NON FOREST LAND

ENVIRONMENTAL IMPACT ASSESSMENT

& BIO DIVERSITY STUDIES

FOR

PIPAKHERI LIMESTONE (BUILDING STONE) MINE

NEAR VILLAGE – PIPAKHERI,

TEHSIL – RAMGANJ MANDI,

DISTRICT – KOTA,(RAJASTHAN)

LEASE AREA – 72.8234 HECT.

M.L.No. 26/2011

PROJECT COST – 5.50 Cr.,

PRODUCTION CAPACITY OF LIMESTONE (BUILDING STONE)
(1,00,000 TPA)

LESSEE

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INTRODUCTION OF MUKUNDRA HILLS NATIONAL PARK

Mukundra Hills (Darrah) National Park

Mukundra Hills National Park is also known as Darrah wildlife Sanctuary . Darrah was declared a (Protected area) wildlife sanctuary in 1955. The Darrah wildlife sanctuary was declared as a National park (Mukundra Hills (Darrah) National Park) in 2004. The park got the nod from National Tiger Conservation Authority (NTCA) in 2013, and the state (Rajasthan) bagged its third tiger reserve in the form of the Mukundra Hills Tiger Reserve. The densely wooded Darrah Sanctuary is spread all over the hilly terrain. The forest of the sanctuary is very thick and dense. After Ranthambhore and Sariska, Rajasthan will now be home to a third big cat habitat-the Mukundara Hills Tiger Reserve.

This study is carried out in Mukundara Hills National Park of Kota. Kota is one of the eastern districts of Rajasthan. This district is situated between 24.2^{o} and 25.2^{o} N and 75.37^{o} and 77.26^{o} S of south-east of Rajasthan. The park is situated between two parallel mountains viz. Mukundra and Gagrola which run across a length of about 80 km (from Murlipura to Rawatbhata). Mukundra Hills (Darrah) National Park is a combination of three wildlife sanctuaries namely Darrah wildlife sanctuary, Chambal wildlife sanctuary and Jaswant Sagar wildlife sanctuary. The Mukundara Hills Tiger Reserve will be spread across four districts-Kota, Bundi, Chittorgarh and Jhalawar-covering an area of 759 sq km. It will boast of a core area of 417 sq km and a buffer zone covering 342.82 sq km. The reserve, expected to ease the big cat population pressure in Ranthambhore, will cover the existing Darrah, Jawahar Sagar and Chambal wildlife sanctuaries.

The four rivers which form the boundary of this valley are Ramzan, Ahu, Kali and Chambal. The name Darrah is taken as the 'pass' in the local language revealing the purpose that the region served earlier. In past, Darrah sanctuary was the royal hunting ground of the Maharaja of Kota. This place is located at a distance of about 50 km from Kota. It is located on the eastern bank of Chambal River and is drained by its tributaries.

National park is an area which is strictly reserved for the betterment of the wildlife & biodiversity, and where activities like developmental, forestry, poaching, hunting and grazing on cultivation are not permitted. Their boundaries are well marked and circumscribed.

Temperature: Maximum – 43^{o} C

Minimum – 5^{o} C

Coordinates – 24°52′05″N and 75°51′22″E

Dominant flora

Babul (Accasia nilotica), Imli (Tamarindicus indica), Banyan (Ficus benghalensis), Ber (Zizyphus mauritania), Dhak (Butea Monosperma), Dhok (Anogeossispendula), Kadam (Authocephalus cadamba), Khajur (Phoenix sylvestris), Khair (Accacia catechu), Karel (Capparis decidua), Khejda (Prosopis specigera), Kakera (Flacourtiaindica), Mohua (Madhuca indica), Neem (Azadirachta indica) etc

Dominant fauna

Panther, Sloth bear, Wolf, Leopard, Chinkara, Spotted deer, Wild boar, Antelope, Sambar, Nilgai, Jackal, Hyena, Jungle cat etc. Many species of birds and reptiles are also found

STUDY OF BIOLOGICAL ENVIRONMENT AROUND PROJECT

1. INTRODUCTION

The basic purpose to exploring the biological environment under Environmental Impact Assessment (EIA) is to assist in the decision making process and to ensure that the project options under consideration are bio-environmental-friendly. EIA identifies ways of improving project environmentally by preventing, minimizing, mitigating or compensating for adverse impacts before exploration and development phase. The present study on the floral assessment of the proposed project is based on field survey of the area supported by secondary data from various governmental and non-governmental sources.

OBJECTIVE OF THE STUDY

The objectives of this study were as follows:

1. To conduct detail study for floral/ faunal/ avifaunal elements in the study area of proposed project site.
2. To assess scheduled species in the proposed site. (Rare, endangered, critically endangered, endemic and vulnerable).
3. To identify locations and features of ecological significance

4. To collect Baseline data for the study area along with a description of the existing terrestrial, wetland and aquatic vegetation.
5. To identify Impact of proposed project before exploration and during development phase on the biological environment.

2 ACTIVITIES UNDERTAKEN DURING THE STUDY

1. Flora survey
   - Identification & documentation of Tree, shrub, herb, climber & grass species
   - Analysis of scheduled taxa of the proposed site
2. Fauna survey
   - Identification and Documentation of Avian, Reptilian, Amphibian, Mammal and other faunal diversity
   - Observations by direct and indirect evidences
   - Analysis of Scheduled species
3. Study of Habitat/microhabitat for the faunal elements in the project site and surrounding areas within 10 km range from the site.
4. Photo documentation for flora and fauna (E – herbarium for flora)

3 STUDY AREA

The study of terrestrial ecology has been carried out within the 10 km radial distance around the mining site. The surrounding area is being used for the mining purpose with prior permission from the government authorities. Some area has also been converted into agricultural field where farming activity has been observed.

Biological components are one of the most important constituent of our environment. They are the integral part of our life as they provide raw materials for livelihoods, trade, medicines and industrial development. Their conservation and sustainable use is very much essential in today's developmental process. Developmental processes are today's demand and cannot be stopped as such.

It has been observed in past that most of our developmental process cost our environment. In order to keep them unaffected or minimum affected while our developmental activity, it is always necessary to know the background of the

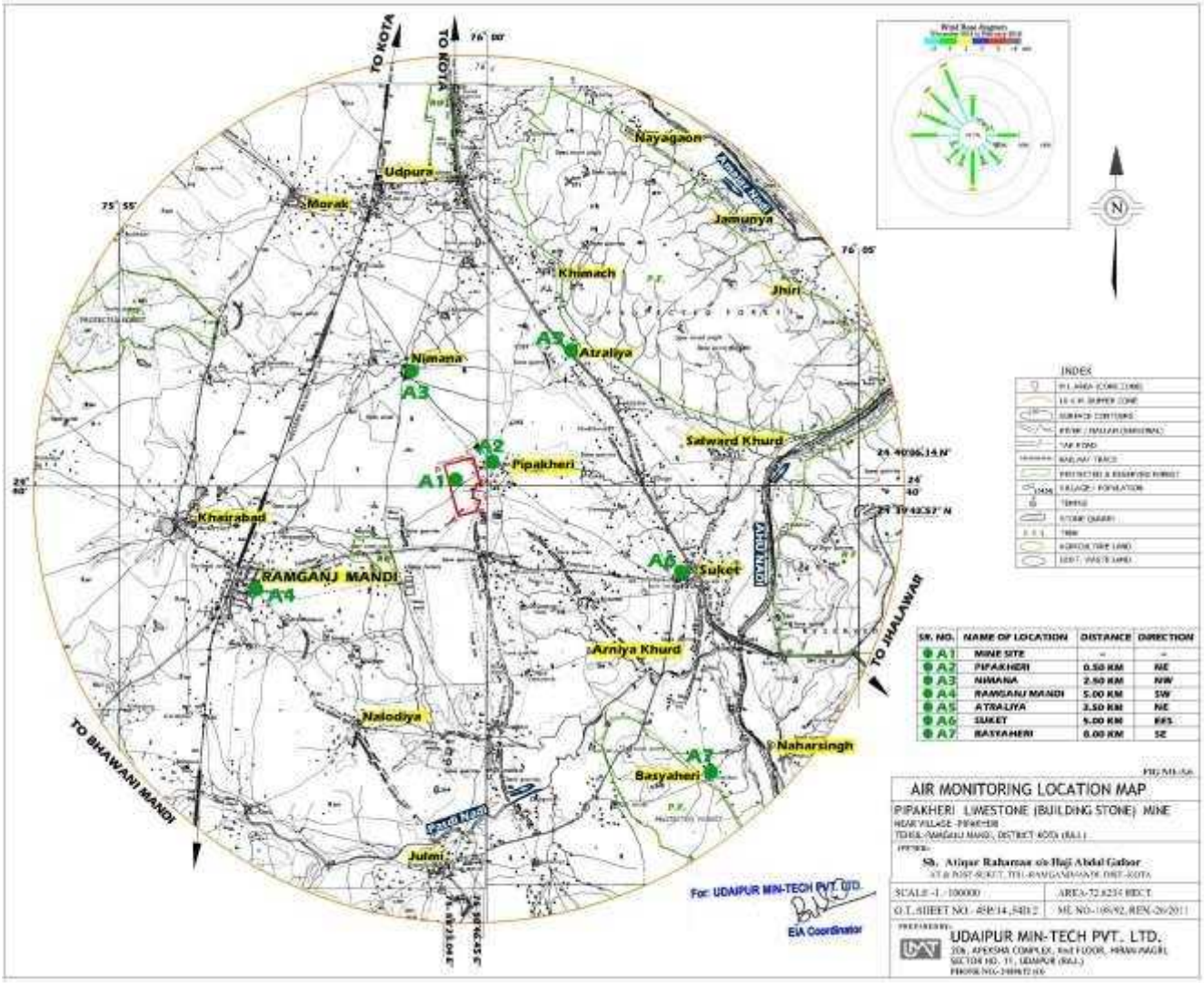
area from biological point of view. After getting such information we can estimate the impact on the environment by the proposed activities and mitigate them. Similar approach has been adopted for conducting the Biological Environment study for the proposed Project. The list of sampling locations studied for biological environment is presented in below table.

TABLE 1: LIST OF SAMPLING LOCATIONS FOR BIOLOGICAL STUDY

Sampling Code	Village	Location from the project site	
		Distance (km)	Direction
EB1	Pipakheri	0.50	NE
EB2	Nimana	2.50	NW
EB3	Ramganj mandi	5.00	SW
EB4	Atraliya	3.50	NE
EB5	Suket	5.00	SEE
EB6	Basiyheri	8.00	SE
EB7	Kahairabad	6.00	W
EB8	Lakhariya	8.00	SSE
EB9	Morak	7.00	NW

Refer Figure 1 for Sampling Locations for Biological Environment in the Study Area.

FIGURE 1: SAMPLING LOCATIONS FOR BIOLOGICAL ENVIRONMENT IN THE STUDY AREA



Sr. No.	Name of Location	Distance	Direction
A1	MINE SITE	–	–
A2	PIPAKHERI	0.50 KM	NE
A3	NIMANA	2.50 KM	NW
A4	RAMGANJ MANDI	5.00 KM	SW
A5	ATRALIYA	3.50 KM	NE
A6	SUKET	5.00 KM	ESE
A7	BASYAHERI	0.00 KM	SE

The proposed project is mining project of lime stone (Building stone) located at village Pipakheri Tehsil Ramganj Mandi District Kota. The topography of the applied area is plane to hilly at most of the places in below figure.

FIGURE 2: MINE LEASE AREA

There is no reserves forest or protected forest land within the lease area. Some protected forests were observed away from lease area.

TABLE 2: LIST OF FOREST IN THE STUDY AREA

S. No.	Forest	Location	Location from the project site	
			Distance (km)	Direction
1	PF	N/V Kuttepur	6.0	NW
2	RF	N/V Mayla	1.7	SW
3	PF	N/V Semalkheri	5.6	SE
4	RF	N/V Lohariya	7.0	SE
5	PF	N/V Atraliya	4.1	NE
6	RF	N/V Dabadeh	6.4	N

The climate of the district is dry semi-arid and usually has south- western monsoon. The minimum and maximum temperatures recorded in the district vary from 4 to 5 degree Celsius to 47 degree Celsius on the higher end. The average Rainfall of the district is 604.03 mm. The region experiences tropical climate.

The buffer zone is dominated by agricultural fields followed by sparse vegetation in between. 10 km buffer area was taken for the present flora and fauna study from the project boundary. The study was under taken during winter season, 2013-14.

SURVEY METHODOLOGY

FLORA

The present study on the floral assessment for the proposed project activity is based on extensive field survey of the area. The study has been conducted in winter season. The plant species were identified during floral survey and with the help of nearby institutions / University and by secondary sources.

Besides the collection of plant species, information was also collected with vernacular names of plant species made by local inhabitants. In this process the whole study area was divided into different sections to get the maximum diversity of plant species. The sampling sites were selected based on land use pattern, topography and floristic composition of the study area. Data on forest type, legal status and their extent in the study area has been collected from forest department. The other relevant data on biodiversity, economically important plant species and medicinal plant, rare and endangered species in the study area have been collected during site visit and from different secondary sources.

FAUNA

The study of fauna takes substantial amount of time to understand the specific faunal characteristics of the area. The assessment of fauna has been done by extensive field survey of the area. During survey, Line Transect method was used for the study of mammals and Transact & Patch sampling was used for Amphibians. In addition the following sources were also used during survey.

- Sighting during ecological studies
- Animal call
- Foot mark and excreta

AVIFAUNA

During Birds survey actual counts of birds were made following the standard survey technique. Observations were made during a walk through in the chosen transect for sighting birds. The number of birds observed in each sampling location was directly counted and listing was made. Birds were noted, counted and identified with the help of 8X40 "Optima Zenith" binocular and standard field identification guides.

Forest and Forest type in the study area:

The vegetation of the study area can be classified into tropical dry deciduous forest type and Mixed miscellaneous forests in accordance with "Survey of Forest Types of India" by Champion and Seth (1968)

Tropical Dry Deciduous Forests

These forests are found in areas having temperature of 25-32^{0}C and annual rainfall of 75-125 cm along with a dry season of about six months. These forests are mostly found in small patches in few parts of the state. Chief characteristic feature of the forests is open canopy of small (10-15 m high) trees and abundance of shrubs. Sporadic growth of certain species of dry deciduous forests is found along the dry river beds of the state. The main species found in this kind of forests are Anogeissus pendula, Anogeissus latifolia, Acacia catechu, Terminalia tomentosa, Terminalia balerica, Terminalia arjuna, Boswellia serrata, Dendrocalamus strictus, Lanea grandis.

Mixed Miscellaneous Forests

These forests are mostly found in south easten and easten part of Rajasthan. These Forests mainly have species like Anogeissus pendula, Anogeissus latifolia, Terminalia tomentosa, Terminalia arjuna, Terminalia chebula, Albizia lebbeck, Dalbergia paniculata etc. and its associates.

FLORAL INVESTIGATION

1. Core zone

This mining project of lime stone (Building stone) located at near village Pipakheri, Tehsil Ramganj Mandi, District Kota. The topography of the applied area is plane most of the places. There is no reserves forest or protected forest land within the lease area.

The area covered under lease is under active mining due to which very few plants (Fig. 3.17) have been observed in the lease area. Some scattered trees of Acacia sp. have observed with some shrub and herbs like Argemone mexicana, Calotropis procera, Ipomoea fistulosa, Lantana camara, Parthenium hysterophorus and Tribulus terrestris etc.

The lease area is surrounded by agriculture fields, Vegetation is limited up to these fields (Fig. 4). The dominant species observed during the survey are Acacia leucophloea, Acacia nilotica, Mangifera indica, Prosopis juliflora, Tamarindus indica, Ailanthus excels, Albizia lebbeck, Azadirachta indica, Bombax ceiba, Dalbergia sissoo, Ziziphus mauritiana etc.

FIGURE 3 : VEGETATION OBSERVED IN THE LEASE AREA

FIGURE 4 : AGRICULTURE FIELDS AROUND MINE LEASE AREA

2. Buffer zone (10 km from the boundary of mine lease area)

The buffer zone covers 10 km radius around the lease area. The assessment of flora and fauna was carried out by visual observation and discussion with the villagers.

This buffer zone is mostly covered with different mining areas and open sparse vegetation along with the agricultural fields and village areas. The buffer zone does not harbour any eco-sensetive areas. The prominent tree species observed in the buffer zone are Azadirachta indica, Mangifera indica, Bombax ceiba, Moringa oleifera, Pongamia pinnata, Prosopis juliflora, Syzygium cumini, Tamarindus indica, Pithecellobium dulce, Polyalthia longifolia, Acacia nilotica, Aegle marmelos, Ailanthus excels, Albizia lebbeck, Albizia procera, Cassia fistula, Dalbergia sissoo, Ficus religiosa, Ficus benghalensis, Ficus racemosa, Emblica officinalis, Tectona grandis, Ziziphus mauritiana, Zizyphus xylopyra etc.

The shrub and herb species observed in the buffer zone are Annona squamosa, Cassia tora, Datura inoxia, Parthenium hysterophorus, Sidaacuta, Lantana camara, Nyctanthes arbor-tristis, Tribulus terrestris, Argemone mexicana,

Calotropis gigantean, Calotropis procera, Ipomoea, fistulosa and Tridax procumbens etc. List of plant species recorded in the study area of proposed project site is presented in below table.

TABLE 3 : LIST OF PLANT SPECIES RECORDED IN THE CORE ZONE

S. No.	Botanical Name	Common Name	Family
Trees			
1	Acacia nilotica*	Desibaval	Fabaceae
2	Azadirachta indica*	Limdo	Meliaceae
3	Emblica officinalis*	Amla	Euphorbiaceae
4	Ficus religiosa*	Piplo	Moraceae
5	Pithecellobium dulce*	Jungle jalebi	Fabaceae
6	Prosopis cineraria*	Khijdo	Fabaceae
7	Prosopis juliflora*	Gando baval	Fabaceae
8	Ziziphus mauritiana*	Bor	Rhamnaceae
Shrubs			
9	Argemone mexicana*	Pila Dhatura	Papaveraceae
10	Calotropis gigantea	Shivark, Akdo	Apocynaceae
Herbs			
11	Acanthospermum hispidum	Kanti	Asteraceae
12	Parthenium hysterophorus*	Gajar Ghaas	Asteraceae
13	Solanum nigrum	Chirpoti	Solanaceae
Climbers			
14	Cuscuta reflexa*	Amarbel	Convolvulaceae
Grass			
15	Cynodon dactylon*	Dub	Poaceae

TABLE 4 : LIST OF PLANT SPECIES RECORDED IN THE BUFFER ZONE

S. No.	Botanical Name	Common Name	Family
Trees			
1.	Acacia catechu	Khair, Kheda	Fabaceae
2.	Acacia leucophloea*	Harmo	Fabaceae
3.	Acacia nilotica*	Desibaval	Fabaceae
4.	Aegle marmelos*	Bel	Rutaceae
5.	Ailanthus excelsa*	Arduso	Simaroubaceae
6.	Albizia lebbeck*	Siras	Fabaceae
7.	Albizia procera*	Kala Siras	Fabaceae

8.	Azadirachta indica*	Limdo	Meliaceae
9.	Cordia dichotoma	Gundo	Boraginaceae
10.	Dalbergia sissoo*	Shisham	Fabaceae
11.	Diospyros melanoxylon	Timru, Tendu	Ebenaceae
12.	Emblica officinalis*	Amla	Euphorbiaceae
13.	Ficus benghalensis*	Vad	Moraceae
14.	Ficus religiosa*	Piplo	Moraceae
15.	Grewia tiliaefolia	Dhaman	Tiliaceae
16.	Lannea coromandelica	Moledi	Anacardiaceae
17.	Mangifera indica*	Aam	Anacardiaceae
18.	Mitragyna parviflora	Kalam, Kimda, Kadamb	Rubiaceae
19.	Phoenix sylvestris*	Khajur	Arecaceae
20.	Pithecellobium dulce*	Jungle jalebi	Fabaceae
21.	Polyalthia longifolia*	Ashoka	Annonaceae
22.	Pongamia pinnata*	Karanj, Kanji	Fabaceae
23.	Prosopis cineraria*	Khijdo	Fabaceae
24.	Prosopis juliflora*	Gando baval	Fabaceae
25.	Salvadora oleoides	Pilu	Salvadoraceae
26.	Syzygium cumini*	Jambu	Myrtaceae
27.	Tamarindus indica	Khati Amli	Fabaceae
28.	Tectona grandis*	Sag	Verbenaceae
29.	Terminalia arjuna	Arjunsad	Combretaceae
30.	Ziziphus mauritiana*	Bor	Rhamnaceae
31.	Zizyphus xylopyra	Ghatbor	Rhamnaceae
Shrubs			
32.	Adhatoda vasica	Adulsa	Acanthaceae
33.	Annona squamosa*	Sitafal	Annonaceae
34.	Argemone mexicana*	Pila Dhatura	Papaveraceae
35.	Calotropis gigantea	Shivark, Akdo	Apocynaceae
36.	Capparis decidua	Kair, Karril	Capparaceae
37.	Commiphora wightii	Guggal	Burseraceae
38.	Ipomoea fistulosa	Beshram	Convolvulaceae
39.	Ipomoea carnea*	Morning Glory	Convolvulaceae
40.	Jatropha gossypifolia*	Ratanjyot	Euphorbiaceae
41.	Ocimum gratissimum	Vantulsi	Lamiaceae
Herbs			
42.	Acanthospermum hispidum	Kanti	Asteraceae
43.	Aerva javanica	Bui	Amaranthaceae
44.	Agave americana*	Ram Baas	Agavaceae
45.	Aloe vera*	Gwarpatha	Liliaceae
46.	Cannabis sativa	Bhang	Cannabaceae
47.	Cassia tora*	Puwad, Panwar	Fabaceae

48.	Datura fastuosa	Kala Dhatura	Solanaceae
49.	Datura inoxia	Dhatura	Solanaceae
50.	Evolvulus alsinoides	Shankh	Convolvulaceae
51.	Parthenium	Gajar Ghaas	Asteraceae
52.	Solanum nigrum	Chirpoti	Solanaceae
53.	Tephrosia purpurea*	Sarpankha	Fabaceae
54.	Tribulus terrestris	Gokharu	Zygophyllaceae
55.	Tridax procumbens*	Kumru	Asteraceae
56.	Abrus precatorius	Chirmi	Fabaceae
Climbers			
57.	Aristolochia bracteolata	Hukkabel	Aristolochiaceae
58.	Cuscuta reflexa*	Amarbel	Convolvulaceae
59.	Mucuna pruriens	Kemach, Kavach	Fabaceae
60.	Tinospora cordifolia	Neem Giloy	Menispermaceae
Grass			
61.	Cymbopogon martinii	Lemon grass	Poaceae
62.	Cynodon dactylon*	Dub	Poaceae
63.	Dichanthium annulatum*	Karad	Poaceae
64.	Heteropogon contortus	Sukhala	Poaceae
65.	Digitaria sp.*	Crabgrass	Poaceae

MEDICINAL PLANTS

Few species with medicinal value have also been found during the field survey. Some of the observed medicinal plants are Acacia nilotica, Aegle marmelos, Albizia procera, Azadirachta indica, Butea monosperma, Calotropis procera, Cassia fistula, Emblica officinalis, Eucalyptus sp., Ficus religiosa, Ficus bengalensis, Mangifera indica, Melia azadirach, Moringa oleifera, Pithecellobium dulce, Polyalthia longifolia, Tridax procumbens, Sida acuta, Syzygium cumini and Tamarindus indica etc. List of medicinal plant species recorded in the study area of proposed project site is presented in below table.

TABLE 5: LIST OF MEDICINAL PLANTS IN BUFFER ZONE

Sr. No	Botanical Name	Common Name	Family	Medicinal Use
1.	Abrus precatorius	Chirmi	Fabaceae	Uterine stimulant, abortifacient, toxic.
2.	Acacia nilotica	Babul	Fabaceae	Demulcent

3.	Aegle marmelos	Bel	Rutaceae	Stomachic, antimicrobial (specific for diarrhoea, colitis, dysentery and enteric infections), digestive, astringent, spasmolytic, hypoglycaemic
4.	Albizia procera	Kala Siras	Mimosaceae	Anti-allergic
5.	Aloe vera	Gwarpatha	Liliaceae	Purgative, Gel—topically emollient, anti-inflammatory antimicrobial (used for wound healing, sunburn)
6.	Azadirachta indica	Neem	Meliaceae	Fever, Skin diseases
7.	Bauhinia variegata	Kachnar	Fabaceae	Buds—a decoction is given in piles (also used against tumours), haematuria, menorrhagia
8.	Butea monosperma	Palash	Fabaceae	Liver disorders
9.	Calotropis procera*	Mudar	Asclepiadaceae	Bronchial asthma, Leaves—used for treating chronic cases of dyspepsia, flatulence, constipation & mucus in stool
10.	Cassia fistula	Amaltas	Fabaceae	Purgative, Febrifugal, Astringent,Antibilious
11.	Cordia dichotoma	Gundo	Boraginaceae	Astringent, Demulcent, Expectorant, Diuretic, Anthelmintic
12.	Dalbergia latifolia	Sisam	Fabaceae	Stimulant, Appetiser, Anthelmintic, Spasmogenic
13.	Dendrocalamus strictus	Manvel	Poaceae	Retained placenta
14.	Emblica officinalis	Aamla	Euphorbiaceae	Antianaemic, Anabolic, Antiemetic, Bechic, Diuretic Astringent, Antihaemorrhagic, Antidiarrhoeal, Antidiabetic, Carminative, Antioxidant
15.	Eucalyptus sp.	Nilgiri	Myrtaceae	Antiseptic, antibiotic, antiviral, Antifungal, antispasmodic
16.	Ficus religiosa	Peepal	Moraceae	Astringent, Antiseptic, Alterative, laxative, Haemostatic
17.	Ficus bengalensis	Bargad	Moraceae	Diabetes, Dysentery
18.	Jatropha curcas	Ratanjyot	Euphorbiaceae	Used for Scabies, Ringworm, Eczema, Whitlow, Warts

Sr. No	Botanical Name	Common Name	Family	Medicinal Use
19.	Lagerstroemia parviflora	Kalhariya , Kakdiyo	Lythraceae	Astringent, Fungitoxic
20.	Lannea coromandelica	Moledi	Anacardiaceae	Bark—Stimulant and Astringent; used in gout; decoction for Aphthae of the mouth and for toothache
21.	Madhuca indica	Mahua	Sapotaceae	Stimulant, Demulcent, Laxative, Anthelmintic, Bechic
22.	Mangifera indica	Aam	Anacardiaceae	Astringent, Antiscorbutic
23.	Melia azadirach	Neem	Meliaceae	Diuretic, Anthelmintic, Antilithic
24.	Moringa oleifera	Mithosa ragavo	Moringaceae	Cardiac and circulatory stimulant
25.	Nyctanthes arbor-tristis	Tamat, Harsing ar	Oleaceae	Febrifuge, Antispasmodic, Anti-inflammatory, Hypotensive, Respiratory stimulant. Used for fevers, Rheumatism,Obstinatesciatica
26.	Ocimum gratissimum	Vantulsi	Lamiaceae	Neurological and Rheumatic affections, in seminal weakness and in aphthae of children, Antibacterial, Antifungal
27.	Pithecellobium dulce*	Jungle jalebi	Fabaceae	Astringent, Febrifuge, Antidysenteric
28.	Polyalthia longifolia*	Ashoka	Annonaceae	Febrifuge, Causes cardiac depression
29.	Tridax procumbens	Kumru	Asteraceae	Styptic, Antidiarrhoeal, Antidysenteric
30.	Sida acuta	Chikan	Malvaceae	Astringent, Cooling, Diuretic Stomachic, Febrifuge,; used for nervous and sexual debility,Haemorrhoids, Biliary disorders
31.	Syzygium cumini	Jamun	Myrtaceae	Acute diarrhea
32.	Tamarindus indica	Imli	Fabaceae	Cooling, Digestive, Carminative, laxative, Antiscorbutic
33.	Tectona grandis	Sagaun	Verbenaceae	Expectorant, Anti-inflammatory, Antibilious,

Sr. No	Botanical Name	Common Name	Family	Medicinal Use
34.	Terminalia arjuna	Arjun	Combretaceae	Cardioprotective and Cardiotonic
35.	Terminalia bellerica	Behada	Combretaceae	Purgative, Astringent
36.	Vitex Negundo	Nirgudi	Verbenaceae	Anti-inflammatory, Analgesic; removes foetid discharges and worms from ulcers

FAUNAL INVESTIGATION

Mammals

Faunal assessment provides a basis for determining relative abundance and rarity of each species which is important for assessing the diversity of fauna of a particular area. Since animals are capable of movements from one place to another, this makes their study entirely different. Different animals prefer different types of habitat for food and shelter.

The land cover of the study area is dominated with mining area, barren land and agriculture fields. The vegetation structure in the study area does not support higher mammalian species. Other than domesticated cows and dogs species like striped palm squirrel (Funambulus palmarum), and Indian gray mongoose (Herpestes edwardsi) were observed in the study area.

FIGURE 5: FIELD SURVEY BY THE EXPERTS

During public consultation it was documented that species like Indian field rat (Rattus rattus), Nilgai or Blue bull (Boselaphus tragocamelus), Indian Hare (Lepus nigricollis) and Jungle cat (Felis chaus) are occasionally observed in the study area. List of Mammals, Reptiles and Amphibians recorded in the study area of the project site is presented in below table.

TABLE 6A : LIST OF FAUNA RECORDED IN CORE ZONE

Sr. No.	Scientific Name	Common Name	Family	Status in Wildlife Protection Act-1972	Status in IUCN Category
1.	Funambulus pennanti	Five Striped Palm Squirrel	Sciuridae	Schedule IV	Least Concern
2.	Lepus nigricollis*	Indian Hare	Leporidae	Schedule IV	Least Concern
3.	Macaca mulatta*	Rhesus Monkey	Cercopithecidae	Schedule II	Least Concern
4.	Rattus rattus	Black Rat	Muridae	Schedule V	Least Concern
5.	Semnopithecus entellus*	Langur	Cercopethicidae	Not Enlisted	Least Concern
6.	Calotes versicolor*	Garden Lizard	Agamidae	Not Enlisted	Not Evaluated

TABLE 6B: LIST OF FAUNA RECORDED IN BUFFER ZONE

Sr. No.	Scientific Name	Common Name	Family	Status in Wildlife Protection Act-1972	Status in IUCN Category
Mammals					
1.	Boselaphus tragocamelus	Nilgai	Bovidae	Schedule III	Least Concern
2.	Canis aureus*	Jackal	Canidae	Schedule II	Least Concern
3.	Cervus unicolor	Sambhar	Cervidae	Schedule III	Not Evaluated
4.	Funambulus pennanti	Five Striped Palm Squirrel	Sciuridae	Schedule IV	Least Concern
5.	Herpestes	Mangoose	Herpestidae	Schedule II	Least Concern
6.	Lepus nigricollis*	Indian Hare	Leporidae	Schedule IV	Least Concern
7.	Macaca mulatta*	Rhesus Monkey	Cercopithecidae	Schedule II	Least Concern
8.	Mus musculus*	Gharelu Musa	Muridae	Schedule V	Least Concern
9.	Rattus rattus	Black Rat	Muridae	Schedule V	Least Concern
10.	Semnopithecus entellus*	Langur	Cercopethicidae	Not Enlisted	Least Concern
Reptiles and Amphibians					
11.	Bufo bufo	Toad	Bufonidae	Not Enlisted	Least Concern
12.	Calotes versicolor*	Garden Lizard	Agamidae	Not Enlisted	Not Evaluated
13.	Naja naja	Spectacled Cobra	Elapidae	Schedule IV	Not Evaluated
14.	Ptyas mucosus	Common Rat Snake	Colubridae	Schedule II	Not Evaluated
15.	Vipera russelli	Russell's Viper	Viperidae	Schedule IV	Not Evaluated

AVIFAUNA

Diversity of avifauna is one of the most important ecological indicators to evaluate the quality of habitats. Now-a-days, avifaunal diversity has been decreasing due to the destruction of natural habitats and human disturbances.

Thus, many species of birds may be forced to inhabit in the urban areas and constrain them to breed there. Birds are essential animal group of an ecosystem and maintain a trophic level. Therefore, study on avifauna and their ecology are important to protect them.

The lease area is having very few thorny plant species and not an ideal habitat for bird species. Species like Red vented bulbul (Pycnonotus cafer), Common myna (Acridotheres tristis), Green bee eater (Merops orientalis), Common crow (Corvus splendens) and spotted dove (Spilopelia chinensis) were observed in the lease area. Different species were observed during field survey in the study area are Indian myna (Acridotheres tristis), House crow (Corvus splendens), Blue rock pigeon (Columba livia), Indian robbin (Saxicoloides fulicatus), Spotted dove (Spilopelia chinensis) Red vented bulbul (Pycnonotus cafer), Black drongo (Dicrurus macrocercus), House sparrow (Passer domesticus), Common Babbler (Turdoides caudate) and Little green bee eater (Merops orientalis) etc. List of birds observed in the study area are presented in below table.

TABLE 7: LIST OF BIRD SPECIES RECORDED IN STUDY AREA

S. N.	Scientific Name	Common Name	Family	Status in Wildlife Protection Act -1972	Status in IUCN Category
1.	Acridotheres ginginianus	Bank Myna	Sturnidae	Schedule IV	Least Concern
2.	Acridotheres tristis*	Common Myna	Sturnidae	Schedule IV	Least Concern
3.	Alcedo atthis*	Small Blue Kingfisher	Alcedinidae	Schedule IV	Least Concern
4.	Bubulcus ibis*	Cattle Egret	Ardeidae	Schedule IV	Least Concern
5.	Cinnyris asiaticus	Purple Sunbird	Nectariniidae	Schedule IV	Least Concern
6.	Columba livia*	Blue Rock Pigeon	Columbidae	Not Enlisted	Least Concern
7.	Corvus macrorhynchos	Jungle Crow	Corvidae	Not Enlisted	Least Concern
8.	Corvus splendens*	House Crow	Corvidae	Schedule V	Least Concern

9.	Coturnix coturnix	Common Quail	Phasianidae	Schedule IV	Least Concern
10.	Cuculus varius	Common Hawk-Cuckoo	Cuculidae	Schedule IV	Least Concern
11.	Dicrurus paradiseus	Racket Tailed Drongo	Dicruridae	Schedule IV	Least Concern
12.	Egretta garzetta*	Little Egret	Ardeidae	Schedule IV	Least Concern
13.	Eudynamys scolopaceus	Koel	Cuculidae	Schedule IV	Least Concern
14.	Francolinus pondicerianus	Grey Partridge	Phasianidae	Schedule IV	Least Concern
15.	Grus antigone*	Sarus Crane	Gruidae	Schedule IV	Vulnerable
16.	Halcyon smyrnensis*	White Breasted Kingfisher	Halcyonidae	Schedule IV	Least Concern
17.	Lonchura malabarica	White Throated Munia	Estrildidae	Schedule IV	Least Concern
18.	Merops orientalis*	Small Green Bee Eater	Meropidae	Not Enlisted	Least Concern
19.	Nycticorax nycticorax	Night Heron	Ardeidae	Schedule IV	Least Concern
20.	Passer domesticus	House Sparrow	Passeridae	Not Enlisted	Least Concern
21.	Pavo cristatus	Common peafowl	Phasianidae	Schedule I	Least Concern
22.	Phalacrocorax niger	Little Cormorant	Phalacrocoracidae	Schedule IV	Least Concern
23.	Ploceus philippinus	Baya Weaver	Ploceidae	Schedule IV	Least Concern
24.	Psittacula cyanocephala	Plum-headed Parakeet	Psittaculidae	Schedule IV	Least Concern
25.	Psittacula krameri*	Rose Ringed Parakeet	Psittaculidae	Schedule IV	Least Concern
26.	Pterocles exustus	Common Sandgrouse	Pteroclididae	Schedule IV	Least Concern
27.	Pycnonotus cafer*	Red Vented Bulbul	Pycnonotidae	Schedule IV	Least Concern
28.	Sarkidiornis melanotos	Comb Duck	Anatidae	Schedule IV	Least Concern
29.	Saxicoloides fulicatus*	Indian Robin	Muscicapidae	Schedule IV	Least Concern
30.	Streptopelia chinensis*	Spotted Dove	Columbidae	Schedule IV	Least Concern
31.	Sturnus pagodarum	Brahminy myna	Sturnidae	Schedule IV	Least Concern
32.	Turdoides caudate	Common Babbler	Timaliidae	Schedule IV	Least Concern

MEASURES FOR PROTECTION OF FLORA & FAUNA

The mining activity will have insignificant effect on the existing flora and fauna. Data have been collected from Government Departments such as forests, agriculture, and various offices to establish the pre project biological environmental conditions. The project area is surrounded by some forests are also lined with agricultural land. The purpose of the project itself is to save the flora around the lease area. It was found that the limestone (building stone) mining activity will not have any significant impact on the biological environment of the region.

Mitigation of Impacts on Biological Environment

There is a requirement to establish a stable ecosystem with both ecological and economic returns. Minimization of soil erosion and dust pollution enhances the beauty of the core and the buffer Zone. To achieve this it is planned to increase plantation activities. The basic objectives of plantations are as follows:-

- Improvement of Soil quality
- Quick vegetative cover to check soil erosion
- Improvement in river bank stability
- Conservation of biological diversity
- Provide forage and browse for wild life

PLANTING METHODOLOGY

TREES

The plantation shall be done in pits. Pits of about 50-cm diameter shall be dug in grid of 3m x 3m up to a depth of 0.5 m. The pits shall be refilled with topsoil after planting the samplings. The samplings of healthy, nursery raised, seedlings in polythene containers shall be transported in baskets. Planting shall be done after first monsoon showers.

The level of the soil shall be about 10 cm above the general level. The soil around the plant shall be pressed to form a low trough.

About 25 gm of chemical fertilizer shall be added in ring of 25-cm radius around the plant. Watering shall be continued after plantation if any dry spell follows. Cleaning and weeding shall be done twice during first and once during following season. Planted area shall be inspected and mortality rate ensured for each species. The dead and dying plants shall be replaced by fresh seedlings.

SHRUBS

Small pits of 30 cm x 30 cm would be dug before the rains. Soon after the rains set in, surplus plants from the adjoining areas would be dug out along with roots and earth around them and transported to site carefully. The shoots of shrubs would first be trimmed with garden scissors at a height of about 45 cm from the ground level, leaving only few leaves(in the lower portion), to minimize water loss due to transpiration from leaves. The shrub will be planted in the pits and refilled with soil mixed with 3 kg of farmyard manure.

The planting spacing shall be 1.5 m x 1.5 m. Weeding will generally not be needed.

NURSERY

Success of Afforestation measures at site will depend on investigation of soil, selection of suitable species to be grown and a good planting stock. Afforestation will be carried out in accordance with an elaborate timetable to be drawn up for sowing and plantation depending upon the afforestation requirements and species to be planted. The relevant works for the success of reclamation and afforestation activities will be carried out after consultation with people of forest department.

PROTECTION OF PLANTATION SITES

The reclaimed and afforested areas have to be protected from cattle menace, human interference, soil erosion, plant diseases, etc. Check bunds, masonry chutes, protected drains, etc. will be constructed wherever required to control and regulate the water flow to prevent soil erosion and washing away of nutrients. Plants will be protected from diseases by the application of proper pesticides. Soil

workings, manuring etc. will be done whenever necessary. Plants will be protected from cattle menace and human interference by providing fencing and proper watch and ward.

GREENBELT DEVELOPMENT

About 33% of total land area should developed as part of green belt, it is recommended that plantation should be done along the peripheral areas and open spaces in the buffer zone of the proposed project site. This will help to reduce the noise pollution; dust spread and also enhances the aesthetic value around the project site.

The expected rate of survival is assumed at 80%. To improve the survival rate in the adverse climate condition necessary consultation would be taken from the Forest department. Proposed plantation area shall be fenced properly for improving the survival rate. Plantation will be carried out in the lease area in phased manner.

Criteria for selection of species for greenbelt

The plant species suitable for greenbelt development need to be selected based on the following criteria:

- Fast growing
- Thick canopy cover
- Perennial and evergreen
- Large leaf area index
- High sink potential

Guidelines for plantation

The plant species identified for greenbelt development should be planted using dug-pit technique. The pit size should be in between 45 cm x 45 cm x 45 cm to 60 cm x 60 cm x 60 cm depending on the soil quality. Soil proposed to be used for filling the pit should be mixed with well decomposed farm yard manure or sewage sludge at the rate of 3.6 kg (on dry weight basis).

The filling of soils should be completed at least 5-10 days before the actual plantation. Healthy seedlings of identified species should be planted in each pit. Proper density of plants (no. per hectare) should be maintained within the greenbelt.

The minimum distance between two plantations should be dependent on the choice of species and compatibility of different species to grow together. The distance should be in between 2.5m to 5m for plantation in greenbelt.

SELECTION OF PLANT SPECIES

Keeping in view the climatic condition & status of soil (Agro climatic zone) and vegetation types, the following plant species are suitable for plantation for the project site. Plant species for green belt development is given in below table.

TABLE 8: LIST OF PLANT SPECIES FOR GREEN BELT DEVELOPMENT

S.No	Scientific Name	Common Name	Family	Habit
1.	Acacia catechu	Khair	Mimoseae	Shrub
2.	Albizia chinensis	Siris	Mimoseae	Tree
3.	Albizia moluccana	Subabul	Mimoseae	Tree
4.	Azadirachta indica	Neem	Meliaceae	Tree
5.	Citrus aurantium	Nebu	Rutaceae	Tree/shrub
6.	Ficus religiosa	Pipal	Moraceae	Tree
7.	Nerium indicum	Kaner	Apocynaceae	Shrub
8.	Terminalia arjuna	Arjuna	Combretaceae	Tree
9.	Zizyphus mauritiana	Ber	Rhamnaceae	Tree
10.	Phyllanthus emblica	Amla	Phyllanthaceae	Tree
11.	Mangifera Indica	Mango	Anacardiaceae	Tree
12.	Syzygium cumini	Jamun	Myrtaceae	Tree
13.	Citrus sinensis	Orange	Rutaceae	Tree
14.	Psidium guajava	Guava	Myrtaceae	Tree