 in favour of M/s Karnataka State Mineral Corporation Limited (erstwhile Mysore Minerals Ltd.) Bengaluru--------requires recommendation of Project Screening Committee for further processing. Hence, this proposal needs to be discussed in this meeting.	48923 eds query.pdf
2	As per the MoEF guidelines dt: 25-10-2024 the instant PARIVESH 1.0 Proposal no. FP/KA/MIN/47146/2020 ----Diversion of 19.3044 ha of forest land in North Eastern (NE) Block, Sandur North Range, Sandur Taluk, Ballari District for pipeline Conveyor Belt at Thimmappanagudi Iron Ore Mine, ML No.2605 in favour of M/s Karnataka State Minerals Corporation Limited [erstwhile M/s Mysore Minerals Limited], Bengaluru---requires recommendation of Project Screening Committee for further processing. Hence, this proposal needs to be discussed in this meeting.	25-01-2024 guidelines.pdf

PSC Members Details:

S.No.	Name	Designation	Email ID
1	Brijesh Kumar	Nodal Officer	apcc***@gmail.com
2	Manjunath R Chavan	Conservator of Forest (CF)	belg*********@gmail.com
3	Heeralal.t.	Conservator of Forest (CF)	ccfb******@gmail.com
4	Cf Bangalore	Conservator of Forest (CF)	cfba**********@gmail.com
5	Dr. Hanumanthappa.k.t	Conservator of Forest (CF)	ccfs***@gmail.com
6	Sri Dayananda K A Ias	District Collector (DC)	deo.**********@gmail.com
7	Patil Yalagouda Shivanagoud	District Collector (DC)	deo.******@gmail.com

S.No.	Name	Designation	Email ID
	a		
8	Sh Gurudatta Hegde	District Collector (DC)	deo.*******@gmail.com
9	Dr. Avinash Menon Rajendran	District Collector (DC)	deo.**********@gmail.com
10	Nitesh Patil	District Collector (DC)	deo.********@gmail.com
11	Latha R	District Collector (DC)	deo.***********@gmail.com
12	Mullai Muhilan M P	District Collector (DC)	dc.m****@gmail.com
13	Prakash A.d	Member Secretary of the State	ms-p*****@gov.in
14	Sandeep Hindurao Suryavamshi	Divisional Forest Officer (DFO)	dcfb*******@gmail.com
15	Ramakrishnappa M	Divisional Forest Officer (DFO)	dcfr****@gmail.com
16	Maria Christu Raja D	Divisional Forest Officer (DFO)	dcfb**@gmail.com
17	Anupama H	Divisional Forest Officer (DFO)	dcft*********@yahoo.in
18	Ganapathi K	Divisional Forest Officer (DFO)	dcfw*********@gmail.com
19	Shivashankar E	Divisional Forest Officer (DFO)	dcf.**********@gmail.com
20	Mohan Kumar D	Divisional Forest Officer (DFO)	dcfs********@gmail.com
21	R.ravishankar	Chief conservator of Forest	ccfh*****@gmail.com
22	Sri G Srinivas	District Collector (DC)	sgha******@gmail.com
23	Saurabh Kumar	Divisional Forest Officer (DFO)	dcfh*****@yahoo.in
24	Cf Mangalore	Conservator of Forest (CF)	ccfm**@yahoo.com

Remarks:

Agenda has been approved.

KSMC

Karnataka State Minerals Corporation Ltd.
(A GOVT. OF KARNATAKA UNDERTAKING)
ಕರ್ನಾಟಕ ಸ್ಟೇಟ್ ಮಿನರಲ್ಸ್ ಕಾರ್ಪೊರೇಷನ್ ಲಿ.
(ಕರ್ನಾಟಕ ಸರ್ಕಾರದ ಉದ್ಯಮ)

11.02.2026

Revised Cost Benefit Analysis

Topo sheet No : 57 A/12 and A/16
Location : North Eastern Block Sandur North Range, Bellary Division, Bellary
Extent : 19.3044 ha

1	Ecosystem services losses due to proposed forest diversion	Rs. 2.37 crores (NPV)
2	Loss of animal husbandry productivity, including loss of fodder	Rs. 23.72 lakhs
3	Cost of human resettlement	NA
4	Loss of public facilities and administrative infrastructure on forest land, which would require forest land if these facilities were diverted due to the project	NA
5	Possession value of forest land diverted	Rs. 71.15 lakhs
6	Cost of suffering to oustees	NA
7	Habitat Fragmentation cost	Rs. 1.19 crores
8	Compensatory Afforestation and soil & moisture conservation cost	Rs. 3.54 crores (18.36 crores per ha)
9	**Total Cost**	**Rs. 8.05 crores**
10	Increase in productively attribute	Nil as the Annual target is fixed by the CEC.
11	Benefit to economy due to the specific project	Rs. 22.56 crores Material to be transported is 0.65 Million tonnes, & the Cost for transporting the material is Rs. 347/- per tonne
12	No. of population benefited due to the project	Rs. 62.07 lakhs 2% of the net profit on CSR activities = 0.02 * 31.04 cr
13	Economic benefits due to direct and indirect employment.	Total benefit 94.07 lakhs As per the DPR, a total of 26 members will be employed for the project.
14	Economic benefit due to the Compensatory afforestation	2.37 crores Guidelines for Forest diversion of Forest land for non-forest purpose under Forest (Conservation) Act 1980 Guidelines. For collection of NPV, NPV charges taken @ 12,28,000/- per ha.
15	**Total Benefit**	**Rs. 26.49 crores**

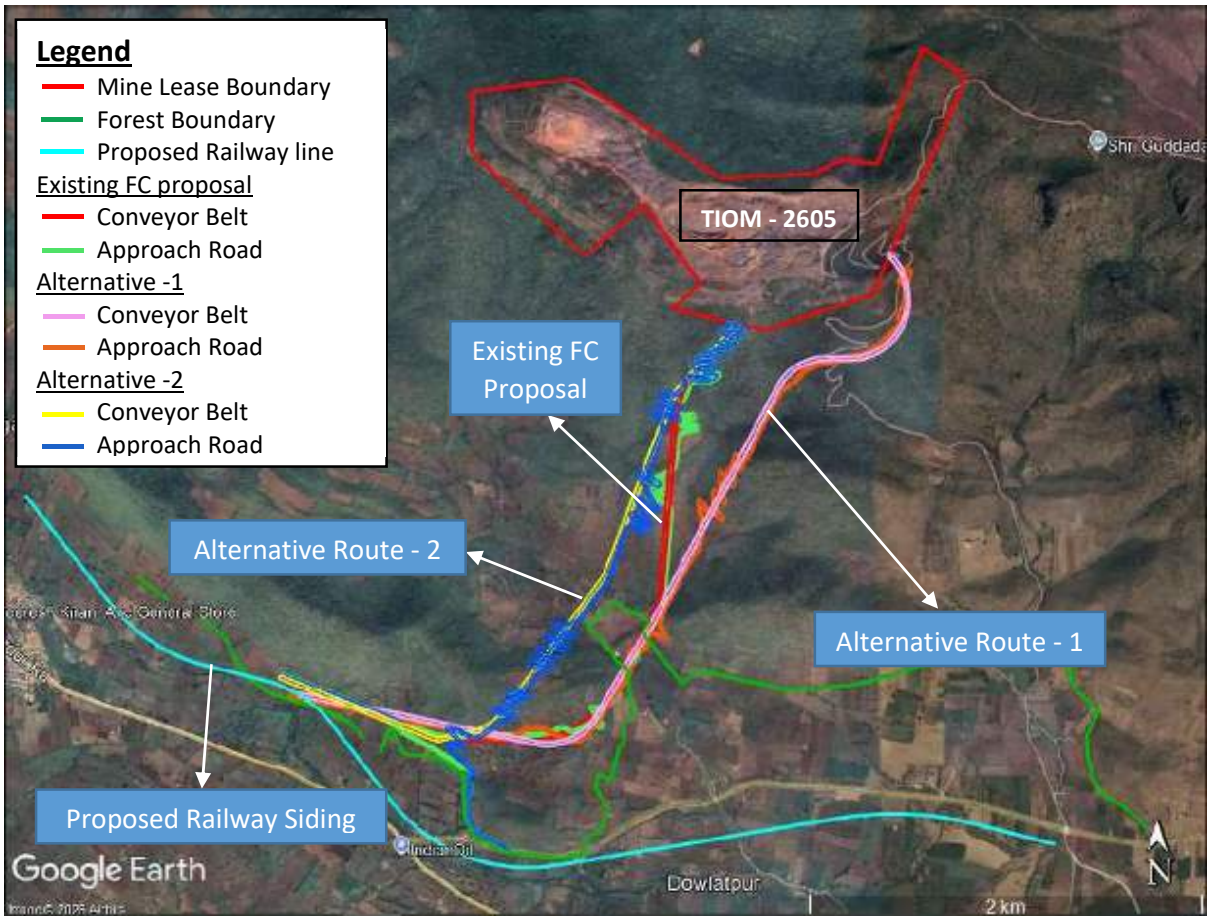
Total Cost- Rs. 8.05 crores	**Total Benefit - Rs. 26.49 crores**	**Cost benefit Ratio - 1:3.29**

For Karnataka State Minerals Corporation Limited,

AUTHORISED SIGNATORY
GENERAL MANAGER (LEE)
Karnataka State Minerals Corporation Limited
BMTC, Shanthinagar, Bengaluru-560 027

Regd. Office: T.T.M.C. 'A' Block, 5th Floor, B.M.T.C. Building, K.H. Road, Shanthinagar, Bengaluru - 560 027
Phone : 080-22278813/14/15/16 ❖ Fax : 080-22213172 ❖ Website: www.ksmc.karnataka.gov.in
CIN : U85110KA1966SGC001620 GSTIN : 29AACCM2873L1Z0

Alternatives Examined for Installation of Conveyor Belt from Thimmappanagudi Iron Ore Mine (TIOM) Head to the Proposed Susheelanagar Railway Siding for Transportation of Iron Ore.



Sl. No.	Particulars	Existing FC Proposal (Area in ha)			Alternative route-1 worked out (Area in ha)			Alternative route-2 worked out (Area in ha)	
		Forest	Non-forest		Forest	Non-forest		Forest	Non-forest
1	Conveyor belt	7.18	0.39		8.72	0.40		7.00	0.00
2	Approach road	8.98	0.33		8.16	0.37		12.32	0.00
3	Total Area	**16.161**	0.719		**16.88**	0.774		**19.32**	0.00

Therefore, the alignment for installation of conveyor belt involving the least Forest area has been considered and submitted for Forest Clearance.

FORMAT – B

CA LAND SUITABILITY CERTIFICATE UNDER FCA 1980

[Cases where the proposed non-forest CA land cannot support the prescribed planting density of 1000 plants per hectare and it is necessary to plant the balance number of plants in degraded forest land (-40^0 canopy density) as per Working Plan prescription in accordance with Government of India FC Guidelines F.No.11-423/2011-FC dated : 08.11.2017].

In compliance of the procedure established for diversion of forestland for non-forest purpose through the Forest Conservation Rules 2003 and guidelines framed under the Forest Conservation Act 1980, the following is certified.

1. The non-forest land parcels shown in the table below proposed by **M/s. Karnataka State Mineral Corporation Limited (Erstwhile Mysore Minerals Ltd) (ML No. 2605; Old ML No. 2002)** for raising compensatory afforestation (CA) against proposed diversion of forest land in North Eastern Block, Sandur South Range, Ballari Division for Conveyor belt proposal vide Proposal No. **FP/KA/MIN/47146/2020 [FORM-A] (19.3044 ha)** has been inspected by me on **07th January, 2022.**
2. The said non-forest CA land parcels are not suitable for raising compensatory afforestation in accordance with the Government of India FC Guidelines F. No. 11-423/2011-FC Dt. 08-11-2017 read with general FC Guidelines, ~~and in case of Private Party/User Agency, further as per Government of Karnataka Order No. FEE 82 FLL 2016 Dt. 31-08-2016~~.
7. It is further reported that, the proposed parcel of CA Land is having good vegetation with native trees/shrubs. The said CA land was handed over to the Department during 1999 vide letter No.REV/LAND/C&D/1994-95 Dt.08.03.1999 (as CA land against anticipated proposals). Since then the land is under the custody of the Forest Department. Over period of time, because of the protection works initiated by the department personnel, good vegetation has grown over the same. Hence, afforestation (CA) cannot be taken up over the proposed lands. Compensatory Planting/Afforestation is thus proposed to be taken up at alternate location in degraded forest area of Kodalu RF [Details in Table-2] in consonance with the Working Plan prescriptions.
3. The KML files, Topo Maps, Geo-referenced Maps & GPS readings of all corners of the proposed CA land parcel are uploaded by User Agency in PART-I of the proposal.
4. The KML files, Topo Maps, Geo-referenced Maps & GPS readings of all corners of the proposed degraded forest land are enclosed in PART-II of the proposal.
5. Additional if any : -

TABLE-1: (Non-forest CA land)

Sl. No.	District, Taluk	Village	Sy. No.	Extent proposed (in Ha)	Plants / ha proposed saplings/ha	Remarks about the adjacency of the proposed land parcel to notified forest
1	2	3	4	6	7	8
1	Ballari Kurugodu	Kuduthini	1251	19.3044	The said CA land was handed over to the Department during 1999 vide letter No.REV/LAND/C&D/1994-95 Dt.08.03.1999 (as CA	The proposed parcel of CA Land is adjacent to Sy.No.1 of Yarabanahalli & Sy.No.1 of Chikkanthapura both of which happens to be a large parcel of CA land given by M/s

	Total	19.3044	land against anticipated proposals). Since then the land is under the custody of the Forest Department. Over period of time because of the protection works initiated by the department personnel, good vegetation has grown over the same. Hence, afforestation (CA) cannot be taken up over the proposed lands.	SMIORE(ML No.2580). The land in the current instance given by M/s. KSMCL (erstwhile M/s. MML) & adjoining CA land given by M/s. SMIORE have been proposed for notification under Section-04 of Karnataka Forest Act, 1963. The land in the current instance given by M/s. KSMCL (erstwhile M/s. MML) along with CA land given by M/s. SMIORE are adjacent to the Chikkanthapura RF of Ballari Range (Map Enclosed). The land in the current instance given by M/s. KSMCL (erstwhile M/s. MML) along with CA land given by M/s. SMIORE have scrub jungle typical to the Eastern Plains of Karnataka and are inhabited by faunal species like Sloth Bear, Leopards, etc. The landscape inclusive of the forests forms a part of watershed that impacts the microclimate of Ballari town.

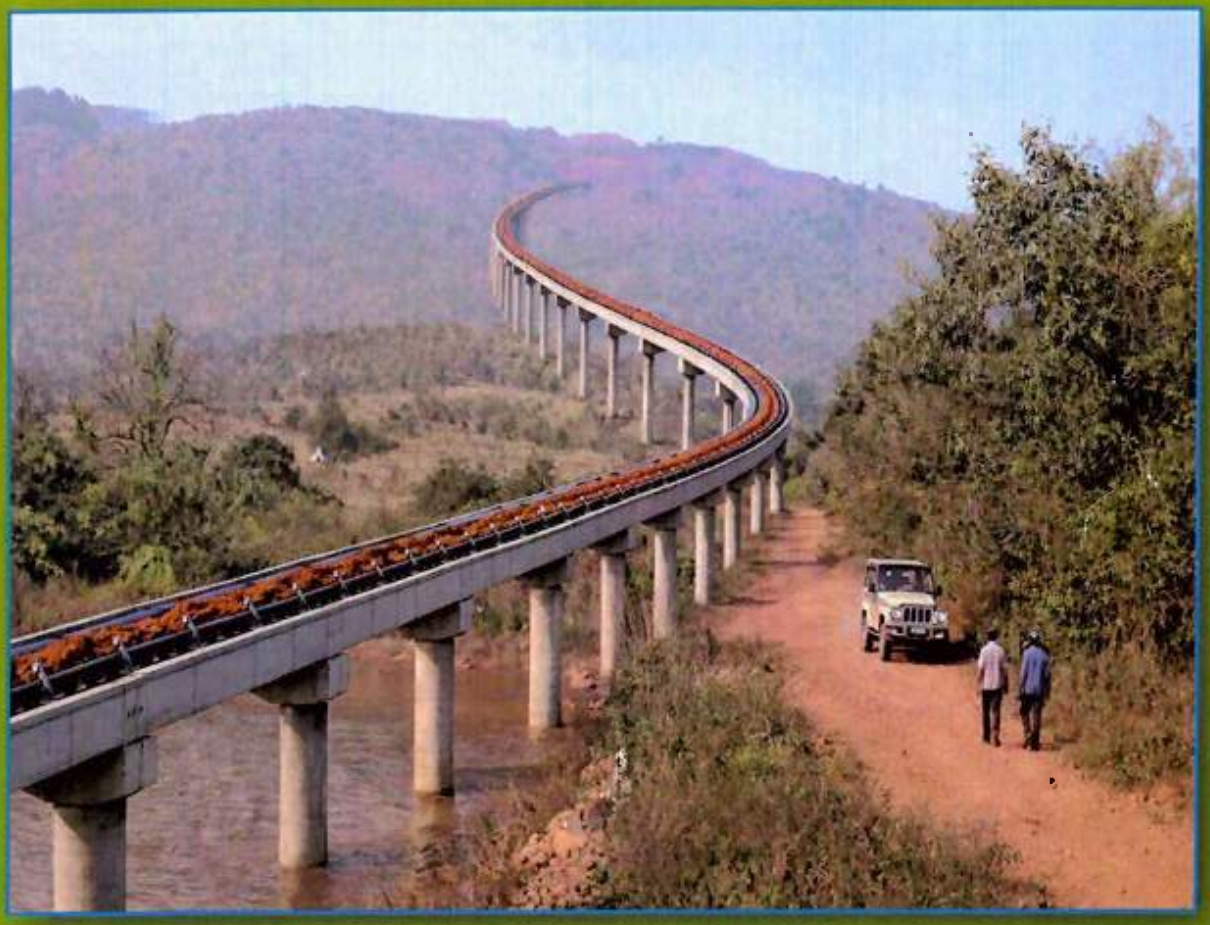
TABLE-2: (Degraded Forest land where the balance number of plants are proposed to be planted in consonance with the Working Plan Prescriptions).

Forest Division	Name of the Forest	Forest Block number	District, Taluk & Hobli	Village	Survey number	Plants / ha proposed to be	Extent proposed (Ha)
1	2	3	4	5	6	7	8
Ballari	Chikkanthapura RF	Chikkanthapura	Sandur Toranagallu	Chikkanthapura	14, 23, 24, 25, 13 & 87	1000 Seedlings / per hectares	19.3044

Place: Ballari
Dated: 18.01.2022

Deputy Conservator of Forests,
Ballari Division, Ballari

Soil and Moisture Conservation Plan for Downhill Conveyor Belt and Service Road of THIMMAPPANAGUDI IRON ORE MINES (TIOM) M.L No. 2605



KSMC

APPLICANT

Karnataka State Minerals Corporation Limited
(Formerly: MYSORE MINERALS LIMITED)
(A Govt. of Karnataka Undertaking)
TTMC "A" Block, 5th floor, BMTC Building Shantinagar,
Bangalore 560 027, Karnataka, India
EMail : ksmcl-enquiries@karnataka.gov.in

Soil and Moisture Conservation Plan for Downhill Conveyor Belt and Service Road of THIMMAPPANAGUDI IRON ORE MINES (TIOM) M.L No. 2605

REF: PROPOSAL NO: **FP/KA/MIN/47146/2020**

APPLICANT

Karnataka State Minerals Corporation Limited
(Formerly: MYSORE MINERALS LIMITED)
(A Govt. of Karnataka Undertaking)
TTMC "A" Block, 5th floor, BMTC Building Shantinagar,
Bangalore 560 027, Karnataka, India
EMail : ksmcl-enquiries@karnataka.gov.in

Project Office: KSMCL, Sandur

PREPARED BY
Deccan Resource Centre, Hosapete
drchospet@gmail.com

2025-26

Soil and Moisture Conservation Plan
for Downhill Conveyor Belt and Service Road of
THIMMAPPANAGUDI IRON ORE MINES (TIOM) M.L No. 2605

Location: Sandur North Range, Ballari Territorial Division, Karnataka, India

Project Proponent: Karnataka State Minerals Corporation Limited (KSMCL)

Plan Period: 2026-2027

January, 2026

The draft "Soil and Moisture Conservation (S&MC) Plan" was prepared and submitted to the Hon'ble Principal Chief Conservator of Forests and Head of Forest Force (HoFF) of Karnataka on _____ for his perusal and kind approval.

The same was got approved by the Hon'ble Principal Chief Conservator of Forests and Head of Forest Force (HoFF) of Karnataka on _____

TABLE OF CONTENTS

I. List of Figures

II. List of Tables:

III. Acronyms

CB	Conveyor Belt
Ft	Feet / foot
Ha	Hectares
IMD	Indian Meteorological Department
ICFRE	Indian Council of Forestry Research and Education
IUCN	International Union for Conservation of Nature
KFD	Karnataka Forest Department
KM	Kilo Meter
KSMCL	Karnataka State Minerals Corporation Limited
LC	Least Concerned
M	Migratory
MM	Monsoon Migratory
MPAP	Maximum Permissible Annual Production
MSL	Mean Sea Level
MTs	Metric Tonnes
MTPA	Million Tonnes Per Annum
NT	Near Threatened
R	Resident
R & R	Rehabilitation and Reclamation Activities
RET	Rare, Endangered, Threatened
RS	Railway Station.
S	Seasonal
SCS	Soil Conservation Services
S&MC	Soil & Moisture Conservation
TIOM	Thimmappanagudi Iron Ore Mines
SR	Service Road
Sq Kms	Square Kilo meters
TIOM	Thimmappanagudi Iron Ore Mines
UOM	Unit of Measurement
VU	Vulnerable
WM	Winter Migratory
WPA	Wildlife (Protection) Act, 1972

IV. Acknowledgments:

1. The Management, KSMCL, Bengaluru
2. The Management of KSMCL, Sandur
3. The Staff of Office and Employees of TIOM,
4. Deputy Conservator of Forest (DCF)- Ballari
5. Range Forest Officer, Sandur North Range, Sandur
6. Villagers and local knowledgeable people.

V. Research Agency:

Research Agency : Deccan Resource Centre, Hospet (R).

Photographs : © Deccan Resource Centre, Hospet.

Address : Deccan Resource Centre (R).
461, "ASHA", Basaveshwara Badavane,
HOSPET-583 201 Bellary Dist, Karnataka. India.
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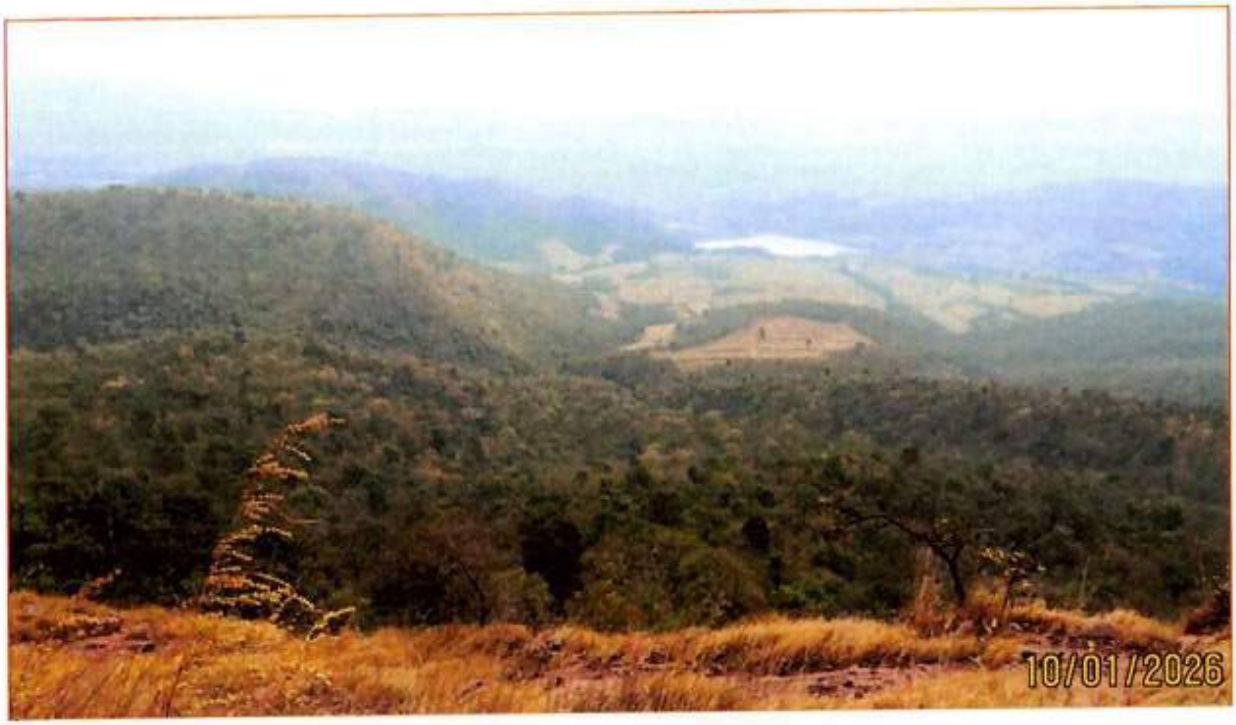


VI. Executive Summary

The comprehensive Soil & Moisture Conservation (S&MC) Plan designed for the downhill pipeline conveyor belt and service road of the Karnataka State Minerals Corporation Limited's (KSMCL) Thimmappanagudi Iron Ore Mine (TIOM) in the ecologically sensitive Sandur region. A total of 19.3044 hectares of forest land is sought for the purpose of installation of Conveyor belt and service road as per the directions of honourable Supreme Court of India vide order dated 7th December, 2017. This order is issued in pursuant to the recommendations of the Central Empowered Committee (CEC) on mining and related activities. The order mandated the replacement of conventional road-based mineral transport with conveyor-based systems in mining regions to arrest environmental degradation caused by heavy vehicular movement. **The length of the proposed downhill linear pipeline conveyor is 3.59 kms in the forest area and 0.20 kms in non-forest area. And the length of the service road is 5.99 kms in the forest area and 0.22 kms in non-forest area.** A total of 19.3044 hectares of forest land and 0.71 hectares of non-forest land is proposed to utilize for this project.

The proposed Conveyor belt is essential for mineral transport, cuts through reserve forest and vital wildlife corridors, presenting acute risks related to accelerated soil erosion, hydrological disruption, and habitat fragmentation. KSMCL, operating under a firm mandate from both the state government and the Supreme Court orders, is committed to balancing economic activity with environmental stewardship. The plan's central goal is to prevent soil loss, maximize localized water infiltration and mitigate the conveyor belt and service road's ecological footprint, thereby ensuring statutory compliance and securing the Forest Clearance for the 19.3044 hectares of forest land in NEB of Sandur North Range Forest of Ballari division. The proposed conveyor belt is establishing a scientifically sound, resilient transportation link is key to the mine's sustainable operation. This conveyor belt prevents the transportation of iron ore by roads and preventing dust and sound pollution in the mining and forest areas. Also reduces the cost of fossil fuel and air pollution by vehicles. The conveyor belt also prevents the road kills in the forest areas, secure the peace and tranquillity to the wildlife, help the forest to flourish by preventing the deposit of dust on leaves.

The imperative for this S&MC Plan is rooted in a robust and multi-faceted regulatory framework. Compliance is strictly mandated by legislation, including the Forest (Conservation) Act, 1980 (FCA), which requires comprehensive catchment area treatment,

and the Mineral Conservation and Development Rules (MCDR), 2017, which specifically mandates the construction of engineered structures such as retaining walls, check dams, and siltation tanks to manage runoff. The technical objectives guiding the plan involve conducting a rigorous scientific baseline assessment of soil and hydrological profiles, accurately identifying all critical erosion hotspots along the route, and promoting groundwater recharge through enhanced infiltration rates.

The Proposed Soil & Moisture Conservation Plan is characterized by its integrated strategy, which effectively merges conventional structural engineering with sustainable bioengineering techniques, ensuring long-term resilience. A total approval budget of ₹32.75 Lakhs is reserved for the financial year 2026-27 – 202829, for implementation of this S&MC plan. The plan commits to significantly expanding erosion control infrastructure beyond existing successful measures. Key proposals include the construction of 2 new check dams in addition to the existing 28 check dams, strategically placed in seasonal drainage lines to diminish water velocity, promote silt deposition, and boost groundwater percolation. To control smaller, localized erosion, the plan allocates resources for the construction of 50 gully plugs of and two Nalabunds to maximize overall aquifer recharge. A crucial, forward-thinking component of the plan is the stabilization of roadside bunds and slopes through extensive planting of grass, seeds, and specific local vegetation. This bioengineering approach is emphasized as a resilient, cost-effective operational choice where deep-rooted ecology underpins structural stability, allowing "roots to replace repairs" and turning the landscape into a long-term partner in risk management. These planned activities build upon the mine's prior successes, which include the construction of 24 farm ponds (6,000 m^3 capacity) and 28 check dams (6,600 m^3 capacity). The successful and continuous execution of this planned system is fundamental for ensuring slope stability, securing regional water resources, and fulfilling all environmental and statutory requirements for KSMCL's continued operation.

CHAPTER – 1 : INTRODUCTION

1.1 OVERVIEW

Mining activities in ecologically sensitive regions of India present complex challenges in balancing economic development, ecosystem integrity, and the rights and well-being of local communities. In recent years, regulators have increasingly emphasized landscape-level planning, cumulative impact assessment, and robust post-mining restoration to ensure that mineral extraction does not irreversibly damage critical habitats or compromise long-term ecological resilience.

The Sandur region in Ballari district, Karnataka, is part of a larger iron ore belt that has been intensively mined and is now recognized as both an economically important and ecologically fragile landscape. The forests here fall largely within southern tropical dry deciduous and scrub forest types and support diverse wildlife communities, including several endemic, threatened, and legally protected species such as the Indian Sloth Bear, Indian Leopard, four-horned antelope and rare plant taxa reported from the broader Sandur hills. These habitats also play a key role in maintaining watershed functions, soil stability, and local microclimates that are vital for surrounding villages and agriculture.

Within this setting, the a downhill pipeline conveyor belt is proposed for installation connecting the Karnataka State Minerals Corporation Limited's Thimmappanagudi Iron Ore Mine (KSMCL-TIOM, Mining Lease No. 2605) to the stock yard near proposed railway siding near Susheelanagara. This conveyor belt traverses the forest of Sandur North Range, cutting across natural habitats, wildlife movement paths and seasonal drainage lines in NEB form TIOM M.L No.2605 to downhill near Susheelanagara. Similar linear infrastructures across Karnataka and India have been shown to fragment habitats, alter animal movement patterns, increase vehicle-wildlife collision risks and facilitate human intrusion and secondary pressures such as fuelwood collection, poaching, and invasive species spread. The transportation of Iron ore from mining area to the destination, involves transportation by the heavy vehicles through road. But this disrupts the tranquillity of forest, disturbing the wildlife species destroying the forest and eroding soil in addition to noise and air pollution. The transportation of iron ore by road also involves in the road kill of the rare species of wildlife.

Therefore, on the guidelines of the honourable Supreme Court of India, a downhill conveyor belt is proposed by KSMCLs TIOM. KSMCL operates the Thimmappanagudi Iron Ore Mine over an area of 136.94 ha with an annual production capacity of 6,50,000 MTs of iron ore. Instead of present

transportation by road, planning to establish a downhill conveyor belt as a critical logistics link between the mine and the state and national highway network and reducing pressure on the forest and wildlife. The conveyor belt and service road corridor passes through reserve forest and undulating terrain with red loamy soils, shallow rocky outcrops, and short-duration surface flows. Such conditions are particularly prone to erosion. Preventive measures such as gullying and contour trenching etc., reduce the impact. In addition to direct biophysical impacts, vehicular movement in service roads can generate dust, noise, and light disturbances, which collectively affect vegetation health, water quality in nearby streams, and behavioural patterns of sensitive wildlife species.

This plan has been developed in alignment with the Ministry of Environment, Forest and Climate Change (MoEF&CC) guidelines, recommendations from the Indian Council of Forestry Research and Education (ICFRE) under the Sustainable Environmental Management Plan (SEMP), and key directions issued by the Hon'ble Supreme Court for mining in sensitive regions. These instruments emphasize principles of sustainable mining, including adherence to the Sustainable Development Framework, implementation of Star Rating criteria under the Mineral Conservation and Development Rules (MCDR) 2017, and systematic reclamation of disturbed areas to restore or enhance ecological function over time. In this context, the present road management and mitigation plan focuses on minimizing habitat fragmentation, preventing soil erosion and sedimentation, improving moisture retention along slopes and drainage lines, and implementing wildlife- and community-sensitive measures that reduce environmental impacts while maintaining essential connectivity for mining operations.

1.2 OBJECTIVES OF THE STUDY:

Rationale:

Mining is a part and parcel of human civilization. Iron ore mining is one of the major mining activities on the basis of which human society across the world is depending. From pin to plane, bike to building - iron is inevitable. Unfortunately, most of the ore existing sub-surface is covered with forest. It is inevitable to clear forest and excavate the earth to extract the ores. Similarly, extraction of Iron and Manganese ore involves destruction of the forest, excavation of the earth, removal and transportation of the ores etc. During this process, the environmental impact such as, disturbance to the natural flow of water, contamination of water with iron ore and the loose soil to runoff in rain water to choke the natural streams. The soil erosion leads to the loss of forest and percolation of water to recharge the underground water table and so on. Therefore, the soil and

moisture conservation initiates have been taken up to prevent any impacts on the soil and moisture of the project area.

Objectives:

1. Assess soil profiles, moisture dynamics, and hydrological behaviour across the project landscape to establish a scientific baseline for conservation planning.
2. Identify critical erosion hotspots, sediment-prone areas, and runoff risks to prioritise vulnerable zones requiring immediate and long-term intervention.
3. Implement Soil & Moisture Conservation (S&MC) structures—such as check dams, gully plugs, engineered drainage channel and culverts.
4. Enhance soil stability, improve infiltration, and promote groundwater recharge through scientifically designed measures that strengthen watershed resilience and support agricultural and ecological systems.
5. Integrate technical assessments with community participation and resource planning to ensure sustainable implementation, minimal disruption from mining activities, and long-term maintenance of soil and water conservation outcomes.

1.3 PROJECT PROPONENT PROFILE

Karnataka State Minerals Corporation Limited (KSMCL) is a Government of Karnataka undertaking established under the Companies Act to undertake systematic and scientific development of mineral resources in the state. As a public sector enterprise, KSMCL operates with dual mandates: economic development through mineral extraction and responsible environmental stewardship.

Core Functions:

- Exploration, extraction, and marketing of minerals including iron ore, manganese, limestone, and other industrial minerals
- Implementation of scientific mining practices adhering to sustainable development principles
- Compliance with environmental, forest, and wildlife protection regulations
- Implementation of compensatory afforestation, habitat restoration, and biodiversity conservation programs
- Engagement with local communities for socio-economic development and conflict resolution

Operational Presence: KSMCLs operates multiple mining leases across Karnataka, with significant operations in the Ballari-Sandur mineral belt, one of India's major iron ore producing

regions. The corporation manages both active mines and associated infrastructure including haul roads, processing facilities, and transportation networks.

KSMCL's Environmental and Conservation Commitments

Karnataka State Minerals Corporation Limited (KSMCL) stands as a cornerstone of the state's mineral economy—a legacy enterprise forged on May 13, 1966, under the Companies Act, 1956. Born from the transition of assets from the erstwhile Board of Mineral Development, the corporation began its journey as Mysore Minerals Limited (MML), later realigning its identity to reflect the state's evolution. Its founding mandate was clear: unlock Karnataka's geological wealth through structured exploration, responsible extraction, and market-oriented distribution.

From its inception, the corporation became an instrument of the state's strategic intent—deploying scientific mining methods, building employment pathways in resource-rich belts, and strengthening the industrial backbone of Karnataka. Over nearly six decades, KSMCL has modernized its operating architecture, pivoted toward integrated resource management, and positioned itself as an essential growth engine for the region's mineral economy.

Historical Foundation, Background, and Growth Trajectory

KSMCL emerged with a clear mandate: consolidate Karnataka's mineral resources, upgrade mining methodologies, and create a sustainable operational pipeline. Initially focused on core minerals, the corporation progressively diversified. Guided by state policies and regulatory frameworks, it adopted advanced mining technologies, embraced compliance-driven governance, and aligned its strategy with evolving industrial demand. This disciplined expansion has enabled KSMC to scale from a traditional mining unit into a multidimensional mineral enterprise with state-wide footprint.

Strategic Mission and Governance Framework

Operating as an extension of Karnataka's development mission, KSMCL balances commercial performance with ecological stewardship. Its governance model emphasizes transparency, regulatory compliance, and performance accountability. Led by a Managing Director and supported by domain-specialist General Managers in Administration & Vigilance, Finance, Marketing, and Supply Chain, the organization's management architecture reflects disciplined oversight and operational rigor. As of March 31, 2023, the corporation remains fully active, marking its last Annual General Meeting on December 30, 2023.

Core Mineral Portfolio and Production Ecosystem

Karnataka's geological diversity is mirrored in KSMCL's extensive mineral portfolio—Iron Ore, Chromite, Manganese, Magnesite, Limestone, Dolomite, Clay, and Dunite. The corporation ranks among the leading producers in several categories, supplying critical inputs to steel, cement, ceramics, and refractory industries.

Key mineral strengths include:

• **Iron Ore**: Over 9,000 million tonnes of magnetite-rich reserves fuelling steel and sponge iron industries.

• **Chromite:** Deposits across Chikmagalur, Chitradurga, Hassan, Mysore, and Shimoga, supporting metallurgical and refractory applications.

• **Manganese:** India's largest recoverable reserves—although operations were halted under the Forest Conservation Act, 1980.

• **Limestone, Dolomite, Magnesite:** Supporting Karnataka's cement and industrial minerals ecosystem.

• **Clay and Dunite:** Supporting specialized ceramic and industrial applications through dedicated processing facilities.

Granite Sector Expansion and Global Market Linkages

Responding to global demand, KSMC entered the international granite sector, exporting premium varieties sourced from Kanakapura, Hassan, Chamarajanagar, Mysore, and Mandya. Karnataka's globally renowned coloured granites—Sparkling Black, Imperial Red, Queen Rose, Indian Juprana, and other multi-coloured stones—position the state as a preferred supplier to markets including Taiwan, Singapore, Australia, the USA, Germany, and Italy.

Chamarajanagar has emerged as a global hub for Absolute Black Granite, complementing KSMCL's 100% Export Oriented Unit in Hassan (presently non-operational). While geopolitical tensions and recession-driven demand slowdown have impacted global granite trade, the corporation continues to leverage its strong resource base to maintain market presence.

Diversification, Modernization, and Operational Infrastructure

KSMCL initiated key diversification programs in the early 1980s, including a stoneware pipe manufacturing unit at Bageshpura and an export-focused granite cutting and polishing facility. Today, the corporation controls:

- 40 mining leases spanning 5,377.83 hectares
- 38 granite and quarry leases covering 294.30 acres

• A workforce of 1,224 employees

This strategic footprint enables the corporation to maintain operational scale, supply chain agility, and regional employment impact.

Financial Performance and Enterprise Sustainability

KSMCL's revenue trajectory reflects the cyclical nature of commodities and the dynamic global trade environment. Historic turnovers have ranged from ₹111.18 crores (2004–05) to ₹334.96 crores (2007–08), with FY 2023 revenues surpassing ₹500 crores. EBITDA declined by 64.01%, though net worth rose by 4.16%, indicating capital stability amid market volatility. FY 2021 recorded exceptional performance with revenue growing by 209.12% and net worth expanding by 18.45%.

Environmental Stewardship and Corporate Social Responsibility

KSMCL champions eco-aligned mining practices, land reclamation, community-centric development, and operational transparency. Its commitment to worker safety was recognized through the SKOCH Silver Award (July 2024) for excellence in Occupational Health and Safety.

Current Status and Forward Outlook

KSMCL continues to anchor Karnataka's mineral development agenda, navigating regulatory complexity, market volatility, and rising competition. With extensive leases, a resilient workforce, and strong government backing, the corporation is positioned for long-term sustainability. Its strategic direction prioritizes modernization, environmental compliance, operational excellence, global market alignment, and future-ready systems—ensuring KSMCL remains a cornerstone of Karnataka's mineral ecosystem.

KSMCL has progressively enhanced its environmental management systems, incorporating:

- **Integrated Environmental Management Plans (EMPs)** for all operational sites
- **Biodiversity Management Plans** addressing flora and fauna conservation
- **Compensatory Afforestation Programs** exceeding statutory requirements
- **Water Conservation Initiatives** including rainwater harvesting and watershed management
- **Air Quality Management Systems** with real-time monitoring and dust suppression measures
- **Community Development Programs** supporting livelihoods, education, and health services in mining-affected areas

1.3.1 Overview of Iron Ore Leases

KSMCL holds two major iron ore mining leases in Karnataka, both located in the Sandur Taluk of Ballari District. These leases are critical to the state's iron ore production and supply chain, serving key industries including steel manufacturing, cement production, and export markets.

Table-1: Summary of Iron Ore Mining Leases in Ballari district by TIOM

Mine Name	ML Number	Location	Area (Ha)	District
Subbarayanahalli Iron Ore Mine, (SIOM)	2629	Sandur Taluk	80.06	Ballari
Thimmappanagudi Iron Ore Mine, (TIOM)	2605	Sandur Taluk	621.59	Ballari

1.3.2 Thimmappanagudi Iron Ore Mine-TIOM (ML No. 2605)

Thimmapanagudi Iron Ore Mine (ML No. 2605) operated by M/s Karnataka State Minerals Corporation Limited (KSMCL) with lease area of 621.59 hectares in Sandur North Eastern Block (NEB) Range forest - represent strategic assets with substantial reserves and production capacity. With ongoing modernization, regulatory compliance, and environmental stewardship, KSMCL is well-positioned to maintain its leadership role in Karnataka's mining industry for decades to come.

Table-2: Details of Thimmappanagudi Iron Ore Mines (KSMCL-TIOM)

Detail	Description	Reference
Mine Operator	M/s Karnataka State Minerals Corporation Limited (KSMCL)	(KSMCL documents, formerly Mysore Minerals Ltd.)
Mining Lease (ML) No.	**ML No. 2605** (often referred to interchangeably with ML No. 2002)	(IBM, Forest Clearance documents)
Mineral	Iron Ore	(IBM, KSMCL documents)
Location	**Thimmappanagudi** Village, Sandur Taluk, Ballari District, Karnataka State	(IBM, Forest Clearance documents)
Forest Block	North Eastern (NE) Block, Sandur North Range, Ballari Division	(Forest Clearance documents)
Lease Area	**136.94 Ha** (Area as per CEC/IBM approval for R&R and Mining Plan Modification)	(IBM Approval, 2019)
Lease Period	Original lease commenced around 1985-1992. Earlier FC approvals cited a lease period up to **December 26, 2035.**	(FC documents, 2001 & 2004)
Mining Method	Fully mechanized Open-Cast Mining method	(EC documents)
Present proposal	19.3044 ha of forest land in NEB for installation of Conveyor Belt	Present document

Table-3 : Production and Reserves		
Details	**Description**	**Reference**
Annual Production Capacity	**6,50,000 Tonnes** (Iron Ore) for the year 2021-22 to 2025-26 (As per IBM's approval for the review period).	(IBM Approval, on 05.02.2021)
Total Mineral Reserves	**5.08 Million Tonnes (MT)** of Iron Ore (As per IBM's approval for the review period).	(IBM Approval, on 05.02.2021)
Estimated Reserve (Forest Land)	**9.29 Million Tonnes** (Estimated reserve at the time of FC proposal submission in 2018).	(FC Form A, 2018)

1.3.3 Regulatory Status and Compliances

The governance of soil and moisture conservation (SMC) in mining landscapes in India is anchored in a multi-layered regulatory architecture, combining central environmental laws, mining-specific legislation, forest conservation mandates, and national watershed management frameworks. Together, these instruments ensure that mining operations are carried out responsibly, preventing land degradation, enhancing hydrological stability, and safeguarding ecological integrity.

The regulatory framework is guided by principles of sustainability, precaution, restoration, and long-term land stewardship, making SMC an essential compliance requirement for all mining leases—especially those operating within forested or environmentally sensitive regions.

1. Forest (Conservation) Act, 1980 (FCA, 1980)

For mining projects involving forestland, FCA mandates that any diversion of forest area requires Central Government approval, subject to conditions related to:

- Soil conservation
- Drainage management
- Catchment treatment
- Slope stabilisation
- Mining road regulation
- Afforestation and rehabilitation measures

MoEF&CC routinely includes Soil & Moisture Conservation Works (SMCWs) as part of Stage-II FC compliance, requiring the lessee to undertake check dams, gully plugging, contour trenches, vegetative stabilization, and watershed measures in and around the mine lease.

2. Environment (Protection) Act, 1986 (EPA, 1986)

Under EPA, mining projects must develop Environmental Management Plans (EMPs) that include:

- Soil erosion control
- Drainage channel design
- Stormwater management
- Sediment retention systems
- Water conservation and groundwater recharge measures

The Act empowers MoEF&CC to prescribe standards and issue directions related to soil protection and hydrological stability in mining landscapes.

3. Environmental Impact Assessment (EIA) Notification, 2006

Mining projects requiring Environmental Clearance (EC) must conduct an EIA study and prepare an EMP that specifically addresses:

- Soil erosion modelling
- Runoff and drainage impacts
- Land degradation and reclamation
- Catchment-level water conservation measures
- Progressive mine closure and post-closure SMC requirements

The EC letters issued by MoEF&CC or SEIAA generally include explicit conditions on:

- Construction of check dams and silt traps
- Stabilisation of mine dumps
- Garland drains and sedimentation ponds
- Stormwater drainage mapping
- Catchment treatment plans

4. Mines and Minerals (Development & Regulation) Act, 1957 (MMDR Act)

The MMDR Act provides the broad legal framework for regulating mining operations across India. Under this Act, SMC is required as part of:

- Mining Plan and Progressive Mine Closure Plan (PMCP)
- Sustainable mine development obligations
- District Mineral Foundation (DMF) expenditure on watershed development

Rule-making under this Act mandates:

- Scientific mining
- Soil conservation
- Reclamation of degraded land
- Protection of water regimes

5. Mineral Conservation and Development Rules (MCDR), 2017

MCDR, amended in 2020, is one of the most explicit regulations mandating soil and moisture conservation in mines.

Key mandatory provisions include:

Rule 31: Environmental Protection Duties of Mine Operators

Mine lease holders must:

- Protect surface and groundwater
- Control soil erosion
- Construct retaining walls, toe walls, drains
- Implement reclamation and afforestation measures
- Stabilise slopes and dumps
- Build check dams, siltation tanks, and garland drains

Rule 34: Mine Closure Plan

The PMCP must include:

- Physical reclamation
- Soil conservation works
- Catchment treatment
- Water harvesting structures
- Long-term slope stability

Thus, SMC is a statutory obligation, not optional.

6. National Water Policy (2012)

The policy promotes:

- Rainwater harvesting
- Watershed-level planning
- Soil moisture conservation
- Aquifer recharge in mining regions

It emphasises decentralised hydrological interventions, making SMC critical for mine areas.

7. Central Ground Water Authority (CGWA) Guidelines

Mining units must adopt:

- Groundwater recharge structures
- Stormwater percolation systems
- Prevention of contamination of water bodies

CGWA clearances often require specific SMC measures in Category-II and Category-III blocks.

8. Indian Bureau of Mines (IBM) Guidelines

IBM Technical Circulars detail that every Mine Plan and Closure Plan must include:

- Watershed management
- Dumps stabilisation
- Soil profile restoration
- Check dams, silt traps, and drainage canals
- Topsoil conservation and reuse

IBM monitors compliance through regular inspections.

9. MoEF&CC Guidelines for Mining in Forest and Wildlife Areas

For mines near protected areas or corridors, MoEF&CC directs:

- No obstruction of natural drainage
- Maintenance of hydrological continuity
- Soil conservation measures to prevent siltation of habitats
- Construction of water harvesting structures for wildlife and local use

These guidelines make SMC integral to wildlife safeguard strategies as well.

10. National Afforestation Programme (NAP)

NAP includes hydrology-linked restoration measures such as:

- Contour trenches
- Deep continuous contour trenches (DCCTs)
- Vegetative barriers
- Moisture conservation pits

These are not mining-specific but are mandated where reclamation overlaps degraded forestlands.

11. District Mineral Foundation (DMF) Regulations

DMF funds are legally earmarked for:

- Watershed development
- Drinking water security
- Soil conservation in mining-affected regions
- Rejuvenation of tanks, streams, and catchments

Thus, SMC measures can be financed through DMF for community benefit.

12. Compensatory Afforestation Rules & Net Present Value (NPV)

When mining diverts forestland:

- SMC appears as a mandatory item in the Site-Specific CA Plan
- Watershed restoration forms part of NPV-funded works

Table-4	Summary of Regulatory Requirements
Regulatory Instrument	**SMC Requirements**
FCA, 1980	Catchment treatment, soil conservation, drainage management
EPA, 1986	EMPs must include erosion & drainage control
EIA Notification 2006	SMC required in EC conditions
MMDR Act	Scientific mining, soil protection, reclamation
MCDR 2017	Mandatory SMC structures, slope stabilisation
IBM Guidelines	Detailed SMC in mine plans
CGWA Norms	Recharge & stormwater management
DMF Policy	Fund SMC works in affected areas
NAP	Vegetative SMC measures
MoEF&CC Circulars	Ensure hydrological continuity in forest areas

Therefore, the regulatory framework for Soil & Moisture Conservation in mining areas in India is robust, multi-dimensional, and tightly integrated with national environmental goals. Compliance is not merely procedural—it is operationally essential for:

- Reducing erosion
- Enhancing water security
- Ensuring slope stability
- Maintaining ecological balance
- Meeting statutory and court-directed obligations
- Achieving sustainable mine operations

Every mining lease, especially in forested or ecologically sensitive zones, must therefore implement a comprehensive, scientifically designed SMC Plan aligned with this regulatory architecture.

The mine's operations and clearance status are heavily influenced by the Supreme Court's orders related to illegal mining in Karnataka.

a) Compliance with Supreme Court Mandate

- **Mandatory Conveyor Belt System:** The mine is one of the leases included in the Hon'ble Supreme Court's order dated December 7, 2017, which directed companies to construct a Pipeline Conveyor Belt System at their own cost for the transportation of iron ore to prevent road damage and illegal transport. | (FC Proposal Narratives)
- **Production Cap:** Production is governed by the Supreme Court-mandated production cap on Iron Ore mining in the Ballari-Chitradurga-Tumakuru region of Karnataka. | (General SC Mining Orders)

b) Forest Clearance (FC) Status (FC Act, 1980)

The company has a complex history of seeking and renewing Forest Clearances, primarily for mining and ancillary activities.

Table-5: Forest Clearance Status of TIOM projects

FC Proposal No.	Project Component	Area (ha)	Status/Purpose	Reference
FP/KA/MIN/47146/2020	Pipeline Conveyor Belt, Service Road, Stock Yard, etc. (Transportation Infrastructure)	**19.3044 ha** (Revised from 19.652 ha)	Diversion of Forest Land for construction as mandated by the Supreme Court. Submitted in July 2020.	(FC Timeline, 2020)
FP/KA/MIN/51647/2020	FC Renewal for Approach Road	10.00 ha	Received Working permission letter from DCF Ballari on 24.12.2025 (Vide letter No. MI/MNG/KSPCL/ML NO.2605/ROAD/2021/843)	-
Original Approvals	Mining activities (FC-I & FC-II)	48.74 ha (FC-I, 2001); 98.224 ha (FC-II, 2004)	Initial Forest Clearances for the main mining lease area.	(FC Form A, 2018)

c) Indian Bureau of Mines (IBM) Approval

- Mining Plan: IBM approved the Modification to the approved "Review and Updation of Mining Plan" including the Progressive Mine Closure Plan (PMCP) on May 16, 2019.
- Approved Area: The approved modification was in respect of the mine over an area of 136.94 Ha (As per CEC). | (IBM Approval Letter, 2019)
- Change in Ownership Name: M/s KSMCL is the successor entity, having been formerly known as M/s Mysore Minerals Limited (MML). | (KSMCL, FC documents)

- Corporate Identity: KSMCL is a State Government Company (A Govt. of Karnataka Undertaking), incorporated on May 13, 1966. Its registered office is in Bengaluru. | (Tofler, KSMCL documents)
- Infrastructure Requirements: The numerous Forest Clearance proposals confirm the current emphasis on establishing linear infrastructure (conveyor belts, pipelines, roads), indicating a shift away from relying solely on truck transport, as mandated by the Supreme Court. | (FC Proposal Narratives)

Soil and water conservation form the backbone of any integrated watershed development strategy, serving as the primary mechanisms for enhancing landscape productivity, ecological stability and hydrological resilience. In this project, the overarching emphasis has been placed on maximising rainwater capture, reducing soil erosion, and improving surface and groundwater availability through a combination of field-level and community-scale interventions.

KSMCL-TIOM has implemented various soil & moisture conservation activities selected carefully, location-specific, low-cost rainwater harvesting structures that were to ensure that even small rainfall events are effectively conserved within the watershed. These measures collectively contribute to slowing runoff, increasing percolation, stabilising soil systems, and providing supplementary irrigation benefits—ultimately reducing land degradation and enhancing agricultural and ecological performance.

Throughout the project period, a diverse set of soil and water conservation structures were implemented in the past as a mandatory process. Farm-level interventions included field bunding, farm ponds, groundwater recharge pits, border strips, broad-bed and furrow systems, among others. These were complemented by the KSMCL-TIOM in and outside of its mining area, such as check dams, nala bunds, percolation tanks, gully plugs, and systematic desolation of aging check dams to restore their full storage potential (Table 3; Figure 12).

Key achievements include:

- **Construction of 24 farm ponds**, collectively creating a rainwater storage capacity of approximately 6,000 m³. These ponds enhance groundwater recharge and provide crucial supplementary irrigation during dry spells.
- **Establishment of 28 check dams** with a combined net storage capacity of around 6,600 m³, which significantly reduces surface runoff, enhances percolation, and improves soil moisture regimes in adjoining agricultural lands.

- **Installation of 6 check walls**, which together conserved about 3,000 m³ of water, stabilising drainage lines and reducing erosive flow velocities.
- **Construction of 2 nala bunds**, capable of conserving an estimated 12,000 m³ of monsoon runoff, serving as key water impoundments with wide-reaching hydrological benefits.
- **Desiltation of existing check dams**, which restored an additional 4,400 m³ of storage capacity, ensuring long-term sustainability of water harvesting structures.

These interventions demonstrate the transformative potential of strategically planned soil and water conservation measures, delivering multiple benefits ranging from enhanced water security and groundwater recharge to improved agricultural productivity and ecological restoration across the watershed.

1.3.4 General Project & Location Details:

Location, Connectivity, and Economy

Muraripura serves as a key settlement in the northern part of Sandur taluk, maintaining strong ties to the region's mining and administrative hubs.

- **Administrative Proximity:**
  - Nearest Town (Taluk HQ): Sandur, located approximately 8 km away.
  - District Headquarters: Ballari, located approximately 55 km away.
- **Connectivity (2011 Status):**
  - Bus Service: Public and private bus services were available within the village.
  - Railway Station: A railway station was available within a 5-10 km distance, indicating reasonable access to the rail network, which is vital for the region's mineral economy. (But no passenger trains)
- **Economic Activity:** The nearest town, Sandur, is the central location for all major economic and commercial activities. Given the village's location near the Sandur hill range, mining-related work and agriculture are the primary sources of livelihood for the working population. The village lies close to the Thimmapanagudi Iron Ore Mine (TIOM-ML No. 2605 and is often mentioned in documents related to the approach roads and ancillary infrastructure for these mines.

KSMCL's Thimmappanagudi Iron Ore Mine (KSMCL-TIOM) is located in North Eastern Block (NEB) of Sandur North Range Forest in Sandur taluk of Ballari district in Karnataka operated by M/s Karnataka State Minerals Corporation Limited (KSMCL) under ML No. 2605, is centrally located within the environmentally sensitive and mineral-rich region of Ballari District, Karnataka.

The mine is specifically situated in the Sandur taluk (sub-district) and falls within the North Eastern Block (NEB) of the Sandur North Range Forest.

1.3.4 Geographical Context

The mine is embedded in the hill ranges of the Ballari-Hospet belt, which is known for having some of the richest iron ore deposits in India. These deposits are primarily found on the hill ranges that are legally designated as Reserved Forest areas, making the diversion of forest land mandatory for the mine's operation.

The Sandur hills resembles the Western Ghats, which, despite being geographically distinct from the main Sahyadri range, contain significant forested hills that have faced heavy ecological pressure due to intensive iron ore mining over the decades. The mining site itself is part of the local ecosystem that contributes to the region's biodiversity.

The Sandur region is characterized by undulating terrain with elevation ranging from 750 to 1000 meters above mean sea level. The landscape is dominated by:

Geological Features:

- Ancient Precambrian rock formations, primarily banded iron formations (BIF) and associated metamorphic rocks
- Rocky hillocks and exposed lateritic outcrops creating natural barriers and microhabitat diversity
- Shallow valley systems with seasonal nallahs (streams) draining into the Narihalla and Tungabhadra river system
- Iron-rich soils with varying depth, from deep red soils in valleys to shallow lithosols on slopes

Topographic Characteristics:

- Gentle to moderate slopes (5-20 degrees) interspersed with steeper rocky faces
- Natural drainage patterns with ephemeral watercourses active during monsoon (June-October)
- Plateau areas with relatively flat terrain supporting scrub vegetation
- Boulder-strewn slopes providing denning sites for large carnivores and reptiles

This rugged topography creates a mosaic of habitat types while also constraining agricultural expansion, resulting in a landscape where forest patches, rocky outcrops, and human-modified areas exist in close proximity.

1.4 VILLAGES AND HUMAN HABITATION UPTO 5 KMS

The Thimmappanagudi Iron Ore Mines (TIOM) is located in the North- Eastern Block (NEB) of Sandur North Range Forest of Sandur taluk in Ballari Territorial Division of Forest. It is located about 5 kilometres from Sandur town and Muraripura. Other villages such as Susheelanagara, Dowlathpura and Krishna Nagara located about 3-4 kilometres away from the boundary of Mining Lease area in the South-Western Side. Muraripura is located in the Eastern side of TIOM area. There is a old temple by name Thimmappanagudi located within the mining lease area. A number of devotees arrive to this ancient temple to offer their prayer periodically on auspious days. TIOM mines derived its name because of the Thimmappanagudi (Temple God Thimmappa). It seems there was human habitation in olden days and later on it was deserted due to various reasons. At present no human habitation is there in and around the temple vicinity but a priest stays there to take care of the routine religious rituals of the Temple.

Nearest Villages and Proximity:

Following are the villages located within 4 kilometres from the boundary of the TIOM.

- **Thimmapanagudi Village:** This village shares its name with the mine and is the closest major settlement, lying adjacent to or near the mining lease area boundary. At present there is no human habitation except for the Thimmappa Temple to which there is a priest who lives in the temple complex and the devotees from Muraripura and other villages visit the Temple during auspicious days to worship the deity. There is an ancient route from Temple to Muraripura village, which is now being used as mining road. Downhill from TIOM in the eastern part, the road lead directly to a junction near this village.
- **Muraripura Village:** Located about 4 kilometres from the boundary of the TIOM, Muraripura village is frequently mentioned in documentation related to the mine's approach roads. The ore is transported via an existing road network that joins the main Muraripura Junction PWD road (State Highway 40). Nearby mining leases, such as ML No. 2549 (operated by H.G. Rangan Goud), are located in the NEB Range forest of Muraripura village, indicating a cluster of mining activity in close proximity to this area.
- **Susheelanagara:** Located about 3 kilometres from the boundary of TIOM Susheelanagara is a reference point mentioned in clearance applications has the existing old road, which is a public road used by the general public to reach the Thimmapanagudi Temple for several decades. This indicates that the mining activities and associated infrastructure (like approach roads) are situated very close to culturally and publicly significant routes and sites.

- **Doulathpura:** Located about 3 kilometres from the boundary of mining lease area, a small village basically consisting of farmers and mine workers.
- **Krishnagara:** Located about 3 kilometres from the boundary of the ML area, the village enclosed with a old fort, consisting of farmers and mine workers. The village is located near Sandur on the main road. Famous for Moharram festival.
- **Sandur town:** Located about 4 kilometres from the boundary of the ML area, the capital city of Erstwhile Ghorpade Kingdom, which ruled Sandur for 2 centuries.
- **Regional Connectivity:** The mine is located in a cluster of major iron ore operations. The district headquarters, Ballari, is approximately 58 km away, and the key trading centre of Hospet (now Hosapete) is about 40 km away on the Northwest direction.

1.4.1 Village Profile:

Muraripura Village Profile (Sandur Taluk, Ballari District, Karnataka)

Muraripura is a significant rural settlement in the Sandur taluk of the Ballari district, Karnataka, known for its location in an area rich in mineral resources and its close proximity to major mining activities.

Demographics and Administration (Census 2011)

Based on the 2011 Census data, Muraripura exhibits the following profile:

Table-6 Village Profile: Muraripura, Sandur taluk, Ballari district (2011)

Sl No.	Particulars	Total	Male	Female
1	Total No. of Houses	202	-	-
2	Population	1,410	704	706
3	Child (0-6)	251	107	144
4	Schedule Caste	13	7	6
5	Schedule Tribe	1,373	685	688
6	Literacy	56.26 %	69.01 %	42.70 %
7	Geographical Area	293.78 Hectares (or 2.93 km²)		
8	Gram Panchayat	Bhujanganagar		
9	Assembly Constituency	Sandur Vidhan Sabha		
10	Parliamentary Constituency	Ballari Lok Sabha		

Table-7 Village Profile: Susheelanagara, Sandur taluk, Ballari district: (2011)				
Sl No.	Particulars	Total	Male	Female
1	Total No. of Houses	854	-	-
2	Population	4,977	2,469	2,508
3	Child (0-6)	902	446	456
4	Schedule Caste	3,141	1,538	1,603
5	Schedule Tribe	709	350	359
6	Literacy	52.66 %	61.54 %	43.91 %
7	Gram Panchayat	Susheelanagara		
8	Assembly Constituency	Sandur Vidhan Sabha		
9	Parliamentary Constituency	Ballari Lok Sabha		

Table-8 Village Profile: Krishna Nagar, Sandur taluk, Ballari district: (2011)				
Sl No.	Particulars	Total	Male	Female
1	Total No. of Houses	1,354	-	-
2	Population	7,027	3,554	3,473
3	Child (0-6)	1,074	533	541
4	Schedule Caste	548	271	277
5	Schedule Tribe	279	141	138
6	Literacy	65.78 %	72.92 %	58.42 %
7	Gram /Town Panchayat	Krishnanagara		
8	Assembly Constituency	Sandur Vidhan Sabha		
9	Parliamentary Constituency	Ballari Lok Sabha		

Table-9 Village Profile: Dowlathpura, Sandur taluk, Ballari district: (2011)				
Sl No.	Particulars	Total	Male	Female
1	Total No. of Houses	471	-	-
2	Population	2,764	1,413	1,351
3	Child (0-6)	440	214	226
4	Schedule Caste	415	223	192
5	Schedule Tribe	80	38	42
6	Literacy	63.86 %	71.14 %	56.09 %
7	Gram Panchayat	Krishnanagara		
8	Assembly Constituency	Sandur Vidhan Sabha		
9	Parliamentary Constituency	Ballari Lok Sabha		

Table-10	Village Profile: Sandur town, Ballari district (2011)			
Sl No.	Particulars	Total	Male	Female
1	Total No. of Houses	7,562	-	-
2	Population	37,431	19,147	18,284
3	Child (0-6)	5,358	2,649	2,709
4	Schedule Caste	5,788	2,918	2,870
5	Schedule Tribe	6,012	3,081	2,931
6	Literacy	78.01 %	85.71%	69.86 %
7	Town Panchayat	Sandur Town Panchayath		
8	Assembly Constituency	Sandur Vidhan Sabha		
9	Parliamentary Constituency	Ballari Lok Sabha		

1.4.2 Occupational profile of the villagers:

About 70% of the population of the villages located around the mining area is depending upon agriculture for their livelihood. Rest of the people work in mining related livelihood activities and very few of them work as state and central government employees. About 60% of the male population of the target villages is working in different occupations. Most of the men in the productive age work as Drivers of mine trucks jeeps, water tankers, as security guards, mine labourers and so on.

About 40 % of the female workers earn their livelihood in agriculture and related activities. But women work hard than men in non-income generating activities such as cooking, cleaning, washing, collection fire wood, grazing, fetching fodder for cattle, fetching water, feeding and nursing the babies, taking care of aged family members, etc., Women workforce in mining activities is considerably

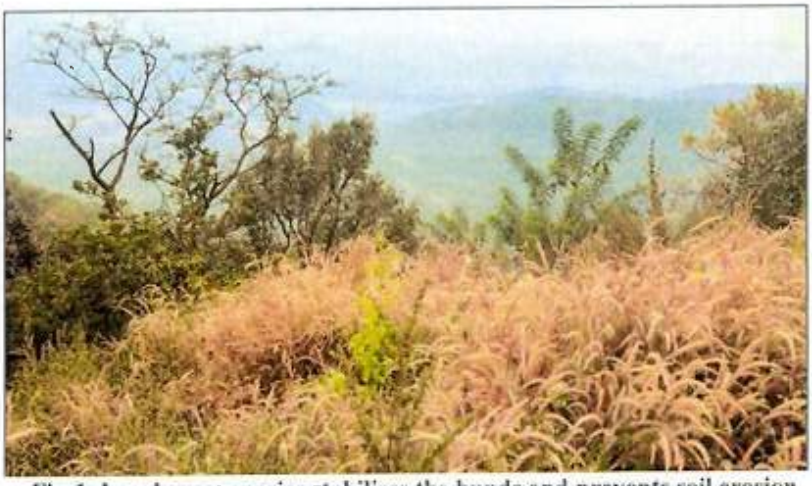


Fig-1 Local grass species stabilises the bunds and prevents soil erosion

CHAPTER -2. DETAILS OF THE PROJECT AREA

2.1 Overview and geography of project area

Deccan Plateau is the oldest geographical landscape comprising parts of Maharashtra, Eastern Plains of Karnataka, Parts of Telangana and Tamil Nadu. The Deccan Plateau is located in the tropic zone comprising of hot climate and dry scrub Jungle.

Fig-2

Location of the study area

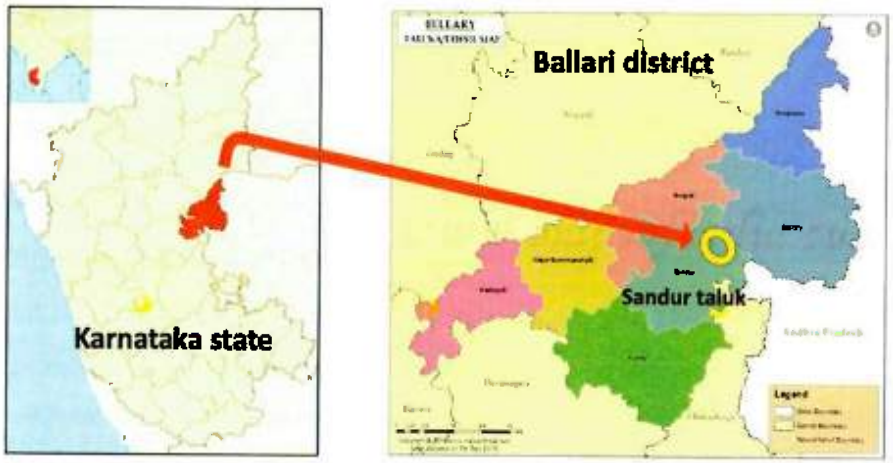
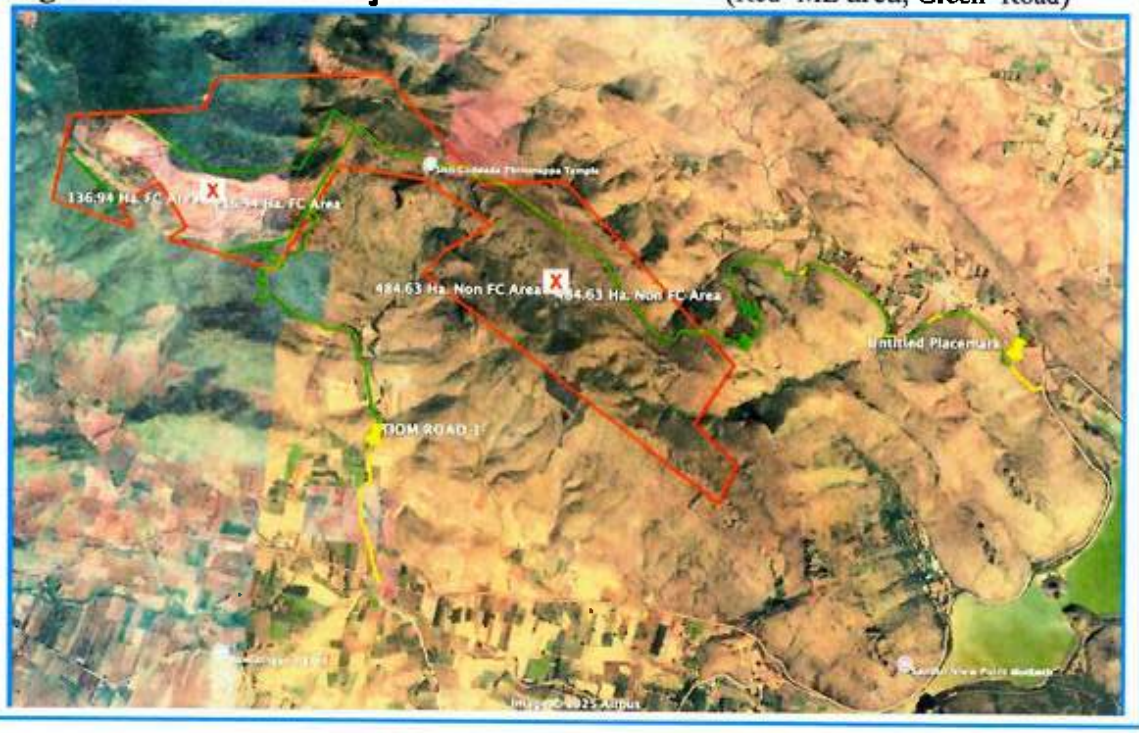


Fig-3. Location of the Project area (Red- ML area, Green- Road)



2.2 Geographic Location and Extent

Location Coordinates:

- District: Ballari (formerly Bellary)
- Taluk: Sandur
- Forest Range: Sandur North Range
- Forest Division: Ballari Territorial Division
- State: Karnataka, India
- Approximate Latitude: 15°05' N to 15°12' N
- Approximate Longitude: 76°30' E to 76°38' E
- **Project Proponent:** Karnataka State Minerals Corporation Limited (KSMCL)

Project Area Extent: The study area encompasses of the land surrounding the 19.3044 hectares designated for a linear downhill corridor with a service road, totalling approximately 19.3044 hectares of forest land and 0.71 hectares of non-forest land. This includes the direct impact zone of the conveyor belt, service road, stock yard and adjacent forest patches, drainage systems, and wildlife movement pathways within Sandur North Range.

The Mining Lease area is located in Ballari district of Karnataka state at about 8-10 km from Sandur town by road. The comprehensive Soil & Moisture Conservation (S&MC) Plan designed for the downhill pipeline conveyor belt and service road of the Karnataka State Minerals Corporation Limited's (KSMCL) Thimmappanagudi Iron Ore Mine (TIOM) in the ecologically sensitive Sandur region. A total of 19.3044 hectares of forest land is sought for the purpose of installation of Conveyor belt and service road as per the directions of honourable Supreme Court of India vide order dated 7th December, 2017. This order is issued in pursuant to the recommendations of the Central Empowered Committee (CEC) on mining and related activities. The order mandated the replacement of conventional road-based mineral transport with conveyor-based systems in mining regions to arrest environmental degradation caused by heavy vehicular movement. **The length of the proposed downhill linear pipeline conveyor is 3.59 kms in the forest area and 0.20 kms in non-forest area. And the length of the service road is 5.99 kms in the forest area and 0.22 kms in non-forest area.** A total of 19.3044 hectares of forest land and 0.71 hectares of non-forest land is proposed to utilize for this project. The Mining Lease area is located in Ballari district of Karnataka state at about 8-10 km from Sandur town by road. The proposed conveyor belt area is geographically located between latitude 15.133223°, longitude 76.529419° at 861 msl altitude in the Southern part of the ML area towards M.L area and latitude 15.117434°, longitude 76.508260° at 649 msl altitude, in the South-Eastern side towards Shusheelanagara. The average width of the conveyor belt area is 20 meters and average width of the service road area is 15 meters. A total of

19.3044 hectares of the forest land and 0.71 hectares of the non-forest land is proposed for this utility. For the purpose of the study, proposed area and the area about 2 kms from the boundary of the mining area has been considered for assessment of S&MC interventions. (Fig-2 &3)

Mining Lease No. 2605 is spread between Muraripura, Sudheelanagara, Doulathpura and Krishnanagara villages. (Survey of India Toposheet Nos 57A/12) in Sandur Taluk, Bellary District of Karnataka. The total lease area is 621.59 hectares in which permission for current mining is granted 136.94 Ha hectares with in this lease area. The mining lease area is surrounded by Thimmappanagudi Reserve Forest in all the directions.

2.3 Physiography and Topography

The Sandur region is characterized by undulating terrain with elevation ranging from 550 to 1030 meters above mean sea level. The landscape is dominated by different geological, hydrological, ecological and climatic features.

Geological Features:

- Ancient Precambrian rock formations, primarily banded iron formations (BIF) and associated metamorphic rocks
- Rocky hillocks and exposed lateritic outcrops creating natural barriers and microhabitat diversity
- Shallow valley systems with seasonal nallahs (streams) draining into the Tungabhadra river system
- Iron-rich soils with varying depth, from deep red soils in valleys to shallow lithosols on slopes

Topographic Characteristics:

- Gentle to moderate slopes (5-20 degrees) interspersed with steeper rocky faces
- Natural drainage patterns with ephemeral watercourses active during monsoon (June-October)
- Plateau areas with relatively flat terrain supporting scrub vegetation
- Boulder-strewn slopes providing denning sites for large carnivores and reptiles

This rugged topography creates a mosaic of habitat types while also constraining agricultural expansion, resulting in a landscape where forest patches, rocky outcrops, and human-modified areas exist in close proximity.

2.4 Climate :

Climatic Conditions:

- Climate Type: Tropical semi-arid with distinct wet and dry seasons
- Annual Rainfall: 500-650 mm, concentrated in southwest monsoon (June-September) with occasional northeast monsoon (October-November)
- Temperature Range: Summer maximum 38-42°C (March-May), Winter minimum 12-18°C (December-January)
- Relative Humidity: 60-80% during monsoon, dropping to 20-40% in summer
- Evapotranspiration: High during summer months, exceeding precipitation for 7-8 months annually

The Sandur hill ranges forms a distinct geomorphic enclave within the broader Deccan Plateau, a region conventionally characterized by extensive arid plains, black-cotton soil tracts, and dominant grassland ecosystems. Extending over an estimated 48-kilometre corridor, the spindle-shaped Sandur massif stretches from the Tungabhadra reservoir in Hospet taluk to Swamihalli in Sandur taluk, establishing a unique topographic and ecological continuum. The dry-deciduous forests covering both the foothills and the elevated ridgelines constitute a markedly differentiated ecosystem when compared to the surrounding Deccan plains, offering higher structural complexity, richer vegetation density, and enhanced microclimatic resilience. The altitudinal gradient of Sandur plays a decisive role in structuring the spatial distribution of flora and fauna, creating niche habitats that support specialised, altitude-dependent biological communities.

As reported in the Gazetteer of Bellary, the elevation above the renowned Kumaraswamy Temple reaches 1,036 metres above mean sea level (MSL) in the southern segment, while Ramagad in the northern axis stands at 992 metres MSL. This elevational variability correlates strongly with changes in species composition, canopy stratification, and seasonal ecological functionality, reinforcing the region's role as a biodiversity hotspot within the eastern corridor of Karnataka.

Altitude acts as a key climatic determinant for the landscape. Dense forest cover across valleys and upper slopes enhances moisture retention, facilitates orographic precipitation, and moderates thermal extremes throughout the year. Subbarayanahalli recorded an annual precipitation volume of 1,666 mm in 2020–21, with the principal monsoon period spanning from June to September. The project area alone received 622 mm of rainfall during September 2020, underscoring the region's high rainfall variability and its dependence on monsoonal circulations. Winter conditions maintain consistently cool temperatures across the hill ranges, whereas summer conditions are marked by pronounced heat and aridity. In 2019–20, the lowest winter temperature documented at Subbarayanahalli was 14.8°C, while the highest temperature of the season was 38°C, recorded on 1 June 2019.

2.5 Hydrology and Drainage pattern:

Hydrological Features: The study area experiences acute seasonal water stress. Surface water availability is limited to:

- Ephemeral streams (nallahs) flowing only during and immediately after monsoon
- Seasonal natural depressions (Lakes) retaining water for 2-4 months post-monsoon
- Artificial water bodies including mine sumps, agricultural tanks, and village ponds
- Groundwater at variable depths (15-40 meters), with limited recharge due to rocky substrate

This extreme seasonality in water availability is a critical driver of wildlife movement patterns and human-wildlife conflict, particularly during the dry season (February-May) when animals concentrate around remaining water sources, including those near roads and habitations.

Fig-4: Check Dam located around TIOM

The hydrology and drainage regime of the Thimmappanagudi Iron Ore Mines (KSMCL-TIOM) in Sandur taluk, Ballari district, is governed by the rugged physiography of the Sandur Schist Belt, the monsoon-dependent rainfall cycle, and the cumulative influence of mining activities within the Tungabhadra sub-basin of the Krishna River system. The landscape is characterized by structurally aligned NE–SW trending hill ridges composed of erosion-resistant formations such as banded hematite quartzite (BHQ), banded hematite jasper (BHJ), ferruginous shale, granitoids, and metavolcanics. These steep ridges and narrow intervening valleys generate a natural drainage network that is predominantly dendritic to sub-dendritic and consists of ephemeral streams that remain active primarily during the southwest monsoon. The drainage pathways generally flow from the elevated slopes toward the lower eastern and north-eastern valley zones, ultimately connecting to the Narihalla River system, which serves as the principal surface-water receptor for the region.

Surface water hydrology across the KSMCL-TIOM lease is shaped by short-duration, high-intensity rainfall events that accelerate runoff across the rocky slopes and limited soil cover. The ephemeral streams arising in and around the mine flow through valley depressions and move in a southwest-to-northeast direction before joining the Narihalla River. This network links the TIOM area hydrologically with the Narihalla Reservoir located near Taranagara village at coordinates 15°07'25.2" N and 76°36'21.9" E. The reservoir, with

Fig-4 Check Dam located at the periphery of TIOM

a storage capacity of approximately 0.8 TMC and a full reservoir level of 542.3 m, meets multiple regional water demands including mining operations, municipal supply, and downstream irrigation. TIOM relies on water sourced from settling tanks that collects rain water and regional supplies for dust suppression through tanker-based 10 KL sprinklers, placing the mine within a competitive local water-use environment shared with agricultural and urban sectors.

The surface hydrology interacts closely with the groundwater system, which occurs mainly in secondary porosity zones within fractured BHQ/BHJ formations and weathered residuum. Seasonal monsoon recharge replenishes these aquifers, leading to periodic fluctuations in the groundwater table that correspond with rainfall availability. Groundwater movement is generally constrained within fracture zones, valley fills, and colluvial pockets, making the hydrogeology highly dependent on structural controls. Hydrological connectivity between ephemeral channels, fracture systems, and valley-fill aquifers increases the potential for mining-related contamination or turbidity to migrate downstream or into shallow groundwater. Although no perennial rivers directly adjoin the KSMCL-TIOM lease, the connectivity through tributaries leading into Narihalla elevates risk pathways for siltation and water-quality degradation if runoff remains unmanaged.

Mining excavation and overburden dumps within KSMCL-TIOM—including major dump sites alter natural topography and disrupt historical drainage paths. During intense rainfall, eroded sediments from these dump slopes are mobilized and transported into natural drainage channels around Susheelanagara and the Muraripura region. This has contributed to increased turbidity and silt deposition in streams that feed the Narihalla River, particularly during peak monsoon episodes. The Narihalla itself, a seasonal watercourse located about 10 km from Sandur, becomes susceptible to silt contamination from upstream mines in the monsoon season, impacting its utility for irrigation and drinking purposes in downstream communities.

To manage runoff and control sediment load, KSMCL-TIOM has implemented an array of storm-water and erosion-control measures including garland drains, retaining walls, check dams, gully plugs, silt-settling tanks, diversion drains, and percolation ponds. These structures are designed to intercept runoff, reduce flow velocity, trap silt, and increase infiltration, thereby maintaining the hydrological equilibrium and protecting downstream waterbodies. Strengthening and expanding the drainage-management infrastructure remain essential for mitigating runoff-induced impacts and ensuring compliance with environmental and mining regulations.

Artificial recharge interventions—such as percolation ponds and check-dam augmentation—are being proposed and expanded across the lease to enhance groundwater storage and reduce the hydrological impacts of land disturbance. Vegetative stabilization measures have already achieved

approximately 80% green cover over 17.75 ha of reclaimed areas, contributing to reduced erosion and improved soil-water retention. Mining excavations currently span over 49.20 hectares with 24.85 hectares under overburden dumps, and these modified landforms heavily influence local groundwater flow patterns and seasonal recharge behaviour.

The proximity of TIOM to the Narihalla Reservoir, which is also proposed to function as the lower reservoir of a 300 MW pumped-storage hydropower project, heightens the need for stringent water-quality safeguards. Siltation from upstream mining can compromise reservoir storage, turbidity, and downstream irrigation reliability. Sustainable mining operations therefore require for the preservation of watershed integrity, aquifer health, and surface-water quality. Continuous monitoring, hydrological modelling, slope stabilization, and water-quality assessment form critical components of the long-term environmental management framework for TIOM, ensuring that mining activities proceed in alignment with hydrological sustainability, ecosystem protection, and regulatory compliance.

2.6 Vegetation Types and Forest Cover

Primary Vegetation Classifications:

Dry Deciduous Forest (Champion & Seth Type 5B/C2): Occurring in relatively better-protected patches with deeper soils, characterized by:

- **Canopy Layer**: Teak (*Tectona grandis*), Terminalia species (*T. tomentosa*, *T. arjuna*), Anogeissus (*Anogeissus latifolia*), reaching 8-15 meters height
- **Sub-canopy:** Lagerstroemia (*Lagerstroemia parviflora*), Butea (*Butea monosperma*), Cassia (*Cassia fistula*)
- **Shrub Layer**: Helicteres (*Helicteres isora*), Grewia species, Ziziphus (*Ziziphus* spp.)
- **Ground Layer**: Seasonal grasses including Heteropogon, Themeda, and Chrysopogon species

Southern Thorn Scrub (Champion & Seth Type 6B): Dominant on degraded sites and rocky slopes:

- Sparse tree layer: Acacia species (*A. leucophloea*, *A. ferruginea*), *Neltuma juliflora* (*Prosopis juliflora* - invasive), *Chromolaena odora* (invasive).
- Dense shrub layer: Lantana (*Lantana camara* - invasive), Carissa (*Carissa carandas*), Phoenix (*Phoenix sylvestris*)
- Ground vegetation sparse during dry season, flush growth during monsoon

Rocky Outcrops and Grasslands:

- Specialized xerophytic vegetation adapted to shallow soils and extreme moisture stress
- Grass species: *Heteropogon contortus*, Aristida species
- Succulents and herbs: Euphorbia species, seasonal forbs

Forest Degradation Issues:

- Invasive species proliferation: *Lantana camara, Chromolaena odorata, Neltuma juliflora (Prosopis juliflora)* and *Parthenium* species have colonized disturbed areas, altering vegetation structure and reducing native species diversity
- Grazing pressure from livestock affecting regeneration
- Edge effects from roads and clearings creating altered microclimates
- Historical mining activities leaving degraded patches with compromised soil structure

2.7 Land Use Pattern

The study area represents a typical mining-influenced landscape with multiple land use categories:

Land Use Distribution (Approximate):

- Reserved Forest: 45%
- Mining Leases (Active and Abandoned): 25%
- Agricultural Land (Dryland cultivation): 20%
- Settlements and Infrastructure: 7%
- Wastelands and Rocky Outcrops: 3%

This heterogeneous landscape creates numerous edge habitats and transition zones where wildlife-human interactions are concentrated.

2.8 Socio-Economic Context

Human Settlements: Multiple villages and hamlets exist within and around the study area, with populations primarily engaged in:

- Agriculture: Dryland crops (jowar, bajra, pulses) with limited irrigation
- Animal Husbandry: Goats, sheep, and cattle grazing in forest fringes
- Mining-related Employment: Permanent and Daily wage labour at KSMCL and private mining operations
- Small-scale Trading: Support services for mining workforce

Population Demographics:

- Total population in impact zone: Approximately 8,000-10,000 people
- Scheduled Castes/Tribes: Significant representation, with forest-dependent livelihoods
- Literacy levels: Moderate, with improving access to education
- Infrastructure: Basic road connectivity, electricity, limited piped water supply

Resource Dependencies: Local communities interact with forest resources through:

- Seasonal grazing of livestock in forest areas (despite restrictions)
- Collection of fuelwood, particularly dead wood
- Minor forest produce collection (tendu leaves, tamarind, medicinal plants)

- Occasional crop raiding by wild herbivores leading to retaliatory attitudes

Understanding this socio-economic context is essential for designing community-sensitive mitigation measures and gaining local cooperation for conflict reduction strategies.

2.9 Mineral Transportation plan

At present the mineral transportation system at the Thimmappanagudi Iron Ore Mines (KSMCL-TIOM) in Sandur taluk, Ballari district, is designed for efficient, compliant, and environmentally safe movement of ore from pit to dispatch. After extraction, ore is hauled by dumpers along graded internal mine roads to the crushing and screening units within the lease. These roads are engineered with proper gradients, drainage, and compacted surfaces to suit 10–25 tonne haulage vehicles. Processed ore is stored in ROM and product stockyards before being dispatched mainly through multi-axle tippers operating under the Karnataka e-permit and IBM mineral-tracking systems.

Mineral dispatch from TIOM follows approved transport corridors connecting the mine to the Sandur–Hospet road network and major consumers such as steel and beneficiation units in the Donimalai–Toranagallu industrial belt. Dust suppression is achieved through regular water sprinkling by 5 Tankers with 8-10 KL capacity, while wheel-wash systems, tarpaulin-covered trucks, and roadside drains minimize dust and sediment spread. Safety is ensured through speed limits, signage, reflector posts, regular road maintenance, and controlled vehicle movement during poor weather or low visibility.

Given the hilly terrain of the Sandur Schist Belt, transportation planning emphasizes safe gradients, stable bends, and protection of seasonal drainage lines. Measures such as check dams, silt traps, and retention walls reduce runoff-related impacts near haul roads. The mine coordinates with local authorities during peak traffic periods to avoid congestion on public roads.

Future improvements include exploring rail-linked dispatch through regional sidings, participation in cluster-level logistics initiatives, and evaluating long-term options such as conveyor-based systems to lower fuel use and emissions. Overall, TIOM's transportation plan supports reliable ore movement while minimizing environmental impacts and maintaining regulatory and community-safety standards. To achieve this a downhill pipeline conveyor belt is proposed in 19.3044 hectares of forest land and 0.71 hectares in non-forest land.

2.10 Impact of transportation of Iron ore on the Hydrology:

At present the mining and mineral transportation from Thimmappanagudi Iron Ore Mines (KSMCL-TIOM) imposes concentrated pressures on ecology, hydrology and drainage of water in its mining areas such as:

i. Disturbance of Soil Structure and Moisture Regime

Mining operations fundamentally alter the natural soil profile by removing or disturbing the nutrient-rich topsoil that sustains vegetation, regulates infiltration, and anchors moisture. Once stripped, the exposed subsoil—typically stony, compact, and low in organic matter—absorbs little water, leading to rapid runoff and reduced moisture availability. On steep and fragile terrains such as the Sandur hills, the loss of topsoil accelerates erosion and disrupts the natural soil–moisture balance. Transportation further compounds these effects. Heavy trucks and dumpers travelling along haul roads compress the soil beneath them, decreasing porosity and preventing water from infiltrating the ground. Compacted road verges lose their buffering capacity, channelling water laterally and initiating rill and gully formation during monsoon rains. This combination of soil disturbance and compaction results in a progressively drier, more erosion-prone landscape.

ii. Enhanced Erosion and Sediment Movement

Mining exposes vast surfaces of loose, unconsolidated soil—pit benches, mine dumps, cleared slopes, and unpaved roads—all of which become active sources of erosion during rainfall. Even moderate showers trigger sheet erosion, while high-intensity monsoon events generate deep rills and gullies. Sediments carried from these disturbed areas travel into natural streams, agricultural fields, tanks, and percolation structures. Over time, this sedimentation reduces the storage capacity of local water bodies and disrupts the hydrological balance of the watershed. Sediment-laden water also affects soil quality downstream, particularly when iron ore fines accumulate in agricultural land, altering soil texture and reducing water-holding capacity. The increased sediment load ultimately destabilises drainage systems, making them more flood-prone and less ecologically functional.

iii. Alteration of Natural Drainage and Watershed Connectivity

Mining reshapes topography by creating deep pits, elevated dumps, and wide haul roads, each of which can interfere with natural drainage pathways. Ephemeral streams that once flowed freely downslope may be diverted, blocked, or redesigned unintentionally by mining infrastructure. This disruption leads to stagnation in certain areas and concentrated, high-velocity flows in others, both of which increase erosion potential. Culverts along transportation roads often become clogged with silt, reducing hydraulic efficiency and causing overtopping during peak rainfall. When haul roads cross natural drainage lines without adequate cross-drainage structures, they act as embankments that fragment micro-watersheds and obstruct subsurface moisture movement. Such fragmentation reduces infiltration opportunities and weakens the natural hydrological continuity of the landscape.

iv. Decline in Groundwater Recharge and Moisture Availability

As infiltration areas shrink due to soil compaction and vegetation loss, the groundwater recharge rate declines significantly. This decline results in lower water tables, drying of seasonal springs, and reduced soil moisture availability for vegetation. Excavation activities may intersect aquifers or disrupt natural fracture systems, altering groundwater flow paths and reducing lateral connectivity. With less moisture retained in the upper soil layers, vegetation struggles to establish, creating further exposure of soil to erosive forces. The decline in soil moisture promotes the spread of invasive species such as *Lantana camara* and *Chromolaena odorata*, which suppress native grasses and offer little contribution to hydrological stability. As a result, the landscape moves toward a state of chronic dryness and reduced ecological resilience.

Therefore, mining and associated transportation collectively generate significant disturbances to soil structure, moisture retention, drainage pathways, and hydrological functioning. The cascade of effects—from erosion and sedimentation to disrupted groundwater recharge and altered watershed dynamics—creates a fragile, erosion-prone environment that can deteriorate rapidly without targeted interventions. A comprehensive Soil & Moisture Conservation Plan, integrating check dams, silt traps, lined drains, stabilised slopes, and vegetation rehabilitation, is essential for restoring hydrological balance and safeguarding the long-term stability of mining-impacted landscapes.

To overcome all these impacts, a downhill pipeline conveyor belt is proposed to establish in 19.3044 hectares of forest land and 0.71 hectares of non-forest land from the mining area to the proposed railway siding towards Susheelanagara.

CHAPTER- 3 MATERIALS AND METHODS

A preliminary reconnaissance of the study area and its adjoining villages was first carried out by the research team to understand the landscape and its ecological context. Subsequently, the team engaged with knowledgeable local residents and farmers who possessed long-standing familiarity with the natural water flow and drainage system in the region. Structured data sheets were prepared for recording of the locations of interventions using GPS units, DSLR and digital cameras was assembled for systematic documentation. Information on water shed was collected through interviews with farmers and survey department of TIOM, while verified compensation records were obtained from the Range Forest Officers of the Sandur North Range. With these preparatory steps completed, comprehensive field surveys and documentation undertaken in and around the study area.

CHAPTER – 4. RESULTS AND DATA ANALYSIS:

Following is result of the study taken up for the proposed soil & moisture conservation plan for M.L.No.2605 of KSMCL-TIOM in Sandur North Block.

The KSMCL-TIOM management has implemented various soil & moisture conservation initiatives as per the guidelines of ICFRE, CEC and other regulatory authorities. During the study, the water ways and streams have been studies and identified the suitable locations for additional treatment apart from the existing ones (Annexure- 4)

During the study it is also documented the substantial implementation of the recommended R&R and dump-management measures, with higher completion in inactive and encroached dumps and staged implementation in active dumps. Most structural water-management measures outside the lease area are complete, while some in-pit and terrace works are planned for later mining stages.

Dump management measures:

For the encroached inactive dump (D1), retaining wall foundations, concrete, and toe walls are completed over 344 m of the 400 m proposed (about 86%), with garland drains constructed over 350 m of the proposed 900 m, constrained by thick forest and site conditions. Coir geotextile has been laid over 1.78 ha (100% of the suggested area), and plantation has been completed over 4.78 ha out of 17.75 ha, with no additional free area available for planting on the remaining virgin forest.

For the inactive dump D2, retaining wall works are fully completed over 411 m (100%), along with associated foundations and toe walls, and garland drains are constructed over 254 m of the proposed 822 m according to field conditions. Coir matting has been completed on 2.0 ha (100% of the suggested area), and plantation progress is limited (0.82 ha of 1.74 ha) due to lack of free space for additional planting.

Active dump management:

For active dump D3, 300 m of the proposed 1,320 m of retaining wall has been completed, with corresponding foundations and toe walls, and 220 m of the proposed 9484 m of garland drains have been constructed as per current site conditions. Coir matting and plantation have been initiated on 1.94 ha each out of 10.70 ha proposed, with the balance to be taken up after dumping ceases and the dump becomes inactive.

For active dump D4, nearly the entire 885 m of retaining wall has been completed (878 m, with 7 m left due to thick forest and steep terrain), including foundation and toe wall works, and 370 m of

garland drain on terraces has been formed (200 m outside and 170 m inside). Geotextile and plantation over 18.95 ha are yet to be started and are explicitly planned for after the dump becomes inactive.

Surface water and slope management

Outside the mine lease, 24 of 34 planned gully plugs (71%) have been constructed, while all 9 masonry check dams and all 8 rock-fill check dams proposed in the R&R plan have been completed (100%). One settling tank of 30 m × 15 m × 3 m has been constructed within the lease area to manage suspended solids in runoff from the mine.

Plantation and afforestation

Avenue plantation along roads has been completed over a total of 3.0 ha (2.0 ha plus an additional 1.0 ha), achieving the planned avenue area fully as per site conditions. Safety-zone greenbelt development has achieved 5.20 ha out of 5.20 ha planned (100%), while afforestation of mined-out pits and bench plantation are planned for progressive mine closure and concurrent operations, and large areas of 95.69 ha and 48.70 ha for wider afforestation remain to be taken up in later phases.

Though there are number of Soil and Moisture conservation measures implemented by KSMCL-TIOM in their lease and mining area, this S&MC plan proposed for construction additional check dams, gully plugs, bund stabilisation by botanical measures etc., as a mandatory requirement for diversion of 19.3044 ha for conveyor belt proposal of Thimmappanagudi Iron Ore Mines (TIOM) of KSMCL. These measures aimed at enhancing the soil and moisture conservation more effectively and adds up to the ecological regeneration.

CHAPTER – 5. PROPOSED SOIL & MOISTURE CONSERVATION PLAN FOR M.L.NO. 2605.:

Following is the proposed soil & moisture conservation plan for Conveyor belt and service road of M.L.No.2605 of KSMCL-TIOM with detailed activities and suitable budget allocation:

Soil and moisture conservation activities:

The rehabilitation of post-mining landscapes presents a unique opportunity to enrich and restore wildlife habitat, transforming disturbed land into functional, biodiverse ecosystems. Unlike managing a pristine area, habitat enrichment on mine sites must address underlying issues of compacted soils, altered topography, and potential contamination. As 19.3044 hectares of forest land is utilised for establishment of downhill conveyor belt from the mining area to the stock yard near Susheelanagara, where railway siding is planned, a number of Soil & Moisture Conservation structures such as gully plugs, check dams, silt traps, culverts, percolation tanks etc., have been constructed as per the guidelines of CEC and other norms set by the various government bodies including that of MoEF&CC.

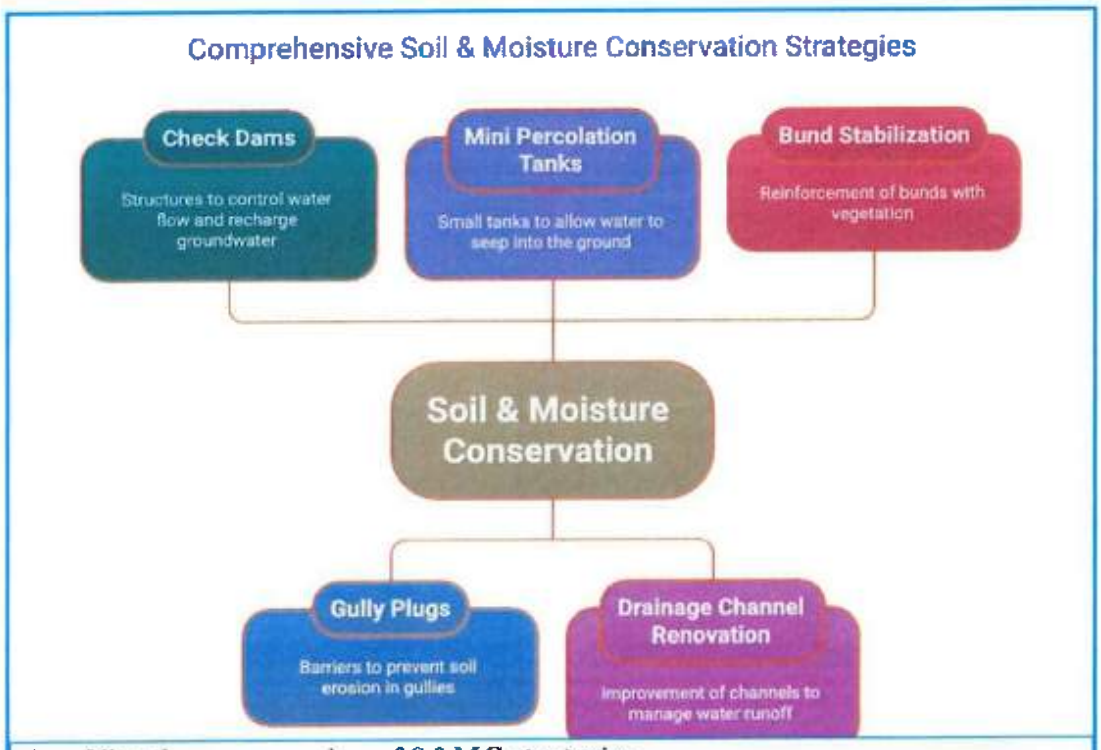


Fig-5 Visual representation of S&MC strategies

Yet as a part of mandatory process for FC, this S&MC plan has been prepared for implementation as per requirement.

5.1 Construction of 2 Check Dams

A check dam is a small masonry or earthen barrier constructed across a seasonal stream, nala, or drainage channel to reduce runoff velocity, arrest sediment, and enhance groundwater recharge. In mining regions and degraded landscapes, check dams play a crucial role in restoring hydrological balance and stabilising disturbed catchments. Under this plan it is proposed to construct 2 check dams across the natural streams.

i. Site Selection Criteria

Engineering standards require that a check dam site meets the following conditions:

1. The nala should have a well-defined section with stable banks.
2. The foundation should preferably be on hard soil, gravel, weathered rock, or firm ground with good bearing capacity.
3. Catchment size should typically be 50–200 hectares for small masonry check dams.
4. The site should allow for adequate storage behind the structure without causing flooding or land acquisition issues.
5. Natural narrowing ("throat") in the nala is ideal to reduce construction width and cost.
6. The downstream reach should be stable enough to handle overflow without causing erosion.

ii. Hydrological & Structural Design Parameters

a) Peak Runoff Estimation

The check dam is designed to safely pass peak discharge using methods such as:

- Rational formula (Q = CiA) for small catchments (Q =peak rate of runoff or maximum discharge, C=Runoff coefficient-ration of runoff to total rainfall, i= intensity of rainfall, A= drainage area.
- SCS Curve Number method. (SCS=Soil Conservation Service)
- Empirical runoff coefficients from watershed manuals

Typical rainfall intensity values from IMD or local watershed statistics guide the design.

b) Dimensions (Typical Small Masonry Check Dam)

(These vary with site conditions but are standard for watershed and mining SMC works)

- Height: 1.0–2.5 m
- Top width: 0.6–1.0 m
- Base width: 1.5–3.0 m depending on height

- Length: 5–20 m across nala depending on channel width
- Freeboard: Minimum 0.3–0.6 m above spillway crest
- Side batter (slope): 0.3H:1V (upstream), 0.2H:1V (downstream)
  Design must ensure over-topping flows do not erode the downstream face.

c) Spillway Design

The spillway allows excess water to flow safely over the structure.

- Spillway width: 0.5–2.0 m depending on discharge
- Spillway crest elevation: below the top of the dam to prevent structural stress
- Energy dissipators: stone pitching, riprap, apron, or drop structure

iii. Structural Components of a Standard Masonry Check Dam

a) Foundation

- Excavated up to firm ground or weathered rock.
- Minimum depth: 0.5–1.0 m below natural bed level.
- Foundation trench is key to preventing overturning or sliding.

b) Masonry Body

Usually built using:

- Rubble stone masonry in cement mortar (1:4 / 1:6)
- Random rubble at sides
- Properly bonded stones to avoid honeycombing
- Curing for a minimum of 7–14 days

c) Apron & Toe Wall (Downstream Protection)

To prevent scouring:

- Apron length: **1.5–3.0 m**
- Thickness: **0.3–0.5 m**
- Toe wall height: **0.3–0.6 m**

d) Cut-off Trench

Constructed on the upstream side:

- Depth: 0.3–0.6 m
- Prevents seepage under the structure
- Filled with compacted clay or concrete

e) Wing Walls / Abutments

Extend up to 2–5 m into the banks to prevent flanking or bypass flow.

Fig- 6 A model Check dam (Archives)

iv. Materials Used

- Rubble stones (locally available)
- Cement mortar (1:4 or 1:6)
- Sand, coarse aggregate
- Stone pitching for upstream side
- Riprap for downstream protection
- Reinforcement (if required in special cases)
- Geo-textile lining (optional for seepage control)

v. Construction Process (Engineering Sequence)

✓ **Survey & Setting Out:**

Engineers conduct contour surveys, cross-sections, and layout marking.

✓ **Excavation & Foundation Preparation:**

The nala bed and banks are excavated to the design depth, ensuring stable bearing strata.

✓ **Laying Cut-off Trench:**

A trench is constructed upstream and filled with clay or concrete to block seepage paths.

✓ **Masonry Construction:**

The dam body is built layer by layer, ensuring proper bonding and mortar consistency.

✓ **Spillway Formation:**

A lowered central portion or notch is shaped to guide controlled overflow.

✓ **Construction of Wing Walls & Abutments:**

These anchor the structure securely into the nala banks.

✓ **Apron & Toe Wall Installation:**

Downstream protection is built to absorb the energy of falling water.

✓ **Pitching & Bank Stabilisation:**

Both upstream and downstream sections are protected with stone pitching or vegetation.

✓ **Curing & Finishing:**

The structure is kept moist for adequate curing to ensure strength.

vi. Performance Characteristics

A well-designed check dam:

- Reduces flow velocity and erosive force
- Traps silt and improves soil fertility upstream
- Enhances infiltration and groundwater recharge
- Increases soil moisture for vegetation

- Extends the effective length of the monsoon's impact
- Reduces downstream flood peaks and sediment transport

vii. Maintenance Requirements

- Regular desilting after monsoon
- Inspection of apron, toe wall, and spillway
- Repair of cracks or seepage spots
- Vegetation control on spillway to avoid flow obstruction

5.2. Construction of Gully Plugs / Boulder Checks:

In iron ore mining regions, gully plugs are no longer viewed as stand-alone erosion checks; they are strategic hydrological assets embedded within mine planning, progressive reclamation, and closure frameworks. The intensive stripping of topsoil, exposure of lateritic and ferruginous formations, and realignment of natural drains convert minor seasonal streams into aggressive erosion conduits. Constructing a series of gully plugs across these micro-catchments is therefore essential to arrest soil loss at source, manage sediment in motion, and re-establish hydrological equilibrium across disturbed mine landscapes.

Expanded Technical and Operational Context

Gullies are formed due to soil erosion along drainage lines by surface water runoff during rains. The gullies once formed by erosion will expand towards upstream side (opposite to the direction of flow), by eroding surface soil, till the measures are taken to stabilize them by structural designs such as plugs (Gully plugs) and boulder checks.

In iron ore mines, runoff typically originates from multiple linear sources—bench faces, dump terraces, safety bunds, and haul roads—before converging into narrow channels. If unchecked, these flows accelerate gully incision, destabilize dump toes, and export fine sediments beyond lease boundaries. Series gully plugs introduce a step-wise energy dissipation system, converting a continuous erosive gradient into a sequence of low-energy detention zones.

Each plug acts independently as a mini check structure, while collectively functioning as a distributed sediment retention and infiltration network. This approach reduces dependency on large downstream check dams, which often face silt overload and frequent desilting requirements.

Ecologically, gully plugs support rapid vegetation establishment, reduce sediment loading into nalas, tanks, and reservoirs, and protect downstream agricultural and forest ecosystems. They also improve slope stability, lowering the risk of dump failure and associated safety incidents.

From a regulatory lens, these structures demonstrate proactive compliance with EMP commitments, enhance audit performance, and strengthen the mine's environmental, social, and governance (ESG) profile. Over time, restored vegetation contributes to carbon sequestration, reinforcing the mine's alignment with climate-resilient development pathways.

Types of Gully Plugs (Mine-Specific Applications)

- **Loose Rock Gully Plugs**
  - Best suited for first- and second-order streams within lease areas
  - Constructed using waste rock, laterite, and boulders from mining operations
  - Allow controlled seepage while retaining sediments
- **Gabion Gully Plugs**
  - Recommended for high-runoff zones below overburden dumps and haul roads
  - Flexible under load, resistant to settlement and overtopping
  - Ideal for series installation in steep gradients
- **Vegetative / Brushwood Gully Plugs**
  - Temporary measures during initial reclamation stages
  - Reduce flow velocity and support early soil binding
  - Often combined with geo-textiles or coir mats
- **Masonry / Concrete Gully Plugs**
  - Used in permanent drainage channels and near infrastructure
  - High structural strength and longer design life
  - Require proper spillways to safely pass peak flows

Materials Used (Optimised for Iron Ore Mines)

- Overburden and waste rock boulders
- Lateritic stones and broken iron ore rejects
- GI wire mesh (4–6 mm) for gabion cages
- Cement, sand, and aggregates for permanent structures
- Brushwood, bamboo, and plantation residues
- Native grass slips (Vetiver, Cymbopogon, Dichanthium, etc.) and shrubs

The reuse of mine-generated material significantly lowers project cost and improves material efficiency metrics under ESG reporting.

Additional Engineering and Design Considerations

- Structures are keyed into the gully bed and sidewalls to prevent undercutting
- Aprons or pitching are provided downstream to avoid scouring
- Crest height is designed lower than gully banks to ensure safe overtopping

- Spacing between plugs is adjusted so that the sediment wedge of one plug meets the toe of the next
- Regular inspection after monsoon events ensures long-term performance

Benefits of Gully Plugs in Iron Ore Mining Areas

- **Erosion and Sediment Control**
  - Arrests headward erosion and lateral gully expansion
  - Captures eroded soil before it exits the lease area
  - Reduces silt load on downstream water bodies
- **Water Resource Augmentation**
  - Increases infiltration and groundwater recharge
  - Moderates peak runoff and flash flow events
  - Supports water availability in semi-arid mining belts
- **Mine Stability and Safety**
  - Improves toe stability of overburden dumps
  - Reduces risk of slope failure and washouts
  - Protects mine roads, culverts, and drains
- **Ecological Restoration**
  - Enables natural soil formation and vegetation succession
  - Creates green corridors along drainage lines
  - Enhances biodiversity and micro-habitat development
- **Socio-Economic and Land Use Gains**
  - Converts wasteland into productive land over time
  - Generates biomass usable as fodder and organic manure
  - Enhances post-mining land usability for forestry or agriculture
- **Regulatory and ESG Alignment**
  - Supports compliance with EMP, PMR, and Mine Closure Plan commitments
  - Demonstrates proactive sediment and water management
  - Improves audit outcomes and stakeholder confidence

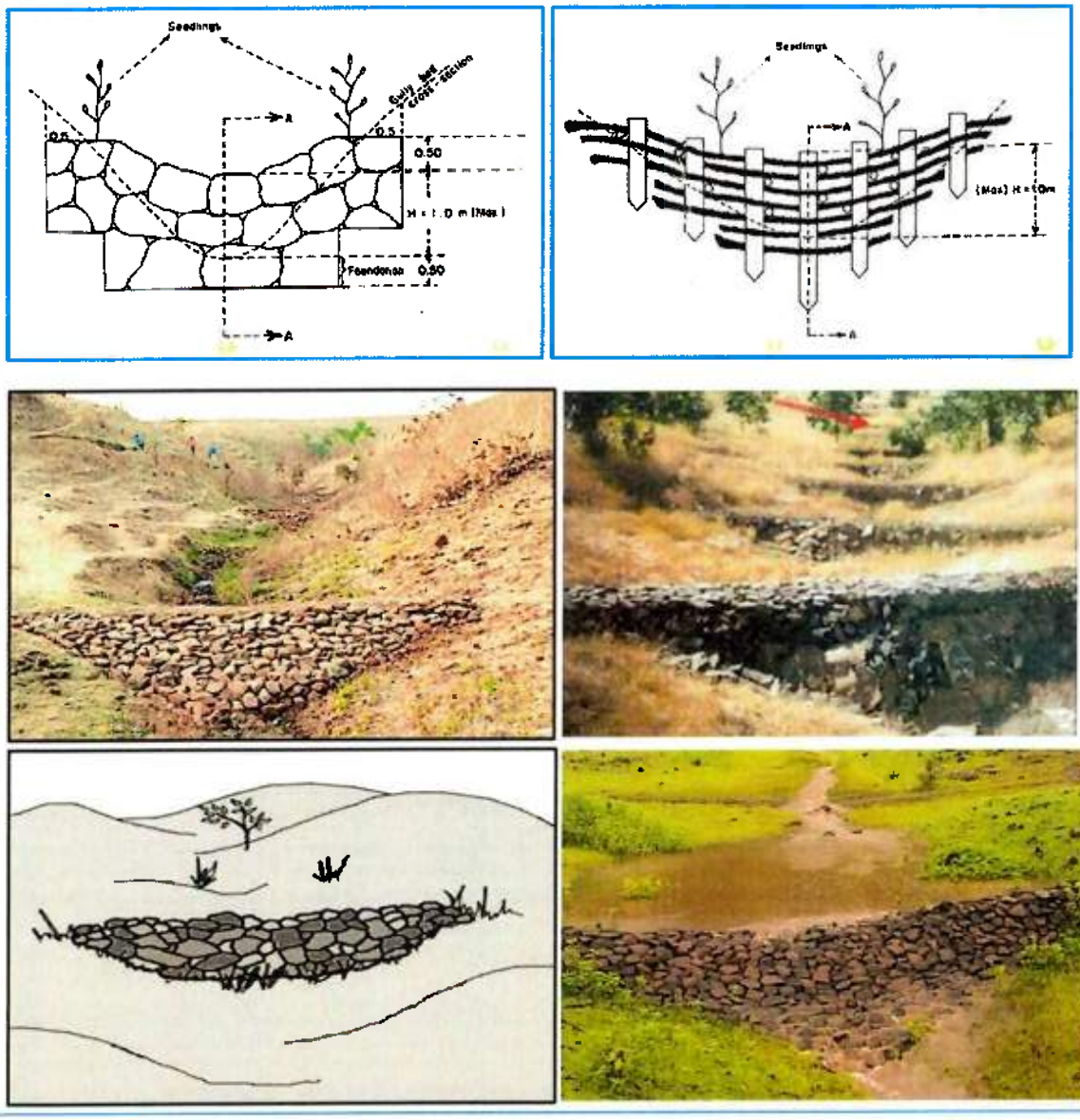
Integration with Mine Rehabilitation and Closure

Series gully plugs form the backbone of slope stabilization and watershed management within mine rehabilitation plans. When combined with contour trenching, check dams, garland drains, and systematic plantation, they accelerate landscape recovery and reduce long-term closure liabilities. Their performance improves year-on-year as sediment builds up and vegetation establishes, making them a self-strengthening intervention.

Therefore, in the iron ore mining context, gully plugs represent low-complexity, high-impact infrastructure—quietly delivering erosion control, silt retention, and hydrological resilience. Deployed thoughtfully in series across small streams, they transform disturbed drainage lines into regenerative systems, ensuring that mineral extraction is balanced with land stewardship, regulatory compliance, and a credible post-mining legacy.

In this S & MC plan it is proposed for 50 Gully Plugs / Boulder Checks of different size in different locations, based on the requirements.

Fig-7: Sample Structures of Gully plugs / Boulder Check



5.3. Construction of Nala bunds :

A nala bund is a small, engineered barrier constructed across a natural drainage channel or seasonal stream to regulate surface runoff, arrest sediment movement, and enhance soil and moisture retention within a catchment. In geological terms, it works with natural slope, lithology, and drainage patterns to slow erosive energy, allowing water to infiltrate rather than escape. In the undulating, hard-rock terrain of the NEB of Sandur North Forest, nala bunds form a critical component of the Soil & Moisture Conservation Plan for the downhill conveyor belt of TIOM-Sandur, proposed over 19.3044 hectares of forest land.

Nala bunds are not merely hydraulic structures; they are quiet negotiators between rock, soil, water, and time. In this landscape, where ferruginous formations weather rapidly and monsoonal runoff carries a high sediment load, nala bunds function as first-line, nature-aligned infrastructure that stabilizes drainage lines influenced by construction activities.

Types of nala bunds :

Earthen nala bunds are made by compacting local soil across small seasonal nalas. They are suitable in gentle slopes and low-flow channels. These bunds slow down rainwater and allow it to soak into the ground. They are simple to build and easy to repair.

Loose boulder nala bunds are constructed by placing locally available stones across rocky nalas. Water can pass through the gaps while soil and silt get trapped upstream. They work well in moderate slopes with hard rock beds. These bunds are durable and blend naturally with the terrain.

Gabion nala bunds are formed using wire mesh boxes filled with stones. They are strong yet flexible and can withstand higher water flow. Gabions reduce erosion while allowing controlled movement of water. They are suitable in unstable or highly erodible drainage lines.

Masonry or cement concrete nala bunds are permanent structures built where water pressure is high. They provide long-term stability and effective control of runoff. A spillway is usually provided to safely release excess water. These bunds are used only at critical locations to minimize environmental impact.

Selection is guided by slope, catchment area, soil texture, drainage density, and lithological control, ensuring structural stability without disrupting natural hydrological continuity.

The materials used are largely local and geologically compatible, including lateritic soil, murum, locally available boulders, wire crates for gabions, sand, and limited cement where permanence is required. This approach reduces haulage pressure, integrates seamlessly with the surrounding geology, and minimizes the project's material footprint.

The construction methodology follows a low-impact, high-control sequence: nala alignment is surveyed in detail; foundations are keyed into stable strata; bunds are built in stepped profiles with properly designed central spillways to safely pass peak flows. Construction is scheduled outside peak monsoon periods to prevent downstream turbidity, and disturbed surfaces are stabilized with native grasses to ensure long-term slope integrity.

In terms of function, nala bunds play a decisive role in the prevention of silt movement. By reducing flow velocity, they trap suspended sediments generated from excavation, conveyor foundations, and exposed forest soils, thereby preventing siltation of downstream nalas, forest floors, and agricultural lands beyond the project boundary.

The ecological and wildlife benefits are significant. Temporary water pools formed upstream of bunds create micro-habitats that support amphibians, invertebrates, and aquatic flora, while also serving as drinking points for birds, herbivores, and small carnivores. Improved soil moisture enhances natural regeneration and strengthens habitat continuity in the forest landscape.

From a hydrogeological perspective, nala bunds substantially improve groundwater recharge. Increased residence time of runoff allows deeper percolation into weathered zones and fracture networks typical of the Sandur hard-rock aquifers, helping sustain base flows and vegetation during dry seasons.

The strategic relevance of nala bunds in mining areas lies in their role as buffers between linear infrastructure—such as downhill conveyor belts—and sensitive forest hydrology. They reduce erosion risks, protect structural foundations, and ensure that mining-related development does not trigger long-term geomorphic instability.

Within the context of the TIOM- downhill conveyor belt project, nala bunds are not supplementary measures but core sustainability assets. As part of the Soil & Moisture Conservation Plan, they convert a potential impact zone into a managed hydrological system—where sediment is controlled, water is conserved, and ecological functions are quietly reinforced across the forested terrain.

It is proposed to construct 2 big nala bunds in and around the proposed conveyor belt vicinity.

5.4. Stabilisation of the bunds (Biological measures):

Stabilisation bunds and other S&MC engineering structures in the mining area is crucial to protect such structures from destruction by runoff water during monsoon. The intervention complements engineering controls by strengthening soil structure through living root systems, reducing erosion risks, and improving moisture retention. This nature-based solution aligns operational resilience with long-term ecological performance. By establishing a living cover of grasses, seeds, and native vegetation, vulnerable bunds are converted into a robust green buffers that hold the line against erosion, rainfall impact, and surface runoff. Within the iron ore mining landscape of TIOM, the service roads and bunds function as operational arteries—carrying material, momentum, and risk in equal measure. Their stabilisation, therefore, is not an aesthetic add-on but a core conservation measure. A vegetation-based, budget-efficient bio-engineering approach repositions these earth structures as resilient, self-reinforcing assets.

Types of Biological Stabilisation Measures

1. Agave Plantation on Bunds

Agave species shall be planted along the crest and outer slopes of bunds due to their:

- Deep and fibrous root systems,
- High drought tolerance,
- Strong soil-binding capability.

Agave acts as a natural retaining barrier, particularly effective on exposed bunds and embankments prone to erosion during high-intensity rainfall.

2. Grass Turfing and Grass Slips

Native, fast-growing grasses shall be established on:

- Inner and outer faces of bunds,
- Drainage channel embankments,
- Reclaimed shoulders of the service road.

Grass cover provides immediate surface protection, reduces raindrop impact, and stabilizes loose soil while enhancing infiltration.

3. Seed Sowing (Seed dibbling/ Broadcasting / Line Sowing)

Seed sowing using a mix of native grasses, legumes, and soil-improving species shall be undertaken on freshly formed bunds and slopes. This method ensures:

- Rapid vegetative cover,
- Nitrogen enrichment of soil (through legumes),
- Improved soil aggregation and moisture holding capacity.

Mulching may be applied to support germination and reduce moisture loss.

4. Shrub and Vegetation Plantation

Native shrubs and small tree species with deep root systems shall be planted at strategic intervals along bunds, particularly in wider embankments and safety zones. These species provide long-term structural stability and ecological continuity along the conveyor corridor.

Location & Application

- Along bunds of contour trenches and drainage channels.
- On service road edges and cut slopes.
- Near culvert approaches, outlets, and silt traps.
- In reclaimed and disturbed patches adjacent to the conveyor alignment.

Planting shall follow contour alignment to avoid preferential flow paths.

Materials & Inputs

- Healthy agave suckers, grass slips, and certified native seeds.
- Local topsoil mixed with compost / organic manure.
- Mulching material (dry grass, straw) where required.
- Protective measures such as fencing in vulnerable sections.

All plant material shall be site-specific and locally adapted, ensuring high survival rates.

Methodology:

- Light dressing of topsoil mixed with compost or mine overburden fines
- Seed dibbling at 30–45 cm spacing along contour lines
- Grass slips planted in staggered rows on bund slopes
- Mulching with dry grass or straw to retain moisture
- Minimal fencing or stone pitching only in high-disturbance zones

Impact on Soil & Moisture Conservation

- Enhances bund stability by reinforcing soil through root networks.
- Reduces erosion and slope failure, especially during monsoon.
- Improves soil moisture retention by reducing surface runoff and evaporation.
- Minimizes sediment load entering drains and natural watercourses.
- Creates a green buffer along the service road, improving micro-climate and visual integration.

Biological measures convert temporary earth structures into self-sustaining, living systems.

Maintenance & Monitoring

- Regular watering during initial establishment phase.
- Replacement of mortalities during monsoon inspections.

- Periodic trimming to maintain structural integrity of bunds.
- Documentation through geo-tagged photographs and survival records as part of statutory compliance reporting.

Benefits :

- Erosion Control: Roots bind soil, reducing wash-off during heavy rains
- Cost Optimization: Eliminates repeated repair of breached bunds
- Silt Management: Prevents sediment movement into drains and roads
- Operational Safety: Stabilised bunds protect haul roads and drainage lines
- Ecological Recovery: Supports pollinators, improves microhabitat
- Aesthetic Integration: Softens mining landscapes, improves visual compliance

Stabilisation of bunds through agave plantation, grass turfing, seed sowing, and native vegetation along the proposed conveyor belt service road at TIOM, ML No. 2605 represents a cost-effective, regulator-preferred biological Soil & Moisture Conservation measure. By integrating engineering and ecological solutions, the approach ensures long-term slope stability, moisture conservation, and compliance with Government of India environmental safeguards—supporting sustainable infrastructure development across the mining landscape.

List of species for biological measures

A. Grasses (Primary Soil Binders)

1. *Chrysopogon zizanioides* — Vetiver / Khus
2. *Cenchrus ciliaris* — Buffel grass
3. *Cynodon dactylon* — Bermuda / Doob grass
4. *Dactyloctenium aegyptium* — Crowfoot grass
5. *Eleusine indica* — Goose grass
6. *Heteropogon contortus* — Spear grass
7. *Panicum maximum* — Guinea grass

B. Herbs & Leguminous Ground Covers (Soil Improvement + Cover)

1. *Crotalaria juncea* — Sunn hemp
2. *Stylosanthes hamata / Stylosanthes scabra* — Stylo
3. *Sesbania bispinosa*
4. *Desmodium triflorum*
5. *Trifolium repens* — White clover (where moisture permits)

C. Shrubs (Bund & Embankment Stabilisation)

1. *Agave americana / Agave sisalana*
2. *Carissa carandas* — Karonda
3. *Ziziphus mauritiana* — Ber
4. *Grewia asiatica / Grewia tiliifolia*

5. *Dodonaea viscosa*
6. *Vitex negundo*
7. *Gliricidia sepium*

D. Trees (Long-Term Structural Stability & Green Belt)

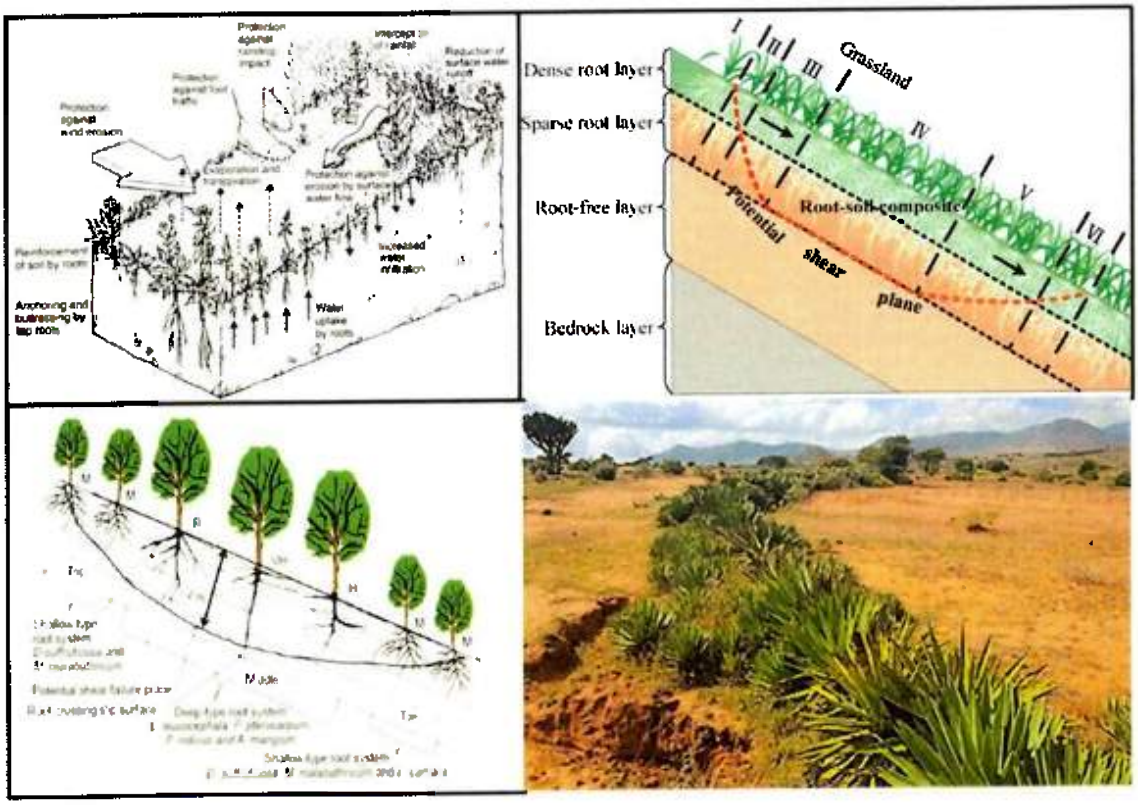
To be planted on wider bunds, safety zones and reclaimed areas — not narrow drain edges.

1. *Anogeissus latifolia*
2. *Lannea coromandelica*
3. *Boswellia serrata*
4. *Pongamia pinnata* (Karanj)
5. *Albizia lebbeck*
6. *Terminalia arjuna* (near moisture zones)
7. *Azadirachta indica* — Neem

E. Climbers / Creepers (Surface Protection)

1. *Ipomoea cairica* (controlled use)
2. *Trichosanthes cucumerina*
3. *Coccinia grandis*
4. *Tinospora cordifolia*

Fig: 8 Some sample images of bund stabilisation:



5.5 BUDGET:

Following is the budget Soil and Moisture Conservation (S&MC) Plan for KSMCL for utility of 19.3044 Ha of forest land in NEB of Sandur North Range Forest for KSMCLs Thimmappanagudi Iron Ore Mines (TIOM) ML No.2605.

Table-11

Sl No	Particulars of activity	Numbers/ Qtty/Extent in Ha	Unit cost (in Lakhs)	2026-27	2027-28	2028-29	Amount (In Lakhs)
				Amount (in Lakh Rs)	Amount (in Lakh Rs)	Amount (in Lakh Rs)	
1	Construction of Check Dams 2 (1each year)	2	5.00	5.00	5.50	0.00	**10.50**
2	Construction of gully plugs / Boulder Checks (small trenches along the streams) Total 50 (25 each year)	50	0.20	5.0	5.0	0.0	**10.00**
3	Construction of Nalabunds 2 (1 Each year)	2	2.50	2.50	2.75	0.00	**5.25**
4	Stabilisation of the bunds by planting agave, grass, seeds and vegetation	LS	LS	2.00	1.00	1.00	**4.00**
5	Miscellaneous / Administrative charges (10%)	LS	1.00	1.00	1.00	1.00	**3.00**
	GRAND TOTAL						**32.75**

(Total Rupees Thirty Two Lakh and Seventy Five Thousand only)

6. ANNEXURES:

Annexure-1: Form B for Conveyor belt and service road:

Annexure-01

FORM - A

Form for seeking prior approval of Central Government under section 2 of the Forest(Conservation) Act,1980 for Diversion of fresh forest area

PART - I
(To be filled up by User Agency)

A. General Details

A-1. Project Details

(i). **Proposal No. :** FP/KA/MIN/47146/2020

(ii). **Name of Project for which Forest Land is required :** Pipeline Conveyor Belt for Thimmappanagudi Iron Ore Mine ML. No. 2605 of KSMCL

(iii). **Short narrative of the proposal and Project/scheme for which the forest land is required :** As per the CEC recommendation the Honorable Supreme Court order 07.12.2017 at para 5 ordered to construct the conveyor belt system at their own cost. In this list our ML. No. 2605 is included. In order to obey the Supreme Court order, the company has investigated suitable route for erection of pipel

(iv). **State :** Karnataka

(v). **Category of the Project :** Mining

(vi). **Shape of forest land proposed to be diverted :** Linear

(vii). **Estimated cost of the Project(Rupees in lacs) :** 9000

(viii). **Total Area of Forest Land proposed for diversion(in ha.):** 19.652

(ix). **Non-Forest Land required for this project(in ha.):** 0.71

(x). **Total period for which the forest land is proposed to be diverted(in years):** 50

A-2. Details of User Agency

(i). **Name :** KARNATAKA STATE MINERALS CORPORATION LIMITED

(ii). **Address1 :** 5th Floor, 'A' Block, TTMC Building, BMTC, Shanthinagar

GENERAL MANAGER (MINES)
Karnataka State Minerals Corporation Limited

(iii). Address2 : Bangalore

(iv). State : Karnataka

(v). District : Bangalore Urban

(vi). Pin : 560027

(vii). Landmark : Bus stand

(viii). Email address : fcenv.ksmcl@gmail.com

(ix). Landline Telephone No. : 80-22278813

(x). Fax No. : 80-22213172

(xi). Mobile No. : 9986142031

(xii). Website (if any) : NIL

(xiii). Legal status of User Agency : State PSU

A-3. Details of Person Making Application

(i). First Name: Naveen

(ii). Middle Name: Raj

(iii). Last Name: Singh

(iv). Gender: Male

(v). Designation: Managing Director

(vi). Address 1: 5th Floor, A Block, TTMC Building, BMTC, Shanthinagar

(vii). Address 2: Bangalore

(viii). State: Karnataka

(ix). District: Bangalore Urban

GENERAL MANAGER

(x). Tehsil: Bangalore South

(xi). Pin: 560027

(xii). Landmark: NIL

(xiii). Email Address: fc.ksmcl@gmail.com

(xiv). Landline Telephone No.: 80-22278813

(xv). Fax No.: 08022213172

(xvi). Mobile No.: 9986142031

(xvii). Copy of documents in support of the competence/authority of the person making this application to make application on behalf of the User Agency:

B. Details of land required for the Project

B-1. Details of proposal seeking prior approval of Central Government under the Act for diversion of forest land for the Project already submitted in the past

List of proposal submitted In Past							
S.no	Proposal Status.	Proposal No.	Moef File No.	Area Proposed for Diversion(Ha.)	Area Diverted(Ha.)	Date of In-Principle Approval	Date of Final Approval
NIL							

B-2. Details of forest land proposed to be diverted

B-2.1 Details of Divisions involved

Details of Divisions involved			
S.no	Division Name	Forest Land(ha.)	Non-Forest Land(ha.)
1.	Bellary	19.652	0.71

B-2.2 Details of Districts involved

District wise breakup			
S.no	District Name	Forest Land(ha.)	Non-Forest Land(ha.)
1.	Bellary	19.652	0.71

GENERAL MANAGER (I.E.E)

8-2.3 Village wise breakup

Villages wise breakup			
S.no	Village	Forest Land(ha.)	Non-Forest Land(ha.)
1	NEB Range	19.652	0
2	Daulathpura	0	0.71

8-2.4 Component wise breakup

Component wise breakup			
S.no	Component	Forest Land(ha.)	Non-Forest Land(ha.)
1	Downhill Conveyor 1	3.317	0.384
2	Downhill Conveyor 2	3.898	0
3	Service Road 1	4.6318	0.3225
4	Service Road 2	2.9867	0
5	Service Road 3	1.5258	0
6	Stock Yard	3.2927	0

C. Maps of forest land proposed to be diverted

Division 1. : Bellary

(i). Area of forest land proposed to be diverted(in ha.) : 19.652

(ii). : Linear

(b). No. of Segments : Seven

Segment wise details		
Segments	Segment Area(in ha.)	Kml File of Segments
1.	3.317	View File
2.	3.898	View File
3.	4.6318	View File
4.	2.9867	View File
5.	1.5258	View File
6.	3.2927	View File
7.	0	View File

(iii). Copy of Survey of India Toposheet indicating boundary of forest land proposed to be diverted: Map

(iv). Scanned copy of the Geo-referenced map of the forest land proposed to be diverted prepared by using GPS or Total Station: Map

D. Justification for locating the Project in forest land and details of alternatives examined:

(i). Copy of note containing justification for locating the Project in forest land:

(ii). Whether a copy of map indicating location of alternative examine is required to be provided: No

(a). Reason for not providing such map The belt conveyor system is a site specific projec

E. Employment likely to be generated

(i). Whether the Project is likely to generate employment ?: Yes

(ii). Permanent/Regular Employment(Number of persons): 15

(iii). Temporary Employment(Number of person-days): 300

F. Displacement of People due to the Project, if any

(i). Whether Project involves displacement?: No

G. Details of Cost-Benefit analysis for the Project

(i). Whether the Project requires Cost-Benefit analysis?: Yes

(a). Copy of Cost-Benefit analysis:

H. Status of Environmental Clearance

(i). Whether the Project requires Clearance under the Environment (Protection) Act 1986 ? : No

I. Status of Wildelife Clearance

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Limited

(i). Whether the Project or a part thereof is located in any Protected Area or their Eco sensitive zone? : No

J. Applicability of special provisions governing Scheduled Areas

(i).Whether the Project or a part thereof is located in a Scheduled Area? : No

K. Status of settlement of rights under the Forest Rights Act,2006 on the forest land proposed to be diverted

(i). Whether the process for settlement of Rights under the Forest Rights Acts 2006 on the forest land proposed to be diverted has been completed? : Yes

(a). Copy of documentry evidence in support of settlement of rights under the Forest Rights Act,2006 on the forest land proposed to be diverted:

L. Details of land identified for Compensatory Afforestation

(i). Whether non-forest or Revenue forest land is required to be provided by User Agency?: Yes

(ii). Whether the area of non-forest land or Revenue forest land required to be provided by User Agency for raising Compensatory Afforestation is less than area of forest land proposed to be diverted ?: No

(iii). No. of districts involved for raising Compensatory Afforestation: 1

(iv). No. of patches: One

District 1. : Bellary

(a). Village: Kuduthini

(b). Area(in ha.): 19.7

(c). Copy of KML file of the patch: View File

(d). Khasra details: 1251

(e). Present owner: Others

(f). Copy of ownership proof:

(g). Copy of Mou/agreement executed between the Present owner and the User Agency:

(h). Copy of non encumberence certificate for the forest land:

(v). Scanned copy of the map of the land identified for creation of Compensatory Afforestation prepared by using GPS ot Total Station:

(vi). Copy of Survey of India Toposheet in 1:50,000 scale indicating location of the land identified for creation of Compensatory Afforestation:

M. Mining Details

M-1. Details of Mineral Concessions

(i). Whether the forest land is aquired under Coal Bearing Areas Act: No

(a). Reference number of Letter of Intent for grant of mining lease.(approval letter of the State Mines and Geology Department): ML. No. 2605

(b). Date of issue of the Letter of Intent(LOI) for grant of mining lease: 27 Dec 1985

(c). Copy the Letter of Intent(LOI):

(d). Total area of the mining lease(in ha.): 621.59

(e). Area of forest land located in the mining lease(in ha.): 136.97

M-2. Details of Mining Plan

(I). Date of approval of mining plan: 16 May 2019

(ii). Approval authority: Indian Bureau of Mines

(iii). Copy of approval of mining plan: No Data

(iv). Copy of approved mining plan: No Data

(v). Nature of mining (underground/opencast): Opencast

GENERAL MANAGER (LEE)

(vi). Copy of the detailed land use plan in 1:4,000 scale prepared by using GPS or Total Station :

(vii). Copy of map of the outer boundary of mining lease area: View file

M-3. Details of prospecting undertaken to assess mineral reserves

(i). Whether detailed prospecting to assess mineral reserve in the lease has been undertaken: No

M-4. Details of extension (if any) of original prospecting licence issued in the past

(i). Whether detailed prospecting to assess mineral reserve in the lease has been undertaken: No

M-5. Brief details of prospecting activities undertaken in the mining lease :

(i). Detail of prospecting activity under taken in the mining lease: 14 core drills and 2 RC borehole to a maximum depth 73 rmtrs drilled with a total meterage of 575.50 rmtrs. Almost 85% of area of ML is covered in the exploration. As a result reserve estimated is in

M-5.1 Details of bore holes drilled for prospecting :

Bore holes drilled for prospecting				
S.no	No. of Bore holes (in forest land)	Diameters(in inch.) forest land	No. of Bore holes (in non-forest land)	Diameters(in inch.) non-forest land
1	16	136.94	0	0

M-5.2 Estimated Reserve along with accuracy and confidence level

Estimated Reserve along with accuracy and confidence level						
Minerals	Estimated Reserve (million tones)	% accuracy (+ -)	% confidence level	Estimated Reserve (million tones)	% accuracy (+ -)	% confidence level
Iron Ore	5.08	90	90	0	0	0

M-6. Details of approval under the Forest (Consevation) Act,1980 obtained for undertaking prospecting activities in the forest land located in the mining lease

(i).Whether approval under the Forest (Conservation) Act, 1980 for undertaking prospecting activities in the forest land located in the mining lease have been obtained Yes

Details of approval under the Forest(Consevation) Act,1980					
S.no	MoEF File No	Date of approval	Area of forest land diverted(in ha.)	From Date	To Date
1	F.No.8-28/2000-FC	18 Apr 2001	48.74	27 Dec 1985	26 Dec 2035
2	F.No.8-28/2000-FC(PT)	08 Nov 2004	98.224	27 Dec 1985	26 Dec 2035

M-7. Mineral wise details

(i). No. of minerals: One

Mineral wise details						
Minerals	Estimated reserve in non forest land(million tons.)	Estimated reserve in forest land(million tons.)	Estimated annual extraction(million tons.)	Estimated life of mine(Yrs.)	Total estimated extraction during mining lease period(million tons.)	Estimated mineral reserve at the end o mining lease(millio tons.)
Iron Ore	0	5.08	0.65	8	5.08	0

M-7.1 Proposed use of the minerals proposed to be raised from the mining lease

(i). Proposed use of the minerals proposed to be raised from the mining lease: Non captive

(ii).Copy note containing details of the plan for the transportation of the minerals proposed to be raised from the mining lease: No Data

Additional information Details

Documents		
S.No	Documents	Remarks
1	[illegible]	Cross Section of Proposed Service Road
2	[illegible]	Undertaking for erection of temporary stone pillars.
3	[illegible]	Withdrawal letter of old FC Proposal No 36390 and 45672
4	[illegible]	Court Order
5	[illegible]	Letter of Indent

6		Change of Name of Company
7		Undertaking for NPV
8		Undertaking for CA Land
9		Deemed Extension of Lease Period
10		GPS Readings of Conveyor Belt Segment 1.
11		GPS Readings of Conveyor Belt Segment 2.
12		GPS Readings of Service Road Segment 1.
13		GPS Readings of Service Road Segment 2.
14		GPS Readings of Service Road Segment 3.
15		GPS Readings of Stock Yard.
16		Land Use Break up.

Print page

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Karnataka State Minerals Corporation Limited
BMTC, Shanthinagar, Bangaluru-560 027

Annexure-2: DGPS reading of Conveyor belt and Approach Road.

Annexure- 6A

Conveyor Belt & Service Road

DGPS Readings

Of

Thimmappanagudi Iron Ore Mine,

ML.No.2605

Of

Karnataka State Minerals Corporation Limited

Over an Extent of 19.3044Ha.

(Earlier Applied area of 19.652Ha.)

Karnataka State Minerals Corporation Limited

Thimmappanagudi Iron Ore Mine,ML.NO.2605

Conveyor Belt DGPS Reading of Left Side

Point ID	Latitude (Local)	Longitude (Local)	Northing	Easting
CL-1	15°07'59.64146"	76°31'45.91603"	1673635.036	664336.912
CL-2	15°07'59.15705"	76°31'45.44012"	1673620.05	664324.808
CL-3	15°07'58.67125"	76°31'45.00480"	1673605.029	664311.916
CL-4	15°07'58.18656"	76°31'44.53081"	1673590.034	664297.869
CL-5	15°07'57.70134"	76°31'44.09098"	1673575.03	664284.843
CL-6	15°07'57.24723"	76°31'43.61585"	1673560.975	664270.755
CL-7	15°07'56.76361"	76°31'43.17821"	1673546.021	664257.794
CL-8	15°07'56.27907"	76°31'42.70692"	1673531.031	664243.828
CL-9	15°07'55.79696"	76°31'42.26705"	1673516.123	664230.799
CL-10	15°07'55.34159"	76°31'41.82946"	1673502.037	664217.833
CL-11	15°07'54.85875"	76°31'41.35866"	1673487.1	664203.881
CL-12	15°07'54.37180"	76°31'40.92058"	1673472.043	664190.906
CL-13	15°07'53.88806"	76°31'40.44676"	1673457.078	664176.855
CL-14	15°07'53.40287"	76°31'40.00847"	1673442.075	664163.883
CL-15	15°07'52.91963"	76°31'39.53700"	1673427.125	664149.912
CL-16	15°07'52.43379"	76°31'39.09954"	1673412.103	664136.956
CL-17	15°07'51.94508"	76°31'38.69449"	1673396.999	664124.968
CL-18	15°07'51.42969"	76°31'38.28636"	1673381.075	664112.894
CL-19	15°07'50.87996"	76°31'37.94931"	1673364.11	664102.949
CL-20	15°07'50.29791"	76°31'37.57646"	1673346.144	664091.942
CL-21	15°07'49.71297"	76°31'37.30371"	1673328.11	664083.925
CL-22	15°07'49.12968"	76°31'36.99799"	1673310.12	664074.922
CL-23	15°07'48.53676"	76°31'36.72119"	1673291.84	664066.786
CL-24	15°07'47.92059"	76°31'36.55186"	1673272.868	664061.862
CL-25	15°07'47.30214"	76°31'36.34754"	1673253.819	664055.894
CL-26	15°07'46.65270"	76°31'36.16939"	1673233.822	664050.715
CL-27	15°07'46.03427"	76°31'36.06232"	1673214.794	664047.65
CL-28	15°07'45.38485"	76°31'35.96107"	1673194.814	664044.766
CL-29	15°07'44.73855"	76°31'35.88718"	1673174.936	664042.699
CL-30	15°07'44.08432"	76°31'35.85317"	1673154.822	664041.823
CL-31	15°07'43.43403"	76°31'35.78140"	1673134.821	664039.82
CL-32	15°07'42.78360"	76°31'35.74536"	1673114.824	664038.883
CL-33	15°07'42.16551"	76°31'35.67152"	1673095.813	664036.81
CL-34	15°07'41.51531"	76°31'35.63526"	1673075.822	664035.867
CL-35	15°07'40.86641"	76°31'35.56587"	1673055.865	664033.934
CL-36	15°07'40.21601"	76°31'35.52720"	1673035.868	664032.918
CL-37	15°07'39.56610"	76°31'35.48987"	1673015.887	664031.943
CL-38	15°07'38.91507"	76°31'35.41910"	1672995.864	664029.969
CL-39	15°07'38.26487"	76°31'35.38096"	1672975.873	664028.969
CL-40	15°07'37.61533"	76°31'35.31088"	1672955.896	664027.016
CL-41	15°07'36.96404"	76°31'35.26801"	1672935.871	664025.875
CL-42	15°07'36.34762"	76°31'35.19538"	1672916.911	664023.839
CL-43	15°07'35.69784"	76°31'35.15692"	1672896.933	664022.829
CL-44	15°07'35.05709"	76°31'35.12336"	1672877.234	664021.965
CL-45	15°07'34.41018"	76°31'35.05151"	1672857.337	664019.958

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Karnataka State Minerals Corporation Limited

CL-46	15°07'33.74267"	76°31'35.00984"	1672836.814	664018.856
CL-47	15°07'33.09334"	76°31'34.93951"	1672816.843	664016.895
CL-48	15°07'32.44265"	76°31'34.90210"	1672796.838	664015.918
CL-49	15°07'31.79286"	76°31'34.82847"	1672776.852	664013.858
CL-50	15°07'31.17638"	76°31'34.79545"	1672757.899	664013.004
CL-51	15°07'30.52550"	76°31'34.75358"	1672737.887	664011.893
CL-52	15°07'29.87681"	76°31'34.68204"	1672717.935	664009.896
CL-53	15°07'29.22558"	76°31'34.64431"	1672697.913	664008.909
CL-54	15°07'28.57442"	76°31'34.57169"	1672677.886	664006.88
CL-55	15°07'27.92565"	76°31'34.53327"	1672657.939	664005.871
CL-56	15°07'27.27259"	76°31'34.49506"	1672637.86	664004.87
CL-57	15°07'26.62370"	76°31'34.42506"	1672617.903	664002.919
CL-58	15°07'26.00510"	76°31'34.38720"	1672598.884	664001.921
CL-59	15°07'25.35633"	76°31'34.31585"	1672578.93	663999.929
CL-60	15°07'24.70430"	76°31'34.27660"	1672558.883	663998.896
CL-61	15°07'24.05680"	76°31'34.20614"	1672538.969	663996.931
CL-62	15°07'23.40575"	76°31'34.16553"	1672518.951	663995.858
CL-63	15°07'22.75518"	76°31'34.12926"	1672498.95	663994.914
CL-64	15°07'22.10409"	76°31'34.05831"	1672478.925	663992.935
CL-65	15°07'21.45386"	76°31'34.02011"	1672458.933	663991.933
CL-66	15°07'20.83741"	76°31'33.94730"	1672439.973	663989.891
CL-67	15°07'20.18783"	76°31'33.91061"	1672420.001	663988.935
CL-68	15°07'19.53521"	76°31'33.83841"	1672399.929	663986.918
CL-69	15°07'18.88619"	76°31'33.80071"	1672379.975	663985.932
CL-70	15°07'18.23397"	76°31'33.76198"	1672359.922	663984.915
CL-71	15°07'17.58592"	76°31'33.68802"	1672339.99	663982.845
CL-72	15°07'16.93695"	76°31'33.61752"	1672320.03	663980.879
CL-73	15°07'16.31980"	76°31'33.47877"	1672301.035	663976.868
CL-74	15°07'15.66722"	76°31'33.37490"	1672280.957	663973.906
CL-75	15°07'15.05112"	76°31'33.20428"	1672261.987	663968.944
CL-76	15°07'14.40345"	76°31'32.99876"	1672242.039	663962.946
CL-77	15°07'13.78435"	76°31'32.76059"	1672222.963	663955.968
CL-78	15°07'13.20145"	76°31'32.48851"	1672204.992	663947.969
CL-79	15°07'12.58627"	76°31'32.18312"	1672186.022	663938.983
CL-80	15°07'12.00118"	76°31'31.84570"	1672167.97	663929.019
CL-81	15°07'11.38547"	76°31'31.53800"	1672148.984	663919.979
CL-82	15°07'10.80358"	76°31'31.19931"	1672131.03	663909.991
CL-83	15°07'10.21990"	76°31'30.89184"	1672113.028	663900.936
CL-84	15°07'09.60300"	76°31'30.55270"	1672093.998	663890.942
CL-85	15°07'09.02148"	76°31'30.24392"	1672076.062	663881.848
CL-86	15°07'08.43835"	76°31'29.90808"	1672058.071	663871.945
CL-87	15°07'07.82066"	76°31'29.60208"	1672039.024	663862.941
CL-88	15°07'07.23831"	76°31'29.26353"	1672021.056	663852.958
CL-89	15°07'06.65383"	76°31'28.95797"	1672003.03	663843.96
CL-90	15°07'06.03732"	76°31'28.61858"	1671984.013	663833.958
CL-91	15°07'05.45646"	76°31'28.31228"	1671966.097	663824.938
CL-92	15°07'04.87086"	76°31'28.00775"	1671948.037	663815.971
CL-93	15°07'04.25625"	76°31'27.67074"	1671929.078	663806.04
CL-94	15°07'03.67111"	76°31'27.36406"	1671911.031	663797.009
CL-95	15°07'03.05493"	76°31'27.02463"	1671892.024	663787.006

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Corporation Limited

CL-96	15°07'02.47056"	76°31'26.71734"	1671874.001	663777.956
CL-97	15°07'01.88697"	76°31'26.37933"	1671855.995	663767.989
CL-98	15°07'01.30643"	76°31'26.04273"	1671838.083	663758.063
CL-99	15°07'00.75510"	76°31'25.66705"	1671821.061	663746.964
CL-100	15°07'00.20537"	76°31'25.32841"	1671804.096	663736.971
CL-101	15°06'59.68641"	76°31'24.92645"	1671788.064	663725.081
CL-102	15°06'59.20079"	76°31'24.51888"	1671773.055	663713.016
CL-103	15°06'58.68704"	76°31'24.04671"	1671757.168	663699.028
CL-104	15°06'58.19748"	76°31'23.60606"	1671742.031	663685.976
CL-105	15°06'57.78104"	76°31'23.10402"	1671729.128	663671.076
CL-106	15°06'57.32994"	76°31'22.59724"	1671715.16	663656.041
CL-107	15°06'56.91108"	76°31'22.09047"	1671702.182	663641.001
CL-108	15°06'56.52046"	76°31'21.55378"	1671690.066	663625.06
CL-109	15°06'56.13489"	76°31'21.01486"	1671678.104	663609.052
CL-110	15°06'55.81149"	76°31'20.44321"	1671668.047	663592.054
CL-111	15°06'55.49142"	76°31'19.83883"	1671658.085	663574.078
CL-112	15°06'55.17240"	76°31'19.26852"	1671648.163	663557.118
CL-113	15°06'54.88008"	76°31'18.66123"	1671639.053	663539.049
CL-114	15°06'54.62463"	76°31'18.05669"	1671631.077	663521.054
CL-115	15°06'54.40073"	76°31'17.42061"	1671624.065	663502.11
CL-116	15°06'54.17969"	76°31'16.78241"	1671617.139	663483.103
CL-117	15°06'53.98602"	76°31'16.11172"	1671611.049	663463.12
CL-118	15°06'53.82589"	76°31'15.47086"	1671605.995	663444.021
CL-119	15°06'53.70352"	76°31'14.83753"	1671602.103	663425.138
CL-120	15°06'53.60885"	76°31'14.16487"	1671599.055	663405.075
CL-121	15°06'53.51701"	76°31'13.49530"	1671596.094	663385.103
CL-122	15°06'53.48748"	76°31'12.82459"	1671595.047	663365.085
CL-123	15°06'53.45403"	76°31'12.15353"	1671593.881	663345.056
CL-124	15°06'53.42427"	76°31'11.48631"	1671592.828	663325.142
CL-125	15°06'53.43182"	76°31'10.81296"	1671592.921	663305.037
CL-126	15°06'53.40155"	76°31'10.14501"	1671591.853	663285.101
CL-127	15°06'53.40683"	76°31'09.47650"	1671591.877	663265.14
CL-128	15°06'53.37993"	76°31'08.80288"	1671590.912	663245.034
CL-129	15°06'53.38451"	76°31'08.13486"	1671590.914	663225.088
CL-130	15°06'53.35606"	76°31'07.46250"	1671589.901	663205.02
CL-131	15°06'53.36041"	76°31'06.79830"	1671589.898	663185.189
CL-132	15°06'53.33181"	76°31'06.12619"	1671588.88	663165.128
CL-133	15°06'53.33851"	76°31'05.45548"	1671588.948	663145.102
CL-134	15°06'53.31304"	76°31'04.78648"	1671588.027	663125.133
CL-135	15°06'53.31640"	76°31'04.11897"	1671587.992	663105.203
CL-136	15°06'53.28749"	76°31'03.44592"	1671586.965	663085.115
CL-137	15°06'53.29331"	76°31'02.77657"	1671587.006	663065.129
CL-138	15°06'53.25605"	76°31'02.10741"	1671586.03	663045.156
CL-139	15°06'53.26936"	76°31'01.43742"	1671585.994	663025.152
CL-140	15°06'53.24162"	76°31'00.77007"	1671585.003	663005.233
CL-141	15°06'53.25012"	76°31'00.10065"	1671585.127	662985.245
CL-142	15°06'53.22248"	76°30'59.43050"	1671584.139	662965.243
CL-143	15°06'53.22503"	76°30'58.76223"	1671584.08	662945.29
CL-144	15°06'53.19854"	76°30'58.09032"	1671583.127	662925.235
CL-145	15°06'53.23639"	76°30'57.42231"	1671584.153	662905.283

GENERAL MANAGER (LEE)
Corporation Limited

CL-146	15°06'53.34067"	76°30'56.75465"	1671587.22	662885.327
CL-147	15°06'53.41038"	76°30'56.11818"	1671589.232	662866.31
CL-148	15°06'53.57634"	76°30'55.44745"	1671594.194	662846.249
CL-149	15°06'53.77790"	76°30'54.81288"	1671600.257	662827.26
CL-150	15°06'54.00942"	76°30'54.17977"	1671607.243	662808.309
CL-151	15°06'54.27339"	76°30'53.57751"	1671615.231	662790.272
CL-152	15°06'54.50688"	76°30'52.94493"	1671622.277	662771.336
CL-153	15°06'54.74034"	76°30'52.31038"	1671629.321	662752.341
CL-154	15°06'54.97128"	76°30'51.70775"	1671636.295	662734.3
CL-155	15°06'55.23698"	76°30'51.07604"	1671644.33	662715.383
CL-156	15°06'55.46934"	76°30'50.43895"	1671651.34	662696.318
CL-157	15°06'55.69568"	76°30'49.83476"	1671658.172	662678.226
CL-158	15°06'55.93154"	76°30'49.20550"	1671665.291	662659.389
CL-159	15°06'56.16602"	76°30'48.60461"	1671672.374	662641.399
CL-160	15°06'56.42741"	76°30'47.96691"	1671680.276	662622.304
CL-161	15°06'56.66108"	76°30'47.33517"	1671687.328	662603.394
CL-162	15°06'56.89447"	76°30'46.73522"	1671694.377	662585.432
CL-163	15°06'57.12697"	76°30'46.09872"	1671701.392	662566.379
CL-164	15°06'57.39043"	76°30'45.46451"	1671709.358	662547.389
CL-165	15°06'57.62322"	76°30'44.86427"	1671716.389	662529.418
CL-166	15°06'57.85537"	76°30'44.22759"	1671723.393	662510.361
CL-167	15°06'58.08958"	76°30'43.59386"	1671730.461	662491.39
CL-168	15°06'58.35276"	76°30'42.99334"	1671738.426	662473.405
CL-169	15°06'58.58354"	76°30'42.35990"	1671745.388	662454.445
CL-170	15°06'58.81618"	76°30'41.72543"	1671752.407	662435.453
CL-171	15°06'59.04998"	76°30'41.12310"	1671759.469	662417.42
CL-172	15°06'59.31245"	76°30'40.48837"	1671767.405	662398.414
CL-173	15°06'59.54456"	76°30'39.88967"	1671774.416	662380.49
CL-174	15°06'59.77891"	76°30'39.25718"	1671781.487	662361.408
CL-175	15°07'00.01121"	76°30'38.62061"	1671788.497	662342.502
CL-176	15°07'00.27535"	76°30'38.01793"	1671796.491	662324.453
CL-177	15°07'00.50678"	76°30'37.38414"	1671803.473	662305.482
CL-178	15°07'00.74048"	76°30'36.75013"	1671810.525	662286.504
CL-179	15°07'00.97285"	76°30'36.14930"	1671817.544	662268.516
CL-180	15°07'01.23442"	76°30'35.51352"	1671825.452	662249.479
CL-181	15°07'01.47630"	76°30'34.82599"	1671832.744	662228.901
CL-182	15°07'01.66967"	76°30'34.31131"	1671838.397	662213.495
CL-183	15°07'01.93391"	76°30'33.64328"	1671846.565	662193.494
CL-184	15°07'02.19507"	76°30'33.00997"	1671854.462	662174.53
CL-185	15°07'02.42843"	76°30'32.40847"	1671861.51	662156.523
CL-186	15°07'02.66322"	76°30'31.77483"	1671868.596	662137.555
CL-187	15°07'02.89508"	76°30'31.17448"	1671875.599	662119.583
CL-188	15°07'03.16045"	76°30'30.53932"	1671883.624	662100.563
CL-189	15°07'03.39255"	76°30'29.90427"	1671890.627	662081.555

GENERAL MANAGER (LEE)
Karnataka ... Corporation Limited

Karnataka State Minerals Corporation Limited

Thimmappanagudi Iron Ore Mine,ML.NO.2605

Conveyor Belt DGPS Reading of Right Side

Point ID	Latitude (Local)	Longitude (Local)	Northing	Easting
CR-1	15°07'59.47200"	76°31'46.64226"	1673629.979	664360.629
CR-2	15°07'58.99050"	76°31'46.21461"	1673615.092	664347.965
CR-3	15°07'58.50392"	76°31'45.74824"	1673600.041	664334.147
CR-4	15°07'58.01851"	76°31'45.29252"	1673585.028	664320.645
CR-5	15°07'57.53374"	76°31'44.85828"	1673570.039	664307.785
CR-6	15°07'57.07986"	76°31'44.38513"	1673555.991	664293.757
CR-7	15°07'56.59621"	76°31'43.94154"	1673541.035	664280.618
CR-8	15°07'56.11228"	76°31'43.47898"	1673526.066	664266.912
CR-9	15°07'55.62537"	76°31'43.03662"	1673511.009	664253.810
CR-10	15°07'55.15026"	76°31'42.58442"	1673496.314	664240.412
CR-11	15°07'54.65591"	76°31'42.13072"	1673481.026	664226.973
CR-12	15°07'54.20698"	76°31'41.68807"	1673467.137	664213.854
CR-13	15°07'53.72356"	76°31'41.21655"	1673452.182	664199.881
CR-14	15°07'53.23685"	76°31'40.77871"	1673437.133	664186.914
CR-15	15°07'52.78408"	76°31'40.30489"	1673423.119	664172.865
CR-16	15°07'52.29709"	76°31'39.86607"	1673408.061	664159.869
CR-17	15°07'51.78167"	76°31'39.42613"	1673392.129	664146.845
CR-18	15°07'51.25395"	76°31'39.02828"	1673375.828	664135.084
CR-19	15°07'50.74399"	76°31'38.61644"	1673360.070	664122.895
CR-20	15°07'50.19354"	76°31'38.27663"	1673343.082	664112.868
CR-21	15°07'49.61019"	76°31'37.97258"	1673325.090	664103.915
CR-22	15°07'49.02620"	76°31'37.70016"	1673307.086	664095.907
CR-23	15°07'48.44373"	76°31'37.42898"	1673289.128	664087.936
CR-24	15°07'47.81794"	76°31'37.21964"	1673269.852	664081.820
CR-25	15°07'47.19988"	76°31'37.01457"	1673250.815	664075.830
CR-26	15°07'46.55191"	76°31'36.84411"	1673230.865	664070.879
CR-27	15°07'45.90143"	76°31'36.73770"	1673210.851	664067.842
CR-28	15°07'45.25173"	76°31'36.67233"	1673190.862	664064.835
CR-29	15°07'44.56907"	76°31'36.56006"	1673169.867	664062.823
CR-30	15°07'43.91852"	76°31'36.48754"	1673149.858	664060.797
CR-31	15°07'43.26797"	76°31'36.45041"	1673129.857	664059.828
CR-32	15°07'42.61721"	76°31'36.37894"	1673109.842	664057.833
CR-33	15°07'41.96760"	76°31'36.34130"	1673089.869	664056.849
CR-34	15°07'41.31813"	76°31'36.26893"	1673069.894	664054.827
CR-35	15°07'40.66780"	76°31'36.23117"	1673049.899	664053.838
CR-36	15°07'40.01725"	76°31'36.19498"	1673029.898	664052.897
CR-37	15°07'39.36783"	76°31'36.12357"	1673009.925	664050.904
CR-38	15°07'38.74928"	76°31'36.08644"	1672990.907	664049.928
CR-39	15°07'38.09977"	76°31'36.01591"	1672970.931	664047.961
CR-40	15°07'37.44855"	76°31'35.97503"	1672950.908	664046.880
CR-41	15°07'36.79800"	76°31'35.93566"	1672930.907	664045.843
CR-42	15°07'36.14753"	76°31'35.86377"	1672910.900	664043.836
CR-43	15°07'35.49683"	76°31'35.82541"	1672890.894	664042.830
CR-44	15°07'34.84649"	76°31'35.75458"	1672870.893	664040.855
CR-45	15°07'34.19579"	76°31'35.71452"	1672850.886	664039.797

GENERAL MANAGER (LEE)

CR-46	15°07'33.54540"	76°31'35.64407"	1672830.883	664037.833
CR-47	15°07'32.89414"	76°31'35.60565"	1672810.860	664036.825
CR-48	15°07'32.24439"	76°31'35.56624"	1672790.882	664035.788
CR-49	15°07'31.59467"	76°31'35.49698"	1672770.900	664033.859
CR-50	15°07'30.94439"	76°31'35.45726"	1672750.906	664032.812
CR-51	15°07'30.29379"	76°31'35.38717"	1672730.897	664030.858
CR-52	15°07'29.64386"	76°31'35.35041"	1672710.915	664029.900
CR-53	15°07'28.99094"	76°31'35.27750"	1672690.833	664027.863
CR-54	15°07'28.35455"	76°31'35.23075"	1672671.265	664026.603
CR-55	15°07'27.70435"	76°31'35.19172"	1672651.274	664025.577
CR-56	15°07'27.05528"	76°31'35.11967"	1672631.311	664023.564
CR-57	15°07'26.39234"	76°31'35.09133"	1672610.931	664022.860
CR-58	15°07'25.77427"	76°31'35.01984"	1672591.921	664020.857
CR-59	15°07'25.12430"	76°31'34.98256"	1672571.938	664019.883
CR-60	15°07'24.47293"	76°31'34.91149"	1672551.904	664017.901
CR-61	15°07'23.82407"	76°31'34.87299"	1672531.954	664016.890
CR-62	15°07'23.17346"	76°31'34.83479"	1672511.951	664015.888
CR-63	15°07'22.52285"	76°31'34.76280"	1672491.941	664013.878
CR-64	15°07'21.87249"	76°31'34.72505"	1672471.945	664012.890
CR-65	15°07'21.22227"	76°31'34.65310"	1672451.947	664010.881
CR-66	15°07'20.57167"	76°31'34.61520"	1672431.944	664009.888
CR-67	15°07'19.92148"	76°31'34.54443"	1672411.947	664007.914
CR-68	15°07'19.27204"	76°31'34.50509"	1672391.979	664006.879
CR-69	15°07'18.62072"	76°31'34.43322"	1672371.947	664004.872
CR-70	15°07'17.97070"	76°31'34.39547"	1672351.962	664003.884
CR-71	15°07'17.32038"	76°31'34.35782"	1672331.968	664002.899
CR-72	15°07'16.67041"	76°31'34.25221"	1672311.970	663999.885
CR-73	15°07'16.05384"	76°31'34.11433"	1672292.992	663995.900
CR-74	15°07'15.40898"	76°31'34.00896"	1672273.152	663992.892
CR-75	15°07'14.78848"	76°31'33.80556"	1672254.040	663986.952
CR-76	15°07'14.16769"	76°31'33.63275"	1672234.925	663981.925
CR-77	15°07'13.55596"	76°31'33.36046"	1672216.068	663973.926
CR-78	15°07'12.97072"	76°31'33.08868"	1672198.025	663965.937
CR-79	15°07'12.35486"	76°31'32.81606"	1672179.042	663957.929
CR-80	15°07'11.80341"	76°31'32.51218"	1672162.030	663948.974
CR-81	15°07'11.22029"	76°31'32.17239"	1672144.039	663938.954
CR-82	15°07'10.63689"	76°31'31.86792"	1672126.046	663929.989
CR-83	15°07'10.05281"	76°31'31.56042"	1672108.031	663920.933
CR-84	15°07'09.50075"	76°31'31.25754"	1672091.002	663912.008
CR-85	15°07'08.91766"	76°31'30.94983"	1672073.018	663902.945
CR-86	15°07'08.33444"	76°31'30.61339"	1672055.024	663893.025
CR-87	15°07'07.75111"	76°31'30.30429"	1672037.032	663883.921
CR-88	15°07'07.16499"	76°31'29.99987"	1672018.956	663874.958
CR-89	15°07'06.61631"	76°31'29.69741"	1672002.030	663866.044
CR-90	15°07'06.03197"	76°31'29.39046"	1671984.008	663857.005
CR-91	15°07'05.44841"	76°31'29.08308"	1671966.010	663847.952
CR-92	15°07'04.85886"	76°31'28.74863"	1671947.822	663838.093
CR-93	15°07'04.31497"	76°31'28.43764"	1671931.042	663828.924
CR-94	15°07'03.73338"	76°31'28.13349"	1671913.104	663819.967
CR-95	15°07'03.14829"	76°31'27.82838"	1671895.060	663810.983

GENERAL MANAGER (LEE)

CR-96	15°07'02.56096"	76°31'27.52738"	1671876.947	663802.121
CR-97	15°07'02.01364"	76°31'2[illegible].21740"	1671860.062	663792.983
CR-98	15°07'01.42997"	76°31'26.87997"	1671842.053	663783.033
CR-99	15°07'00.88002"	76°31'26.54062"	1671825.082	663773.019
CR-100	15°07'00.33040"	76°31'26.20039"	1671808.119	663762.978
CR-101	15°06'59.77865"	76°31'25.82924"	1671791.086	663752.015
CR-102	15°06'59.26076"	76°31'25.42488"	1671775.085	663740.053
CR-103	15°06'58.74195"	76°31'25.01751"	1671759.056	663728.001
CR-104	15°06'58.25667"	76°31'24.54544"	1671744.044	663714.010
CR-105	15°06'57.77402"	76°31'24.10549"	1671729.120	663700.978
CR-106	15°06'57.32092"	76°31'23.60097"	1671715.090	663686.011
CR-107	15°06'56.90302"	76°31'23.09399"	1671702.142	663670.964
CR-108	15°06'56.48088"	76°31'22.62516"	1671689.071	663657.056
CR-109	15°06'56.06147"	76°31'22.08622"	1671676.070	663641.055
CR-110	15°06'55.70828"	76°31'21.54892"	1671665.104	663625.088
CR-111	15°06'55.34273"	76°31'20.97637"	1671653.751	663608.072
CR-112	15°06'55.03306"	76°31'20.37251"	1671644.109	663590.109
CR-113	15°06'54.71038"	76°31'19.80103"	1671634.073	663573.115
CR-114	15°06'54.39095"	76°31'19.19409"	1671624.131	663555.062
CR-115	15°06'54.13405"	76°31'18.59215"	1671616.111	663537.145
CR-116	15°06'53.87923"	76°31'17.95276"	1671608.147	663518.110
CR-117	15°06'53.65483"	76°31'17.31450"	1671601.119	663499.101
CR-118	15°06'53.46564"	76°31'16.64217"	1671595.165	663479.068
CR-119	15°06'53.30435"	76°31'16.00493"	1671590.077	663460.077
CR-120	15°06'53.14724"	76°31'15.33475"	1671585.109	663440.101
CR-121	15°06'53.02246"	76°31'14.66344"	1671581.136	663420.085
CR-122	15°06'52.92829"	76°31'14.02724"	1671578.110	663401.110
CR-123	15°06'52.86878"	76°31'13.35610"	1671576.143	663381.085
CR-124	15°06'52.84054"	76°31'12.68674"	1671575.136	663361.106
CR-125	15°06'52.80497"	76°31'12.01449"	1671573.904	663341.043
CR-126	15°06'52.77721"	76°31'11.34539"	1671572.913	663321.072
CR-127	15°06'52.78150"	76°31'10.67531"	1671572.907	663301.065
CR-128	15°06'52.75272"	76°31'10.00733"	1671571.884	663281.128
CR-129	15°06'52.75675"	76°31'09.33790"	1671571.870	663261.140
CR-130	15°06'52.73020"	76°31'08.66827"	1671570.915	663241.153
CR-131	15°06'52.73545"	76°31'07.99596"	1671570.938	663221.079
CR-132	15°06'52.70803"	76°31'07.32835"	1671569.958	663201.153
CR-133	15°06'52.71391"	76°31'06.65599"	1671569.999	663181.077
CR-134	15°06'52.68396"	76°31'05.98802"	1671568.941	663161.141
CR-135	15°06'52.69074"	76°31'05.31884"	1671569.011	663141.160
CR-136	15°06'52.66324"	76°31'04.64606"	1671568.027	663121.079
CR-137	15°06'52.66736"	76°31'03.97950"	1671568.016	663101.177
CR-138	15°06'52.63939"	76°31'03.30701"	1671567.018	663081.105
CR-139	15°06'52.64414"	76°31'02.64054"	1671567.027	663061.206
CR-140	15°06'52.61546"	76°31'01.96682"	1671566.006	663041.097
CR-141	15°06'52.61978"	76°31'01.30088"	1671566.002	663021.213
CR-142	15°06'52.59671"	76°31'00.63132"	1671565.155	663001.228
CR-143	15°06'52.60123"	76°30'59.96269"	1671565.156	662981.264
CR-144	15°06'52.57333"	76°30'59.29424"	1671564.161	662961.313
CR-145	15°06'52.57721"	76°30'58.62194"	1671564.141	662941.239

GENERAL MANAGER (I.E.E)

CR-146	15°06'52.54996"	76°30'57.95472"	1671563.166	662921.324
CR-147	15°06'52.58687"	76°30'57.28342"	1671564.162	662901.274
CR-148	15°06'52.69171"	76°30'56.61255"	1671567.246	662881.222
CR-149	15°06'52.78280"	76°30'55.94119"	1671569.908	662861.158
CR-150	15°06'52.96073"	76°30'55.30953"	1671575.246	662842.261
CR-151	15°06'53.16078"	76°30'54.67653"	1671581.264	662823.320
CR-152	15°06'53.36098"	76°30'54.03958"	1671587.285	662804.261
CR-153	15°06'53.62495"	76°30'53.44223"	1671595.275	662786.370
CR-154	15°06'53.85564"	76°30'52.80327"	1671602.233	662767.244
CR-155	15°06'54.09196"	76°30'52.17334"	1671609.366	662748.387
CR-156	15°06'54.32206"	76°30'51.53639"	1671616.307	662729.321
CR-157	15°06'54.58588"	76°30'50.93650"	1671624.291	662711.355
CR-158	15°06'54.81926"	76°30'50.29877"	1671631.333	662692.265
CR-159	15°06'55.05147"	76°30'49.66560"	1671638.339	662673.312
CR-160	15°06'55.31438"	76°30'49.06388"	1671646.295	662655.291
CR-161	15°06'55.54485"	76°30'48.42672"	1671653.247	662636.219
CR-162	15°06'55.77993"	76°30'47.79721"	1671660.342	662617.375
CR-163	15°06'56.01550"	76°30'47.16513"	1671667.452	662598.453
CR-164	15°06'56.27827"	76°30'46.56027"	1671675.404	662580.339
CR-165	15°06'56.51115"	76°30'45.92892"	1671682.431	662561.440
CR-166	15°06'56.74139"	76°30'45.29431"	1671689.376	662542.444
CR-167	15°06'56.97433"	76°30'44.65679"	1671696.404	662523.361
CR-168	15°06'57.23865"	76°30'44.05585"	1671704.404	662505.363
CR-169	15°06'57.47251"	76°30'43.42047"	1671711.461	662486.344
CR-170	15°06'57.70542"	76°30'42.78756"	1671718.489	662467.399
CR-171	15°06'57.96854"	76°30'42.18497"	1671726.451	662449.352
CR-172	15°06'58.20138"	76°30'41.55125"	1671733.477	662430.383
CR-173	15°06'58.43289"	76°30'40.91829"	1671740.462	662411.436
CR-174	15°06'58.66581"	76°30'40.28284"	1671747.490	662392.415
CR-175	15°06'58.92673"	76°30'39.68720"	1671755.386	662374.576
CR-176	15°06'59.16252"	76°30'39.05090"	1671762.502	662355.529
CR-177	15°06'59.39337"	76°30'38.44822"	1671769.473	662337.486
CR-178	15°06'59.62590"	76°30'37.81138"	1671776.489	662318.424
CR-179	15°06'59.89046"	76°30'37.17799"	1671784.490	662299.457
CR-180	15°07'00.12497"	76°30'36.57823"	1671791.574	662281.501
CR-181	15°07'00.35606"	76°30'35.94179"	1671798.545	662262.451
CR-182	15°07'00.58794"	76°30'35.30737"	1671805.541	662243.461
CR-183	15°07'00.85041"	76°30'34.70189"	1671813.483	662225.328
CR-184	15°07'01.08327"	76°30'34.06895"	1671820.510	662206.382
CR-185	15°07'01.31555"	76°30'33.43694"	1671827.519	662187.464
CR-186	15°07'01.54786"	76°30'32.83747"	1671834.536	662169.517
CR-187	15°07'01.81485"	76°30'32.20369"	1671842.611	662150.539
CR-188	15°07'02.04572"	76°30'31.56948"	1671849.577	662131.555
CR-189	15°07'02.27744"	76°30'30.96708"	1671856.574	662113.521
CR-190	15°07'02.51170"	76°30'30.33355"	1671863.644	662094.557
CR-191	15°07'02.77751"	76°30'29.73197"	1671871.690	662076.540

GENERAL MANAGER (LEE)
Karnata[illegible] Corporation Limited

Karnataka State Minerals Corporation Limited

Thimmappanagudi Iron Ore Mine,ML.NO.2605

Service Road DGPS Reading of Left Side

Point ID	Latitude (Local)	Longitude (Local)	Northing	Easting
LR-01	15°07'59.89223"	76°31'44.43544"	1673642.435	664294.657
LR-02	15°07'59.61510"	76°31'45.04302"	1673634.044	664312.855
LR-03	15°07'59.34304"	76°31'45.63875"	1673625.807	664330.698
LR-04	15°07'58.92115"	76°31'45.23491"	1673612.757	664318.732
LR-05	15°07'58.92561"	76°31'44.56367"	1673612.754	664298.692
LR-06	15°07'58.91306"	76°31'43.89834"	1673612.23	664278.832
LR-07	15°07'58.85089"	76°31'43.65029"	1673610.268	664271.44
LR-08	15°07'58.73439"	76°31'43.51102"	1673606.659	664267.307
LR-09	15°07'58.48309"	76°31'43.40236"	1673598.913	664264.117
LR-10	15°07'58.23741"	76°31'43.43495"	1673591.369	664265.143
LR-11	15°07'58.08134"	76°31'43.54520"	1673586.595	664268.468
LR-12	15°07'57.95631"	76°31'43.84528"	1673582.815	664277.453
LR-13	15°07'57.87111"	76°31'44.23507"	1673580.278	664289.108
LR-14	15°07'57.60949"	76°31'44.89856"	1673572.375	664308.972
LR-15	15°07'57.34735"	76°31'45.51449"	1673564.447	664327.416
LR-16	15°07'57.25728"	76°31'45.72495"	1673561.723	664333.718
LR-17	15°07'57.16039"	76°31'45.06230"	1673558.807	664313.956
LR-18	15°07'57.02545"	76°31'44.34313"	1673554.31	664292.515
LR-19	15°07'56.81768"	76°31'43.23327"	1673547.694	664259.426
LR-20	15°07'56.69639"	76°31'42.57505"	1673543.829	664239.801
LR-21	15°07'56.62072"	76°31'42.16140"	1673541.418	664227.469
LR-22	15°07'56.50586"	76°31'41.93518"	1673537.841	664220.74
LR-23	15°07'56.30648"	76°31'41.78822"	1673531.682	664216.395
LR-24	15°07'56.02864"	76°31'41.79650"	1673523.145	664216.702
LR-25	15°07'55.82011"	76°31'42.05952"	1673516.791	664224.599
LR-26	15°07'55.79696"	76°31'42.26705"	1673516.123	664230.799
LR-27	15°07'55.79948"	76°31'43.17598"	1673516.389	664257.934
LR-28	15°07'55.76770"	76°31'43.84522"	1673515.552	664277.92
LR-29	15°07'55.74302"	76°31'44.26952"	1673514.882	664290.592
LR-30	15°07'55.62290"	76°31'43.61047"	1673511.053	664270.943
LR-31	15°07'55.48842"	76°31'42.87914"	1673506.768	664249.138
LR-32	15°07'55.28710"	76°31'41.77706"	1673500.351	664216.28
LR-33	15°07'55.16485"	76°31'41.11911"	1673496.457	664196.664
LR-34	15°07'55.00779"	76°31'40.46648"	1673491.495	664177.214
LR-35	15°07'54.84446"	76°31'39.96991"	1673486.372	664162.424
LR-36	15°07'54.62933"	76°31'39.75920"	1673479.716	664156.179
LR-37	15°07'54.26522"	76°31'39.77452"	1673468.529	664156.715
LR-38	15°07'54.07620"	76°31'40.00130"	1673462.767	664163.525
LR-39	15°07'54.04602"	76°31'40.59654"	1673461.963	664181.302
LR-40	15°07'53.63857"	76°31'40.20281"	1673449.359	664169.635
LR-41	15°07'53.57264"	76°31'39.51382"	1673447.194	664149.677
LR-42	15°07'53.46418"	76°31'39.05904"	1673443.762	664135.526
LR-43	15°07'53.21825"	76°31'38.88071"	1673436.167	664130.255
LR-44	15°07'52.98872"	76°31'38.90132"	1673429.117	664130.919
LR-45	15°07'52.73908"	76°31'39.12258"	1673421.49	664137.578

GENERAL MANAGER (LEE)
Karnataka State Minerals Corporation Limited

LR-46	15°07'52.68829"	76°31'39.32667"	1673419.972	664143.682
LR-47	15°07'51.93802"	76°31'39.54129"	1673396.958	664150.25
LR-48	15°07'51.68076"	76°31'39.61357"	1673389.067	664152.463
LR-49	15°07'51.48281"	76°31'39.89529"	1673383.042	664160.915
LR-50	15°07'51.43411"	76°31'40.14395"	1673381.597	664168.349
LR-51	15°07'51.47901"	76°31'40.81653"	1673383.116	664188.419
LR-52	15°07'51.50601"	76°31'41.48537"	1673384.085	664208.381
LR-53	15°07'51.53416"	76°31'42.15101"	1673385.089	664228.247
LR-54	15°07'51.62808"	76°31'42.94639"	1673388.141	664251.972
LR-55	15°07'51.30308"	76°31'42.35644"	1673378.029	664234.43
LR-56	15°07'50.98475"	76°31'41.77476"	1673368.125	664217.132
LR-57	15°07'50.79298"	76°31'41.29223"	1673362.131	664202.768
LR-58	15°07'50.76185"	76°31'40.62662"	1673361.036	664182.903
LR-59	15°07'50.89721"	76°31'39.97202"	1673365.06	664163.332
LR-60	15°07'51.03361"	76°31'39.31579"	1673369.116	664143.711
LR-61	15°07'50.99701"	76°31'38.90636"	1673367.906	664131.496
LR-62	15°07'50.96877"	76°31'38.78028"	1673367.012	664127.738
LR-63	15°07'47.68999"	76°31'36.47533"	1673265.765	664059.627
LR-64	15°07'47.69549"	76°31'35.80244"	1673265.794	664039.537
LR-65	15°07'47.79921"	76°31'35.14089"	1673268.845	664019.765
LR-66	15°07'47.83409"	76°31'34.78697"	1673269.843	664009.191
LR-67	15°07'47.67244"	76°31'34.46696"	1673264.809	663999.672
LR-68	15°07'47.34755"	76°31'34.37272"	1673254.804	663996.928
LR-69	15°07'47.08779"	76°31'34.48991"	1673246.845	664000.482
LR-70	15°07'46.79257"	76°31'34.99489"	1673237.877	664015.621
LR-71	15°07'46.39692"	76°31'35.53934"	1673225.831	664031.959
LR-72	15°07'46.00228"	76°31'36.06986"	1673213.812	664047.882
LR-73	15°07'45.57281"	76°31'36.67090"	1673200.738	664065.918
LR-74	15°07'45.24204"	76°31'37.25173"	1673190.693	664083.329
LR-75	15°07'45.07752"	76°31'37.89969"	1673185.771	664102.708
LR-76	15°07'45.13673"	76°31'38.57011"	1673187.73	664122.711
LR-77	15°07'45.16582"	76°31'39.13861"	1673188.742	664139.677
LR-78	15°07'45.07076"	76°31'38.95808"	1673185.783	664134.307
LR-79	15°07'44.91294"	76°31'38.30423"	1673180.797	664114.821
LR-80	15°07'44.78538"	76°31'37.65275"	1673176.741	664095.399
LR-81	15°07'44.66203"	76°31'36.99846"	1673172.815	664075.892
LR-82	15°07'44.62755"	76°31'36.86617"	1673171.727	664071.95
LR-83	15°07'44.53189"	76°31'36.60839"	1673168.734	664064.274
LR-84	15°07'44.46923"	76°31'36.53813"	1673166.793	664062.19
LR-85	15°07'43.85187"	76°31'36.48533"	1673147.809	664060.746
LR-86	15°07'43.72000"	76°31'36.59071"	1673143.778	664063.92
LR-87	15°07'43.62099"	76°31'36.81540"	1673140.782	664070.649
LR-88	15°07'43.58378"	76°31'37.48633"	1673139.778	664090.687
LR-89	15°07'43.51683"	76°31'38.15520"	1673137.859	664110.67
LR-90	15°07'43.48012"	76°31'38.82578"	1673136.87	664130.698
LR-91	15°07'43.41003"	76°31'39.49041"	1673134.854	664150.555
LR-92	15°07'43.40735"	76°31'39.83307"	1673134.843	664160.786
LR-93	15°07'43.24874"	76°31'39.18472"	1673129.834	664141.464
LR-94	15°07'43.12236"	76°31'38.52726"	1673125.813	664121.862
LR-95	15°07'42.96771"	76°31'37.88522"	1673120.927	664102.728

GENERAL MANAGER (I EE)
Limited

LR-96	15°07'42.67762"	76°31'37.29047"	1673111.888	664085.034
LR-97	15°07'42.19304"	76°31'36.81464"	1673096.896	664070.932
LR-98	15°07'41.64384"	76°31'36.49265"	1673079.951	664061.436
LR-99	15°07'40.99065"	76°31'36.35698"	1673059.848	664057.526
LR-100	15°07'40.34263"	76°31'36.30642"	1673039.922	664056.155
LR-101	15°07'39.69739"	76°31'36.25461"	1673020.08	664054.746
LR-102	15°07'39.04750"	76°31'36.20409"	1673000.097	664053.376
LR-103	15°07'38.39930"	76°31'36.15194"	1672980.165	664051.958
LR-104	15°07'37.74715"	76°31'36.10381"	1672960.112	664050.661
LR-105	15°07'37.27499"	76°31'35.95888"	1672945.571	664046.464
LR-106	15°07'36.64334"	76°31'35.23761"	1672926.008	664025.036
LR-107	15°07'36.36266"	76°31'34.63241"	1672917.256	664007.028
LR-108	15°07'36.08093"	76°31'34.03003"	1672908.473	663989.104
LR-109	15°07'35.79792"	76°31'33.42617"	1672899.65	663971.137
LR-110	15°07'35.51972"	76°31'32.81806"	1672890.974	663953.042
LR-111	15°07'35.36602"	76°31'32.47475"	1672886.179	663942.825
LR-112	15°07'35.17129"	76°31'32.29180"	1672880.156	663937.405
LR-113	15°07'34.82895"	76°31'32.24772"	1672869.626	663936.162
LR-114	15°07'34.54178"	76°31'32.46081"	1672860.844	663942.585
LR-115	15°07'34.46124"	76°31'32.74737"	1672858.428	663951.157
LR-116	15°07'34.52566"	76°31'33.41208"	1672860.546	663970.988
LR-117	15°07'34.59263"	76°31'34.07770"	1672862.743	663990.846
LR-118	15°07'34.61521"	76°31'34.29739"	1672863.482	663997.4
LR-119	15°07'34.60496"	76°31'34.58028"	1672863.226	664005.848
LR-120	15°07'34.53157"	76°31'34.65326"	1672860.985	664008.042
LR-121	15°07'34.48044"	76°31'34.61832"	1672859.407	664007.01
LR-122	15°07'34.30684"	76°31'33.97414"	1672853.938	663987.815
LR-123	15°07'34.14297"	76°31'33.32629"	1672848.767	663968.509
LR-124	15°07'33.92619"	76°31'32.69256"	1672841.973	663949.635
LR-125	15°07'33.76123"	76°31'32.45547"	1672836.854	663942.592
LR-126	15°07'33.51706"	76°31'32.34202"	1672829.327	663939.257
LR-127	15°07'33.28598"	76°31'32.38804"	1672822.234	663940.68
LR-128	15°07'33.01571"	76°31'32.64078"	1672813.98	663948.283
LR-129	15°07'32.95982"	76°31'32.85100"	1672812.306	663954.572
LR-130	15°07'32.98432"	76°31'33.52018"	1672813.198	663974.545
LR-131	15°07'33.03996"	76°31'34.18811"	1672815.047	663994.474
LR-132	15°07'33.04785"	76°31'34.42217"	1672815.338	664001.46
LR-133	15°07'32.85195"	76°31'33.78493"	1672809.185	663982.477
LR-134	15°07'32.66504"	76°31'33.14366"	1672803.307	663963.372
LR-135	15°07'32.48321"	76°31'32.56797"	1672797.6	663946.224
LR-136	15°07'32.27982"	76°31'32.38231"	1672791.31	663940.724
LR-137	15°07'31.96410"	76°31'32.36837"	1672781.604	663940.376
LR-138	15°07'31.73790"	76°31'32.52580"	1672774.685	663945.124
LR-139	15°07'31.49309"	76°31'33.14473"	1672767.29	663963.654
LR-140	15°07'31.29492"	76°31'33.78344"	1672761.332	663982.765
LR-141	15°07'31.06666"	76°31'34.51247"	1672754.468	664004.579
LR-142	15°07'30.93693"	76°31'34.77453"	1672750.536	664012.431
LR-144	15°06'58.31719"	76°31'23.69948"	1671745.729	663688.74
LR-145	15°06'58.37934"	76°31'23.03286"	1671747.501	663668.824
LR-146	15°06'58.45266"	76°31'22.36880"	1671749.617	663648.982

GENERAL MANAGER (I.E.E)

LR-147	15°06'58.42687"	76°31'22.15507"	1671748.78	663642.606
LR-148	15°06'58.31940"	76°31'22.04907"	1671745.455	663639.464
LR-149	15°06'58.15392"	76°31'22.03520"	1671740.367	663639.086
LR-150	15°06'57.86229"	76°31'22.22182"	1671731.443	663644.72
LR-151	15°06'57.29830"	76°31'22.56421"	1671714.18	663655.062
LR-152	15°06'56.74287"	76°31'22.91524"	1671697.183	663665.661
LR-153	15°06'56.18390"	76°31'23.25874"	1671680.075	663676.036
LR-154	15°06'55.62983"	76°31'23.60510"	1671663.118	663686.495
LR-155	15°06'55.20343"	76°31'23.89135"	1671650.073	663695.132
LR-156	15°06'55.43595"	76°31'23.27385"	1671657.091	663676.646
LR-157	15°06'55.70150"	76°31'22.65440"	1671665.124	663658.095
LR-158	15°06'55.73237"	76°31'22.49703"	1671666.04	663653.39
LR-159	15°06'55.73725"	76°31'21.93243"	1671666.073	663636.532
LR-160	15°06'55.54694"	76°31'21.38257"	1671660.111	663620.156
LR-161	15°06'55.16161"	76°31'20.66905"	1671648.121	663598.935
LR-162	15°06'54.93584"	76°31'20.25664"	1671641.097	663586.67
LR-163	15°06'54.78674"	76°31'18.46305"	1671636.144	663533.152
LR-164	15°06'55.04942"	76°31'17.84834"	1671644.089	663514.743
LR-165	15°06'55.12105"	76°31'17.15804"	1671646.148	663494.118
LR-166	15°06'55.02351"	76°31'16.69162"	1671643.057	663480.213
LR-167	15°06'54.67134"	76°31'16.12124"	1671632.113	663463.259
LR-168	15°06'54.37883"	76°31'15.60802"	1671623.017	663447.998
LR-169	15°06'54.22004"	76°31'14.95450"	1671618.001	663428.52
LR-170	15°06'54.13022"	76°31'14.29167"	1671615.104	663408.75
LR-171	15°06'54.03558"	76°31'13.62879"	1671612.058	663388.979
LR-172	15°06'53.96600"	76°31'12.96402"	1671609.783	663369.146
LR-173	15°06'53.94145"	76°31'12.31134"	1671608.893	663349.664
LR-174	15°06'53.94366"	76°31'11.64538"	1671608.824	663329.781
LR-175	15°06'53.91674"	76°31'10.97656"	1671607.858	663309.818
LR-176	15°06'53.92343"	76°31'10.30652"	1671607.925	663289.812
LR-177	15°06'53.89527"	76°31'09.63683"	1671606.922	663269.823
LR-178	15°06'53.86582"	76°31'08.96637"	1671605.878	663249.812
LR-179	15°06'53.86958"	76°31'08.29422"	1671605.855	663229.743
LR-180	15°06'53.84306"	76°31'07.62672"	1671604.902	663209.82
LR-181	15°06'53.84896"	76°31'06.95484"	1671604.945	663189.759
LR-182	15°06'53.82058"	76°31'06.28574"	1671603.935	663169.788
LR-183	15°06'53.82491"	76°31'05.61287"	1671603.929	663149.698
LR-184	15°06'53.79908"	76°31'04.94652"	1671602.997	663129.808
LR-185	15°06'53.80474"	76°31'04.28006"	1671603.034	663109.909
LR-186	15°06'53.77767"	76°31'03.60806"	1671602.063	663089.852
LR-187	15°06'53.78256"	76°31'02.94001"	1671602.076	663069.905
LR-188	15°06'53.75048"	76°31'02.27387"	1671600.952	663050.023
LR-189	15°06'53.75803"	76°31'01.60097"	1671601.046	663029.931
LR-190	15°06'53.72962"	76°31'00.93227"	1671600.035	663009.973
LR-191	15°06'53.73520"	76°31'00.26220"	1671600.068	662989.966
LR-192	15°06'53.74033"	76°30'59.59021"	1671600.087	662969.902
LR-193	15°06'53.71276"	76°30'58.92009"	1671599.102	662949.9
LR-194	15°06'53.71976"	76°30'58.25229"	1671599.179	662929.96
LR-195	15°06'53.72492"	76°30'57.58268"	1671599.2	662909.967
LR-196	15°06'53.79278"	76°30'56.91594"	1671601.148	662890.047

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... Corporation Limited

LR-197	15°06'53.89582"	76°30'56.25840"	1671604.18	662870.393
LR-198	15°06'54.06385"	76°30'55.60767"	1671609.209	662850.929
LR-199	15°06'54.26396"	76°30'54.96957"	1671615.228	662831.835
LR-200	15°06'54.49639"	76°30'54.34435"	1671622.243	662813.119
LR-201	15°06'54.72623"	76°30'53.72148"	1671629.178	662794.474
LR-202	15°06'54.96741"	76°30'53.10055"	1671636.462	662775.884
LR-203	15°06'55.20527"	76°30'52.47636"	1671643.644	662757.198
LR-204	15°06'55.44606"	76°30'51.85269"	1671650.916	662738.527
LR-205	15°06'55.68733"	76°30'51.23124"	1671658.203	662719.921
LR-206	15°06'55.92580"	76°30'50.60653"	1671665.403	662701.219
LR-207	15°06'56.16784"	76°30'49.98632"	1671672.714	662682.651
LR-208	15°06'56.40548"	76°30'49.36283"	1671679.889	662663.986
LR-209	15°06'56.64649"	76°30'48.73980"	1671687.168	662645.333
LR-210	15°06'56.88494"	76°30'48.11846"	1671694.369	662626.732
LR-211	15°06'57.12808"	76°30'47.49480"	1671701.713	662608.06
LR-212	15°06'57.34765"	76°30'46.85836"	1671708.33	662589.012
LR-213	15°06'57.61740"	76°30'46.25657"	1671716.497	662570.988
LR-214	15°06'57.84499"	76°30'45.62821"	1671723.362	662552.18
LR-215	15°06'58.08699"	76°30'45.00380"	1671730.671	662533.486
LR-216	15°06'58.32682"	76°30'44.38216"	1671737.914	662514.876
LR-217	15°06'58.56646"	76°30'43.75982"	1671745.151	662496.244
LR-218	15°06'58.80666"	76°30'43.13868"	1671752.405	662477.649
LR-219	15°06'59.05005"	76°30'42.51299"	1671759.757	662458.917
LR-220	15°06'59.28633"	76°30'41.89309"	1671766.891	662440.359
LR-221	15°06'59.52162"	76°30'41.27083"	1671773.995	662421.731
LR-222	15°06'59.76645"	76°30'40.64921"	1671781.391	662403.12
LR-223	15°07'00.00836"	76°30'40.02324"	1671788.697	662384.38
LR-224	15°07'00.24474"	76°30'39.34198"	1671795.822	662363.99
LR-225	15°07'00.48774"	76°30'38.78205"	1671803.175	662347.222
LR-226	15°07'00.72659"	76°30'38.15547"	1671810.449	662328.464
LR-227	15°07'00.96763"	76°30'37.53701"	1671817.668	662309.949
LR-228	15°07'01.20732"	76°30'36.91317"	1671824.906	662291.273
LR-229	15°07'01.44762"	76°30'36.29057"	1671832.164	662272.634
LR-230	15°07'01.68418"	76°30'35.67027"	1671839.306	662254.064
LR-231	15°07'01.92666"	76°30'35.04456"	1671846.63	662235.332
LR-232	15°07'02.16659"	76°30'34.42329"	1671853.877	662216.732
LR-233	15°07'02.40801"	76°30'33.79893"	1671861.168	662198.041
LR-234	15°07'02.64829"	76°30'33.17733"	1671868.425	662179.431
LR-235	15°07'02.88721"	76°30'32.55638"	1671875.64	662160.842
LR-236	15°07'03.12872"	76°30'31.93290"	1671882.935	662142.176
LR-237	15°07'03.37145"	76°30'31.31147"	1671890.267	662123.572
LR-238	15°07'03.61066"	76°30'30.68919"	1671897.491	662104.943
LR-239	15°07'03.81590"	76°30'30.15975"	1671903.69	662089.093
LR-240	15°07'03.36280"	76°30'29.96185"	1671889.725	662083.28
LR-241	15°06'55.94330"	76°30'47.64392"	1671665.332	662612.764
LR-242	15°06'55.63302"	76°30'48.44200"	1671655.96	662636.657
LR-243	15°06'55.16778"	76°30'48.91678"	1671641.759	662650.931
LR-244	15°06'54.70695"	76°30'49.38627"	1671627.693	662665.045
LR-245	15°06'54.24592"	76°30'49.85884"	1671613.622	662679.252
LR-246	15°06'53.83683"	76°30'50.27863"	1671601.135	662691.872

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Karnataka State Industries Corporation Limited

LR-247	15°06'53.53499"	76°30'50.86844"	1671591.98	662709.546
LR-248	15°06'53.23131"	76°30'51.46193"	1671582.769	662727.329
LR-249	15°06'52.93013"	76°30'52.05781"	1671573.636	662745.184
LR-250	15°06'52.62511"	76°30'52.64821"	1671564.383	662762.876
LR-251	15°06'52.31490"	76°30'53.24190"	1671554.972	662780.667
LR-252	15°06'52.01862"	76°30'53.83669"	1671545.989	662798.488
LR-253	15°06'51.72258"	76°30'54.42692"	1671537.012	662816.173
LR-254	15°06'51.42449"	76°30'55.01827"	1671527.972	662833.891
LR-255	15°06'51.09339"	76°30'55.61173"	1671517.919	662851.68
LR-256	15°06'50.77075"	76°30'56.19214"	1671508.123	662869.077
LR-257	15°06'50.44057"	76°30'56.77122"	1671498.094	662886.436
LR-258	15°06'50.11260"	76°30'57.34503"	1671488.133	662903.638
LR-259	15°06'49.78652"	76°30'57.92108"	1671478.23	662920.906
LR-260	15°06'49.42253"	76°30'58.47807"	1671467.158	662937.613
LR-261	15°06'49.02350"	76°30'59.01310"	1671455.005	662953.672
LR-262	15°06'48.63301"	76°30'59.54943"	1671443.115	662969.767
LR-263	15°06'48.27197"	76°31'00.08683"	1671432.13	662985.889
LR-264	15°06'48.07636"	76°31'00.32832"	1671426.168	662993.141
LR-265	15°06'47.94074"	76°31'00.97584"	1671422.133	663012.502
LR-266	15°06'47.76872"	76°31'01.63101"	1671416.982	663032.099
LR-267	15°06'47.60090"	76°31'02.39337"	1671411.981	663054.897
LR-268	15°06'47.37770"	76°31'01.76189"	1671404.991	663036.09
LR-269	15°06'46.95917"	76°31'01.26874"	1671392.027	663021.455
LR-270	15°06'46.63588"	76°31'02.96526"	1671382.029	663012.463
LR-271	15°06'46.31389"	76°31'02.95866"	1671372.132	663012.334
LR-272	15°06'45.85568"	76°31'01.42426"	1671358.145	663026.333
LR-273	15°06'45.66148"	76°31'01.60004"	1671352.213	663031.622
LR-274	15°06'45.00804"	76°31'01.54740"	1671332.12	663030.189
LR-275	15°06'44.35767"	76°31'01.47180"	1671312.117	663028.07
LR-276	15°06'43.74126"	76°31'01.35282"	1671293.148	663024.648
LR-277	15°06'43.08811"	76°31'01.22342"	1671273.048	663020.923
LR-278	15°06'42.44117"	76°31'01.10475"	1671253.141	663017.518
LR-279	15°06'41.82375"	76°31'00.99918"	1671234.144	663014.497
LR-280	15°06'41.43412"	76°31'00.93634"	1671222.156	663012.703
LR-281	15°06'40.81417"	76°31'01.19148"	1671203.156	663020.452
LR-282	15°06'40.22513"	76°31'01.44818"	1671185.106	663028.242
LR-283	15°06'39.60633"	76°31'01.70475"	1671166.141	663036.033
LR-284	15°06'39.01745"	76°31'01.96086"	1671148.096	663043.805
LR-285	15°06'38.42984"	76°31'02.25985"	1671130.098	663052.857
LR-286	15°06'38.16965"	76°31'02.40475"	1671122.132	663057.238
LR-287	15°06'37.67848"	76°31'02.85756"	1671107.13	663070.867
LR-288	15°06'37.38447"	76°31'03.13363"	1671098.151	663079.166
LR-289	15°06'36.88999"	76°31'03.58465"	1671083.047	663092.738
LR-290	15°06'36.59292"	76°31'04.17539"	1671074.039	663110.438
LR-291	15°06'36.26501"	76°31'04.76531"	1671064.083	663128.121
LR-292	15°06'35.63587"	76°31'05.93779"	1671044.989	663163.262
LR-293	15°06'35.40333"	76°31'06.55484"	1671037.97	663181.734
LR-294	15°06'35.07512"	76°31'07.14468"	1671028.005	663199.415
LR-295	15°06'34.71260"	76°31'07.68361"	1671016.975	663215.583

GENERAL MANAGER (LEE)
Karnataka State Industrial Investment Limited

Karnataka State Minerals Corporation Limited

Thimmappanagudi Iron Ore Mine,ML.NO.2605

Service Road DGPS Reading of Right Side

Point ID	Latitude (Local)	Longitude (Local)	Northing	Easting
RR-1	15°07'59.33602"	76°31'46.84656"	1673625.843	664366.758
RR-2	15°07'59.07014"	76°31'47.45575"	1673617.798	664385.001
RR-3	15°07'58.76724"	76°31'47.77971"	1673608.556	664394.737
RR-4	15°07'58.45941"	76°31'47.74625"	1673599.089	664393.804
RR-5	15°07'58.22397"	76°31'47.43725"	1673591.788	664384.63
RR-6	15°07'58.33914"	76°31'46.77702"	1673595.191	664364.895
RR-7	15°07'58.45078"	76°31'46.11552"	1673598.484	664345.123
RR-8	15°07'58.50392"	76°31'45.74824"	1673600.041	664334.147
RR-9	15°07'57.73704"	76°31'45.89898"	1673576.503	664338.811
RR-10	15°07'57.49397"	76°31'46.51953"	1673569.162	664357.389
RR-11	15°07'57.42271"	76°31'46.68953"	1673567.008	664362.479
RR-12	15°07'57.24319"	76°31'46.79167"	1673561.512	664365.567
RR-13	15°07'57.01055"	76°31'46.78469"	1673554.36	664365.409
RR-14	15°07'56.81738"	76°31'46.64711"	1673548.395	664361.343
RR-15	15°07'56.73337"	76°31'46.34617"	1673545.75	664352.376
RR-16	15°07'56.77326"	76°31'45.68085"	1673546.838	664332.505
RR-17	15°07'56.65844"	76°31'45.02081"	1673543.172	664312.825
RR-18	15°07'56.53363"	76°31'44.36640"	1673539.2	664293.315
RR-19	15°07'56.41869"	76°31'43.76446"	1673535.542	664275.37
RR-20	15°07'56.27402"	76°31'43.63060"	1673531.068	664271.404
RR-21	15°07'56.23762"	76°31'44.29491"	1673530.087	664291.244
RR-22	15°07'56.18977"	76°31'44.96721"	1673528.757	664311.325
RR-23	15°07'56.17410"	76°31'45.21785"	1673528.327	664318.811
RR-24	15°07'55.98436"	76°31'45.54608"	1673522.564	664328.651
RR-25	15°07'55.59117"	76°31'45.58244"	1673510.488	664329.821
RR-26	15°07'55.35927"	76°31'45.28181"	1673503.298	664320.895
RR-27	15°07'55.31257"	76°31'44.61350"	1673501.724	664300.954
RR-28	15°07'55.19047"	76°31'43.95657"	1673497.835	664281.368
RR-29	15°07'55.06922"	76°31'43.29800"	1673493.972	664261.733
RR-30	15°07'54.94969"	76°31'42.64162"	1673490.161	664242.163
RR-31	15°07'54.88912"	76°31'42.30930"	1673488.231	664232.255
RR-32	15°07'54.40270"	76°31'41.84770"	1673473.185	664218.578
RR-33	15°07'54.29491"	76°31'42.51198"	1673470.011	664238.433
RR-34	15°07'54.18332"	76°31'43.16702"	1673466.717	664258.012
RR-35	15°07'54.02242"	76°31'43.39680"	1673461.82	664264.907
RR-36	15°07'53.77020"	76°31'43.47313"	1673454.085	664267.239
RR-37	15°07'53.47227"	76°31'43.36429"	1673444.906	664264.054
RR-38	15°07'53.34116"	76°31'43.04506"	1673440.81	664254.551
RR-39	15°07'53.32139"	76°31'42.37409"	1673440.063	664234.524
RR-40	15°07'53.28824"	76°31'41.70897"	1673438.905	664214.675
RR-41	15°07'53.22397"	76°31'41.03318"	1673436.79	664194.514
RR-42	15°07'53.18949"	76°31'40.69123"	1673435.659	664184.312
RR-43	15°07'53.02134"	76°31'40.52991"	1673430.458	664179.532
RR-44	15°07'52.93777"	76°31'41.19499"	1673428.028	664199.405
RR-45	15°07'52.89894"	76°31'41.86310"	1673426.973	664219.36

GENERAL MANAGER (LEE)
Karnataka State Minerals Corporation Limited

RR-46	15°07'52.87598"	76°31'42.31586"	1673426.361	664232.881
RR-47	15°07'52.75682"	76°31'42.57171"	1673422.753	664240.545
RR-48	15°07'52.47557"	76°31'42.68750"	1673414.133	664244.062
RR-49	15°07'52.24234"	76°31'42.63280"	1673406.954	664242.479
RR-50	15°07'52.09152"	76°31'42.45065"	1673402.28	664237.073
RR-51	15°07'52.15764"	76°31'43.11701"	1673404.451	664256.953
RR-52	15°07'52.17425"	76°31'43.42575"	1673405.026	664266.166
RR-53	15°07'52.04381"	76°31'43.63426"	1673401.06	664272.419
RR-54	15°07'51.87972"	76°31'43.71559"	1673396.034	664274.883
RR-55	15°07'51.71792"	76°31'43.74963"	1673391.069	664275.933
RR-56	15°07'51.45998"	76°31'43.66410"	1673383.123	664273.435
RR-57	15°07'51.13523"	76°31'43.08182"	1673373.022	664256.121
RR-58	15°07'50.81343"	76°31'42.49830"	1673363.01	664238.77
RR-59	15°07'50.49450"	76°31'41.91613"	1673353.088	664221.457
RR-60	15°07'50.30457"	76°31'41.27730"	1673347.118	664202.426
RR-61	15°07'50.27345"	76°31'40.61243"	1673346.023	664182.584
RR-62	15°07'50.37624"	76°31'39.95160"	1673349.045	664162.834
RR-63	15°07'50.54227"	76°31'39.29966"	1673354.012	664143.335
RR-64	15°07'50.51534"	76°31'38.99601"	1673353.121	664134.275
RR-65	15°07'49.89547"	76°31'38.72300"	1673334.014	664126.257
RR-66	15°07'49.27734"	76°31'38.54840"	1673314.98	664121.177
RR-67	15°07'48.66105"	76°31'38.35415"	1673295.999	664115.51
RR-68	15°07'48.07938"	76°31'38.03842"	1673278.057	664106.208
RR-69	15°07'47.62458"	76°31'37.55022"	1673263.978	664091.731
RR-70	15°07'47.40234"	76°31'37.08695"	1673257.052	664077.947
RR-71	15°07'47.26677"	76°31'36.33908"	1673252.73	664055.649
RR-72	15°07'47.27273"	76°31'35.66728"	1673252.774	664035.592
RR-73	15°07'47.30433"	76°31'35.04542"	1673253.616	664017.02
RR-74	15°07'46.94590"	76°31'35.59123"	1673242.713	664033.391
RR-75	15°07'46.55067"	76°31'36.16997"	1673230.687	664050.754
RR-76	15°07'46.12175"	76°31'36.76684"	1673217.629	664068.665
RR-77	15°07'45.74596"	76°31'37.42037"	1673206.215	664088.256
RR-78	15°07'45.59278"	76°31'37.97373"	1673201.622	664104.809
RR-79	15°07'45.62573"	76°31'38.63401"	1673202.772	664124.514
RR-80	15°07'45.65815"	76°31'39.05255"	1673203.856	664137.002
RR-81	15°07'45.49056"	76°31'39.52923"	1673198.804	664151.269
RR-82	15°07'44.93474"	76°31'39.60279"	1673181.737	664153.584
RR-83	15°07'44.61105"	76°31'39.09995"	1673171.685	664138.641
RR-84	15°07'44.45349"	76°31'38.44553"	1673166.706	664119.138
RR-85	15°07'44.29677"	76°31'37.79580"	1673161.755	664099.774
RR-86	15°07'44.16838"	76°31'37.14079"	1673157.673	664080.246
RR-87	15°07'44.13860"	76°31'36.93118"	1673156.714	664073.995
RR-88	15°07'44.07339"	76°31'37.16990"	1673154.759	664081.136
RR-89	15°07'44.03403"	76°31'37.83326"	1673153.687	664100.948
RR-90	15°07'43.96517"	76°31'38.50174"	1673151.71	664120.92
RR-91	15°07'43.93016"	76°31'39.17108"	1673150.773	664140.91
RR-92	15°07'43.82854"	76°31'39.83221"	1673147.788	664160.67
RR-93	15°07'43.79526"	76°31'40.13920"	1673146.828	664169.842
RR-94	15°07'43.53562"	76°31'40.32200"	1673138.887	664175.355
RR-95	15°07'43.11276"	76°31'40.26783"	1673125.88	664173.828

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RR-96	15°07'42.88483"	76°31'39.85103"	1673118.788	664161.434
RR-97	15°07'42.75922"	76°31'39.19267"	1673114.791	664141.806
RR-98	15°07'42.63619"	76°31'38.53500"	1673110.873	664122.197
RR-99	15°07'42.44299"	76°31'37.89393"	1673104.802	664103.1
RR-100	15°07'42.05657"	76°31'37.34843"	1673092.813	664086.897
RR-101	15°07'41.50778"	76°31'37.01044"	1673075.877	664076.924
RR-102	15°07'40.87639"	76°31'36.85062"	1673056.439	664072.287
RR-103	15°07'40.22704"	76°31'36.79672"	1673036.471	664070.817
RR-104	15°07'39.57818"	76°31'36.74809"	1673016.519	664069.504
RR-105	15°07'38.93093"	76°31'36.69839"	1672996.617	664068.158
RR-106	15°07'38.27753"	76°31'36.61164"	1672976.518	664065.708
RR-107	15°07'37.63493"	76°31'36.58924"	1672956.764	664065.177
RR-108	15°07'37.01638"	76°31'36.37499"	1672937.709	664058.913
RR-109	15°07'36.46435"	76°31'35.89330"	1672920.643	664044.65
RR-110	15°07'36.11483"	76°31'35.19196"	1672909.756	664023.786
RR-111	15°07'35.81558"	76°31'34.59737"	1672900.435	664006.099
RR-112	15°07'35.52338"	76°31'33.99909"	1672891.331	663988.3
RR-113	15°07'35.24459"	76°31'33.39409"	1672882.638	663970.298
RR-114	15°07'35.05126"	76°31'32.97088"	1672876.608	663957.704
RR-115	15°07'34.78754"	76°31'33.12258"	1672868.534	663962.289
RR-116	15°07'35.02974"	76°31'33.58602"	1672876.074	663976.073
RR-117	15°07'35.08094"	76°31'34.25491"	1672877.787	663996.032
RR-118	15°07'35.09969"	76°31'34.48272"	1672878.41	664002.829
RR-119	15°07'34.96339"	76°31'34.94217"	1672874.317	664016.575
RR-120	15°07'34.74459"	76°31'35.08065"	1672867.621	664020.756
RR-121	15°07'34.38144"	76°31'35.05237"	1672856.454	664019.99
RR-122	15°07'34.10326"	76°31'34.96539"	1672847.887	664017.452
RR-123	15°07'33.90155"	76°31'34.32833"	1672841.555	663998.476
RR-124	15°07'33.69697"	76°31'33.69416"	1672835.136	663979.587
RR-125	15°07'33.50672"	76°31'33.05172"	1672829.156	663960.447
RR-126	15°07'33.40653"	76°31'32.92361"	1672826.05	663956.644
RR-127	15°07'33.45885"	76°31'33.59409"	1672827.797	663976.65
RR-128	15°07'33.48597"	76°31'34.26493"	1672828.77	663996.672
RR-129	15°07'33.50282"	76°31'34.67429"	1672829.373	664008.89
RR-130	15°07'33.27089"	76°31'34.96351"	1672822.305	664017.574
RR-131	15°07'32.63568"	76°31'34.74292"	1672802.737	664011.124
RR-132	15°07'32.43801"	76°31'34.10585"	1672796.53	663992.146
RR-133	15°07'32.24199"	76°31'33.46581"	1672790.373	663973.08
RR-134	15°07'32.04525"	76°31'32.99757"	1672784.229	663959.143
RR-135	15°07'31.83673"	76°31'33.63339"	1672777.952	663978.17
RR-136	15°07'31.63406"	76°31'34.26734"	1672771.855	663997.14
RR-137	15°07'31.45429"	76°31'34.81695"	1672766.445	664013.587
RR-138	15°07'30.98489"	76°31'35.45199"	1672752.15	664032.646
RR-139	15°07'30.37666"	76°31'35.83326"	1672733.536	664044.159
RR-140	15°07'29.72828"	76°31'35.78596"	1672713.6	664042.885
RR-141	15°07'29.07752"	76°31'35.74103"	1672693.59	664041.683
RR-142	15°07'28.43067"	76°31'35.69113"	1672673.7	664040.331
RR-143	15°07'27.78194"	76°31'35.64668"	1672653.793	664039.143
RR-144	15°07'27.13366"	76°31'35.59925"	1672633.82	664037.865
RR-145	15°07'26.48215"	76°31'35.55132"	1672613.787	664036.574

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RR-146	15°07'25.84000"	76°31'35.49955"	1672594.041	664035.165
RR-147	15°07'25.18887"	76°31'35.45066"	1672574.019	664033.845
RR-148	15°07'24.53769"	76°31'35.40471"	1672553.997	664032.612
RR-149	15°07'23.89108"	76°31'35.35564"	1672534.114	664031.285
RR-150	15°07'23.24061"	76°31'35.31077"	1672514.114	664030.085
RR-151	15°07'22.59223"	76°31'35.26280"	1672494.177	664028.791
RR-152	15°07'21.93354"	76°31'35.21485"	1672473.923	664027.5
RR-153	15°07'21.28442"	76°31'35.16603"	1672453.964	664026.181
RR-154	15°07'20.63319"	76°31'35.11109"	1672433.938	664024.68
RR-155	15°07'19.98276"	76°31'35.05000"	1672413.935	664022.995
RR-156	15°07'19.36519"	76°31'34.98752"	1672394.942	664021.262
RR-157	15°07'18.71652"	76°31'34.91948"	1672374.992	664019.369
RR-158	15°07'18.06561"	76°31'34.85574"	1672354.975	664017.605
RR-159	15°07'17.41585"	76°31'34.79203"	1672334.992	664015.842
RR-160	15°07'16.76568"	76°31'34.72594"	1672314.997	664014.008
RR-161	15°07'16.11591"	76°31'34.66317"	1672295.014	664012.272
RR-162	15°07'15.46413"	76°31'34.52818"	1672274.955	664008.381
RR-163	15°07'14.84660"	76°31'34.35790"	1672255.941	664003.43
RR-164	15°07'14.23226"	76°31'34.09900"	1672237.006	663995.831
RR-165	15°07'13.64731"	76°31'33.84978"	1672218.977	663988.516
RR-166	15°07'13.03119"	76°31'33.59587"	1672199.989	663981.066
RR-167	15°07'12.44619"	76°31'33.33997"	1672181.957	663973.551
RR-168	15°07'11.82981"	76°31'33.08060"	1672162.96	663965.939
RR-169	15°07'11.24587"	76°31'32.77546"	1672144.95	663956.954
RR-170	15°07'10.69675"	76°31'32.46273"	1672128.009	663947.734
RR-171	15°07'10.11248"	76°31'32.15498"	1672109.989	663938.671
RR-172	15°07'09.52949"	76°31'31.84258"	1672092.007	663929.468
RR-173	15°07'08.94633"	76°31'31.53009"	1672074.02	663920.263
RR-174	15°07'08.39451"	76°31'31.22193"	1672056.996	663911.181
RR-175	15°07'07.81215"	76°31'30.90955"	1672039.034	663901.979
RR-176	15°07'07.23079"	76°31'30.59752"	1672021.102	663892.787
RR-177	15°07'06.64229"	76°31'30.28339"	1672002.95	663883.534
RR-178	15°07'06.06172"	76°31'29.97691"	1671985.044	663874.507
RR-179	15°07'05.47820"	76°31'29.64866"	1671957.043	663864.832
RR-180	15°07'04.92642"	76°31'29.35102"	1671950.023	663856.063
RR-181	15°07'04.34457"	76°31'29.04195"	1671932.077	663846.96
RR-182	15°07'03.76074"	76°31'28.72388"	1671914.058	663837.588
RR-183	15°07'03.21033"	76°31'28.40391"	1671897.085	663828.153
RR-184	15°07'02.62625"	76°31'28.08536"	1671879.069	663818.766
RR-185	15°07'02.04363"	76°31'27.76597"	1671861.097	663809.355
RR-186	15°07'01.45236"	76°31'27.49039"	1671842.868	663801.253
RR-187	15°07'00.90523"	76°31'27.12890"	1671825.978	663790.577
RR-188	15°07'00.35542"	76°31'26.81004"	1671809.015	663781.175
RR-189	15°06'59.80482"	76°31'26.43586"	1671792.016	663770.121
RR-190	15°06'59.28651"	76°31'26.04066"	1671776.004	663758.432
RR-191	15°06'58.73802"	76°31'25.64449"	1671759.065	663746.721
RR-192	15°06'58.25159"	76°31'25.22550"	1671744.029	663734.315
RR-193	15°06'57.99551"	76°31'25.00264"	1671736.113	663727.716
RR-194	15°06'57.83386"	76°31'24.63482"	1671731.068	663716.769
RR-195	15°06'57.83957"	76°31'24.16749"	1671731.147	663702.815

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RR-196	15°06'57.06348"	76°31'23.30085"	1671707.116	663677.106
RR-197	15°06'56.50786"	76°31'23.64152"	1671690.111	663687.395
RR-198	15°06'55.95130"	76°31'23.99409"	1671673.079	663698.04
RR-199	15°06'55.39764"	76°31'24.35382"	1671656.137	663708.898
RR-200	15°06'54.93944"	76°31'24.44184"	1671642.074	663711.624
RR-201	15°06'54.71400"	76°31'23.97436"	1671635.048	663697.715
RR-202	15°06'54.74703"	76°31'23.61895"	1671635.99	663687.096
RR-203	15°06'54.97174"	76°31'22.98957"	1671642.766	663668.257
RR-204	15°06'55.19416"	76°31'22.35995"	1671649.471	663649.412
RR-205	15°06'55.24187"	76°31'22.22593"	1671650.91	663645.4
RR-206	15°06'55.00660"	76°31'21.60149"	1671643.55	663626.807
RR-207	15°06'54.77725"	76°31'20.97564"	1671636.372	663608.171
RR-208	15°06'54.50249"	76°31'20.36847"	1671627.802	663590.101
RR-209	15°06'54.22830"	76°31'19.76680"	1671619.25	663572.196
RR-210	15°06'54.10994"	76°31'19.49982"	1671615.558	663564.25
RR-211	15°06'54.11312"	76°31'18.83308"	1671615.518	663544.343
RR-212	15°06'54.11071"	76°31'18.58799"	1671615.393	663537.026
RR-213	15°06'54.53711"	76°31'17.85551"	1671628.346	663515.066
RR-214	15°06'54.63852"	76°31'17.40134"	1671631.368	663501.485
RR-215	15°06'54.56585"	76°31'16.87541"	1671629.026	663485.798
RR-216	15°06'54.20251"	76°31'16.32111"	1671617.745	663469.326
RR-217	15°06'53.93914"	76°31'15.87274"	1671609.558	663455.995
RR-218	15°06'53.21696"	76°30'57.80285"	1671583.634	662916.648
RR-219	15°06'53.29215"	76°30'57.22553"	1671585.826	662899.396
RR-220	15°06'53.37847"	76°30'56.56183"	1671588.342	662879.562
RR-221	15°06'53.46524"	76°30'55.89557"	1671590.872	662859.652
RR-222	15°06'53.69341"	76°30'55.26850"	1671597.755	662840.881
RR-223	15°06'53.92880"	76°30'54.64648"	1671604.861	662822.26
RR-224	15°06'54.15901"	76°30'54.01784"	1671611.806	662803.443
RR-225	15°06'54.39509"	76°30'53.39409"	1671618.934	662784.77
RR-226	15°06'54.62970"	76°30'52.76752"	1671626.015	662766.013
RR-227	15°06'54.86540"	76°30'52.14542"	1671633.131	662747.389
RR-228	15°06'55.09857"	76°30'51.52073"	1671640.168	662728.689
RR-229	15°06'55.33148"	76°30'50.89688"	1671647.198	662710.014
RR-230	15°06'55.56854"	76°30'50.27345"	1671654.355	662691.351
RR-231	15°06'55.80221"	76°30'49.64625"	1671661.408	662672.575
RR-232	15°06'56.03677"	76°30'49.02169"	1671668.488	662653.879
RR-233	15°06'56.27104"	76°30'48.39780"	1671675.559	662635.202
RR-234	15°06'56.46887"	76°30'47.86408"	1671681.529	662619.226
RR-235	15°06'56.40000"	76°30'47.83559"	1671679.407	662618.389
RR-236	15°06'56.15736"	76°30'48.45567"	1671672.077	662636.954
RR-237	15°06'56.05875"	76°30'48.70645"	1671669.098	662644.462
RR-238	15°06'55.60025"	76°30'49.18278"	1671655.105	662658.781
RR-239	15°06'55.13553"	76°30'49.65178"	1671640.919	662672.882
RR-240	15°06'54.66723"	76°30'50.11854"	1671626.623	662686.916
RR-241	15°06'54.27240"	76°30'50.51177"	1671614.57	662698.74
RR-242	15°06'53.97025"	76°30'51.10671"	1671605.406	662716.567
RR-243	15°06'53.66821"	76°30'51.69998"	1671596.246	662734.344
RR-244	15°06'53.36633"	76°30'52.29216"	1671587.09	662752.088
RR-245	15°06'53.06357"	76°30'52.88420"	1671577.907	662769.828

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RR-246	15°06'52.76107"	76°30'53.47714"	1671568.732	662787.595
RR-247	15°06'52.45820"	76°30'54.06952"	1671559.546	662805.346
RR-248	15°06'52.15528"	76°30'54.66325"	1671550.359	662823.137
RR-249	15°06'51.85113"	76°30'55.25553"	1671541.133	662840.884
RR-250	15°06'51.54562"	76°30'55.84730"	1671531.866	662858.617
RR-251	15°06'51.21012"	76°30'56.41994"	1671521.673	662875.786
RR-252	15°06'50.89699"	76°30'57.00072"	1671512.169	662893.192
RR-253	15°06'50.53398"	76°30'57.57276"	1671501.13	662910.348
RR-254	15°06'50.20524"	76°30'58.14990"	1671491.146	662927.649
RR-255	15°06'49.87403"	76°30'58.71188"	1671481.083	662944.498
RR-256	15°06'49.48183"	76°30'59.25105"	1671469.14	662960.679
RR-257	15°06'49.08640"	76°30'59.78475"	1671457.097	662976.697
RR-258	15°06'48.69290"	76°31'00.32379"	1671445.115	662992.874
RR-259	15°06'48.52711"	76°31'00.55966"	1671440.068	662999.952
RR-260	15°06'48.35971"	76°31'01.21401"	1671435.059	663019.524
RR-261	15°06'48.22386"	76°31'01.86427"	1671431.018	663038.967
RR-262	15°06'48.09071"	76°31'02.51697"	1671427.06	663058.483
RR-263	15°06'47.98810"	76°31'02.93803"	1671423.993	663071.076
RR-264	15°06'47.82572"	76°31'03.11868"	1671419.04	663076.504
RR-265	15°06'47.36867"	76°31'03.07280"	1671404.984	663075.231
RR-266	15°06'47.11418"	76°31'02.44966"	1671397.034	663056.68
RR-267	15°06'46.95624"	76°31'01.97493"	1671392.082	663042.54
RR-268	15°06'46.47241"	76°31'01.43927"	1671377.102	663026.65
RR-269	15°06'46.04555"	76°31'01.93242"	1671364.086	663041.464
RR-270	15°06'45.95110"	76°31'02.03808"	1671361.205	663044.639
RR-271	15°06'45.29708"	76°31'02.08743"	1671341.114	663046.251
RR-272	15°06'44.64526"	76°31'02.01823"	1671321.068	663044.323
RR-273	15°06'43.99605"	76°31'01.90674"	1671301.093	663041.133
RR-274	15°06'43.34574"	76°31'01.78983"	1671281.082	663037.78
RR-275	15°06'42.72752"	76°31'01.67100"	1671262.058	663034.363
RR-276	15°06'42.07832"	76°31'01.55687"	1671242.083	663031.093
RR-277	15°06'41.42817"	76°31'01.43973"	1671222.077	663027.734
RR-278	15°06'40.84118"	76°31'01.70726"	1671204.092	663035.846
RR-279	15°06'40.25409"	76°31'01.97364"	1671186.104	663043.924
RR-280	15°06'39.66598"	76°31'02.24054"	1671168.085	663052.018
RR-281	15°06'39.04499"	76°31'02.50607"	1671149.055	663060.077
RR-282	15°06'38.49029"	76°31'02.76392"	1671132.06	663067.894
RR-283	15°06'37.99907"	76°31'03.20860"	1671117.055	663081.275
RR-284	15°06'37.50919"	76°31'03.66072"	1671102.093	663094.877
RR-285	15°06'37.31186"	76°31'03.84026"	1671096.065	663100.28
RR-286	15°06'37.01433"	76°31'04.43147"	1671087.043	663117.995
RR-287	15°06'36.71646"	76°31'05.02113"	1671078.01	663135.663
RR-288	15°06'36.38736"	76°31'05.61025"	1671068.017	663153.323
RR-289	15°06'36.08922"	76°31'06.20199"	1671058.977	663171.053
RR-290	15°06'35.79061"	76°31'06.79210"	1671049.921	663188.736
RR-291	15°06'35.49566"	76°31'07.38629"	1671040.979	663206.539
RR-292	15°06'35.10262"	76°31'07.96412"	1671029.019	663223.875
RR-293	15°06'34.93734"	76°31'08.27275"	1671024.003	663233.125

GENERAL MANAGER (LEE)
Karnataka State Minerals Corporation Limited

Karnataka State Minerals Corporation Limited

Thimmappanagudi Iron Ore Mine,ML.NO.2605

Stock Yard DGPS Readings

Point ID	Latitude (Local)	Longitude (Local)	Northing	Easting
A	15°06'56.91205"	76°30'40.03576"	1671693.541	662385.409
B	15°07'00.47485"	76°30'41.73670"	1671803.386	662435.438
C	15°06'58.37328"	76°30'49.12056"	1671740.316	662656.336
NEB568	15°06'51.66313"	76°30'46.03279"	1671533.458	662565.567
NEB570	15°06'54.01572"	76°30'42.83403"	1671605.103	662469.567
NEB571	15°06'55.19485"	76°30'42.37151"	1671641.246	662455.508
NEB572	15°06'56.51826"	76°30'40.92866"	1671681.622	662412.15

GENERAL MANAGER (LEE)
Karnataka State Minerals Corporation Limited
BMTC, [illegible], Bangalore-560 027

Annexure-3: Abstract of Tree Enumeration by RFO Sandur North

ABSTRACT

Tree Enumeration [illegible] Proposed Conveyor Belt & Stock Yard M/s Karnataka State Minerals Corp [illegible] Limited, Thimmappanagudi Iron Ore Mine, ML No.2605

Sl No	Local Name	Botanical Name	Girth in cm				
			Up to 40 cm	41-60 cm	61-80 cm	Above 81 cm	Grand Total
1	Aligilli	*Wrightia tinctoria*	5	-	-	-	5
2	Anjali Mara	*Jungal wood*	3	-	-	-	3
3	Arali Mara	*Ficus religiosa*	-	-	-	1	1
4	Bargi	*Ziziphus oenoplia*	5	-	-	-	5
5	Basiri	*Ficus racemosa*	11	3	-	5	19
6	Bevu	*Azadirchta indica*	27	22	7	22	78
7	Bhage	*Albizzia lebbeck*	7	2	-	-	9
8	Budure	*Terminalia tomentosa*	233	20	3	2	258
9	Buta	*Excoecaria agalloch*	1	-	-	-	1
10	Chennagi	*Lagerstromia paviflora*	29	-	-	-	29
11	Dhupa	*Boswellia serrata*	2	2	18	17	39
12	Dindal	*Anogeissus latifolia*	373	21	4	-	398
13	Haasina	Hardwickia bianata	3	1	-	-	4
14	Halasina Mara	*Artocarpus Heterophyllus*	1	-	-	1	2
15	Hippe	*Bassia Latifolia*	18	5	-	1	24
16	Honne	*Pterocarpus marsupium*	16	10	2	-	28
17	Hunase	*Tamarindus indica*	1	1	2	-	4
18	Jani	*Grewia tilliaefolia*	48	5	1	-	54
19	Kad Bende	Tetrameles nudiflora	-	2	-	-	2
20	Kad Bikke	*Gardenia latifolia*	2	-	-	-	2
21	Kadu Bende	*Kydia Calycana*	-	-	2	-	2
22	Kakke	*Cassia fistula*	21	2	-	-	23
23	Kamara	*Hardwickia bianata*	6	4	2	1	13
24	Kodale	*Diospyros melanoxylon*	1	3	1	-	5
25	Kothambari	*Jungal wood*	8	-	-	-	8
26	Madakari mara		-	1	-	-	1
27	Maddi	Boswellia serrata	21	5	2	-	28
28	Masivala	*Chloroxylon swietenia*	11	5	1	-	17
29	Marthi	*Terminalia tomentosa*	137	66	5	-	208
30	Mutthie	*Terminalia ellietica*	7	-	-	-	7
31	Nelli	*Embilica officinalis*	17	2	-	-	19
32	Nooli	*Alstonia scholaris*	-	1	-	-	1
33	Pacchari	*Dalbergia paniculata*	10	3	-	-	13
34	Palike	*Givotia rottaleriformis*	5	6	3	12	26
35	Sagwani	Tectona grandis	69	5	-	1	75
36	Some	*Soymida febrifuga*	77	5	3	4	89
37	Theraddhu	*Acacia catechu*	111	21	2	-	134
38	Thondarsi	*Gymnosporia montana*	2	-	-	-	2
39	Thumbre	*Diospyros melanoxylon*	17	3	6	-	26
40	Tugali	*Albizzia amara*	20	1	-	-	21
41	Uded	*Stereospermum chelonoides*	70	4	-	-	74
		TOTAL	1395	231	64	67	1757

GUARD
NAGAR BEAT
RANGE

[illegible] Range
[illegible] Section
[illegible] North Range

ಪಲಯ ಅರಣ್ಯಾಧಿಕಾರಿ
ಉತ್ತರ ವಲಯ
ಸಂಡೂರು

Assistant Conservator of Forest
Bellary Sub Division, Bellary

Annexure-4: R & R progress Report of KSMCL-TIOM

Karnataka State Minerals Corporation Limited **(Erstwhile: Mysore Minerals Limited)** **Thimmappanagudi Iron Ore Mines, ML.No.2605** **R&R Progress Report**						**Date:06.12.2025**
Dump Number	**Particulars of Work**	**Dimension in M**				**Remarks**
		Length in M3	**Width**		**Height**	
			Top	**Bottom**		
Engineering Measures for Encroached Area: (Inactive Dump-D1)	Foundation in hard soil mixed with boulders including hard rock. (Retention Wall)	344/400	2.5	2.5	0.5	As suggested by ICFRE, against 400 mtrs length 344 mtrs length completed. Remaining quantity not done due to thick Forest growth.(86%)
	Plain cement concrete (1:4:8)in foundation (Retention Wall)	344/400	2.5	2.5	0.10	
	Toe Wall RR dry (Retention Wall)	344/400	1.50	2.50	2.00	
	Garland Drain (GD-1)	350/900	Top width 2.00 mtr. Bottom width 1.00 mtr. Centre height 1.00 mtr			Out of 900 mtrs. length at present 350 mtrs length garland drain constructed both inside and outside of Retaining wall as per field condition.
	Plantation over waste dump area	0.82/1.74	Out of 1.74 Ha. Suggested,0.82 Ha. Completed			There is no free area available for plantation all virgin Forest land.
Engineering Measures for dump management (INACTIVE DUMP-D2)	Foundation in hard soil mixed with boulders including hard rock.	411/411	2.50	2.50	0.50	As suggested by ICFRE, 411 mtrs. length completed Retaining wall constructed .(100%)
	Plain cement concrete (1:4:8)in foundation	411/411	2.50	2.50	0.10	
	Toe Wall RR dry	411/411	1.50	2.50	2.00	
	Garland drain (1m bottom width, 2m top width and 1m deep in inclined chutes)	254/822	Top width 2.00 mtr. Bottom width 1.00 mtr. Centre height 1.00 mtr			Out of 822 mtrs. length at present 254 mtrs length garland drain constructed both inside and outside of Retaining wall as per field condition.
	Providing & fixing geo-textile on outer surface of slope of waste dump	1.78/1.78 Ha	1.78Ha			As suggested by ICFRE 1.78 Ha. Coir mating work completed.
	Plantation over waste dump area	4.78/17.75	4.78Ha.			As suggested by ICFRE out of 17.75 Ha, 4.78Ha. plantation work completed. For balance there is no free space available for plantation.

	Providing & fixing geo-textile on outer surface of slope of waste dump	2.0/2.0Ha	2.0 Ha			As suggested by ICFRE 2.0 Ha Coir mating work completed
Engineering Measures for dump management :(ACTIVE DUMP-D3)	Foundation in hard soil mixed with boulders including hard rock.(Retention Wall)	300/1320	3.00	3.00	1.00	According to site condition at present 300 mtrs Length Retaining wall constructed remaining length will be constructed concurrent mining work Since it is a Active dump
	Plain cement concrete (1:4:8)in foundation (Retention Wall)	300/1320	3.00	3.00	0.15	
	Toe Wall RR dry (Retention Wall)	300/1320	1.50	3.00	3.00	
	Garland drain (1m bottom width, 2m top width and 1m deep in inclined chutes)	220/9484	Top width 2.00 mtr Bottom width 1.00 mtr Centre height 1.00 mtr			At present 220 mtrs length garland drain in side of Retaining wall constructed according to site condition.
	Providing & fixing geo-textile on outer surface of slope of waste dump	1.94/10.70Ha.	1.94 Ha			As present 1.94 Ha. Coir mating work completed according to site condition.
	Plantation over waste dump area	1.94./10.70Ha.	1.94 Ha			At present 1.94 Plantation work completed for remaining portion dumping are is not available. Since it is a active dump.
Engineering Measures for dump management :(ACTIVE DUMP-D4)	Foundation in hard soil mixed with boulders including hard rock. (RW)	878/885	3.00	3.00	1.00	Total proposed 885Mtrs achieved 878Mtrs, remaining 7mtrs not done, due thick forest and steep ground elevation
	Plain cement concrete (1:4:8)in foundation (RW)	878/885	3.00	3.00	0.15	
	Toe Wall RR dry (RW)	878/885	1.50	3.00	3.00	
	Garland drain (1m bottom width, 2m top width and 1m deep in inclined chutes)	0/7444	–	–	–	GD in dump terraces, can be taken up only after completion of dumping in stages
	Garland drain (1m bottom width, 2m top width and 1m deep in all terraces)	370/370	Top width 2.00 mtr. Bottom width 1.00 mtr. Centre height 1.00 mtr			Out side 200 mtrs. completed and inside 170 mtrs. trenches is formed.
	Providing & fixing geo-textile on outer surface of slope of waste dump	0/18.95 Ha.	–	–	–	Since it is a active dump coir mating will be taken up only after the dump is inactive.
	Plantation over waste dump area	0/18.95 Ha.	–	–	–	Since it is a active dump Plantation work will be taken up only after the dump is inactive
Engineering Measures for Surface Water Management :(INACTIVE DUMP)	Gully Plug	24/34 No's	–	–	–	24 Nos. Gully Plugs constructed with various dimensions as per field conditions at outside the mine lease area.(71%)
	Masonry Check Dam (12Mtrs 7Nos & 15Mtrs 2Nos)	9/9 No's	–	–	–	As suggested by ICFRE in R & R plan 9 Nos. of Masonry Check Dams was constructed with various dimensions as per field conditions at outside the mine lease area.(100%)
	Rock fill Check Dam (10Mtrs 3Nos & 12Mtrs 5Nos)	8/8 No's	–	–	–	As suggested by ICFRE in R & R plan 8 Nos. of Rock fill Check Dams was constructed with various dimensions as per field conditions at outside the mine lease area.(100%)
	Settling tank	1/1No.	30.00	15.00	3.00	1No. Settling Tank constructed at inside the mine lease area as per field condition.
Afforestation	Avenue Plantation on roads	3.0Ha/3.0 Ha.				a) 2.0 Ha. Avenue plantation work completed as per field condition. b) 1.00Ha Avenue plantation on roads work done (area is completed. (100%))
	Afforestation of mined out area	0/95.69 Ha				This will be taken up after closure of mining at present backfilling work is under progress
	Mine pit Bench Plantation	0/48.70 Ha.				This will be taken up concurrent to mining.
	Developing green belt in safety zone	5.20 Ha/5.20 Ha.				As suggested by ICFRE in R & R plan 5.20 Ha. Of plantation work at safety zone area is completed. (100%)

7. PLATES

Plate-1 **Some images of mining area of KSMCL-TIOM**

KSMCL-TIOM Entrance gate

KSMCL-TIOM Entrance from main road

Thimmappana Gudi located in side of KSMCL-TIOM

KSMCL-TIOM road inside the lease area

Plate-2 **Awareness Program**

TB Awareness Camp in Mines

Swacchata Programme Awareness for Employees

Plate-3 **R & R images of KSMCL-TIOM**

Check dams of KSMCL-TIOM

Retention wall of KSMCL-TIOM

Plate-4 **R & R images of KSMCL-TIOM**

Plate-5 Soil & Moisture Conservation works by KSMCL- TIOM

Plate-6 **Settling Tank of KSMCL-TIOM**

Plate-7 **Nursery of KSMCL-TIOM**

Plate-8 **Plantation works of KSMCL-TIOM**

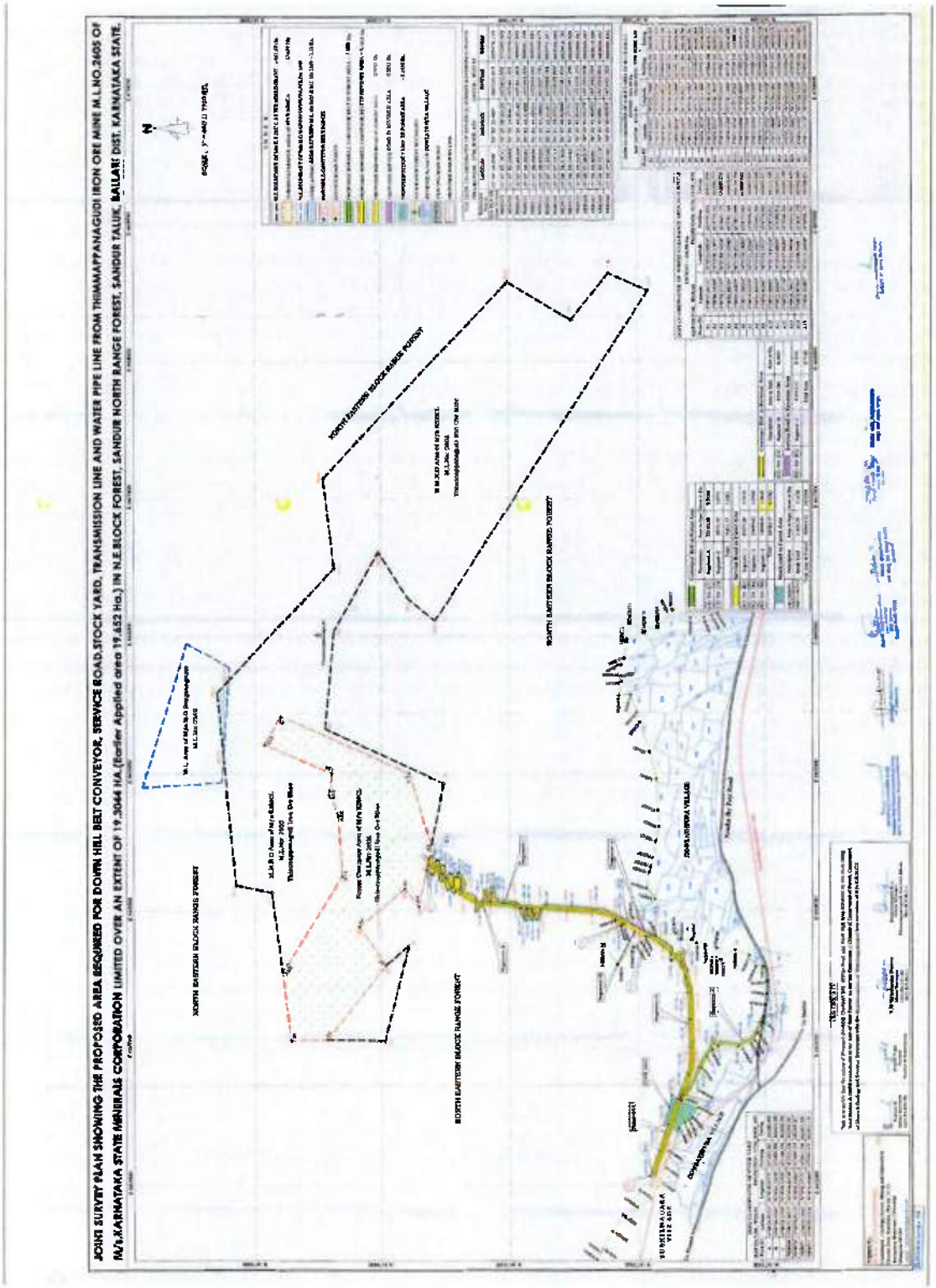
Plantation

Plate-9 Plantation works of KSMCL-TIOM

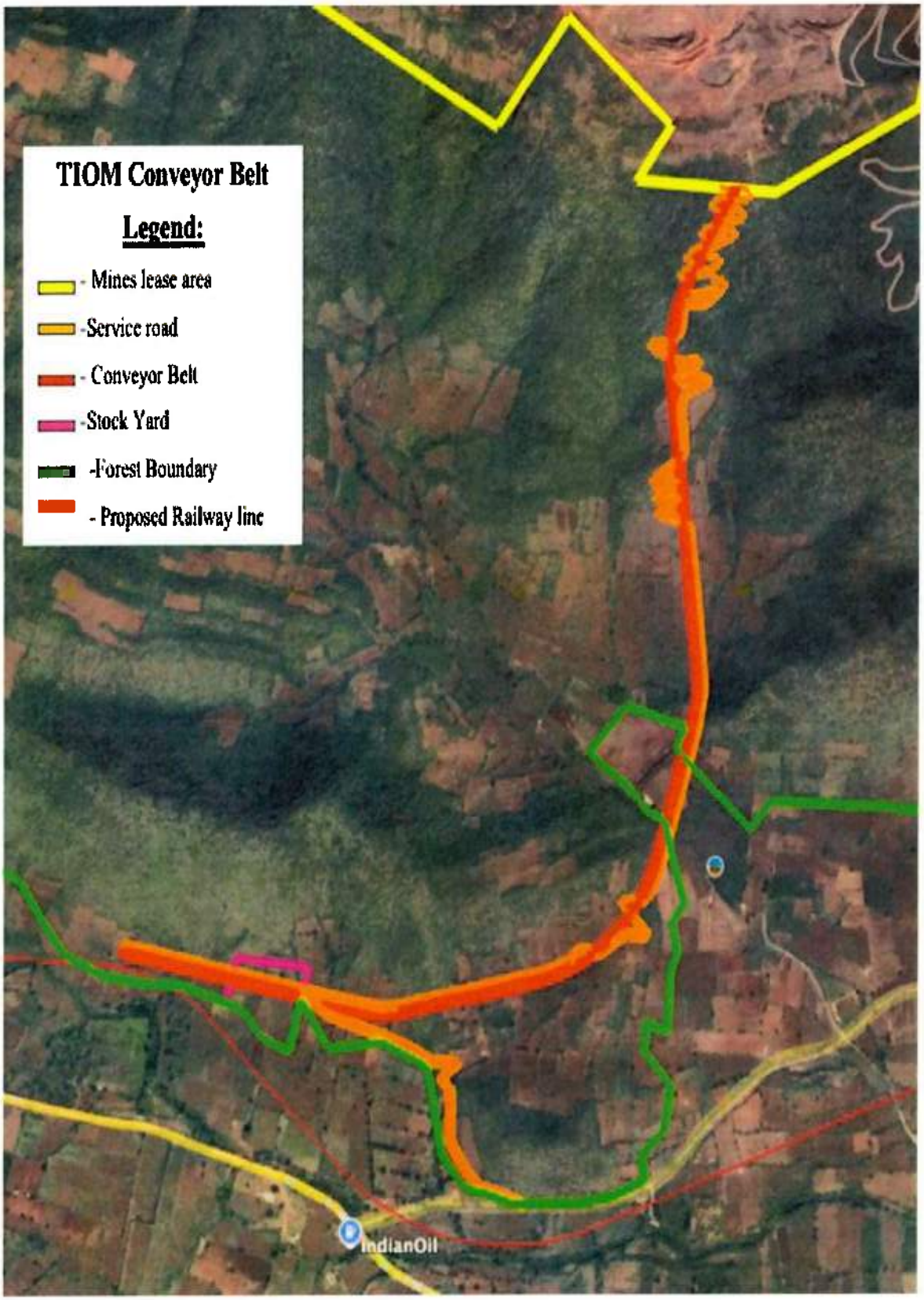
Plate-10 Sprinkling water on mining road to suppress dust

8. MAPS:

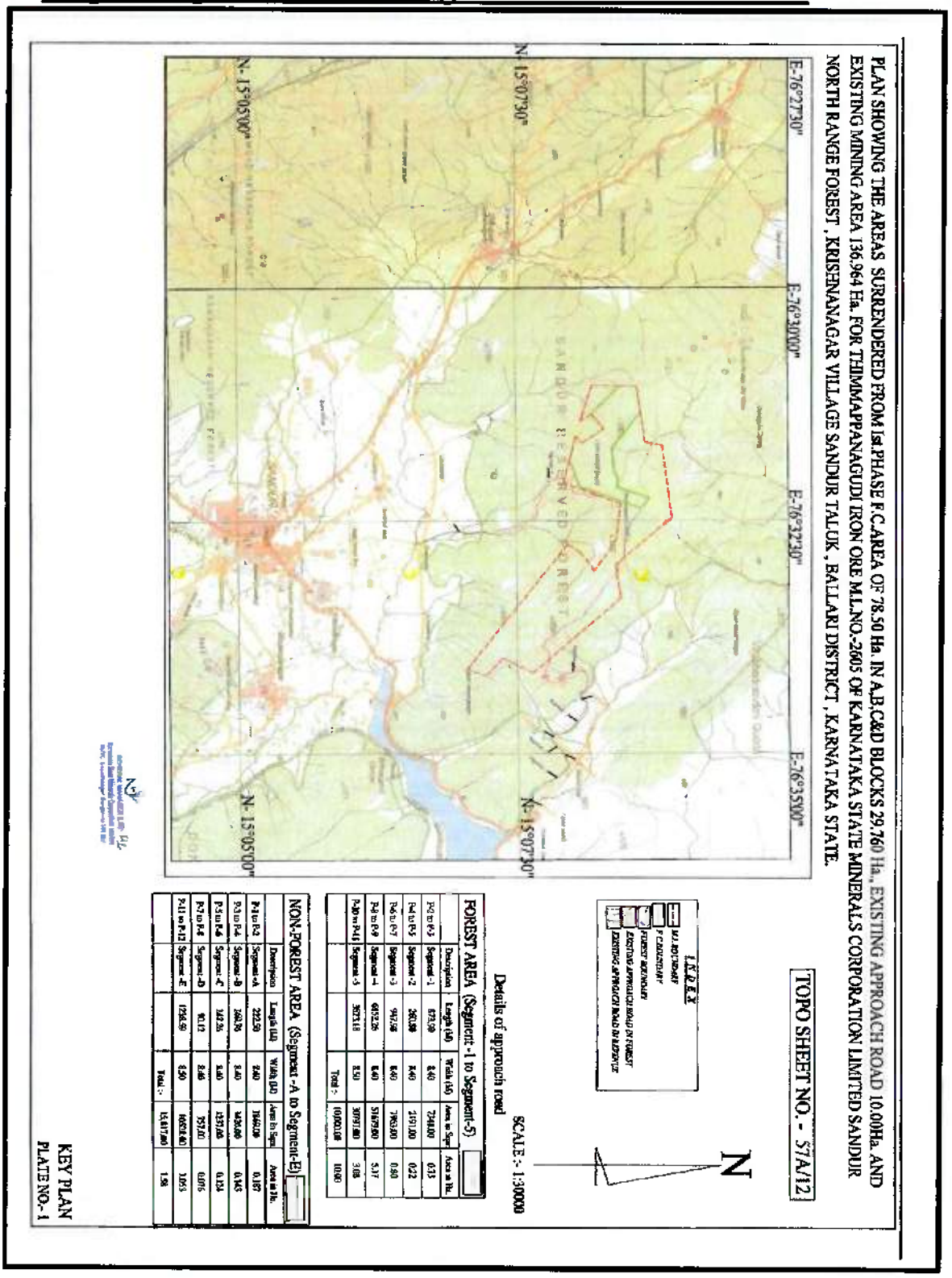
Map-1. Joint Survey Map of the existing road:



Map-2: Satellite Map of Existing Road of TIOM:



Map-3: Toposheet of Existing Road of KSMCL TIOM:



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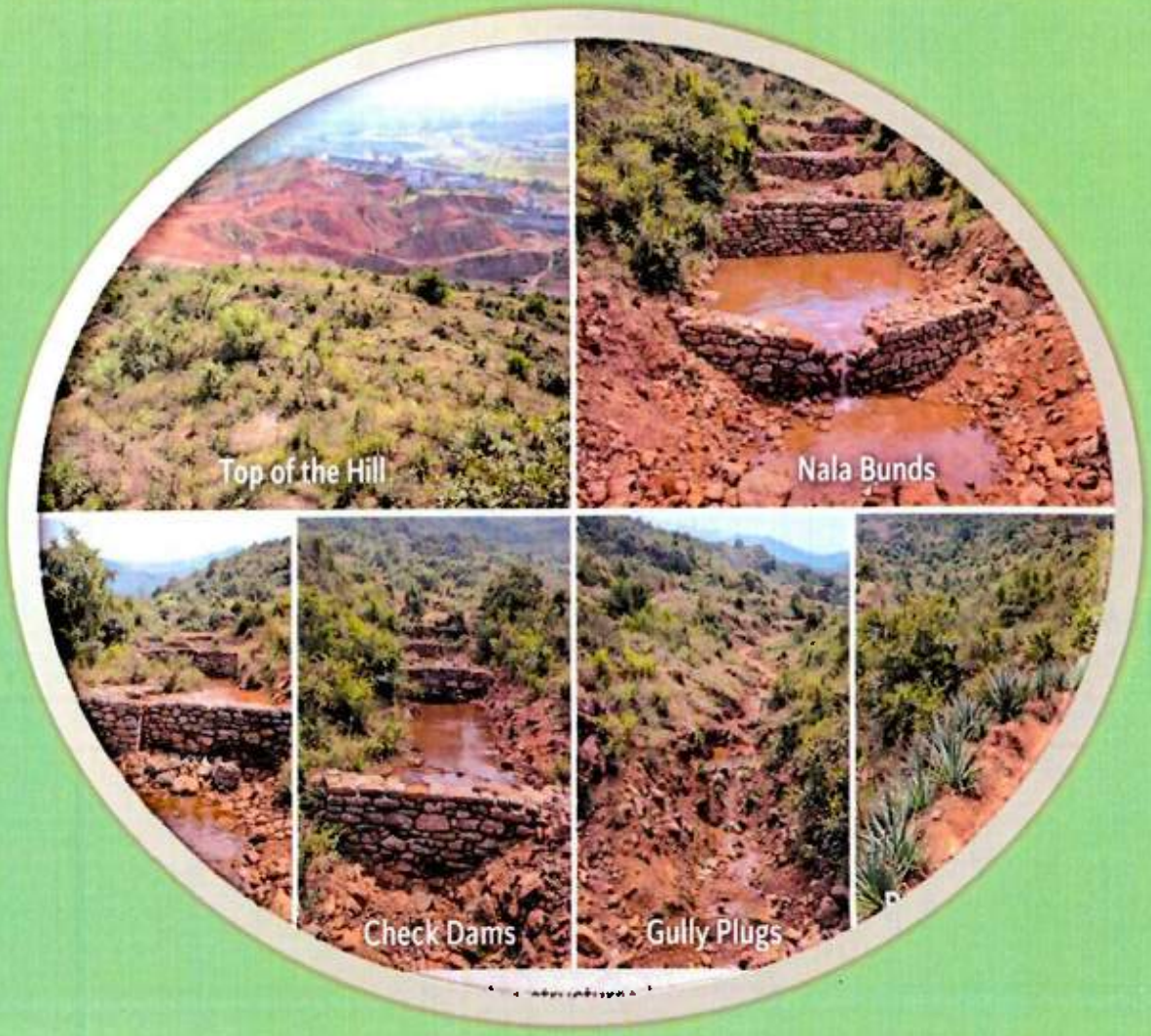
Soil and Moisture Conservation Plan for Downhill Conveyor Belt and Service Road of Thimmappanagudi Iron Ore Mines (TIOM) M.L No. 2605



Karnataka State Minerals Corporation Limited
(Formerly: MYSORE MINERALS LIMITED)
(A Govt. of Karnataka Undertaking)
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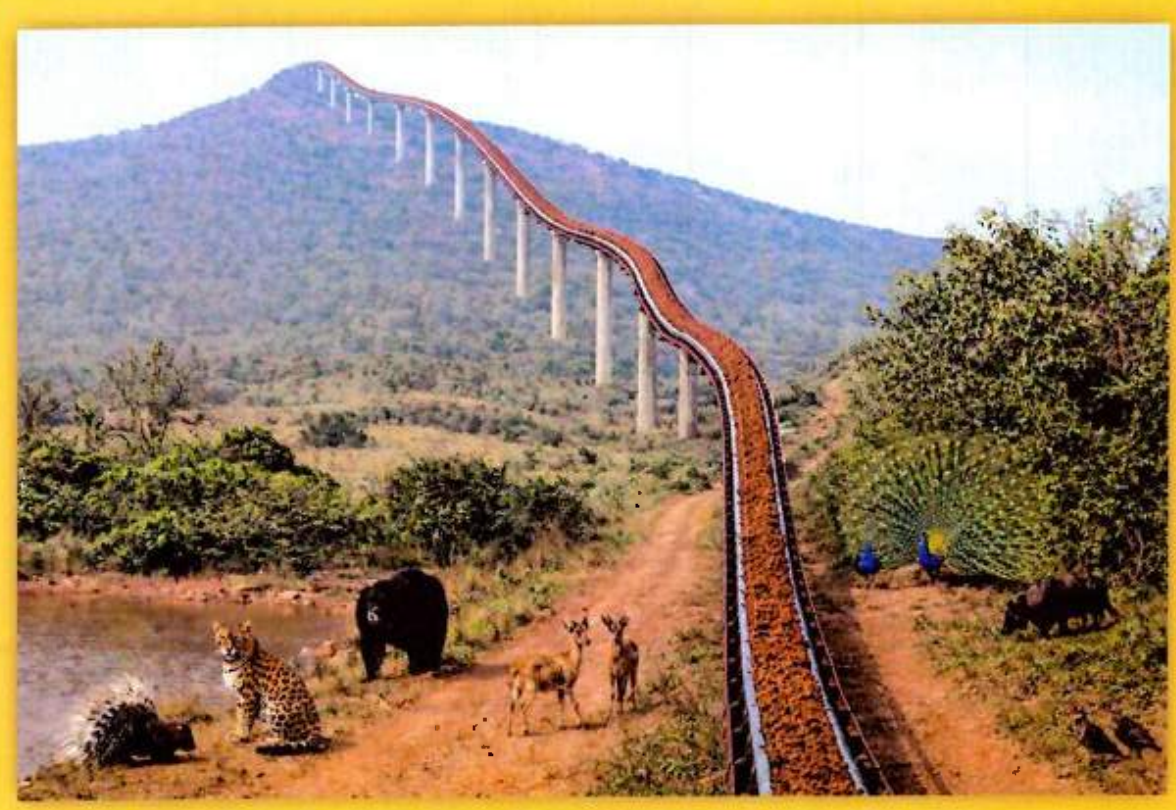
WILDLIFE MANAGEMENT PLAN
Construction of Downhill Pipeline Conveyor Belt
of
THIMMAPPANAGUDI IRON ORE MINES (TIOM)
M.L No. 2605



KSMC

APPLICANT

Karnataka State Minerals Corporation Limited
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2025-26

Wildlife Management Plan

For Construction of Downhill Pipeline Conveyor Belt of Thimmappanagudi Iron Ore Mines (TIOM)

M.L No. 2605

REF: PROPOSAL NO: **FP/KA/MIN/47146/2020**

APPLICANT

Karnataka State Minerals Corporation Limited
(Formerly: MYSORE MINERALS LIMITED)
(A Govt. of Karnataka Undertaking)
TTMC "A" Block, 5th floor, BMTC Building Shantinagar,
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Sandur-583119, Ballari district, Karnataka

Prepared by:
Deccan Resource Centre ®
Hospet

2025-26

WILDLIFE MANAGEMENT PLAN (WMP)
FOR CONSTRUCTION OF DOWNHILL PIPELINE CONVEYOR BELT OF THIMMAPPANAGUDI IRON ORE MINE (ML 2605)

Location: Sandur North Range, Ballari Territorial Division, Karnataka, India

Project Proponent: Karnataka State Minerals Corporation Limited (KSMCL)

Plan Period: 2026-2029

February, 2026

REF: PROPOSAL NO: **FP/KA/MIN/47146/2020**

The draft "Wildlife Conservation Plan" for diversion of 19.3044 ha of Forest land in NEB range forest of Sandur taluk, Ballari district for installing Conveyor Blet of KSMCL-TIOM was prepared and submitted to the Hon'ble Principal Chief Conservator of Forests and Chief Wildlife Warden of Karnataka on _____ for his perusal and kind approval.

The same was got approved by the Hon'ble Principal Chief Conservator of Forests (Wildlife) and Chief Wildlife Warden of Karnataka on _____

TABLE OF CONTENTS

III. Acronyms

BNHS	Bombay Natural History Society
CR	Critically Endangered
EN	Endangered/
EX	Extinct
Ft	Feet / foot
Ha	Hectares
IUCN	International Union for Conservation of Nature
KFD	Karnataka Forest Department
KPI	Key Performance Indicator
KM	Kilo Meter
KSMCL	Karnataka State Minerals Corporation Limited
LC	Least Concerned
M	Migratory
MM	Monsoon Migratory
MPAP	Maximum Permissible Annual Production
MSL	Mean Sea Level
MT	Million Tonnes
MTPA	Million Tonnes Per Annum
NT	Near Threatened
R	Resident
R & R	Rehabilitation and Reclamation Activities
RET	Rare, Endangered, Threatened
RS	Railway Station.
S	Seasonal
S&MC	Soil & Moisture Conservation
TIOM	Thimmappanagudi Iron Ore Mines
Sq Kms	Square Kilo meters
UOM	Unit of Measurement
VU	Vulnerable
WM	Winter Migratory
WPA	Wildlife (Protection) Act, 1972

IV. Acknowledgments:

1. The Management, KSMCL, Bengaluru
2. The Management of KSMCL, Sandur
3. The Staff of Office and Employees of TIOM,
4. Deputy Conservator of Forest (DCF)- Ballari
5. Range Forest Officer, Sandur North Range, Sandur
6. Society for Wildlife and Nature, (SWaN)- Hospet
7. Villagers and local knowledgeable people.

V. Research Agency:

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Photographs : Deccan Resource Centre, Hospet.

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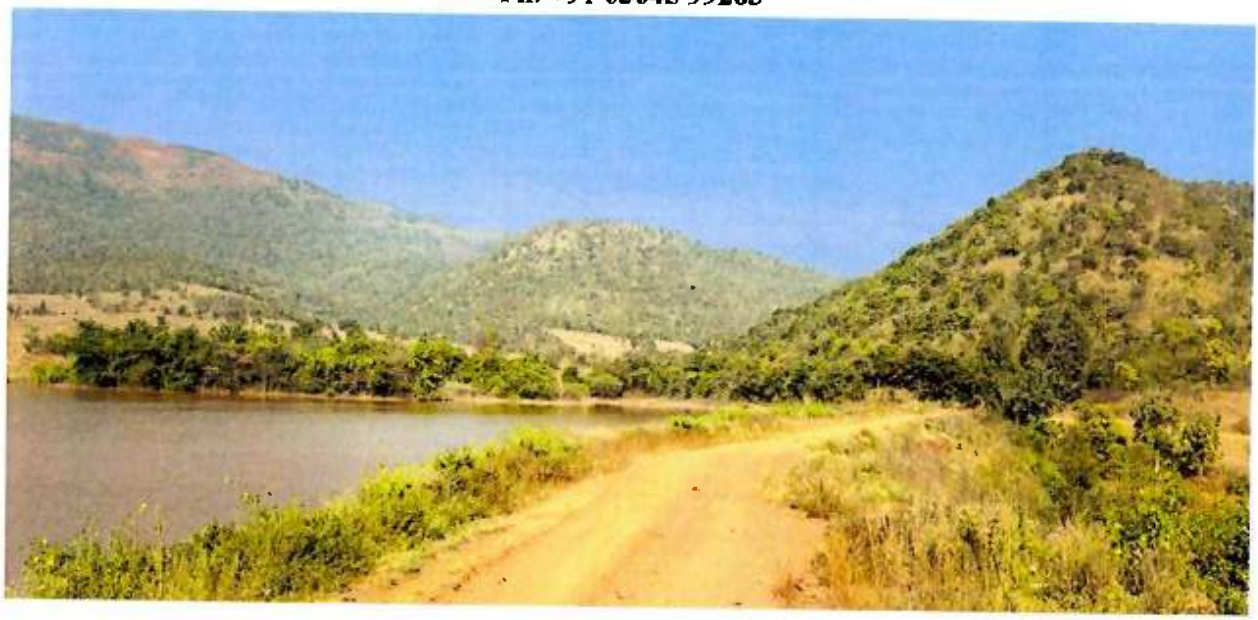


VI. Executive Summary

This Wildlife Management Plan (WMP) or Wildlife Conflict Mitigation Plan (WCMP) has been prepared for the forest clearance for utilizing 19.3044 hectares of forest land in Sandur North Forest for construction of downhill linear pipeline conveyor belt of Thimmappanagudi Iron Ore Mine (ML 2605) operated by Karnataka State Minerals Corporation Limited (KSMCL) in the Sandur North Eastern Block Range Forest of Ballari Territorial Division, Karnataka. As per the recommendation of the Central Empowered Committee (CEC) the Honourable Supreme Court of India order dated 07.12.2017 at para number 5 ordered to construct conveyor belt system at the cost of the mining company. As TIOM is also included in the list, the company has investigated a suitable route for erection of the downhill pipeline conveyor belt with minimal destruction to the forest area. **The length of the proposed downhill linear pipeline conveyor is 3.59 kms in the forest area and 0.20 kms in non-forest area. And the length of the service road is 5.99 kms in the forest area and 0.22 kms in non-forest area.** A total of 19.3044 hectares of forest land and 0.71 hectares of non-forest land is proposed to utilize for this project. The company has conducted various survey and developed the maps for implementation of the project and submitted the Form A for seeking prior approval of Central Government under section 2 of Forest (Conservation) Act, 1980 for diversion of fresh forest area with the proposal number: FP/KA/MIN/47146/2020. As a detailed Wildlife Management Plan (WMP) is mandatory for such clearances, this WMP is prepared. The plan addresses wildlife conservation challenges arising from construction and transportation related traffic and anthropogenic activities in a landscape that supports significant biodiversity including Schedule-I species such as Indian sloth bear (*Melursus ursinus*), Four-horned Antelope (*Tetracerus quadricornis*) and leopard (*Panthera pardus*).

At present the Iron ore is being transported by the existing road that traverses a mosaic landscape of dry deciduous forests, mining leases, agricultural lands, and rural settlements, creating multiple interface zones where human-wildlife interactions occur. Vehicular movements, habitat fragmentation, clouds of dust, water scarcity during summer months, and waste disposal practices have increased wildlife-human conflict incidents and wildlife mortality risks.

But the proposed downhill conveyor belt prevents all such adversities of vehicular movement in the forest area and let the forest land a better place for the wildlife, as the iron ore is transported down hill through a conveyor belt.

As part of mandatory requirements, the company availed services of wildlife experts to prepare Wildlife Conservation Plan for downhill conveyor belt for TIOM Mining Lease No..2605. The study was carried out by taking up field surveys, interaction with the villagers, graziers, mine workers, villagers etc., and data on existing flora and fauna, issues related to human-wildlife interactions was collected.

The presence of different species of flora and fauna has been documented inside and up to 2 kms around the project area. About 213 species of major floral species have been documented along the road side and surrounding areas. It was found that 21 species of mammals 9 species of reptiles including Geckos and Lizards, 13 species of Snakes and 1 species of Tortoise and 2 species of Turtles is found. About 113 species of birds have been recorded in and around 5 kms from the TIOM vicinity.

Data on man-animal conflict was also collected and found that the attack on humans by bears and leopards is very less but lifting of dogs and minor livestock by Leopards is prevailing in some parts of the villages outside the study area. Though attack of bears on humans was very less, crop ride by bears and wild boars is the most common issue in some villages in the fringes of the forest.

Based on the study conducted this WMP integrates habitat enrichment, active monitoring, research, and community engagement components with a total approved budget of ₹79.22 lakhs for the financial year 2026-27 to 2028-29. Key interventions include construction and maintenance of 10 waterholes, installation of bird nests of various sizes and shapes for different species, deployment of 2 full-time forest watchers, establishment of 1 anti-poaching camp with watch tower, installing signboards along the roadside and the targeted awareness programs for mine workers and local communities. This WMP also proposes to take up extended research and documentation on biodiversity in and around the proposed area of intervention for 3 years.

The plan adopts an adaptive management framework with clearly defined performance indicators, monitoring protocols, and trigger mechanisms for rapid intervention. Implementation will be coordinated between KSMCL, the Karnataka Forest Department, local communities, and research partners to ensure effective mitigation of wildlife conflicts while maintaining operational requirements of the mining activity.

CHAPTER – 1 : INTRODUCTION

1.1 Overview

Mining in ecologically sensitive landscapes demands a calibrated balance between economic imperatives and biodiversity stewardship. In India's peninsular dry deciduous belt, this balance is particularly delicate. The Sandur region of Ballari District, Karnataka, exemplifies such a landscape—one where iron ore extraction has historically underpinned regional development, while the surrounding forests sustain diverse wildlife assemblages, including several protected and threatened species.

Recognizing this dual mandate, Karnataka State Minerals Corporation Limited (KSMCL), a State Public Sector Undertaking of the Government of Karnataka, proposes the construction of a Downhill Pipeline Conveyor Belt System for the transportation of iron ore from the Thimmappanagudi Iron Ore Mine (Mining Lease No. 2605) to the designated stockyard. The project is situated within the Sandur North Range of the Ballari Territorial Forest Division and necessitates the diversion of a limited extent of forest land for a linear, compliance-driven infrastructure facility integral to mining operations.

Project Rationale and Judicial Compliance

The proposal is rooted in statutory and judicial compliance, particularly the directions of the Hon'ble Supreme Court of India vide order dated 07 December 2017, issued pursuant to the recommendations of the Central Empowered Committee (CEC). The order mandated the replacement of conventional road-based mineral transport with conveyor-based systems in mining regions to arrest environmental degradation caused by heavy vehicular movement.

In alignment with this directive, KSMCL undertook detailed technical and environmental investigations to identify an optimal, site-specific alignment for the downhill pipeline conveyor belt within ML No. 2605. The conveyor system is designed to replace truck haulage entirely, thereby delivering measurable reductions in dust emissions, noise levels, fuel consumption, traffic congestion, and accident risks—benefits that directly translate into improved environmental and human safety outcomes. The downhill configuration further enhances operational efficiency by leveraging gravity-assisted material flow, reinforcing energy optimization.

Land Requirement and Project Configuration

Initially, diversion of 19.652 hectares of forest land and 0.718 hectares of non-forest land was proposed for a lease period of 50 years. Subsequently, based on alignment optimization and ground validation, the forest land requirement was revised downwards to 19.3044 hectares. The forest land falls entirely within the Ballari Territorial Forest Division.

The project alignment has been conceptualized as a narrow linear corridor, explicitly designed to minimize forest fragmentation, edge effects, and unnecessary land take. Component-wise and segment-wise break-up of forest land requirements has been clearly delineated to facilitate transparent appraisal and post-approval monitoring. High-precision DGPS surveys have been conducted along the entire alignment, generating geo-referenced coordinates to ensure accurate demarcation and strict adherence to the approved corridor during execution.

The total estimated project cost is ₹9,000 lakh, reflecting long-term infrastructure investment and lifecycle operational requirements. Project components include downhill conveyor belt segments, essential service roads for construction and maintenance, and a stockyard facility.

Regulatory and Social Safeguards

The project does not fall within any Protected Area, Eco-Sensitive Zone, Wildlife Sanctuary, or Scheduled Area. The process for settlement of rights under the Forest Rights Act, 2006 has been completed for the forest land proposed for diversion. No human habitation is affected, and the project does not entail displacement, resettlement, or rehabilitation, thereby ensuring negligible social impact.

As a statutory offset measure, KSMCL has proposed Compensatory Afforestation over 19.7 hectares of identified non-forest land at Kudathini Village, Ballari District—marginally exceeding the forest area proposed for diversion. Ownership details, survey numbers, and geo-referenced maps for the compensatory afforestation land have been furnished, ensuring full conformity with forest conservation norms.

Wildlife Management and Impact Mitigation

While the conveyor system significantly reduces impacts associated with road-based transport, mining landscapes inherently present wildlife-related risks. These include habitat degradation, disruption of movement corridors, edge effects, seasonal water stress, and increased human–wildlife interactions near operational areas. Such conflicts pose ecological risks as well as operational and safety concerns for workers and local communities.

To address these challenges, KSMCL has prepared a comprehensive Wildlife Management (Mitigation) Plan (WMP) with a total financial outlay of ₹79.22 lakh. The plan adopts a mitigation-plus approach, focusing not only on impact minimization but also on ecological enhancement. Key interventions include habitat enrichment, invasive species management, development of waterholes, installation of bird nesting structures, fire prevention and firefighting infrastructure, anti-poaching measures, wildlife monitoring, research and documentation, and targeted awareness programs for workers and nearby communities. Implementation will be carried out in close coordination with the Forest Department to strengthen landscape-level ecological resilience.

Legal and Regulatory Framework

The Wildlife Management Plan has been prepared in compliance with the following statutory provisions and policy frameworks:

- **Wildlife (Protection) Act, 1972**, with specific reference to Schedule I and Schedule II species
- **Forest (Conservation) Act, 1980**, including compensatory afforestation requirements
- **Environment (Protection) Act, 1986** and associated EIA Notifications
- **Mines and Minerals (Development and Regulation) Act, 1957**
- **Karnataka Forest Act, 1963** and relevant Rules
- Guidelines issued by MoEF&CC for wildlife conservation in mining areas
- Directions of the Karnataka State Board for Wildlife and the Karnataka Forest Department

The plan is further aligned with the National Wildlife Action Plan (2017–2031) and the Karnataka State Biodiversity Strategy and Action Plan.

Regulatory Procedure

Under the EIA Notification, 2006, the Forest (Conservation) Act, 1980, and the Wildlife (Protection) Act, 1972, infrastructure projects in forest and wildlife landscapes are required to adopt preventive and mitigative measures to safeguard habitats, wildlife, and human interests. Activities proposed within National Parks, Wildlife Sanctuaries, or Tiger Reserves require consultation and approval from the Standing Committee of the National Board for Wildlife (SC-NBWL), as applicable, in accordance with Supreme Court directions.

The proposed downhill pipeline conveyor belt system represents a strategic transition from impact-intensive mineral transportation to an infrastructure-led mitigation model. It is firmly

anchored in judicial mandates, statutory compliance, and sustainable mining principles. By minimizing ecological disturbance, enhancing wildlife safeguards, and improving operational efficiency, the project delivers a future-ready solution that aligns economic productivity with environmental responsibility. Accordingly, diversion of forest land is sought strictly for this site-specific, compliance-driven infrastructure essential for responsible mining operations.

1.2 OBJECTIVES OF THE STUDY:

Rationale:

Mining is a part and parcel of human civilization. Iron ore mining is one of the major mining activities on the basis of which human society across the world is depending. From pin to plane, bike to building - iron is inevitable. Unfortunately, most of the ore existing sub-surface is covered with forest. It is inevitable to clear forest and excavate the earth to extract the ores. Similarly, extraction of Iron and Manganese ore involves destruction of the forest, excavation of the earth, removal and transportation of the ores etc. All these activities, naturally, are disturbing the habitat and its denizens. Therefore it is imminent to implement the mitigation measures to save wildlife, its habitat and prevent any instances of Human-wildlife conflict by adopting suitable management / conservation practices.

The Wildlife Management Plan is designed to mitigate human-wildlife conflicts and enhance biodiversity conservation during the installation and operation of a downhill conveyor belt system from the hilltop mining area to lower elevations of stock yard near Susheelanagara. This plan addresses potential ecological disturbances caused by linear infrastructure development while simultaneously creating wildlife conservation opportunities through compensatory habitat enhancement measures, community engagement, and long-term monitoring protocols.

The main objectives of the conservation plan are to safeguard the wildlife from disturbances, empower the people to take up their role in conservation of the wildlife and nature.

This Wildlife Conflict Mitigation Plan or Wildlife Management plan (WMP) is designed to achieve the following primary objectives:

Wildlife Conflict Mitigation Objectives:

- **Installation of Artificial Waterholes:** Establish 8-10 strategically located artificial waterholes along and around the conveyor corridor at regular intervals to ensure wildlife

access to drinking water, especially during summer months when natural water sources diminish.

- **Deployment of Dedicated Forest Guards and Wildlife Monitoring Teams:** Appoint 2 trained forest watchers exclusively for monitoring wildlife activity along and around the conveyor belt corridor. They identify and prevent any instance of damage to the wildlife habitat and also watch and ward any instances of forest fires.
- **Installation of Artificial Bird Nests and Perching Structures:** Install 100-200 artificial nesting boxes for cavity-nesting birds such as barbets, mynas, owls, and parakeets at appropriate heights (3-6 meters) on trees adjacent to the conveyor corridor to compensate for potential nesting habitat loss.
- **Systematic Wildlife Research and Biodiversity Documentation:** Conduct comprehensive baseline and ongoing wildlife surveys using camera traps, line transects, point counts, and pugmark analysis to document species diversity, population density, and behavioral patterns along the conveyor corridor.
- **Conducting Wildlife Conservation Awareness Programs for Mine Staff:** Organize quarterly wildlife awareness training sessions for all mine workers, staff on wildlife conservation and environment protection.
- **Community Engagement and Village-level Awareness Campaigns:** Conduct bi-annual wildlife conservation awareness programs in surrounding villages including Muraripura, Susheelanagra, Dowlathpura, Krishnanagara and nearby settlements, reaching approximately 500-1000 community members and students annually through interactive sessions and documentary screenings on human-wildlife coexistence.
- **Installation of Informative Signboards and Directional Markers:** Install 10 weather-resistant multilingual (Kannada, English) signboards at strategic locations along the conveyor corridor and other wildlife areas displaying messages on wildlife conservation, speed limits, noise restrictions, prohibition of littering, and emergency contact numbers for wildlife rescue.
- **Publication and Distribution of Wildlife Conservation Literature:** Design and publish 1,000 copies of illustrated brochures in local languages featuring wildlife species found in the area, their ecological importance, conservation status, and guidelines for peaceful coexistence with wildlife.

- **Establish Continuous Wildlife Monitoring Systems:** Deploy camera traps, acoustic sensors, and biodiversity monitoring stations along the conveyor alignment to track wildlife activity patterns, population dynamics, and behavioral responses to infrastructure.

Organization of the Wildlife Conservation Plan:

The wildlife conservation plan is organized as follows.

1. Introduction and background information of the project area, which includes location, statutory clearances, land use pattern, topography, hydrology & drainage, human habitation with 5 kms radius from the boundary of the project area, demography and profile of the villages within 5 kms from the radius of the project area, their dependency on forest etc.,
2. Biodiversity of the wildlife habitat inside and outside the leased area with status of major flora and faunal species and their conservation status, Impact of the project on the flora and fauna and details of movement of major faunal species in and outside the project area, conservation plan for the wildlife including schedule-I species.
3. Historic data on human-wildlife interactions inside and outside the project area, strategies for mitigation of conflict between human-wildlife with more emphasis on human-leopard conflict and human- sloth bear conflict.
4. Working plan proposed for conservation of wildlife in and around project area and awareness programs and related activities to be taken up.

Document Structure and Scope

This document provides a comprehensive framework for mitigating wildlife conflicts along the proposed downhill pipeline conveyor belt area of KSMCLs Thimmappanagudi Iron Ore Mine. It encompasses baseline ecological assessments, conflict hotspot identification, detailed mitigation interventions with technical specifications, monitoring protocols, budget allocations, and institutional arrangements for implementation. The plan covers a 3-year operational period with annual review and adaptive management provisions, with the year (2026-27 to 2028-29) interventions and budget detailed based on KSMCLs approved wildlife works program.

1.3 PROJECT PROPONENT PROFILE

Karnataka State Minerals Corporation Limited (KSMCL) is a Government of Karnataka undertaking established under the Companies Act to undertake systematic and scientific development of mineral resources in the state. As a public sector enterprise, KSMCL operates

with dual mandates: economic development through mineral extraction and responsible environmental stewardship.

Core Functions:

- Exploration, extraction, and marketing of minerals including iron ore, manganese, limestone, and other industrial minerals
- Implementation of scientific mining practices adhering to sustainable development principles
- Compliance with environmental, forest, and wildlife protection regulations
- Implementation of compensatory afforestation, habitat restoration, and biodiversity conservation programs
- Engagement with local communities for socio-economic development and conflict resolution

Operational Presence: KSMCL operates multiple mining leases across Karnataka, with significant operations in the Ballari-Sandur mineral belt, one of India's major iron ore producing regions. The corporation manages both active mines and associated infrastructure including haul roads, processing facilities, and transportation networks.

KSMCL's Environmental and Conservation Commitments

Karnataka State Minerals Corporation Limited (KSMCL) stands as a cornerstone of the state's mineral economy—a legacy enterprise forged on May 13, 1966, under the Companies Act, 1956. Born from the transition of assets from the erstwhile Board of Mineral Development, the corporation began its journey as Mysore Minerals Limited (MML), later realigning its identity to reflect the state's evolution. Its founding mandate was clear: unlock Karnataka's geological wealth through structured exploration, responsible extraction, and market-oriented distribution.

From its inception, the corporation became an instrument of the state's strategic intent—deploying scientific mining methods, building employment pathways in resource-rich belts, and strengthening the industrial backbone of Karnataka. Over nearly six decades, KSMCL has modernized its operating architecture, pivoted toward integrated resource management, and positioned itself as an essential growth engine for the region's mineral economy.

Historical Foundation, Background, and Growth Trajectory

KSMCL emerged with a clear mandate: consolidate Karnataka's mineral resources, upgrade mining methodologies, and create a sustainable operational pipeline. Initially focused on core minerals, the corporation progressively diversified. Guided by state policies and regulatory frameworks, it adopted advanced mining technologies, embraced compliance-driven governance, and aligned its strategy with evolving industrial demand. This disciplined expansion

has enabled KSMCL to scale from a traditional mining unit into a multidimensional mineral enterprise with state-wide footprint.

Strategic Mission and Governance Framework

Operating as an extension of Karnataka's development mission, KSMCL balances commercial performance with ecological stewardship. Its governance model emphasizes transparency, regulatory compliance, and performance accountability. Led by a Managing Director and supported by domain-specialist General Managers in Administration & Vigilance, Finance, Marketing, and Supply Chain, the organization's management architecture reflects disciplined oversight and operational rigor. As of March 31, 2023, the corporation remains fully active, marking its last Annual General Meeting on December 30, 2023.

Core Mineral Portfolio and Production Ecosystem

Karnataka's geological diversity is mirrored in KSMCL's extensive mineral portfolio—Iron Ore, Chromite, Manganese, Magnesite, Limestone, Dolomite, Clay, and Dunite. The corporation ranks among the leading producers in several categories, supplying critical inputs to steel, cement, ceramics, and refractory industries.

Key mineral strengths include:

- Iron Ore: Over 9,000 million tonnes of magnetite-rich reserves fuelling steel and sponge iron industries.
- Chromite: Deposits across Chikmagalur, Chitradurga, Hassan, Mysore, and Shimoga, supporting metallurgical and refractory applications.
- Manganese: India's largest recoverable reserves—although operations were halted under the Forest Conservation Act, 1980.
- Limestone, Dolomite, Magnesite: Supporting Karnataka's cement and industrial minerals ecosystem.
- Clay and Dunite: Supporting specialized ceramic and industrial applications through dedicated processing facilities.

Granite Sector Expansion and Global Market Linkages

Responding to global demand, KSMCL entered the international granite sector, exporting premium varieties sourced from Kanakapura, Hassan, Chamarajanagar, Mysore, and Mandya. Karnataka's globally renowned colored granites—Sparkling Black, Imperial Red, Queen Rose, Indian Juprana, and other multi-coloured stones—position the state as a preferred supplier to markets including Taiwan, Singapore, Australia, the USA, Germany, and Italy.

Chamarajanagar has emerged as a global hub for Absolute Black Granite, complementing KSMCL's 100% Export Oriented Unit in Hassan (presently non-operational). While geopolitical tensions and recession-driven demand slowdown have impacted global granite trade, the corporation continues to leverage its strong resource base to maintain market presence.

Diversification, Modernization, and Operational Infrastructure

KSMCL initiated key diversification programs in the early 1980s, including a stoneware pipe manufacturing unit at Bageshpura and an export-focused granite cutting and polishing facility. Today, the corporation controls:

- 40 mining leases spanning 5,377.83 hectares
- 38 granite and quarry leases covering 294.30 acres
- A workforce of 1,224 employees

This strategic footprint enables the corporation to maintain operational scale, supply chain agility, and regional employment impact.

Financial Performance and Enterprise Sustainability

KSMCL's revenue trajectory reflects the cyclical nature of commodities and the dynamic global trade environment. Historic turnovers have ranged from ₹111.18 crores (2004–05) to ₹334.96 crores (2007–08), with FY 2023 revenues surpassing ₹500 crores. EBITDA declined by 64.01%, though net worth rose by 4.16%, indicating capital stability amid market volatility. FY 2021 recorded exceptional performance with revenue growing by 209.12% and net worth expanding by 18.45%.

Environmental Stewardship and Corporate Social Responsibility

KSMCL champions eco-aligned mining practices, land reclamation, community-centric development, and operational transparency. Its commitment to worker safety was recognized through the SKOCH Silver Award (July 2024) for excellence in Occupational Health and Safety.

Current Status and Forward Outlook

KSMCL continues to anchor Karnataka's mineral development agenda, navigating regulatory complexity, market volatility, and rising competition. With extensive leases, a resilient workforce, and strong government backing, the corporation is positioned for long-term sustainability. Its strategic direction prioritizes modernization, environmental compliance, operational excellence, global market alignment, and future-ready systems—ensuring KSMCL remains a cornerstone of Karnataka's mineral ecosystem.

KSMCL has progressively enhanced its environmental management systems, incorporating:

- **Integrated Environmental Management Plans (EMPs)** for all operational sites
- **Biodiversity Management Plans** addressing flora and fauna conservation
- **Compensatory Afforestation Programs** exceeding statutory requirements
- **Water Conservation Initiatives** including rainwater harvesting and watershed management

- **Air Quality Management Systems** with real-time monitoring and dust suppression measures
- **Community Development Programs** supporting livelihoods, education, and health services in mining-affected areas

Role in Wildlife Conflict Mitigation

For this WMP, KSMCL assumes responsibility as:

1. **Primary Funding Agency:** Allocating approved budgets for all mitigation interventions
2. **Implementation Coordinator:** Managing contractors, procurement, and work execution
3. **Monitoring Authority:** Overseeing data collection, performance tracking, and reporting
4. **Stakeholder Liaison:** Coordinating with Forest Department, local communities, and research institutions
5. **Adaptive Manager:** Responding to monitoring findings with corrective actions and plan modifications

1.3.1 Overview of Iron Ore Leases

KSMCL holds two major iron ore mining leases in Karnataka, both located in the Sandur Taluk of Ballari District. These leases are critical to the state's iron ore production and supply chain, serving key industries including steel manufacturing, cement production, and export markets.

Summary of Iron Ore Mining Leases

Table-1: Summary of Iron Ore Mining Leases in Ballari district by KSMCL

Mine Name	ML Number	Location	Area (Ha)	District
Subbarayanahalli Iron Ore Mine, (SIOM)	2629	Sandur Taluk	80.06	Ballari
Thimmappanagudi Iron Ore Mine, (TIOM)	2605	Sandur Taluk	621.59	Ballari

1.3.2 Thimmappanagudi Iron Ore Mine-TIOM (ML No. 2605)

Thimmapanagudi Iron Ore Mine (ML No. 2605) operated by M/s Karnataka State Minerals Corporation Limited (KSMCL) with lease area of 621.59 hectares in Sandur North Range forest (NEB) - represent strategic assets with substantial reserves and production capacity. With ongoing modernization, regulatory compliance, and environmental stewardship, KSMCL is well-positioned to maintain its leadership role in Karnataka's mining industry for decades to come.

Table-2:	Details of Thimmappanagudi Iron Ore Mines (KSMCL-TIOM)	
Detail	**Description**	**Reference**
Mine Operator	M/s Karnataka State Minerals Corporation Limited (KSMCL)	(KSMCL documents, formerly Mysore Minerals Ltd.)
Mining Lease (ML) No.	**ML No. 2605** (often referred to interchangeably with ML No. 2002)	(IBM, Forest Clearance documents)
Mineral	Iron Ore	(IBM, KSMCL documents)
Location	Thimmappanagudi Village, Sandur Taluk, Ballari District, Karnataka State	(IBM, Forest Clearance documents)
Forest Block	North Eastern (NE) Block, Sandur North Range, Ballari Division	(Forest Clearance documents)
Lease Area	**136.94 Ha** (Area as per CEC/IBM approval for R&R and Mining Plan Modification)	(IBM Approval, 2019)
Lease Period	Original lease commenced around 1985-1992. Earlier FC approvals cited a lease period up to **December 26, 2035.**	(FC documents, 2001 & 2004)
Mining Method	Fully mechanized Open-Cast Mining method	(EC documents)
Ongoing proposal	Renewal of existing road of 10 kilometre (10 Ha)	Received working permission letter from DCF Ballari on 24.12.2025 (Vide Letter No.M1/MNG/KSPCL/ML No.2605/ROAD/2021/843)
Present Proposal	**Downhill Pipeline Conveyor Belt (19.3044 ha)**	**ON GOING PROJECT**

Table-3 :	Production and Reserves	
Detail	**Description**	**Reference**
Annual Production Capacity	**6,50,000 MTS** (Iron Ore) for the year 2021-22 to 2025-26 (As per IBM's approval for the review period).	(IBM Approval, on 05.02.2021)
Total Mineral Reserves	**5.08 Million Tonnes (MT)** of Iron Ore (As per IBM's approval for the review period).	(IBM Approval, on 05.02.2021)
Estimated Reserve (Forest Land)	**9.29 Million Tonnes** (Estimated reserve at the time of FC proposal submission in 2018).	(FC Form A, 2018)

1.3.3 Regulatory Status and Compliances

The mine's operations and clearance status are heavily influenced by the Supreme Court's orders related to illegal mining in Karnataka.

a) Compliance with Supreme Court Mandate

- **Mandatory Conveyor Belt System:** The mine is one of the leases included in the Hon'ble Supreme Court's order dated December 7, 2017, which directed companies to construct a Pipeline Conveyor Belt System at their own cost for the transportation of iron ore to prevent road damage and illegal transport. (This FC Proposal)
- **Production Cap:** Production is governed by the Supreme Court-mandated production cap on Iron Ore mining in the Ballari-Chitradurga-Tumakuru region of Karnataka. (General SC Mining Orders)

b) Forest Clearance (FC) Status (FC Act, 1980)

The company has a complex history of seeking and renewing Forest Clearances, primarily for mining and ancillary activities.

Table-4: Forest Clearance Status of TIOM projects

FC Proposal No.	Project Component	Area (ha)	Status/Purpose	Reference
FP/KA/MIN/51647/2020	FC Renewal for Approach Road	10.00 ha	Received working permission letter from DCF Ballari on 24.12.2025 (Vide Letter No. M1/MNG/KSPCL/ML No.2605/ROAD/2021/843)	-
Original Approvals	Mining activities (FC-I & FC-II)	48.74 ha (FC-I, 2001); 98.224 ha (FC-II, 2004)	Initial Forest Clearances for the main mining lease area.	(FC Form A, 2018)
FP/KA/MIN/47146/2020	**Pipeline Conveyor Belt, Service Road, Stock Yard, etc. (Transportation Infrastructure)**	**19.3044 ha (Revised from 19.652 ha) 0.718 hectares of non-forest land**	**Diversion of Forest Land for construction as mandated by the Supreme Court. Submitted in July 2020.**	**Current proposal**

c) Indian Bureau of Mines (IBM) Approval

- Mining Plan: IBM approved the Modification to the approved "Review and updation of Mining Plan" including the Progressive Mine Closure Plan (PMCP) on May 16, 2019.
- Approved Area: The approved modification was in respect of the mine over an area of 136.94 Ha (As per CEC). (IBM Approval Letter, 2019)

- Change in Ownership Name: M/s KSMCL is the successor entity, having been formerly known as M/s Mysore Minerals Limited (MML). (KSMCL, FC documents)
- Corporate Identity: KSMCL is a State Government Company (A Govt. of Karnataka Undertaking), incorporated on May 13, 1966. Its registered office is in Bengaluru. (Tofler, KSMCL documents)
- Infrastructure Requirements: The numerous Forest Clearance proposals confirm the current emphasis on establishing linear infrastructure (conveyor belts, pipelines, roads), indicating a shift away from relying solely on truck transport, as mandated by the Supreme Court.

1.3.4 General Project & Location Details:

Location, Connectivity, and Economy

Muraripura serves as a key settlement in the northern part of Sandur taluk, maintaining strong ties to the region's mining and administrative hubs.

- **Administrative Proximity:**
  - Nearest Town (Taluk HQ): Sandur, located approximately 8 km away.
  - District Headquarters: Ballari, located approximately 55 km away.
- **Connectivity (2011 Status):**
  - Bus Service: Public and private bus services were available within the village.
  - Railway Station: A railway station was available within a 5-10 km distance, indicating reasonable access to the rail network, which is vital for the region's mineral economy. (But no passenger trains)
- **Economic Activity:** The nearest town, Sandur, is the central location for all major economic and commercial activities. Given the village's location near the Sandur hill range, mining-related work and agriculture are the primary sources of livelihood for the working population. The village lies close to the Thimmapanagudi Iron Ore Mine (TIOM-ML No. 2605 and is often mentioned in documents related to the approach roads and ancillary infrastructure for these mines.

KSMCL's Thimmappanagudi Iron Ore Mine (KSMCL-TIOM) is located in North Eastern Block (NEB) of Sandur North Range Forest in Sandur taluk of Ballari district in Karnataka operated by M/s Karnataka State Minerals Corporation Limited (KSMCL) under ML No. 2605, is centrally located within the environmentally sensitive and mineral-rich region of Ballari District, Karnataka. The mine is specifically situated in the Sandur taluk (sub-district) and falls within the North Eastern Block (NEB) of the Sandur North Range Forest.

1.3.4 Geographical Context

The mine is embedded in the hill ranges of the Ballari-Hospet belt, which is known for having some of the richest iron ore deposits in India. These deposits are primarily found on the hill ranges that are legally designated as Reserved Forest areas, making the diversion of forest land mandatory for the mine's operation.

The Sandur hills resembles the Western Ghats, which, despite being geographically distinct from the main Sahyadri range, contain significant forested hills that have faced heavy ecological pressure due to intensive iron ore mining over the decades. The mining site itself is part of the local ecosystem that contributes to the region's biodiversity.

The Sandur region is characterized by undulating terrain with elevation ranging from 750 to 1000 meters above mean sea level. The landscape is dominated by:

Geological Features:

- Ancient Precambrian rock formations, primarily banded iron formations (BIF) and associated metamorphic rocks
- Rocky hillocks and exposed lateritic outcrops creating natural barriers and microhabitat diversity
- Shallow valley systems with seasonal nallahs (streams) draining into the Narihalla and Tungabhadra river system
- Iron-rich soils with varying depth, from deep red soils in valleys to shallow lithosols on slopes

Topographic Characteristics:

- Gentle to moderate slopes (5-20 degrees) interspersed with steeper rocky faces
- Natural drainage patterns with ephemeral watercourses active during monsoon (June-October)
- Plateau areas with relatively flat terrain supporting scrub vegetation
- Boulder-strewn slopes providing denning sites for large carnivores and reptiles

This rugged topography creates a mosaic of habitat types while also constraining agricultural expansion, resulting in a landscape where forest patches, rocky outcrops, and human-modified areas exist in close proximity.

1.4 VILLAGES AND HUMAN HABITATION UPTO 5 KMS

The Thimmappanagudi Iron Ore Mines (TIOM) is located in the North- Eastern Block (NEB) of Sandur North Range Forest of Sandur taluk in Ballari Territorial Division of Forest. It is located about 5 kilometres from Sandur town and Muraripura. Other villages such as Susheelanagara, Dowlathpura and Krishna Nagara located about 3-4 kilometres away from the boundary of Mining Lease area in the South-Western Side. Muraripura is located in the Eastern side of TIOM area. There is a old temple by name Thimmappanagudi located within the mining lease area. A number of devotees arrive to this ancient temple to offer their prayer periodically on festive days. TIOM mines derived its name because of the Thimmappanagudi (Temple God Thimmappa). It seems there was human habitation in olden days and later on it was deserted due to various reasons. At present no human habitation is there in and around the temple vicinity but a priest stays there to take care of the routine religious rituals of the Temple.

Nearest Villages and Proximity:

Following are the villages located within 4 kilometres from the boundary of the TIOM.

- **Thimmapanagudi Village:** This village shares its name with the mine and is the closest major settlement, lying adjacent to or near the mining lease area boundary. At present there is no human habitation except for the Thimmappa Temple to which there is a priest who lives in the temple complex and the devotees from Muraripura and other villages visit the Temple during auspicious days to worship the deity. There is an ancient route from Temple to Muraripura village, which is now being used as mining road. Downhill from TIOM in the eastern part, the road lead directly to a junction near this village.
- **Muraripura Village:** Located about 4 kilometres from the boundary of the TIOM, Muraripura village is frequently mentioned in documentation related to the mine's approach roads. The ore is transported via an existing road network that joins the main Muraripura Junction PWD road (State Highway 40). Nearby mining leases, such as ML No. 2549 (operated by H.G. Rangan Goud), are located in the NEB Range forest of Muraripura village, indicating a cluster of mining activity in close proximity to this area.
- **Susheelanagara:** Located about 3 kilometres from the boundary of TIOM Susheelanagara is a reference point mentioned in clearance applications has the existing old road, which is a public road used by the general public to reach the Thimmapanagudi Temple for several decades. This indicates that the mining activities and associated infrastructure (like approach roads) are situated very close to culturally and publicly significant routes and sites.

- **Doulathpura:** Located about 3 kilometres from the boundary of mining lease area, a small village basically consisting of farmers and mine workers.
- **Krishnagara:** Located about 3 kilometres from the boundary of the ML area, the village enclosed with a old fort, consisting of farmers and mine workers. The village is located near Sandur on the main road. Famous for Moharram festival.
- **Sandur town:** Located about 4 kilometres from the boundary of the ML area, the capital city of Erstwhile Ghorpade Kingdom, which ruled Sandur for 2 centuries.
- **Regional Connectivity:** The mine is located in a cluster of major iron ore operations. The district headquarters, Ballari, is approximately 58 km away, and the key trading centre of Hospet (now Hosapete) is about 40 km away on the Northwest direction.

1.4.1 Village Profiles:

Muraripura Village Profile (Sandur Taluk, Ballari District, Karnataka)

Muraripura is a significant rural settlement in the Sandur taluk of the Ballari district, Karnataka, known for its location in an area rich in mineral resources and its close proximity to major mining activities.

Demographics and Administration (Census 2011)

Based on the 2011 Census data, Muraripura exhibits the following profile:

Table-5 Village Profile: Muraripura, Sandur taluk, Ballari district (2011)

Sl No.	Particulars	Total	Male	Female
1	Total No. of Houses	202	-	-
2	Population	1,410	704	706
3	Child (0-6)	251	107	144
4	Schedule Caste	13	7	6
5	Schedule Tribe	1,373	685	688
6	Literacy	56.26 %	69.01 %	42.70 %
7	Geographical Area	293.78 Hectares (or 2.93 km²)		
8	Gram Panchayat	Bhujanganagar		
9	Assembly Constituency	Sandur Vidhan Sabha		
10	Parliamentary Constituency	Ballari Lok Sabha		

Table-6	Village Profile: Susheelanagara, Sandur taluk, Ballari district: (2011)			
Sl No.	**Particulars**	**Total**	**Male**	**Female**
1	Total No. of Houses	854	-	-
2	Population	4,977	2,469	2,508
3	Child (0-6)	902	446	456
4	Schedule Caste	3,141	1,538	1,603
5	Schedule Tribe	709	350	359
6	Literacy	52.66 %	61.54 %	43.91 %
7	Gram Panchayat	Susheelanagara		
8	Assembly Constituency	Sandur Vidhan Sabha		
9	Parliamentary Constituency	Ballari Lok Sabha		

Table-7	Village Profile: Krishna Nagar, Sandur taluk, Ballari district: (2011)			
Sl No.	**Particulars**	**Total**	**Male**	**Female**
1	Total No. of Houses	1,354	-	-
2	Population	7,027	3,554	3,473
3	Child (0-6)	1,074	533	541
4	Schedule Caste	548	271	277
5	Schedule Tribe	279	141	138
6	Literacy	65.78 %	72.92 %	58.42 %
7	Gram /Town Panchayat	Krishnanagara		
8	Assembly Constituency	Sandur Vidhan Sabha		
9	Parliamentary Constituency	Ballari Lok Sabha		

Table-8	Village Profile: Doulathpura, Sandur taluk, Ballari district: (2011)			
Sl No.	**Particulars**	**Total**	**Male**	**Female**
1	Total No. of Houses	471	-	-
2	Population	2,764	1,413	1,351
3	Child (0-6)	440	214	226
4	Schedule Caste	415	223	192
5	Schedule Tribe	80	38	42
6	Literacy	63.86 %	71.14 %	56.09 %
7	Gram Panchayat	Krishnanagara		
8	Assembly Constituency	Sandur Vidhan Sabha		
9	Parliamentary Constituency	Ballari Lok Sabha		

Table-9	Village Profile: Sandur town, Ballari district (2011)			
Sl No.	Particulars	Total	Male	Female
1	Total No. of Houses	7,562	-	-
2	Population	37,431	19,147	18,284
3	Child (0-6)	5,358	2,649	2,709
4	Schedule Caste	5,788	2,918	2,870
5	Schedule Tribe	6,012	3,081	2,931
6	Literacy	78.01 %	85.71%	69.86 %
7	Town Panchayat	Sandur Town Panchath		
8	Assembly Constituency	Sandur Vidhan Sabha		
9	Parliamentary Constituency	Ballari Lok Sabha		

1.4 .2 Occupational profile of the villagers:

About 70% of the population of the villages located around the mining area is depending upon agriculture for their livelihood. Rest of the people work in mining related livelihood activities and very few of them work as state and central government employees. About 60% of the male population of the target villages is working in different occupations. Most of the men in the productive age work as Drivers of mine trucks jeeps, water tankers, as security guards, mine labourers and so on.

About 40 % of the female workers earn their livelihood in agriculture and related activities. But women work hard than men in non-income generating activities such as cooking, cleaning, washing, collection fire wood, grazing, fetching fodder for cattle, fetching water, feeding and nursing the babies, taking care of aged family members, etc., Women workforce in mining activities is considerably low.

1.4.3 Dependency of locals on Non-Timber Forest Produce (NTFP)

Agriculture is one of the major source of livelihood for the majority of people living around the project area. Next major occupation is agricultural and daily wage labour. Some people run petty shops, some are milk and vegetable vendors, and some more people earn their livelihood from petty business. Others are earning from being truck and jeep drivers, mechanics and doing some mining related labour works. Average family income of the area is 15,000 to 30,000 per annum.

The forest in and around the mining lease area is classified as Thimmappanagudi Reserve Forest with an area of 621.59 hectares. Some of the forest and mining area belong to

the Revenue land. According to the working plan of Ballari division, the forest in Sandur is classified as Southern dry mixed deciduous forests of Type-5A/C3 (Champion &Seth) that spread in 31,000 hectares.

As per the same working plan document, the mean density of 210 stems/ ha has been recorded. The highest density of 508 stems / ha was found in Swamimalai Block of Sandur Forest Range followed by Ramanamalai Block at 447 stems / ha. The Bellary division is rich in forest products in significant quantities. Non Timber Forest Produce such as Tendu leaves, leaves of *Butea monosperma,* different herbs, fruits etc., were collected extensively in the olden days.

There are few traditional medicinal practitioners who collect, seeds of Goose berry (Nelli Kayi), Seeds of *Terminalia catapa* (Tare Kayi), *T.chebula* (Alale Kayi) and other herbs from the forest. But this trend is slowly declining due to availability of modern medical treatment in most of the villages. In olden days the villagers were collecting the leaves of *Butea monosperma* (Patrole) for making use & throw plates. However, due to availability of single use plastic plates at cheaper prices, the people stopped buying the plates made up of leaves. Hence, as demand vanishes, the people stopped collecting the leaves. Most of the women folk of the villages around the forest, collecting Tendu or Tupra leaves (*Diospyros melanoxylon)* in olden days and selling it for *beedi* industry. As people shifted from smoking *beedis* to chewing *gutka*, the demand for *beedi*s also declined, hence collection of Tendu leaves also stopped. As most of the villagers got LPG cylinders for cooking under CSR program of mining companies and Pradhana Manthi Ujwala Yojana (PMUY), the wood cutting has drastically declined. Yet, some people make brooms using the leaves of Silver date palm - *Phoenix sylvestris* found in the fringes of the forest. Some people still collect dry wood as substitute of LPG stoves.

Therefore, the dependency of the villagers on forest is majorly restricted for grazing their livestock and for collection of fruits and some medicinal herb only.

1.4.4 Cattle population and dependency on the forest for grazing and wildlife interaction:

According to the Ballari district Statistical report for the year 2018-19, there are 46,286 indigenous breed of cattle and about 510 mixed breed cattle are therein entire Sandur taluk. Further, about 14,119 buffalos, 1,05,005 Sheep, 25,521 goats, 1,426 pigs, 2,576 dogs, 1,50,934 poultry are there in entire taluk. As 20 % of the villages of Sandur taluk fall within 10 kms from the project area, at least 20% of the livestock population in general, Cows, Buffalos, Sheep and goats in particular are depending upon the forest of Sandur taluk. As the most of the surface land is farmland and reduction of village *Gomals* or grazing postures, the lives stock is totally

depending upon the forest for grazing. But due to the widespread of alien weeds such as *Lantana camara,* Eupatorium the availability of grass become scarce. To tackle this problem most of the villagers began growing nutritious fodder plants in their farmlands for feeding the hybrid variety of cows which yield a large quantity of milk and generate good income.

The major wildlife species such as, Indian Sloth Bear – *Melursis ursinus,* Leopard- *Panthera pardus,* Four-horned Antelope- *(Tetracerus quadricornis)* , Wild Boar- *Sus scrofa,* Jackal, Fox etc., were sighted on some occasions in the outskirts of the Mining Lease area. Though all these species are not sighted regularly, but found in good number in Gudekote Sanctuary, which lies about 30 kms from the project area and Daroji bear sanctuary that is located about 11 kms from the project area (aerial distance) (Map-64)

According to the shepherds and cattle graziers- leopards elusively lift their sheep, goat or young cattle into the bushes and predate upon it. Bears also sometimes attack on the crop such as maize, jowar, millets etc., result in financial loss for the farmer.

Fig-1 A long queue of Trucks waiting for transporting ore outside of the project area

CHAPTER -2. DETAILS OF THE PROJECT AREA

2.1 Overview and geography of project area

Deccan Plateau is the oldest geographical landscape comprising parts of Maharashtra, Eastern Plains of Karnataka, Parts of Telangana and Tamil Nadu. The Deccan Plateau is located in the tropic zone comprising of hot climate and dry scrub Jungle. The East flowing rivers that originate in Western Ghats flow through this Deccan Plateau as life lines and cater the needs of man and animals.

Fig-2

Location of the study area

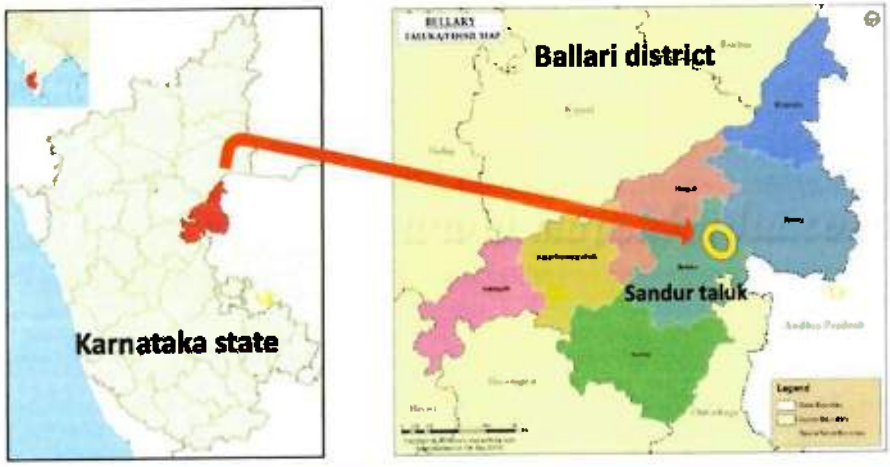


Fig-3. Location of the Project area

(Yellow- ML area, Green- Forest boundary, Red-Conveyor Belt, Orange-Service road)

2.2 Geographic Location and Extent

Location Coordinates:

- District: Ballari (formerly Bellary)
- Taluk: Sandur
- Forest Range: Sandur North Range (NEB)
- Forest Division: Ballari Territorial Division
- State: Karnataka, India
- Approximate Latitude: 15°05' N to 15°12' N
- Approximate Longitude: 76°30' E to 76°38' E
- **Project Proponent:** Karnataka State Minerals Corporation Limited (KSMCL)

Project Area Extent: The study area encompasses a 19.3044 hectares in a linear downhill corridor with a service road, totalling approximately 19.3044 hectares of forest land and 0.718 hectares of non-forest land. This includes the direct impact zone of the conveyor belt, service road, stock yard and adjacent forest patches, drainage systems, and wildlife movement pathways within Sandur North Range.(Fig-2 &3)

2.3 Physiography and Topography

The Sandur region is characterized by undulating terrain with elevation ranging from 550 to 1030 meters above mean sea level. The landscape is dominated by different geological, hydrological, ecological and climatic features.

Geological Features:

- Ancient Precambrian rock formations, primarily banded iron formations (BIF) and associated metamorphic rocks
- Rocky hillocks and exposed lateritic outcrops creating natural barriers and microhabitat diversity
- Shallow valley systems with seasonal nallahs (streams) draining into the Tungabhadra river system
- Iron-rich soils with varying depth, from deep red soils in valleys to shallow lithosols on slopes

Topographic Characteristics:

- Gentle to moderate slopes (5-20 degrees) interspersed with steeper rocky faces
- Natural drainage patterns with ephemeral watercourses active during monsoon (June-October)
- Plateau areas with relatively flat terrain supporting scrub vegetation
- Boulder-strewn slopes providing denning sites for large carnivores and reptiles

This rugged topography creates a mosaic of habitat types while also constraining agricultural expansion, resulting in a landscape where forest patches, rocky outcrops, and human-modified areas exist in close proximity.

2.4 Climate :

Climatic Conditions:

- Climate Type: Tropical semi-arid with distinct wet and dry seasons
- Annual Rainfall: 500-650 mm, concentrated in southwest monsoon (June-September) with occasional northeast monsoon (October-November)
- Temperature Range: Summer maximum 38-42°C (March-May), Winter minimum 12-18°C (December-January)
- Relative Humidity: 60-80% during monsoon, dropping to 20-40% in summer
- Evapotranspiration: High during summer months, exceeding precipitation for 7-8 months annually

The Sandur hill ranges forms a distinct geomorphic enclave within the broader Deccan Plateau, a region conventionally characterized by extensive arid plains, black-cotton soil tracts, and dominant grassland ecosystems. Extending over an estimated 48-kilometre corridor, the spindle-shaped Sandur massif stretches from the Tungabhadra reservoir in Hospet taluk to Swamihalli in Sandur taluk, establishing a unique topographic and ecological continuum. The dry-deciduous forests covering both the foothills and the elevated ridgelines constitute a markedly differentiated ecosystem when compared to the surrounding Deccan plains, offering higher structural complexity, richer vegetation density, and enhanced microclimatic resilience. The altitudinal gradient of Sandur plays a decisive role in structuring the spatial distribution of flora and fauna, creating niche habitats that support specialised, altitude-dependent biological communities.

As reported in the Gazetteer of Bellary, the elevation above the renowned Kumaraswamy Temple reaches 1,036 metres above mean sea level (MSL) in the southern segment, while Ramagad in the northern axis stands at 992 metres MSL. This elevational variability correlates strongly with changes in species composition, canopy stratification, and seasonal ecological functionality, reinforcing the region's role as a biodiversity hotspot within the eastern corridor of Karnataka.

Altitude acts as a key climatic determinant for the landscape. Dense forest cover across valleys and upper slopes enhances moisture retention, facilitates orographic precipitation, and moderates thermal extremes throughout the year. Subbarayanahalli recorded an annual precipitation volume of 1,666 mm in 2020–21, with the principal monsoon period spanning from June to September. The project area alone received 622 mm of rainfall during September 2020, underscoring the region's high rainfall variability and its dependence on monsoonal circulations. Winter conditions maintain consistently cool temperatures across the hill ranges, whereas summer conditions are marked by pronounced heat and aridity. In 2019–20, the lowest winter temperature documented at Subbarayanahalli was 14.8°C, while the highest temperature of the season was 38°C, recorded on 1 June 2019.

Champion and Seth's (1968) national forest classification framework designates this landscape as "Southern Tropical Dry Deciduous Forest," with the sub-category "Mixed Deciduous Forest." Tree species typically undergo synchronous leaf-shedding during winter, remaining bare through the peak summer months as part of their adaptive drought-mitigation strategy. The floristic assemblages at higher altitudes diverge significantly from those in the plains. Species typically associated with the Western Ghats—including *Impatiens lawii* and *Clerodendrum serratum*—occur along the crest zones, indicating biogeographical linkages and historical dispersal corridors. The region also hosts the rare, long-interval blooming species *Strobilanthes kunthiana* (Neelakurinji), which flowers once every twelve years on the steep elevated slopes of Swamimalai and Ramanamalai—outside the current mining lease boundary. High-value timber species such as Red Sanders (*Pterocarpus santalinus*), Sandalwood (*Santalum album*), Rosewood (*Dalbergia latifolia*), and Teak (*Tectona grandis*) are distributed sporadically across select pockets of the Sandur hills contributing to the landscape's economic and conservation significance. Narrow endemic plant *Crotalaria sandoorensis* that confined to Sandur hills in general and Ramgad in particular also found in and around TIOM mining area.

Faunal diversity shows comparable ecological divergence. Major mammals such as Indian Sloth Bear, Indian Leopard, Four-horned Antelope, several bird species typically restricted to the

Western Ghats—such as the Red-whiskered Bulbul, Oriental White-eye, Red Spur-fowl, Puff-throated Babbler, and Brown-headed Barbet—are recorded within the Sandur ranges, reflecting the habitat heterogeneity and favourable microclimatic conditions supported by the region. The unique interplay of altitude, forest composition, rainfall patterns, and terrain complexity positions Sandur as a critical ecological asset within the central Deccan landscape and warrants strategic conservation, monitoring, and sustainable development planning to ensure long-term ecosystem resilience.

2.5 Hydrology and Drainage pattern:

Hydrological Features: The study area experiences acute seasonal water stress. Surface water availability is limited to:

- Ephemeral streams (nallahs) flowing only during and immediately after monsoon
- Seasonal natural depressions (Lakes) retaining water for 2-4 months post-monsoon
- Artificial water bodies including mine sumps, agricultural tanks, and village ponds
- Groundwater at variable depths (15-40 meters), with limited recharge due to rocky substrate

This extreme seasonality in water availability is a critical driver of wildlife movement patterns and human-wildlife conflict, particularly during the dry season (February-May) when animals concentrate around remaining water sources, including those near roads and habitations.

The hydrology and drainage regime of the Thimmappanagudi Iron Ore Mines (KSMCL-TIOM) in Sandur taluk, Ballari district, is governed by the rugged physiography of the Sandur Schist Belt, the monsoon-dependent rainfall cycle, and the cumulative influence of mining activities within the Tungabhadra sub-basin of the Krishna River system. The landscape is characterized by structurally aligned NE–SW trending hill ridges composed of erosion-resistant formations such as banded hematite quartzite (BHQ), banded hematite jasper (BHJ), ferruginous shale, granitoids, and metavolcanics. These steep ridges and narrow intervening valleys generate a natural drainage network that is predominantly dendritic to sub-dendritic and consists of ephemeral streams that remain active primarily during the southwest monsoon. The drainage pathways generally flow from the elevated slopes toward the lower eastern and north-eastern valley zones, ultimately connecting to the Narihalla River system, which serves as the principal surface-water receptor for the region.

Surface water hydrology across the KSMCL-TIOM lease is shaped by short-duration, high-intensity rainfall events that accelerate runoff across the rocky slopes and limited soil cover. The ephemeral streams arising in and around the mine flow through valley depressions and move in a southwest-to-northeast direction before joining the Narihalla River. This network links the TIOM area hydrologically with the Narihalla Reservoir located near Taranagara village at coordinates 15°07'25.2" N and 76°36'21.9" E. The reservoir, with a storage capacity of approximately 0.8 TMC and a full reservoir level of 542.3 m, meets multiple regional water demands including mining operations, municipal supply, and downstream irrigation. TIOM relies on water sourced from settling tanks that collects rain water and regional supplies for dust suppression through tanker-based 10 KL sprinklers, placing the mine within a competitive local water-use environment shared with agricultural and urban sectors.

The surface hydrology interacts closely with the groundwater system, which occurs mainly in secondary porosity zones within fractured BHQ/BHJ formations and weathered residuum. Seasonal monsoon recharge replenishes these aquifers, leading to periodic fluctuations in the groundwater table that correspond with rainfall availability. Groundwater movement is generally constrained within fracture zones, valley fills, and colluvial pockets, making the hydrogeology highly dependent on structural controls. Hydrological connectivity between ephemeral channels, fracture systems, and valley-fill aquifers increases the potential for mining-related contamination or turbidity to migrate downstream or into shallow groundwater. Although no perennial rivers directly adjoin the KSMCL-TIOM lease, the connectivity through tributaries leading into Narihalla elevates risk pathways for siltation and water-quality degradation if runoff remains unmanaged.


Check dam located at the periphery of TIOM

Mining excavation and overburden dumps within KSMCL-TIOM—including major dump sites alter natural topography and disrupt historical drainage paths. During intense rainfall, eroded sediments from these dump slopes are mobilized and transported into natural drainage channels around Susheelanagara and the Muraripura region. This has contributed to increased turbidity and silt deposition in streams that feed the Narihalla River, particularly during peak monsoon episodes. The Narihalla itself, a seasonal

watercourse located about 10 km from Sandur, becomes susceptible to silt contamination from upstream mines in the monsoon season, impacting its utility for irrigation and drinking purposes in downstream communities.

To manage runoff and control sediment load, KSMCL-TIOM has implemented an array of storm-water and erosion-control measures including garland drains, retaining walls, check dams, gully plugs, silt-settling tanks, diversion drains, and percolation ponds. These structures are designed to intercept runoff, reduce flow velocity, trap silt, and increase infiltration, thereby maintaining the hydrological equilibrium and protecting downstream waterbodies. Strengthening and expanding the drainage-management infrastructure remain essential for mitigating runoff-induced impacts and ensuring compliance with environmental and mining regulations.

Artificial recharge interventions—such as percolation ponds and check-dam augmentation—are being proposed and expanded across the lease to enhance groundwater storage and reduce the hydrological impacts of land disturbance. Vegetative stabilization measures have already achieved approximately 80% green cover over 17.75 ha of reclaimed areas, contributing to reduced erosion and improved soil-water retention. Mining excavations currently span over 46.20 hectares with 24.40 hectares under overburden dumps, and these modified landforms heavily influence local groundwater flow patterns and seasonal recharge behaviour.

The proximity of TIOM to the Narihalla Reservoir, which is also proposed to function as the lower reservoir of a 300 MW pumped-storage hydropower project, heightens the need for stringent water-quality safeguards. Siltation from upstream mining can compromise reservoir storage, turbidity, and downstream irrigation reliability. Sustainable mining operations therefore require for the preservation of watershed integrity, aquifer health, and surface-water quality. Continuous monitoring, hydrological modelling, slope stabilization, and water-quality assessment form critical components of the long-term environmental management framework for TIOM, ensuring that mining activities proceed in alignment with hydrological sustainability, ecosystem protection, and regulatory compliance.

2.6 Vegetation Types and Forest Cover

Primary Vegetation Classifications:

Dry Deciduous Forest (Champion & Seth Type 5B/C2): Occurring in relatively better-protected patches with deeper soils, characterized by:

- **Canopy Layer**: Teak (*Tectona grandis*), Terminalia species (*T. tomentosa*, *T. arjuna*), Anogeissus (*Anogeissus latifolia*), reaching 8-15 meters height
- **Sub-canopy:** Lagerstroemia (*Lagerstroemia parviflora*), Butea (*Butea monosperma*), Cassia (*Cassia fistula*)
- **Shrub Layer**: Helicteres (*Helicteres isora*), Grewia species, Ziziphus (*Ziziphus* spp.)
- **Ground Layer**: Seasonal grasses including Heteropogon, Themeda, and Chrysopogon species

Southern Thorn Scrub (Champion & Seth Type 6B): Dominant on degraded sites and rocky slopes:

- Sparse tree layer: Acacia species (*A. leucophloea*, *A. ferruginea*), *Neltuma juliflora* (*Prosopis juliflora* - invasive), *Chromolaena odora* (invasive).
- Dense shrub layer: Lantana (*Lantana camara* - invasive), Carissa (*Carissa carandas*) etc.,
- Ground vegetation sparse during dry season, flush growth during monsoon

Rocky Outcrops and Grasslands:

- Specialized xerophytic vegetation adapted to shallow soils and extreme moisture stress
- Grass species: *Heteropogon contortus*, Aristida species
- Succulents and herbs: Euphorbia species, seasonal forbs

Forest Degradation Issues:

- Invasive species proliferation: *Lantana camara, Chromolaena odorata* and *Neltuma juliflora* (*Prosopis juliflora)* have colonized disturbed areas, altering vegetation structure and reducing native species diversity
- Grazing pressure from livestock affecting regeneration
- Edge effects from roads and clearings creating altered microclimates
- Historical mining activities leaving degraded patches with compromised soil structure

2.7 Land Use Pattern

The study area represents a typical mining-influenced landscape with multiple land use categories:

Land Use Distribution (Approximate):

- Reserved Forest: 45%
- Mining Leases (Active and Abandoned): 25%
- Agricultural Land (Dryland cultivation): 20%
- Settlements and Infrastructure: 7%
- Wastelands and Rocky Outcrops: 3%

This heterogeneous landscape creates numerous edge habitats and transition zones where wildlife-human interactions are concentrated.

2.8 Socio-Economic Context

Human Settlements: Multiple villages and hamlets exist within and around the study area, with populations primarily engaged in:

- Agriculture: Dryland crops (jowar, bajra, pulses) with limited irrigation
- Animal Husbandry: Goats, sheep, and cattle grazing in forest fringes
- Mining-related Employment: Permanent and Daily wage labour at KSMCL and private mining operations
- Small-scale Trading: Support services for mining workforce

Population Demographics:

- Total population in impact zone: Approximately 8,000-10,000 people
- Scheduled Castes/Tribes: Significant representation, with forest-dependent livelihoods
- Literacy levels: Moderate, with improving access to education
- Infrastructure: Basic road connectivity, electricity, limited piped water supply

Resource Dependencies: Local communities interact with forest resources through:

- Seasonal grazing of livestock in forest areas (despite restrictions)
- Collection of fuelwood, particularly dead wood
- Minor forest produce collection (tendu leaves, tamarind, medicinal plants)
- Occasional crop raiding by wild herbivores leading to retaliatory attitudes

Understanding this socio-economic context is essential for designing community-sensitive mitigation measures and gaining local cooperation for conflict reduction strategies.

The Mining Lease area is located in Ballari district of Karnataka state at about 8-10 km from Sandur town by road. The proposed conveyor belt area is geographically located between latitude 15.133223°, longitude 76.529419° at 861 msl altitude in the Southern part of the ML area towards M.L area and latitude 15.117434°, longitude 76.508260° at 649 msl altitude, in the South-Eastern side towards Shusheelanagara. The average width of the conveyor belt area is 20 meters and average width of the service road area is 15 meters. A total of 19.3044 hectares of the forest land and 0.718 hectares of the non-forest land is proposed for this utility.

For the purpose of the study, proposed area and the area about 2 kms from the boundary of the mining area has been considered for assessment of flora and fauna. The rationale behind this is, that, the wildlife keep on moving within its territory that may be more than 2 kms for major fauna and birds have no limit for their movements.

2.9 Present Mineral Transportation plan

The mineral transportation system at the Thimmappanagudi Iron Ore Mines (KSMCL-TIOM) in Sandur taluk, Ballari district, is designed for efficient, compliant, and environmentally safe movement of ore from pit to dispatch. After extraction, ore is hauled by dumpers along graded internal mine roads to the crushing and screening units within the lease. These roads are engineered with proper gradients, drainage, and compacted surfaces to suit 10–25 tonne haulage vehicles. Processed ore is stored in ROM and product stockyards before being dispatched mainly through multi-axle tippers operating under the Karnataka e-permit and IBM mineral-tracking systems.

Mineral dispatch from TIOM follows approved transport corridors connecting the mine to the Sandur–Hospet road network and major consumers such as steel and beneficiation units in the Donimalai–Toranagallu industrial belt. Dust suppression is achieved through regular water sprinkling by 5 Tankers with 8-10 KL capacity, while wheel-wash systems, tarpaulin-covered trucks, and roadside drains minimize dust and sediment spread. Safety is ensured through speed limits, signage, reflector posts, regular road maintenance, and controlled vehicle movement during poor weather or low visibility.

Given the hilly terrain of the Sandur Schist Belt, transportation planning emphasizes safe gradients, stable bends, and protection of seasonal drainage lines. Measures such as check dams, silt traps, and retention walls reduce runoff-related impacts near haul roads. The mine coordinates with local authorities during peak traffic periods to avoid congestion on public roads.

Future improvements include exploring rail-linked dispatch through regional sidings, participation in cluster-level logistics initiatives, and evaluating long-term options such as conveyor-based systems to lower fuel use and emissions. Overall, TIOM's transportation plan supports reliable ore movement while minimizing environmental impacts and maintaining regulatory and community-safety standards.

2.10 Impact of transportation on the Wildlife and Forest

Mineral transportation from the Thimmappanagudi Iron Ore Mines (KSMCL-TIOM) imposes concentrated pressures on wildlife across the Sandur Schist Belt, where haul-road traffic, dust, noise, vibration, and artificial lighting disturb animal movement and degrade habitat quality. The Indian Sloth Bear and Indian Leopard—both wide-ranging, crepuscular species—face elevated collision and disturbance risks along transport corridors, especially in narrow valleys and stream

(kolla) crossings that function as natural movement routes. Frequent vehicle convoys displace these species from foraging zones, increase energetic stress, and fragment their home ranges. Wild Boar, Black-naped Hare, Mongoose, Monkeys, Civets, Monitor Lizards and snakes are particularly vulnerable to roadkill because they use roadside vegetation, moist depressions, and culverts as feeding and shelter sites; truck movement during monsoon and dusk/dawn periods heightens this mortality risk.

Dust deposition from uncovered or fast-moving trucks reduces forage quality for herbivores, alters ground cover, and clogs small water pools used by wildlife. Runoff from haul roads mobilizes silt into ephemeral streams that feed the Narihalla catchment, affecting aquatic prey species relied upon by carnivores and constricting access to clean water for mammals and reptiles. Noise and vibration disrupt denning behaviour of Sloth Bears and reduce the hunting efficiency of Leopards in forest–scrub mosaics bordering the transport network.

Mitigation requires disciplined speed control, crepuscular-hour restrictions, continuous haul-road watering, tarpaulin-covered loads, and functioning drainage/silt traps at every stream crossing. Wildlife-safe culverts and vegetated crossings at identified pinch-points, combined with driver-training and signage, reduce collisions and behavioural displacement. Regular monitoring using roadkill registers, camera traps, and dust/silt-load assessments ensures transparent compliance. Over time, shifting part of ore dispatch to shared cluster rail infrastructure or conveyor systems can substantially lower road-traffic pressure, improving safety for Sloth Bears, Leopards, Wild Boar, Black-naped Hares, reptiles, and the broader wildlife community dependent on the Sandur hill ecosystem.

2.11 Positive Impact of Downhill Conveyor belt on the Wildlife and Forest

The proposed downhill pipeline conveyor belt system represents a strategic, sustainability-led transformation in mineral transportation with substantial positive impacts on forest ecosystems and wildlife. By completely replacing conventional truck-based haulage, the project substantially reduces vehicular traffic through forest areas, thereby lowering dust emissions, noise levels, fuel consumption and associated air pollution. This directly benefits forest vegetation by minimizing dust deposition on foliage, improving photosynthetic efficiency and preserving soil health, while simultaneously reducing disturbance to wildlife.

The conveyor system's narrow, linear footprint has been carefully optimized to limit forest fragmentation and edge effects, safeguarding habitat continuity and movement corridors for

terrestrial fauna. The downhill, gravity-assisted design further enhances energy efficiency, translating into reduced greenhouse gas emissions and a smaller operational carbon footprint. Importantly, the elimination of frequent heavy vehicle movement significantly mitigates risks of wildlife mortality, behavioural stress, and human–wildlife conflict, thereby enhancing both ecological and occupational safety.

Complementing these inherent design advantages, the project is supported by a comprehensive Wildlife Management Plan and compensatory afforestation over an area marginally exceeding the forest land diverted. Targeted measures such as habitat enrichment, water resource development, invasive species control, and monitoring programs strengthen landscape-level ecological resilience. Collectively, the proposed conveyor belt system exemplifies a forward-looking, compliance-driven infrastructure solution that integrates mining efficiency with long-term conservation of forest ecosystems, flora, and fauna.

CHAPTER- 3 MATERIALS AND METHODS

A preliminary reconnaissance of the study area and its adjoining villages was first carried out by the research team to understand the landscape and its ecological context. Subsequently, the team engaged with knowledgeable local residents and farmers who possessed long-standing familiarity with the wildlife habitats and species occurring in the region. Structured data sheets were prepared for recording direct sightings and indirect signs, and field equipment—including GPS units, DSLR and digital cameras, and latest camera traps-were assembled for systematic documentation. Information on man–animal conflict was collected through interviews with farmers, while verified compensation records were obtained from the Range Forest Officers of the Sandur North Range. With these preparatory steps completed, comprehensive field surveys and documentation of faunal diversity were undertaken in and around the study area.

3.1 Trail monitoring and data collection

Following the initial visit to the site, systematic monitoring and data collection were undertaken with the support of trained local field assistants. Early survey efforts focused on documenting both direct and indirect evidence of wildlife presence, accompanied by photographic records. Indirect signs of key species—including the Indian Sloth Bear, Indian Leopard, Four-horned Antelope, Rusty-spotted Cat and several reptile species—were systematically recorded. Photographic documentation of birds and small mammals was also carried out to capture the broader faunal diversity of the landscape.

Field observations included identifying pugmarks, scat, digging marks, feeding remnants, nesting or denning sites, and other verifiable traces of wildlife activity. Opportunistic information provided by villagers regarding mammal sightings and movement patterns was incorporated to strengthen the dataset. Because many species traverse extensive home ranges in search of food and water, wildlife data were collected not only within the immediate study area but also across adjoining habitats, including Muraripura-Ramgada and surrounding landscapes extending up to 10 kilometres from the project boundary.

3.2 Identification and documentation:

Most of the direct sightings were recorded using DSLR cameras and camera traps. The same cameras were used to photograph different species of flora and birds present in different locations of the study area. Birds are identified by using binoculars and guides published by reputed institutes like, BNHS and others. Some birds like Brown-headed Barbets, Ioras were identified by their typical calls. Pug marks, Scat and quills, hairs, of mammals are also identified and documented. Most of the birds of Sandur were photographed in their natural habitat without disturbing their natural behaviour.

CHAPTER-4 RESULT AND FINDINGS OF THE STUDY:

The 48 kilometre spindle shaped Sandur hills cut out of the plain land and showcase the trains of Sahyadri hills. This is the area between Wester Ghats and Eastern Ghats. The forest evolved Sandur hills resulted in a rich and unique biological diversity. The higher elevation of the Sandur hills helped to evolve the forest different from that of plains of Deccan Plateau. The floral diversity is well documented in earlier studies in the Medicinal Plantation Conservation Area and other forests of Sandur by various researchers and organisations. The rapid assessment of the floral and faunal distribution in the current study revealed the following floral and faunal diversity in and around the study area:

4.1 Floral Diversity Assessment of KSMCL–TIOM Conveyor Belt Area

The Sandur hill ranges of Ballari district represent one of the most ecologically distinctive forest landscapes of southern India, forming a transitional zone between the Eastern Deccan Plateau and peninsular dry deciduous forest systems. The North Eastern Block (NEB) of the Sandur North Range Forest, proposed for the installation of a downhill conveyor belt over 19.3044 ha of forest land for KSMCL–Thimmappanagudi Iron Ore Mines (TIOM), supports a mosaic of vegetation types shaped by topography, edaphic conditions, and seasonal rainfall regimes.

Floristic diversity forms the structural and functional backbone of forest ecosystems. Plants regulate microclimate, stabilize soils, control hydrological processes, and provide the primary energy base for wildlife. Any linear infrastructure in forest land, particularly in a biodiversity-rich region such as Sandur, therefore necessitates a rigorous, quantitative assessment of plant diversity as part of the Wildlife Management Plan (WMP).

The present study documents and analyses the floral diversity of the NEB, based on a comprehensive inventory of 214 vascular plant species. The assessment goes beyond mere listing and evaluates taxonomic structure, life-form composition, conservation status, and ecological diversity indices, providing a scientifically defensible baseline for impact prediction, mitigation planning, and long-term ecological management.

The present floristic assessment was carried out in the North Eastern Block (NEB) of the Sandur North Range Forest, Ballari district, Karnataka, falling within the proposed alignment of the downhill conveyor belt of KSMCL–Thimmappanagudi Iron Ore Mines (TIOM). The study area encompasses 19.3044 ha of forest land, characterized by undulating terrain, rocky outcrops, shallow to moderately deep soils, and vegetation typical of Southern Tropical Dry Deciduous Forests interspersed with scrub and grassland patches.

Floristic Survey and Data Collection

A systematic floristic survey was undertaken to document the vascular plant diversity within the project influence area. Field observations were supplemented with existing floristic records and secondary data to ensure completeness of the species inventory.

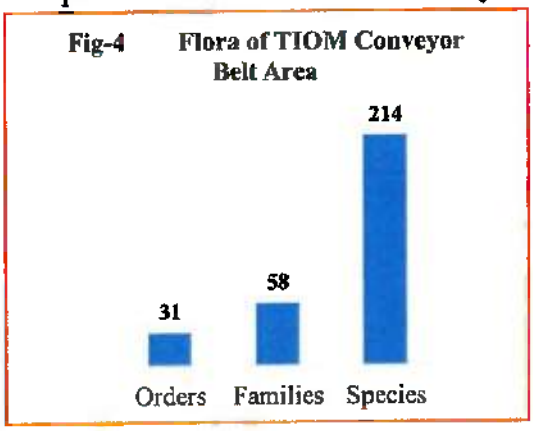
- All vascular plant species encountered were recorded, including trees, shrubs, climbers, herbs, grasses, sedges, ferns, and parasitic plants.
- Species identification was carried out using standard regional floras (e.g., *Flora of the Presidency of Madras*, *Flora of Karnataka*) and cross-verified with current taxonomic databases.
- Nomenclature and higher classification follow the Angiosperm Phylogeny Group IV (APG IV) system to maintain taxonomic consistency.
- Each species was categorized based on plant life-form (plant type) such as tree, shrub, herb, climber, grass, sedge, fern, or parasitic plant.
- Conservation status is based on the IUCN Red List, with invasive species explicitly identified.

- The final checklist comprised 214 plant species, representing the complete floristic assemblage of the study area.

Taxonomic Structure of the Flora

The floristic composition of the KSMCL–TIOM project area in the North Eastern Block (NEB) of the Sandur North Range Forest reveals a highly structured and taxonomically diverse plant assemblage, reflecting the ecological heterogeneity and evolutionary history of the Sandur landscape. The inventory of 214 vascular plant species, distributed across multiple taxonomic hierarchies, provides valuable insights into the phylogenetic breadth, functional diversity, and ecological resilience of the forest ecosystem.

The North-Eastern Block (NEB) of Sandur North Range Forest, despite anthropogenic pressures, supports a significant assemblage of Wild Flora and Faunal species representative of peninsular India's dry deciduous forest ecosystems. According to the study by FRLHT-Bengaluru and Karnataka Medicinal Plants Authority, Govt of Karnataka forest of Sandur has more than 350 species of plants. The Working plan of Ballari district, Karnataka Forest Department has listed out several major floral species in the study area including trees, shrubs, climbers, herbs and grasses. During the current study period, 214 species of plants listed in a rapid assessment. (Fig-4, Table-10).



According to the study, 214 major species of plants found in the study area, belongs to 58 families, 31 Orders. This is indicates the healthy floral diversity in the study area (Fig-4)

Table-10 Plant Orders and Species found in KSMCL-TIOM Conveyor Belt area

Rank	Order	Number of Species	Percentage
1	Fabales	43	20.19%
2	Gentianales	22	10.33%
3	Lamiales	22	10.33%
4	Poales	17	7.98%
5	Sapindales	13	6.10%
6	Malpighiales	12	5.63%
7	Myrtales	11	5.16%
8	Asterales	10	4.69%
9	Malvales	9	4.23%
10	Rosales	8	3.76%
11	Caryophyllales	5	2.35%
12	Asparagales	5	2.35%
13	Solanales	5	2.35%
14	Boraginales	4	1.88%
15	Santalales	4	1.88%
16	Magnoliales	3	1.41%
17	Commelinales	3	1.41%
18	Ranunculales	2	0.94%
19	Dioscoreales	2	0.94%
20	Celastrales	2	0.94%
21	Ericales	2	0.94%
22	Alismatales	1	0.47%
23	Arecales	1	0.47%
24	Brassicales	1	0.47%
25	Fagales	1	0.47%
26	Liliales	1	0.47%
27	Oxalidales	1	0.47%
28	Piperales	1	0.47%
29	Polypodiales	1	0.47%
30	Vitales	1	0.47%
31	Zygophyllales	1	0.47%
	Total	213	100.00%

Floral Orders: The study revealed 31 floral orders in the study area. Among the 31 orders Fabales is the largest order with 43 species. This amounts to 20.19% of all studied floral species in the study area. Genitianales and Lamiales share the second largest order with 22 species each (10.33%), Poales is the third largest order with 17 species (7.98%) and Sapindale with 13 species stands fourth highest order in the list (6.10%). Malpighiales is the fifth largest order with 12 species (5.63%). All other orders have 11 to 1 species each. This indicates the dominance of some floral species and also floral diversity in the study area. (Fig-5, Table-10)

Fig-5: Orders with highest number of families in hierarchial Order

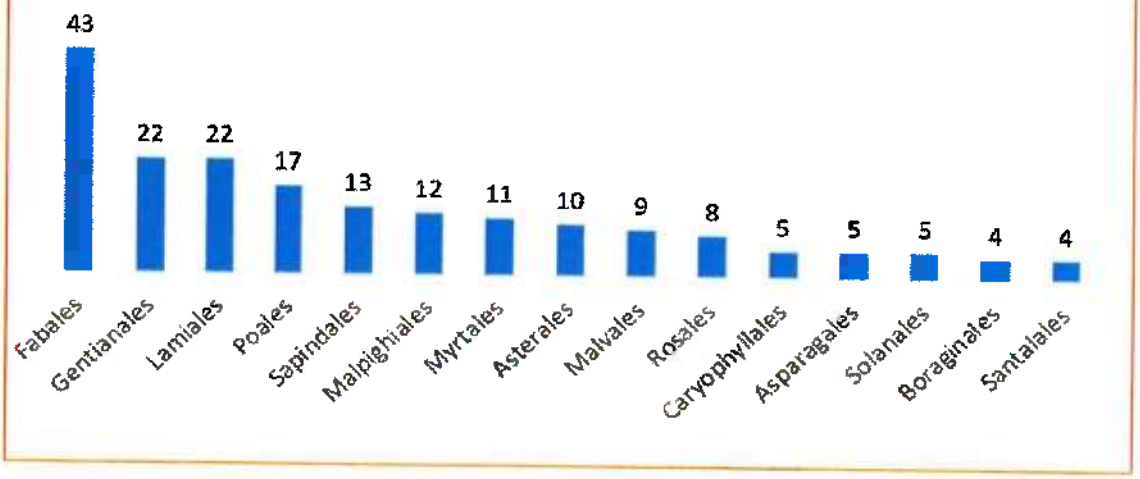
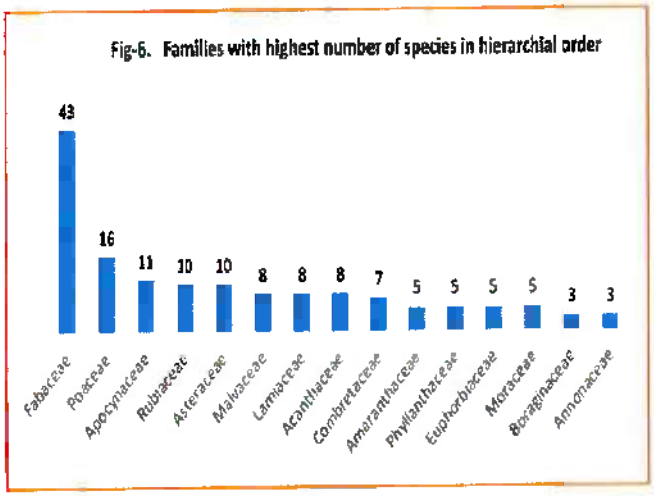


Table: 11 Hierarchy of Plant families and the species found in KSMCL-TIOM Conveyor Belt area

Rank	Family	Number of Species	Percentage
1	Fabaceae	43	20.09%
2	Poaceae	16	7.48%
3	Apocynaceae	11	5.14%
4	Rubiaceae	10	4.67%
5	Asteraceae	10	4.67%
6	Malvaceae	8	3.74%
7	Lamiaceae	8	3.74%
8	Acanthaceae	8	3.74%
9	Combretaceae	7	3.27%
10	Amaranthaceae	5	2.34%
11	Phyllanthaceae	5	2.34%
12	Euphorbiaceae	5	2.34%
13	Moraceae	5	2.34%
14	Boraginaceae	3	1.40%
15	Annonaceae	3	1.40%
16	Commelinaceae	3	1.40%
17	Rutaceae	3	1.40%
18	Sapindaceae	3	1.40%
19	Anacardiaceae	3	1.40%
20	Rhamnaceae	3	1.40%
21	Convolvulaceae	3	1.40%
22	Dioscoreaceae	2	0.93%
23	Ebenaceae	2	0.93%
24	Celastraceae	2	0.93%
25	Salicaceae	2	0.93%
26	Verbenaceae	2	0.93%
27	Orobanchaceae	2	0.93%
28	Lythraceae	2	0.93%
29	Myrtaceae	2	0.93%
30	Santalaceae	2	0.93%
31	Solanaceae	2	0.93%
32	Meliaceae	2	0.93%
33	Asparagaceae	2	0.93%
34	Araceae	1	0.47%
35	Arecaceae	1	0.47%
36	Amaryllidaceae	1	0.47%
37	Asphodelaceae	1	0.47%
38	Hypoxidaceae	1	0.47%
39	Capparaceae	1	0.47%
40	Heliotropiaceae	1	0.47%
41	Bignoniaceae	1	0.47%
42	Oleaceae	1	0.47%
43	Colchicaceae	1	0.47%
44	Bixaceae	1	0.47%
45	Cyperaceae	1	0.47%
46	Aristolochiaceae	1	0.47%
47	Actiniopteridaceae	1	0.47%
48	Menispermaceae	1	0.47%
49	Papaveraceae	1	0.47%
50	Casuarinaceae	1	0.47%
51	Loganiaceae	1	0.47%
52	Loranthaceae	1	0.47%
53	Olacaceae	1	0.47%
54	Burseraceae	1	0.47%
55	Simaroubaceae	1	0.47%
56	Vitaceae	1	0.47%
57	Oxalidaceae	1	0.47%
58	Zygophyllaceae	1	0.47%
	Total Species	**214**	**100.00%**

Floral Families: The study reveals 58 floral families in the study area. Fabaceae is the family with largest number of species, i.e 43 species (20.09%). Poaceae family has 16 species and stands second in the list (7.48%). Apocynaceae has 11 species and stands third in the hierarchy (5.14%). Rubiaceae Asteraceae has 10 species each which share fourth largest families (4.67%). Malvaceae Lamiaceae and Acanthaceae have 8 species each (3.74%). Combretaceae has 7 species (3.27%), Amaranthaceae, Phyllanthaceae, Euphorbiaceae and Moraceae has 5 species each (2.34%). Boraginaceae, Annonaceae, Commelinaceae, Rutaceae, Sapindaceae, Anacardiaceae, Rhamnaceae and Convolvulaceae has 3 species each (1.40%). Dioscoreaceae, Ebenaceae, Celastraceae, Salicaceae, Verbanaceae, Orobanchaceae, Lytharaceae, Myrtaceae, Santalaceae, Solanaceae, Meliaceae and Asparagaceae has 2 species each (0.93%). All other families have 1 species each (Table:11, Fig-6)



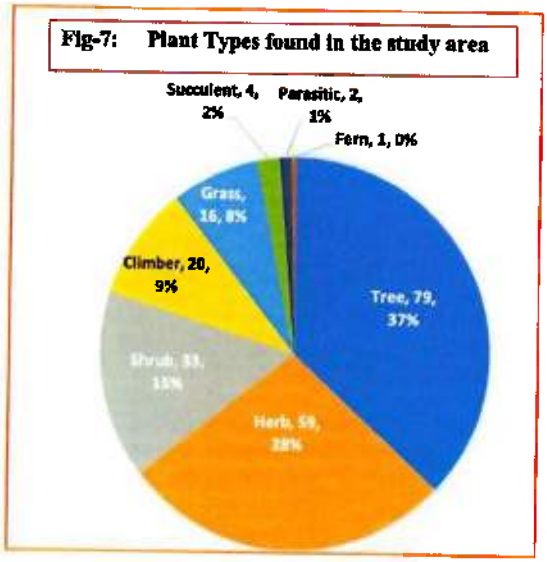
The analysis of the flora reveals that the plant species belong to Fabaceae family are found in abundance in the TIOM conveyor belt area. Some of the plants belong to this family are, *Senegalia catechu, Albizia amara, Cassia fistula, Hardwickia binata, Neltuma juliflora, Pongamia pinnata, Vachellia nilotica* can be seen in entire study area and also these species are found in good numbers. Species like *Albizia amara, Carissa carandas and Senegalia catetchu* represent the traits of the dry scrub jungle. The species belong to Poaceae majorly consists of grasses are also abundant which plays a vital role in prevention of soil erosion. (Anexure-1, Plate-3)

Table:12 Plant Types found in the study area

Sl No.	Plant Type	Species Count	Percentage
1	Tree	79	37.09%
2	Herb	59	27.23%
3	Shrub	33	15.49%
4	Climber	20	9.39%
5	Grass	16	7.51%
6	Succulent	4	1.88%
7	Parasitic	2	0.94%
8	Fern	1	0.47%
Total Plants		214	

Plant types: Among the 214 major floral species 79 species, the plant types of trees (37.09%), 59 species of shrubs (27.23%) 33 species of herbs (15.49%), 20 species of climbers (9.39%), and 16 species of grasses (7.51%), 4 Succulents (1.88%), Parasites 2 (0.94%) and 1 species of Fern (0.47%) are found in the study area of TIOM Conveyor belt location. (Table-12, Fig-7)

Fig-7: Plant Types found in the study area



Among trees, *Senegalia catechu, Albizia amara*, Carissa carandas are found to be the dominant and widespread species followed by *Hardwickia binate, Neltuma juliflora, Pongamia pinnata, Zyziphus jujuba, Zyziphus oenoplea*. Ficus species, *Climbers* such as *Capparis zeylenica* bear fruits which are eaten by Sloth bears, boars and birds.

Ecological Significance:

The dominance of woody life forms indicates a structurally mature dry deciduous ecosystem, capable of supporting diverse faunal assemblages. Herbs and grasses contribute to seasonal productivity, particularly during the monsoon, while climbers and parasitic species add vertical and functional complexity. This layered vegetation structure enhances habitat heterogeneity and ecological resilience.

4.1.1. Conservation Status of Flora of TIOM

The IUCN Red List of Threatened Species, founded in 1964, is the world's most comprehensive inventory of the global conservation status of biological species. It uses a set of precise criteria to evaluate the extinction risk of thousands of species and subspecies. These criteria are relevant to all species and all regions of the world, making it a universal standard for biodiversity health.

The status is divided into nine formal categories, ranging from Least Concern (LC) to Extinct (EX).

Not Evaluated (NE): Species that have not yet been assessed against the IUCN Red List criteria.

Data Deficient (DD): Species for which available information is insufficient to determine extinction risk, signalling a need for targeted research.

Least Concern (LC): Species with stable or widespread populations and no immediate risk of extinction under current conditions.

Near Threatened (NT): Species close to qualifying for a threatened category and likely to do so if pressures continue.

Vulnerable (VU): Species facing a high risk of extinction in the medium-term due to significant population or habitat decline.

Endangered (EN): Species exposed to a very high risk of extinction in the near future if threats are not mitigated.

Critically Endangered (CR): Species at an extremely high risk of imminent extinction in the wild.

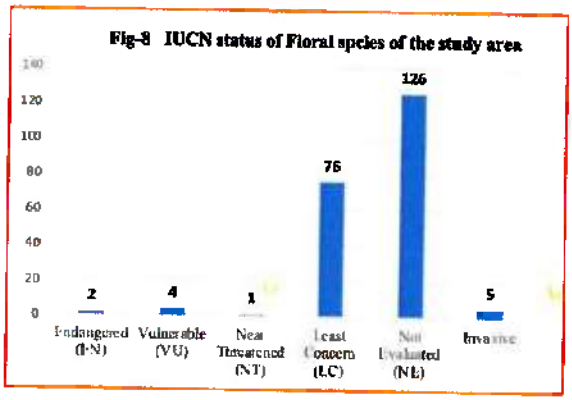
Extinct in the Wild (EW): Species that survive only in captivity, cultivation, or outside their natural range.

Extinct (EX): Species for which there is no reasonable doubt that the last individual has died.

The IUCN status serves as a critical "barometer of life," guiding conservation actions and policy changes worldwide. It helps governments and NGOs prioritize which habitats and species require immediate funding and legal protection. By providing a clear, science-based framework, the Red List highlights the impact of human activity on the planet's ecosystem.

Table-13: IUCN status of Floral species of the study area

IUCN Category	No. of Species
Endangered (EN)	2
Vulnerable (VU)	4
Near Threatened (NT)	1
Least Concern (LC)	76
Not Evaluated (NE)	126
Invasive	5
Total	**214**



The study reveals the rich floral diversity of the TIOM conveyor belt area with a number of species of conservation importance. The International Union of Conservation of Nature (IUCN) categorises the living being in different categories of conservation importance, which is the indicator of their population loss. Among the 214 species, 1 species -*Pterocarpus marsupium* is listed as Near Threatened (NT), 4 species of plants found in the study area are categorised under Vulnerable (VU) species, they are, *Senegalia ferruginea, Santalum album, Chloroxylon swietenia.* Two species, i.e *Pterocarpus santalinus, Crotalaria sandoorensis* are listed under Endangered Category. (Table-13, Fig-8)

Crotalaria sandoorensis is highly endemic to Sandur hills in general and Ramgad vicinity in particular. But this hemp species is found in different locations of TIOM Conveyor belt area.

Alien Invasive Species: Across the TIOM landscape, three invasive botanical disruptors—*Lantana camara, Chromolaena odorata, Mesosphaerum suaveolens, Neltuma juliflora, Chromolaena odorata (Syn.Eupatorium odoratum) and Parthenium hysterophorus* —have established a pervasive footprint, lining road corridors and infiltrating forest interiors. Their unchecked expansion has displaced native grasslands, leaving the forest floor overwhelmed by dense, impenetrable thickets.

Lantana camara advances through an unintended supply chain engineered by wildlife. Birds and sloth bears consume its berries and, through natural waste pathways, broadcast viable seeds across the terrain. Likewise, the pods of ***Neltuma juliflora*** (*Prosopis juliflora*) are readily eaten by goats and wild boars; after passing through the acidic digestive systems of these animals, the seeds emerge primed for aggressive germination. These species have become so integrated into local food webs that their spread has turned into a self-sustaining biological distribution network.

Mesosphaerum suaveolens (syn. *Hyptis suaveolens*) is an aggressive invasive species widely established across Indian forests, scrublands, and fallow areas. It forms dense monospecific

stands that suppress native ground flora and inhibit natural regeneration. Its strong allelopathic properties alter soil chemistry, giving it a competitive advantage over indigenous species. The invasion reduces habitat quality for native insects and small fauna, disrupting local trophic interactions. Unchecked spread of *M. suaveolens* accelerates ecosystem degradation and complicates forest management and restoration efforts.

Yet the most operationally hazardous invader is ***Chromolaena odorata*** *(Syn.Eupatorium odoratum)*. This fast-growing weed scales rapidly and deploys a prolific reproductive strategy: a single plant can generate between 80,000 and 160,000 airborne seeds, each capable of taking root with the arrival of the monsoon. Once established, it expands with ruthless velocity, engulfing forest strata and outcompeting native flora.

Parthenium hysterophorus is a highly invasive alien weed that aggressively colonizes forest edges, grasslands, and disturbed ecosystems. It suppresses native understorey vegetation through allelopathic chemicals, reducing plant diversity and altering forest regeneration dynamics. The invasion disrupts local food webs by degrading habitat quality for insects, herbivores, and ground-nesting fauna. Its dominance lowers soil fertility and interferes with natural succession, weakening ecosystem resilience. In the long term, *Parthenium* invasion erodes forest health and compromises the stability and services of local ecosystems.

Fig-9: Invasive Alien Species found in the study area

The cumulative proliferation of these three five invasive weeds erodes grassland ecosystems, diminishes fodder availability for herbivores, and triggers cascading declines across the trophic hierarchy. As grasslands vanish, herbivore populations contract—setting off an inevitable downstream loss of carnivores. This ecological disruption underscores the urgent need for strategic, science-driven intervention to restore ecosystem resilience and safeguard endemic biodiversity (Fig-9)

Therefore, the management of KSMCL- TIOM management shall take a serious note of these Alien Invasive Vicious weeds and eradicate them where ever possible to save the native species of flora and fauna.

4.1.2. Floral Diversity Indices:

Floral diversity indices convert floristic data into quantitative indicators of ecosystem complexity, stability, and resilience. By integrating species richness and evenness, indices such as the Shannon–Wiener Index and Simpson's Diversity Index function as strategic KPIs for ecosystem health in Environmental Impact Assessment (EIA) and sustainability planning. High index values indicate balanced community structure, efficient niche partitioning, and strong ecological buffering, while low values reflect dominance, disturbance, or anthropogenic stress.

In the present assessment, the dataset is species-rich but abundance-neutral; therefore, interpretation focuses on potential diversity and ecosystem condition rather than population dominance.

Table-14: Floral Diversity Indices:

Diversity Metric	Level of Analysis	Value	Ecological Interpretation
Species Richness (R)	Species	214	Very high floristic richness, indicating habitat heterogeneity and multiple ecological niches
Taxonomic Richness	Families	58	Broad phylogenetic spread reflecting structural and functional diversity
Taxonomic Richness	Orders	31	Wide evolutionary representation; absence of taxonomic concentration
Shannon–Wiener Index (H′)	Families	3.57	Very high diversity; strong evenness and balanced taxonomic distribution
Shannon–Wiener Index (H′)	Orders	2.791	High diversity at higher taxonomic level; no order-level dominance
Gini–Simpson Index (1 − D)	Families	0.939	Low dominance; high functional redundancy and ecosystem stability
Gini–Simpson Index (1 − D)	Orders	0.962	Extremely high diversity; resilient and well-organized community structure

High Shannon and Simpson values, combined with elevated richness across species, families, and orders, confirm low dominance, high evenness, and strong ecological buffering capacity. The high richness across orders and families indicates broad evolutionary representation rather

than concentration within a narrow taxonomic lineage, reflecting a structurally complex dry deciduous forest ecosystem.

From a forward-looking management lens, this taxonomic breadth elevates the conservation value of the landscape and reinforces the need for ecologically prudent project design, strict construction-phase controls, invasive species management, and long-term restoration planning.

Richness Metrics

Species richness (R = 214) represents the total number of unique plant species recorded in the study area. High family (58) and order (31) richness values demonstrate floristic heterogeneity and phylogenetic breadth, signifying habitat complexity and multiple ecological niches.

Shannon–Wiener Diversity Index (H′)

The Shannon Diversity Index integrates species richness and relative abundance and measures uncertainty in predicting the taxonomic group of a randomly selected species.

Denoted as *H*, this index is calculated as:

$$H = -\Sigma p_i * ln(p_i)$$

Where:

- (sum) = summation
- (ln) = natural logarithm
- (p_i) = proportion of species *i* in the community

Higher H′ values indicate higher diversity and evenness. A value of **H′ = 0** represents a monospecific community, while values **> 3.0** denote highly diverse systems.

- H′ (Families) = 3.57
- H′ (Orders) = 2.791

The higher family-level value is expected due to greater taxonomic resolution. These values indicate even species distribution, absence of dominance, and high community complexity. Such conditions reflect balanced competition, strong understorey diversity, and resistance to floristic homogenization.

Simpson's Diversity Index (D)

Simpson's index emphasizes dominance by estimating the probability that two randomly selected individuals belong to different species.

$$D = 1 - \left(\frac{\Sigma\, n(n-1)}{N(N-1)} \right)$$

n = the total number of organisms of a particular species
N = the total number of organisms of all species

The Shannon Diversity Index (sometimes called the Shannon-Wiener Index) is used to measure the diversity of species in a community.

Simpson's Index (1 – D) = 0.962

This indicates a **96.2% probability** that two randomly selected species are different, confirming very low dominance and high functional redundancy.

- Very high diversity (close to 1.0)
- 96.2% probability that two randomly selected species are different
- Low dominance by any single family

Ecological Interpretation:

Collectively, the diversity indices indicate:

- **High species richness** → floristic heterogeneity and habitat complexity
- **High Shannon diversity** → ecological stability and evenness
- **High Simpson index** → low dominance and structural resilience

Despite numerical representation of families such as Fabaceae and Poaceae, diversification across life forms (trees, shrubs, herbs, climbers) prevents ecological monopolization. This structure supports efficient niche partitioning and coexistence of multiple functional groups. Such ecosystems are resilient but not invulnerable and can tolerate only carefully managed, low-intensity disturbance.

Gini–Simpson Index (1 – D)

The Gini–Simpson Index (1 – D) is a dominance-sensitive diversity metric that expresses the probability that two randomly selected individuals belong to different species. It is widely used as a robustness indicator of community structure in ecological assessments.

Formula

$$D = 1 - \left(\frac{\Sigma\, n(n-1)}{N\,(N-1)} \right)$$

Where:

- (n) = number of individuals (or species representation) of a particular species
- (N) = total number of individuals (or total species representation) in the community

Interpretation

- Values range from 0 to 1
- Values closer to 1 indicate high diversity and low dominance
- Values closer to 0 indicate strong dominance by few species

Ecological Significance

A high **(1 – D)** value reflects:

- Low taxonomic dominance
- High evenness
- Strong functional redundancy
- Greater resilience to disturbance

Result: Gini–Simpson Diversity Index (1 – D)

The calculated Gini–Simpson Diversity Index (1 – D) for the study area indicates very high floristic diversity with minimal dominance.

- At Order level: **1 – D = 0.962**
- At Family level: **1 – D = 0.939**

These values imply a 96.2% (orders) and 93.9% (families) probability that two randomly selected plant species belong to different taxonomic groups. Such high values, approaching unity, confirm low dominance by any single order or family, strong taxonomic evenness, and high functional redundancy. From an ecological performance standpoint, the results demonstrate that the floristic community of the North Eastern Block is structurally stable, resilient to species-specific disturbances, and capable of maintaining ecosystem functions under moderate stress, provided anthropogenic pressures are carefully managed.

In forest ecosystems, particularly dry deciduous systems, a high Gini–Simpson Index signals a well-balanced community structure, where no single taxon monopolizes resources, supporting long-term ecological stability and adaptive capacity.

Influence of Invasive Alien Species:

Invasive species (*Lantana camara, Chromolaena odorata, Mesosphaerum suaveolens, Parthenium hysterophorus, Solanum mauritianum,* and *Neltuma juliflora*) constitute a small fraction of total richness but exert disproportionate ecological impact. While invasives may inflate numerical richness, they reduce evenness, suppress regeneration, alter successional pathways, and degrade functional diversity.

Therefore, diversity indices must be interpreted alongside qualitative ecological assessment rather than in isolation.

The floristic diversity of the KSMCL–TIOM North Eastern Block is exceptionally rich, structurally complex, and ecologically balanced, with 214 species across 58 families and 31 orders. Diversity indices confirm high richness, strong evenness, and low dominance—hallmarks of a resilient dry deciduous forest.

From a Wildlife Management Plan and risk-governance perspective, the area must be treated as a sensitive biodiversity unit, where conservation-aligned project design, strict construction controls, invasive species management, and native restoration are mandatory to safeguard long-term ecosystem integrity.

4..1.3 Impact of Floral diversity on Fauna:

The successful proliferation and sustenance of this entire wildlife community—often referred to as faunal diversity—are fundamentally and directly tied to the abundance and variety of the local plant life, or floral diversity.

The plant community fulfils multiple, non-negotiable roles that drive the overall biodiversity of the region:

Sustenance (Food Web Foundation): A wide variety of fruiting trees and shrubs form the essential base of the food web, providing critical nutrition for a broad range of animals, from large megafauna to smaller species. These consumers include Sloth bears, Boars, Monkeys, Langurs, and numerous species of birds. Key plant providers are species such as *Ziziphus jujube, Z.oenoplia, Cassia fistula, Ixora pavetta, Carissa carandas, Canthium parviflorum, Gardenia gummifera, Annona squamosa, Grewia latifolia, G. orbiculata, G. asiatica, G. hirsuta,* and *diverse Ficus species*. The dead branches and trees are eaten up by termites, which are also a part of food of Sloth bears. Hence, securing the floral food base of bears and other animals will help in mitigation of Man-bear conflict in and around the project area.

- **Pollination and Reproduction:** The specialized flowering plants are crucial for sustaining local honey bee populations by providing nectar. The presence of these pollinators, in turn, ensures the reproductive success of the flora itself, which guarantees the continued availability of the fruiting plants that sustain the herbivores.
- **Shelter and Habitat:** The structure provided by the trees and bushes offers vital shelter, cover, and protected nesting sites for birds and other terrestrial fauna. This structural complexity is essential for protection from predators, successful reproduction, and thermal regulation, contributing directly to population stability.

Therefore, the entire ecological integrity of the area hinges on this relationship. The presence, health, and variety of wildlife (faunal diversity) are a direct reflection of, and are critically dependent on, the abundance and functional diversity of the suitable plant species (floral diversity) in the vicinity.

4.2 Faunal diversity in and around the project area:

The presence of different faunal species has been documented in side and about 5 kms around the project area. The presence / absence of animals is documented by interacting with the villagers and livestock herders. Indirect evidences such as, pug marks, scat or defecation of the animals, diggings marks, and direct sightings were documented to ascertain the existence of respective wildlife species. Extensive use of latest models of camera traps such as Bushnell, Browning and Gardepro 5 & 6 models. Used. About Ten Camera Traps installed in the strategic locations of TIOM-Conveyor Belt area after identified the animal trails. The camera traps using the triple motion sensors documented the photographs of Major mammals, birds and reptiles. The memory card of each camera traps is replaced with a new one. The images were screened for identification of the wild animal and selected. As the camera traps trigger at the motion of grass and swinging trees also, thousands of false images recorded. Hence careful scanning of each image is essential.

The mammals are represented by 21 species, among 25 reptiles 9 species of Geckos and Lizards, 13 species of Snakes, 1 species of Tortoise and 2 species of turtles found. 113 species of birds have been recorded in and around Muraripura-Susheelanagara region around TIOM.

4.2.1 Mammals:

During the study, it was found that the rocky terrain of the forest and other landscapes inside and outside of the project area, provide an ideal habitat for Rare, Endangered and Threatened (RET) species including, Indian Sloth Bear- *Melursus ursinus,* Indian Panther – *Panthera pardus,* Four-horned Antelope- *Tetracerus quadricornis* and other wildlife forms. Though the positive sites of Sloth bear, Four-horned Antelope and Leopard were found, direct sightings was not possible due to their nocturnal habit and sensitivity to human presence. Yet, all these species including Rusty-spotted Cat is documented in the camera traps.

As the study area is located between Gudekote Bear Sanctuary and Daroji Bear Sanctuary, the bears and leopards roam freely from their habitat around the villages in the study area for food and water. The Sandur forest harbours a considerable number of Sloth Bears, Leopards, Jackals, Porcupines, Small Indian Civet, Palm Civet, Jungle Cat etc., and other life forms. Four-horned Antelope –*Tetracerus* quadricornis is found in entire study area. They are highly sensitive to humans and vehicles, yet recorded in camera traps that installed by the side of the road. Wild boars are quite common in and around the farmlands during the crop season. A Critically Endangered mammal Indian Pangoin –*Manis crassicaudata* is highly poached for feeding the Traditional Chinese Medicine, and the chances of poaching the same cannot be ruled out in the low lands and around the villages. Therefore while scouting in and around the study area, the team came across the scat, pugmarks, evidences of destruction of termite mound by bears, scat of leopards, pugmarks of cats etc., and all these evidences were promptly recorded (Annexure-2, Plate-4)

Large Mammals (Schedule I and II Species):

Indian Sloth Bear (Melursus ursinus) **- Schedule I**: Sloth bears are resident in the rocky hillocks and forest patches of the study area. Population estimates suggest 3-4 individuals utilize the landscape, with concentrated activity during fruiting seasons (March-May for *Grewia ixora,* Ficus species, June-July for ber *Ziziphus mauritiana*). Bears exhibit crepuscular to nocturnal activity patterns and utilize termite mounds, rocky crevices, and caves as day shelters. Road crossings are frequent during foraging movements between hillock systems, particularly during pre-monsoon when water stress drives them toward moist valley areas.

Table-15: Major mammal species of conservation importance

Sl No	Common name	Scientific name	IUCN Status	WPA, 1972
1	Indian Sloth Bear	*Melursus ursinus*	VU	Schedule-1
2	Four-horned Antelope	*Tetracerus quadricornis*	VU	Schedule-1
3	Indian Leopard	*Panthera pardus*	VU	Schedule-1
4	Bonnet Macaque	*Macaca radiata*	VU	Schedule-II
5	Rusty-spotted Cat	*Prionailurus rubiginosus*	NT	Schedule-1
6	Tufted Gray Langur	*Semnopithecus priam*	NT	Schedule-II
7	Indian Pangolin	*Manis crassicaudata*	EN	Schedule-I

***Leopard (Panthera pardus)* - Schedule I:** Leopards maintain territories overlapping the study area, with camera trap evidence suggesting 2-3 individuals (adults and sub-adults) regular presence. This adaptable carnivore thrives in human-modified landscapes, preying on chital, wild pig, dogs, and livestock. Leopards use rocky outcrops as resting sites and movement corridors along drainage lines. Human-leopard conflict incidents, primarily livestock depredation, occur periodically, with 2-3 reported cases annually in the broader Sandur landscape.

Four-horned Antelope (FHA) (*Tetracerus quadricornis*) - Schedule I: Rare, documented in different parts of TIOM Conveyor belt area and also outside of the lease area. This is a diurnal herbivore prefers, hilly grasslands. It is frequently recorded in camera traps by the side of the mining road in Curve-1, at waterhole near Ganesh Temple, in the plantation area and other parts also. Generally documented solitary and with the calf. Presence of this herbivore is indicator of healthy ecosystem, as they are the major prey base for the Leopards. Hence, need to provide a good habitat for the FHA by removing the weeds, creating grasslands (Table-15)

Other Mammals:

- **Indian Pangolin: Schedule-I**
- **Rusty-spotted cat: (*Prionailurus rubiginosus*) - Schedule I:** Rare, reported from undisturbed forest patches around TIOM and rest of the Sandur Forest.
- **Primates:** Bonnet Macaque-Macaca radiata, Tufted Gray Langur, Schedule- II
- **Civets:** Asian Palm Civet, Small Indian Civet- Schedule-II
- **Mongoose:** Indian Gray Mongoose, Ruddy Mongoose Schedule-II
- **Jungle Cat:** *Felis chaus*
- **Wild Pig (Sus scrofa):** Widely distributed, agricultural pest, forms sounder groups
- **Rodents and Small Mammals:** Squirrels, porcupine, hares, various murid rodents

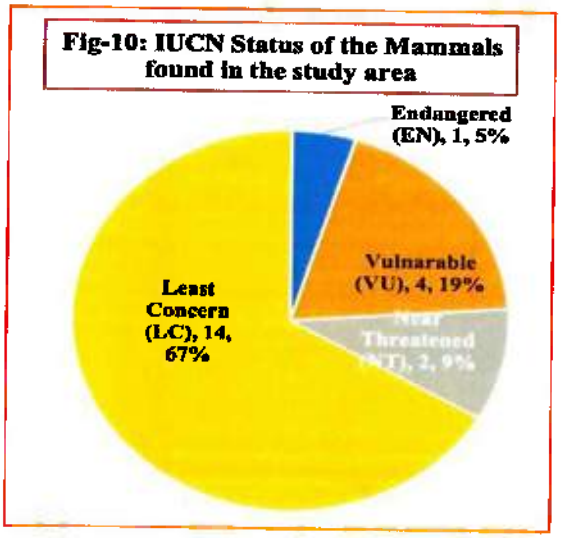
4.2.1.1 Conservation status of Mammals found in the study area:

The conservation status of mammals, such as the IUCN Red List and the Wildlife Protection Act (WPA), 1972, is very important for protecting wildlife in their natural habitat. The IUCN status helps us understand how threatened a species is at the global level. It tells us which animals are safe, which are declining, and which are at risk of extinction. The WPA-1972 gives legal protection to mammals in India, based on their conservation importance. Species listed in higher schedules get stronger protection under Indian law. These systems help forest departments and planners take correct decisions for wildlife conservation. They are also useful while preparing wildlife management plans, and forest clearance proposals. For mammals, which need large habitats, such protection helps maintain ecological balance. Conservation status also creates awareness among people about the need to protect wildlife. Overall, IUCN and WPA-1972 together play a key role in conserving mammals and safeguarding our natural heritage.

IUCN status of Mammals in the study area:

The present study aims at the exploration of faunal diversity in the study area. Though the most of the mammals are not visible during broad day light, and which become nocturnal owing to excessive human activities, their movement and existence is recorded only by indirect evidences like, pug marks, scat and other evidences including the secondary data by the villagers. For the direct photographic evidence 10 latest and advanced camera traps were installed in the strategic locations of the study. As per the interviews with the villagers and indirect evidences collected, along with the camera trap images, it is found that there are about 20 mammals are existing in and around the study area. Some of these mammals may move in a limited area for food and water, but some animals such as Indian Leopard and Sloth bears traverse far away distance up to 5 kms from their shelter in search of food and water in different seasons.

Fig-10: IUCN Status of the Mammals found in the study area



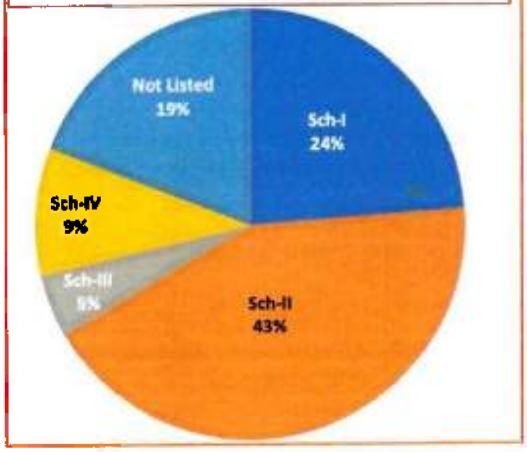
As far as their conservation status is concerned, the International Union for Conservation of Nature (IUCN) has categorized all the living beings on Earth, on the basis of their population and abundance. Out of 20 species of mammals existing around the study area, 13 of them are classified as Least Concerned (LC) (72%), 4 species are listed as

Near Threatened (NT) (22%) and 1 species of mammals are listed under Endangered (EN) category (6%). Indian Pangolin is the only rare mammal that is listed under Endangered (EN) category by IUCN. Near Threatened (NT) species are, Indian sloth bear, Leopard, Four-horned Antelope and Bonnet macaque. Four-horned Antelope is seen in the grassy slopes of Sandur hills around in Muraripura, Taranagara vicinity and other parts of Sandur taluk. (Fig-10)

WPA-1972 Schedule of Mammals in the study area:

The Wildlife Protection Act (WPA), 1972 schedules are very important for the conservation of wildlife in India. They classify animals into different schedules based on the level of protection they need. Species listed under Schedule I get the highest legal protection, with strict punishment for hunting or trade. This helps in saving rare and endangered wildlife from poaching and illegal activities. The schedules guide forest and wildlife officials in enforcing conservation laws effectively. They also help planners and project authorities identify legally protected species in a project area. WPA schedules play a key role in preparing EIA reports and wildlife conservation plans. They ensure that development activities do not harm highly protected species and their habitats. The schedules support long-term conservation by protecting key species that maintain ecological balance. Overall, the WPA 1972 schedules form the legal backbone of wildlife conservation in India.

Fig-11: WPA-1972 Schedule of the Mammals found in the study area



Highly endangered mammal found is Indian Pangolin-*Manis crassicaudata,* which is also highly poached for Traditional Chinese Medicine (TCM). Earlier reports confirm the arrest of poachers in Sandur and rest of the district. Though this highly sensitive, nocturnal and shy mammal is neither sighted directly, nor in the camera traps, but the secondary reports and its indirect evidences prove the existence of this mammal, which is listed as Schedule-I species under WPA-1972. Apart from this, Four-horned Antelope-*Tetracerus quadricornis,* Indian Sloth Bear-*Melursus ursinus*, Indian Leopard-*Panthera pardus,* Rusty-spotted Cat-*Prionailurus rubiginosus* are listed under Schedule-I of WPA-1972. This amounts to 23.81% of all mammals found in the study area. 9 species of mammals found in the study area are listed under Schedule-II of WPA Act-1972 (42.86%). These 9 mammals are, Bonnet Macaque, Tufted Gray Langur, Indian Jackal, Indian Fox, Jungle Cat, Small Indian Civet, Asian Palm Civet, Indian Gray

Mongoose, Ruddy Mongoose. 1 species, i.e Indian wild pig found in abundance in the study area is listed under Schedule-III of WPA-1972 (4.76%). 2 species of mammals such as, Indian Crested Porcupine and Indian Black-naped Hare are listed under Schedule-IV of WPA-1972 (9.52%). All other 4 small mammals such as, Three-stiped Palm Squirrel, Indian Flying-fox, Field Mouse, Bandicoot Rat are not listed in any Schedules of WPA-1972 (19.05%).

Impact of abundance of Herbivores on Carnivores:

The more number of herbivores such as Four-horned Antelope, Tufted Gray Langur, Bonnet Macaque, Wild Boar, Black-naped Hare, etc., help in securing the food chain of carnivores such as Leopards. Availability of more number of herbivores directly related to less man-leopard conflict. Therefore, this wildlife conservation plan is aimed at securing the natural food base of Leopard and other carnivores to prevent Man-leopard conflict in and around the project area.

4.2.2 Avifauna:

Mr.Kumar Ghorpade had listed 166 species of birds in Sandur Valley in 1976 of which he recorded different species of Vultures, and rare birds. (JBNHS, 1973) He also reported for the first time of sighting of rare bird like Spotted Babbler (Puff-throated Babbler) *Pellorneum ruficeps* from Karnataka and the entire Deccan Plateau. The same bird is also seen in Sandur hills now also. He also reported occurrence of Indian Lorikeet (Vernal Hanging Parrot) *Loriculus vernalis*, Ultramarine Flycatcher-*Muscicapa supercilioaris*, Grey-headed Flycatcher (Grey-headed Canary Flycatcher) *Culicicapa ceylonensis* etc., but afterwards no one reported sighting of these birds. Also no sighting of Vultures from Sandur hills is reported for last 20 years. Need to explore the presence of these birds in Sandur valley in a detailed research.

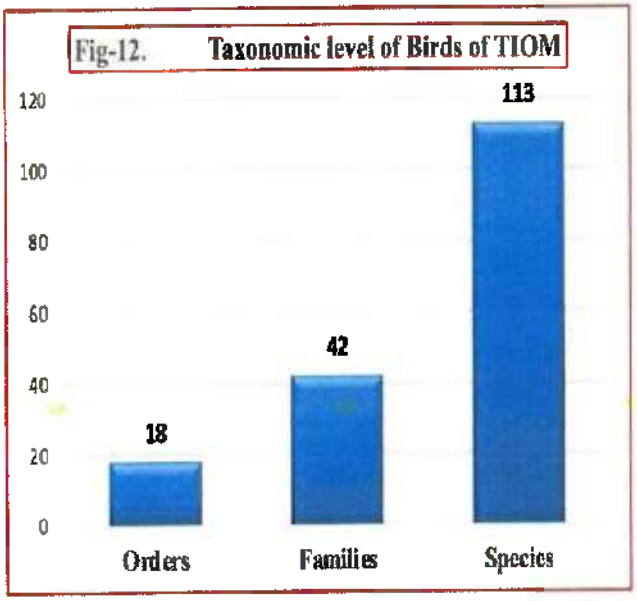
Indian Roller-
State Bird of Karnataka

Birds are the part and parcel of our biodiversity. Birds are the most common wildlife that everyone sees in their day-to-day life. Birds are adapted to different habitats according to their feeding and nesting behaviour. In the quick survey of biodiversity assessment, it is found that about 113 species of birds that belongs to 18 Orders and 42 Families found in and around the TIOM Conveyor belt area. As the birds move in a wide range, the data of birds is collected

from 4-5 kms around the boundary of TIOM-Muraripura -Susheelanagara area. There are deciduous forests, grasslands, scrub jungle, farmlands, water bodies, human habitations around the study area where different species of birds adopt to live in different habitats. Hence moved around the foot hills and data is collected. It is a matter of great importance that these birds can be seen only in higher altitude of Sandur in entire Deccan Plateau of Karnataka. State bird of Karnataka Indian Roller is found across Karnataka is found in the outskirts of the study area. This bird is also listed as Near Threatened (NT) by IUCN. (Fig-12).

Uncommon birds like, Painted Spurfowl, Paradise Flycatcher etc., are found in higher altitudes. Large birds like, Cormorants, Herons and other waterfowls are seen in Narihalla Dam and other small water bodies in Winter. Raptors like, Short-toed Snake Eagle, Brahminy Kite, Black Kite, Black-shouldered Kite, Shikra also found in and around the study area. As they fly in high altitude, they might visit the Sandur hill ranges occasionally in flight and for hunting the prey. The typical dense deciduous forest attracts a number of winter visiting birds for food and shelter.

Fig-12. Taxonomic level of Birds of TIOM



Bird orders and families:

During the Rapid assessment, it is found that about 113 species of birds belong to 42 families of 18 bird orders in the TIOM and Muraripura vicinity. Among all bird orders the Passeriformes is the largest order with 19 families and 67 species of birds found in the study area. 59.29 % of the birds found in the study area belong to the different families of order Passeriformes. Passeriformes has vivid species of birds like Larks, Swallows, Wagtails, Minivets, Bulbuls, Shrikes, Babblers, Prinias, Warblers, Flycatchers, Munias, Weavers, Mynas, Drongos, Crows, Buntings etc. (Table-16, Fig-13)

Table-16: Nuber of Avian Order and familes found in the study area

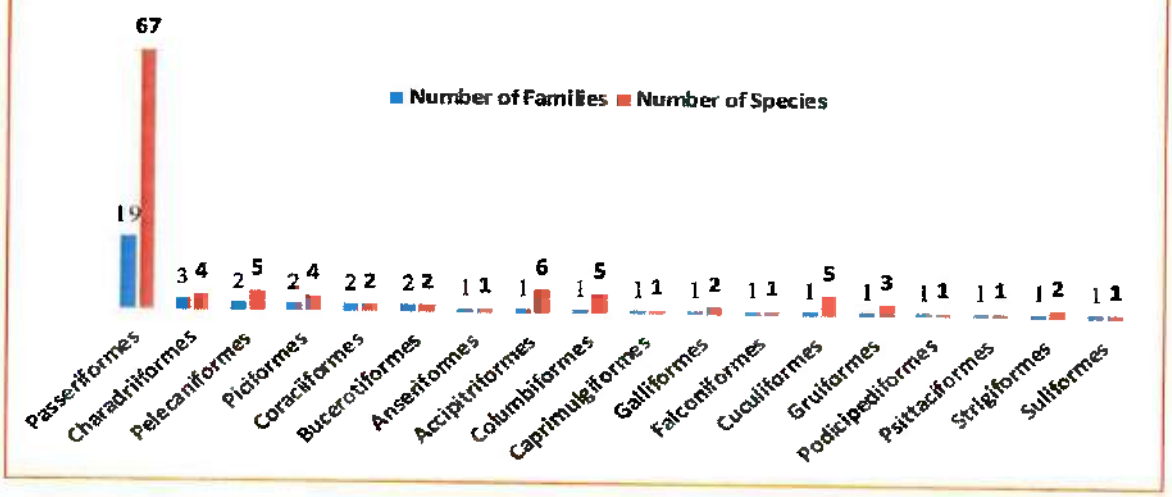
Sl. No.	Order	Number of Families	%
1	Passeriformes	19	45.24%
2	Charadriiformes	3	7.14%
3	Bucerotiformes	2	4.76%
4	Coraciiformes	2	4.76%
5	Pelecaniformes	2	4.76%
6	Piciformes	2	4.76%
7	Accipitriformes	1	2.38%
8	Anseriformes	1	2.38%
9	Caprimulgiformes	1	2.38%
10	Columbiformes	1	2.38%
11	Cuculiformes	1	2.38%
12	Falconiformes	1	2.38%
13	Galliformes	1	2.38%
14	Gruiformes	1	2.38%
15	Podicipediformes	1	2.38%
16	Psittaciformes	1	2.38%
17	Strigiformes	1	2.38%
18	Suliformes	1	2.38%
	Total Families	42	

Charadriiformes is the second largest bird orders with 3 families of birds each found in the study area. This amounts to 7.14 % of the all-bird families found in the study area. This order has families of different birds like Indian Stone-curlew, Red-wattled Lapwing, Black-winged Stilt etc.

Bucerotiformes, Coraciiformes, Pelcaniformes and Piciformes comprise the third largest bird order with 2 families each found in the study area. 4.76% of the total birds families found here belong to these four families. Most of the birds belong to this order are waders, waterfowls and birds live around water bodies like, Plovers, Lapwings, Stilts etc. All other families have 1 species each.

Most of these bird orders with families are the typical birds of Deccan Plateau and can be seen elsewhere of North-Eastern Plains of Karnataka. But some birds of higher altitude that can be seen in some parts of Western Ghats found here are restricted to some pockets of Sandur hills only. When we consider the family with large number of bird species, Muscicapidae-has 9 species each. 7.96% of all birds present in the study area belong to this family. Oriental Magpie-robin, Indian Robin, Pied Bushchat etc., belong to this family. 2nd largest families are

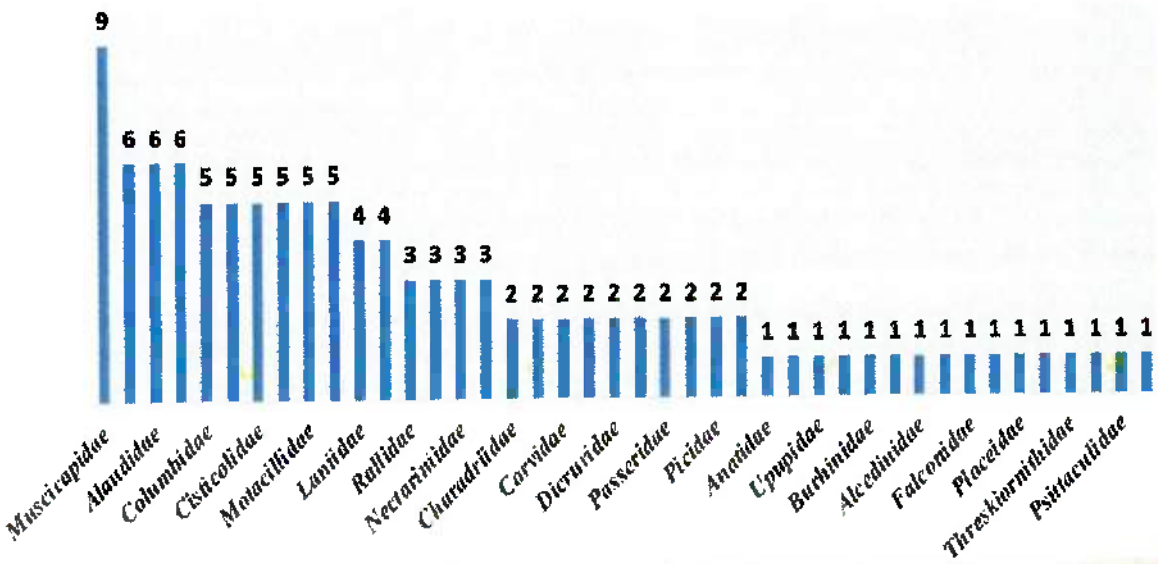
Fig-13 Number of orders and families



Accipitridae, Alaudidae and Leiothrichidae, which have 6 species each (5.31%) has birds such as Oriental Honey-buzzard, Black-winged Kite, Black Kite etc., The 3rd largest families are, Columbidae, Cuculidae, Cisticolidae, Hirundinidae, motacillidae and Sturnidae, which have 5 species each and this amounts to 4.42% of all birds found in the study area. Rock Pigeon, Spotted Dove, Indian Bush Lark, Ashy Prinia, Barn Swallow, Paddy field Pipit, Common Myna etc., belong to these families (Fig-14).

The detailed information of the other families and species is provided in Annexure-3.

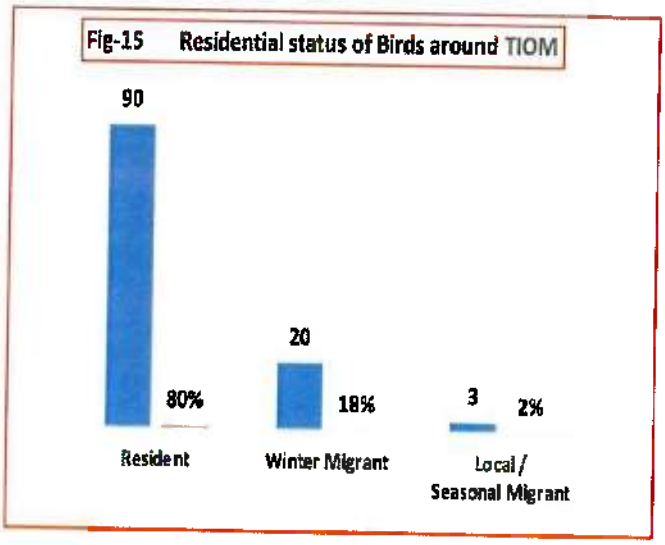
Fig-14. List of families and number of Species



Residential Status:

The birds that live and breed in the same habitat and that never migrate are classified as Resident Birds. Some birds move from one ecosystem to another in search of food, water and for breeding purposes within the region in different seasons. This movement is not far from their permanent habitat and this movement is driven by the basic necessity of food, water and breeding purposes. Such birds are considered as the Seasonal birds. Some more species of birds migrate from Northern Hemisphere to Southern Hemisphere in search of safe shelter, food and water. Most of them migrate in the beginning of the winter season from Northern countries to escape from harsh and unfavourable climatic conditions to the temperate and tropical countries such as India. Such birds that migrate in winter are called as Winter Migratory birds. But some birds migrate during the monsoon such birds are called as Monsoon Migratory birds.(Fig-15)

In the present study, it is found that 80 % birds (90) are resident birds, 18 % (20) are Winter Migratory birds, 2% (3) are Seasonal migratory birds.



The frequency and abundance of the birds is based upon their periodicity of sightings and numbers in the given habitat. In the present study area, 83% of the birds are seen commonly in the entire habitat, therefore these birds have been classified as Common Birds. 86 of the birds found in the study area are common birds. Some birds are not seen regularly are classified as Uncommon birds. In the Study area there are about 11% of the birds (12 species) are Uncommon Birds. Only 4 % of the birds are Rare birds such as Painted Spurfowl, Asian Brown Flycatcher and Red-breasted Flycatcher. etc. Only 2% of the birds are sporadic, that means, occur irregularly or in a low number. They are Oriental Honey-buzzard, common Kestrel etc.

Importance of birds in ecology:

The avifauna or birds play a vital role in ecology. They spread seeds of the fruits eaten and help in propagation of the forest. Most of the birds eat insects and control their population and eventually, help the farmers to get rid of pests of the crop. Carnivore birds such as Owls and Raptors predate upon Rats, snakes etc., and control their population. The scavenging birds such as Crows, black kite etc., eat dead animals and keep the environment clean. The more number of birds directly related to the health of the ecosystem.

Therefore, the present Wildlife Management Plan is aimed at increasing local wild species of plants, which provide them with fruits, shelter and space for nesting.

A pair of Painted Spurfowls

4.2.3 REPTILES:

Reptiles are the cold blooded vertebrates that creep and have scaly skin. They propagate by laying eggs. Dinosaurs were the largest reptiles once ruled the world and now become extinct for more than 65.5 million years. Now we see the miniature of them in the form of house Gekos, Calotes, Lizards etc. Some of the ancient reptiles such as Turtles, tortoises and crocodiles still survive. But snakes and Lizards are the modern day reptiles that evolved over the period of time (Annexure-4, plate-5)

In the current study area about 25 reptiles have been identified. Among them the largest numbers of reptiles present are Snakes with 13 species (52%), Geckos and Lizards comprises of 9 species (36%) and Tortoises and Turtles comprises 3 species (12%). As there are no big rivers in the vicinity no crocodiles are reported.

There are 24 species of fresh water turtles and 4 species of Tortoises found in India. Among which 3 species are found in the water bodies surrounding the Sandur hills such as Taranagara dam and other lakes. The fresh water Turtles are, Indian Black Turtle-*Melanochelys trijuga*, Indian Flap-shell Turtle-*Lissemys punctata*. Only one Tortoise species- Indian star tortoise - *Geochelone elegans* is found in the scrub jungle and grasslands around the in the periphery of the study area. (Fig-16). This Tortoise species is adopted to live in dry habitat of scrub jungles. It is unfortunate that this species is poached and sold for commercial purposes for pet trade and some tribal communities eat the meat of this tortoise as a delicacy. Thus, pushing their population towards depletion. But in the study area there were no such reports of poaching of this rare species.

The snakes such as 'Common Rat Snake'-*Ptyas mucosa*, Russel's Viper-*Daboia russelii*, Spectacled Cobra- *Naja naja*, Checkered Keelback- *Xenochrophis piscator*, Lizards such as, Monitor Lizard-*Varanus bengalensis*, Rock Agama- *Psammophilus dorsalis*, Indian Chameleon-*Chamaeleo zeylanicus* are also found in the study area. There are many more reptiles in the region that need to be explored in the detailed research.

Fig-16 Turtles and Tortoise found around 5 kms from the Project Area.

Star Tortoise

Indian Black Turtle -*Melanochelys trijuga*

Indian flapshell turtle - *Lissemys punctata*

4.3 ANIMAL PROFILES:

During the study of the faunal diversity in and around the project area, the people expressed their concern about the three species of major mammals such as Indian Sloth Bear, Indian Leopard and Wild Boar, which either predates upon their livestock or crop. The common men have developed fear psychosis about the bears and leopards owing to the gravity of fatal injuries they instil and the consequences of the attack. The Leopards lift their livestock such as calves, goats and sheep and result in economic loss. But most of the farmers complain about the excessive population of Wild Boar that propagates rapidly and destroy their crop resulting in economic loss for the farmer; hence there is a need to create awareness about these and other wildlife species among the villagers. To have a better understanding of these and related species, detailed information is given below.

4.3. 1 Indian Sloth Bear – *Melursus ursinus.*

Scientific classification

1	Kingdom:	Animalia
2	Phylum:	Chordata
3	Class:	Mammalia
4	Order:	Carnivora
5	Suborder:	Caniformia
6	Family:	Ursidae
7	Subfamily:	Ursinae
8	Genus:	*Melursus* Meyer, 1793
9	Species:	*M. ursinus*
10	Sub species	*Melursis ursinus ursinus* (Shaw 1791)

Local Names of Indian Sloth Bear

1	Kannada	*Karadi*
2	Telugu	*Elagu Banti*
3	Tamil	*Karadi*
4	Malayali	*Tenkarati, Pani Karudi*
5	Marathi	*Aaswaal*
6	Hindi	*Bhaalu, Reench*
7	English	Indian Sloth Bear
8	Scientific name	***Melursus ursinus ursinus (Shaw 1791)***

The Indian Sloth Bear (*Melursus ursinus*), is commonly known as *'karadi'*, in Kannada and Tamil. It belongs to family of URSIDAE order CARNIVORA of class Mammalia. Among the four bear species found in India, Sloth Bear is the mediocre sized species. Believed as mythological *Jambavantha* who ruled the mythical *Kishkinda* kingdom. The Sloth bear has become a part of folklore and stories among the pastoral community.

Distribution

Indian Sloth bear is distributed in entire Indian Sub-continent from foot hills of Himalayas till Ceylon.

There are two sub-species of Sloth Bears

1. Indian Sloth Bear *Melursus ursinus ursinus* (Shaw 1791)
2. Sri Lankan Sloth Bear *Melursus ursinus inornatus* (Pucheran, 1855)

Sloth bears prefer drier forests, scrub jungles, forests with rocky terrains, grasslands, mostly at lower elevations. Also seen in the deciduous forests of Western Ghats, Malnad, Nilgiri biosphere etc.

In Karnataka large population of Sloth bears is distributed in Gangavathi taluk of Koppal district, Daroji and Gudekote Bear Sanctuaries of Ballari district, Hosadurga and Holalkere taluk of Chitradruga district, Sira and Madhugiri of Tumkur district, Forests of Ramanagara and Savanadurga in Bangalore district,. MM hills and so on.

Conservation Status:

Union of Conservation of Nature (IUCN) = **Vulnerable (VU)**

Indian Wildlife Protection Act, 1972 = Schedule - I

Physical description

Size : Total body length - 140 to 190 cms. (Up to 6 ft)
Height : 2 to 3 ft at the shoulder level.
Weight : Adult male attains up to 140 kg
Adult female attains up to 95 kg.

Life expectancy: up to 40 years in captivity.

Other features of Indian Sloth bears:

- Females are smaller than male.
- Females have more fur between their shoulders

- Both male and female have long and thick muzzle, small jaws and bulbous snouts with wide nostril that can be closed at will.
- Long lower lips, upper incisors absent which help in sucking termites and ants easily.
- 4 inch long sickle shaped blunt claws.
- Short tail of 6-7 inch long.
- Fore limbs are longer than the hind limbs.
- Hairless webs unite the pads of the fingertips.
- The head is comparatively large but ears and eyes are relatively small.
- Large and floppy ears that covered with long hair.
- The coat is long, shaggy and unkempt.
- Entire body is covered with black fur, a large V-shaped cream colored mark on the chest.
- Relatively poor sense of sight and hearing, but has a good sense of smell.

Behaviour

Indian Sloth bears mark trees by biting and clawing, rubbing and sometimes by defecating, which may serve as a type of olfactory communication. They use a variety of vocalizations like squeals, screams, roars, howls, growls etc., while feeding and during interactions with other bears as well as on encountering predators and human beings. The Sloth bear is enormously powerful for its size and possess greater strength.

In case of sudden encounter, they stand on hind limbs, roar and run away if it is in safe zone. If the bear is in danger zone or very close to human beings, it may maul seriously before escaping away. They are nocturnal usually sleep during the day in the caves and under the thick bushes, wake up by evening and roam in search of food throughout the night. They drink water at least once in a day.

Food habits

- 35-45 % of food consists of Termites, ants and dung beetles.
- They also eat larva of dung beetle, honey bees and honey.
- Eat all kinds of fruits and berries that are sweetish or pulpy. Some of them are *Artocarpus heterophyllus* (jack fruit) *Carissa carandas* (kavali), *Grewia dominae* (ulupi), *Grewia orbiculata* (kari jane), *Canthium parviflorum* (kaare), *Zyziphus jujube* (Bare), *Cassia fistula* (kakke) *Eugenea Jambolana* (nerale), *Diospyros melanoxylon* (Tupra, tendu), Ficus species etc. They also eat the fleshy flowers of *Madhuka latifolia* (Mahuva) greedily and sometimes get intoxicated.
- Also visits farmlands to eat maize, pea nut, sunflower, sugar cane, water melon, pomegranate, grapes, Guava, Sapota, Papaya, mango, banana etc.
- Devours molasses in jaggery plants, climbs coco palm trees to drink *neera* or *toddy*.
- Sometimes eat the left out food around the human settlements.
- A bear rips open a termite mound with its strong claws, pokes its muzzle into the hole and blows the debris away. Then it sucks the termites like a vacuum cleaner. This vacuuming ants and termites is so noisy that it can be heard 300 meter away!

Importance of Sloth bears in the ecosystem:

- Feeding behaviour of Sloth bears changes with the seasonal flowering and fruiting of different plants. All the consumed seeds of the forest fruits go through the acid treatment in the bear's gastric system. These seeds are distributed throughout the forest in the form of

excreta and they germinate easily in the monsoon. Thus, bears help in propagation of the forest!

- Bears eat termites and ants, for this they dig the termite mound and Ant hills. They also dig the ground for the buried dung ball of dung beetle to eat pupa. In all these process the bears dig the ground surface. During monsoon the rain water is percolated through these diggings, thus recharging the ground water table.

Reproductive behaviour:

Mating season is between end of summer and onset of monsoon (April to June). During this period the male chases the female, they fight; quarrel for weeks and at the end they mate. After mating they separate. Gestation period is about 210 days. The mother give birth to young ones deep inside a cave in the rocky boulders or dig a burrow in the bushes. Generally litters two cubs, rarely three. Cubs born blind, naked without fur. Open the eyes after three weeks, fur start growing rapidly. Mother carries the cubs on her back (piggy riding) after one month, during this period she is ferocious. Cubs stay with mother up to 3 years and become independent afterwards.

Protected areas of Indian Sloth Bears in Karnataka

1. Daroji Bear Sanctuary, Kamalapura, Hospet taluk, Ballari dist, Karnataka, India
2. Gudekote Bear Sanctuary, Gudekote, Kudligi taluk, Ballari dist, Karnataka, India.

Threats facing by Indian Sloth bears:

- **Poaching:** Sloth bears are listed under Vulnerable (VU) by IUCN and given protection as Schedule-1 species under Wildlife (Protection) Act, 1972. The major threat facing by the Sloth bears was poaching of cubs few decades ago for using them for bear dancing. But bear dancing is completely wiped away in India and poaching of cubs is stopped.
- **Habitat Loss:** Sloth bears are facing the threat of habitat loss by the stone quarries. Most of the sloth bears take shelter in the rocky caves of hillocks that belong to revenue land. When the same revenue land is leased out for stone quarrying, the bears are forced to leave their age old natural shelters. Such bears go in search of new habitat and face threat of killing by the people out of fear.
- **Vengeance Killing:** In some cases the when the bears attack on humans, the people chase the bear and kill it. In some cases, the people put live electricity wires along the boundary of the farmlands to electrocute and kill the bears.

Man-bear conflict around project area:

The Sloth bears are the crepuscular and nocturnal animals, which are active in the early evenings, night and late morning. They sleep in the caves or under the bushes during the day and wake up by early evening and slowly start moving out of their shelter in search of food and

water. They move out of the forest towards farmlands when Ground nut, Maize, fruits are available and feed upon them. Usually, they walk lazily and look inactive. But in case of sudden encounter, they either run away when the humans are away or attack when they are very close. Usually they install a blow with long clawed paw or a small bite on the victim before running away. But the mother with cubs is always ferocious and can attack humans without reason when they are seen in close quarters. The sudden growl with rapid charge would shock the humans and become victims of the attack before realizing. In some cases, the bears attack fatally and most of the victims succumb to the serious wounds.

Around the project area, the reports of attacks of bears on peoples are considerably low, whereas instances of crop ride and loss of crop is observed. Karnataka Forest Department has been providing financial assistance to the families in case of man-animal conflicts in the district including crop loss.

CONSERVATION MEASURES:

Proposed measures for mitigation of Man-bear conflict:

Habitat enrichment:

Enrich the Sloth bear habitat by following conservation measures:

- Plant the endemic / local wild species of fruiting trees in forest outside the project area.
- Enrich the ecosystem by Soil and moisture conservation activities.
- Provide artificial waterholes in the bear habitat away from human settlements, so as to provide them water during all seasons. This measure will prevent them from roaming around human habitation for water.
- Prevent the collection of dead / dry wood from the forest, as the dead or dry would is eaten up by termites and termite hill is formed. The same termites are the part of diet of Sloth bears.
- Prevent collection of wild fruits from the forest such as *Annona squamosa* (Seethaphal) and honey from the forest, which are essential diet of Sloth bears.

Awareness:

- Create awareness among the people of villages within 10 kms from the Project area about the importance of Sloth bears, reasons for conflicts and preventive measures etc.
- Install sign boards along the mining / civil roads in the bear landscape about cautioning the divers to go slowly and watchfully.

- Install the sign boards / Posters about importance of Sloth bears and how to prevent any instances of attack.

Monitoring and supporting:

- Identify the Sloth bears regular path or movements in different seasons and alert the people in this corridor.
- Establish a network of informers / watchers to monitor the movement of Sloth bears, provide communication gadgets such as walkie-talkie.
- Clear the thick growth of bushes and weeds in and around human habitation so as to the entire area clearly visible and to prevent bears from hiding in such thick bushes. Also clear the thick bushes in both sides of the roads in the bear corridor.
- Appoint the watchers or facilitators to help the farmers to get compensation for their crop loss made by Sloth bears.
- Support the identified villagers by providing subsidized LPG connection with Stove to prevent firewood collection.

4.3.2 Indian Leopard – *Panthera pardus*

Scientific Classification

1	Kingdom	Animalia
2	Phylum	Chordata
3	Class	Mammalia
4	Order	Carnivora
5	Family	Felidae
6	Genus	*Panthera*
7	Species (Binomial name)	*Panthera Pardus*
8	Sub species (Trinomial name)	***Panthera pardus fusca*** (Meyer), 1794

Local Names

1	Kannada	*Chirathe, Kiruba, Honigya*
2	Telugu	*Chirutha puli*
3	Tamil	*Chirutai*
4	Marathi	*Karda, Diblya wagh*
5	Hindi	*Tendwa, Chitta*
6	English	Indian Leopard, Panther
7	Scientific name	***Panthera pardus fusca*** **(Meyer), 1794**

Description of Indian Leopard:

The Indian Leopard *(Panthera Pardus fusca)* is widely distributed in the Indian Sub-continent. This is one of the five big cats found India. (other big cats: Asiatic Lion, Bengal Tiger, Snow Leopard and Clouded Leopard). There are 27 sub species of leopards exist in the world. The one in India is the sub species *fusca.* Their population is estimated about 12,000 in 2014 in India.

Conservation status

International Union of Conservation of Nature (IUCN) - Vulnerable (VU)

Indian Wildlife Protection Act, 1972 - Schedule – I

Distribution

Indian Leopard is found in all types of forests in India. It is adopted to live in tropical rain forests, temperate deciduous, alpine coniferous, dry scrub jungles, rocky terrains, grasslands and even adopted to live in the dense cultivated crops like sugar cane fields. Western Ghats to Eastern Ghats, Foot hills of Himalayas to Nilgiri biosphere, It is highly adoptable animal commonly seen around human settlements to prey upon dogs and livestock. It is seen in the Tiger territory of 17 states in India.

SIZE :

Total body length

Male: (Head to base of the tail)- 127 cms to 142 cms. (Up to 5 ft)

Tail: - 91 cm (3 ft)

Female: (Head to base of the tail)- 104 cms to 117 cms. (Up to 3.5 ft)

Tail: - 87 cm (3.10 ft)

Height : 2 to 2.5 ft at the shoulder level.

Weight : Adult male attains up to 70 kg

Adult female attains up to 60 kg.

Life expectancy: Average: 12 0 17 years. Maximum 20 years in captivity.

Pale yellow or Yellowish brown or golden coat with rosette spots.

Melanistic form has more black shade and dark rosette, thus called as Black Panther.

Forelimbs have 5 toes and hind limbs have 4 toes with retractable claws.

Males are larger and heavier than females.

The Pattern rosettes are unique to each Individual leopard.

They have strong sense of vision and hearing but comparatively poor sense of smell.

Behaviour

Indian Leopard is generally a nocturnal animal, rests throughout the day on trees or in the caves and go for hunting in the night. Sometimes they hunt during the day also. They are elusive, powerful and generally solitary. They are good climbers of trees and rest on the branches of the large trees during the day. They are so strong to climb the trees with their kills and come down the trees head first. Powerful runner runs at 58 kms per hour. Leap up to 20 ft easily and Jump up to 10 ft vertically. They produce different vocalizations like grunts, roars, growls, meows, and purrs.

Feeding habits

- Basically carnivore, feeds upon the meat.
- Leopards are versatile and opportunistic hunters and have a very broad diet from fowls to ungulates, dogs to cattle. The diet includes herbivores like axis deer, Sambar deer, Nilgai, (not in the project area) wild boar, Spotted deer, Langur, Macaque, Hare, Peafowl, Spur fowl etc.
- The Leopard that lives in the scrub and grasslands chiefly depends upon the dogs and livestock.
- Strikes the prey in a lightning speed and drags the hunt into the thick bush, into a cave or upon a tree to feed leisurely.

Breeding behaviour

- Generally, Leopards mate throughout the year.
- During mating season leopards makes a typical vocal sound called "sawing" to attract its mate, "sawing" is also produced to establish its territory.
- Both hunt and stay for weeks till successful mating takes place and separates.
- Gestation period is up to 105 days
- The female use a secluded and safe place in a cave, crevice among rocks, huge hollow of trees or in a thicket / bush for littering.
- Generally litters 2-4 cubs of which generally two survive.
- Cubs born blind and open eyes after a week.
- Cubs stay in the hidden location for six weeks till they grow fit to follow mother.
- Cubs stay with mother up to 2 years and become independent after words.

Leopards in Karnataka's Protected Areas:

1. Nagarahole, Bandipur, Dandeli-Anshi, Bhadra, BRT- Tiger Reserves.
2. Daroji and Gudekote bear sanctuary, Bellary district.

Threats facing by Indian Leopard:

Fig-17: A file photo of Leopard captured in Sandur taluk

Habitat Loss: Leopards are facing the threat of habitat loss by the stone quarries, urbanization, encroachment etc.. Most of the Leopards take shelter in the rocky caves of hillocks that belong to revenue land. When the same revenue land is leased out for stone quarrying, the Leopards are forced to leave their age old natural shelters. Such leopards go in search of new habitat and face threat of killing by the people out of fear. The fragmentation of the natural habitat resulted in loss of prey base.

The loss of prey base: The loss of habitat is resulted in loss of natural prey base of Leopards. Hence they depend majorly on feral dogs, live stocks and minor prey animals only.

Vengeance Killing: In some cases the when a leopard kills a sheep or goat and any other livestock; the people sometimes poison the same and kill the leopards. These retaliatory killings go unnoticed generally.

Man-Leopard conflict around Project area: The Leopards are the crepuscular and nocturnal animals, which are active in the early evenings, night and late morning. They sleep in the caves or under the bushes during the day and wake up by early evening. Usually, leopards attack only the animals smaller than its body height. But times attack on the calves also.

Hanuman Langur in the periphery of the Project area

The man-leopard conflict is not reported in and around the project area except for attack on livestock and dogs. But during 2015-2018, there were a number of attacks of Leopards on people; some of them succumb to the attack in Sandur taluk. 4 people killed in Leopard attack between Susheelanagara and Siddapura areas which is locate beyond 5 kms from

the project area in Ramanamalai hill ranges in Sandur taluk. It is strange that the fatal attack by leopards was not reported in Sandur taluk from 1993 onwards.

In strange circumstances, the Leopards, killed 4 people in the span of 3 years. After 2018 not a single report of leopard attack reported in Sandur taluk. Yet, lifting of dogs, sheep, goats, calves or young cattle from human settlements is reported.

The chronology of leopard attacks in Sandur taluk:

12.10.2015 : Mr. Mabu sab 54 years, Susheelanagara (Between Susheelanagar-Siddapura) Leopard attacked and killed him while he was working in his farmland located near forest.

25.10.2015 : Prakash Naik: 14 years, Susheelanagara (Between Susheelannagara and Siddapura) Leopard attacked and killed him while grazing his cattle in the forest.

12.11.2015: Mr. Bharamalingappa, 60 years, Shepherd, Siddapura. (Siddapura) Leopard attacked a goad and dragged into the bushes, he went to snatch the dead goad from Leopard, which attacked him and killed

10.7.2018 : Mr. Shankar Naik, 23 years, Susheela nagara, He was grazing his cattle between Susheela Nagara and Siddapura, when the leopard attacked and killed him.

12.8.2018: Mr. Jambaiah, 25 years, Siddapura, The leopard attacked him while he was grazing the cattle in the fringes of the forests. He was recovered from the injuries.

Though there were no reports of attack of leopards on humans in and outside of the project area, the sightings of leopards, reports of lifting of live stocks, dogs, etc., is reported regularly. This indicates the Leopards are active around the project area.(Fig-17)

CONSERVATION MEASURES:

Proposed measures for mitigation of Man-Leopard conflict:

Habitat enrichment:

- ✓ Enrich the habitat by following conservation measures:
- ✓ Plant the endemic / local wild species of fruiting trees in forest outside the project area. This will attract the Bonnet macaque and Hanuman Langur, Wild boars etc., which are the food base for Leopards.
- ✓ Enrich the ecosystem by Soil and moisture conservation activities, this helps the enrichment of the habitat and help growth of floral diversity.
- ✓ Provide artificial waterholes in the Leopards habitat away from human settlements, so as to provide them water during all seasons. This measure will prevent them from roaming around human habitation for water.

Awareness:

- Create awareness among the people of villages within 10 kms from the Project area about the importance of Leopards, reasons for conflicts and preventive measures etc.
- Install sign boards along the mining / civil roads in the wildlife landscape about cautioning the divers to go slowly and watchfully to prevent hitting the wildlife.
- Install the sign boards / Posters about importance of wildlife and how to prevent any instances of attack.

Monitoring and facilitating:

- Identify the Leopards regular path or movements in different seasons and alert the people in this corridor.
- Establish a network of informers / watchers to monitor the movement of wildlife including Leopards, provide communication gadgets such as walkie-talkie to them.
- Appoint the watchers or facilitators to help the victims of attack get suitable treatment or compensation. In case of attack on livestock, help the People to get suitable compensation for loss of their livestock / domestic animals in Leopard attack.
- Clear the thick bushes and weeds of Lantana, Ipomoea, Eupatorium etc., in and around the villages to prevent the leopards from hiding in it. Also clear the bushes along the roads side in the Leopard corridor
- Establish a rapid response team to rush to the spot of Leopard attack and help the victims to get first aid and suitable treatment.
- Use camera traps to monitor the regular movement of Leopards.

4.3.3 Four-horned Antelope (*Tetracerus quadricornis*)

It is called as *kondakuri* in Kannada and *Chousingha* in Hindi, is a unique and somewhat elusive ungulate native to the Indian subcontinent. It holds the distinction of being the only wild mammal in the world with four horns.

Taxonomy

The Chousingha is a member of the family Bovidae and is the only species within its genus.

- **Kingdom** : Animalia
- **Phylum** : Chordata
- **Class** : Mammalia
- **Order** : Artiodactyla
- **Family** : Bovidae
- **Subfamily** : Bovinae
- **Genus** : *Tetracerus*
- **Species.** : *T. quadricornis*

Distribution and Habitat

The Four-horned Antelope is endemic to India and Nepal.

- **Range:** Found across Peninsular India, from the foothills of the Himalayas to the Deccan Plateau. Key populations exist in states like Gujarat (Gir National Park), Madhya Pradesh (Kanha), and Odisha.
- **Habitat:** They prefer open dry deciduous forests and hilly terrain with significant grass cover or undergrowth. They are rarely found far from a water source.
- It is notably absent from open grasslands—an intentional habitat strategy aligned with predator avoidance and energy efficiency.

Physical Characteristics and Size

The Chousingha is one of the smallest Asian bovids, characterized by its slender build and unique cranial features.

- **Horns:** Only males have horns. They possess a posterior pair (8–12 cm) and a shorter anterior pair (2–5 cm) located on the forehead.
- **Size:** They stand about 55–65 cm at the shoulder and weigh between 17–22 kg.
- **Coat:** Their fur is short and coarse, typically a reddish-brown or yellowish-fawn colour, with white undersides and a dark stripe running down the front of each leg.

Feeding and Breeding Ecology

These antelopes are known for their shy, solitary nature, unlike many other gregarious bovid species.

- **Diet:** They are selective browsers, feeding on a variety of grasses, herbs, shrubs, flowers, and fruits (such as *Amla* or *Ber*). They require frequent access to water.
- **Social Structure:** They are generally solitary but may be seen in pairs. They are sedentary and maintain small home ranges.
- **Breeding:** Mating usually occurs during the monsoon season (July to September).

Gestation: The gestation period is approximately **8 months**, usually resulting in the birth of one or two fawns.

Threats and Conservation Status

The Four-horned Antelope faces several survival challenges due to its specialized habitat requirements.

Habitat Loss: The primary risk vectors include habitat fragmentation due to agriculture, forest degradation, hunting pressure, over grazing and infrastructure expansion in dry forest landscapes. Low population density and solitary behaviour further amplify vulnerability by reducing recovery bandwidth after local disturbances.

Conservation Status:

- **IUCN Red List:** Vulnerable (VU).
- **CITES:** Appendix III (in Nepal).
- **Wildlife Protection Act (India):** Schedule I (highest level of protection)

The Four-horned Antelope is currently listed as Vulnerable (IUCN Red List) and placed under Schedule I of the Wildlife (Protection) Act, 1972 in India, granting it the highest legal protection. From a forward-looking conservation lens, safeguarding this species requires landscape-level habitat continuity, disturbance-sensitive forest management, and long-term population monitoring. Protecting the Four-horned Antelope is not just about species survival—it is a strategic investment in maintaining the ecological integrity of India's dry forest ecosystems.

4.3.4 Rusty-Spotted Cat (*Prionailurus rubiginosus*)

The Rusty-spotted Cat is the smallest wild felid in the world, a quiet micro-predator operating beneath the radar of larger carnivores. Endemic to the Indian subcontinent, it represents a high-value ecological asset within dry deciduous forests, scrublands, and fragmented human-dominated landscapes. Though diminutive in size, its role in trophic regulation and ecosystem balance is disproportionately significant.

https://critter.science/the-rusty-spotte

Taxonomy:

- Kingdom : Animalia
- Phylum. : Chordata
- Class. : Mammalia
- Order. : Carnivora
- Family. : Felidae
- Subfamily. : Felinae
- Genus. : *Prionailurus*
- Species. : *Prionailurus rubiginosus* (I. Geoffroy Saint-Hilaire, 1831)

Taxonomic Note:

The species shares lineage with the Leopard Cat (*P. bengalensis*) but has diverged evolutionarily to exploit smaller prey niches and denser understorey microhabitats.

Morphology & Physical Description (Body)

- Head–body length: 35–48 cm
- Tail length: 15–30 cm
- Weight: 0.9–1.6 kg
- Shoulder height: ~25 cm

Key Physical Traits:

- Coat is greyish-fawn to rufous, marked with distinct rusty-brown spots, especially on flanks and back
- Four dark stripes run from the eyes across the forehead, a diagnostic feature
- Large eyes adapted for low-light hunting, reflecting strong nocturnal specialization
- Slender limbs and semi-retractile claws facilitate arboreal agility

Operational Insight:

Its compact morphology is a design optimized for stealth, enabling exploitation of narrow ecological windows inaccessible to larger carnivores.

Distribution & Habitat Ecology

Geographic Range:

- India (widely but patchily distributed)
- Sri Lanka
- Nepal (lowland Terai)

Habitat Utilization:

- Dry and moist deciduous forests
- Scrub forests and thorn jungles
- Grassland–forest mosaics
- Agricultural edges and plantation landscapes

Ecological Flexibility:

The Rusty-spotted Cat demonstrates adaptive resilience, persisting in moderately disturbed habitats provided prey availability and refuge cover remain intact.

5. Ecology & Trophic Role

This species functions as a meso-predator, filling a critical control point in the food web.

Diet Profile:

- Rodents (rats, mice)
- Small birds and nestlings
- Lizards and geckos
- Amphibians
- Insects and occasionally small reptiles

Ecosystem KPI:

By regulating rodent populations, the Rusty-spotted Cat indirectly supports crop protection, disease control, and vegetation regeneration—a silent partner in landscape sustainability.

Behaviour (Operational Patterns)

- Activity pattern: Primarily nocturnal and crepuscular
- Social structure: Solitary, except during mating and maternal care
- Territoriality: Maintains small home ranges with scent marking
- Locomotion: Agile climber; frequently uses trees for resting and hunting

Behavioural Traits:

- Highly elusive and cryptic
- Freezes rather than flees when threatened
- Uses dense ground cover and rock crevices as daytime refuges

Behavioural Insight:

Its low detection rate often leads to systematic under-representation in wildlife surveys, masking true population status.

Reproduction & Breeding Biology:

- Breeding season: Not strictly seasonal; peaks observed post-monsoon
- Gestation period: ~65–70 days
- Litter size: 1–3 kittens
- Den sites: Rock crevices, hollow trees, abandoned burrows

Parental Investment:

- Female provides exclusive care
- Kittens are born blind and fully dependent
- Weaning occurs at ~6–8 weeks

Population Dynamics Note:

Low reproductive output combined with high juvenile mortality increases population sensitivity to habitat disturbance.

Predation & Threat Interactions

Natural Predators:

- Larger carnivores (Leopards, Jungle Cats)
- Raptors (eagles, owls)

Anthropogenic Threats:

- Habitat fragmentation
- Road mortality
- Accidental trapping and snaring
- Persecution due to misidentification as feral cats

Conservation Status & Extinction Risk

- IUCN Red List: Near Threatened (NT)
- Wildlife (Protection) Act, India: Schedule I
- CITES: Appendix I

Primary Threat Drivers:

- Forest degradation and linear infrastructure
- Mining and quarry expansion
- Agricultural intensification
- Lack of species-specific conservation planning

Extinction Risk Outlook:

While not imminently endangered, continued landscape fragmentation could push localized populations toward functional extinction, particularly outside protected areas.

10. Conservation Significance & Way Forward

The Rusty-spotted Cat is a flagship species for micro-carnivore conservation, indicating the health of understory ecosystems.

Strategic Conservation Actions:

- Integrate species into WMP /EIA baseline studies
- Mitigate road mortality through wildlife crossings
- Retain scrub and undergrowth during forest management
- Conduct camera-trap-based population assessments
- Build community awareness to reduce persecution

In the grand architecture of biodiversity, the Rusty-spotted Cat is a small cog with outsized influence. Protecting this species is not merely an act of preservation—it is a strategic investment in ecosystem stability, functional resilience, and ethical stewardship of India's natural capital. The future demands that conservation planning moves beyond megafauna and embraces these quiet custodians of balance.

Chapter – 5. Impact of the proposed activity on flora & fauna and proposed conservation measures:

This wildlife conservation plan is prepared as a part of mandatory requirements for getting permission for installation of Downhill pipeline Conveyor Belt of Thimmappanagudi Iron Ore Mine (ML 2605). The present wildlife conservation plan is designed on the basis of the grass-root level research and interaction with the forest department and the community. The recommendations made in this report include the activities to be taken up in three years from the date of initiation of the project. The same activities shall be renewed and continued for next period as long as the conveyor belt activities are continued.

5.1 Note on existing disturbances:

Basically mining is a disturbing activity in which, drilling, blasting, processing, loading, transportation etc., activities involved. KSMCL-TIOM adopted the strategy of mining with minimal disturbances to the environment and wildlife. No mining and transportation activities are undertaken after sunset and before sunrise, which help the wildlife to move freely in their territory.

All the active mines are involved in mining activities such as drilling, blasting, excavating, processing, transporting, etc., in their respective areas. The major existing disturbance is transportation of vehicles from the mining areas to the stock yards or to the target industries. When there is an order for ore from any steel producing industry, a beeline of trucks and vigorous movement of loaded and empty trucks is seen. In this process a heavy cloud of dust is deposited on the trees, crop and the wild animals detract from their path.

Apart from this, two railway lines such as one from Swamihalli to Hosapete and another one from Ranjithpura to Toranagallu run along the Sandur hills amidst the forest carrying iron ore. The harsh sound of the trains also deters or scares the wildlife from moving around.

Added to these disturbances, population of the villages around is also multiplied, and they depend upon the surrounding forest for their requirement of fire wood, fodder for cattle and for grazing their livestock. Most of the people afford to buy motor bikes, jeeps, cars, tractors etc., and their movement in and around the forest also disturbing the wildlife in the entire vicinity.

The proposed installation of downhill conveyor belt as per the directions of the honourable Supreme Court of India, vide order dated 07 December 2017, issued pursuant to the recommendations of the Central Empowered Committee (CEC). This WMP is prepared as a part of the mandatory procedures for getting permission for use of 19.3044 hectares of forest land in NEB of Sandur North Forest of Ballari Territorial Division.

5.2 Measures taken up under SEMP

Following measures were taken up in and around mining areas of TIOM as a part of implementing Supplementary Environment & Management Plan (SEMP) prescribed by ICFRE as per the directions of the Hon'ble Supreme Court of India

5.2.1 Soil and Moisture Conservation (S&MC) measures under SEMP

As a part of mandatory mining activities, following Supplementary Environment & Management Plan (SEMP) activities have been taken up by TIOM in its area of operation at present (Annexure-7). (Plate- 9-13)

- **Stabilization of dumps:** The waste dumps have been stabilized by various measures such as covering surface with coco coir mats and spreading humus soil on it and seeds of various grasses, *Stylo hemata*, legumes, etc., are broadcasted and watered with sprinklers. This helped the seeds to grow and cover the entire waste dumps with greenery in the first succession. A number of various plants such as *Gliricidia*, are planted to create humus soil.

After continuous management of the waste dump yards for many years, the secondary and tertiary succession of plants is observed. Many of the old dump yards of TIOM have diverse species of flora and fauna.

- **Plantation:** Extensive plantation of local species of trees have been done in entire residential area, mining office area, by the side of the roads and in the boundary of the leased area to check dust and to keep the entire ecosystem healthy. About 24,200 plants planted within the leased area and 26,550 plants planted outside the lease area till date (Plate-13-15).
- **Rain water harvesting and Silt traps:** A number of rain water harvesting structures, such as, silt traps, gully plugs, percolation tanks, check dams, etc., have been built along the valleys and across the creeks and water ways. All these measures helped in trapping the silt with in these structures and allow the rain water to go outside the project area with less silt. These measures also helped in percolation of water into the ground and recharge ground water eventually, helped the bore wells in the farmlands around to provide sufficient water to the farmer.
- **Supporting the fauna:** A number of water troughs have been placed in the strategic locations of wildlife corridors and filling the same regularly to provide water to the wildlife though out the year. Various species of fruiting trees were planted to provide the wildlife food and shelter in reclamation areas.
- **Awareness and sensitization:** TIOM conducts various awareness programs on conservation of wildlife and environment. Observes different days and weeks of importance such as World Environment Day, Wildlife Week, Earth day etc., regularly.

5.2.2 Impact of proposed activity on Flora and fauna

As already mentioned, the present 'Wildlife Conservation Plan" is prepared to get permission for Linear downhill pipeline conveyor belt in 19.3044 hectares. At present the transportation of Iron ore from TIOM through its mines road is continued till the conveyor belt is ready for use. There is also a proposal of establishing a railway line near the proposed stock yard at the end of the conveyor belt towards Susheelanagara. The proposal includes installation of downhill conveyor belt and a service road in the proposed forest area of 19.3044 hectares. During the construction activities, there will be a disturbance to the forest and it inhabitants.

The construction of a downhill conveyor belt for transporting iron ore through forest areas can affect forests, wildlife, and the overall ecosystem in several ways. Clearing land for the conveyor leads to loss of trees and plants, which reduces forest cover and disturbs natural regeneration. Construction activities create noise, dust, and human movement, which scare wildlife and force

animals to move away from their normal habitats. The conveyor line can act like a barrier, cutting across animal movement paths and increasing the risk of injury or isolation of wildlife populations. Soil digging and movement on slopes can cause erosion and loss of fertile topsoil, especially during the monsoon. Changes in drainage patterns may affect nearby streams and moisture-loving plants. Increased access for workers can also lead to forest fires, waste, and the spread of invasive plant species. Over time, these disturbances can reduce habitat quality and biodiversity in the area. However, if construction is carefully planned with minimum tree cutting, proper soil protection, and wildlife crossings, the impacts can be reduced. Regular monitoring and restoration of disturbed areas can help forests recover. With such measures, mining transport needs can be balanced with forest and wildlife conservation.

The WMP addresses the mitigation measures such as, the activities shall take place during the day between 8 am to 5 pm, construction of sufficient waterholes and other measures area proposed. Therefore, there is no severe disturbance to the existing diversity as well as Wildlife in the project area.

a) Impact on landscape and its management:

The construction activities in the forest areas poses a severe and multifaceted threat to the surrounding forest biodiversity, resulting in impacts that are both direct and far-reaching. These road networks, established to transport equipment and extracted resources, act as agents of environmental degradation that significantly outstrip the immediate footprint of the mining activity itself.

The primary ecological damage stems from habitat fragmentation. Roads physically bisect previously contiguous forest blocks into smaller, isolated patches. This physical separation prevents the movement of many forest-interior species, such as small mammals, reptiles and certain bird populations.

The construction of a downhill conveyor belt in an iron ore mining landscape brings visible changes to landform, land use, and overall environmental balance. Cutting of slopes and levelling of ground alters the natural terrain and may affect the visual quality of the landscape. Removal of vegetation exposes soil surfaces, increasing the risk of erosion and landslides, especially during heavy rainfall. Movement of machinery and materials can compact soil, reducing its natural water-holding capacity. The conveyor structure introduces a permanent industrial element into an otherwise natural or semi-natural setting. Dust generation during construction can settle on nearby plants and agricultural lands, affecting their growth. To manage these

impacts, careful route selection along existing disturbed areas should be prioritized. Proper slope stabilization, retaining walls, and drainage structures are essential to maintain landscape stability. Re-vegetation with native plant species along the conveyor corridor can help restore visual harmony and ecological function. With systematic planning and landscape management, the conveyor belt can be integrated into the mining area with controlled and manageable impacts.

The WMP proposes to take mitigative measures to take up construction activities with minimum disturbance to the landscape.

b) Impact on Ecology and its management:

The impact of mining roads on forest ecology is profound, primarily driven by habitat fragmentation and degradation. Management efforts must focus on mitigation and minimizing human-wildlife interaction.

Ecological Impact

The construction of a downhill conveyor belt in an iron ore mining area of KSMCL-TIOM can disturb the natural ecology of the surrounding environment. Clearing of vegetation directly reduces plant cover and affects the food and shelter available for many species. Noise, vibration, and human activity during construction disturb animals and birds, causing temporary or permanent displacement. Soil excavation and movement can damage soil organisms and disrupt nutrient cycles. Increased soil erosion may reduce soil fertility and affect nearby streams through siltation. Changes in natural drainage can alter moisture conditions needed by native plants and small fauna. The disturbed corridor may allow invasive species to spread and replace native vegetation. To manage these impacts, construction should be limited to the minimum required area and avoided during sensitive wildlife breeding seasons. Native species should be planted quickly in disturbed zones to support ecological recovery. Continuous ecological monitoring and adaptive management can help ensure that ecological impacts remain controlled and reversible over time.

The proposed WMP addresses all such issues pertaining to the ecological impacts during construction activities of conveyor belt and service road.

5.2.3 Management and Mitigation of Impact on Flora and fauna

Effective management strategies focus on preventing fragmentation and reducing disturbance:

- **Strategic Alignment and Micro-Siting**
  Detailed ecological surveys should guide the conveyor alignment to avoid dense vegetation, wildlife habitats, and sensitive ecological zones.
- **Controlled and Phased Vegetation Clearance**
  Vegetation removal should be limited, phased, and confined to essential areas only, allowing faster natural recovery and reducing habitat loss.
- **Protection of Retained Trees and Vegetation**
  Standing trees and shrubs near the corridor should be fenced and buffered to prevent damage from machinery and material movement.
- **Topsoil Conservation and Habitat Restoration**
  Topsoil should be stripped separately, stored safely, and reused during restoration to maintain soil fertility and support native plant regeneration.
- **Native Species–Based Compensatory Afforestation**
  Re-plantation using local tree, shrub, and grass species should be undertaken to restore food sources and shelter for fauna.
- **Slope Stabilization and Erosion Control**
  Bio-engineering measures such as turfing, mulching, coir matting, and retaining structures should be adopted to prevent soil loss and landslides.
- **Dust Suppression Measures**
  Regular water sprinkling on haul paths, construction zones, and material storage areas should be carried out to reduce dust deposition on vegetation and respiratory stress on wildlife.
- **Regulation of Construction Timing**
  Construction activities should be restricted to daytime hours only, avoiding early morning, evening, and night periods to minimize disturbance to nocturnal and crepuscular wildlife.
- **Noise and Light Management**
  Use of low-noise equipment and controlled lighting prevents unnecessary stress and behavioural changes in animals.

- **Wildlife Movement and Connectivity**
  Provision of underpasses, culverts, and canopy bridges helps maintain natural animal movement across the conveyor alignment.
- **Worker Awareness and Access Control**
  Environmental sensitization of workers and strict control on movement, waste disposal, and fire use reduce indirect ecological impacts.
- **Invasive Species Prevention**
  Disturbed areas should be quickly stabilized and monitored to prevent the spread of invasive plant species.
- **Ecological Monitoring and Adaptive Management**
  Continuous monitoring of flora and fauna enables timely corrective actions and ensures long-term ecological stability.

These measures collectively ensure that ecological impacts remain within manageable limits while supporting sustainable mining operations. Together, these measures create a structured mitigation pathway that limits ecological disruption, supports habitat recovery, and aligns mining infrastructure development with biodiversity conservation objectives. By prioritizing ecological integrity in road planning and diligently enforcing mitigation measures, the devastating impact of mining infrastructure on forest biodiversity can be substantially reduced.

Measures suggested by ICFRE towards biodiversity conservation:

Following measures suggested by the ICFRE to conserve biodiversity in mining areas are being implemented:

- ✓ Reducing man made disturbances such as no mining activities and transportation after sunset.
- ✓ No human activities outside the residential area in early morning, evening and during night.
- ✓ Plantation of native species of trees and removal of exotic species.
- ✓ Identification of natural wildlife habitats outside the mining lease area and protecting them.
- ✓ Conservation of habitat of herpetofauna such as snakes, lizards, toads, frogs etc., by planting grasses and herbaceous species.
- ✓ Enriching the habitat of avifauna by planting fruiting trees such as *Ficus benghalensis, F.religiosa, F.racemosa, F.imfectiora, Annona squamosa, Ziziphus jujube, Z.oenoplea.*

Pithecellobium dulce, etc., local species of trees. And also plant trees such as *Acacia nilotica* for roosting of birds. Birds prefer to nest on such thorny trees.

- ✓ Plantation of grasses, *Stylo hemata*, local shrubs, herbs and trees on and along slopes, contour bunds, silt traps, check dams, mine boundaries and dump yards etc., to be taken up to prevent silt formation in the water bodies. This will also helpful for aquatic flora and fauna.
- ✓ Dense green belt consisting of shrubs and trees of different species is being created around the mine lease areas and also along the haul roads which will act also as a dust and noise barrier.
- ✓ Conducting awareness programs for people of different walks of life such as, students, youth, farmers, graziers, mine workers and general public about the importance of biodiversity, wild life and its habitats.
- ✓ A number of check dams have been constructed and continue to be constructed in the mine lease areas to prevent the soil erosion. This will be able to store sufficient quantity of filtered water in the area and will act as water holes for the faunal life present in the region.
- ✓ Forest fire is one of the major threats to the forest, that destroys the fragile habitat of a large number of wildlife species. Hence protecting the existing forest is to be given highest priority. The lessee needs to continue to take of fire preventive measures around 2 km from the project area as is being undertaken presently. It is also suggested that fire preventing squad should be formed to fight the forest fire.

Chapter– 6. Status of Wildlife Conservation in the district as per the working plan:

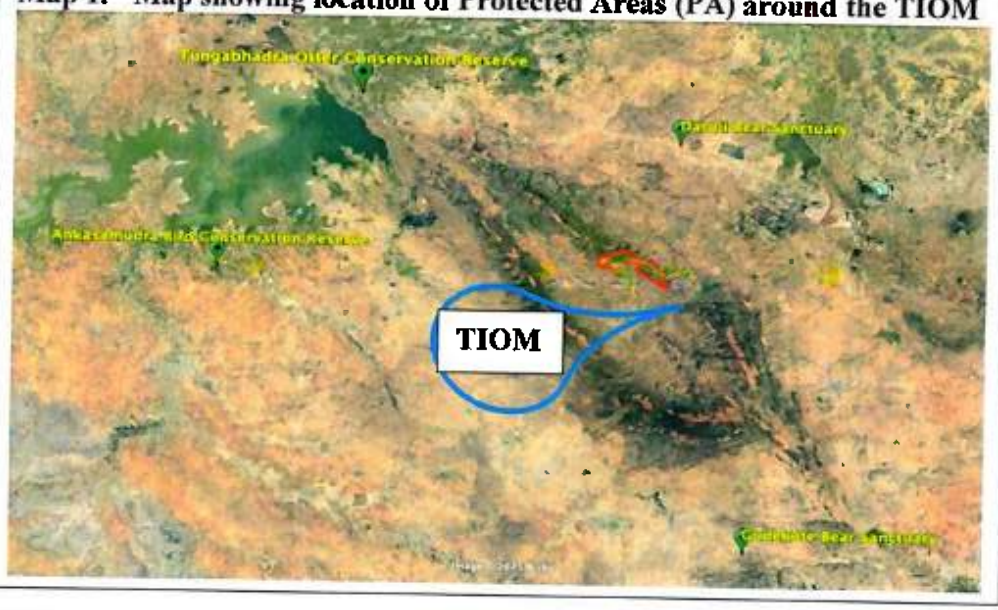
6.1 Status of conservation of major wildlife species in Ballari-Vijayanagara district:

Ballari district is a part of Deccan plateau and a typical biodiversity is evolved over the period time. The hot climatic conditions in the plains and cool temperature in the lush green forests of Sandur are contrasting. The forest developed in the plains and on the Sandur hills is also typical. The district is marked with rocky boulders and hills that surrounded by plain dry landscape. The scrub jungle in the plains is marked with typical flora such as *Albizia amara, Acacia nilotica, Acacia catechu, Annona squamosal, Grewia* species etc. But the floral diversity is different on the Sandur hills due to its higher elevation. The faunal diversity is naturally evolved based on the floral diversity. Tigers, Spotted Deers, Sambhar, Chinkara etc., species

were flourished in Sandur hills till 1960s. But all these species now become extinct from Sandur hills.

But the forest in Ballari district is enriched with a good number of Indian Sloth bears, Indian Leopard, Jackals, Foxes, etc. Indian Wolf and Hyena become very rare. The undivided Ballari district has two bear sanctuaries such as, **Daroji bear sanctuary** in Hospet taluk and **Gudekote Bear Sanctuary** in Kudligi taluk. There is **Tungabhadra Otter Conservation Reserve** in Hospet taluk and **Ankasamudra Bird Conservation reserve** in H.B.Halli taluk. Thus the project is surrounded with rich biodiversity. All the four Protected Areas (PAs) are located between 10-35 kilometre away from the project area of TIOM M.L.No 2605. (Map-1)

Map 1: Map showing location of Protected Areas (PA) around the TIOM



6.2 Daroji bear sanctuary:

The 55 sq kms of Bilikallu (East) forest has been declared as Daroji Bear Sanctuary on 17th October, 1994. Later on, in 2009, 27 sq kms of Bukkasagara Reserve Forest is added to Daroji Bear sanctuary. The rocky cave and boulders surrounded with scrub jungle make the sanctuary a typical habitat for sloth bears. After formation of sanctuary the man-bear conflict is totally reduced. A healthy population of Indian Sloth Bear – *Melursus ursinus* and Leopard – *Panthera pardus* is flourishing in this sanctuary. Apart from these flagship species, other wildlife species such as, Porcupine, Pangolin, Jackal, Foxes, Wild boars, Jungle cat, Common mongoose, ruddy mongoose, Black-naped hare, hanuman Langur, bonnet macaque, different species of bats, Reptiles such as Star tortoise, Indian Flap-shell turtle, Indian Black turtle, Monitor lizards, different species of calotes and agamas, different species of snakes including Python, Cobra, Russell's Viper etc., more than 120 species of birds and found here. It is located about 11 kilometres away (Aerial distance) from the Project Area.

6.3 Gudekote bear sanctuary:

Gudekote in Kudligi taluk is noted for attack of sloth bears on humans and crop loss. A number of people got injured and some of them killed during bear attacks before 2012. But after declaring the bear habitat in Gudekote as "bear sanctuary", strict conservation measures were taken by the forest department. This resulted in drastic reduction of man-bear conflict within a couple of years. The habitat of Gudekote Bear Sanctuary is similar to that of Daroji bear sanctuary and consisting similar species of flora and fauna. It is located about 22 kilometres away from the Project Area.

6.4 Tungabhadra Otter Conservation Reserve:

The 35 kilo meter stretch of Tungabhadra River from Holei Mudlapura to Kampli bridge has amazing aquatic biodiversity. The flagship species of the river is Smooth-coated Otters which flourish throughout the river. There is a good population of Mugger Crocodile in the river. There are two species of giant turtles such as *Nilssonia lethii* and *Chitra indica*, which are protected under WPA,1972. Other turtles such as Indian Flapshell Turtle and Indian Black Turtles ; more than 90 species of fishes found in this river. To save these wildlife from poaching, the Karnataka Forest Department formed the 35 km stretch of the river as "Tungabhadra Otter Conservation Reserve" in 2015. It is located about 20 kilometres from the project area.

6.5 Ankasamudra Bird Conservation Reserve.

The 244 sq kms of lake near Ankasamudra in H.B.Halli taluk, Ballari district is formed as "Ankasamudra Bird Conservation Reserve" in 2016. The lake located by the side of the river Tungabhadra is a haven of hundreds of species of local and migratory birds. During the day most of the birds forage in the backwaters of T.B.Dam and surrounding paddy fields and in the evening all these birds return to Ankasamudra lake for roosting. Birds such as Painted Storks, Openbill, Black Ibis, White Ibis, Grey Heron, Pond Heron, Purple Heron, Egrets, Spot billed ducks, cormorants, Grebes and many more species of birds built nest on the trees of *Acacia nilotica* and successfully breeding.

Ankasamudra Bird Conservation Reserve is located about 55 kilometres from the project area

Apart from these, Critically Endangered bird Great Indian Bustard are found in Siruguppa, Near Threatened bird – Yellow-throated Bulbul found in and around Hampi and various mammals, reptiles, birds found in different habitats of the district.

Therefore, there are less activity of wildlife inside the leased area and wildlife is flourishing in outside the leased area and rest of the habitats in the district. Yet, the wildlife in the periphery shall be monitored, documented and protected from hunting and poaching.

Chapter – 7. Proposed Activities under Wildlife Conservation Plan (WMP) for Conveyor Belt Area of TIOM-M.L.No. 2605.:

Following are the proposed activities under wildlife conservation plan for conveyor belt of KSMCL-TIOM M.L.No.2605 with detailed activities and suitable budget allocation (Table-17)

7.1 Enrichment of Wildlife habitat:

The rehabilitation of post-mining landscapes presents a unique opportunity to enrich and restore wildlife habitat, transforming disturbed land into functional, biodiverse ecosystems. Unlike managing a pristine area, habitat enrichment on mine sites must address underlying issues of compacted soils, altered topography, and potential contamination. The proposed actions include construction of waterholes and installation of bird nests.

7.1.1. Construction and Maintenance of Waterholes

Post-mining sites often have drastically altered hydrology and drainage patterns, with issues like increased runoff, erosion, or even Acid Mine Drainage (AMD), which can contaminate water sources. Waterhole construction must be approached carefully to ensure the habitat enhancement does not become an ecological trap.

Key considerations for waterholes in reclaimed areas include:

- **Water Quality Control:** Water bodies must be designed to mitigate or treat acidic or heavy metal runoff. Techniques may involve using passive treatment systems like constructed wetlands, which use specific plants to filter out contaminants and neutralize acidity before water reaches the main waterhole.
- **Safe Design:** Waterholes should be shallow at the edges to provide safe access for small animals and birds and prevent entrapment. Creating varying depths also caters to a wider range of species, from amphibians requiring shallow pools to mammals needing permanent water.
- **Erosion Buffers:** Establishing an immediate buffer zone of dense, native vegetation (planted post-weed removal) around the waterhole is crucial to prevent sediment and nutrient runoff from the disturbed slopes, maintaining water clarity and quality.

In arid zones, artificial waterholes in reclaimed mines have proven highly effective, attracting a similar diversity of large mammals as natural water sources, provided the water quality is maintained. In this project construction of 10 waterholes are proposed.

7.1.2. Installation of Bird Nests (Structural Supplementation)

Reclaimed mining landscapes, especially in their early stages, are often characterized by young, small, or sparsely-spaced trees, lacking the mature snags and large tree cavities essential for cavity-nesting birds.

The installation of artificial nesting structures provides immediate habitat for avian species:

- **Creating Missing Structures:** Bird boxes and artificial nests directly compensate for the lack of mature trees, providing immediate, secure breeding sites for woodpeckers, owls, and other secondary cavity nesters.
- **Supporting Disturbance-Oriented Species:** Interestingly, the open, disturbed nature of early-stage mine reclamation can benefit certain "disturbance-oriented" bird species, such as Interior Least Terns, which may use the flat, gravelly spoil piles as nesting grounds. Management plans can capitalize on this by creating specific features like managed cliffs or berms to support these species.
- **Reconciling Conflict:** In active mining sites, the placement of desirable nesting structures away from operational areas can act as a mitigation measure, diverting birds from equipment and infrastructure where they might pose a risk or be exposed to harm.

Habitat enrichment in a mining context is an exercise in ecological engineering. By focusing on controlling competitive invasives, guaranteeing a safe water source, and strategically adding missing structural elements, a barren mine site can be successfully converted into a resilient and functional wildlife habitat mosaic. During this project period it is planned install about 200 birds nests for different species in the project area.

7.2 Conservation and Monitoring of Wildlife Habitat:

Effective Wildlife Management Plans (WMP) in this mining areas shall transition from site rehabilitation to long-term habitat security and monitoring. A vital component of this transition involves establishing a dedicated, protected presence on the ground. Three key actions—the appointment of forest watchers, provision of medical insurance, and construction of anti-poaching camps with watchtowers—are crucial for ensuring the sustained conservation of rehabilitated wildlife habitat and the safety of personnel. These measures directly address threats like poaching and encroachment while facilitating continuous data collection on habitat recovery.

7.2.1. Appointment of Forest Watchers

The appointment of two dedicated 2 forest watchers for a minimum of 36 months provides a continuous human presence vital for deterrence and data collection.

- **Deterrence and Enforcement:** Watchers serve as the primary line of Défense against poaching, illegal logging, and unauthorized entry into the rehabilitated zone. Their visible presence acts as a significant deterrent, helping to protect vulnerable wildlife and newly planted vegetation from human interference.
- **Monitoring and Data Collection:** The watchers are essential for executing the habitat monitoring plan. They can conduct regular transect walks to observe wildlife usage of the restored area, monitor the condition of waterholes, track the success of installed bird nests, and report any re-emergence of invasive weeds. This continuous, on-the-ground data is invaluable for the adaptive management of the WMP.
- **Fire Prevention:** In dry, reclaimed areas, the watchers are the first responders for wildfire detection and suppression, protecting the significant investment made in the habitat restoration.

The 36-month period is a critical minimum, covering all seasons to establish baseline data and secure the habitat during its vulnerable early stages. Late on, the KSMCL-TIOM shall continue to take services of the private forest watchers to take care of watch and ward as long as the mining operation are active.

7.2.2 Medical Insurance for Watchers

Providing comprehensive medical insurance for the forest watchers is not just an ethical requirement; it is a critical component of ensuring the sustainability and professionalism of the conservation effort.

- **Personnel Retention:** Conservation work, particularly anti-poaching and remote monitoring, can be hazardous. Offering security in the form of medical insurance is a powerful tool for recruitment and retention. It encourages experienced personnel to commit to the 36-month term and beyond, ensuring continuity of knowledge and effort.
- **Risk Mitigation:** Watchers operate in challenging environments, potentially facing risks from dangerous wildlife, accident, or exposure to harsh weather or remnant mining hazards. Insurance guarantees that necessary medical attention is swift and accessible, which is crucial for protecting the safety of the staff responsible for protecting the habitat.

- **Compliance:** This measure reflects the mining company's commitment to labour safety standards and corporate social responsibility (CSR), aligning the WMP with best practices for operational integrity.

7.2.3. Construction of Anti-Poaching Camp with Watch Tower

The construction of a dedicated anti-poaching camp with a watchtower provides the necessary logistical and strategic infrastructure for the watchers to operate effectively.

- **Operational Base:** The camp serves as a permanent lodging and storage facility, minimizing travel time and maximizing the time the watchers spend patrolling the area. It provides a secure location for storing monitoring equipment, field notes, and emergency supplies.
- **Strategic Surveillance:** The watchtower is the most critical element, offering elevated, long-range visibility over the rehabilitated landscape. This height advantage is invaluable for:
- **Detecting Poacher Activity:** Early detection of intruders, especially at dawn or dusk, can prevent illegal activity before harm occurs.
- **Fire Spotting:** Identifying the first signs of smoke over the restored canopy, enabling a rapid response to minimize damage.
- **Monitoring of wildlife movements:** Providing a non-intrusive platform for observing animal movement patterns and congregation points, especially around the constructed waterholes.

All these provisions establish a robust, supported, and strategic presence on the ground. They transform a passive rehabilitation effort into an active conservation program, ensuring the longevity of the wildlife habitat created in the post-mining landscape. In this project one watch tower cum Anti-poaching Camp (APC).

7.3 Research and Education:

Within a Wildlife Management Plan (WMP) for a mining area, research and education are not mere supplementary activities; they are essential for long-term compliance, adaptive management, and fostering a conservation culture. These actions ensure that rehabilitation efforts are scientifically grounded, communicated effectively, and supported by all stakeholders, from site workers to the local community.

7.3.1. Research and Documentation of Flora & Fauna:

Research and documentation form the backbone of a successful WMP. This involves systematically collecting data to assess the progress of habitat restoration and guide conservation decisions.

- **Baseline Data and Recolonization:** Documentation must start with a pre-mining / pre-operation baseline and continue throughout the post-reclamation phase. Ecologists study the diversity, richness, and density of native flora and fauna species returning to the rehabilitated area, comparing it to reference sites. Use of camera traps and collection of direct and indirect evidences of the wildlife is proposed.
- **Fauna as Indicators:** Monitoring focuses on key faunal species, particularly those listed as Rare, Endangered, or Threatened (RET) under national legislation, as well as species like amphibians or specific insect groups that serve as bio-indicators of water and soil health.
- **Documentation Output:** The findings must be compiled into formal reports detailing the success rate of revegetation, species return patterns, and any emerging ecological challenges (e.g., soil acidification, dust impacts). This information validates the WMP and informs necessary adjustments, such as introducing new planting methods or additional water quality measures. As there is no mining and transportation activities, the wildlife movement in and around the mining areas affirms that there is no harm to the peace and tranquillity of the wildlife in and around the mining areas. The research and documentation activities are proposed for 3 years.

7.3.2. Installation of Hoardings and Signboards / Annual Maintenance

Hoardings and Signboards are crucial for on-site communication, acting as visual cues to enforce conservation protocols and safety.

- **Enforcement and Safety:** Signs delineate critical wildlife zones (e.g., nesting areas, animal corridors, protected waterholes), preventing disturbance by workers and unauthorized visitors. They clearly communicate prohibitions (e.g., "No Dumping," "No Entry," "Speed Limit 20 km/h - Wildlife Area, etc.,") and mandatory actions (e.g., "Use Designated Route Only").
- **Public Awareness:** Hoardings placed at the mine entrance or along perimeter roads can educate the public and contractors about the company's commitment to biodiversity and the presence of sensitive species in the area.

- **Maintenance:** The harsh environment of a mining area requires annual maintenance to replace faded, damaged, or obscured signs. Using durable, weather-proof materials and ensuring adequate lighting are essential to maintain their effectiveness as a constant reminder of conservation rules.

  During the project period it is proposed to install 10 sign boards in various locations of the project area.

7.3.3. Printing of Posters, Pamphlets, Banners, etc.

Printed materials serve as accessible, take-away reminders that reinforce the educational message both on and off-site.

- **Targeted Information:** Posters and pamphlets provide detailed, species-specific information (e.g., images of protected birds using the installed nests, information on local snakes and first aid). This is particularly effective for communicating with non-literate workers or for giving students a tangible souvenir of their visit.
- **Community Engagement:** Banners and posters displayed in local villages, schools, and community centres surrounding the mine help build local support for the WMP and share the success of the rehabilitation efforts, fostering a sense of shared stewardship.
- It is proposed to print and distribute 500 booklets, 5000 brochures, 100 posters on conservation of wildlife and ecology.

7.3.4. Awareness Program for Workers and Students

The **Awareness Program** is the active component that translates research and policies into action, targeting the two most critical groups: site personnel and the future generation.

- **Worker Training:** All mine employees, contractors, and visitors must undergo an induction program that highlights the objectives of the WMP. This training covers topics like wildlife encounter protocols, minimizing dust and noise, proper waste disposal, and the strict prohibition of hunting or collecting flora/fauna. The goal is to embed a conservation culture where every worker is a steward.
- **Student Education (Future Stewards):** Programs for local students and educational institutions (field visits, lectures, essay competitions) inspire the next generation to value and protect the rehabilitated ecosystem. These activities connect academic learning with real-world conservation, ensuring the long-term sustainability of the area.

During the project period, it is planned to conduct awareness programs at various levels, Mine workers, officials, villagers and students of schools and colleges of surrounding villages.

7.4 BUDGET:

Table-17: Following is the budget for the Wildlife management activities KSMCL for utility of existing road at Thimmappanagudi Mines (ML No.2605) in Sandur North Range of Ballari Territorial Division.

Sl No	Particulars of activity	Numbers / Qtty/Extent in Ha	Unit cost (in Lakhs)	2026-27 Amount (in Lakh Rs)	2027-28 Amount (in Lakh Rs)	2028-29 Amount (in Lakh Rs)	Amount (In Lakhs)
A	**Enrichment of Wildlife Habitat**						
1	Construction of Waterholes and maintenance	10	1.00	10.00	1.00	1.00	**12.00**
2	Installation of birds nests	200	0.10	2.00	1.00	1.00	**4.00**
	Total of A			**12.00**	**2.00**	**2.00**	**16.00**
B	**Conservation and Monitoring of Wildlife Habitat**						
1	Forest Watchers 2 x 36 months = 72	72	0.17	4.08	4.284	4.500	**12.86**
2	Medical Insurance Watchers Employee	2	0.10	0.20	0.22	0.24	**0.66**
3	Construction of Anti-poaching Camp with Watch tower & annual maintenance	1	25.00	25.00	0.50	0.50	**26.00**
	Total of B			**29.28**	**5.00**	**5.24**	**39.52**
C	**Research and Education**						
1	Research and documentation	1	LS	4.85	4.90	4.95	**14.70**
2	Installation of Hoardings and Signboards / Annual maitenance	10	0.15	1.50	0.00	0.00	**1.50**
3	Printing of Posters, Pamphlets, Banners, Booklets etc	LS	LS	1.00	1.00	1.00	**3.00**
4	Awareness program for Workers, Villagers and Students	10	0.15	1.50	1.50	1.50	**4.50**
	Total of C			**8.85**	**7.40**	**7.45**	**23.70**
	GRAND TOTAL						**79.22**

Total Rupees Seventy Nine Lakh and Twenty Two Thousand only

8. ANNEXURES:

Annexure-1

Checklist of Flora of KSMCL-Thimmappanagudi Iron Ore Mines (TIOM) Proposed conveyor belt area

Sl No	Order	Family	Botanical Name	Common Name in English	Common Name in Kannada	Plant Type	Conservation Status
1	Alismatales	Araceae	*Arisaema tortuosum*	Cobra lily	ಕೆಂಪು ಮಣಿ ಗಿಡ	Herb	NE
2	Arecales	Arecaceae	*Phoenix loureini*	Hill date palm	ಬೆಟ್ಟ ಈಚಲು	Tree	NE
3	Asparagales	Amaryllidaceae	*Crinum defixum*	Crinum lily	ಕಾಡು ಈರುಳ್ಳಿ	Herb	NE
4	Asparagales	Asparagaceae	*Agave americana*	Agave	ಕತ್ತಾಳೆ	Succulant Herb	NE
5	Asparagales	Asparagaceae	*Asparagus racemosus*	Asparagus grass	ಶತಾವರಿ	Climber	NE
6	Asparagales	Asphodelaceae	*Aloe vera*	Aloe vera	ಲೋಳೆಸರ	Succulant Herb	NE
7	Asparagales	Hypoxidaceae	*Curculigo orchioides*	Golden eye grass	ನೆಲತೆಂಗು	Herb	NE
8	Asterales	Asteraceae	*Acanthospermum hispidum*	Starbur	ಕಡ್ಡಿಮುಳ್ಳು	Herb	NE
9	Asterales	Asteraceae	*Blepharispermum subsessile*	Stalkless Eyelashpod	ರಸನಾ	Shrub	NE
10	Asterales	Asteraceae	*Chromolaena odorata*	Devil Weed Eupatorium	ರಕ್ಕಸಕಳೆ	Shrub	Invasive
11	Asterales	Asteraceae	*Cyanthillium cinereum*	Purple feabane	ಸಹದೇವಿ	Herb	NE
12	Asterales	Asteraceae	*Dicoma tomentosa*	Wolly Dicoma	ನವನಂಜಿ	Herb	NE
13	Asterales	Asteraceae	*Laggera alata*	Winged-stem laggera	ಬೆಟ್ಟದ ಕುಪಪೆಗಿಡ	Herb	NE
14	Asterales	Asteraceae	*Parthenium hysterophorus*	Parthenium	ಪಾರ್ಥೇನಿಯಂ	Herb	Invasive
15	Asterales	Asteraceae	*Tridax procumbens*	Coatbutton	ಟಿಕ್ಕಿ ತಪ್ಪ	Herb	LC
16	Asterales	Asteraceae	*Vernonia albicans*	Vernonia spp.	ಗಾಯದೊಪ್ಪಲು	Herb	NE
17	Asterales	Asteraceae	*Vicoa indica*	Indian Golden Daisy	ಸೋನಾಮುಡಿ	Herb	NE
18	Boraginales	Boraginaceae	*Cordia myxa*	Indian Cherry	ಬಳ್ಳೆ	Tree	NE
19	Boraginales	Boraginaceae	*Ehretia aspera*	Chamror	ಬಗರಿ	Tree	NE
20	Boraginales	Boraginaceae	*Heliotropium supinum*	Heliotrope	ರತ್ನಗಂಧಿ	Herb	NE
21	Boraginales	Heliotropiaceae	*Heliotropium indicum*	Indian turnsole	ಚೇಳುಬಾಲದ ಗಿಡ	Herb	LC
22	Brassicales	Capparaceae	*Capparis zeylanica*	Ceylone Caper	ಗೋವಿಂದಫಲ	Climber	LC
23	Caryophyllales	Amaranthaceae	*Achyranthes aspera*	Prickly Chaff Flower	ಉತ್ತರಾಣಿ	Herb	NE
24	Caryophyllales	Amaranthaceae	*Aerva lanata*	Mountain knotgrass	ಬಿಳಿ ಹಿಂಡಿಸೊಪ್ಪು	Herb	LC
25	Caryophyllales	Amaranthaceae	*Aerva sanguinolenta*	Climbing wool plant	ನೆಲ ಹಿಂಡಿ ಸೊಪ್ಪು	Herb	NE
26	Caryophyllales	Amaranthaceae	*Allmania nodiflora*	Node flower allmania	ಬುದ್ದೆ ಸೊಪ್ಪು	Herb	NE
27	Caryophyllales	Amaranthaceae	*Alternanthera pungens*	Paper thorn	ಹಾದರಗಿತ್ತಿ ಮುಳ್ಳು	Herb	NE
28	Celastrales	Celastraceae	*Gymnosporia emarginata*	Notched-leaf spike Thorn	ಸಣ್ಣ ತಂಡರಸಿ	Shrub	NE
29	Celastrales	Celastraceae	*Maytenus senegalensis*	Red spike Thorn	ತಂಡರಸಿ	Shrub	NE

30	Commelinales	Commelinaceae	*Commelina communis*	Dayflower	ಗುಬ್ಬಚ್ಚಿ ಬಾಳೆ	Herb	LC
31	Commelinales	Commelinaceae	*Commelina ensifolia*	Dayflower	ಗುಬ್ಬಚ್ಚಿ ಹುಲ್ಲು	Herb	NE
32	Commelinales	Commelinaceae	*Cyanotis tuberosa*	Sahyadri Dew-grass	ನೀಲಿ ಸ್ಪಂಜು ಹೂ	Herb	NE
33	Dioscoreales	Dioscoreaceae	*Dioscorea oppositifolia*	Cinnamon Vine	ಕಾದುಗೆಣಸು	Climber	NE
34	Dioscoreales	Dioscoreaceae	*Dioscorea tomentosa*	Woolly Yam	ಬಿಳಿಗೆಣಸು	Climber	NE
35	Ericales	Ebenaceae	*Diospyros melanoxylon*	Tendu / Indian ebony	ತುಮ್ಮಿ	Tree	NE
36	Ericales	Ebenaceae	*Diospyros montana*	Bobay ebony	ಕಲ್ಲಂದಿ	Tree	NE
37	Fabales	Fabaceae	*Acacia planifrons*	Umbrell Thorn	ಕೊಡಜಾಲಿ	Tree	LC
38	Fabales	Fabaceae	*Albizia amara*	Krishna siris	ತುಗ್ಗಿ	Tree	LC
39	Fabales	Fabaceae	*Alysicarpus vaginalis*	Alyce clover	ನಾಮದ ಸೊಪ್ಪು	Herb	LC
40	Fabales	Fabaceae	*Abrus precatorius*	Rosary pea	ಗುಲಗಂಜಿ	Climber	LC
41	Fabales	Fabaceae	*Atylosia scarabaeoides*	Peanut grass	ಕಡಲೆ ಹುಲ್ಲು	Climber	NE
42	Fabales	Fabaceae	*Bauhinia malabarica*	Mountain bauhinia	ಮಂದಾರ/ಬಸವನಪಾದ	Tree	NE
43	Fabales	Fabaceae	*Bauhinia racemosa*	Beedi leaf tree	ಗಂಡು ಹಾಸಿನ ಮರ	Tree	NE
44	Fabales	Fabaceae	*Butea monosperma*	Flame of the forest	ಮುತ್ತುಗ	Tree	LC
45	Fabales	Fabaceae	*Canavalia virosa*	Large jack-bean	ಮರಳು ಅವರೆ	Climber	NE
46	Fabales	Fabaceae	*Cassia fistula*	Golden shower tree	ಕಕ್ಕೆ	Tree	LC
47	Fabales	Fabaceae	*Crotalaria hebecarpa*	Rattlepod	ನೆಲ ಹುರುಳಿ	Herb	NE
48	Fabales	Fabaceae	*Crotalaria pallida*	Rattlepod	ಗಿಡಿಗಿಡಿ ಗಿಡ	Herb	LC
49	Fabales	Fabaceae	*Crotalaria sandoorensis*	Ramasenabu / Ram Hemp	ರಾಮಸೆಣಬು	Herb	EN
50	Fabales	Fabaceae	*Dalbergia latifolia*	Indian rosewood	ಬೀಟಿ / ಇಬ್ಬಡಿ	Tree	VU
51	Fabales	Fabaceae	*Dalbergia paniculata*	White Rosewood	ಬಿಳಿಬೀಟಿ/ಹಚ್ಚೇರಿ	Tree	NE
52	Fabales	Fabaceae	*Delonix regia*	Ujjain Desmodium	ಕರಿಹೊನ್ನೆ	Climber	NE
53	Fabales	Fabaceae	*Desmodium cojetnensis*	Tick trefoil	ಕಾಡು ಪುಳ್ಳಂ ಪುರಚಿ	Herb	LC
54	Fabales	Fabaceae	*Desmodium triflorum*	Gulmohar	ಗುಲ್ ಮೊಹರ್,	Tree	LC
55	Fabales	Fabaceae	*Dichrostachys cinerea*	Sicklebush Ashy babool	ಒಡವಿನ ಮರ	Tree	LC
56	Fabales	Fabaceae	*Hardwickia binata*	Anjan / Ironwood	ಹಾಸಿನ ಮರ	Tree	LC
57	Fabales	Fabaceae	*Indigofera linifolia*	Narrow leaf indigo	ಗಂಜಿ ಕಸ	Herb	NE
58	Fabales	Fabaceae	*Indigofera wightii*	Pale Indigo	ಸಾದಾ ನೀಲಿ	Shrub	NE
59	Fabales	Fabaceae	*Mucuna pruriens*	Velvet bean	ನಸುಗುನ್ನಿ	Climber	LC
60	Fabales	Fabaceae	*Neltuma juliflora*	Mesquite	ಬಳ್ಳಾರಿ ಜಾಲಿ	Shrub	Invasive
61	Fabales	Fabaceae	*Peltophorum vogelianum*	Peltophorum	ಹಳದಿ ತುರಾಯಿ	Tree	NE
62	Fabales	Fabaceae	*Pithecellobium dulce*	Manila tamarind	ಸಿಹಿ ಹುಣಿಸೆ	Tree	NE
63	Fabales	Fabaceae	*Pongamia pinnata*	Karanja / Pongam	ಹೊಂಗೆ	Tree	NE

64	Fabales	Fabaceae	*Pterocarpus marsupium*	Indian Kino	ಹೊನ್ನೆ	Tree	NT
65	Fabales	Fabaceae	*Pterocarpus santalinus*	Red Sanders	ರಕ್ತ ಚಂದನ	Tree	EN
66	Fabales	Fabaceae	*Rhynchosia hirta*	Hairy snoutbean	ನೀರಿಗಂಟಿ	Climber	LC
67	Fabales	Fabaceae	*Rhynchosia mintna*	Burn-mouth vine	ಬಚ್ಚಲವರೆ	Climber	LC
68	Fabales	Fabaceae	*Senegalia catechu*	Cutch tree	ಕರೇದ	Tree	LC
69	Fabales	Fabaceae	*Senegalia cinundra*	Kach	ಕೆಂಪು ಜಾಲಿ	Tree	LC
70	Fabales	Fabaceae	*Senegalia ferruginea*	Rusty Acacia	ಬನ್ನಿ ಮರ	Tree	VU
71	Fabales	Fabaceae	*Senna auriculata*	Tanners Cassia	ತಂಗಡಿ	Shrub	NE
72	Fabales	Fabaceae	*Senna siamea*	Siamese cassia	ಸೀಮೆ ತಂಗಡಿ	Tree	NE
73	Fabales	Fabaceae	*Senna tora*	Stinking Cassia	ನಾಯಿ ಅಲಸಂದಿ	Herb	NE
74	Fabales	Fabaceae	*Stylosanthes fruticosa*	Shrubby stylo	ಕಾಡು ಹುರುಳಿ	Shrub	LC
75	Fabales	Fabaceae	*Stylosanthes hamata*	Caribbean stylo	ಕಾಡು ಅಲಸಂದಿ	Herb	LC
76	Fabales	Fabaceae	*Tamarindus indica*	Tamarind	ಹುಣಸೆ	Tree	LC
77	Fabales	Fabaceae	*Vachellia farnesiana*	Sweet Acacia	ಕಸ್ತೂರಿ ಜಾಲಿ	Shrub	NE
78	Fabales	Fabaceae	*Vachellia leucophloea*	Brewers acacia	ಬಿಳಿಜಾಲಿ/ಬ್ಯಾಲದ ಮರ	Tree	LC
79	Fabales	Fabaceae	*Vachellia nilotica*	Babul	ಕರಿಜಾಲಿ	Tree	LC
80	Fagales	Casuarinaceae	*Casuarina equisetifolia*	Survey Poles	ಸರ್ವೆ ಮರ	Tree	NE
81	Gentianales	Apocynaceae	*Calotropis gigantea*	Crown flower	ದೊಡ್ಡ ಎಕ್ಕೆ	Shrub	LC
82	Gentianales	Apocynaceae	*Calotropis procera*	Apple of Sodom	ಸಣ್ಣ ಎಕ್ಕೆ	Shrub	LC
83	Gentianales	Apocynaceae	*Caralluma diffusa*	Indian Caralluma	ಮೊಲದಕೋಡು	Herb	NE
84	Gentianales	Apocynaceae	*Carissa carandas*	Karonda	ಕಾರೆ	Shrub	LC
85	Gentianales	Apocynaceae	*Catharanthus pusillus*	Tiny Vinca	ಬಿಳಿಕಾಸಿಕಡಗಿಲು	Herb	NE
86	Gentianales	Apocynaceae	*Holostemma ada-kodien*	Ringed Swallo-wort	ಜೀವಂತಿ	Climber	NE
87	Gentianales	Apocynaceae	*Wrightia tinctoria*	Pala indigo	ಬೆಪ್ಪಾಲೆ	Tree	LC
88	Gentianales	Apocynaceae	*Hemidesmus indicus*	Indian sarsaparilla	ಸೊಗದ ಬೇರು	Climber	LC
89	Gentianales	Apocynaceae	*Pergularia daemia*	Hair knot plant	ತಳವಾರನ ಬಳ್ಳಿ	Climber	NE
90	Gentianales	Apocynaceae	*Plumeria obtusa*	Singapore Frangipani	ದೇವ ಕಣಗಿಲೆ	Tree	LC
91	Gentianales	Apocynaceae	*Vincetoxicum indicum*	Vomiting swallow-wort	ಅಡುಮುಟ್ಟದ ಬಳ್ಳಿ	Climber	LC
92	Gentianales	Loganiaceae	*Strychnos potatorum*	Cleaning nut tree	ಚಿಲ್ಲ	Tree	NE
93	Gentianales	Rubiaceae	*Canthium coromandelicum*	Canthium	ಕಾರೆ	Shrub	NE
94	Gentianales	Rubiaceae	*Catunaregam spinosa*	Mountain Pomegranate	ಮಂಗಾರಿ/ದೊಡ್ಡ ಕಾರೆ	Shrub	NE
95	Gentianales	Rubiaceae	*Gardenia gummifera*	Gummy Gardenia	ಬಿಕ್ಕೆ	Shrub	NE
96	Gentianales	Rubiaceae	*Gardenia latifolia*	Indina box wood	ಅಡವಿ ಬಿಕ್ಕೆ	Tree	NE
97	Gentianales	Rubiaceae	*Haldina cordifolia*	Adina / Haldu	ಅರಿಶಿನ ತೇಗ	Tree	NE
98	Gentianales	Rubiaceae	*Ixora pavetta*	Ixora.	ಗೊರವಿ	Shrub	LC
99	Gentianales	Rubiaceae	*Meyna hawtayneana*	Meyna	ಚೇಗುಗಡ್ಡೆ	Shrub	NE

100	Gentianales	Rubiaceae	*Morinda pubescens*	Indian Mulberry	ಮಡ್ಡಿ ಮರ	Shrub	NE
101	Gentianales	Rubiaceae	*Mussaenda frondosa*	Mussaenda	ಬೆಳ್ಳೀಚ	Shrub	NE
102	Gentianales	Rubiaceae	*Oldenlandia corymbosa*	Oldenlandia	ಪರ್ಪಟ ಗಿಡ	Herb	NE
103	Lamiales	Acanthaceae	*Andrographis lineata*	Striped Chiretta	ನೇರಳೆ ನೆಲಬೇವು	Herb	NE
104	Lamiales	Acanthaceae	*Andrographis paniculata*	Kalmegh	ನೆಲಬೇವು	Herb	LC
105	Lamiales	Acanthaceae	*Eranthemum roseum*	Blue eranthemum	ಕಪ್ಪು ಕರ್ಪೆ. ನೇರಳೆ ಹೂ	Herb	NE
106	Lamiales	Acanthaceae	*Justicia glabra*	Smooth Justicia	ಕರಿನಕ್ಕೆ	Herb	NE
107	Lamiales	Acanthaceae	*Lepidagathis subarmata*	Crested Lepidagathis	ಗಂಟುಕಾಳು ಗಡ್ಡೆ	Herb	NE
108	Lamiales	Acanthaceae	*Rhinacanthus nasutus*	Snake Jasmine	ನಾಗಮಲ್ಲಿಗೆ	Herb	NE
109	Lamiales	Acanthaceae	*Rostellularia crinita*	Small flowered Justicia	ಹುಚ್ಚು ನೆಲಬೇವು	Herb	NE
110	Lamiales	Acanthaceae	*Strobilanthes pavala*	Shadeloving cone flower	ಮೂರಿಕೋಟೆ	Herb	NE
111	Lamiales	Bignoniaceae	*Dolichandrone atrovirens*	Wavy Trumpet flower	ಉದುರೆ	Tree	NE
112	Lamiales	Lamiaceae	*Anisomeles indica*	Indian catmint	ಮಂಗಮಾರಿ/ಹುಚ್ಚು ತುಂಬೆ	Herb	NE
113	Lamiales	Lamiaceae	*Lavandula bipinnata*	Feather-leaved Lavender	ಸರ್ವಾರಿ	Herb	NE
114	Lamiales	Lamiaceae	*Leucas aspera*	Common Leucas	ತುಂಬೆ	Herb	NE
115	Lamiales	Lamiaceae	*Mesosphaerum suaveolens*	American Mint	ವಿದೇಶಿ ತುಳಸಿ	Herb	Invasive
116	Lamiales	Lamiaceae	*Ocimum tenuiflorum*	Holy Basil	ತುಳಸಿ	Herb	LC
117	Lamiales	Lamiaceae	*Orthosiphon thymiflorus*	Thyme Java Tea	ಹುಚ್ಚು ತುಳಸಿ	Herb	NE
118	Lamiales	Lamiaceae	*Tectona grandis*	Teak	ತೇಗ	Tree	LC
119	Lamiales	Lamiaceae	*Vitex negundo*	Nirgundi	ಲಕ್ಕಿ	Shrub	LC
120	Lamiales	Oleaceae	*Jasminum arborescens*	Jasmine relative	ಕಾಡು ಮಲ್ಲಿಗೆ	Climber	NE
121	Lamiales	Orobanchaceae	*Parasopubia delphinifolia*	Common Sopubia	ತುತ್ತೂರಿ ಹೂ	Herb	NE
122	Lamiales	Orobanchaceae	*Striga asiatica*	Witchweed	ಅಗ್ನಿ ಹೂ	Herb	NE
123	Lamiales	Verbenaceae	*Lantana camara*	Lantana	ಚಮರಂಗ	Shrub	Invasive
124	Lamiales	Verbenaceae	*Stachytarpheta indica*	Indian Snakeweed	ಕರಿ ಉತ್ತರಾಣಿ	Shrub	LC
125	Liliales	Colchicaceae	*Gloriosa superba*	Glory lily	ಗಾಳಿ ಹೂ	Climber	VU
126	Magnoliales	Annonaceae	*Annona squamosa*	Custard apple	ಸೀತಾಫಲ	Tree	LC
127	Magnoliales	Annonaceae	*Miliusa tomentosa*	Woolly miliusa	ಲೇಬಿ ಹಣ್ಣು ?	Tree	NE
128	Magnoliales	Annonaceae	*Polyalthia cerasoides*	Cherry Ashok	ಸಣ್ಣ ಹಸ್ಸರೆ	Tree	NE
129	Malpighiales	Phyllanthaceae	*Bridelia retusa*	Spinous Kino Tree	ಮುಳ್ಳುಹೊನ್ನೆ	Tree	NE
130	Malpighiales	Phyllanthaceae	*Flueggea leucopyrus*	Bushweed	ಬಿಲಿಸೂಲಿ	Shrub	NE
131	Malpighiales	Phyllanthaceae	*Phyllanthus emblica*	Amla	ಬೆಟ್ಟದ ನೆಲ್ಲಿ	Tree	LC
132	Malpighiales	Phyllanthaceae	*Phyllanthus amarus*	Stone breaker	ನೆಲನೆಲ್ಲಿ	Medicinal Herb	LC
133	Malpighiales	Phyllanthaceae	*Phyllanthus reticulatus*	Black honey Shrub	ಕರಿಸೂಲಿ, ಕರಿವೂಲಿ	Shrub	LC

134	Malpighiales	Euphorbiaceae	*Acalypha indica*	Indian Mercury	ಕುಪ್ಪಿ ಗಿಡ	Medicinal	NE
135	Malpighiales	Euphorbiaceae	*Euphorbia hirta*	Asthma weed	ಹುಳುಕಡ್ಡಿ ಸೊಪ್ಪು	Herb	LC
136	Malpighiales	Euphorbiaceae	*Euphorbia nivulia*	Leafy Milk Hedge	ಎಲೆಕಳ್ಳಿ	Shrub	NE
137	Malpighiales	Euphorbiaceae	*Givotia rottleriformis*	White catamaran	ಬೆಟ್ಟತಾವರೆ	Tree	NE
138	Malpighiales	Euphorbiaceae	*Jatropha gossypiifolia*	Bellyache bush	ಚಿಕ್ಕ ಕಾಮು ಹರಳು	Shrub	LC
139	Malpighiales	Salicaceae	*Casearia esculenta*	Saptarangi	ದೊಡ್ಡ ಹನಿಚೆ	Tree	NE
140	Malpighiales	Salicaceae	*Flacourtia indica*	Governor's plum	ಮುಳ್ಳುಕಾರೆ	Tree	LC
141	Malvales	Bixaceae	*Cochlospermum religiosum*	Silk cotton tree	ಅರಿಶಿನ ಬೂರುಗ	Tree	NE
142	Malvales	Malvaceae	*Abutilon indicum*	Indian abution	ಮುದ್ರೆ ಗಿಡ	Medicinal	NE
143	Malvales	Malvaceae	*Grewia hirsuta*	Nagbala Crossberry	ಉಡಿಪೆ	Shrub	NE
144	Malvales	Malvaceae	*Grewia latifolia*	Emu berry,	ಉಲಿಪಿ	Shrub	NE
145	Malvales	Malvaceae	*Grewia tiliifolia*	Dhamani	ತಡಸಲು	Tree	NE
146	Malvales	Malvaceae	*Grewia orbiculata*	Roundleaf Crossberry	ಕರಿಜಾನೆ	Shrub	NE
147	Malvales	Malvaceae	*Helicteres isora*	Indian Screw Tree	ಎಡಮುರಿ	Shrub	LC
148	Malvales	Malvaceae	*Sterculia urens*	Gum karaya tree	ಕೆಂದಾಳೆ/ರಕ್ತ ತಾಳ	Tree	NT
149	Malvales	Malvaceae	*Urena lobata*	Congo Jute	ಕಾಡುಪತ್ತಿ	Shrub	NE
150	Myrtales	Combretaceae	*Terminalia anogeissiana*	Axlewood	ದಿಂಡಲು	Tree	NE
151	Myrtales	Combretaceae	*Terminalia arjuna*	Arjun tree	ಹೊಳೆಮತ್ತಿ	Medicinal	NE
152	Myrtales	Combretaceae	*Terminalia bellirica*	Beach Almond	ತಾರೆಕಾಯಿ	Medicinal	LC
153	Myrtales	Combretaceae	*Terminalia catappa*	Indian Almond	ಕಾಡುಬಾದಾಮಿ	Edible fruit	LC
154	Myrtales	Combretaceae	*Terminalia chebula*	Haritaki	ಅಳಲೆ ಕಾಯಿ	Medicinal	LC
155	Myrtales	Combretaceae	*Terminalia elliptica*	Indian laurel	ಮತ್ತಿ ಮರ	Valuable Timber	LC
156	Myrtales	Combretaceae	*Terminalia paniculata*	Kindal Tree	ಹೊನಗಲು	Tannin	NE
157	Myrtales	Lythraceae	*Lagerstroemia parviflora*	Dhaman	ಚನ್ನಂಗಿ	Tree	NE
158	Myrtales	Lythraceae	*Woodfordia fruticosa*	Fire flame bush	ತಾಮ್ರ ಪುಷ್ಪಿ	Shrub	NE
159	Myrtales	Myrtaceae	*Eucalyptus hybrid*	Eucalyptus	ನೇಲಗಿರಿ	Tree	NE
160	Myrtales	Myrtaceae	*Syzygium cumini*	Java Plum	ನೇರಳೆ	Tree	LC
161	Oxalidales	Oxalidaceae	*Oxalis corniculata*	Creeping wood sorrel	ಹುಳಿ ಸೊಪ್ಪು	Herb	LC
162	Piperales	Aristolochiaceae	*Aristolochia indica*	Indian birthwort	ಈಶ್ವರಿ ಬಳ್ಳಿ	Medicinal Climber	NE
163	Poales	Cyperaceae	*Fimbristylis ovata*	Sedge	ಗುಡ್ಡ ಹುಲ್ಲು	Grass	NE
164	Poales	Poaceae	*Aristida adscensionis*	Three-awn grass	ಬಂಡಿ ಹುಬ್ಬಿನ ಹುಲ್ಲು	Grass	LC
165	Poales	Poaceae	*Cenchrus biflorus*	Indian Sandbur	ಅಂಟು ಪುರ್ಲಿ	Grass	LC
166	Poales	Poaceae	*Chrysopogon fulvus*	Gur grass	ಕೆಂಪು ಸುಳ್ಳು ಗಡ್ಡ ಹುಲ್ಲು	Grass	NE
167	Poales	Poaceae	*Cymbopogon caesius*	Kachi grass	ಕಾಚಿ ಹುಲ್ಲು	Grass	NE
168	Poales	Poaceae	*Cymbopogon coloratus*	Colorful Lemon Grass	ಕರಡಾ ಹುಲ್ಲು	Grass	NE

169	Poales	Poaceae	*Cymbopogon martini*	Palmarosa	ಅಂಬಿಹುಲ್ಲು	Grass	LC
170	Poales	Poaceae	*Cynodon dactylon*	Bermuda grass	ಗರಿಕೆ	Grass	LC
171	Poales	Poaceae	*Digitaria stricta*	Leafless Mistletoe	ಗಿಡಭಕ್ಷಕ	Grass	NE
172	Poales	Poaceae	*Eleusine indica*	Goosegrass	ಗಂಜಳ	Grass	LC
173	Poales	Poaceae	*Eustachys petraea*	Pinewoods fingergrass	ಫ್ಯಾನ್ ಹುಲ್ಲು	Grass	NE
174	Poales	Poaceae	*Pennisetum orientale*	Oriental Fountain Grass	ಚಿಲುಮೆ ಹುಲ್ಲು	Grass	NE
175	Poales	Poaceae	*Trachys muricata*	Indian Rough Grassq	ಒರಟು ಹುಲ್ಲು	Grass	NE
176	Poales	Poaceae	*Urochloa setigera*	Bbristly Signal Grass	ಹುಲ್ಲು	Grass	NE
177	Poales	Poaceae	*Cymbopogon flexuosus*	Lemongrass	ನಿಂಬೆ ಹುಲ್ಲು	Grass	LC
178	Poales	Poaceae	*Heteropogon contortus*	Spear grass	ಓಬುಹುಲ್ಲು	Grass	LC
179	Poales	Poaceae	*Urochloa panicoides*	Fodder Grass	ಮೇವಿನಹುಲ್ಲು	Grass	NE
180	Polypodiales	Actiniopteridaceae	*Actinopteris radiata*	Peacocks tail fern	ಮಯೂರ ಶಿವೆ	Herb	NE
181	Ranunculales	Menispermaceae	*Tinospora cordifolia*	Guduchi / Giloy	ಅಮೃತಬಳ್ಳಿ	Climber	LC
182	Ranunculales	Papaveraceae	*Argemone mexicana*	Mexican poppy	ಅರಿಷಿನ ಉಮ್ಮತ್ತಿ/ದತ್ತೂರಿ	Herb	NE
183	Rosales	Moraceae	*Ficus arnottiana*	Indian Rock Fig	ಕಲ್ಲುಶತ್ತಿ	Tree	NE
184	Rosales	Moraceae	*Ficus benghalensis*	Banyan	ಆಲ	Tree	LC
185	Rosales	Moraceae	*Ficus mollis*	Soft Fig	ಕಾಡು ಗೋಡೆ, ಕಲ್ಲಾಲ	Tree	NE
186	Rosales	Moraceae	*Ficus racemosa*	Cluster fig	ಅತ್ತಿ ಹಣ್ಣಿನ ಮರ	Tree	LC
187	Rosales	Moraceae	*Ficus religiosa*	Peepal / Sacred fig	ಅರಳಿ	Tree	LC
188	Rosales	Rhamnaceae	*Ziziphus xylopyrus*	Woody-Fruit Jujube	ಗಂಡುಬೋರ	Tree	NE
189	Rosales	Rhamnaceae	*Ziziphus jujuba*	Jujube	ಬೋರೆಹಣ್ಣು	Tree	LC
190	Rosales	Rhamnaceae	*Ziziphus mauritiana*	Ber	ಸಣ್ಣ ಬೋರ	Tree	LC
191	Santalales	Loranthaceae	*Dendrophthoe falcata*	Mistletoe	ಬದನಿಕೆ	Shrub	NE
192	Santalales	Olacaceae	*Ximenia americana*	Hog Plum	ನಕ್ಕೆ ಹಣ್ಣು	Tree	LC
193	Santalales	Santalaceae	*Santalum album*	Sandalwood	ಶ್ರೀಗಂಧ	Tree	VU
194	Santalales	Santalaceae	*Viscum articulatum*	Mistletoe	ಗಿಡ ಭಕ್ಷಕ	Invasive Climber	NE
195	Sapindales	Anacardiaceae	*Lannea coromandelica*	Indian ash tree	ಉಡಿಮರ, ಗೊಡ್ಡನ ಮರ	Tree	NE
196	Sapindales	Anacardiaceae	*Mangifera indica*	Mango	ಮಾವು	Tree	NE
197	Sapindales	Anacardiaceae	*Semicarpus anacardium*	Marking nut tree	ಕೇರು/ಗೇರು ಬೀಜ	Tree	LC
198	Sapindales	Burseraceae	*Boswellia serrata*	Indian frankincense	ಗುಗ್ಗುಳ, ಧೂಪದ ಮರ	Tree	NT
199	Sapindales	Meliaceae	*Azadirachta indica*	Neem	ಬೇವಿನ ಮರ	Tree	LC
200	Sapindales	Meliaceae	*Soymida febrifuga*	Indian Redwood	ಸೋಮ	Tree	NE
201	Sapindales	Rutaceae	*Aegle marmelos*	Bael	ಬಿಲ್ವ ಪತ್ರೆ	Tree	LC
202	Sapindales	Rutaceae	*Chloroxylon swietenia*	Satinwood	ಮಸಿವಾಳ	Tree	VU
203	Sapindales	Rutaceae	*Limonia acidissima*	Wood apple	ಬೇಲದ ಮರ	Edible fruit	NE

204	Sapindales	Sapindaceae	*Cardiospermum halicacabum*	Balloon vine	ಬೆಕ್ಕಿನ ಬುದ್ದೆ ಬಳ್ಳಿ	Climber	LC
205	Sapindales	Sapindaceae	*Dodonaea viscosa*	Hop Bushweed	ಬಂಡರಿಕೆ	Shrub	NE
206	Sapindales	Sapindaceae	*Sapindus mukorossi*	Soapnut	ಅಂಟುವಾಳ	Tree	LC
207	Sapindales	Simaroubaceae	*Ailanthus excelsa*	Coramandel ailantho	ದೊಡ್ಡಬೇವು	Tree	LC
208	Solanales	Convolvulaceae	*Ipomoea eriocarpa*	Tiny Morning Glory	ಮುಳ್ಳು ಬಳ್ಳಿ	Climber	NE
209	Solanales	Convolvulaceae	*Ipomoea purpurea*	Common Morning Glory	ನೀಲಿ ಉಷಾ	Climber	NE
210	Solanales	Convolvulaceae	*Jacquemontia paniculata*	Mauve Clustervine	ನೀಲಿಹೂಬಳ್ಳಿ	Climber	NE
211	Solanales	Solanaceae	*Solanum lasiocarpum*	Prickly Egg plant	ಮುಳ್ಳುಬದನೆ	Medicinal Herb	NE
212	Solanales	Solanaceae	*Solanum mauritianum*	Tree Tobacco	ಕಾಡುಬದನೆ	Herb	NE
213	Vitales	Vitaceae	*Cissus repanda*	Wavy-leaved Cissus	ಮುಡಿಬಳ್ಳಿ	Climber	NE
214	Zygophyllales	Zygophyllaceae	*Balanites aegyptiaca*	Desert Date	ಇರುವಾದ ಮರ	Medicinal Tree	LC

Annexure-2: Major mammals found in and around TIOM conveyor belt area (5 kms)

Sl No.	Order	Family	Common Name	Scientific Name	IUCN Status	WPA (1972) Schedule
1	Pholidota	Manidae	Indian Pangolin	*Manis crassicaudata*	EN	Sch- I
2	Artiodactyla	Bovidae	Four-horned Antelope	*Tetracerus quadricornis*	VU	Sch- I
3	Carnivora	Felidae	Indian Leopard	*Panthera pardus*	VU	Sch- I
4	Carnivora	Ursidae	Indian Sloth Bear	*Melursus ursinus*	VU	Sch- I
5	Primates	Cercopithecidae	Bonnet Macaque	*Macaca radiata*	VU	Sch II
6	Carnivora	Felidae	Rusty-spotted Cat	*Prionailurus rubiginosus*	NT	Sch- I
7	Primates	Cercopithecidae	Tufted Gray Langur	*Semnopithecus priam*	NT	Sch- II
8	Carnivora	Canidae	Indian Jackal	*Canis aureus*	LC	Sch- II
9	Carnivora	Canidae	Indian Fox	*Vulpes bengalensis*	LC	Sch-II
10	Artiodactyla	Suidae	Indian Wild Pig	*Sus scrofa*	LC	Sch- III
11	Carnivora	Felidae	Jungle Cat	*Felis chaus*	LC	Sch-II
12	Carnivora	Viverridae	Small Indian Civet	*Viverricula indica*	LC	Sch-II
13	Carnivora	Viverridae	Asian Palm Civet	*Paradoxurus hermaphroditus*	LC	Sch-II
14	Carnivora	Herpestidae	Indian Grey Mongoose	*Urva edwardsii*	LC	Sch-II
15	Carnivora	Herpestidae	Ruddy Mongoose	*Urva smithii*	LC	Sch- II
16	Rodentia	Hystricidae	Indian Crested Porcupine	*Hystrix indica*	LC	Sch- IV
17	Lagomorpha	Leporidae	Indian Black-naped Hare	*Lepus nigricollis*	LC	Sch- IV
18	Rodentia	Sciuridae	Three-striped Palm Squirrel	*Funambulus palmarum*	LC	Not Listed
19	Chiroptera	Pteropodidae	Indian Flying-fox	*Pteropus giganteus*	LC	Not Listed
20	Rodentia	Muridae	Field Mouse	*Mus booduga*	LC	Not Listed
21	Rodentia	Muridae	Bandicoot Rat	*Bandicoota indica*	LC	Not Listed

EN-Endangered, VU-Vulnerable, NT-Near Threatened, LC-Least Concern, Sch-Schedule of Wildlife Protection Act (WPA) 1972

*Need to explore more number of Mammals in detailed study

Annexure-3: Checklist of Avian Species found in KSMCL-TIOM proposed Conveyor Belt area

Sl. No.	Order	Family	Common Name	Scientific Name	Residential Status	IUCN
1	Accipitriformes	Accipitridae	Black Kite	*Milvus migrans*	Resident	LC
2	Accipitriformes	Accipitridae	Black-winged Kite	*Elanus caeruleus*	Resident	LC
3	Accipitriformes	Accipitridae	Brahminy Kite	*Haliastur indus*	Resident	LC
4	Accipitriformes	Accipitridae	Oriental Honey-buzzard	*Pernis ptilorhynchus*	Resident	LC
5	Accipitriformes	Accipitridae	Shikra	*Accipiter badius*	Resident	LC
6	Accipitriformes	Accipitridae	White-eyed Buzzard	*Butastur teesa*	Resident	LC
7	Anseriformes	Anatidae	Indian Spot-billed Duck	*Anas poecilorhyncha*	Resident	LC
8	Bucerotiformes	Bucerotidae	Indian Grey Hornbill	*Ocyceros birostris*	Resident	LC
9	Bucerotiformes	Upupidae	Hoopoe	*Upupa epops*	Resident	LC
10	Caprimulgiformes	Caprimulgidae	Jungle Nightjar	*Caprimulgus indicus*	Resident	LC
11	Charadriiformes	Burhinidae	Indian Stone-curlew	*Burhinus indicus*	Resident	LC
12	Charadriiformes	Charadriidae	Red-wattled Lapwing	*Vanellus indicus*	Resident	LC
13	Charadriiformes	Charadriidae	Yellow-wattled Lapwing	*Vanellus malabaricus*	Resident	LC
14	Charadriiformes	Recurvirostridae	Black-winged Stilt	*Himantopus himantopus*	Resident	LC
15	Columbiformes	Columbidae	Eurasian Collared Dove	*Streptopelia decaocto*	Resident	LC
16	Columbiformes	Columbidae	Laughing Dove	*Spilopelia senegalensis*	Resident	LC
17	Columbiformes	Columbidae	Red Turtle Dove	*Streptopelia tranquebarica*	Resident	LC
18	Columbiformes	Columbidae	Rock Pigeon	*Columba livia*	Resident	LC
19	Columbiformes	Columbidae	Spotted Dove	*Spilopelia chinensis*	Resident	LC
20	Coraciiformes	Alcedinidae	White-throated Kingfisher	*Halcyon smyrnensis*	Resident	LC
21	Coraciiformes	Coraciidae	Indian Roller	*Coracias benghalensis*	Resident	NT
22	Cuculiformes	Cuculidae	Asian Koel	*Eudynamys scolopaceus*	Resident	LC
23	Cuculiformes	Cuculidae	Blue-faced Malkoha	*Phaenicophaeus viridirostris*	Resident	LC
24	Cuculiformes	Cuculidae	Greater Coucal	*Centropus sinensis*	Resident	LC
25	Cuculiformes	Cuculidae	Jacobin Cuckoo	*Clamator jacobinus*	Migrant	LC
26	Cuculiformes	Cuculidae	Common Hawk-Cuckoo	*Hierococcyx varius*	Resident	LC
27	Falconiformes	Falconidae	Common Kestrel	*Falco tinnunculus*	Winter Migrant	LC
28	Galliformes	Phasianidae	Grey Francolin	*Ortygornis pondicerianus*	Resident	LC
29	Galliformes	Phasianidae	Indian Peafowl	*Pavo cristatus*	Resident	LC
30	Gruiformes	Rallidae	Brown Crake	*Zapornia akool*	Resident	LC

31	Gruiformes	Rallidae	Common Coot	*Fulica atra*	Winter Migrant	LC
32	Gruiformes	Rallidae	White-breasted Waterhen	*Amaurornis phoenicurus*	Resident	LC
33	Passeriformes	Alaudidae	Ashy-crowned Sparrow-lark	*Eremopterix griseus*	Resident	LC
34	Passeriformes	Alaudidae	Indian Bush Lark	*Mirafra erythroptera*	Resident	LC
35	Passeriformes	Alaudidae	Rufous-tailed Lark	*Ammomanes phoenicurus*	Resident	LC
36	Passeriformes	Alaudidae	Singing Bush Lark	*Mirafra cantillans*	Resident	LC
37	Passeriformes	Alaudidae	Sykes's Lark	*Galerida deva*	Resident	LC
38	Passeriformes	Campephagidae	Black-headed Cuckooshrike	*Lalage melanoptera*	Resident	LC
39	Passeriformes	Cisticolidae	Ashy Prinia	*Prinia socialis*	Resident	LC
40	Passeriformes	Cisticolidae	Grey-breasted Prinia	*Prinia hodgsonii*	Resident	LC
41	Passeriformes	Cisticolidae	Jungle Prinia	*Prinia sylvatica*	Resident	LC
42	Passeriformes	Cisticolidae	Plain Prinia	*Prinia inornata*	Resident	LC
43	Passeriformes	Cisticolidae	Common Tailorbird	*Orthotomus sutorius*	Resident	LC
44	Passeriformes	Corvidae	House Crow	*Corvus splendens*	Resident	LC
45	Passeriformes	Corvidae	Indian Jungle Crow	*Corvus culminatus*	Resident	LC
46	Passeriformes	Dicruridae	Ashy Drongo	*Dicrurus leucophaeus*	Resident	LC
47	Passeriformes	Dicruridae	Black Drongo	*Dicrurus macrocercus*	Resident	LC
48	Passeriformes	Emberizidae	Black-headed Bunting	*Emberiza melanocephala*	Winter Migrant	LC
49	Passeriformes	Emberizidae	Red-headed Bunting	*Emberiza bruniceps*	Winter Migrant	LC
50	Passeriformes	Estrildidae	Red Avadavat	*Amandava amandava*	Resident	LC
51	Passeriformes	Estrildidae	Scaly-breasted Munia	*Lonchura punctulata*	Resident	LC
52	Passeriformes	Estrildidae	Tricoloured Munia	*Lonchura malacca*	Resident	LC
53	Passeriformes	Hirundinidae	Barn Swallow	*Hirundo rustica*	Winter Migrant	LC
54	Passeriformes	Hirundinidae	Red-rumped Swallow	*Cecropis daurica*	Resident	LC
55	Passeriformes	Hirundinidae	Wire-tailed Swallow	*Hirundo smithii*	Resident	LC
56	Passeriformes	Hirundinidae	Streak-throated Swallow	*Petrochelidon fluvicola*	Resident	LC
57	Passeriformes	Laniidae	Bay-backed Shrike	*Lanius vittatus*	Resident	LC
58	Passeriformes	Laniidae	Brown Shrike	*Lanius cristatus*	Winter Migrant	LC
59	Passeriformes	Laniidae	Long-tailed Shrike	*Lanius schach*	Resident	LC
60	Passeriformes	Laniidae	Southern Grey Shrike	*Lanius meridionalis*	Winter Migrant	LC
61	Passeriformes	Leiothrichidae	Jungle Babbler	*Argya striata*	Resident	LC
62	Passeriformes	Leiothrichidae	Large Grey Babbler	*Argya malcolmi*	Resident	LC
63	Passeriformes	Leiothrichidae	Tawny-bellied Babbler	*Dumetia hyperythra*	Resident	LC

64	Passeriformes	Leiothrichidae	Yellow-billed Babbler	*Argya affinis*	Resident	LC
65	Passeriformes	Leiothrichidae	Yellow-eyed Babbler	*Chrysomma sinense*	Resident	LC
66	Passeriformes	Motacillidae	Paddyfield Pipit	*Anthus rufulus*	Resident	LC
67	Passeriformes	Motacillidae	White Wagtail	*Motacilla alba*	Winter Migrant	LC
68	Passeriformes	Motacillidae	White-browed Wagtail	*Motacilla maderaspatensis*	Resident	LC
69	Passeriformes	Motacillidae	White-browed Pipit	*Anthus godlewskii*	Winter Migrant	LC
70	Passeriformes	Muscicapidae	Asian Brown Flycatcher	*Muscicapa dauurica*	Winter Migrant	LC
71	Passeriformes	Muscicapidae	Indian Robin	*Copsychus fulicatus*	Resident	LC
72	Passeriformes	Muscicapidae	Oriental Magpie-robin	*Copsychus saularis*	Resident	LC
73	Passeriformes	Muscicapidae	Pied Bushchat	*Saxicola caprata*	Resident	LC
74	Passeriformes	Muscicapidae	Common Stonechat	*Saxicola maurus*	Winter Migrant	LC
75	Passeriformes	Muscicapidae	Red-breasted Flycatcher	*Ficedula parva*	Winter Migrant	LC
76	Passeriformes	Muscicapidae	Indian Paradise Flycatcher	*Terpsiphone paradisi*	Resident	LC
77	Passeriformes	Nectariniidae	Purple Sunbird	*Cinnyris asiaticus*	Resident	LC
78	Passeriformes	Nectariniidae	Purple-rumped Sunbird	*Leptocoma zeylonica*	Resident	LC
79	Passeriformes	Nectariniidae	Pale-billed Flowerpecker	*Dicaeum erythrorhynchos*	Resident	LC
80	Passeriformes	Nectariniidae	Thick-billed Flowerpecker	*Dicaeum agile*	Resident	LC
81	Passeriformes	Passeridae	House Sparrow	*Passer domesticus*	Resident	LC
82	Passeriformes	Passeridae	Indian Silverbill	*Euodice malabarica*	Resident	LC
83	Passeriformes	Ploceidae	Baya Weaver	*Ploceus philippinus*	Resident	LC
84	Passeriformes	Pycnonotidae	Red-vented Bulbul	*Pycnonotus cafer*	Resident	LC
85	Passeriformes	Pycnonotidae	White-browed Bulbul	*Pycnonotus luteolus*	Resident	LC
86	Passeriformes	Rhipiduridae	White-spotted Fantail	*Rhipidura albogularis*	Resident	LC
87	Passeriformes	Sturnidae	Brahminy Starling	*Sturnia pagodarum*	Resident	LC
88	Passeriformes	Sturnidae	Common Myna	*Acridotheres tristis*	Resident	LC
89	Passeriformes	Sturnidae	Rosy Starling	*Pastor roseus*	Winter Migrant	LC
90	Passeriformes	Sturnidae	Southern Hill Myna	*Gracula indica*	Resident	LC
91	Pelecaniformes	Ardeidae	Cattle Egret	*Bubulcus ibis*	Resident	LC
92	Pelecaniformes	Ardeidae	Grey Heron	*Ardea cinerea*	Resident	LC
93	Pelecaniformes	Ardeidae	Indian Pond Heron	*Ardeola grayii*	Resident	LC
94	Pelecaniformes	Ardeidae	Little Egret	*Egretta garzetta*	Resident	LC
95	Pelecaniformes	Threskiornithidae	Red-naped Ibis	*Pseudibis papillosa*	Resident	LC
96	Piciformes	Megalaimidae	Coppersmith Barbet	*Psilopogon haemacephalus*	Resident	LC

97	Piciformes	Megalaimidae	Large Green Barbet	*Psilopogon viridis*	Resident	LC
98	Piciformes	Picidae	Black-rumped Flameback	*Dinopium benghalense*	Resident	LC
99	Piciformes	Picidae	Brown-capped Pygmy Woodpecker	*Yungipicus nanus*	Resident	LC
100	Podicipediformes	Podicipedidae	Little Grebe	*Tachybaptus ruficollis*	Resident	LC
101	Psittaciformes	Psittaculidae	Rose-ringed Parakeet	*Psittacula krameri*	Resident	LC
102	Strigiformes	Strigidae	Indian Eagle Owl	*Bubo bengalensis*	Resident	LC
103	Strigiformes	Strigidae	Spotted Owlet	*Athene brama*	Resident	LC
104	Suliformes	Phalacrocoracidae	Little Cormorant	*Microcarbo niger*	Resident	LC
105	Passeriformes	Muscicapidae	Oriental Blue Flycatcher	*Cyornis tickelliae*	Resident	LC
106	Passeriformes	Motacillidae	Yellow Wagtail	*Motacilla flava*	Winter Migrant	LC
107	Passeriformes	Hirundinidae	Plain Martin	*Riparia paludicola*	Resident	LC
108	Passeriformes	Leiothrichidae	Rufous-fronted Babbler	*Argya rufifrons*	Resident	LC
109	Passeriformes	Sturnidae	Bank Myna	*Acridotheres ginginianus*	Resident	LC
110	Passeriformes	Alaudidae	Ashy-crowned Finch-lark	*Eremopterix griseus*	Resident	LC
111	Passeriformes	Muscicapidae	Verditer Flycatcher	*Eumyias thalassinus*	Winter Migrant	LC
112	Passeriformes	Nectariniidae	Crimson Sunbird	*Aethopyga siparaja*	Resident	LC
113	Passeriformes	Pycnonotidae	Red-whiskered Bulbul	*Pycnonotus jocosus*	Resident	LC

Annexure-4

Checklist of common reptiles found in and around TIOM area up to 5 Kilometres.

Sl No.	Common name	Scientific name
	Geckos and Lizards	
1	Giant Leaf-toed Gecko	*Hemidactylus giganteous*
2	Rock Gecko	*Pristurus rupestris*
3	Termite Hill Gecko	*Hemidactylus triedrus*
4	Rock Agama	*Psammophilus dorsalis*
5	Common Garden Lizard	*Calotes versicolor*
6	Forest Calotes	*Calotes rouxii*
7	Indian Chameleon	*Chameleo zeylanicus*
8	Spotted Supple Skink	*Lygosoma punctata*
9	Monitor Lizard	*Varanus bengalensis*
	Snakes*	
1	Spectacled Cobra	*Naja naja*
2	Red Sand Boa	*Eryx johnii*
3	Russel's Boa	*Gongylophis conicus*
4	Checkered Keelback	*Xenochrophis piscator*
5	Common Krait	*Bungarus caeruleus*
6	Indian Rock Python	*Python molurus*
7	Common Rat Snake	*Ptyas mucosa*
8	Russell's Viper	*Daboia russelii*
9	Saw-scaled Viper	*Echis carinatus*
10	Common Indian Cat Snake	*Boiga trigonata*
11	Common Wolf Snake	*Lycodon capicunus*
12	Green Vine Snake	*Oxybelis fulgidus*
13	Bronze-backed Tree Snake	*Dendrelaphis tristis*
	Tortoise and Turtles	
1	Indian Flapshell Turtle	*Lissemys punctata*
2	Indian black turtle	*Melanochelys trijuga*
3	Starred Tortoise	*Geochelone elegans*

** More number of snakes is there, need to identify.*

Annexure-5: DGPS readings of Conveyor Belt & Service Road :

Annexure- 6A

Conveyor Belt & Service Road

DGPS Readings

Of

Thimmappanagudi Iron Ore Mine,

ML.No.2605

Of

Karnataka State Minerals Corporation Limited

Over an Extent of 19.3044Ha.

(Earlier Applied area of 19.652Ha.)

Karnataka State Minerals Corporation Limited

Thimmappanagudi Iron Ore Mine,ML.NO.2605

Conveyor Belt DGPS Reading of Left Side

Point ID	Latitude (Local)	Longitude (Local)	Northing	Easting
CL-1	15°07'59.64146"	76°31'45.91603"	1673635.036	664338.912
CL-2	15°07'59.15705"	76°31'45.44012"	1673620.05	664324.808
CL-3	15°07'58.67125"	76°31'45.00480"	1673605.029	664311.916
CL-4	15°07'58.18656"	76°31'44.53081"	1673590.034	664297.869
CL-5	15°07'57.70134"	76°31'44.09098"	1673575.03	664284.843
CL-6	15°07'57.24723"	76°31'43.61585"	1673560.975	664270.755
CL-7	15°07'56.76361"	76°31'43.17821"	1673546.021	664257.794
CL-8	15°07'56.27907"	76°31'42.70692"	1673531.031	664243.828
CL-9	15°07'55.79696"	76°31'42.26705"	1673516.123	664230.799
CL-10	15°07'55.34159"	76°31'41.82946"	1673502.037	664217.833
CL-11	15°07'54.85875"	76°31'41.35866"	1673487.1	664203.881
CL-12	15°07'54.37180"	76°31'40.92058"	1673472.043	664190.906
CL-13	15°07'53.88806"	76°31'40.44676"	1673457.078	664176.865
CL-14	15°07'53.40287"	76°31'40.00847"	1673442.075	664163.883
CL-15	15°07'52.91963"	76°31'39.53700"	1673427.125	664149.912
CL-16	15°07'52.43379"	76°31'39.09954"	1673412.103	664136.956
CL-17	15°07'51.94508"	76°31'38.69449"	1673396.999	664124.968
CL-18	15°07'51.42969"	76°31'38.28636"	1673381.075	664112.894
CL-19	15°07'50.87996"	76°31'37.94931"	1673364.11	664102.949
CL-20	15°07'50.29791"	76°31'37.57646"	1673346.144	664091.942
CL-21	15°07'49.71297"	76°31'37.30371"	1673328.11	664083.925
CL-22	15°07'49.12968"	76°31'36.99799"	1673310.12	664074.922
CL-23	15°07'48.53676"	76°31'36.72119"	1673291.84	664066.786
CL-24	15°07'47.92059"	76°31'36.55186"	1673272.868	664061.862
CL-25	15°07'47.30214"	76°31'36.34754"	1673253.819	664055.894
CL-26	15°07'46.65270"	76°31'36.16939"	1673233.822	664050.715
CL-27	15°07'46.03427"	76°31'36.06232"	1673214.794	664047.65
CL-28	15°07'45.38485"	76°31'35.96107"	1673194.814	664044.766
CL-29	15°07'44.73855"	76°31'35.88718"	1673174.936	664042.699
CL-30	15°07'44.08432"	76°31'35.85317"	1673154.822	664041.823
CL-31	15°07'43.43403"	76°31'35.78140"	1673134.821	664039.82
CL-32	15°07'42.78360"	76°31'35.74536"	1673114.824	664038.883
CL-33	15°07'42.16551"	76°31'35.67152"	1673095.813	664036.81
CL-34	15°07'41.51531"	76°31'35.63526"	1673075.822	664035.867
CL-35	15°07'40.86641"	76°31'35.56587"	1673055.865	664033.934
CL-36	15°07'40.21601"	76°31'35.52720"	1673035.868	664032.918
CL-37	15°07'39.56610"	76°31'35.48987"	1673015.887	664031.943
CL-38	15°07'38.91507"	76°31'35.41910"	1672995.864	664029.969
CL-39	15°07'38.26487"	76°31'35.38096"	1672975.873	664028.969
CL-40	15°07'37.61533"	76°31'35.31088"	1672955.896	664027.016
CL-41	15°07'36.96404"	76°31'35.26801"	1672935.871	664025.875
CL-42	15°07'36.34762"	76°31'35.19538"	1672916.911	664023.839
CL-43	15°07'35.69784"	76°31'35.15692"	1672896.933	664022.829
CL-44	15°07'35.05709"	76°31'35.12336"	1672877.234	664021.965
CL-45	15°07'34.41018"	76°31'35.05151"	1672857.337	664019.958

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CL-46	15°07'33.74267"	76°31'35.00984"	1672836.814	664018.856
CL-47	15°07'33.09334"	76°31'34.93951"	1672816.843	664016.895
CL-48	15°07'32.44265"	76°31'34.90210"	1672796.838	664015.918
CL-49	15°07'31.79286"	76°31'34.82847"	1672776.852	664013.858
CL-50	15°07'31.17638"	76°31'34.79545"	1672757.899	664013.004
CL-51	15°07'30.52550"	76°31'34.75358"	1672737.887	664011.893
CL-52	15°07'29.87681"	76°31'34.68204"	1672717.935	664009.896
CL-53	15°07'29.22558"	76°31'34.64431"	1672697.913	664008.909
CL-54	15°07'28.57442"	76°31'34.57169"	1672677.886	664006.88
CL-55	15°07'27.92565"	76°31'34.53327"	1672657.939	664005.871
CL-56	15°07'27.27259"	76°31'34.49506"	1672637.86	664004.87
CL-57	15°07'26.62370"	76°31'34.42506"	1672617.903	664002.919
CL-58	15°07'26.00510"	76°31'34.38720"	1672598.884	664001.921
CL-59	15°07'25.35633"	76°31'34.31585"	1672578.93	663999.929
CL-60	15°07'24.70430"	76°31'34.27660"	1672558.883	663998.896
CL-61	15°07'24.05680"	76°31'34.20614"	1672538.969	663996.931
CL-62	15°07'23.40575"	76°31'34.16553"	1672518.951	663995.858
CL-63	15°07'22.75518"	76°31'34.12926"	1672498.95	663994.914
CL-64	15°07'22.10409"	76°31'34.05831"	1672478.925	663992.935
CL-65	15°07'21.45386"	76°31'34.02011"	1672458.933	663991.933
CL-66	15°07'20.83741"	76°31'33.94730"	1672439.973	663989.891
CL-67	15°07'20.18783"	76°31'33.91061"	1672420.001	663988.935
CL-68	15°07'19.53521"	76°31'33.83841"	1672399.929	663986.918
CL-69	15°07'18.88619"	76°31'33.80071"	1672379.975	663985.932
CL-70	15°07'18.23397"	76°31'33.76198"	1672359.922	663984.915
CL-71	15°07'17.58592"	76°31'33.68802"	1672339.99	663982.845
CL-72	15°07'16.93695"	76°31'33.61752"	1672320.03	663980.879
CL-73	15°07'16.31980"	76°31'33.47877"	1672301.035	663976.868
CL-74	15°07'15.66722"	76°31'33.37490"	1672280.957	663973.906
CL-75	15°07'15.05112"	76°31'33.20428"	1672261.987	663968.944
CL-76	15°07'14.40345"	76°31'32.99876"	1672242.039	663962.946
CL-77	15°07'13.78435"	76°31'32.76059"	1672222.963	663955.968
CL-78	15°07'13.20145"	76°31'32.48851"	1672204.992	663947.969
CL-79	15°07'12.58627"	76°31'32.18312"	1672186.022	663938.983
CL-80	15°07'12.00118"	76°31'31.84520"	1672167.97	663929.019
CL-81	15°07'11.38547"	76°31'31.53800"	1672148.984	663919.979
CL-82	15°07'10.80358"	76°31'31.19931"	1672131.03	663909.991
CL-83	15°07'10.21990"	76°31'30.89184"	1672113.028	663900.936
CL-84	15°07'09.60300"	76°31'30.55270"	1672093.998	663890.942
CL-85	15°07'09.02148"	76°31'30.24392"	1672076.062	663881.848
CL-86	15°07'08.43835"	76°31'29.90808"	1672058.071	663871.945
CL-87	15°07'07.82066"	76°31'29.60208"	1672039.024	663862.941
CL-88	15°07'07.23831"	76°31'29.26353"	1672021.056	663852.958
CL-89	15°07'06.65383"	76°31'28.95797"	1672003.03	663843.96
CL-90	15°07'06.03732"	76°31'28.61858"	1671984.013	663833.958
CL-91	15°07'05.45646"	76°31'28.31228"	1671966.097	663824.938
CL-92	15°07'04.87086"	76°31'28.00776"	1671948.037	663815.971
CL-93	15°07'04.25625"	76°31'27.67074"	1671929.078	663806.04
CL-94	15°07'03.67111"	76°31'27.36406"	1671911.031	663797.009
CL-95	15°07'03.05493"	76°31'27.02463"	1671892.024	663787.006

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CL-96	15°07'02.47056"	76°31'26.71734"	1671874.001	663777.956
CL-97	15°07'01.88697"	76°31'26.37933"	1671855.995	663767.989
CL-98	15°07'01.30643"	76°31'26.04273"	1671838.083	663758.063
CL-99	15°07'00.75510"	76°31'25.66705"	1671821.061	663746.964
CL-100	15°07'00.20537"	76°31'25.32841"	1671804.096	663736.971
CL-101	15°06'59.68641"	76°31'24.92645"	1671788.064	663725.081
CL-102	15°06'59.20079"	76°31'24.51888"	1671773.055	663713.016
CL-103	15°06'58.68704"	76°31'24.04671"	1671757.168	663699.028
CL-104	15°06'58.19748"	76°31'23.60606"	1671742.031	663685.976
CL-105	15°06'57.78104"	76°31'23.10402"	1671729.128	663671.076
CL-106	15°06'57.32994"	76°31'22.59724"	1671715.16	663656.041
CL-107	15°06'56.91108"	76°31'22.09047"	1671702.182	663641.001
CL-108	15°06'56.52046"	76°31'21.55378"	1671690.066	663625.06
CL-109	15°06'56.13489"	76°31'21.01486"	1671678.104	663609.052
CL-110	15°06'55.81149"	76°31'20.44321"	1671668.047	663592.054
CL-111	15°06'55.49142"	76°31'19.83883"	1671658.085	663574.078
CL-112	15°06'55.17240"	76°31'19.26852"	1671648.163	663557.118
CL-113	15°06'54.88008"	76°31'18.66123"	1671639.053	663539.049
CL-114	15°06'54.62463"	76°31'18.05669"	1671631.077	663521.054
CL-115	15°06'54.40073"	76°31'17.42061"	1671624.065	663502.11
CL-116	15°06'54.17969"	76°31'16.78241"	1671617.139	663483.103
CL-117	15°06'53.98602"	76°31'16.11172"	1671611.049	663463.12
CL-118	15°06'53.82589"	76°31'15.47086"	1671605.995	663444.021
CL-119	15°06'53.70352"	76°31'14.83753"	1671602.103	663425.138
CL-120	15°06'53.60885"	76°31'14.16487"	1671599.055	663405.075
CL-121	15°06'53.51701"	76°31'13.49530"	1671596.094	663385.103
CL-122	15°06'53.48748"	76°31'12.82459"	1671595.047	663365.085
CL-123	15°06'53.45403"	76°31'12.15353"	1671593.881	663345.056
CL-124	15°06'53.42427"	76°31'11.48631"	1671592.828	663325.142
CL-125	15°06'53.43182"	76°31'10.81296"	1671592.921	663305.037
CL-126	15°06'53.40155"	76°31'10.14501"	1671591.853	663285.101
CL-127	15°06'53.40683"	76°31'09.47650"	1671591.877	663265.14
CL-128	15°06'53.37993"	76°31'08.80288"	1671590.912	663245.034
CL-129	15°06'53.38451"	76°31'08.13486"	1671590.914	663225.088
CL-130	15°06'53.35606"	76°31'07.46250"	1671589.901	663205.02
CL-131	15°06'53.36041"	76°31'06.79830"	1671589.898	663185.189
CL-132	15°06'53.33181"	76°31'06.12619"	1671588.88	663165.128
CL-133	15°06'53.33851"	76°31'05.45548"	1671588.948	663145.102
CL-134	15°06'53.31304"	76°31'04.78648"	1671588.027	663125.133
CL-135	15°06'53.31640"	76°31'04.11897"	1671587.992	663105.203
CL-136	15°06'53.28749"	76°31'03.44592"	1671586.965	663085.115
CL-137	15°06'53.29331"	76°31'02.77657"	1671587.006	663065.129
CL-138	15°06'53.26605"	76°31'02.10741"	1671586.03	663045.156
CL-139	15°06'53.26936"	76°31'01.43742"	1671585.994	663025.152
CL-140	15°06'53.24162"	76°31'00.77007"	1671585.003	663005.233
CL-141	15°06'53.25012"	76°31'00.10065"	1671585.127	662985.245
CL-142	15°06'53.22248"	76°30'59.43050"	1671584.139	662965.243
CL-143	15°06'53.22503"	76°30'58.76223"	1671584.08	662945.29
CL-144	15°06'53.19854"	76°30'58.09032"	1671583.127	662925.235
CL-145	15°06'53.23639'	76°30'57.42231"	1671584.153	662905.283

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Corporation Limited

CL-146	15°06'53.34067"	76°30'56.75465"	1671587.22	662885.327
CL-147	15°06'53.41038"	76°30'56.11818"	1671589.232	662866.31
CL-148	15°06'53.57634"	76°30'55.44745"	1671594.194	662846.249
CL-149	15°06'53.77790"	76°30'54.81288"	1671600.257	662827.26
CL-150	15°06'54.00942"	76°30'54.17977"	1671607.243	662808.309
CL-151	15°06'54.27339"	76°30'53.57751"	1671615.231	662790.272
CL-152	15°06'54.50688"	76°30'52.94493"	1671622.277	662771.336
CL-153	15°06'54.74034"	76°30'52.31038"	1671629.321	662752.341
CL-154	15°06'54.97128"	76°30'51.70775"	1671636.295	662734.3
CL-155	15°06'55.23698"	76°30'51.07604"	1671644.33	662715.383
CL-156	15°06'55.46934"	76°30'50.43895"	1671651.34	662696.313
CL-157	15°06'55.69568"	76°30'49.83476"	1671658.172	662678.226
CL-158	15°06'55.93154"	76°30'49.20550"	1671665.291	662659.389
CL-159	15°06'56.16602"	76°30'48.60461"	1671672.374	662641.399
CL-160	15°06'56.42741"	76°30'47.96691"	1671680.276	662622.304
CL-161	15°06'56.66108"	76°30'47.33517"	1671687.328	662603.394
CL-162	15°06'56.89447"	76°30'46.73522"	1671694.377	662585.432
CL-163	15°06'57.12697"	76°30'46.09872"	1671701.392	662566.379
CL-164	15°06'57.39043"	76°30'45.46451"	1671709.358	662547.389
CL-165	15°06'57.62322"	76°30'44.86427"	1671716.389	662529.418
CL-166	15°06'57.85537"	76°30'44.22759"	1671723.393	662510.361
CL-167	15°06'58.08958"	76°30'43.59386"	1671730.461	662491.39
CL-168	15°06'58.35276"	76°30'42.99334"	1671738.426	662473.405
CL-169	15°06'58.58354"	76°30'42.35990"	1671745.388	662454.445
CL-170	15°06'58.81618"	76°30'41.72543"	1671752.407	662435.453
CL-171	15°06'59.04998"	76°30'41.12310"	1671759.469	662417.42
CL-172	15°06'59.31245"	76°30'40.48837"	1671767.405	662398.414
CL-173	15°06'59.54456"	76°30'39.88967"	1671774.416	662380.49
CL-174	15°06'59.77891"	76°30'39.25218"	1671781.487	662361.408
CL-175	15°07'00.01121"	76°30'38.62061"	1671788.497	662342.502
CL-176	15°07'00.27535"	76°30'38.01793"	1671796.491	662324.453
CL-177	15°07'00.50678"	76°30'37.38414"	1671803.473	662305.482
CL-178	15°07'00.74048"	76°30'36.75013"	1671810.525	662286.504
CL-179	15°07'00.97285"	76°30'36.14930"	1671817.544	662268.516
CL-180	15°07'01.23442"	76°30'35.51352"	1671825.452	662249.479
CL-181	15°07'01.47630"	76°30'34.82599"	1671832.744	662228.901
CL-182	15°07'01.66367"	76°30'34.31131"	1671838.397	662213.495
CL-183	15°07'01.93391"	76°30'33.64328"	1671846.565	662193.494
CL-184	15°07'02.19507"	76°30'33.00997"	1671854.462	662174.53
CL-185	15°07'02.42843"	76°30'32.40847"	1671861.51	662156.523
CL-186	15°07'02.66922"	76°30'31.77483"	1671868.596	662137.555
CL-187	15°07'02.89508"	76°30'31.17448"	1671875.599	662119.583
CL-188	15°07'03.16045"	76°30'30.53932"	1671883.624	662100.563
CL-189	15°07'03.39255"	76°30'29.90427"	1671890.627	662081.555

GENERAL MANAGER (LEE)
Karnataka [illegible] Corporation Limited
[illegible]-560 027

Karnataka State Minerals Corporation Limited

Thimmappanagudi Iron Ore Mine,ML.NO.2605

Conveyor Belt DGPS Reading of Right Side

Point ID	Latitude (Local)	Longitude (Local)	Northing	Easting
CR-1	15°07'59.47200"	76°31'46.64226"	1673629.979	664360.629
CR-2	15°07'58.99050"	76°31'46.21461"	1673615.092	664347.965
CR-3	15°07'58.50392"	76°31'45.74824"	1673600.041	664334.147
CR-4	15°07'58.01851"	76°31'45.29252"	1673585.028	664320.645
CR-5	15°07'57.53374"	76°31'44.85828"	1673570.039	664307.785
CR-6	15°07'57.07986"	76°31'44.38513"	1673555.991	664293.757
CR-7	15°07'56.59621"	76°31'43.94154"	1673541.035	664280.618
CR-8	15°07'56.11228"	76°31'43.47898"	1673526.066	664266.912
CR-9	15°07'55.62537"	76°31'43.03662"	1673511.009	664253.810
CR-10	15°07'55.15026"	76°31'42.58442"	1673496.314	664240.412
CR-11	15°07'54.65591"	76°31'42.13072"	1673481.026	664226.973
CR-12	15°07'54.20698"	76°31'41.68807"	1673467.137	664213.854
CR-13	15°07'53.72356"	76°31'41.21655"	1673452.182	664199.881
CR-14	15°07'53.23685"	76°31'40.77871"	1673437.133	664186.914
CR-15	15°07'52.78408"	76°31'40.30489"	1673423.119	664172.865
CR-16	15°07'52.29709"	76°31'39.86607"	1673408.061	664159.869
CR-17	15°07'51.78167"	76°31'39.42613"	1673392.129	664146.845
CR-18	15°07'51.25395"	76°31'39.02838"	1673375.828	664135.084
CR-19	15°07'50.74399"	76°31'38.61644"	1673360.070	664122.895
CR-20	15°07'50.19354"	76°31'38.27663"	1673343.082	664112.868
CR-21	15°07'49.61019"	76°31'37.97258"	1673325.090	664103.915
CR-22	15°07'49.02620"	76°31'37.70016"	1673307.086	664095.907
CR-23	15°07'48.44373"	76°31'37.42898"	1673289.128	664087.936
CR-24	15°07'47.81794"	76°31'37.21964"	1673269.852	664081.820
CR-25	15°07'47.19988"	76°31'37.01457"	1673250.815	664075.830
CR-26	15°07'46.55191"	76°31'36.84411"	1673230.865	664070.879
CR-27	15°07'45.90143"	76°31'36.73770"	1673210.851	664067.842
CR-28	15°07'45.25173"	76°31'36.63233"	1673190.862	664064.835
CR-29	15°07'44.56907"	76°31'36.56006"	1673169.867	664062.823
CR-30	15°07'43.91852"	76°31'36.48754"	1673149.858	664060.797
CR-31	15°07'43.26797"	76°31'36.45041"	1673129.857	664059.828
CR-32	15°07'42.61721"	76°31'36.37894"	1673109.842	664057.833
CR-33	15°07'41.96760"	76°31'36.34130"	1673089.869	664056.849
CR-34	15°07'41.31813"	76°31'36.26893"	1673069.894	664054.827
CR-35	15°07'40.66780"	76°31'36.23117"	1673049.899	664053.838
CR-36	15°07'40.01725"	76°31'36.19498"	1673029.898	664052.897
CR-37	15°07'39.36783"	76°31'36.12357"	1673009.925	664050.904
CR-38	15°07'38.74928"	76°31'36.08644"	1672990.907	664049.928
CR-39	15°07'38.09977"	76°31'36.01591"	1672970.931	664047.961
CR-40	15°07'37.44855"	76°31'35.97503"	1672950.908	664046.880
CR-41	15°07'36.79800"	76°31'35.93566"	1672930.907	664045.843
CR-42	15°07'36.14753"	76°31'35.86377"	1672910.900	664043.836
CR-43	15°07'35.49683"	76°31'35.82541"	1672890.894	664042.830
CR-44	15°07'34.84649"	76°31'35.75458"	1672870.893	664040.855
CR-45	15°07'34.19579"	76°31'35.71452"	1672850.886	664039.797

GENERAL MANAGER (LEE)

CR-46	15°07'33.54540"	76°31'35.64407"	1672830.883	664037.833
CR-47	15°07'32.89414"	76°31'35.60565"	1672810.860	664036.825
CR-48	15°07'32.24439"	76°31'35.56624"	1672790.882	664035.788
CR-49	15°07'31.59467"	76°31'35.49698"	1672770.900	664033.859
CR-50	15°07'30.94439"	76°31'35.45726"	1672750.906	664032.812
CR-51	15°07'30.29379"	76°31'35.38717"	1672730.897	664030.858
CR-52	15°07'29.64386"	76°31'35.35041"	1672710.915	664029.900
CR-53	15°07'28.99094"	76°31'35.27750"	1672690.833	664027.863
CR-54	15°07'28.35455"	76°31'35.23075"	1672671.265	664026.603
CR-55	15°07'27.70435"	76°31'35.19172"	1672651.274	664025.577
CR-56	15°07'27.05528"	76°31'35.11967"	1672631.311	664023.564
CR-57	15°07'26.39234"	76°31'35.09133"	1672610.931	664022.860
CR-58	15°07'25.77427"	76°31'35.01984"	1672591.921	664020.857
CR-59	15°07'25.12430"	76°31'34.98256"	1672571.938	664019.883
CR-60	15°07'24.47293"	76°31'34.91149"	1672551.904	664017.901
CR-61	15°07'23.82407"	76°31'34.87299"	1672531.954	664016.890
CR-62	15°07'23.17346"	76°31'34.83479"	1672511.951	664015.888
CR-63	15°07'22.52285"	76°31'34.76280"	1672491.941	664013.878
CR-64	15°07'21.87249"	76°31'34.72505"	1672471.945	664012.890
CR-65	15°07'21.22227"	76°31'34.65310"	1672451.947	664010.881
CR-66	15°07'20.57167"	76°31'34.61520"	1672431.944	664009.888
CR-67	15°07'19.92148"	76°31'34.54443"	1672411.947	664007.914
CR-68	15°07'19.27204"	76°31'34.50509"	1672391.979	664006.879
CR-69	15°07'18.62072"	76°31'34.43322"	1672371.947	664004.872
CR-70	15°07'17.97070"	76°31'34.39547"	1672351.962	664003.884
CR-71	15°07'17.32038"	76°31'34.35782"	1672331.968	664002.899
CR-72	15°07'16.67041"	76°31'34.25221"	1672311.970	663999.885
CR-73	15°07'16.05384"	76°31'34.11433"	1672292.992	663995.900
CR-74	15°07'15.40898"	76°31'34.00896"	1672273.152	663992.892
CR-75	15°07'14.78848"	76°31'33.80556"	1672254.040	663986.952
CR-76	15°07'14.16769"	76°31'33.63275"	1672234.925	663981.925
CR-77	15°07'13.55596"	76°31'33.36046"	1672216.068	663973.926
CR-78	15°07'12.97072"	76°31'33.08868"	1672198.025	663965.937
CR-79	15°07'12.35486"	76°31'32.81606"	1672179.042	663957.929
CR-80	15°07'11.80341"	76°31'32.51218"	1672162.030	663948.974
CR-81	15°07'11.22029"	76°31'32.17239"	1672144.039	663938.954
CR-82	15°07'10.63689"	76°31'31.86792"	1672126.046	663929.989
CR-83	15°07'10.05281"	76°31'31.56042"	1672108.031	663920.933
CR-84	15°07'09.50075"	76°31'31.25754"	1672091.002	663912.008
CR-85	15°07'08.91766"	76°31'30.94983"	1672073.018	663902.945
CR-86	15°07'08.33444"	76°31'30.61339"	1672055.024	663893.025
CR-87	15°07'07.75111"	76°31'30.30429"	1672037.032	663883.921
CR-88	15°07'07.16499"	76°31'29.99987"	1672018.956	663874.958
CR-89	15°07'06.61631"	76°31'29.69741"	1672002.030	663866.044
CR-90	15°07'06.03197"	76°31'29.39046"	1671984.008	663857.005
CR-91	15°07'05.44841"	76°31'29.08308"	1671966.010	663847.952
CR-92	15°07'04.85886"	76°31'28.74863"	1671947.822	663838.093
CR-93	15°07'04.31497"	76°31'28.43764"	1671931.042	663828.924
CR-94	15°07'03.73338"	76°31'28.13349"	1671913.104	663819.967
CR-95	15°07'03.14829"	76°31'27.82838"	1671895.060	663810.983

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CR-96	15°07'02.56096"	76°31'27.52738"	1671876.947	663802.121
CR-97	15°07'02.01364"	76°31'27.21740"	1671860.062	663792.983
CR-98	15°07'01.42997"	76°31'26.87997"	1671842.053	663783.033
CR-99	15°07'00.88002"	76°31'26.54062"	1671825.082	663773.019
CR-100	15°07'00.33040"	76°31'26.20039"	1671808.119	663762.978
CR-101	15°06'59.77865"	76°31'25.82924"	1671791.086	663752.015
CR-102	15°06'59.26076"	76°31'25.42488"	1671775.085	663740.053
CR-103	15°06'58.74195"	76°31'25.01751"	1671759.056	663728.001
CR-104	15°06'58.25667"	76°31'24.54544"	1671744.044	663714.010
CR-105	15°06'57.77402"	76°31'24.10549"	1671729.120	663700.978
CR-106	15°06'57.32092"	76°31'23.60097"	1671715.090	663686.011
CR-107	15°06'56.90302"	76°31'23.09399"	1671702.142	663670.964
CR-108	15°06'56.48088"	76°31'22.62516"	1671689.071	663657.056
CR-109	15°06'56.06147"	76°31'22.08622"	1671676.070	663641.055
CR-110	15°06'55.70828"	76°31'21.54892"	1671665.104	663625.088
CR-111	15°06'55.34273"	76°31'20.97637"	1671653.751	663608.072
CR-112	15°06'55.03306"	76°31'20.37251"	1671644.109	663590.109
CR-113	15°06'54.71038"	76°31'19.80103"	1671634.073	663573.115
CR-114	15°06'54.39095"	76°31'19.19409"	1671624.131	663555.062
CR-115	15°06'54.13405"	76°31'18.59215"	1671616.111	663537.145
CR-116	15°06'53.87923"	76°31'17.95276"	1671608.147	663518.110
CR-117	15°06'53.65483"	76°31'17.31450"	1671601.119	663499.101
CR-118	15°06'53.46564"	76°31'16.64217"	1671595.165	663479.068
CR-119	15°06'53.30435"	76°31'16.00493"	1671590.077	663460.077
CR-120	15°06'53.14724"	76°31'15.33475"	1671585.109	663440.101
CR-121	15°06'53.02246"	76°31'14.66344"	1671581.136	663420.085
CR-122	15°06'52.92829"	76°31'14.02724"	1671578.110	663401.110
CR-123	15°06'52.86878"	76°31'13.35610"	1671576.143	663381.085
CR-124	15°06'52.84054"	76°31'12.68674"	1671575.136	663361.106
CR-125	15°06'52.80497"	76°31'12.01449"	1671573.904	663341.043
CR-126	15°06'52.77721"	76°31'11.34539"	1671572.913	663321.072
CR-127	15°06'52.78150"	76°31'10.67531"	1671572.907	663301.065
CR-128	15°06'52.75272"	76°31'10.00733"	1671571.884	663281.128
CR-129	15°06'52.75675"	76°31'09.33790"	1671571.870	663261.140
CR-130	15°06'52.73020"	76°31'08.66827"	1671570.915	663241.153
CR-131	15°06'52.73545"	76°31'07.99596"	1671570.938	663221.079
CR-132	15°06'52.70803"	76°31'07.32835"	1671569.958	663201.153
CR-133	15°06'52.71391"	76°31'06.65599"	1671569.999	663181.077
CR-134	15°06'52.68396"	76°31'05.98802"	1671568.941	663161.141
CR-135	15°06'52.69074"	76°31'05.31884"	1671569.011	663141.160
CR-136	15°06'52.66324"	76°31'04.64606"	1671568.027	663121.079
CR-137	15°06'52.66736"	76°31'03.97950"	1671568.016	663101.177
CR-138	15°06'52.63939"	76°31'03.30701"	1671567.018	663081.105
CR-139	15°06'52.64414"	76°31'02.64054"	1671567.027	663061.206
CR-140	15°06'52.61546"	76°31'01.96682"	1671566.006	663041.097
CR-141	15°06'52.61978"	76°31'01.30088"	1671566.002	663021.213
CR-142	15°06'52.59671"	76°31'00.63132"	1671565.155	663001.228
CR-143	15°06'52.60123"	76°30'59.96269"	1671565.156	662981.264
CR-144	15°06'52.57333"	76°30'59.29424"	1671564.161	662961.313
CR-145	15°06'52.57721"	76°30'58.62194"	1671564.141	662941.239

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CR-146	15°06'52.54996"	76°30'57.95472"	1671563.166	662921.324
CR-147	15°06'52.58687"	76°30'57.28342"	1671564.162	662901.274
CR-148	15°06'52.69171"	76°30'56.61255"	1671567.246	662881.222
CR-149	15°06'52.78280"	76°30'55.94119"	1671569.908	662861.158
CR-150	15°06'52.96073"	76°30'55.30953"	1671575.246	662842.261
CR-151	15°06'53.16078"	76°30'54.67653"	1671581.264	662823.320
CR-152	15°06'53.36098"	76°30'54.03958"	1671587.285	662804.261
CR-153	15°06'53.62495"	76°30'53.44223"	1671595.275	662786.370
CR-154	15°06'53.85564"	76°30'52.80327"	1671602.233	662767.244
CR-155	15°06'54.09196"	76°30'52.17334"	1671609.366	662748.387
CR-156	15°06'54.32206"	76°30'51.53639"	1671616.307	662729.321
CR-157	15°06'54.58588"	76°30'50.93650"	1671624.291	662711.355
CR-158	15°06'54.81926"	76°30'50.29877"	1671631.333	662692.265
CR-159	15°06'55.05147"	76°30'49.66560"	1671638.339	662673.312
CR-160	15°06'55.31438"	76°30'49.06388"	1671646.295	662655.291
CR-161	15°06'55.54485"	76°30'48.42672"	1671653.247	662636.219
CR-162	15°06'55.77993"	76°30'47.79721"	1671660.342	662617.375
CR-163	15°06'56.01550"	76°30'47.16513"	1671667.452	662598.453
CR-164	15°06'56.27827"	76°30'46.56027"	1671675.404	662580.339
CR-165	15°06'56.51115"	76°30'45.92892"	1671682.431	662561.440
CR-166	15°06'56.74139"	76°30'45.29431"	1671689.376	662542.444
CR-167	15°06'56.97433"	76°30'44.65679"	1671696.404	662523.361
CR-168	15°06'57.23865"	76°30'44.05585"	1671704.404	662505.363
CR-169	15°06'57.47251"	76°30'43.42047"	1671711.461	662486.344
CR-170	15°06'57.70542"	76°30'42.78756"	1671718.489	662467.399
CR-171	15°06'57.96854"	76°30'42.18497"	1671726.451	662449.352
CR-172	15°06'58.20138"	76°30'41.55125"	1671733.477	662430.383
CR-173	15°06'58.43289"	76°30'40.91829"	1671740.462	662411.436
CR-174	15°06'58.66581"	76°30'40.28284"	1671747.490	662392.415
CR-175	15°06'58.92673"	76°30'39.68720"	1671755.386	662374.576
CR-176	15°06'59.16252"	76°30'39.05090"	1671762.502	662355.529
CR-177	15°06'59.39337"	76°30'38.44822"	1671769.473	662337.486
CR-178	15°06'59.62590"	76°30'37.81138"	1671776.489	662318.424
CR-179	15°06'59.89046"	76°30'37.17799"	1671784.490	662299.457
CR-180	15°07'00.12497"	76°30'36.57823"	1671791.574	662281.501
CR-181	15°07'00.35606"	76°30'35.94179"	1671798.545	662262.451
CR-182	15°07'00.58794"	76°30'35.30737"	1671805.541	662243.461
CR-183	15°07'00.85041"	76°30'34.70189"	1671813.483	662225.328
CR-184	15°07'01.08327"	76°30'34.06895"	1671820.510	662206.382
CR-185	15°07'01.31555"	76°30'33.43694"	1671827.519	662187.464
CR-186	15°07'01.54786"	76°30'32.83747"	1671834.536	662169.517
CR-187	15°07'01.81485"	76°30'32.20369"	1671842.611	662150.539
CR-188	15°07'02.04572"	76°30'31.56948"	1671849.577	662131.555
CR-189	15°07'02.27744"	76°30'30.96708"	1671856.574	662113.521
CR-190	15°07'02.51170"	76°30'30.33355"	1671863.644	662094.557
CR-191	15°07'02.77751"	76°30'29.73197"	1671871.690	662076.540

Karnataka State Minerals Corporation Limited

Thimmappanagudi Iron Ore Mine,ML.NO.2605

Service Road DGPS Reading of Left Side

Point ID	Latitude (Local)	Longitude (Local)	Northing	Easting
LR-01	15°07'59.89223"	76°31'44.43544"	1673642.435	664294.657
LR-02	15°07'59.61510"	76°31'45.04302"	1673634.044	664312.855
LR-03	15°07'59.34304"	76°31'45.63875"	1673625.807	664330.698
LR-04	15°07'58.92115"	76°31'45.23491"	1673612.757	664318.732
LR-05	15°07'58.92561"	76°31'44.56367"	1673612.754	664298.692
LR-06	15°07'58.91306"	76°31'43.89834"	1673612.23	664278.832
LR-07	15°07'58.85089"	76°31'43.65029"	1673610.268	664271.44
LR-08	15°07'58.73439"	76°31'43.51102"	1673606.659	664267.307
LR-09	15°07'58.48309"	76°31'43.40236"	1673598.913	664264.117
LR-10	15°07'58.23741"	76°31'43.43495"	1673591.369	664265.143
LR-11	15°07'58.08134"	76°31'43.54520"	1673586.595	664268.468
LR-12	15°07'57.95631"	76°31'43.84528"	1673582.815	664277.453
LR-13	15°07'57.87111"	76°31'44.23507"	1673580.278	664289.108
LR-14	15°07'57.60949"	76°31'44.89856"	1673572.375	664308.972
LR-15	15°07'57.34735"	76°31'45.51449"	1673564.447	664327.416
LR-16	15°07'57.25728"	76°31'45.72495"	1673561.723	664333.718
LR-17	15°07'57.16039"	76°31'45.06230"	1673558.607	664313.956
LR-18	15°07'57.02545"	76°31'44.34313"	1673554.31	664292.515
LR-19	15°07'56.81768"	76°31'43.23327"	1673547.694	664259.426
LR-20	15°07'56.69639"	76°31'42.57505"	1673543.829	664239.801
LR-21	15°07'56.62072"	76°31'42.16140"	1673541.418	664227.469
LR-22	15°07'56.50586"	76°31'41.93518"	1673537.841	664220.74
LR-23	15°07'56.30648"	76°31'41.78822"	1673531.682	664216.395
LR-24	15°07'56.02864"	76°31'41.79650"	1673523.145	664216.702
LR-25	15°07'55.82011"	76°31'42.05952"	1673516.791	664224.599
LR-26	15°07'55.79696"	76°31'42.26705"	1673516.123	664230.799
LR-27	15°07'55.79948"	76°31'43.17598"	1673516.389	664257.934
LR-28	15°07'55.76770"	76°31'43.84522"	1673515.552	664277.92
LR-29	15°07'55.74302"	76°31'44.26952"	1673514.882	664290.592
LR-30	15°07'55.62290"	76°31'43.61047"	1673511.053	664270.943
LR-31	15°07'55.48842"	76°31'42.87914"	1673506.768	664249.138
LR-32	15°07'55.28710"	76°31'41.77706"	1673500.351	664216.28
LR-33	15°07'55.16485"	76°31'41.11911"	1673496.457	664196.664
LR-34	15°07'55.00779"	76°31'40.46648"	1673491.495	664177.214
LR-35	15°07'54.84446"	76°31'39.96991"	1673486.372	664162.424
LR-36	15°07'54.62933"	76°31'39.75920"	1673479.716	664156.179
LR-37	15°07'54.26522"	76°31'39.77452"	1673468.529	664156.715
LR-38	15°07'54.07620"	76°31'40.00130"	1673462.767	664163.525
LR-39	15°07'54.04602"	76°31'40.59654"	1673461.963	664181.302
LR-40	15°07'53.63857"	76°31'40.20281"	1673449.359	664169.635
LR-41	15°07'53.57264"	76°31'39.53382"	1673447.194	664149.677
LR-42	15°07'53.46418"	76°31'39.05904"	1673443.762	664135.526
LR-43	15°07'53.21825"	76°31'38.88071"	1673436.167	664130.255
LR-44	15°07'52.98872"	76°31'38.90132"	1673429.117	664130.919
LR-45	15°07'52.73908"	76°31'39.12258"	1673421.49	664137.578

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Karnataka State Minerals Corporation Limited

LR-46	15°07'52.68829"	76°31'39.32667"	1673419.972	664143.682
LR-47	15°07'51.93802"	76°31'39.54129"	1673396.958	664150.25
LR-48	15°07'51.68076"	76°31'39.61357"	1673389.067	664152.463
LR-49	15°07'51.48281"	76°31'39.89529"	1673383.042	664160.915
LR-50	15°07'51.43411"	76°31'40.14395"	1673381.597	664168.349
LR-51	15°07'51.47901"	76°31'40.81653"	1673383.116	664188.419
LR-52	15°07'51.50601"	76°31'41.48537"	1673384.085	664208.381
LR-53	15°07'51.53416"	76°31'42.15101"	1673385.089	664228.247
LR-54	15°07'51.62808"	76°31'42.94639"	1673388.141	664251.972
LR-55	15°07'51.30308"	76°31'42.35644"	1673378.029	664234.43
LR-56	15°07'50.98475"	76°31'41.77476"	1673368.125	664217.132
LR-57	15°07'50.79298"	76°31'41.29223"	1673362.131	664202.768
LR-58	15°07'50.76185"	76°31'40.62662"	1673361.036	664182.903
LR-59	15°07'50.89721"	76°31'39.97202"	1673365.06	664163.332
LR-60	15°07'51.03361"	76°31'39.31579"	1673369.116	664143.711
LR-61	15°07'50.99701"	76°31'38.90636"	1673367.906	664131.496
LR-62	15°07'50.96877"	76°31'38.78028"	1673367.012	664127.738
LR-63	15°07'47.68999"	76°31'36.47533"	1673265.765	664059.627
LR-64	15°07'47.69549"	76°31'35.80244"	1673265.794	664039.537
LR-65	15°07'47.79921"	76°31'35.14089"	1673268.845	664019.765
LR-66	15°07'47.83409"	76°31'34.78697"	1673269.843	664009.191
LR-67	15°07'47.67244"	76°31'34.46696"	1673264.809	663999.672
LR-68	15°07'47.34755"	76°31'34.37272"	1673254.804	663996.928
LR-69	15°07'47.08779"	76°31'34.48991"	1673246.845	664000.482
LR-70	15°07'46.79257"	76°31'34.99489"	1673237.877	664015.621
LR-71	15°07'46.39692"	76°31'35.53934"	1673225.831	664031.959
LR-72	15°07'46.00228"	76°31'36.06986"	1673213.812	664047.882
LR-73	15°07'45.57281"	76°31'36.67090"	1673200.738	664065.918
LR-74	15°07'45.24204"	76°31'37.25173"	1673190.693	664083.329
LR-75	15°07'45.07752"	76°31'37.89969"	1673185.771	664102.708
LR-76	15°07'45.13673"	76°31'38.57011"	1673187.73	664122.711
LR-77	15°07'45.16582"	76°31'39.13861"	1673188.742	664139.677
LR-78	15°07'45.07076"	76°31'38.95808"	1673185.783	664134.307
LR-79	15°07'44.91294"	76°31'38.30423"	1673180.797	664114.821
LR-80	15°07'44.78538"	76°31'37.65275"	1673176.741	664095.399
LR-81	15°07'44.66203"	76°31'36.99846"	1673172.815	664075.892
LR-82	15°07'44.62755"	76°31'36.86617"	1673171.727	664071.95
LR-83	15°07'44.53189"	76°31'36.60839"	1673168.734	664064.274
LR-84	15°07'44.46922"	76°31'36.53813"	1673166.793	664062.19
LR-85	15°07'43.85187"	76°31'36.48533"	1673147.809	664060.746
LR-86	15°07'43.72000"	76°31'36.59071"	1673143.778	664063.92
LR-87	15°07'43.62099"	76°31'36.81540"	1673140.782	664070.649
LR-88	15°07'43.58378"	76°31'37.48633"	1673139.778	664090.687
LR-89	15°07'43.51683"	76°31'38.15520"	1673137.859	664110.67
LR-90	15°07'43.48012"	76°31'38.82578"	1673136.87	664130.698
LR-91	15°07'43.41003"	76°31'39.49041"	1673134.854	664150.555
LR-92	15°07'43.40735"	76°31'39.83307"	1673134.843	664160.786
LR-93	15°07'43.24874"	76°31'39.18472"	1673129.834	664141.464
LR-94	15°07'43.12236"	76°31'38.52726"	1673125.813	664121.862
LR-95	15°07'42.96771"	76°31'37.88522"	1673120.927	664102.728

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LR-96	15°07'42.67762"	76°31'37.29047"	1673111.888	664085.034
LR-97	15°07'42.19304"	76°31'36.81464"	1673096.896	664070.932
LR-98	15°07'41.64384"	76°31'36.49265"	1673079.951	664061.436
LR-99	15°07'40.99065"	76°31'36.35698"	1673059.848	664057.526
LR-100	15°07'40.34263"	76°31'36.30642"	1673039.922	664056.155
LR-101	15°07'39.69739"	76°31'36.25461"	1673020.08	664054.746
LR-102	15°07'39.04750"	76°31'36.20409"	1673000.097	664053.376
LR-103	15°07'38.39930"	76°31'36.15194"	1672980.165	664051.958
LR-104	15°07'37.74715"	76°31'36.10381"	1672960.112	664050.661
LR-105	15°07'37.27499"	76°31'35.95988"	1672945.571	664046.464
LR-106	15°07'36.64334"	76°31'35.23761"	1672926.008	664025.036
LR-107	15°07'36.36266"	76°31'34.63241"	1672917.256	664007.028
LR-108	15°07'36.08093"	76°31'34.03003"	1672908.473	663989.104
LR-109	15°07'35.79792"	76°31'33.42617"	1672899.65	663971.137
LR-110	15°07'35.51972"	76°31'32.81806"	1672890.974	663953.042
LR-111	15°07'35.36602"	76°31'32.47475"	1672886.179	663942.825
LR-112	15°07'35.17129"	76°31'32.29180"	1672880.156	663937.405
LR-113	15°07'34.82895"	76°31'32.24772"	1672869.626	663936.162
LR-114	15°07'34.54178"	76°31'32.46081"	1672860.844	663942.585
LR-115	15°07'34.46124"	76°31'32.74737"	1672858.428	663951.157
LR-116	15°07'34.52566"	76°31'33.41208"	1672860.546	663970.988
LR-117	15°07'34.59263"	76°31'34.07770"	1672862.743	663990.846
LR-118	15°07'34.61521"	76°31'34.29739"	1672863.482	663997.4
LR-119	15°07'34.60496"	76°31'34.58028"	1672863.226	664005.848
LR-120	15°07'34.53157"	76°31'34.65326"	1672860.985	664008.042
LR-121	15°07'34.48044"	76°31'34.61832"	1672859.407	664007.01
LR-122	15°07'34.30684"	76°31'33.97414"	1672853.938	663987.815
LR-123	15°07'34.14297"	76°31'33.32629"	1672848.767	663968.509
LR-124	15°07'33.92619"	76°31'32.69256"	1672841.973	663949.635
LR-125	15°07'33.76123"	76°31'32.45547"	1672836.854	663942.592
LR-126	15°07'33.51706"	76°31'32.34202"	1672829.327	663939.257
LR-127	15°07'33.28598"	76°31'32.38804"	1672822.234	663940.68
LR-128	15°07'33.01571"	76°31'32.64078"	1672813.98	663948.283
LR-129	15°07'32.95982"	76°31'32.85100"	1672812.306	663954.572
LR-130	15°07'32.98432"	76°31'33.52018"	1672813.198	663974.545
LR-131	15°07'33.03996"	76°31'34.18811"	1672815.047	663994.474
LR-132	15°07'33.04785"	76°31'34.42217"	1672815.338	664001.46
LR-133	15°07'32.85195"	76°31'33.78493"	1672809.185	663982.477
LR-134	15°07'32.66504"	76°31'33.14366"	1672803.307	663963.372
LR-135	15°07'32.48321"	76°31'32.56797"	1672797.6	663946.224
LR-136	15°07'32.27982"	76°31'32.38231"	1672791.31	663940.724
LR-137	15°07'31.96410"	76°31'32.36837"	1672781.604	663940.376
LR-138	15°07'31.73790"	76°31'32.52580"	1672774.685	663945.124
LR-139	15°07'31.49309"	76°31'33.14473"	1672767.29	663963.654
LR-140	15°07'31.29492"	76°31'33.78344"	1672761.332	663982.765
LR-141	15°07'31.06666"	76°31'34.51247"	1672754.468	664004.579
LR-142	15°07'30.93693"	76°31'34.77453"	1672750.536	664012.431
LR-144	15°06'58.31719"	76°31'23.69948"	1671745.729	663688.74
LR-145	15°06'58.37934"	76°31'23.03286"	1671747.501	663668.824
LR-146	15°06'58.45266"	76°31'22.36880"	1671749.617	663648.982

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LR-147	15°06'58.42687"	76°31'22.15507"	1671748.78	663642.606
LR-148	15°06'58.31940"	76°31'22.04907"	1671745.455	663639.464
LR-149	15°06'58.15392"	76°31'22.03520"	1671740.367	663639.086
LR-150	15°06'57.86229"	76°31'22.22182"	1671731.443	663644.72
LR-151	15°06'57.29830"	76°31'22.56421"	1671714.18	663655.062
LR-152	15°06'56.74287"	76°31'22.91524"	1671697.183	663665.661
LR-153	15°06'56.18390"	76°31'23.25874"	1671680.075	663676.036
LR-154	15°06'55.62983"	76°31'23.60510"	1671663.118	663686.495
LR-155	15°06'55.20343"	76°31'23.89135"	1671650.073	663695.132
LR-156	15°06'55.43595"	76°31'23.27385"	1671657.091	663676.646
LR-157	15°06'55.70150"	76°31'22.65440"	1671665.124	663658.095
LR-158	15°06'55.73237"	76°31'22.49703"	1671666.04	663653.39
LR-159	15°06'55.73725"	76°31'21.93243"	1671666.073	663636.532
LR-160	15°06'55.54694"	76°31'21.38257"	1671660.111	663620.156
LR-161	15°06'55.16161"	76°31'20.66905"	1671648.121	663598.935
LR-162	15°06'54.93584"	76°31'20.25664"	1671641.097	663586.67
LR-163	15°06'54.78674"	76°31'18.46305"	1671636.144	663533.152
LR-164	15°06'55.04942"	76°31'17.84834"	1671644.089	663514.743
LR-165	15°06'55.12105"	76°31'17.15804"	1671646.148	663494.118
LR-166	15°06'55.02361"	76°31'16.69162"	1671643.057	663480.213
LR-167	15°06'54.67134"	76°31'16.12124"	1671632.113	663463.259
LR-168	15°06'54.37883"	76°31'15.60802"	1671623.017	663447.998
LR-169	15°06'54.22004"	76°31'14.95450"	1671618.001	663428.52
LR-170	15°06'54.13022"	76°31'14.29167"	1671615.104	663408.75
LR-171	15°06'54.03558"	76°31'13.62879"	1671612.058	663388.979
LR-172	15°06'53.96600"	76°31'12.96402"	1671609.783	663369.146
LR-173	15°06'53.94145"	76°31'12.31134"	1671608.893	663349.664
LR-174	15°06'53.94366"	76°31'11.64538"	1671608.824	663329.781
LR-175	15°06'53.91674"	76°31'10.97656"	1671607.858	663309.818
LR-176	15°06'53.92343"	76°31'10.30652"	1671607.925	663289.812
LR-177	15°06'53.89527"	76°31'09.63683"	1671606.922	663269.823
LR-178	15°06'53.86582"	76°31'08.96637"	1671605.878	663249.812
LR-179	15°06'53.86958"	76°31'08.29422"	1671605.855	663229.743
LR-180	15°06'53.84306"	76°31'07.62672"	1671604.902	663209.82
LR-181	15°06'53.84896"	76°31'06.95484"	1671604.945	663189.759
LR-182	15°06'53.82058"	76°31'06.28574"	1671603.935	663169.788
LR-183	15°06'53.82491"	76°31'05.61287"	1671603.929	663149.698
LR-184	15°06'53.79908"	76°31'04.94652"	1671602.997	663129.808
LR-185	15°06'53.80474"	76°31'04.28006"	1671603.034	663109.909
LR-186	15°06'53.77767"	76°31'03.60806"	1671602.063	663089.852
LR-187	15°06'53.78256"	76°31'02.94001"	1671602.076	663069.905
LR-188	15°06'53.75048"	76°31'02.27387"	1671600.952	663050.023
LR-189	15°06'53.75803"	76°31'01.60097"	1671601.046	663029.931
LR-190	15°06'53.72962"	76°31'00.93227"	1671600.035	663009.973
LR-191	15°06'53.73520"	76°31'00.26220"	1671600.068	662989.966
LR-192	15°06'53.74033"	76°30'59.59021"	1671600.087	662969.902
LR-193	15°06'53.71276"	76°30'58.92009"	1671599.102	662949.9
LR-194	15°06'53.71976"	76°30'58.25229"	1671599.179	662929.96
LR-195	15°06'53.72492"	76°30'57.58268"	1671599.2	662909.967
LR-196	15°06'53.79278"	76°30'56.91594"	1671601.148	662890.047

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LR-197	15°06'53.89582"	76°30'56.25840"	1671604.18	662870.393
LR-198	15°06'54.06385"	76°30'55.60767"	1671609.209	662850.929
LR-199	15°06'54.26396"	76°30'54.96957"	1671615.228	662831.835
LR-200	15°06'54.49639"	76°30'54.34435"	1671622.243	662813.119
LR-201	15°06'54.72623"	76°30'53.72148"	1671629.178	662794.474
LR-202	15°06'54.96741"	76°30'53.10055"	1671636.462	662775.884
LR-203	15°06'55.20527"	76°30'52.47636"	1671643.644	662757.198
LR-204	15°06'55.44606"	76°30'51.85269"	1671650.916	662738.527
LR-205	15°06'55.68733"	76°30'51.23124"	1671658.203	662719.921
LR-206	15°06'55.92580"	76°30'50.60653"	1671665.403	662701.219
LR-207	15°06'56.16784"	76°30'49.98632"	1671672.714	662682.651
LR-208	15°06'56.40548"	76°30'49.36283"	1671679.889	662663.986
LR-209	15°06'56.64649"	76°30'48.73980"	1671687.168	662645.333
LR-210	15°06'56.88494"	76°30'48.11846"	1671694.369	662626.732
LR-211	15°06'57.12808"	76°30'47.49480"	1671701.713	662608.06
LR-212	15°06'57.34765"	76°30'46.85836"	1671708.33	662589.012
LR-213	15°06'57.61740"	76°30'46.25657"	1671716.497	662570.988
LR-214	15°06'57.84499"	76°30'45.62821"	1671723.362	662552.18
LR-215	15°06'58.08699"	76°30'45.00380"	1671730.671	662533.486
LR-216	15°06'58.32682"	76°30'44.38216"	1671737.914	662514.876
LR-217	15°06'58.56646"	76°30'43.75982"	1671745.151	662496.244
LR-218	15°06'58.80666"	76°30'43.13868"	1671752.405	662477.649
LR-219	15°06'59.05005"	76°30'42.51299"	1671759.757	662458.917
LR-220	15°06'59.28633"	76°30'41.89309"	1671766.891	662440.359
LR-221	15°06'59.52162"	76°30'41.27083"	1671773.995	662421.731
LR-222	15°06'59.76645"	76°30'40.64921"	1671781.391	662403.12
LR-223	15°07'00.00836"	76°30'40.02324"	1671788.697	662384.38
LR-224	15°07'00.24474"	76°30'39.34198"	1671795.822	662363.99
LR-225	15°07'00.48774"	76°30'38.78205"	1671803.175	662347.222
LR-226	15°07'00.72859"	76°30'38.15547"	1671810.449	662328.464
LR-227	15°07'00.96763"	76°30'37.53701"	1671817.668	662309.949
LR-228	15°07'01.20732"	76°30'36.91317"	1671824.906	662291.273
LR-229	15°07'01.44762"	76°30'36.29057"	1671832.164	662272.634
LR-230	15°07'01.68418"	76°30'35.67027"	1671839.306	662254.064
LR-231	15°07'01.92666"	76°30'35.04456"	1671846.63	662235.332
LR-232	15°07'02.16659"	76°30'34.42329"	1671853.877	662216.732
LR-233	15°07'02.40801"	76°30'33.79893"	1671861.168	662198.041
LR-234	15°07'02.64829"	76°30'33.17733"	1671868.425	662179.431
LR-235	15°07'02.88721"	76°30'32.55638"	1671875.64	662160.842
LR-236	15°07'03.12872"	76°30'31.93290"	1671882.935	662142.176
LR-237	15°07'03.37145"	76°30'31.31147"	1671890.267	662123.572
LR-238	15°07'03.61066"	76°30'30.68919"	1671897.491	662104.943
LR-239	15°07'03.81590"	76°30'30.15975"	1671903.69	662089.093
LR-240	15°07'03.36280"	76°30'29.96185"	1671889.725	662083.28
LR-241	15°06'55.94330"	76°30'47.64392"	1671665.332	662612.764
LR-242	15°06'55.63302"	76°30'48.44200"	1671655.96	662636.657
LR-243	15°06'55.16778"	76°30'48.91678"	1671641.759	662650.931
LR-244	15°06'54.70695"	76°30'49.38627"	1671627.693	662665.045
LR-245	15°06'54.24592"	76°30'49.85884"	1671613.622	662679.252
LR-246	15°06'53.83683"	76°30'50.27863"	1671601.135	662691.872

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LR-247	15°06'53.53499"	76°30'50.86844"	1671591.98	662709.546
LR-248	15°06'53.23131"	76°30'51.46193"	1671582.769	662727.329
LR-249	15°06'52.93013"	76°30'52.05781"	1671573.636	662745.184
LR-250	15°06'52.62511"	76°30'52.64821"	1671564.383	662762.876
LR-251	15°06'52.31490"	76°30'53.24190"	1671554.972	662780.667
LR-252	15°06'52.01862"	76°30'53.83669"	1671545.989	662798.488
LR-253	15°06'51.72258"	76°30'54.42692"	1671537.012	662816.173
LR-254	15°06'51.42449"	76°30'55.01827"	1671527.972	662833.891
LR-255	15°06'51.09339"	76°30'55.61173"	1671517.919	662851.68
LR-256	15°06'50.77075"	76°30'56.19214"	1671508.123	662869.077
LR-257	15°06'50.44057"	76°30'56.77122"	1671498.094	662886.436
LR-258	15°06'50.11260"	76°30'57.34503"	1671488.133	662903.638
LR-259	15°06'49.78652"	76°30'57.92108"	1671478.23	662920.906
LR-260	15°06'49.42253"	76°30'58.47807"	1671467.158	662937.613
LR-261	15°06'49.02350"	76°30'59.01310"	1671455.005	662953.672
LR-262	15°06'48.63301"	76°30'59.54943"	1671443.115	662969.767
LR-263	15°06'48.27197"	76°31'00.08683"	1671432.13	662985.889
LR-264	15°06'48.07636"	76°31'00.32832"	1671426.168	662993.141
LR-265	15°06'47.94074"	76°31'00.97584"	1671422.133	663012.502
LR-266	15°06'47.76872"	76°31'01.63101"	1671416.982	663032.099
LR-267	15°06'47.60090"	76°31'02.39337"	1671411.981	663054.897
LR-268	15°06'47.37770"	76°31'01.76189"	1671404.991	663036.09
LR-269	15°06'46.95917"	76°31'01.26874"	1671392.027	663021.455
LR-270	15°06'46.63588"	76°31'00.96526"	1671382.029	663012.463
LR-271	15°06'46.31389"	76°31'00.95866"	1671372.132	663012.334
LR-272	15°06'45.85568"	76°31'01.42426"	1671358.145	663026.333
LR-273	15°06'45.66148"	76°31'01.60004"	1671352.213	663031.622
LR-274	15°06'45.00804"	76°31'01.54740"	1671332.12	663030.189
LR-275	15°06'44.35767"	76°31'01.47180"	1671312.117	663028.07
LR-276	15°06'43.74126"	76°31'01.35282"	1671293.148	663024.648
LR-277	15°06'43.08811"	76°31'01.22342"	1671273.048	663020.923
LR-278	15°06'42.44117"	76°31'01.10475"	1671253.141	663017.518
LR-279	15°06'41.82375"	76°31'00.99918"	1671234.144	663014.497
LR-280	15°06'41.43412"	76°31'00.93634"	1671222.156	663012.703
LR-281	15°06'40.81417"	76°31'01.19148"	1671203.156	663020.452
LR-282	15°06'40.22513"	76°31'01.44818"	1671185.106	663028.242
LR-283	15°06'39.60633"	76°31'01.70475"	1671166.141	663036.033
LR-284	15°06'39.01745"	76°31'01.96086"	1671148.096	663043.805
LR-285	15°06'38.42984"	76°31'02.25985"	1671130.098	663052.857
LR-286	15°06'38.16965"	76°31'02.40475"	1671122.132	663057.238
LR-287	15°06'37.67848"	76°31'02.85756"	1671107.13	663070.862
LR-288	15°06'37.38447"	76°31'03.13361"	1671098.151	663079.166
LR-289	15°06'36.88999"	76°31'03.58465"	1671083.047	663092.738
LR-290	15°06'36.59292"	76°31'04.17539"	1671074.039	663110.438
LR-291	15°06'36.26501"	76°31'04.76531"	1671064.083	663128.121
LR-292	15°06'35.63587"	76°31'05.93779"	1671044.989	663163.262
LR-293	15°06'35.40333"	76°31'06.55484"	1671037.97	663181.734
LR-294	15°06'35.07512"	76°31'07.14468"	1671028.005	663199.415
LR-295	15°06'34.71260"	76°31'07.68361"	1671016.975	663215.583

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Karnataka State Minerals Corporation Limited

Karnataka State Minerals Corporation Limited

Thimmappanagudi Iron Ore Mine,ML.NO.2605

Service Road DGPS Reading of Right Side

Point ID	Latitude (Local)	Longitude (Local)	Northing	Easting
RR-1	15°07'59.33602"	76°31'46.84656"	1673625.843	664366.758
RR-2	15°07'59.07014"	76°31'47.45575"	1673617.798	664385.001
RR-3	15°07'58.76724"	76°31'47.77971"	1673608.556	664394.737
RR-4	15°07'58.45941"	76°31'47.74625"	1673599.089	664393.804
RR-5	15°07'58.22397"	76°31'47.43725"	1673591.788	664384.63
RR-6	15°07'58.33914"	76°31'46.77702"	1673595.191	664364.895
RR-7	15°07'58.45078"	76°31'46.11552"	1673598.484	664345.123
RR-8	15°07'58.50392"	76°31'45.74824"	1673600.041	664334.147
RR-9	15°07'57.73704"	76°31'45.89898"	1673576.503	664338.811
RR-10	15°07'57.49397"	76°31'46.51953"	1673569.162	664357.389
RR-11	15°07'57.42271"	76°31'46.68953"	1673567.008	664362.479
RR-12	15°07'57.24319"	76°31'46.79167"	1673561.512	664365.567
RR-13	15°07'57.01055"	76°31'46.78469"	1673554.36	664365.409
RR-14	15°07'56.81738"	76°31'46.64711"	1673548.395	664361.343
RR-15	15°07'56.73337"	76°31'46.34617"	1673545.75	664352.376
RR-16	15°07'56.77326"	76°31'45.68085"	1673546.838	664332.505
RR-17	15°07'56.65844"	76°31'45.02081"	1673543.172	664312.825
RR-18	15°07'56.53363"	76°31'44.36640"	1673539.2	664293.315
RR-19	15°07'56.41869"	76°31'43.76446"	1673535.542	664275.37
RR-20	15°07'56.27402"	76°31'43.63060"	1673531.068	664271.404
RR-21	15°07'56.23762"	76°31'44.29491"	1673530.087	664291.244
RR-22	15°07'56.18977"	76°31'44.96721"	1673528.757	664311.325
RR-23	15°07'56.17410"	76°31'45.21785"	1673528.327	664318.811
RR-24	15°07'55.98436"	76°31'45.54608"	1673522.564	664328.651
RR-25	15°07'55.59117"	76°31'45.58244"	1673510.488	664329.821
RR-26	15°07'55.35927"	76°31'45.28181"	1673503.298	664320.895
RR-27	15°07'55.31257"	76°31'44.61350"	1673501.724	664300.954
RR-28	15°07'55.19047"	76°31'43.95657"	1673497.835	664281.368
RR-29	15°07'55.06922"	76°31'43.29800"	1673493.972	664261.733
RR-30	15°07'54.94969"	76°31'42.64162"	1673490.161	664242.163
RR-31	15°07'54.88912"	76°31'42.30930"	1673488.231	664232.255
RR-32	15°07'54.40270"	76°31'41.84770"	1673473.185	664218.578
RR-33	15°07'54.29491"	76°31'42.51198"	1673470.011	664238.433
RR-34	15°07'54.18332"	76°31'43.16702"	1673466.717	664258.012
RR-35	15°07'54.02242"	76°31'43.39680"	1673461.82	664264.907
RR-36	15°07'53.77020"	76°31'43.47313"	1673454.085	664267.239
RR-37	15°07'53.47227"	76°31'43.36429"	1673444.906	664264.054
RR-38	15°07'53.34116"	76°31'43.04506"	1673440.81	664254.551
RR-39	15°07'53.32139"	76°31'42.37409"	1673440.063	664234.524
RR-40	15°07'53.28824"	76°31'41.70897"	1673438.905	664214.675
RR-41	15°07'53.22397"	76°31'41.03318"	1673436.79	664194.514
RR-42	15°07'53.18949"	76°31'40.69123"	1673435.659	664184.312
RR-43	15°07'53.02134"	76°31'40.52991"	1673430.458	664179.532
RR-44	15°07'52.93777"	76°31'41.19499"	1673428.028	664199.405
RR-45	15°07'52.89894"	76°31'41.86310"	1673426.973	664219.36

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RR-46	15°07'52.87598"	76°31'42.31586"	1673426.361	664232.881
RR-47	15°07'52.75682"	76°31'42.57171"	1673422.753	664240.545
RR-48	15°07'52.47557"	76°31'42.68750"	1673414.133	664244.062
RR-49	15°07'52.24234"	76°31'42.63280"	1673406.954	664242.479
RR-50	15°07'52.09152"	76°31'42.45065"	1673402.28	664237.073
RR-51	15°07'52.15764"	76°31'43.11701"	1673404.451	664256.953
RR-52	15°07'52.17425"	76°31'43.42575"	1673405.026	664266.166
RR-53	15°07'52.04381"	76°31'43.63426"	1673401.06	664272.419
RR-54	15°07'51.87972"	76°31'43.71559"	1673396.034	664274.883
RR-55	15°07'51.71792"	76°31'43.74963"	1673391.069	664275.933
RR-56	15°07'51.45998"	76°31'43.66410"	1673383.123	664273.435
RR-57	15°07'51.13523"	76°31'43.08182"	1673373.022	664256.121
RR-58	15°07'50.81343"	76°31'42.49830"	1673363.01	664238.77
RR-59	15°07'50.49450"	76°31'41.91613"	1673353.088	664221.457
RR-60	15°07'50.30457"	76°31'41.27730"	1673347.118	664202.426
RR-61	15°07'50.27345"	76°31'40.61243"	1673346.023	664182.584
RR-62	15°07'50.37624"	76°31'39.95160"	1673349.045	664162.834
RR-63	15°07'50.54227"	76°31'39.29966"	1673354.012	664143.335
RR-64	15°07'50.51534"	76°31'38.99601"	1673353.121	664134.275
RR-65	15°07'49.89547"	76°31'38.72300"	1673334.014	664126.257
RR-66	15°07'49.27734"	76°31'38.54840"	1673314.98	664121.177
RR-67	15°07'48.66105"	76°31'38.35415"	1673295.999	664115.51
RR-68	15°07'48.07938"	76°31'38.03842"	1673278.057	664106.208
RR-69	15°07'47.62458"	76°31'37.55022"	1673263.978	664091.731
RR-70	15°07'47.40234"	76°31'37.08695"	1673257.052	664077.947
RR-71	15°07'47.26677"	76°31'36.33908"	1673252.73	664055.649
RR-72	15°07'47.27273"	76°31'35.66728"	1673252.774	664035.592
RR-73	15°07'47.30433"	76°31'35.04542"	1673253.616	664017.02
RR-74	15°07'46.94590"	76°31'35.59123"	1673242.713	664033.391
RR-75	15°07'46.55067"	76°31'36.16997"	1673230.687	664050.754
RR-76	15°07'46.12175"	76°31'36.76684"	1673217.629	664068.665
RR-77	15°07'45.74596"	76°31'37.42037"	1673206.215	664088.256
RR-78	15°07'45.59278"	76°31'37.97373"	1673201.622	664104.809
RR-79	15°07'45.62573"	76°31'38.63401"	1673202.772	664124.514
RR-80	15°07'45.65815"	76°31'39.05255"	1673203.856	664137.002
RR-81	15°07'45.49056"	76°31'39.52923"	1673198.804	664151.269
RR-82	15°07'44.93474"	76°31'39.60279"	1673181.737	664153.584
RR-83	15°07'44.61105"	76°31'39.09995"	1673171.685	664138.641
RR-84	15°07'44.45349"	76°31'38.44553"	1673166.706	664119.138
RR-85	15°07'44.29677"	76°31'37.79580"	1673161.755	664099.774
RR-86	15°07'44.16838"	76°31'37.14079"	1673157.673	664080.246
RR-87	15°07'44.13860"	76°31'36.93118"	1673156.714	664073.995
RR-88	15°07'44.07339"	76°31'37.16990"	1673154.759	664081.136
RR-89	15°07'44.03403"	76°31'37.83326"	1673153.687	664100.948
RR-90	15°07'43.96517"	76°31'38.50174"	1673151.71	664120.92
RR-91	15°07'43.93016"	76°31'39.17108"	1673150.773	664140.91
RR-92	15°07'43.82854"	76°31'39.83221"	1673147.788	664160.67
RR-93	15°07'43.79526"	76°31'40.13920"	1673146.828	664169.842
RR-94	15°07'43.53562"	76°31'40.32200"	1673138.887	664175.355
RR-95	15°07'43.11276"	76°31'40.26783"	1673125.88	664173.828

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RR-96	15°07'42.88483"	76°31'39.85103"	1673118.788	664161.434
RR-97	15°07'42.75922"	76°31'39.19267"	1673114.791	664141.806
RR-98	15°07'42.63619"	76°31'38.53500"	1673110.873	664122.197
RR-99	15°07'42.44299"	76°31'37.89393"	1673104.802	664103.1
RR-100	15°07'42.05657"	76°31'37.34843"	1673092.813	664086.897
RR-101	15°07'41.50778"	76°31'37.01044"	1673075.877	664076.924
RR-102	15°07'40.87639"	76°31'36.85062"	1673056.439	664072.287
RR-103	15°07'40.22704"	76°31'36.79672"	1673036.471	664070.817
RR-104	15°07'39.57818"	76°31'36.74809"	1673016.519	664069.504
RR-105	15°07'38.93093"	76°31'36.69839"	1672996.617	664068.158
RR-106	15°07'38.27753"	76°31'36.61164"	1672976.518	664065.708
RR-107	15°07'37.63493"	76°31'36.58924"	1672956.764	664065.177
RR-108	15°07'37.01638"	76°31'36.37499"	1672937.709	664058.913
RR-109	15°07'36.46435"	76°31'35.89330"	1672920.643	664044.65
RR-110	15°07'36.11483"	76°31'35.19196"	1672909.756	664023.786
RR-111	15°07'35.81558"	76°31'34.59737"	1672900.435	664006.099
RR-112	15°07'35.52338"	76°31'33.99909"	1672891.331	663988.3
RR-113	15°07'35.24459"	76°31'33.39409"	1672882.638	663970.298
RR-114	15°07'35.05126"	76°31'32.97088"	1672876.608	663957.704
RR-115	15°07'34.78754"	76°31'33.12258"	1672868.534	663962.289
RR-116	15°07'35.02974"	76°31'33.58602"	1672876.074	663976.073
RR-117	15°07'35.08094"	76°31'34.25491"	1672877.787	663996.032
RR-118	15°07'35.09969"	76°31'34.48272"	1672878.41	664002.829
RR-119	15°07'34.96339"	76°31'34.94217"	1672874.317	664016.575
RR-120	15°07'34.74459"	76°31'35.08065"	1672867.621	664020.756
RR-121	15°07'34.38144"	76°31'35.05237"	1672856.454	664019.99
RR-122	15°07'34.10326"	76°31'34.96539"	1672847.887	664017.452
RR-123	15°07'33.90155"	76°31'34.32833"	1672841.555	663998.476
RR-124	15°07'33.69697"	76°31'33.69416"	1672835.136	663979.587
RR-125	15°07'33.50672"	76°31'33.05172"	1672829.156	663960.447
RR-126	15°07'33.40653"	76°31'32.92361"	1672826.05	663956.644
RR-127	15°07'33.45885"	76°31'33.59409"	1672827.797	663976.65
RR-128	15°07'33.48597"	76°31'34.26493"	1672828.77	663996.672
RR-129	15°07'33.50282"	76°31'34.67429"	1672829.373	664008.89
RR-130	15°07'33.27089"	76°31'34.96351"	1672822.305	664017.574
RR-131	15°07'32.63568"	76°31'34.74292"	1672802.737	664011.124
RR-132	15°07'32.43801"	76°31'34.10585"	1672796.53	663992.146
RR-133	15°07'32.24199"	76°31'33.46581"	1672790.373	663973.08
RR-134	15°07'32.04525"	76°31'32.99757"	1672784.229	663959.143
RR-135	15°07'31.83673"	76°31'33.63339"	1672777.952	663978.17
RR-136	15°07'31.63406"	76°31'34.26734"	1672771.855	663997.14
RR-137	15°07'31.45429"	76°31'34.81695"	1672766.445	664013.587
RR-138	15°07'30.98489"	76°31'35.45199"	1672752.15	664032.646
RR-139	15°07'30.37666"	76°31'35.83326"	1672733.536	664044.159
RR-140	15°07'29.72828"	76°31'35.78596"	1672713.6	664042.885
RR-141	15°07'29.07752"	76°31'35.74103"	1672693.59	664041.683
RR-142	15°07'28.43067"	76°31'35.69113"	1672673.7	664040.331
RR-143	15°07'27.78194"	76°31'35.64668"	1672653.753	664039.143
RR-144	15°07'27.13366"	76°31'35.59925"	1672633.82	664037.865
RR-145	15°07'26.48215"	76°31'35.55132"	1672613.787	664036.574

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RR-146	15°07'25.84000"	76°31'35 49955"	1672594.041	664035.165
RR-147	15°07'25.18887"	76°31'35 45066"	1672574.019	664033.845
RR-148	15°07'24.53769"	76°31'35 40471"	1672553.997	664032.612
RR-149	15°07'23.89108"	76°31'35 35564"	1672534.114	664031.285
RR-150	15°07'23.24061"	76°31'35.31077"	1672514.114	664030.085
RR-151	15°07'22.59223"	76°31'35.26280"	1672494.177	664028.791
RR-152	15°07'21.93354"	76°31'35.21485"	1672473.923	664027.5
RR-153	15°07'21.28442"	76°31'35.16603"	1672453.964	664026.181
RR-154	15°07'20.63319"	76°31'35.11109"	1672433.938	664024.68
RR-155	15°07'19.98276"	76°31'35.05000"	1672413.935	664022.995
RR-156	15°07'19.36519"	76°31'34.98752"	1672394.942	664021.262
RR-157	15°07'18.71652"	76°31'34.91948"	1672374.992	664019.369
RR-158	15°07'18.06561"	76°31'34.85574"	1672354.975	664017.605
RR-159	15°07'17.41585"	76°31'34.79203"	1672334.992	664015.842
RR-160	15°07'16.76568"	76°31'34.72594"	1672314.997	664014.008
RR-161	15°07'16.11591"	76°31'34.66317"	1672295.014	664012.272
RR-162	15°07'15.46413"	76°31'34.52818"	1672274.955	664008.381
RR-163	15°07'14.84660"	76°31'34.35790"	1672255.941	664003.43
RR-164	15°07'14.23226"	76°31'34.09900"	1672237.006	663995.831
RR-165	15°07'13.64731"	76°31'33.84978"	1672218.977	663988.516
RR-166	15°07'13.03119"	76°31'33.59587"	1672199.989	663981.066
RR-167	15°07'12.44619"	76°31'33.33997"	1672181.957	663973.551
RR-168	15°07'11.82981"	76°31'33.08060"	1672162.96	663965.939
RR-169	15°07'11.24587"	76°31'32.77546"	1672144.95	663956.954
RR-170	15°07'10.69675"	76°31'32.46273"	1672128.009	663947.734
RR-171	15°07'10.11248"	76°31'32.15498"	1672109.989	663938.671
RR-172	15°07'09.52949"	76°31'31.84258"	1672092.007	663929.468
RR-173	15°07'08.94633"	76°31'31.53009"	1672074.02	663920.263
RR-174	15°07'08.39451"	76°31'31.22193"	1672056.996	663911.181
RR-175	15°07'07.81215"	76°31'30.90955"	1672039.034	663901.979
RR-176	15°07'07.23079"	76°31'30.59752"	1672021.102	663892.787
RR-177	15°07'06.64229"	76°31'30.28339"	1672002.95	663883.534
RR-178	15°07'06.06172"	76°31'29.97691"	1671985.044	663874.507
RR-179	15°07'05.47820"	76°31'29.64866"	1671967.043	663864.832
RR-180	15°07'04.92642"	76°31'29.35102"	1671950.023	663856.063
RR-181	15°07'04.34457"	76°31'29.04195"	1671932.077	663846.96
RR-182	15°07'03.76074"	76°31'28.72388"	1671914.068	663837.588
RR-183	15°07'03.21033"	76°31'28.40391"	1671897.085	663828.153
RR-184	15°07'02.62625"	76°31'28.08536"	1671879.069	663818.766
RR-185	15°07'02.04363"	76°31'27.76597"	1671861.097	663809.355
RR-186	15°07'01.45236"	76°31'27.49039"	1671842.868	663801.253
RR-187	15°07'00.90523"	76°31'27.12890"	1671825.978	663790.577
RR-188	15°07'00.35542"	76°31'26.81004"	1671809.015	663781.175
RR-189	15°06'59.80482"	76°31'26.43586"	1671792.016	663770.121
RR-190	15°06'59.28651"	76°31'26.04066"	1671776.004	663758.432
RR-191	15°06'58.73802"	76°31'25.64449"	1671759.065	663746.721
RR-192	15°06'58.25159"	76°31'25.22550"	1671744.029	663734.315
RR-193	15°06'57.99551"	76°31'25.00264"	1671736.113	663727.716
RR-194	15°06'57.83386"	76°31'24.63482"	1671731.068	663716.769
RR-195	15°06'57.83957"	76°31'24.16749"	1671731.147	663702.815

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RR-196	15°06'57.06348"	76°31'23.30085"	1671707.116	663677.106
RR-197	15°06'56.50786"	76°31'23.64152"	1671690.111	663687.395
RR-198	15°06'55.95130"	76°31'23.99409"	1671673.079	663698.04
RR-199	15°06'55.39764"	76°31'24.35382"	1671656.137	663708.898
RR-200	15°06'54.93944"	76°31'24.44184"	1671642.074	663711.624
RR-201	15°06'54.71400"	76°31'23.97436"	1671635.048	663697.715
RR-202	15°06'54.74703"	76°31'23.61895"	1671635.99	663687.096
RR-203	15°06'54.97174"	76°31'22.98957"	1671642.766	663668.257
RR-204	15°06'55.19416"	76°31'22.35995"	1671649.471	663649.412
RR-205	15°06'55.24187"	76°31'22.22593"	1671650.91	663645.4
RR-206	15°06'55.00660"	76°31'21.60149"	1671643.55	663626.807
RR-207	15°06'54.77725"	76°31'20.97564"	1671636.372	663608.171
RR-208	15°06'54.50249"	76°31'20.36847"	1671627.802	663590.101
RR-209	15°06'54.22830"	76°31'19.76680"	1671619.25	663572.196
RR-210	15°06'54.10994"	76°31'19.49982"	1671615.558	663564.25
RR-211	15°06'54.11312"	76°31'18.83308"	1671615.518	663544.343
RR-212	15°06'54.11071"	76°31'18.58799"	1671615.393	663537.026
RR-213	15°06'54.53711"	76°31'17.85551"	1671628.346	663515.066
RR-214	15°06'54.63852"	76°31'17.40134"	1671631.368	663501.485
RR-215	15°06'54.56585"	76°31'16.87541"	1671629.026	663485.798
RR-216	15°06'54.20251"	76°31'16.32111"	1671617.745	663469.326
RR-217	15°06'53.93914"	76°31'15.87274"	1671609.558	663455.995
RR-218	15°06'53.21696"	76°30'57.80285"	1671583.634	662916.648
RR-219	15°06'53.29215"	76°30'57.22553"	1671585.826	662899.396
RR-220	15°06'53.37847"	76°30'56.56183"	1671588.342	662879.562
RR-221	15°06'53.46524"	76°30'55.89557"	1671590.872	662859.652
RR-222	15°06'53.69341"	76°30'55.26850"	1671597.755	662840.881
RR-223	15°06'53.92880"	76°30'54.64648"	1671604.861	662822.26
RR-224	15°06'54.15901"	76°30'54.01784"	1671611.806	662803.443
RR-225	15°06'54.39509"	76°30'53.39409"	1671618.934	662784.77
RR-226	15°06'54.62970"	76°30'52.76752"	1671626.015	662766.013
RR-227	15°06'54.86540"	76°30'52.14542"	1671633.131	662747.389
RR-228	15°06'55.09857"	76°30'51.52073"	1671640.168	662728.689
RR-229	15°06'55.33148"	76°30'50.89688"	1671647.198	662710.014
RR-230	15°06'55.56854"	76°30'50.27345"	1671654.355	662691.351
RR-231	15°06'55.80221"	76°30'49.64625"	1671661.408	662672.575
RR-232	15°06'56.03677"	76°30'49.02169"	1671668.488	662653.879
RR-233	15°06'56.27104"	76°30'48.39780"	1671675.559	662635.202
RR-234	15°06'56.46887"	76°30'47.86408"	1671681.529	662619.226
RR-235	15°06'56.40000"	76°30'47.83559"	1671679.407	662618.389
RR-236	15°06'56.15736"	76°30'48.45567"	1671672.077	662636.954
RR-237	15°06'56.05875"	76°30'48.70645"	1671669.098	662644.462
RR-238	15°06'55.60025"	76°30'49.18278"	1671655.105	662658.781
RR-239	15°06'55.13553"	76°30'49.65178"	1671640.919	662672.882
RR-240	15°06'54.66723"	76°30'50.11854"	1671626.623	662686.916
RR-241	15°06'54.27240"	76°30'50.51177"	1671614.57	662698.74
RR-242	15°06'53.97025"	76°30'51.10671"	1671605.406	662716.567
RR-243	15°06'53.66821"	76°30'51.69998"	1671596.246	662734.344
RR-244	15°06'53.36633"	76°30'52.29216"	1671587.09	662752.088
RR-245	15°06'53.06357"	76°30'52.88420"	1671577.907	662769.828

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RR-246	15°06'52.76107"	76°30'53.47714"	1671568.732	662787.595
RR-247	15°06'52.45820"	76°30'54.06952"	1671559.546	662805.346
RR-248	15°06'52.15528"	76°30'54.66325"	1671550.359	662823.137
RR-249	15°06'51.85113"	76°30'55.25553"	1671541.133	662840.884
RR-250	15°06'51.54562"	76°30'55.84730"	1671531.866	662858.617
RR-251	15°06'51.21012"	76°30'56.41994"	1671521.673	662875.786
RR-252	15°06'50.89699"	76°30'57.00072"	1671512.169	662893.192
RR-253	15°06'50.53398"	76°30'57.57276"	1671501.13	662910.348
RR-254	15°06'50.20524"	76°30'58.14990"	1671491.146	662927.649
RR-255	15°06'49.87403"	76°30'58.71188"	1671481.083	662944.498
RR-256	15°06'49.48183"	76°30'59.25105"	1671469.14	662960.679
RR-257	15°06'49.08640"	76°30'59.78475"	1671457.097	662976.697
RR-258	15°06'48.69290"	76°31'00.32379"	1671445.115	662992.874
RR-259	15°06'48.52711"	76°31'00.55966"	1671440.068	662999.952
RR-260	15°06'48.35971"	76°31'01.21401"	1671435.059	663019.524
RR-261	15°06'48.22386"	76°31'01.86427"	1671431.018	663038.967
RR-262	15°06'48.09071"	76°31'02.51697"	1671427.06	663058.483
RR-263	15°06'47.98810"	76°31'02.93803"	1671423.993	663071.076
RR-264	15°06'47.82572"	76°31'03.11868"	1671419.04	663076.504
RR-265	15°06'47.36867"	76°31'03.07280"	1671404.984	663075.231
RR-266	15°06'47.11418"	76°31'02.44966"	1671397.034	663056.68
RR-267	15°06'46.95624"	76°31'01.97493"	1671392.082	663042.54
RR-268	15°06'46.47241"	76°31'01.43927"	1671377.102	663026.65
RR-269	15°06'46.04555"	76°31'01.93242"	1671364.086	663041.464
RR-270	15°06'45.95110"	76°31'02.03808"	1671361.205	663044.639
RR-271	15°06'45.29708"	76°31'02.08743"	1671341.114	663046.251
RR-272	15°06'44.64526"	76°31'02.01823"	1671321.068	663044.323
RR-273	15°06'43.99605"	76°31'01.90674"	1671301.093	663041.133
RR-274	15°06'43.34574"	76°31'01.78983"	1671281.082	663037.78
RR-275	15°06'42.72752"	76°31'01.67100"	1671262.058	663034.363
RR-276	15°06'42.07832"	76°31'01.55687"	1671242.083	663031.093
RR-277	15°06'41.42817"	76°31'01.43973"	1671222.077	663027.734
RR-278	15°06'40.84118"	76°31'01.70726"	1671204.092	663035.846
RR-279	15°06'40.25409"	76°31'01.97364"	1671186.104	663043.924
RR-280	15°06'39.66598"	76°31'02.24054"	1671168.085	663052.018
RR-281	15°06'39.04499"	76°31'02.50607"	1671149.055	663060.077
RR-282	15°06'38.49029"	76°31'02.76392"	1671132.06	663067.894
RR-283	15°06'37.99907"	76°31'03.20860"	1671117.055	663081.275
RR-284	15°06'37.50919"	76°31'03.66072"	1671102.093	663094.877
RR-285	15°06'37.31186"	76°31'03.84026"	1671096.065	663100.28
RR-286	15°06'37.01433"	76°31'04.43147"	1671087.043	663117.995
RR-287	15°06'36.71646"	76°31'05.02113"	1671078.01	663135.663
RR-288	15°06'36.38736"	76°31'05.61025"	1671068.017	663153.323
RR-289	15°06'36.08922"	76°31'06.20199"	1671058.977	663171.053
RR-290	15°06'35.79061"	76°31'06.79210"	1671049.921	663188.736
RR-291	15°06'35.49566"	76°31'07.38629"	1671040.979	663206.539
RR-292	15°06'35.10262"	76°31'07.96412"	1671029.019	663223.875
RR-293	15°06'34.93734"	76°31'08.27275"	1671024.003	663233.125

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Thimmappanagudi Iron Ore Mine,ML.NO.2605

Stock Yard DGPS Readings

Point ID	Latitude (Local)	Longitude (Local)	Northing	Easting
A	15°06'56.91205"	76°30'40.03576"	1671693.541	662385.409
B	15°07'00.47485"	76°30'41.73670"	1671803.386	662435.438
C	15°06'58.37328"	76°30'49.12056"	1671740.316	662656.336
NEB568	15°06'51.66313"	76°30'46.03279"	1671533.458	662565.567
NEB570	15°06'54.01572"	76°30'42.83403"	1671605.103	662469.567
NEB571	15°06'55.19485"	76°30'42.37151"	1671641.246	662455.508
NEB572	15°06'56.51826"	76°30'40.92866"	1671681.622	662412.15

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BMTC, Shanthinagar, Bangalore-560 027

Karnataka State Minerals Corporation Limited

Thimmappanagudi Iron Ore Mine,ML.NO.2605

Village Reference points DGPS Readings

Point ID	Latitude (Local)	Longitude (Local)	Northing	Easting
VR-G	15°06'47.92161"	76°30'59.90525"	1671421.325	662980.542
VR-A	15°06'56.51826"	76°30'40.92866"	1671681.622	662412.15
VR-B	15°06'56.43009"	76°30'41.06947"	1671678.941	662416.373
VR-C	15°06'55.19485"	76°30'42.37151"	1671641.246	662455.508
VR-D	15°06'54.01572"	76°30'42.83403"	1671605.103	662469.567
VR-E	15°06'51.66313"	76°30'46.03279"	1671533.458	662565.567
VR-F	15°06'50.73119"	76°30'55.68811"	1671506.803	662854.037
VR-?	15°07'04.18384"	76°30'29.40186"	1671914.843	662066.388
H-VR	15°06'55.86591"	76°30'47.86853"	1671662.999	662619.486
VR-P	15°07'03.44736"	76°31'27.96179"	1671904.279	663814.902
1A	15°07'00.47485"	76°30'41.73670"	1671803.386	662435.438
2A	15°06'58.37328"	76°30'49.12056"	1671740.316	662656.336
3A	15°06'55.67754"	76°30'47.92921"	1671657.223	662621.338
4A	15°06'51.49745"	76°30'46.05562"	1671528.37	662566.284
5/A	15°06'53.79963"	76°30'42.85593"	1671598.466	662470.266
6A	15°06'55.00540"	76°30'42.36358"	1671635.422	662455.311
7A	15°06'56.48072"	76°30'40.86812"	1671680.455	662410.351
8A	15°06'56.91205"	76°30'40.03576"	1671693.541	662385.409

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Annexure-6: Abstract of Tree Enumeration by RFO Sandur North,

ABSTRACT

Tree Enumeration Corp — Proposed Conveyor Belt & Stock Yard M/s Karnataka State Minerals Limited, Thimmappanagudi Iron Ore Mine, ML No.2605

Sl No	Local Name	Botanical Name	Girth in cm				
			Up to 40 cm	41-60 cm	61-80 cm	Above 81 cm	Grand Total
1	Aligilli	*Wrightia tinctoria*	5	-	-	-	5
2	Ankali Mara	*Jungal wood*	3	-	-	-	3
3	Arali Mara	*Ficus religiosa*	-	-	-	1	1
4	Bargi	*Zizyphus oenoplia*	5	-	-	-	5
5	Basiri	*Ficus racemosa*	11	3	-	5	19
6	Bevu	*Azadirchta indica*	27	22	7	22	78
7	Bhage	*Albizzia lebbeck*	7	2	-	-	9
8	Budure	*Terminalia tomentosa*	233	20	3	2	258
9	Buta	*Excoecaria agallocha*	1	-	-	-	1
10	Chennagi	*Lagerstromia parviflora*	29	-	-	-	29
11	Dhupa	*Boswellia serrata*	2	2	18	17	39
12	Dindal	*Anogeissus latifolia*	373	21	4	-	398
13	Haasina	Hardwickia bianata	3	1	-	-	4
14	Halasina Mara	*Artocarpus Heterophyllus*	1	-	-	1	2
15	Hippe	*Bassia Latifolia*	18	5	-	1	24
16	Honne	*Pterocarpus marsupium*	16	10	2	-	28
17	Hunase	*Tamarindus indica*	1	1	2	-	4
18	Jani	*Grewia tilliaefolia*	48	5	1	-	54
19	Kad Bende	Tetrameles nudiflora	-	2	-	-	2
20	Kad Bikke	*Gardenia latifolia*	2	-	-	-	2
21	Kadu Bende	*Kydia Calycana*	-	-	2	-	2
22	Kakke	*Cassia fistula*	21	2	-	-	23
23	Kamara	*Hardwickia bianata*	6	4	2	1	13
24	Kodale	*Diospyros melanoxylon*	1	3	1	-	5
25	Kothambari	*Jungal wood*	8	-	-	-	8
26	Madakari mara		-	1	-	-	1
27	Maddi	Boswellia serrata	21	5	2	-	28
28	Masivala	*Chloroxylon swietenia*	11	5	1	-	17
29	Matthi	*Terminalia tomentosa*	137	66	5	-	208
30	Mutthie	*Termimalia ellietica*	7	-	-	-	7
31	Nelli	*Embilica officinalis*	17	2	-	-	19
32	Nooli	*Alstonia scholaris*	-	1	-	-	1
33	Pachari	*Dalbergia paniculata*	10	3	-	-	13
34	Palike	*Givotia rottaleriformis*	5	6	3	12	26
35	Sagwani	Tectona grandis	69	5	-	1	75
36	Some	*Soymida febrifuga*	77	5	3	4	89
37	Theraddhu	*Acacia catechu*	111	21	2	-	134
38	Thondarsi	*Gymnosporia montana*	2	-	-	-	2
39	Thumbre	*Diospyros melanoxylon*	17	3	6	-	26
40	Tugali	*Albizzia amara*	20	1	-	-	21
41	Uded	*Stereospermum chelonoides*	70	4	-	-	74
		TOTAL	1395	231	64	67	1757

GUARD
NAGAR BEAT
OR RANGE

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ಸಂಡೂರು

Assistant Conservator of Forest
Bellary Sub Division, Bellary

Annexure-7: R & R progress Report of KSMCL-TIOM

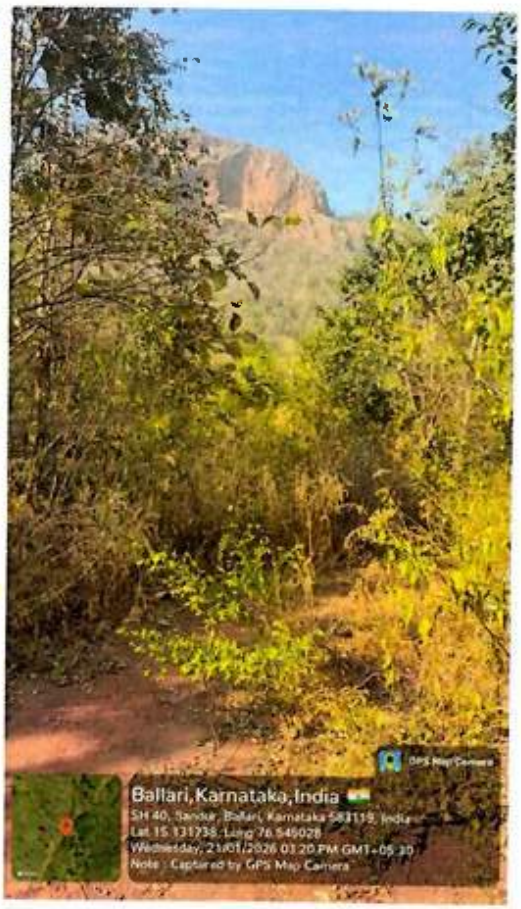
Karnataka State Minerals Corporation Limited **(Erstwhile: Mysore Minerals Limited)** **Thimmappanagudi Iron Ore Mines, ML.No.2605** **R&R Progress Report**						**Date:06.12.2025**
Dump Number	**Particulars of Work**	**Dimension in M**				**Remarks**
		Length in M3	**Width**		**Height**	
			Top	**Bottom**		
Engineering Measures for Encroached Area: (Inactive Dump-D1)	Foundation in hard soil mixed with boulders including hard rock. (Retention Wall)	344/400	2.5	2.5	0.5	As suggested by ICFRE, against 400 mtrs length 344 mtrs length completed. Remaining quantity not done due to thick Forest growth.(86%)
	Plain cement concrete (1:4:8)in foundation (Retention Wall)	344/400	2.5	2.5	0.10	
	Toe Wall RR dry (Retention Wall)	344/400	1.50	2.50	2.00	
	Garland Drain (GD-1)	350/900	Top width 2.00 mtr. Bottom width 1.00 mtr. Centre height 1.00 mtr			Out of 900 mtrs. length at present 350 mtrs length garland drain constructed both inside and outside of Retaining wall as per field condition.
	Plantation over waste dump area	0.82/1.74	Out of 1.74 Ha. Suggested,0.82 Ha. Completed			There is no free area available for plantation all virgin Forest land.
Engineering Measures for dump management (INACTIVE DUMP-D2)	Foundation in hard soil mixed with boulders including hard rock.	411/411	2.50	2.50	0.50	As suggested by ICFRE, 411 mtrs. length completed Retaining wall constructed .(100%)
	Plain cement concrete (1:4:8)in foundation	411/411	2.50	2.50	0.10	
	Toe Wall RR dry	411/411	1.50	2.50	2.00	
	Garland drain (1m bottom width, 2m top width and 1m deep in inclined chutes)	254/822	Top width 2.00 mtr. Bottom width 1.00 mtr. Centre height 1.00 mtr			Out of 822 mtrs. length at present 254 mtrs length garland drain constructed both inside and outside of Retaining wall as per field condition.
	Providing & fixing geo-textile on outer surface of slope of waste dump	1.78/1.78 Ha	1.78Ha			As suggested by ICFRE 1.78 Ha. Coir mating work completed.
	Plantation over waste dump area	4.78/17.75	4.78Ha.			As suggested by ICFRE out of 17.75 Ha, 4.78Ha. plantation work completed. For balance there is no free space available for plantation.

	Providing & fixing geo-textile on outer surface of slope of waste dump	2.0/2.0Ha.	2 0 Ha			As suggested by ICFRE 2.0 Ha. Coir mating work completed
Engineering Measures for dump management :(ACTIVE DUMP-D3)	Foundation in hard soil mixed with boulders including hard rock.(Retention Wall)	300/1320	3.00	3.00	1.00	According to site condition at present 300 mtrs Length Retaining wall constructed remaining length will be constructed concurrent mining work Since it is a Active dump
	Plain cement concrete (1:4:8)in foundation (Retention Wall)	300/1320	3.00	3.00	0.15	
	Toe Wall RR dry (Retention Wall)	300/1320	1.50	3.00	3.00	
	Garland drain (1m bottom width, 2m top width and 1m deep in inclined chutes)	220/9484	Top width 2.00 mtr Bottom width 1.00 mtr Centre height 1.00 mtr			At present 220 mtrs. length garland drain in side of Retaining wall constructed according to site condition
	Providing & fixing geo-textile on outer surface of slope of waste dump	1.94/10.70Ha.	1.94 Ha.			As present 1.94 Ha. Coir mating work completed according to site condition
	Plantation over waste dump area	1.94./10.70Ha.	1 94 Ha.			At present 1.94 Plantation work completed for remaining portion dumping are is not available Since it is a active dump.
Engineering Measures for dump management :(ACTIVE DUMP-D4)	Foundation in hard soil mixed with boulders including hard rock. (RW)	878/885	3.00	3.00	1.00	Total proposed 885Mtrs achieved 878Mtrs, remaining 7mtrs not done, due thick forest and steep ground elevation
	Plain cement concrete (1:4:8)in foundation (RW)	878/885	3.00	3.00	0.15	
	Toe Wall RR dry (RW)	878/885	1.50	3.00	3.00	
	Garland drain (1m bottom width, 2m top width and 1m deep in inclined chutes)	0/7444	–	–	–	GD in dump terraces, can be taken up only after completion of dumping in stages
	Garland drain (1m bottom width, 2m top width and 1m deep in all terraces)	370/370	Top width 2.00 mtr. Bottom width 1.00 mtr. Centre height 1.00 mtr			Out side 200 mtrs. completed and inside 170 mtrs. trenches is formed
	Providing & fixing geo-textile on outer surface of slope of waste dump	0/18.95 Ha	–	–	–	Since it is a active dump coir mating will be taken up only after the dump is inactive.
	Plantation over waste dump area	0/18.95 Ha.	–	–	–	Since it is a active dump Plantation work will be taken up only after the dump is inactive.
Engineering Measures for Surface Water Management :(INACTIVE DUMP)	Gully Plug	24/34 No's	–	–	–	24 Nos. Gully Plugs constructed with various dimensions as per field condations at outside the mine lease area.(71%)
	Masonry Check Dam (12Mtrs 7Nos & 15Mtrs 2Nos)	9/9 No's	–	–	–	As suggested by ICFRE in R & R plan 9 Nos. of Masonry Check Dams was constructed with various dimensions as per field conditions at outside the mine lease area.(100%)
	Rock fill Check Dam (10Mtrs 3Nos & 12Mtrs 5Nos)	8/8 No's	–	–	–	As suggested by ICFRE in R & R plan 8 Nos. of Rock fill Check Dams was constructed with various dimensions as per field conditions at outside the mine lease area.(100%)
	Settling tank	1/1No.	30.00	15.00	3.00	1No. Setling Tank constructed at inside the mine lease area as per field condition.
Afforestation	Avenue Plantation on roads	3.0Ha/3.0 Ha				a) 2.0 Ha. Avenue plantation work completed as per field condition. b) 1.00Ha Avenue plantation on roads work done (area is completed. (100%))
	Afforestation of mined out area	0/95.69 Ha.				This will be taken up after closure of mining at present backfilling work is under progress
	Mine pit Bench Plantation	0/48.70 Ha.				This will be taken up concurrent to mining.
	Developing green belt in safety zone	5.20 Ha/5.20 Ha.				As suggested by ICFRE in R & R plan 5 20 Ha. Of plantation work at safety zone area is completed (100%)

9. PLATES

Plate-1. Images of Flora around KSMCL-TIOM

Plate-1.1



Crotalaria sandoorensis found in the valley around KSMCL-TIOM area

Eranthemum roseum

Lagerstroemia lanceolata

Rhinacanthus nasutus

Plate-1.2 Images of Flora around KSMCL-TIOM

Stachytarpheta jamaicensis

Gardenia gummifera

Crotalaria pallida

Andrographis paniculata

Carissa carandas

Grewia hirsuta

Calotropis gigantica

Ziziphus oenoplea

Vachelia nilotica

Plate-1.3 Some fruits & Flowers of the forest around TIOM

***Balanites roxburghii* (ಇಂಗಳಾರ)**

***Grewia flavescens* (ಕರ್ಕಲಿ),**

***Wrightia tinctoria* (ಬೆಪ್ಪಾಲೆ)**

***Ageratum conyzoides* (Goat Weed)**

***Strobilanthes pavala* (ನವಿಲು ಪುಷ್ಪ)**

***Canthium parviflorum* (ಕಾರೆ)**

Plate-2 Invasive Exotic Species (IES) of Weeds

Lantana camara (Lantane-ಹುಂಡಿ, ಚದುರಂಗ)

American Basil-
Mesosphaerum suaveolens

Neltuma juliflora (Ballari Jali)

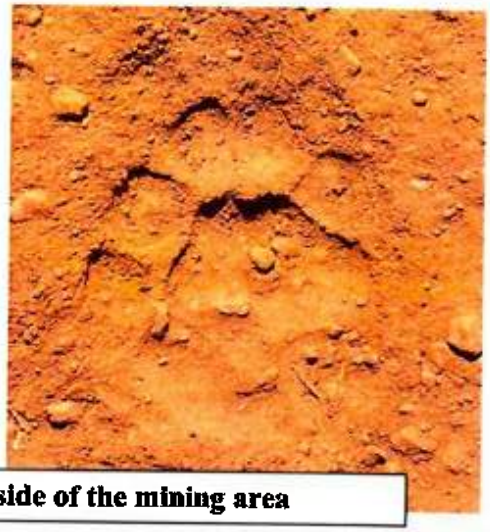
Chromolaena odorata (Devil Weed)

Parthenium hysterophorus

Plate-3 **Indirect evidences of Wildlife around KSMCL-TIOM**

Digging of Termite mound bySloth Bear

Faecal matter of Sloth bear



Pug mark of a Leopard outside of the mining area

Pug marks of Indian Leopard in the dried stream near the Conveyor belt area

Foot marks of Sloth bear on the road outside of the mining area

Plate-4 Four-horned Antelope recorded in Camera traps around the Mining Lease area of TIOM

Male Four Horned Antelope near the Curve-1

Female Four Horned Antelope near the Curve-1

FHA mother and kid near Ganesh Gudi

Female FHA

Male Four Horned Antelope near the Curve-1

Plate-5 **Wildlife found in Camera traps around the Mining Lease area of TIOM**

Indian Leopard near Plantation area and in the valley of conveyor belt

Indian Sloth Bear near check dam and in the conveyor belt valley

Plate-6 Rusty-spotted Cat and Jungle cats found in the Study area

Rusty-spotted Cat near Ganesh Gudi

Rusty-spotted Cat in the valley near proposed Conveyor Belt

A Jungle Cat near Check Dam

A Jungle Cat in the valley near proposed Conveyor Belt

Plate-7 **Small Indian Civet in Camera traps in and around the Mining Lease area of TIOM**

S.I. Civet near Check Dam

Small Indian Civet in the mining area

A pair of Small Indian Civet near Ganesh Temple

Small Indian Civet near the Curve-1

Small Indian Civet behind Singanakere

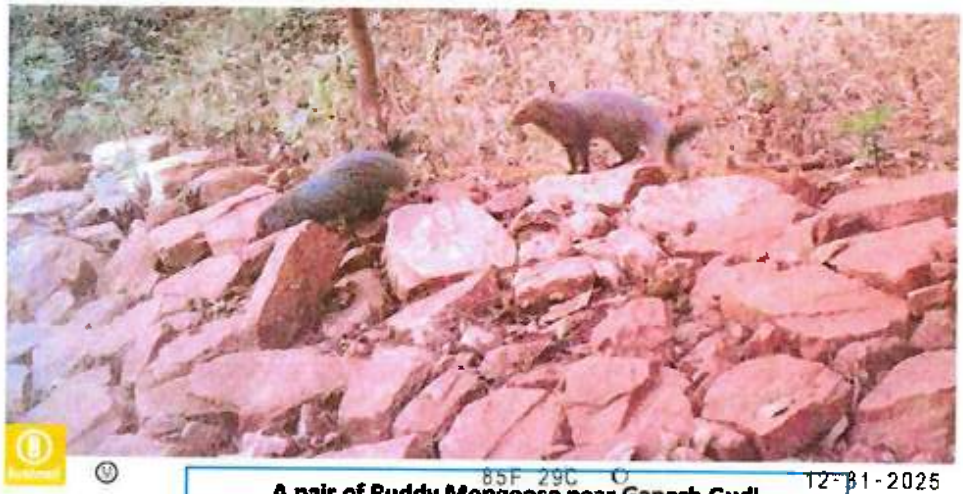
Plate-8 **Small Indian Civet in Camera traps in and around the Mining Lease area of TIOM**

Asian Palm Civet at Curve-1

A pair of Asian Palm Civet near Ganesh Temple

Droppings of Asian Palm Civet at Curve-1

Plate-9 **Common Mongoose and Ruddy Mongoose in Camera traps in and around the Mining Lease area of TIOM**



A pair of Ruddy Mongoose near Ganesh Gudi

Ruddy Mongoose near Curve-1

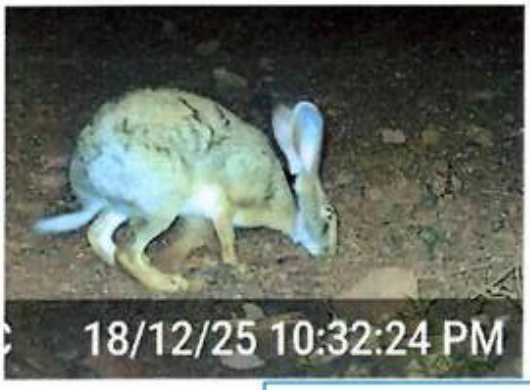
Common Mongoose near Check Dam

Common Mongoose near Ganesh Gudi

Plate-10 **Other Mammals and Reptiles found in Camera traps in and around the Mining Lease area of TIOM**

Bonnet Macaque

Tufted Gray Langur



Black-naped Hares in the Singanakere Area

Monitor Lizard in the Singanakere Area

Plate-11 **Other Mammals and Reptiles found in Camera traps in and around the Mining Lease area of TIOM**

Indian Crested Porcupine near Conveyor belt valley

Indian Crested Porcupine near Check Dam

Indian Crested Porcupine behind Singanakere

Indian Crested Porcupine near Conveyor belt valley

Indian Crested Porcupine near the check dam

Plate-12 **Wild Boars found in Camera traps in and around the Mining Lease area of TIOM**

A Wild Boars in the Singanakere area

A Wild Boars near Check dam

Wild Boars in conveyor belt valley

Wild Boars in the conveyor belt area

A sounder of Wild Boars near Check dam

Plate-13 **Installation of Camera Traps in and around the Mining Lease area of TIOM**

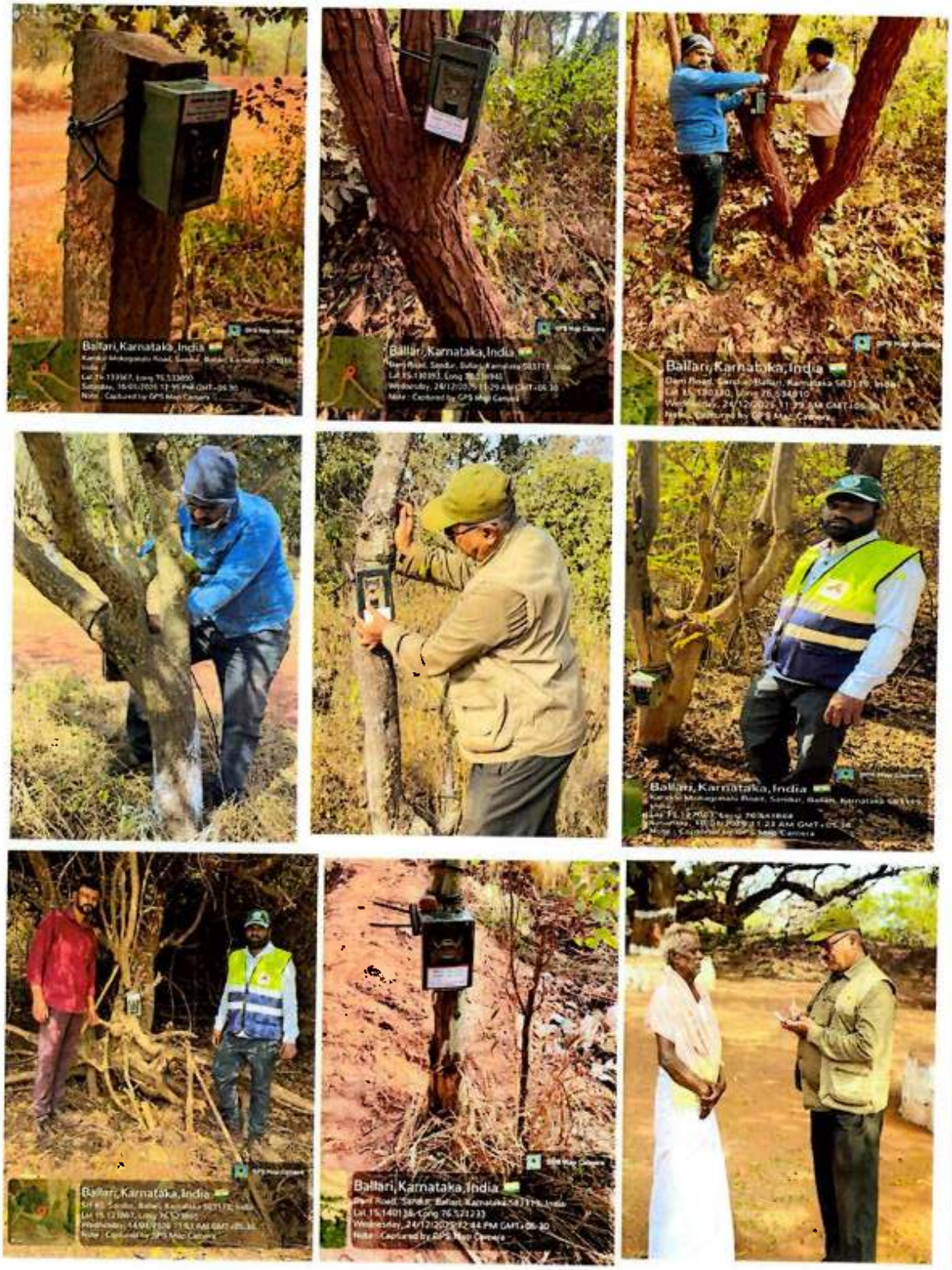


Plate-14 Some Reptiles found around KSMCL-TIOM area

Indian Chameleon

Spotted supple skink

Green Vine Snake

Star Tortoise

Monitor Lizard

Plate-15 Images of some birds found around KSMCL-TIOM

White-spotted Fantail

Peacock at the entrance

Pied Bushchat

Spotted Dove

Indian Grey Hornbill

Ashy Drongo

Indian paradise flycatcher-female

Plate-16 Some images of mining area of KSMCL-TIOM

KSMCL-TIOM Entrance gate

KSMCL-TIOM Entrance from main road

Thimmappana Gudi located in side of KSMCL-TIOM

KSMCL-TIOM road inside the lease area

Plate-17 Awareness Program by TIOM

TB Awareness Camp in Mines

Swacchata Programme Awareness for Employees

Plate-18 R & R images of KSMCL-TIOM

Stabilisation of the waste dump slopes

Check dams of KSMCL-TIOM

Retention wall to prevent soil erosion

Plate-19 R & R images of KSMCL-TIOM

Plate-20 Soil & Moisture Conservation works by KSMCL- TIOM

Plate-21 **Settling Tank of KSMCL-TIOM**

Plate-22 **Nursery of KSMCL-TIOM**

Plate-23 Plantation works of KSMCL-TIOM

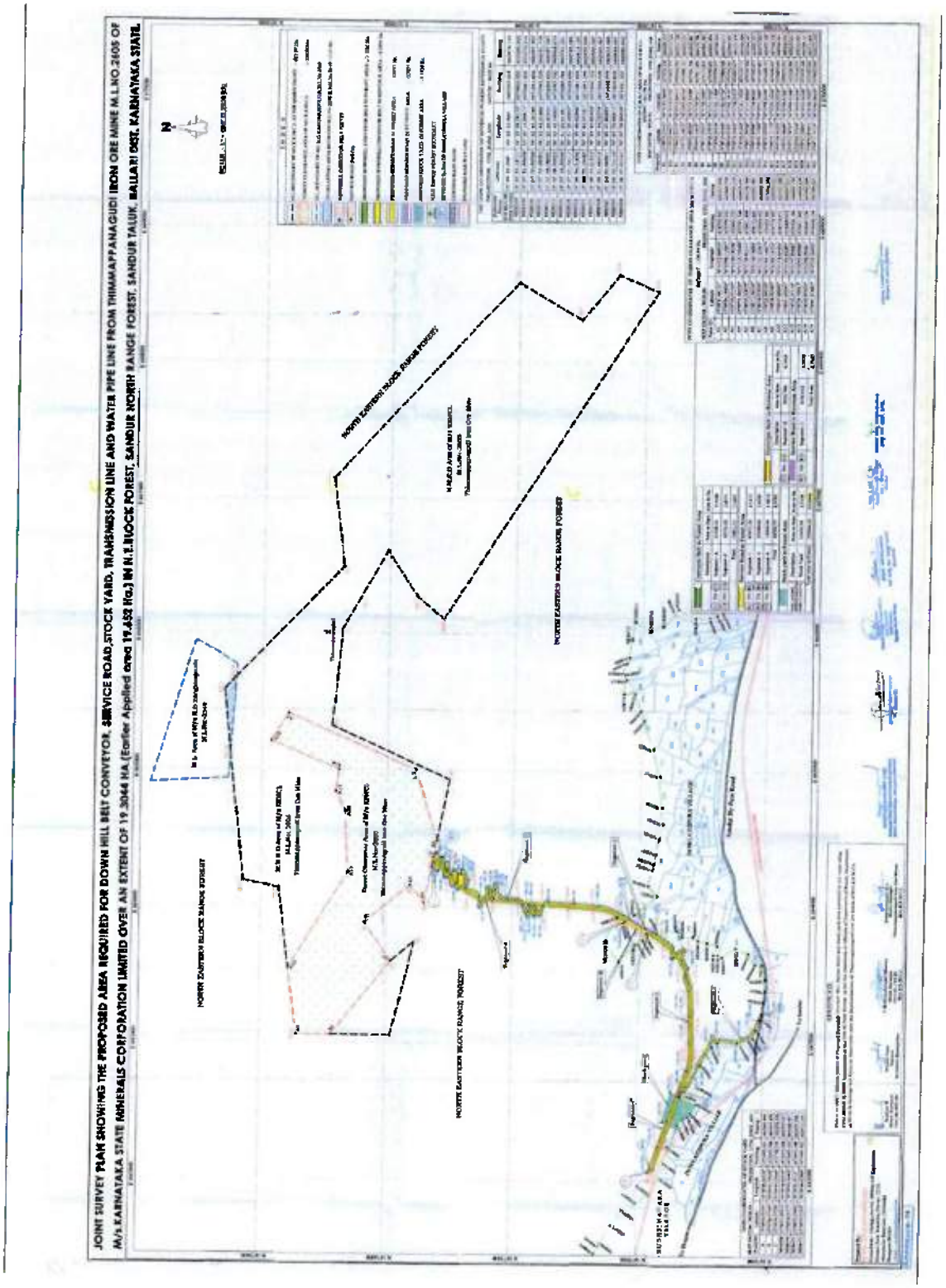
Plantation

Plate-24 Plantation works of KSMCL-TIOM

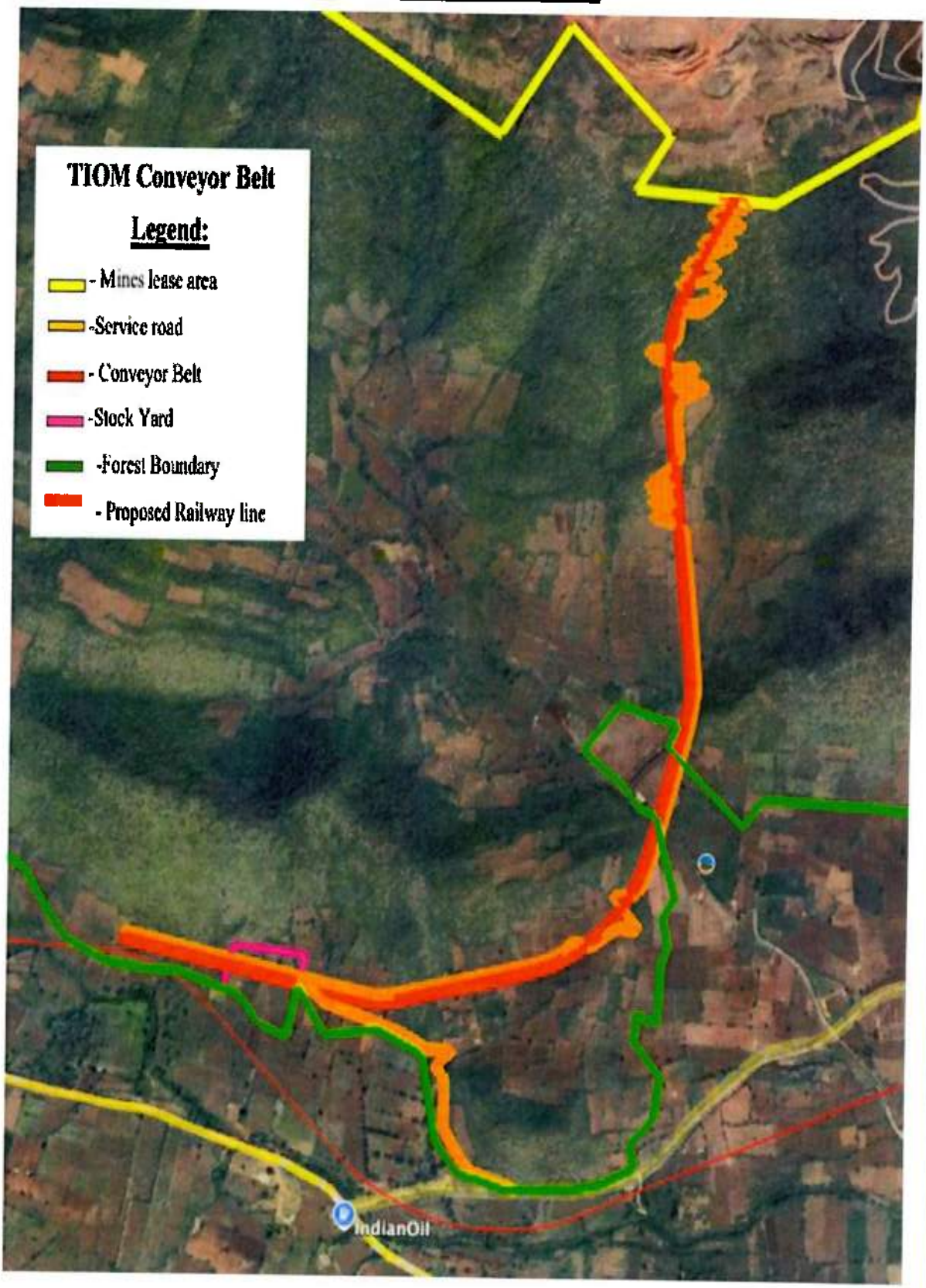
Plate-25 Sprinkling water on mining road to suppress dust

10. MAPS:

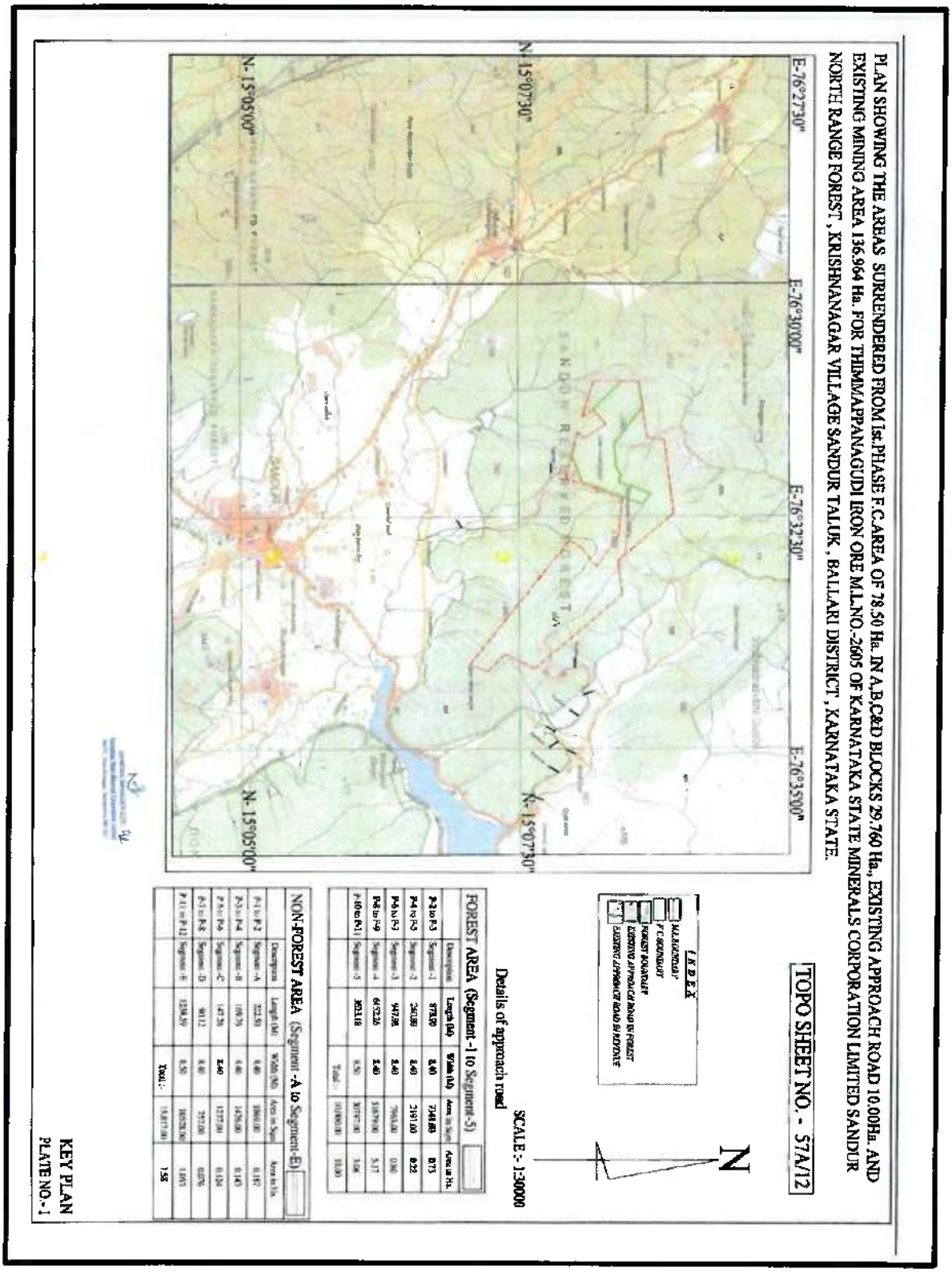
Map-2. Joint Survey Map of the proposed Conveyor Belt and Service Road of TIOM:



Map-3: Satellite Map of Existing Road of TIOM:



Map-4: Toposheet of Existing Road of KSMCL TIOM:



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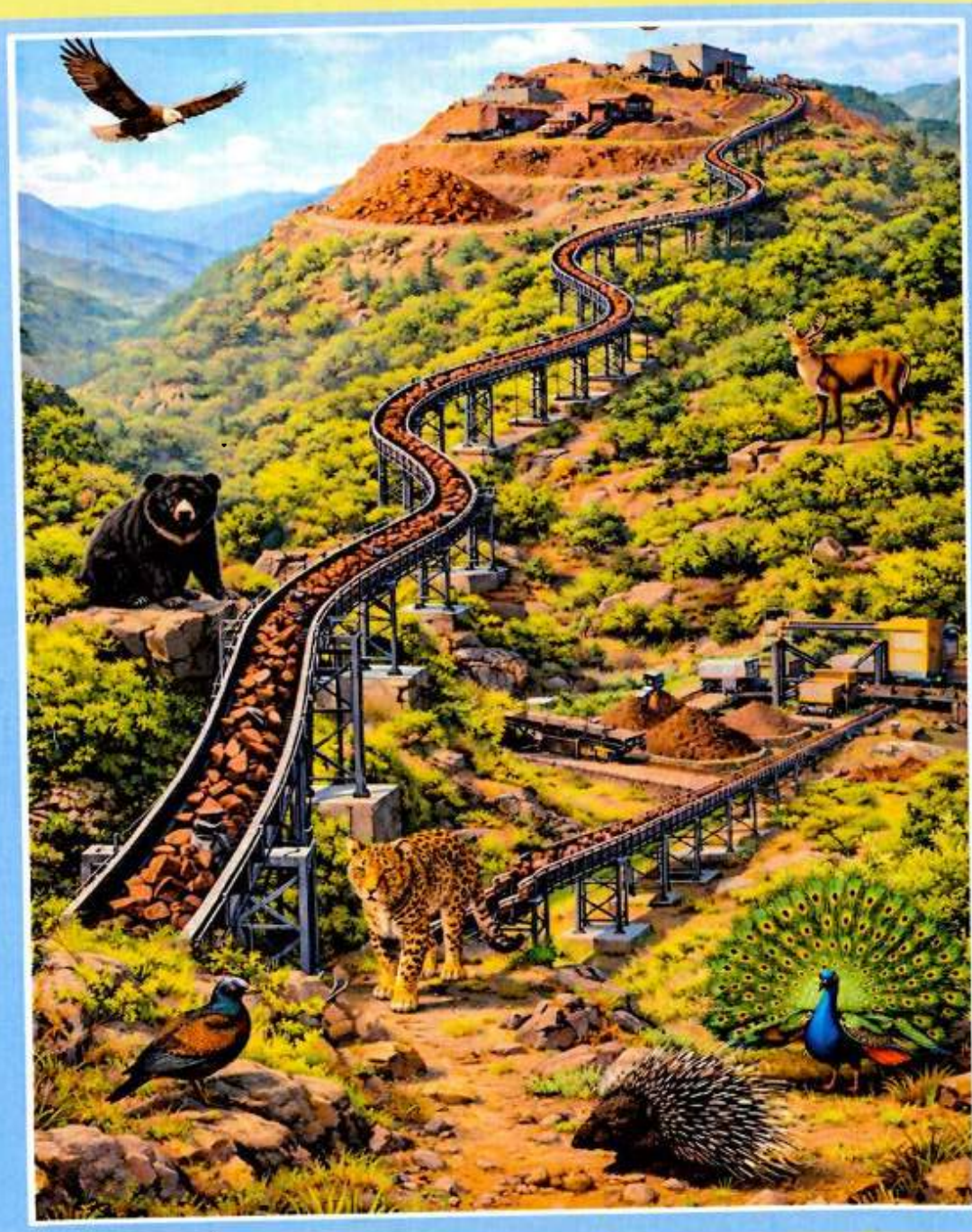
Wildlife Management Plan for 19.3044 ha Downhill Conveyor belt and Service road of Thimmappanagudi Iron Ore Mines (KSMCL-TIOM),ML No. 2605 Sandur, Ballari district, Karnataka.



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