By Speed Post/e-mail

GOVERNMENT OFODISHA
FOREST, ENVIRONMENT & CLIMATE CHANGE DEPARTMENT
*****

No. FE-DIV-FLD-0101-2021-34751 /FE&CC, Date 27 NOV 2025
10F(Cons)179/2015

From

Shri K.S Pradeep, IFS
Director, Environment-cum-Special Secretary to Government

To

The Assistant Inspector General of Forests (FC),
Govt. of India, MoEF&CC (F.C. Division),
Indira Paryavaran Bhawan, Jor Bagh Road,
Aliganj, New Delhi-110003.

Sub: Proposal for seeking prior approval of the Central Government under Section 2 (1) (ii) of the Van (Sanrakshan Evam Samvardhan) Adhiniyam, 1980 for diversion of balance forest land of 89.961 ha (Fresh area 79.367 ha and 10.594 ha earlier diverted area for renewal and land use change) (originally proposed area of 84.707 ha) in favour of Shri Avin Jain (Heir of late Shri DC Jain) for mining of Iron and Manganese Ore in Dalpahar Iron & Manganese Ore Mines located in Baitrani RF II, District Keonjhar (Odisha)-regd.

Ref: Letter F.No.8-31/2015-FC dtd.14.11.2025 of AIG of Forests, Govt. of India, MoEF&CC(FC Division), New Delhi

Sir,

In inviting a reference to the captioned subject, I am directed to inform that with reference to the letter referred under, the Addl. PCCF (FD&NO, FC Act), O/o the PCCF & HoFF, Odisha vide letter No.23696/9F (MG)-18/2025, dtd.25.11.2025 has intimated that based on the decision of the Advisory Committee, the authorized signatory of the project proponent has submitted certain submissions for reconsideration of its decision dated 27.10.2025 of MoEF & CC, GoI, New Delhi and reqeusted to kindly move to Govt. of India, MoEF&CC, New Delhi for re-consideration of the decision of the Advisory Committee dtd.27.10.2025 for diversion of additional 79.367 ha virgin forest land.

In view of the above, a copy of the aforesaid letter dtd.27.10.2025 of Addl. PCCF (FD&NO, FCA), O/o the PCCF & HoFF, Odisha along with its annexures are sent herewith for kind information and further necessary action by the Ministry.

Yours faithfully,

27/11/25

Director, Env.-cum-Special Secretary to Government

(PTO)

Memo No. 34752 / FE&CC, Date 27 NOV 2025

Copy forwarded to the Deputy Director General of Forests (Central), Government of India, Ministry of Environment, Forests & Climate Change, Regional Office, A/3, Chandrasekharpur, Bhubaneswar-23 for information and necessary action.

Director, Env.-cum-Special Secretary to Government

Memo No. 34753 / FE&CC Date 27 NOV 2025

Copy forwarded to the Principal Chief Conservator of Forests (Wildlife) & Chief Wildlife Warden, Odisha/ Addl. Principal Chief Conservator of Forests (FD&NO, FC Act), O/o the PCCF & HoFF, Odisha for information and necessary action.

Director, Env.-cum-Special Secretary to Government

Memo No. 34754 /FE&CC, Date 27 NOV 2025

Copy forwarded to the Steel & Mines Department/ Director, Environment-cum-Special Secretary to Govt., FE&CC Department/ Member Secretary, SPCB, Odisha/ Collector, Keonjhar for information and necessary action.

Director, Env.-cum-Special Secretary to Government

Memo No. 34755 /FE&CC, Date 27 NOV 2025

Copy forwarded to the Regional Chief Conservator of Forests, Rourkela Circle/ Divisional Forest Officer, Keonjhar Forest Division for information and necessary action.

Director, Env.-cum-Special Secretary to Government

Memo No. 34756 /FECC, Date 27 NOV 2025

Copy forwarded to Avin Jain, POA, C/o-Dharamchand Jain (Mining Lessee), Dharam villa, 12-A, Mahatma Gandhi Marg, Ring Road, Lajpat Nagar-IV, New Delhi-110024 for information and necessary action.

Director, Env.-cum-Special Secretary to Government

32284/FE/25
26/11/2025

STATE FOREST HEADQUARTERS, ODISHA
OFFICE OF THE PRINCIPAL CHIEF CONSERVATOR OF FORESTS & HoFF
PLOT NO. GD-2/12, ARANYA BHAWAN, CHANDRASEKHARPUR
BHUBANESWAR-751023
E-mail-: nodal.pccfodisha@gmail.com

ADDITIONAL CHIEF SECRETARY TO GOVT. ★ FOREST, ENV. & CLIMATE CHANGE DEPT. ★ 25 NOV 2025

No. 23696 /9F (MG) – 18/2015
Dated, Bhubaneswar the 25th November' 2025

From

Dr. K. Murugesan, IFS
Additional Principal Chief Conservator of Forests
(Forest Diversion & Nodal Officer, FC Act)
O/o the PCCF & HoFF, Odisha, Bhubaneswar

To

The Additional Chief Secretary to Government
Forest, Environment & Climate Change Department
Govt. of Odisha, Kharavel Bhawan
Bhubaneswar, Odisha

Sub:- Proposal for seeking prior approval of the Central Government under Section 2(1) (ii) of the Van (Sanrakshan Evam Samvardhan) Adhiniyam, 1980 for diversion of balance forest land of 89.961 ha (fresh area 79.367 ha and 10.594 ha earlier diverted area for renewal and land use change) (originally proposed area of 84.707 ha) in favour of Shri Avin Jain (heir of late Shri DC Jain) for mining of Iron and Manganese Ore in Dalpahar Iron & Manganese Ore Mines located in Baitarani RF-II, District-Keonjhar – Advisory Committee observations/decision dated 14.11.2025 regarding.

Ref:- (i) F.No. 8-31/2015-FC dated 14.11.2025 of the Assistant Inspector General of Forests, Government of India, MoEF& CC (FC Division), New Delhi.
(ii) Memo No. 34266/FE&CC dated 20.11.2025 of the Director, Environment-cum-Special Secretary to Government, FE&CC Department.
(ii) Representation dated 20.11.2025 of the Authorised Signatory, Dalpahar Iron & Manganese Ore Mines, Keonjhar addressed to the Addl. Director General of Forests, MoEF & CC, GoI, New Delhi. (copy enclosed).

Sir,

In inviting a reference to the above mentioned subject, it is to inform that the Advisory Committee vide its meeting held on 27.10.2025 have communicated the following decision vide letter dated 14.11.2025 -:

"Accordingly, keeping in view the recommendations of the Advisory Committee and approval of the same by the competent authority in the ministry, it has been decided that the proposal for diversion of additional 79.367 ha virgin forest land cannot be accepted in the present proposition and the state may therefore restrict the mining operations to the 10.594 ha forest land which has already been diverted".

Based on the above decision of the Advisory Committee, the authorized signatory of the project proponent addressed to the Addl. Director General of Forests, MoEF & CC, GoI, New Delhi and others has humbly submitted the following points for kind reconsideration of its decision dated 27.10.2025-:

That, the mining operation within the already diverted forest land over 10.594 ha is technically infeasible, operationally unsafe, and inconsistent with scientific mining norms, as supported by authoritative technical evidence, including the independent scientific study conducted by IIT (ISM) Dhanbad. The IIT(ISM) Dhanbad has carried out a study on "Geotechnical Feasibility, Slope Stability Analysis, and Environmental Impact Mechanism Study for Proposed Lateral Mining at Dalpahar Iron and Manganese Ore Mine, Odisha" (enclosed as **Annexure-I**).

Accordingly, the authorized signatory of the project proponent has put forth the following submissions for kind consideration:-

1. Safety and Geotechnical Considerations to ensure secure and efficient mining operations (Supported by IIT-ISM Report)

The IIT(ISM) Dhanbad report states that scientific mining is not feasible within the limited 10.594 ha area due to the following reasons-:

- The existing pit has already reached geotechnical stability limits, and further deepening will create unsafe bench configurations and continuing mining within this confined zone will result in:
  - High bench and slope failure risks, as deepening without lateral expansion will reduce the minimum Factor of Safety (1.5) mandated under DGMS Circular 3/2020.
  - Violation of DGMS Regulation 106(2) (b) of the Metalliferous Mines Regulations, 1961.
  - Increased likelihood of accidents and unsafe working conditions.
- The study concludes that mining in the current diverted area is neither safe nor technically viable, and expansion into the adjoining mineralized zone is essential to maintain slope stability and ensure worker safety. Therefore, our humble request is to allow diversion of additional 79.367 ha for non-forest use for safety and legally compliant mining.

2. Mining of the ore body extending beyond the present broken up area in virgin forest area of 79.367 ha for ecological restorations, resource recovery, economic viability and operational safety vis-à-vis technical Non-Feasibility of Restricting Operations to 10.594 ha.

The authorized signatory of the project proponent has further submitted that, comparatively, controlled lateral (parallel) mining provides wide benches, safer slopes, and improved air-noise dispersion, reduced erosion, and adequate space for essential environmental infrastructure. It would enable phased backfilling, terracing, and continuous reclamation, ensuring

long-term slope stability and ecological restoration. Lateral expansion will also facilitate resource recovery, economic viability, and operational safety.

This later expansion is only possible with the kind permission of Advisory Committee to allow diversion of additional 79.367 ha for non-forest use.

- At the same time, it is informed that 2005 diversion of 10.594 ha was based only on existing old manual workings prior to 1980, not on actual geological continuity based on scientific mining.
- The IIT-ISM technical evaluation and the Approved Mining Plan confirm that:
  - The ore body extends substantially beyond the previously diverted patches and whatever ore remain within the diverted area can't be mined due to the restriction of the Pit boundary within the diverted area only
  - Several patches within the diverted area are exhausted or non- mineralised.
  - Individual patches-seven out of eight being less than 1 ha-are inadequate to support safe or scientific mechanised mining.

Therefore, restricting mining to the existing diverted area would simultaneously result in unscientific, unsafe and economically non-viable operations.

3. Compatibility with the Approved Mining Plan and Statutory Requirements

- The Approved Mining Plan (IBM) mandates integrated development of the mine in the mineralised zone, requiring 34.897 ha by April 2026 for face advancement, haul road development, approach roads to ore zones, Infrastructure such as workshop and office and Overburden handling and reclamation. Confined operations within 10.594 ha will directly contradict this statutory plan, approved by IBM. The plan is enclosed as **Annexure-II.**

Adherence to the IBM-approved plan would require the unbroken forest land of 79.367 ha and compliance to Rule 11 of the MCDR, relating to scientific and systematic mining.

Further, the Deputy Director of Mines, Joda Circle reported that out of the total mining lease area of 89.961 ha (coming under Baitarani Reserve Forest) working is confined in diverted forest area of 10.594 ha (already broken up) which has been divided in to 8 small and scattered blocks, roads and safety zone. Now, working is continuing in 8 pits and working pits have reached their restricted boundaries. Hence, currently there is no scope for lateral or vertical expansion of the above working pits within the existing diverted forest area for achieving the proposed production target without forest clearance for the remaining lease area. He also requested the Mines Manager, Dalpahar Iron and Manganese Mines to obtained forest clearance for remaining part of the lease to avoid the violation. The copy of the letter of DDM, Joda Circle is enclosed as **Annexure-III.**

4. Environmental Implications of Restricted Working

The project proponent has further reiterated that operating only in the existing broken area will increase, rather not decrease, environmental impact:

- Creation of unstable slopes due to forced deepening.
- Poor drainage, erosion, and runoff issues.
- Inefficient waste disposal due to lack of space.
- Inability to execute progressive reclamation or final pit design.

By contrast, controlled expansion into the proposed 79.367 ha will enable:

- Systematic benching and waste management
- Stable slope design
- Proper drainage and erosion control
- Timely reclamation and post-mining restoration.

This approach is more aligned with long-term ecological stability.

4. Socio-Economic and Regulatory Implications of Mining as per the Approved Plan

- The mining operation, when executed as per the approved plan, supports a large workforce across all skill categories. Apart from essential technical personnel such as operators, mechanics, welders, fitters and electricians, the mine provides daily employment to nearly 400 unskilled & semi-skilled workers engaged in ore dressing, sorting of Manganese Ore. Any restriction on the operational area will significantly jeopardise these livelihood opportunities for local communities in the Keonjhar district.

Reduced production will lead to a decline in statutory revenue to the Government of Odisha, including royalty, DMF, NMET, GST and other levies that directly contribute to regional development.

It will also affect compliance with NPV, CAMPA and Compensatory Afforestation commitments already undertaken, which is calculated on the entire forest land in Block "A", including applied forest land of 79.367 ha. The User Agency has deposited **Rs 15,62,13,308/-** as Compensatory levies, NPV and other charges.

- Operational constraints will also restrict the Company's ability to undertake CSR and community development initiatives in nearby villages, thereby depriving local populations of critical support in healthcare, education, drinking water, skill development, and livelihood enhancement programmes.
- Further, restricting mine operations will adversely impact compliance with statutory environmental obligations, including NPV, CAMPA and Compensatory Afforestation commitments that have already been undertaken and financially provisioned.

6. Precedents of Forest Diversion in the Same Landscape that has facilitated in scientific mining and in adding to the economic gain of all the stakeholders.

In similar geo-ecological conditions, large forest diversions have been approved for scientifically managed mines:

- Tata Steel-Joda West Manganese Mine: 436.678 ha
- Tata Steel-Khondbond Iron Mine: 453.150 ha
- Shree Metaliks - Khondbond Iron Mine: 35.774 ha
- OMC-Tiringpahar Iron Mine: 79.300 ha
- OMC Khondbond Iron Mine: 292.578 ha

Dalpahar's proposed diversion of 79.367 ha is modest compared to these precedents and is also proposed to be fully consistent with ecological and regulatory norms applied in the region.

It is pertinent to mention that the Government of Odisha has extended the validity of the entire lease up to 8th June, 2036.

It will not be out of place to mention that over 63% of national manganese demand is import-dependent. And allowing Dalpahar Iron & Manganese Mine to operate on scientifically over the entire lease area of 89.96 ha will reduce the import dependency, ensuring constant supply to the numerous Steel industries of the area.

Based on the facts cited above, it is submitted to kindly move Govt. of India, MoEF & CC, New Delhi for re-consideration of the decision of the Advisory Committee dated 27.10.2025 for diversion of additional 79.367 ha virgin forest land.

Encl: Compliance in two sets

Yours faithfully

Additional Principal Chief Conservator of Forests
(Forest Diversion and Nodal Officer, FC Act)

Memo No. 23697 / Dt. 25-11-2025

Copy forwarded to the Assistant Inspector General of Forests (FC), Government of India, Ministry of Environment, Forests & Climate Change (F.C. Division), Indira Paryavaran Bhawan, Aliganj, Jor Bagh Road, New Delhi-110003 for favour of kind information and necessary action with reference to F.No. 8-31/2015-FC dated 14.11.2025 of the Assistant Inspector General of Forests, Government of India, MoEF& CC (FC Division), New Delhi.

Additional Principal Chief Conservator of Forests
(Forest Diversion and Nodal Officer, FC Act)

Memo No. 23698 /Dt. 25-11-2025

Copy forwarded to the Regional Chief Conservator of Forests, Rourkela Circle for information and necessary action with reference to Memo No. 34269/FE&CC dated 20.11.2025 of the Director, Environment-cum-Special Secretary to Government, FE&CC Department.

Additional Principal Chief Conservator of Forests
(Forest Diversion and Nodal Officer, FC Act)

Memo No. 23699 /Dt. 25-11-2025

Copy forwarded to the Divisional Forest Officer, Keonjhar Forest Division for information and necessary action with reference to Memo No.34269/FE&CC dated 20.11.2025 of the Director, Environment-cum-Special Secretary to Government, FE&CC Department.

Additional Principal Chief Conservator of Forests
(Forest Diversion and Nodal Officer, FC Act)

Memo No. 23700 /Dt. 25-11-2025

Copy forwarded to Avin Jain, POA, C/o Dharamchand Jain (Mining Lessee), Dharam Villa, 12-A, Mahatma Gandhi Marg, Ring Road, Lajpat Nagar IV, New Delhi-110024 for information and necessary action with reference to F.No. 8-31/2015-FC dated 14.11.2025 of the Assistant Inspector General of Forests, GoI, MoEF & CC (FC Division), New Delhi Memo No. 34270/FE&CC dated 20.11.2025 of the Director, Environment-cum-Special Secretary to Government, FE&CC Department.

Additional Principal Chief Conservator of Forests
(Forest Diversion and Nodal Officer, FC Act)

Annexure-I

A REPORT

ON

Integrated Geotechnical, Environmental, and Resource Evaluation for Lateral Expansion of Dalpahar Iron and Manganese Ore Mine, Odisha

FOR

(M/s DC JAIN)
M/S AVIN JAIN

PREPARED BY

INDIAN INSTITUTE OF TECHNOLOGY (INDIAN SCHOOL OF MINES)

DHANBAD

JHARKHAND-826004

NOVEMBER, 2025

भारतीय प्रौद्योगिकी संस्थान (भारतीय खनि विद्यापीठ), धनबाद
धनबाद, झारखण्ड, भारत, पिन – 826004
INDIAN INSTITUTE OF TECHNOLOGY (INDIAN SCHOOL OF MINES),
DHANBAD DHANBAD, JHARKHAND, INDIA, PIN – 826004
(An Autonomous Institute under Ministry of Education, Govt. of India)

CERTIFICATE OF WORK

This is to certify that work entitled "**Integrated Geotechnical, Environmental, and Resource Evaluation for Lateral Expansion of Dalpahar Iron and Manganese Ore Mine, Odisha**" has been carried out by the Department of Mining Engineering & Environmental Science and Engineering, IIT(ISM), Dhanbad.

Prof. Santosh Kumar Behera
Assistant Professor
Department of Mining Engineering
Indian Institute of Technology (ISM)
Dhanbad-826004

Prof. Brijesh Kumar Mishra
Associate Professor
Dept of Environmental Science & Engg.
Indian Institute of Technology (ISM)
Dhanbad-826004

Date: 18/11/2025

ACKNOWLEDGEMENT

I would like to express my deepest gratitude to all those who contributed to the successful completion of this scientific report on the iron ore mining industry.

Firstly, I extend my sincere thanks to **(M/s DC Jain) M/s Avin Jain, Odisha**, for providing the necessary resources, facilities, and access to industry-specific data. Their support has been invaluable in carrying out this study.

I am particularly grateful to **Mr. Avin Jain, Managing Director, Mr. S N Mohanty, Vice President, Mr. Utpal Jana, Mine Manager** for their insights, encouragement, and continued guidance throughout the course of this project. Their expertise and commitment greatly contributed to the quality and completeness of this work.

I extend my appreciation to the **Director of IIT(ISM) Dhanbad, the Dean (R&D), IIT(ISM) Dhanbad,** and other officials of the institute for their moral and technical support during the course of this study.

Finally, I express my gratitude to the various scientific agencies whose reports and data have contributed significantly to the preparation of this document.

Prof. Santosh Kumar Behera
Assistant Professor
Department of Mining Engineering
Indian Institute of Technology (ISM)
Dhanbad-826004

Prof. Brijesh Kumar Mishra
Associate Professor
Dept of Environmental Science & Engg.
Indian Institute of Technology (ISM)
Dhanbad-826004

DISCLAIMAR

The conclusions and recommendations presented in this report are based on the integrated scientific assessment carried out jointly by faculty members of IIT (ISM) Dhanbad, covering both **mining feasibility and slope stability aspects** (as evaluated by **Prof. Santosh Kumar Behera**) and **environmental impact mechanisms and sustainability considerations** (as evaluated by **Prof. Brijesh Kumar Mishra**). These findings are supported by site inspections, discussions with project personnel, review of mining operational practices, and evaluation of documents including the Geological report, EIA/EMP report for the Dalpahar Iron and Manganese Ore Mines.

This report also utilizes secondary information, mine plans, geological sections, production records, and operational details supplied by the project proponent. Certain interpretations and statements herein may include forward-looking assessments representing the expert opinions of the undersigned authors regarding the safe, scientific, and environmentally sustainable expansion of mining operations. These statements are based on the best available information at the time of assessment. IIT (ISM) Dhanbad, its faculty members, or associated experts do not assume any responsibility for the accuracy, completeness, or future applicability of such forward-looking assessments in light of potential operational, regulatory, geological, or environmental changes.

The analyses and suggestions contained in this document are intended solely for technical decision-making and regulatory appraisal purposes. **They should not be construed as legal, financial, or professional certification** of any kind. The project proponent is responsible for obtaining all statutory permissions and complying with applicable regulatory requirements.

Prof. Santosh Kumar Behera
Assistant Professor
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EXECUTIVE SUMMARY

The Dalpahar Iron and Manganese Ore Mine, located within the Baitarani Reserve Forest in Keonjhar District, Odisha, is an operational brownfield mine where historical workings were carried out without systematic planning prior to 1980. A comprehensive scientific study was undertaken by IIT(ISM) Dhanbad to assess geotechnical feasibility, evaluate mineable reserves, review environmental implications, and determine the necessity of lateral mining expansion beyond the presently diverted 10.594 ha forest area.

Extensive review of geological reports, approved Mining Plans (2024–26), forest diversion documents, drone surveys, geological report and field inspections revealed that the existing diverted area is largely depleted of recoverable ore. Major mineralized zones occur outside the currently diverted blocks, particularly along the NE–SW geological trend. Within the confined 10.594 ha, only 10,875 tonnes of iron ore and 34,846 tonnes of manganese ore are presently extractable—insufficient for sustained or economically viable mining.

Geotechnical modelling using the Limit Equilibrium Method indicates that the existing overall pit slope of 37° maintains a safe Factor of Safety (FOS) of 1.52–1.96, meeting DGMS standards. However, deeper ore extraction within the confined area would require steepening the slope beyond 45°, reducing FOS to 1.0–1.15, far below the statutory minimum of 1.5, making further deepening unsafe and non-compliant. Inadequate lateral space also prevents construction of essential mining infrastructure—haul roads, OB dumps, settling ponds, garland drains, and stockyards—within regulatory limits.

Environmental analysis shows that confined deepening within small pit fragments significantly escalates dust concentration (20–30%), noise reflection (8–12%), stormwater turbidity (30–40%), groundwater inflow (40–60%), and slope erosion (1.3–1.6×). The lack of space prevents effective drainage management, settling pond construction, progressive reclamation, or topsoil preservation. This leads to cumulative environmental stress inconsistent with sustainable mining principles prescribed by MoEF&CC, IBM, CPCB, and DGMS.

Comparatively, controlled lateral (parallel) mining provides wide benches, safer slopes, improved air–noise dispersion, reduced erosion, and adequate space for essential environmental infrastructure. It enables phased backfilling, terracing, and continuous reclamation, ensuring long-term slope stability and ecological restoration. Lateral expansion also facilitates resource recovery, economic viability, and operational safety.

Overall, the study concludes that continued mining inside the limited 10.594 ha area is technically unsafe, environmentally unsound, economically unviable, and non-compliant with statutory requirements. Additional forest land diversion is scientifically essential to ensure safe slope geometry, access to major mineralized zones, proper environmental management, and sustainable mine development. Granting approval for the proposed lateral expansion will optimize resource utilization while ensuring adherence to DGMS, IBM, and MoEF&CC regulatory frameworks and maintaining environmental safeguards.

1.0 INTRODUCTION

The Dalpahar Iron and Manganese Ore Mine is a proposed brownfield mining project located in the Baitarani Reserve Forest, Barbil Tehsil, Keonjhar District of Odisha. The project is situated in a forested landscape and within proximity to rural settlements, making environmental management and socio-economic considerations vital. Mining, if not managed scientifically, could pose significant risks to land stability, hydrology, biodiversity, and local communities. Recognizing these sensitivities, the project framework emphasizes proactive integration of sustainable practices covering waste management, water conservation, logistics optimization, ecological safeguards, and community development.

The mining lease was originally granted in December 1956 to M/s M.A. Tulloch & Co. for manganese ore, during a period when there was no concept of systematic mine planning or requirement for an approved Mining Plan. Consequently, the early mining operations were manual and unscientific, undertaken in scattered small patches based on surface indications and trial pits driven largely by hunch-based exploration, without any systematic assessment of the mineralized zones much before the year 1980.

Dalpahar mining lease of Late D C Jain over 89.961Hectares constitutes Block-A out of total area of 101.171Hectares having five different continuous/discontinuous blocks and it was executed on 09.06.1986 after lapsing of the lease of M/s M.A. Tulloch & Co. and the scope was expanded to include both Iron and Manganese ore.

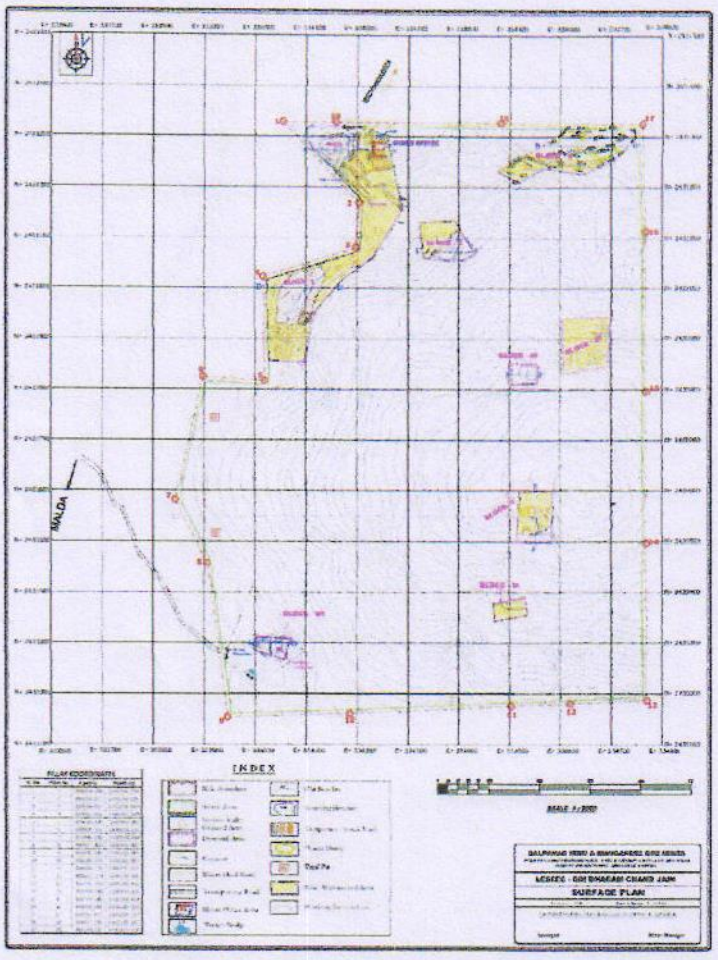


Fig. 1.1 Surface plan of the Dalpahar Iron and manganese mines

Table 1.1 location and accessibility

(a)	Lease Details	
	Name of the Mine	Dalpahar Iron and Manganese ore mines
	Latitude	21° 58' 43.04" N – 21° 58'04.70" N
	Longitude	85° 23' 59.17" E – 85° 23' 26.72" E
(b)	Toposheet No.	73G-5
(c)	Nearest Village	Khandobandh 1Km (SE), Bichhakhundi 1.1 Km (N), Jalahari 2.5 Km (SE)
(d)	Town, Tehsil, District, and State	Joda, Barbil Tehsil, Keonjhar District, Odisha
(e)	Nearest Railway Station	Jaroli R.S. 2.7 Km (SE)
(f)	Nearest Airport	Bhubaneshwar Airport 195 Km (S)
(g)	Approachability Village	The area is approachable from: ➢ Khandobandh 1Km (SE)

		➢ Bichhakhundi 1.1 Km (N) ➢ Jalahari 2.5 Km (SE)			
(h)	Topography	Max elevation - 723 m from MSL Min elevation - 553 m from MSL			
SALIENT FEATURES OF THE BUFFER ZONE					
(i)	Nearest major water bodies		Name	Distance	Direction
			Suna Nadi	800m	NW
			Dalko Nala	3.0Km	NE
			Baitarani River	4.6Km	E
			Kakarpani Nala	5.3Km	SW
			Topadihi Nala	9.2Km	W
(j)	Local Places of Historical and Tourism Interest,	As per district and state records, there are no such places within 10Km radius.			
(k)	Environmental sensitive areas, Protected areas as per Wildlife Protection Act, 1972	Nil within a 10 Km radius			
(l)	Reserved / Protected Forests	The ML area falls in the Baitarani Reserve Forest			
(m)	Seismic Zone	The area falls in Zone – II (Least Active)			

2. PROJECT PROPONENT: SRI D.C. JAIN, DALPAHAR IRON AND MANGANESE ORE MINES, ODISHA

With decades of entrepreneurial experience, Sri D.C. Jain (Power of Attorney: Sri Avin Jain) has established himself as a reputed mine owner, recognized for his commitment to operational excellence and ethical business practices. Anchored by a diversified project portfolio and a solid organizational foundation, the proponent is accredited with adopting systematic and sustainable mining procedures. Employing a large team of skilled professionals, the proponent has made a noteworthy contribution to India's mining sector. The mining of Iron Ore & Manganese Ore being done through mechanized operation and require skilled manpower, but dressing, sorting & sizing of manganese ore is being done manually, which requires huge unskilled and semiskilled manpower and generate employment at large scale for the local people. The continuous investment in upgrading human resources, technology, and infrastructure reflects the belief that the strength of resources and responsible management will define the long-term success of the Dalpahar Iron and Manganese Ore Mine.

Fig. 2.1 Visit of IIT(ISM) team to the mine site

2.1 Objectives

The key objectives of this Report are:

1. To assess the mining feasibility of confined versus lateral expansion of different blocks in the Dalpahar lease area.
2. To evaluate the environmental implications of confined deep mining versus lateral expansion and identify the scientifically preferable option.

2.2 Scope of work

This study integrates geotechnical feasibility and environmental science to evaluate whether mining can be safely and sustainably confined within the 10.594 ha forest-cleared area or requires lateral expansion. The assessment covers mining geometry, ore availability within UPL of 10.594 ha, slope stability, air–noise–dust dispersion, hydrology, erosion, groundwater behaviour, and reclamation potential. The report provides a scientific justification—based on comparative environmental impact mechanisms—for permitting lateral (parallel) mining as the environmentally superior and sustainable alternative, aligned with MoEF&CC, DGMS, IBM, CPCB, and Forest (Conservation) Act guidelines.

3. REVIEW OF EXISTING DATA

A comprehensive review of existing technical documents was undertaken to establish the geological framework, mining history, and regulatory compliance status of the study area. This included evaluation of the approved Mining Plan (2024–2026), Geological Sections, Working and Conceptual Plans, feasibility and production reports, and the forest diversion documentation associated with the currently diverted area.

3.1 Geological Reports and Mapping Records

The following geological sources were examined:

- Surface geological plan (Fig 3.1)
- Geological Sections Report
- Conceptual Section Report
- Working Section Report
- Drone-based Photogrammetry Report indicating current pit conditions
- Geological narrative in Approved Mining Plan (2024–2026)

Key Geological Observations

- The deposit exhibits banded iron formation with alternating hematite–shale sequences.
- Ore occurs as discontinuous lenses, with moderate dip, and displays variable thickness across sections.
- Geological continuity is strongest in the NE–SW direction, consistent with structural trends of the host formation.
- Ore body shows pinching and swelling, necessitating section-wise volume estimation.
- Weathered and lateritic capping is present in the top 3–8 m in certain parts.

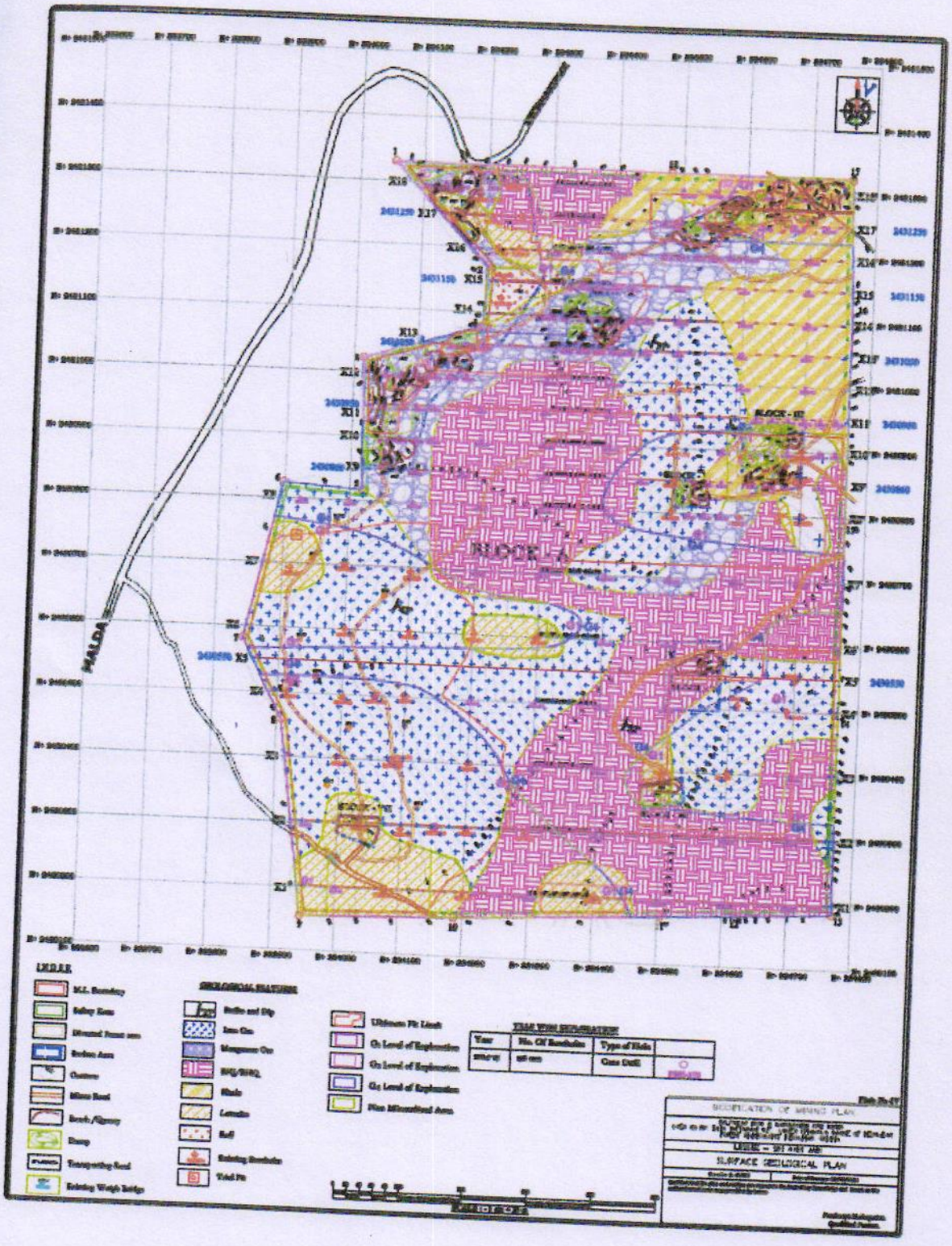
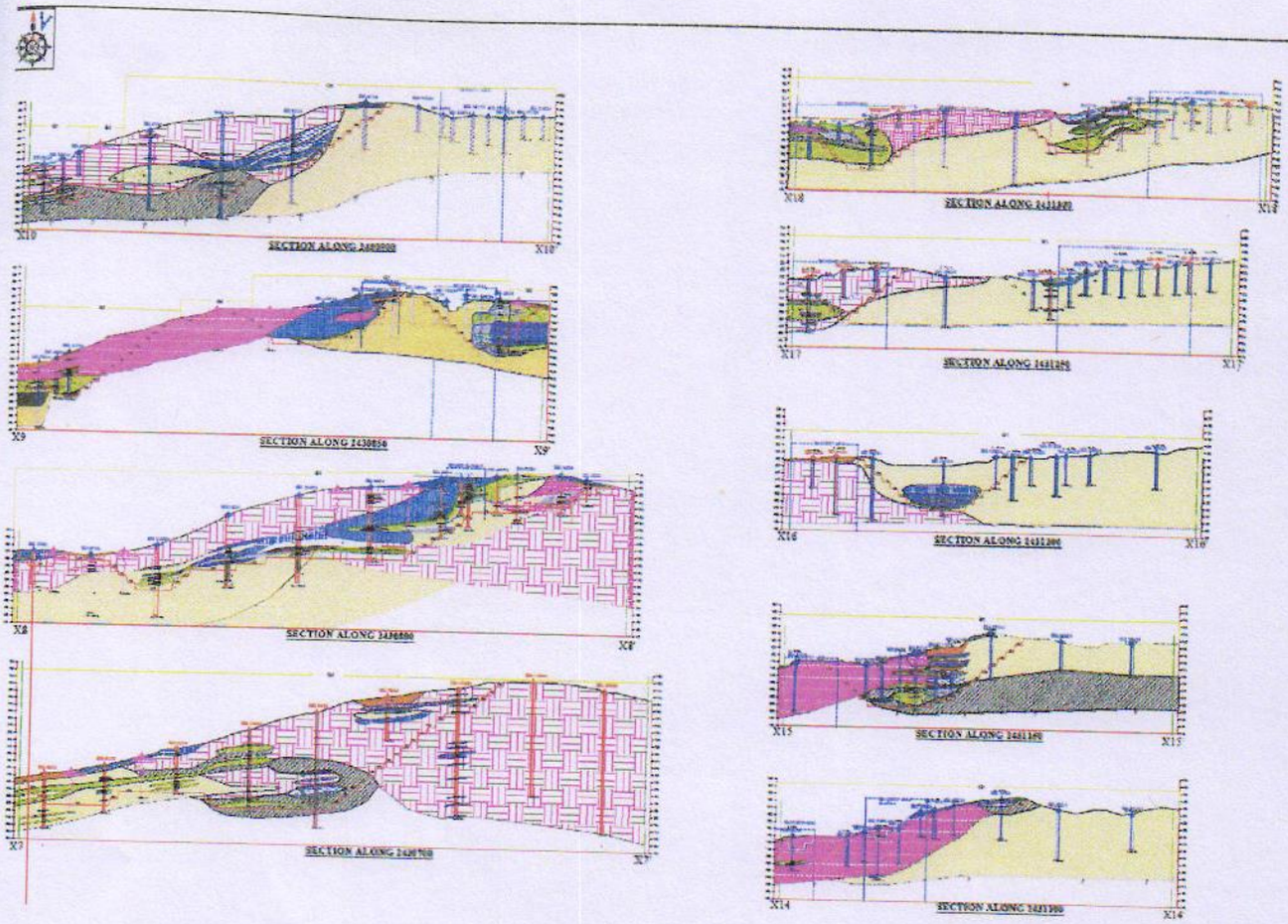


Fig. 3.1 Surface geological plan


SECTION ALONG 2432000
SECTION ALONG 2430850
SECTION ALONG 2430000
SECTION ALONG 2429700
SECTION ALONG 2431800
SECTION ALONG 2431600
SECTION ALONG 2431400
SECTION ALONG 2431200
SECTION ALONG 2431000

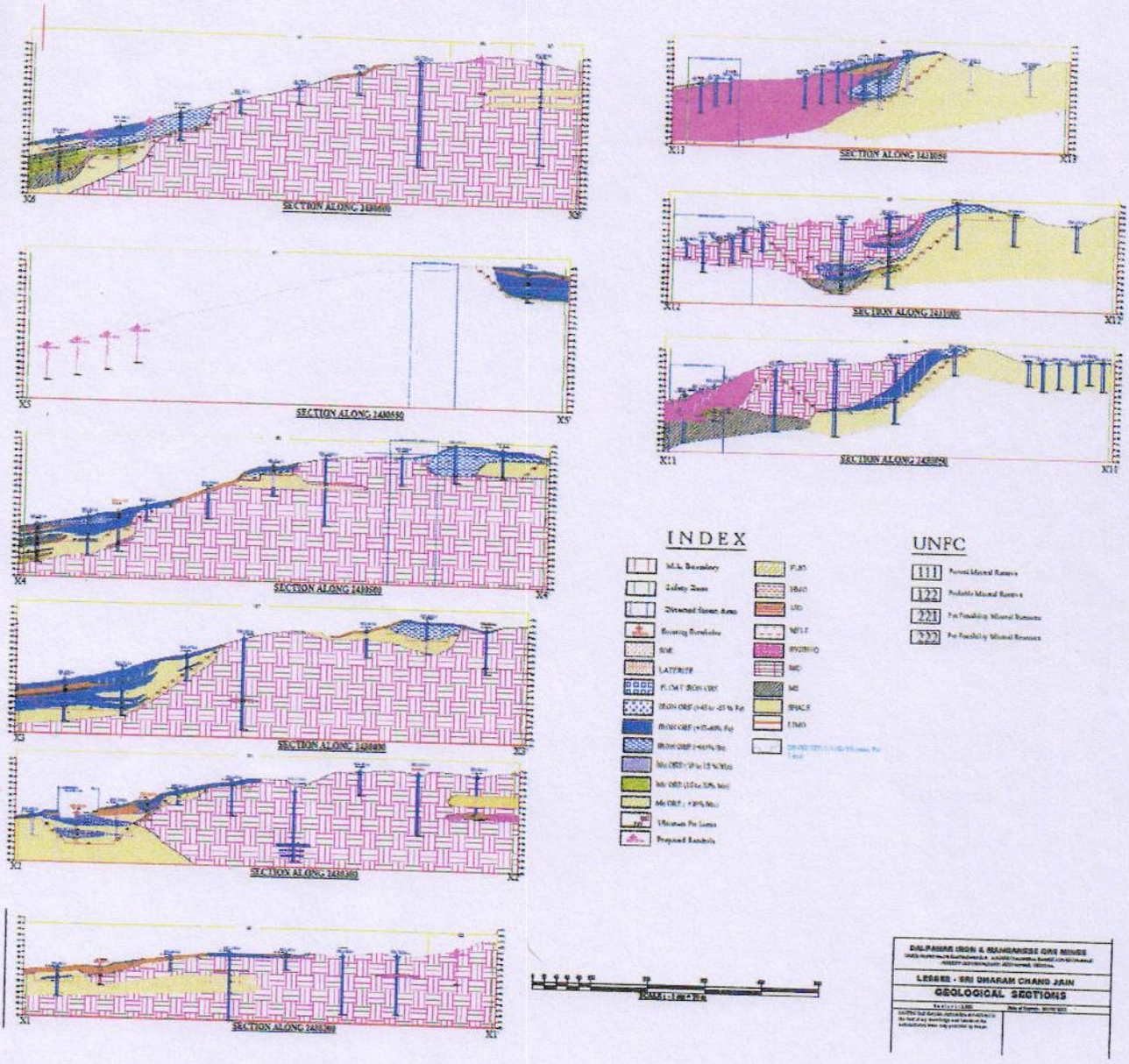


Fig. 3.2 Geological sections

Structural Characteristics

The BHQ and BHJ exposed in the surface are mostly massive in nature.

3.2 Approved Mining Plans and Compliance Documents

The approved Mining Plan outlines:

- Proposed pit geometry
- Production capacity limits

- Mine waste handling arrangements
- Haul road design principles
- Bench height/width regulatory compliance
- Environmental protection and safety measures
- Key findings:
- Overall pit slope proposed 28 to 37°, compliant with DGMS traditions for hard rock quarries.
- Bench height maintained at 10 m, with bench width ≥ height (bench width 12 m).
- Working levels and working directions match the geological disposition of ore.

3.3 Forest Diversion Documents

Forest diversion documents (FD stage–I & II) indicate:

- 10.594 Ha area, which were broken prior to 1980 has been legally diverted under forest conservation act (FCA -1980) for mining and allied activities.
- Conditions for soil stabilization, plantation, and surface reclamation.
- Restrictions on overburden dumping and construction within forest land.
- The reviewed documents validate that the proposed workings fall strictly within the diverted boundary, with no encroachment beyond approved forest land.

4. FIELD INVESTIGATION

A detailed field investigation was conducted to examine the existing mining pits, working benches, haul roads, exposed geological sections, ore-body continuity, and current operational conditions. The primary objective of the field study was to validate the geological understanding derived from historical reports and to establish the present status of ore exposure, structural conditions, and pit stability.

The investigations include:

- Direct inspection of active and inactive mining faces
- Geotechnical and structural mapping
- Verification of ore-zone continuity across sections
- Drone-supported mapping of (broken-up area) diverted area
- Assessment of water conditions, bench stability, and slope behavior

4.1 Methodology of Field Inspection

Field investigation involved the following sequential steps:

Visual Inspection of Working Areas

- Bench conditions were photographed.
- Exposure of ore bands, waste contacts, and laminations were recorded.

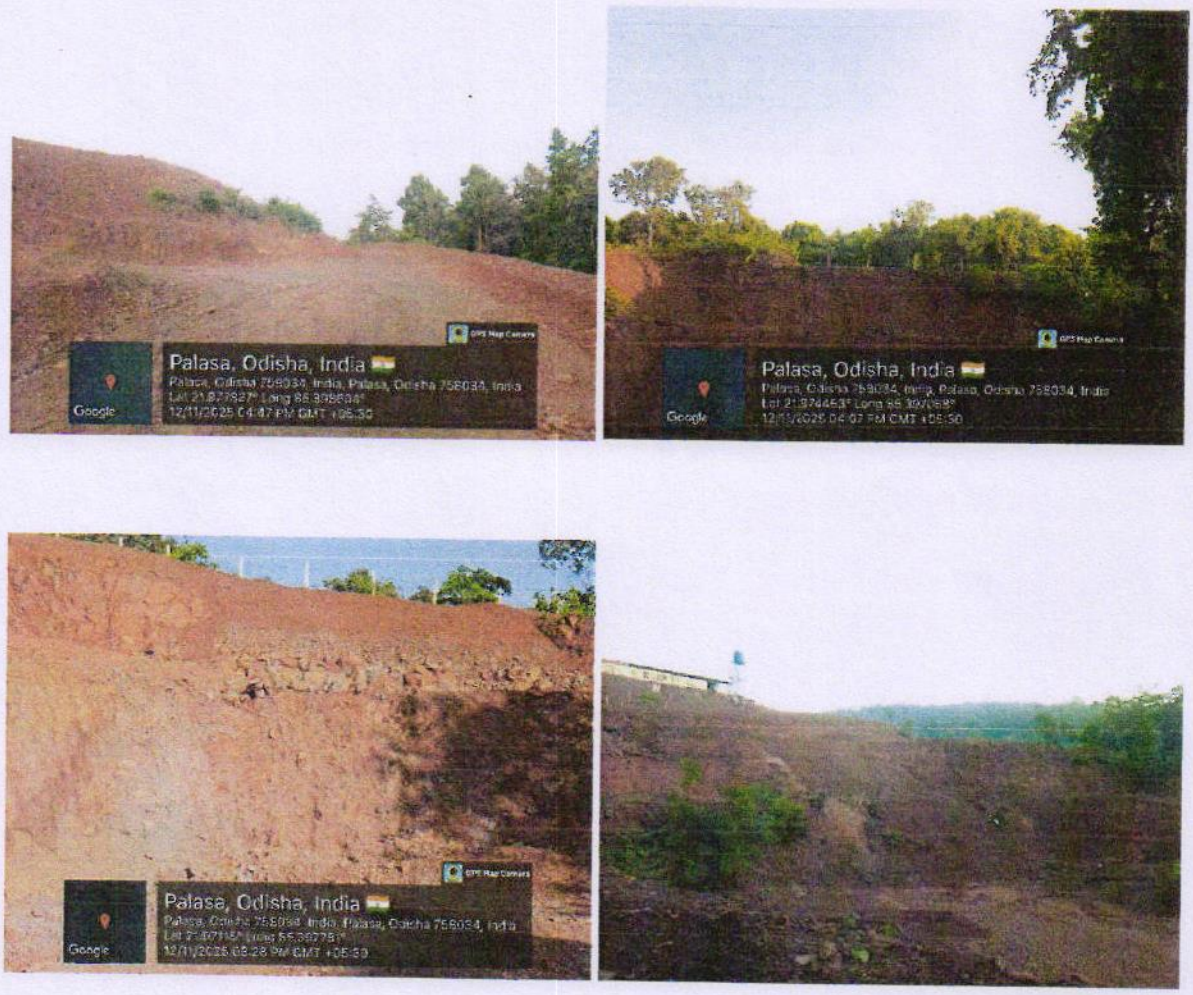


Fig. 4.1 Field visit photographs

Using the drone imagery:

- Surface topography and slopes were validated.
- Disturbances due to past workings were identified.

- Lithological boundaries were visually interpreted.

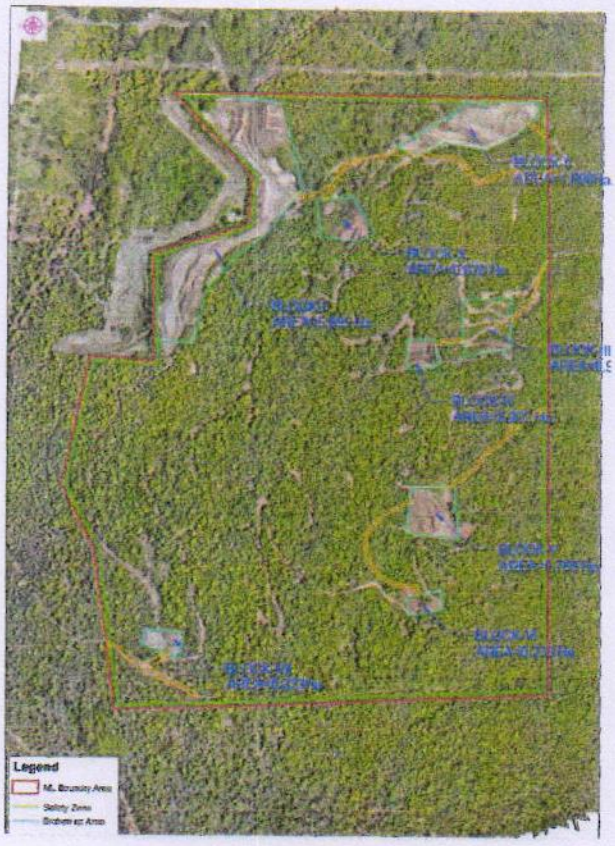


Fig. 4.2 Drone image of the mining area

4.2 Observations from Field Inspection

Condition of Mining Pits

- The existing pits exhibit multi-bench geometry with bench heights varying between 10 m.
- The benches are overall stable, with minor raveling observed in weathered zones.
- No major slope failures or bench collapses were reported during field inspection.
- Haul roads were found to be functional but require periodic grading.

Ore Body Exposure

- Ore exposure is clearly visible in Block IV and V.
- Hematite rich zones are distinctly banded and follow the predicted orientations from sections.
- The ore lenses match the NE–SW geological trend.

- Stratified pocket deposits could be found in different ore bodies.
- No abrupt termination or fault displacement affecting the ore was observed.

Hydrogeological Conditions

- No standing water observed.
- No seepage of water is visible.
- Water conditions are manageable with existing drainage and sumps.

Comparison with Geological Sections

- Geological section files provided were matched against field exposures.
- Ore boundaries on sections align well with bench exposures, confirming correct lithological interpretation.
- The general dip (16° to 52°) observed in the field matches the dip seen on the conceptual sections.

Key Outcomes of Field Investigation

- Existing benches are structurally stable with manageable geotechnical risks further heightening and deepening may result in stability issues of the mine benches.
- Drone imagery confirms pit geometry and assists in validating volumetric estimates.
- Field-measured trends align with documented geological patterns.
- Geological and structural conditions favour safe and systematic lateral expansion of mining with additional diverted forest land.

5. EVALUATION OF MINEABLE ORE

This section presents the scientific estimation of mineable ore reserves within the forest-diverted area of the lease. The assessment integrates:

- Geological sections (X11–X18)
- Pit design constraints
- Operational limitations under DGMS/IBM guidelines
- Environmental and forest diversion boundaries.

The objective is to quantify the recoverable portion of the ore body under actual working constraints and

identify any blocked or unmined zones that may require redesign or lateral extension.

5.1 Methodology for Reserve Estimation

Total ore resource was estimated using the cross-sectional area x distance of influence (from the digitized mine plan and section) x bulk density

Table 3.1 Bulk density adopted from the reported data in the mining plan.

Sr. No.	Ore	Mineral	Bulk Density (t/m^3)
1.	Iron ore	+55%Fe	3.4
2.	Iron ore	45-55%Fe	2.5
3.	Mn ore	+20%Mn	2.5
4.	Mn Ore	10-20%Mn	2

Mineable reserve = Total resources – blocked resource

The blocked resource consists of ores blocked within safety zone at the mine boundaries and ore left below ultimate pit limit. Further, the ore resources and the mineable reserve was estimated for the entire mine lease. The main reasons for blocked ore are listed below.

- Pit-wall slope limits (28° to 37° overall slope)
- Presence of safety zones
- Forest-diversion boundary restrictions

5.2 Diverted block wise Ore Quantification

Source of Data

The resource and mineable reserve were obtained from:

- Digitized mine plan and section.
- Digitized geological plan and section.
- From the geological report.

Table 5.2 Summary Table of Digitized Areas, Volumes & Tonnages

Status of iron & manganese ore availability in 10.594 hectare of forest diverted land								
Broken Block	Area in Hect	Iron ore Resource (in tonnes)			Manganese ore Resource (in tonnes)			Remarks
		Mineable	Blocked	Total	Mineable	Blocked	Total	
I	5.095	0	0	0	22713	823224	845937	Blocked due to safety zone and Lease boundary
II	1.598	2000	11500	13500	7073	25875	32948	Blocked due to forest land.
III	0.931	0	24700	24700	1100	173061	174161	Blocked due to forest land.
IV	0.202	0	56063	56063	0	32289	32289	Blocked due to forest land.
V	0.769	0	121780	121780	0	0	0	Blocked due to forest land.
VI	0.233	0	0	0	0	0	0	No mineral occurrence.
VII	0.223	0	182153	182153	0	0	0	Blocked due to forest land.
X	0.678	8875	0	8875	3960	0	3960	Mineral occurrence in isolated pocket.
Road	0.865	0	0	0	0	0	0	
Total	**10.594**	**10875**	**396196**	**407071**	**34846**	**1054449**	**1089295**	

Breakup of section wise ore reserve in Block – I

Block -I

- The entire broken block area is 5.095 hectare spread in N-S direction .
- The entire block based on different section from north side to south side are X18 to X11.

Section X18

- In section X18, in the Eastern side non mineralization area exists and on the western and NW side pit cannot be extend due to safety zone and mine lease boundary (Fig. 1).
- The ultimate pit limit (UPL) drawn on the diverted boundary also confirms the same.

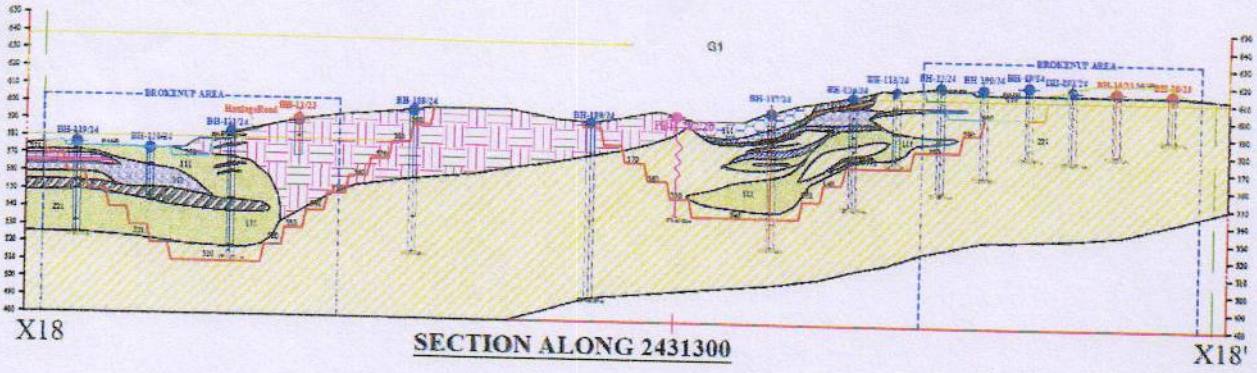


Fig. 5.1 Section along X18 of block-I

Section X17

- In section X17, it has been observed that ore is occurring below 546 mRL, however as per the UPL the pit bottom RL could go up to 550 mRL. Considering this with the existing UPL, extraction of ore is not possible at this section.

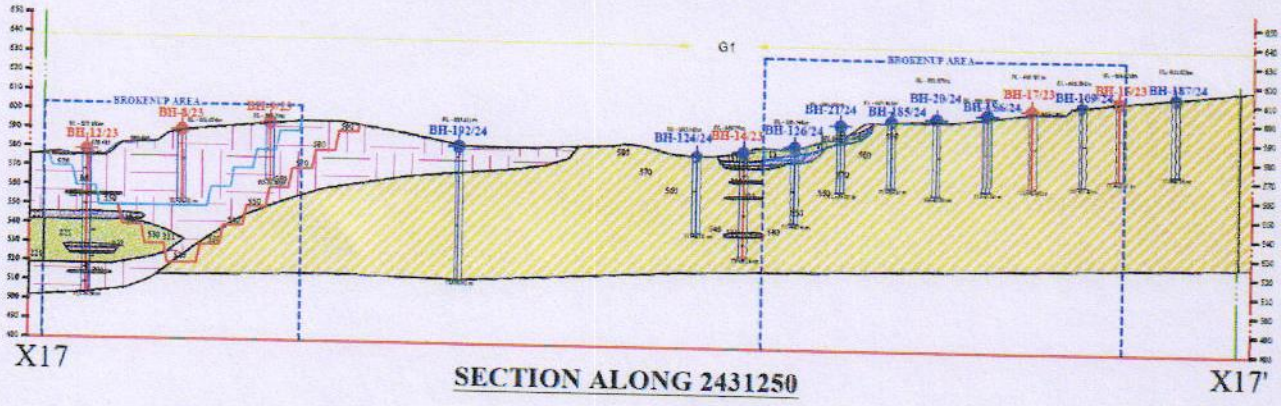


Fig. 5. 2 Section along X17 of block-I

Section X16

- In section X16, only laterite and BHJ could be found as per the exploration data and no ore is found with the diverted boundary.
- However, iron ore occurs after 50 m on the Eastern side of the diverted boundary which can only be mined after lateral expansion up to 250m on the eastern side at section X16.
- Further, this ore occurs at a depth of 545 mRL to 515mRL and the surface mRL above the ore deposit is 574 mRL.
- This can only be mined after diversion of additional forest area.

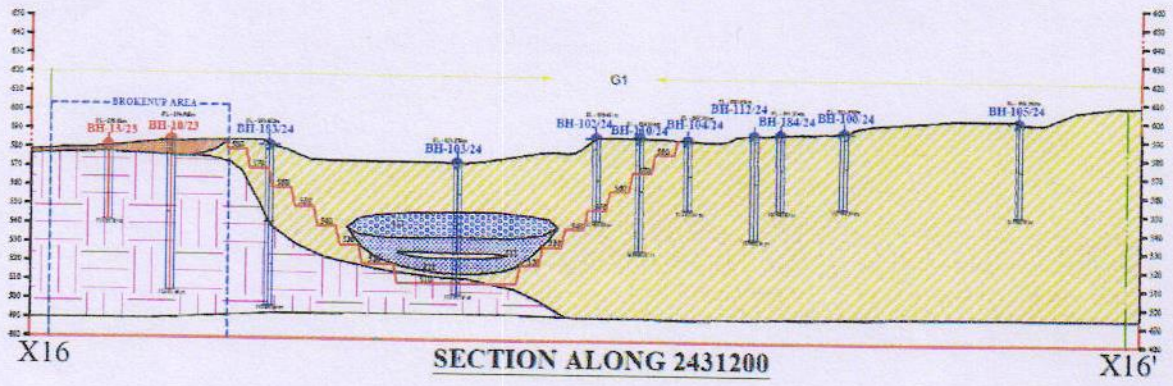


Fig. 5.3 Section along X16 of block-I

Section X15

- In section X15, only laterite and BHJ could be found as per the exploration data and no ore is found with the diverted boundary.
- However, iron and manganese ore occurs after 100 m on the Eastern side and extend up to 300 m in east direction of the diverted boundary. These ores can only be mined after lateral expansion up to 300 m on the eastern side at section X15.
- Further, these iron and manganese occurs in pockets from a depth of 616 mRL to 512mRL.
- These ores can only be mined after diversion of additional forest area.

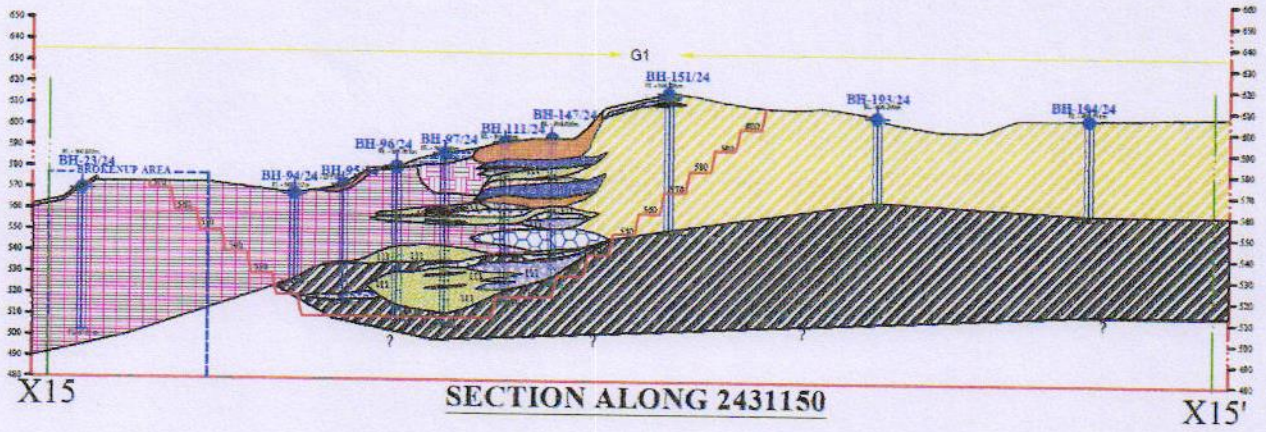


Fig. 5.4 Section along X15 of block -I

Section X14

- In section X14, ore could be found below 534 to 528 mRL, however as per diverted boundary limit and UPL the pit bottom RL could go up to 550 mRL. Hence, the ore couldn't me extracted at this section.

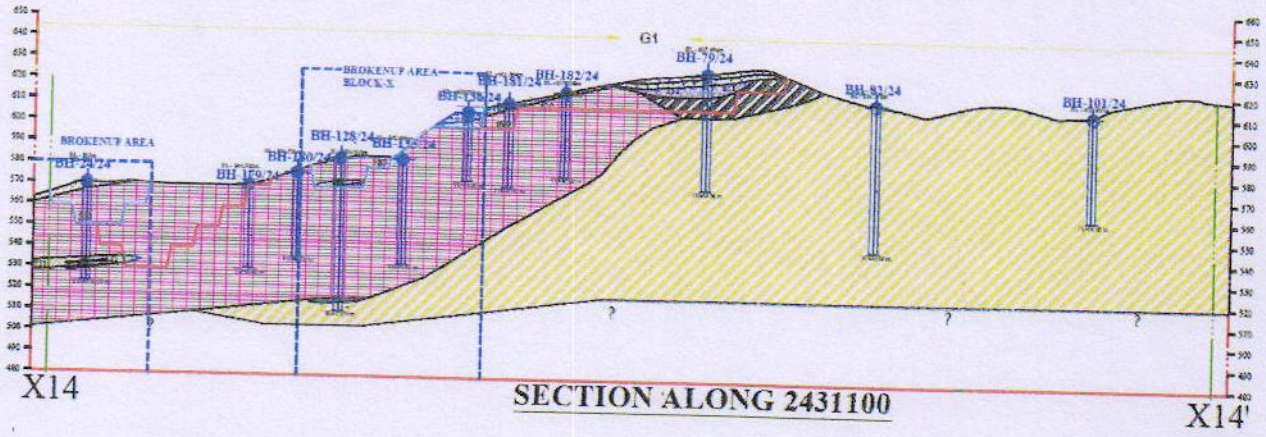


Fig. 5.5 Section along X14 of block-I

Section X13

- In section X14, only laterite and BHJ could be found as per the exploration data and no ore is found within the diverted boundary.

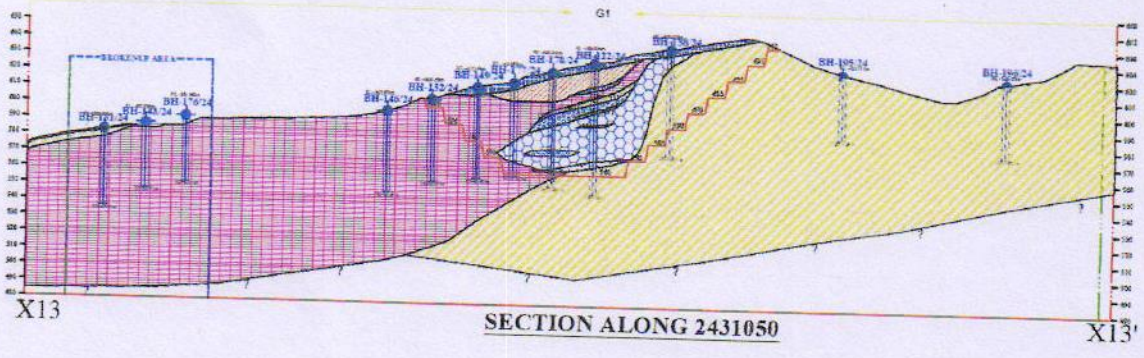


Fig. 5.6 Section along X13 of block-I

Section X12

- In section X12, consist of majority of BHJ and no mineralization zone.

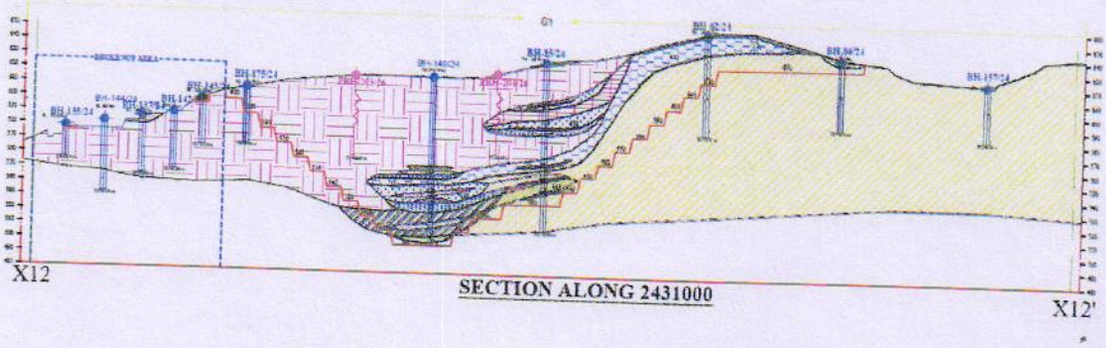


Fig. 5.7 Section along X12 of block-I

Section X11

- In section X11, multiple pocket deposits occur at different depths with the deepest pocket deposit occurring below mRL 540 MRL. Considering all the pocket deposit within the diverted boundary the minable reserve comes to be 15290 tonnes of manganese and the blocked ore within diverted area is 45540 tonnes.
- Further, for complete extraction of the blocked resource of 45540 tonnes additional lateral expansion of the pit at this section is required up to 100 m on Eastern side from the existing diverted boundary.

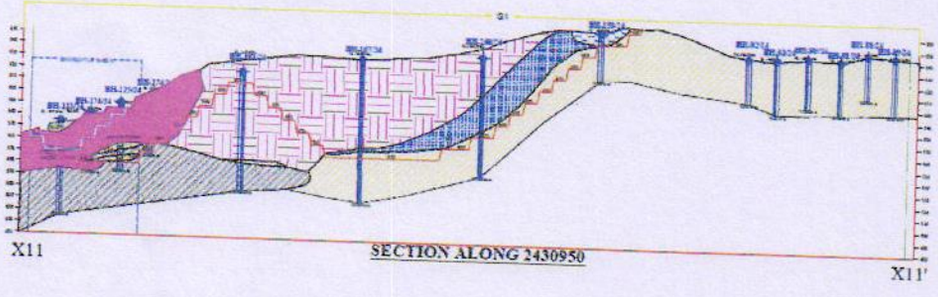


Fig. 5.8 Section along X11 of block-I

Table 5.3 Summary Table of Tonnages of ore in block-I

Section	Mineable ore (tonnes)	Blocked (tonnes)	Total (tonnes)
X18	4453	571039	575492
X17	1210	197075	198285
X16	0	0	0
X15	0	0	0
X14	1760	9570	11330
X13	0	0	0

X12	0	0	0
X11	15290	45540	60830
		Total (tonnes)	**845937**

Block -II

- The entire broken block area is 1.598 hectare.
- In this block in the eastern side below OB dump is non mineralized zone.
- However, in the western side of the block-II mineralization exist.
- Further, in the southern side persistent manganese could be found.
- Based on the data, the mineable reserve in this block is 1672 tonne of manganese and 12474 tonne of ore is going to be blocked due to ultimate pit limit (forest diverted land)
- Considering the pit limit and safety aspects in the block-II further expansion of his block is required in western side up to a distance of 150 m from the existing western boundary of block-II.

Block-III

- In this block mineralization zone is in the SE region.
- The entire broken block area is 0.931 hectare whereas the mineralization area is 0.1 hectare towards the SE diverted boundary. Further, the topography consists of a steep ground slope which required lateral expansion for further extraction of this much of ore.
- Further, the blocked reserve of 24700 tonnes of iron ore and 17416 tonnes of manganese ore are within the diverted land. These much of ore cannot be extracted within the existing pit boundary limit due to safety and slope stability issues which would occur while deep excavation with steep mine slope.
- Hence, further expansion is required in the East direction up to mine lease boundary and in South direction up to 50m.

Block-IV

- The entire broken block area is 0.202 hectare
- This block is entirely excavated forming two benches within the pit limit.
- Further, deepening and extraction is not possible due to safety and slope stability issues.

- Based on the data, the existing mineable reserve is nill, the blocked reserve of 56063 tonnes of iron ore and 32289 tonnes of manganese ore are within the diverted land. These blocked ores are due to ultimate pit limit restriction.
- Also, mineralization is existing in all the four directions of this block hence, further lateral expansion of this block is required in all direction N (100 m), S (100 m), E (50 m), W (250 m)

Block- V

- The entire broken block area is 0.769 hectare
- The mineable ore from this block is extracted forming two benches within the pit limit on the SE side.
- Further, deepening and extraction is not possible due to safety and slope stability issues.
- Based on the data, the existing mineable reserve is nill, the blocked reserve of 121780 tonnes of iron ore is within the diverted land. This blocked ore is due to ultimate pit limit restriction.
- In this block mineralization zone is in the SE region.
- Further expansion is required in the E direction up to mine lease boundary and 100 m in S direction.

Block- VI

- The entire broken block area is 0.233 hectare
- The mineable ore from this block is completed extracted forming two benches within the pit limit.
- Also, the mineable and blocked reserve in this block is nil.

Block-VII

- The entire broken block area is 0.223 hectare
- This block is entirely excavated forming two benches within the pit limit.
- Further, deepening and extraction is not possible due to safety and slope stability issues.
- Based on the data, the existing mineable reserve is nil, the blocked reserve of 182153 tonnes of iron ore is within the diverted land. This blocked ore is due to ultimate pit limit restriction.

- Also, mineralization is existing in all the four directions of this block hence, further lateral expansion of this block is required in all direction N (300 m), S (50 m), E (200 m), W (70 m up to lease boundary)

Block-X

- The entire broken block area is 0.678 hectare
- Based on the data, the existing mineable reserve is 8875 tonnes of iron ore and manganese of 3960 tonnes. It would take hardly one month time to completely extract these much of ore.
- Further, ore is existing in the Eastern side of the existing pit, which require further lateral expansion of the pit on the E side up to a distance of 100 m.

6. SAFETY AND STABILITY CONSIDERATIONS CONSIDERING MINING WITHIN EXISTING 10.594 HECTRE DIVERTED FOREST AREA

Safety and geotechnical stability are core requirements for scientific and sustainable mining operations. This chapter outlines the structural stability of benches and overall pit slopes, with statutory regulations and minimize risk during mining within the forest-diverted area. This section compares the change in stability if the existing mine slope changes from 37° to relatively higher slope 45° considering the rock mass geotechnical properties.

Rock Mass Characteristics

The rock mass comprises:

- Laterite, lateritic iron ore, Hematite (Massive, Laminated, blue dust), BHJ/BHQ
- Alternating shale
- Occasional lateritic cap near surface

Table 6.1 Relevant Geotechnical properties Used in numerical modeling

Parameter	
Cohesion (intact)	130 kPa
Friction angle (intact)	57°
Bench height	10 m
Bench width	12 m
Overall slope	28°–37°
Unit weight	25 kN/m³

To conduct the numerical modeling Limit Equilibrium Method has been used alongwith

Limit Equilibrium Method

In the Limit Equilibrium Method (LEM) approach, the stability of any mass is analyzed, assuming incipient failure, along a potential slip surface. It often enables the solution of many problems by simple statics, provided some simplifying assumptions are made. Limit equilibrium methods are generally not concerned with stress distribution at every point, above or below the assumed slip surface within the potential failure mass. Even though the limit equilibrium approach is not a precise one in the mathematical sense, the results obtained by limit equilibrium and plasticity analysis show remarkably close agreement in many cases. Limit equilibrium methods have been applied to a wide range of problems involving soil and rock slopes, and there is little doubt of their continued popularity. Here, specific computer programs are developed using LEM.

Bishop Simplified Method:

The normal force on the base of the slice is obtained by resolving the total forces normal to the base. Gives fairly accurate results but is restricted to slip surfaces of circular shape. The iterative procedure is required for the solution but convergence is rapid. Useful for hand calculation. Errors are possible where a portion of the slip surface has a steep negative slope near the toe. Calculation of normal forces on slip surface possible. This should be done in addition to determining FOS. Suitable for both total and effective stress analysis of circular failure surfaces in soil and soft rock. The equation for the factor of safety is given as follows:

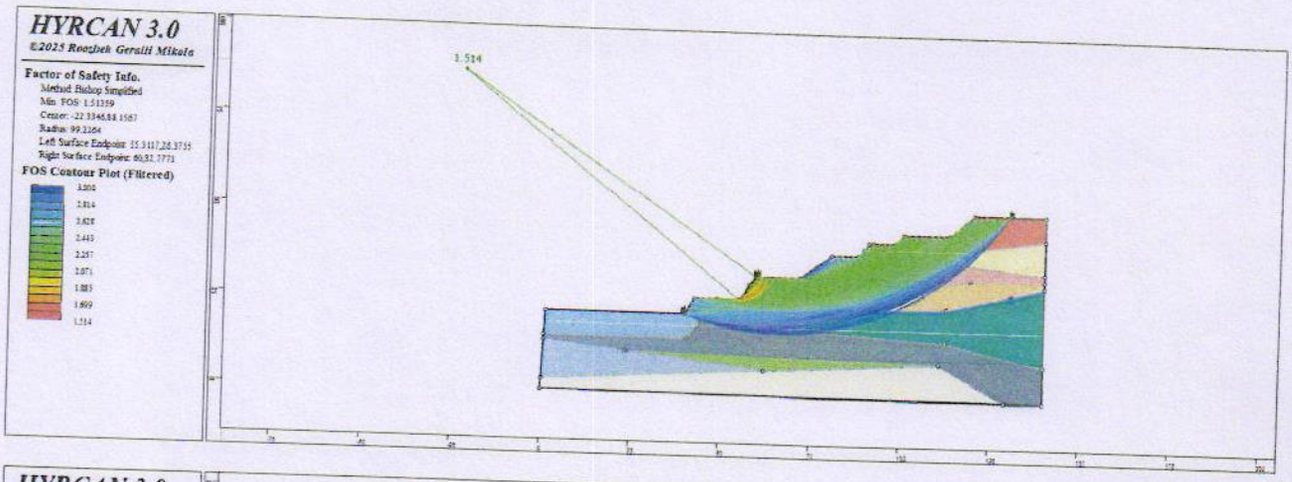
$$FOS = \frac{cl + W\tan\phi}{m * W\sin\alpha}$$

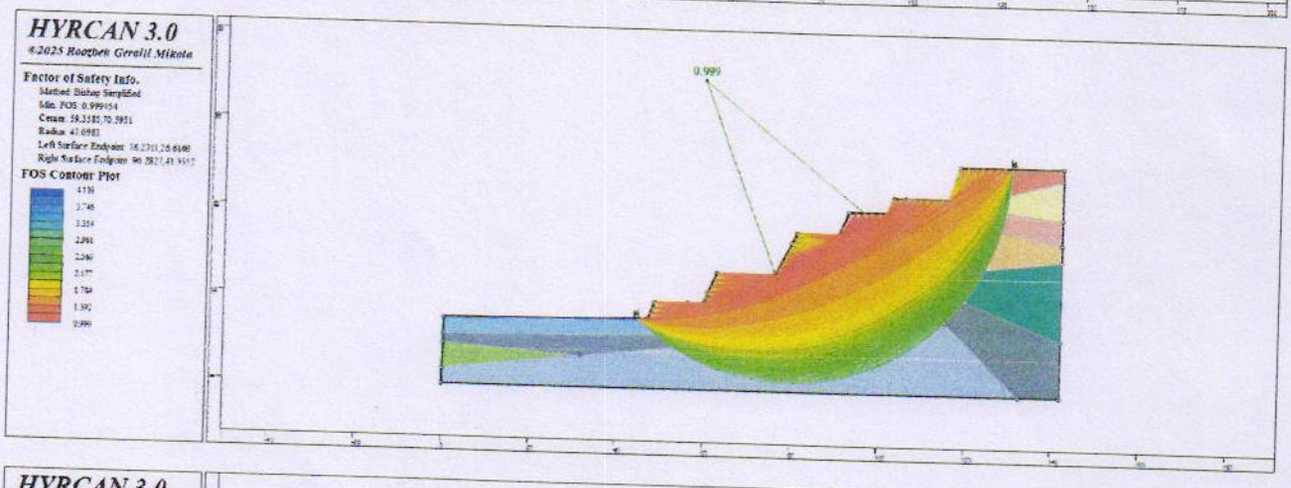
$$m = \cos\alpha + \frac{\tan\phi * \sin\alpha}{FOS}$$

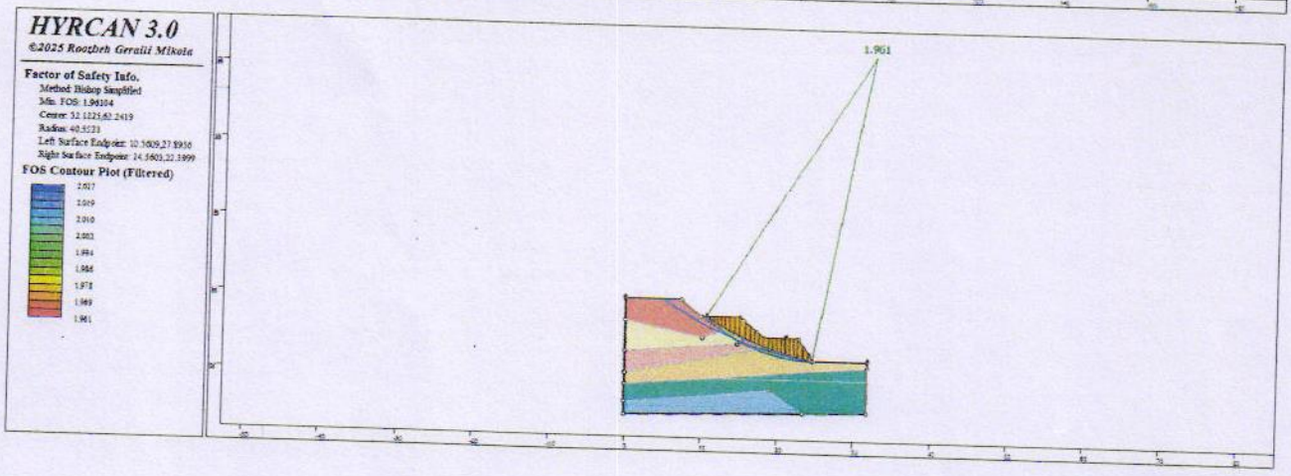
where, c is the cohesion of the material, φ is the angle of internal friction and W is the dead of the slice. As a first trial value, the Fellenius method's safety factor is used. There are some other methods of stability analysis and are discussed in the following section.

Based on numerical modelling following FS were obtained for different blocks

Pit slope angle	FOS , Block-I	FOS , Block-IV	
37°	1.52	1.96	
45°	1	1.15	


HYRCAN 3.0
©2025 Rootbeh Geraiti Mikata
Factor of Safety Info.
Method: Bishop Simplified
Min. FOS: 1.51359
Center: -22.3346,88.1587
Radius: 99.2264
Left Surface Endpoint: 35.3117,26.3735
Right Surface Endpoint: 60.82,.1771
FOS Contour Plot (Filtered)
3.000
2.814
2.628
2.443
2.257
2.071
1.885
1.699
1.514
1.514


HYRCAN 3.0
©2025 Rootbeh Geraiti Mikata
Factor of Safety Info.
Method: Bishop Simplified
Min. FOS: 0.999154
Center: 59.3585,70.5931
Radius: 47.0983
Left Surface Endpoint: 36.2791,26.6160
Right Surface Endpoint: 90.3827,43.3557
FOS Contour Plot
4.136
3.745
3.354
2.963
2.572
2.181
1.790
1.399
0.999
0.999


HYRCAN 3.0
©2025 Rootbeh Geraiti Mikata
Factor of Safety Info.
Method: Bishop Simplified
Min. FOS: 1.96104
Center: 52.1225,62.2419
Radius: 40.5223
Left Surface Endpoint: 10.3609,27.8936
Right Surface Endpoint: 24.5603,22.3999
FOS Contour Plot (Filtered)
2.017
2.009
2.000
1.992
1.984
1.975
1.967
1.961
1.961

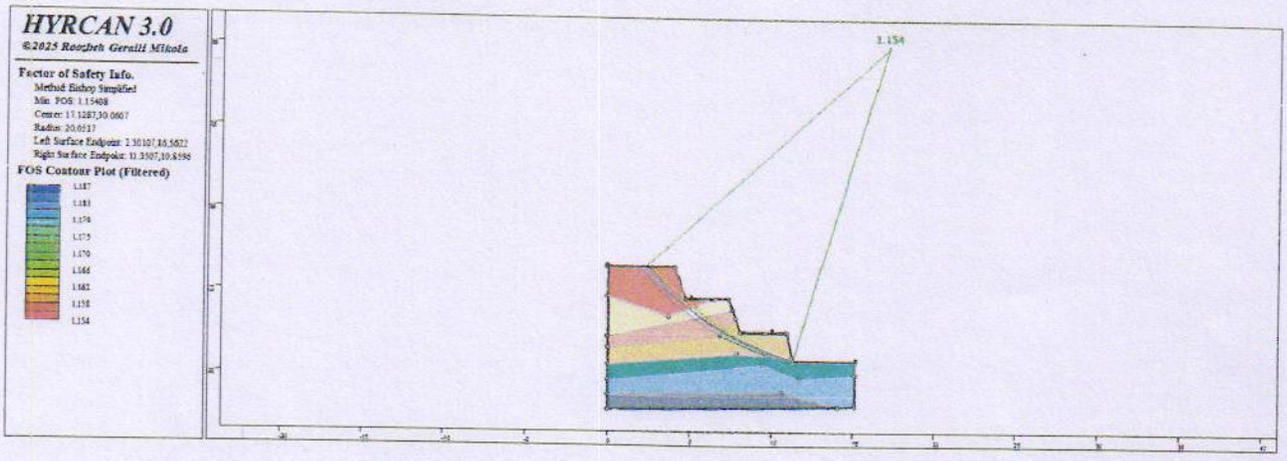


Fig. 6.1 Results of numerical modelling for increasing slope angle from 37° to 45° for different mine blocks

7. COMPLIANCE REVIEW

As per DGMS circular no. 3 of 2020, which says a minimum factor of safety requirement of 1.5. As it could be found from the investigation that mining within existing 10.594 hectre diverted forest area needs increasing the depth of mine as there is no space for lateral expansion. The only option left for mining is to go deeper, however while going deeper with smaller mining block areas (as per Table 5.2) may be practically not possible considering safety and stability of the slopes. This has been justified with the numerical modelling results which shows a reduction of FS below 1.5 with increasing overall mine slope angle from 37° to 45°.

Pit slope angle	FOS , Block-I	FOS , Block-IV	
37°	1.52	1.96	
45°	1	1.15	

Further, considering the Scientific mining & conservation the blocked ore reserve need to scientifically extracted without compromising safety. This needs lateral expansion of different blocks as elaborated in the previous section.

1. Severely Constrained Working Geometry

The 10.594 ha diverted area provides inadequate lateral working space for creating safe and regulation-compliant mine benches, haul roads, sump areas, OB dumping zones, and safety berms.

As per MMR 1961 and DGMS Technical Circulars (02/2010 & 03/2020), iron & manganese open pits require:

Bench height: 10m

Bench width: ≥12 m

Overall pit slope: ≤37° for competent hard rock

Haul road width: ≥3× vehicle width + 1 m (normally 12–15 m for dumpers)

2. Insufficient Depth Advancement Due to Slope Restrictions

Geotechnical analysis indicates:

Safe slope: 37° with FOS 1.52 and 1.96

Required slope for deeper ore: 45° (unsafe), FOS 1and 1.15

Since DGMS mandates minimum FOS = 1.5 for permanent pit slopes, deepening the pit within the current boundary is prohibited.

Without additional land to flatten the slope and expand the pit laterally, depth advancement stops prematurely, leaving major ore reserves inaccessible.

3. Large Quantities of Ore Blocked by Regulatory Geometry

Due to the inability to expand laterally or steepen slopes, the following ore reserves remain blocked within the diverted area of 10.594 Ha due to UPL restriction:

Iron ore: 396196 tonnes

Manganese ore: 1054449 tonnes

These can only be accessed if the pit can be expanded outward, which requires additional forest area.

Further 18.64 Million tonnes of Mineable Iron ore and 4.52 Million tonnes of Manganese Ore can be mined with Forest diversion over additional 79.364 Ha area.

4. Dominance of Low-Grade Manganese Ore

Entire mineable reserve 34846 tonnes of manganese ore having grade 17.5% Mn which require proper blending with high grade ore. Hence, extraction of such low-grade ore without blending is not economically viable.

Within the restricted boundary:

No sufficient blending stockyard area exists.

The limited high-grade zones cannot be sequentially mined due to slope & safety constraints.

Thus, the mine cannot achieve grade control or economic viability within the current diversion area.

5. Inadequate Space for Mining Infrastructure

Core mine infrastructure normally requires a minimum of 3–5 ha, including:

Crushing & screening plant

Weighbridge

Workshop

Fuel & oil storage

Waste dump & subgrade stockpile

Settling pond / WTP

These cannot be accommodated within the existing 10.594 ha diversion area, forcing unsafe crowding of facilities, which violates DGMS & CPCB norms.

6. Environmental & Hydrogeological Constraints

Without more area, the mine cannot provide:

Proper rainwater diversion drains

Garland drains

Sedimentation ponds sized per MOEF&CC norms (based on catchment area)

Safe discharge & settling capacity

This increases erosion, slope failure probability, and violation of environmental clearance.

The restricted forest-diverted boundary does not allow the horizontal development needed to maintain these standards while simultaneously accessing deeper ore.

8. SCIENTIFIC ASSESSMENT OF ENVIRONMENTAL IMPLICATIONS OF CONFINED VS. LATERAL MINING IN THE DALPAHAR LEASE AREA

This chapter presents a scientific evaluation of the environmental implications of restricting mining solely within the existing 10.594 ha forest-cleared blocks versus adopting a controlled lateral (parallel) mining approach in the Dalpahar lease area. The assessment, based on air-noise dispersion behaviour, hydrological and stormwater response, groundwater interaction, soil erosion mechanisms, and reclamation feasibility, indicates that confined deepening significantly amplifies environmental stress—leading to

higher particulate accumulation, increased acoustic reflection, elevated runoff turbidity, greater groundwater inflow, and the inability to implement essential environmental infrastructure or progressive reclamation. In contrast, lateral mining provides improved dispersion conditions, safer hydrological pathways, reduced erosion, better slope stabilisation, and enables concurrent backfilling and ecological restoration. The findings clearly establish lateral mining as the environmentally preferable and scientifically sustainable option for long-term operations in the Dalpahar mining lease.

Baseline Environmental Setting: Baseline conditions from the EIA–EMP (2024) report indicates that:

- Air quality within national standards
- Noise levels within prescribed limits with daytime dominance
- Surface water with moderate suspended load (typical of mining belt)
- Groundwater at shallow–moderate depth, recharged seasonally
- Slopes generally steep (18–32%), making erosion likely
- Ecology with no Schedule-I species in the 10.594 ha blocks and mostly degraded patches due to historical disturbance

These values provide a reference against which environmental changes are assessed.

8.1 Environmental Limitations of Confined Deep Mining Inside 10.594 ha

Air Pollution Increase (PM, Dust, Blasting Fumes): Confined deep mining within small pit fragments may causes a increase in PM levels, driven by:

- **Reduced ventilation**: Pit deepening restricts airflow, trapping dust and blasting fumes.
- **Increased haul-road gradient**: Steeper internal slopes increase wheel-generated dust by **20–30%**.
- **Thermal inversion in valleys**: Early-morning inversions hold particulate matter inside pit walls.
- **Limited pit opening width**: Less cross-sectional area for atmospheric dispersion.

This results in higher cumulative dust load compared to lateral mining.

Noise and Vibration Increase (Blasting, Machinery): Deep confined pits elevate noise levels by **10–15%** and vibration by **20–30%**, because:

- **Acoustic reflection**: Sound waves bounce between pit walls, amplifying noise ("echo stacking").

- **Restricted blast wave dissipation**: Pressure waves from blasting are trapped inside steep pits.
- **Higher engine load**: Steep gradients force machinery to operate at higher RPM.
- **Lower setback from forest edge**: Noise travels more directly to surrounding vegetation.

These impacts contradict eco-sensitive management near forest boundaries.

Stormwater Accumulation, Erosion & Turbidity Increase: Deep confined pits experience an increase in turbidity and stormwater stress, because.

- **High natural slopes** (18–32%) increase runoff velocity, transporting large sediment loads.
- **No space for garland drains or settling ponds**, causing uncontrolled inflow.
- **Fine mining sediments accumulate at pit bottom**, rapidly mobilized during rainfall.
- **Gully erosion at pit edges** adds more solids.
- **Stagnant water** increases turbidity and risk of overflow into forest areas.

Groundwater Inflow Increase and Forest-Edge Drawdown: Groundwater inflow may increase by in deeper confined pits, because.

- **Perched aquifers** are intercepted at deeper elevations.
- **Higher hydraulic gradient** toward the pit increases seepage.
- **Fractured BHJ zones** at depth have higher transmissivity.
- **Wider seepage surface area** develops as the pit deepens.

This increases local drawdown, stressing forest vegetation dependent on shallow aquifers.

No Provision for Progressive Reclamation: Confined blocks prevent sequential backfilling and revegetation, leading to:

- Longer exposure of bare surfaces
- Higher erosion
- Delayed ecological recovery
- Permanent disturbance until end-of-life mining

Thus, confined deepening creates continuous environmental degradation.

8.2 Expanded Scientific Basis for Evaluating Confined vs. Lateral Mining Options

i. Confined deep mining may increase PM levels by approximately 20–30%, primarily due to restricted dispersion, dust entrapment, and reduced airflow within narrow pit walls.

ii. Noise levels may rise by around 8–12% because sound waves reflect and amplify inside deep, confined pit geometries.

iii. Stormwater turbidity may increase by nearly 30–40% under confined deepening due to higher sediment inflow, lack of space for drains, and unregulated runoff pathways.

iv. Groundwater inflow can increase by about 40–60% when deeper pit faces intersect perched aquifers and fractured zones, potentially affecting local drawdown near forest vegetation.

v. Steep confined slopes can lead to approximately 1.3–1.6× higher soil erosion compared to lateral benches where terracing and slope stabilization are feasible.

vi. Confined deep pits tend to act as pollutant pockets, allowing dust, blasting fumes, and fine suspended solids to accumulate due to limited natural ventilation.

vii. Essential environmental infrastructure such as garland drains, settling ponds, topsoil yards, and controlled haul-road layouts cannot be adequately accommodated within the restricted 10.594 ha area.

viii. Long-term landscape stability may be compromised as confined deep pits increase risks of gully formation, erosion, slope stress, and stormwater stagnation during monsoon periods.

ix. Progressive reclamation is not practically achievable within the existing confined blocks, resulting in prolonged exposure of worked-out surfaces and delayed ecological restoration.

x. Lateral (parallel) mining helps reduce cumulative environmental footprint, improves hydrology and drainage, supports phased reclamation, and aligns more closely with sustainable mining practices and regulatory guidelines.

9 Conclusion

In view of the above, the following conclusions are evident:

- The currently diverted 10.594 ha area is largely depleted of mineable reserves, leaving minimal extractable ore within the existing boundary.

- Major mineralized zones lie outside the presently diverted area, as confirmed through detailed geological investigations.
- Geotechnical analysis shows that the existing pit slope of 37° maintains a safe FOS (>1.5).
    - Steepening the slope to 45°, required to access deeper reserves within the limited area, reduces the FOS to 1.0–1.15, which is below the statutory minimum.
    - As per DGMS guidelines, Regulation 106(2)(b) of MMR 1961, and DGMS Circular 3 of 2020, mines must maintain a minimum FOS of 1.5.
    - Therefore, deepening or further excavation within the existing area is unsafe and non-compliant.
- Considering the limited mineable reserve, the predominantly low-grade manganese ore, and the regulatory and geotechnical constraints that prevent safe and compliant deepening of the pit, the study conclusively establishes that mining within the existing 10.594 ha diverted forest area is not feasible. To ensure safe, economically viable, and regulation-compliant mining operations, additional forest land diversion is essential for optimizing resource extraction while adhering to DGMS safety standards and statutory mining regulations.
- Continued operations within the existing area are technically unsafe and unscientific.
- To maintain compliance with MCDR, IBM, and DGMS standards, and to ensure safe and systematic mining, additional contiguous land in the mineralized zone must be diverted.
- The proposed additional land diversion is, therefore, essential for sustainable mineral exploitation, ensuring optimal resource utilization while maintaining full adherence to statutory, environmental, and safety norms.
- Further, the advantages of Lateral Expansion as proposed would have the benefits in terms of Increased ore recovery, achievement of production as per mining plan, improved slope stability & safety, easier equipment deployment, reduced excavation cost per tonne, enhanced drainage and water control, better compliance with forest-diversion boundaries, lower long-term reclamation effort
- Restricting mining entirely to the existing 10.594 ha forest-diverted area results in a concentrated environmental burden. Confined deep pits trap dust, amplify noise, increase stormwater turbidity, and intercept groundwater at a faster rate, causing local drawdown near forest vegetation. The lack of space prevents the implementation of essential environmental controls such as drains, settling ponds, and topsoil yards. Soil erosion increases, and progressive reclamation becomes impossible.

This approach leads to cumulative, long-lasting environmental stress and contradicts MoEF&CC's principles of sustainable mining and ecological restoration.

- Lateral mining distributes disturbances horizontally rather than vertically, reducing pollution concentrations, lowering groundwater stress, and enabling construction of environmental infrastructure. It allows sequential backfilling, terracing, and revegetation, ensuring continuous reclamation and achieving zero-net expansion of disturbed land. Hydrological behaviour, dust dispersion, slope stability, and ecological conditions all improve under this layout. Therefore, controlled lateral expansion is scientifically justified, environmentally preferable, and fully aligned with sustainable, low-impact mining practices. The project should be granted forest clearance to implement this environmentally superior option.

In summary, controlled lateral expansion is scientifically justified, environmentally superior, and essential for safe, sustainable, and regulation-compliant mining. Granting forest clearance for the proposed expansion is therefore strongly recommended.

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Annexure - III

OFFICE OF THE DEPUTY DIRECTOR OF MINES,
JODA CIRCLE, JODA
STEEL & MINES DEPARTMENT,
GOVT. OF ODISHA

At/PO: Baneikala, Dist. Keonjhar-758038
Mail: ddm.joda@orissaminerals.gov.in

No: 3378 /Mines, Dt: 09 /10/2025.

From,

The Deputy Director of Mines,
Joda Circle, Dist. Keonjhar

To

The Mines Manager,
Dalpahar Iron & Mn. Mines (Block-A) of M/s D.C. Jain

Sub:- Obtain forest clearance from remaining part of the lease.

Sir,

With reference to subject cited above, I am to say that during verification of concerned Junior Mining Officer of Dalpahar Iron & Mn. Mines (Block-A) of M/s D.C. Jain it is observed that out of the total mining lease area of 89.961 Ha. (Coming under Baitarani Reserve Forest) working is confined in diverted forest area of 10.594 Ha. (already broken up) which has been diverted into 8 small and scattered blocks, roads and safety zone. For financial year 2025-26 you have got permissions which are mentioned below

Sl. No	Block No.	Pit No.	Type of Ore	Proposed level in MP for FY. 2025-26
1	Block- VII	1	Iron	RL. 623 m. to 563 m.
2	Block- VI	2	Iron	RL. 703 m. to 653 m.
3	Block- V	3	Iron	RL. 723 m. to 683 m.
4	Block- IV	4	Iron & Mn.	RL. 683 m. to 653 m.
5	Block- I	5	Manganese	RL. 573 m. to 563 m.
6	Block- X	6	Manganese	RL. 613 m. to 593 m.
7	Block- II	7	Manganese	RL. 593 m. to 573 m.
8	Block- I	8	Manganese	RL. 593 m. to 563 m.

Now working is continuing in above 8 pits. The working pits are reached to its restricted boundaries. Hence currently there is no scope for lateral or vertical expansion of the above working pits within the existing diverted forest area.

for achieving the proposed production target it is so difficult until forest clearance obtained for the remaining lease area.

You are therefore requested to obtain forest clearance from remaining part of the lease to avoid the violation.

This is for your kind information and necessary action.

Yours faithfully,

09/X/25

Deputy Director of Mines,
Joda Circle, Dist.: Keonjhar