



SOUTH EASTERN COALFIELDS LIMITED
OFFICE OF THE GENERAL MANAGER, RAIGARH AREA

P.B. No. 27, P.O. Raigarh, Dist: Raigarh (C.G.) 496001
Ph No. 07762-222008, 224129, Fax No. 07762-223152

Ref: - SECL/GM/RGH/2023/ 298

Date: - 12/08/2023

To,
The Director IA-II (Coal Mining) Division,
Ministry of Environment, Forest & Climate Change
Indira Paryavaran Bhawan,
Jor Bagh Road, New Delhi-
110003

Subject: EDS reply wrt Application of Environmental Clearance in respect of "Expansion of Baroud Opencast coal mine from 3.5 MTPA to 4.2 MTPA of M/s South Eastern Coalfields Limited in an area of 1111.40 ha located in District Raigarh (Chhatisgarh) - regarding EC under EIA Notification, 2006.

Ref:- 1. OM F.No. IA3-22/10/2022-IA.III (E 177258) dt 11.04.2022
2. Proposal No.: IA/CG/MIN/274062/2022
3. EDS dt 25.05.2023

Dear Sir,

Baroud OC Expansion project has existing EC of 3.5 MTPA in project area of 1111.40 ha located at dist. Raigarh CG state of South Eastern Coalfields Limited of Raigarh Area vide letter no J-11015/228/2007-IA.II(M) dated:20th May 2009. Now it is proposed for expansion of capacity from 3.5 MTPA to 4.2 MTPA (upto 20%).

As per the OM F.No. IAA32/10/2022-IA.III (E 177258) dt 11.04.2022, it is proposed for consideration of Environmental Clearance for expansion upto 20% of Baroud OC Expansion project, within the existing premises/mine lease area, without additional land acquisition". With reference to the EDS generated 25.05.2022, the reply EDS is enclosed with revised application in FORM-2 for grant of EC in respect of Baroud OC expansion project from uploaded along with all documents/annexures/KML etc.

It is therefore most earnestly solicited that proposal may kindly be considered in the ensuing EAC meeting for Baroud OC expansion project from 3.5 MTPA to 4.2 MTPA in project area of 1111.40 ha.

Thanking You

12/08/2023
General Manager
SECL Raigarh Area

BAROUD OC EXPANSION PROJECT from 3.5 MTPA to 4.2 MTPA**Proposal No.: IA/CG/MIN/274062/2022**

Sl.No	EDS dt 25.05.2022	Reply
1	copies of previous ECs along with to be attached.	Attached as Annexure-1
2	Form-2 does not include baseline data in section 16.	Baseline data is filled in revised Form-2
3	Approval of wildlife conservation plan or acknowledgement copy to be attached.	Attached as Annexure-2
4	Certified compliance report of existing EC to be provided.	IRO Certified compliance report attached as Annexure-3
5	PP itself indicated the excess production beyond the EC granted values. Whether this application is for 20% expansion or violation category due to excess production. Please clarify.	The application is not for violation category. This application is for 20% expansion i.e. 3.5 MTPA to 4.2 MTPA (upto 50% i.e. 3.5 to 5.25 MTPA under clause 7(ii) vide OM F.No. IA3-22/10/2022-IA.III (E 177258) dt 11.04.2022)
6	Copies of all CTOs and Latest copy of CTO	Attached as Annexure-4
7	Latest Copy of permission of CGWA.	Applied vide application no.21-4/7619/CT/MIN/2022. CGWA has approved the proposal on 07.07.2023 NOC awaited. Attached as Annexure-5
8	latest Approval of DGMS	Attached as Annexure-6
9	Land acquisitions status of 1111.4 ha.	1111.4 Ha Acquired. Attached as Annexure-7
10	There is no status provided for FC in section 24 after confirming forest land is involved in the project. Therefore, form-2 to be revised and submit the status of FC in the project.	<p>The FC proposal was not linked during filling the form due to technical issue. Now also status of Forest Land in section 24 is not editable in Form-2. However, total 381.273 Ha Forest Land involved in the project.</p> <p>a. 19.001 Ha. –Final Stage obtained vide letter No. 8सी/21/2003–एफसीडब्ल्यू/577 दि. – 02.04.2004</p> <p>b. 123.899 Ha. - Final Stage obtained vide F. No. 8-102/2005-FC Dated: 13th December 2006.</p> <p>c. Stage-I FC obtained 238.373 Ha FL vide no. 8-35/2019-FC dt 12.05.2023</p> <p>Forest Clearance obtained -Attached as Annexure-8</p> <p>Revised Form-2 is being submitted</p>


12.08.2023
N.O.(ENVT), SECL RAIGARH AREA

No J-11016/228/2007-IA.II(M)
Government of India
Ministry of Environment & Forests

Paryavaran Bhawan,
C.G.O. Complex,
New Delhi - 110510.

Dated: 20th May 2008

To
General Manager (W.B.P/Env.),
M/s South Eastern Coalfields Ltd.,
Bilaspur, Chhattisgarh

Sub: **Expansion of Baroud Opencast Mine (1 MTPA to 3.5 MTPA and expansion in lease area from 312.17 ha to 1111.40 ha) and of M/s SECL, in village Baroud, Tehsil Gharghora, Dist. Raigarh, Chhattisgarh - EC based on TOR granted on 28.06.2007- reg.**

Sir,

This is with reference to letter No. 43011/43/2007-CPAM dated 05.03.2007 forwarding the application for Terms of Reference (TOR) and this Ministry's letter dated 28.06.2007 granting TOR to the above-mentioned project and subsequent letter No. CIL/EMP-TOR/2008/05 of M/s CIL dated 07.01.2009 with application for environmental clearance based on TOR and subsequent letters of M/s SECL dated 05.03.2009 and 30.04.2009 on the above-mentioned subject. The Ministry of Environment & Forests has considered your application. The project is for expansion of Baroud Opencast Coalmine Project in terms of annual production capacity of coal from 1 MTPA to 3.5 MTPA and lease area from 312.17 ha to 1111.40 ha. The project was granted environmental clearance on 27.03.2008 for a production capacity of 1MTPA of coal in a project area of 312.17 ha. Of the total project area, 588.15 ha is agricultural land, 379.43 ha is forestland, 143.82 ha is Govt. wasteland. River Kurket flows adjacent to western boundary of the ML. It is proposed to modify the surface water drainage of the area. There are no National Parks, Wildlife Sanctuary, Biosphere Reserves found in the 15 km buffer zone. A number of open, mixed forest are found in the core and buffer zone.

Maximum rated capacity of the mine is 3.5 million tonnes per annum (MTPA) of coal production. Mining will be both opencast (OC) by mechanised method using shovel-dumper. Of the total lease area, 881.65 ha is for quarry area, area for storage of topsoil is 1.25 ha, area for ext. OB dumps 38.70 ha, 0.15 ha is mineral storage area, roads 11.61 ha, green belt 10 ha, safety zone 151.74 ha, Infrastructure & other facilities 15.31ha, and 0.89 ha outside the ML for township for 132 dwelling units established at a distance of 2 km from ML. Mineral transportation of 10, 605 TPD of coal from mine to railway siding would be by road. Ultimate working depth of the mine is 160 m below ground level (bgl). Present working depth is 70m bgl. Water table is in the range of 4.43 - 7.01m bgl during pre-monsoon and 2.42-3.77m bgl during post-monsoon. Peak water demand is 750 m³/d of water of which 200 m³/d is for dust suppression, 20 m³/d is for domestic consumption, 30 m³/d is for green belt, 50 m³/d is for CHP, 60 m³/d for workshop, and balance in township (370 m³/d). Of the total water demand, 500 m³/d would be met from groundwater and 250 m³/d is from mine water. An estimated 553.66 Mm³ of OB would be generated over the balance life of the mine, of which 544.16 Mm³ would be dumped in de-coaled void of 770 ha and the balance 9.50 Mm³ of OB would be stored in external OB dump of an area of 38.70 ha. Backfilling would begin from 2nd year of the expansion project. Of the 881.65 ha of the quarry area, an area of 770 ha would be reclaimed with vegetation. Life of the project at the rated capacity of 3.5 MTPA is 48 years. The project involves R&R of 4 villages - Baroud, Bajaan, Phaguram, and Kurmobaona - comprising 390 PAFs and 835 land custeers from the expansion project. Capital cost of the project is Rs. 130.43 crores. Project approved by M/s SECL on 21.06.2007. Public Hearing was conducted on 11.04.2008.

2. The Ministry of Environment & Forests has examined the application in accordance with the EIA Notification 2006 and under the provisions thereof, hereby accords environmental clearance for the above-mentioned Baroud Opencast Mine for expansion in production capacity from 1 MTPA to 3.5 MTPA and expansion in lease area from 312.17 ha to 1111.40 ha under the provisions of the Environmental Impact Assessment Notification, 2006 and amendments thereto and Circulars issued thereon and subject to the compliance of the terms and conditions mentioned below:

A. Specific Conditions

- (i) No mining operations shall be undertaken in 379.43 ha of forestland, until forestry clearance has been obtained under the provisions of FC Act, 1980.
- (iii) Prior approval of the CGWA shall be obtained for using ground water (500 m³/d) for the mining operation.
- (iv) Mining shall be carried out as per statuette at a safe distance from River Kurket and other surface water bodies flowing in and near the Mine Lease/ project area.
- (v) Top soil shall be stored in the earmarked dumps and used for green belt development and for plantation/reclamation.
- (vi) Mineral transportation by road shall cease when rail link is established and shall be expedited with the railways authorities.
- (vii) OB shall be stacked at the earmarked external OB dumpsite of 38.70 ha within ML area. The ultimate slope of the dump shall not exceed 28°. Monitoring and management of existing reclaimed dumpsites including slope stability shall continue until the vegetation becomes self-sustaining. Compliance status shall be submitted to the Ministry of Environment & Forests and its Regional office located at Bhopal on a yearly basis.
- (viii) Garland drains (size, gradient and length) around the safety areas such as mine shaft and low lying areas and sump capacity shall be designed keeping 50% safety margin over an above the peak sudden rainfall and maximum discharge in the area adjoining the mine sites. Sump capacity shall also be provided adequate retention period to allow proper settling of silt material.
- (ix) Catch drains and siltation ponds of appropriate size shall be constructed to arrest silt and sediment flows from soil, OB and mineral dumps. The water so collected shall be utilised for watering the mine area, roads, green belt development, etc. The drains shall be regularly desilted and maintained properly.
Garland drains (size, gradient and length) and sump capacity shall be designed keeping 50% safety margin over and above the peak sudden rainfall and maximum discharge in the area adjoining the mine site. Sump capacity shall also provide adequate retention period to allow proper settling of silt material.
- (x) Dimension of the retaining wall at the toe of the dumps and OB benches within the mine to check run-off and siltation shall be based on the rainfall data
- (xi) Crushers at the existing and the proposed additional high capacity CHP shall be operated with high efficiency bag filters/water sprinkling system shall be provided to check fugitive emissions from crushing operations. conveyor system which shall be closed, haulage roads, transfer points, etc.
- (xii) Drills shall be wet operated only.
- (xiii) Controlled blasting shall be practiced with use of delay detonators and only during daytime. The mitigative measures for control of ground vibrations and to arrest the fly rocks and boulders shall be implemented.
- (xiv) An afforestation plan covering an area not less than 854.27 ha shall be implemented, which includes backfilled area (770 ha) and ext. OB dump (38.70ha), along ML boundary, green belt (10 ha), along roads, infrastructure (7.92 ha), safety zone (27.66 ha), undisturbed/vacant land and area outside the lease - R&R site, township by planting native species in consultation with the local DFO/Agriculture Department. The density of the trees shall be around 2500 plants per ha.

- (xv) Of the total 881.65 ha of the quarry area, an area of 770 ha of excavated area shall be reclaimed with plantation/afforestation by planting native plant species in consultation with the local DFO/Agriculture Department. The density of the trees shall be around 2500 plants per ha. The balance 111.65 ha of de-coaled the void left shall be converted into a water reservoir, shall be gently sloped and the upper benches of the reservoir shall be stabilised with plantation and the periphery of the reservoir fenced.
- (xvi) A Programme for conservation of the wildlife particularly the rare and endangered species/Schedule-I fauna and endangered flora and species of medicinal importance found in the study area shall be formulated and implemented in consultation with the Forest and Wildlife Departments in the State Government. Separate funds shall be earmarked for implementation of the various activities there under and the status thereof shall be regularly reported to this Ministry and the MOEF Regional Office, Bhopal. The project authorities shall participate in a Regional Action Plan of the State Government for conservation of flora and fauna found within the study area.
- (xvii) A detailed ground water monitoring action plan (along with budgetary provisions) for monitoring groundwater quality and level in consultation with the Central/State Ground Water Board be prepared and implemented. Regular monitoring of groundwater level and quality shall be carried out by establishing a network of existing wells and construction of new piezometers. The monitoring for quantity shall be done four times a year in pre-monsoon (May), monsoon (August), post-monsoon (November) and winter (January) seasons and for quality in May. Data thus collected shall be submitted to the Ministry of Environment & Forests and to the Central Pollution Control Board quarterly within one month of monitoring.
- (xviii) A Plan for water conservation and recharge measures of ground water along with budgetary provisions be prepared and implemented in consultation with the Central/State Ground Water Board to mitigate the adverse impact of mining which may lead to depletion of water levels in the area. The Company shall put up artificial groundwater recharge measures for augmentation of groundwater resource. In case monitoring of groundwater levels indicate decline of water table. Any additional water requirement for mining operation shall be met from rainwater/recycling of water only. The project authorities shall meet water requirement of nearby village(s) in case the village wells go dry due to dewatering of mine.
- (xix) ETP shall also be provided for treatment of effluents from workshop, CHP and an STP shall be provided for treating wastewater (from the township) and the treated effluents shall be used for green belt development. Wastewater generated from the mine shall be treated and recycled for mine operations and the balance wastewater and mine water discharge shall be treated to prescribed standards before discharge into the surface waters/agricultural use.
- (xx) Besides carrying out regular periodic health check up of their workers, 10% of the workers identified from workforce engaged in active mining operations shall be subjected to health check up for occupational diseases and hearing impairment, if any, through an agency such as NIOH, Ahmedabad within a period of one year and the results reported to this Ministry and to DGMS.
- (xxi) For monitoring land use pattern and for post mining land use, a time series of land use maps, based on satellite imagery (on a scale of 1:5000) of the core zone and buffer zone, from the start of the project until end of mine life shall be prepared once in 3 years (for any one particular season which is consistent in the time series) and the report submitted to MOEF and its Regional office at Bhopal.
- (xxii) R&R shall be not less than the norms prescribed in National R&R Policy 2007 and shall be implemented within a specified agreed time schedule of 2014-2016.
- (xxiii) A detailed Plan for CSR with specific budgetary allocation (capital and revenue) for various skill development and alternate livelihood programmes and schemes and implemented through establishment of cooperatives and SHGs. Costs for CSR would have a capital expenditure of not less than Rs 1 crore and an annual revenue expenditure of Rs 1.5 crores for Baroud Project. This is in addition to 2.5% of the company's earnings to be utilised for CSR.

for the balance life of 48 years. A detailed pre-project survey be carried on the socio-economic status of the local communities living in the villages near the project area before start of the mining operation based on a scientific methodology based on UNDP Human Development Index and monitoring the impact of project on the socio-economic and human development of the local communities, which shall be used as a base-line data for monitoring the progress of the status of human and socio-economic development in the area during and after the project life which is reflected in their Annual Report of the company and is also furnished as part of the Monitoring Report submitted to MOEF.

- (xxiv) A Final Mine Closure Plan along with details of Corpus Fund shall be submitted to the Ministry of Environment & Forests five year before mine closure for approval. Habitat Restoration Plan of the mine area shall be carried out using a mix of native species found in the original ecosystem, which were conserved in-situ and ex-situ in an identified area within the lease for reintroduction in the mine during mine reclamation and at the post mining stage for habitat restoration.

B. General Conditions

- (i) No change in mining technology and scope of working shall be made without prior approval of the Ministry of Environment and Forests.
- (ii) No change in the calendar plan including excavation, quantum of mineral coal and waste shall be made.
- (iii) Four ambient air quality monitoring stations shall be established in the core zone as well as in the buffer zone for monitoring SPM, RSPM, SO₂ and NO_x, and heavy metals such as Hg, Pb, Cr, As, etc. Location of the stations shall be decided based on the meteorological data, topographical features and environmentally and ecologically sensitive targets in consultation with the State Pollution Control Board.
- (iv) Data on ambient air quality (SPM, RSPM, SO₂, NO_x and heavy metals such as Hg, Pb, Cr, As, etc) shall be regularly submitted to the Ministry including its Regional Office and to the State Pollution Control Board and the Central Pollution Control Board once in six months.
- (v) Fugitive dust emissions (SPM, RSPM, and heavy metals such as Hg, Pb, Cr, As, etc) from all the sources shall be controlled regularly monitored and data recorded properly. Water spraying arrangement on haul roads, wagon loading, dumper trucks (loading and unloading) points shall be provided and properly maintained.
- (vi) Adequate measures shall be taken for control of noise levels below 85 dBA in the work environment. Workers engaged in blasting and drilling operations, operation of HEMM, etc shall be provided with ear plugs/muffs.
- (vii) Industrial wastewater (workshop and wastewater from the mine) shall be properly collected, treated so as to conform to the standards prescribed under GSR 422 (E) dated 19th May 1983 and 31st December 1983 or as amended from time to time before discharge. Oil and grease trap shall be installed before discharge of workshop effluents.
- (viii) Vehicular emissions shall be kept under control and regularly monitored. Vehicles used for transporting the mineral shall be covered with tarpaulins and optimally loaded.
- (ix) Environmental laboratory shall be established with adequate number and type of pollution monitoring and analysis equipment in consultation with the State Pollution Control Board.
- (x) Personnel working in dusty areas shall wear protective respiratory devices and they shall also be provided with adequate training and information on safety and health aspects.
Occupational health surveillance programme of the workers shall be undertaken periodically to observe any contractions due to exposure to dust and to take corrective measures, if needed.

- (xi) A separate environmental management cell with suitable qualified personnel shall be set up under the control of a Senior Executive, who will report directly to the Head of the company
- (xii) The funds earmarked for environmental protection measures shall be kept in separate account and shall not be diverted for other purpose. Year-wise expenditure shall be reported to this Ministry and its Regional Office at Bhopal.
- (xiii) The Regional Office of this Ministry located at Bhopal shall monitor compliance of the stipulated conditions. The Project authorities shall extend full cooperation to the office(s) of the Regional Office by furnishing the requisite data/ Information/monitoring reports
- (xiv) A copy of the will be marked to concerned Panchayat/ local NGO, if any, from whom any suggestion/representation has been received while processing the proposal.
- (xv) State Pollution Control Board shall display a copy of the clearance letter at the Regional Office, District Industry Centre and Collector's Office/Tehsildar's Office for 30 days.
- (xvi) The Project authorities shall advertise at least in two local newspapers widely circulated around the project, one of which shall be in the vernacular language of the locality concerned within seven days of the clearance letter informing that the project has been accorded environmental clearance and a copy of the clearance letter is available with the State Pollution control Board and may also be seen at the website of the ministry of Environment & Forests at <http://envfor.nic.in>. The compliance status shall also be uploaded by the project authorities in their website and regularly updated at least once in six months so as to bring the same in the public domain. The environmental monitoring data shall also be displayed at the entrance of the project premises and mines office and in corporate office and on the company's website and regularly updated..

3. The Ministry or any other competent authority may stipulate any further condition for environmental protection.

4. Failure to comply with any of the conditions mentioned above may result in withdrawal of this clearance and attract the provisions of the Environment (Protection) Act, 1986

5. The above conditions will be enforced *inter-alia*, under the provisions of the Water (Prevention & Control of Pollution) Act, 1974, the Air (Prevention & Control of Pollution) Act, 1981, the Environment (Protection) Act, 1986 and the Public Liability Insurance Act, 1991 along with their amendments and Rules. The proponent shall ensure to undertake and provide for the costs incurred for taking up remedial measures in case of soil contamination, contamination of groundwater and surface water, and occupational and other diseases due to the mining operations.



(Dr T Chandini)
Director

Copy to:

1. Secretary, Ministry of Coal, New Delhi.
2. Secretary, Department of Environment & Forests, Government of Chhattisgarh, Secretariat, Raipur.
3. Chief Conservator of Forests, Regional office (EZ), Ministry of Environment & Forests, E-2/240 Arear Colony, Bhopal - 462018.
4. Chairman, Chhattisgarh State Environment Conservation Board, 1-Tilak Nagar, Shiv Mandir Chowk, Main Road, Avanti Vihar, RAIPUR-Chhattisgarh - 492001.
5. Chairman, Central Pollution Control Board, CBD-cum-Office Complex, East Arjun Nagar, New Delhi -110032.
6. Member-Secretary, Central Ground Water Authority, Ministry of Water Resources, Curzon Road Barracks, A-2, W-3 Kasturba Gandhi Marg, New Delhi.
7. District Collector, Raigarh, Government of Chhattisgarh, New Delhi.
8. Monitoring File 9. Guard File 10. Record File.

Dated: 27th March 2006

To
Chief General Manager (Civil/Env./Forest),
M/s South Eastern Coalfields Ltd.,
Bilaspur, Chhattisgarh.

Sub: Baroud Opencast Expansion Project (1 MTPA) of M/s South Eastern Coalfields Ltd. (SECL), located in village Lat, Tehsil Dharamjalgarh, District Raigarh, Chhattisgarh - environmental clearance - reg.

Sir.

This has reference to Ministry of Coal's letter No. 43011/21/2005- CPAM dated 26.08.2005 forwarding your application and M/s Coal India Ltd.'s letter No. C/II/DI/IN/2005/119 dated 22.09.2005 and your letters dated 14.11.2005, 07.12.2005 and 02.03.2006 on the above-mentioned subject. The Ministry of Environment & Forests has considered your application. It has been noted that the project is for expansion in the existing Baroud Opencast Coalmine Project, in terms of both lease area from 65.731 ha to 311.28 ha and production of coal from 0.3 MTPA to 1 MTPA rated capacity. The total project area is 312.17 ha of which the total lease area is 311.28 ha and 0.89 ha is for township located outside the lease area. Of the project area, 71.42 ha is agricultural land, 142.90 ha is forestland and 97.85 ha is Govt. land. Forestry clearance has been obtained for 19.001 ha on 02.04.2004. Of the total lease area, area for excavation is 249.67 ha, 1.25 ha is for storage of topsoil, 8 ha is for OB dumps, 0.15 ha is for mineral storage, 2.50 ha is for infrastructure, 11.61 ha is for roads, 10 ha is for green belt, ETP is for 0.10 ha and safety zone is 28 ha. There are no National Parks, Wildlife Sanctuary, Biosphere Reserves found in the 10 km buffer zone. River Kurket flows at a distance of 80m on the western side of the ML boundary. R&R involves three villages - Baroud, Bijari and Phaguram located in the core zone. R&R will be completed before commencement of project activities. Mining is opencast by semi-mechanised method. The expansion in the rated capacity of the mine is from 0.30 million tonnes per annum (MTPA) to 1 MTPA of coal production. Mineral transportation of 3030 TPD of coal is by road. Present working depth is 20.1m below ground level (bgl). Ultimate working depth of the mine is 58 m bgl. Water table is in the range of 3.83-6.99 m bgl in the core zone and 2.48-4.56m bgl in the buffer zone. Mining will intersect water table. Average water requirement is 660 m³/d, which will be met from groundwater (310 m³/d) and from mine pit water (350 m³/d). An estimated 81.20 Mm³ of OB will be generated, of which 79.70 Mm³ will be backfilled and the balance will be dumped in one external dump of maximum 30m height. Backfilling will begin from 3rd year onwards. Public Hearing was held on 13.10.2004. NOC has been obtained on 03.03.2005. Life of the mine at the rated capacity is 30 years. The project has been approved by M/s SECL on 29.05.2003. The capital cost of the project is 28.02 crores.

2. The Ministry of Environment & Forests hereby accords environmental clearance for the above-mentioned Baroud Opencast Expansion Coal Project of M/s SECL for expansion in production of coal to 1 MTPA rated capacity under the provisions of the Environmental Impact Assessment Notification, 1994 and subsequent amendments thereto subject to the compliance of the terms and conditions mentioned below:

A. Specific Conditions

- (i) No mining developmental activity shall commence in the forestland without prior clearance for diversion of forestland under the provisions of the FC (Act), 1980.

Sr. A. Ghosh, Mo.

should be stacked properly with proper slope at earmarked site(s) and should not be active and shall be used for reclamation and development of green belt.

OB should be stacked at earmarked external OB dumpsite(s) within ML area and shall be a maximum height of 30m only and consist of benches of 10 to 15 m each. The ultimate slope of the dump shall not exceed 28°. Backfilling shall begin at the end of 4th year in the de-coaled area. Monitoring and management of existing reclaimed dumpsites should continue until the vegetation becomes self-sustaining. Compliance status should be submitted to the Ministry of Environment & Forests and its Regional office located at Bhopal on yearly basis.

- (iv) Catch drains and siltation ponds of appropriate size should be constructed to arrest silt and sediment flows from soil, OB and mineral dumps. The water so collected should be utilised for watering the mine area, roads, green belt development, etc. The drains should be regularly desilted and maintained properly.
Garland drains (size, gradient and length) and sump capacity should be designed keeping 50% safety margin over and above the peak sudden rainfall and maximum discharge in the area adjoining the mine site. Sump capacity should also provided adequate retention period to allow proper settling of silt material.
- (v) Dimension of the retaining wall at the toe of the dumps and OB benches within the mine to check run-off and siltation should be based on the rainfall data.
- (vi) Crushers at the CHP should be operated with high efficiency bag filters, water sprinkling system should be provided to check fugitive emissions from crushing operations, conveyor system, haulage roads, transfer points, etc.
- (vii) Drills should be wet operated or with dust extractors and operated only during daytime.
- (viii) Controlled blasting should be practiced with use of delay detonators. The mitigative measures for control of ground vibrations and to arrest the fly rocks and boulders should be implemented.
- (ix) An area of 268 ha area shall be brought under afforestation which includes area under green belt (10 ha), reclaimed external OB dump (8 ha), along roads, along ML boundary/safety zone and non-mineralised areas near buildings, infrastructure, CHP and reclaimed backfilled area (250 ha) and 5 ha in township outside the lease by planting native species in consultation with the local DFO/Agriculture Department. The density of the trees should be around 2500 plants per ha.
- (x) A Progressive Closure Plan shall be implemented by reclamation of 250 ha of quarry area which is backfilled and afforested by planting native plant species in consultation with the local DFO/Agriculture Department. The density of the trees should be around 2500 plants per ha. The balance 26.32 ha of the excavated area being converted into a water reservoir shall be gently sloped and stabilised with plantation and protected with peripheral fencing.
- (xi) The company shall obtain approval of CGWA/CGWB Regional Office for use of groundwater for mining operations.
- (xii) The embankment along the ML boundary adjoining the Kurket River shall be located keeping safety barrier as per norms and shall be sufficiently higher than the HFL of the river and stabilised with plantation developed thereon to ensure that the mine is not inundated even during peak water flow.

Monitoring of groundwater level and quality should be carried out by establishing a network of monitoring wells and construction of new piezometers. The monitoring for quantity should be done four times a year in pre-monsoon (May), monsoon (August), post-monsoon (November) and winter (January) seasons and for quality in May. Data thus collected should be submitted to the Ministry of Environment & Forests and to the Central Pollution Control Board quarterly within one month of monitoring.

The Company shall put up artificial groundwater recharge measures for augmentation of groundwater resource. The project authorities should meet water requirement of nearby village(s) in case the village wells go dry due to dewatering of mine.

- (xv) Sewage treatment plant should be installed in the existing colony. ETP should also be provided for workshop and CHP wastewater.
- (xvi) R&R involving 3 villages, namely Baroud, Bijari and Phaguram located in the core zone shall be as per National Policy for R&R and shall be completed within specified time-schedule.
- (xvii) Digital processing of the entire lease area using remote sensing technique should be done regularly once in 3 years for monitoring land use pattern and report submitted to MOEF and its Regional office at Bhopal.
- (xviii) A Final Mine Closure Plan along with details of Corpus Fund should be submitted to the Ministry of Environment & Forests 5 years in advance of final mine closure for approval.
- (xix) Consent to Operate shall be obtained before expanding mining operations.

B. General Conditions

- (i) No change in mining technology and scope of working should be made without prior approval of the Ministry of Environment and Forests.
- (ii) No change in the calendar plan including excavation, quantum of mineral coal and waste should be made.
- (iii) Four ambient air quality monitoring stations should be established in the core zone as well as in the buffer zone for SPM, RPM, SO₂ and NO_x monitoring. Location of the stations should be decided based on the meteorological data, topographical features and environmentally and ecologically sensitive targets in consultation with the State Pollution Control Board.
- (iv) Data on ambient air quality (SPM, RPM, SO₂ and NO_x) should be regularly submitted to the Ministry including its Regional Office at Bhopal and to the State Pollution Control Board and the Central Pollution Control Board once in six months.
- (v) Fugitive dust emissions from all the sources should be controlled regularly monitored and data recorded properly. Water spraying arrangement on haul roads, wagon loading, dump trucks (loading and unloading) points should be provided and properly maintained.
- (vi) Adequate measures should be taken for control of noise levels below 85 dBA in the work environment. Workers engaged in blasting and drilling operations, operation of HEMM, etc should be provided with ear plugs/muffs.
- (vii) Industrial wastewater (workshop and wastewater from the mine) should be properly collected, treated so as to conform to the standards prescribed under GSR 422 (E) dated 19th May 1993


and 31st December 1993 or as amended from time to time before discharge. Oil and grease trap should be installed before discharge of workshop effluents.

- (viii) Vehicular emissions should be kept under control and regularly monitored. Vehicles used for transporting the mineral should be covered with tarpaulins and optimally loaded.
- (ix) Environmental laboratory should be established with adequate number and type of pollution monitoring and analysis equipment in consultation with the State Pollution Control Board.
- (x) Personnel working in dusty areas should wear protective respiratory devices and they should also be provided with adequate training and information on safety and health aspects.
Occupational health surveillance programme of the workers should be undertaken periodically to observe any contractions due to exposure to dust and to take corrective measures, if needed.
- (xi) A separate environmental management cell with suitable qualified personnel should be set up under the control of a Senior Executive, who will report directly to the Head of the company.
- (xii) The funds earmarked for environmental protection measures should be kept in separate account and should not be diverted for other purpose. Year-wise expenditure should be reported to this Ministry and its Regional Office at Bhopal.
- (xiii) The Regional Office of this Ministry located at Bhopal shall monitor compliance of the stipulated conditions. The Project authorities shall extend full cooperation to the office(s) of the Regional Office by furnishing the requisite data/ information/ monitoring reports.
- (xiv) A copy of the will be marked to concerned Panchayat/ local NGO, if any, from whom any suggestion/representation has been received while processing the proposal.
- (xv) State Pollution Control Board should display a copy of the clearance letter at the Regional Office, District Industry Centre and Collector's Office/Tehsildar's Office for 30 days.
- (xvi) The Project authorities should advertise at least in two local newspapers widely circulated around the project, one of which shall be in the vernacular language of the locality concerned within seven days of the clearance letter informing that the project has been accorded environmental clearance and a copy of the clearance letter is available with the State Pollution control Board and may also be seen at the website of the ministry of Environment & Forests at <http://envfor.nic.in>.

3. The Ministry or any other competent authority may stipulate any further condition for environmental protection.

4. Failure to comply with any of the conditions mentioned above may result in withdrawal of this clearance and attract the provisions of the Environment (Protection) Act, 1986.

5. The above conditions will be enforced *inter-alia*, under the provisions of the Water (Prevention & Control of Pollution) Act, 1974, the Air (Prevention & Control of Pollution) Act, 1981, the Environment (Protection) Act, 1986 and the Public Liability Insurance Act, 1991 along with their amendments and Rules.


(Dr. V. Chandini)
Additional Director

- Secretary, Ministry of Coal, New Delhi.
- Secretary, Department of Environment & Forests, Government of Chhattisgarh, Secretariat, Raipur.
- 3. Chief Conservator of Forests, Regional office (E2), Ministry of Environment & Forests, H-2/240 Arear Colony, Bhopal - 462016.
- 4. Chairman, Chhattisgarh Environment Conservation Board, 14/3 Park Street, Choubey Colony, Raipur.
- 5. Chairman, Central Pollution Control Board, CBD-cum-Office Complex, East Arjun Nagar, New Delhi - 110032.
- 6. Member-Secretary, Central Ground Water Authority, Ministry of Water Resources, Curzon Road Barracks, A-2, W-3 Kasturba Gandhi Marg, New Delhi.
- ✓ 7. Shri M.K. Shukla, CGM, Coal India Limited, SCOPE Minar, Core-1, 4th Floor, Vikas Marg, Laxminagar, New Delhi.
- 8. District Collector, Raigarh, Government of Chhattisgarh, New Delhi.
- 9. Monitoring File 10. Guard File 11. Record File

No.J-11015/99/2005.IA.II (M)
Government of India
Ministry of Environment & Forests

Paryavaran Bhawan,
C.G.O. Complex, Lodi Road,
New Delhi - 110 003

Dated the 20th May 2005

To
Director (Technical-P&P)
M/s South Eastern Coalfields Ltd.
Seepat Road,
Bilaspur,
Chhattisgarh

Subject: Expansion of Baroud open cast coal mine of M/s South Eastern Coalfields Ltd. located in Village Baroud, Tehsil Gharghora, District Raigarh, Chhattisgarh - environmental clearance req.

Sir,

This has reference to Ministry of Coal letter No.43011/15/2002-CPAM dated 24.03.2003 and your letter No. SECL/BSP/Envt./2005/EMP/171 dated 10.03.2005 and subsequent letter dated 18.03.2005 & 19.03.2005 and Coal India Ltd., Delhi letter dated 01.04.2005 on the subject mentioned above. The Ministry of Environment and Forests has examined the application. It has been noted that the proposal is for expansion of coal production from 0.12 MTY to 0.30 MTY. Total land requirement is 97.021 ha out of which 65.731 ha is lease area and 31.29 ha area will be acquired outside the mine lease area. Out of the total lease area of 65.731 ha, 4.02 ha is an agricultural land, 19.001 ha is forestland and 42.710 ha is others Government land. Area proposed for excavation is 65.731 ha. Out of the 31.29 ha area acquired outside the mine lease area 0.32 ha is for storage of top soil, 10.0 ha for OB dumps, 6.47 ha for infrastructure, 10.0 ha for green belt and 4.50 ha for rehabilitation site. Township is located outside the mine lease at a distance of 5 km in an area of 4.50 ha comprising 70 dwelling units. No ecologically sensitive area such national park/sanctuary/biosphere reserve etc. reported within 10 km radius of the project. One village comprising of 738 population from 186 households is in the core zone. Displacement of population is involved. The annual targeted production capacity of the mine is 0.30 Million Tonnes. Working is opencast with shovel dumper combination involving blasting. Ultimate working is 22.28 m bgl. Total water requirement is 410 m³/day out of which 310m³/day will be met from ground water and 100m³/day from mine sump. The project involves removal of about 2.883 Mm³ of over burden, of which 0.434 Mm³ will be dumped as external dump and 2.45 Mm³ OB will be backfilled. Backfilling will be start from 3rd year onwards. NOC from the State Pollution Control Board obtained on 01.03.2005 for production capacity of 0.30 MTPA. Public hearing held on 31.07.2003. Project report has been approved on 31.03.2005 for enhancing production from 0.12 MTY to 0.30 MTY. Capital cost of the project is Rs.5.83 crores.

2. The Ministry of Environment and Forests hereby accords environmental clearance to the above mentioned coal mining project of M/s South Eastern Coalfields Ltd. for production capacity of 0.30 MTY by opencast method involving total land requirement of 97.021 ha including mine lease area of 65.731 ha under the provisions of the Environment Impact Assessment Notification, 1994 as amended on 04.05.1994.

and 10.04.1997 subject to strict compliance of the terms and conditions mentioned below:

A. Specific conditions

- (I) The environmental clearance is subject to approval of the State Landuse Department, Government of Chhattisgarh for diversion of agricultural land for non-agricultural use.
- (II) Top soil should be stacked properly with proper slope at earmarked site(s) with adequate measures and should be used for reclamation and rehabilitation of mined out area.
- (III) OB dumps should be stacked at earmarked dump site(s) only and should not be kept active for long period. Proper terracing of OB dump should be carried out so as to ensure that the overall slope does not exceed 28 degree. Backfilling should start from 3rd year onwards. Monitoring and management of rehabilitated areas should continue until the vegetation becomes self-sustaining. Compliance status should be submitted to the Ministry of Environment & Forests on yearly basis.
- (IV) Catch drains and siltation ponds of appropriate size should be constructed to arrest silt and sediment flows from soil, OB and mineral dumps. The water so collected should be utilized for watering the mine area, roads, green belt development etc. The drains should be regularly desilted and maintained properly.
Garland drains of appropriate size should be constructed, to collect surface run-off from the OB and waste dump site(s) and taken to settling pond before discharge.
- (V) Dimension of the retaining wall at the toe of dumps and OB benches within the mine to check run-off and siltation should be based on the rain fall data.
- (VI) Green belt should be raised by planting the native species around the ML area, Coal Handling Plants, roads, OB dump sites etc. In consultation with the local DFO / Agriculture Department. The density of the trees should be around 1500 plants-per-ha.
- (VII) The project authorities should meet the water requirement of nearby village(s) in case the village wells go dry due to de-watering of the mine.
- (VIII) The project authority should implement suitable conservation measures to augment ground water resources in the area in consultation with the Regional Director, Central Ground Water Board.
- (IX) Regular monitoring of ground water level and quality should be carried out by establishing a network of existing wells and constructing new piezometers during the mining operation. The monitoring should be carried out four times in a year - pre-monsoon (April-May), monsoon (August), post-monsoon (November) and winter (January) and the data thus collected may be sent regularly to MOEF, Central Ground Water Authority and Regional Director central-Ground-water-Board.

- (x) Permission from the competent authority should be obtained for drawal of water for domestic requirement.
- (xi) Appropriate mitigative measures should be taken to prevent pollution of Kurket River in consultation with the State Pollution Control Board.
- (xii) Coal handling plant should be provided with adequate number of high efficiency dust extraction system. Loading and unloading areas including all the transfer points should also have efficient dust control arrangements. These should be properly maintained and operated.
- (xiii) Sewage treatment plant should be installed for the colony. ETP should also be provided for workshop and GHP wastewater.
- (xiv) Consent to operate should be obtained from SPCB for the enhanced production.
- (xv) Vehicular emissions should be kept under control and regularly monitored.
- (xvi) The project proponent should effectively implement actions suggested in the conservation plan in consultation with the concerned forest officials. Specific measures as proposed in the conservation plan for restoration and rehabilitation of sloth bear and other endangered fauna should be taken. The effectiveness of the conservation measures shall be monitored with inputs obtained from Forest Department and report furnished to this Ministry and its Regional Office.
- (xvii) A Final Mine Closure Plan along with details of Corpus Fund should be submitted to the Ministry of Environment & Forests 5 years in advance of final mine closure for approval.

B. General conditions

- (i) No change in mining technology and scope of working should be made without prior approval of the Ministry of Environment & Forests.
- (ii) No change in the calendar plan including excavation, quantum of mineral coal and waste should be made.
- (iii) Four ambient air quality monitoring stations should be established in the core zone as well as in the buffer zone for RPM, SPM, SO₂, NO_x & CO monitoring. Location of the stations should be decided based on the meteorological data, topographical features, and environmentally and ecologically sensitive targets in consultation with the State Pollution Control Board.
- (iv) ~~Data on ambient air quality (RPM, SPM, SO₂, NO_x & CO) should be regularly submitted to the Ministry including its Regional office at Bhopal and the State Pollution Control Board / Central Pollution Control Board once in six months.~~
- (v) Drills should be wet operated or with dust extractors and controlled blasting should be practised.

- (vi) Fugitive dust emissions from all the sources should be controlled regularly monitored and data recorded properly. Water spraying arrangement on haul roads, wagon loading, dump trucks (loading & unloading) should be provided and properly maintained.
- (vii) Adequate measures should be taken for control of noise levels below 85 dBA in the work environment. Workers engaged in blasting and drilling operations, operations of HEMM, etc. should be provided with ear plugs / muffs.
- (viii) Industrial waste water (workshop and waste water from the mine) should be properly collected, treated so as to conform to the standards prescribed under GSR 422 (E) dated 19th May, 1993 and 31st December, 1993 or as amended from time to time. Oil and grease trap should be installed before discharge of workshop effluents.
- (ix) Acid mine water, if any, has to be treated and disposed of after conforming to the standard prescribed by the competent authority.
- (x) Environmental laboratory should be established with adequate number and type of pollution monitoring and analysis equipment in consultation with the State Pollution Control Board.
- (xi) Personnel working in dusty areas should wear protective respiratory devices and they should also be provided with adequate training and information on safety and health aspects.

Occupational health surveillance program of the workers should be undertaken periodically to observe any contractions due to exposure to coal dust and take corrective measures, if needed.

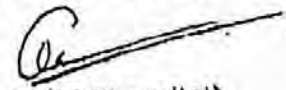
- (xii) A separate environmental management cell with suitable qualified personnel should be set-up under the control of a Senior Executive, who will report directly to the Head of the Organization.
- (xiii) The funds earmarked for environmental protection measures should be kept in separate account and should not be diverted for other purpose. Year wise expenditure should be reported to the Ministry and its Regional Office located at Bhopal.
- (xiv) The Regional Office of this Ministry located at Bhopal shall monitor compliance of the stipulated conditions. The project authorities should extend full cooperation to the officer (a) of the Regional Office by furnishing the requisite data / information / monitoring reports.
- (xv) A copy of clearance letter will be marked to concerned Panchayat / local NGO, if any, from whom and suggestion / representation has been received while processing the proposal.
- (xvi) State Pollution Control Board should display a copy of the clearance letter at the Regional office, District Industry Centre and Collector's office/ Tehsildar's Office for 30 days.

(xvii) The project authorities should advertise at least in two local newspapers widely circulated around the project, one of which shall be in the vernacular language of the locality concerned informing that the project has been accorded environmental clearance and a copy of the clearance letter is available with the State Pollution Control Board and may also be seen at web site of the Ministry of Environment & Forests at <http://envfor.nic.in>.

3. The Ministry or any other competent authority may alter/modify the above conditions or stipulate any further condition in the interest of environment protection.

4. Failure to comply with any of the conditions mentioned above may result in withdrawal of this clearance and attract action under the provisions of Environment (Protection) Act, 1986.

5. The above conditions will be enforced *inter-alla*, under the provisions of the Water (Prevention & Control of Pollution) Act, 1974, the Air (Prevention & Control of Pollution) Act, 1981, the Environment (Protection) Act, 1986 and the Public Liability Insurance Act, 1991 along with their amendments and rules.


(Dr. T. Chandini)
Additional Director

Copy to:

1. Secretary, Ministry of Coal, Government of India, Shastri Bhawan, New Delhi.
2. Secretary, Department of Environment, Government of Chhattisgarh, Secretariat, Raipur
3. Secretary, Department of Forests, Government of Chhattisgarh, Secretariat, Raipur
4. Chief Conservator of Forests (Central), Ministry of Environment & Forests, Regional Office (WZ), E-2/240 Arera Colony, Bhopal-462 016.
5. Chairman, Central Pollution Control Board, CBD-Cum-Office Complex, East Arjun Nagar, New Delhi-110 032.
6. Chairman, Chhattisgarh Environment Conservation Board, 14/3 Park Street, Choubay Colony, Raipur.
7. Member Secretary, Central Ground Water Authority, A2, W3 Curzon Road Barracks, K.G. Marg, New Delhi-110001.
8. District Collector Raigarh District, Chhattisgarh.
9. Shri M.K. Shukla, Chief General Manager, Coal India Limited, 407/8, Surya Kiran, 19 Kasturba Gandhi Marg, New Delhi-110 001.
10. EI Division, Ministry of Environment & Forests, EI Division, New Delhi.
11. Monitoring File.
12. Guard File.
13. Record File.

आदेश द्वारा सुधीर कुमार अग्रवाल, भा.व.से. प्रधान मुख्य वन संरक्षक,
(वन्यप्राणी एवं जैव विविधता संरक्षण) सह मुख्य वन्यप्राणी
अभिरक्षक, छत्तीसगढ़

सेक्टर-19, नार्थ ब्लॉक, अरण्य भवन, प्रथम तल, अटल नगर, नवा रायपुर

cwlwec@gmail.com

(☎0771-2512880. ☎ 0771-2512881)

आदेश क्रमांक/व.प्रा./प्रबंध-498/194 //आदेश//
नवा रायपुर, दिनांक - 12.07.2023

मुख्य वन संरक्षक, बिलासपुर वृत्त, बिलासपुर का पत्र क्रमांक/तक./1734 दिनांक 23.06.2023 द्वारा मेसर्स साउथ ईस्टर्न कोल फील्ड लिमिटेड को रायगढ़ वनमंडल अंतर्गत बरौद खुली खदान हेतु 238.373 हे. वन भूमि व्यपवर्तन के संबंध में भारत सरकार, पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय, नई दिल्ली के पत्र दिनांक 12.05.2023 में प्रस्ताव के प्रथम चरण स्वीकृति में अधिरोपित शर्तों के पालनार्थ वन्यप्राणी संरक्षण योजना तैयार कर इस कार्यालय को प्रस्तुत किया गया है।

“पूर्व में कार्यालयीन आदेश क्रमांक/व.प्रा./प्रबंध-498/147 दिनांक 15.09.2022 द्वारा मेसर्स साउथ ईस्टर्न कोल फील्ड लिमिटेड को जारी आदेश को निरस्त किया जाता है एवं वर्तमान में मुख्य वन संरक्षक, बिलासपुर वृत्त, बिलासपुर का पत्र क्रमांक/तक./1734 दिनांक 23.06.2023 द्वारा अनुशंसित संशोधित वन्यप्राणी संरक्षण योजना का अनुमोदन किया जाता है।”

प्रस्तुत वन्यप्राणी संरक्षण योजना का परीक्षण किया गया। आवेदक संस्थान द्वारा प्रस्तुत वन्यप्राणी संरक्षण योजना का क्रियान्वयन हेतु प्रावधानित राशि कुल 10 वर्षों में उपयोग करते हुये वर्षवार आबंटन किया गया है। अनुमोदित योजना में भारत सरकार द्वारा जारी निर्देशों के पालन में हाथी रोधक दीवार एवं हाथी के अन्य सुरक्षा उपायों को सम्मिलित करते हुये जल स्रोत निर्माण, रहवास विकास इत्यादि संबंधित राशि का विवरण परिशिष्ट-1 में दर्शित है।

उक्त वन्यप्राणी संरक्षण योजना की लागत राशि 26.82 करोड़ वर्तमान दरों पर है। परियोजना में देरी होने से समय लागत बढ़ेगी, जिसमें प्राईस इन्डेक्स के हिसाब से वृद्धि होगी। परियोजना के क्रियान्वयन के समय जो भी लागत आयेगी वह प्रस्तावकों को वन विभाग में एकमुश्त जमा करानी होगी, जिससे मूल्य वृद्धि के प्रभाव को समाप्त किया जा सके। वन विभाग इस प्रकार जमा की गई राशि से वन्यप्राणी संरक्षण योजना में दर्शाये समय सारणी के अनुसार क्रियान्वित करेगा।

अनुमोदित वन्यप्राणी संरक्षण योजना में दर्शाये गये उपरोक्त घटकों के संगत फील्ड में किये जाने वाले कार्यों का कार्यवार/स्थलवार प्रोजेक्ट संबंधित वनमण्डलाधिकारी के द्वारा तत्समय प्रचलित मार्गदर्शी सिद्धांतों (व्यय नार्मस, कार्य की प्रकृति, वन्यप्राणी प्रबंधन के संबंध में लागू होने वाले अन्य तकनीकी तथ्यों व निर्देशों) के अनुरूप तैयार कर सक्षमतानुसार तकनीकी स्वीकृति/अनुमोदन हेतु

//2//

अनुशंसा सहित संबंधित मुख्य वन संरक्षक को प्रेषित किया जावेगा। संबंधित मुख्य वन संरक्षक द्वारा प्रोजेक्ट की तकनीकी स्वीकृति/अनुमोदन की अनुशंसा के साथ मुख्य वन्यप्राणी अभिरक्षक छत्तीसगढ़ को प्रेषित किया जावेगा। प्रोजेक्ट का परीक्षण वन्यप्राणी संरक्षण योजना की उपयुक्तता की दृष्टि से किया जाकर मुख्य वन्यप्राणी अभिरक्षक के द्वारा कार्य हेतु प्रशासकीय स्वीकृति जारी किये जाने के साथ प्रोजेक्ट, प्रशासकीय स्वीकृति/बजट आबंटन करने हेतु सक्षम अधिकारी को प्रेषित किया जावेगा। प्रशासकीय स्वीकृति आदेश जारी किये जाने के पश्चात् ही कार्यों का क्रियान्वयन वनमंडलाधिकारी द्वारा किया जावेगा।

वन्यप्राणी संरक्षण योजना के कार्यों की मॉनिटरिंग का कार्य संबंधित मुख्य वन संरक्षक व मुख्य वन्यप्राणी अभिरक्षक छ.ग. द्वारा किया जावेगा। किये जा रहे कार्यों की भौतिक व आर्थिक प्रगति से मुख्य वन्यप्राणी अभिरक्षक को प्रतिमाह वनमंडलाधिकारी द्वारा अवगत कराया जावेगा।

प्रधान मुख्य वन संरक्षक (व.प्रा.) सह मुख्य वन्यप्राणी
अभिरक्षक, छत्तीसगढ़, नवा रायपुर

पृ.क्रमांक/व.प्रा./प्रबंध-498/3211

नवा रायपुर, दिनांक - 12.07.2023

प्रतिलिपि सूचनार्थ एवं आवश्यक कार्यवाही हेतु प्रेषित :-

1. अपर प्रधान मुख्य वन संरक्षक (भू-प्रबंध) नवा रायपुर। कृपया वन्यप्राणी संरक्षण योजना में प्रावधानित राशि 26.82 करोड़ एकमुश्त जमा करने हेतु परियोजना प्रस्तावकों को आदेशित करें।
2. मुख्य वन संरक्षक, बिलासपुर वृत्त, बिलासपुर।
3. मुख्य वन संरक्षक वन्यजीवन और क्षेत्रीय निदेशक, अचानकमार टायगर रिजर्व, बिलासपुर।
4. वनमंडलाधिकारी, रायगढ़ वनमंडल, रायगढ़।
5. मुख्य महाप्रबंधक, एस.ई.सी.एल. रायगढ़ क्षेत्र।


प्रधान मुख्य वन संरक्षक (व.प्रा.) सह मुख्य वन्यप्राणी
अभिरक्षक, छत्तीसगढ़, नवा रायपुर

CHAPTER - 8

REVISED PROPOSED BUDGET FOR WILDLIFE CONSERVATION AND AFFECTED
AVIFAUNA ALTERNATIVE HABITAT MANAGEMENT PLAN OF OCP BAROUD


S. No.	Activities	Proposed Activity	Area/No. in ha.	Amount in Rs.	Duration in Years	Remark	Nodal/ Agency
1	Habitat Improvement	Mixed Plantation on Revenue Forest (Refer to chapter-8.2, S.No.- 03)	3 ha.	485,000	10	Plantation in Bulekera village and fruit bearing tree species first year for plantation with Fencing and 5 year maintenance (Buffer zone comp.1312)	Forest Dept.
		Big tree plantation on School/ Aaganbadi and another govt. office (Refer to chapter 8.2, S.No. – 01, 02)	0.5 ha.	1,500,000	5	aganbadi, first year plantation and 5 year maintenance and management like tree guards/fencing, drainage etc.	Forest Dept.
		Plantation on Road side (Both side) (Refer to chapter-8.2, S.No.- 08)	4 ha.	5,668,148	5	Plantation on (roadside) of fruitbearing tree species with barbed wire fencing and 5 year maintenance.	Forest Dept.
		Rehabilitation exiting ecosystem improvement (Refer to chapter-8.2, S.No.-06, 07)	20 ha.	588,440	10	RDF Plantation activity has been proposed on suitable tree species at degraded forest land (Saraipali village) of buffer zones with 5 year maintenance & management.	Forest Dept.
		Development of grassland (Refer to chapter 8.2, S.No.-13,14)	5 ha.	3,927,000	5	Establishment of natural grassland on Faguram dam and Porda dam area of Buffer zone of OCP Baroud.	Forest Dept.
		Placement of artificial nest, Birdsfeeder, water pots (Refer to chapter- 8.2, S.No.-04, 05)	1000 Nest boxes	500,000	5	Placement for up to 2 years monitoring and evaluation establish artificial nest box.	Forest Dept.
2	Biodiversity improvement	Establishment of birds paradise (Pakshi vihar) including Fruit bearing tree species plantaion on dumping	L.S	11,000,000	3	Creation of avifauna habitat (Pakshi Vihar) on dumping sites among the OCP Baroud. (Included 10% for monitoring & Evaluation By the SFRTI)	SECL/ Forest Dept.
3	Plantation on River and pond/dam side	Plantation on River side (Both side) (Refer to chapter- 8.2, S.No.09)	10 ha.	1,987,960	5	Plantation of fruit (Kurket River) bearing tree species with barbed wire fencing and 5 year maintenance.	Forest Dept.
		Plantation on faguram dam/Pond (Refer to chapter 8.2, S.No.10,11)	5 ha.	993,980	5	Plantation on faguram dam (surrounding area) with tree guard and and 9 year maintenance.	Forest Dept.
		Plantation on Porda dam Refer to chapter-8.2, S.No.12)	8 ha.	1,590,368	5	Plantation on porda village dam (surrounding area) with and 5 year maintenance.	Forest Dept.
4	Riverbank restoration work/Catchment area and channel treatment	Riverbank restoration	L.S	1,000,000	5	Restoration activity proposed on Kurket river Approx. 3 km (Bothside)	Forest Dept.

5	Treatment for upgradation on degraded forest to normal forest through Soil & Moisture Conservation (SMC) activity	Soil moisture conservation (Refer to chapter-8.2, S.No.15)	10 ha.	30,250	5	SMC plan activity proposed on Range Gharghoda comp. 1312 Bulakela village buffer zone of OCP Baroud and 2 year maintenance	Forest Dept.
6	Training & workshop/ Awareness camp	Organized of social awareness program, empowering and sensitizing villagers for conservation of Avifauna and wildlife.		600,000	3	Training program should be conducted for local community on nearby villages for awareness of avifauna and wildlife conservation	Forest Dept.
7	Monitoring and Evaluation	Monitoring and Evaluation	L.S	1,500,000	3	Monitoring & annual assessment of all proposed activities, artificial nest, and plantation activity should be monitored and evaluated for next five years.	Forest Dept./ Independent Agency
			Total (A)	31,371,146			


**Principal Chief Conservator of Forest (Wildlife) cum
Chief Wildlife Warden
Chhattisgarh, Nava Raipur**

**REVISED PROPOSED BUDGET FOR WILDLIFE CONSERVATION AND AFFECTED
AVIFAUNA ALTERNATIVE HABITAT MANAGEMENT PLAN OF OCP BAROUD**


		For 10 Years (Rs. in Lakh)										Total in Rs.				
		1	2	3	4	5	6	7	8	9	10					
8	Human Elephant Conflict Management	1.A. Wages/Honorarium of Hathi Tracking team (5 Person @ Rs. 9000 per month)	LS	5.88	5.88	5.88	5.88	5.88	0	0	0	0	0	2,940,000	Human Elephant conflict management related all activities will be carried out in the selected range as well as compartment of concerned Forest Division/Awareness & education program should be conducted for affected area in buffer zone in OCP Baroud.	Forest Dept.
		1.B. Hiring of Vehicle	LS	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1,400,000		
		1.C. Uniform, Shoes, Blanket, tracking Equipment, Night vision Camera & Binoculars	LS	4.00	0	0	0	0	0	0	0	0	0	400,000		
		1.D. Protective Equipment, Flare gun	LS	4.00	0	0	0	0	0	0	0	0	0	400,000		
		2. Early Warning System	LS	5.00	0	0	0	0	0	0	0	0	0	500,000		
		3. Hathi Mitra Dal	LS	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3,000,000		
		4. Hiring of Veterinaries Service	LS	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	500,000		
		5. Rewards	LS	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	200,000		
		6. Hiring of Legal Experts/Advocate	LS	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	200,000		
		7. Purchase of public awareness material	LS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1,000,000		
		8. Establishment of Transit First Aid Centre	LS	10.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,500,000		
		9. Awareness and education program	LS	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1,500,000		
Total(B)												13,540,000				
Grand total (A+B)												44,911,146				


 Principal Chief Conservator of Forest (Wildlife) cum
 Chief Wildlife Warden
 Chhattisgarh, Nava Raipur

**REVISED PROPOSED BUDGET FOR WILDLIFE CONSERVATION AND AFFECTED
AVIFAUNA ALTERNATIVE HABITAT MANAGEMENT PLAN OF OCP BAROUD**

Sl. No.	Activities	Amount in Cr.														
		Years from clearing the area										Total	Unit	Rate in Cr.	Total Amount in Cr.	
		1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th					
1	Construction of Elephant Proof Wall	20.56											20.56	Per Km.	1.23	20.56
2	Protective Equipment for Wildlife conflict															
2(i)	Purchase of Vehicle for Protection for Human elephant Conflict, Raigarh Forest Division, Dharamjaigarh Forest Division and adjacent Forest division (Isuzu D-Max).	0.22	0.22	0.22	0.22	0.22	0.22						1.32	Per nos	0.22	1.32
2(ii)	Establishment of Human Rescue Center in Pusalda Village.	0.2											0.20	LS	0.20	0.20
2(iii)	Computer Set for Monitoring and Evaluation and other equipment for wildlife protection (Anti scheneear stick, Gum boots, Night Vision Camera).	0.05	0.05	0.05	0.05								0.20	LS	0.05	0.20
2(iv)	Drone Camera for Elephant Movement Tracking	0.025	0.025										0.050	LS	0.03	0.05
	TOTAL(D)															22.33

Grand Total - (A+B) 4.49 + (D) 22.33 = 26.82 Crore


 12/7/23
 Principal Chief Conservator of Forest (Wildlife) cum
 Chief Wildlife Warden
 Chhattisgarh, Nava Raipur



GOVERNMENT OF INDIA
MINISTRY OF ENVIRONMENT, FORESTS & CLIMATE CHANGE
INTEGRATED REGIONAL OFFICE, RAIPUR

Aranya Bhawan
 North Block, Sector -19
 Nava Raipur, Atal Nagar
 Chhattisgarh – 492 002
 Date: 19th June, 2023

F.No.3-50/2009(Env)

To
 The Member Secretary, EAC (Coal Mining)
 III Floor, Vayu Wing
 Indira Paryavaran Bhawan
 Jor Bagh, Aliganj Road
 New Delhi – 110 003

Sub.: Certified Compliance Status Report of Environmental Clearance No.J-11015/228/2007-IA-II(M) dated 20.05.2009 Granted by Ministry of Environment, Forest & Climate Change for Baroud Opencast Coal Mine (3.5 MTPA) from the Mine Lease Area 1111.40 ha located at village Baroud, Tehsil Gharghoda, District Raigarh, Chhattisgarh by M/s South Eastern Coalfields Ltd.- reg.

Ref: Environmental Clearance No.J-11015/228/2007-IA-II(M) dated 20.05.2009 Granted by Ministry of Environment, Forest & Climate Change

Sir,

Please find enclosed herewith the Certified Monitoring Report on the status of compliance of the imposed conditions in environmental clearance as mandated by the Ministry's letter dated 08.06.2022 and also requested by the project proponent. During the mine inspection the proponent has been instructed to

- (i) furnish FC Stage-II after obtained to this office (specific condition.i).
- (ii) furnish copy of NOC from CGWA to this office (specific condition.iii).
- (iii) complete construction of silo at the earliest and furnish its details to this office (specific condition.v).
- (iv) furnish the details of explosives used during mining operations (specific condition.xii).
- (v) furnish details of backfilling of internal dumps and plantation (specific condition.xii).
- (vi) complete construction of ETP and furnish its function to this office (specific condition.xix).
- (vii) furnish details of occupational health check-up to this office at the earliest (specific condition.xx).
- (viii) furnish latest comprehensive details of R&R activities (specific condition.xxi).
- (ix) complete installation of CAAQMS and furnish its functioning to this office (general condition.iii).
- (x) establish environmental laboratory inside Mine Office premises (general condition. ix).

This issues with the approval of Competent Authority.

Yours faithfully,

(Dr Pasupala Ravi)
 Scientist D

Copy to

- (1) Chief General Manager (Environment), M/s South Eastern Coalfields Ltd., Seepat Road, Bilaspur – 495 006 instructed to comply.

(2) Scientist F, Monitoring Cell, III Floor, Vayu Wing, Indira Paryavaran Bhawan, Jor Bagh, Aliganj Road, New Delhi – 110 003.



(Dr Pasupala Ravi)
Scientist D

Monitoring Report on the Status of Compliance of Stipulated Conditions in the Environmental Clearance No.J-11015/228/2007-IA-II(M) dated 20.05.2009 Granted by Ministry of Environment, Forest & Climate Change for Baroud Opencast Coal Mine (3.5 MTPA) from the Mine Lease Area 1111.40 ha located at village Baroud, Tehsil Gharghoda, District Raigarh, Chhattisgarh by M/s South Eastern Coalfields Ltd.

1. Project details
 - (a) Project type : 1(a) Mining of coal
 - (b) Name of the Project : Baroud Opencast Coal Mine (3.5 MTPA) from the Mine Lease Area 1111.40 ha located at village Baroud, Tehsil Gharghoda, District Raigarh, Chhattisgarh by M/s South Eastern Coalfields Ltd.
 - (c) Environmental Clearance details : No.J-11015/299/2008-IA-II(M) dated 18th February, 2014.
 - (d) Locations : Village Baroud, Tehsil Gharghoda, District Raigarh, Chhattisgarh
 - (e) Address of Correspondence : M/s South Eastern Coalfields Ltd. Seepat Road, Bilaspur – 495 006, Chhattisgarh
 - (f) Date of Monitoring : Site was inspected by Dr Pasupala Ravi, Scientist D on 16.06.2023
2. Present Status : Actively mining by the proponent. However, complaint case No.217/2014 Kshetriya Adhikari, Paryavaran Samrakshan Mandal Vs M/s Baroud Open Cast Mine (SECL) in the Hon'ble High Court of Chhattisgarh, alleged that the agency has been mining without obtaining environmental clearance and CTO excavated coal up to 1.377 MT in 2007-2008, 1.555 MT in 2008-2009, 1.130 MT in 2009-2010 and 1.436 MT in 2010-2011 and 1.751 MT in the year 2011-2012.
3. Site Pictures : Enclosed as ANNEXURE
4. Compliance of conditions imposed in EC letter no.J-11015/228/2007-IA-II(M) dated 20.05.2009

A. Specific Conditions

- (i) No mining operations shall be undertaken in 379.43 ha forestland, until forestry clearance has been obtained under the provisions of FC Act. 1980.

Compliance status

The proponent obtained FC for the forestland of 142.90 ha. Further the proponent

informed that FC Stage-I dated 12.05.2023 for the forestland of 238.373 ha has been obtained. **Therefore the proponent has been requested to furnish FC Stage-II after obtained to this office.**

- (iii) Prior approval of the CGWA shall be obtained for using ground water (500 m³/d) for the mining operation.

Compliance status

The proponent informed that in-principle approval has been received from CGWA. E-mail copy of in-principle approval received from CGWA has been furnished to this office. **Therefore the proponent has been requested to furnish copy of NOC from CGWA to this office.**

- (iv) Mining shall be carried out as per statuette at a safe distance from river Kurket and other surface water bodies flowing in and near the mine lease / project areas.

Compliance status

The proponent informed that the no diversion/modification of river/drainage has been done so far and shall not be done in future also.

- (v) Top soil shall be stored in the earmarked dumps and used for green belt development and for plantation / reclamation.

Compliance status

The proponent stored top soil in the earmarked internal dump and same has been used for green belt development and for plantation/reclamation.

- (vi) Mineral transportation by road shall cease when rail link is established and shall be expedited with the railways authorities.

Compliance status

The proponent informed that the coal has been transported by tarpaulin covered trucks to Baroud railway siding and Korichhapar railway siding as per the condition imposed. **On the day of inspection construction of silo with rapid loading system has been observed. Therefore the proponent has been requested to complete construction of silo at the earliest and furnish its details to this office.**

- (vii) OB shall be stacked at the earmarked external OB dump site of 38.70 Ha within ML area. The ultimate slope of the dump shall not exceed 28 degree. Monitoring and management of existing reclaimed dumpsites including slope stability shall continue until the vegetation becomes self-sustaining. Compliance status shall be submitted to the Ministry of environment & Forest and its Regional office located at Bhopal a yearly basis.

Compliance status

The proponent has stacked OB at two earmarked external dumpsites as per the measurements. It has been informed that the slope stability studies have been conducted periodically. Further, the proponent informed that the monitoring and management of existing reclaimed dumpsites has been carried periodically. Slope stability studies are conducted periodically. Slope stability has been sustained and the vegetation has grown in trees in self-sustaining OB area of 10.46 ha.

- (viii) Garland drains (size, gradient and length) around the safety areas such as mine shaft and low lying areas and sump capacity shall be designed keeping 50% safety margin over and above the peak sudden rainfall and maximum discharge in the area adjoining the mine sites. The sumps capacity shall also be provided adequate retention period to allow proper setting of silt material.

Compliance status

Garland drain around the mine of average cross-section 4.5 m x 4.0 m of about 3.5 KM length has been constructed. A sump of 1000 million gallon capacity has been constructed with maximum rainfall of 250 mm and keeping 50% safety margin. No mine shaft has been observed.

- (ix) Catch drain and siltation ponds of appropriate size shall be constructed to arrest silt and sediment flows from soil, OB and mineral dumps. The water so collected be utilized for watering the mine area, roads, green belt development etc. The drains shall be regularly desilted and maintained properly.

Garland drains (size, gradient and length) and sump capacity shall be designed keeping 50% safety margin over and above the peak sudden rainfall and maximum discharge in the area adjoining the mine site. Sump capacity shall also provide adequate retention period to allow proper settling of silt material.

Compliance status

Catch drains all around the approach roads, OB dumps of average size 2.00 m x 1.50 m of all together about 4 KM length have been constructed. Some low lying area of sufficient size has been automatically made between the dumps which act as Siltation ponds to arrest silt and for sedimentation. The drains are regularly de-silted and maintained properly before monsoon as a monsoon preparation work. A sump of 1000 million gallon capacity has been constructed with maximum rainfall of 250 mm and keeping 50% safety margin. No mine shaft has been observed.

- (x) Dimension of the retaining wall at the toe of the dumps and OB benches within the mine to check run – off and siltation shall be based on the rainfall data.

Compliance status

The proponent informed that average rainfall in the mine lease area has been 1250

mm per year. The proponent constructed retaining wall of width 0.15 m and height 1.60 m of RCC at the toe of the OB dumps to check run-off of the soil.

- (xi) Crushers at the existing and the proposed additional high capacity CHP shall be operated with high efficiency bag filters/ water sprinkling system shall be provided to check fugitive emissions from crushing operations, conveyer system which shall be closed, haulage roads, transfer point etc.

Compliance status

No CHP has been seen. The proponent has deployed three water tankers (two tankers of 18 KL, one tankers of 28 KL capacity) to control fugitive emission from haulage roads, transfer points, etc.

- (xii) Drill shall be wet operated only.

Compliance status

The proponent mentioned that only wet operated drills have been used for drilling operation.

- (xiii) Controlled blasting shall be practiced with use of delay detonators and only during daytime. The mitigative measures for control of ground vibration and to arrest the fly rocks and shall be implemented.

Compliance status

The proponent informed that controlled blasting during daytime using Nonel has been carried out. Further, the proponent mentioned that the mitigative measures for control of ground vibrations and to arrest the fly rocks boulders have been implemented. **The proponent has been instructed to furnish the details of explosives used during mining operations.**

- (xiv) An afforestation plan covering an area not less than 854.27 ha shall be implemented, which includes backfilling area (770 ha) and ext. OB dump (38.70 ha) along ML boundary, green belt (10 Ha), along roads, infrastructures (7.92 ha.) safety zone (27.65 ha), undisturbed/ vacant land and area outside the lease- R& R site, township by planting native species in consultation with the local DFO/ Agriculture Department. The density of the trees shall be around 2500 plants per ha

Compliance status

The proponent informed that the plantation work has been carried out in mine area by Chhattisgarh Rajya Van Vikas Nigam. Total 25,000 native plants in 6.46 ha of external dump and 10,000 plants in 4.00 ha of internal dump have been planted. In addition to this 4.75 km safety zone plantation as greenbelt (9500 plants) in of 3.56 ha has been done. Plantation in the Baroud residential colony has also been done. The proponent has furnished year wise plantation details to this office.

- (xv) Of the total 881.65 ha of the quarry area an area of 770 ha of excavated area shall be reclaimed with plantation / afforestation by planting native plant species in consultation with the local DFO/ Agriculture department. The density of the trees shall be around 2500 plants per ha. The balance 111.65 Ha of decoaled, the void left shall be converted into a water reservoir, shall be gently sloped and the upper benches of the reservoir shall be stabilized with plantation and the periphery of the reservoir fenced.

Compliance status

The proponent informed that the plantation work has been carried out in mine area by Chhattisgarh Rajya Van Vikas Nigam. Total 25,000 native plants in 6.46 ha of external dump and 10,000 plants in 4.00 ha of internal dump have been planted. In addition to this 4.75 km safety zone plantation as greenbelt (9500 plants) in of 3.56 ha has been done. Plantation in the Baroud residential colony has also been done. The proponent has furnished year wise plantation details to this office.

The proponent informed that internal dumps will be rehandled to extract the lower seams and thereafter, the backfilling will be completed and plantation will be done on internal dump. Therefore the proponent has been requested to furnish comprehensive details to this office.

- (xvi) A Programme for conservation of the wildlife particularly the rare and endangered species/ scheduled-I fauna and endangered flora and species of medicinal importance found in the study area shall be formulated and implemented in consultation with the forest and wildlife departments in the State Government. Separate funds shall be earmarked for implementation of the various activities there under and the status thereof shall be regularly reported to this Ministry and the MOEF regional office Bhopal. The project authorities shall participate in a Regional Action plan of the state Government for conservation of flora and fauna found within the study area.

Compliance status

The proponent informed that the wildlife conservation plan has been prepared and implemented in consultation with the State Forest Department. Details have been received in this office.

- (xvii) A detailed ground water monitoring action plan (along with budgetary provisions) for monitoring ground water quality and level in consultation with the Central/State Ground Water Board be prepared and implemented. Regular monitoring of ground water level and quality shall be carried out by establishing a network of existing wells and construction of new piezometers. The monitoring for quantity shall be done four times a year in pre-monsoon (May) monsoon (August), post monsoon (November) and winter (January) seasons and for quality in May Data thus collect shall be submitted to the Ministry of Environment & Forests and to the Central Pollution Control Board quarterly within one month of monitoring.

Compliance status

A pond with capacity 500 gallon for ground water recharge has been constructed among the internal dump of the mine. Two piezometers have been installed, one near Mine Office and other near Auramuda village. The ground water levels of piezometer and nearby villages are done quarterly basis in consultation with CMPDIL. The values found of monitored groundwater quality appeared within permissible limits.

- (xviii) A plan for water conservation and recharge measures of ground water along with budgetary provisions be prepared and implemented in consultation with the Central/ State Ground Water Board to mitigate the adverse impact of mining, which may lead to depletion of water levels in the area. The Company shall put up artificial ground water recharge measures for augmentation of groundwater resource in case monitoring of ground water levels indicate decline of water table. Any additional requirements for mining operation shall be met from rainwater/ recycling of water only. The project authorities shall meet water requirement of nearby village(s) in case the village wells go dry due to dewatering of mine.

Compliance status

A pond with capacity 500 gallon for ground water recharge has been constructed among the internal dump of the mine. It has been informed that the rainwater of surrounding catchment area accumulates in this pond which recharges the ground water level. Sumps established within the mine also recharge the ground water. Water requirement for mining operation/industrial purpose has been met from the mine water collected at the sump. Further, the proponent informed that no ground water has been used for mining operations except domestic use.

- (xix) ETP shall also be provided for treatment of effluents from workshop, CHP and STP shall be provided for treating wastewater from the township and the treated effluents shall be used for green belt development. Wastewater generated from the mine shall be treated and recycled for mine operations and the balance waste water and mine water discharge shall be treated to prescribed standards before discharge into the surface waters/ agricultural use.

Compliance status

The proponent initiated construction of ETP in workshop area and intimated on the day of inspection that ETP shall be completed within six months. Oil and grease trap has been provided for treatment of effluent from workshop. No CHP in the mine has been observed. Conventional soak pit tank has been provided for waste water from colony. Further, the proponent informed that the maximum quantity of mine water has been used for dust suppression at working face, haul road, approach road, coal stockyard, etc. and for plantation. Mine water is discharged to surface after sedimentation at sump as well as at settling tank. The effluent water quality monitoring has been done consultation with CMPDI on regular intervals and all the parameters found within permissible limits. **Therefore the proponent has been instructed to complete construction work of ETP and furnish its functioning to**

this office.

- (xx) Besides carrying out regular periodic health checkup of their workers, 10% of the worker identified from workforce engaged in active mining operations shall be subjected to health checkup for occupational diseases and hearing impairment, if any, through an agency such as NIOH, Ahmedabad within a period of one year and the results reported to this ministry and to DGMS.

Compliance status

The proponent informed that periodical occupational health check-up of the employees has been carried out every year. *The proponent has been requested to furnish details to this office at the earliest.*

- (xxi) For monitoring land use pattern and for post mining land use, a time series of land use maps, based on satellite imagery (on a scale of 1: 5000) of the core zone and buffer zone, from the start of the project until end of mine life shall be prepared once in 3 years (for any one particular season which is consistent in the time series), and the report submitted to MOEF and its Regional office at Bhopal.

Compliance status

The proponent informed that digital survey of entire lease hold area/core zone has been carried out and regularly monitored by the CMPDIL based on the satellite data. The satellite imagery has been furnished to this office.

- (xxii) R&R shall be not less than the norms prescribed in National R&R policy 2007 and shall be implemented within a specified agreed time scheduled of 2014-2015.

Compliance status

The proponent informed that the affected families have opted for monetary compensation in lieu of RR. The RR policy sanctioned amount has been ~10.0 crores. Out of 331 in Baroud village thirteen PAFs have been compensated till date. *Therefore, the proponent has been instructed to furnish latest comprehensive details to this office.*

- (xxiii) A detailed plan for CSR with specific budgetary allocation (capital & revenue) for various skill development and alternate livelihood programmes and schemes and implemented through establishment of cooperative and SHGs. Costs for CSR would have a capital expenditure of not less than Rs. 1 crore and an annual revenue expenditure of Rs. 1.5 crores for Baroud project . This is in addition to 2.5% of the company's earnings to be utilized for CSR for the balance life of 48 years of the Baroud project. A detailed pre- project survey be carried out on the socio-economic status of the local communities living in villages near the project area before start of the mining operation based on a scientific methodology based on UNDP Human Development Index and monitoring the impact of project on the socio economic and human development of the local communities, which shall be used as a base-line data for monitoring the progress of the status of human and socio- economic development

in the area during and after the project life which is reflected in their Annual Report of the company and is also furnished as part of the Monitoring Report submitted to MOEF.

Compliance status

The proponent informed that the CSR works using 2% net profit has been undertaken as per the guidance received from District Administration. **The proponent has been requested to furnish the comprehensive details of CSR activities to this office.**

- (xxiv) A Final Mine Closure Plan along with details of Corpus Fund shall be submitted to the Ministry of Environment & Forests five year before mine closure for approval. Habitat Restoration Plan of the mine area shall be carried out using a mix of native species found in the original ecosystem, which were conserved in – situ and ex- situ in an identified area within the lease of reintroduction in the mine during mine reclamation and at the post mining stage for habitat restoration.

Compliance status

The proponent informed that a progressive mine closure plan has been prepared with the corpus fund deposited in escrow account.

B. General Conditions

- (i) No change in mining technology and scope of working shall be made without prior approval of the Ministry of Environment and Forests.

Compliance status

The proponent informed that no change in technology and scope of working has been done and shall not be done without prior approval.

- (ii) No change in the Calendar plan including excavation, quantum of mineral coal and waste shall be made.

Compliance status

The proponent informed that no change in calendar plan of production for quantum of mineral coal has been made and shall not be so without made without prior approval.

- (iii) Four ambient air quality monitoring stations shall be established in the core zone as well as in the buffer zone for monitoring SPM, RSPM, SO₂ and NO_x, and heavy metals such as Hg, Pb, Cr, As, etc. Location of the stations shall be decided based on the meteorological data, topographical features and environmentally and ecologically sensitive targets in consultation with the State Pollution Control Board.

Compliance status

The proponent has established four ambient air-quality monitoring in the core zone as well in the buffer zone for PM₁₀, PM_{2.5}, SO₂ and NO_x. Further the proponent informed that regular monitoring of heavy metals once in six month has been carried out. Copy of monitoring report has been received in this office. Further, installation of continuous ambient air quality monitoring system (CAAQMS) has been initiated and informed that same shall be completed within fifteen days. Therefore the proponent request to complete installation and furnish this office of CAAQMS functioning.

- (iv) Data on ambient air quality (SPM, RSPM, SO₂, NO_x and heavy metals such as Hg, Pb, Cr, As, etc.) shall be regularly submitted to the Ministry including its Regional Office and to the State Pollution Control Board and the Central Pollution Control Board once in six months.

Compliance status

Data on ambient air quality (PM₁₀, PM_{2.5}, SO₂ and NO_x) and heavy metals such Hg, As, Ni, Cd, Cr with a copy to CECB and CPCB and third party monitoring have been received.

- (v) Fugitive dust emissions (SPM, RSPM, and heavy metals such as Hg, Pb, Cr, As, etc) from all the sources shall be controlled regularly monitored and data recorded properly. Water spraying arrangement on haul roads, wagon loading, and dumper trucks (loading and unloading) points shall be provided and properly maintained.

Compliance status

The proponent deployed three water tankers (two tankers of 18 KL, one tankers of 28 KL capacity) to control fugitive emission from haulage roads, transfer points, etc.

- (vi) Adequate measures shall be taken for control of noise levels below 85 dBA in the work environment. Workers engaged in blasting and drilling operations, operation of HEMM etc. shall be provided with ear plugs/muffs.

Compliance status

The proponent informed that the protective measures (e.g., ear plugs, muffs) have been provided to the workers for control of noise levels below 85 dBA in the mine area.

- (vii) Industrial waste water (workshop and wastewater from the mine) shall be properly collected, treated so as to conform to the standards prescribed under GSR 422 (E) dated 19th May 1993 and 31st December 1993 or as amended from time to time before discharge, Oil and grease trap shall be installed before discharge of workshop effluents.

Compliance status

The proponent has constructed pucca settling tank for treatment mine water

discharge. Kuccha settling pond for sedimentation of particles has been observed. The proponent constructed oil and grease traps in excavation workshop. The proponent informed that the effluent water quality has been monitored regularly by CMPDIL and the values mentioned therein appeared within the permissible limits.

- (viii) Vehicular emissions shall be kept under control and regularly monitored. Vehicles used for transporting the mineral shall be covered with tarpaulins and optimally loaded.

Compliance status

Optimally loaded vehicles transporting coal with covered tarpaulin plying in around the mine area have been seen. The proponent informed that vehicles have been checked for PUC certificate regularly.

- (ix) Environmental laboratory shall be established with adequate number and type of pollution monitoring and analysis equipment in consultation with the State Pollution Control Board.

Compliance status

The proponent informed that CMPDIL has environmental lab of its own and does the monitoring and analysis works of Environmental parameters. **Therefore the proponent has been instructed to establish environmental laboratory inside Mine Office premises.**

- (x) Personnel working in dusty areas shall wear protective respiratory devices and they shall also be provided with adequate training and information on safety and health aspects. Occupational health surveillance programme of the workers shall be undertaken periodically to observe any contractions due to exposure to dust and to take corrective measures, if needed.

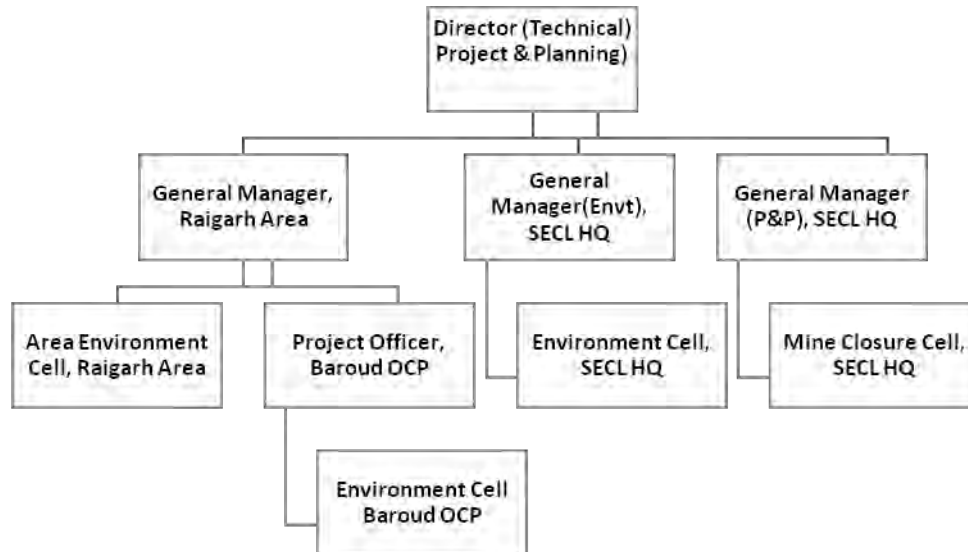
Compliance status

On the day of inspection workers with protective measures (safety shoes, gum boot, safety helmet, fluorescent jackets, first aid kit, raincoat and dust mask) have been noticed. The proponent informed that the workers have been given training on safety and health aspects.

- (xi) A separate environmental management cell with suitable qualified personnel shall be set – up under the control of Senior Executive, who will report directly to the Head of the Company.

Compliance status

The proponent has furnished the following administrative order.



- (xii) The funds earmarked for environmental protection measures shall be kept in separate account and shall not be diverted for other purpose. Year – wise expenditure shall be reported to this ministry and its Regional Office at Bhopal.

Compliance status

The proponent informed that the funds have been earmarked for environmental protection measures. The expenditure incurred for last three years has been furnished to this office.

- (xiii) The Regional Office of this Ministry located at Bhopal shall monitor compliance of the stipulated conditions. The project authorities shall extend full cooperation to the office (s) of the Regional Office by furnishing the requisite data / information/ monitoring reports.

Compliance status

The proponent has extended cooperation so far and assured to extend cooperation in future also.

- (xiv) A copy of the Environment Clearance letter shall be marked to concerned Panchayat / local NGO, If any from whom any suggestion/ representation has been received while processing the proposal.

Compliance status

The proponent has informed that the copies of EC letter have been shared with Panchayat / local NGO as imposed.

- (xv) State pollution Control Board shall display a copy of the clearance letter at the Regional Office, District Industry Centre and Collector’s Officer/ Tehsildar’s Office for 30 days

Compliance status

The proponent has informed that the copies of EC letter have been shared to display at respective offices.

- (xvi) The project authorities shall advertise at least in two local newspapers widely circulated around the project, one of which shall be in the vernacular language of the locality concerned within seven days of issue of the clearance letter informing that the project has been accorded environmental clearance and a copy of the clearance letter is available with the State pollution Control Board and may also be seen at website of the Ministry of Environment & Forest at <http://envfor.nic.in>. The compliance status shall also be uploaded by the project authorities in their website and regularly updated at least once in 6 months so as to bring the same in the public domain. The monitoring data for environmental parameters (Air, Water, Soil, & Noise) shall also be displayed at the entrance of the project premises and mines office and in corporate office and on the company website.

Compliance status

The proponent informed that the grant of environment clearance has been advertised in two local newspapers and also shared copy of EC letter with CECB. The proponent informed that EC compliance has been uploaded in SECL website and can be downloaded from <http://www.secl-cil.in/environment.php>. The monitoring data for environmental parameters has also displayed at SECL website http://www.secl-cil.in/em_report.php and displayed at the entrance of the project premises and mines office. The proponent has been requested to furnish copies of newspaper prints to his office.

- (3) The Ministry or any other competent authority may stipulate any further condition for environmental protection.

Compliance status

The proponent has agreed to abide as per the imposed condition.

- (4) Failure to comply with any of the conditions mentioned above may result in withdrawal of this clearance and attract the provisions of the Environment (Protection) Act, 1986

Compliance status

Copy of Form- V has been furnished to this office.

- (5) The above conditions will be enforced *inter-alia*, under the provisions of the water (Prevention & control of Pollution) Act, 1974, the Air, (Prevention & control of pollution Act, 1981, the Environment (Protection) Act, 1986 and the Public Liability insurance Act, 1991 along with their Amendments and rules. The Proponent shall

ensure to undertake and provide for the costs incurred for taking up remedial measures in case of soil contamination, contamination of groundwater and surface water, and occupational and other diseases due to the mining operations.

Compliance status

The proponent has agreed to abide as per the imposed condition.

Remarks

The proponent has been instructed to

- (i) furnish FC Stage-II after obtained to this office (specific condition.i).
- (ii) furnish copy of NOC from CGWA to this office (specific condition.iii).
- (iii) complete construction of silo at the earliest and furnish its details to this office (specific condition.v).
- (iv) furnish the details of explosives used during mining operations (specific condition.xii).
- (v) furnish details of backfilling of internal dumps and plantation (specific condition.xii).
- (vi) complete construction of ETP and furnish its function to this office (specific condition.xix).
- (vii) furnish details of occupational health check-up to this office at the earliest (specific condition.xx).
- (viii) furnish latest comprehensive details of R&R activities (specific condition.xxi).
- (ix) complete installation of CAAQMS and furnish its functioning to this office (general condition.iii).
- (x) establish environmental laboratory inside Mine Office premises (general condition. ix).



(Dr Pasupala Ravi)
Scientist D



CHHATTISGARH ENVIRONMENT CONSERVATION BOARD

Paryavas Bhawan, North Block, Sector - 19,
Nava Raipur Atal Nagar, District - Raipur (C.G.)
e-mail - hocecb@gmail.com

No. **3495/TS/CECB/ 2022**

Nava Raipur Atal Nagar, Raipur, Dated **18/08/2022**

To,

The General Manager,
M/s Baroud Opencast Mine,
South Eastern Coal Fields Limited,
Raigarh Area, Behind Collectorate,
Chhote Atarmunda,
District - Raigarh (C.G.)

Sub: - Renewal of the consent of the Board under section 25 of the Water (Prevention and Control of Pollution) Act, 1974 and under section 21 of the Air (Prevention and Control of Pollution) Act, 1981.

- Ref: -
1. Consent of the Board issued under section 25 of the Water (Prevention and Control of Pollution) Act, 1974 vide letter no. 6454/TS/CECB/2015 Raipur, dated: 06/01/2015 and under section 21 of the Air (Prevention and Control of Pollution) Act, 1981 vide letter no. 6456/TS/CECB/2015 Raipur, dated: 06/01/2015.
 2. Last renewal of the Board issued under section 25 of the Water (Prevention and Control of Pollution) Act, 1974 and under section 21 of the Air (Prevention and Control of Pollution) Act, 1981 vide letter no. 4833/TS/CECB/2019 Nava Raipur Atal Nagar, Raipur, dated: 06/09/2019.
 3. Your online application no. 10389497, dated 04/07/2022.

--:: 00 :--

With reference to your above application, consents under section 25 of the Water (Prevention and Control of Pollution) Act, 1974 and under section 21 of the Air (Prevention and Control of Pollution) Act, 1981 are hereby renewed for the period of **three years i.e. from 26/09/2022 to 31/08/2025**, subject to the fulfillment of the terms and conditions incorporated in the water consent letter no. **6454/TS/CECB/2015 Raipur, dated: 06/01/2015** and air consent letter no. **6456/TS/CECB/2015 Raipur, dated: 06/01/2015** and subsequent renewal(s)/amendment(s) issued by the Board and additional conditions mentioned below.

This renewal of consent is valid for production capacity of: -

Product	Production Capacity
Mining of Coal	3.5 Million Tonnes per Annum (Three Point Five Million Tonnes per Annum)

Additional Conditions

A. Water (Prevention and Control of Pollution) Act, 1974

1. Mine management shall operate and maintain effluent treatment system regularly to meet prescribed standards all the time. No effluent shall be discharged out side of the factory premises in any circumstances; hence zero discharge condition outside the mine premises shall be maintained all the time. Treated mine water shall be reused in water sprinkling, plantation, irrigation etc.
2. Mine management shall execute action plan for study, utilization of fly ash in overburden stabilization and backfilling and rain water harvesting with time period as mentioned in letter dated 01/07/2022. In case the industry fails to implement above works in the stipulated time period, the bank guarantee may be forfeited.
3. Mine management shall submit bank guarantee with extended period upto 31/03/2026 within 03 months.
4. Mine management shall comply with guidelines issued by CPCB for railway siding for pollution control and environmental conservation.
5. Mine management shall comply the provisions of notification dated 31/12/2021 issued by MoEF & CC regarding utilization of fly ash in mixing with over burden back filling of mine.
6. Mine management shall transport the coal in properly covered vehicles to avoid dust emission during transportation. Mine management shall also ensure use of mechanically covered vehicles for transportation of coal before 12/07/2023 (if required).
7. Mine management shall comply with the provision of Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016. (as amended upto date)
8. All the solid waste industrial and domestic shall be disposed off in environment friendly manner as per rule.
9. All the internal roads shall be maintained pucca. Roads shall be cleaned regularly. Dust, muck and sludge collected from roads shall be disposed properly.
10. Mine management shall submit Environment Statement to this Board as per provision of Environment (Protection) Amendment Rule, 1993 for the previous year ending 31st March on or before 30th September every year.
11. Extension in tree plantation shall be carried out in the open areas available within and around the mine area in during monsoon season. Fruit bearing species like mango, tamarind, guava etc. shall be given preference in this regard.

12. This renewal of consent is being issued under the "Scheme of Auto-Renewal of Consent" of the Board issued vide office order no. 5937 dated 29/01/2018 as per self certificate submitted by authorized signatory Mr. Rajeev Singh, Sub Area Manager, Baroud OCP of M/s Baroud Opencast Mine, South Eastern Coal Fields Limited, Raigarh Area, Behind Collectorate, Chhote Atarmunda, District - Raigarh (C.G.).
13. Chhattisgarh Environment Conservation Board reserves the rights to revoke the consent / renewal of consent at any time for any violation/non-compliance.
14. In case, if the capital investment is increased by such amount that the total investment exceeds the range for which renewal fees has been paid, the Mine management shall have to pay the difference amount of renewal fees for the corresponding block years.
15. In case, the prescribed fee payable is amended in future, the Mine management shall be liable to pay the difference amount for corresponding block years.

B. Air (Prevention and Control of Pollution) Act, 1981

1. Mine management shall operate and maintain the air pollution control equipments properly. Mine management shall ensure the emission quality meets the standards prescribed by the Board.
2. Mine management shall execute action plan for study, utilization of fly ash in overburden stabilization and backfilling with time period as mentioned in letter dated 01/07/2022. In case the industry fails to implement above works in the stipulated time period, the bank guarantee may be forfeited.
3. Mine management shall submit bank guarantee with extended period up to 31/03/2026 within 03 months.
4. Mine management shall install 01 No. of CAAQMS towards habitation area within six months. Calibration & data validation shall be carried out of CAAQMS and mine management shall ensure availability of real time data in CECB/CPCB server.
5. Ambient air quality within mine area shall be kept within latest prescribed standards.
6. Mine management shall comply the provisions of notification dated 31/12/2021 issued by MoEF & CC regarding utilization of fly ash in mixing with over burden and back filling.
7. Mine management shall comply with the provision of Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016. (as amended upto date)
8. All the solid waste industrial and domestic shall be disposed off in environment friendly manner.
9. All the internal roads shall be maintained pucca. Roads shall be cleaned regularly. Dust, muck and sludge collected from roads shall be disposed properly.

10. Mine management shall transport the coal in properly covered vehicles to avoid dust emission during transportation. Mine management shall also ensure use of mechanically covered vehicles for transportation of coal before 12/07/2023.
11. Mine management shall submit Environment Statement to this Board as per provision of Environment (Protection) Amendment Rule, 1993 for the previous year ending 31st March on or before 30th September every year.
12. Extension in tree plantation shall be carried out in the open areas available within and around the mine area in during monsoon season. Fruit bearing species like mango, tamarind, guava etc. shall be given preference in this regard.
13. This renewal of consent is being issued under the "Scheme of Auto-Renewal of Consent" of the Board issued vide office order no. 5937 dated 29/01/2018 as per self certificate submitted by authorized signatory Mr. Rajeev Singh, Sub Area Manager, Baroud OCP of M/s Baroud Opencast Mine, South Eastern Coal Fields Limited, Raigarh Area, Behind Collectorate, Chhote Atarmunda, District - Raigarh (C.G.).
14. Chhattisgarh Environment Conservation Board reserves the rights to revoke the consent / renewal of consent at any time for any violation/non-compliance.
15. In case, if the capital investment is increased by such amount that the total investment exceeds the range for which renewal fees has been paid, the Mine management shall have to pay the difference amount of renewal fees for the corresponding block years.
16. In case, the prescribed fee payable is amended in future, the Mine management shall be liable to pay the difference amount for corresponding block years.

Member Secretary

Chhattisgarh Environment Conservation Board
Nava Raipur Atal Nagar, Raipur (C.G.)

Endt. No. **3496** /TS/CECB/2022 Nava Raipur Atal Nagar, Raipur, Dated **18/08/2022**

Copy to: - Regional Officer, Regional Office, Chhattisgarh Environment Conservation Board, Raigarh (C.G.). Please ensure compliance and report, if any condition/conditions are violated by the industry.

Sd/-

Member Secretary

Chhattisgarh Environment Conservation Board
Nava Raipur Atal Nagar, Raipur (C.G.)



CHHATTISGARH ENVIRONMENT CONSERVATION BOARD
Paryavas Bhawan, North Block, Sector - 19,
Nava Raipur Atal Nagar, District - Raipur (C.G.)
e-mail - hocecb@gmail.com

No. **4833/TS/CECB/ 2019** Nava Raipur Atal Nagar, Raipur, Dated **06/09/2019**
To,

The General Manager,
M/s Baroud Opencast Mine,
South Eastern Coal Fields Limited,
Raigarh Area, Behind Collectorate,
Chhote Atarmunda,
District - Raigarh (C.G.)

Sub: - Renewal of the consent of the Board under section 25 of the Water (Prevention and Control of Pollution) Act, 1974 and under section 21 of the Air (Prevention and Control of Pollution) Act, 1981.

Ref: -

1. Consent of the Board issued under section 25 of the Water (Prevention and Control of Pollution) Act, 1974 vide letter no. 6454/TS/CECB/2015 Raipur, dated: 06/01/2015 and under section 21 of the Air (Prevention and Control of Pollution) Act, 1981 vide letter no. 6456/TS/CECB/2015 Raipur, dated: 06/01/2015.
2. Last renewal of the Board issued under section 25 of the Water (Prevention and Control of Pollution) Act, 1974 vide letter no. 169/TS/CECB/2018 Naya Raipur, dated: 03/04/2018 and under section 21 of the Air (Prevention and Control of Pollution) Act, 1981 vide letter no. 171/TS/CECB/2018 Naya Raipur, dated: 03/04/2018.
3. Your online application no. 3327559, dated 25/06/2019 and subsequent correspondence letter ending dated 15/07/2019.

--:: 00 ::--

With reference to your above application, consents under section 25 of the Water (Prevention and Control of Pollution) Act, 1974 and under section 21 of the Air (Prevention and Control of Pollution) Act, 1981 are hereby renewed for the period of **three years from 26/09/2019 to 25/09/2022**, subject to the fulfillment of the terms and conditions incorporated in the water consent letter no. **6454/TS/CECB/2015 Raipur, dated: 06/01/2015** and air consent letter no. **6456/TS/CECB/2015 Raipur, dated: 06/01/2015** and subsequent renewal(s)/amendment(s) issued by the Board and additional conditions mentioned below.

This renewal of consent is valid for production capacity of: -

Product	Production Capacity
Mining of Coal	3.5 Million Tonnes per Annum (Three Point Five Million Tonnes per Annum)

Additional Conditions

A. Water (Prevention and Control of Pollution) Act, 1974

1. Industry shall operate and maintain effluent treatment system regularly to meet prescribed standards all the time. No effluent shall be discharged out side of the factory premises in any circumstances; hence zero discharge condition outside the factory promises shall be maintained all the time.
2. Industry shall execute action plan for utilization of fly ash each in overburden stabilization and backfilling within a period of three years as per proposal submitted vide letter dated 27/03/2018 alongwith bank guarantee. In case the industry fails to implement above works in the stipulated time period, the bank guarantee may be forfeited.
3. Industry shall comply the provisions of notification dated 03/11/2009 (Amended) regarding utilization of fly ash in over burden and back filling.
4. Industry shall transport the coal in mechanically covered vehicles to avoid dust emission during transportation.
5. This renewal of consent is being issued under the "Scheme of Auto-Renewal of Consent" of the Board issued vide office order no. 5937 dated 29/01/2018 as per self certificate submitted by authorized signatory Mr. S.K. Mishra, Sub Area Manager, Baroud Sub Area of M/s Baroud Opencast Mine, South Eastern Coal Fields Limited, Raigarh Area, Behind Collectorate, Chhote Atarmunda, District - Raigarh (C.G.).
6. Extensive tree plantation shall be carried out in the open areas available within and around the plant premises in the current monsoon season. Fruit bearing species like mango, tamarind, guava etc. shall be given preference in this regard.
7. Chhattisgarh Environment Conservation Board reserves the rights to revoke the consent / renewal of consent at any time for any violation/non-compliance.

B. Air (Prevention and Control of Pollution) Act, 1981

1. Industry shall operate and maintain the air pollution control equipments properly. Industry shall ensure the emission quality meets the standards prescribed by the Board.
2. Industry shall execute action plan for utilization of fly ash each in overburden stabilization and backfilling within a period of three years as per proposal submitted vide letter dated 27/03/2018 alongwith bank guarantee. In case the industry fails to implement above works in the stipulated time period, the bank guarantee may be forfeited.

3. Industry shall comply the provisions of notification dated 03/11/2009 (Amended) regarding utilization of fly ash in over burden and back filling.
4. Industry shall transport the coal in mechanically covered vehicles to avoid dust emission during transportation.
5. This renewal of consent is being issued under the "Scheme of Auto-Renewal of Consent" of the Board issued vide office order no. 5937 dated 29/01/2018 as per self certificate submitted by authorized signatory Mr. S.K. Mishra, Sub Area Manager, Baroud Sub Area of M/s Baroud Opencast Mine, South Eastern Coal Fields Limited, Raigarh Area, Behind Collectorate, Chhote Atarmunda, District - Raigarh (C.G.).
6. Extensive tree plantation shall be carried out in the open areas available within and around the plant premises in the current monsoon season. Fruit bearing species like mango, tamarind, guava etc. shall be given preference in this regard.
7. Chhattisgarh Environment Conservation Board reserves the rights to revoke the consent / renewal of consent at any time for any violation/non-compliance.

Member Secretary

Chhattisgarh Environment Conservation Board
Nava Raipur Atal Nagar, Raipur (C.G.)

Endt. No. **4834/TS/CECB/ 2019** Nava Raipur Atal Nagar, Raipur, Dated **06/09/2019**

Copy to: - Regional Officer, Regional Office, Chhattisgarh Environment Conservation Board, Raigarh (C.G.). Please ensure compliance and report, if any condition/conditions are violated by the industry.

Member Secretary

Chhattisgarh Environment Conservation Board
Nava Raipur Atal Nagar, Raipur (C.G.)



CHHATTISGARH ENVIRONMENT CONSERVATION BOARD
Paryavas Bhawan, North Block, Sector - 19,
Naya Raipur (C.G.)
Email - hocecb@gmail.com

No. 171 /TS/CECB/ 2018
To,

Naya Raipur, Dated 3/4/2018

The General Manager,
M/s Baroud Opencast Mine,
South Eastern Coal Fields Limited,
Raigarh Area, Behind Collectorate,
Chhote Atarmunda,
District - Raigarh (C.G.)

Sub: - Renewal of consent of the Board for Mining of Coal - 3.5 Million Tonnes per Annum under section 21 of the Air (Prevention and Control of Pollution) Act, 1981.

- Ref: -
1. Consent of the Board for issued under section 21 of the Air (Prevention and Control of Pollution) Act, 1981 vide letter no. 6456/TS/CECB/2015 Raipur, dated: 06/01/2015.
 2. Last renewal of consent of the Board for Mining of Coal issued under section 21 of the Air (Prevention and Control of Pollution) Act, 1981 vide letter no. 4735/TS/CECB/2016, dated: 02/01/2016.
 3. Your online application no. 487168, dated: 01/07/2017 and subsequent correspondence letter ending dated: 27/03/2018.

--:: 00 ::--

With reference to your above application consent is hereby renewed for a period of **two years from 26/09/2017 to 25/09/2019**, subject to the fulfillment of the terms and conditions incorporated in the schedule of the **consent letter No. 6456/TS/CECB/2015 Raipur, dated: 06/01/2015**, subsequent renewals issued by Board and additional conditions mentioned below:

This renewal of consent is valid for production capacity of: -

Product	Production Capacity
Mining of Coal	3.5 Million Tonnes per Annum (Three Point Five Million Tonnes per Annum)

Additional Conditions

1. Industry shall operate and maintain the air pollution control equipments properly. Industry shall ensure the emission quality meets the standards prescribed by the Board.

2. Industry shall execute action plan for utilization of fly ash each in overburden stabilization and backfilling within a period of three years as per proposal submitted vide letter dated 27/03/2018 alongwith bank guarantee. In case the industry fails to implement above works in the stipulated time period, the bank guarantee may be forfeited.
3. Industry shall submit Environment Statement to the Board as per provision of Environment (Protection) amendment Rule, 1993 for the previous year ending 31st March on or before 30th September every year.
4. Industry shall extend green belt in the open areas available within and around the mine area in the coming monsoon season. Fruit bearing species like mango, tamarind, guava etc. shall be given preference in this regard. Local leguminous grass-land should also be preferred for green belt development.

Please acknowledge the receipt of this letter.

For & on behalf of
Chhattisgarh Environment Conservation Board



Member Secretary

Chhattisgarh Environment Conservation Board
Naya Raipur (C.G.)

Endt. No. 172/TS/CECB/2018

Naya Raipur, dated: 3/4/2018

Copy to: - Regional Officer, Regional Office, Chhattisgarh Environment Conservation Board, Raigarh (C.G.). Please ensure compliance and report, if any condition/conditions are violated by the industry.



Member Secretary

Chhattisgarh Environment Conservation Board
Naya Raipur (C.G.)





CHHATTISGARH ENVIRONMENT CONSERVATION BOARD
Paryavas Bhawan, North Block, Sector - 19,
Naya Raipur (C.G.)
Email - hocecb@gmail.com

No. **169** /TS/CECB/ 2018
To,

Naya Raipur, Dated **3/4/2018**

The General Manager,
M/s Baroud Opencast Mine,
South Eastern Coal Fields Limited,
Raigarh Area, Behind Collectorate,
Chhote Atarmunda,
District - Raigarh (C.G.)

Sub: - Renewal of consent of the Board for Mining of Coal - 3.5 Million Tonnes per Annum under section 25/26 of the Water (Prevention and Control of Pollution) Act, 1974.

- Ref: -
1. Consent of the Board for issued under section 25/26 of the Water (Prevention and Control of Pollution) Act, 1974 vide letter no. 6454/TS/CECB/2015 Raipur, dated: 06/01/2015.
 2. Last renewal of consent of the Board for Mining of Coal issued under section 25/26 of the Water (Prevention and Control of Pollution) Act, 1974 vide letter no. 4733/TS/CECB/2016, dated: 02/01/2016.
 3. Your online application no. 487168, dated: 01/07/2017 and subsequent correspondence letter ending dated:

With reference to your above application consent is hereby renewed for a period of **two years from 26/09/2017 to 25/09/2019**, subject to the fulfillment of the terms and conditions incorporated in the schedule of the **consent letter No. 6454/TS/CECB/2015 Raipur, dated: 06/01/2015**, subsequent renewals issued by Board and additional conditions mentioned below:

This renewal of consent is valid for production capacity of: -

Product	Production Capacity
Mining of Coal	3.5 Million Tonnes per Annum (Three Point Five Million Tonnes per Annum)

Additional Conditions

- 1- Industry shall operate and maintain effluent treatment system regularly to meet prescribed standards all the time. No effluent shall be discharged out side of the factory premises in any circumstances; hence zero discharge condition outside the factory promises shall be maintained all the time.

- 2- Industry shall execute action plan for utilization of fly ash each in overburden stabilization and backfilling within a period of three years as per proposal submitted vide letter dated 27/03/2018 alongwith bank guarantee. In case the industry fails to implement above works in the stipulated time period, the bank guarantee may be forfeited.
- 3- Industry shall submit Environment Statement to the Board as per provision of Environment (Protection) amendment Rule, 1993 for the previous year ending 31st March on or before 30th September every year.
- 4- Industry shall extend green belt in the open areas available within and around the mine area in the coming monsoon season. Fruit bearing species like mango, tamarind, guava etc. shall be given preference in this regard. Local leguminous grass-land should also be preferred for green belt development.

Please acknowledge the receipt of this letter.

For & on behalf of
Chhattisgarh Environment Conservation Board



Member Secretary

Chhattisgarh Environment Conservation Board
Naya Raipur (C.G.)

Endt. No. 170 /TS/CECB/2018

Naya Raipur, dated: 3/4/2018

Copy to: - Regional Officer, Regional Office, Chhattisgarh Environment Conservation Board, Raigarh (C.G.). Please ensure compliance and report, if any condition/conditions are violated by the industry.



Member Secretary

Chhattisgarh Environment Conservation Board
Naya Raipur (C.G.)





CHHATTISGARH ENVIRONMENT CONSERVATION BOARD
Commercial Complex, C.G. Housing Board Colony,
Kabir Nagar, Raipur (C.G.) 492 099

No. 4733 /TS/CECB/2015
 To,

Raipur, dated: 02/11/2015

✓ The General Manager,
 M/s Baroud Opencast Mine,
 South Eastern Coal Fields Limited,
 Raigarh Area, Behind Collectorate,
 Chhote Atarmunda,
District - Raigarh (C.G.)

Sub: - Renewal of consent of the Board for Mining of Coal - 3.5 Million Tonnes per Annum under section 25/26 of the Water (Prevention and Control of Pollution) Act, 1974.

- Ref: -
1. Consent of the Board for issued under section 25/26 of the Water (Prevention and Control of Pollution) Act, 1974 vide letter no. 6454/TS/CECB/2015 Raipur, dated: 06/01/2015.
 2. Your letter No. SECL/RGH/GM/FOREST/2014/15, dated: 11/12/2014 and subsequent correspondence letter ending dated: 15/09/2015.

--: 00 :--

With reference to your above application consent is hereby renewed for a period of **two years from 26/09/2015 to 25/09/2017**, subject to the fulfillment of the terms and conditions incorporated in the schedule of the consent letter No. 6454/TS/CECB/2015 Raipur, dated: 06/01/2015, subsequent renewals issued by Board and additional conditions mentioned below:

This renewal of consent is valid for production capacity of: -

Product	Production Capacity
Mining of Coal	3.5 Million Tonnes per Annum (Three Point Five Million Tonnes per Annum)

Additional Conditions

- 1- Industry shall operate and maintain effluent treatment system regularly to meet prescribed standards all the time. No effluent shall be discharged out side of the factory premises in any circumstances; hence zero discharge condition outside the factory promises shall be maintained all the time.

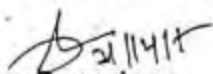
S.E.C.L. Raigarh Area
 Dy. No. - E.S. 116
 Date: 02/11/15

*No (Env. Dept.)
 Communicate it
 to Baroud Sub Area
 12-1-16*

- 2- Industry shall submit Environment Statement to the Board as per provision of Environment (Protection) amendment Rule, 1993 for the previous year ending 31st March on or before 30th September every year.
- 3- Industry shall extend green belt in the open areas available within and around the mine area. Fruit bearing species like mango, tamarind, guava etc. shall be given preference in this regard. Local leguminous grass-land should also be preferred for green belt development.

Please acknowledge the receipt of this letter:

For & on behalf of
Chhattisgarh Environment Conservation Board Raipur (C.G.)



Member Secretary
Chhattisgarh Environment Conservation Board
Raipur (C.G.)

Endt. No.
Copy to: -

/TS/CECB/2015

Raipur, dated: / /2015

- 1- Regional Officer, Regional Office, Chhattisgarh Environment Conservation Board, Raipur (C.G.). Please ensure compliance and report, if any condition/conditions are violated by the industry.
- 2- Cess Section, Chhattisgarh Environment Conservation Board, Raipur (C.G.).


Member Secretary
Chhattisgarh Environment Conservation Board
Raipur (C.G.)



CHHATTISGARH ENVIRONMENT CONSERVATION BOARD
Commercial Complex, C.G. Housing Board Colony,
Kabir Nagar, Raipur (C.G.) 492 099

No. **4735/TS/CECB/2015**

Raipur, dated: 02/11/2015

To,

The General Manager,
M/s Baroud Opencast Mine,
South Eastern Coal Fields Limited,
Raigarh Area, Behind Collectorate,
Chhote Atarmunda,
District - Raigarh (C.G.)

Sub: - Renewal of consent of the Board for Mining of Coal - 3.5 Million Tonnes per Annum under section 21 of the Air (Prevention and Control of Pollution) Act, 1981.

- Ref: -
1. Consent of the Board for issued under section 21 of the Air (Prevention and Control of Pollution). Act, 1981 vide letter no. 6456/TS/CECB/2015 Raipur, dated: 06/01/2015.
 2. Your letter No. SECL/RGH/GM/FOREST/2014/15, dated: 11/12/2014 and subsequent correspondence letter ending dated: 15/09/2015.

--: 00 :-

With reference to your above application consent is hereby renewed for a period of **two years from 26/09/2015 to 25/09/2017**, subject to the fulfillment of the terms and conditions incorporated in the schedule of the consent letter No. 6456/TS/CECB/2015 Raipur, dated: 06/01/2015, subsequent renewals issued by Board and additional conditions mentioned below:

This renewal of consent is valid for production capacity of: -

Product	Production Capacity
Mining of Coal	3.5 Million Tonnes per Annum (Three Point Five Million Tonnes per Annum)

Additional Conditions


1. Industry shall operate and maintain the air pollution control equipments properly. Industry shall ensure the emission quality meets the standards prescribed by the Board.

*NO (Env. L. Permit)
to Baroud Sub Area
12.11.15*

2. Industry shall submit Environment Statement to the Board as per provision of Environment (Protection) amendment Rule, 1993 for the previous year ending 31st March on or before 30th September every year.
3. Industry shall extend green belt in the open areas available within and around the mine area. Fruit bearing species like mango, tamarind, guava etc. shall be given preference in this regard. Local leguminous grass-land should also be preferred for green belt development.

Please acknowledge the receipt of this letter.


For & on behalf of
Chhattisgarh Environment Conservation Board Raipur (C.G.)


Member Secretary
Chhattisgarh Environment Conservation Board
Raipur (C.G.)

Endt. No. /TS/CECB/2015
Copy to: -

Raipur, dated: ___ / ___ /2015

Regional Officer, Regional Office, Chhattisgarh Environment Conservation Board, Raigarh (C.G.). Please ensure compliance and report, if any condition/conditions are violated by the industry.


Member Secretary
Chhattisgarh Environment Conservation Board
Raipur (C.G.)



El: - 05 /Raigarh/14

Date: - 05/11/15

RECEIVED

S. O. (M) No.

DATE 14/11/15

CHHATTISGARH ENVIRONMENT CONSERVATION BOARD

Commercial Complex, C.G. Housing Board Colony,
Kabir Nagar, Raipur (C.G.) 492 099

No. 6454 /TS/CECB/20014
To,

Raipur, dated: 6/11/2014

✓ The General Manager,
M/s Baroud Opencast Mine,
South Eastern Coal Fields Limited,
Raigarh Area, Behind Collectorate,
Chhote Atarmunda,
District - Raigarh (C.G.)

Sub: - Grant of consent for expansion under section 25/26 of the Water (Prevention and Control of Pollution) Act, 1974.

- Ref: -
1. Environmental Clearance from MoEF issued vide letter No. J-11015/228/2007-IA.II(M), dated: 20/05/2009.
 2. Your application letter no. SECL/GM/RGH/P&P/09/512, dated: 05/09/2009.

--: 00 :--

With reference to your above application, consent is hereby granted for a period of **one year after the date of filing the court case on 25/09/2014 i.e. from 26/09/2014 to 25/09/2015**, subject to the fulfillment of the following terms and conditions: -

This consent for expansion is valid for following products & production capacity: -

Name of Product	Production Capacity
Mining of Coal	3.5 Million Tonnes/Year (Fifteen Million Tonnes per Year)

Note: -

This consent is granted to the industry without prejudice to the court case pending in the Court of Law and in no way to be taken as a measure of proof that industry has not violated any related environmental laws at any time in the past. Hence whatsoever may be decision of Hon'ble Court, shall be binding on the industry and this Board.

Please acknowledge the receipt of this letter.

For & on behalf of
Chhattisgarh Environment Conservation Board

(Signature)
Member Secretary

Chhattisgarh Environment Conservation Board
Raipur (C.G.)

S.E.C.L. Raigarh Area
Dy. No. - ES
Date 13/11/15

GM/02 ✓
SAM, Baroud
NO (Env) ✓

(Signature)
15/11/14

Endt. No.
Copy to: -

/TS/CECB/2014

Raipur, dated: ___/___/2014

1. Regional Officer, Regional Office, Chhattisgarh Environment Conservation Board, Raigarh (C.G.). Please ensure compliance and report, if any condition/conditions are violated by the industry.
2. Cess Section, Chhattisgarh Environment Conservation Board, Raipur (C.G.).

Member Secretary
Chhattisgarh Environment Conservation Board
Raipur (C.G.)

El: - 05 /Raigarh/14
Date: - 05/01/15



RECEIVED

J. O. (A) No. _____
DATE: 14/1/15

CHHATTISGARH ENVIRONMENT CONSERVATION BOARD
Commercial Complex, C.G. Housing Board Colony,
Kabir Nagar, Raipur (C.G.) 492 099

No. 6456 ITS/CECB/2014
To,

Raipur, dated: 6/1/2014

✓ The General Manager,
M/s Baroud Opencast Mine,
South Eastern Coal Fields Limited,
Raigarh Area, Behind Collectorate,
Chhote Atarmunda,
District - Raigarh (C.G.)

Sub: - Grant of consent for expansion under section 21 of the Air (Prevention and Control of Pollution) Act, 1981.

- Ref: - 1. Environmental Clearance from MoEF issued vide letter No. J-11015/228/2007-IA.II(M), dated: 20/05/2009.
2. Your application letter no. SECL/GM/RGH/P&P/10/113, dated: 05/09/2009.

--: 00 :--

With reference to your above application, consent is hereby granted for a period of **one year after the date of filing the court case on 25/09/2014 i.e. from 26/09/2014 to 25/09/2015**, subject to the fulfillment of the following terms and conditions: -

This consent for expansion is valid for following products & production capacity: -

Name of Product	Production Capacity
Mining of Coal	3.5 Million Tonnes/Year (Three point Five Million Tonnes per Year)

Note: -

This consent is granted to the industry without prejudice to the court case pending in the Court of Law and in no way to be taken as a measure of proof that industry has not violated any related environmental laws at any time in the past. Hence whatsoever may be decision of Hon'ble Court, shall be binding on the industry and this Board.

Terms & Conditions: -

1. The industry shall comply with all the terms and conditions of Environmental Clearance given by Ministry of Environment and Forests, Government of India vide letter no. J-11015/228/2007-IA.II(M), dated: 20/05/2009.



CHHATTISGARH ENVIRONMENT CONSERVATION BOARD
Commercial Complex, C.G. Housing Board Colony,
Kabir Nagar, Raipur (C.G.) 492 099

No. 6450 ITS/CECB/2014

Raipur, dated: 6/11/2014

To,

✓ The General Manager,
M/s Baroud Opencast Mine,
South Eastern Coal Fields Limited,
Raigarh Area, Behind Collectorate,
Chhote Atarmunda,
District - Raigarh (C.G.)

Sub: - Renewal of consent of the Board for Mining of Coal issued under section 25/26 of the Water (Prevention and Control of Pollution) Act, 1974.

Ref: - 1. Consent of the Board for Mining of Coal issued under section 25/26 of the Water (Prevention and Control of Pollution) Act, 1974 vide letter no. 6523, dated: 29/11/2007.
2. Your letter No. SECL/CGM/RGH/25(A)/08/290, dated: 24/06/2008 and subsequent corresponding ending dated: 25/11/2013.

--: 00 :--

With reference to your above application consent is hereby renewed from 27/03/2008 to 25/09/2014, subject to the fulfillment of the terms and conditions incorporated in the consent letter No. 6523, dated: 29/11/2007, issued by the Board and additional conditions mentioned below:

This renewal of consent is valid for production capacity of: -

Name of Product	Production Capacity
Mining of Coal	1.0 Million Tonnes per Year (One point Zero Million Tonnes per Year)

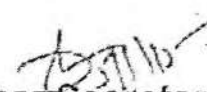
Additional Conditions

1. Industry shall ensure the treated effluent quality within prescribed effluent standard all the time. Industry shall not discharge effluent out side the premises in any circumstances; hence Zero discharge condition shall be maintained all the time.

2. Industry shall submit Environment Statement to the Board as per provision of Environment (Protection) amendment Rule, 1993 for the previous year ending 31st March on or before 30th September every year.
3. Extensive tree plantation shall also be carried out in the open areas available within and around the mine lease area. Fruit bearing species like mango, tamarind, guava etc. shall be given preference in this regard. Local leguminous grass-land should also be preferred for green belt development.

Please acknowledge the receipt of this letter.

For & on behalf of
Chhattisgarh Environment Conservation Board Raipur (C.G.)



Member Secretary
Chhattisgarh Environment Conservation Board
Raipur (C.G.)

Endt. No. /TS/CECB/2014

Raipur, dated: / /2014

Copy to: -

- 1- Regional Officer, Regional Office, Chhattisgarh Environment Conservation Board, Raipur (C.G.) Please ensure compliance and report, if any condition/conditions are violated by the industry.
- 2- Cess Section, Chhattisgarh Environment Conservation Board, Raipur (C.G.).


Member Secretary
Chhattisgarh Environment Conservation Board
Raipur (C.G.)



CHHATTISGARH ENVIRONMENT CONSERVATION BOARD
Commercial Complex, C.G. Housing Board Colony,
Kabir Nagar, Raipur (C.G.) 492 099

No. 6452/TS/CECB/2014

Raipur, dated: 6/11/2014

To,

✓ The General Manager,
M/s Baroud Opencast Mine,
South Eastern Coal Fields Limited,
Raigarh Area, Behind Collectorate,
Chhote Afarmunda,
District - Raigarh (C.G.)

Sub: - Renewal of consent of the Board for Mining of Coal issued Under Section 21 of the Air (Prevention and Control of Pollution) Act, 1981.

- Ref: -
1. Consent of the Board for Mining of Coal issued under section 21 of the Air (Prevention and Control of Pollution) Act, 1981 vide letter no. 6525, dated: 29/11/2007.
 2. Your letter No. SECL/CGM/RGH/25(A)/08/290, dated: 24/06/2008 and subsequent corresponding ending dated: 25/11/2013.

--: 00 :--

With reference to your above application consent is hereby renewed from 27/03/2008 to 25/09/2014, subject to the fulfillment of the terms and conditions incorporated in the consent letter No. 6525, dated: 29/11/2007, issued by the Board and additional conditions mentioned below:

This renewal of consent is valid for production capacity of: -

Name of Product	Production Capacity
Mining of Coal	1.0 Million Tonnes per Year (One point Zero Million Tonnes per Year)

Additional Conditions

1. Industry shall operate and maintain existing pollution control facility regularly. Industry shall ensure the ambient air quality within the prescribed limits all the time.

2. Industry shall submit Environment Statement to the Board as per provision of Environment (Protection) amendment Rule, 1993 for the previous year ending 31st March or before 30th September every year.
3. Extensive tree plantation shall also be carried out in the open areas available within and around the mine lease area. Fruit bearing species like mango, tamarind, guava etc. shall be given preference in this regard. Local leguminous grass-land should also be preferred for green belt development.

Please acknowledge the receipt of this letter.

For & on behalf of
Chhattisgarh Environment Conservation Board Raipur (C.G.)

[Signature]
Member Secretary
Chhattisgarh Environment Conservation Board
Raipur (C.G.)

Endt. No. /TS/CECB/2014
Copy to: -

Raipur, dated: 1 /2014

Regional Officer, Regional Office, Chhattisgarh Environment Conservation Board, Raigarh (C.G.). Please ensure compliance and report, if any condition/conditions are violated by the industry.

Member Secretary
Chhattisgarh Environment Conservation Board
Raipur (C.G.)



CHHATTISGARH ENVIRONMENT CONSERVATION BOARD
1-Tilak Nagar, Shiv Mandir Chowk, Main Road,
Awanti Vihar, Raipur (C.G.) 492 006

No. **6523** /TS/CECB/2007
To,

Raipur, dated: **29/11/2007**

✓ The General Manager
M/s Baroud Opencast Mine,
South Eastern Coal Fields Limited,
Raigarh Area, Behind Collectorate,
Chhote Atarmunda,
District - Raigarh (C.G.)

Sub: - Grant of consent with expansion under section 25/26 of the Water (Prevention and Control of Pollution) Act, 1974.

- Ref: - 1. NOC issued by the Board for vide letter No. 387/TS/CECB/2005 Raipur, dated: 01/03/2005 for expansion of coal mine from 0.12 million tonne per annum to 0.3 million tonne per annum.
2. Environmental Clearance from MoEF given vide letter No. J-11015/99/2005-IA.II (M), dated: 20/05/2005 for expansion of coal mine from 0.12 million tonne per annum to 0.3 million tonne per annum.
3. Environmental Clearance from MoEF given vide letter No. J-11015/358/2005-IA.II (M), dated: 27/03/2006 for expansion of coal mine from 0.3 million tonne per annum to 1.0 million tonne per annum.
4. Your application letter no. SECL/GM/Rai/Envt./05/131, dated: 17/09/2005 and subsequent correspondence ending dated: 03/08/2007.

--:: 00 ::--

With reference to your above application, consent is hereby granted subject to the fulfillment of the terms and conditions incorporated in the schedule annexed here to for a period of **one year from the date of issuance of environmental clearance i.e. from 27/03/2006 to 26/03/2007 and subsequently renewed upto 26/03/2008.**

This consent is valid for following products & production capacity: -

Name of Product	Production Capacity
Mining of Coal	1.0 Million Tonne/Annum (One Million Tonne per Annum)

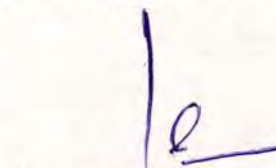
Note: -

The above production capacity include the existing production capacity of Mining of Coal - 0.12 Million Tonne/Annum for which consent has already been granted under Water and Air (Prevention and Control of Pollution) Act.

Please acknowledge the receipt of this letter.

For & on behalf of
Chhattisgarh Environment Conservation Board

(As approved by the Chairman
vide Note Sheet dispatch No.
1332, dated: 12/11/2007).



Member Secretary

Chhattisgarh Environment Conservation Board
Raipur (C.G.)

Endt. No. /TS/CECB/2007
Copy to: -

Raipur, dated: ___/___/2007

1. Regional Officer, Regional Office, Chhattisgarh Environment Conservation Board, Raigarh (C.G.). Please ensure compliance and report, if any condition/conditions are violated by the industry.
2. Cess Section, Chhattisgarh Environment Conservation Board, Raipur (C.G.).



Member Secretary

Chhattisgarh Environment Conservation Board
Raipur (C.G.)



CHHATTISGARH ENVIRONMENT CONSERVATION BOARD
1-Tilak Nagar, Shiv Mandir Chowk, Main Road,
Awanti Vihar, Raipur (C.G.) 492 006

CONSENT LETTER

No. /EI/Raigarh/CECB/2007 Raipur, dated:
Sub: Consent to **M/s Baroud Opencast Mine** for the discharge of effluent under section 25/26 of the Water (Prevention & Control of Pollution) Act, 1974.
Ref: Applications Letter No. SECL/GM/Rai/Envt./05/131, dated: 17/09/2005 and subsequent correspondence ending dated: 03/08/2007 of **M/s Baroud Opencast Mine**, (Expiry Date

1. With reference to the above application for consent to discharge of effluent into the natural water courses under the Water (Prevention & Control of Pollution) Act, 1974, here-in-after referred to as the Act, **M/s Baroud Opencast Mine** is authorized by the State Board to discharge its industrial and other effluents arising out of their premises into the local stream/river/well in accordance with the general and special conditions as mentioned in the Annexure.
2. This consent shall be valid for a period of **one year from the date of issuance of environmental clearance i.e. from 27/03/2006 to 26/03/2007 and subsequently renewed upto 26/03/2008.**

This consent is valid for following products & production capacity: -

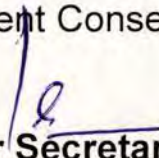
Name of Product	Production Capacity
Mining of Coal	1.0 Million Tonne/Annum (One Million Tonne per Annum)

Note: -

The above production capacity include the existing production capacity of Mining of Coal - 0.12 Million Tonne/Annum for which consent has already been granted under Water and Air (Prevention and Control of Pollution) Act.

Please acknowledge the receipt of this letter.

For & on behalf of
Chhattisgarh Environment Conservation Board


Member Secretary

Chhattisgarh Environment Conservation Board
Raipur (C.G.)

Seal
Enclosure: Annexure

(I)
ANNEXURE

M/s Baroud Opencast Mine

Location of Factory: Village -Baroud, Tehsil - Gharghoda,
District -Raigarh (C.G.)

Vide consent no. / /EI/Raigarh/CECB/2007, dated:

A. GENERAL CONDITIONS: -

1. All discharges authorized shall be consistent with terms and conditions of this Consent Facility expansions, production increases or process Modifications which result in new or increased discharges of pollutants must be reported by submission of a new Consent, application or if such new, or increased discharge does not violate the effluent limitations specified in the Consent, by submission to the Board details of such new or increased discharges of pollutants in which case the consent may be modified to specify effluent limitations for any pollutants not identified and limited here in the discharge of any pollutant more frequently than or at a level in excess of that identified and authorized by the Consent shall constitute a violation of the terms and conditions of the Consent.

2. After notice and opportunity for the hearing, this consent may be modified, suspended or revoked by the Board in whole or in part during its term for cause including, but not limited to the following: -
 - (a) Violation of any terms and conditions of this Consent.
 - (b) Obtaining this Consent by misrepresentation of failure to disclose fully all relevant facts.
 - (c) A change in any condition that requires temporary or permanent reduction or elimination of the authorized discharge.

3. Notwithstanding para(2) above, if a toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is established for a toxic pollutant which is present in the discharge authorized here in and such standard or prohibition is more stringent than any limitation upon such pollutant in this Consent the Consent shall be revised or modified in accordance with the toxic effluent

standard or prohibition that the Board may consider and the applicant shall be so notified.

4. The applicant shall allow the staff of Chhattisgarh Environment Conservation Board and/or their authorized representative, upon the Presentation of credentials:
 - (a) To enter upon the applicant's premises where an effluent source is located or in which any records are required to be kept under the terms and conditions of this Consent.
 - (b) To have access to and copy at reasonable time any records required to be kept under the terms and conditions of this Consent.
 - (c) To inspect at reasonable time any monitoring equipment or monitoring method required in this Consent; or
 - (d) To sample at reasonable time any discharge of pollutants.
5. The applicant shall at all times maintain in good working order and operate as efficiently as possible all treatment or control facilities of system installed or used by him to achieve compliance with the terms and conditions of this Consent.
6. The issuance of this Consent does not convey any property rights in either real or personal property or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Central, State or local laws or regulation.
7. The Consent does not authorize or approve the construction of any physical structures or facilities or the undertaking of any work in any water course.
8. The specific effluent limitations and other pollution controls applicable to the discharge permitted here in are set forth below as specific conditions. Also set forth below are self-monitoring and reporting requirements. Unless otherwise specified, the applicant shall submit duplicate original copies of all reports to the Chhattisgarh Environment Conservation Board. Except for data determined to be confidential all such reports shall be available for public inspection at the office of the Chhattisgarh Environment Conservation Board. Knowingly making any false statement on any such report may result in the imposition of criminal penalties as provide for in section 42 of the Act.

B. SPECIAL CONDITIONS: -

1. Initial Effluent limitation during the period beginning on the effective date of this consent and lasting until one calendar year discharge from outfalls shall be limited and monitored by the applicant as specified below: -

(a) The following shall be limited by the applicant as specified.

S.No.	Effluent Characteristics	Discharge Limitation				Monitoring Requirements	
		Average		Maximum		Frequency of Measurement	Type of Sample
		Mg/l	Kg/Day	Mg/l	Kg/Day		

Daily/Weekly/Monthly/Tri-monthly.

Grab/ 24 Hours Composite

In Addition to above discharge shall be limited and monitored as specified below:

S.No.	Effluent Characteristics	Discharge Limitation				Monitoring Requirements	
		Average		Maximum		Frequency of Measurement*	Type of Sample †
		Mg/l	Kg/Day	Mg/l	Kg/Day		

Daily/Weekly/Monthly/Tri-monthly.

Grab/ 24 Hours Composite

For the purpose of this sub-section, the daily average discharge is the total discharge by weight during the calendar month divided by the number of days in month the production or commercial facility was operating for the purpose of the sub-section the daily maximum discharge means the total discharge by weight during any calendar day.

(b) The pH shall not be less than 5.5 or greater than 9.0

2. Final effluent Limitation: - During the period beginning from 1st day of month of commissioning of the plant and lasting until the date of expiration of this Consent, discharge from the outfalls shall be limited and monitored by the applicant as specified below:-

(a) The following shall be limited and monitored by the applicant as specified.

S. No.	Effluent Characteristics	Discharge Limitation				Monitoring Requirements	
		Average		Maximum		Frequency of Measurement*	Type of Sample †
		Mg/l	Kg/Day	Mg/l	Kg/Day		
1	B.O.D.	--	--	30	19.8	Monthly	24 hours Composite
2	C.O.D.	--	--	250	165.0		
3	S.S.	--	--	100	66.0		
	pH 5.5 to 9.0 Flow: 660 Cum/Day	(Industrial & Domestic)				Daily	Grab

* Daily/Weekly/Monthly/Tri-monthly.

† Grab/ 24 Hours Composite

Additional, outfalls shall be monitored as follows:

- (i) Flow, Temperature and Total solids: One per month
- (ii) Grab Samples Maximum discharge temperature above upstream receiving water shall be in accordance with the standard of ISI at 40⁰ C.
- (iii) Uniform as per ISI 2490 at 40⁰ C.

The temperature shall be monitored once per month of each outfall. For the purpose of the sub-section the daily average is the total discharge by weight during calendar month divided by the number of days in month that the production or commercial facility was operating for the purpose of this sub-section, the daily maximum discharge means the total discharge by weight during any calendar day.

(b) The pH shall not be less than 5.5 or greater than 9.0 for outfalls. The samples are taken as monthly, grab samples.

3. Schedule of Compliance for effluent Limitation:- The applicant shall achieve compliance with the effluent limitation: specified above for discharge from outfalls in accordance with the following schedule:

- (i) Report of Progress : Tri - Monthly
- (ii) Completion of final plans by
- (iii) Award of contract of other commitment of financing
- (iv) Commencement of construction by
- (v) Report of construction progress
- (vi) Completion of construction by
- (vii) Attainment of operational level by

Please see on page no 11 to 16

(b) The applicant shall submit to the Consent issuing Authority the required report of progress or where a specific action is required in (a) above to be taken by a certain date a written notice of compliance or non-compliance with each of the above scheduled dates, post marked not later than 14 days following each elapsed date. Each notice of compliance shall include the following: -

- (1) A short description of the non-compliance.
- (2) A description of any action taken or proposed by the applicant to comply with the elapsed scheduled requirement without further delay.
- (3) An estimate of any factor which tend to explain or mitigate the non-compliance, and
- (4) An estimate of the date, the applicant will comply with the elapsed scheduled requirement and assessment of the possibility that the applicant will meet the next scheduled requirement time.

4. Compilation of monitoring Data

(a) Samples and measurements taken to meet the monitoring requirements specified above shall be representative of the volume and nature of monitored discharge.

- (b) Following promulgation of guidelines establishing test procedures for the analysis of pollutants, all sampling and analytical methods used to meet monitoring requirements specified above shall conform to such guidelines. Unless otherwise specified sampling and analytical methods shall conform to the latest edition of the Indian Standard specifications and where it is not specified the guidelines as per standard methods for the examination of Water & Waste Water 13th Edition of the American Public Health Association, New York U.S.A. shall be used.
- (c) The applicant shall take samples and measurement to meet the monthly requirements specified above at the location indicated below:

POINT OF SAMPLING

- (i) Outfalls of waste.
- (ii) 100 meters from point of confluence, down stream to river or lake.

5. Recording of Monitoring activities and Results:

- (a) The applicant shall make and maintain records of all information resulting from monitoring activities by this Consent.
- (b) The applicant shall record for each measurement of sample taken pursuant to the requirements of this Consent the following information:
 - (1) The date, exact place and time of sampling
 - (2) The dates on which analysis was performed.
 - (3) Who performed the analysis?
 - (4) The analytical techniques or methods used and
 - (5) The result of all required analysis.
- (c) If applicant monitors any pollutant more frequently as is required by this Consent he shall include the results of such monitoring in the calculation and reporting of values required in the discharge monitoring reports, which may be prescribed by the Board, such increased frequency shall be indicated on the Discharge Monitoring Report form.
- (d) The applicant shall retain for a minimum of 3 years all records of monitoring activities and result including all

records of calibration and maintenance of instrumentation and original strip chart regarding continuous monitoring instrumentation. The period of retention shall be the extent during the course of any unresolved litigation regarding the discharge of pollutants by the applicant or when requested by the Central or State Board.

6. Reporting of Monitoring Results:

- (a) Monitoring information required by this Consent shall be summarized and reported by submitting a Discharge Monitoring Report form duly filled in and signed, to the Board's office at the following address:

CHHATTISGARH ENVIRONMENT CONSERVATION BOARD
1-Tilak Nagar, Shiv Mandir Chowk, Main Road,
Awanti Vihar, Raipur (C.G.) 492 006

- (b) Each submitted Discharge Monitoring Report shall be signed as follows:

(i) If submitted by Corporation by a Principal Executive Officer of at least the level of Vice-President or his duly authorized representative, if such representative is responsible for the overall operation of the facility from which the discharge described in the discharge Monitoring Report originates,

(ii) If submitted by a partnership firm, by a general partner.

(iii) If submitted by a sole proprietor, the proprietor,

(iv) If submitted by a Municipal, State or Central Government or other public enterprises, by a Principal Executive Officer, ranking elected official commanding officer, or other duly authorized employee.

- (c) All information submitted on the Discharge Monitoring Form shall be based upon measurements and sampling carried out during the three previous calendar months. The first Discharge Monitoring Report shall be submitted for a period ending 60 days from issuance. Thereafter reporting period shall end on the last date of each month. The applicant shall submit a Discharge Monitoring Report post

marked no later than 28th day of the month following each completed reporting period.

7. Limitation of Discharge of Oil Hazardous Substance in harmful quantities: The applicant shall not discharge oil in quantities defined as harmful in regulations. In addition the applicant shall not discharge hazardous substance into natural water course in quantities defined as harmful in regulations promulgated by the Board. Nothing in this Consent shall be deemed to preclude the institution of any legal action nor relieve the applicant from any responsibilities, liabilities, or penalties to which the applicant is or may be subject to clauses.
8. Limitation of visible Floating Solids and Foam: During the period beginning date of issuance and lasting until the date of expiration of this Consent the applicant shall not discharge floating solids or visible foam.
9. Disposal of Collected Solids:
 - a) Intake Water Treatment: Solid Sludge's, dirt, silt or other pollutant separated from or resulting from treatment of intake or supply waters prior to use by the applicant shall be disposed off in such a manner as to prevent any pollutant from such materials from entering any such water Any live fish or other animals collected or trapped as a result of intake water screening or treatment may be returned to water,
 - b) Waste water Treatment, Solid sludge's, filter backwash or other pollutant removed from or resulting from treatment or control of waste waster shall be disposed of in such a manner as to prevent any pollutants from such materials from entering natural water.
10. Non-compliance with Effluent Limitations:
 - (a) If for any reason the applicant does not comply with or will be unable to comply with or will be unable to comply with any daily maximum effluent limitations specified in this Consent the applicant shall immediately notify the Consent issuing authority or his designee by telephone No. 0771-2443923/2443934 and provide the Consent issuing Authority with the following information in writing within 5 days of such notification:
 - i) Cause of non-compliance.

- ii) A description of the non-complying discharge including its impact upon the receiving water.
 - iii) Anticipated time, of non compliance is expected to continue or if such condition has been corrected, the duration of non-compliance.
 - iv) Steps taken by the applicant to reduce and eliminate the non-complying discharge and;
 - v) Steps to be taken by the applicant to prevent recurrence of conditions of non compliance.
- (b) The applicant shall take all responsible steps to minimize any adverse impact to natural waters resulting from non-compliance with any effluent limitation specified in this Consent including such accelerated or additional monitoring as necessary to determine the nature and impact of the non-complying discharge.
- (c) Nothing in this Consent shall be construed to relieve the applicant from civil or criminal penalties for non-compliance, whether or not such non-compliance is due to factors beyond his control such as equipment break down electric power failure, accident or natural disaster.

Limitation of Batch Discharge.

SPECIAL CONDITIONS

11. Provision for Electric Power Failure: The applicant shall either-
- (a) No later than certify in writing to the consent issuing authority that applicant has installed or provided for an alternative electric power source sufficient to operate all facilities utilized by the applicant to maintain compliance with the terms and conditions of the Consent or.
 - (b) No later than 30 days after the effective date of his Consent, certify in writing to the consent issuing authority that upon the reduction, loss, or failure of one or more of the primary sources of electric power to any facilities utilized by the applicant to maintain compliance with the terms and conditions of his consent, the applicant shall halt, reduce or otherwise Control production and/or all discharges in order to maintain compliance with the terms & conditions of this Consent.
12. Prohibition of By pass of Treatment Facilities: The diversion or by-pass of any discharge from facility utilized by the applicant to

maintain compliance with the terms and conditions of this Consent is prohibited except:

- (i) Where unavoidable to prevent loss of life severe property damage, or
 - (ii) Where excessive storm drainage or run off would damage any facilities necessary for compliance with the terms and conditions of this Consent. The applicant shall immediately notify the consent issuing authorities in writing of each such diversion or by-pass in accordance with the procedure specified above for reporting non-compliance.
13. Spill Prevention and Containment Plan: Within 90 days of the effective date of the Consent the applicant shall prepare and submit to the consent issuing authority; a Spill Prevention; Containment and Countermeasure Plan for the facility covered by this Consent. Such plan shall include the following information and procedures relating to the prevention of spills and unauthorized discharges or oil and hazardous substances;
- (a) A description of a reporting system to be used to notify immediately persons responsible for management of a facility and appropriate State and Central authorities;
 - (b) A description of equipment or facilities (including overall facility) for the prevention, containment of spills and unauthorized discharge;
 - (c) A list of all oil and hazardous materials used processed or stored at the facility including the normal quantity maintained on the premises for each listed material;
 - (d) A brief description of any spills or unauthorized discharge which occurred during the 36 months period preceding the effective date of this Consent and subsequent measures taken by the applicant or reduce the possibility of further spills or unauthorized discharges; and.
 - (d) An implementation schedule for additional equipment or facilities which might be required for sub para (b) above but which are not yet operational.

SPECIAL CONDITIONS

1. Industry shall abide by all the conditions stipulated by the Ministry of Environment & Forests, GoI, vide Environmental Clearance Letter No. J-11015/358/2005-IA.II (M), dated: 27/03/2006.
2. Total mining lease area for coal mine shall not be more than total lease area of 312.169 hectares.
3. Industry shall upgrade/modify the existing effluent treatment arrangement for proper treatment of industrial [mine water including acid mine water (if any), heavy vehicle washing/workshop/ coal handling plant waste water etc.] and domestic effluent. Industry shall ensure the treated effluent quality within the standards prescribed by Board published in Gazette Notification dated 25.03.88 all the time. Industry shall provide sewage treatment plant for the colony. Industry shall provide adequate facility for proper treatment of industrial [mine water including acid mine water (if any), heavy vehicle washing/workshop/ coal handling plant waste water etc.] and domestic effluent generated due to capacity enhancement also. The major parameters of treated effluent shall be kept within the limits as follows:-:

S. No.	Parameters	Limits
1.	pH	5.5 - 9.0
2.	Suspended Solids	100 Milligram per Liter
3.	BOD	30 Milligram per Liter
4.	COD	250 Milligram per Liter
5.	Oil and Grease	10 Milligram per Liter

Chhattisgarh Environment Conservation Board may further stipulate stringent limit depending upon environmental conditions.

4. Industry shall provide suitable arrangement of drains/pipe networks to ensure adequate flow for utilization of treated effluent inside the mining lease area. Treated waste waters/effluent shall be recycled for mine operations. The mine discharge water/domestic effluent after proper treatment shall be utilized in plantation, dust suppression, sprinkling on roads or other useful purposes. Industry shall also provide adequate arrangement for supply of treated mine water as maximum as possible to nearby villages for use of different purposes such as irrigation/agriculture/drinking etc. Industry shall use treated mine water as maximum as possible and the concept of zero discharge shall be adapted to a maximum possible extent. In case of discharge of treated mine water into nalla/river, industry shall ensure the nalla/river un-affected with respect to its water quality and its

- designated use. Industry shall provide adequate scientific arrangement for ground water re-charging by using treated mine water.
5. Industry shall provide adequate measuring arrangement for the measurement of water utilized in different categories and effluent generated.
 6. Industry shall install separate electric metering arrangement for the running of pollution control devices. This arrangement shall be made in such a fashion that any non-functioning of pollution control device/devices shall immediately stop the electric supply to the production/handling unit and shall remain tripped till the pollution control device/devices are made functional again.
 7. Industry shall provide safe and scientific arrangement for handling, collection, storage, transportation and disposal of all solid wastes etc. Industry shall not store/dump solid wastes outside the mine lease area in any circumstances without prior permission of the Board. Garland drain with appropriate check dams shall be provided all around the coal/reject coal storage area to avoid any erosion during rainy season before on set of monsoon. Mining rock/boulders shall be used for road making and land filling. Industry shall obtain letter of authorization under Hazardous Wastes (Management and Handling) Rules, 1989 (as amended) from the Board as per requirement. Appropriate arrangement shall be provided as per law for collection/treatment/storage/ transportation/ disposal of hazardous wastes (if any). Industry shall provide adequate arrangement for collection, transportation, treatment and disposal of municipal solid wastes generated.
 8. All internal roads including haulage road shall be made pucca as far as possible. Water spraying arrangements shall be made during transportation of coal and other waste materials on haul roads. Good house keeping practices shall be adopted by the industry.
 9. Industry shall take due precaution and appropriate measures to arrest and minimize vibration and noise effects during mining activities. Industry shall provide proper arrangement to control the noise pollution. Industry shall install appropriate noise barriers/control measures including acoustic hoods, silencers, enclosures etc. on all sources of noise generation to control the noise. Workers engaged in blasting and drilling operations, operations of heavy earth moving machinery (HEMM) etc. shall be provided with ear plugs/muffs. The ambient noise level shall not exceed 75 dB (A) during day time and 70 dB (A) during night time within premises. Adequate measures shall be taken for control of noise levels below 85 dB (A) in the work

environment. Occupational exposure limit of noise specified by Director General of Mines Safety (DGMS) for coal mine shall be complied.

10. Industry shall ensure that the blasting and other mining operations shall not cause any damages to near by settlements. Controlled blasting shall be practiced. The mitigation measures for control of ground vibrations and to arrest fly rocks and boulders shall be implemented. Industry shall take due precaution and appropriate measures to arrest and minimize vibration and noise effects during mining activities.
11. All the slope of external dumps shall be maintained at a maximum of 28 degrees. Top soil shall be stacked properly in a dump with proper slope at earmarked site(s) with adequate measures and should be used for reclamation and rehabilitation of mined out area and for green belt development.
12. Regular monitoring of subsidence movement on the surface over working area and impact on water bodies/vegetation/structures/surrounding should be continued till movement ceases completely. In case of observation of any high rate of subsidence movement, appropriate measures should be taken to avoid loss of life and material. Cracks should be effectively plugged with ballast and clayey soil/suitable material.
13. Adequate measures shall be taken to prevent entry of surface water into working mine.
14. Industry shall take effective steps to check the soil erosion from coal/reject coal/other dump/waste material storage and dumping areas etc. and causing silting problem in nearby nalla/river/pond during rainy season. Sufficient numbers of check dams of adequate capacity shall be constructed to prevent the same. Check dams and silting ponds of appropriate size shall be constructed to arrest silt and sediment flow from soil and coal/ reject coal storage area and other dump areas. The water/effluent so collected shall be utilized for watering the mine area, roads, green belt development etc. The drains shall be regularly de-silted and maintained. Garland drain of appropriate size shall be constructed prior to mining/excavation operations to collect surface run-offs from the mining area, soil dumps, waste dumps etc. Garland drain (size, gradient & length) and sump capacity shall be designed keeping 50% safety margin over and above the peak sudden rainfall and maximum discharge in the area adjoining the mine site. Sump capacity shall also provide adequate retention period to allow proper settling of silt material. Plantation shall be taken up for soil stabilization along the slopes of

- the dump (if any). Sedimentation pits shall be constructed at the corners of the garland drains. The surface run-off shall be de-silted through a series of check dams and drains before final disposal.
15. Regular monitoring of ground water level and quality shall be carried out by establishing a network of existing wells and constructing new piezometers at suitable locations in and around mine area. Regular monitoring of surface and ground water quality shall be carried out by establishing a network of stations at suitable locations in mine area/adjacent to mine area. The frequency of monitoring (quality and quantity) shall be four time a year - pre-monsoon (April/May), monsoon (August), post-monsoon (November) and winter (January) seasons. Data generated from groundwater regime monitoring will be submitted to Board on an annual basis.
 16. Extensive tree plantation with broad leaf local plant species in and around mine lease area, coal handling plant, roads, other material dump sites etc. and in the open areas available within the premises shall be carried out. Adequate wide green belt of broad leaf local plant species shall be developed along the mine lease area especially towards residential area/villages. A green belt of adequate width should be raised by planting the local species along the mine boundary, waste rock dumps, ventilation fan, roads and in selected open areas in consultation with local DFO/Agriculture Department. At least 2500 plant species per hectare shall be planted. Industry shall abide by the decisions taken by Ministry of Environment and Forests, Government of India / Central Pollution Control Board/ State Government /Chhattisgarh Environment Conservation Board from time to time in this regard.
 17. Industry shall adopt rain water harvesting technique in the mine area and residential area for recharge of ground water. Industry shall develop rainwater harvesting structures to harvest the rain water for utilization in the lean season as well as to recharge the ground water table onset of monsoon. The mine authorities should meet water requirement of nearby village(s) in case the village wells go dry due to de-watering of the mine.
 18. Industry shall use fly ash brick, fly ash block and fly ash based products in the construction/repairing activities. Industry shall also use fly ash/bottom ash for filling low lying areas within premises and mined out areas as per notification/guideline/direction of Ministry of Environment and Forests, Government of India/ Central Government/ Central Pollution Control Board/State Government/ Chhattisgarh Environment Conservation Board. Industry shall ensure transportation

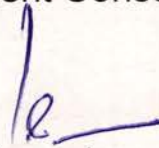
of fly ash for back filling/beneficial uses by covered truck to prevent emission during transportation.

19. Industry shall establish an environmental management cell to carryout function relating to environmental management under the supervision of senior executive who will directly report to the head of organization. A full-fledged laboratory with qualified technical/ scientific staff shall be provided to monitor the influent, effluent, ground water, soil, ambient air quality, stack emission (if any) and environmental samples etc.
20. Industry shall follow the pollution control measures recommended in code of practice for environment pollution prevention and control for coal mines evolved by Central Pollution Control Board.
21. Industry shall not cut down the trees as far as possible. Industry shall obtain prior permission from competent authority to cut down trees as per requirement.
22. Industry shall provide adequate vehicle emission monitoring arrangement for monitoring of all the transporting/ vehicles and others vehicles. Industry shall allow for loading of coal in transporting vehicles only after emission monitoring and after ensuring that the vehicle in which the coal is being loaded is ensuring the emission limit as prescribed.
23. Necessary fund shall be provided for implementation above conditions for environmental safeguards. The funds earmarked for environmental protection measures shall be kept in separate account and not diverted for any other purpose.
24. Industry shall obtain statutory clearances/licenses from concerned Central/State Government Departments, Boards, Bodies and Corporations etc. Industry shall follow direction issued by Central /State Government, Central Pollution Control Board/Chhattisgarh Environment Conservation Board from time to time regarding control of water & air pollution and for environmental conservation.
25. The issuance of 'consent to operate' does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Central, State or local laws or regulations.
26. Any change in production/mining capacity, process, raw materials used, project profile (mining technology and scope of working) etc. shall be intimated to the Board and prior permission of the Board shall be obtained for the same.

27. Board may amend/cancel any of the conditions and further stringent the emission/effluent limit as and when deemed necessary in the interest of environmental protection, change in the project profile or non-satisfactory implementation of the stipulated conditions etc.

This consent and the authorization to discharge shall expire after twelve months starting from the first day of the month of commissioning of the plant. The applicant shall not discharge after the date of expiration. The applicant shall submit such information forms and fees as required by the Board not later than 180 days prior to the date of expiry.

For & on behalf of
Chhattisgarh Environment Conservation Board



Member Secretary
Chhattisgarh Environment Conservation Board
Raipur (C.G.)



एस. ई. सी. एल. रायगढ़
कार्य: स. बा. क्रमांक
दिनांक 3/12/07



El: - /Raigarh/07
Date: -

CHHATTISGARH ENVIRONMENT CONSERVATION BOARD
1-Tilak Nagar, Shiv Mandir Chowk, Main Road,
Awanti Vihar, Raipur (C.G.) 492 006

No. 6525/TS/CECB/2007

Raipur, dated: 29/11/2007

To,

✓ The General Manager
M/s Baroud Opencast Mine,
South Eastern Coal Fields Limited,
Raigarh Area, Behind Collectorate,
Chhote Atarmunda,
District - Raigarh (C.G.)

Sub: - Grant of consent with expansion under section 21 of the Air (Prevention and Control of Pollution) Act, 1981.

- Ref: - 1. NOC issued by the Board for vide letter No. 387/TS/CECB/2005 Raipur, dated: 01/03/2005 for expansion of coal mine from 0.12 million tonne per annum to 0.3 million tonne per annum.
2. Environmental Clearance from MoEF given vide letter No. J-11015/99/2005-IA.II (M), dated: 20/05/2005 for expansion of coal mine from 0.12 million tonne per annum to 0.3 million tonne per annum.
3. Environmental Clearance from MoEF given vide letter No. J-11015/358/2005-IA.II (M), dated: 27/03/2006 for expansion of coal mine from 0.3 million tonne per annum to 1.0 million tonne per annum.
4. Your application letter no. SECL/GM/Rai/Envnt./05/131, dated: 17/09/2005 and subsequent correspondence ending dated: 03/08/2007.

--: 00 :--

With reference to your above application, consent is hereby granted for a period of **one year from the date of issuance of environmental clearance i.e. from 27/03/2006 to 26/03/2007 and subsequently renewed upto 26/03/2008**, subject to the fulfillment of the following terms and conditions: -

This consent is valid for following products & production capacity: -

Name of Product	Production Capacity
Mining of Coal	1.0 Million Tonne/Annum (One Million Tonne per Annum)

Note: -

The above production capacity include the existing production capacity of Mining of Coal - 0.12 Million Tonne/Annum for which consent has already been granted under Water and Air (Prevention and Control of Pollution) Act.

Terms & Conditions: -

1. Industry shall abide by all the conditions stipulated by the Ministry of Environment & Forests, GoI, vide Environmental Clearance Letter No. J-11015/358/2005-IA.II (M), dated: 27/03/2006.
2. Total mining lease area for coal mine shall not be more than total lease area of 312.169 hectares.
3. Industry shall upgrade/modify the existing dust emission control arrangements. Industry shall install proper air pollution control equipments of adequate capacity at all the points of emission (i.e. stock yard, coal handling plant, crusher, coal conveyer system and all transfer/junction points etc.). Drills shall be wet operated or with dust extractors. Emission of particulate matter from various sections shall not exceed 100 Mg/Nm³ (One Hundred Milligrams/Normal Cubic Meter). Chhattisgarh Environment Conservation Board may further stipulate stringent particulate matter emission limit depending upon environmental conditions. The height of stacks (if any) shall be kept at least 30 meters.
4. Industry shall provide adequate arrangement for control of dust emission from screens, vibrator, rotary breakers, crushers, all transfer points, junction points etc. Effective steps shall be taken to avoid fugitive emission during mining, handling and transportation etc. of coal and other waste materials. All transfer points/junction points and conveying system shall be covered. Coal handling plant shall be provided with adequate number of high efficiency dust extraction or suppression system. Loading and unloading areas including all the transfer points/junction points shall also have efficient dust control arrangements. Adequate arrangements shall be provided to control fugitive emission during handling, transportation etc. The coal shall not be transported in

open vehicles to avoid dust emission. Coal shall be transported in properly covered (by tarpaulin or other suitable materials) vehicles only. Adequate water arrangement on haul roads, wagon loading (if any) and dump trucks (loading and unloading) shall be provided and properly maintained.

5. Ambient air quality within the mine lease area shall conform to the standards prescribed by Board published in Gazette Notification dated 25/03/88. The Suspended Particulate Matter (SPM), Respirable Particulate Matter (RPM), Sulphur dioxide (SO₂) and Oxides of Nitrogen (NO_x) concentration in downwind direction considering predominant wind direction, at a distance of 500 meters from the dust generating sources such as loading or unloading, haul road, coal transportation road, coal handling plant, railway siding (if any), blasting, drilling, over burden dumps, or any other dust generating external sources shall be maintained within the standards specified by Ministry of Environment and Forests, Government of India in GSR 742(E) dated 25-09-2000 as below:-

Pollutant	Time weighted average	Concentration in Ambient Air
Suspended Particulates Matter (SPM)	Annual Average*	430 µg/m ³
	24 hours**	600 µg/m ³
Respirable Particulate Matter (Size less than 10 µm) (RPM)	Annual Average*	215 µg/m ³
	24 hours**	300 µg/m ³
Sulphur Dioxide (SO ₂)	Annual Average*	80 µg/m ³
	24 hours**	120 µg/m ³
Oxide of Nitrogen as NO ₂	Annual Average*	80 µg/m ³
	24 hours**	120 µg/m ³

Note

* Annual Arithmetic mean for the measurements taken in a year, following the guidelines for frequency of sampling laid down.

** 24 hourly / 8 hourly values shall be met 92% of the time in a year. However, 8% of the time it may exceed but not on two consecutive days.

In case any residential or commercial or industrial place falls within 500 meters of any dust generating sources, the National Ambient Air Quality Standards shall be followed.

Chhattisgarh Environment Conservation Board may further stipulate stringent limit depending upon environmental conditions. Industry shall ensure the ground level concentration of pollutants




M.P. POLLUTION CONTROL BOARD
PARYAVARAN PARISAR, E-5, ARERA COLONY, BHOPAL - 462016

3. Extensive tree plantation shall be carried out in the open areas available within the mining lease area.

Please acknowledge the receipt of this letter

For & on behalf of
M.P. Pollution Control Board



(G.D. AGARWAL)
MEMBER SECRETARY

Endt No. /TS/Ez/MPPCB/99

Date:

Copy to:-

1. Zonal Officer, M.P. Pollution Control Board, Raipur.
2. Regional Officer, M.P. Pollution Control Board, Bilaspur.
3. Monitoring Section, M.P. Pollution Control Board, Bhopal


(G.D. AGARWAL)
MEMBER SECRETARY
M.P. POLLUTION CONTROL BOARD
BHOPAL

P:43:44(minbpur)
ukn

in ambient air within standard prescribed for residential, rural areas in the nearby residential/rural areas due to mining operations.

6. Ambient air quality monitoring stations shall be established (at least four) in the core zone as well as buffer zone for SPM, RPM, NO_x, SO₂ and CO. Location and number of the ambient air quality stations shall be decided based on meteorological data, topographical features and environmentally and ecologically sensitive targets and the frequency of monitoring shall be undertaken in consultation with the Board.
7. Industry shall install separate electric metering arrangement for the running of pollution control devices. This arrangement shall be made in such a fashion that any non-functioning of pollution control device/devices shall immediately stop the electric supply to the production/handling unit and shall remain tripped till the pollution control device/devices are made functional again.
8. Industry shall provide safe and scientific arrangement for handling and disposal of all solid wastes such as over burden, coal dust/sludge etc. Industry shall store coal dust/sludge etc. inside the premises for few days only and not for longer period. Industry shall not store/dump solid wastes such as; over burden, coal dust/sludge etc. outside the premises in any circumstances without prior permission of the Board. Safe and scientific arrangement for temporary storage of coal dust/sludge shall be provided in the premises and it shall be disposed off as early as possible without delay.
9. All internal roads including haulage road shall be made pucca as far as possible. Water spraying arrangements shall be made during transportation of coal and other waste materials on haul roads. Good house keeping practices shall be adopted by the industry.
10. Industry shall take due precaution and appropriate measures to arrest and minimize vibration and noise effects during mining activities. Industry shall provide proper arrangement to control the noise pollution. Industry shall install appropriate noise barriers/control measures including acoustic hoods, silencers, enclosures etc. on all sources of noise generation to control the noise. Workers engaged in blasting and drilling operations, operations of heavy earth moving machinery (HEMM) etc. shall be provided with ear plugs/muffs. The ambient noise level shall not exceed 75 dB (A) during day time and 70 dB (A) during night time within premises. Adequate measures shall be taken for control of noise levels below 85 dB (A) in the work environment.

Occupational exposure limit of noise specified by Director General of Mines Safety (DGMS) for coal mine shall be complied.

11. Industry shall ensure that the blasting and other mining operations shall not cause any damages to near by settlements. Controlled blasting shall be practiced. The mitigation measures for control of ground vibrations and to arrest fly rocks and boulders shall be implemented. Industry shall take due precaution and appropriate measures to arrest and minimize vibration and noise effects during mining activities.
12. All the slope of external dumps shall be maintained at a maximum of 28 degrees. Top soil shall be stacked properly in a dump with proper slope at earmarked site(s) with adequate measures and should be used for reclamation and rehabilitation of mined out area and for green belt development.
13. Backfilling of void (internal dump) shall be done and the mined out area shall be reclaimed to its original surface level. The monitoring of the safety of the internal backfill dump shall be done with the latest technologies and equipment as part of safety measures.
14. Extensive tree plantation with broad leaf local plant species in and around mine lease area, coal handling plant, roads, other material dump sites etc. and in the open areas available within the premises shall be carried out. Adequate wide green belt of broad leaf local plant species shall be developed along the mine lease area especially towards residential area/villages. A green belt of adequate width should be raised by planting the local species along the mine boundary, waste rock dumps, ventilation fan, roads and in selected open areas in consultation with local DFO/Agriculture Department. At least 2500 plant species per hectare shall be planted. Industry shall abide by the decisions taken by Ministry of Environment and Forests, Government of India / Central Pollution Control Board/ State Government /Chhattisgarh Environment Conservation Board from time to time in this regard.
15. Industry shall use fly ash brick, fly ash block and fly ash based products in the construction/repairing activities. Industry shall also use fly ash/bottom ash for filling low lying areas within premises and mined out areas as per notification/guideline/direction of Ministry of Environment and Forests, Government of India/ Central Government/ Central Pollution Control Board/State Government/ Chhattisgarh Environment Conservation Board. Industry shall ensure transportation of fly ash for back filling/beneficial uses by covered truck to prevent emission during transportation.


16. Industry shall establish an environmental management cell to carryout function relating to environmental management under the supervision of senior executive who will directly report to the head of organization. A full-fledged laboratory with qualified technical/scientific staff shall be provided to monitor the influent, effluent, ground water, soil, ambient air quality, stack emission (if any) and environmental samples etc.
17. Industry shall follow the pollution control measures recommended in code of practice for environment pollution prevention and control for coal mines evolved by Central Pollution Control Board.
18. Industry shall provide adequate vehicle emission monitoring arrangement for monitoring of all the transporting/ vehicles and others vehicles. Industry shall allow for loading of coal in transporting vehicles only after emission monitoring and after ensuring that the vehicle in which the coal is being loaded is ensuring the emission limit as prescribed.
19. Necessary fund shall be provided for implementation above conditions for environmental safeguards. The funds earmarked for environmental protection measures shall be kept in separate account and not diverted for any other purpose.
20. Industry shall obtain statutory clearances/licenses/permission from concerned Central/State Government Departments, Boards, Bodies and Corporations etc. Industry shall follow direction issued by Central /State Government, Central Pollution Control Board/Chhattisgarh Environment Conservation Board from time to time regarding control of water & air pollution and for environmental conservation.
21. The issuance of 'consent to operate' does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Central, State or local laws or regulations.
22. Any change in production/mining capacity, process, raw materials used, project profile (mining technology and scope of working) etc. shall be intimated to the Board and prior permission of the Board shall be obtained for the same.
23. Board may amend/cancel any of the conditions and further stringent the emission/effluent limit as and when deemed necessary in the interest of environmental protection, change in the project profile or non-satisfactory implementation of the stipulated conditions etc.

This consent is valid for the stated period and has to be renewed every year. Application with annual license fee in this regard shall reach the office 4 months before the expiry of this consent.

Please acknowledge the receipt of this letter.

For & on behalf of
Chhattisgarh Environment Conservation Board

(As approved by the Chairman
vide Note Sheet dispatch No.
1332, dated: 12/11/2007).


Member Secretary


Chhattisgarh Environment Conservation Board
Raipur (C.G.)

Endt. No. /TS/CECB/2007

Raipur, dated: ___/___/2007

Copy to: -

Regional Officer, Regional Office, Chhattisgarh Environment Conservation Board, Raipur (C.G.). Please ensure compliance and report, if any condition/conditions are violated by the industry.


Member Secretary

Chhattisgarh Environment Conservation Board
Raipur (C.G.)



CHHATTISGARH ENVIRONMENT CONSERVATION BOARD
NANAK NIWAS, CIVIL LINES, Raipur (C.G.)

No. 2619 /TS/B-139/CECB/2003

Raipur, Dated 21/7/03

To,

✓ General Manager,
M/s Baroud Open Cast Mine,
South Eastern Coal Fields Limited,
Raigarh Area,
R.G. Model - School Building,
P.B. No.35,
Dist- RAIGARH (C.G.)

Sub :- Renewal of consent of the Board under section 21 of the Air (Prevention and Control of Pollution) Act, 1981.

Ref :- Your Application No. SECL:GM:RGH:SO(C):WC:2001:532 Dated 17/02/2001 and subsequent correspondence ending dated 24/03/2003.

With reference to your above application consent is hereby renewed for a period of Two Years from 01-01-2001 to 31-12-2002, subject to the fulfillment of the terms and conditions incorporated in the schedule of the *consent letter No. 18942 dated 26-09-1995* and subsequent renewals issued by Board and additional conditions mentioned below :

This renewal of consent is valid for production capacity of :

Name of Product	Production Capacity
Mining of Coal	0.120 Million Tonne /Year {One Lac Twenty Thousand Metric Tonne per Year}

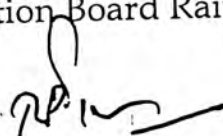
Additional Conditions

1. The industry shall maintain & operate their pollution control facilities properly so that the emission level should conform the prescribed standards all the time.
2. The Industry shall submit Environment Statement to this Board as per provision of Environment (Protection) Amendment Rule, 1993 for the previous year ending 31st March on or before 30th September every year.

3. The industry shall improve house keeping within the mine lease area.
4. All Internal roads especially near coalbunker areas shall be made pucca. Water sprinkling arrangement shall be made to control dust emission during handling and transportation of coal and other materials.
5. To minimize fugitive emission all conveyor belts, transfer points, junction points etc. shall be covered and at each transfer points, junction points etc. appropriate air pollution control equipment shall be installed.
6. The industry shall provide LPG connection to their employees to the maximum possible extent.
7. The industry shall not increase production more than capacity mentioned in this consent letter & shall not initiate any action regarding expansion without obtaining prior consent of the Board.
8. Extensive tree plantation shall be carried out in the open area available within the mine lease area.

Please acknowledge the receipt of this letter.

For & on behalf of
Chhattisgarh Environment Conservation Board Raipur (C.G.)


(R.P. Tiwari)

Officer on Special Duty


Chhattisgarh Environment Conservation Board
Raipur (C.G.)

Endt. No.

/TS/B-139/CECB/2003

Raipur, Dated

Regional Officer, Chhattisgarh Environment Conservation
Board, Raipur (C.G.).


(R.P. Tiwari)

Officer on Special Duty

Chhattisgarh Environment Conservation Board
Raipur (C.G.)



M.P. POLLUTION CONTROL BOARD
PARYAVARAN PARISAR, E-5, ARERA COLONY, BHOPAL-462016

No. 4445 /TS/MPPCB/2000

Date: 10-3-2000

To

General Manager,
M/s. Baroud Open Cast Mine,
SECL, Raigarh Area,
R.G. Modal - School Building,
P.B. No. 35,
Distt. RAIGARH [MP].

Sub: Renewal of consent of the Board under section 21 of the Air (Prevention and Control of Pollution) Act, 19781.

Ref: Your letter No. 3695 dated: 27.09.99 and subsequent correspondence ending dated: 05.11.99.

:-:-:-

With reference to your above application consent is hereby renewed for a period of one year from 01.01.2000 to 31.12.2000 subject to the fulfilment of the terms and conditions incorporated in the schedule of the consent letter No. 18942 dated: 26.09.95 and subsequent renewal issued to you by this office and additional conditions mentioned below:-

This renewal of consent is valid for production capacity of:

<u>Name of Product</u>	<u>Production Capacity</u>
MINING OF COAL	0.120 Million T/Year (One Lac Twenty Thousand Tonne per Year).

Additional Conditions:-

1. The industry shall improve their existing pollution control facilities and operate these properly so that the emission could be maintained within the prescribed standards.
2. The submission of environmental statement by the industries who seek consent under Water & Air Act or both and authorisation under the Hazardous Waste Management and Handling Rules 1989 has been made mandatory under the Environment (Protection) Act, 1986. As per this provision, such industries are required to submit environmental statement for the previous year ending 31st March on or before 30th September every year to the Board.

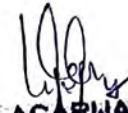


M.P. POLLUTION CONTROL BOARD
PARYAVARAN PARISAR, E-5, ARERA COLONY, BHOPAL-462016

3. Extensive tree plantation shall be carried out in the open areas available within the Mining lease area.

Please acknowledge the receipt of this letter

For & on behalf of
M.P. Pollution Control Board


(G.D. AGARWAL)
MEMBER SECRETARY

Endt No. /TS/Ez/MPPCB/2000

Date:

Copy to:-

1. Zonal Officer, M.P. Pollution Control Board, Raipur.
2. Regional Officer, M.P. Pollution Control Board, Bilaspur.
3. Monitoring Section, M.P. Pollution Control Board, Bhopal

(G.D. AGARWAL)
MEMBER SECRETARY
M.P. POLLUTION CONTROL BOARD
BHOPAL

P: 121:122 [min.3]
ukn



M.P. POLLUTION CONTROL BOARD
 PARYAVARAN PARISAR, E-5, ARERA COLONY, BHOPAL - 462016

No. 13097/TS/Ez/MPPCB/99

818) 21/55
 Date: 26-7-99

To

General Manager,
 M/s. Baroud Open Cast Mines,
 SECL, Raigarh Area,
 R.G. Model School Building, P.B. No. 35,
 Distt. RAIGARH (MP).

1037
 3.8.99

Sub: Renewal of consent of the Board under section 21 of the Air (Prevention and Control of Pollution) Act, 1981.

Ref: Your Letter No.570 dated: 25.11.98 and subsequent correspondence ending dated: 02.04.99.

With reference to your above application consent is hereby renewed for a period of one year from 01.01.99 to 31.12.99 subject to the fulfilment of the terms and conditions incorporated in the schedule of the consent letter No. 18942 dated: 26.09.95 and subsequent renewals issued by this office and additional conditions mentioned below:-

SO(C)

This renewal of consent is valid for production capacity of:

[Signature]
 CAN
 2/8/99

Name of Product

Production Capacity

Mining of Coal

0.120 Million T/Year (One Lac Twenty Thousand Metric Tonnes Per Year).

SPR(C)/AHS
 for na
 17/8

Additional Conditions:-

1. The industry shall improve their existing pollution control facilities and maintain the same properly so that emission could be achieved within the prescribed standards.

2. The submission of environmental statement by the industries who seek consent under Water & Air or both and authorisation under the Hazardous Waste Management and Handling Rules 1989 has been made mandatory under the Environment (Protection) Act, 1986. As per this provision, such industries are required to submit environmental statement for the previous year ending 31st March on or before 30th September every year to the Board.



M.P. POLLUTION CONTROL BOARD
PARYAVARAN PARISAR, E-5, ARERA COLONY, BHOPAL-462016

No. 768 /TS/Ez/MPPCB/98

Date: 15-1-99

To

General Manager,
M/s. Baroud Open Cast Mines,
SECL, Raigarh Area,
R.G. Model School Building, P.B. No. 35,
Distt. RAIGARH (MP).

Sub: Renewal of consent of the Board under section 21
of the Air (Prevention and Control of Pollution)
Act, 1981.

Ref: Your Letter No.3906 dated: 25.11.97. and subsequent
correspondence ending dated: 30.10.98.

:-:-:-

With reference to your above application consent is hereby renewed for a period of one year from 01.01.98 to 31.12.98 subject to the fulfilment of the terms and conditions incorporated in the schedule of the consent letter No. 18942 dated: 26.09.95 issued by this office and additional conditions mentioned below:-

This renewal of consent is valid for production capacity of:

<u>Name of Product</u>	<u>Production Capacity</u>
Mining of Coal	0.120 Million T/Year (One Lac Twenty Thousand Metric Tonnes Per Year).

Additional Conditions:-

1. The industry shall improve their existing pollution control facilities and maintain the same properly so that emission could be achieved within the prescribed standards.
2. The submission of environmental statement by the industries who seek consent under Water & Air or both and authorisation under the Hazardous Waste Management and Handling Rules 1989 has been made mandatory under the Environment (Protection) Act, 1986. As per this provision, such industries are required to submit environmental statement for the previous year ending 31st March on or before 30th September every year to the Board.
3. Industry shall implement all the pollution control measures as per the environmental management plan and progress report shall be submitted to Board regularly.




M.P. POLLUTION CONTROL BOARD
PARYAVARAN PARISAR, E-5, ARERA COLONY, BHOPAL-462016

4. Extensive tree plantation shall be carried out in the open areas available within the mining lease area.

Please acknowledge the receipt of this letter

For & on behalf of
M.P. Pollution Control Board


(G.D. AGARWAL)
MEMBER SECRETARY

Endt No-769 /TS/Ez/MPPCB/98

Date: 15-1-99

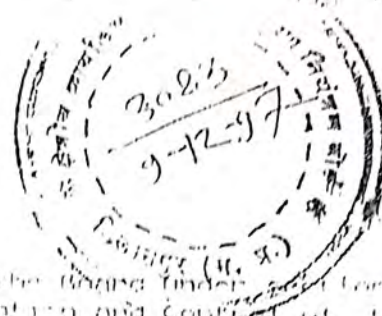
Copy to:-

1. Zonal Officer, M.P. Pollution Control Board, Raipur.
2. Regional Officer, M.P. Pollution Control Board, Bilaspur.
3. Monitoring Section, M.P. Pollution Control Board, Bhopal

(G.D. AGARWAL)
MEMBER SECRETARY
M.P. POLLUTION CONTROL BOARD
BHOPAL

P:43:44(minbpur)
ukn

SOCU / EE (C) / ENYT.
Sharma
GM.



Revenue Division
S/o. Revenue Officer, East India
S/O. P. O. Revenue
Village - John Charkhadia
Distt. RAJGARH (M.P.)

Subject: Renewal of consent of the mining under section 25/26
of the Water Conservation and Control Act, 1974.

Reference: Your letter No. 302/5/1/1989 dated 30-01-97 &
22.09.97.

With reference to your above letter consent is hereby
renewed for a period of 5 years from 01.01.98 to 31.12.02
subject to the fulfillment of the terms and conditions
incorporated in the schedule of the consent letter No. 18/74
dated 26.09.95 issued by this office and additional conditions
mentioned below:-

This renewal of consent is valid for production capacity of:

Name of Product	Production Capacity
1. Mining of Coal	0.120 Million Tonnes/year (One Lakh Twenty Thousand Metric Tonnes per year)

Additional Conditions:-

- The industry shall improve their existing pollution control facilities and maintain the same properly so that the treated effluent could be achieved within the prescribed standards.
- Measuring arrangement shall be made for consumption of water and waste water discharged
- The submission of environmental statement by the Industries who seek consent under Water & Air or both Acts and authorisation under the Hazardous Waste Management and Handling Rules, 1989 has been made mandatory under the Environment (Protection) Act, 1986. As per this provision, such industries are required to submit environmental statement for the previous year ending 31st March on or before 30th September every year to the Board.
- The industry shall utilise treated waste water on land for

13/12/97
302/5
ch. 12

19/12/97

9/2/98
302/5

irrigation purpose or for plantation etc.

5. The industry should construct silting pond so that in rainy season the silt from over burden may not create any silting problem in nearby surface water bodies.

6. Industry shall have to submit Mining Plan & Environmental Management plan approved by Indian Bureau of Mines.

7. Industry shall have to submit data regarding the land degradation, top soil degradation year wise.

8. The post mining land use^{plan} should be made compatible to the pre-mining land use plan to the extent possible by suitably land spacing the external and internal over burden dumps.

9. Industry shall apply for the consent renewal for the year 1998 along with requisite fee within 15 days.

10. Extensive tree plantation shall be carried out in the open areas available within the mining lease area.

Please acknowledge the receipt of this letter.

For & on behalf of
M.P. Pollution Control Board

sd

(O.K. UPMANYU)
MEMBER SECRETARY

Encl: No. 20995/TS/Ez/MPPCB/97
Copy to:-

Date: 5-12-97-

1. Zonal Officer, M.P. Pollution Control Board, Raipur.
- ✓ 2. Regional Officer, M.P. Pollution Control Board, Bilaspur.
3. Cess Section, M.P. Pollution Control Board, Bhopal
4. Monitoring Section, M.P. Pollution Control Board, Bhopal

sd

(O.K. UPMANYU)
MEMBER SECRETARY
M.P. POLLUTION CONTROL BOARD
BHOVAL

P- 142-143 (reen-1)

MADHYA PRADESH POLLUTION CONTROL BOARD
PARYANARAN PARISAR E-5, ARERA COLONY BHOPAL-462016

Rejo A/b

TS/EE/MPPCB/95

Date:

To,

General Manager,
M/s. Baroud Open Cast Mine,
South Eastern Coal Fields Ltd.,
P.O. Baroud,
Village, Teh. Ghaghoda,
Dist. RAIGARH (M.P.).

Sub: Renewal of consent of the Board under section 21
of the Air (Prevention and Control of Pollution)
Act, 1981.

Ref: Your renewal application No./Letter No. SECL/RGMZ
ACME/ENVIRO/Baroud/95-96/1336 Dt: 28.04.95.

:-:-:-:-:-

With reference to your above application consent
is hereby renewed for a period of 2 years from 1.1.94
to 31.12.95 subject to the fulfilment of the terms and
conditions incorporated in the schedule of the consent
letter No. ET/Revision/27/81/153 Dated: 23-9-95 issued to
you by this office.

This renewal of consent is valid for production
capacity of:-

<u>Product</u>	<u>Production Capacity</u>
Mining of Coal	0.120 MT/Year (One Lakh Twenty Thousand Metric Tonnes per Year).

Please acknowledge the receipt of this letter.

For & on behalf
M.P. Pollution Control Board

MEMBER SECRETARY

Endt No. 18945/TS/EE/MPPCB/95

Date: 26-9-95

Copy to:-

1. Regional Officer, M.P. Pollution Control Board,
Bilaspur.
2. Chief Municipal Officer, Municipal Council,
Ghaghoda, Dist. Raigarh (M.P.).

MEMBER SECRETARY
M.P. POLLUTION CONTROL BOARD
BHOPAL

U.K. NAIR
7895.

21/10
17-34
4-10-95

Ak
21/10/95
A. Kumar

17

MADHYA PRADESH POLLUTION CONTROL BOARD
PARYAWARAN PARISAR E-5, ARERA COLONY BHOPAL-462016

M /TS/Ez/MPPCB/95

Date:

To,

General Manager,
M/s. Baroud Open Cast Mines,
South Eastern Coal Fields Ltd.,
P.O. Baroud Village, Teh. Gharghoda,
Dist RAIGARH (M.P.).

Sub: Renewal of consent of the Board under section 25/25 of the Water (Prevention and Control of Pollution) Act, 1974.

Ref: Your renewal application No./Letter No. SECL/
GM/RGM/ACME/ENVIRO/Baroud/95-96/1336 Dt: 28.4.95.

:-:-:-:-

With reference to your above application consent is hereby renewed for a period of 2 year from 01.01.94 to 31.12.95 subject to the fulfilment of the terms and conditions incorporated in the schedule of the consent letter No. *EH/Rajgarh/25/2/1/53* Dated: *23-9-95* issued to you by this office.

renewal of
This consent is valid for production capacity of:-

<u>Product</u>	<u>Production Capacity</u>
Mining of Coal	0.120 MT/Year (One Lakh Twenty Thousand Metric Tonnes per Year).

Please acknowledge the receipt of this letter.

For & on behalf of
M.P. Pollution Control Board

sdl
MEMBER SECRETARY

Endt No. 18949 /TS/Ez/MPPCB/95

Date: 26-9-95

Copy to:-

1. Regional Officer, M.P. Pollution Control Board, Bilaspur.
2. Cass Section, M.P. Pollution Control Board, Bhopal.
3. Chief Municipal Officer, Municipal Council, Gharghoda, Dist. Raigarh.

[Signature]
MEMBER SECRETARY
M.P. POLLUTION CONTROL BOARD
BHOPAL

U.K. NAIR
7895.

pv-
22/10/95



ENVIRONMENT RAIGARH AREA <envtrghsecl@gmail.com>

Decision of 55th Internal EAC _ 21-4/7619/CT/MIN/2022(BAROUD OC EXPANSION PROJECT)

2 messages

Central Ground Water Authority <cgwa@nic.in>
To: envtrghsecl@gmail.com, envrontech@instalinks.net

Fri, Jul 7, 2023 at 2:37 PM

Sir,**You are here with requested to find the below decision for the mentioned application.**

The internal EAC is of the considered opinion that the CHR is as per SOP and is approved for 3372 KLD/ 1230780 KLY.

Regards,

O/o सदस्य सचिव Member Secretary,
केंद्रीय भूजल प्राधिकरण Central Ground Water Authority

जल शक्ति मंत्रालय, भारत सरकार Ministry of Jal Shakti, Govt. of India
18/11, जामनगर हाउस, मानसिंह रोड, नई दिल्ली-110011
18/11, Jamnagar House, Mansingh Road, New Delhi-110011
Ph- (011) 23383824; Fax- (011) 23382051; e-mail: cgwa@nic.in



ENVIRONMENT RAIGARH AREA <envtrghsecl@gmail.com>
To: sambaroud.bijari@gmail.com

Fri, Jul 7, 2023 at 4:54 PM

Regards
Nodal Officer (Environment)
South Eastern Coalfields Limited
Raigarh Area

----- Forwarded message -----

From: **Central Ground Water Authority** <cgwa@nic.in>
Date: Fri, Jul 7, 2023 at 2:39 PM
Subject: Decision of 55th Internal EAC _ 21-4/7619/CT/MIN/2022(BAROUD OC EXPANSION PROJECT)
To: <envtrghsecl@gmail.com>, <envrontech@instalinks.net>

Sir,**You are here with requested to find the below decision for the mentioned application.**

The internal EAC is of the considered opinion that the CHR is as per SOP and is approved for 3372 KLD/ 1230780 KLY.

Regards,

O/o सदस्य सचिव Member Secretary,

केंद्रीय भूजल प्राधिकरण Central Ground Water Authority

जल शक्ति मंत्रालय, भारत सरकार Ministry of Jal Shakti, Govt. of India

18/11, जामनगर हाउस, मानसिंह रोड, नई दिल्ली-110011

18/11, Jamnagar House, Mansingh Road, New Delhi-110011

Ph- (011) 23383824; Fax- (011) 23382051; e-mail: cgwa@nic.in





Meeting of the Internal Expert Appraisal Committee is scheduled to be held on 05.07.2023 at 10:30 am onwards - reg

4 messages

Central Ground Water Authority <cgwa@nic.in>

Wed, Jun 28, 2023 at 5:37 PM

To: nvjpriya@yahoo.co.in, krishageo@gmail.com, subashiitr009@gmail.com, managerbalrampur@gmail.com, envtrghsecl@gmail.com, envrontech@instalinks.net, noenvthsdahq@gmail.com, crinunadalla@gmail.com
Cc: "RD, CGWA" <rdcgwa-cgwb@nic.in>

Sir/Madam,

1. This is to inform that Meeting of the Internal Expert Appraisal Committee is scheduled to be held on 05.07.2023 at 10:30 am in **online/ offline Mode** at Central Ground Water Authority, gallery 18/11, Jamnagar House, New Delhi -110011. The list of applications for Internal EAC is as under:

Sl.No	Application code	Application Number	Project Name	Present Category	Quantum (KLD)	Fresh/Renewal	Type of project
1	74178	21-4/9945/GJ/INF/2022	J. KUMAR INFRAPROJECTS PVT. LTD	Safe	45KLD and Dewatering 1056.40 KLD	Fresh (New)	INF
2	74179	21-4/9946/GJ/INF/2022	J. KUMAR INFRAPROJECTS PVT. LTD	Safe	45KLD and Dewatering 971.53 KLD	Fresh (New)	INF
3	73962	21-4/7406/CT/MIN/2022	BALRAMPUR 10/12 INCLINES	Semi Critical	7117	Fresh (Existing)	MIN
4	75453	21-4/7619/CT/MIN/2022	BAROUD OC EXPANSION PROJECT	Safe	2974	Fresh (Existing)	MIN
5	77386	21-4/7992/CT/MIN/2023	B-SEAM UNDERGROUND MINE	Safe	1308	Fresh (Existing)	MIN

2. Project Proponent and their consultants/experts are requested to attend the meeting by virtual /physical mode to present the IAR/CHR and groundwater Modelling report as per applicability as per SOP.

3. All project proponents and their consultants are advised to submit the presentations of individual projects/applications as per Annexure-I, well within time in advance up to 03.07.2023 via return mail to cgwa@nic.in only.

4. All project proponents and their consultants are advised to confirm their presence in the meeting.

5. The PPT should be in line with IAR/CHR and modelling report and in concurrence to SOP. In case of discrepancies between PPT and IAR/CHR, the application shall be rejected.

6. While joining the VC both the PP and the consultant have to be present. **It is strictly advised to the PP and the consultant to only join with the same firm name they are representing** so that the Technical team can identify them and let them in the lobby when their turn comes (**It is advised to be patient and wait in the lobby for their turn**).

7. It is requested to kindly furnish source of content being presented (**page no. and figure no. of report**) at the base of each PPT/ slides.

8. Also it is to humbly request all the PP and the consultants to be available from 10:30 AM onwards till the completion of their respective project's presentation.

PPs and Consultants are requested to join the meeting via below mentioned Webex link:

<https://centralgroundwaterauthority.webex.com/centralgroundwaterauthority/j.php?MTID=m6400cca3289b24ed3a2b54c5014d49e8>

Wednesday, July 5, 2023 10:30 AM | 10 hours | (UTC+05:30) Chennai, Kolkata, Mumbai, New Delhi

Meeting number: 2519 470 8723

Password: IEAC2023 (43222023 from video systems)




Regards,

O/o सदस्य सचिव Member Secretary,

केंद्रीय भूजल प्राधिकरण Central Ground Water Authority

जल शक्ति मंत्रालय, भारत सरकार Ministry of Jal Shakti, Govt. of India
18/11, जामनगर हाउस, मानसिंह रोड, नई दिल्ली-110011
18/11, Jamnagar House, Mansingh Road, New Delhi-110011
Ph- (011) 23383824; Fax- (011) 23382051; e-mail: cgwa@nic.in

**3 attachments**

-  **Annexure-I.docx**
15K
-  **Check List.pdf**
185K
-  **SOP for IAR & CHG Report 09-02-2022 (1).pdf**
1298K

ENVIRONMENT RAIGARH AREA <envtrghsecl@gmail.com>
To: Central Ground Water Authority <cgwa@nic.in>
Cc: Pawan Agrawal <environtech@instalinks.net>, sambaroud.bijari@gmail.com

Mon, Jul 3, 2023 at 10:50 AM

Dear Sir,

We would like to inform you that we will participate in a meeting to be held on 05/07/2023 for the NOC (Application No. 21-4/7619/CT/MIN/2022) of Baroud **OC Expansion Project** of SECL Raigarh Area

This is for your kind information & needful please.




Encl: PPT, Check list , Annexure-A & CHR & IAR with Modeling

Regards
Nodal Officer (Environment)
South Eastern Coalfields Limited
Raigarh Area

 **Annexure - 3 - CHS -IAMR Baroud OCP F - Modi.pdf**

[Quoted text hidden]

3 attachments

-  **Check List, SECL - Baroud OCP.pdf**
723K
-  **Annexure-A - SECL - Baroud OCP for Participant.pdf**
881K
-  **Presentation - Baraud OCP SECL.pdf**
7537K

Pawan Agrawal <environtech@instalinks.net>
To: ENVIRONMENT RAIGARH AREA <envtrghsecl@gmail.com>
Cc: Central Ground Water Authority <cgwa@nic.in>, sambaroud.bijari@gmail.com

Wed, Jul 5, 2023 at 1:50 PM

Dear Sir,
PFA herewith to email the CGWA New Delhi in their ID : cgwa@nic.in

[Quoted text hidden]

--
regards
Advisor
For, Environ Techno Consultants
(Accredited Consultant - RGNGWTRI - CGWB)
Call +91 9301011914

 **Revised Applction Baroud OC Expansion Project.pdf**
485K

ENVIRONMENT RAIGARH AREA <envtrghsecl@gmail.com>
To: Central Ground Water Authority <cgwa@nic.in>
Cc: Pawan Agrawal <environtech@instalinks.net>, sambaroud.bijari@gmail.com

Wed, Jul 5, 2023 at 3:28 PM

Dear Sir,

With reference to the EAC meeting held on 05.07.2023 in respect of Baroud OC Expansion Project of SECL Raigarh Area, as per instruction of the committee please find attached herewith **revised application (Application No. 21-4/7619/CT/MIN/2022)** for **quantity of 3372 m3/day (1230780 m3/year)**.

This is for your kind information and issuance of NOC please.

Regards
Nodal Officer (Environment)
South Eastern Coalfields Limited
Raigarh Area

[Quoted text hidden]

 **Revised application Baroud.pdf**
1533K

Ministry of Jal Shakti
Department of Water Resources, River Development and Ganga Rejuvenation
Central Ground Water Authority (CGWA)
Application for Issue of NOC to Abstract Ground Water (NOCAP)
Application for Permission to Dewater Ground Water for Mining Industry
(Application for New NDC)

Application Number : 21-4/7619/CT/MIN/2022

1. General information:

Water Quality:	Fresh Water
Whether Ground Water Utilization for:	Existing Industry
Date of Commencement Mine/Project:	01/05/1973
Date of Expansion:	
Application Type Category/ Type of Application	Coal

2. Name of Mine/Project:

BAROUD OC EXPANSION PROJECT

3. Location Details of the Mining Unit- (Attach Site, Approved Mining Plan) (\$) :

Address Line 1 :	OFFICE OF THE SUB AREA MANAGER
Address Line 2 :	BAROUD SUB AREA,
Address Line 3 :	SOUTH EASTERN COALFIELDS LIMITED
State:	CHHATTISGARH
District:	RAIGARH
Sub-District:	GHARGHODA
Village/Town:	Baraud
Latitude:	22.271547
Longitude	83.334874
Area Type :	Non-Notified
Area Type Category :	Safe
Whether industry is MSME:	No
Whether the project falls in Wetland Area:	No

4. Communication Address

Address Line 1:	OFFICE OF THE GENERAL MANAGER,
Address Line 2:	SOUTH EASTERN COALFIELDS LIMITED,
Address Line 3:	CHHOTE ATRAMUDA RAIGARH
State:	CHHATTISGARH
District:	RAIGARH
Sub-District:	RAIGARH
Pincode:	496001
Phone Number with Area Code:	
Mobile Number:	91 9425530783
Fax Number:	
E-Mail:	envtrghseci@gmail.com

5. Salient Features of the Activity:

Baroud OC Expansion Project has peak production capacity of coal 3.5 MTPA and lease area of 1111.40 ha. The project was granted environmental clearance on 20.05.2009.

Ministry of Jal Shakti
Department of Water Resources, River Development and Ganga Rejuvenation
Central Ground Water Authority (CGWA)
Application for Issue of NGC to Abstract Ground Water (NOCAP)
Application for Permission to Dewater Ground Water for Mining Industry
(Application for New NOC)

Application Number : 21-4/7619/CT/MIN/2022

6. Land Use Details of the Surroundings (km 10 Radius – Outside): (\$)

Land Use Details of the Surroundings(km 10 radius):	Attached as Annexure-1
---	------------------------

7. Land Use Detail of Project Area

Land Use Details	Existing (sq meter)	Proposed (sq meter)	Grand Total (sq meter)
Green Belt Area	368000.00	7332000.00	7700000.00
Open Land	3244000.00	0.00	3244000.00
Road/ Paved Area	116100.00	33900.00	150000.00
Rooftop area of building/ sheds	12500.00	7500.00	20000.00
Total	3740600.00	7373400.00	11114000.00

8. Topography of the Area

- a) Regional
- b) Project Area

9. Drainage in the Area (River / Nala etc)

- a) Regional
- b) Project Area

10. Source of Availability of Surface Water – Furnish Details:

11. Average Annual Rainfall in the Area (in mm):

12. Townships/Viliages within 10 km radius of the Project:

13. Whether the Groundwater Table will be intersected by Activity :-

Yes

(a) At What Depth (m bgl)	Pre-monsoon	Post-monsoon
Minimum (m bgl)	4.75	2.40
Maximum (m bgl)	11.30	7.43
(b) Maximum Depth Proposed to Dewater (m bgl)	78.00	
(c) Groundwater Flow Dirccction (Attach Map)(\$)	Attached as Annexure-2	
(d) Any Other Information	Estimated mine seepage and Rain Water to issue the Fresh NOC is 2567 KLD from mine seepage and 405 KLD from Rain Water. Due to intersecting of ground water table Maximum 2972 KLD De-watering of mine seepage along with rain water is proposed to be done.	

14. Total Water Requirement for various Purpose to be Mentioned

	(m3/day)	(m3/year)
Ground Water Required through Abstract Structure	400.00	146000.00
Ground Water Abstracted on account of Dewatering / Mining Seepage 2587KLD + Rain Water 405 KLD	2972.00	1084780.00
Total Ground Water Withdrawal	3372.00	1230780.00

15. Details of De-Watering Structure

(a) De-Watering Existing Structure

Number of Existing Structures:	2
--------------------------------	---

Ministry of Jal Shakti
Department of Water Resources, River Development and Ganga Rejuvenation
Central Ground Water Authority (CGWA)
Application for Issue of NGC to Abstract Ground Water (NOCAP)
Application for Permission to Dewater Ground Water for Mining Industry
(Application for New NOC)

Application Number : 21-4/7619/CT/MIN/2022

S No.	Type of Structure Name / Year of Construction	Depth Meter / Diameter (mm)	Depth to Water Level (Meters below Ground Level)	Discharge (m3/Hour)	Operational Hours(Day) / Days(Year)	Mode of Lift Name	Horse Power of Pump	Whether fitted with Water Meter	Whether Permission Registered with CGWA /if so Details Thereof
1	Mining Pits / 2020	40.00 / 150	3.50	272.00	12 / 365	Centrifugai Pump	300.00	Yes	Yes / Application for NOC was applied vide Application Number : 21-4/732/CT/MIN/2017 Status: Rejected
2	Mining Pits / 2020	40.00 / 150	3.50	272.00	12 / 365	Centrifugai Pump	300.00	Yes	Yes / Application for NOC was applied vide Application Number : 21-4/732/CT/MIN/2017 Status: Rejected

(b) De-Watering Requirement and Proposed Structure Detail

Number of Proposed Structures: 2

S. No.	Type of Structure Name / Year of Construction	Depth (Meter) / Diameter (mm)	Depth to Water Level (Meters below Ground Level)	Discharge (m3/Hour)	Operational Hours(Day) / Days(Year)	Mode of Lift Name	Horse Power of Pump	Whether fitted with Water Meter	Whether Permission Registered with CGWA/if so Details Thereof
1	Mining Pits / 2022	40.00 / 150	3.50	272.00	12 / 365	Centrifugai Pump	300.00	No	No / -
2	Mining Pits / 2023	40.00 / 150	3.50	272.00	12 / 365	Centrifugai Pump	300.00	No	No / -

16. Proposed Utilization of Pumped Water (Please Attach Details)(m3/year) (\$)

(a) Domestic Use in Mines & Colony	146090	BW water for domestic use will be 15 KLD in Mine & + 385 KLD in Colony.
(h) Water Supply	21900.00 KLY	Workshop, Crusher and other uses. 50 KLD + 10 KLD
(c) Agriculture	—	Supply to villagers if demand by the District Collector (DM) of Raigarh or State Government.
(d) Green Belt Development	76475.00 KLY	Water will be utilized for Green Belt development & Horticulture works. Mir area 200 KLD + 15 KLD
(e) Suppression of Dust	209875.00 KLY	Pumped water will be utilized for dust suppression measures.400KLD in Mine & 175 KLD in CHP.
(f) Recharge	153475.00 KLY	Balance Mine seepage and rain water is proposed 2122 KLD = 774530 KL/Year and it will stored in 2 number mine pit already coal mined out (Non active pit) to recharge the Ground Water as well as evaporation losses. Supply to nearby village if demand send by State Govt or DC / DM Raigarh (Chhattisgarh). About 153475 Cum / Year RW is proposed to be recharges after all losses.
(g) Any Other Item		if demanded came for Ground Water from nearby viliage to use the mine water instead of BW water, then SECL will supply to them.

Ministry of Jal Shakti
Department of Water Resources, River Development and Ganga Rejuvenation
Central Ground Water Authority (CGWA)
Application for Issue of NOC to Abstract Ground Water (NOCAP)
Application for Permission to Dewater Ground Water for Mining Industry
(Application for New NOC)

Application Number : 21-4/7619/CT/MIN/2022

17. Monitoring of Ground Water Regime (Attach Map(\$))

- (a) Location Details of the Wells / Piezometers (Latitude, Longitude, Reduced Level)
- (b) Number of Wells / Piezometers
- (c) Attach Details of GW Level of Observation Wells / Piezometers (At Least for One Year) (\$)
- (d) Number of Wells / Piezometers Proposed to Monitor
- (e) Number of Piezometers Proposed to Monitor to Construct in Surroundings
- (f) General Water Quality Report from NABL accredited lab (In the Area and Surroundings) (\$)
- (g) Any Other Item

18. Proposed Pump / Pumping Groundwater Outside the Mine Pit for Domestic or Other Use (If so, give Details):

Number of Existing Structures:

4

S No.	Type of Structure Name / Year of Construction	Depth (Meter) / Diameter (mm)	Depth to Water Level (Meters below Ground Level)	Discharge (m3/Hour)	Operational Hours (Day) / Days (Year)	Mode of Lift Name	Horse Power of Pump	Whether fitted with Water Meter	Whether Permission Registered with CGWA/If so Details Thereof
1	Borewell / 1996	90.00 / 300	3.50	17.00	8 / 365	Submersible Pump	5.00	Yes	Yes / Application for NOC was applied vide Application Number : 21-4/732/CT/MIN/2017 Status: Rejected
2	Borewell / 2008	90.00 / 300	3.50	10.00	8 / 365	Submersible Pump	5.00	Yes	Yes / Application for NOC was applied vide Application Number : 21-4/732/CT/MIN/2017 Status: Rejected
3	Borewell / 2010	90.00 / 300	3.50	10.00	8 / 365	Submersible Pump	5.00	Yes	Yes / Application for NOC was applied vide Application Number : 21-4/732/CT/MIN/2017 Status: Rejected
4	Borewell / 2015	90.00 / 300	3.50	10.00	8 / 365	Submersible Pump	5.00	Yes	Yes / Application for NOC was applied vide Application Number : 21-4/732/CT/MIN/2017 Status: Rejected

Number of Proposed Structures:

4

S. No.	Type of Structures Name / Year of Construction	Depth (Meter) / Diameter (mm)	Depth to Water Level (Meters below Ground Level)	Discharge (m3/Hour)	Operational Hours (Day) / Days (Year)	Mode of Lift Name	Horse Power of Pump	Whether fitted with Water Meter	Whether Permission Registered with CGWA/If so Details Thereof
--------	--	-------------------------------	--	---------------------	---------------------------------------	-------------------	---------------------	---------------------------------	---

Ministry of Jal Shakti
Department of Water Resources, River Development and Ganga Rejuvenation
Central Ground Water Authority (CGWA)
Application for Issue of NOC to Abstract Ground Water (NOCAP)
Application for Permission to Dewater Ground Water for Mining Industry
(Application for New NOC)

Application Number : 21-4/7619/CT/MIN/2022

1	Borewell 2022	/ 90.00 300	/ 3.50	10.00	8 / 365	Submersible Pump	5.00	No	No / -
2	Borewell 2022	/ 90.00 300	/ 3.50	10.00	8 / 365	Submersible Pump	5.00	No	No / -
3	Borewell 2023	/ 90.00 300	/ 3.50	10.00	8 / 365	Submersible Pump	5.00	No	No / -
4	Borewell 2023	/ 90.00 300	/ 3.50	10.00	8 / 365	Submersible Pump	5.00	No	No / -

19. **Groundwater Availability Report (Please Enclose a Comprehensive Report on Groundwater Condition / Groundwater Quality in and Around 5Km of the Area) Map showing location of groundwater regime monitoringwells, flow chart showing details of water requirement and recycle water use and gainfull of pumped water- (\$)**

20. **Details of Rainwater Harvesting / Artificial Recharge Measures for Groundwater Recharge in the Area. If already Implemented, details may be Furnished. (Attach Report on Comprehensive & Feasible Rainwater Harvesting / Recharge Proposal).- (\$)**

21. **TOR/EC/Approval letter from statutory bodies viz Ministry of Environment & Forest (MoEF) or State Pollution Control Board (SPCB) or State Level Expert Appraisal Committee(SEAC) or State Level Environment Impact Assessment Authority (SLEIAA)- (\$)**

Attached Referral Letter No Record Found!

Letter Number

22. **Have you Applied Earlier for the Same Purpose with CGWA / State Ground Water Authority:**

If Yes, so Details thereof with Status:

Application Number : 21-4/732/CT/MIN/2017

Status: Rejected

1) Hyper Link – SECL BAROUD OCP

<https://drive.google.com/drive/folders/1rIOP2dCHWyYpCJpgsC9vXbcdX0HdIf0?usp=sharing>

MINING USE- Self Declaration

I hereby certify that the data and information furnished above are true to the best of my knowledge and belief and I am aware that if any part of the data / information submitted is found to be false or misleading at any stage, the application will be rejected outright.

I hereby declare that all the mandatory documents prescribed in the application form have been uploaded and no blank /irrelevant documents have been uploaded. I am also aware that any false/ wrong submission /uploading of document will lead to rejection of my application without any notice.

It is to certify that no case related to ground water withdrawal/ contamination is pending against the industry/ project/ unit as on date. Any such case filed against the company/ project/ unit in respect of ground water withdrawal/ contamination during the pendency of this application shall be immediately brought to the notice of CGWA.

I hereby undertake that in case any environmental compensation/ penalty is imposed on the firm by any statutory authority, I shall comply with the decision of such authority.

1. Application Proforma is subject to modification from time to time.

2. Application is submitted online on website <http://cgwa-noc.gov.in> to following office.

Regional Director,Central Ground Water Board North Central Chhattisgarh, 2nd Floor, LK Corporate and Logistic Park, Dhamtari Road, NH-30, Dumartarai, RAIPUR, CHHATTISGARH, 492015

3. Incomplete application will be summarily rejected.

Scanned copy of last page of application with signature and seal should be attached at prescribed place before

Ministry of Jal Shakti
Department of Water Resources, River Development and Ganga Rejuvenation
Central Ground Water Authority (CGWA)
Application for Issue of NOC to Abstract Ground Water (NOCAP)
Application for Permission to Dewater Ground Water for Mining industry
(Application for New NOC)

Application Number : 21-4/7619/CT/MIN/2022

submission of application.

4. Receipt of Processing Fee of Rs. 10000.00/- (Rupees Ten Thousand Only) submitted through NON TAX RECEIPT PORTAL (<https://bharatkosh.gov.in>) should be attached in online application at prescribed place before submission of application.

Processing Fee:-

Bharat Kosh Transaction Ref. No:-

Bharat Kosh Transaction Date:-

Note:- The Processing Fee is Non-Refundable. Applicant should ensure and Check Eligibility of Submission of Application and Required Documents before Submitting Online Application.

5. Hard copy of application required:	No		
6. Ground Water Quality Approved	Not Define	Ground Water Charge Required:	Not Define
Ground Water Charge Recieve:	No	Ground Water Charge Amount:	
		Ground Water Area Amount:	

Attached Files:

1). Site Plan : (Refer 3)

No Attachment Found!

2). Approved Mining Plan : (Refer:3)

S.No	Attachment Name	File Name
1	Approved Mining Plan	ANNEXURE-3 PR Baroud OCP.pdf
2	EC BAROUD	ANNEXURE-9 EC Baroud.pdf
3	Baroud CTO	ANNEXURE-10 BAROUD CTO.pdf
4	NOC	NOC.pdf

3). Topcsketch of Surroundings 10 km Radius Gutside : (Refer: 3)

No Attachment Found!

4). Document of Ownership of the land : (Refer-7)

No Attachment Found!

5). Source of Availabiity of Surface Water : (Refer-10)

No Attachment Found!

6). GroundWater flow Direction Map : (Refer: 13-C)

No Attachment Found!

7). Proposed Utilization of Pumped Water : (Refer: 16)

No Attachment Found!

3). Monitoring of Groundwater Regime Map : (Refer: 17)

No Attachment Found!

9). GW Level of Observation Wells / Piezometer : (Refer: 17-C)

Ministry of Jal Shakti
Department of Water Resources, River Development and Ganga Rejuvenation
Central Ground Water Authority (CGWA)
Application for Issue of NOC to Abstract Ground Water (NOCAP)
Application for Permission to Dewater Ground Water for Mining industry
(Application for New NOC)

Application Number : 21-4/7619/CT/MIN/2022

No Attachment Found!

10). General Quality of Ground Water in the Area : (Refer: 17-f)

No Attachment Found!

11). Hydrogeological Report (Previous:Groundwater Availability Report) : (Refer: 19)

S.No	Attachment Name	File Name
1	Annexure - 5 CHS - IAMR Baroud OCP	Annexure - 5 - CHS - AMR Baroud OCP F.pdf

12). Rain Water Harvesting/Artificial Recharge proposal (Previous:Details of Rainwater Harvesting and Artificial Recharge Measures) : (Refer: 20)

S.No	Attachment Name	File Name
1	Annexure - 4 RWH in Baroud OCP Mine	Annexure - 4 RWH Adopted.pdf
2	Annexure - 13a - BAROUD - MAY 2022 BW	Annexure - 13a - BAROUD - MAY 2022 BW.pdf
3	Annexure - 13b - MAY 2022 MINE Water Quality	Annexure - 13b - MAY 2022 MINE Water Quality.pdf
4	Annexure -13c - MAY 2022 RIVER Water Quality	Annexure -13c - MAY 2022 RIVER Water Quality.pdf
5	NOC	NOC.pdf

13). Authorization Letter (Previous:Authorization) :

No Attachment Found!

15). Extra Attachment :

S.No	Attachment Name	File Name
1	Request letter GW charge.	ANNEXURE-11 Request letter GW Recharge.pdf
2	Annexure - 12 - Hyper Link Baroud	Annexure - 12 - Hyper Link SECL Baroud.pdf
3	Annexure - 1 with 2 - Land use and GW Flow	Annexure - 1 with 2 - Land use and GW Flow.pdf

16). Scanned Mining Application :

No Attachment Found!

17). TOR/EC/Approval Letter :

No Attachment Found!

18). Bharat Kosh Receipt (Processing Fee):

S.No	Attachment Name	File Name
1	Annexure - 7 Fee BK Baroud	Annexure - 7 - Fee BK Baroud.pdf

19). Application with Signature and Seal:



Ministry of Jai Shakti
Department of Water Resources, River Development and Oanga Rejuvenation
Central Ground Water Authority (CGWA)
Application for Issue of NOC to Ahstract Oround Water (NOCAP)
Application for Permission to Dewater Ground Water for Mining Industry
(Application for New NOC)

Application Number : 21-4/7619/CT/MIN/2022

S.No	Attachment Name	File Name
1	Save As Draft	ANNEXURE-8 BAROUD SAD.pdf
2	Bharatkosh receipt	ANNEXURE-7 BAROUD BHARATKOSH.pdf
3	Annexure - 14 - SADApplication Baroud	Annexure - 14 - SADApplication Baroud.pdf
4	Abstraction charge	Baroudadv.pdf

20). MSME certificate in case of MSME:

No Attachment Found!

21). Approval from Wetland Authority (in case of project area falling in Wetland zone):

S.No	Attachment Name	File Name
1	AFFIDAVIT WETLAND	ANNEXURE-6 Baroud Affidavid.pdf

22). Penalty :

No Attachment Found!

Date : 05/07/2023

Place : Baroud

Associated User : baroudoc

Submitted By User : haroudoc

Submission Date : 05/07/2023


SANDEEP MARKAM
Nodal Officer (Environment)
SECL - Raigarh Area
राज्य.सी.एस. रायपुर क्षेत्र

* in case signed by any authorized signatory, the details of the signatory with the authorization shall be enclosed.



भारत सरकार
Govt. of India
श्रम एवं रोजगार विभाग
Ministry of Labour & Employment
स्वास्थ्य एवं सुरक्षा महाविभाग
Directorate-General of Mines Safety



NO: 010426|SEZ|Raiigarh Region|Perm|2021|9656

Date: 30/07/2021

From
Director of Mines Safety, RAIGARH REGION Region, SOUTH EASTERN ZONE RANCHI
JHARKHAND

To
RAM BHUWAN VERMA
Office of Sub Area Manager Office of Sub Area Manager

Sub: Permission under Regulation 196(3) of the Coal Mines Regulations, 2017 to conduct blasting in opencast workings, where any permanent building or structure of permanent nature not belonging to owner lies within the danger zone, at Baroud Opencast Mine of M/s SECL.

Sir,

Please refer to your online Application ID 143268 dated 26.05.2021 and physical documents related with the application submitted vide letters No. 373 dated 25.05.2021 & 1410 dated 01.07.2021 along with plans and report on control blasting study of Baroud Opencast Mine by M/s CMPDI, Bilashpur, Job No.504566 dated July-2020 on the above subject.

The matter has since been examined on the basis of the scientific report and information furnished in the application under reference and shown on the enclosed plans and sections submitted by you.

In exercise of powers conferred upon the Chief Inspector of Mines (also designated as Director-General of Mines Safety) under the provisions of Reg. 196(3) of the Coal Mines Regulations, 2017 and by virtue of the authorisation granted to me by the Chief Inspector of Mines (also designated as Director-General of Mines Safety) under Section 6(1) of the Mines Act, 1952, I, hereby permit you to conduct blasting in opencast workings at Baroud Opencast Mine of M/s SECL in the areas, bounded by points A1 to A6 & A1, B1 to B5 & B1, C1 to C5 & C1 and D1 to D9 & D1 and washed in orange colour as shown on the plan No. SECL/BRD/SUR/2021/167 dated 01.07.2021, submitted along with the application, where any permanent building, hutment or structure, etc. of permanent nature not belonging to owner lies within the danger zone, subject to the condition that the aggregate maximum charge per delay and per round shall not exceed the amount fixed as below and the following conditions including the conditions in the enclosed ANNEXURE-1 being strictly complied with:

1.0 The aggregate maximum charge per delay & per round and drilling parameters shall not exceed the amount as fixed below:

Distance of structures/buildings from the blasting site (in meters)	Dia. of hole (mm)	Depth of hole (m)	Burden/ Spacing (m)	Maximum charge/delay (Kg)	Maximum charge/round (Kg)
> 200m – 300m	159	6.0	4.0/4.5	40	750
301m – 500m	159	6.0	4.0/4.5	45	900

2.0 The controlled deep-hole blasting shall be carried out strictly in accordance with the blasting parameters fixed and the patterns as per the recommendations contained in the scientific study report on control blasting

of Baroud Opencast Mine issued by M/s CMPDI, Bilashpur, vide Job No.504566 dated August-2016.

- 3.1 No blasting shall be conducted within 200m from any village or bustees, hutments/dwellings, not belonging to the Owner and within 100m of any public road and HT line. The restricted zone from the nearest hutments/dwellings, public road, HT line & state highway shall be clearly demarcated on the ground by actual survey.
- 3.2 In case of any difficulties, close co-ordination with the experts of the concerned Scientific Agency shall be maintained to decide safe blasting.
- 3.3 The peak particle velocity (PPV) of blast-induced ground vibrations shall be measured with every blast and PPV Peak particle velocity (PPV) at 100 m from the site of blast shall not exceed the limit prescribed in the table below:

Peak Particle Velocity (PPV)	Dominant exciting frequency in Hz		
	<8 Hz	8 – 25 Hz	> 25 Hz
Threshold PPV (mm/second)	5	10	15

For the purpose, required instrument/seismograph/vibrograph, triggered by geo-phone and capable of giving digital output, shall solely be made & kept available at the mine.

- 3.4 Blast hole initiation pattern shall use one delay period of 17 millisecond between the hole and 42 millisecond between the rows.
- 3.5 Only Non-electric initiation system shall be used to fire the shots. Initiation of blasting round shall be done in such a manner that the detonation front of waves generated during blasting moves away from the structures/buildings.
- 4.0 The management shall indemnify the occupants/owners of the houses/dwellings/buildings or other structures and the public authority concerned, if any, against danger to their property or injury to them or others present arising out of operation conducted under the permission.
- 5.0 In case of any complaint of rattling of doors/windows during blasting is received and flying fragments due to blasting travelling for more than 10.0 m from the site of blasting, further blasting operations shall be suspended forthwith and intimation sent to the Directorate of Mines Safety, Raigarh Region. Blasting operations shall not be resumed without a fresh permission from this Directorate.
- 6.0 Please note that, this permission is subject to the following additional conditions:
- 6.1 In case of any actual or apprehended danger of any sort arising out of the blast is observed or noticed the blasting shall be stopped forthwith and this office shall be informed immediately.
- 6.2 This permission is being issued specifically under the regulations mentioned above & without prejudice to any other provisions of law which may be or may become applicable at any time.
- 6.3 In the event of any change in the circumstances connected with this permission/ exemption which is likely to endanger the life of persons employed in the mine or the mine, the mining operations for which this permission has been granted shall be stopped forthwith and intimation thereof shall be sent to this Directorate. The said mining operation shall not be resumed without express and fresh permission in writing from this Directorate.
- 6.4 If at any time any one of the conditions, subject to which this permission/exemption has been granted, is violated or not complied with, this permission/exemption shall be deemed to have been revoked with immediate effect.
- 6.5 Except where otherwise provided for in this conditional permission, all provisions of the Coal Mines Regulations, 2017 shall be complied with. This conditional permission is subject to amendment or withdrawal at any time if considered necessary in the interest of safety and or conservation of coal.

6.6 This permission shall remain valid for a period of 5(Five) years from the date of issue of this letter.

ANNEXURE -I

Enclosure to permission under Regulation 196(3) of the Coal Mines Regulations, 2017 to conduct blasting in opencast workings, where any permanent building or structure of permanent nature not belonging to owner lies within the danger zone, at Baroud Opencast Mine of M/s SECL.

- 1.0 Conditions for conduct of deep hole blasting in the mine as specified in the Gazette Notification No. GSR No.985(E), dated 1st October, 2018 read with Regulation 194 of Coal Mines Regulations, 2017 shall be strictly complied with.
- 1.1 Conditions for transport of explosives in bulk for conducting deep hole blasting in the mine as specified in the Gazette Notification No. GSR No.982(E), dated 1st October, 2018 shall be strictly complied with.
- 1.2 In the event of the coal seam being on fire or hot strata being encountered, conditions for conducting blasting in fire areas in opencast coal mine as specified in the Gazette Notification No. GSR No.986(E), dated 1st October, 2018 shall be strictly complied with.
- 2.0 The entire operations of transport of the explosives to the site of its use, drilling, charging, stemming and blasting operations shall be placed under the direct personal supervision of an Assistant Manager holding 1st Class Manager's Certificate of Competency (Blasting Officer), who shall ensure that the said operations are carried out in accordance with the provisions of the Coal Mines Regulations, 2017, orders made there under and other guidelines and directives issued in this regard, by the Manager.
- 2.1 Notwithstanding anything contained in the Coal Mines Regulations, 2017, preparation of charges, charging and stemming of deep-holes shall be carried out under the personal supervision of an Overman (Blasting Overman), trained in controlled blasting techniques, who shall fire the shots himself.
- 2.2 Position of every deep hole to be drilled shall be distinctly marked by the Blasting Overman so as to be readily seen by the drillers. Spotting and alignment of drill holes shall be decided by the Blasting Overman and while doing so attention shall be given to the bench faces.
- 2.3 Only Competent persons i.e. explosive carrier trained in controlled blasting techniques and duly authorized by manager shall be permitted for charging & firing the shots.
- 2.4 A Code of Safe practices for controlled deep-hole blasting and unsafe practices prohibited shall be framed by the manager and implemented under the direct personal supervision of the "Blasting officer" (Assistant Manager in-charge of Blasting).
- 2.5 Only such minimum number of person shall be allowed to remain at the charging site as are required during charging operations and firing of shot holes.
- 3.0 To control flying fragments resulting out of blasting from projecting beyond a distance of 10 meters from the place of firing, following precautions shall be taken:
- a. No shot hole shall be fired in crushed, broken or fractured ground/strata.
 - b. Blasting shall be done against a free face only. Blasted material shall be cleared off before commencement of drilling operations for succeeding round. The free face shall be free of from loose stones, pebbles and shall be made vertical or near vertical.
 - c. Top stemming column shall not be less than the burden.
 - d. Only such stemming material that are free from pebbles and stone chips shall be used. Moist sand shall be used for stemming of deep-holes.
 - e. The area falling within a distance of 100 cm from the collar of each blast hole shall be cleaned of loose stones, drill cuttings, debris and other loose material.

- f. Variation in inclination of holes shall be kept within 5 degrees to avoid variation in crest and toe burden.
- g. Effective muffling of shot-holes, with proper muffling screens (with old conveyor belt/wire-mesh of 25.0 mm in a grid of 1.2 x 1.8 m in size) overlain with sufficient numbers (3 to 4) of sand bags of 40 kgs weight each shall be done in such a manner to ensure flying fragments do not reach more than 10 m from the site of blast.

4.0 In case, with any of the deep-hole rounds fired, the peak particle velocity of ground vibrations resulting out of blasting is observed to be more than 10 mm/second at structures/buildings not belonging to the mine or the flying fragments project to a distance beyond 10 m from the place of firing, blasting operations shall be discontinued and this Directorate shall be informed immediately. The blasting operations connected with this permission shall not be resumed unless express permission in writing is accorded by this Directorate afresh.

5.0 When the workings approaches within 500 m from the public road, no blasting in opencast working shall be done, till such time the ACM in charge of blasting operation has ensured that, no person/vehicle passes on the said roads during the time of blasting. For the purpose, barricades/drop gates on either end of the roads within 500m radius from the blasting site shall be provided & maintained and during blasting guard shall be posted on the barrier and person/vehicle shall not be allowed to pass on the said roads during blasting and till the time all clear signal after blasting is obtained.

6.0 A proper record of drilling and blast parameters like spacing & burden of holes, hole depth, number of holes fired in the round, charge/hole, charge/delay, and charge/round, length of explosive column(s) & stemming column length(s), initiation pattern (with proper sketches), manner of muffling etc. and blast results like fragmentation, ground vibration observed (PPV, frequency & air over pressure), distance upto which flying fragments are projected etc shall also be kept maintained in a bound paged book of each round of deep-hole blasting. The records shall be duly signed by the Assistant Manager, in-charge of blasting, and countersigned by the Manager of the mine.

7.0 Drilling and charging of deep-holes shall not be carried out in the same area at the same time.

8.0 All charging, stemming and connecting-up shall be done while standing on solid, that is to say, on the side of holes away from the quarry face.

9.0 Blasting operations shall be done only during daylight hours and when the workings are generally clear of other work persons, i.e. the period between two consecutive shifts or at the beginning or end of a working shift. The time of blasting shall be circulated to all concerned and to habitants of structures and dwellings, not belonging to M/s SECL. The timings shall also be conspicuously posted on the notice board. All holes charged on any one day shall be fired on the same day.

10.0 Code of practice for safe blasting shall be framed by the Manager, which shall be followed by all concerned.

11.0 Two-way communication by wireless or walkie-talkie sets shall be provided to the Assistant Manager in-charge of blasting, shot-firers, and to the assistants of the shot-firer. The sets shall remain switched off during handling and charging of explosives.

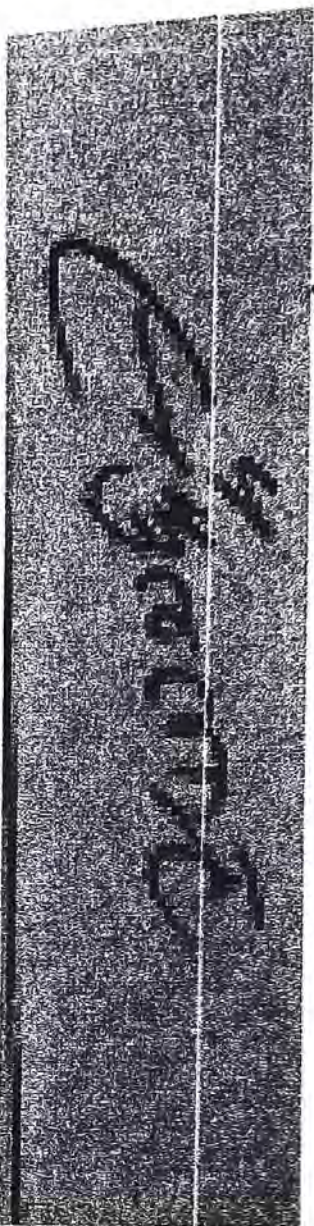
12.0 During the approach and progress of electric storm no explosives shall be handled. If charging operation has already begun the work shall be discontinued and all exposed wires shall be coiled up and placed in the mouth of the holes and covered by something other than a metal plate. Charging operation shall be resumed only after the storm has completely been passed. If the firing circuit has been set up before the thunderstorm came on, the persons at the site shall be withdrawn at the earliest and the blast shall be fired off immediately after giving efficient warning and ensuring that all persons within the danger zone have taken proper shelter.

13.0 After firing of the shots no person shall enter or be allowed to enter the place until it has been inspected by an Assistant Manager or Overman and declared safe.

14.0 A scheme for prevention of pilferage of explosives through unauthorized persons or authorized persons shall be made and implemented in the mine.

15.0 Blasting operations shall be so regulated that broken coal/carbonaceous matter is removed and transported out of the opencast workings/quarry expeditiously.

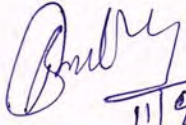
Your Sincerely,

A rectangular area containing a handwritten signature in dark ink. The signature is written in a cursive style and appears to read 'SAIFULLAH ANSARI'. The background of this area is a dark, textured grey.

SAIFULLAH . ANSARI (DIRECTOR - RAIGARH REGION)

THIS IS A SYSTEM GENERATED DOCUMENT, DOES NOT REQUIRE ANY SIGNATURE.

BAROUD OCM (3 MTY)				
DT. 11/08/2023				
Fig. in Ha.				
	Tenancy Land	Govt. Land	Forest Land	Total
Acquired	588.15	143.82	379.43	1111.40
Possessed	531.14	139.87	142.90	813.90


 11/08/23
 प्रमारी अधिकारी (सू-उपमार्ग)
 एस.डी.सी.प्रम.उपमार्ग क्षेत्र



भारत सरकार
GOVERNMENT OF INDIA
पर्यावरण एवं वन मंत्रालय
MINISTRY OF ENVIRONMENT & FORESTS

क्षेत्रीय कार्यालय, पश्चिमी क्षेत्र
Regional Office, Western Region,
केन्द्रीय पर्यावरण भवन
Kendriya Parayavarana Bhavan,
लिंक रोड नं 3/Link Road No. 3,
E-5, अरा कालोनी/Arera Colony,
भोपाल (म.प्र.) Bhopal-462016 (M.P.)
दूरभाष /Phone 2466525, 2465496, 2465054
Fax: 0755-2463102
Telegram: CENTFOREST
अणुडाक /E-mail: rccfwr@sancharnet.in

14-02-4-2004

कमांक: 8सी/21/2003-एफसीडब्ल्यू/577

प्रति,

प्रधान सचिव,
छत्तीसगढ़ शासन,
वन विभाग,
डी०के० भवन, रायपुर ।

27/4
सचिव, वन

304
28-11-2004

विषय: रायगढ़ जिले में रायगढ़ वनमंडल अंतर्गत ग्राम बरौद तहसील घरघोड़ा स्थित राजस्व वन के खसरा कमांक 756/1 की 19.001 हे० राजस्व वनभूमि खुली खदान हेतु साउथ ईस्टर्न कोलफील्ड लिमि० के पक्ष में प्रत्यावर्तन का प्रस्ताव ।

- संदर्भ: 1. इस कार्यालय का पत्रांक 8सी/21/2003-एफसीडब्ल्यू/498 दिनांक 12.03.2004
2. मु०व०स०(भू-सर्वे), छत्तीसगढ़ का पत्रांक भू-सर्वे/11/खनिज/726 दिनांक 29-03-2004

महोदय,

कृपया छत्तीसगढ़ सरकार के उक्त विषयक पत्रांक 20/व.सं./2003 दिनांक 03.04.1993 का संदर्भ ग्रहण करें जिसके द्वारा वन (संरक्षण) अधिनियम, 1980 की धारा-2 के अन्तर्गत केन्द्र सरकार के अनुमोदन का अनुरोध किया गया था ।

उक्त वनभूमि के उल्लिखित उद्देश्य हेतु प्रत्यावर्तन के लिए इस कार्यालय के उपरोक्त संदर्भित पत्र (1) द्वारा, उसमें लगायी गयी शर्तों के अधीन, सिद्धान्ततः सहमति दी गयी थी । उपरोक्त संदर्भित पत्र (2) द्वारा कोडल अधिकारी, छत्तीसगढ़ शासन ने उक्त शर्तों की पूर्ति का अनुपालन प्रतिवेदन प्रस्तुत किया है । अतः अधोस्ताक्षरी द्वारा केन्द्र सरकार की ओर से रायगढ़ जिले में रायगढ़ वनमंडल अंतर्गत ग्राम बरौद तहसील घरघोड़ा स्थित राजस्व वन के खसरा कमांक 756/1 की 19.001 हे० राजस्व वनभूमि खुली खदान हेतु साउथ ईस्टर्न कोलफील्ड लिमि० को वनेतर उपयोग के लिये दिये जाने का वन (संरक्षण) अधिनियम, 1980 की धारा-2 के अन्तर्गत निम्नलिखित शर्तों पर औपचारिक अनुमोदन किया जाता है :-

1. वनभूमि का वैधानिक स्वरूप अपरिवर्तित रहेगा ।
2. वन विभाग द्वारा उपयोगकर्ता के खर्चे पर 38.002 हे० अवकमित वन भूमि (कक्ष क० 1113 पी., ग्राम-सोनबरसा, तहसील खरसिया, जनपद रायगढ़) पर क्षतिपूरक वृक्षारोपण किया जायेगा ।

.....2....

29 APR 2004
DSM

56 2/5

3. उपयोगकर्ता के व्यव पर खनन पट्टा क्षेत्र का 4 फुट उंचे आर0सी0सी0 सीमा स्तंभों जिन पर विनय कम संख्या तथा स्तंभ से स्तंभ की दूरी लिखी होगी से, सीमांकन किया जाएगा ।
4. वन (संरक्षण) अधिनियम, 1980 के अंतर्गत इस अनुमोदन की अवधि खनन पट्टे की नई लीज की तक रहेगी ।
5. Reclamation Plan के अनुसार उत्खनित क्षेत्र का Reclamation उपयोगकर्ता के व्यव पर वनवि के निर्देशन में किया जाएगा ।
6. प्रत्यावर्तित वनभूमि के अतिरिक्त किसी वनभूमि पर ओवरवर्डन की डमिंग नहीं की जायेगी ।
7. इस खनन पट्टे का अन्तरण खनन हेतु किसी अन्य अभिकरण को करने के पूर्व केन्द्र सरकार की अनुमति आवश्यक होगी ।
8. वनभूमि का उपयोग प्रत्येक कार्य के अतिरिक्त अन्य किसी कार्य के लिए नहीं किया जायेगा ।
9. राज्य सरकार द्वारा लगाई गई अन्य कोई भी शर्त ।

भवदीय
डी.वी.नेगी
(डी0 वी0 नेगी)

प्रतिलिपि:

मुख्य वन संरक्षक (केन्द्रीय)

1. निदेशक(एफ0सी0) पर्यावरण एवं वन मंत्रालय, पर्यावरण भवन, सी0जी0ओ0 काम्पलेक्स, लांवी रोड, दिल्ली ।
2. मुख्य वन संरक्षक(भू-प्रबंध) एवं नॉडल अधि0, छत्तीसगढ़ शासन, वन विभाग, जेल रोड, रायपुर।
3. वनमण्डलाधिकारी, (सामान्य), रायगढ़ वनमण्डल, रायगढ़ (छत्तीसगढ़) ।
4. महाप्रबंधक, एस0ई0सी0एल0, वरौंद, जिला रायगढ़ (छत्तीसगढ़) ।
5. आदेश पत्रावली

s:\order\mining\9

(डी0 वी0 नेगी)
मुख्य वन संरक्षक (केन्द्रीय)

25/5/24
29/5

महाराष्ट्र
तारकान बस्ती
पर प्रस्तुत करावे ।

25/5/24
01/05

21/5/24

पं.
अ. लापड
1/5/24

11018/170 GILS, No. 10/1102, SECL, Raigarh.

F. No. 8-152/2005-FC

Government of India

Ministry of Environment and Forests

(FC Section)

-s/759

u/10/03

Paryavaran Bhawan
CGO Complex, Lodhi Road
New Delhi-110003

Dated : 13th December 2006

स्वा. प्र. वि. सं. 10/1102

2704

12-10-06

The Secretary (Forests),
Government of Chhattisgarh,
Raipur.

Sub: Diversion of 123.899 ha of forest land for Baroud Expansion Open Cast Project of South Eastern Coalfields Limited (SECL) in Baroud, Raigarh, Chhattisgarh.

Sir,

I am directed to refer to your letter No. F-5-33/05/10-2 dated 17.10.2005 whereunder the above mentioned proposal was submitted seeking prior approval of the Central Government in accordance with Section-2 of the Forest (Conservation) Act, 1980, and to say that the above proposal was examined by the Forest Advisory Committee (FAC) constituted under Section-3 of the Act.

2. After careful consideration of the proposal of the State Government and on the basis of the recommendation of the above mentioned Advisory Committee, the Central Government granted in-principle approval vide letter of even no. dated 23.08.2006, subject to certain conditions. The compliance of these conditions was submitted vide letter of Chief Conservator of Forests (Land Management) Chhattisgarh No. Land Management/Khamij/3221 dated 13.11.2006. After consideration of the proposal and compliance of various conditions by the State Government, the Central Government hereby conveys its approval under Section-2 of the Forest (Conservation) Act, 1980 for diversion of 123.899 ha of forest land for Baroud Expansion Open Cast Project of South Eastern Coalfields Limited (SECL) in Baroud, Raigarh, Chhattisgarh, subject to the fulfilment of following conditions :-

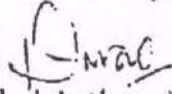
- (i) Legal status of the forest land shall remain unchanged.
- (ii) Compensatory Afforestation shall be raised over degraded forest land/orange areas double in extent to the forest land being diverted and shall be maintained at the project cost.
- (iii) The orange areas identified for Compensatory Afforestation shall be declared as Reserved Forests/Protected Forests under Indian Forest Act, 1927.
- (iv) The mining lease period under the Forest (Conservation) Act, 1980 shall be co-terminus with the current lease granted under MMRD Act, 1957 or any other Act or for 20 years, whichever is earlier.
- (v) The State Government shall immediately deposit NPV and all other funds with the Ad-hoc Body of Compensatory Afforestation Fund Management and Planning Authority (CAMPA) in Account No. CA 1591 of Corporation Bank (A

Copy to
SAM (Baroud)
SR (Baroud)
M " S. Agal
thru

Government of India Enterprises), Block-11, Ground Floor, C.G.O. Complex, Phase-1, Lodhi Road, New Delhi-110003, as per the instructions communicated vide letter No. 5-2/2006-FC dated 20.05.2006.

- (vi) RCC pillars of 4 feet height shall be erected to demarcate the area by the user agency at the project cost and will be marked with forward and back bearings.
- (vii) The user agency shall raise, fence and maintain a safety zone around the mining area and will also raise and maintain the plantation over an area one and half times in extent of the safety zone at the project cost.
- (viii) The reclamation plan shall be implemented as per the plan submitted by the user agency. Progress of reclamation shall be monitored regularly by the State Forest Department and the Regional Office, Bhopal.
- (ix) The top soil shall be protected at the project cost.
- (x) Trees shall be felled only when it becomes necessary and that too under strict supervision of State Forest Department, and at the cost of the project.
- (xi) No labour camps shall be established on the forest land.
- (xii) All necessary measures should be taken by the user agency to protect the environment.
- (xiii) Sufficient firewood shall be provided by the user agency to the labourers at the project cost after purchase from the State Forest Department/Forest Development Corporation.
- (xiv) The user agency shall ensure that there should be no damage to the available wildlife.
- (xv) The forest land shall not be used for any purpose other than that specified in the proposal.
- (xvi) The forest land thus diverted shall be non-transferable. Whenever the forest land is not required, it shall be surrendered to the State Forest Department under intimation to this Ministry.

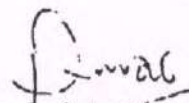
Yours faithfully,


(Pankaj Asthana)

Assistant Inspector General of Forests

Copy to :-

1. The Principal Chief Conservator of Forests, Government of Chhattisgarh, Raipur.
2. The Nodal Officer, Forest Department, Government of Chhattisgarh, Raipur.
3. The Chief Conservator of Forests, Regional Office, Bhopal.
4. User Agency.
5. Guard File
6. Monitoring Cell of FC Section.


(Pankaj Asthana)

Assistant Inspector General of Forests

Government of India
Ministry of Environment, Forest and Climate Change
(Forest Conservation Division)

Indira Paryavaran Bhawan
Aliganj, Jorbagh Road
New Delhi – 1100 03
Dated: 12 May, 2023

To
The Principal Secretary (Forests),
Department of Forest, Environment and Climate Change,
Government of Chhattisgarh.
Raipur.

Sub: Proposal seeking prior approval of the Central Government under Section -2 (ii) of the Forest (Conservation) Act, 1980 for non-forestry use of 238.373 ha of forest land in favour of M/s South Eastern Coalfields Limited for Baroud Expansion Open Cast Coal Mining project (3 MT) in Raigarh District of Chhattisgarh. -regarding (online Proposal No. FP/CG/MIN/30359/2012).

Sir/Madam,

I am directed to refer to the Government of Chhattisgarh's letter No. no. 5-33/2005/10-2 dated 3.12.2019 on the above mentioned subject, seeking prior approval of Central Government under Section-2 (ii) of the Forest (Conservation) Act, 1980, and to say that the said proposal has been examined by the Advisory Committee constituted by the Central Government under Section-3 of the aforesaid Act.

2. After careful consideration of the proposal of the Government of Chhattisgarh and on the basis of the recommendations of the Advisory Committee, the Central Government hereby agrees to accord **stage-I / In-principle** approval under the Forest (Conservation) Act, 1980 for seeking prior approval of the Central Government under Section -2 (ii) of the Forest (Conservation) Act, 1980 for non-forestry use of 238.373 ha of forest land in favour of M/s South Eastern Coalfields Limited for Baroud Expansion Open Cast Coal Mining project (3 MT) in Raigarh District of Chhattisgarh, subject to the following conditions:-

- i. Legal status of the diverted forest land shall remain unchanged;
- ii. Compensatory afforestation over degraded forest land, double in extent to the forest land being diverted, shall be raised by the State Forest Department at the project cost within three years from the date of grant of Stage - II approval. As far as possible, a mixture of local indigenous species shall be planted and monoculture of any species may be avoided. With provision for ten years on subsequent maintenance;
- iii. The cost of compensatory afforestation at the prevailing wage rates as per compensatory afforestation scheme and the cost of survey, demarcation and erection of permanent pillars, if required on the CA land, shall be deposited in advance with the Forest Department by the user agency. The CA will be maintained for 10 years. The scheme may include afforestation of indigenous species with appropriate provision for anticipated cost increase for works scheduled for subsequent years, into the account of National Authority, CAMPA

managed by the State Govt.;

iv. The land identified for the purpose of CA shall be clearly depicted on a Survey of India topo sheet of 1:50,000 scale;

v. The KML files of diverted area and the CA areas shall be uploaded on the e-Green watch portal with all requisite details prior to Stage II approval;

vi. The User Agency shall transfer the funds towards the cost of Net Present Value (NPV) of the forest land being diverted under this proposal in accordance with the MoEF&CC's guidelines dated 6.01.2022 read with guidelines dated 19.01.2022 into the account of National Authority, CAMPA managed by the State Govt.;

vii. All the conditions as proposed by the CWLW, Govt. of Chhattisgarh vide letter dt. 24.03.2023 shall be applicable at the cost of user agency as below and the admissible funds will be transferred into the National Authority CAMPA;

a. An elephant proof wall in the entire boundary of the mine area shall be constructed and 2 to 4 gates may be kept for traffic movement.

b. The user agency shall provide the funds for the proposed Hathi Mitra Dal and a Gajraj vehicle.

c. 300 mtr river safety buffer zone will be kept for protection of river Kurkut.

d. The arrangements shall be made by the user agency for not mixing the polluted water from the mining area into the flow of River Kurkut.

e. Minimum of 200 mtr safety buffer zone to be kept w.r.t. standing mountain on the northern boundary of the proposed mining area.

f. No new road will be constructed and the transportation of the coal in the area should be done using the existing road only.

g. Any further extension of the mining operation in the area shall be taken after a detailed study of the impact of currently approved mines on the habitat area and the efficacy of mitigation measures provided in the revised wildlife management plan.

h. A detailed revised comprehensive wildlife conservation plan shall prepared and implemented accordingly at the cost of the user agency.

viii. The compensatory levies to be realized from the User Agency under the project shall be transferred/ deposited, through e-challan, in to the account of National Authority, CAMPA pertaining to the State concerned through e-portal (<https://parivesh.nic.in/>);

ix. The User Agency shall prepare a list of existing village tanks and other water bodies with GPS co-ordinates located within five km from the mine lease boundary. This list is to be duly verified by the concerned Divisional Forest Officer. The User Agency shall regularly undertake desilting of these village tanks and other water bodies so as to mitigate the impact of siltation of such tanks/water bodies. A detailed approved plan for desilting of identified ponds and water bodies to be prepared in consultation with forest department and shall be submitted to MoEF&CC before Stage-II approval;

x. State Government shall complete settlement of rights, in term of the Scheduled Tribes and Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, if any, on the forest land to be diverted and submit the documentary evidence, along

with compliance of Stage-I approval, as prescribed by this Ministry's letter No. 11-9/1998-FC (Pt.) dated 03.08.2009 read with 05.07.2013, in support thereof;

xi. The User Agency shall comply with the Hon'ble Supreme Court order on re-grassing, and re-grass the mining area and any other areas which may have been disturbed due to mining to restore them to a condition which is fit for growth of fodder, flora, fauna, etc. in a timely manner;

xii. The complete compliance report shall be uploaded on e-portal (<https://parivesh.nic.in/>);

xiii. Additional amount of the NPV of the diverted forest land, if any, becoming due after finalization of the same by the Hon'ble Supreme Court of India on receipt of the report from the Expert Committee, shall be charged by the State Government from the User Agency. The User Agency shall furnish an undertaking to this effect;

xiv. User agency shall restrict the felling of trees to minimum number in the diverted forest land and the trees shall be felled under the strict supervision of the State Forest Department and the cost of felling of trees shall be deposited by the User Agency with the State Forest Department;

xv. The user agency shall provide suitable under/over pass in Protected Area / Forest Area as per recommendations of CWLW / NBWL / AC / REC;

xvi. Following activities, as per approved plan / schemes, shall be undertaken in the lease area by the User Agency under the supervision of the State Forest Department. Approved scheme/plan shall be submitted to the Ministry along with compliance of Stage-I approval:

(a) Mitigative measures to minimize soil erosion and choking of stream, to be implemented within a period of three year of issue of Stage-II approval;

(b) Planting of adequate drought hardy plant species and sowing of seeds, in the appropriate area within the mining lease to arrest soil erosion in accordance with the approved scheme;

(c) Construction of check dams, retention / toe walls to arrest sliding down of the excavated material along the contour in accordance with the approved scheme;

(d) Stabilize the overburden dumps by appropriate grading/benching, in accordance with the approved scheme, so as to ensure that angles of repose at any given place is less than 28° ; and

(e) No damage shall be caused to the top-soil and the user agency will follow the top soil management plan;

xvii. Safety Zone Management: Following activities, at project cost, shall be undertaken by the user agency for the management of safety zone as per relevant guidelines issued by the Ministry's guidelines:

(a) User agency shall ensure demarcation of safety zone (7.5-meter strip all along the inner boundary of the mining lease area), and its fencing, protection and regeneration by erecting adequate number of 6 feet high RCC boundary pillars inscribed with DGPS coordinates with barbed wire

fencing within three years and maintained thereafter as per the approved working plan of the State Govt.;

(b) Boundary of the safety zone of the mining lease, adjacent to habitation/roads, should be properly fenced by the user agency;

(c) Safety zone shall be maintained as green belt around mining lease and to ensure dense canopy in the area, regeneration shall be taken up in this area by the user agency at project cost under the supervision of the State Forest Department;

(d) Afforestation on degraded forest land to be selected elsewhere, measuring one and a half times the area under safety zone, shall also be done at the project cost under the supervisions of the State Forest Department. The degraded forest land (DFL) so selected will be informed to the MoEF&CC with shape files before Stage-II approval and afforestation will be done within three years from the date of Stage-II clearance and maintained thereafter in accordance with the approved Plan in consultation with the State Forest Department; and

(e) The State Government and the user agency shall ensure that safety zone is maintained as per the prescribed norms;

xviii. The user agency shall comply with all the provisions recommended in the hydro-logical study prepared by CMPDIL.

xix. The user agency shall implement the R&R Plan as per the R&R Policy of State Government in consonance with National R&R Policy, Government of India before the commencement of the project work. The said R&R Plan will be monitored by the State Government/Regional Office of MoEF &CC along with indicators for monitoring and expected observable milestones

xx. Period of diversion of the said forest land under this approval shall be for a period co-terminus with the period of the mining lease granted under the Mines and Minerals (Development and Regulation) Act, 1957, as amended and the Rules framed there-under;

xxi. The User Agency shall obtain the Environment Clearance as per the provisions of the Environmental (Protection) Act, 1986, if required;

xxii. No labour camp shall be established on the forest land and the User Agency shall provide fuels preferably alternate fuels to the labourers and the staff working at the site so as to avoid any damage and pressure on the nearby forest areas;

xxiii. The boundary of the diverted forest land, mining lease and safety zone, as applicable, shall be demarcated on ground at the project cost, by erecting four feet high reinforced cement concrete pillars, each inscribed with its serial number, distance from pillar to pillar and GPS co-ordinates;

xxiv. No additional or new path will be constructed inside the forest area for transportation of construction materials for execution of the project work;

xxv. The forest area shall be used for the purpose of which it is granted. The total forest land utilized for the project shall not exceed 238.373 ha. for mining;

xxvi. The forest land proposed to be diverted shall under no circumstances be transferred to any other agency, department or person without prior approval of the Central Government;

xxvii. No damage to the flora and fauna of the adjoining area shall be caused;

xxviii. The layout plan of the mining plan/ proposal shall not be changed without the prior approval of the Central Government;

xxix. The concerned Divisional Forest Officer, will monitor and take necessary mitigative measures to ensure that there is no adverse impact on the forests in the surrounding area;

xxx. Trees should be felled in phased manner as per the requirement in the approved Plan with prior permission of concerned DFO;

xxxi. The user agency shall explore the possibility of translocation of maximum number of trees identified to be felled and shall ensure that any tree felling shall be done only when it is unavoidable and that too under strict supervision of the State Forest Department;

xxxii. Any other condition that the Ministry of Environment, Forest and Climate Change may stipulate from time to time in the interest of conservation, protection and development of forests & wildlife shall be carried with by the State Government and user agency;

xxxiii. The User Agency shall submit the annual self -compliance report in respect of the above stated conditions to the State Government, concerned Regional Office and to this Ministry by the end of March every year regularly;

xxxiv. The user agency shall comply all the provisions of the all Acts, Rules, Regulations, Guidelines, Hon'ble Court Order (s) and NGT Order (s) pertaining to this project, if any, for the time being in force, as applicable to the project; and

xxxv. Violation of any of these conditions will amount to violation of Forest (Conservation) Act, 1980 and action would be taken as prescribed in para 1.21 of Chapter 1 of the Handbook of comprehensive guidelines of Forest (Conservation) Act, 1980 as issued by this Ministry's letter No. 5-2/2017-FC dated 28.03.2019.

After receipt of compliance report on fulfillment of the conditions mentioned above, the proposal shall be considered for final approval under Section-2 of the Forest (Conservation) Act, 1980. Transfer of forest land shall not be affected till final approval is granted by the Central Government in this regard.

Yours faithfully,

(Dr. Dheeraj Mittal)

Assistant Inspector General of Forests

Copy to: -

1. The Principal Chief Conservator of Forests (HoFF), Government of Chhattishgarh, Raipur.
2. The Nodal Office (FCA) Forest Department, Government of Chhattishgarh,

I/42902/2023

Raipur.

3. The Regional Officer, Integrated Regional Office, Raipur of MoEF&CC.
4. User Agency.
5. Monitoring Cell, FC Division, MoEF & CC, New Delhi, for uploading.

आदेश द्वारा सुधीर कुमार अग्रवाल, भा.व.सं. प्रधान मुख्य वन संरक्षक,
(वन्यप्राणी एवं जैव विविधता संरक्षण) सह मुख्य वन्यप्राणी
अभिरक्षक, छत्तीसगढ़

सेक्टर-19, नार्थ ब्लॉक, अरण्य भवन, प्रथम तल, अटल नगर, नवा रायपुर

cwlweg@gmail.com

(☎0771-2512880, ☎ 0771-2512881)

आदेश क्रमांक/व.प्रा./प्रबंध-498/194 //आदेश//
नवा रायपुर, दिनांक - 12.07.2023

मुख्य वन संरक्षक, विलासपुर वृत्त, विलासपुर का पत्र क्रमांक/तक./1734 दिनांक 23.06.2023 द्वारा मेसर्स साउथ ईस्टर्न कोल फील्ड लिमिटेड को रायगढ़ वनमंडल अंतर्गत बरीद खुली खदान हेतु 238.373 हे. वन भूमि व्यपवर्तन के संबंध में भारत सरकार, पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय, नई दिल्ली के पत्र दिनांक 12.05.2023 में प्रस्ताव के प्रथम चरण स्वीकृति में अधिरोपित शर्तों के पालनार्थ वन्यप्राणी संरक्षण योजना तैयार कर इस कार्यालय को प्रस्तुत किया गया है।

“पूर्व में कार्यालयीन आदेश क्रमांक/व.प्रा./प्रबंध-498/147 दिनांक 15.09.2022 द्वारा मेसर्स साउथ ईस्टर्न कोल फील्ड लिमिटेड को जारी आदेश को निरस्त किया जाता है एवं वर्तमान में मुख्य वन संरक्षक, विलासपुर वृत्त, विलासपुर का पत्र क्रमांक/तक./1734 दिनांक 23.06.2023 द्वारा अनुशंसित संशोधित वन्यप्राणी संरक्षण योजना का अनुमोदन किया जाता है।”

प्रस्तुत वन्यप्राणी संरक्षण योजना का परीक्षण किया गया। आवेदक संस्थान द्वारा प्रस्तुत वन्यप्राणी संरक्षण योजना का क्रियान्वयन हेतु प्रावधानित राशि कुल 10 वर्षों में उपयोग करते हुये वर्षवार आबंटन किया गया है। अनुमोदित योजना में भारत सरकार द्वारा जारी निर्देशों के पालन में हाथी रोधक दीवार एवं हाथी के अन्य सुरक्षा उपायों को सम्मिलित करते हुये जल स्रोत निर्माण, रहवास विकास इत्यादि संबंधित राशि का विवरण परिशिष्ट-1 में दर्शित है।

उक्त वन्यप्राणी संरक्षण योजना की लागत राशि 28.82 करोड़ वर्तमान दरों पर है। परियोजना में देरी होने से समय लागत बढ़ेगी, जिसमें प्राईस इन्डेक्स के हिसाब से वृद्धि होगी। परियोजना के क्रियान्वयन के समय जो भी लागत आयेगी वह प्रस्तावकों को वन विभाग में एकमुश्त जमा करानी होगी, जिससे मूल्य वृद्धि के प्रभाव को समाप्त किया जा सके। वन विभाग इस प्रकार जमा की गई राशि से वन्यप्राणी संरक्षण योजना में दर्शाये समय सारणी के अनुसार क्रियान्वित करेगा।

अनुमोदित वन्यप्राणी संरक्षण योजना में दर्शाये गये उपरोक्त घटकों के संगत फील्ड में किये जाने वाले कार्यों का कार्यवार/स्थलवार प्रोजेक्ट संबंधित वनमण्डलाधिकारी के द्वारा तत्समय प्रचलित मार्गदर्शी सिद्धांतों (व्यय नार्मस, कार्य की प्रकृति, वन्यप्राणी प्रबंधन के संबंध में लागू होने वाले अन्य तकनीकी तथ्यों व निर्देशों) के अनुरूप तैयार कर सक्षमतानुसार तकनीकी स्वीकृति/अनुमोदन हेतु



//2//

अनुशंसा सहित संबंधित मुख्य वन संरक्षक को प्रेषित किया जावेगा। संबंधित मुख्य वन संरक्षक द्वारा प्रोजेक्ट की तकनीकी स्वीकृति/अनुमोदन की अनुशंसा के साथ मुख्य वन्यप्राणी अभिरक्षक छत्तीसगढ़ को प्रेषित किया जावेगा। प्रोजेक्ट का परीक्षण वन्यप्राणी संरक्षण योजना की उपयुक्तता की दृष्टि से किया जाकर मुख्य वन्यप्राणी अभिरक्षक के द्वारा कार्य हेतु प्रशासकीय स्वीकृति जारी किये जाने के साथ प्रोजेक्ट, प्रशासकीय स्वीकृति/बजट आबंटन करने हेतु सक्षम अधिकारी को प्रेषित किया जावेगा। प्रशासकीय स्वीकृति आदेश जारी किये जाने के पश्चात् ही कार्यों का क्रियान्वयन वनमंडलाधिकारी द्वारा किया जावेगा।

वन्यप्राणी संरक्षण योजना के कार्यों की मॉनिटरिंग का कार्य संबंधित मुख्य वन संरक्षक व मुख्य वन्यप्राणी अभिरक्षक छ.ग. द्वारा किया जावेगा। किये जा रहे कार्यों की भौतिक व आर्थिक प्रगति से मुख्य वन्यप्राणी अभिरक्षक को प्रतिमाह वनमंडलाधिकारी द्वारा अवगत कराया जावेगा।

प्रधान मुख्य वन संरक्षक (व.प्रा.) सह मुख्य वन्यप्राणी
अभिरक्षक, छत्तीसगढ़, नवा रायपुर

पृ.क्रमांक/व.प्रा./प्रबंध-498/3211

नवा रायपुर, दिनांक - 12.07.2023

प्रतिलिपि सूचनार्थ एवं आवश्यक कार्यवाही हेतु प्रेषित :-

1. अपर प्रधान मुख्य वन संरक्षक (नू-प्रबंध) नवा रायपुर। कृपया वन्यप्राणी संरक्षण योजना में प्रावधानित राशि 26.82 करोड़ एकमुश्त जमा करने हेतु परियोजना प्रस्तावकों को आदेशित करें।
2. मुख्य वन संरक्षक, बिलासपुर वृत्त, बिलासपुर।
3. मुख्य वन संरक्षक वन्यजीवन और क्षेत्रीय निदेशक, अचानकमार टायगर रिजर्व, बिलासपुर।
4. वनमंडलाधिकारी, रायगढ़ वनमंडल, रायगढ़।
5. मुख्य महाप्रबंधक, एस.ई.सी.एल. रायगढ़ क्षेत्र।


प्रधान मुख्य वन संरक्षक (व.प्रा.) सह मुख्य वन्यप्राणी
अभिरक्षक, छत्तीसगढ़, नवा रायपुर

CHAPTER - 8

REVISED PROPOSED BUDGET FOR WILDLIFE CONSERVATION AND AFFECTED
AVIFAUNA ALTERNATIVE HABITAT MANAGEMENT PLAN OF OCP BAROUD


S. No.	Activities	Proposed Activity	Area/No. in ha.	Amount in Rs.	Duration in Years	Remark	Nodal/ Agency
1	Habitat Improvement	Mixed Plantation on Revenue Forest (Refer to chapter-8.2, S.No.- 03)	3 ha	485,000	10	Plantation in Bulekera village and fruit bearing tree species first year for plantation with Fencing and 5 year maintenance (Buffer zone comp.1312)	Forest Dept.
		Big tree plantation on School/ Aaganbadi and another govt. office (Refer to chapter 8.2, S.No. - 01, 02)	0.5 ha.	1,500,000	5	aganbadi, first year plantation and 5 year maintenance and management like tree guards/fencing, drainage etc.	Forest Dept.
		Plantation on Road side (Both side) (Refer to chapter-8.2, S.No.- 08)	4 ha.	5,668,148	5	Plantation on (roadside) of fruitbearing tree species with barbed wire fencing and 5 year maintenance.	Forest Dept.
		Rehabilitation exiting ecosystem improvement (Refer to chapter-8.2, S.No.-06, 07)	20 ha.	588,440	10	RDF Plantation activity has been proposed on suitable tree species at degraded forest land (Saraipali village) of buffer zones with 5 year maintenance & management.	Forest Dept.
		Development of grassland (Refer to chapter 8.2, S.No.-13,14)	5 ha.	3,927,000	5	Establishment of natural grassland on Faguram dam and Porda dam area of Buffer zone of OCP Baroud.	Forest Dept.
		Placement of artificial nest, Birdfeeder, water pots (Refer to chapter- 8.2, S.No.-04, 05)	1000 Nest boxes	500,000	5	Placement for up to 2 years monitoring and evaluation establish artificial nest box.	Forest Dept.
2	Biodiversity Improvement	Establishment of birds paradise (Pakshi vihar) including Fruit bearing tree species plantaion on dumping	L S	11,000,000	3	Creation of avifauna habitat (Pakshi Vihar) on dumping sites among the OCP Baroud. (Included 10% for monitoring & Evaluation By the SFRTI)	SECL/ Forest Dept.
3	Plantation on River and pond/dam side	Plantation on River side (Both side) (Refer to chapter- 8.2, S.No.09)	10 ha.	1,987,960	5	Plantation of fruit (Kurket River) bearing tree species with barbed wire fencing and 5 year maintenance.	Forest Dept.
		Plantation on faguram dam/Pond (Refer to chapter 8.2, S.No.10,11)	5 ha.	993,980	5	Plantation on faguram dam (surrounding area) with tree guard and and 9 year maintenance.	Forest Dept.
		Plantation on Porda dam Refer to chapter-8.2, S.No.12)	8 ha.	1,590,368	5	Plantation on porda village dam (surrounding area) with and 5 year maintenance.	Forest Dept.
4	Riverbank restoration work/Catchment area and channel treatment	Riverbank restoration	L S	1,000,000	5	Restoration activity proposed on Kurket river Approx. 3 km (Bothside)	Forest Dept.

5	Treatment for upgradation on degraded forest to normal forest through Soil & Moisture Conservation (SMC) activity	Soil moisture conservation (Refer to chapter-8.2, S.No.15)	10 ha	30,250	5	SMC plan activity proposed on Range Gharghoda comp. 1312 Bulakela village buffer zone of OCP Baroud and 2 year maintenance	Forest Dept.
6	Training & workshop/ Awareness camp	Organized of social awareness program, empowering and sensitizing villagers for conservation of Avifauna and wildlife.		600,000	3	Training program should be conducted for local community on nearby villages for awareness of avifauna and wildlife conservation	Forest Dept.
7	Monitoring and Evaluation	Monitoring and Evaluation	LS	1,500,000	3	Monitoring & annual assessment of all proposed activities, artificial nest, and plantation activity should be monitored and evaluated for next five years.	Forest Dept / Independent Agency
			Total (A)	31,371,146			


**Principal Chief Conservator of Forest (Wildlife) cum
Chief Wildlife Warden
Chhattisgarh, Nava Raipur**

**REVISED PROPOSED BUDGET FOR WILDLIFE CONSERVATION AND AFFECTED
AVIFAUNA ALTERNATIVE HABITAT MANAGEMENT PLAN OF OCP BAROUD**


		For 10 Years (Rs. in Lakh)										Total in Rs.				
		1	2	3	4	5	6	7	8	9	10					
8	Human Elephant Conflict Management	1.A. Wages/Honorarium of Hathi Tracking team (5 Person @ Rs. 9000 per month)	L.S	5.88	5.88	5.88	5.88	5.88	0	0	0	0	0	2,940,000	Human Elephant conflict management related all activities will be carried out in the selected range as well as compartment of concerned Forest Division/Awareness & education program should be program should be conducted for affected area in buffer zone in OCP Baroud	Forest Dept.
		1.B. Hiring of Vehicle	L.S	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1,400,000		
		1.C. Uniform, Shoes, Blanket, tracking Equipment, Night vision Camera & Binoculars	L.S	4.00	0	0	0	0	0	0	0	0	0	400,000		
		1.D. Protective Equipment, Flare gun	L.S	4.00	0	0	0	0	0	0	0	0	0	400,000		
		2. Early Warning System	L.S	5.00	0	0	0	0	0	0	0	0	0	500,000		
		3. Hathi Mitra Dal	L.S	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3,000,000		
		4. Hiring of Veterinaries Service	L.S	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	500,000		
		5. Rewards	L.S	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	200,000		
		6. Hiring of Legal Experts/Advocate	L.S	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	200,000		
		7. Purchase of public awareness material	L.S	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1,000,000		
		8. Establishment of Transit First Aid Centre	L.S	10.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,500,000		
		9. Awareness and education program	L.S	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1,500,000		
Total(B)												13,540,000				
Grand total (A+B)												44,911,146				


 Principal Chief Conservator of Forest (Wildlife) cum
 Chief Wildlife Warden
 Chhattisgarh, Nava Raipur

**REVISED PROPOSED BUDGET FOR WILDLIFE CONSERVATION AND AFFECTED
AVIFAUNA ALTERNATIVE HABITAT MANAGEMENT PLAN OF OCP BAROUD**

Sl. No.	Activities	Amount in Cr.												Total	Unit	Rate in Cr.	Total Amount in Cr.
		Years from clearing the area															
		1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th						
1	Construction of Elephant Proof Wall	20.56												20.56	Per Km.	1.23	20.56
2	Protective Equipment for Wildlife conflict																
2(i)	Purchase of Vehicle for Protection for Human elephant Conflict, Raigarh Forest Division, Dharamjaigarh Forest Division and adjacent Forest division (Isuzu D-Max).	0.22	0.22	0.22	0.22	0.22	0.22							1.32	Per nos	0.22	1.32
2(ii)	Establishment of Human Rescue Center in Pusalda Village.	0.2												0.20	LS	0.20	0.20
2(iii)	Computer Set for Monitoring and Evaluation and other equipment for wildlife protection (Anti scheneear stick, Gum boots, Night Vision Camera).	0.05	0.05	0.05	0.05									0.20	LS	0.05	0.20
2(iv)	Drone Camera for Elephant Movement Tracking	0.025	0.025											0.050	LS	0.03	0.05
	TOTAL(D)																22.33

Grand Total - (A+B) 4.49 + (D) 22.33 = 26.82 Crore


 12/7/23
 Principal Chief Conservator of Forest (Wildlife) cum
 Chief Wildlife Warden
 Chhattisgarh, Nava Raipur

*WILDLIFE CONSERVATION PLAN INCLUDING ALTERNATIVE HABITAT
DEVELOPMENT PLAN FOR AVIFAUNA WITHIN THE OCP BAROUD SECL
AREA RAIGARH, CHHATTISGARH*



PUBLISHED BY



*STATE FOREST RESEARCH AND TRAINING INSTITUTE (SFRTI)
RAIPUR, CHHATTISGARH*

*Published by: State Forest Research and Training Institute Raipur,
Chhattisgarh
Published in July 2019*

Front Cover:

Baya Weaver and Green Bee Eater in core mining area of OCP Baroud, C.G.

Back Cover:

Woodpecker, OCP Baroud, C.G

All rights reserved regarding publication of the Project report of Alternative Habitat Development Plan for affected Avifauna of OCP Baroud, Raigarh, and Chhattisgarh. No parts of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording or by any information storage and retrieval system, without prior permission in writing from Director, State Forest Research and Training Institute, Raipur. Enquiries concerning reproduction outside the scope of above should be sent to:

Director

State Forest Research and Training Institute

Near Chhattisgarh Legislative Assembly, Zero Point, Raipur-493111,

Chhattisgarh

Email: directorsfrti@gmail.com

PREFACE

This Project is a systematic and scientific study of real, site-specific issues related to conservation of wildlife and avifauna with the application of management concepts and expertise. The project “Alternative Habitat Development Plan for affected Avifauna and Wildlife Conservation Plan for affected wildlife species of Open Cast Project Baroud, Raigarh, Chhattisgarh” was proposed by the South Eastern Coalfield Limited (Coal India Limited), OCP Baroud, Raigarh, for stage II clearance for the diversion of 236.53 hectare of Protected Forest and Revenue Forest land for Baroud Open Cast Mine (OCM) in Gharghoda Forest Range, District Raigarh, Chhattisgarh in favor of SECL and project was undertaken by State Forest Research and Training Institute, Raipur (C.G).

The major objectives were:

1. To survey and documentation of the existing wildlife (mammals, reptiles) of OCP Baroud, Raigarh area.
2. To estimate species diversity and population dynamics of avifauna in the OCP Baroud, Raigarh area.
3. To study the habit, habitat and nesting pattern of different species of Avifauna.
4. To GPS survey of the densities, water bodies, nesting areas, migratory birds area, and wildlife corridor of any in the proposed study area.
5. To study the presence and movement of animals and birds by seasonal survey.
6. To study the impact assessment of proposed mining activities along with the existing biotic pressure on habit and habitat of the existing wildlife species including avifauna.
7. Pilot testing, evaluation and monitoring of appropriate measures for the desired site.

8. Preparation of habitat enrichment/development plan for the wildlife species and avifauna of the core zone for preferential adoption of the surrounding area as alternative habitat.
9. Initial monitoring and guidance to the executing agency (Forest Department) for the implementation of the plan.

The research teams of State Forest Research and Training Institute Raipur (C.G) have conducted extensive scientific surveys and conceptualized the alternative plan for the avian species and conservation plan for affected wildlife species from the core to the buffer zone of the study area.

As a result of three seasonal studies, 740 individual from 64 different species of avifauna were recorded in the affected area, which indicates the rich diversity of avian species in the study area. The alternative habitat as per the developed action plan is to be provided. The primary data analysis was based on “**Lines transect methodology**” in which the avian biodiversity as well as their habitats were studied and analyzed.

The project report attempts to bring under one cover the entire hard work and dedication put in by the research team for the completion of this work.

The key findings and recommendations have been provided in the document, which we trust, will be useful for all the stakeholders and decision makers associated with the avian biodiversity and wildlife species of the OCP Baroud area. The final conclusion and the recommendation along with the conservation plan and budget proposal have also been prepared for the implementation of the project.

I hope this report will help, not only the management of OCP Baroud but also help the Forest Department to conserve and protect the wildlife, avifauna and their habitat.



(S.S Bajaj IFS)
**Additional Principal Chief Conservator of Forest
State Forest Research and Training
Institute Raipur, Chhattisgarh**

Acknowledgement

The preparation of Wildlife Conservation Plan including Alternative Habitat Development Plan for Avifauna within the Open Cast Project Baroud lease area and its surrounding would not have taken shape but, for the valuable inputs, suggestions, guidance, support and efforts of a number of resource persons.

I would like to thank Shri Mudit Kumar Singh IFS, PCCF & HoFF, Director, State Forest Research and Training Institute, for his continuous support, valuable suggestions and guidance.

I would like to also thank Shri A.B Minz IFS, Ex- Additional Director, SFRTI, and Smt. Nirmala Xess A.C.F, SFRTI for their help and supports.

I would like to appreciate the efforts of Shri M.M Ujjaini Technical Assistant and Project in-charge, Shri Amit Kumar Baghel J.R.F, Shri Jeevan Shirin Toppo S.R.F, Shri Vijay Kumar Bhagat J.R.F., Shri Kamlesh dadsena J.R.F, Shri Rajesh Kumar Toppo F.A and Shri Ashutosh Pandey Ex- S.R.F, in field surveys, data collection, analysis and report writing.

My special thanks to Chief Conservator of Forest Bilaspur, Divisional Forest Officer Raigarh Forest Division and his field staffs, General Manager SECL Raigarh, Sub-area Manager of Open Cast Project Baroud and Nodal Officer SECL Raigarh and the officers involved with the project for sparing their valuable time and providing facilities for the research team.

The Conservation Management Plan remains open to alteration so as to offer protection to the local birds, wildlife species and their habitat. It should be interpreted as a static design remaining flexible to inputs from the concerned authorities, of whom I am appreciative in advance.

I hope this report will be helpful to develop alternative habitat for avifauna. Wildlife Conservation Plan will also ensure efficient protection, conservation & management for avifauna and wildlife species of the OCP Baroud mining area.



(S.S Bajaj IFS)

**Additional Principal Chief Conservator of Forest
State Forest Research and Training
Institute Raipur, Chhattisgarh**



**TEAM MEMBERS
FOR**

**“PREPARATION OF WILDLIFE CONSERVATION PLAN INCLUDING
ALTERNATIVE HABITAT DEVELOPMENT PLAN FOR AFFECTED
AVIFAUNA OF CORE MINING AREA OF OCP BAROUD AREA,
RAIGARH DIVISION, C.G”**

S. No.	Name	Designation
1	Shri Mudit Kumar Sigh, IFS	PCCF & HOFF, Director, State Forest Research and Training Institute
2.	Shri S.S Bajaj, IFS	Additional Principal Chief Conservator of Forest, SFRTI
3.	Shri A.B Minz, IFS	Ex- Additional Director State Forest Research and Training Institute
4.	Smt. Nirmla Xess	ACF, State Forest Research and Training Institute
5.	Shri Manas Manohar Ujjaini	Project In-charge, SFRTI Technical
6.	Shri Amit Kumar Baghel	Junior Research fellow, SFRTI
7.	Shri Jeevan Shirin Toppo	Junior Research fellow, SFRTI
8.	Shri Vijay Kumar Bhagat	Junior Research fellow, SFRTI
9.	Shri Kamlesh Dadsena	Junior Research fellow, SFRTI
10.	Shri Rajesh Toppo	Field Assistant, SFRTI
11.	Shri Ashutosh Kumar Pandey	Ex-Senior Research fellow, SFRTI



**STATE FOREST RESEARCH AND TRAINING INSTITUTE (SFRTI)
RAIPUR, CHHATTISGARH**

Contents

TITLE	PAGE NO.
EXECUTIVE SUMMARY	I-VII
CHAPTER - 1 : INTRODUCTION	1-9
1.1 Biodiversity	1-3
1.2 Wildlife conservation	3-4
1.3 Project background	5
1.4 History of mining	6
1.5 Project site information	6-9
CHAPTER - 2 : REVIEW OF LITERATURE	10-18
2.1 Direct impact of mining on wildlife	10-11
2.2 Wildlife response to post-mining reclamation	11
2.3 Avifauna	12
2.4 Avifauna response to post-mining reclamation	12-16
2.5 Ecological effects of paved roads inside the forest on birds	16-17
2.6 Reclamation practices	17-18
CHAPTER - 3 : METHODOLOGY	19-22
3.1 Line transect methodology	19
3.2 Field survey	20-22
3.3 Layout of line transect	22
CHAPTER - 4 : OBSERVATIONS OF COLLECTED DATA AND ANALYSIS	23-38
4.1 Summer season survey	23-28
4.2 Winter season survey	29-33
4.3 Autumn season survey	34-38
CHAPTER 5 : RESULTS AND DISCUSSION	39-61
5.1 Floral diversity of study site	39-41
5.2 Avifaunal diversity of study site	45-50
5.3 Conservation status of avifauna	51-56
5.4 Discussion	57-61
CHAPTER 6 : RECOMMENDATIONS AND WILDLIFE CONSERVATION PLAN	62-96
6.1 Recommendations	62-63
6.2 Conservation Plan	64-70
6.3 Conservation plan for fauna	71-74
6.4 Conservation Plan For avifauna	75-85
6.5 Conservation plan for elephant	86-97
CHAPTER 7 : ENVIRONMENTAL MITIGATION MEASURES	98-101
7.1 Environmental mitigation measures	98-101
CHAPTER 8 : PROPOSED BUDGET FOR ALTERNATIVE HABITAT MANAGEMENT PLAN OF OCP BAROUD	102-107
8.1 Proposed budget for alternative habitat management plan of OCP Baroud	102-104

8.2 Proposed activity & location for alternative habitat management plan of OCP Baroud	105-107
PHOTO PLATES OF AVIFAUNA IN OCP BAROUD	108-111
PHOTO PLATES OF AVIFAUNA NEST IN OCP BAROUD	112
PHOTO PLATES OF ARTIFICIAL NEST	113
PHOTO PLATS OF BIRD FEEDER	114
CHAPTER 9: REFERENCES	115-122
Annexure I Bird survey datasheets (Core zone)	123-127
Annexure II Habitat survey datasheets (Core zone)	128-136
Annexure III Avifauna checklist of first seasonal survey 2018 by SFRTI	137-140
Annexure IV Detailed description of birds including habit habitat and nesting pattern	141-165
Annexure V Reptiles	166-175
Annexure VI Mammals	176-189

List of Tables

TITLE	PAGE NO.
Table No.1.1: Production of key minerals	3
Table No.1.2: Requirement of land in hectare	7
Table No. 3.1: Datasheet of bird survey	21
Table No. 3.2: Datasheet for habitat study at every 300 m on transect line	21
Table No 3.3: Datasheet for wildlife study on transect line	22
Table No. 4.1 Summary of available tree species present in study area	23
Table No. 4.2 Overall average vegetation percentage of mining area	24
Table no 4.3 Overall average vegetation cover of mining area	25
Table No.4.4 List of recorded avifauna in summer seasons on study site	26-27
Table No. 4.5 Available tree species present in project area	29
Table No. 4.6: Aaverage vegetation percentage of mining Area	30
Table no. 4.7 Average vegetation cover of mining area	30
Table No.4.7 List of recorded avifauna in winter seasons	32-27
Table No. 4.8: Available tree species present in study area	34
Table No. 4.9: Overall average vegetation percentage of mining Area	35
Table No. 4.10 List of avifauna in autumn seasons	37
Table No.5.1 Overall summary of recorded girth class and regeneration status of tree species in study site	39-40
Table no.5.2 Over all tree species in three seasons	42
Table No.5. 3 List of tree species present in study site	43
Table no.5.4 Seasonal vegetation in present in the Core & Buffer zone	43
Table no.5.5 Average vegetation in present in the Core & Buffer zone	44
Table no 5.6 Recorded avifauna in core zone area	45-46
Table no 5.7 Recorded avifauna in Buffer zone in study area	48-49
Table No. 5.8. Check list of total number of Birds present in OCP Baroud, Raigarh	51-52
Table no.5.9 Seasonal variation of birds species present in OCP Baroud, Raigarh	53-54

List of Figure

TITLE	PAGE NO.
Figure No.1.1 Forest cover Chhattisgarh (State action plan)	2
Figure No.1.2 Google map of mining area of OCP Jampali, Chhal & Baroud	8
Figure No.3.1 Line transect methodology	19
Figure No.3.2 Detail survey methodology of Line Transect Method	19

List of Graphs

TITLE	PAGE NO.
Graph No 4.1: Tree diversity of core and buffer zone	24
Graph No 4.2: Average vegetation comparisons of mining area	30
Graph No. 4.3: Status of individual species found in summer season of OCP Baroud	28
Graph No. 4.4: Tree diversity of core and buffer zone	30
Graph No. 4.5: Overall average vegetation cover of mining area	31
Graph No. 4.6: Status of individual species found in winter season of OCP Baroud	33
Graph No.4.7 Available tree species present in study area	35
Graph No.4.8 Overall average vegetation percentage of mining area	36
Graph No.4.9 Status of individual species found in April season of OCP Baroud	38
Graph No.5.1 Overall summary of available tree species	41
Graph No. 5.2: Status of tree species found in OCP Baroud	42
Graph no. 5.3 Seasonal vegetation cover in present in the Core & Buffer area	44
Graph No. 5.4 Average vegetation in present in the Core & Buffer area	44
Graph no. 5.5 Avifauna recorded in core zone of Study site	47
Graph no 5.6. Avifauna recorded in buffer zone of study site	50
Graph No. 5.7: Seasonal variation of individual avifauna species found in OCP Baroud	55
Graph no. 5.8. Species variation of avifauna	56

Abbreviations

OCP	Open Cast Project
SFRTI	State Forest Research and Training Institute, Raipur, C.G
ESMP	Environmental and Social Mitigation Project
MoEF	Ministry of Environment and Forest
CC	Climate Change
CSBSAP	Chhattisgarh Biodiversity Strategy and Action Plan
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
CIL	Coal India Limited
SECL	South Eastern Coal Field Limited
SC	Scheduled Caste
ST	Scheduled Tribe
FRA	Forest Reclamation Approach
SEIAA	State Environment Impact Assessment Authority
SPM	Suspended Particulate Matter
OB	Overburden
GLC	Ground Level Concentrations
NTFP	Non Timber Forest Produce
PPE	Personal Protective Equipment
IUCN	International Union for Conservation of Nature
LC	Least Concern
Land Cover Related Abbreviations Used in Datasheets	
R	Resident
B	Barren Land
A	Agriculture Land
G	Grassland
W	Woodland
S	Scrubland
Human Settlement Related Abbreviations Used in Datasheets	
S	Settlement
R	Metal Road
E	Electricity
P	Pond
W	Well/Tube well
Observations related Abbreviations Used in Datasheets	
1	Illicit Felling
2	Girdling
3	Dead Tree
4	Living / Healthy Tree
5	Diseased Tree

EXECUTIVE SUMMARY

Chhattisgarh state is identified as having one of the richest biodiversity habitats in the country; it has one of the densest forests in India, rich flora and fauna, several species of exotic flora and fauna and abundant non-timber forest products (NTFP's), with tremendous potential for value addition.

The variability among living organisms from all sources including Terrestrial, Marine and other Aquatic ecosystems and the ecological complexes to which they are part of, includes diversity within species, between species, and Ecosystems. Diversity within species (or genetic diversity) refers to variability in the functional units of heredity present in any material of plant, animal, microbial or another origin. Species diversity is used to describe the variety of species, - whether wild or domesticated within a geographical area.

Similarly, Chhattisgarh is one of the richest Indian states in terms of mineral wealth, with 28 varieties of major minerals, including diamonds and rank second in the country in mineral production. The state holds a major share of coal deposits in India, which has led to the State also being a major power producer and being power surplus state.

The environmental impact of the coal industry involves issues like land degradation, waste disposal, water, air and noise pollution etc. caused by mining, processing and the use of its product. In addition to atmospheric pollution, coal burning produces hundreds of millions of tons of solid waste products annually, including fly ash, bottom ash, and flue gas desulfurization sludge, that contain mercury, uranium, thorium, arsenic, and other heavy metals.

The removal of vegetative cover and activities associated with the construction of haul roads, stockpiling of topsoil, displacement of overburden and hauling of soil and coal increase the quantity of dust around mining operations. Dust degrades air quality in the immediate area, has an

adverse impact on vegetative life, and creates health and safety hazards for mine workers and nearby residents.

Surface mining of coal causes direct and indirect damage to wildlife. The impact on wildlife stems primarily from disturbing, removing and redistributing the land surface. The most direct impact on wildlife is destruction or displacement of species in areas of excavation and spoils piling. Pit and spoil areas are not capable of providing food and cover for most species of wildlife. More sedentary animals like invertebrates, reptiles, burrowing rodents and small mammals may also disappear or destroyed due to mining activities.

Displacement of wildlife populations from the mine site is another direct impact of mining. As mining proceeds on a site, wildlife moves to adjacent areas and establishes territories and home ranges.

In some species, reproduction is likely to be affected during the breeding season, when displacement occurs. Wildlife response to post-mining reclamation is based on the wildlife species in question, their habitat requirements, and presence of a source population to colonize the mine site and the structure and composition of the vegetation on the mine site post-reclamation and in the surrounding landscape. The majority of studies on wildlife response were focused simply on documenting the numerical response of species in question on the mine site for a brief period of post-reclamation.

Therefore the Ministry of Environment, Forest and Climate Change has notified the Environmental Impact Assessment (EIA) notification, 2006 under the provisions of the Environment (Protection) Act, 1986, which regulates development and their expansion/modernization of 39 sectors/activities listed in the schedule to the EIA notification, 2006. The Government of Chhattisgarh has identified the State Forest Department as nodal agency to prepare the Chhattisgarh Biodiversity Strategy and Action Plan i.e. CSBSAP.

To overcome the impact of mining activities on avifauna and wildlife found in Gharghoda Range; Raigarh Forest division, Chhattisgarh, SECL Baroud had sent a proposal to SFRTI, Raipur to prepare a Wildlife

Conservation Plan including alternative habitat development plan for affected avifauna. Hence State Forest Research and Training Institute (SFRTI) Raipur Chhattisgarh has made a project proposal on an “preparation of Wildlife Conservation Plan including alternative habitat development plan for affected avifauna of core zone of OCP Baroud, Baroud zone, Chhattisgarh” after a pilot survey of the mining zone.

The study involved detailed systematic and scientific processes of identifying, predicting, evaluating and analyzing the potential impacts of OCP on avian bird species, wildlife and its habitat within the OCP Baroud lease zone and surrounding area of Raigarh Forest Division. Extensive field studies were undertaken within the mining lease boundary of OCP Baroud and observations were made during the course of seasonal field survey that formed the foundation of conservation management plan for the betterment of species.

OBJECTIVES

1. To survey and documentation of the existing wildlife (mammals, reptiles) of OCP Baroud.
2. To estimate the species diversity and population dynamics of avifauna in the OCP Baroud.
3. To study the habit, habitat and nesting pattern of different species of avifauna.
4. To GPS survey of the densities, water bodies, nesting areas, migratory birds area, and wildlife corridor of any in the proposed study area.
5. To study the presence and movement of animals and bird's by Seasonal survey.
6. To study the impact assessment of proposed mining activities along with the existing biotic pressure on habit and habitat of the existing wildlife species including avifauna of the core zone.
7. Pilot testing, evaluation and monitoring of appropriate measures for the desired site.

8. Preparation of habitat enrichment/development plan for the wildlife species and avifauna of the core zone for preferential adoption of the surrounding area as alternative habitat.
9. Initial monitoring and guidance to the executing agency (Forest dept.) for the implementation of the plan.

The proposed mining area is located in the south of village Baroud at an approximate distance of 12 km on Gharghoda - Raigarh State Highway and 45 km from Raigarh town. The block is bounded by latitude 22°16'11.11" and longitudes 83° 20'07.55" and is included in the Survey of India Topo Sheet No. 64 N/4. It is situated in the Raigarh district of Chhattisgarh. There are about 1111.40 hectare area of land proposed to acquire out of 1111.40 hectare area 236.53 hectare area had been already acquired and mining started in OCP Baroud area. Existing mining area of OCP Baroud / land already acquired: 236.53 Ha. Located at the centre of the whole mining area. Only two compartments should fall under proposed mining area namely **comp. no. 1285 & 1286 PF**.

Line transect method has been applied for the bird count and their habitat survey. Line-transect distance sampling methods were also used to estimate the abundance of many biological populations such as animals, birds and plant species including nonliving things. Total of 22 transects have been taken during the three seasonal survey in core and buffer zone. Sampling in every 300 m and 10 m circular quadrates have been taken observations of vegetation composition (Grass, herb, shrub and regeneration).

On the basis of three seasonal field surveys, **740 individuals of 64 different bird species** have been recorded. The 740 individuals belong to 64 species they are categorized based on nesting pattern. The population of avifauna abundant By Common Myna, Indian Rollar, Little Swift, Rose ringed Parakeet; Red vented Bulbul, Purple Sun Bird, and Cattle Egret. Mostly the birds found during the survey are endemic and resident.

In the study area, dominated floral species found mainly Sal (*Shorea robusta*), Char (*Buchanania lanzan*), Mahua (*Madhuca indica*), Saja (*Terminalia tomentosa*), Dhawda (*Anogeissus latifolia*), Koriya (*Pinus koraiensi*), Senha (*Lagerstoemia parviflora*), Mango (*Mangifera indica*), Tendu (*Diospyros melanoxylon*), (*Ficus bengalensis*), Harra (*Terminalia chebula*) etc.

The overall ecological value of mining area where mining is carried out, must be considered. This should include the interconnections between habitats in the vicinity of the mining project which may be affected by fragmentation of the habitat. Many species, particularly avifauna, mammals and their dynamic territories that extend beyond site boundaries, making them vulnerable to changes in external or local environmental conditions

The proposed coal mine would create an impact on the environment in two distinct phases; during the development phase, which may be regarded as temporary or short term. During the operation which would have long term effects. These impacts will have a negative effect on the avifauna of the area.

To minimize the impacts of mining on different environmental factors with reference to avifauna and wildlife species, recommendations are given as follows:

Recommended Action Plan

1. Green belts should be developed around the mining boundary.
2. The wastage coal dust particles in the dumping site of Coalmines should be managed properly to reduce air pollution and loss of avifaunal diversity & habitats.
3. Biological reclamation should be done to transform the degraded land and waste dump into a self - sustaining ecologically stable land form. Re-vegetation of waste dump is recommended to the slope stability, enhances the infiltration of rainwater to increase the soil fertility.
4. Top soil management is needed to maintain the top soil stockpile to retain fertility. Excavated top soil can be dumped for future use such as

meadow development and plantation purpose in order to further mitigation for habitat conservation of avifauna.

5. Fruit bearing and feeder tree species have to prefer by the available avifaunal species in the area, to be needed to planted in the buffer zone for plantation of avifauna conservation. Some of the tree species to be planted are: *Sal (Shorea robusta)*, *Char (Buchanania lanzan)*, *Mahua (Madhuca latifolia)*, *Tendu (Diospyros melanoxylon)*, *Aonla (Phyllanthus emblica)*, *Arjun (Terminalia arjuna)*, *Saja (Terminalia tomentosa)*, *Baheda (Terminalia bellerica)*, *Bija (Pterocarpus masupium)*, *Bargad (Ficus benghalensis)*, *Peepal (Ficus religiosa)*, *Dhawda (Anogeissus latifolia)* and *Khair (Acacia catechu)* etc.
6. Multiple water storage facilities need to be developed in the buffer zone assures the water availability throughout the year. The existing ponds, resources recharge should be maintain.
7. The mining in the buffer zone along the River banks of Kurket (Nala) must be avoided to insure of the river changing the path.
8. The social awareness program should be conducted among the local communities and villagers to provide information & awareness about birds and wild life there contribution in ecosystem and environment.
9. Artificial nest made up of local light & fine wood materials, nest will be prepared with the help of JFM Committee and local forest staff and placement of artificial nest in the buffer zone for affected avifauna of core zone.
10. Soil moisture conservation (SMC) work should be done for the Bulekera village (buffer zones) of OCP baroud
11. Establishment of the artificial avifauna paradise similar to *Pakshi Vihar* to be developed by dumping site.
12. Best practices from forest department should be implemented for the prevention of forest fire.

13.Plantation and conservation efforts should be monitor regularly during various growth stages of site.

CHAPTER - 1

INTRODUCTION

1.1 BIODIVERSITY

The variability among living organisms from all sources including inter alia, Terrestrial, Marine and other Aquatic Ecosystems and the Ecological complexes of which they are part; includes diversity within species, between species and of ecosystems.

Diversity within species (or genetic diversity) refers to variability in the functional units of heredity present in any material of plant, animal, microbial or other origin. Species diversity is used to describe the variety of species - whether wild or domesticated) within a geographical area. Estimates of the total number of species (defined as a population of organisms which are able to interbreed freely under natural conditions) range from 2 to 100 million, though less than 1.5 million have actually been described. Ecosystem diversity refers to the enormous variety of plant, animal and micro organism communities and ecological processes that make them function. In short, biodiversity refers to the variety of life on earth. This variety provides the building blocks to adapt to changing environmental conditions in the future.

The Government of Chhattisgarh has identified the State Forest Department as nodal agency to prepare the Chhattisgarh Biodiversity Strategy and Action Plan i.e. CSBSAP.

Biodiversity is under threat worldwide. Loss of biodiversity is one of the world's most pressing crises. The world's biodiversity is diminishing rapidly (*Balmford et al., 2003 and Jenkins et al., 2003*). Amongst all, the massive degradation of natural habitat is considered as the prime cause of loss of many species throughout the world. Many of the species are declining to critical population levels due to destruction, fragmentation and degradation of their natural habitat. Besides these, climatic changes, pollution, invasion of competent species, anthropogenic activities performed in the name of development etc. all contribute in destabilizing the natural ecosystems.

Information about species and ecosystems is essential for moving towards more sustainable use of available natural resources.

Chhattisgarh state is identified as having one of the richest biodiversity habitats in the country; it has one of the densest forests in India, rich flora and fauna, several species of exotic flora and fauna and abundant non-timber forest products (NTFP's), with tremendous potential for value addition. Chhattisgarh state falls under the Deccan biodiversity zone. The forests of the state fall under two major forest types, i.e. Tropical Moist Deciduous forest and the Tropical Dry Deciduous forest.

Chhattisgarh has 55,674 sq km of forests, which is 41.18 percent of its geographical area. It has the third largest area under forest cover after Madhya Pradesh and Arunachal Pradesh. Of this, three percent is under very dense forest, 25.82 percent is moderately dense, 12.28 percent is open forest and 0.09 percent is scrub (Fig. 1). The forest ecosystem of the state has very rich biodiversity comprises primarily with Sal dominated forests, followed by Teak forests and mixed forest ecosystem. As per the latest status of Chhattisgarh Forest policy report 2011, there has been a net decrease of 192 sq.km in the forest cover from 2009.

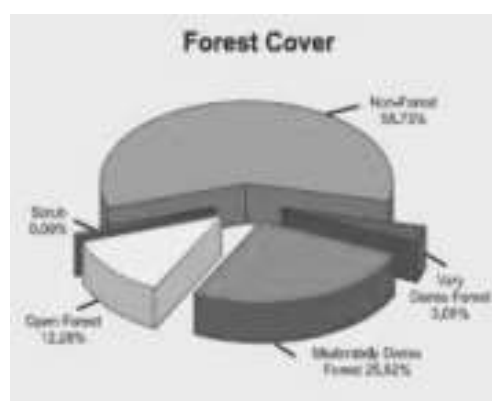


Fig.1.1 Forest Cover Chhattisgarh (State action plan)

Chhattisgarh is among the richest Indian states in terms of mineral wealth, with 28 varieties of major minerals, including diamonds and ranks second in the country in mineral production. The state holds a major share of coal deposits in India, which has led to the State also being a major power producer and being power surplus. It is the only state in India to have tin ore reserves. About one-fifth of the iron-ore in the country is mined in the state and one of the best-quality, iron-ore deposits in the world is found at the Bailadila mines in the South of Chhattisgarh from where it is exported to Japan and other countries (table 1.1). Rich deposits of bauxite, limestone, dolomite, and

corundum are also found in the state, making it the ideal location for low-cost of production of end products such as cement and aluminium. During 2009-10, the state had contributed 14.09 per cent in the national revenue from minerals (State action plan 2011).

Table No1.1 Production of key minerals

Mineral	Production – 2008-09 (Million Tons)
Coal	97.0
Iron Ore	32.9
Limestone	15.6
Dolomite	1.2
Bauxite	1.6
Tin ore (Concentrate)	57500*

* In Kilogram

Chhattisgarh state have plenty of energy resources such as Coal, Mineral this state is second largest coal producing region after Jharkhand in India. The environmental impact of the coal industry includes issues such as land use, waste management, water and air pollution caused by the coal mining, processing and the use of its products. In addition to atmospheric pollution, coal burning produces hundreds of millions of tons of solid waste products annually, including fly ash, bottom ash, and flue-gas desulfurization sludge, that contain mercury, uranium, thorium, arsenic, and other heavy metals.

1.2 WILDLIFE CONSERVATION

Wildlife conservation is the practice of protecting animal species and their habitats. In order to survive, a species requires adequate food, water, shelter, space, and opportunities to reproduce. Wildlife conservation refers to the considered practice of ensuring protection for wild faunal species, their habitats, and plants. It has sustainable Effort to maintain and use natural resources including wildlife in ways they ensure that those resources will be available in the future.

“Wildlife conservation is the application of ecological knowledge to populations of vertebrate animals and their plant and animal associates in a manner that strikes a balance between the needs of those populations and the needs of people” (*Robinson and Bolen 1999*).

Wildlife conservation aims to stop the progress of the loss in the ecological biodiversity by taking into consideration ecological principles such as carrying capacity, disturbance and succession and environmental conditions such as food, water, shelter, space, and opportunities to reproduce with the aim of balancing the needs of wildlife with the needs of people. Wildlife is best preserved in their natural habitat. Wildlife wing of the forest department has adopted two pronged strategy for the Wildlife Conservation, protection and awareness generation

Coal is the only natural energy resource and fossil fuel available in abundance in India. The major environmental challenges encountering the coal industry are impacts of mine fires, dust suppression and control particularly haul road dust consolidation, treatment of mine waters containing heavy metals/acid mine drainage, restoration of water table and quality of ground and surface water, augmentation of pumped out mine water for drinking purpose, reclamation of mined out areas with pre-determined land use patterns conducive to the local populations etc. The biggest environmental challenge facing the coal industry is the issue of greenhouse gases and acid rain. Overall environmental management improvement has been taking place with the implementation of state of art environmental management schemes particularly under Environmental and Social Mitigation Project (ESMP) of CIL (*Dr.Gurdeep Singh, June 2008*).

Chhattisgarh state is rich in energy resources. The main energy resource is Coal. The State produces 15% of total coal of the country; The main coal producing areas are: Korba - Produces 75% coal of the state and 11% of the country, Hasdo-Rampur Colliery, Mand-Raigarh Colliery, Vishrampur Colliery, Lakhanpur Colliery, Tatapani-Ramkola Colliery, Jhilmili Colliery, Sonhat Colliery, Jhagrakhand Colliery, Chirmiri-Kurasiya Colliery (*Chhattisgarh Biodiversity plan*).

Surface mining of coal causes direct and indirect damage to wildlife. The impact on wildlife stems primarily from disturbing, removing and redistributing

the land surface. Some impacts are short-term, and confined to the mine site; others have far-reaching, long-term effects. The most direct effect on wildlife is destruction or displacement of species in areas of excavation and spoils piling. Pit and spoil areas are not capable of providing food and cover for most species of wildlife. Mobile wildlife species like game animals, birds, and predators leave these areas. More sedentary animals like invertebrates, reptiles, burrowing rodents and small mammals may be destroyed (*Anurag et al 2018*).

To overcome the impact of mining activities on avifauna and Wildlife found in Gharghoda range; Raigarh division, Chhattisgarh, SECL Raigarh had proposed the project to SFRTI, Raipur to prepare a Wildlife Conservation Plan including alternative habitat development plan for affected avifauna species.

As per MoEF clearance regarding a condition (Clause 9) “The user agency consultation with the state government shall create and maintain alternate habitat/ home for avifauna, their nesting trees are to be cleared under this project. Birds nests will be artificially made out of eco-friendly material, placed in the area including the forest area and human settlements; adjoining the forest area being diverted for the project.”

1.3 PROJECT BACKGROUND

A Project Report for Baroud OCP in Baroud Geological Block was prepared in March 2003, and was approved in May 2003 for a targeted capacity of 1.00 MTY at a capital expenditure of Rs.19.99 crores.

The proposed Baroud Opencast falls under the administrative control of Raigarh Area of SECL. The Project Report is based on the “Geological Report on Baroud Block” prepared by CMPDI in March 1991. Eight coal seams, namely, VI, V (T), V (B), Local, IV, III, II, II (A) and I occur within the block. Of these, older seams I, II and IIA are generally thin and impersistent. In Dharam and Baroud Underground Mines, Seam III is being exploited.

With an increased demand projected on SECL in XIth plan, Baroud OCP was proposed to expand from 1.0 MTY to 3.0 MTY.

Accordingly, an expansion PR of Baroud OCP (1.0 – 3.50 MTY) was prepared and approved in September 2007 within the sanctioned mine boundary with an initial capital requirement of Rs. 50.38 crores. This report was completed March 2010 at a completion cost of Rs. 46.95 crores.

Liberalization of power sector has resulted in a sharp increase in demand for power grade coal. Expansion of Baroud Opencast is, again therefore, proposed with a view to fulfill the growth in demand. In this context, this project named Baroud OC (Seam-III) Project (6.0 MTY) has been conceived.

1.4 HISTORY OF MINING

The proposed area under consideration falls in Mand - Raigarh Coalfield of Raigarh district (Chhattisgarh). Mining activities in the area started long back in 1940 but remained confined to very small manual quarrying and Baroud opencast mine is running.

1.5 PROJECT SITE INFORMATION

LOCATION

The project is located of village Baroud at an approximate distance of 10 km on Raigarh - Dharamjaygarh State highway and 50 km from Raigarh town. It is situated in the Raigarh district of Chhattisgarh.

CLIMATE

The area is characterized by tropical climate with well defined summer from April to June, rainy season from July to September and winter from November to February. May is the hottest month when the temperature rises to a maximum of 46⁰C December being the coldest month, the temperature falls to a minimum of 7⁰C.

The average annual rainfall is about 1500 mm. The wind direction is generally westerly to north westerly. Relative humidity during monsoon ranges from 75% to 80% and in summer from 18% to 60%.

PHYSIOGRAPHY

The Baroud is largely characterized by a plain country. The altitude varies between 231 m in the west to 267 m above MSL in the north eastern part of the block. The elevation of the ground varies between 255 m to 267 m along a linear patch running NE-SW in the central part of the property. The ground

has a general slope towards NE, SE & SW. Most of the area is covered by soil and cultivate land. The westerly flowing Kurket River with their tributaries form the main drainage of the Baroud.

LAND USE PLAN

The project envisages 1111.40 Ha of land for quarry, industrial and residential complex, safety zone and external dumps etc. This includes 363.58 Ha of land already acquired/under process and, 747.82 Ha of land to be acquired. The break-up of the land is as follows:-

Table No 1.2 Requirement of land in Ha

Sl. No.	Particulars	Reserve / Revenue Forest	Tenancy	Government	Total
(A)	Land (Baroud OC Exp)	142.90	163.33	57.35	363.58
	(External dump, quarry, safety zone,etc.)				
(B)	Additional land requirement (Baroud Rai West OC)				
a	Quarry area	175.96	373.20	73.16	622.32
b	Safety zone*	27.65	35.53	10.81	73.99
c	External dump	25.00	11.20	2.50	38.70
d	Land for industrial development,colony,approach road	7.92	4.89		12.81
	Subtotal Additional Land required (C)	236.53	424.82	86.47	747.82
	TOTAL LAND FOR THE PROJECT(A+C)				1111.40
	* 8.5 Ha forest land not to be acquired, falling in safety zone.				



Land use plan OCP Baroud

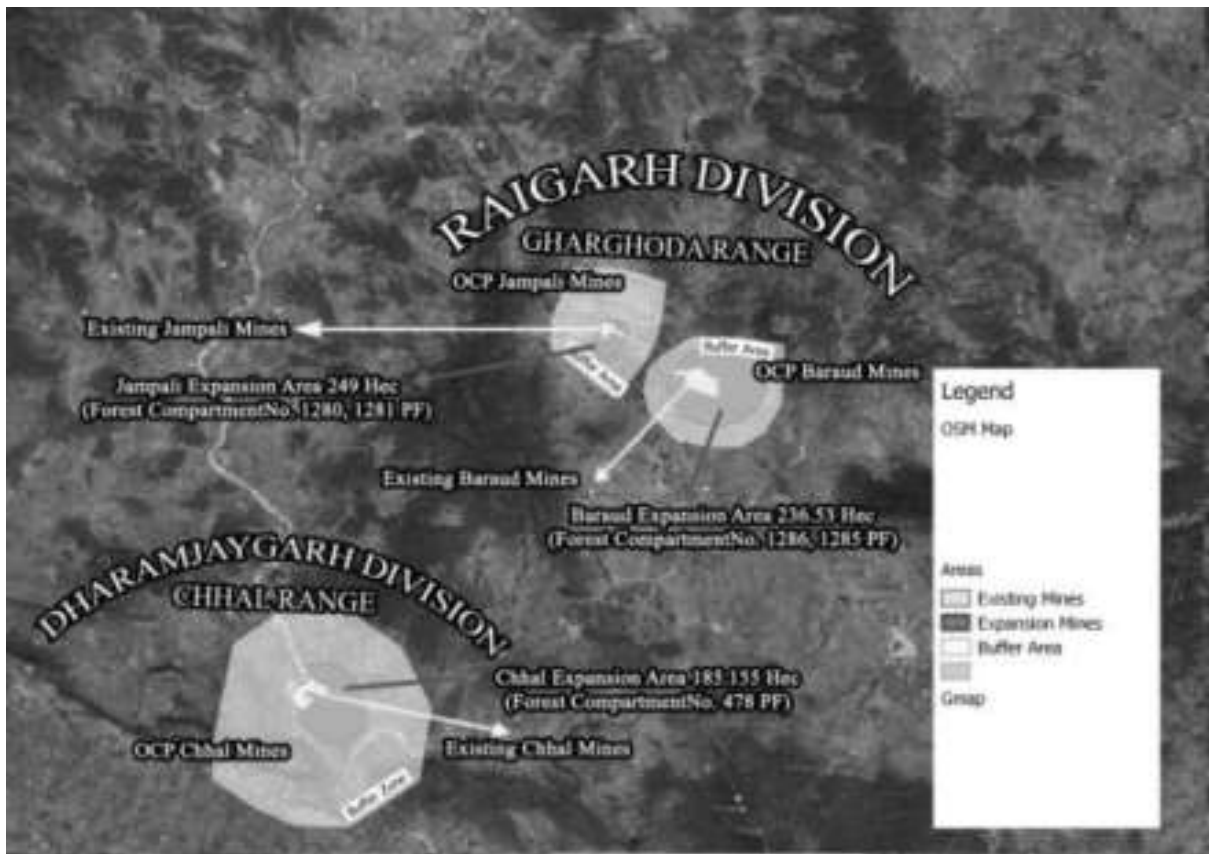


Fig 1.2 Google map of Mining area of OCP Jampali, Chhal & Baroud

FOREST

There are about 379.43 ha. of forest land in mining area most of which has already been acquired. Out of 379.43ha. land 236.53ha. land including the protected forest area rest area will be proposed from revenue forest area to this out of 236.53ha. Total two compartments should fall under proposed mining area namely comp. no. 1285 and 1286. Similarly the forest cover in buffer zone is about 4123.47ha.(4502.90ha. in the study area) in the absence of scientific management in the past , these forest has suffered from heavy felling, biotic pressure put exerted by the human being and domestic animal of surrounding areas is also tremendous.

The inventory of forest resource is made based on the guidelines of forest department. pilot survey is pre-requisite to finalized the most efficient survey design about 40 to 50 sample plot are lead out to cover up entire range variation existing within the forest population of working plan area (Ref.-working plan of Raigarh).

The earlier survey of flora & fauna in proposed mining area was done by CMPDI and they adopted the similar methodology as applied in working plan therefore the shape of sampling unit is square. Sizes of the sampling selected are 0.1 ha. Or 0.16 ha. It is selected based on fact that about 40-50 trees are including within sample unit finally the inventory data of each sample unit is trail in the plot description form and the tree enumeration form. Beside forest officials visit for reconnaissance survey in each compartment to know tree species, grasses, climbers etc. and entire in the compartment history format

CHAPTER - 2

REVIEW OF LITERATURE

The mining of coal in India has significant effects on wildlife populations and their habitats. The extraction of coal by various means (deep mining, long wall mining, contour mining, area mining or mountain top removal mining with valley fill) has a significant impact on terrestrial and aquatic ecosystems which can be felt for decades. Given the difficulty in extracting coal from geologic strata that are generally not readily accessible from the surface, it is inevitable that there will be some significant changes in the flora and fauna of the area within and surrounding the mine site.

The impacts of coal mining on wildlife populations occur at two primary levels:

- 1) Immediate, direct effects of mining in terms of direct mortality, disturbance and displacement of wildlife populations during mining activities.
- 2) Changes in wildlife populations associated with long-term changes in land cover associated with mine sites and their reclamation.

The goals of this literature review are to

- 1) Review the extant literature on the effects of coal mining on aquatic and terrestrial avifauna populations and habitat;
- 2) Review the literature relative to the effectiveness of reclamation practices in restoring conditions conducive for avifauna habitat; and
- 3) Identify areas where research is needed to further the science needed to better mitigate the impacts of mining on avian resources.

2.1 DIRECT IMPACTS OF MINING ON WILDLIFE

Very little literature exists on the direct effects of coal mining on wildlife. Mining certainly has direct effects as individuals and populations of species that occurred on the site pre-mining may sometimes be killed or displaced. Direct mortality will occur when the species in question is not mobile enough to avoid mining equipment, especially young ones. We did not find any literature that

estimates the rate of direct mortality for any potentially affected species. Displacement of wildlife populations from the mine site is another direct effect of mining. As mining proceeds on a site, wildlife moves to adjacent areas and establishes territories and home ranges. We were unable to locate any studies that documented the extent of this displacement and the implications in terms of survival and reproduction for coal mining in the Jampali. Some studies have been conducted on this topic in the Korba (C.G). In some species, reproduction is likely interrupted during the breeding season in which the displacement occurs. Survival of displaced individuals may be lower than survival would have been during the pre-mining period because displaced individuals may experience greater competition for resources in unfamiliar areas and may experience greater predation rates initially as they learn how to adjust to new surroundings.

2.2 WILDLIFE RESPONSE TO POST-MINING RECLAMATION

Wildlife response to post-mining reclamation is based on the wildlife species in question, their habitat requirements, and presence of a source population to colonize the mine site, and the structure and composition of the vegetation on the mine site post-reclamation and in the surrounding landscape. Wildlife response can be characterized in a variety of ways, including relative abundance on the site, survival, reproduction, movements, foraging behavior, and other behavioral traits. The majority of studies on wildlife response focused simply on documenting the numerical response of species in question on the mine site during some time post-reclamation. To understand the full implications of wildlife response and effects on habitat quality, more in depth research is needed to document the demography (reproduction, survival, immigration, emigration) of the species that colonize mine sites post-reclamation.

2.3 AVIFAUNA

Birds provide several ecological functions such as pest control, pollination, seed dispersal and plant reproduction in thousands of economically and culturally important plant species through its consumption of various terrestrial, aquatic and aerial resources (*Whelan et al., 2015*). Foraging ecology of birds contribute regulating services such as scavenging carcasses and nutrient cycling (*Whelan et al., 2008*). Bird communities also provide a reliable ecological indicator of forest condition (*Canterburry et al., 2000*) due to their sensitivity to environmental perturbations, relevance to ecosystem functioning (e.g., in pollination and seed dispersal), and relative ease in *sampling* (*Brown, 1991*). Moreover, birds are associated with singular habitats, they are short-lived species so any change in composition may manifest shortly after a disturbance. Hence, they can be used to develop habitat associations which are predictors of relative human disturbance levels and may be affected by some tourist activities (*Higginbottom et al., 2003; Newsome et al., 2004*). The bird population is an indication of environmental changes as they respond fast to threats and changing environment conditions (*Barov, 2011*).

As significant as being one of the mega diverse countries, the Mining and mineral processing have the potential to be important sources of income and driving forces behind broader economic development (*Eggert, 2001*). With this, the country is faced with a great challenge in utilizing the rich available mineral resources for economic growth and development without compromising its ecological integrity and species diversity.

2.4 AVIFAUNA RESPONSE TO POST-MINING RECLAMATION

The vast majority of studies conducted on wildlife response have focused on birds in part because birds are easily monitored using various count-based surveys. The effects of mining on avian communities occur initially by the removal of vegetation in preparation for mining. If the site is forested, vegetation removal occurs through timber harvest or clearing. Although few studies have been done to specifically evaluate the changes associated with

mine sites from pre-mining to post-mining land uses, there is substantial literature of the effects of timber harvest on avian communities and populations—see review in (*Sallabanks et al. 2000*). There are substantial differences in avian response to timber harvest for forest regeneration and avian response to timber harvest or clearing in preparation for mining because of the nature and timing of the re-vegetation that occurs. In timber harvest for forest management, tree regeneration begins within the first growing season post-harvest on the site and birds respond relatively quickly to the vigorous flush of woody re-growth. On mine sites, the reclamation process takes more time, and the vegetation responds more slowly, especially if the site is being reclaimed with shrubs and trees for reforestation.

On reclaimed mine lands which were originally forested, avian communities shift from forest bird communities to communities associated with early successional habitats, grassland birds and scrub-shrub birds. These changes in bird communities have conservation implications because in some cases there are forest bird species present that have declining populations and are of high conservation concern, such as the Cerulean Warbler (*Setophaga cerulea*) in the Appalachian Mountains (*Buehler et al. 2006*). Negative impacts on forest bird populations have to be weighed against positive gains in early succession bird populations. Many species associated with early successional habitats, such as the Henslow's Sparrow (*Ammodramus henslowii*) and the Golden-Winged Warbler (*Vermivora chrysoptera*) are also of high conservation priority (*Hunter et al. 2001, Buehler et al. 2007*).

Coal mining in the eastern United States seldom encounters bird species that are federally listed as threatened or endangered but most of the bird studies associated with mining have focused on characterizing songbird communities post-reclamation. Post-mining songbird studies have documented grassland bird response to reclamation when the reclamation has resulted in grassland cover. In general, grassland mine reclamation has been successful in creating habitat suitable for grassland bird use. The grassland species attracted to reclaim mine

lands include a diversity of songbirds and grassland raptors such as Northern Harriers (*Circus cyaneus*) and Short-eared Owls (*Asio flammeus*) (*Rohrbaugh and Yahner 1996, Vukovich 2004, Vukovich et al. 2006*).

Reclaimed mine sites in Pennsylvania, Kentucky, Illinois, Indiana, West Virginia, and Ohio are supporting breeding populations of Henslow's Sparrows (*Bajema et al. 2001, Bajema and Lima 2001, DeVault et al. 2002, Scott et al. 2002, Mattice et al. 2005, Monroe and Ritchison 2005, Stauffer 2008, Stauffer et al. 2011*) and/or Grasshopper Sparrows (*Ammodramus savannarum*) (*Whitmore 1979, Whitmore 1981, Wray et al. 1982, DeVault et al. 2002, Scott et al. 2002, Ammer 2003, Mattice et al. 2005, Galligan et al. 2006, Stauffer 2008, Stauffer et al. 2011*), two grassland species of conservation concern. Reproductive rates by these species were comparable to reproduction in other settings (*Ammer 2003, Monroe and Ritchison 2005, Galligan et al. 2006, Stauffer et al. 2011*). No published survival data are available for grassland songbirds breeding on reclaimed mine lands. Adult and juvenile survival data are generally unavailable for most grassland songbirds (*Perlut et al. 2008*), because adult dispersal, depending on the species, may be high and return rates in ephemeral grassland habitats is often very poor (*Jones et al. 2007*). Without survival data, it is impossible to accurately determine whether reclaimed mine lands are providing conditions conducive for supporting source populations for priority species (*Anders and Marshall 2005*). Several authors have noted that reclaimed coalmine lands in the region were providing important grassland habitat contributing significantly to grassland bird conservation rangewide (*Rohrbaugh and Yahner 1996, Bajema et al. 2001, Mattice et al. 2005, Monroe and Ritchison 2005, Stauffer et al. 2011*).

Golden-Winged Warbler populations have been declining precipitously in the Appalachian region (*Buehler et al. 2007*), and the species has been petitioned for listing under the Endangered Species Act in 2010 (*USFWS 2011*). Golden-winged populations occupy shrubby, early successional habitats often associated with reclamation of contour and area mines (*Bulluck and Buehler*

2008). Plant succession on mine lands is often slow, which provides for a prolonged period in which habitat conditions are conducive for Golden-Winged Warblers.

Succession on mine lands post-reclamation can be successfully set back by prescribed burning to further prolong the period of suitability for Golden-Winged's (*D. Buehler and K. Percy, unpubl. data*). In some cases, however, recent coal mining may compromise golden-winged habitat where remaining is occurring on old contour and area mine sites that are currently occupied by golden-winged (*D. Buehler, unpubl. data*). A mine land reclamation prescription is being developed for Golden-Winged Warbler habitat restoration to address this issue (*D. Buehler and K. Percy, unpubl. data*).

Although grassland and scrub-shrub birds benefit from the early successional habitat developed from post-mining reclamation, forest-dwelling birds are adversely affected by land use change from forest to grassland, regardless of the origin of the change. Concern has been expressed related to habitat loss for Cerulean Warblers in the Appalachian Mountains associated with deforestation from coal mining (*Buehler et al. 2006, Wood et al. 2006, Bulluck 2007*).

Mining also affects forest songbirds in adjacent forested areas because of the creation of edge effects and because of forest fragmentation. Cerulean Warbler abundance, for example, was lower in forests adjacent to mountaintop removal mining with valley fill (*Wood et al. 2006*), although edges associated with contour mines in Tennessee were not associated with lower cerulean abundance (*Beachy 2008*). Cerulean Warbler reproduction was lowering adjacent to forest disturbances from timber harvest than in undisturbed forest stands (*Boves 2011*). Similar relationships with cerulean reproduction and edges created by mining might be expected, although these relationships need to be documented.

Reclaimed coalmine lands can also provide habitat that supports upland game bird populations, including Northern Bobwhite (*Colinus virginiana*)

(Beckerle 2004), American Woodcock (*Scolopax minor*) (Gregg 1997), Eastern Wild Turkey (*Meleagris gallopavo*) (Rice 1986), and Ruffed Grouse (*Bonasa umbellus*) (Kimmel and Samuel 1984). Although the potential for mine lands to contribute to Northern Bobwhite population recovery is cited in the National Bobwhite Conservation Initiative revised plan (Palmer et al. 2011), we were unable to locate any literature that demonstrated how this might be accomplished. Kentucky Department of Fish and Wildlife Resources (KDFWR), in cooperation with the University of Tennessee, is conducting a northern bobwhite population ecology and habitat management project on Peabody Wildlife Management Area, a reclaimed coal mining area, which will generate information on how bobwhites are doing on reclaimed mine grasslands and how to enhance their habitat (J. Morgan, KDFWR, pers. comm.). Reclamation of mine lands in grasses and legumes provided poor quality grouse brood habitat, although later successional stages provided better brood habitat quality (Kimmel and Samuel 1984). Wild Turkeys used reclaimed mine lands extensively and densities on mine lands exceeded densities on nearby control areas (Rice 1986).

2.5 ECOLOGICAL EFFECTS OF PAVED ROADS INSIDE THE FOREST ON BIRDS

While the most obvious threat of paved roads to individual birds is injury or mortality due to vehicle collisions, this is often considered less compelling when compared to the more insidious effects of roads, such as behavior, modification or decreased population density, diversity, and/or breeding success (Reijnen and Foppen 1994, Forman and Alexander 1998, Jacobson 2005, Ramp et al. 2006, Reijnen and Foppen 2006). However, in some cases, direct road mortality is the major threat to a population (Mumme et al. 2000, Ramsden 2003, Reijnen and Foppen 2006). Given the vast network of roads in combination with other persistent anthropogenic factors at work (e.g., habitat loss, fragmentation, non-native species invasions, climate change), the potential impact of road mortality on specific wildlife populations should not be dismissed (Erritzoe et al. 2003, Glista et al. 2008).

Many studies report that certain species of birds avoid roads, paved or otherwise, when selecting habitat during some part of their life cycle (Ferrer and Harte 1997, Parrish et al. 2001, Sara and DiVittorio 2003, Bollinger and Gavin 2004, Arcos and Salvadores 2005, Balbontin 2005, Carrascal et al. 2006, Gavashelishvili and McGrady 2006). The risk of nest abandonment can also increase near roads (Gorog et al. 2005). In an extreme case, Great Bustard populations in Portugal appear to be concentrating themselves geographically, with new road building responsible for three of the local population declines (Pinto et al. 2005). Long-term trends suggest the Portuguese population may ultimately become confined to a single high quality site, thereby increasing probability of extinction (Pinto et al. 2005). For those species which use roadways as habitat, maintenance activities to roads and ditches can inadvertently destroy nests, a particular concern for declining species such as the Burrowing Owl (Catlin and Rosenberg 2006).

Road-related threats to bird populations deserve more attention, however, conservation or mitigation action is often considered to be warranted only after a population-level decline can be demonstrated (Reijnen and Foppen 2006). Many road-related bird studies are conducted in or adjacent to protected areas, illustrating there may be no panacea that escapes road-related impacts (Reijnen and Foppen 1994, Bard et al. 2002, Gutzwiller and Barrow 2003, Clevenger et al. 2003, Frey and Conover 2006, Ramp et al. 2006).

2.6 RECLAMATION PRACTICES

Coal mining results in large landscape changes as soils and vegetation are removed. Changes to forested areas can shift habitat availability and bird communities (James and Wamer, 1982; Hardt and Forman, 1989; Bolger et al., 1991; Winter et al., 2000; Herzog et al., 2001; Galligan et al., 2006; Wickham et al., 2007; and Loss et al., 2009). Several bird species have benefited in recent decades from the reclamation of surface coal mines (Bajema et al. 2001, DeVault et al. 2002, Ingold 2002). Burger (2011) defined four periods of reclamation: tree-planting by hand, grassland, shrub/scrub, and the Forest Reclamation Approach (FRA) (Angel et al., 2005).

Managing and reclaiming land to establish vegetation patches (e.g., grasslands, forest, wetlands, early succession) of different stages can provide habitat for diverse wildlife and aquatic species. Restoring a diverse community of native and site-adapted vegetation that includes a variety of structural features is the first step to attract wildlife *species* (Brenner and Kelly 1981; Camenzind 1984; Parmenter and MacMahon 1990).

Birds are generally one of the first types of wildlife to visit a mine site following reclamation due to their mobility and active search for suitable habitat (Brändle *et al.* 2003). Many bird species are not restricted to a single vegetation type, but rather depend on some combination of early successional habitat, open areas, and young and mature forests to find food and shelter and raise young (Hunter *et al.* 2001).

Although mining activities can have several negative impacts on wildlife populations, animals can return to reclaimed areas after mining if reclamation produces suitable habitat and individuals that can serve as colonists persist in the surrounding area. Site characteristics created by reclamation and the development of post mining vegetation and habitat features influence the types of wildlife that use mined sites. The reclamation process provides habitat management opportunities for some species; through various reclamation techniques and procedures, mine lands can be manipulated to attract and support desired wildlife species (Scott and Zimmerman 1984). The following recommended actions may improve the condition of wildlife habitat on reclaimed mine sites.

CHAPTER- 3

METHODOLOGY

3.1 LINE TRANSECT METHOD

Line transects method has been applied for the bird count and their habitat survey. Line-transect distance sampling methods were also used to estimate the abundance of many biological populations such as animals, birds and plant species including nonliving things. In a line-transect survey method, an observer moves along a transect line and note the location of all birds detected to the line (*Bird census and survey techniques, Richard D. Gregory, David W. Gibbons, and Paul F. Donald, 2004*).

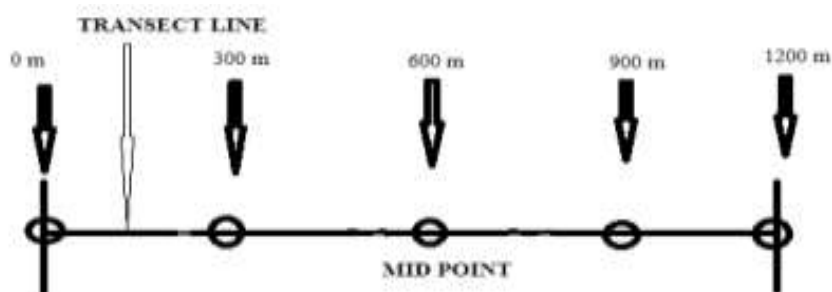


Fig 3.1: Line Transect Methodology

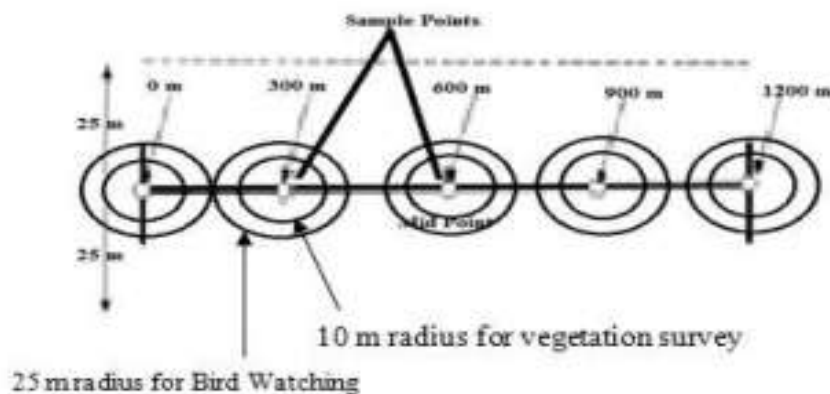


Fig 3.2: Detail survey methodology of Line Transect Methodology

3.1.1 Basic Procedures in Line Transect Sampling

Two types of data are recorded in line transect sampling, as shown in data collection point page no. 24. These are either (1) the perpendicular distances from the transect line x or (2) the sighting distances r and angles θ . However, studies based on sighting distances and angles have been found to be subject to biases and are only discussed briefly here.

The usual assumptions made with line transect sampling are the following:

1. All objects on the transect line are detected.
2. Objects do not move in response to the observer before the detection is recorded.
3. Objects are only counted once.
4. Objects are recorded at the point of initial detection.
5. Distances are measured without errors.
6. Transect lines are randomly located in the study area.

A further assumption sometimes made for the estimation of standard errors is that

7. Sightings are independent events, and the number of objects detected follows a Poisson distribution.

3.2 Field Survey

The field survey technique to observe the abundance of wildlife, avifauna, habitat, nesting pattern & surrounding vegetation in core zone applied seasonally; to estimate the current status of species diversity of avifauna & wildlife in the mining area. On the basis of species of wildlife & avifaunal diversity survey; it should be easy to determine the ecological behavior of each individual species and resulting to develop alternate habitat of affected avifauna & Wildlife Conservation Plan at the 5 km periphery or buffer zone of mining area.

Total 22 line transect were taken in the core and buffer zone during Summer Winter and Autumn seasons survey. During the field surveys, we made a line transect of 1200 m (mostly used a path / trail followed by the villagers to enter in the forest) in which distance sampling were taken in every 300 m in the transect to estimate the population of avifauna, its habit, habitat and nesting pattern including the floral diversity of the proposed mining area. A circular sample plot of 10 m radius had been taken in each transect at an interval of 300 m i.e total 5 sample plots made in one transect namely 0m, 300m, 600m, 900m, 1200m in which vegetation composition (grass, herb, shrub and regeneration)

and all tree species data had been taken including height and girth along with the counting of avifauna & wildlife. The data sheets used during the field survey are as follows:

Table NO. 3.1: Datasheet for Bird status survey

Date: ----- Cell-ID: ----- Team: ----- Trail-length: -----

GPS at every 300 m			Sighting information				Remark
S.N.	Latitude	Longitude	Species	Number	Perp. Dist.	Bearing A T	

Table No 3.2: Datasheet for habitat study at every 300 m on transect line

Date: ----- Cell-ID: ----- Team: ----- Trail-length: -----

S. N.	GPS Location		Time (hrs.)	Land-cover (100m radius)	Vegetation (3 dominant species)			Vegetation composition				Human structure (500m radius)	
	Lat.	Long.			B / A / G / W / S	Tree spp.	Parameters	Observation 1 / 2 / 3 / 4 / 5	Grass	Herb	Shrub		Regeneration

* Land cover – B (barren) / A (Agriculture) / G (Grassland) / W (Woodland) / S (Scrubland)

** Human structure – S (Settlement) / R (Metal road) / E (Electricity) / P (Pond) / W (Well / tube well)

*** Observation – 1. Illicit felling 2. Girdling 3. Dead tree 4. Living / Healthy 5. Diseased

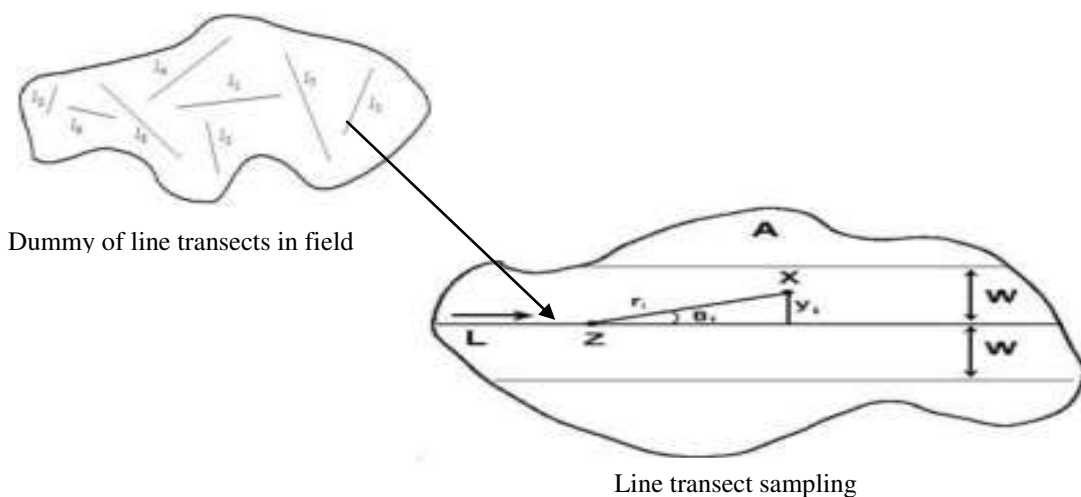
Table No 3.3: Datasheet for wildlife study on transect line

Date: _____ Cell-ID: ___ Team: _____ Trail-length: _____

GPS at every 300 m			Sighting information							
S. N.	Latitude	Longitude	Wildlife Species			Perp. Dist.	Bearing		Type of Species	Observation
			Direct Sighting	Indirect Sighting	Number		A	T		

3.3 Basic Concepts of Line-Transect Sampling

Layout of line transect



CHAPTER- 4

OBSERVATIONS OF COLLECTED DATA AND ANALYSIS

4.1 SUMMER SEASON SURVEY

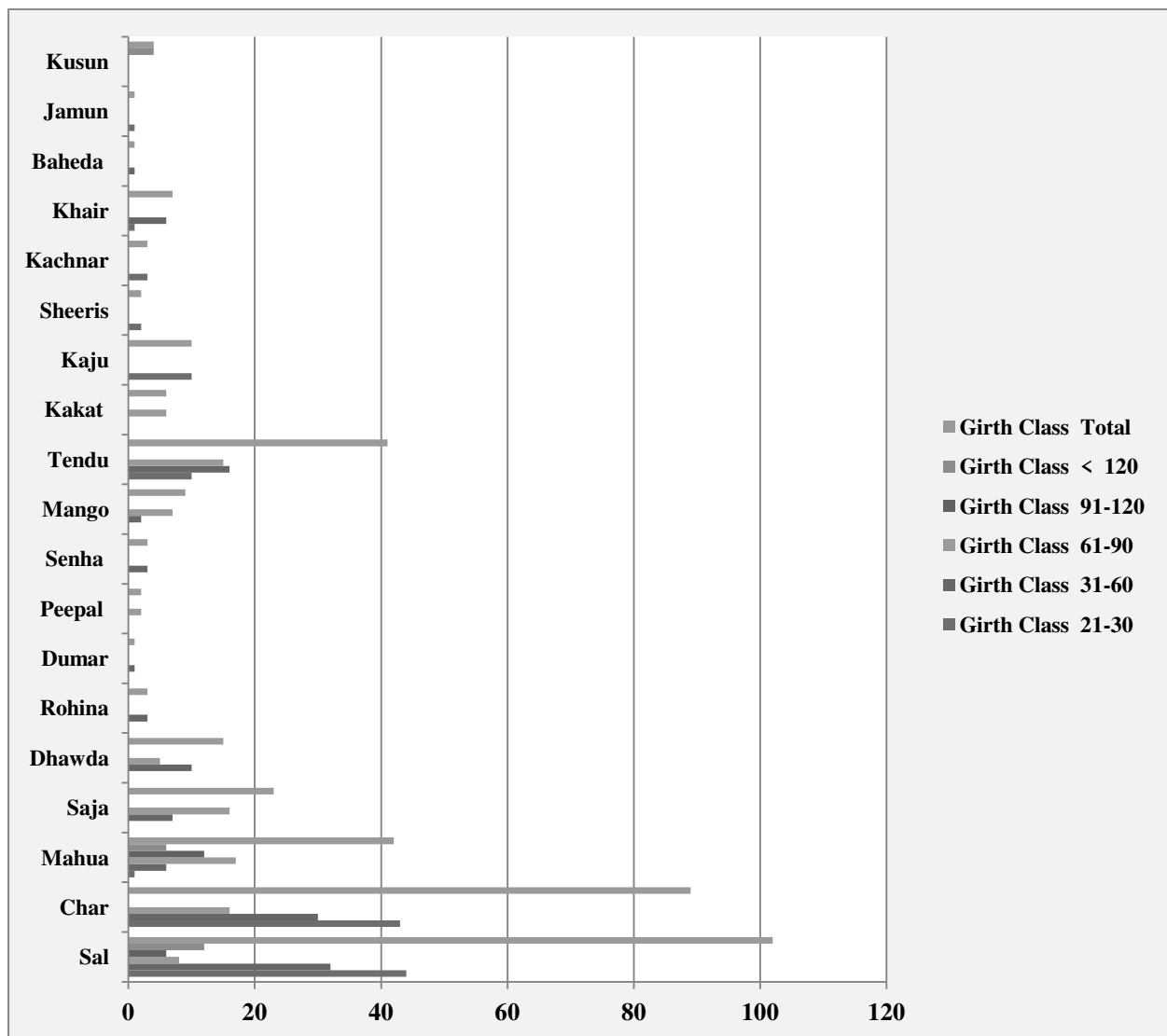
4.1.1 Floral diversity of study site

On the basis of the field survey the data have been collected and analyzed as; The vegetation of core zone of proposed minig area for excavation are mainly surrounded by the tree species: Sal (*Shorea robusta*), Char (*Buchanania lanzan*), Mahua (*Madhuca indica*), Saja (*Terminalia tomentosa*), Dhawda (*Anogeissus latifolia*), Rohina (*Mallotus philippensis*), Dumar (*Ficus racemosa*) Peepal (*Ficus religiosa*), Senha (*Lagerstoemia parviflora*) (Bombax ceiba), Mango (*Mangifera indica*), Tendu (*Diospyros melanoxylon*), Kakat (*Garuga pinnata*) Kaju (*Anacrdium occidentale*) Jamun (*Syzygium cumini*), Kusum (*Schleichera oleosa*) and Baheda (*Terminalia bellerica*) etc. and the complete floral diversity data recorded given below tabulated in table no.4.1.

Table No. 4.1 Summary of available tree species present in study area

Summary of Available Tree Species in 45 sample plot (Total Area = 14137.2 m square)								
S. no.	Tree Species	Girth Class						Regeneration Status
		21-30	31-60	61-90	91-120	< 120	Total	Up to 20 cm
1	Sal	44	32	8	6	12	102	76
2	Char	43	30	16	-	-	89	33
3	Mahua	1	6	17	12	6	42	16
4	Saja	-	7	16	-	-	23	5
5	Dhawda	-	10	5	-	-	15	17
6	Rohina	-	3		-	-	3	8
7	Dumar	-	1		-	-	1	-
8	Peepal	-	-	2	-	-	2	-
9	Senha	-	3		-	-	3	24
10	Mango	-	2	7	-	-	9	-
11	Tendu	10	16	15	-	-	41	33
12	Kakat	-	-	6	-	-	6	9
13	Kaju	10	-	-	-	-	10	-
14	Sheeris	2	-	-	-	-	2	-
15	Kachnar	3	-	-	-	-	3	-
16	Khair	1	6	-	-	-	7	-

17	Baheda		1			1	
18	Jamun	1				1	8
19	Kusun				4	4	
Area Details : Total Number of transect = 9; Total number of plots = 9 x 5 = 45 ; Area of one Sample Plot = 314.16 m Square							



Graph 4.1: Tree diversity of core and buffer zone

Vegetation cover - After the statistical calculation of all 9 transect following vegetation is recorded in table no.4.2

Table No. 4.2 Average vegetation percentage of study site

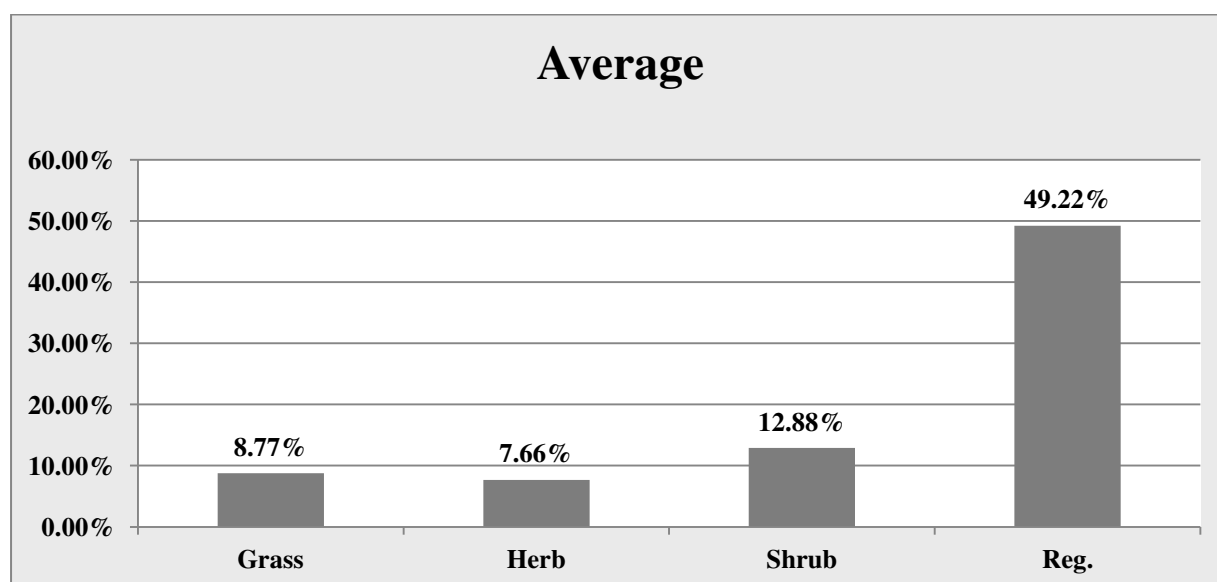
Table No. 02: Overall vegetation percentage of mining Area

Transect No.	Grass	Herb	Shrub	Reg.
1	8%	8%	8%	8%
2	3%	4%	7%	46%
3	18%	11%	21%	90%
4	13%	7%	23%	13%

5	10%	7%	8%	31%
6	4%	8%	8%	9%
7	5%	8%	10%	130%
8	13%	7%	18%	80%
9	5%	9%	13%	36%
Total	79%	69%	116%	443%
% (Total divided by 9)	8.77%	7.66%	12.88%	49.22%

Table no 4.3. Overall Average Vegetation cover of study site

Vegetation	Average
Grass	8.77%
Herb	7.66%
Shrub	12.88%
Reg.	49.22%



Graph 4.2: Overall Average vegetation comparisons of study site

As per the vegetation survey, 9x5 transects sample plots have been drawn in the core and buffer zone respectively; in which the diversity of tree species categorized under five girth classes i.e. 21-30 cm, 31-60 cm, 61-90 cm, 91-120 cm followed by above 120 cm (table no.6 and graph 2); whereas the overall vegetation comparison of floral diversity other than tree species have been recorded i.e. grassland 8.77%, herbs 7.66 %, shrubs 12.88 % the regeneration percentage have been recorded which is 49.22% (Refer to table no. 4.3 and graph 4. 2).

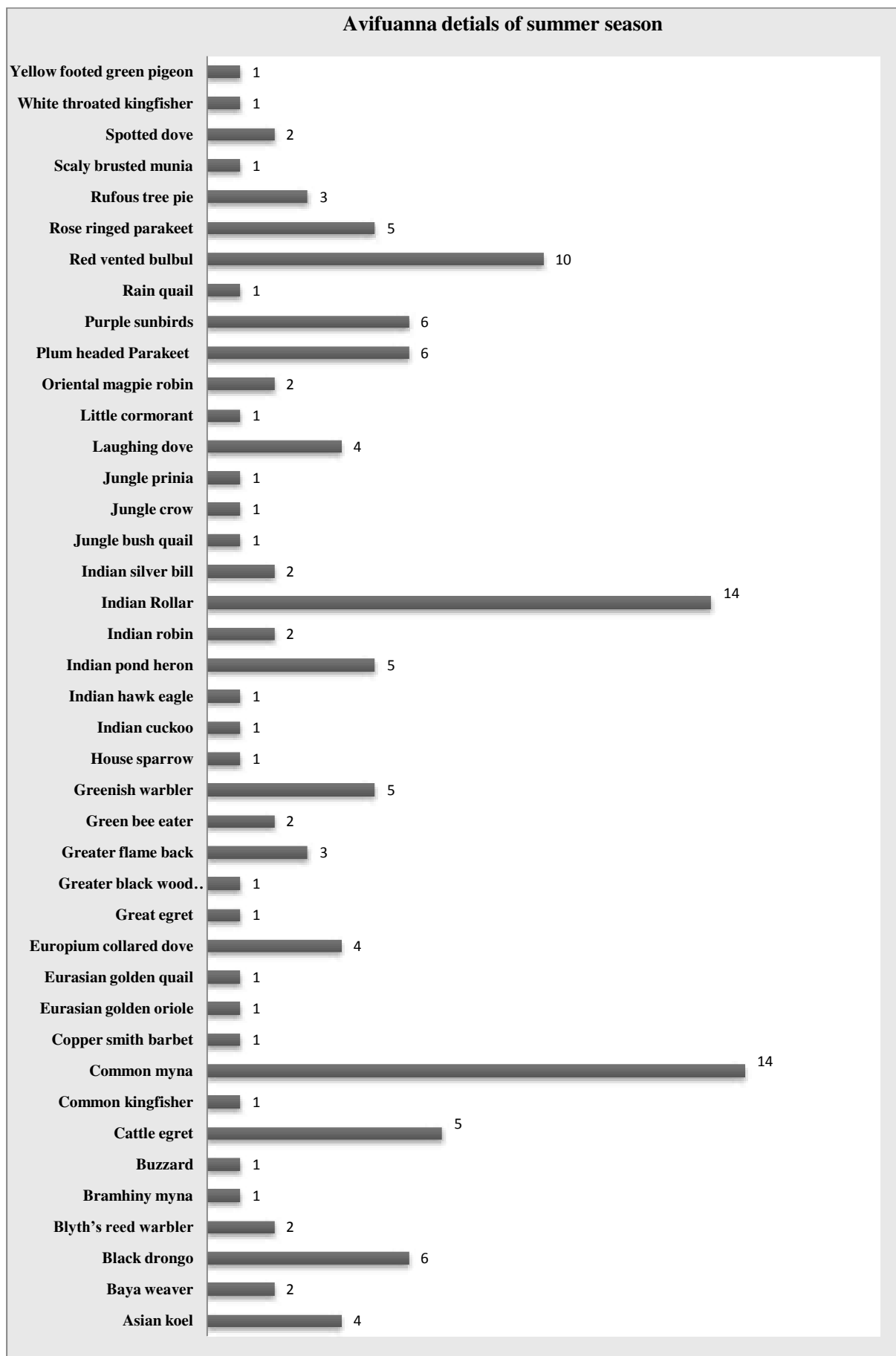
4.1.2 Avifauna

According to State Forest Research and Training Institute (SFRTI) Raipur's seasonal survey work have been carried out in which, 124 individual belongs to 41 different species has been recorded. As per recorded data, the population of avifauna dominated by Common Myna, Indian Roller, Red Vented Bulbul, Black Drongo, Rose Ringed Parakeet, and Purple Sunbirds etc. Mostly the birds found during the survey are endemic and resident. The avifaunal diversity of mining area are tabulated in table no 4.4 and graph 4.3.

Table No.4.4 List of Recorded Avifauna in Summer Seasons on study site

S.N	Birds species	No. of birds
1.	Asian Koel	4
2.	Baya Weaver	2
3	Black Drongo	6
4.	Blyth's Reed Warbler	2
5.	Bramhiny Myna	1
6.	Buzzard	1
7.	Cattle Egret	5
8.	Common Kingfisher	1
9.	Common Myna	14
10.	Copper Smith Barbet	1
11.	Eurasian Golden Oriole	1
12.	Eurasian Golden Quail	1
13.	Europium Collared Dove	3
14.	Great Egret	1
15.	Greater Black Wood Packer	1
16.	Greater Flame Back	3
17.	Green Bee Eater	2
18.	Greenish Warbler	5
19	House Sparrow	1
20.	Indian Cuckoo	1
21.	Indian Hawk Eagle	1
22	Indian Pond Heron	5
23.	Indian Robin	2
24.	Indian Rollar	14
25.	Indian Silver Bill	2
26.	Jungle Bush Quail	1
27.	Jungle Crow	1
28.	Jungle Prinia	1
29.	Laughing Dove	3
30.	Little Cormorant	1
31	Oriental Magpie Robin	2

32.	Plum Headed Parakeet	6
33.	Purple Sunbirds	6
34.	Rain Quail	1
35.	Red Vented Bulbul	10
36.	Rose Ringed Parakeet	4
37.	Rufous Tree Pie	3
38.	Scaly Brusted Munia	1
39.	Spotted Dove	2
40.	White Throated Kingfisher	1
41.	Yellow Footed Green Pigeon	1
Total		124



Graph No. 4.3: Status of individual species found in summer season

4.2 WINTER SEASON SURVEY

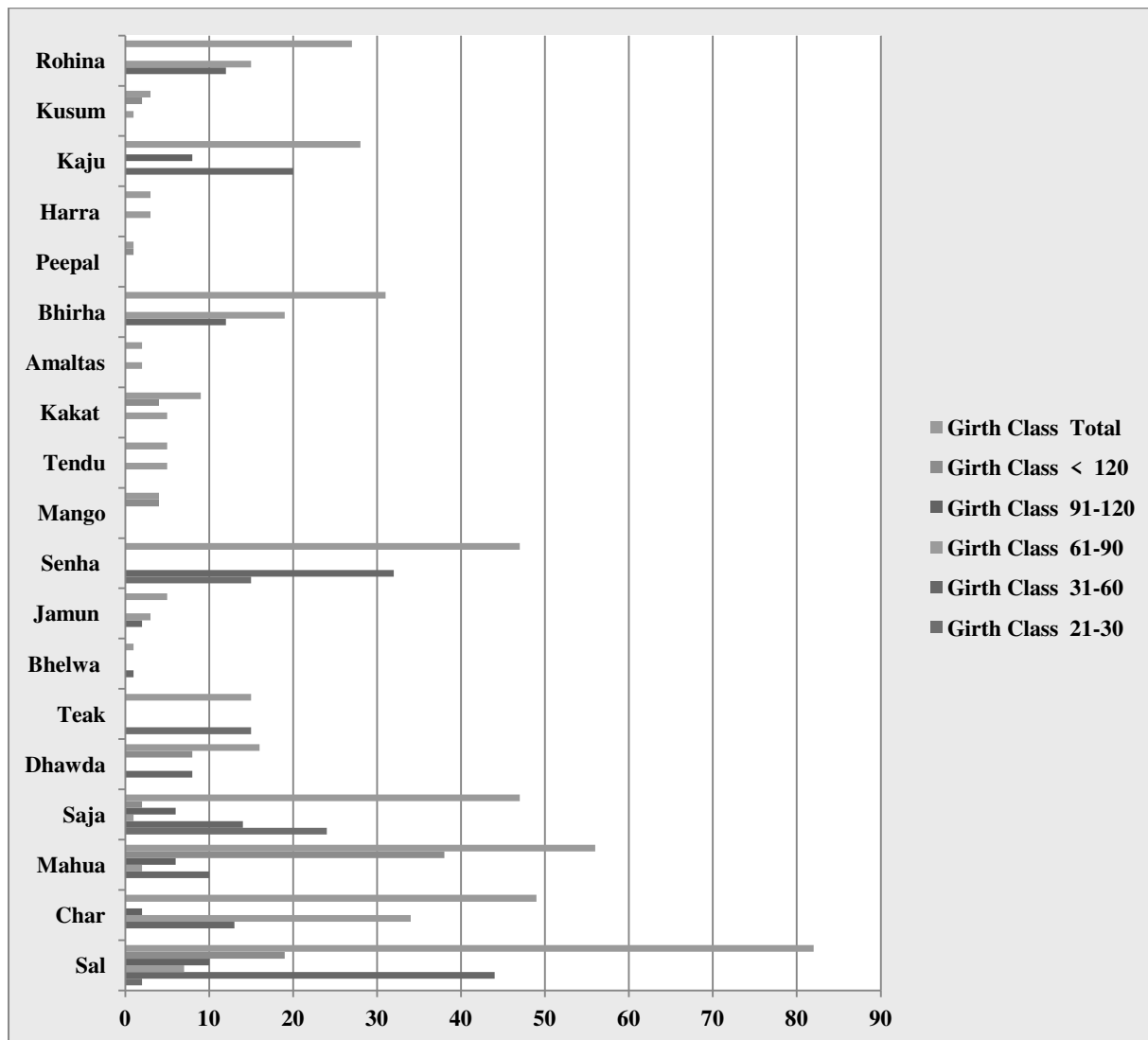
4.2.1 Floral diversity of study site

On the basis of the field survey the data have been observed and analyzed as; The core zone of mining area proposed for excavation are mainly surrounded by the Sal (*Shorea robusta*), Char (*Buchanania lanzan*), Mahua (*Madhuca indica*), Saja (*Terminalia tomentosa*), Dhawda (*Anogeissus latifolia*), Teak (*Tectona grandis*), Bhelwa (*Semecarpus anacardium*), Jamun (*Syzygium cumini*) Senha (*Lagerstoemia parviflora*), Mango (*Mangifera indica*), Tendu (*Diospyros melanoxylon*), Kekat (*Garuga pinnata*), Amaltash (*Cassia fistula*) Peepal, (*ficus religiosa*) Harra (*Terminalia chebula*) and Baheda (*Terminalia bellerica*) etc. and the complete floral diversity data recorded during the seasonal field survey of core and buffer zone of proposed mining site are tabulated / illustrated in table no.4.5.

Table No. 4.5 Available tree species present in study site

Summary of Available Tree Species in 35 sample plot (Total Area = 10995.6 m square)								
S. no.	Tree Species	Girth Class						Regeneration Status
		21-30	31-60	61-90	91-120	< 120	Total	Up to 20 cm
1	Sal	2	44	7	10	19	82	-
2	Char	-	13	34	2	-	49	-
3	Mahua	-	10	2	6	38	56	-
4	Saja	24	14	1	6	2	47	-
5	Dhawda	-	8	-	-	8	16	-
6	Teak	15	-	-	-	-	15	-
7	Bhelwa	-	1	-	-	-	1	-
8	Jamun	-	2	3	-	-	5	-
9	Senha	15	32	-	-	-	47	3
10	Mango	-	-	-	-	4	4	-
11	Tendu	-	-	5	-	-	5	-
12	Kakat	-	-	5	-	4	9	-
13	Amaltas	-	-	2	-	-	2	-
14	Bhirha	-	12	19	-	-	31	-
15	Peepal	-	-	-	-	1	1	-
16	Harra	-	-	3	-	-	3	-
17	Kaju	-	20	-	8	-	28	-
18	Kusum	-	-	1	-	2	3	-
19	Rohina	-	12	15	-	-	27	-

Area Details : Total Number of transect = 7; Total number of plots = 7 x 5 = 35 ; Area of one Sample Plot = 314.16 m Square



Graph 4.4: Tree diversity of core and buffer zone

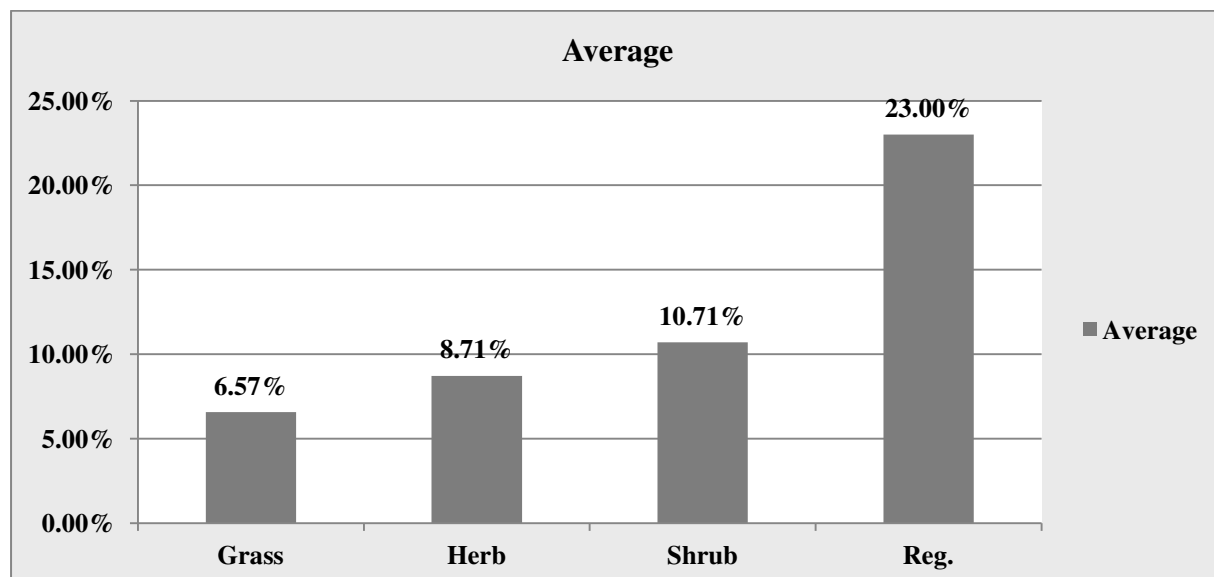
Vegetation cover - After the statistical calculation of all 7 transect following vegetation is recorded in table no. 4.6

Transect No.	Grass	Herb	Shrub	Reg.
1	5%	5%	6%	22%
2	5%	10%	14%	32%
3	8%	7%	8%	30%
4	5%	7%	6%	8%
5	5%	5%	5%	9%
6	7%	17%	14%	30%
7	11%	10%	22%	30%
Total	46%	61%	75%	161%

% (Total divided by 7)	6.57%	8.71%	10.71%	23.00%
------------------------	-------	-------	--------	--------

Table no. 4.7 Overall Average Vegetation cover of mining area

Vegetation	Average
Grass	6.57%
Herb	8.71%
Shrub	10.71%
Reg.	23.00%



Graph 4.5 Overall average vegetation cover of study site

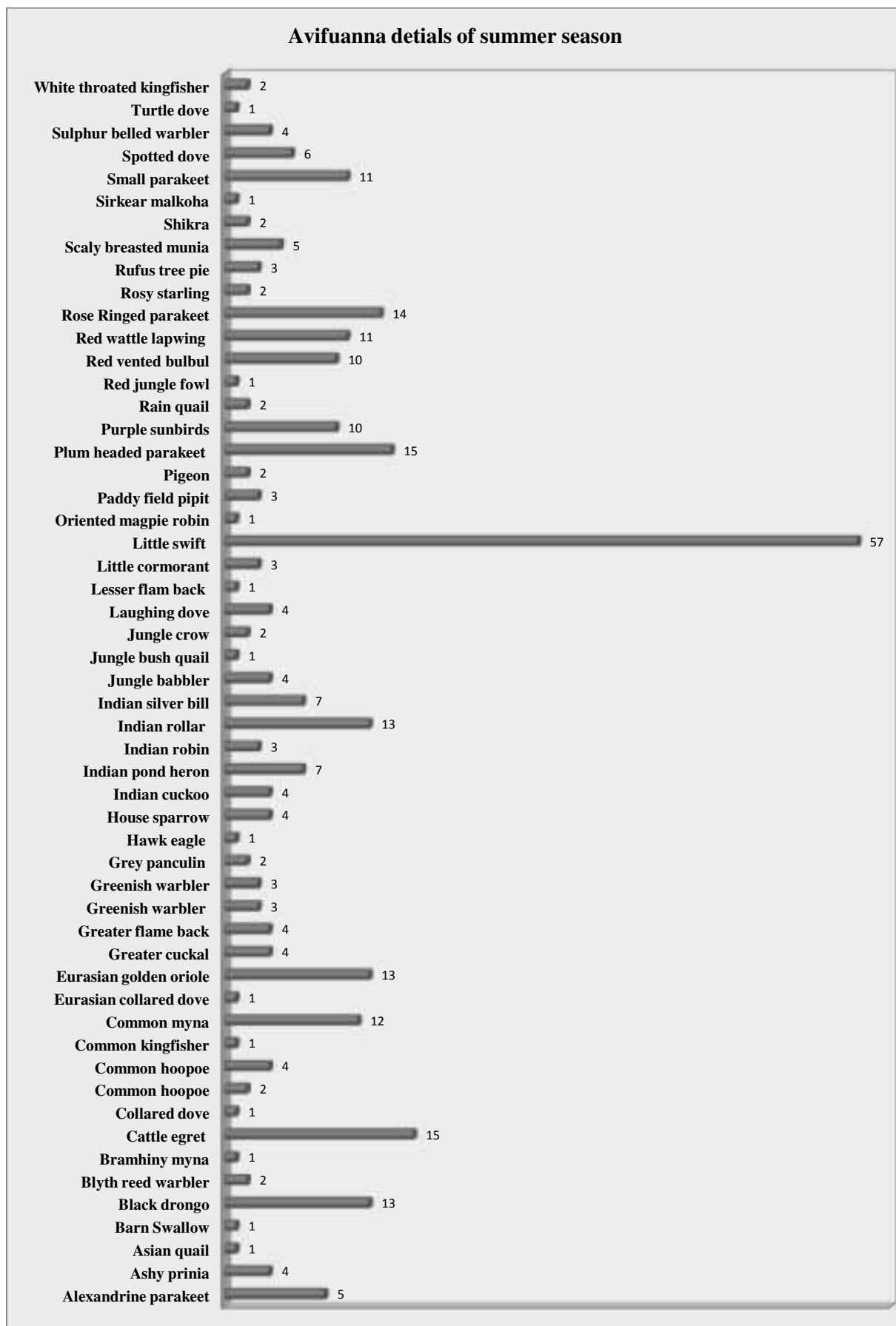
As per the vegetation survey, 7x5 transects sample plots were drawn in the core and buffer zone respectively; in which the diversity of tree species categorized under five girth classes i.e. 21-30 cm, 31-60 cm, 61-90 cm, 91-120 cm followed by above 120 cm. Whereas the overall vegetation comparison of floral diversity other than tree species are recorded in percent i.e. grassland 6.57%, herbs 8.71%, shrubs 10.71% and the regeneration percentage is 23% (Refer to table no. 4.6 and graph 4.5).

4.2.2 Avifaunal diversity

According to seasonal survey, 307 individual belongs to 54 different species has been recorded. As per recorded data, the population of avifauna dominated by Little Swift, Cattle Egret, Rose Ringed Parakeet, Plum Headed Parakeet, Indian Roller, Black Drongo and Eurasian Golden Oriole etc. Mostly the birds found during the survey are endemic and resident. The avifaunal diversity of mining area are tabulated in table no 4.7 and graph 4.6.

Table No.4.7 List of recorded avifauna in winter seasons

S.N	Birds species	Number of birds
1.	Alexandrine Parakeet	5
2.	Ashy Prinia	4
3.	Asian Quail	1
4.	Barn Swallow	1
5.	Black Drongo	13
6.	Blyth Reed Warbler	2
7.	Bramhiny Myna	1
8.	Cattle Egret	15
9.	Collared Dove	1
10.	Common Hoopoe	2
11.	Common Hoopoe	4
12.	Common Kingfisher	1
13.	Common Myna	12
14.	Eurasian Collared Dove	1
15.	Eurasian Golden Oriole	13
16.	Greater Cuckal	4
17.	Greater Flame Back	4
18.	Greenish Warbler	3
19.	Greenish Warbler	3
20.	Grey Panculin	2
21.	Hawk Eagle	1
22.	House Sparrow	4
23.	Indian Cuckoo	4
24.	Indian Pond Heron	7
25.	Indian Robin	3
26.	Indian Rollar	13
27.	Indian Silver Bill	7
28.	Jungle Babbler	4
29.	Jungle Bush Quail	1
30.	Jungle Crow	2
31.	Laughing Dove	4
32.	Lesser Flam Back	1
33.	Little Cormorant	3
34.	Little Swift	57
35.	Oriented Magpie Robin	1
36.	Paddy Field Pipit	3
37.	Pigeon	2
38.	Plum Headed Parakeet	15
39.	Purple Sunbirds	10
40.	Rain Quail	2
41.	Red Jungle Fowl	1
42.	Red Vented Bulbul	10
43.	Red Wattle Lapwing	11
44.	Rose Ringed Parakeet	14
45.	Rosy Starling	2
46.	Rufus Tree Pie	3
47.	Scaly Breasted Munia	5
48.	Shikra	2
49.	Sirkear Malkoha	1
50.	Small Parakeet	11
51.	Spotted Dove	6
52.	Sulphur Belled Warbler	4
53.	Turtle Dove	1
54.	White Throated Kingfisher	2
Total		307



Graph No. 4.6 Status of individual species found in winter season

4.3 AUTUMN SEASON SURVEY

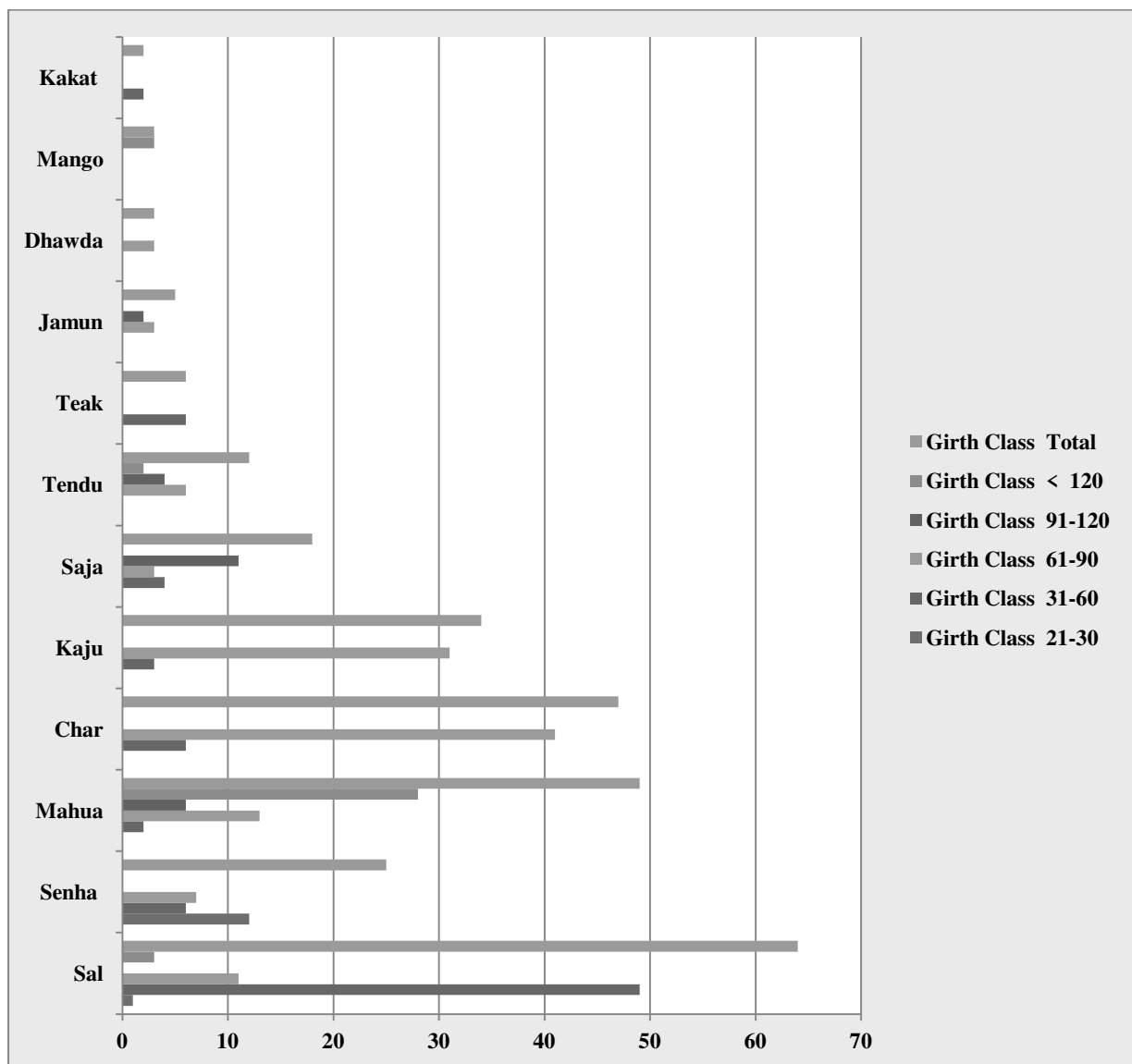
4.3.1 Floral diversity of study site:

On the basis of the field survey the data have been collected and analyzed as; The core zone of mining area proposed for excavation are mainly surrounded by the tree species Sal (*Shorea robusta*), Senha (*Lagerstoemia parviflora*), Mahua (*Madhuca indica*), Char (*Buchanania lanzan*), Kaju (*Anacrdium occidentale*), Tendu (*Diospyros melanoxylon*), Teak (*Tectona grandis*), Jamun, (*Syzygium cumini*) Dhawda (*Anogeissus latifolia*) Mango (*Mangifera indica*) and Kekad (*Garuga pinnata*) etc. and the complete floral diversity data recorded during the seasonal field survey of core and buffer zone of proposed mining site are tabulated / illustrated in table no. 4.8.

Table No. 4.8: Available tree species present in study area

Summary of Available Tree Species in 30 sample plot (Total Area = 9424.8 m square)								
S. no.	Tree Species	Girth Class						Regeneration Status
		21-30	31-60	61-90	91-120	< 120	Total	Up to 20 cm
1	Sal	1	49	11	-	3	64	-
2	Senha	12	6	7	-	-	25	29
3	Mahua	-	2	13	6	28	49	-
3	Char	-	6	41	-	-	47	-
4	Kaju	-	3	31	-	-	34	-
5	Saja	-	4	3	11	-	18	-
6	Tendu	-	-	6	4	2	12	3
7	Teak	-	6	-	-	-	6	-
8	Jamun	-	-	3	2	-	5	-
9	Dhawda	-	-	3	-	-	3	-
10	Mango	-	-	-	-	3	3	-
11	Kakat	-	2	-	-	-	2	-

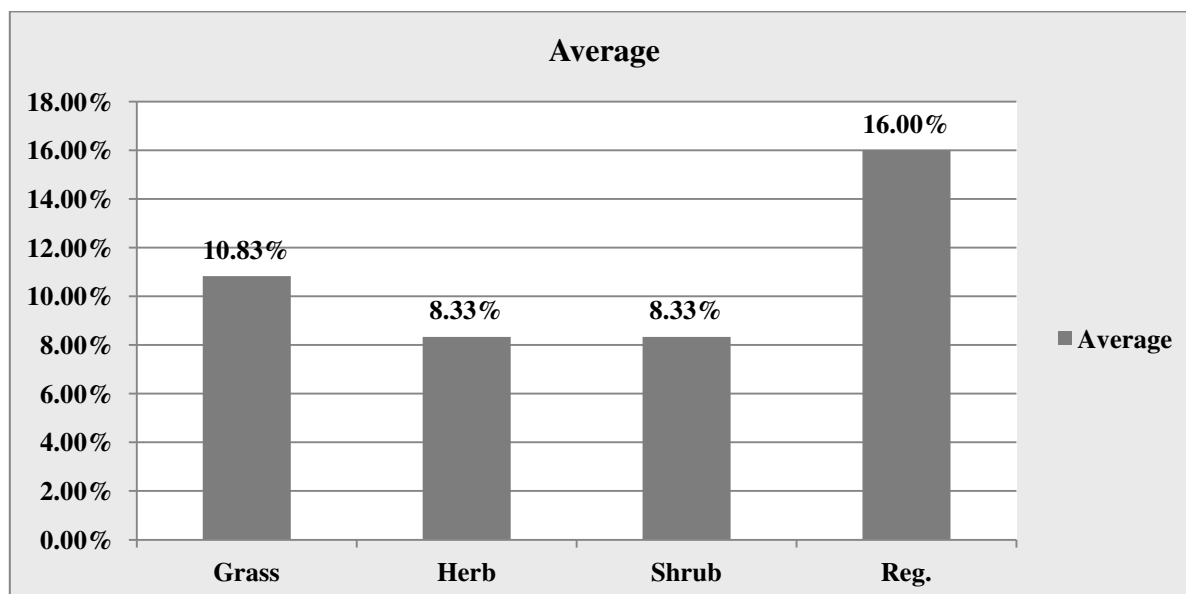
Area Details : Total Number of transect = 6 ; Total number of plots = 6 x 5 = 30 ; Area of one Sample Plot = 314.16 m Square



Graph No.4.7 Available Tree Species present in study area

Table No. 4.9: Average vegetation percentage of mining Area

Transect No.	Grass	Herb	Shrub	Reg.
1	12%	6%	10%	10%
2	10%	9%	9%	20%
3	14%	7%	5%	5%
4	9%	7%	3%	6%
5	9%	9%	10%	25%
6	11%	12%	13%	30%
Total	65%	50%	50%	96%
% (Total divided by 6)	10.83%	8.33%	8.33%	16.00%



Graph No.4.8 Overall Average vegetation percentage of mining Area

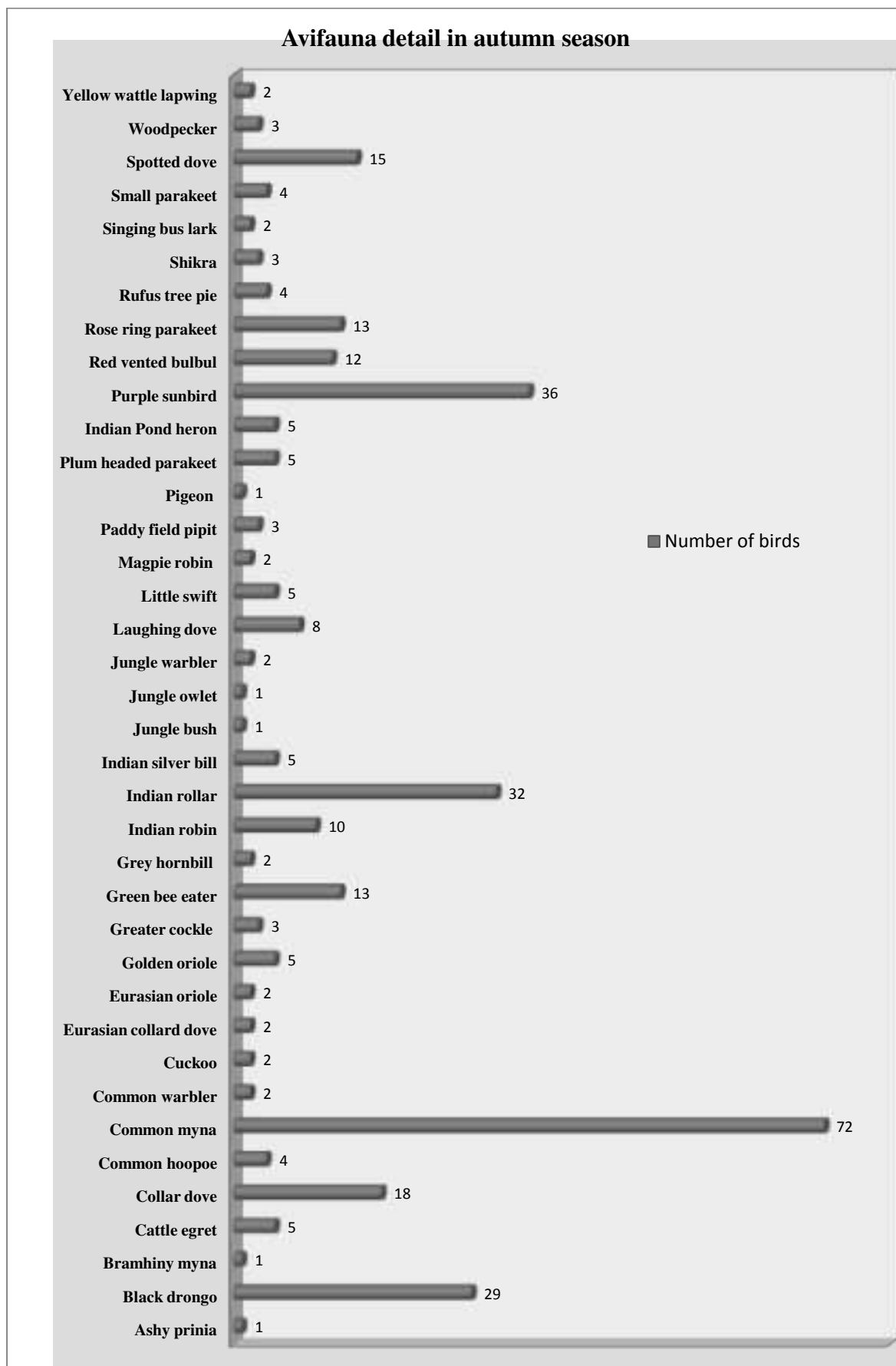
As per the vegetation survey, 6x5 transects sample plots were drawn in the core and buffer zone respectively; in which the diversity of tree species categorized under five girth classes i.e. 21-30 cm, 31-60 cm, 61-90 cm, 91-120 cm followed by above 120 cm. Whereas the overall vegetation comparison of floral diversity other than tree species are recorded in percent i.e. grassland 10.83%, herbs 8.33%, shrubs 8.33% and the regeneration percentage is 16% (Refer to table no. 4.9 and graph 4.8).

4.3.2 Avifauna

According to seasonal survey, 309 individual belongs to 38 different species has been recorded. As per recorded data, the population of avifauna dominated by Common Myna, Black Drongo, Purple Sunbird, Indian Rollar, Collared Dove, Spotted Dove, and Green Bee Eater etc. Mostly the birds found during the survey are endemic and resident. The avifaunal diversity of mining area are tabulated in table no 4.10 and graph 4.9.

Table No. 4.10 List of avifauna in autumn seasons

S.N	Birds species	Number of birds
1	Ashy Prinia	1
2	Black Drongo	29
3	Bramhiny Myna	1
4	Cattle Egret	5
5	Collared Dove	18
6	Common Hoopoe	4
7	Common Myna	48
8	Common Warbler	2
9	Cuckoo	2
10	Eurasian Collard Dove	2
11	Eurasian Oriole	2
12	Golden Oriole	5
13	Greater Cockle	3
14	Green Bee Eater	13
15	Grey Hornbill	2
16	Indian Robin	10
17	Indian Rollar	32
18	Indian Silver Bill	5
19	Jungle Bush	1
20	Jungle Owlet	1
21	Jungle Warbler	2
22	Laughing Dove	8
23	Little Swift	5
24	Magpie Robin	2
25	Paddy Field Pipit	3
26	Pigeon	1
27	Plum Headed Parakeet	5
28	Indian Pond Heron	5
29	Purple Sunbird	36
30	Red Vented Bulbul	12
31	Rose Ring Parakeet	13
32	Rufus Tree Pie	4
33	Shikra	3
34	Singing Bus Lark	2
35	Small Parakeet	4
36	Spotted Dove	15
37	Woodpecker	3
38	Yellow Wattle Lapwing	2
<i>Total</i>		309



Graph No. 4.9 Status of individual species found in April season

CHAPTER - 5

RESULT AND DISCUSSION

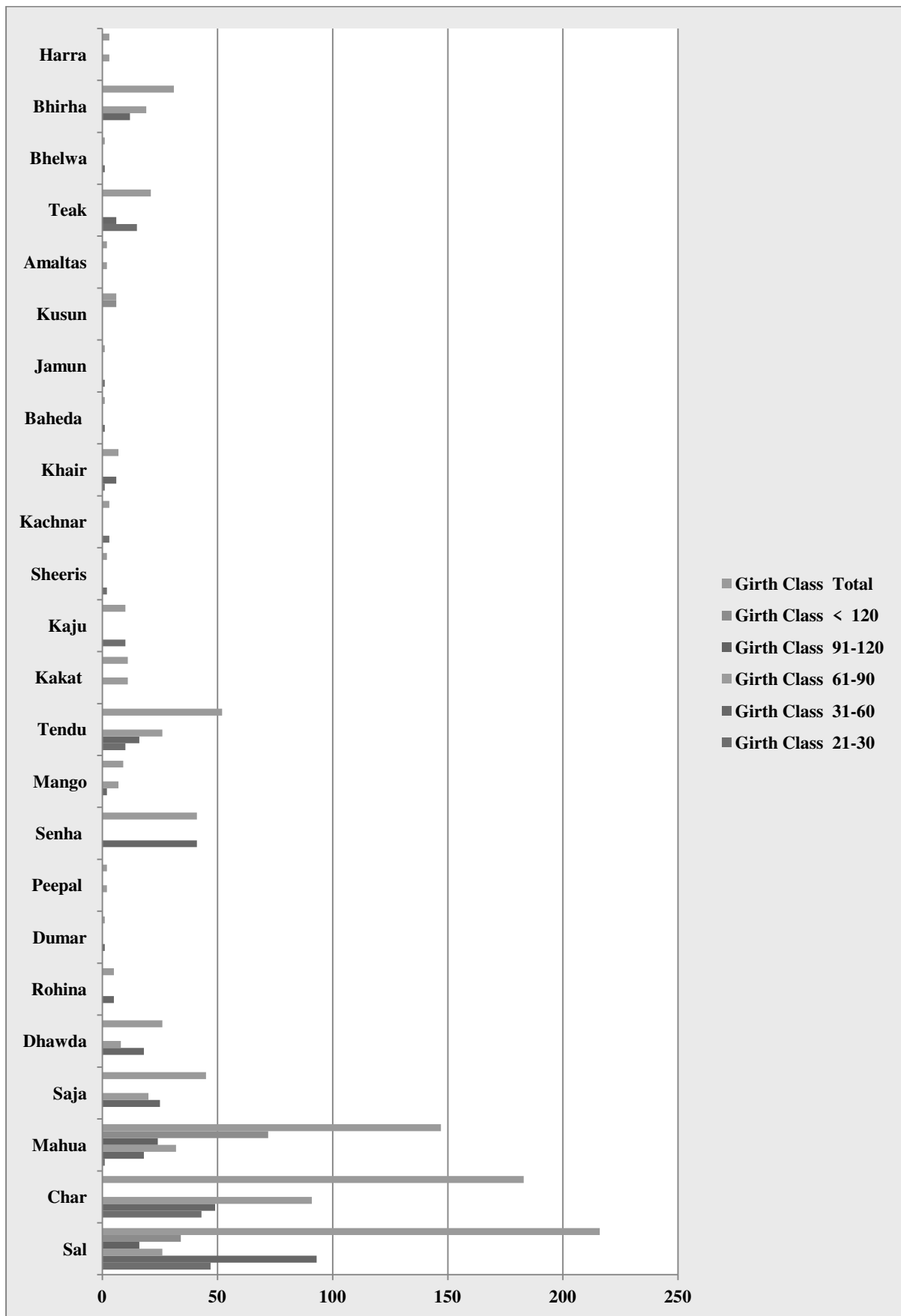
5.1 FLORAL DIVERSITY OF STUDY SITE

On the basis of the field survey (as discussed above in chapter 4) the data have been collected and analyzed as; The core zone of proposed mining area to be surrounded by the tree species : Sal (*Shorea robusta*), Char (*Buchanania lanzan*), Mahua (*Madhuca indica*), Saja (*Terminalia tomentosa*), Dhawda (*Anogeissus latifolia*), Rohina (*Mallotus philippensis*), Dumar (*Ficus glomerata*) Peepal, (*ficus religiosa*) Senha (*Lagerstoemia parviflora*), Mango (*Mangifera indica*), Tendu (*Diospyros melanoxylon*), Kekad (*Garuga pinnata*), Kaju (*Anacrdium occidentale*) Kachnar (*Bauhinia variegata*) Khair (*Senegalia catechu*) Baheda (*Terminalia bellerica*) Jamun (*Syzygium cumini*) Amaltas (*Cassia fistula*) Teak (*Tectona grandis*), Amaltash (*Cassia fistula*) Teak (*Tectona grandis*), Bhelwa (*Semecarpus anacardiam*), Harra (*Terminalia chebula*) and etc. Sal (*Shorea robusta*), Senha (*Lagerstoemia parviflora*), Mango (*Mangifera indica*), Koriya (*Pinus koraiensi*), Plash (*Butea monosperma*), Baheda (*Terminalia bellerica*), and Harra (*Terminalia chebula*), etc. and the complete floral diversity data recorded during the seasonal field survey of core and buffer zone of proposed mining site are tabulated / illustrated in table no.5.1

Table No.5.1 Overall summary of recorded girth class and regeneration status of tree species in study site

Summary of Available Tree Species in 110 sample plot (Total Area = 34557.6 m square)								
S. no.	Tree Species	Girth Class						Regeneration Status
		21-30	31-60	61-90	91-120	< 120	Total	Up to 20 cm
1	Sal	47	93	26	16	34	216	76
2	Char	43	49	91	2		183	33
3	Mahua	1	18	32	24	72	147	16
4	Saja	24	25	20	17	2	45	5
5	Dhawda	-	18	8	-	8	26	17
7	Rohina	-	5	15	-	-	5	8
9	Dumar	-	1	-	-	-	1	-

10	Peepal	-	-	2	-	1	2	-
11	Senha	27	41	7	-	-	41	56
12	Mango	-	2	7	-	7	9	-
13	Tendu	10	16	26	4	2	52	36
14	Kakat	-	2	11	-	4	11	9
15	Kaju	10	23	31	8	-	10	-
16	Sheeris	2	-	-	-	-	2	-
17	Kachnar	3	-	-	-	-	3	-
18	Khair	1	6	-	-	-	7	-
20	Baheda	-	1	-	-	-	1	-
21	Jamun	1	2	6	2	-	1	8
22	Kusun	-	-	1	-	6	6	-
23	Amaltas	-	-	2	-	-	2	-
24	Teak	15	6	-	-	-	21	-
25	Bhelwa	-	1	-	-	-	1	-
26	Bhirha	-	12	19	-	-	31	-
27	Harra	-	-	3	-	-	3	-
<p>Area Details : Total Number of transect = 22; Total number of plots = 22 x 5 = 110; Area of one Sample Plot = 314.16 m Square</p>								

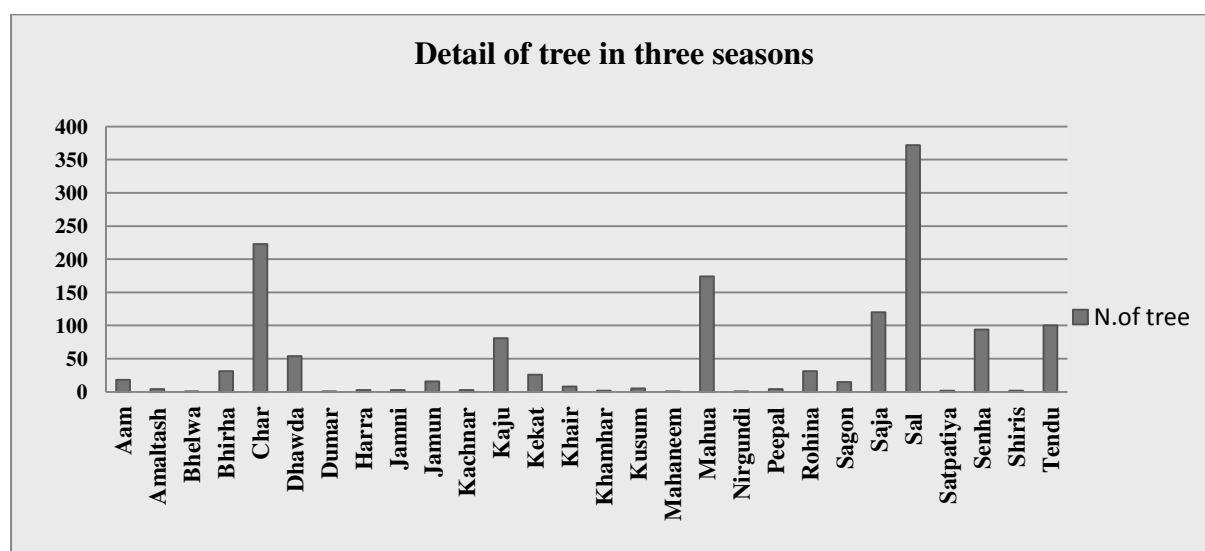


Graph No.5.1 Overall summary of available tree species

28 tree species were also observed such as Sal, Char, Mahua, Tendu mostly found in the study area

Table no.5.2 over all tree Species in three seasons

S.N	Name of Tree Species	No. of tree
1.	Aam	18
2.	Amaltash	4
3.	Bhelwa	1
4.	Bhirha	31
5.	Char	223
6.	Dhawda	54
7.	Dumar	1
8.	Harra	3
9.	Jamni	3
10.	Jamun	16
11.	Kachnar	3
12.	Kaju	81
13.	Kekat	26
14.	Khair	8
15.	Khamhar	2
16.	Kusum	5
17.	Mahaneem	1
18.	Mahua	174
19.	Nirgundi	1
20.	Peepal	4
21.	Rohina	31
22.	Sagon	15
23.	Saja	120
24.	Sal	372
25.	Satpatiya	2
26.	Senha	94
27.	Shiris	2
28.	Tendu	100



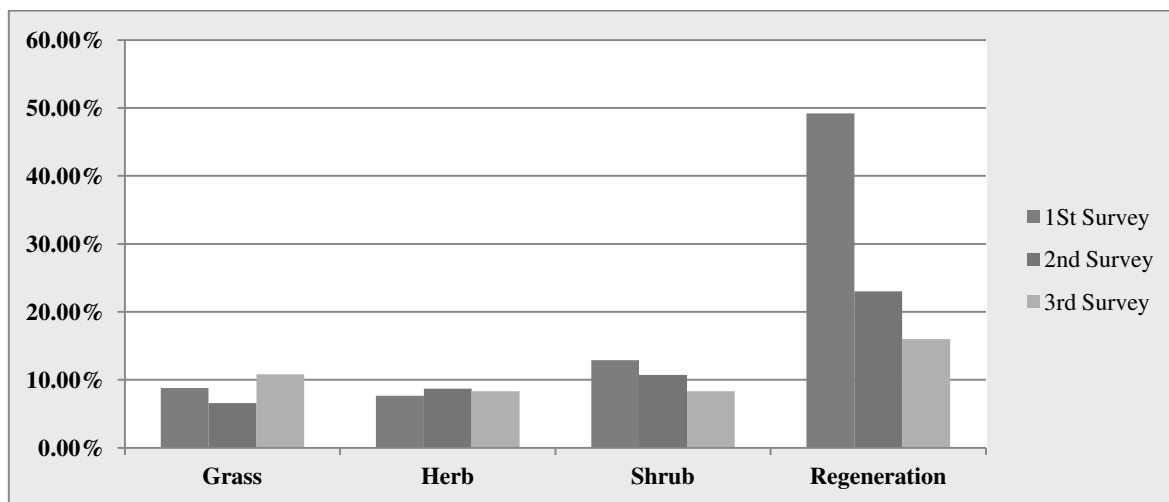
Graph No. 5.2: Status of Tree species found in OCP Baroud

Table no 5. 3 List of tree species present in study site,

S. N	Local Name	Common Name	Botanical name	family
1.	Aam	Mango	<i>Mangifera indica</i>	Anacardiaceae
2.	Amaltash	amaltash	<i>Cassia fistula</i>	Fabaceae
3.	Bahera	Bahera	<i>Terminalia bellerica</i>	Combretaceae
4.	Bhelwa	Bhelwa	<i>Semecarpus anacardiam</i>	Anacardiaceae
5.	Bhirra	Bhirra	<i>Chloroxylon swietenia</i>	Miliaceae
6.	Dhawda		<i>Anogeissus latifolia</i>	Combretaceae
7.	Dumar	Gular	<i>Ficus glomerata</i>	Moraceae
8.	Harra	Harra	<i>Terminalia chebula</i>	Combreraceae
9.	Jamun	Jamun	<i>Syzygium cumini</i>	Myrtaceae
10.	Kachnar	Kachnar	<i>Bauhinia variegata</i>	Leguminosae
11.	Kaju	Kaju	<i>Anacrdium occidentale</i>	Anacardiaceae
12.	Kekad	Kekar	<i>Garuga pinnata</i>	Burseraceae
13.	Kossum	Kusum	<i>Schleichera oleosa</i>	Sapindaceae
14.	Mahaneem	Mahaneem	<i>Ailanthus excelsa</i>	Simarubaceae
15.	Mahua	Mahua	<i>Madhuca indica</i>	Sapotaceae
16.	Sagaon	Teak	<i>Tectona grandis</i>	Lamiaceae
17.	Saja	Saja	<i>Terminallia tomentosa</i>	Combretaceae
18.	Senha	Senha	<i>Lagerstoemia parviflora</i>	Lythraceae
19.	Tendu	Tendu	<i>Diospyros melanoxylon</i>	Ebenaceae
20.	Chhar	Chhar	<i>Buchanania lanzan</i>	Anacardiaceae
21.	Sal	Sal	<i>Shorea robusta</i>	Dipterocarpaceae
22.	Khair	Khair	<i>Senegalia catechu</i>	Fabaceae
23.	Khamhar	Khamhar	<i>Gmelina arborea</i>	Lamiaceae
24.	Nirgundi	Nirgundi	<i>Vitex negundo</i>	Lamiaceae
25.	Peepal	Peepal	<i>Ficus religiosa</i>	Moraceae
26.	Rohina	Rohina	<i>Mallotus philippensis</i>	euphorbia
27.	Satpatiya	Satpatiya	<i>Alstonia scholaris</i>	Apocynaceae
28.	Shirish	Shirish	<i>Albizia lebbek</i>	Fabaceae

Table no.5.4 Seasonal vegetation in Present in the Core & Buffer zone

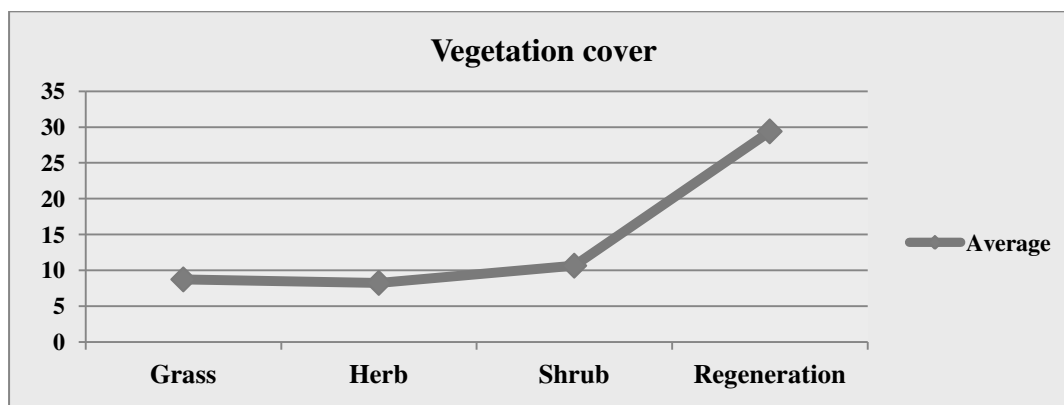
Vegetation	Summer season	Winter seasons	Autumn seasons
Grass	8.77%	6.57%	10.83%
Herb	7.66%	8.71%	8.33%
Shrub	12.88%	10.71%	8.33%
Regeneration	49.22%	23.00%	16.00%



Graph no. 5.3 Seasonal vegetation cover in Present in the Core & Buffer zone

Table no.5.5 Average vegetation in Present in the Core & Buffer zone

Vegetation	Average
Grass	8.72
Herb	8.23
Shrub	10.64
Regeneration	29.4



Graph No. 5.4 Average vegetation in Present in the Core & Buffer zone

- According to the first seasonal survey of study site the 132 individuals of 48 different species in the summer season. 305 Second seasonal and 335 3rd seasonal avifauna species have been reported.
- The avifaunal habitat in the study area were also recorded in each transects.
- Nesting area, height of nest placement, pattern of nesting, Tree species where nest had been placed were also observed in the study area.

- Dominating tree species were also observed such as Sal, Char, Mahua, Tendu mostly found in the study area along with the ficus tree species.

5.2 AVIFAUNAL DIVERSITY OF STUDY SITE

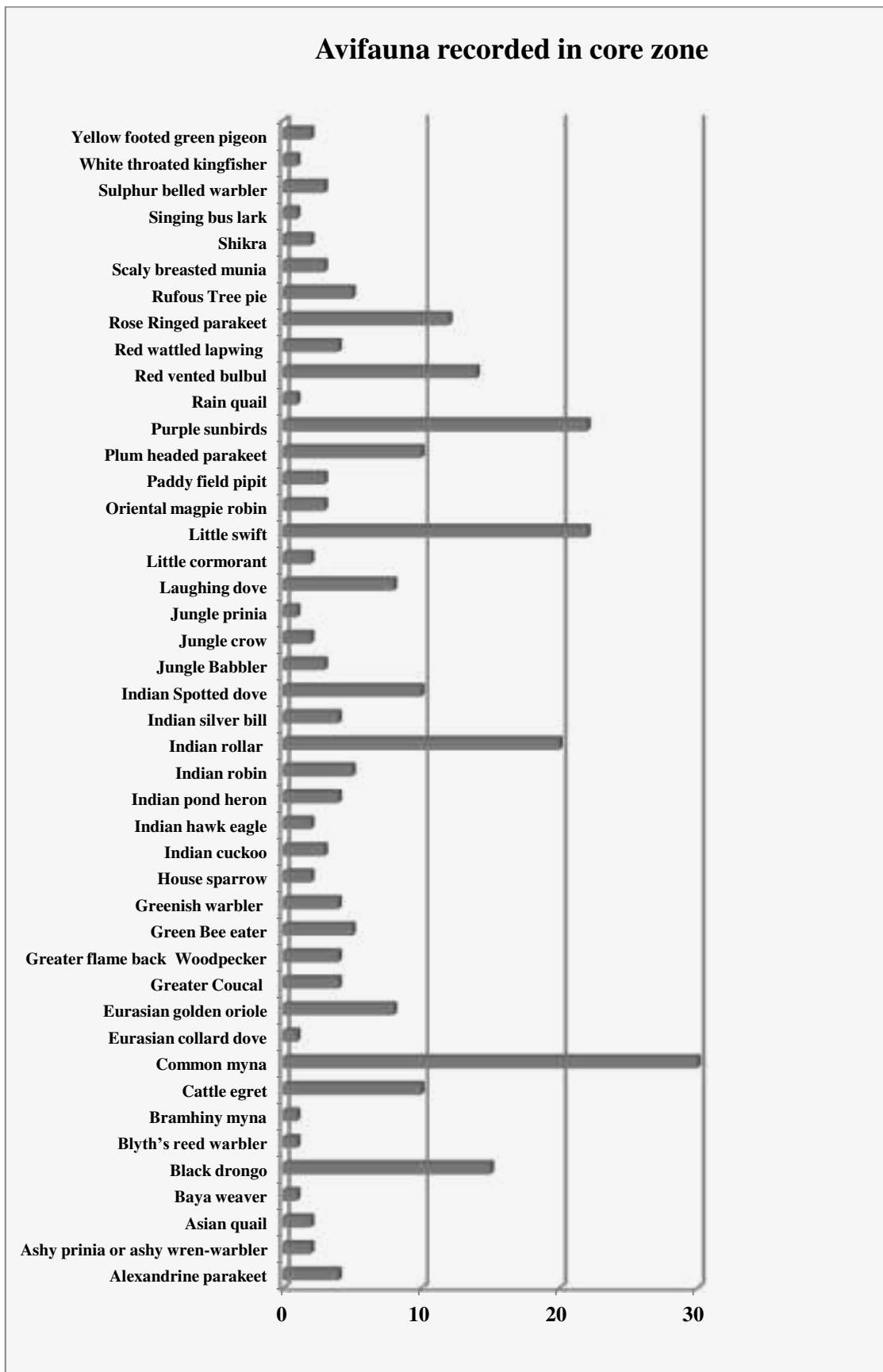
5.2.1 Avifauna recorded in Core zone

The tree seasonal survey of core zone area we are recorded the 267 individuals of 44 different avifauna species.

Table no 5.6 Recorded Avifaunas in core zone area

S.N	Name of birds species	Total no of birds
1.	Alexandrine Parakeet	4
2.	Ashy Prinia Or Ashy Wren-Warbler	2
3.	Asian Quail	2
4.	Baya Weaver	2
5.	Black Drongo	15
6.	Blyth's Reed Warbler	1
7.	Bramhiny Myna	1
8.	Cattle Egret	10
9.	Common Myna	30
10.	Eurasian Collard Dove	1
11.	Eurasian Golden Oriole	8
12.	Greater Coucal	4
13.	Greater Flame Back Woodpecker	4
14.	Green Bee Eater	5
15.	Greenish Warbler	4
16.	House Sparrow	2
17.	Indian Cuckoo	3
18.	Indian Hawk Eagle	2
19.	Indian Pond Heron	4
20.	Indian Robin	5
21.	Indian Rollar	20
22.	Indian Silver Bill	4
23.	Indian Spotted Dove	10
24.	Jungle Babbler	3
25.	Jungle Crow	2
26.	Jungle Prinia	1
27.	Laughing Dove	8
28.	Little Cormorant	2
29.	Little Swift	22
30.	Oriental Magpie Robin	3
31.	Paddy Field Pipit	3

32.	Plum Headed Parakeet	10
33.	Purple Sunbirds	22
34.	Rain Quail	1
35.	Red Vented Bulbul	14
36.	Red Wattle Lapwing	4
37.	Rose Ringed Parakeet	12
38.	Rufous Tree Pie	5
39.	Scaly Breasted Munia	3
40.	Shikra	2
41.	Singing Bus Lark	1
42.	Sulphur Belled Warbler	3
43.	White Throated Kingfisher	1
44.	Yellow Footed Green Pigeon	2
	Total	267



Graph no. 5.5 Avifauna recorded in Core zone of Study site

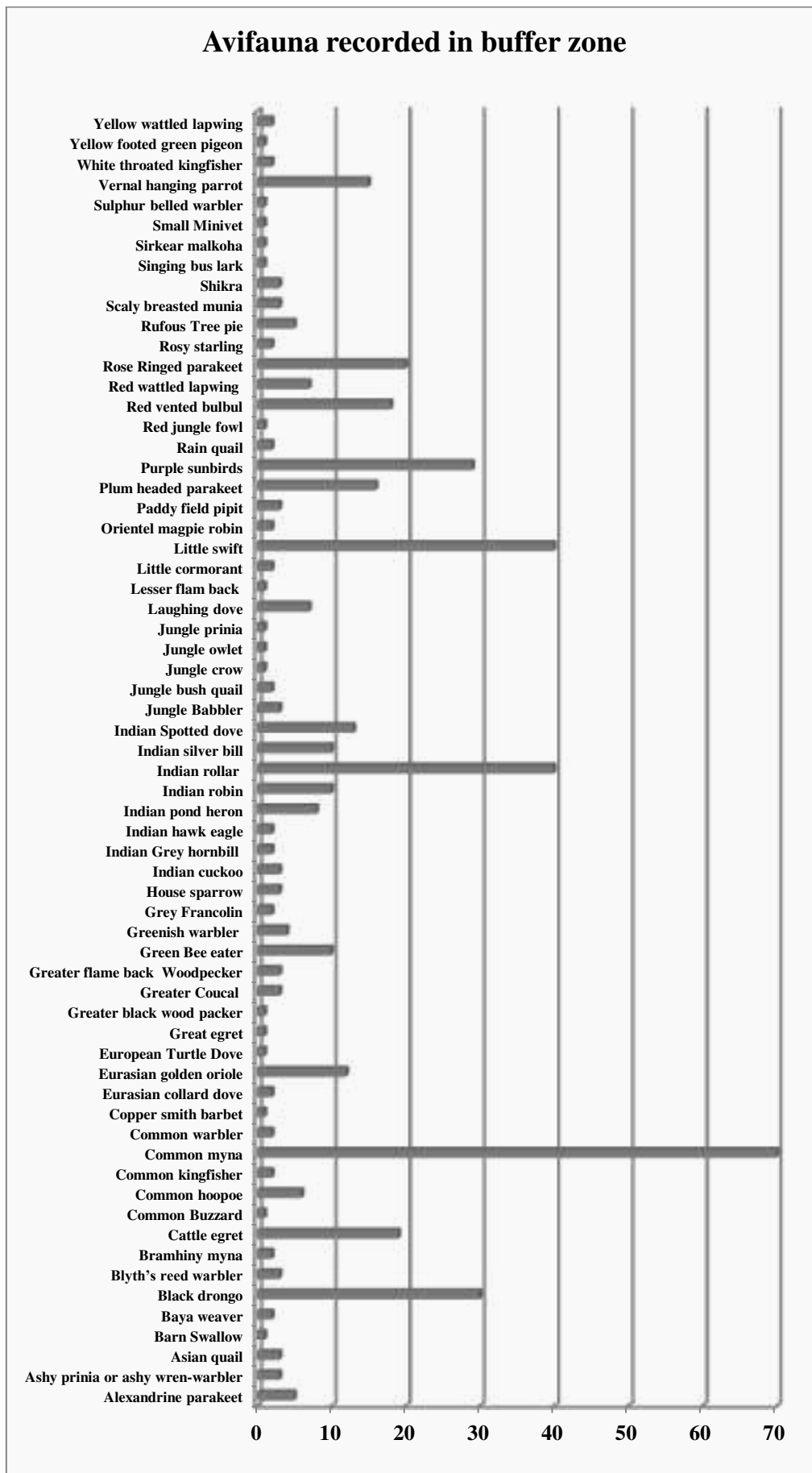
5.2.2 Avifauna recorded in Buffer zone

The tree seasonal survey of buffer zone area we are recorded the 473 individuals of 64 different avifauna species.

Table no 5.7 Recorded avifauna in Buffer zone in study area

S.N	Name of birds species	Total no of birds
1.	Alexandrine Parakeet	5
2.	Ashy Prinia Or Ashy Wren-Warbler	3
3.	Asian Quail	3
4.	Barn Swallow	1
5.	Baya Weaver	2
6.	Black Drongo	30
7.	Blyth's Reed Warbler	3
8.	Bramhiny Myna	2
9.	Cattle Egret	19
10.	Common Buzzard	1
11.	Common Hoopoe	6
12.	Common Kingfisher	2
13.	Common Myna	70
14.	Common Warbler	2
15.	Copper Smith Barbet	1
16.	Eurasian Collard Dove	2
17.	Eurasian Golden Oriole	12
18.	European Turtle Dove	1
19.	Great Egret	1
20.	Greater Black Wood Packer	1
21.	Greater Coucal	3
22.	Greater Flame Back Woodpecker	3
23.	Green Bee Eater	10
24.	Greenish Warbler	4
25.	Grey Francolin	2
26.	House Sparrow	3
27.	Indian Cuckoo	3
28.	Indian Grey Hornbill	2
29.	Indian Hawk Eagle	2
30.	Indian Pond Heron	8
31.	Indian Robin	10
32.	Indian Rollar	40
33.	Indian Silver Bill	10
34.	Indian Spotted Dove	13
35.	Jungle Babbler	3
36.	Jungle Bush Quail	2

37.	Jungle Crow	1
38.	Jungle Owlet	1
39.	Jungle Prinia	1
40.	Laughing Dove	7
41.	Lesser Flam Back	1
42.	Little Cormorant	2
43.	Little Swift	40
44.	Oriental Magpie Robin	2
45.	Paddy Field Pipit	3
46.	Plum Headed Parakeet	16
47.	Purple Sunbirds	29
48.	Rain Quail	2
49.	Red Jungle Fowl	1
50.	Red Vented Bulbul	18
51.	Red Wattled Lapwing	7
52.	Rose Ringed Parakeet	20
53.	Rosy Starling	2
54.	Rufous Tree Pie	5
55.	Scaly Breasted Munia	3
56.	Shikra	3
57.	Singing Bus Lark	1
58.	Sirkear Malkoha	1
59.	Small Minivet	1
60.	Sulphur Belled Warbler	1
61.	Vernal Hanging Parrot	15
62.	White Throated Kingfisher	2
63.	Yellow Footed Green Pigeon	1
64.	Yellow Wattled Lapwing	2
	Total	473



Graph no 5.6. Avifauna recorded in buffer zone of study site

5.3 CONSERVATION STATUS OF AVIFAUNA

According to the First seasonal survey of study site we are found the 124 individuals of 41 species different in the summer season, and second seasonal 305 individuals of different 54 species and 3rd seasonal survey 309 individuals of different 38 avifauna species are recorded.

Overall three seasonal survey total 740 individual species of avifauna were recorded from 64 different species recorded in OCP Baroud area (Refer to table no 5.4 & 5.7&5.10.).

Biodiversity is under treat worldwide and birds are the prime victim of the declining trend of biodiversity. It was observed that many of the birds recorded in OCP Bharoud are enlisted in the threatened categories of IUCN as well as in the schedules of wild life (Protection) Act, 1972.

The conservation status of birds according to IUCN, and the wildlife (Protection) Act, 1972, along with their local status is presented in the table...

Table No. 5.8. Check list of total number of Birds present in OCP Baroud, Raigarh area

S. No.	Common Name	Local Name	Scientific Name	Family	IUCN Status	Habitat Status
1.	Alexandrine Parakeet	Parrot, Tota	<i>Psittacula eupatria</i>	<i>Psittacidae</i>	LC	R
2.	Ashy Prinia Or Ashy Wren-Warbler	-----	<i>Prinia socialis</i>	<i>Cisticolidae</i>	LC	R
3.	Barn Swallow	-----	<i>Hirundo rustica</i>	<i>Hirundinidae</i>	LC	R
4.	Baya Weaver	Gauraiya	<i>Ploceus philippinus</i>	<i>Ploceidae</i>	LC	R
5.	Black Drongo	Karrauna	<i>Dicrurus macrocercus</i>	<i>Dicruridae</i>	LC	R
6.	Blyth Reed Warbler	-----	<i>Acrocephalus dumetorum</i>	<i>Acrocephalidae</i>	LC	R
7.	Bramhiny Myna	Maina	<i>Sturnia pagodarum</i>	<i>Sturnidae</i>	LC	R
8.	Common Buzzard	-----	<i>Buteo buteo</i>	<i>Accipitridae</i>	LC	R
9.	Cattle Egret	Gay Bagula	<i>Bubulcus ibis</i>	<i>Ardeidae</i>	LC	R
10.	Common Hoopoe	-----	<i>Upupa epops</i>	<i>Upupidae</i>	LC	R
11.	Common Kingfisher	Kilkila	<i>Alcedo atthis</i>	<i>Alcedinidae</i>	LC	R
12.	Common Myna	Salhai/ desimyna	<i>Acridotheres tristis</i>	<i>Sturnidae</i>	LC	R
13.	Copper Smith Barbet	-----	<i>Psilopogon haemacephalus</i>	<i>Megalaimidae</i>	LC	R
14.	Eurasian Collared Dove	Padki	<i>Streptopelia decaocto</i>	<i>Columbidae</i>	LC	R
15.	Eurasian Golden Oriole	-----	<i>Oriolus oriolus</i>	<i>Oriolidae</i>	LC	R
16.	European Turtle Dove	Padki	<i>Streptopelia turtur</i>	<i>Columbidae</i>	VU	R
17.	Great Egret	Bagula	<i>Ardea alba</i>	<i>Ardeidae</i>	LC	R

18.	Greater Coucal	Koyal	<i>Centropus sinensis</i>	<i>Cuculidae</i>	LC	R
19.	Greater Black Wood Packer	Katpodva	<i>Dryocopus martius</i>	<i>Picidae</i>	LC	R
20.	Greater Flame Back Woodpecker	Katpodva	<i>Dryocopus martius</i>	<i>Picidae</i>	LC	R
21.	Green Bee Eater	Patinga	<i>Merops orientalis</i>	<i>Meropidae</i>	LC	R
22.	Greenish Warbler	-----	<i>Phylloscopus trochiloides</i>	<i>Phylloscopidae</i>	LC	R
23.	Grey Francolin	-----	<i>Francolinus pondicerianus</i>	<i>Phasianidae</i>	LC	R
24.	Grey Hornbill	Dhanesh	<i>(Ocyeros birostris</i>	<i>Bucerotidae</i>	LC	R
25.	House Sparrow	Gouriaya	<i>Passer domesticus</i>	<i>Passeridae</i>	LC	R
26.	Indian Cuckoo	-----	<i>Cuculus micropterus</i>	<i>cuculidae</i>	LC	R
27.	Indian Hawk Eagle	-----	<i>Nisaetus cirrhatus</i>	<i>Accipitridae</i>	LC	R
28.	Indian Pond Heron	Khokho bakli	<i>Ardeola grayii</i>	<i>Ardeidae</i>	LC	R
29.	Indian Robin	Chirak	<i>Saxicoloides fulicatus</i>	<i>Muscicapidae</i>	LC	R
30.	Indian Roller	Nilkanth/teohra	<i>Coracias benghalensis</i>	<i>Coraciidae</i>	LC	R
31.	Indian Silver Bill	-----	<i>Euodice malabarica</i>	<i>Estrildidae</i>	LC	R
32.	Indian Spotted Dove	Padki	<i>Streptopelia chinensis suratensis</i>	<i>Columbidae</i>	LC	R
33.	Jungle Babbler	Satbhaiya	<i>Turdoides striata</i>	<i>Leiothrichidae</i>	LC	R
34.	Jungle Bush Quail	Titar	<i>Perdica asiatica</i>	<i>Phasianidae</i>	LC	R
35.	Jungle Crow	Koua	<i>Corvus culminatus</i>	<i>Corvidae</i>	LC	R
36.	Jungle Owlet	Ullu	<i>Glaucidium radiatum</i>	<i>Strigidae</i>	LC	R
37.	Jungle Prinia	-----	<i>Prinia sylvatica</i>	<i>Cistacolidae</i>	LC	R
38.	Laughing Dove	Padki	<i>Spilopelia senegalensis</i>	<i>Columbidae</i>	LC	R
39.	Lesser Flame Back	-----	<i>Dinopium benghalense</i>	<i>Picidae</i>	LC	R
40.	Little Cormorant	-----	<i>Microcarbo niger</i>	<i>Phalacrocoracidae</i>	LC	R
41.	Little Swift	-----	<i>Apus affinis</i>	<i>Apodidae</i>	LC	R
42.	Oriental Magpie Robin	-----	<i>Copsychus saularis</i>	<i>Muscicapidae</i>	LC	R
43.	Paddy Field Pipit	-----	<i>Anthus rufulus</i>	<i>Motacillidae</i>	LC	R
44.	Yellow-Footed Green Pigeon	Kabootar	<i>Treron phoenicoptera</i>	<i>Columbidae</i>	LC	R
45.	Plum Headed Parakeet	Tota/Sua	<i>Psittacula cyanocephala</i>	<i>Psittacidae</i>	LC	R
46.	Purple Sun Bird	-----	<i>Nectarania asiatica asiatica (Latham)</i>	<i>Nectariniini</i>	LC	R
47.	Rain Quail	Quail	<i>Coturnix coromandelica</i>	<i>Phasianidae</i>	LC	R
48.	Red Jungle Fowl	Jungli murga	<i>Gallus gallus</i>	<i>Phasianidae</i>	LC	R
49.	Red Vented Bulbul	Fikkadlow	<i>Pycnonotus cafer</i>	<i>Pycnonotidae</i>	LC	R
50.	Red Wattled Lapping	-----	<i>Vanellus indicus</i>	<i>Charadriidae</i>	LC	R
51.	Rose Ringed Parakeet	Tota/Sua	<i>Psittacula krameri</i>	<i>Psittaculidae</i>	LC	R
52.	Rosy Starling	-----	<i>Pastor roseus</i>	<i>Sturnidae</i>	LC	R
53.	Rufous Tree Pie	-----	<i>Dendrocitta vagabunda</i>	<i>Corvini</i>	LC	R
54.	Scaly Breasted Munia	-----	<i>Lonchura punctulata</i>	<i>Estrildidae</i>	LC	R
55.	Shikra	Cheel	<i>Accipiter badius</i>	<i>Accipitridae</i>	LC	R
56.	Singing Bush Lark	-----	<i>Mirafra javanica</i>	<i>Alaudidae</i>	LC	R
57.	Sirkeer Malkoha	-----	<i>Taccocua leschenaultii</i>	<i>Cuculidae</i>	LC	R
58.	Small Minivet	-----	<i>Pericrocotus</i>	<i>Campephagida</i>	LC	R

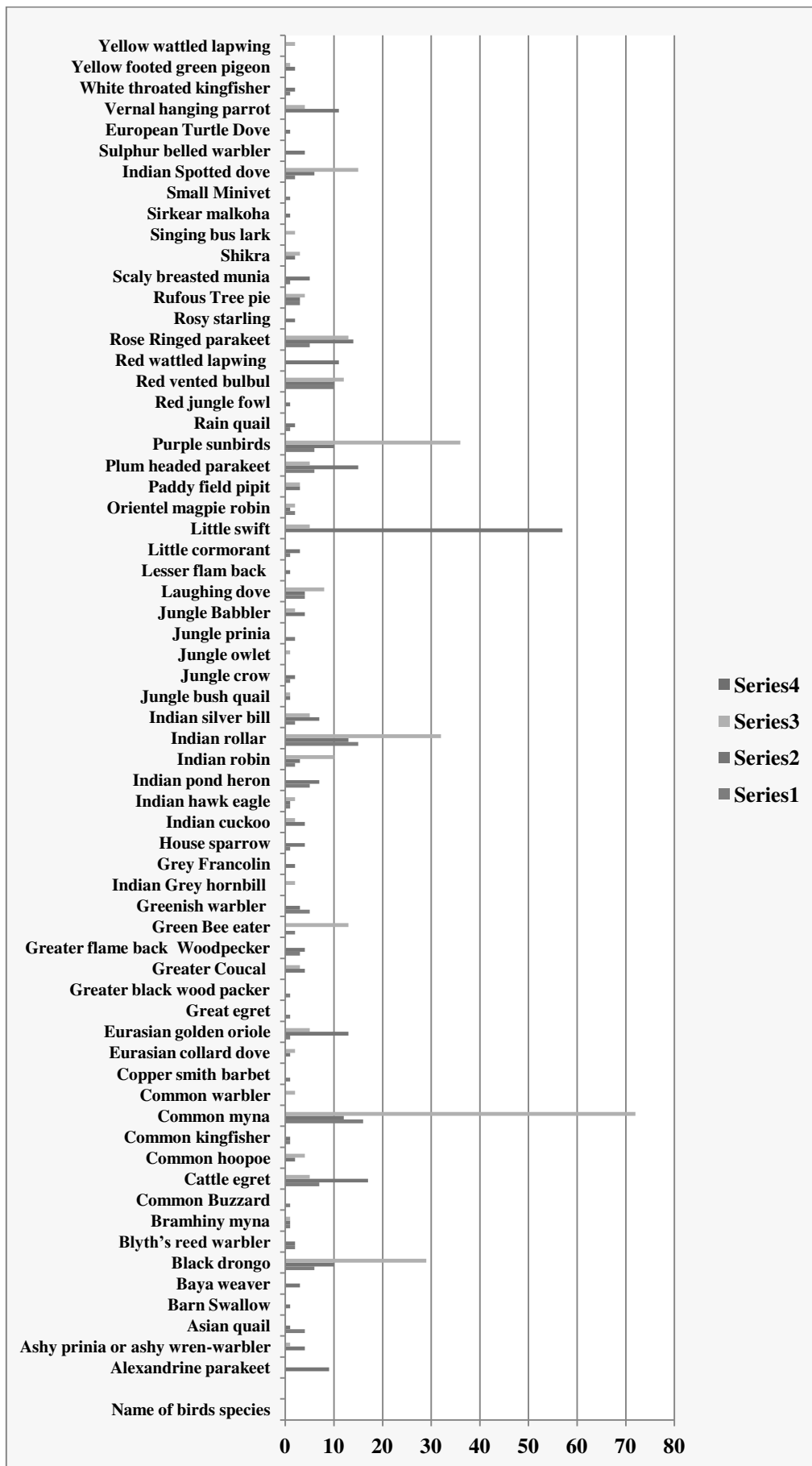
59.	Spotted Dove	-----	<i>Streptopelia chinensis suratensis</i>	<i>Columbidae</i>	LC	R
60.	Sulphur-Bellied Warbler	-----	<i>Phylloscopus griseolus</i>	<i>Acrocephalidae</i>	LC	R
61.	White Throated Kingfisher	Kilkila	<i>Halcyon smyrnensis</i>	<i>Alcedinidae</i>	LC	R
62.	Yellow Wattled Lapwing	-----	<i>Vanellus malabaricus</i>	<i>Charadriidae</i>	LC	R
63.	Yellow-Footed Green Pigeon	Kabootar	<i>Treron phoenicoptera</i>	<i>Columbidae</i>	LC	R
64.	Vernal Hanging Parrot	Tota	<i>Loriculus vernalis</i>	<i>Psittaculidae</i>	LC	R

- **Extinct (EX)** – beyond reasonable doubt that the species is no longer extant.
- **Extinct in the wild (EW)** – survives only in captivity, cultivation and/or outside native range, as presumed after exhaustive surveys.
- **Critically endangered (CR)** – in a particularly and extremely critical state.
- **Endangered (EN)** – very high risk of extinction in the wild, meets any of criteria A to E for Endangered.
- **Vulnerable (VU)** – meets one of the 5 red list criteria and thus considered to be at high risk of unnatural (human-caused) extinction without further human intervention.
- **Near threatened (NT)** – close to being at high risk of extinction in the near future.
- **Least concern (LC)** – unlikely to become extinct in the near future.
- **Not evaluated (NE)**

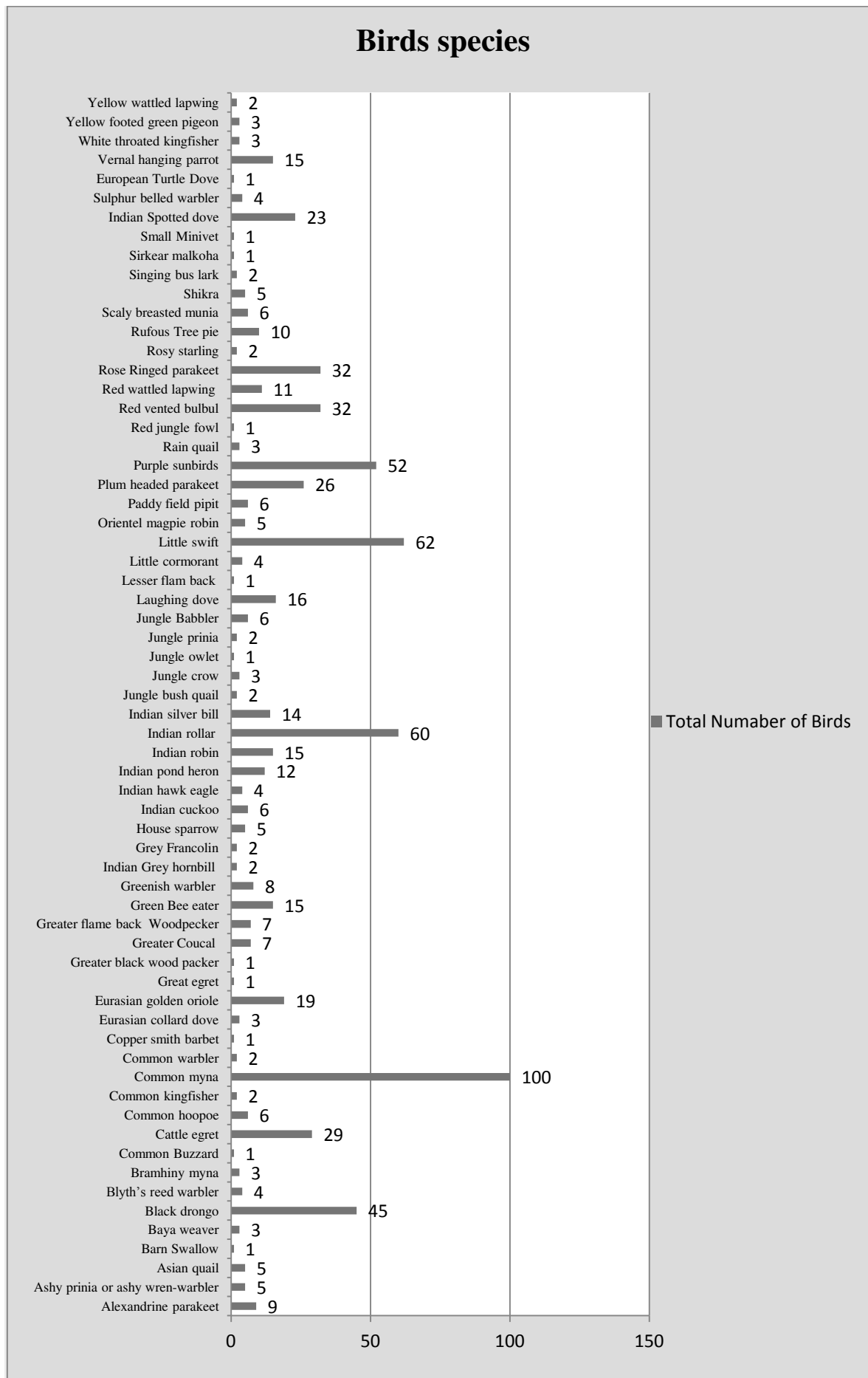
Table no.5.9 Seasonal Variation of Birds species Present in OCP Baroud, Raigarh

S.N	Name of birds species	Summer	Winter	Autumn	Total No. Of bird in three season
1.	Alexandrine Parakeet	-	9	-	9
2.	Ashy Prinia Or Ashy Wren-Warbler	-	4	1	5
3.	Asian Quail	4	1	-	5
4.	Barn Swallow	-	1	-	1
5.	Baya Weaver	-	3	-	3
6.	Black Drongo	6	10	29	45
7.	Blyth's Reed Warbler	2	2	-	4
8.	Bramhiny Myna	1	1	1	3
9.	Common Buzzard	1	-	-	1
10.	Cattle Egret	7	17	5	29
11.	Common Hoopoe	-	2	4	6
12.	Common Kingfisher	1	1	-	2
13.	Common Myna	16	12	72	100
14.	Common Warbler	-	-	2	2
15.	Copper Smith Barbet	1	-	-	1
16.	Eurasian Collard Dove	-	1	2	3
17.	Eurasian Golden Oriole	1	13	5	19
18.	Great Egret	1	-	-	1
19.	Greater Black Wood Packer	1	-	-	1
20.	Greater Coucal	-	4	3	7

21.	Greater Flame Back Woodpecker	3	4	-	7
22.	Green Bee Eater	2	-	13	15
23.	Greenish Warbler	5	3	-	8
24.	Indian Grey Hornbill	-	-	2	2
25.	Grey Francolin	-	2	-	2
26.	House Sparrow	1	4	-	5
27.	Indian Cuckoo	-	4	2	6
28.	Indian Hawk Eagle	1	1	2	4
29.	Indian Pond Heron	5	7	-	12
30.	Indian Robin	2	3	10	15
31.	Indian Rollar	15	13	32	60
32.	Indian Silver Bill	2	7	5	14
33.	Jungle Bush Quail	-	1	1	2
34.	Jungle Crow	1	2	-	3
35.	Jungle Owlet	-	-	1	1
36.	Jungle Prinia	2	-	-	2
37.	Jungle Babbler	-	4	2	6
38.	Laughing Dove	4	4	8	16
39.	Lesser Flam Back	-	1	-	1
40.	Little Cormorant	1	3	-	4
41.	Little Swift	-	57	5	62
42.	Oriental Magpie Robin	2	1	2	5
43.	Paddy Field Pipit	-	3	3	6
44.	Plum Headed Parakeet	6	15	5	26
45.	Purple Sunbirds	6	10	36	52
46.	Rain Quail	1	2	-	3
47.	Red Jungle Fowl	-	1	-	1
48.	Red Vented Bulbul	10	10	12	32
49.	Red Wattled Lapwing	-	11	-	11
50.	Rose Ringed Parakeet	5	14	13	32
51.	Rosy Starling	-	2	-	2
52.	Rufous Tree Pie	3	3	4	10
53.	Scaly Breasted Munia	1	5	-	6
54.	Shikra	-	2	3	5
55.	Singing Bus Lark	-	-	2	2
56.	Sirkear Malkoha	-	1	-	1
57.	Small Minivet	1	-	-	1
58.	Indian Spotted Dove	2	6	15	23
59.	Sulphur Belled Warbler	-	4	-	4
60.	European Turtle Dove	-	1	-	1
61.	Vernal Hanging Parrot	-	11	4	15
62.	White Throated Kingfisher	1	2	-	3
63.	Yellow Footed Green Pigeon	-	2	1	3
64.	Yellow Wattled Lapwing	-	-	2	2
Total		124	307	309	740



Graph No. 5.7: Seasonal Variation of individual avifauna species found in study area



Graph no. 5.8. Species variation of avifauna

5.4 DISCUSSION

During field survey observation OCP Baroud area we had surveyed the area of Comp. 285 & 286 (Core zone) and 1312 (Buffer zone) in which total 22 transect were made to study the existing avifauna of the area and their habitat including wildlife and existing flora and encroachments if any. After seasonal survey, total 740 individual species of avifauna were recorded from 64 different species recorded in OCP Baroud area (Refer to the table no. 5.9).

According to the summer seasonal survey of study site we are found the 124 individuals of 41 different species in the Summer season, and Winter seasonal 305 individuals of 54 different species and Autumn seasonal survey 309 individuals and 38 different avifauna species are recorded. (Refer to table no.5.9 graph no.5.7)

Accordingly, the alternative habitat development proposed in the buffer zone (Bulakela village) comp.no.1312 for the conservation of avifauna for better conservation measures artificial nesting trail proposed for avifauna as per their habit, habitat, and behavior and nesting pattern.

A part from the above survey technique we studied the working plan report of Raigarh- Dharamjaygarh division in which total 86 tree species were mentioned 121 species of avifauna had been mentioned.

Gharghoda ranges under Raigarh forest division were found dense forest with Sal, Char, and Mahua dominated forest. During field survey most of the birds' nests were found in Sal species followed by Char then Mahua, Saja. This study will be helpful for preparation of alternative habitat development for the affected avifauna present in the study site. In each intervals observation of birds, its counting vegetation study, dominating tree species, birds nest & its pattern were being documented.

We had surveyed in the particular patch of Gharghoda range, in which water bodies not present hence birds found in the water bodies were not seen in the study area whereas 14 water birds was mentioned in the Working Plan .

It was observed bird's diversity of Core zone which is lesser than Buffer zone. There were some major disturbances in core zone which affect bird diversity due to large amount of noise pollution occurred by blasting, air pollution by the mining dust, habitat degradation due to tree felling and ground digging, vehicle moment and anthropogenic pressure. Buffer zone was well established with agriculture land and forestland, which may provide suitable habitat for birds, and they may settle down there (*Vishwakarma, et.al 2018*). The above discussion, the impact of noise, air and land disturbance of study site affecting the diversity of bird population.

It was also observed the direct impacts on the living organisms of the mining area, which may range from death of plants and animals due to mining activity or contact with toxic wastes and mine drainages, disturbance of wildlife habitat due to blasting and heavy machines. Indirect impacts may include changes in nutrient cycling, disruption of food chain and instability of ecosystem (*Gayatri et al 2010*). Therefore, it is acceptable that biodiversity of flora and fauna needs essential amount of fresh atmosphere which is necessary for life.

Although grassland and scrub-species birds benefit from the early successive habitat development from post mining reclamation, forest-dwelling birds are adversely affected by land use change from forest to grassland, regardless of the origin of the changes. Concern has been expressed related to habitat loss for cerulean warblers in the Appalachian Mountains associated with deforestation from coal mining. (*Buechler et al.2006,wood et al.2006, Bulluck 2007*).

It is also been observed that the vast majority of this studies conducted on wild life response have focused on birds and wildlife in part because birds are easily monitored using various count based survey. The effects of mining on avian communities occur initially by the removal of vegetation in preparation for mining. If the site is forested, vegetation removal occurs through timber harvest or clearing. Although few studies have been done specifically evaluate the changes associated with mine sites from pre-mining to post-mining land uses. (*Sallabanks et al. 2000.*).

It was observed the most obvious threat of paved roads to individual birds is injury or mortality due to vehicle collisions, this is often considered less compelling when compared to the more insidious, effect of roads such as behaviour modification or decreased population density, diversity, and or breeding success. (*Reijnen and Foppen 1994, Forman and Alexander 1998, Jacobson 2005, Ramp et al, 2006*).

It is evident from the result that in winter, there is higher birds diversity and abundance in Core and Buffer zone in OCP Bharoud. The result of this study concurs with the findings of (*Elsen et al, 2017*), who concluded that primary forest harbours many birds during the breeding period, but mining. Especially increased pollution has resulted in the loss of primary forest. (Refer graph no 5.7 table no 5.9).

It was observed that the during Summer, shrub land had higher density of birds where was a lower density in grassland because grasslands usually remain dried in this season ,shrub land provides greater openness in the habitat, which support shrubs that provide food and cover for different birds species. (*Askirs et at, 2012, Shochat et at, 2010*). (Refer to table no.5.4 graph 5.3.).

Similar observations have been found in the study area, the diversity of birds, and in particular the native species, is positively correlated with increasing structural complexity of the vegetation. Also a seasonal change in species diversity of birds occurs in forests due to their foraging behaviour (*Robertson and Hackwell 1995*).

Forests attract a large number of avifauna because they provide suitable habitat for most birds, especially those birds that are associated with vegetation, and for most, the existence of tree is a vital component of their life cycle. The bird's level of interest on various forests depends on the age of the stands. The composition of bird species is highly related to the vegetation structure of forests (*Robertson and Hackwell 1995*).

Our study also signifies that bird diversity is impacted by climate condition (Temperature) (*Waterhouse and Trapani, 2002*) according to *parsesan (2005)*,

weather conditions determine bird diversity by the spatial temporal shift of the species from one habitat to the other, seeking favourable condition. The highest diversity is in the forest due to the availability of food, water, breeding sites, breeding material and cover from predators. (Hobson et al. 2003).

This chapter draws upon MoEF Environmental clearance, National Rehabilitation and Resettlement Policy 2007, impacts of mining on environmental factors such as air, water, noise, land, vegetation, wildlife and birds and mitigation measures. It also entails discussions on bird species diversity and population dynamics, habit, habitat and nesting pattern, existing biotic pressure on habit and habitat in the core zone, habitat loss for wildlife species that live in communities dependent upon each other, etc. Survival of such species can depend on soil conditions, local climate, altitude, and other features of the local habitat. Mining causes direct as well as indirect damage to this wildlife. The discussion also includes the field survey methodology, collected data observation and their analysis, status of avifauna in core and buffer zone, alternative habitat and artificial nesting pattern of avifauna.

The current status of avifauna as per their nesting pattern are categorized in eight part which are Scrape Nesting Birds, Burrow Nesting Birds, Cavity Nesting Birds, Cup Shaped Nesting Birds, Saucer/Plate form Nesting Birds, Platform Nesting Birds, Pendent Nesting Birds, Sphere Shaped Nesting Birds found in the core zone of OCP Baroud. This data shows that the rich avifaunal diversity of OCP Baroud is good and alternative habitat is needed.

It has been found that there are certain species of birds in the study area that have been classified under different threat categories by the IUCN (Version 2014.2) of these, *Streptopelia turtur* were placed in the Vulnerable category. All the remaining species (n = 63) are placed in the Least Concern category (Table 5.8.)

Therefore, the above discussion part shows the problems occurred in bird diversity and their habitat, which were directly or indirectly affected from air, noise and land disturbance from mining activities. The whole reasonable parts

should be solved from proper conservational practices attempted regarding biodiversity conservation of flora and fauna.

CHAPTER - 6

RECOMMENDATIONS AND WILDLIFE CONSERVATION PLAN

6.1 RECOMMENDATIONS

1. Green belts should be developed around the mining boundary.
2. The wastage coal dust particles in the dumping site of coal mine's should be managed properly to reduce air pollution and loss of avifaunal diversity & habitats.
3. Biological reclamation should be done to transform the degraded land and waste dump into a self - sustaining ecologically stable land form. Re-vegetation of waste dump is recommended to the slope stability, enhances the infiltration of rain water to increases the soil fertility.
4. Top soil management *is* needed to maintain the top soil stockpile to retain fertility. Excavated top soil can be dumped for future use such as meadow development and plantation purpose in order to further mitigation for habitat conservation of avifauna.
5. Fruit bearing and feeder tree species that are prefer by the birds available in the area, to be needed to planted in the buffer zone for plantation of avifauna conservation. Some of the tree species to be planted are: Bargad (*Ficus benghalensis*), Peepal (*Ficus religiosa*) Sal (*Shorea robusta*), Char (*Buchanania lanzan*), Mahua (*Madhuca latifolia*), Tendu (*Diospyros melanoxylon*), Aonla (*Phyllanthus emblica*), Arjun (*Terminalia Arjuna*), Saja (*Terminalia Tomentosa*), Baheda (*Terminalia Bellerica*), Bija (*Pterocarpus Masupium*), Dhawda (*Anogeissus latifolia*) and Khair (*Acacia catechu*) etc.
6. Multiple water storage facilities need to be developed in the buffer zone assures the water availability throughout the year. The existing ponds, resources recharge should be maintain.
7. The mining in the Buffer zone along the River banks of Kurket (Nala) must be avoided to insure of the river changing the path.

8. The social awareness program should be conducted among the local communities and villagers to provide information & awareness about birds and wild life there contribution in ecosystem and environment.
9. Artificial nest made up of local, light & fine wood materials, nest will be prepared with the help of JFM Committee and local forest staff and placement of artificial nest in the Buffer zone for affected avifauna of core zone.
10. Establishment of the artificial avifauna paradise similar to *Pakshi Vihar* to be developed by dumping site.
11. Soil moisture conservation (SMC) work should be done for the Bulekera village (Buffer zone) of OCP Baroud
12. Best practices from Forest Department should be implemented for the prevention of forest fire.
13. Plantation and conservation efforts should be monitor regularly during various growth stages of site.

6.2 CONSERVATION PLAN

6.2.1 Plantation

Plantation of the disturbed area will be undertaken simultaneously following mining. Plantation over undisturbed area including green belt will be carried out of the first five year itself. To reduce the impact of air pollution towards the habitation, forest, road etc., it has been proposed to create and maintain a green belt around the mine.

6.2.2 Greenbelt Development

A green belt of 7.5 m width will be proposed to be developed around the mining lease area. The green belt will consist mainly of the trees but will have shrubs, herbs and climbers also. The green belt vegetation, with respect to pollution, performs dual function:

1. Absorb some of the gaseous pollutants
2. Prevent the escape of dust and noise

So it is necessary to develop a greenbelt in and around the pollutant site with suitable, local species to combat the air pollution, effectively. The green belt function also as amalgamating the physical structures of the mines with surrounding environment greenbelt is developed primarily to absorb and to check the escape of pollutants. Although only local species will be used but the green belt may not have any relevance to biodiversity.

6.2.3 Plantation in the Green belt

Green belt Plantation will be started with the start of the mining will be completed within the five years. Plant species will be selected with in following criteria thus tolerance to dust pollutions, evergreen trees, shed bearer fleshy leaf tree species shrubs and some herbs species combination will be planted in green belt area, local source variety of plant species will be selected.

6.2.4 List of Recommended Species for Plantation

Trees (T) and small trees (t)

S.No	Common Name	Tree (T)/Small tree (t)	Botanical Name
1.	Sal	T	<i>Shorea robusta</i>
2.	Pipal	T	<i>Ficus religiosa</i>
3.	Mahua	T	<i>Madhuca latifolia</i>
4.	Jamun	T	<i>Syzygium cumini</i>
5.	Tendu	t	<i>Diospyros melanxylon</i>
6.	Saja	T	<i>Terminalia tomentosa</i>
7.	Arjun	T	<i>Terminalia arjuna</i>
8.	Achar/Char	T	<i>Buchanania lanzan</i>
9.	Aonla	T	<i>Emblica officinatis</i>
10.	Kusum	T	<i>Schleichera oleosa</i>
11.	Khair	T	<i>Acacia catechu</i>
12.	Gular	T	<i>Ficus glomerata</i>
13.	Baheda	T	<i>Terminalia bellerica</i>
14.	Bhilwa	T	<i>Semecarpus anacardium</i>
15.	Harra	T	<i>Terminalia chebula</i>

Shrubs (Sh) and Herbs (H)

S.No	Common Name	Shrubs (Sh)/Herbs (H)	Botanical Name
1.	Dudhi	Sh.	<i>Wrightia tinctoria</i>
2.	Lantana	Sh.	<i>Lantana camara</i>
3.	Kaner	Sh.	<i>Nerium odoratum</i>
4.	Bhatkateya	H	<i>Solanum trilobatum</i>
5.	Chhind	Sh	<i>Phoenix acaulis</i>
6.	Kathjamun	Sh.	<i>Eugenia heyneana</i>
7.	Chhoti Lajwanti	H	<i>Hemigraphis indica</i>
8.	Katma, Amti	Sh.	<i>Antidesma ghaesembilla</i>
9.	Khirni	Sh.	<i>Mimusops hexandra</i>
10.	Charota	H	<i>Cassia tora</i>
11.	Phetoa	Sh.	<i>Gardenia turgida</i>
12.	Marodphal	Sh.	<i>Helicteres isora</i>
13.	Gokhuru (bada)	H	<i>Acanthospermum hirsutum</i>

Bamboo and grasses

S.No	Common Name	Botanical Name
1	Bans Bamboo	<i>Dendrocalamus strictus</i>
2	Bhurbhusi Grass	<i>Eragostis tenella</i>
3	Doob ghas Dag grass	<i>Cynodon dactylon</i>
4	Kans Dag grass	<i>Saccharum spontaneum</i>
5	Phulbahari Dag grass	<i>Arundinella setosa</i>

6	Sukla	<i>Heteropogon contortus</i>
7	Kanta bahari Dag grass	<i>Aristida setacea</i>
8	Kanta bahiri	<i>Aristida adscensionis</i>
9	Ghas	<i>Eleusine indica</i>
10	Ghas	<i>Eragrostiell sp.</i>
11	Ghas	<i>Bothriochloa pertusa</i>
12	Ghas	<i>Themeda quadrivalvis</i>
13	Ghas	<i>Iselema laxum</i>

6.2.5 Over burden dump management

The overburden soil will be first be dumped, temporarily and then later on it will be used for filling the void. The overburden consists of two type of soil

- ❖ The top lower soil about 0.5 meter average thickness. It is rich in nutrient and suitable for plant growth, and
- ❖ The lower soil, which in true sense is not a soil but is earth, because in this soil organic matter is totally absent and is generally poor in nutrients required for plant growth.
- ❖ These two types of soil will be dumped separately. After dumping the soil for 2-3 years the top soil, dumped separately, will then be used as the top layer over the lower soil.

6.2.6 Backfill dump

Backfill dump will start from 3rd year. Backfill will continue till this quarry is completely worked out. For backfilling and reclamation, part of the waste will be available. Part of the OB waste will have to be dumped in outside dump.

6.2.7 Top soil dump

The total top soil generated during the life of mine will be stacked separately in a soil stock pile. It will be used for growing plant along the fingers of the site roads and reclamation of external dump and back filled area. The top

soil stockpile will be of low height not exceeding 6m and will be grassed to retain fertility.

6.2.8 Reclamation of backfill area

The soil used for backfilling will be a better soil than the original soil because during dumping some leaf litter will be added to it and some grasses will be promoted to grow on it through seed sowing.

1. Bio-Reclamation

Biological reclamation will be done to transform the degraded land and waste dump into a self - sustaining ecologically stable land form. This will prevent soil erosion, dust pollution and will create aesthetic beauty. Re-vegetation of waste dump through systematic means, increases the slope stability, enhances the infiltration of rain water and its availability, increases the soil fertility and promotes natural regeneration of native plant species.

2. Species Selection for Reclamation of the Area

Successful bio-reclamation would largely depend on the selection of appropriate species for re-vegetation. While selecting plant species following parameters will be considered.

- Local and native to the soil
- Nitrogen fixing leguminous species will form at least 30% of the total plantation.
- Shrubs, herbs and grasses to check soil erosion and development of fertile soil.

Apart from above top Soil management will be done to ensure the inoculation of Microorganism, seed, organic matter etc.

3. Tree Plantation

Criteria for the selection of plants:

Plant species selected for plantation in the backfilled, overburden soil should possess any or more of the following properties.

- a. Have soil binding property.
- b. Be a nitrogen fixer.
- c. Be able to tolerate, at least to some extent, the crack formation in the soil.
- d. Have drought tolerance ability.
- e. Be able to grow in a slope.
- f. Be able to grow in nutrient and organic matter poor soil.
- g. Be a local species.

Plantation of trees will be done at the rate of 1000 seedlings per ha of the area.

Plantation of the overburden soil will be taken up in two phases.

6.2.9 Plantation in the buffer zone

Trees will be planted in the buffer zone also. This plantation will be done at selected places only and only local species will be used in the plantation. Some of the tree species included will be: Mahua (*Madhuca latifolia*), Sal (*Shorea robusta*), Dhawda (*Anogeissus latifolia*), Tendu (*Diospyros melanoxylon*), Char (*Buchanania lanzan*), Khair (*Acacia catechu*), Aonla (*Phyllanthus emblica*), Arjun (*Terminalia arjuna*), Saja (*Terminalia tomentosa*), Baheda (*Terminalia bellerica*), Bargad (*Ficus benghalensis*), Peepal (*Ficus religiosa*), etc.

- Care will be taken to include some fruit bearing trees like Gular (*Ficus glomerata*), Char (*Buchanania lanzan*), Aonla (*Phyllanthus emblica*) Aam (*Mangifera indica*) and such trees to provide food to the herbivores which in turn will be the food source of the carnivores.
- Water, particularly during drier seasons, becomes the most important factor to all types of wild animals including the mammals, birds and reptiles. If water is available safely, then all other factors become

secondary for the presence and survival of the wild life in any forested area.

- Places suitable for mini watersheds will be identified in the core as well as in the buffer zone to store rainwater. Further, to make water available at all the times, throughout the year, some of these water holes will be recharged through artificial means. Proper slope will be given to approach these water sources so that the wild animals will be able to drink water without any difficulty.
- Proper cover through vegetation or any other type of even artificial cover will be developed near to these water sources so that the prey species will be able to hide themselves from the predators, at the time of approaching the water sources.
- To attract the birds, plants yielding food to the birds will be planted on priority basis. If water and food are available to the birds without any anthropogenic disturbances the area can become an ideal place for bird watching.
- Execution of the above works is proposed to be taken by the forest department of Chhattisgarh financed by the company.

The different species that have history of good survival and growth under similar site conditions shall be planted. The suggested species for plantation are given below:

Fruit bearing trees

- Jamun
- Mango
- Imli,
- Sitaphal,
- Bel,
- Char
- Tendu
- Gular
- Bargad etc.

Medicinal trees

- Neem
- Karanj
- Harra
- Behara
- Aonla
- Arjun
- Shikakai
- Mahua Etc.

Timber value trees

- Teak
- Shivan
- Ghamar
- Sisham
- Safed Sirus
- Bamboo
- Sal
- Bija etc.

Ornamental trees

- Amaltas
- Gulmohar
- Kapok
- Memecelonedule,

6.3 CONSERVATION PLAN FOR FAUNA

Several reasons for the decline of wild life and methods for their conservation are practiced. However the best method for the conservation of wild life is related directly to the maintenance of ecosystems in their natural condition, allowing their natural development and degree of protection afforded to the wildlife and their habitat. Both these phenomena (ecosystem development and habitat protection) are related to anthropogenic factors. Some of the important anthropogenic factors are listed below:

- ❖ Habitat fragmentation and destruction
- ❖ Man-animal conflict
- ❖ Forest fire
- ❖ Poaching
- ❖ Stake holders dependence on forest resources
- ❖ Creating awareness amongst forest stake holders
- ❖ Water scarcity

The plan for wild life conservation, with respect to above situations, is detailed as under:

6.3.1 Habitat improvement

Some of the common trees to be planted for habitat improvement will include: *Terminalia tomentosa*, *Anogeissus latifolia*, *Madhuca latifolia*, *Buchanania lanzan*. Together with these some fruit yielding species should also be planted eg: Mango, Tendu and Gular etc. *Ficus benghalensis* is also encountered in the forests but with a very low frequency, but is a flagship species and should be planted with similar frequency. To this it is important to add the plantation of Aonla, which has almost disappeared from the area. The area vegetated with the local species will provide natural environment, food and

shelter to the wild life attracting them more to the area. Some hideouts, suitable to different wildlife species, should also be created at suitable places.

6.3.2 Elimination of Man-animal conflict

Man-animal conflict is a difficult problem to be eliminated. The conflict is both deliberate as well as inadvertent. However, conflict can be minimized through employing local persons to form anti-depredation team. The conflict can be minimized also through protecting the area, preventing the entry of human beings or the cattle in the area. First aid facilities should be provided in the villages to meet exigencies in case of any conflict.

6.3.3 Prevention of forest fire

Forest fire is caused both naturally as well as by the human beings. Anthropogenic causes will be minimized through forming a fire line around the forest area. To add to the prevention of fire local persons will be employed as fire guards, during the fire prone season. The team will be instructed to fight the fire as soon as it is detected. Watch towers will also be constructed to detect forest fire. Awareness program against forest fire will also be run in adjoining villages.

6.3.4 Prevention of poaching

Poaching is undoubtedly a serious problem in the conservation of wild life. Several methods are employed by the poachers, to kill or trap the wild life, of which poisoning and traps of different types are more common. A proper vigilance will be maintained to check such menace. Poaching menace will be eliminated seriously neither all the efforts to promote wild life survival in the area will go in to waste.

6.3.5 Creating awareness amongst forest stake holders

Awareness about the environment and wild life will be created amongst the adjoining villages. They will be informed about the importance of a good environment, a healthy ecosystem and more importantly about the wild life.

Through slide and film shows they will be convinced about the sustenance of natural ecosystems. They will be convinced that their own survival depends upon the survival of a healthy ecosystem, to which a wide variety of wild life is an essential component. To develop affection of the people towards the wild life some of them will be taken to some zoos and wild life sanctuaries. Awareness programmers will be run with the help of Forest Officers and more importantly some national experts will be invited to deliver talk's awareness, related to wildlife conservation.

6.3.6 Water availability

Rainfall in the area is about 1300 mm, sufficiently to be categorized as a wet zone. However, due to lack of proper storage, severe water scarcity develops during the summer months. To make the water available throughout the year it is essential to create water storage facility. Multiple water storage places will be created in the Buffer zone through improving the existing ponds, constructing stop dams in the water channels and through creating water holes. Also, camouflage and hiding places should be created. Some wildlife species fulfill their salt requirement through licking the soil. Salt deposits will be arranged for such species adjacent to the water holes. These water holes will also be helpful in recharging the ground water and thus will be supporting good growth of the vegetation.

6.3.7 Restriction of grazing and creation of waterholes

Waterholes will be constructed outside the plain area for exclusive use of wildlife. This will reduce direct conflict between the wild animals and cattle. Patrolling parties will check and stop the entry and illegal grazing of cattle in the area. Heavy grazing not only reduces the herbaceous cover but brings about compaction of the soil also. It also favors the growth of non-palatable, unwanted weeds like *Lantana camara*, *Hyptis suaveolens*, *Plectranthus incanus*, and

Ageratum conyzoides and so on. Such weeds will be uprooted and eradicated, preferably before their flowering and fruiting, to promote the growth of fodder grasses.

6.3.8 Training and awareness programme

This is the most important aspect of wild life conservation people will be educated regarding the importance of wild life conservation through mass publicity by installing sign-boards, conducting audio visual classes and distributing literature in respective villages in the buffer zone. Experts in the field of wild life conservation will also be invited to deliver talks through slides.

6.3.9 Encourage local villagers to grow trees on their own on field bunds/court yards etc

In consultation with Forest Department the company will provide some finance, to grow saplings of tree species, having importance for wood, small timber and fuel wood to distribute to the villagers. Bamboo will be another important species with a lot of environmental and economic value. This will, no doubt, will help reduce dependence of people on Revenue Forest; as a result the ecological condition of the area will improve so the wild life will be attracted to this area.

6.3.10 Creation of conservation awareness

What if a few species of wildlife become endangered or extinct? How are we concerned if the Indian Cheetah has been lost forever or the Asiatic lion is precariously perched on the verge of extinction? Why should we spend crores of rupees to protect the tiger? The answers to these questions of “what”, “how” and “why” should form the basis for creating conservation awareness among the public- an understanding of the importance of biological diversity of inter-relationships in nature, of the sustenance and stability of ecosystems and of man’s impact on the natural world.

6.4 CONSERVATION PLAN FOR AVIFAUNA

India is rich in Biodiversity with two global Hotspots. The avifauna of India includes around 1301 species, (*Clements & James, 2000*). Birds are the indicators of the health of an ecosystem as they indicate its needs and diversity. However, detailed study, exclusively on birds of Raigarh district has been carried out. According to working plan, Raigarh division shows diversity of habitat like barren, woodland, shrub land, agricultural and grassland etc. This diversity of topography and habitat offers suitable environment and opportunities for the bird population for breeding, feeding, resting and nesting. Beside this, some of natural habitats of avifauna were disturbed by mining of coal production expansion. From growth of mining, the natural habitat of birds are getting affected which results decreased population of avifauna in other manner. To conserve affected avifauna, it is most important to conserve the species of birds and their habitat.

The avifauna conservation plan should be planned in such a manner that habitat, water and food availability were naturally surrounded in newest location. The conservation plan for avifauna is detailed as below:

6.4.1 MAJOR STRUCTURES FOR ALTERNATE HABITAT DEVELOPMENT

Species diversity has often been the prime attribute in conservation strategies. Sites have been evaluated merely by the number of species they contain (Ranjit.R.J, Daniels; A landscape approach to conservation of birds). The major structures for alternate habitat development of avifauna conservation should be focused on food, water and shelter availability. The conservation plan consist the food, water and shelter availability considered with scientific recommendations. The avifauna conservation plan is based majorly on availability of following points:

- (i). Food availability,
- (ii). Water availability;
- (iii). Shelter availability.

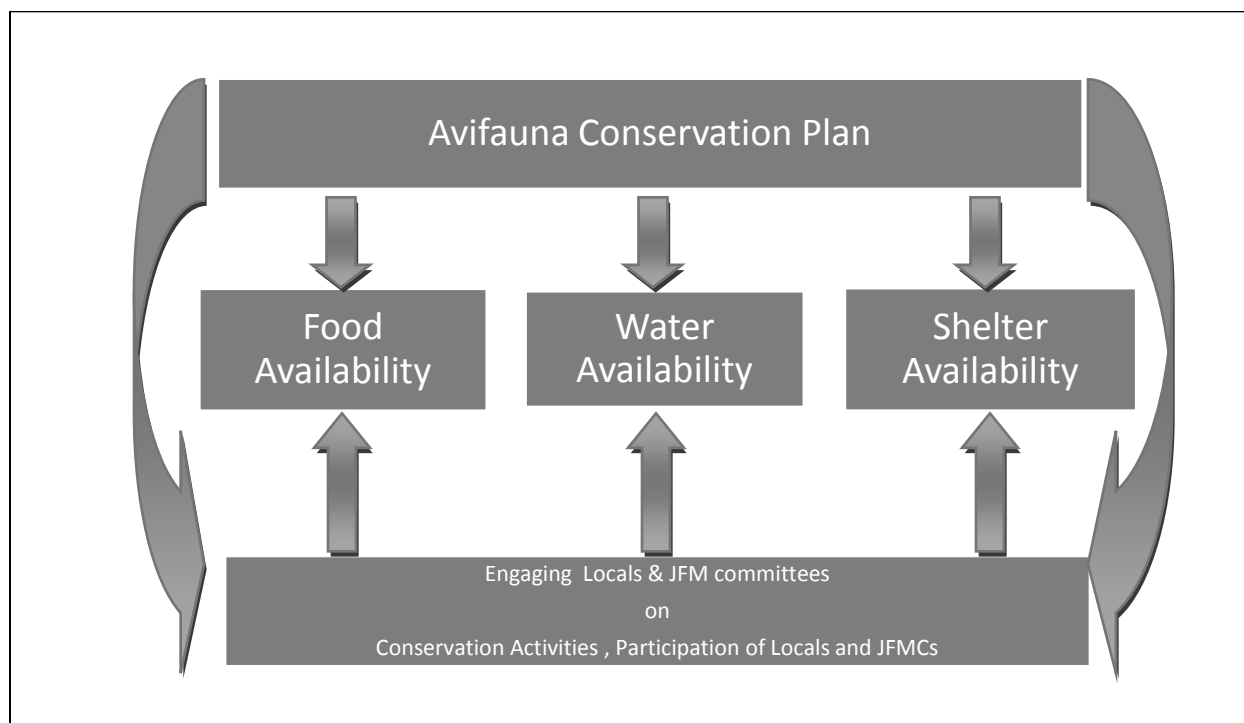


Figure: Conceptual model for improving Avifauna Conservation Plan.

(I). Food availability

For every living creature, food is important need to survive and to live. In line with previous studies in pied flycatchers (*Verhulst 1994; Siikamäki 1998*), our food supplementation was successful at increasing nestling survival until fledging. In supplemented nests, the effect of breeding density on adult body mass and fledging probability was cancelled out. The decrease in provisioning rate with increasing density in control nests, independently of dispersal status, also disappeared in supplemented nests, mainly because of an increase in provisioning rate in high-density habitats. Food availability thus played a role in mediating the

density-dependence of these traits and in particular the differences between dispersing and philopatric individuals in patterns of density-dependence on adult body mass and fledging probability, although the last result remains to be confirmed with more statistical power.

(a). Bird feeder -Bird feeders are artificial structures for feeding birds in proper medium. The structure is made such a manner that a hollow container for foods, seeds etc and consist of holes through which grains or seeds were feed by birds. Bird feeders are available in different models such as crop feeders, seed feeders etc. These feeders can also be constructed by wood logs or bamboos. This structure can be made by local peoples by proper instructions and demonstration.

(b). Plantation of Fruit Tree Species: To promote people for planting fruit yielding tree species such as Jamun, Ficus spps, anjeer etc.

(c). Encouraging locals for cereal crop cultivation: Promoting locals for cultivation of crops like Bajra, Kodo, Kutki, Tilhan etc. They are also encouraged for growing green vegetables like bitter ground (Kheera), green vegetables etc.

(II). Water availability:

(a). Selecting Habitat in water available location: The annual rainfall in Raigarh district is about 1300 mm and is sufficient to be categorized as a wet zone. However, selection of alternate habitat in Buffer zone for nest placement will be chosen nearby the natural water bodies like Nala, Ponds or Rivers. Due to lack of proper storage, severe water scarcity develops during the summer months.

(b). Construction of water Structures: Secondly, to make the water available throughout the year it is essential to create water storage facility. Multiple water storage places will be created in the Buffer zone through improving the existing ponds, constructing stop dams in the water channels and through creating

water holes. Moreover, permanent water sources are important to foster bird diversity (Tilghman 1987; Jokimäki 1992).

(c). Mud Pot or ‘Sakore’ made by locals: The next structure is ‘mud pot’ or ‘Sakore’ which is also effective model for conservation of avifauna for the purpose of water and food storage. The plate like mud pots can be easily made by ‘potter’ and can be constructed by local villagers. Involving local villagers or local potter will be helpful for this purpose and for rise of their participation awareness. These mud pots can be easily placed in anywhere and also in branches of trees.

(III). Shelter availability:

Birds are generally one of the first types of wildlife to visit a mine site following reclamation due to their mobility and active search for suitable habitat (Brändle *et al.* 2003). The availability of different kinds of nest-boxes may increase the colonization of urban parks by a great variety of cavity-nesting birds (Jokimäki 1999). Many bird species are not restricted to a single vegetation type, but rather depend on some combination of early successional habitat, open areas, and young and mature forests to find food and shelter and raise young (Hunter *et al.* 2001). For providing the shelter to avifauna will be based on nesting patterns of bird species found in Raigarh district. Internationally recommended artificial nests will be constructed by the help of local communities / Joint forest management. Detailed nest designs are mentioned below.

6.4.2 Artificial nesting

Before the artificial nesting trail we had surveyed the avifauna species of mining site and categorized them according to their habit, habitat and nesting pattern through which artificial nesting is being proposed.

Artificial nesting structures can be used to increase avifauna reproductive success in Buffer zones where natural nest site are unavailable or unsuitable. While artificial nesting structure cannot replace natural nesting habitats, they can increase the number of nesting site available in an area. Many types of avifauna use artificial nesting structures including song birds, woodpecker, waterfowl, and raptors. While structures are generally designed to meet the nesting requirements of certain species, they may also be used by none target animals and provide roosting and winter cover for variety of birds. Nest boxes, nesting platform or shelves, and nesting baskets, culverts, and cylinders are some of the common types of artificial nesting structures. The most effective artificial nesting structures are those installed enclose proximity to brood-rearing habitat, adequate escape/concealment cover, a reliable source of food and water and other element of the habitat of target species. Predators, competitors and territory sizes for individual species also influence the usefulness of nesting structures. Nest monitoring and maintenance actions can be taken to limit competing or undesirable species access reproduction success, and provide an opportunity for landowners and managers to observe avifauna. Cavity nesting birds which mainly nests in tree cavities are likely to use nest box. Primary cavity nesting species, such as members of the woodpecker family, excavate nesting cavity in live / standing dead tree (snags), Secondary cavity nesters (e.g. some passerine or perching birds, owls, and waterfowl) use cavities abandoned by primary excavators and those formed by fungus, knots, and tree subject to decay. The presence of snags in forested areas is directly related to the quality and quantity of nesting habitat for many cavities nesting species.

Construction Material: structures made of wood are relatively inexpensive and easy to build. Wood seems to be the most weather resistant, insulating material, and most avifauna species prefer wood to metal or plastic structures. For most nest

boxes, $\frac{3}{4}$ inch rough-cut borders are best used for construction. Since cavity nesting waterfowl do not carry nesting material to the nest, 3-4 inches of coarse sawdust or woodchips should be placed inside the nest box. Nest boxes intended for use by Woodpeckers can be tightly packed with sawdust to resemble decaying woody material. Old nesting material should be removed at the start of each nesting season and replaced with fresh material. While many artificial nesting structures are designed for cavity nesters, some provide nesting sites for other avifauna. Nesting platforms, baskets and cylinders are used by waterfowl, raptors and other species. If wire mesh is used as nest support material, the weave must be tight enough to prevent eggs and young from falling.

Designs range from simple platforms to complex, multi-compartment structures some of these design are more successful than others, and most can be built or acquired from a variety of suppliers. Basic nest box designs can be modified to accommodate various species by altering dimensions or entrance hole sizes. The size of the entrance hole also influences the internal temperature of the box, predator accessibility, and use by competing non-target species.

Basic Nest Box Characteristic:

1. Should be made of wood; Sal (*Shorea robusta*), Sisoo (*Dalbergia sisoo*), Babool (*Acacia nilotica*) etc (preferred, most weather resistant).
2. Box should open from the side or top for maintenance and cleaning.
3. Sides of nest box should enclose the floorboard (recessed $\frac{1}{4}$ inch) to prevent rain seepage.
4. Nails, woodscrews, and hinges should be rust proof.
5. Entrance hole dimensions should accommodate the desired bird species; hole should not be large enough to allow competitors and predators access.

6. A double thick entrance and extended roof to deter predators like squirrels and raccoons.
7. Ventilation holes or slits at the top of both sides, just beneath the roof of the box.
8. Drainage holes (four or five) drilled into the bottom of the nest box to allow for drainage.
9. Song bird nest box should not have a perch, which increase predator access; native song birds do not use perches.
10. Nest box should not be treated with green preservative, it is poisonous to birds.
11. Nest box should not be painted on the inside or painted bright, unnatural colors on the outside (may attract predators or exotic species) (Avifauna survey 2013).

Artificial nest designs

Design I

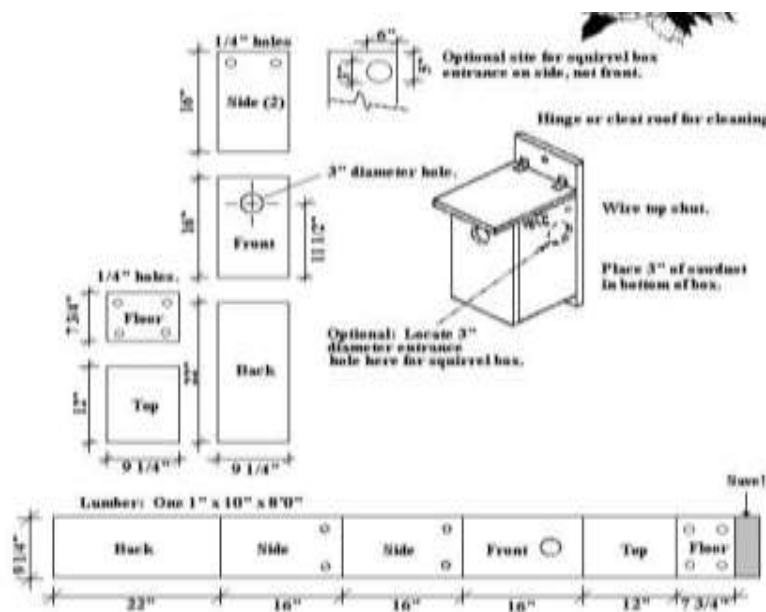


Fig 14: Ideal nest design for Doves, Parakeets, and Orioles.

Design IV

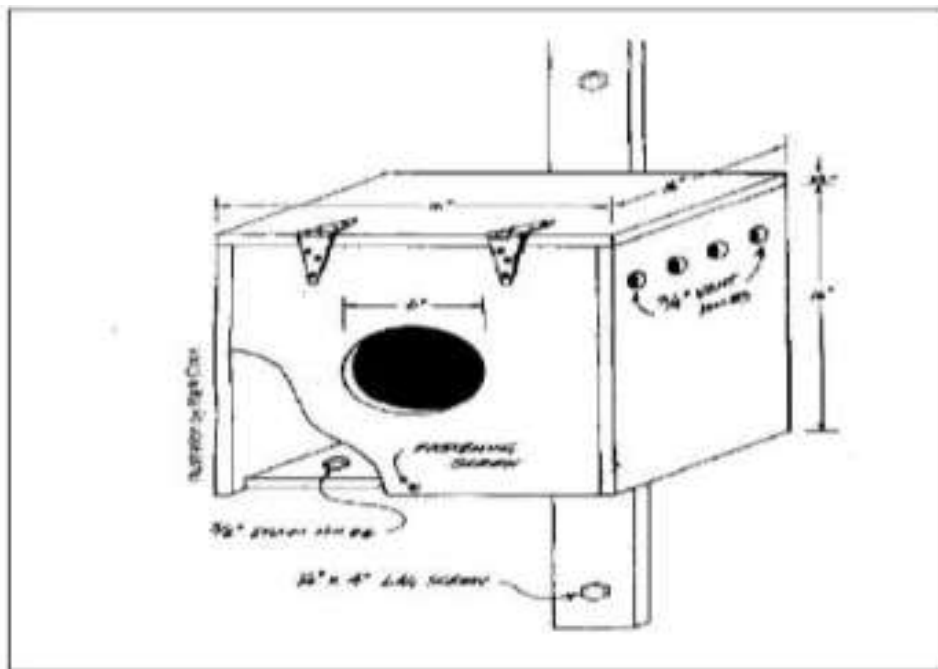


Fig 17: Ideal nest design for Owl and Owlets.

Design V

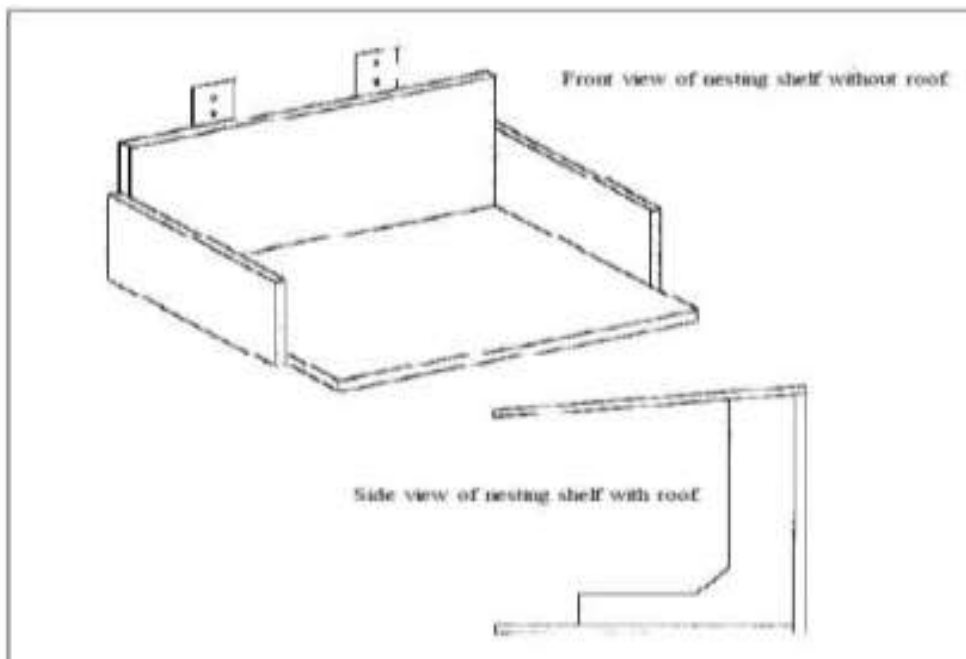


Fig 18: Ideal nest design for Platform and Twig nesting birds.

Design VI

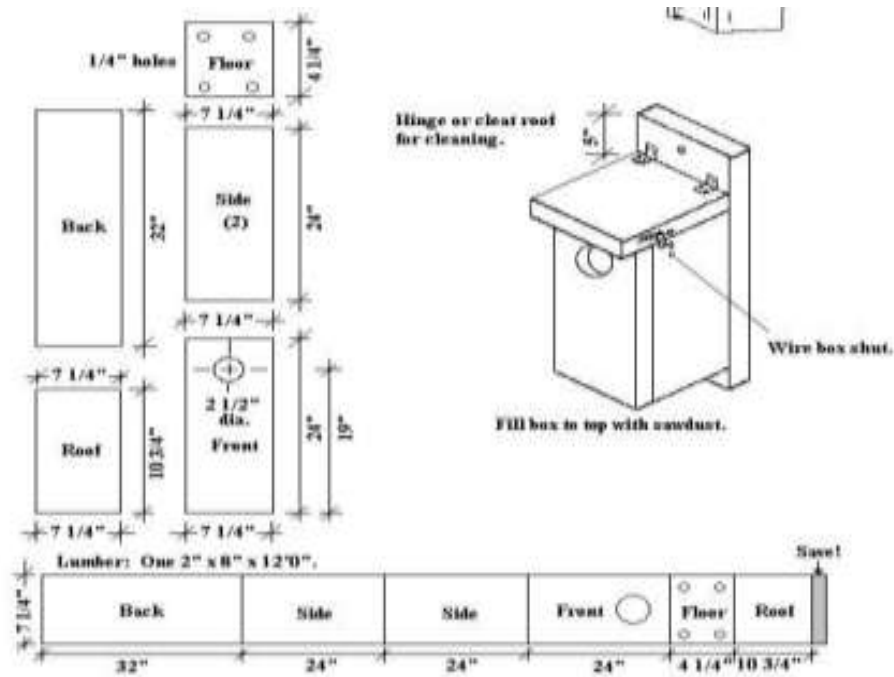


Fig 19: Ideal Nest design for Excavators having yellow tail and red patch on the back of head and neck

Design VII

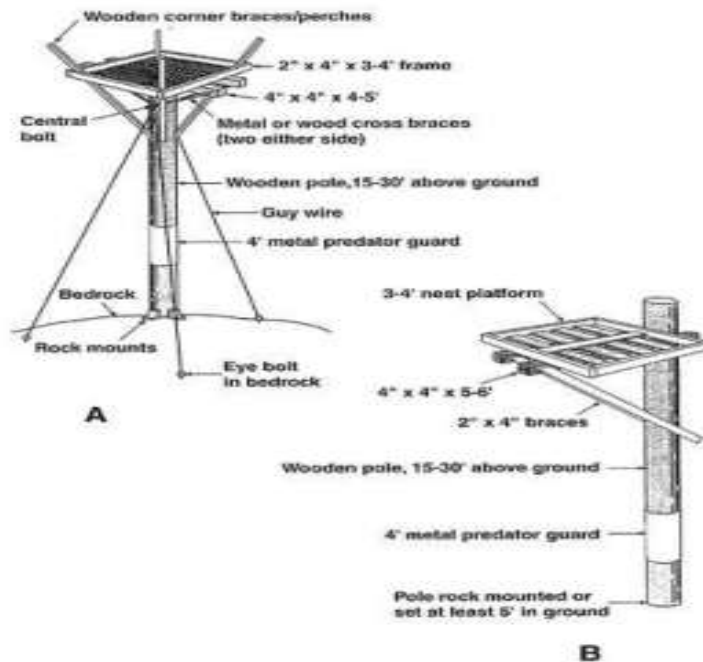


Fig 20: Ideal nest design for Raptors.

Design VIII

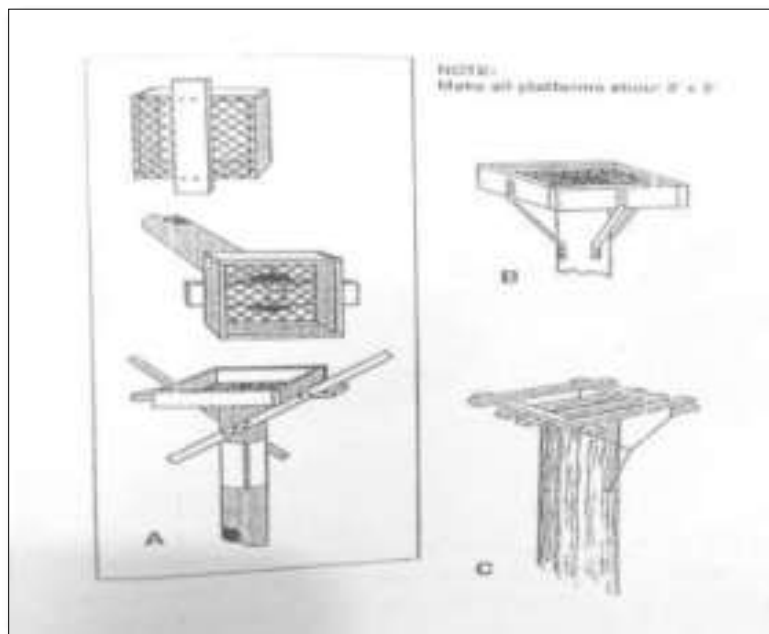


Fig 21: Ideal nest design for Raptors.

Design IX

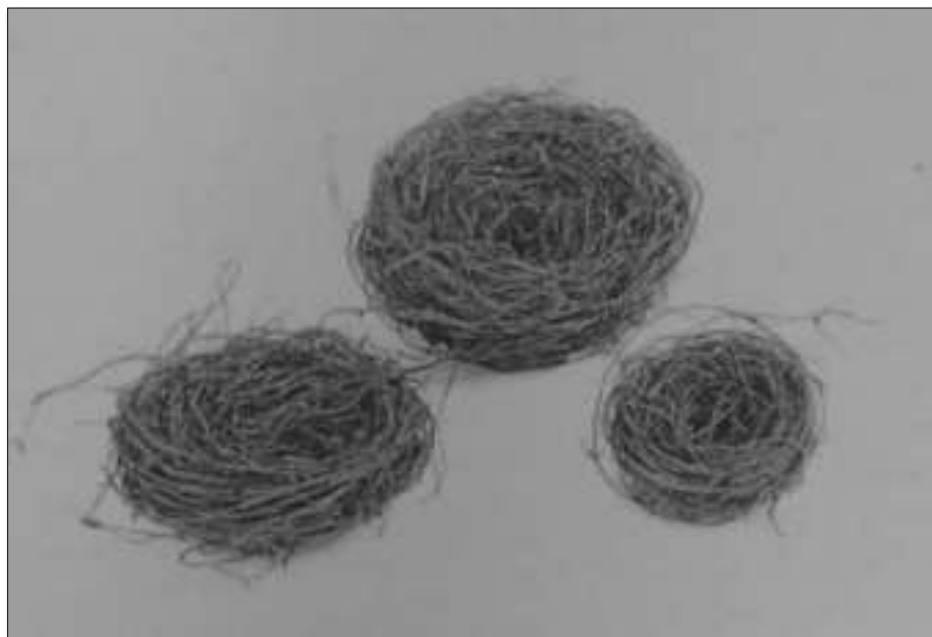


Fig 22: Ideal nest design for Grassland birds and Cup nesting birds.

As per the above cited figures for all the birds found in the mining area of OCP Bharoud. The artificial nesting design proposed for all birds characterized on their habit, habitat and nesting patterns (Fig 1-8)

6.5 CONSERVATION PLAN FOR ELEPHANT

Elephants are major agents of change and are often indicated as those large herbivores possessing the ability of changing entire ecosystems in terms of vegetation structure and composition, thereby affecting a whole series of other ecosystem components as well. The exclusive role of elephants as agents of change could thus far not be completely isolated from the multitude of factors involved in ecosystem dynamics.

Globally, wild elephants are present in 50 countries, 13 of which are in Asia and 37 in Africa. At present the number of wild Asian elephants (*Elephas maximus*) is between 35,000 and 50,000 (www.elephantcare.org), while the number in captivity is around 16,000. The trend in almost all Asian range states has been a drastic decline in wild elephant numbers, due to a range of anthropogenic factors related to increasing human population, loss and degradation of forest habitat, fragmentation of breeding populations and increasing human-elephant conflict (HEC).

The Asian elephant is categorized as an ‘endangered’ species in the Red List of the World Conservation Union (www.iucnredlist.org) and is classified with the Convention for International Trade of Endangered Species (www.cites.org). They have declined from over 5 million animals located throughout the continent 100 years ago, to the current number confined to fragmented habitats in sub-Saharan regions. Whereas poaching for ivory and meat was a major reason for the decline in the past, loss of habitat is the biggest threat to their continued survival at present. Paradoxically, though, elephant numbers are increasing in some countries and may need to be controlled in order to prevent degradation of their habitats.

India holds by far the largest number of wild Asian elephants, estimated at about 26,000 to 28,000 or nearly 60% of the population of the species (*Bist 2002*).

Elephas maximus is placed in Schedule I and Part I of Indian Wildlife Protection Act (1972) conferring it the highest level of protection. Wild elephants are presently distributed over an area of about 109,500 km² (*Santiapillai and Sukumar, 2006*); this is approximately 3% of India's geographical area. Adjacent to some of these areas, a segment of the elephant population killed an average of 350 people annually over the last five years (2005-2006 to 2009-2010) (Project Elephant), and damaged an average of 330 km² of crops every year for the last three years (2007-2008 to 2009-2010) (Project Elephant).

Northern Chhattisgarh in Central India has been home of Asian elephants since historical times. However, in the early part of the 20th century they became locally extinct (*Singh, 2002*). In 1988 elephants migrated from the prime elephant habitat of Jharkhand into Chhattisgarh and caused extensive damage to life and property. Since then, HEC cases have been increasing due to straying of migratory elephants in the state (*Singh, 2002*). The number of wild elephants in the year 2007-08 in the state estimated to be 122 (*MoEF, 2008*). Major reason for prolonged stay of elephants in the state could be better forest cover (44 %), heavy mining, habitat degradation and deforestation in the states of Jharkhand and Orissa (*Singh, 2002; Earth Matters Foundation, 2008*). Even the state of Chhattisgarh is primarily inhabited by tribal communities dependent largely on agriculture and minor forest produce. Increasing human pressure on forested areas is resulting in increased incidences of human-elephant conflicts. This necessitated a detailed assessment of habitat suitability and dispersal corridor for elephants in the area.

6.5.1 Records of the Elephant's movement in Raigarh District.

During 19th century and earlier elephants were, recorded only from the northern part (Raigarh district) of the state but for unknown reasons the species left the area in the beginning of the 20th century. During this time the species was

recorded from Raigarh District. However, the species re-entered the area of Chhattisgarh state, in 1980s, around the year 1986. The elephants then entered the area of Raigarh district, from Orissa state. In the beginning their entry was occasional, coming and going in to and out of the area. However, in later years their entry as well as their residence time, within the area of the state, has increased.

6.5.2 At present, the study area of Gharghoda Range under Raigarh Forest Division has been observed the elephant movement.

1. Important points in the conservation of elephants: Following are some key points in the conservation of elephants:

- ❖ Require 150-250 kg of plant food every day, with preference for grasses.
- ❖ Evolved to a large size, with black color. The black color absorbs more heat.
- ❖ Lack sweat gland to dissipate the body heat, hence, require a shade in sunny days, or require frequent cooling through wallowing or spreading water over the body.
- ❖ Have very poor visibility particularly during night. Their eyes do not shine in the night, because of reduced number of cones, unlike the canines like tiger, leopard and even bovid like the cow.
- ❖ A good source of water is required also for drinking.
- ❖ Frequent dusting of the body or mud cover over the body is required to protect the body from the biting insects.
- ❖ Change in cropping pattern by introducing crops disliked by elephant or the plant which act as elephant repellent (e.g. Patchouli, (Pachouli) *Helianthus annuus* (Sunflower) *Capsicum annum* (Chilli) *Sesamum indicum* (Til) and Citrus should be promoted.

2. HABITAT

Elephants are generalists, but use mainly scrub forest. They can be found in the jungle, but generally on the edge where open, grassy areas are accessible. They prefer areas that combine grass, low woody plants, and forest. Elephants rarely forage in one area for more than a few days in a row. In general, food, water and shade are the three basic resources that can be expected to influence the movement of the elephant (*Sukumar et al, 2003*). Their Home range ranges from 30-600 km².

3. FOOD

Elephants eat a wide variety of species of vegetation. They are herbivore, folivore and lignivore. More than 100-130 different species of plants may be eaten. They prefer grasses, but they also consume bark, roots, leaves, wood, stems and leaves of trees, vines, shrubs, tubers, bamboo and barn. An average day's intake is 150-200kg of wet vegetation. The proportions of the different plant types in their diet vary depending upon the habitat and season. Annual diet has been found to be dominated by grass. Maximum straying distance covered by the raiding elephant has been recorded up to 5.5km.

4. Time-activity budget of elephants.

Generally they are active almost throughout the day during rainy and winter months, but during summer months they are active only in the morning and evening hours. They become active well before dawn and start their morning activities in the vicinity of the area where they spent night. Evening hour is the time for drinking and bathing especially during summers. In summer season percentage of movement is more due to lack of fodder species and shrinkage of natural water sources.

5. FOOD PLANTS

Following is a list of plants reported as food by different workers. However, only the names of plants, local to the area, have been taken and the local names have been changed. Part of the plant eaten may be different for the different species.

SN	Local Name	Botanical Name
1.	Khair	<i>Acacia catechu</i>
2.	Babool	<i>Acacia nilotica</i>
3.	Bel	<i>Aegle marmelos</i>
4.	Kala siris	<i>Albizia lebbek</i>
5.	Bans	<i>Bambusa arundinacea</i>
6.	Safed siris	<i>Albizia procera</i>
7.	Kachnar	<i>Bauhinia variegata</i>
8.	Mahul	<i>Bauhinia vahlii</i>
9.	Khatua	<i>Bauhinia malabarica</i>
10.	Semal	<i>Bombax ceiba</i>
11.	Ghas	<i>Brachiaria sp.</i>
12.	Kasai	<i>Bridelia retusa</i>
13.	Kumhi	<i>Careya arborea</i>
14.	Lassora	<i>Cordia myxa</i>
15.	Ghas	<i>Cymbopogon flexuosus</i>
16.	Grass	<i>Cynodon dactylon Doob</i>
17.	Shisham	<i>Dalbergia sissoo</i>
18.	Bans/ Bamboo	<i>Dendrocalamus strictus</i>
19.	Urai/Khus	<i>Desmostachya bipinnata</i>
20.	Ghas	<i>Eleusine sp.</i>
21.	Amla	<i>Emblica officinalis</i>
22.	Nilgiri	<i>Eucalyptus spp</i>
23.	Bagai Ghas	<i>Eulaliopsis binata</i>
24.	Kaith	<i>Feronia elephantum</i>
25.	Bargad/Bar	<i>Ficus bengalensis</i>
26.	Dumar/Gular	<i>Ficus glomerata</i>
27.	Pipal	<i>Ficus religiosa</i>
28.	Duranga-hesa	<i>Ficus rumphii</i>
29.	Pakar	<i>Ficus infectoria</i>
30.	Kandai	<i>Flacourtia indica</i>
31.	Kekad	<i>Garuga pinnata</i>
32.	Dhaman	<i>Grewia elastica</i>
33.	Ainthe	<i>Helicteres isora</i>

34.	Korea	<i>Holarrhena antidysenterica</i>
35.	Karmata	<i>Ipomoea spp.</i>
36.	Ulu	<i>Imperata arundinacea</i>
37.	Baranga/Pula	<i>Kydia calycina</i>
38.	Senha/Sidha	<i>Lagerstroemia parviflora</i>
39.	Kaith	<i>Limonia acidissima</i>
40.	Sinduri/Rohini	<i>Mallotus philippinensis</i>
41.	Lajwanti	<i>Mimosa pudica</i>
42.	Mudhi	<i>Mitragyna parvifolia</i>
43.	Banana	<i>Musa paradisiaca</i>
44.	Bichhloo	<i>Neyraudia arundinacea</i>
45.	Dhan	<i>Oryza sativa</i>
46.	Tinsa	<i>Ougeinia oojeinensis</i>
47.	Buta Chhind	<i>Phoenix humilis</i>
48.	Jangal Jalebi	<i>Pithecellobium dulce</i>
49.	Mainphal	<i>Randia dumetorium</i>
50.	Kandi-khar	<i>Saccharum munja</i>
51.	Ganna	<i>Saccharum officinarum</i>
52.	Kans	<i>Saccharum spontaneum</i>
53.	Sisal	<i>Sansevieria sp.</i>
54.	Kosam/Kusum	<i>Schleichera oleosa</i>
55.	Sarai/Sal	<i>Shorea robusta</i>
56.	Jamun	<i>Syzygium cumini</i>
57.	Amlı / Imli	<i>Tamarindus indica</i>
58.	Saja	<i>Terminalia tomentosa</i>
59.	Sagaun / Teak	<i>Tectona grandis</i>
60.	Giloe / Gurch	<i>Tinospora cordifolia</i>
61.	Hathi ghas / Pirlu	<i>Thysanolaena agrostis</i>
62.	Bhander	<i>Zizyphus mauritiana</i>
63.	Ghont	<i>Zizyphus xylopyra</i>

The most commonly consumed species belong to family *Poaceae* and *Fabaceae* (17.65%) followed by *Moraceae* (14.71%). Elephants extensively feed on *Artocarpus heterophyllus*, *Syzygium cumini*, *Acacia nilotica*, *A. catechu*, *Dalbergia sissoo*, *Zizyphus mauritiana*, *Aegle marmelos* and *Ficus* species, besides various grasses and shrubs (Bhagat et al, 2017). *Saccharum spontaneum*, *Thysanolaena maxima* and fruit parts of *Dillenia indica*, are some of the other species recorded to be preferred by elephants. Some other food plants have been reported by the villagers of elephant moving areas of Chhattisgarh state. The list includes:

<i>Musa paradisiaca</i>	Kela	All the parts are edible.
<i>Oryza sativa</i>	rice	Eat very cleverly the fruiting part, only, in the barn yard they dismantle the heap of gathered rice.
<i>Saccharum officinarum</i>	Ganna	One of the most preferred food item.
<i>Dendrocalamus strictus</i>	Bamboo	All the parts are edible.
<i>Ficus benghalensis</i>	Bargad	Leaves and barks were eaten mostly.
<i>Ficus religiosa</i>	peepal	Leaves and barks were eaten mostly.
<i>Artocarpus heterophyllus</i>	Kathal	Fruits, leaves and barks were eaten mostly.
<i>Milium velutinum</i>	Bhilwa	Leaves and barks were eaten mostly.
<i>Pterocarpus marsupium</i>	Bija	Barks were eaten mostly.
<i>Zea mays</i>	Makka	Whole plant's parts are eaten.
<i>Phoenix sylvestris</i>	Chhind	Rhizomes are edible.
<i>Phoenix acaulis</i>	Buta chhind	Rhizomes are edible.
<i>Buchanania lanzan</i>	Char	The saplings are up-rooted; the root is thrashed clean of soil and is then eaten.
<i>Goruga pinnata</i>	Kekad	Barks were eaten mostly.
<i>Carica papaya</i>	Papita	Whole plant's parts are eaten.

Some of the elephants develop fascination for country made alcoholic drinks called "Handia".

6. THREATS

The pre-eminent threats to the Asian elephant today are habitat loss, degradation, agriculture and farming, grazing, mining, human interference, trade, pollution, hunting for ivory, insurgency, corridor loss, anthropogenic pressures on the habitat, man-elephant conflict, forest fires, illegal captures of live animals etc. Poisoning and disease are some other threats to the animal.

7. SOLUTION

Habitat destruction by man has threatened the survival of the Asian Elephant. Therefore; maintenance of the habitat is the first requirement in the conservation of the elephants. If proper habitat is absent or is below the desirable standard, then it may be developed. Elephants require, simultaneously, two types of habitats:

a. Dense forest with tall trees and

b. Scrub jungle and grasslands dense forest is required as refuge and protection from intense sun rays.

While scrub and grasslands are required as a better feeding area. Tall trees are not a good source of food because their foliage and tender twigs are beyond the reach of elephant's trunk. It is only the fallen fruit and bark of such trees which can be eaten. It is generally difficult to peel off the bark from trees. In a scrub or grassland, it is easy to feed. The food item may be foliage, tender shoot, entire plant or even the root; all are within their easy reach. With respect to the area, there are two options for the conservation of the elephants:

- **Restrict the elephants in a defined area**
- **Develop a corridor for long, may be interstate, migration route.**

Development of a corridor far beyond the OCP Chhal Dhramjaigah mining lease area will be the best choice for the conservation of the species. The corridor, to be developed, must have both the dense forest with tall trees as well as shrubby areas. Now it depends upon the condition of the area to decide that the shrubby areas should be forming outer fringe to the tall tree area or should be in the middle or should be in patches in between the tall trees. The corridor belt should be of sufficient width and should be planned either away from the village settlements or the isolated houses near to their path should be shifted. Elephants require 150-200kg of food per head, per day. Habitat planning should include provisions to yield sufficient food. It is important now to decide about the plant species. The food plants should be of more liking type to the elephants. To keep the food plants within easy reach of the elephants, regular planting of new plants or pruning to stimulate coppicing, should be made. Some of the food plant species suggested to be planted in the area are:

Dendrocalamus strictus, (Bans) *D. Rhedhii* (Bans), *Bambusa arundinacea* (Bans), *Ficus benghalensis* (Bargad), *F. religiosa* (peepal), *F. glomerata* (Gular), *F. rumphii* (Jangali Bargad), *F. infectoria* (Pakar), *Artocarpus heterophyllus* (Kathal), *Semecarpus anacardium* (Bhelwa), *Pterocarpus marsupium* (Bija), *Phoenix sylvestris* (Chhind), *Phoenix acaulis* (Buta chhind), *Buchanania lanzan* (Char), *Feronia elephantum* (Kaith), *Goruga pinnata* (Kekat), *Thysanolaena agrostis* (Hathi ghas), *Cymbopogon flexuosus* (ghas), *Themeda quadrivalvis* (Ghas), *Iseilema laxum* (Ghas), *Bothriochloa pertusa* (Ghas), *Apluda mutica* (Ghas) etc. Bamboos (*Dendrocalamus strictus*, *Bambusa arundinacea*) are one group of fast growing plants which can form a good proportion of diet to the elephants. Another bamboo species *Dendrocalamus rhedii* will be an exotic species to the area but is common in Western Ghats. It has a thin stem. Elephants have special liking for the bamboo plant and it is easy to grow the plant in sufficient quantity in short time. However, it is not a species which can create any problem. The villagers in OCP Chhal area have informed that the elephants have special liking for *Buchanania lanzan*. The saplings of the plant are uprooted and the root thrashed clean and eaten. With the vegetation it is essential to develop perennial sources of water with some salt ponds, within the conservation area.

6.5.3 ELEPHANT CORRIDOR

There is a need to establish an elephant reserve, combining the Tamor-Pingla and Semarsoot wildlife sanctuaries in Sarguja district and Badalkhol wildlife sanctuary in Jashpur district. Corridor will be developed to join these three wildlife sanctuaries. However, still no notification has been issued.

6.5.4 SOME SUGGESTIONS TO ESCAPE ELEPHANT DAMAGE

Methods adopted to escape elephant damage may be categorized as

1. Active and Passive methods

- Noise-making like shouting, drum beating, bursting fire crackers, firing gun shots into the air (by forest officials only),
- Using elephant torch light
- Pelting stones and lighted fuel-woods.
- Loudspeaker broadcasting of tiger roaring sound However, the major drawback of using all these methods is that these may provoke the raiding elephants increasing the possibility of more damage to the crops and other properties as well as higher risk to the farmer's life. Further, if the active methods fail to be effective, singly, then combined effort should be made.

2. Passive methods

- Change in cropping pattern by introducing some elephant repellent alternative cash crops (e.g. Patchouli, *Helianthus annuus*, *Capsicum annum* and Citrus).
- Digging trenches around village area.
- Planting sisal (*Agave Americana*) around village boundary.
- Solar fencing.
- Improvement of water sources.
- Raise/improve fodder resources.
- Fencing houses with GI wires.

Elephants avoid shining objects. GI wires are cheapest, shining objects to distract the elephants. Barbed wire fencing is gradually proving ineffective in preventing the movement of elephants. In the buffer zone of the presently applied mining lease area also the elephant have broken barbed wire fencing and entered a nursery. Crops of elephant liking should be avoided, as far as possible. Some of the crops, listed above, should be used to replace the more traditional crops like the sugarcane and rice. In Karnataka elephant proof trenches are being dig around the village area, but I have observed in Raigarh district in Chhattisgarh state that the

elephants can move down and up in trenches of good depth. Sisal has been found to be good to prevent the elephants to cross the sisal planted area. The plant yields a good quality fiber. Electric fencing has also been suggested as one of the methods but in Assam it has been found to be a failure as the elephant have discovered techniques to break such fences, safely. In areas like kamakshya nagar in Dhenkanal division in Orissa improvement of fodder resources in the forest has shown promising result of restricting the elephants more in the forest area. Passive methods are always better to avoid man-elephant conflicts. More important are the selection of plants as alternative crop as well as plants to check the entry of elephants in to the settlement areas. A good amount of researches and suggestions on the conservation and reducing its conflicts with human being is going on, resulting in suggestions coming frequently on these aspects. With the above, some more, methods are being suggested for affected region:

- **Two doors in a house:** Most of the houses in villages have only one door or exit. In case the elephant enters the house through the door, the occupants can escape through another door.
- **Timely information:** Timely information to the helping person about the approach of elephants can reduce the conflicts as well as loss of human life. For this a network should be formed with the villages and the forest officers.
- **Elephant torch:** The elephant torch should be provided to each of the vulnerable villages. Presently the torch is only with the forest officer, one torch for several villages.

Some more suggestions to avoid conflicts:

- Do not make crowd near elephant.
- Maintain at least 300 meter distance from the elephant.
- Do not wear red, white or colorful clothes.
- Day time is their resting time; do not disturb them during day time.

- Do not injure them neither they become more violent.
- Do not allow children, ladies and aged persons to go near the elephants.
- Do not prepare liquor or “handia” (country liquor) in the elephant movement area, because elephants like it and can smell it from distance. Do not go near the elephant after taking alcoholic drink.
- Elephants have good smelling power so keep in mind the direction of the wind.
- Elephant can run at a speed of 30-40km per hour, so do not run straight instead make zig-zag running.
- While running throw towel, handkerchief, cap or any other cloth so that they will get attracted to that and will get engaged with that.
- In a hilly terrain run towards the slope.
- While running away from an elephant do not hide behind a tree nor climb up a tree in the evening.
- To prevent the entry of elephants in a village burn wood and “Masal”. Collect in a group and make noise by beating drum, tin etc. Try to drive them towards non in habituated area.
- Make the payment for compensation of elephant loss, early.
- Inform loss of human life or property, within 24 hours to the Patwari or the nearest forest employee.

Steps taken in Africa, to escape elephant damage

- Elephant area is fenced with ropes. Fencing ropes are smeared with a mixture of chilli + tobacco powder in engine oil. Disagreeable smell of the mixture helps to some extent, to ward off the elephants
- Honey bee combs are promoted on the elephant corridor boundary. Honey bees ward off the elephants.
- Electronic tracking devices are attached to the elephants to track their movements. This helps in timely information to the villagers.

CHAPTER - 7

ENVIRONMENTAL MITIGATION MEASURES

7.1 Environmental Mitigation Measures

A) Mitigation measures of Air Pollution:

- Dust cannot be avoided completely due to the nature of the activities during mining operation. However it can be managed by regularly water spraying (particularly during the dry season) on haul roads, transfer points of conveyers and crushers.
- A fleet of sprinkler vehicles with adequate water spray systems will be made available and would be operational at all times.
- The novel enclosures method for control of fugitive particulate emission involves the application of porous wind fences (also referred to as wind screens).
- OB dumps areas will be isolated and re-vegetated.
- Plantation along coal transportation roads, infrastructures etc.
- Stabilization of unpaved surfaces.
- Tarpaulin covers shall be used over the beds of trucks, which will be used for transportation of overburden and coal, which are prone to fugitive dust emission.
- Idling, of delivery trucks/equipment should not be permitted.

B) Mitigation measures of Water Pollution:

The impact on water quality will be due to mine discharge. There will not be any impact on nearby water body as there isn't any surface water body in the vicinity of the mines. The change in the ground and surface water quality will be more pronounced mainly due to population increase by setting of new townships and influx of population from other areas.

- The surface water from the mining area will be regulated in such a manner so as to cause minimum contamination and alteration to the natural drainage system.
- The storm water will be diverted from the mining areas through a series of diversion banks intercept drains to either the natural drainage channels or to water storage reservoirs.
- All drain channels will provide with small stone/rock barriers across drain to water current and to arrest solid particles. This will also be cleaned periodically.
- Sewage treatment plan is proposed for sewage from office and colony.
- The mine water will be collected in setting tanks after sedimentation clear water will be discharged in natural stream.
- A network of drains, sedimentation control dams and sumps will be provided in the in-pit drainage so that maximum quantity of water will be reused to store in the water reservoirs.

C) Mitigation measures of Noise Pollution:

- Acoustic treatment of rotating equipments.
- Compulsory use of personnel protective equipment (PPE) such as ear plugs for water workers.
- All machine mountings will have in their foundations anti vibration pads / sheets for reducing the vibration and nearby noise.
- Installation of noise generating machinery, strictly in-compliance with the recommendation of the manufactures. This would ensure an installation free from vibration and exhaust leaks which are also measure contributors to increased noise levels.
- Use of dumping materials such as thin rubber sheet for wrapping the worn places of compressors, generators etc.

- Shock absorbing techniques to reduce impact.
- Use of physical barriers and green belt development around the mine to restrict the noise from going outside the proposed mine boundary during operation.

D) Mitigation measures of land use:

- Design the mining and associated activities for the minimum possible forest land requirement.
- Design the mining activities in such a manner that the changes in the surface drainage pattern are minimum.
- In case of opencast mines plan the mine with decommissioning, closure, reclamation and rehabilitation so that the land after mining can be brought in economic uses.

E) Mitigation Measures for Soil profile:

- Provisions should be made in opencast mining for separate removal and handling of top and sub-soils so that these can be re-laid at the time of reclamation for developing the land uses of the reclaimed surface.
- River bank and their stability plan for soil conservation.

F) Mitigation Measures for Vegetation:

- The vegetation cover will be improved by scientific green belt development as per MoEF guidelines 2006.
- The plantation should be made 4 times the number of existing plants before the mine is started.
- The plantation will be done as per the approved mining plan and Environmental Management Plan.
- Using advanced technologies such as remote sensing and Geographic Information Systems for planning, monitoring and evaluating forest cover.

G) Mitigation Measures for Wildlife:

- Development of alternate habitat for affected avifauna of core zone to buffer zone.
- Artificial nesting placement, trails and their regular monitoring by coordination with the forest department.
- Development of migratory corridors for wild animals.
- Check the natural streams to restore the water banks.

CHAPTER - 8

REVISED PROPOSED BUDGET FOR WILDLIFE CONSERVATION AND AFFECTED
AVIFAUNA ALTERNATIVE HABITAT MANAGEMENT PLAN OF OCP BAROUD

S. No.	Activities	Proposed Activity	Area/No. in ha.	Amount in Rs.	Duration in Years	Remark	Nodal/ Agency
01.	Habitat Improvement	Mixed Plantation on Revenue forest (Refer to chapter 8.2 S.No.- 03)	3 ha.	4,85,000	10	Plantation in Bulekera village and fruit bearing tree species first year for plantation with Fencing and 5 year maintenance (Buffer zone comp. 1312)	Forest Dept.
		Big tree plantation on School /Aaganbadi and another govt.office (Refer to chapter 8.2 S.No. – 01,02)	0.5	15,00,000	5	Plantation activity in to the schools and aganbadi, first year plantation and 5 year maintenance and management like tree guards/ fencing drainage etc.	Forest Dept.
		Plantation on Road side (Both side) (Refer to chapter 8.2 S.No.- 08)	4 ha	56,68,148	5	Plantation on (road side) of fruit bearing tree species with barbed wire fencing and 5 year maintenance.	Forest Dept.
		Rehabilitation exiting ecosystem improvement (Refer to chapter 8.2 S.No.- 06, 07)	20 ha	5,88,440	10	RDF Plantation activity has been proposed on suitable tree species at degraded forest land (Saraipali village) of buffer zones with 5 year maintenance & management.	Forest Dept.
		Development of grassland (Refer to chapter 8.2 S.No. 13,14)	5 ha.	39,27,000	5	Establishment of natural grassland on Faguram dam and Porda dam area of Buffer zone of OCP Baroud.	Forest Dept.
		Placement of artificial nest , Birdfeeder , water pots (Refer to chapter 8.2 S.No. 04,05)	1000 Nest boxes	5,00,000	5	Placement for up to 2 years monitoring and evaluation establish artificial nest box.	Forest Dept.
02.	Biodiversity improvement	Establishment of birds paradise (Pakshi vihar) including Fruit bearing tree species plantation on dumping sites	L.S	1,10,00,000	3	Creation of avifauna habitat (Pakshi Vihar) on dumping sites among the OCP Baroud. (Included 10% for monitoring & Evaluation By the SFRTI	SECL /Forest Dept.
		Plantation on River side (Both side) (Refer to chapter 8.2 S.No. 09)	10 ha	19,87,960	5	Plantation of fruit (Kurket River) bearing tree species with barbed wire fencing and 5 year maintenance.	Forest Dept.

03.	Plantation on River and pond /dam side	Plantation on faguram dam /Pond (Refer to chapter 8.2 S.No. 10,11,)	5 ha	9,93,980	5	Plantation on faguram dam (surrounding area) with tree guard and and 9 year maintenance.	Forest Dept									
		Plantation on Porda dam Refer to chapter8.2 S.No. 12)	8 ha	15,90,368	5	Plantation on porda village dam (surrounding area) with and 5 year maintenance.	Forest Dept.									
04.	Riverbank restoration work / Catchment area and channel treatment	Riverbank restoration	L.S	10,00,000	5	Restoration activity proposed onKurket river Approx 3 km (Bothside)	Forest Dept.									
05.	Treatment for up gradation on degraded forest to normal forest through Soil & Moisture Conservation (SMC)activity	Soil moisture conservation (Referto chapter 8.2 S.No. 15)	10 ha	30,250	5	SMC plan activity proposed onRange Gharghoda comp. 1312 Bulakela village buffer zone ofOCP Baroud and 2 year mainte nance	Forest Dept.									
06.	Training & workshop /Awareness camp	Organized of social awareness program, empowering and sensitizing villagers for conservation of Avifauna andwildlife.		6,00,000	3	Training program should be conducted for local community on nearby villages for awareness of avifauna and wildlife conservation	Forest Dept.									
07.	Monitoring and Evaluation.	Monitoring and Evaluation	L.S.	15,00,000	3	Monitoring & annual assessmentof all proposed activities, artificial nest, and plantation activity should be monitored and evaluated for next five years.	ForestDept./ Independent Agency									
			Total (A)	3,13,71,146												
08.	Human Elephant Conflict Management	For 10 Year (Rs in Lakh)											Human Elephant conflict management related all activities will be carried out in the selected range as well as compartment of concern Forest Division./ Awareness & education programshould be conducted for affected area in buffer zone in	Forest Dept		
			1	2	3	4	5	6	7	8	9	10				
		I. A. Wages/ Honorarium of Hathi Tracking team (5 Person @ Rs. 9000 per month)	L.S	5.88	5.88	5.88	5.88	5.88	0	0	0	0			0	29,40,000
		I.B. Hiring of Vehicle	L.S	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40			1.40	14,00,000
		I.C. Uniform, Shoes, Blanket, tracking Equipment, Night vision Camera & Binoculars	L.S	4.00	0	0	0	0	0	0	0	0			0	4,00,000
I.D. Protective Equipment, Flare gun	L.S	4.00	0	0	0	0	0	0	0	0	0	4,00,000				

	2. Early Warning System	L.S	5.00	0	0	0	0	0	0	0	0	0	0	5,00,000	OCP Baroud.
	3. Hathi Mitra Dal	L.S	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	30,00,000	
	4. Hiring of Veterinaries Service	L.S	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	5,00,000	
	5. Rewards	L.S	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	2,00,000	
	6. Hiring of Legal Experts/ Advocate	L.S	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	2,00,000	
	7. Purchase of public awareness material	L.S	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	10,00,000	
	8. Establishment of Transit First Aid Centre	L.S	10.00	5.00	0	0	0	0	0	0	0	0	0	15,00,000	
	9. Awareness and education program	L.S	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	15,00,000	
			Total(B)											1,35,40,000	
			Grand total (A+B)											4,49,11,146	
In Words: FOUR CRORES FOURTY NINE LAKHS ELEVEN THOUSAND ONE HUNDRED FORTY SIX RUPEES ONLY															

Note:-

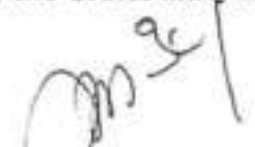
- ❖ The Budget is proposed on 2019 recent rate of Rs. 300 /man days. The costs should be revised depending upon the increase in wage
- ❖ Budget for Plantation of Safety zone is imposed earlier under condition of EIA report by the SECL and this report only recommends the favorable plant species which provides food, shelter and alternate habitat for avifauna and wildlife.
- ❖ **CAMPA Norms:** - All the proposed activities in the budget were taken under CAMPA norms.
- ❖ Regarding any doubt, Implementing agency should get the clarification from PCCF (W.L.) cum Chief Wildlife Warden C.G.
- ❖ The implementing agency should follow the guideline issued by project elephant and MoEF&CC.


 इन प्रकृतिकारि
 राधेश्वर, वनमन्त्रालय

REVISED PROPOSED BUDGET FOR WILDLIFE CONSERVATION AND AFFECTED AVIFAUNA ALTERNATIVE HABITAT MANAGEMENT PLAN OF OCP BAROUD

S. No.	ACTIVITIES	Amount in Cr.														
		Years from clearing the area										Total	Unit	Rate Cr.	Total Amount in Cr.	
		1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th					
Human Elehpant Conflict Management																
1	Construction of Elephant Proof Wall	20.56	-	-	-	-	-	-	-	-	-	20.56	Per Km.	1.23	20.56	
2	Protective Equipment, for Wlidlife conflict															
2(i)	Purchase of Vehicle for Protection for Human elephant Conflict, Raigarh Forest Division, Dharamjaigarh Forest Division and adjecent Forest division (Isuzu D-Max)	0.22	0.22	0.22	0.22	0.22	0.22	-	-	-	-	1.32	per nos	0.22	1.32	
2(ii)	Eastablisemnt of Human Rescue Center in Pusalda Village	0.20	-	-	-	-	-	-	-	-	-	0.20	LS	0.20	0.20	
2(iii)	Computer Set for Monitoring and Evaluation and othe equipment for wildlife protection (Anti schenear stick, Gum boots, Night Vision Camera)	0.05	0.05	0.05	0.05	-	-	-	-	-	-	0.20	LS	0.05	0.20	
2(iv)	Drone Camera for Elephant Movement Tracking	0.025	0.025	-	-	-	-	-	-	-	-	0.050	LS	0.03	0.05	
												TOTAL(D)				22.33

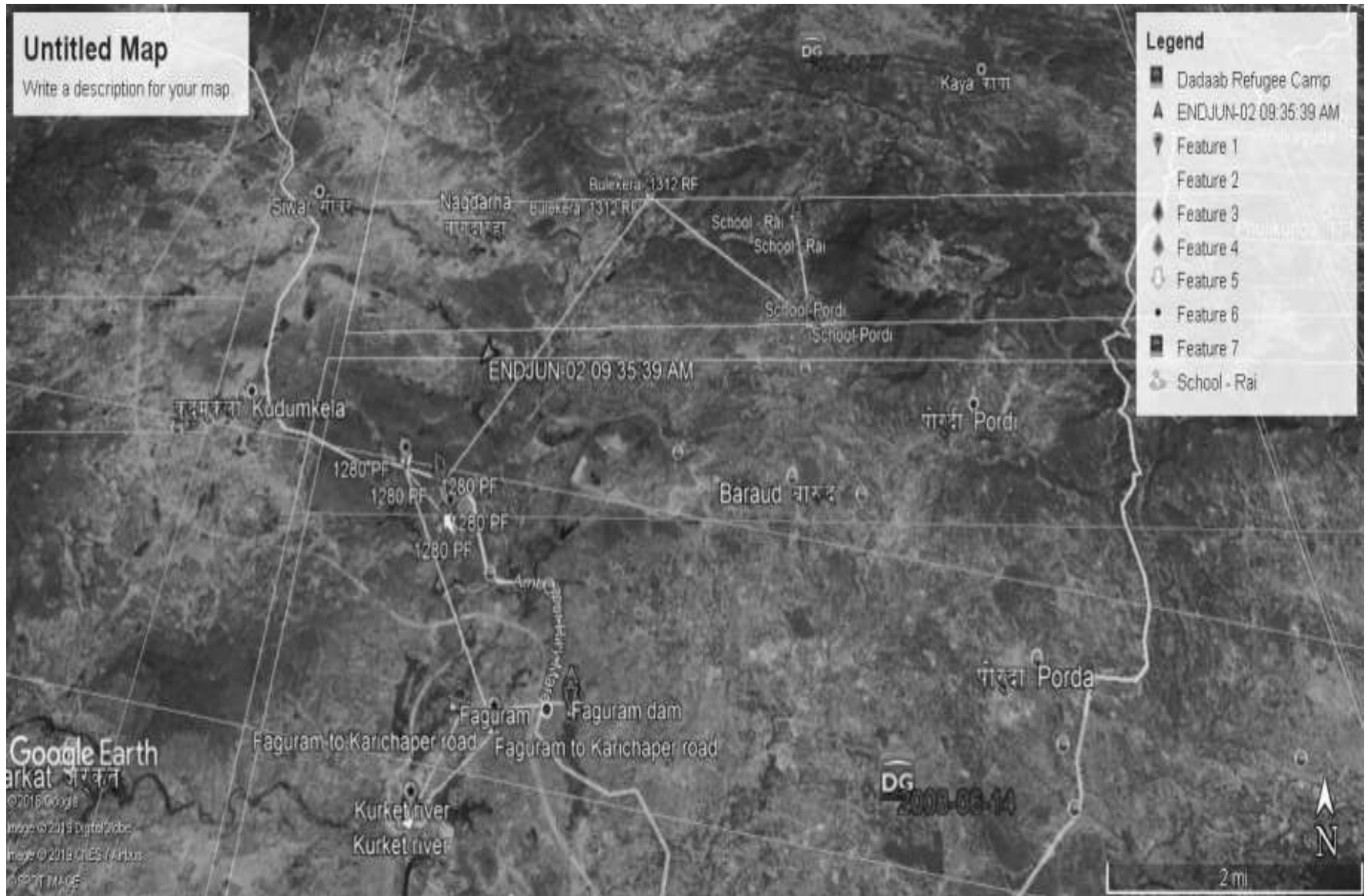
Rupees Twenty two Crores thirty three lacs Only


 Divisional Forest Officer
 Raigarh

8.2 PROPOSED ACTIVITY & LOCATION FOR ALTERNATIVE HABITAT MANAGEMENT PLAN OF OCP BAROUD

S no.	Name of Division	Name of Range	Activity	Comp.no./ Village	GPS Location	Area in ha./km	No. of plants/box	Recommended species. tree	Remark
01.	Raigarh	Gharghoda	Plantation (As per camp norms @ Rs 2500/ per plant.)	Primary School Rai	22 ⁰ 18'22.45" 83 ⁰ 21'59.27"	1 ha	550	Shady, Fruit bearing	Revenue land
02.	Raigarh	Gharghoda		Primary school-Pordi	22 ⁰ 17'18.38" 83 ⁰ 22'04.22"		550		
03.	Raigarh	Gharghoda	Mixed Plantation (As per camp norms @ Rs 161799 per ha.)	Bulekera-1312 RF	22 ⁰ 18'42.18" 83 ⁰ 20'24.80"	3 ha	3300	Fruit bearing, Terminaliya arjuna,	Forest land and Fencing required and Monitoring
04.	Raigarh	Gharghoda	Placement of Nest box	Bulekera-1312 RF	22 ⁰ 18'42.18" 83 ⁰ 20'24.80"	---	500 nest box	---	1000 nest box and 250 bird feeder & 250 water pots will be placed for Buffer zone & monitoring
05.	Raigarh-Gharghoda	Gharghoda		Saraipali 1280 PF	22 ⁰ 15'50.27" 83 ⁰ 18'34.24"		500 nest box	---	
06.	Raigarh	Gharghoda	RDFplantation (As per camp norms @ Rs 29422 per ha.)	Saraipali 1280 PF	22 ⁰ 15'33.01" 83 ⁰ 18'42.15"	20 hac	11000	Shady, ornamental, Fruit bearing	RDF plantation activity Forest land
07.	Raigarh	Gharghoda		Saraipali 1280 P	22 ⁰ 15'58.58" 83 ⁰ 18'13.77"		11000	Shady, ornamental Fruit bearing	Forest land
08.	Raigarh	Gharghoda	Road side plantation (As per camp norms @	Faguram to Karichaper road	22 ⁰ 14'04.92" 83 ⁰ 19'16.63"	4 ha	2000	Shady, Fruit bearing,	Revenue land

			Rs1288215.30 per ha)						
09.	Raigarh	Gharghoda	Plantation on River /Pond Dam (Both& surrounding) (As per camp norms @ 1,98,796 per ha.)	Kurket river Bulekera	22 ⁰ 13`33.91” 83 ⁰ 18`42.07”	10 ha	11000	Shady, Fruit bearing, Terminaliya arjuna Jamun, Ficus species.	Revenue land
10.	Raigarh	Gharghoda		Faguram pond	22 ⁰ 14`11.79” 83 ⁰ 18`59.40”	5. ha	22		Revenue land
11.	Raigarh	Gharghoda		Faguram dam	22 ⁰ 14`16.46” 83 ⁰ 19`52.87”		5500		Revenue land
12.	Raigarh	Gharghoda		Porda dam	22 ⁰ 14`31.34” 83 ⁰ 23`27.02”	8 ha	8800		Revenue land
13.	Raigarh	Gharghoda	Development of grassland As per CA norms @ Rs 7,85,400 per ha .	Faguram dam	22 ⁰ 14`16.46” 83 ⁰ 19`52.87”	3 ha	----	--	Development of grass land
14.	Raigarh	Gharghoda		Porda dam	22 ⁰ 14`31.34” 83 ⁰ 23`27.02	2 ha	---	---	Development of grass land
15.	Raigarh	Gharghoda	SMC activity As per camp norms @ Rs 3025 per ha.	Bulekera-1312 RF	22 ⁰ 18`42.18” 83 ⁰ 20`24.80”	10 ha		--	SMC plan activity proposed on Range Gharghoda comp. 1312 Bulakela village buffer zone of OCP Baroud



Google map showing specific plan & location of OCP Baroud

GLIMPSES OF AVIFAUNA IN OCP BAROUD



Eurasian Golden Oriole



Little Cormorant



Asian Open Bill Stork



Copper Smith Barbet



Red Vented Bulbul



Laughing Dove



Little Egret



Asian Pied Starling



Common Tailor Bird



Variable Wheatear



Cattle Egret



Indian Silver bill



Common Myna



Pond Heron



House Sparrow



Green Bee Eater



Purple Sun Bird





Asian Koel



Indian Pond Heron



Common Pigeon



Jungle Bush Quail



Indian Roller



Cattle Egret

GLIMPSES OF AVIFAUNA NEST IN OCP BAROUD



Cavity Shaped Nest



Cavity Shaped Nest



Cup Shaped Nest



Pendulum Shaped Nest



Cup Shaped Nest



Platform Shaped Nest

GLIMPSES OF ARTIFICIAL NEST IMAGES



Design for Sparrow, Myna etc



Design for Indian Robin, Roller etc



Design for Doves, Parakeets etc



Design for cavity Nesters



Design for Owls & Owlets Design for Platform Nesters

GLIMPSES OF BIRD FEEDER



Construction of bamboo based bird feeder in SFRTI

CHAPTER - 9

REFERENCES

-
- ❖ Ammer, F. K. (2003). *Population level dynamics of grasshopper sparrow populations breeding on reclaimed mountaintop mines in West Virginia. Ph.D. dissertation, West Virginia University, Morgantown.*
 - ❖ Anders, A. D. and Marshall, M. R. (2005). *Increasing the accuracy of productivity and survival estimates in assessing land bird population status. Conservation Biology 19:66-74.*
 - ❖ Angel, P., V. Davis, J. Burger, D. Graves, and C. Zipper. (2005). *The Appalachian Regional Reforestation Initiative (ARRI). Forest Reclamation Advisory, 1, 1-2.*
 - ❖ Arcos, F., and Salvadores, R. (2005). *Habitat selection by territorial males of Little Bustard *Tetrax tetrax* in a NW Iberian population. Ardeola 52:151–157.*
 - ❖ Avifauna survey report for Power Grid Corporation, 765 KV D/C Jharsuguda-Dharamjaigarh (Korba), Transmission line, prepared by Conservation core Society and Bilaspur State University, 2013.
 - ❖ Bajema, R. A., Devault T.L., Scott P.E., and Lima S.L. (2001). *Large reclaimed coal mine grasslands and their significance for Henslow's Sparrows in the American Midwest. Auk 118:422–431.*
 - ❖ Balbontin, J. (2005). *Identifying suitable habitat for dispersal in Bonelli's eagle: An important issue in halting its decline in Europe. Biological Conservation 126:74–83.*
 - ❖ Bard, A. M., Smith, H.T., Egensteiner, E. D., Mulholland, R., Harber, T. V., Heath, G. W., Miller, W. J. B. and Weske, J. S. (2002). *A simple structural method to reduce road-kills of royal terns at bridge sites. Wildlife Society Bulletin 30:603–605.*
 - ❖ *Best Management Practices Manual, Ministry of Environment and Forests, Government of India, February 2003.*
 - ❖ Beachy, T. A. (2008). *Cerulean warbler (*Dendroica cerulea*) breeding ecology and habitat selection, initial response to forest management, and association with anthropogenic disturbances in the Cumberland Mountains of Tennessee. M.S. thesis, University of Tennessee, Knoxville.*
 - ❖ Beckerle, L. T. (2004). *Techniques for encouraging native plants and creating bobwhite quail habitat on drastically disturbed land. Proceedings*

- of the National Meeting of the American Society of Mining and Reclamation 21:127.
- ❖ *Bhushan, Chandra Rich Lands, Poor People: The Socio-Environmental Challenges of Mining in India. Rich, Lands, Poor People: The Socio-Environmental Challenges of Mining in India.*
 - ❖ *Boaz A.A. et a.l, Birds of Chhattisgarh (2012), First edition published by Ela Foundation and Forest Department Chhattisgarh.*
 - ❖ *Bolger, D.T., A.C. Alberts, and M.E. Soule. (1991). Occurrence patterns of bird species in habitat fragments: Sampling, extinction, and nested species subsets. The American Naturalist, 137, 155-166.*
 - ❖ *Bollinger, E. K., and Gavin, T. A. (2004). Responses of nesting bobolinks *Dolichonyx oryzivorus* to habitat edges. Auk 121:767–776.*
 - ❖ *Boves, T. A. (2011). Multiple responses by Cerulean Warblers to experimental forest disturbance in the Appalachian Mountains. Ph. D. dissertation, University of Tennessee, Knoxville.*
 - ❖ *Brändle, M., Durka, W., Krug, H. and Brandl, R. (2003). The assembly of local flora and fauna: Plants and birds in non-reclaimed mining sites. Ecography 26:652-60.*
 - ❖ *Brenner, F. J., and Kelly, J. (1981). Characteristics of bird communities on surface mined lands in Pennsylvania. Environmental Management 5:441-49.*
 - ❖ *Brown, K.S. jr. (1991). Conservation of Neotropical environments: insects as indicators. In: Collins, N.M., Thomas, J.A. (Eds.), The conservation of insects and their habitats. Academic Press, London, pp. 449–504.*
 - ❖ *Buehler, D. A., Welton, M. J. and Beachy, T. A. (2006). Predicting cerulean warbler habitat use in the Cumberland Mountains of Tennessee. Journal of Wildlife Management 70:1763-1769.*
 - ❖ *Buehler, D. A., Roth, A. M., Vallender, R., Will, T. C., Confer, J. L., Canterbury, R. A., Swarthout, S. B., Rosenberg, K. V. and Bulluck, L. P. (2007). Status and conservation priorities of Golden-Winged Warbler (*Vermivora chrysoptera*) in North America. The Auk 124:1439-1445.*
 - ❖ *Bulluck, L. P. and Buehler, D. A. (2008). Factors influencing golden-winged warbler (*Vermivora chrysoptera*) nest-site selection and nest survival in the Cumberland Mountains of Tennessee. Auk 125:551-559.*
 - ❖ *Burger, J.A. (2011). Sustainable mine land reclamation in the eastern U.S. coalfields: A case for an ecosystem reclamation approach. Paper presented*

- at the 2011 National Meeting of the American Society of mining and Reclamation, Bismarck, ND.
- ❖ Camenzind, F. J. 1984. Wildlife and coal development: An overview. *Minerals and the Environment* 6:94-100.
 - ❖ Canterbury, G.E., T.E. Martin, D.R. Petit, L.J. Petit and D.F. Bradford (2000). Bird communities and habitat as ecological indicators of forest condition in regional monitoring. *Conservation Biology*, 14, 544–558.
 - ❖ Carrascal, L. M., Seoane, J., Palomino, D. and Alonso, C. L. (2006). Habitat preferences, population size and demographic trends of Houbara Bustard *Chlamydotis undulata* in Lanzarote and La Graciosa (Canary Islands). *Ardeola* 53:251–269.
 - ❖ Catlin, D. H., and Rosenberg, D.K. (2006). Nest destruction associated with mortality and dispersal of burrowing owls in the Imperial Valley, California. *Southwestern Naturalist* 51:406–409.
 - ❖ Clevenger, A. P., Chruszcz, B. and Gunson, K.E. (2003). Spatial patterns and factors influencing small vertebrate fauna road-kill aggregations. *Biological Conservation* 109:15–26.
 - ❖ Devault, T. L., Scott, P.E., Bajema R.A., and Lima, S.L. (2002). Breeding bird communities of reclaimed coal-mine grasslands in the American Midwest. *Journal of Field Ornithology* 73:268–275.
 - ❖ Dutta, P., Mahatha, S. and De, P. 2004. Opencast mining impact. A methodology for cumulative impact assessment of opencast mining projects with special reference to air quality assessment. *Impact Assessment and Project Appraisal*, volume 22, number 3, September 2004, pages 235–250, Beech Tree Publishing, 10 Watford Close, Guildford, Surrey GU1 2EP, UK.
 - ❖ EIA Guidance Manual - Ministry of Minerals, Ministry of Environment and Forest, Government of India, New Delhi, February 2010.
 - ❖ Erritzoe, J., Mazgajski, T. D. and Rejt, L. (2003). Bird casualties on European roads—a review. *Acta Ornithologica* 38:77–93.
 - ❖ Ferrer, M., and Harte, M. (1997). Habitat selection by immature Spanish Imperial Eagles during the dispersal period. *Journal of Applied Ecology* 34:1359–1364.
 - ❖ Forman, R. T. T., and Alexander, L. E. (1998). Roads and their major ecological effects. *Annual Review of Ecological Systems* 29:207–231.
 - ❖ Frey, S. N., and Conover, M. R. (2006). Habitat use by meso-predators in a corridor environment. *Journal of Wildlife Management* 70:1111–1118.

- ❖ Gavashelishvili, A., and McGrady, M. J. (2006). *Breeding site selection by Bearded Vulture Gypaetus barbatus and Eurasian Griffon Gyps fulvus in the Caucasus. Animal Conservation* 9:159–170.
- ❖ Galligan, E.W., T.L. DeVault, and S. Lima. (2006). *Nesting success of grassland and savanna birds on reclaimed surface coal mines of the Midwestern United States. The Wilson Journal of Ornithology*, 118, 537-546.
- ❖ Glista, D. J., DeVault, T. L. and DeWoody, J. A. (2008). *Vertebrate road mortality predominantly impacts amphibians. Herpetological Conservation and Biology* 3(1):77–87.
- ❖ Gorog, A. J., Pamungkas, B. and Lee, R.J. (2005). *Nesting ground abandonment by the Maleo Macrocephalon maleo in North Sulawesi: identifying conservation priorities for Indonesia's endemic megapode. Biological Conservation* 126:548–555.
- ❖ Gregg, I. D. (1997). *American Woodcock use of reclaimed surface mines in West Virginia. M. S. thesis, West Virginia University, Morgantown.*
- ❖ Gutzwiller, K. J., and Barrow, W.C. (2003). *Influences of roads and development on bird communities in protected Chihuahuan Desert landscapes. Biological Conservation* 113:225–237.
- ❖ Hardt, R.A. and R.T.T Forman. (1989). *Boundary form effects on woody colonization of reclaimed surface mines. Ecology*, 70, 1252-1260.
- ❖ Herzog, F., A. Lausch, E. Muller, H. Thulke, U. Steinhardt, and S. Lehmann. (2001). *Landscape Metrics for Assessment of Landscape destruction and Rehabilitation. Environmental Management* 27, 91-107.
- ❖ Hunter, W. C., D. A. Buehler, R. A. Canterbury, J. L. Confer, and P. B. Hamel. 2001. *Conservation of disturbance-dependent birds in eastern North America. The Wildlife Society Bulletin* 29:440-55.
- ❖ Ingold, D. J. (2002). *Use of reclaimed stripmine by grassland nesting birds in east-central Ohio. Ohio Journal of Science* 102:56–62.
- ❖ Jacobson, S. L. (2005). *Mitigation measures for highway-caused impacts to birds. In C. J. Ralph and T. D. Rich (eds.). USDA Forest Service General Technical Report PSWGTR- 191, Volume I and II, 1043–1050. Forest Service, U.S. Department of Agriculture. 1294pp.*
- ❖ James, F.C. and N.O. Wamer. (1982). *Relationships between temperate forest bird communities and vegetation structure. Ecology*, 63, 159-171.

- ❖ Jones, S. L., Dieni, J. S., Green, M. T. and Gouse, P. J. (2007). Annual return rates of breeding grassland songbirds. *Wilson Journal of Ornithology* 119:89-94.
- ❖ Kadekodi, Gopal K. 2010. *The Health of Mining and Wealth of Miners* July 24, *Economic & Political Weekly* XIV (30): 14-15.
- ❖ Kimmel, R. O. and Samuel, D. E. (1984). Ruffed grouse brood habitat on reclaimed surface mines in West Virginia. *Environmental Geochemistry and Health* 6:150-153.
- ❖ Loss, S.R., M.O. Ruiz, and J.D. Brawn. (2009). Relationships between avian diversity, neighborhood age, income, and environmental characteristics of an urban landscape. *Biological Conservation*, 142, 2578-2585.
- ❖ Mattice, J. A., Brauning, D. W. and Diefenbach, D. R. (2005). Abundance of grassland sparrows on reclaimed surface mines in western Pennsylvania. Pages 504-510 in C. J. Ralph and T. D. Rich, editors. *Bird conservation implementation and integration in the Americas: Proceedings of the Third International Partners in Flight Conference*, USDA Forest Service General Technical Report PSW-GTR-191.
- ❖ Ministry of Mines 2008. *National Mineral Policy (For non - fuel and non - coal minerals)*, Government of India
- ❖ Ministry of Mines 2011. *Mining Policy and Legislation, Annual Report 2010-2011*
- ❖ Monroe, M. S. and Ritchison, G. (2005). Breeding biology of Henslow's Sparrows on reclaimed coal mine grasslands in Kentucky *Journal of Field Ornithology* 76:143-149.
- ❖ Mumme, R. L., Schoech, S. J., Woolfenden, G. E. and Fitzpatrick, J. W. (2000). Life and death in the fast lane: demographic consequences of road mortality in the Florida Scrub-Jay. *Conservation Biology* 14:501–512.
- ❖ Palmer, W. E., Terhune, T. M. and McKenzie, D. F. (2011). *The National Bobwhite Conservation Initiative: A range-wide plan for recovering bobwhites*. National Bobwhite Technical Committee Technical Publication, ver. 2.0.
- ❖ Parmenter, R. R., and J. A. MacMahon. (1992). faunal community development on disturbed lands: An indicator of reclamation succession. In *Evaluating Reclamation Success: The Ecological Consideration— Proceedings of a Symposium*, ed. J. C. Chambers and G. L. Wade, 73-89. (Contains selected papers from the 1990 Mining and Reclamation

- Conference and Exhibition of the American Society for Surface Mining and Reclamation, held April 23-26, 1990, in Charleston, W.Va.) U.S. Department of Agriculture. U.S. Forest Service. Northeast Forest Experiment Station General Technical Report NE-164. Radnor, Pa.: Northeastern Forest Experiment Station.*
- ❖ *Parrish, T. L., Hubert, W. A., Anderson, S. H., Purcherelli, M. J. and Mangus, W. (2001). Distributions of roosting Sandhill Cranes as identified by aerial thermography. Prairie Naturalist 33:93–100.*
 - ❖ *Perlut, N. G., A. M. Strong, T. M. Donovan, and N. J. Buckley. 2008. Grassland songbird survival and recruitment in agricultural landscapes: implications for source-sink demography. Ecology 89:1941-1952.*
 - ❖ *Pinto, M., Rocha, P. and Moreira, F. (2005). Long-term trends in Great Bustard *Otis tarda* populations in Portugal suggest concentration in single high quality area. Biological Conservation 124:415–423.*
 - ❖ *Ramp, D., Wilson, V. K., and Croft, D. B. (2006). Assessing the impacts of roads in peri-urban reserves: road-based fatalities and road usage by wildlife in the Royal National Park, New South Wales, Australia. Biological Conservation 129:348–359.*
 - ❖ *Ramsden, D. J. (2003). Barn owls and major roads: results and recommendations from a 15-year research project. Barn Owl Trust, Ashburton, Devon, UK.*
 - ❖ *Reijnen, R., and Foppen, R. (1994). The effects of car traffic on breeding bird populations in woodland. I. Evidence of reduced habitat quality for Willow Warblers *Phylloscopus trochilus* breeding close to a highway. Journal of Applied Ecology 31:85–94.*
 - ❖ *Reijnen R., and Foppen, R. (2006). Chapter 12: Impact of road traffic on breeding bird populations. In Davenport, J. and J. L. Davenport (eds.). The ecology of transportation: managing mobility for the environment, 255–274. Springer, the Netherlands.*
 - ❖ *Rice, F. H. (1986). Response of wild turkeys to surface coal mining in north central Pennsylvania. M. S. thesis, Pennsylvania State University, University Park, Pennsylvania.*
 - ❖ *Rohrbaugh, R. W., Jr. and Yahner, R. H. (1996). Reclaimed surface mines: an important nesting habitat for northern harriers in Pennsylvania. Pages 307-314 in D. Bird, D. Varland, and J. Negro, editors. Raptors in human*

- landscapes. Adaptations to built and cultivated environments. Academic Press.
- ❖ Sara, M., and Di Vittori, M. (2003). Factors influencing the distribution, abundance and nest-site selection of an endangered Egyptian vulture *Neophron percnopterus* population in Sicily. *Animal Conservation* 6:317–328.
 - ❖ Scott, M. D., and G. M. Zimmerman. (1984). Wildlife management at surface coal mines in the Northwest. *Wildlife Society Bulletin* 12:364-70.
 - ❖ Scott, P. E., Devault, T.L., Bajema, R. A., and Lima, S. L. (2002). Grassland vegetation and bird abundances on reclaimed midwestern coal mines. *Wildlife Society Bulletin* 30:1006–1014.
 - ❖ Standard terms of reference [TOR] for EIA / EMP report for Projects / activities requiring Environment clearance under EIA Notification, 2006, Ministry of Environment, Forest and Climate Change, April 2015.
 - ❖ Singh, Dr. Gurdeep. Mitigating environmental and social impacts of Coal mining in India. 1st International Conference on “Managing the Social & Environmental Consequences of Coal Mining in India’ during November 19-21, 2007 at New Delhi, *Mining Engineer Journal*, June, 2008.
 - ❖ Singh, Gurdeep. Regional Environmental and Social Challenges facing the Coal Industry. The Coal Summit Organised the India Energy Forum, Indian Coal Forum and MGMI, 19-20 October 2005.
 - ❖ Singh, Gurdeep and Gupta, R. K. Water Pollution from Coal Washeries and its Impact on Damodar River. *The Indian Mining & Engg. J.* 44 (3), 2005.
 - ❖ Singh, A. N., Raghubanshi, A. S. and Singh, J. S, Plantations as a tool for mine spoil restoration, *Current Science*, 82:12, June 2002.
 - ❖ Singh, Gurdeep and Puri, S. K. Air quality assessment in Korba Coalfield *Indian Journal of Air Pollution Control*, IV (2) 31-41, Sept 2004.
 - ❖ Singh, Gurdeep, Water pollution issues and control strategies in mining areas, *Minetech*, 20:1 pp45-53, Jan-Feb 1999.
 - ❖ Singh, Gurdeep, Water sustainability through Augmentation of Underground Pumped out Water for Potable Purpose from Coal Mines of Eastern India. *Environmental Geochemistry*, Vol8, No. 1 & 2, pp.89-94, 2005.
 - ❖ Singh, Arun P. 2010. Butterfly diversity in tropical moist deciduous sal forests of Ankua Reserve Forest, Koina Range, Saranda Division, West

- Singhbhum District, and Jharkhand, India. Journal of Threatened Taxa* 2(9): 1130-1139.
- ❖ Singh, R. K. 2000. *Impact of Iron ore mining on the elephant habitat of Singhbhum forests, Bihar. Thesis presented to the Saurashtra University, Rajkot, India for the degree of Doctor of Philosophy in Wildlife Science.*
 - ❖ Stauffer, G. E. (2008). *Nesting ecology and site fidelity of grassland sparrows on reclaimed surface mines in Pennsylvania. M. S. thesis, Pennsylvania State University, University Park.*
 - ❖ Stauffer, G. E., Diefenbach, D. R., Marshall, M. R. and Brauning, D. W. (2011). *Nest success of grassland sparrows on reclaimed surface mines. Journal of Wildlife Management* 75:548-557.
 - ❖ Tripathy, D. P., Panigrahi, D. C. and Singh, Gurdeep 1997. *Environmental Impacts of Mine Fires - A Case Study of a Part of Jharia Coalfield, 2nd WOMEC, Katowice, Poland.*
 - ❖ Whelan, C.J., C.H. Sekercioglu and D.G. Wenny (2015). *Why bird matter from economic ornithology to ecosystem services. J. Ornithol.,* 156, 227-238.
 - ❖ Whelan, C.J., D.G. Wenny and R.J. Marquis (2008). *Ecosystem services provided by birds. Annals of the New York Academy of Sci.,* 1134, 25-60.
 - ❖ Wickham, J.D., K. Riitters K., Wade, T.G., Coan, M., and Homer, C. (2007). *The effect of Appalachian mountaintop mining on interior forest. Landscape Ecology,* 22, 179-187.
 - ❖ Winter, M., Johnson, D.J., and Faaborg, J. (2000). *Evidence for edge effects on multiple levels in tallgrass prairie. The Condor,* 102, 256-266.
 - ❖ Wood, P. B., Bosworth, S. B. and Dettmers, R. (2006). *Cerulean warbler abundance and occurrence relative to large-scale edge and habitat characteristics. Condor* 108:154-165.
 - ❖ https://en.wikipedia.org/wiki/Waste_management
 - ❖ <https://en.wikipedia.org/wiki/Ecology>

ANNEXURE I

Datasheet for bird status survey

Cell-ID: **T1** Team: Manas Manohar Ujjaini, Tumesh Koshle, Rajesh Toppo, Gulshan Janghel. Trail-length: 1 (Km)

GPS at every 300 m			Sighting information					
S.N.	Latitude	Longitude	Species	Number	Perp. Dist.	Bearing		Observation
						A	T	
0 M	22°16'38.62"	83°20'20.42"	Indian Rollar	1	7 yard	260°	320°	Pearching
			Greenish Varblar	01	-	-	-	By Chirping
			Laughing Dove	01	7 yard	262°	320°	Pearching
			Common Myna	02	10 yard			parching
300 M	22°16'39.04"	83°20'19.68"	Europium Collared Dove	04	7 yard-	251°	280°	parching
			Black Drongo	01	56 yard	350°	280	parching
600 M	22°16'39.03"	83°20'19.68	Rose Ringed Parakit	02				flying
1000 M	22°16'38.64"	83°20'20.35"	Collered Dove	06	15 miter	165°	215°	parching
			Rose Ringed Parakit	02	61 miter			flying
			Black Drongo	01				By Chirping
			Greater Black Wood Packer	01				By Chirping

Datasheet for bird status survey

Cell-ID: **T2** Team: Manas Manohar Ujjaini, Tumesh Koshle, Rajesh Toppo, Gulshan Janghel, Trail-length: 1 (Km)

GPS at every 300 m			Sighting information					
S.N.	Latitude	Longitude	Species	Number	Perp. Dist.	Bearing		Observation
						A	T	
0 M	22°15'20.13"	83°19'20.36"	Laughing Dove	02	13 yard	350°	265°	Pearching
			Indian Rollar	01	5yard -	291°	265°	Pearching
			Red Vented Bulbul	01	15yard	258°	265°	Pearching
			Black Drongo	01				Flying
			Cattle Egret	06				Flying
			Asian Koel	02				By Chirping
			Common Myna	01				By Chirping
300 M	22°15'20.18"	83°19'20.24"	Common Myna	02	8 yard-	294°	309°	Pearching
			Indian Silvar Bill	01				By Chirping
			Black Drongo	01				By Chirping
			Purpal Sun Bird	02				By Chirping
600 M	22°15'20.18"	83°19'20.24"	Indian Rollar	02	13 Yard	198°	295°	Pearching
			Common Kingfisher	02	20 Yard	310°	295°	Pearching

REPORT OF WILDLIFE AND AVIFAUNA SURVEY OF OCP BAROUD, RAIGARH AREA

			Eropion Golden Quial	01				By Chirping
			Purple Sunbird	01				By Chirping
			Indian Robin	01	10 Yard	230`	295`	Pearching
1000 M	22°15'27.00"	83°19'00.27"	Black Drongo	01	12 Yard	303`	273`	Pearching
			Red Vented Bulbul	03	12 Yard	303`	273`	Pearching

Datasheet for bird status survey

Cell-ID: T3 Team: Manas Manohar Ujjaini, Tumesh Koshle, Rajesh Toppo, Gulshan Janghel, Trail-Length: 1.2 (Km)

GPS at every 300 m			Sighting information					
S.N.	Latitude	Longitude	Species	Number	Perp. Dist.	Bearing		Observation
						A	T	
0 M	22°15'39.86"	83°19'41.27"	Red Vented Bulbul	04	11.89 Yard	189°	230°	Pearching
300 M	22°15'40.37"	83°19'52.24"	Indian Pond Heron	04	-	-	-	By flying
			Greater Flame Back	01	-	-	-	By Chirping
600 M	22°15'40.95"	83°20'01.05"	Plum Headed Parakeet	02	-	-	-`	By Chirping
			Red Vented Bulbul	02	2.5 yard	180°	100°	Pearching
900 M	22°15'37.11"	83°20'09.54"	Purple Sun Bird	01	-	-	-	By Chirping
			Blyth's Reed Warbler	01	-	-	-	By Chirping
			Laughing Dove	02	-	-	-`	By Chirping
1200m	22°15'32.05"	83°20'16.46"	Laughing Dove	02	-	-	-	By Chirping
			Jangle Bush Quail	01	-	-	-	By walking

Datasheet for bird status survey

Cell-ID: T 4 Team: Manas Manohar Ujjaini, Tumesh Koshle, Rajesh Toppo, Gulshan Janghel, Trail-length: 1.2 (Km)

GPS at every 300 m			Sighting information					
S.N.	Latitude	Longitude	Species	Number	Perp. Dist.	Bearing		Observation
						A	T	
0 M	22°16'28.55"	83°20'01.85"	Copper Smith Barbet	01	2.74 yard	349	300°	Pearching
			Indian Roller	01	-	-	-	By Chirping
			Asian Koel	02	-	-	-	Pearching
			Common Myna	02	6.40 yard	-	300	By flying
			Rose Ringed Parakeet	01	7 yard	-	°	By flying
300 M	22°16'35.50"	83°19'55.26"	Cattle Egret	01	-	-	-	By flying
			Red Vented Bulbul	01	-	-	-	By Chirping
			Blyth's Reed Warbler	01	-	-	-	By Chirping
600 M	22°16'40.57"	83°19'47.13"	Indian Roller	01	28.10 yard	232°	291°	Pearching

			Greenish Warbler	02	-	-	-	By Chirping
			Indian Silver Bill	01	-	-	-	By Chirping
			Red Vented Bulbul	01	-	-	-	By Chirping
900 M	22°16'43.90"	83°19'38.58"	Purple Sun Bird	01	-	-	-	By Chirping
			Rufous Tree Pie	01	-	-	-	By Chirping
			Asian Koel	01	-	-	-	By Chirping
			Greenish Warbler	01	-	-	-	By Chirping
			Indian Roller	01	-	-	-	By Chirping
			Common Myna	02	-	-	-	By Chirping
1200m	22°16'46.93"	83°19'37.47"	Greater Flame Belt	01	-	-	-	By Chirping
			Spotted Dove	02	-	-	-	By Parching
			Rufous Tree Pie	01	-	-	-	By Chirping
			Black Drongo	01	-	-	-	By Chirping
			Asian Koel	01	-	-	-	By Chirping
			Common Myna	01	-	-	-	By Chirping
			Cattle Egret	01	-	-	-	By Chirping
			Little Cormorant	01	-	-	-	By Chirping

Datasheet for bird status survey

Cell-ID: T 5 Team: Manas Manohar Ujjaini, Tumesh Koshle, Rajesh Toppo, Gulshan Janghel Trail-Length: 1.2 (Km)

GPS at every 300 m			Sighting information					
S.N.	Latitude	Longitude	Species	Number	Perp. Dist.	Bearing		Observation
						A	T	
0 M	22°16'38.75"	83°20'28.45"	Yellow Footed Green Pigeon	10	-	-	-	By flying
300 M	22°16'36.25"	83°20'39.10"	Common Myna	02	-	-	-	By Chirping
600 M	22°16'34.32"	83°20'49.33"	Black Drongo	02	6.40 yard	212 °	131 °	Pearching
			Red Vented Bulbul	02	6.40 yard	212 °	131 °	Pearching
			Cattle Egret	02	-	-	-	By Chirping
900 M	22°16'30.22"	83°20'59.42"	Spotted Dove	03	-	-	-	By Chirping
			Great Egret	07	-	-	-	By flying
1200m	22°16'29.12"	83°21'09.55"	Plum Headed Parakeet	01	-	-	-	By Chirping
			Black Drongo	01	-	-	-	By Chirping
			Buzzard	01	-	-	-	By Chirping
			Greater Flame Back	02	-	-	-	By Chirping
			Scaly Brusted Munia	01	-	-	-	By Chirping

Datasheet for bird status survey

Cell-ID: T 6 Team: Manas Manohar Ujjaini, Tumesh Koshle, Rajesh Toppo, Gulshan Janghel, Trail-length: 1 (Km)

GPS at every 300 m			Sighting information					
S.N.	Latitude	Longitude	Species	Number	Perp. Dist.	Bearing		Observation
						A	T	
0 M	22°17'27.69"	83°20'11.84"	Indian Pond Heron	01	5.48m	220	145	Pearching
			Green Bee Eater	02	-	-	-	By Flying

			Common Myna	01	6.48m	270 °	145 °	Pearching
300 M	22°17'31.96"	83°20'02.19"	Green Bee Eater	01	6.77	110 °	120 °	Pearching
			Greenish Warbler	01	-	-	-	By flying
			Indian Roller	01	-	-	-	By Chirping
600 M	22°17'36.68"	83°19'53.10"	Common Myna	02	-	-	-	By flying
			Eurasian Collared Dove	02	7.44	45 °	110 °	Pearching
			Purple Sun Bird	01	-	-	-	By Chirping
			Indian Roller	01	-	-	-	By Chirping
1000 M	22°17'41.87"	83°19'52.83"	Common Myna	01	-	-	-	By Chirping
			Indian Roller	02	-	-	-	By Chirping
			Cattle Egret	07	-	-	-	By Chirping
			Indian Pond Heron	05	-	-	-	By Chirping
			Baya Weaver	02	-	-	-	By Chirping
			Oriental Magpie-Robin	02	-	-	-	By Chirping
			Plum Headed Parakeet	07	-	-	-	By Chirping
			Red -Vented Bulbul	02	-	-	-	By Chirping

Datasheet for bird status survey

Cell-ID: T 7 Team: Manas Manohar Ujjaini, Tumesh Koshle, Rajesh Toppo, Gulshan Janghel, Trail-length: 1.2 (Km)

GPS at every 300 m			Sighting information					
S.N.	Latitude	Longitude	Species	Number	Perp. Dist.	Bearing		Observation
						A	T	
0 M	22°17'22.56"	83°20'40.70"	White -Throated Kingfisher	01	-	-	-	By Chirping
			Common Myna	02	-	-	-	By Flying
			Rose Parakeet	01	-	-	-	By Flying
300 M	22°17'33.66"	83°20'38.42"	Rain Quail	01	-	-	-	By Flying
			Greenish Warbler	01	-	-	-	By flying
			Indian Roller	01	-	-	-	By Chirping
600 M	22°17'43.57"	83°20'41.27"	Common Myna	02	-	-	-	By flying
			Eurasian Collared Dove	02	7.44	45 °	110 °	Pearching
			Purple Sun Bird	01	-	-	-	By Chirping
			Indian Roller	01	-	-	-	By Chirping
900 M	22°17'52.67"	83°20'46.73"	Common Myna	01	-	-	-	By Chirping
			Indian Roller	02	-	-	-	By Chirping
			Cattle Egret	07	-	-	-	By Chirping
1200 M	22°17'01.88"	83°20'49.46"	Indian Pond Heron	05	-	-	-	By Chirping
			Baya Weaver	02	-	-	-	By Chirping
			Oriental Magpie-Robin	02	-	-	-	By Chirping
			Plum Headed Parakeet	07	-	-	-	By Chirping
			Red -Vented Bulbul	02	-	-	-	By Chirping

Datasheet for bird status survey

Cell-ID: T 8 Team: Manas Manohar Ujjaini, Tumesh Koshle, Rajesh Toppo, Vijay Gulshan Janghel, Trail-length: 1.0 (Km)

GPS at every 300 m			Sighting information					
S.N.	Latitude	Longitude	Species	Number	Perp. Dist.	Bearing		Observation
						A	T	
0 M	22 ⁰ 17'22.00"	83 ⁰ 21'05.49"	Plum Headed	01	-	-	-	By Chirping
			Black Drongo	01	64.09	212 °	131	Pearching
			Indian Roller	01	-	-	-	By flying
300 M	22 ⁰ 17'17.08"	83 ⁰ 21'14.43"	Plum Headed Parakeet	01	-	-	-	By Chirping
600 M	22 ⁰ 17'05.19"	83 ⁰ 21'16.11"	Nill	-	-	-	-	-
1000 M	22 ⁰ 16'55.25"	83 ⁰ 21'12.40"	Rose Ringed Parakeet	01	-	-	-	By Chirping
			Indian Roller	01	-	-	-	By Chirping
			Indian Pond Heron	04	-	-	-	By flying
			Common Myna	02	-	-	-	By Chirping
			Rufous Tree Pie	01	-	-	-	By Chirping
			Eurasian Golden Oriole	01	-	-	-	By Chirping

Datasheet for bird status survey

Cell-ID: T 9 Team: Manohar Manohar Ujjaini, Tumesh Koshle, Rajesh Toppo, Gulshan Janghel, Trail-length: 1.2 (Km)

GPS at every 300 m			Sighting information					
S.N.	Latitude	Longitude	Species	Number	Perp. Dist.	Bearing		Observation
						A	T	
0 M	22 ⁰ 17'02.99"	83 ⁰ 22'11.84"	Common Myna	01	-	-	-	By Chirping
			House Sparrow	02	-	-	-	By Chirping
			Jungle Crow	1	-	-	-	By flying
300 M	22 ⁰ 17'83.22"	83 ⁰ 22'10.58"	Indian Robin	01	-	-	-	By Chirping
			Red Vented Bulbul	01	-	-	-	By Chirping
			Indian Hawk Eagle	01	-	-	-	By flying
600 M	22 ⁰ 16'44.10"	83 ⁰ 22'17.18"	Indian Roller	01	-	-	-	By flying
			Jungle Prinia	01	-	-	-	By Chirping
			Bramhiny Myna	01	38.40 yard	310 °	350 °	Pearching
900 M	22 ⁰ 16'34.54"	83 ⁰ 22'18.80"	Cattle Egret	03	-	-	-	By flying
			Black Drongo	04	-	-	-	By flying
			Indian Cuckoo	01	-	-	-	By flying
1200m	22 ⁰ 16'23.72"	83 ⁰ 22'21.71"	Common Myna	02	-	-	-	By Chirping
			Indian Roller	01	-	-	-	By flying

ANNEXURE II

Datasheet For Habitat Characterization At Every 300 M Along Transect Route

Cell-ID: **T 1** Team: Manas Manohar Ujjaini, Tumesh Koshle, Rajesh Toppo, Gulshan Janghel,

S.N.	Latitude	Longitude	Land-cover (100m radius)	Vegetation (3 dominant species)			Vegetation composition				Human structure (500m radius)
			B/A /G/ W/S	Tree species	Parameters	Observation 1 / 2 / 3/ 4/ 5	Grass	Herb	Shrub	Regeneration	
0 M	22 ^o 16'38.62"	83 ^o 20'20.42"	W	Mahua	08	4	>5%	5%	5%	0 %	R,E, S,
				Tendu	06	4					
				Char	02	4					
				Dhawda	06	4					
300 M	22 ^o 16'39.04"	83 ^o 20'19.68"	W	Saja	02	4	1%	2%	1%	1%	W
			S	Tendu	06	4					
				Dhawda	02	4					
600 M	22 ^o 16'39.03"	83 ^o 20'19.68"	A,S	Sal	08	4	1%	1%	1%	1%	
				saja	05	4					
				char	08						
1000 M	22 ^o 16'38.64"	83 ^o 20'20.35"	G	Mahua	02	4	4%	1%	0 %	0%	
				Saja	07						
				dhawda	07						

Abbreviation: **Land cover** – **B** (barren) / **A** (Agriculture) / **G** (Grassland) / **W** (Woodland) / **S** (Scrubland)

Human structure – **S** (Settlement) / **R** (Metal road) / **E** (Electricity) / **P** (Pond) / **W** (Well / tube well)

Observation – 1. Illicit felling 2. Girdling 3. Dead tree 4. Living / Healthy 5. Diseased

Datasheet for habitat characterization at every 300 m along transect route

Cell-ID: T2 Team: , Manas Manohar Ujjaini, Tumesh Koshle, Rajesh Toppo, Gulshan Janghel

S.N.	Latitude	Longitude	Time (hrs.)	Land-cover (100m radius) B/A /G/ W/S	Vegetation (3 dominant species)			Vegetation composition				Human structure (500m radius) S/H/R/E/W/P
					Tree species	Parameters(cm)	Observation 1 / 2 / 3 / 4 / 5	Grass	Herb	Shrub	Regeneration	
				0 M	22°15`20.13"	83°19`20.36"	6:36 AM	W	Mahua	12	4	0%
					Tendu	30	4					
					Saja	35	4					P
300 M	22°15`20.18"	83°19`20.24"	7:06 AM	W,S	Mahua	22	4	0%	1%	2%	11%	P
					Sal	28	4					
					Char	40	4					
600 M	22°15`20.18"	83°19`20.24"		W,S	Sal	30	4	1%	2%	2%	10%	
					Char	12	4					
					Mahua	80	4					
1000M	22°15`27.00"	83°19`00.27			Sal	905	4	1%	0%	1%	15%	R
					Dhawda	15	4					
					Char	25	4					

Abbreviation: **Land cover** – **B** (barren) / **A** (Agriculture) / **G** (Grassland) / **W** (Woodland) / **S** (Scrubland)

Human structure – **S** (Settlement) / **R** (Metal road) / **E** (Electricity) / **P** (Pond) / **W** (Well / tube well)

Observation – 1. Illicit felling 2. Girdling 3. Dead tree 4. Living / Healthy 5. Diseased

Datasheet for habitat characterization at every 300 m along transect route

Cell-ID: T3 Team: Manas Manohar Ujjaini, Tumesh Koshle, Rajesh Toppo, Gulshan Janghel

S.N.	Latitude	Longitude	Land-cover (100m radius)	Vegetation (3 dominant species)			Vegetation composition				Human structure (500m radius)
			B/A /G/ W/S	Tree species	Parameters(cm)	Observation 1 / 2 / 3/ 4/ 5	Grass	Herb	Shrub	Regeneration	S/H/R/E/W/P
0 M	22°15'39.86"	83°19'41.27"	A/W	Char (08)	G 0.32m	4	1%	1%	5%	10 %	W
				Sal (06)	G 0.40m						
				Saja (02)	G 0.50m						
300 M	22°15'40.37"	83°19'52.24"	A	Kusum (02)	G 1.20m	4	1%	1%	2%	5%	P/R
				Mahua (03)	G 2.0m						
				Char(4)	G 0.30m						
600 M	22°15'40.95"	83°20'01.05"	W/S	Jamun (2)	G 0.10m	4	1%	2%	2%	10%	P/R
				Char(8)	G 0.20m						
900M	22°15'37.11"	83°20'09.54"	W/S	Jamun (3)	G 0.20m	4	5%	2%	5%	25%	S/W
				Sal(32)	G 0.20m						
				Char(6)	G 0.25m						
1200m	22°15'32.05"	83°20'16.46"	W/S	Sal (22)	G 0.20m	4	10%	5%	7%	30%	Null
				Char (6)	G 0.25m						
				Tendu (10)	G <0.10.m						

Abbreviation: **Land cover** – B (barren) / A (Agriculture) / G (Grassland) / W (Woodland) / S (Scrubland)

Human structure – S (Settlement) / R (Metal road) / E (Electricity) / P (Pond) / W (Well / tube well)

Observation – 1. Illicit felling 2. Girdling 3. Dead tree 4. Living / Healthy 5. Diseased

Datasheet for habitat characterization at every 300 m along transect route

Cell-ID: T4 Team: Manas Manohar Ujjaini, Tumesh Koshle, Rajesh Toppo, Gulshan Janghel

S.N.	Latitude	Longitude	Land-cover (100m radius)	Vegetation (3 dominant species)			Vegetation composition				Human structure (500m radius)
				B/A /G/ W/S	Tree species	Parameters(cm)	Observation 1 / 2 / 3/ 4/ 5	Grass	Herb	Shrub	
			S/H/R/E/W/P								
0 M	22°16`28.55 "	83°20`01.85 "	S	Kekat (6)	G 0.70m	4	5%	2%	5%	1%	R/E/S
				Kachnar (3)	G 0.30m						
				Khair (1)	G 0.20m						
300 M	22°16`35.50 "	83°19`55.26 "	A	Sal (12)	G 1.50m	4	3%	1%	2%	7%	Nil
				Mahua (2)	G 0.90m						
				Saja (2)	G 0.45m						
600 M	22°16`40.57 "	83°19`47.13 "	S/W	Sal(8)	G 0.40m	4	3%	2%	8%	5%	Nil
				Char(4)	G 0.70m						
				Siris (2)	G 0.30m	5					
900M	22°16`43.90 "	83°19`38.58 "	W/A	Jamun (1)	G 0.60m	4	1%	1%	2%	2%	Nil
				Mahua (2)	G 0.55m						
				Saja (2)	G 0.70m						
1200M	22°16`46.93 "	83°19`37.47 "	W/A	Dumar (1)	G 0.40m	4	1%	1%	6%	5%	P
				Char (2)	G 0.70m						
				Khair (6)	G 0.40m						

Abbreviation: **Land cover** – **B** (barren) / **A** (Agriculture) / **G** (Grassland) / **W** (Woodland) / **S** (Scrubland)

Human structure – **S** (Settlement) / **R** (Metal road) / **E** (Electricity) / **P** (Pond) / **W** (Well / tube well)

Observation – 1. Illicit felling 2. Girdling 3. Dead tree 4. Living / Healthy 5. Diseased

Datasheet for habitat characterization at every 300 m along transect route

Cell-ID: T5 Team: Manas Manohar Ujjaini, Tumesh Koshle, Rajesh Toppo, Gulshan Janghel

S.N.	Latitude	Longitude	Land-cover (100m radius)	Vegetation (3 dominant species)			Vegetation composition				Human structure (500m radius)
			B/A /G/ W/S	Tree species	Parameters(cm)	Observation 1 / 2 / 3/4/5	Grass	Herb	Shrub	Regeneration	S/H/R/E/W/P
0 M	22°16'38.75"	83°20'28.95"	W	Mahua (2)	G 0.15m	1,4	1%	1%	2%	2%	H/E
				Senha (2)	G 0.05m						
300 M	22°16'36.25"	83°20'39.10"	B	Tendu (3)	G 0.08m	4	5%	1%	1%	1%	H
600 M	22°16'34.32"	83°20'49.33"	B	Senha(5)	G 0.15m	4	0%	9%	1%	5%	P
900M	22°16'30.22"	83°20'59.42"	W	Senha(2)	G 0.50m	4	2%	2%	3%	3%	R
				Mahua (2)	G 0.08m						
1200M	22°16'29.12"	83°21'09.55"	W	Mahua (2)	G 0.30m	4	2%	1%	1%	20%	Nil
				Char (5)	G 0.80m						
				Sal (10)	G 0.40m						

Abbreviation: **Land cover** – B (barren) / A (Agriculture) / G (Grassland) / W (Woodland) / S (Scrubland)

Human structure – S (Settlement) / R (Metal road) / E (Electricity) / P (Pond) / W (Well / tube well)

Observation – 1. Illicit felling 2. Girdling 3. Dead tree 4. Living / Healthy 5. Diseased

Datasheet for habitat characterization at every 300 m along transect route

Cell-ID: T6 Team: Manas Manohar Ujjaini, Tumesh Koshle, Rajesh Toppo, Gulshan Janghel

S.N.	Latitude	Longitude	Land-cover (100m radius)	Vegetation (3 dominant species)			Vegetation composition				Human structure (500m radius)
			B/A /G/ W/S	Tree species	Parameters(cm)	Observation 1 / 2 / 3/ 4/ 5	Grass	Herb	Shrub	Regeneration	S/H/R/E/W/P
0 M	22 ^o 17`27.69"	83 ^o 20`11.84"	A	Kkamhar (2)	G 0.40m	4	1%	2%	5%	1 %	P
				Sal (3)	G 0.13m						
				Tendu (2)	G 0.16m						
300 M	22 ^o 17`31.96"	83 ^o 20`02.19"	A	Mahua (1)	G 0.65m	4	1%	2%	1%	1%	Null
				Char (4)	G 0.565m						
				Tendu (2)	G <0.10m						
600 M	22 ^o 17`36.68"	83 ^o 19`53.10"	W	Bhirra (01)	G 0.05m	4	1%	2%	1%	2%	Null
				Khair (1)	G 0.07m						
				Rohini (8)	G 0.15m						
1000M	22 ^o 17`41.87"	83 ^o 19`52.83"	W	Jamun (2)	G 0.08m	4	1%	2%	1%	5%	R
				Sal (2)	G 0.20m						

Abbreviation: **Land cover** – **B** (barren) / **A** (Agriculture) / **G** (Grassland) / **W** (Woodland) / **S** (Scrubland)

Human structure – **S** (Settlement) / **R** (Metal road) / **E** (Electricity) / **P** (Pond) / **W** (Well / tube well)

Observation – 1. Illicit felling 2. Girdling 3. Dead tree 4. Living / Healthy 5. Diseased

Datasheet for habitat characterization at every 300 m along transect route

Cell-ID: T7 Team: Manas Manohar Ujjaini, Tumesh Koshle, Rajesh Toppo, Gulshan Janghel

S.N.	Latitude	Longitude	Land-cover (100m radius)	Vegetation (3 dominant species)			Vegetation composition				Human structure (500m radius)
			B/A /G/ W/S	Tree species	Parameters(cm)	Observation 1 / 2 / 3/ 4/ 5	Grass	Herb	Shrub	Regeneration	S/H/R/E/W/P
0 M	22°17'22.56"	83°20'40.70"	W	Mahua (2)	G 0.50m	4	1%	1%	2%	5%	R/E/S
				Char (2)	G 0.25m						
				Senha (1)	G 0.10m						
300 M	22°17'33.66"	83°20'38.42"	W	Sal (2)	G 0.10m	4	1%	2%	2%	25%	Nil
				Tendu (2)	G 0.10m						
600 M	22°17'43.57"	83°20'41.27"	W	Sal(5)	G 0.18m	4	1%	1%	1%	15%	Nil
				Tendu (6)	G 0.14m						
900M	22°17'52.67"	83°20'46.73"	W	Senha (6)	G 0.14m	4	1%	2%	3%	40%	Nil
				Tendu (7)	G 0.40m						
				Kekat (9)	G 0.21m						
1200M	22°17'01.88"	83°20'49.46"	W	Senha (8)	G 0.07m	1,4	1%	2%	2%	25%	Nil
				Dhawda (5)	G 0.09m						
				Saja (5)	G 0.12m						

Abbreviation: **Land cover** – **B** (barren) / **A** (Agriculture) / **G** (Grassland) / **W** (Woodland) / **S** (Scrubland)

Human structure – **S** (Settlement) / **R** (Metal road) / **E** (Electricity) / **P** (Pond) / **W** (Well / tube well)

Observation – 1. Illicit felling 2. Girdling 3. Dead tree 4. Living / Healthy 5. Diseased

Datasheet for habitat characterization at every 300 m along transect route

Cell-ID: **T8** Team: *Manas Manohar Ujjaini, Tumesh Koshle, Rajesh Toppo, Gulshan Janghel*

S.N.	Latitude	Longitude	Land-cover (100m radius)	Vegetation (3 dominant species)			Vegetation composition				Human structure (500m radius)
			B/A /G/ W/S	Tree species	Parameters(c m)	Observation 1 / 2 / 3/ 4/ 5	Gras s	Herb	Shrub	Regeneration	S/H/R/E/W/P
0 M	22°17'22.00"	83°21'05.49"	W	Mahua (8)	G 0.56m	4	1%	2%	3%	25%	R
				Char (5)	G 0.25m						
				Senha (5)	G 0.10m						
300 M	22°17'17.08"	83°21'14.43"	A/W	Mango (1)	G 0.70m	1,4	2%	5%	3%	30%	Nil
				Kaju (2)	G 0.35m						
				Char (2)	G 0.25m						
600 M	22°17'05.19"	83°21'16.11"	A/W	Kaju (5)	G 0.28m	1,4	5%	5%	5%	15%	P/R
				Char (1)	G 0.15m						
1000 M	22°16'55.25"	83°21'12.90"	A	Mahua (2)	G 0.28m	1,4	5%	5%	5%	10%	Nil
				Char (4)	G 0.20m						
				Dhawda (3)	G 0.10m						

Abbreviation: **Land cover** – **B** (barren) / **A** (Agriculture) / **G** (Grassland) / **W** (Woodland) / **S** (Scrubland)

Human structure – **S** (Settlement) / **R** (Metal road) / **E** (Electricity) / **P** (Pond) / **W** (Well / tube well)

Observation – 1. Illicit felling 2. Girdling 3. Dead tree 4. Living / Healthy 5. Diseased

Datasheet for habitat characterization at every 300 m along transect route

Cell-ID: **T9** Team: Manas Manohar Ujjaini, Tumesh Koshle, Rajesh Toppo, Gulshan Janghel

S.N.	Latitude	Longitude	Land-cover (100m radius)	Vegetation (3 dominant species)			Vegetation composition				Human structure (500m radius)
			B/A /G/ W/S	Tree species	Parameters(cm)	Observation 1 / 2 / 3/ 4/ 5	Grass	Herb	Shrub	Regeneration	S/H/R/E/W/P
0 M	22°17'02.99"	83°22'11.84"	W/A	Mango (3)	G 0.75m	1,4	1%	2%	3%	30%	R/E/S
				Peepal(2)	G 0.90m						
				Senha (1)	G 0.10m						
300 M	22°17'83.22"	83°22'10.58"	A	Mahua (2)	G1.05m	1,4	1%	2%	5%	-	R
				Peepal (1) Nirgundi (1)	G 4.45m G 0.10m						
600 M	22°16'44.10"	83°22'17.18"	A	Mango (2)	G 0.58m	1,4	1%	2%	1%	2%	P/R
				satpatiya(2)	G 0.40m						
900M	22°16'34.54"	83°22'18.80"	A	Jamun (1)	G 0.20m	1,4	1%	2%	2%	3%	Nil
				Mahua (2)	G 0.90m						
				Mango (2)	G 0.95m						
1200M	22°16'23.72"	83°22'21.71"	A/W	Mango (2)	G 0.85m	1,4	1%	1%	2%	1%	R

Abbreviation: **Land cover** – **B** (barren) / **A** (Agriculture) / **G** (Grassland) / **W** (Woodland) / **S** (Scrubland)

Human structure – **S** (Settlement) / **R** (Metal road) / **E** (Electricity) / **P** (Pond) / **W** (Well / tube well)

Observation – 1. Illicit felling 2. Girdling 3. Dead tree 4. Living / Healthy 5. Diseased

ANNEXURE - III

Avifauna checklist of Seasonal survey 2019 by SFRTI

S. No.	Common Name	Local Name	Scientific Name	Family	IUCN Status	Habitat Status
1.	Alexandrine Parakeet	Parrot, Tota	<i>Psittacula eupatria</i>	<i>Psittacidae</i>	LC	R
2.	Ashy Prinia Or Ashy Wren-Warbler	-----	<i>Prinia socialis</i>	<i>Cisticolidae</i>	LC	R
3.	Barn Swallow	-----	<i>Hirundo rustica</i>	<i>Hirundinidae</i>	LC	R
4.	Baya Weaver	Gauraiya	<i>Ploceus philippinus</i>	<i>Ploceidae</i>	LC	R
5.	Black Drongo	Karrauna	<i>Dicrurus macrocercus</i>	<i>Dicruridae</i>	LC	R
6.	Blyth Reed Warbler	-----	<i>Acrocephalus dumetorum</i>	<i>Acrocephalidae</i>	LC	R
7.	Bramhiny Myna	Maina	<i>Sturnia pagodarum</i>	<i>Sturnidae</i>	LC	R
8.	Common Buzzard	-----	<i>Buteo buteo</i>	<i>Accipitridae</i>	LC	R
9.	Cattle Egret	Gay Bagula	<i>Bubulcus ibis</i>	<i>Ardeidae</i>	LC	R
10.	Common Hoopoe	-----	<i>Upupa epops</i>	<i>Upupidae</i>	LC	R
11.	Common Kingfisher	Kilkila	<i>Alcedo atthis</i>	<i>Alcedinidae</i>	LC	R
12.	Common Myna	Salhai/ desimyna	<i>Acridotheres tristis</i>	<i>Sturnidae</i>	LC	R
13.	Copper Smith Barbet	-----	<i>Psilopogon haemacephalus</i>	<i>Megalaimidae</i>	LC	R
14.	Eurasian Collared Dove	Padki	<i>Streptopelia decaocto</i>	<i>Columbidae</i>	LC	R
15.	Eurasian Golden Oriole	-----	<i>Oriolus oriolus</i>	<i>Oriolidae</i>	LC	R
16.	European Turtle Dove	Padki	<i>Streptopelia turtur</i>	<i>Columbidae</i>	VU	R
17.	Great Egret	Bagula	<i>Ardea alba</i>	<i>Ardeidae</i>	LC	R
18.	Greater Coucal	Koyal	<i>Centropus sinensis</i>	<i>Cuculidae</i>	LC	R
19.	Greater Black Wood Packer	Katpodva	<i>Dryocopus martius</i>	<i>Picidae</i>	LC	R
20.	Greater Flame Back Woodpecker	Katpodva	<i>Dryocopus martius</i>	<i>Picidae</i>	LC	R
21.	Green Bee Eater	Patinga	<i>Merops orientalis</i>	<i>Meropidae</i>	LC	R
22.	Greenish Warbler	-----	<i>Phylloscopus trochiloides</i>	<i>Phylloscopidae</i>	LC	R
23.	Grey Francolin	-----	<i>Francolinus pondicerianus</i>	<i>Phasianidae</i>	LC	R
24.	Grey Hornbill	Dhanesh	<i>Ocyrceros birostris</i>	<i>Bucerotidae</i>	LC	R
25.	House Sparrow	Gouriaya	<i>Passer domesticus</i>	<i>Passeridae</i>	LC	R
26.	Indian Cuckoo	-----	<i>Cuculus micropterus</i>	<i>cuculidae</i>	LC	R
27.	Indian Hawk Eagle	-----	<i>Nisaetus cirrhatus</i>	<i>Accipitridae</i>	LC	R
28.	Indian Pond Heron	Khokho bakli	<i>Ardeola grayii</i>	<i>Ardeidae</i>	LC	R
29.	Indian Robin	Chirak	<i>Saxicoloides fulicatus</i>	<i>Muscicapidae</i>	LC	R
30.	Indian Roller	Nilkanth/teohra	<i>Coracias benghalensis</i>	<i>Coraciidae</i>	LC	R
31.	Indian Silver Bill	-----	<i>Euodice malabarica</i>	<i>Estrildidae</i>	LC	R
32.	Indian Spotted Dove	Padki	<i>Streptopelia chinensis suratensis</i>	<i>Columbidae</i>	LC	R
33.	Jungle Babbler	Satbhaiya	<i>Turdoides striata</i>	<i>Leiotherichidae</i>	LC	R
34.	Jungle Bush Quail	Titar	<i>Perdica asiatica</i>	<i>Phasianidae</i>	LC	R
35.	Jungle Crow	Koua	<i>Corvus culminatus</i>	<i>Corvidae</i>	LC	R

INTERIM ACTION TAKEN REPORT OF OCP BAROUD, RAIGARH AREA

36.	Jungle Owlet	Ullu	<i>Glaucidium radiatum</i>	<i>Strigidae</i>	LC	R
37.	Jungle Prinia	-----	<i>Prinia sylvatica</i>	<i>Cistacolidae</i>	LC	R
38.	Laughing Dove	Padki	<i>Spilopelia senegalensis</i>	<i>Columbidae</i>	LC	R
39.	Lesser Flame Back	-----	<i>Dinopium benghalense</i>	<i>Picidae</i>	LC	R
40.	Little Cormorant	-----	<i>Microcarbo niger</i>	<i>Phalacrocoracidae</i>	LC	R
41.	Little Swift	-----	<i>Apus affinis</i>	<i>Apodidae</i>	LC	R
42.	Oriental Magpie Robin	-----	<i>Copsychus saularis</i>	<i>Muscicapidae</i>	LC	R
43.	Paddy Field Pipit	-----	<i>Anthus rufulus</i>	<i>Motacillidae</i>	LC	R
44.	Yellow-Footed Green Pigeon	Kabootar	<i>Treron phoenicoptera</i>	<i>Columbidae</i>	LC	R
45.	Plum Headed Parakeet	Tota/Sua	<i>Psittacula cyanocephala</i>	<i>Psittacidae</i>	LC	R
46.	Purple Sun Bird	-----	<i>Nectarania asiatica asiatica (Latham)</i>	<i>Nectariniini</i>	LC	R
47.	Rain Quail	Quail	<i>Coturnix coromandelica</i>	<i>Phasianidae</i>	LC	R
48.	Red Jungle Fowl	Jungli murga	<i>Gallus gallus</i>	<i>Phasianidae</i>	LC	R
49.	Red Vented Bulbul	Fikkadlow	<i>Pycnonotus cafer</i>	<i>Pycnonotidae</i>	LC	R
50.	Red Wattled Lapping	-----	<i>Vanellus indicus</i>	<i>Charadriidae</i>	LC	R
51.	Rose Ringed Parakeet	Tota/Sua	<i>Psittacula krameri</i>	<i>Psittaculidae</i>	LC	R
52.	Rosy Starling	-----	<i>Pastor roseus</i>	<i>Sturnidae</i>	LC	R
53.	Rufous Tree Pie	-----	<i>Dendrocitta vagabunda</i>	<i>Corvini</i>	LC	R
54.	Scaly Breasted Munia	-----	<i>Lonchura punctulata</i>	<i>Estrildidae</i>	LC	R
55.	Shikra	Cheel	<i>Accipiter badius</i>	<i>Accipitridae</i>	LC	R
56.	Singing Bush Lark	-----	<i>Mirafra javanica</i>	<i>Alaudidae</i>	LC	R
57.	Sirkeer Malkoha	-----	<i>Taccocua leschenaultii</i>	<i>Cuculidae</i>	LC	R
58.	Small Minivet	-----	<i>Pericrocotus cinnamomeus</i>	<i>Campephagidae</i>	LC	R
59.	Spotted Dove	-----	<i>Streptopelia chinensis suratensis</i>	<i>Columbidae</i>	LC	R
60.	Sulphur-Bellied Warbler	-----	<i>Phylloscopus griseolus</i>	<i>Acrocephalidae</i>	LC	R
61.	White Throated Kingfisher	Kilkila	<i>Halcyon smyrnensis</i>	<i>Alcedinidae</i>	LC	R
62.	Yellow Wattled Lapwing	-----	<i>Vanellus malabaricus</i>	<i>Charadriidae</i>	LC	R
63.	Yellow-Footed Green Pigeon	Kabootar	<i>Treron phoenicoptera</i>	<i>Columbidae</i>	LC	R
64.	Vernal Hanging Parrot	Tota	<i>Loriculus vernalis</i>	<i>Psittaculidae</i>	LC	R

Characterization of bird species according to their nesting pattern

1. **Scrape Nesting Birds:** - The simplest nest construction is the Scrape, which merely a shallow depression in soil or vegetation.

Bird species found in Baroud OCP area:

- a) Jungle Bush Quail

2. **Burrow Nesting Birds:** - Soil plays a different role in the burrow nest: the eggs and young in most cases the incubating parent birds are sheltered under the earth.

Bird species found in Baroud OCP area:

- a) Green Bee Eater
- b) White Throated Kingfisher

3. **Cavity Nesting Birds:-** The cavity nest is a chamber, typically in living or dead wood, but sometimes in the trunks of tree ferns or large cacti, including saguaro. In tropical areas, cavities are sometimes excavated in arboreal insect nests.

Bird species found in Baroud OCP area:

- a) Common Myna (Secondary cavity nester)
- b) Lesser Golden Backed Woodpecker (Primary cavity nester)
- c) Copper Smith Barbet (Primary cavity nester)
- d) House Sparrow (Secondary cavity nester)
- e) Bramhiny Starling (Secondary cavity nester)
- f) Indian Robin (Secondary cavity nester)
- g) Indian Roller (Secondary cavity nester)
- h) Oriental Magpie Robin (Secondary cavity nester)
- i) Rose Ringed Parakeet (Secondary cavity nester)
- j) Plum Headed Parakeet

4. **Cup Shaped Nesting Birds: -** The cup nest is smoothly hemispherical inside, with a deep depression to house the eggs. Most are made of pliable materials including grasses though a small number are made of mud or saliva.

Bird species found in Baroud OCP area:

- a) Indian Spotted Dove
- b) Black Drongo
- c) Common Hawk Cuckoo
- d) White Rumped Munia
- e) Indian Cuckoo (Mostly use a nest of crows and drongos)
- f) Blyth Reed Warbler
- g) Greenish Warbler
- h) Laughing Dove
- i) Asian Koel (Brood parasite lays egg on different birds nest)
- j) Eurasian Collared Dove
- k) Eurasian Golden Oriole

l) Common Buzzard

5. **Platform Nesting Birds:** - The platform nest is a large structure, often many times the size of the (typically large) bird which has built it. Depending on the species, these nests can be on the ground or elevated.

Bird species found in Baroud OCP area:

- a) Indian Pond Heron
 - b) Little Cormorant (mostly nest beside Indian Pond Heron and Little Egret in colonies)
 - c) Rufous Treepie
 - d) Yellow Footed Green Pегion
 - e) Jungle Crow
 - f) Great Egret
6. **Pendant Nesting Birds:** - The pendant nest is an elongated sac woven of pliable materials such as grasses and plant fibers and suspended from a branch.

Bird species found in Baroud OCP area:

- a) Common Kingfisher
 - b) Purple Sunbird
 - c) Indian Silver Bill
 - d) Baya Weaver
7. **Sphere Shaped Nesting Birds:** - The Sphere nest is roundish structure; it is completely enclosed, except for a small opening which allows access.

Bird species found in Baroud OCP area:

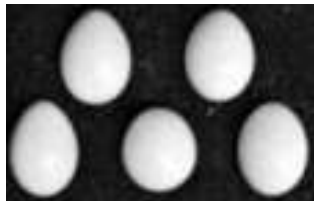
- a) Red Vented Bulbul
- b) Jungle Prinia

Annexure- IV

Detailed description of birds including habit habitat and nesting pattern

1. Scrape Nesting Bird species found in Baroud OCP area:

- a) **Common Name:** **Jungle Bush Quail**
Zoological Name: *Perdicula asiatica*
Family: Phasianidae
Conservation Status: Least Concern
Voice Call: Advertising call is a rhythmic, harsh, slightly grating “chee-chee-chuck, chee-chee-chuck
Habitat: Dry scrub and brush habitats, often stony, ranging from thin grass to fairly dense deciduous.
Feeding: The diet of the jungle bush quail consists mainly of seeds. particularly of grasses, although it also takes insects.
Breeding Season: Breeding takes place after the rains and lasts until the onset of colder weather
Nesting Pattern: their housing is, they need to be provided with plenty of green branches to provide sheltered and a place for the hens to lay.
Economic Importance: Sometimes, these quail are kept in aviaries. They have a pet trade.



Nesting of Rain Quail



Male Bird



Female Bird

2. Burrow Nesting Bird species found in Baroud OCP area:

- a) **Common Name:** **Green Bee Eater**
Zoological Name: *Merops orientalis*
Family: Meropidae
Conservation Status: Least Concern
Voice Call: The calls are a nasal trill tree-tree-tree-tree, usually given in flight. Commonest call is a rolling or burry “trrrr....trrrr...” or a similar “trip..trip..trrrr...trrrr.

- Habitat:** They are mainly insect eaters and they are found in grassland, thin scrub and forest often quite far from water.
- Feeding:** bee-eaters predominantly eat insects, especially bees, wasps and ants, which are caught in the air by sorties from an open perch
- Breeding Season:** The breeding season is from March to June.
- Nesting Pattern:** These are often solitary nesters, making a tunnel in a sandy bank. They nest in hollows in vertical mud banks.



Nesting of Green Bee Eater



Male Female Bird are alike

- b) Common Name:** **White Throated Kingfisher**
- Zoological Name:** *Halcyon smyrnensis*
- Family:** Alcedinidae
- Conservation Status:** Least Concern
- Voice Call:** chake-ake-ake-ake-ake
- Habitat:** White-throated kingfisher is a common species of a variety of habitats, mostly in the trees, wires or other perches.
- Feeding:** This species mainly hunts large crustaceans, insects, earthworms, rodents, snakes, fish and frogs. Predation of small birds such as the Oriental white-eye, chick of a Red-Wattled Lapwing, Sparrows and Munias have been reported.
- Breeding Season:** Monsoon
- Nesting Pattern:** The nest is a tunnel (50 cm long, but a nest with a 3-foot tunnel has been noted) in an earth bank.
- Predators:** With a powerful bill and rapid flight, these Kingfishers have few predators when healthy and rare cases of predation by a Black Kite and a Jungle Crow may be of sick or injured birds.
- Economic Importance:** White-throated kingfishers eat domestic and agricultural pests, including both mammalian and insect pests. Like many generalists, these birds help to control the populations of small vertebrates and invertebrates that might otherwise do costly

damage to human works and food supplies. (Ali and Ripley, 1983)



Nesting of White Throated Kingfisher Male Female Bird are alike

3. Cavity Nesting Bird species found in Baroud OCP area:

- a) **Common Name:** **Common Myna**
- Zoological Name:** *Acridotheres tristis*
- Family:** Sturnidae
- Conservation Status:** Least Concern
- Voice Call:** The calls includes croaks, squawks, chirps, clicks, whistles and 'growls', and the bird often fluffs its feathers and bobs its head in singing.
- Habitat:** Common Myna nests in commercial, Residential and bushland habitats.
- Feeding:** Like most starlings, the common myna is omnivorous. It feeds on insects, crustaceans, reptiles, small mammals, seeds, grain and fruits and discarded waste from human habitation.
- Breeding Season:** Depending on geographical location, common mynas have been reported to breed anywhere from 1-3 times yearly. In their native range, common mynas begin nesting in March and breeding lasts through September.
- Nesting Pattern:** nest in a hole in a tree or wall
- Predators:** Common nest predators of common mynas are house crows (*Corvus splendens*) and house cats (*Felis silvestris*). Javan mongooses (*Herpestes javanicus*) raid nests to take nestlings and eggs. Common mynas roost together for predator defense and often mob predators in flocks.
- Economic Importance:** Common mynas may be helpful in reducing insect populations in agricultural areas. Common mynas also pollinate and disperse the seeds of economically important trees. Common

mynas are often sold as pets for their intelligence and ability to mimic human speech.



Nesting of Common Myna



Male Female Birds are alike

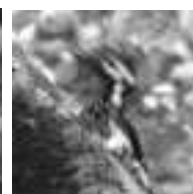
- a) **Common Name:** **Lesser Golden Backed Woodpecker**
Zoological Name: *Dinopium benghalense benghalense* (Linnaeus)
Family: Picidae
Conservation Status: Least Concern
Voice Call: Klikir-r-r-r
Habitat:
 1. It is associated with open forest and cultivation lands.
 2. They are often seen in urban areas with wooded avenues.
 3. It is somewhat rare in the Kutch and desert region of Rajasthan**Feeding:** They feed on insects mainly beetle larvae from under the bark, Visit termite mounds and sometimes feed on nectar.
Breeding Season: February and July
Nesting Pattern: The nest hole is usually excavated by the birds and has a horizontal entrance and descends into a cavity. Nests have also been noted in mud embankments. They adapt well in human-modified habitats making use of artificial constructions.



Nesting of Lesser Golden Back



Male Bird



Female Bird

- b) **Common Name:** **Copper Smith Barbet**
Zoological Name: *Megalaima haemacephala*
Family: Megalaimidae
Conservation Status: Least Concern
Voice Call: tuk...tuk...tuk
Habitat: Throughout their wide range they are found in gardens, groves and sparse woodland. Habitats with trees having dead wood suitable for excavation is said to be important.

Feeding: Prefers banyan, Peepal, and etc and the occasional insect, caught in aerial sallies. Flower petals may also be included in their diet.

Breeding Season: The breeding season is mainly February to April in India.

Nesting Pattern: Birds nest and roost in cavities.

Mortality Factor: Adult birds are sometimes taken by predatory species. In urban areas, there are records of collisions with structures including white walls. Pesticide poisoning has also been noted.



Nesting of Coppersmith Barbet Male Bird

Female Bird

- c) **Common Name:** House Sparrow
- Zoological Name:** *Passer domesticus*
- Family:** Passeridae
- Conservation Status:** Least Concern
- Voice Call:** chirrup, tschilp, or Philip, "chur-chur-r-r-it-it-it-it", House sparrows give a nasal alarm call, the basic sound of which is transcribed as quer, and a shrill chree call in great distress.
- Habitat:** The house sparrow is closely associated with human habitation and cultivation. Primarily associated with man, living around buildings from isolated farms to urban centres.
- Feeding:** As an adult, the house sparrow mostly feeds on the seeds of grains and weeds, but it is opportunistic and adaptable, and eats whatever foods are available.
- Breeding Season:** Feb–Sept, varying with latitude, but can be interrupted by high temperature and monsoon rains; up to three broods.
- Nesting Pattern:** Holes in cliffs and banks, or tree hollows, are also used. A sparrow sometimes excavates its own nests in sandy banks or rotten branches, but more frequently uses the nests of other birds such as those of swallows in banks and cliffs, and old tree cavity nests.
- Predators:** Many hawks and owls hunt and feed on house sparrows. Known predators of nesting young or eggs

include cats, domestic dogs, raccoons, and many snakes. House sparrows avoid predation by foraging in small flocks so that there are many eyes watching out for potential predators.

Parasite and Disease:

The commonly recorded bacterial pathogens of the house sparrow are often those common in humans, and include Salmonella and Escherichia coli.



Nesting of House Sparrow

Male Bird

Female Bird

d) **Common Name:**

Bramhiny Starling

Zoological Name:

Sturnia pagodarum

Family:

Sturnidae

Conservation Status:

Least Concern

Voice Call:

They have musical call notes that are long made up of a series of slurred notes that ends abruptly.

Habitat:

found in dry forest, scrub jungle and cultivation and is often found close to human habitations. The especially favour areas with waterlogged or marshy lands.

Feeding:

The brahminy starling is omnivorous, eating fruit and insects.

Breeding Season:

March to September

Nesting Pattern:

It builds its nest in tree holes or artificial cavities. The nest is lined with grass, feathers and rags.



Nesting of Bramhiny Myna

Male Bird

Female Bird

e) **Common Name:**

Indian Robin

Zoological Name:

Saxicoloides fulicatus

Family:

Muscicapidae

Conservation Status:

Least Concern

Voice Call:

Song a very short, high-pitched, creaky squeaky jumble of 4–5 notes in minor key.

Habitat: This bird is found in open stony, grassy and scrub forest habitats. They are mainly found in dry habitats and are mostly absent from the thicker forest regions and high rainfall areas. The species is often found close to human habitation and will frequently perch on rooftops.

Feeding: They feed mostly on insects but are known to take frogs and lizards especially when feeding young at the nest. Individuals may forage late in the evening to capture insects attracted to lights.

Breeding Season: December to September

Nesting Pattern: Nests are built between rocks, in holes in walls or in a tree hollow. Nests are lined with animal hair and it has been noted that many nests have pieces of snake sloughs.

Predators: Nestlings may be preyed on by the Rufous treepie.



Nesting of Indian Robin



Male Bird



Female Bird

f) **Common Name:** **Indian Roller**

Zoological Name: *Coracias benghalensis*

Family: Coraciidae

Conservation Status: Least Concern

Voice Call: The call of the Indian roller is a harsh crow-like chack sound. It also makes a variety of other sounds, including metallic boink calls.

Habitat: They are very commonly seen perched along roadside trees and wires and are commonly seen in open grassland and scrub forest

Feeding: They descend to the ground to capture their prey which may include insects, arachnids, small reptiles (including Calotes versicolor (changeable lizard) and small snakes and amphibians.

Breeding Season: March to June

Nesting Pattern:

Holes created by woodpeckers or wood boring insects in trees such as Sal favored for nesting. Nest cavities may also be made by tearing open rotten tree trunks or in cavities in building.



Nesting of Indian Roller



Male Bird



Female Bird

g) **Common Name:**

Oriental Magpie Robin

Zoological Name:

Copsychus saularis

Family:

Muscicapidae

Conservation Status:

Least Concern

Voice Call:

harsh hissing krshhh

Habitat:

They are common birds in urban gardens as well as forests. The oriental magpie-robin is found in open woodland and cultivated areas often close to human habitations.

Feeding:

The diet of magpie robins includes mainly insects and other invertebrates. Although mainly insectivorous, they are known to occasionally take flower nectar, leeches, centipedes and even fish.

Breeding Season:

March to July

Nesting Pattern:

They nest in tree hollows or niches in walls or building, often adopting nest boxes.



Nesting of Oriental Magpie Robin



Male Bird



Female Bird

h) **Common Name:**

Rose Ringed Parakeet

Zoological Name:

Psittacula krameri

Family:

Psittaculidae

Conservation Status:

Least Concern

Voice Call:

“kii-a” or “kii-ak”

- Habitat:** Rose-Ringed Parakeet is common in cultivated areas, urban parks and gardens, dry and open forests.
- Feeding:** In the wild, rose-ringed parakeets usually feed on buds, fruits, vegetables, nuts, berries, and seeds.
- Breeding Season:** September to December
- Nesting Pattern:** They built nest in the hollow of trees.
- Aviculture:** Rose-Ringed Parakeets are popular as pets and they had a long history in aviculture.
- Economic Status:** populations of these birds are decreasing due to trapping for the pet trade. Despite some people's attempts to revive their population by freeing these birds from local markets, the rose-ringed parakeet's population has dropped drastically in many areas of the Indian subcontinent.



J) Common Name: Plum Headed Parakeet

Zoological Name: *Psittacula cyanocephala*

Family: Psittacidae

Conservation Status: Least Concern

Voice Call: The usual flight and contact call is tink

Habitat: The plum-headed parakeet is a bird of forest and open woodland, even in city gardens

Feeding: They feed on grains, fruits, the fleshy petals of flowers (*Salmalia*, *Butea*) and sometimes raid agricultural fields and orchards.

Breeding Season: The breeding season in India is mainly from December to April and July to August in Sri Lanka.

Nesting Pattern: Nests in tree holes.



Nesting of Plum Headed Parakeet Male Female Birds are alike

4. Cup Shaped Nesting Bird species found in Baroud OCP area:

- a) **Common Name:** **Indian Spotted Dove**
Zoological Name: *Streptopelia chinensis suratensis*
Family: Columbidae
Conservation Status: Least Concern
Voice Call: Krookruk-krukroo... kroo kroo kroo
Habitat: woodland, scrub, farmland and ground.
Feeding: They forage on the ground for grass seeds, grains, fallen fruits and seeds of other plants.
Breeding Season: Summer
Nesting Pattern: They nest mainly in low vegetation, building a flimsy cup of twigs in which two whitish eggs are laid. Nests are sometimes placed on the ground or on buildings and other structures.



Nesting of Indian Spotted Dove



Male Bird



Female Bird

- b) **Common Name:** **Black Drongo**
Zoological Name: *Dicrurus macrocercus*
Family: Dicruridae
Conservation Status: Least Concern
Voice Call: It is said that they imitate the call of the Shikra so as to put mynas to flight and then to steal prey. False alarm calls has also been noted.
Habitat: The black drongo is found predominantly in open forests and usually perches and hunts close to the ground. They are mostly aerial predators of insects but also glean from the ground or off vegetation. The black drongo can be found in savannas, fields, and urban habitats.
Feeding: They feed mainly on insects such as grasshoppers, cicadas, termites, wasps, bees, ants, moths, beetles and dragonflies.
Breeding Season: Black drongos breed mainly in February and March in southern

India and until August in other parts of the country.

Nesting Pattern:

The nest is a cup made with a thin layer of sticks placed in the fork of branch, and is built in a week by both the male and female. The usual clutch is three or rarely four eggs laid in a cup nest placed in the fork of an outer branch of tree. Large leafy tree such as the jackfruit are preferred.

Predators:

some predators such as the Javan hawk-eagle but the black eagle, a nest predator are mobbed with equal intensity in all seasons.

Mobbing:

Their habit of driving away predators from near their nests is believed to encourage other birds such as orioles, doves, pigeons, babblers, and especially bulbuls, to nest in the vicinity.



Nesting of Black Drongo



Male Female Birds are alike

c) **Common Name:**

Common Hawk Cuckoo

Zoological Name:

Hierococcyx varius

Family:

Cuculidae

Conservation Status:

Least Concern

Voice Call:

The call "Pee kahan" or "Papecha" When moving with a flock of babblers the chick makes a grating kee-kee call to beg for food

Habitat:

Wooded country, in deciduous and semi-evergreen forests, gardens, groves of cultivated trees.

Feeding:

Common hawk-cuckoos feed mainly on insects and are specialised feeders that can handle hairy caterpillars.

Breeding Season:

Breeds Mar–Jul in India, Jan–Apr in Sri Lanka.

Nesting Pattern:

Nesting at top of tree using grass and sticks to make cup shaped nest.

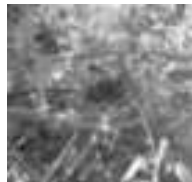


Nesting of Common Hawk Cuckoo



Male Female Birds are alike

- d) **Common Name:** **White Rumped Munia**
Zoological Name: *Lonchura striata*
Family: Estrildidae
Conservation Status: Least Concern
Voice Call: Loud call or distance call of male a single "peep!", female gives double or churring.
Habitat: It frequents open woodland, grassland and scrub, and is well able to adapt to agricultural land use
Feeding: It is a gregarious bird which feeds mainly on seeds
Breeding Season: Summer to pre monsoon
Nesting Pattern: The nest is a large domed grass structure in a tree, bush or grass into which three to eight white eggs are laid.



Nesting of White Rumped Munia

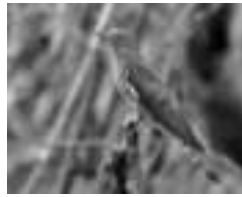


Male Female Birds are alike

- e) **Common Name:** **Indian Cuckoo**
Zoological Name: *Cuculus micropterus*
Family: Cuculidae
Conservation Status: Least Concern
Voice Call: Pikki- Hoon.....The call is loud with four notes. They have been transcribed as "orange-pekoe", "bo-ko-ta-ko", "crossword puzzle" or "one more bottle". In Bengali, it is interpreted as "bou-kotha-kao". "Bride, please speak".
Habitat: preferred habitat is deciduous and evergreen forests but also occur in garden lands and thick scrub
Feeding: They feed on hairy caterpillars and other insects but sometimes take fruits.
Breeding Season: March to August

Nesting Pattern:

It lays its single egg mostly in the nests of drongos and crows. It removes and eats an egg from the host nest before laying its own.



Male Bird



Female Bird

f) Common Name: Blyth Reed Warbler

Zoological Name: *Acrocephalus dumetorum*

Family: Acrocephalidae

Conservation Status: Least Concern

Voice Call: Song, given chiefly at night, characteristic, very varied mix of notes, some harsh tchar, some clear.

Habitat: Adapted to varied habitats, not necessarily close to water. This small passerine bird is a species found in scrub or clearings, often near water, but it is not found in marshes.

Feeding: Blyth's reed warbler is insectivorous, but will take other small food items, including berries.

Breeding Season: Season end of May to Jul; one brood per season. Monogamous, with facultative polygyny; pair formation takes place on breeding grounds.

Nesting Pattern: 4-6 eggs are laid in a nest in a bush.



Nesting of Blyth Reed Warbler



Male Female Bird are alike

g) Common Name: Greenish Warbler

Zoological Name: *Phylloscopus trochiloides*

Family: Phylloscopidae

Conservation Status: Least Concern

Voice Call: Call of nominate, given throughout year, a sharp, shrill and penetrating disyllabic “chee-wee.

Habitat: It breeds in lowland deciduous or mixed forest; non-breeding birds in the warmer parts of its range may move to mountain habitat in summer.

Feeding: This small passerine is insectivorous.

Breeding Season: May to mid-Aug

Nesting Pattern: The nest is on the ground in low shrub.



Nesting of Greenish Warbler



Male Female Bird are alike

h) **Common Name:** Laughing Dove

Zoological Name: *Spilopelia senegalensis*

Family: Columbidae

Conservation Status: Least Concern

Voice Call: The chuckling call is a low rolling croo-doo-doo-doo-doo with rising and falling amplitude.

Habitat: It is a common and widespread species in scrub, dry farmland and habitation over a good deal of its range, often becoming very tame.

Feeding: Laughing doves eat the fallen seeds, mainly of grasses, other vegetable matter and small ground insects such as termites and beetles.

Breeding Season: The breeding season varies by location.

Nesting Pattern: The nest is a very flimsy platform of twigs built in a low bush and sometimes in crevices or under the eaves of houses.

Predators: Southern grey shrike have been observed preying on an adult laughing dove in northwestern India while the lizard buzzard is a predator of the species in Africa.



Nesting of Laughing Dove



Male Bird



Female Bird

- i) **Common Name:** Asian Koel
- Zoological Name:** *Eudynamys scolopacea*
- Family:** Cuculidae
- Conservation Status:** Least Concern
- Voice Call:** The familiar song of the male is a repeated **koo-Ooo**. The female makes a shrill **kik-kik-kik...** call. Calls vary across populations.
- Habitat:** The Asian Koel is a bird of light woodland and cultivation land.
- Feeding:** It is insectivorous, but will also take berries and other soft fruit.
- Breeding Season:** March to August
- Nesting Pattern:** Brood parasite lays its single egg in the nests of a variety of birds, including the jungle crow.



Male Bird



Female Bird

- j) **Common Name:** Eurasian Collared Dove
- Zoological Name:** *Streptopelia decaocto*
- Family:** Columbidae
- Conservation Status:** Least Concern
- Voice Call:** The song is a coo-COO-coo, sound is a hah-hah.
- Habitat:** In its original range in India, Sri Lanka and other parts of Asia inhabits semi-desert and arid.
- Feeding:** Takes seed, cereal grain, fruits of herbs and grasses and some green parts of plants.
- Breeding Season:** Season prolonged but mainly Mar–Oct in cooler parts of range.
- Nesting Pattern:** Collared Doves typically breed close to human habitation wherever food resources are abundant and there are trees for nesting; almost all nests are within 1 km (0.62 mi) of inhabited buildings. The female lays two white eggs in a stick nest, which she incubates during the night and which the male incubates during the day



Nesting of Erasian Callared Dove



Male Female Birds are alike

k) Common Name: Eurasian Golden Oriole

Zoological Name: *Oriolus oriolus*

Family: Oriolidae

Conservation Status: Least Concern

Voice Call: The song is a beautiful fluting weela-wee-ooo or or-iii-ole, unmistakable once heard.

Habitat: The Eurasian Golden Oriole inhabits a range of habitats. In Western Europe they prefer open broadleaf forests and plantations, copses, riverine forest, orchards, large gardens; in Eastern Europe they may inhabit more continuous forest as well as mixed or coniferous forests. They generally avoid treeless habitats but may forage there. In their wintering habitat they are found in semi-arid to humid woodland, tall forests, riverine forest, woodland/savanna mosaic and savanna

Feeding: They feed on insects and fruit, using their bills to pick insects out of crevices.

Breeding Season: Eurasian Golden Orioles may delay breeding until they are 2 or 3 years of age. Males usually arrive at breeding area several days before the females. The fidelity to a territory or even to a specific nest site suggests that the pair-bond may continue from one breeding season to the next

Nesting Pattern: The nest is placed high in a tree towards the edge of the crown. The deep cup-shaped nest is suspended below a horizontal fork of thin branches.



Nesting of Eurasian Golden Oriole



Male Female Birds are alike

1) **Common Name:** **Common Buzzard**

Zoological Name: *Buteo buteo*

Family: Accipitridae

Conservation Status: Least Concern

Voice Call: The call is a plaintive peea-ay, similar to a cat's meow.

Habitat: Buzzards do not normally form flocks, but several may be seen together on migration or in good habitat. The Victorian writer on Dartmoor, William Crossing, noted he had on occasions seen flocks of 15 or more at some places.

Feeding: The common buzzard breeds in woodlands, usually on the fringes, but favours hunting over open land. It eats mainly small mammals, and will come to carrion.

Breeding Season: March to July

Nesting Pattern: The nest, built by both birds, is usually in a tree, rocky crag or cliff. It is a substantial structure of branches, twigs, heather and other available material. The average size of a newly built nest is 1 m in diameter and 60cm deep. Re-used nests can be 1.5 m across. The shallow cup in the nest is lined with green material immediately prior to egg laying, with further material added gradually until the young fledge.

Predator: The common buzzard is a large and opportunistic predator, surviving on a purely carnivorous diet. The common buzzard primarily preys on small mammals (such as rodents) and birds, along with a variety of other animals including insects, earthworms, snakes and carrion.



Common Buzzard

5. Platform Nesting Bird species found in Baroud OCP area:

- a) **Common Name:** Indian Pond Heron
- Zoological Name:** *Ardeola grayii* (Skyes)
- Family:** Ardeidae
- Conservation Status:** Least Concern
- Voice Call:** They are usually silent but may give a harsh croak when flushed or near their nests.
- Habitat:** The water body needs to be either shallow enough, or have a shelving margin in which it can wade. Although most common in the lowlands it also occurs in mountain tarns, lakes, reservoirs, large and small rivers, marshes, ponds, ditches, flooded areas, coastal lagoons, estuaries and the sea shore.
- Feeding:** The Indian pond heron's feeding habitat is marshy wetlands. They usually feed at the edge of ponds but make extensive use of floating vegetation such as water hyacinth to access deeper water.
- Breeding Season:** The breeding season begins with the onset of the monsoons.
- Nesting Pattern:** They nest in small colonies, often with other wading birds, usually on platforms of sticks in trees or shrubs. Most nests are built at a height of about 9 to 10 m in large leafy trees.



Nesting of Indian Pond Heron



Male Bird



Female Bird

- B) **Common Name:** Little Cormorant
- Zoological Name:** *Microcarbo niger*
- Family:** Phalacrocoracidae
- Conservation Status:** Least Concern
- Voice Call:** They also produce grunts and groans, a low pitched ah-ah-ah and kok-kok-kok calls.
- Habitat:** It inhabits wetlands, ranging from small village ponds to large lakes, and sometimes tidal estuaries.

Feeding: Little cormorants tend to forage mainly in small loose groups and are often seen foraging alone. They swim underwater to capture their prey, mainly fish.

Breeding Season: November to February

Nesting Pattern: They may nest beside Indian pond herons and little egrets in Colonies. The nest is built in about two weeks. The whitish eggs turn muddy with age and incubation begins when the first egg is laid.

Predator: predators on eggs and hatchlings include gulls and crows, fledging taken by bald eagles and white tailed eagles. The presence of humans or large predators will cause adults to leave nests, leaving them vulnerable to predation. (Hatch, et al., 2000)



Nesting of Little Cormorant



Male Female Birds are alike

c) **Common Name:** Rufous Treepie

Zoological Name: *Dendrocitta vagabunda*

Family: Corvini

Conservation Status: Least Concern

Voice Call: bob-o-link or ko-tree

Habitat: Open forest consisting of scrub, plantations and gardens.

Feeding: Like other corvids it is very adaptable, omnivorous and opportunistic in feeding.

Breeding Season: April to June

Nesting Pattern: The nest is built in trees and bushes and is usually a shallow platform



Nesting of Rufous Treepie



Male Female Birds are alike

d) **Common Name:** **Yellow-Footed Green Pigeon**

Zoological Name: *Treron phoenicoptera*

Family: Columbidae

Conservation Status: Least Concern

Voice Call: They have pleasant, soft and mellow whistling calls which usually give the first indication of their presence in a locality.

Habitat: Forest, scrubland, parks and gardens in lowlands and foothills; avoids high mountains.

Feeding: The birds deftly climb about the twigs of fruit-bearing trees, often clinging upside down to get at some fig or berry, they keep in flocks of from 10 to 50 birds, and sometimes collect in enormous numbers on banyan or Peepal trees to gorge themselves on the ripe figs, in association with Mynas, Hornbills, Bulbuls and other frugivorous species.

Breeding Season: March to April

Nesting Pattern: Nest is a relatively slight platform of twigs in a tree or shrub.



*Nesting Of Yellow-Footed
Green Pigeon*

e) **Common Name:** **Jungle Crow**

Zoological Name: *Corvus macrorhynchos*

Family: Corvidae

Conservation Status: Least Concern

Voice Call: The voice is a harsh kaaw-kaaw.

Habitat: In the New World, a small population of house crows is established in the area around it is associated with human settlements throughout its range, from small villages to large cities.

Feeding: House crows feed largely on refuse around human habitations, small reptiles and mammals, and other animals such as insects and other small invertebrates, eggs, nestlings, grain and fruits.

Breeding Season: The breeding season is mainly March–April in northern India and earlier in south India.

Nesting Pattern: The nest is a platform of twigs placed in a large tree and very rarely on buildings.



Nesting of Jungle Crow



Male



Female

f) Common Name: Great Egret

Zoological Name: *Ardea alba*

Family: Ardeidae

Conservation Status: Least Concern

Voice Call: Rather vocal: gives “kre, kre, kre” or “kark, kark, kark” in aggression and flight, with an “aaah”

Habitat: The little egret's habitat varies widely, and includes the shores of lakes, rivers, canals, ponds, lagoons, marshes and flooded land, the bird preferring open locations to dense cover.

Feeding: Their diet is mainly fish, but amphibian, small reptiles, mammals and birds are also eaten as well as crustaceans, molluscs, insects, spiders and worms.

Breeding Season: Monsoon

Nesting Pattern: Little egrets nest in colonies on trees, often with other wading birds.



Great Egret



Nesting of Great Egret

6. Pendant Nesting Bird species found in Baroud OCP area:

a) **Common Name:** Common Kingfisher

Zoological Name: *Alcedo atthisp*

Family: Alcedinidae

Conservation Status: Least Concern

Voice Call: uttering a sharp chi-chcc, chi-chec, shrit-it-it and nestlings call for food with a churring noise.

Habitat: Common kingfishers are found on the shores of lakes, ponds, streams, and in wetlands.

Feeding: its diet consists of small fish, tadpoles, water beetles and their larva, and other aquatic insects.

Breeding Season: Common Kingfisher have 2-3 clutches yearly one in April, another by July and sometimes a final clutch in early October.

Nesting Pattern: scrubs and bushes with overhanging branches close to shallow open water.

Predators: Common kingfishers have few natural predators as adults. Nestlings may be preyed on by snakes and other ground-dwelling predators, but kingfishers are aggressive birds and do defend their young against predators.



Nesting of Common Kingfisher

Male Bird

Female Bird

b) **Common Name:** Purple Sunbird

Zoological Name: *Cinnyris asiaticus*

Family: Nectariniidae

Conservation Status: Least Concern

Voice Call: The song is rapid rattle followed by ringing, metallic notes. "chwit" or "chwing!"

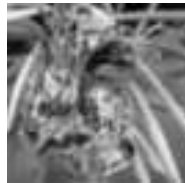
Habitat: Thin forest and garden land, including those in dense urban areas.

Feeding: They rarely hover at flowers and usually perch to forage for nectar. They are important pollinators of some plant species such as *Butea monosperma*, *Acacia* spp.

Breeding Season: The primary breeding season is before the Monsoons, April to June in northern India and January to June in Sri Lanka.

Nesting Pattern: The nest is a pouch made of cobwebs, thin strips of vegetation, lichens and bark. The entrance hole on the side is often shaded by an overhanging projection.

Predators: Owls are main predators.



Nesting of Purple Sunbird



Male Bird



Female Bird

c) Common Name: Indian Silver Bill

Zoological Name: *Lonchura malabarica*

Family: Estrildidae

Conservation Status: Least Concern

Voice Call: The call of the Indian silverbill is a swift trill, and other vocalizations include a high-pitched 'chirrup' flight call and a harsh 'tch wit' alarm call.

Habitat: Indian silver bill inhabits dry, open, cultivated as well as sparse scrub-and-bush country, and avoids humid forest.

Feeding: They feed on the ground or on low shrubs and grass stalks.

Breeding Season: Breeds throughout year, varying locally, generally beginning with onset of rains; mainly in winter months in Indian Subcontinent;

Nesting Pattern: Nests have been found in a variety of locations, such as in low thorny bushes, up to 3-4 meters from the ground in trees, and even among the lower sticks of eagle nests. Indian silver bill also habitually utilizes old Weaver-bird nests for lying in.



Nest Material



Male



Female

7. Sphere Shaped Nesting Bird species found in Baroud OCP area

a) **Common Name:** Red Vented Bulbul

Zoological Name: *Pycnonotus cafer*

Family: Pycnonotidae

Conservation Status: Least Concern

Voice Call: The typical call has been transcribed as ginger beer but a number of sharp single note calls likened as pick are also produced.

Habitat: This is a bird of dry scrub, open forest, plains and cultivated lands.

Feeding: They consume leaves, flowers, buds, nectar, pollen, fruits, berries, and figs. Animal matter mainly includes insects and spiders. They were also found to prey on garden lizards and geckos.

Breeding Season: June to September

Nesting Pattern: Red-vented bulbuls build their nests in bushes at a height of around 2–3 m.

Predators: Predation cats, the small Indian mongoose and the Rat were also found to prey on eggs, nestlings and adult birds.



Nesting of Red Vented Bulbul Male Female Birds are alike

b) **Common Name:** Jungle Prinia

Zoological Name: *Prinia sylvatica*

Family: Cisticolidae

Conservation Status: Least Concern

Voice Call: The song is a repetitive pit-pretty, pit-pretty, pit-pretty.

Habitat: Favours dry scrubby bush-jungle, with boulders and grassland intermixed.

Feeding: Takes variety of small invertebrates, chiefly insects and their larvae.

Breeding Season: Season Mar–Oct, chiefly during Jun–Sept monsoon.

Nesting Pattern: It builds its nest in a shrub or tall grass.



Nesting of Jungle prinia



Male Female Birds are alike

8. Pendant Nesting Bird species found in OCP Baroud area:

a) Common Name: Baya Weaver

Zoological Name: *Ploceus philippinus*

Family: Ploceidae

Conservation Status: Least Concern

Voice Call: Their calls are a continuous chit-chit-... sometimes ending in a wheezy chee-eee-ee that is produced by males in a chorus.

Habitat: Grassland, scrub with scattered trees, mangroves and cultivated areas.

Feeding: They forage in flocks for seeds, both on the plants and on the ground.

Breeding Season: The breeding season of the baya weavers is during the monsoons.

Nesting Pattern: These pendulous nests are retort-shaped, with a central nesting chamber and a long vertical tube that leads to a side entrance to the chamber.

Predators: They also feed on insects (including butterflies), sometimes taking small frogs, geckos and mollusks, especially to feed their young.



Nesting of Baya weaver



Male Female Birds are alike

ANNEXURE - V

REPTILES

a) **Common Name:** Indian Python

Zoological Name: *Python molurus*

Family: Pythonidae

Conservation Status: Near Threatened

Description: In India, the nominate subspecies grows to 3 metres (9.8 ft) on average. This value is supported by a 1990 study in Keoladeo National Park, where the biggest 25% of the python population was 2.7–3.3 metres (8.9–10.8 ft) long. Only two specimens even measured nearly 3.6 metres (11.8 ft). Because of confusion with the Burmese python, exaggerations and stretched skins in the past, the maximum length of this subspecies is hard to tell.

Habitat: Occurs in a wide range of habitats, including grasslands, swamps, marshes, rocky foothills, woodlands, "open" jungle and river valleys. They depend on a permanent source of water. Sometimes they can be found in abandoned mammal burrows, hollow trees, dense water reeds and mangrove thickets.

Feeding: Like all snakes, Indian pythons are strict carnivores and feed on mammals, birds and reptiles indiscriminately, but seem to prefer mammals. Roused to activity on sighting prey, the snake will advance with a quivering tail and lunge with an open mouth. Live prey is constricted and killed. One or two coils are used to hold it in a tight grip. The prey, unable to breathe, succumbs and is subsequently swallowed head first. After a heavy meal, they are disinclined to move. If forced to, hard parts of the meal may tear through the body.

Reproduction: Oviparous, up to 100 eggs are laid by the animal, which are protected and incubated by the female. Towards this end, it has been shown that they are capable of raising their body temperature above the ambient

level through muscular contractions. The hatchlings are 45–60 cm (18–24 in) in length and grow quickly.



b) Common Name: Russell's Viper

Zoological Name: *Daboia russelii*

Family: Viperidae

Description: *D. russelii* can grow to a maximum total length (body + tail) of 166 cm (5.5 ft) and averages about 120 cm (4 ft) on mainland Asian populations, although island populations may be slightly smaller on average. It is more slenderly built than most other vipers. Ditmars (1937) reported the following dimensions for a "fair-sized adult specimen". The head is flattened, triangular, and distinct from the neck. The snout is blunt, rounded, and raised. The nostrils are large, each in the middle of a large, single nasal scale. The lower edge of the nasal touches the nasorostral.

Habitat: *D. russelii* is not restricted to any particular habitat, but does tend to avoid dense forests. The snake is mostly found in open, grassy or bushy areas, but may also be found in second growth forests (scrub jungles), on forested plantations and farmland. It is most common in plains, coastal lowlands, and hills of suitable habitat.

Feeding: *D. russelii* feeds primarily on rodents, especially murid species. However, it will eat just about anything; including rats, mice, shrews, squirrels, lizards, land crabs, scorpions, and other arthropods. Juveniles are crepuscular, feeding on lizards and foraging actively. As they grow and become adults, they begin to specialize in rodents. Indeed, the presence of rodents and lizards is the main reason they are attracted to human habitation.

Reproduction: *D. russelii* is ovoviparous. Mating generally occurs early in the year, although gravid females may be found at any time. The gestation period is more than six months. Young are produced from May to November, but mostly in June and July. It is a prolific breeder. Litters of 20–40 are common, although fewer offspring may occur, as few as one. The reported maximum is 75 in a single litter. At birth, juveniles are 215–260 mm (8.5–10.2 in) in total length.



c) **Common Name:** Common Krait

Zoological Name: *Bungarus caeruleus*

Family: Elapidae

Description: The average length is 0.9 m (3.0 ft), but they can grow to 1.75 m (5 ft 9 in). Males are longer, with proportionately longer tails. The head is flat and the neck hardly evident. The body is cylindrical, tapering towards the tail. The tail is short and rounded. The eyes are rather small, with rounded pupils, indistinguishable in life. The head shields are normal, with no loreals; four shields occur along the margin of the lower lip; the third and fourth supraoculars touch the eye. The scales are highly polished, in 15-17 rows; the vertebral row is distinctly enlarged and hexagonal. Ventrals number 185-225 and caudals 37-50, entire.

Habitat: Its range comprises a wide variety of habitats. It is found in fields and low scrub jungle, as well as inhabited areas. It is known to take up residence in termite mounds, brick piles, rat holes, even inside houses.^[1] It is frequently found in water or in proximity to a water source.

Feeding: The common krait feeds primarily on other snakes, including: "blind worms" (snakes of the genus *Typhlops*); and cannibalizes on other kraits, including the young. It also feeds on small mammals (such as rats, and mice), lizards and frogs. The young are known to eat arthropods.

Reproduction: oviparous



Common Name: Banded Krait

Zoological Name: *Bungarus fasciatus*

Family: Elapidae

Conservation Status: Least Concern

Description: The banded krait is easily identified by its alternate black and yellow crossbands, its triangular body cross section, and the marked vertebral ridge consisting of enlarged vertebral shields along its body. The head is broad and depressed. The eyes are black. It has arrowhead-like yellow markings on its otherwise black head and has yellow lips, lores, chin, and throat. The longest banded krait measured was 2.25 m (7 ft 5 in) long, but normally the length encountered is 1.8 m (5 ft 11 in). The snake has an entire anal plate and single subcaudals. The tail is small, about one-tenth the length of the snake. The scientific name of the genus is derived from the Telugu word *bangarum* meaning "gold", referring to the yellow rings around its body.

Habitat: Banded kraits may be seen in a variety of habitats, ranging from forests to agricultural lands. They inhabit termite mounds and rodent holes close to water, and often live near human settlement, especially villages, because of their supply of rodents and water. They prefer the open plains of

the countryside. The banded krait has been found in Myanmar up to an altitude of 5000 feet.

Feeding: The banded krait feeds mainly on other snakes, but is also known to eat fish, frogs, skinks, and snake eggs. Among the snakes taken by banded kraits are:

- Sunbeam snake *Xenopeltis unicolor*
- Rainbow water snake *Enhydris enhydris*
- Red-tailed pipe snake *Cylindrophis ruffus*
- Chequered keelback *Xenochrophis piscator*
- Buff-striped keelback *Amphiesma stolatum*
- Rat snake or dhaman *Ptyas mucosus*
- Indo-Chinese rat snake *Ptyas korros*
- Cat snake *Boiga trigonata*.
- Russell's viper (*Daboia russelii*)

Reproduction: Little is known of its breeding habits. In Myanmar, a female has been dug out while incubating a clutch of eight eggs, four of which hatched in May. Young have been recorded to measure 298 to 311 mm on hatching. The snake is believed to become adult in the third year of its life, at an approximate length of 914 mm.



d) Common Name: Chameleons Or Chamaeleons

Zoological Name: *Chamaeleo zeylanicus*

Family: Chamaeleonidae

Description: Chameleons vary greatly in size and body structure, with maximum total lengths varying from 15 mm (0.59 in) in male Brookesia

micra (one of the world's smallest reptiles) to 68.5 cm (27.0 in) in the male *Furcifer oustaleti*. Many have head or facial ornamentation, such as nasal protrusions, or horn-like projections in the case of *Trioceros jacksonii*, or large crests on top of their heads, like *Chamaeleo calyptratus*. Many species are sexually dimorphic, and males are typically much more ornamented than the female chameleons.

Habitat: Chameleons inhabit all kinds of tropical and mountain rain forests, savannas, and sometimes deserts and steppes. The typical chameleons from the subfamily Chamaeleoninae are arboreal, usually living in trees or bushes, although a few (notably the Namaqua chameleon) are partially or largely terrestrial. Most species from the subfamily Brookesiinae, which includes the genera *Brookesia*, *Rieppeleon*, and *Rhampholeon*, live low in vegetation or on the ground among leaf litter. Many species of chameleons are threatened by extinction. Declining chameleon numbers are due to habitat loss.

Feeding: All chameleons are primarily insectivores that feed by ballistically projecting their long tongues from their mouths to capture prey located some distance away. While the chameleons' tongues are typically thought to be one and a half to two times the length of their bodies (their length excluding the tail), smaller chameleons (both smaller species and smaller individuals of the same species) have recently been found to have proportionately larger tongue apparatuses than their larger counterparts.

Reproduction: Chameleons are mostly oviparous, with some being ovoviviparous. The oviparous species lay eggs three to six weeks after copulation. The female will dig a hole — from 10–30 cm (4–12 in), deep depending on the species — and deposit her eggs. Clutch sizes vary greatly with species. Small *Brookesia* species may only lay two to four eggs, while large veiled chameleons (*Chamaeleo calyptratus*) have been known to lay clutches of 20–200 (*veiled chameleons*) and 10–40 (*panther chameleons*)

eggs. Clutch sizes can also vary greatly among the same species. Eggs generally hatch after four to 12 months, again depending on species.



e) Common Name: Monitor Lizards

Zoological Name: *Varanus varius*

Family: Varanidae

Conservation Status: According to IUCN Red List of threatened species, most of the Monitor lizard's species fall in the categories of least concern but the population is decreasing globally.

Description: The various species cover a vast area, occurring through Africa, the Indian Subcontinent, to China, down Southeast Asia to Brunei, Indonesia, the Philippines, New Guinea, Australia and islands of the Indian Ocean, and the South China Sea.

Habitat: Monitor lizards are, as a rule, almost entirely carnivorous, consuming prey as varied as insects, crustaceans, arachnids, myriapods, mollusks, fish, amphibians, reptiles, birds, and mammals. Most species feed on invertebrates as juveniles and shift to feeding on vertebrates as adults. Deer make up about 50% of the diet of adults of the largest species, *Varanus komodoensis*. In contrast, three arboreal species from the Philippines, *Varanus bitatawa*, *Varanus mabitang*, and *Varanus olivaceus*, are primarily fruit eaters. – Although normally solitary, groups as large as 25 individual monitor lizards are common in ecosystems that have limited water resources.

Feeding: The meat of monitor lizards is eaten by some tribes in India, Thailand, and Australia and in West Africa as a supplemental meat source. The meat of monitor lizards is used in Nepal for medicinal and food purpose.



f) **Common Name:** Common House Gecko

Zoological Name: *Hemidactylus frenatus*

Family: Gekkonidae

Conservation Status: Least Concern

Description: Like many geckos, this species can lose its tail when alarmed. Its call or chirp rather resembles the sound "gecko, gecko". However, this is an interpretation, and the sound may also be described as "tchak tchak tchak" (often sounded three times in sequence). In Asia/Southeast Asia, notably Indonesia, Thailand, Singapore, and Malaysia, geckos have local names onomatopoeically derived from the sounds they make:

Habitat: Most geckos are nocturnal, hiding during the day and foraging for insects at night. They can be seen climbing walls of houses and other buildings in search of insects attracted to porch lights, hence their name "house gecko". Spread around the world by ships, these geckos are now common in the Deep South of the United States, large parts of tropical and sub-tropical Australia, and many other countries in South and Central America, Africa, South Asia, and the Middle East. In winter time, in a lot of these climates, they are known for going into a state of brumation in order to withstand the cold. They grow to a length of between 75–150 mm (3–6 in), and live for about 5 years. These small geckos are non-venomous and harmless to humans.



g) Common Name: Lizards

Zoological Name: *Hemidactylus flaviviridis*

Family: Gekkonidae

Description: Aside from legless lizards, most lizards are quadrupedal and move using gaits with alternating movement of the right and left limbs with substantial body bending. This body bending prevents significant respiration during movement, limiting their endurance, in a mechanism called Carrier's constraint. Several species can run bipedally,^[8] and a few can prop themselves up on their hindlimbs and tail while stationary. Several small species such as those in the genus *Draco* can glide: some can attain a distance of 60 metres (200 feet), losing 10 metres (33 feet) in height. Some species, like geckos and chameleons, adhere to vertical surfaces including glass and ceilings. Some species, like the common basilisk, can run across water.

Habitat: Lizards are found worldwide, excluding the far north and Antarctica, and some islands. They can be found in elevations from sea level to 5,000 m (16,000 ft). They prefer warmer, tropical climates but are adaptable and can live in all but the most extreme environments. Lizards also exploit a number of habitats; most primarily live on the ground, but others may live in rocks, on trees, underground and even in water. The marine iguana is adapted for life in the sea.

Feeding: The majority of lizard species are predatory and the most common prey items are small, terrestrial invertebrates, particularly insects. Many species are sit-and-wait predators though others may be more active foragers. Chameleons prey on numerous insect species, such

as beetles, grasshoppers and winged termites as well as spiders. They rely on persistence and ambush to capture this prey.

Reproduction: Ost social interactions among lizards are between breeding individuals. Territoriality is common and is correlated with species that use sit-and-wait hunting strategies. Males establish and maintain territories that contain resources which attract females and which they defend from other males.



ANNEXURE - VI

MAMMALS

Common Name: Greater Short-Nosed Fruit Bat

Zoological Name: *Cynopterus sphinx*

Family: Pteropodidae

Conservation Status: Least Concern

Description: These bats have a relatively long snout. Their upper parts are brown to grey-brown with paler under parts. The fur is very fine and silky. The ears and wing bones of *C. sphinx* are edged in white. Lower cheek teeth rounded without accessory cusps. The wing span of the adult is about 48 cm. Juveniles are lighter than adults. Average forearm length 70.2mm (64-79mm).

Habitat: The greater short-nosed fruit bat is found from Pakistan to Vietnam. It is common in tropical forests and areas where fruit crops are cultivated. They can also be found in grassland and mangrove forests. They typically nest high in palm trees. The bats chew the fronds of the palms to construct fairly simple tents. These bats are also known to construct tents by closely interweaving the leaves and twigs of creeping vines which cover buildings, but such nests are constructed only when palms are not available.

Feeding: These bats are frugivorous, locate their preferred food items by scent. They have been described as voracious feeders, eating more than their body weight in food in one sitting. Some preferred fruits include ripe guava, banana, chikoo, dates and lychees. Short-nosed fruit bats inflict serious damage on many fruit crops, and are considered pests. In addition, these bats are possible vectors for Japanese encephalitis, which is serious disease in humans. These bats are important dispersers of date palm seeds, and pollinate many night blooming flowers.

Reproduction: The adult sex ratio is very female biased. Researchers attribute this to the relatively rapid maturation of females compared to males. In Central India, *C. sphinx* breeds twice per year. Females produce a single young at a time. Each half of the bicornate uterus functions during alternate breeding

cycles. The first pregnancy cycle occurs from October through February/March. Mating occurs immediately postpartum, and a second offspring is born in July. Gestation period is about 3–5 months.



Common Name: Black-Bearded Tomb Bat

Zoological Name: *Taphozous melanopogon*

Family: Emballonuridae

Conservation Status: Least Concern

Description: Head and body length is 9–10 cm. Forearm 6 cm. Wingspan 37–40 cm. Tip of the tail is conspicuous and free. Grayish brown above with a grizzled appearance. Lighter on the shoulders, hind neck, and underside. Fur short and dense. Body appears rather flattened above and below. Hairy chin. In older males, at about 5–6 months, a blackish beard can be seen. Claws purplish with whitish tip. Young are grayer and darker. No gular sacs as in *Taphozous longimanus*. It has only small pores.

Habitat: Black-Bearded Tomb Bats are found in habitats including rainforests, woodlands, tombs, deserted buildings, rock formations, caverns, cliffs, and arid country plains. They prefer densely sheltered areas. They roost in groups ranging from 200 to 4000 individuals. (Kunz and Pierson, 1994; Lekagul and McNeely, 1988) Feeding: *Taphozous melanopogon* feeds primarily on flying insects, although it also sometimes feeds on small fruits. It hunts by echolocation emitting a "click" or "tic" that can be faintly audible, to humans. (Boonsong and McNeely, 1988) Primary Diet, carnivore, insectivore
Animal Foods insects, Plants foods Fruits

Reproduction: Information on mating systems is not available. The mating season lasts for only a few weeks in the winter. The female gives birth to one

live infant sometime in early spring. (Hill and Smith, 1986; Kunz and Pierson, 1994; Lekagul and McNeely, 1988).



Common Name: Field Rat

Zoological Name: *Bandicota bengalensis*

Family: Muridae

Conservation Status: Least Concern

Description: The lesser bandicoot and two other species are nocturnal or most active at twilight. They construct burrows to nest and bear their litters. The number of bandicoot babies can range from two to 18. Their staple diet is grains, fruit, and invertebrates. They are prone to destroying cultivated crops in fields. Of all the three species, the lesser bandicoot is an especially aggressive burrower and has been reported to make tunnels in concrete cellars.

Habitat: These rats are also known to inhabit houses in villages and are particularly aggressive when threatened. The controls are done by mechanical (mouse trap etc.), rodenticides and biological control (by introducing rodent diseases etc.)

Reproduction: Female can have up to 10 litters. Young (10-12 per litter) are born blind and naked. Young reach sexual maturity around 60 days after birth. Lifespan of adults is about 8–9 months.

Common Name: Indain Bush Rat

Zoological Name: *Golunda ellioti*

Family: Muridae

Conservation Status: Least Concern



Description: Head and body length is 12–14 cm. Tail is 9-11. Yellowish brown upperparts are speckled with black and reddish yellow. Ventral surface grayish with a yellowish speckle, Orange-yellow incisor teeth, Tail, dark above and yellowish below, Body fur spiny, Rounded head with a blunt nose, with small eyes mark, Relatively short bill.

Habitat: It is a partially diurnal, fossorial also terrestrial, semi-arboreal, not particularly gregarious, herbivorous species. It is found in varied habitat conditions from tropical dry deciduous, dry wood, shrub, tropical thorn forests and grassy clumps, may venture in to cultivated lands, bushes, orchards, scrublands, grasslands close to streams, tropical dry deciduous, except cold deserts. Also found near granite hills with sandy loam and silty soil. In Sri Lanka, this species is found in low country, dry zone and mountain wet zone, low country semi evergreen forests, wet patana grasslands. It has been found to occupy rocky and hilly tracts, burrows, grassland close to streams, build nests on thick bush, shrubs (Molur *et al.* 2005). This can be a serious agricultural pest species (Corbet and Hill 1992).

Common Name: Black Rat

Zoological Name: *Rattus rattus*

Family: Muridae

Conservation Status: Least Concern

Description: The black rat originated in India and Southeast Asia, and spread to the Near East and Egypt, and then throughout the Roman Empire, reaching Great Britain as early as the 1st century. Europeans subsequently spread it throughout the world. The black rat is again largely confined to warmer areas, having been supplanted by the brown rat (*Rattus norvegicus*) in cooler regions and urban areas. In addition to being larger and more aggressive, the change from wooden structures and thatched roofs to bricked and tiled buildings favored the burrowing brown rats over the arboreal black



rats. In addition, brown rats eat a wider variety of foods, and are more resistant to weather extremes.

Habitat: Black Rats adapt to a wide range of habitats. In urban areas they are found around warehouses, residential buildings, and other human settlements. They are also found in agricultural areas, such as in barns and crop fields. In urban areas, they prefer to live in dry upper levels of buildings, so they are commonly found in wall cavities and false ceilings. In the wild, black rats live in cliffs, rocks, the ground, and trees. They are great climbers and prefer to live in trees, such as pines and palm trees. Their nests are typically spherical and made of shredded material, including sticks, leaves, other vegetation, and cloth. In the absence of trees, they can burrow into the ground. Black rats are also found around fences, ponds, riverbanks, streams, and reservoirs.

Reproduction: They often meet and forage together in close proximity within and between sexes. Rats tend to forage after sunset.

Common Name: Indian House Shrew

Zoological Name: *Suncus murinus*

Family: Soricidae

Conservation Status: Least Concern

Description: The house shrew has a uniform, short, dense fur of mid-grey to brownish-grey color. The tail is thick at the base and a bit narrower at the tip, and is covered with a few long, bristle-like hairs that are thinly scattered. They have short legs with five clawed toes. They have small external ears and an elongated snout. They also emit a strong odor of musk, derived from musk glands that are sometimes visible on each side of the body. The odor is especially noticeable during the breeding season.

Habitat: It is widespread and found in all habitats, including deserts and human habitations. The habitat of this species is normally near human settlement, specifically near the house. Some also live on the ground in leaf litter and grass.

It has been recorded up to 2825 m above sea level near Darjeeling, West Bengal, but only to up to 300 m in Taiwan.

The house shrew has a habit of moving quickly along the edges of the walls when it enters human habitations. As it runs it makes a chattering sound which resembles the sound of jingling money, which has earned them the name "money shrew" in China.

When alarmed, the house shrew makes an ear-piercing, high-pitched shriek, resembling the sound of



nails scraping a chalkboard or a metal fork scraping glass, which repels house cats. Predators also leave the house shrew alone because of its musky smell and even when they catch one by mistake they will rarely eat it

Common Name: Jungle Cat

Zoological Name: *Felis chaus*

Family: Felidae

Conservation Status: Least Concern

Description: The distribution of jungle cat is largely oriental; it occurs in the Middle East, the Indian subcontinent, central and Southeast Asia, Sri Lanka and in southern China. It is the most common small wild cat in India

Habitat: The distribution of jungle cat is largely oriental; it occurs in the Middle East, the Indian subcontinent, central and Southeast Asia, Sri Lanka and in southern China. It is the most common small wild cat in India. Thought to be absent south of the Isthmus of Kra in the Malayan peninsula, the possibility of its occurrence was reported from a highly fragmented forest in the Malaysian state of Selangor in 2010.

A habitat generalist, the jungle cat inhabits places with adequate water and dense vegetation, such as swamps, wetlands littoral and riparian areas, grasslands and shrub. It is common in agricultural lands, such as fields of bean and sugarcane, across its range, and has often been sighted near human

settlements. As reeds and tall grasses are typical of its habitat, it is known as "reed cat" or "swamp cat". It can thrive even in areas of sparse vegetation, but does not adapt well to cold climates and is rare in areas where snowfall is common. Historical records indicate that it occurs up to elevations of 2,310 m (7,580 ft) in the Himalayas. It shuns rainforests and woodlands.

Reproduction: Both sexes become sexually mature by the time they are one year old. Females enter oestrus lasting for about five days, from January to March. In males, spermatogenesis occurs mainly in February and March.

Common Name: Indian Wildboar

Zoological Name: *Sus scrofa cristatus*

Family: Suidae

Conservation Status: Least Concern

Description: The Indian boar differs from its European counterpart by its large



mane which runs in a crest along its back from its head to lower body, larger, more sharply featured and straighter skull, its smaller, sharper ears and overall lighter build. It is taller and more sparsely haired than the European form, though its back bristles are much more developed. The tail is also more tufted, and the cheeks hairier. Adults measure from 83.82 to 91.44 cm (33.00 to 36.00 in) in shoulder height (with one specimen in Bengal having reached 38 inches) and five feet in body length. Weight ranges from 90.72 to 136.08 kg (200.0 to 300.0 lb).

Habitat: The animal's primary habitat consists of well developed, broad-leaved and mixed forests, along with marshy mixed forests, with coniferous forests and undergrowths being of secondary importance. Forests made up entirely of oak groves and beeches are used only during the fruit-bearing season.

Reproduction: The breeding period in most areas lasts from November to January, though most mating only lasts a month and a half. Prior to mating, the males develop their subcutaneous armor, in preparation for confronting rivals.

Common Name: Common Mongoose

Zoological Name: *Herpestes edwardsi*

Family: Herpestidae

Conservation Status: Least Concern

Description: The Indian grey mongoose or common grey mongoose (*Herpestes edwardsi*) is a mongoose species mainly found in West Asia and on the Indian subcontinent. In North Indian languages

(Hindi/Punjabi) it is called Nevlaa. The grey mongoose is commonly found in open forests, scrublands and cultivated fields, often close to human habitation. It lives in burrows, hedgerows and thickets, among



groves of trees, and takes shelter under rocks or bushes and even in drains. It is very bold and inquisitive but wary, seldom venturing far from cover. It climbs very well. Usually found singly or in pairs. It preys on rodents, snakes, bird's eggs and hatchlings, lizards and variety of invertebrates.

Habitat: They appear to be able to occupy a wide variety of habitats but preferring open types. These include grasslands, open areas, rocky patches, scrub, semi-desert, cultivated fields and other disturbed areas, areas of thickets, bushy vegetation, dry secondary forest, thorn forest, forest edges, and also near human settlement.

Reproduction: The Indian Grey Mongoose mates between March and October, it breeding two to three times each year. The gestation period lasts for 60 to 65 days; the female gives birth to two to four offsprings.



Common Name: Rhesus Macaque

Zoological Name: *Herpestes edwardsi*

Family: Herpestidae

Conservation Status: Least Concern

Description: The rhesus macaque is brown or grey in color and has a pink face, which is bereft of fur. Its tail is of medium length and averages between 20.7 and 22.9 cm (8.1 and 9.0 in). Adult males measure about 53 cm (21 in) on average and weigh about 7.7 kg (17 lb). Females are smaller, averaging 47 cm (19 in) in length and 5.3 kg (12 lb) in weight. Rhesus macaques have, on average, 50 vertebrae. Their ratio of arm length to leg length is 89%. They have dorsal scapulae and a wide rib cage. The rhesus macaque has 32 teeth with a dental formula of 2.1.2.3/2.1.2.3 and bilophodont molars. The upper molars have four cusps: paracone, metacone, protocone, and hypocone. The lower molars also have four cusps: metaconid, protoconid, hypoconid, and entoconid.

Habitat: Rhesus macaques are native to India, Bangladesh, Pakistan, Nepal, Burma, Thailand, Afghanistan, Vietnam, southern, China, and some neighboring areas. They have the widest geographic ranges of any nonhuman primate, occupying a great diversity of altitudes throughout Central, South, and Southeast Asia. Inhabiting arid, open areas, rhesus macaques may be found in grasslands, woodlands, and in mountainous regions up to 2,500 m (8,200 ft) in elevation.

Reproduction: Adult male macaques try to maximize their reproductive success by entering into sex with females, both in and outside the breeding period. Females prefer to mate with males that will increase the survival of their young. Thus, a consort male provides resources for his female and protects her from predators. Larger, more dominant males are more likely to provide for the females. The breeding period can last up to 11 days, and a female usually mates with four males during that time.

Common Name- Common Indian Hare

Zoological Name- *Lepus nigricollis ruficaudates*

Family- Liporadade

Conservation Status- Least Concern

Habitat- *Lepus nigricollis* are generally found in areas where large tracts of bush and jungle alternate with farm land. They are also commonly sighted in coastal herb communities. Hilly areas, particularly the depressions at the base of hills, are preferred habitats for *Lepus nigricollis*.



Physical Description- *Lepus nigricollis* are also called black-naped hares due to the patch of black fur that runs along the nape of the neck. The top of the tail is also black and the back and face are brown with black hairs scattered throughout. The under parts are white. Total length ranges from 40 to 70 cm and weight ranges from 1.35 to 7 kg.

Reproduction- During mating season, male *Lepus nigricollis* become aggressive, sparring with other males using their forepaws and "boxing" with their hind feet. Males will attempt to mate with as many females as they can.

Common Name- The Three Striped Palm Squirrel

Zoological Name- *Funambulus Palmarum*

Family- Sciuridae

Conservation Status- Least Concern

Habitat- This is a very adaptable species. It is a diurnal and semi-arboreal. This species occurs in tropical and subtropical dry deciduous forest, mangrove forest, grasslands, scrublands, plantations, rural gardens and urban areas. In Sri Lanka, found throughout the island except in deep jungles.



Physical Description- The Palm Squirrel is about the size of a large chipmunk, with a bushy tail slightly shorter than its body. The back is a grizzled, grey-brown colour with three conspicuous white stripes which run from head to tail. The two outer stripes run from the forelegs to the hind legs only. It has a creamy-white belly and a tail covered with interspersed, long, black and white hair. The ears are small and triangular. Juvenile squirrels have significantly lighter coloration, which gets progressively darker as they age. Albinism is rare, but exists in this species.

Reproduction- Naturally active, their activity reaches levels of frenzy during the mating season. They tend to be very protective of their food sources, often guarding and defending them from birds and other squirrels. Unlike some other species of squirrel, the Indian palm squirrel does not hibernate.

Common Name- Timber Wolf

Zoological Name- *Canis lupus pallipes*

Family-Canidae

Conservation Status- Least Concern

Habitat- The gray wolf is a habitat generalist, and can occur

in deserts, grasslands, forests and arctic tundras. Habitat use by gray wolves is strongly correlated with the abundance of prey, snow

conditions, absence or low livestock densities, road densities, human presence and topography. In cold climates, the gray wolf can reduce the flow of blood near its skin to conserve body heat.



Physical Description- A Small Wolf with pelage shorter than that of northern wolves, and with little to no under. Fur color ranges from greyish-red to reddish-white with black tips. The dark V shaped stripe over the shoulders is much more pronounced than in northern wolves. The under parts and legs are

more or less white. Generally, wolves have a high heart weight of 0.93%-1.07% total body mass compared to the average mammal at 0.59% total body mass.

Reproduction- The Gray Wolf is generally monogamous with mated pairs usually remaining together for life. Upon the death of one mated wolf, pairs are quickly re-established. Since males often predominate in any given wolf population, unpaired females is a rarity. If a dispersing male gray wolf is unable to establish a territory or find a mate, he mates with the daughters of already established breeding pairs from other packs. Such gray wolves are termed "Casanova wolves" and, unlike males from established packs, they do not form pair bonds with the females they mate with. Some gray wolf packs may have multiple breeding females this way, as is the case in Yellowstone National Park. Gray wolves also practice alloparental care, in which a wolf pair may adopt the pup or pups of another. This might take place if the original parents die or are for some reason separated from them. In addition to heterosexual behavior, homosexual behavior has been observed in gray wolves. Male gray wolves often mount each other when the highest ranking female in the pack comes into heat.



Common Name- Striped Hyaena

Zoological Name- *Hyaena hyaena*

Family- Hyaenidae

Conservation Status- Near- Threatened

Habitat- The Striped Hyena typically inhabits deserts, semi deserts, scrub forests, woodlands, grasslands, acacia bushlands, rocky terrain and tropical savannas. Family groups live in dens which are usually caves with narrow entrances and are concealed with large boulders. Dens can extend over a distance of 4 – 5 metres.

Physical Description- Male and female Striped Hyenas are very similar in appearance, although males are slightly larger. Striped Hyenas generally measure between 1–1.15 metres in length excluding the tail (which measures 12.5 inches), and stand 0.66 – 0.75 metres at



the shoulder. Males weigh between 26 – 41 kilograms (57 – 90 pounds) and females weigh 26 – 34 kilograms (57 – 75 pounds). Their coats are generally light grey to beige in colour and they have a black patch on their throat.

Reproduction- There is no specific breeding season for the Striped Hyena. After a gestation period of 90 – 92 days a litter of 2 – 4 helpless cubs are born in nesting dens. Hyena cubs are born blind and their ear canals are closed. Their coats are white to grey with clear black stripes. After 7 – 8 days, the cubs are able to open their eyes and their teeth develop after 3 weeks. Cubs can eat solid food after a month; however, weaning can vary from 8 weeks to 12 months while learning foraging skills from their mother. Both male and female provide parental care. Female Striped Hyenas have 6 teats whereas the Brown Hyena only has 4. The life span of the Striped Hyena is 24 years in captivity.

Common Name- Indian Fox

Zoological Name -Vulpes Bengalensis

Family- Canidae

Conservation Status- Least Concern

Habitat- The Indian Fox prefers semi-arid, flat to undulating terrain, scrub and grassland habitats where it is easy to hunt and dig dens. It avoids dense forests, steep terrain, tall grasslands and true deserts (Johnsingh and Jhala 2004). The species is relatively common in areas of low rainfall, where the vegetation is typically scrub, thorn or dry deciduous forests, or short grasslands (Rodgers et

al. 2000). In the Indian peninsula, the species is restricted to plains and open scrub forest. Home ranges have been estimated at about 2 km² (Maurya 2012). Diet mostly consists of arthropods, rodents, reptiles, fruits and birds, in that order of occurrence in scats (Home and Jhala 2009). Pups are born between December and February, but can be as late as March. Short resource rich grassland patches in an agro-pastoral landscape are preferred for denning and pup rearing (*Punjabi et al. 2013*).

Physical Description- The Bengal Fox is a medium-sized fox with an elongated muzzle with black hair in small patches on the upper part of the muzzle. Its large, bushy, black-tipped tail is its most prominent feature, accounting for as much as 60% of the length of its body. Usually the tail trails behind but when the fox is running, it carries its tail horizontally, and then holds it vertically when making sudden turns. The color of the fox's coat varies according to the season and within a population but is usually gray on the back and paler on the belly, with dark brown on the ears, with black edges. Their ears are large in comparison to their body and are possibly an adaptation for thermoregulation in their hot and dry habitats.

Reproduction- Bengal Foxes are usually monogamous and form pair bonds that may last for their lifetime. The breeding season is from December to January, announced by digging a new den or re-excavating an old one. Pups are born from January to March. The gestation period is 50–60 days, and between 3 to 6 pups are born within a den. Both mother and father help to raise the pups, which are weaned at about 1 month old. Pups are sometimes nursed by a number of females. In the daytime they are likely to rest under bushes, but in summer they rest in dens. Independence is reached at 4 - 5 months old and sexual maturity by 1 - 2 years old.



For further details/query contact:-

STATE FOREST RESEARCH & TRAINING INSTITUTE

Near Vidhan Sabha, Baloda Bazar Road, Raipur - 493111, Chhattisgarh

Email: directorsfrti@gmail.com, Phone No. – 0771 - 2285121, 2285125