Observations on Soil quality:

Soils of study area are sandy loam by nature. Specific Conductivity and pH are in normal range. Organic matter content is sufficient. The concentration of Nitrogen, Phosphorus and Potassium were medium. The soils of study area are fit for cultivation.

3.6 Biological Environment

The basic purpose of exploring the biological environment under Environmental Impact Assessment (EIA) is to assist the decision making and to ensure that project option under consideration is environmental friendly. An Ecological survey of study area was conducted particularly with reference to listing of species and assessment of existing baseline ecological condition in study area. The main objective of ecological survey were aimed at assessing the existing flora and fauna component to study area to understand the possible impact on biological environment caused by any project activity and to formulate if necessary the appropriate mitigation/preventive measures for such impact. Data for same has been collected through secondary source and by site visit.

3.6.1 Scope Aim and Objectives ofThe Study:

1. To inventories the floral and faunal components of the project area (Project site or core zone and 10 km radius buffer zone)
2. To locate demarcate and understand ecological setting of the project area in term of National Park/Wildlife sanctuary/Reserve Forest/ Eco-sensitive area/wetland etc. within 10 km radius of project site (if any).
3. To identify schedule-I, rare, endemic and endangered species within the study area and prepare conservation plan for the same.
4. To identify impact zone and evaluate the likely impact of the project on floral and faunal component of project study area.
5. To suggest/prepare action plan to mitigate likely impact on biodiversity of project area through plantation around project area.

The information present in this chapter has been collected through field study, consultation with local people and collation of available literature with various institution and organization. The summary of data collected from these sources as a part of EIA study is outlined. With change in environmental condition the vegetation cover as well as animal reflects several changes in it's structure, density and composition respectively.

Survey Methodology:
The information presented in this chapter has been Collation of available published literature including those from relevant organizations like the Botanical survey of India, and wildlife institute of India. The respective forest department of the state concerned,research papers,article, booksand reliable website

available. Apart from that Primary field survey was carried out for Floral & Faunal Inventory/Importance by Field Studies.

Field study: The detailed ecological survey was carried out in the following two zones of project area:

- **Core zone:** Within the project site.
- **Buffer zone:** Around the project site within 10 km radius.

3.6.2 Flora

General Vegetation Pattern-The climatic, edaphic and biotic variations with their complex interrelationship and composition of species, which are adapted to these variations, have resulted in different vegetation cover, characteristic of each region (Ohasi,1975). The tree species, herbs, shrubs, climbers and major crops, were documented during this baseline study. Hisar is the west central most district of Haryana state with total geographical area of 3,983 sq. kms it lies between 28^0 56' 00" to 29^0 38' 00" north latitude and 75^0 21' 12" to 76^0 18' 12" east longitude. It is surrounded by Fatehabad district in north, Bhiwani district in south, Jind and Rohtak district in east and Rajasthan in west. The district has predominantly plain topography and is located 234 mts above mean sea level. . As per the Champion & Seth Classification of Forest Types (1968), the forests in Haryana belong to three Forest Type Groups i.e. Tropical Dry Deciduous Forest, Tropical Thorn Forest and Subtropical Pine Forests which are divided into 10 Forest Types.

Table 3.10: FOREST COVER AREA IN HISAR DISTRICT OF HARYANA (Area in Sq Km)

Geographical Area	Very Dense Forest	Mod Dense Forest	Open Forest	Total	% Green Area
3,983	0.00	11.86	45.78	57.64	1.45
Source: India State Forest Report, Haryana, 2019					

Floral biodiversity: A general study of floral community for both core area and buffer zone are carried out separately the details are provided below-

Core Zone- The existing project has already developedapprox. 34581 sq m [9.6% of plot area] of green belt within the premises.JSHL has also developed extensive green area in the vicinity of the premises i.e.,Jindal Club, OP Jindal Marg, OP Jindal Mill Gate area Park etc. The list of tree species planted are provided below in the table.

Table 3.11: The list of species planted

S.NO.	BOTANICAL NAME	COMMON NAME	FAMILY
		TREES	
1	*Azardirechta indica*	Neem	Meliaceae
2	*Pongamia pinnata*	Karanj	Fabaceae
3	*Cassia Seiamea*	Amaltas	Caesalpiniaceae
4	*Delonix regia*	Gulmohar	Caesalpiniaceae
5	*Polyalthia longifolia*	Ashoka	Annonaceae

6	*Alstoniascholaris*	Saptparni	Apocynaceae
7	*Seamea saman*	Siris	Mimosaceae
8	*Eucalyptus*	Safeda	Myrtaceae
9	*Terminalia arjuna*	Arjun	Combretaceae
10	*Mimusopselengii*	Moulsari	Sapotaceae
11	*Plumeria alba*	Champa	Apocynaceae
12	*Lagerstromia speciosa*	Jarul	Litharaceae
13	*Bombax ceiba*	Semal	Bombacaceae
14	*Ficus religiosa*	Peepal	Moraceae
15	*Ficus infectoria*	Pilkhan	Moraceae
16	*Mangifera indica*	Aam	Anacardiaceae
17	*Syzigiumcumini*	Jamun	Myrtaceae
18	*Grevillea robusta*	*Silver oak*	Proteaceae
19	*Melia azadirachta*	Bakain	Meliaceae
20	*Delbergia sissoo*	Sheesham	Fabaceae
21	*Ficus elastica*	Rubber	Moraceae
22	*Moringa oleifera*	Sahijan	Moringaceae
23	*Morus alba*	Sahtoot	Moraceae
24	*Bauhinia purpurea*	Kachnar	Caesalpiniaceae
25	*Jacaranda mimosifolia*	Neeli gulmohar	Bignoniaceae
26	*Neolamarckiacadamba*	Kadam	Rubiaceae
27	*Tabebuia argentia*	Basant rani	Bignoniaceae
28	*Aegle marmelos*	Bel	Rutaceae
29	*Callistemon lanceolatus*	Bottle brush	Myrtaceae
30	*Albizia lebbeck*	Siris	Mimosaceae
31	*Phyllanthus emblica*	*Indian goseberry*	Phyllanthaceae
32	*Washington filifera*	Desert fan palm	Arecaceae
33	*Phoenix dactylifera*	Date Palm	Arecaceae
34	*Cycas revoluta*	Sago palm	Cycadaceae
35	*Bismarkia sp.*	*Bismarkia*	Arecaceae
36	*Wodyetiabifurcata*	Fox tail Palm	Arecaceae
37	*Caryota mitis*	Fishtail Palm	Arecaceae
38	*Areca palm*	Betel Palm	Arecaceae
39	*Rhapisexcelsa*	Lady Palm	Arecaceae
40	*Cycuscircinalis*	Queen sago	Cycadaceae

S.NO.	BOTANICAL NAME	COMMON NAME	FAMILY
		SHRUBS/HEDGES	
1	*Thevetia peruviana*	Kaner	Apocyanaceae
2	*Conocarpus*	Buttonwood	Combretaceae
3	*Hamelia patens*	Fire bush	Rubiaceae
4	*Ticoma capensis*	Tecoma	Bignoniaceae
5	*Ticomagorichori*	Tecoma	Bignoniaceae
6	*Bougainvellia glabra*	*Bougainvellia*	Nyctaginaceae
7	*Ficus panda*	Weeping fig/Pukar	Moraceae
8	*Ficus retusa*		Moraceae
9	*Murraya exotica*	Orange jasmine/Kamini	Rutaceae

10	*Tabernaemontanadivaricata*	Crape jasmine/Chandni	Apocyanaceae
11	*Clerodendruminerme*	Sankuppi	Lamiaceae
12	*Jatropha curcas*	Ratanjyot	Euphorbiaceae
13	*Durantaerrecta*	Golden duranta	Verbenaceae
14	*Rosa indica*	Rose	Rosaceae
15	Lagerstroemia indica	Saavni	Lythraceae
16	Bambusawamin	*Buddha belly bamboo*	Poaceae
17	*Bombusa vulgaris*	*Golden Bamboo*	Poaceae
18	*Bauhinia tomentosa*	Kachnar	Leguminoceae
19	*Hibiscus rosa sinensis*	Gurhal	Malvaceae
20	*Jasmine sambac*	Bela	Oleaceae
21	*Nyctanthes arbor-tristis*	*Harsingar*	Oleaceae

Buffer Zone-Bir Hisar Protected forest is situated 7.2 km NW from the project site. The vegetative community of the area is mainly under open scrub forest and because of urbanization area is usually surrounded with planted varieties e.g., Neem (*Azadirachta indica*), Safeda (*Eucalyptus*), Peepal (*Ficus religiosa*),Shisham (*Delbergia sissoo*)etc. The prominent grass species is *Cyanodondactylon.*

Trees: The dominant trees in and around the study area are Listed below in the **Table 3.12**

Table 3.12 :Dominant Trees In and Around the Study Area

SN	Botanical Name	Common Name	Family
1	*Albizzia lebbeck*	Siris	Fabaceae
2	*Aegle marmelos*	Bel	Rutaceae
3	*Azadirachta indica*	Neem	Meliaceae
4	*Acacia nilotica*	Babool	Fabaceae
5	*Acacia catechu*	Khair	Fabaceae
6	*Artocarpus heterophyllus*	Jackfruit (Kathal)	Moraceae
7	*Alianthusexcelsa*	Mahanimb	Simaroubaceae
8	*Alstoniascholaris*	Saptparni	Apocyanaceae
9	*Bauhinia purpurea*	Kachnar	Fabaceae
10	*Butea monosperma*	Palash	Fabaceae
11	*Bombax ceiba*	Semur	Malvaceae
12	*Cassia fistula*	Amaltas	Caesalpiniaceae
13	*Callistemon lanceolatus*	Bottle Brush	Myrtaceae
14	*Carrisa karandas*	Karaunda	Apocyanaceae
15	*Cordia myxa*	Lasura	Fabaceae
16	*Delbergiasisso*	Sheesham	Fabaceae
17	*Delonix regia*	Gulmohar	Caesalpeniaceae
18	*Diospyrus melanoxylon*	Tendu	Ebenaceae
19	*Emblica officinalis*	Amla	Euphorbiaceae
20	*Eucalyptus sp.*	Safeda	Myrtaceae
21	*Ficus racemosa*	Goolar	Moraceae

SN	Botanical Name	Common Name	Family
22	*Ficus virens*	Pakad	Moraceae
23	*Ficus benghalensis*	Bargad	Moraceae
24	*Ficus religiosa*	Pipal	Moraceae
25	*Ficus infectoria*	Pilkhan	Moraceae
26	*Jacaranda mimosifolia*	Neeli Gulmohar	Bignoniaceae
27	*Kigelia pinnata*	Balamkheera	Bignoniaceae
28	*Morus alba*	Sahtoot	Moraceae
29	*Mangiifera indica*	Aam	Anacardiaceae
30	*Madhuca longifolia*	Mahua	Sapotaceae
31	*Mimusopselengii*	Moulasari	Sapotaceae
32	*Moringa oleifera*	Sahajan	Moringaceae
33	*Polyalthia longifolia*	Asoka	Annonaceae
34	*Pithecolobium dulce*	Jungle Jalebi	Fabaceae
35	*Prosopis julifera*	Khejri	Fabaceae
36	*Psidium guajava*	Amrood	Myrtaceae
37	*Populus ciliata*	Poplar	Saliaceae
38	*Syzygiumcumini*	Jamun	Myrtaceae
39	*Terminalia arjuna*	Arjun	Combretaceae
40	*Terminalia bellirica*	Bahera	Combretaceae
41	*Thevetia peruviana*	Kaner	Apocyanaceae
42	*Tamarindus indicus*	Imli	Fabaceae
43	*Tectona grandis*	Teak	Lamiaceae
44	*Ziziphus mauritiana*	Ber	Rhamnaceae

Source: On the basis of primary site visit and in consultation with Local Peoples and concerned State ForestDept.

Herbs Shrubs& Grasses: The species observed in the study area are listed below in the in the **Table 3.13**

Table 3.13: Herbs, Shrubs& Grasses Observed in the Study Area

SN	Botanical Name	Common Name	Family
HERBS			
1	*Aloe vera*	Ghrit Kumari	Liliaceae
2	*Achyranthus*	Chirchita	Amaranthaceae
3	*Amaranthus gracilis*	Cholai	Amaranthaceae
4	*Argemone maxicana*	Satyanasi	Papavaraceae
5	*Ageratum conyzoides*	GandhauriGhas	Asteraceae
6	*Adhatodavasica*	Bansa	Acanthaceae
7	*Boerhaviadiffusa*	Gadahpurna	Nyctaginaceae
8	*Cannabis sativa*	Bhang	Urticaceae
9	*Calatropisprocera*	Madar	Asclepiadaceae
10	*Chenopodium albus*	Bathua	Amaranthaceae
11	*Dhaturainoxia*	Dhatura	Solanaceae

12	*Euphorbia hirta*	Dudhi	Euphorbiaceae
13	*Ocimum sanctum*	Tulsi	Lamiaceae
14	*Parthenium hysterophorus*	GajarGhas	Asteraceae
15	*Solanum nigrum*	Makoi	Solanaceae
16	*Tribulus terrestris*	Gokaharu	Zygophyllaceae
SHRUBS			
1	*Abutilon indicum*	Kanghi	Malvaceae
2	*Bougainvellia glabra*	Bougainvellia	Nyctaginaceae
3	*Cestrum nocturnum*	Raat Rani	Solanaceae
4	*Carrisa carandas*	Karaunda	Apocyanaceae
5	*Citrus aurentifolia*	Lime	Rutaceae
6	*Cassia tora*	Chakunda	Caesalpiniaceae
7	*Ipomea*	Besharam/Behaya	Convolvulaceae
8	*Lawsoniainermis*	Mehandi	Lytharaceae
9	*Lantana camara*	Raimunia	Verbenaceae
10	*Mimosa pudica*	Chui Mui	Fabaceae
11	*Murrayakoeniigi*	Curry patta	Rutaceae
12	*Nerium indicum*	Kaner	Apocyanaceae
13	*Riccinus communis*	Arandi	Euphorbiaceae
14	*Sacchrummunja*	Moonj	Gramineae
15	*Tridax procumbens*	Baramasi	Asteraceae
16	*Vinca rosea*	Sadabahar	Apocyanaceae
17	*Vitex negundo*	Begunia	Lamiaceae
GRASSES			
1	*Andropoganannulatus*	Gandra	Poaceae
2	*Cyanodondactylon*	Dub	Poaceae
3	*Cymbopogan martini*	Lemon Grass	Poaceae
4	*Desmostachya*	Kusha	Poaceae

Source: On the basis of primary site visit and in consultation with Local Peoples and concerned State Forest Dept.

Medicinal Plant Species of the area: The project area is also endowed with several medicinal plants. The common medicinal tree plants of the region are *Aegle marmelos*, *Azadirachtaindica*,*Emblicaofficinalis*,*Terminaliaarjuna*etc.The herb species which are recorded in area having medicinal values are *Aloe vera*, *oscimum sanctum* etc.

Table 3.14: List of Medicinal Plants in the Study Area

SN	BOTANICAL NAME	FAMILY	COMMON NAME	MEDICINAL USE
TREES				
1	*Acacia nilotica*	Fabaceae	Babool	Pharmacy, preparing emulsions, Tablets, pills
2	*Aegle marmelos*	Rutaceae	Bel	Anti-inflammatory, anti-pyretic, anti-fungal
3	*Azadirachta indica*	Meliaceae	Neem	Antiseptic, insecticidal, oil as stimulant
4	*Bauhinia*	Caesalpiniaceae	Kachnar	Used in dropsy, pain, rheumatism, thigh

	purpurea			swelling, convulsion, intoxication, blackness
5	*Butea monosperma*	Fabaceae	Palash	Gum is astringent for treatment of diarrhea
6	*Cassia fistula*	Fabaceae	Amaltas	Control fever, gas trouble, and laxative
7	*Emblica officinalis*	Euphorbiacea	Amla	Source of Vitamin C, coolant & laxative
8	*Eucalyptus sp.*	Myrtaceae	Safeda	Oil used as an antiseptic, Hypertension, pulmonary hemorrhage
9	*Madhuca indica*	Sapotaceae	Mahua	Flower liquor as an appetizer, pulmonary hemorrhage, hypertension
10	*Magnifera indica*	Anacardiaceae	Aam	Control stomach pain, diarrhea, urine sugar
11	*Syzygiumcumini*	Myrtaceae	Jamun	Anti: bacterial, fungal, viral, inflammatory, diarrheal, allergic, cancer,diabetic, ulcerogenic,cardio-protective, hypoglycemic
12	*Terminalia arjuna*	*Combretaceae*	Arjun	Bark of tree used in High BP and cholesterol control
SHRUBS				
13	*Calatropisprocera*	*Asclepiadeacea*	Madar	Useful in digestive disorder, diarrhea, stomach ulcer, toothache, Cramps
14	*Citrus aurentifolia*	*Rutaceae*	Nimbu	Rich source of Vitamin C
HERBS				
15	*Argemone maxicana*	*Papavaraceae*	Satyanasi	Painkiller, diuretic, and anti-inflammatory. The seed is used as a purgative
16	*Dhaturainoxia*	*Solanaceae*	Dhatura	Treat asthma, malarial fever, palpitation, hypertension, distrace, aortic disorder
17	*Tribulus terrestris*	*Zygophyllaceae*	Gokharu	Useful in kidney, bladder, urinary tract, and urogenital related conditions
18	*Tridex procumbens*	*Asteraceae*	Baramasi	Antibacterial, anti-inflammatory, reduce high blood sugar, wound healing etc.
19	*Aloe vera*	*Liliaceae*	Ghritkumari	Aloe vera is known for its antibacterial, antiviral, and antiseptic properties

Source: On the basis of primary site visit and in consultation with Local Peoples and concerned State ForestDept.

Economically Important Flora of Study Area:

Agricultural Crops: Climatic conditions of a region affect the agricultural cropping pattern of different are. Thus, it produces different crop. Amongst the host of climatic factors i.e., rainfall, temperature, humidity, wind velocityand duration of sunshine affect the cropping pattern in significant way, Annual rainfall and it's distribution over the entire year and regimes of diurnal and annual temperature are by far the prominent factors affecting agriculture and life style of people.Cropping pattern is shown in **Table 3.15:**

Table 3.15: Seasonal Crop of Study Area

Crop	Name	Season
Rabi	Wheat,Gram,Mustard,Seeds,Potatoes,Onion	September-April
Kharif	Paddy,Maize,Bajra,Groundnut,Sugarcane,Rice	June-October

Different fruits like Banana, Papaya, Mangoes, and Vegetables like potatoes, chilly, brinjal, cauliflower, capsicum are also grown by local peoples. The consultation with local peoples reveals that farmers are cultivating the improved varieties in the fields.

Table 3.16: Major Crops of the Study Area

KHARIF			RABI	
SN	**SCIENTIFIC NAME**	**COMMON NAME**	**SCIENTIFIC NAME**	**COMMON NAME**
CEREALS				
1	*Oryza sativa*	Rice	*Triticum aestivum*	Wheat
2	*Sorghum vulgare*	Jwar		
3	*Millets*	Bajra		
4	Zea mays	Maize		
PULSES				
5	*Cajanus cajan*	Arhar	*Cicer arietinum*	Gram
6	*Phaseolus angularis*	Urad		
7	*Phaseolus aurens*	Moong		
OIL SEEDS				
8	*Sesamum indicum*	Til		
9	*Arachis hypogea*	Groundnut		
VEGETABLES				
10	*Capsicum annum*	Chilly	*Solanum tuberosum*	Potato
11	*Zinziber officinale*	Ginger	*Coriandrum annum*	Coriander
12	*Allium cepa*	Onion	*Allium sativum*	Garlic
13	*Vitis vinifera*	Grapes	*Daucus carota*	Carrot
14	*Solanum melongena*	Brinjal	*Pisum saivum*	Pea
15			*Solanum lycopersicum*	Tomato

Source: On the basis of primary site visit and in consultation with Local Peoples and concerned State Forestdept.

Waste Land: Wasteland are also observed in the area which are found dominated by

*Lantana,IpomeaCalatropis,Parthenium,Argemone*etc.

Vegetation in and Around Human Settlement-The common species grown near village are Neem, Mahua, Jamun, Imli, Safeda, Bargad etc.

Rare, Endangered & Endemic Species: No rare, endangered or endemic species of flora is recorded from core area as well as buffer zone of the project site.

3.6.3 Fauna

Faunal biodiversity Ageneral study of faunal community for both core area and buffer zone are carried out separately the details are provided below-

Core Zone-The core zone of the project area doesn't have any unique faunal community as the habitat and environmental conditions of core area is similar to buffer zone. So some faunal species from buffer zone frequently visit to core zone in search of food and water.

The common species which are observed during site visit are Monkey (*Macaca mullata),* Indian garden Lizard (*Calotes versicolor*), Gilahari (*Funambuluspennantii) and* birds like Pigeon (*Columba livia)*and Crow (*Corvus splendens)* etc.

Table 3.17:List of Species in Core Zone:

SN	ZOOLOGICAL NAME	COMMON NAME	FAMILY	STATUS IN WPA 1972	STATUS IN IUCN CATEGORY
MAMMALS					
1.	*Funambuluspennantii*	Gilhari	Sciuridae	Schedule IV	Least Concern
2.	*Maccacamulata*	Monkey	Cercopethicidae	Schedule II	Least Concern
REPTILES					
3.	*Chamaleochamaleons*	Chameleon	Gekkonidae	Not Enlisted	Not Evaluated
4.	*Calotes versicolor*	Common Garden Lizard	Agamidae	Not Enlisted	Not Evaluated
AVES					
5.	*Corvus splendens*	Crow	Corvidae	Schedule IV	Least Concern
6.	*Columba livia*	Pigeon	Columbidae	Not Enlisted	Least Concern

Source: On the basis of primary site visit and in consultation with Local Peoples

Buffer Zone-The species observed in buffer zone (10 Km around the project area) are listed in the table given below-

Table 3.18:Faunal Biodiversity of Study Area

SN	ZOOLOGICAL NAME	COMMON NAME	FAMILY	STATUS IN WPA 1972	STATUS IN IUCN CATEGORY
MAMMALS					
DOMESTIC SPECIES					
1.	*Felis catus*	Domestic Cat	Felidae	Schedule II	Least Concern
2.	*Sus scrofa*	Pig	Suidae	Schedule III	Least Concern
3.	*Bos taurus*	Cow	Bovidae	Not Enlisted	Not Evaluated
4.	*Canis lupus*	Dog	Canideae	Not Enlisted	Not Evaluated
5.	*Capra aegagrus hircus*	Goat	Bovidae	Not Enlisted	Not Evaluated
6.	*Bubalus bubalis*	Buffalo	Bovidae	Not Enlisted	Not Evaluated
WILD SPECIES					
7.	*Herpetesedwardsii*	Nevala	Herpestidae	Schedule II	Least Concern
8.	*Funambuluspennantii*	Gilhari	Sciuridae	Schedule IV	Least Concern

SN	ZOOLOGICAL NAME	COMMON NAME	FAMILY	STATUS IN WPA 1972	STATUS IN IUCN CATEGORY
9.	*Rattus rattus*	Chuha	Muridae	Schedule V	Least Concern
10.	*Rousettus leschenaultii*	Indian Fruit Bat	Pteropodidae	Schedule V	Least Concern
11.	*Semnopithecus entellus*	Langur	Cercopethicidae	Not Enlisted	Least Concern
12.	*Maccacamulata*	*Monkey*	Cercopethicidae	Schedule II	Least Concern
REPTILES					
13.	*Ptyasmucosus*	Common rat snake/Dhaman	Colubridae	Schedule II	Least Concern
14.	*Bungarus caeruleus*	Common Indian Krait	Elapidae	Schedule IV	Least Concern
15.	*Hemidactylus maculates*	Rock Gaeko	Gekkonidae	Not Enlisted	Not Evaluated
16.	*Chamaleochamaleons*	Chameleon	Gekkonidae	Not Enlisted	Not Evaluated
17.	*Hemidactylus brooki gray*	Chipkali	Gekkonidae	Not Enlisted	Not Evaluated
AMPHIBIANS					
18.	*Rana tigrina*	Common Frog	Ranidae	Schedule IV	Least Concern
19.	*Rana hexadactyla*	Indian Pond Frog	Ranidae	Schedule IV	Least Concern
20.	*Bufo bufo*	Toad	Bufonidae	Not Enlisted	Not Evaluated
BUTTERFLIES/INSECTS					
21.	*Delias eucharis*	Common jezebel	Pieridae	Schedule II	Least Concern
22.	*Danaus chrysippus*	Plain tiger	Nymphalideae	Schedule IV	Least Concern
23.	*Euremahecabe*	Common grass yellow butterfly	Pieridae	Schedule II	Least Concern
24.	*Papiliopolymnestor*	Blue mormon	Papilionidae	Schedule IV	Least Concern
25.	*Acheta domesticus*	Jhingur/Cricket	Gryllidae	Not Enlisted	Not Evaluated
26.	*Apisdorsata*	Honey Bee	Apidae	Not Enlisted	Not Evaluated

Source: On the basis of primary site visit and in consultation with Local Peoples and concerned State ForestDept.

Birds: The List of Avifauna present in and around the study area are listed below in the **Table 3.19.**

Table 3.19:List of Avifauna present in and around the study area

SN	ZOOLOGICAL NAME	COMMON NAME	FAMILY	STATUS IN WPA 1972	STATUS IN IUCN CATEGORY
1	*Gallus gallus*	JungliMurghi	Phasianidae	Schedule IV	Least Concern
2.	*Achridotherustristris*	Common Myna	Sturnidae	Schedule IV	Least Concern
3.	*Corvus splendens*	Crow	Corvidae	Schedule IV	Least Concern

SN	ZOOLOGICAL NAME	COMMON NAME	FAMILY	STATUS IN WPA 1972	STATUS IN IUCN CATEGORY
4.	*Eudynamysscolopaceous*	Koel	Cuculidae	Schedule IV	Least Concern
5.	*Psittaculakrameri*	Parrot	Psittaculadae	Schedule IV	Least Concern
6.	*Pycnonotuscafer*	Bulbul	Pycnonotidae	Schedule IV	Least Concern
7.	*Saxicoloidesfulicatus*	Robin	Muscicapidae	Schedule IV	Least Concern
8.	*Ploceusphilippinus*	Baya Weaver	Plocidae	Schedule IV	Least Concern
9.	*Coturnix coturnix*	Bater	Phasianidae	Schedule IV	Least Concern
10.	*Vanellus indicus*	Red Wattled Lapwing	Charadriidae	Schedule IV	Least Concern
11.	*Bubulcus ibis*	Bagula	Ardeidae	Schedule IV	Least Concern
12.	*Bubo bubo*	Owl	Strigidae	Schedule IV	Least Concern
13.	*Ardeolagrayii*	Pond Heron	Ardeidae	Schedule IV	Least Concern
14.	*Columba livia*	Pigeon	Columbidae	Not Enlisted	Least Concern
15.	*Passer domesticus*	Sparrow	Passeridae	Not Enlisted	Least Concern

Source: On the basis of primary site visit and in consultation with Local Peoples and concerned State ForestDept.

Table 3.20: Schedules Species in Study Area

S.No.	Schedule of Wildlife Protection Act 1972	Number of Species
1	Schedule I	0
2	Schedule II	5
3	Schedule III	1
4	Schedule IV	19
5	Schedule V	2
6	Schedule VI	0

Methodology Sample Collection, Preservation & Analysis:

The samples were collected from 10 cm depth below the water surface in polyethylene bottles presoaked in 10% nitric acid solution for 24 hours and thoroughly rinsed with distilled water before use.

Preservation of sample is done by adding 5 ml of 4% Formalin. The preserved samples were kept undisturbed for 24 hours to allow the sedimentation of plankton suspended in water. After 24 Hrs the supernatant was discarded carefully without disturbing the sediment and final volume of concentrated sample was maintained 50 ml.

Qualitative analysis of Phytoplankton is done by Lackey Drop Method (Lackey,1938) . A drop of sample is placed on the strip of slide and covered with covers lip. Now the no. of individual of each microorganism is counted under microscope and the no. is expressed per ml of sample.

For zooplankton desired volumes of water were filtered through plankton net having mesh size of 75µ to represent all the available groups. Drop count method for the analysis were followed, as prescribed in APHA (1995).

PHYTOPLANKTON: The Phytoplankton community in the study area comprises of mainly Chlorophyceae, Cyanophyceae and Euglinophyceae. Chlorophyceae and Cyanophyceae were the most dominant group observed in the study area. Dominant Species observed are *Microcystis, Nostoc, Anabeena, Scendesmus* and *chlorella* etc.

Table 3.21: Phytoplankton community in the study area

Family	Species	Family	Species
Chlorophyceae	*Scenedesmus sp.*	**Cyanophyceae**	*Anabaena sp.*
	Closterium sp.		*Nostoc sp.*
	Ulothorix sp.		*Microcystis sp.*
	Chlorella sp.		*Oscillatoria sp.*
	Volvox sp.	**Euglenophyceae**	*Euglena sp.*
	Oedogonium sp		

ZOOPLANKTON:

The Zooplankton of the study area comprises of four group i,e Protozoans, Rotifers, Copepods and Cladocerons. List of zooplankton species identified are provided below in table:

Table 3.22: Zooplankton community in the study area

GROUP	SPECIES	GROUP	SPECIES
Protozoans	*Paramecium sp.*	**Copepods**	*Cyclops sp.*
	Vorticella sp.		*Mesocyclops sp.*
Cladocerons	*Daphnia sp.*		
	Moina sp.		

CONCLUSION& INTERPRETATION

The biological environment in the surrounding of the study area is dominated by grasses with scattered tree/Shrub species, All the species reported from core zone are common and generally found in wide variety of habitat of the urban ecosystem of the study area, no endemic/endangered sp. were recorded from core area of the project site. Apart from that there is no Biosphere reserve, National Park, Wildlife sanctuary, Tiger Reserve or Elephant reserve are reported within 10 Km radius of project site and project area is also devoid of any breeding and nesting ground of any faunal species. Bir Hisar Protected Forest and a deer park is situated 7.2 km NW of project site. So, it can be stated that existing project and associated activities do not influence biodiversity of the area.

3.7 Satellite Imagery & LULC Map of Study Area

The study of land use in the area enables one to know about the present land use practices as well as to know the type of land that can be used for various development activities envisaged in post project scenario. The land use pattern indicates the manner in which different parts of land in the study area is

being utilized. It is an important indicator of environmental health and human activity and a degree of inter-play between these two. The land-use map of the study area was prepared by utilizing principal resources: -

- Survey of India topo-sheet of 1:50,000 scale (44O/16);
- Satellites imagery data without any cloud cover of year 2021 Sentinel 2A Satellite Image. Sentinel-2 carries the Multispectral Imager (MSI). This sensor delivers 13 spectral bands ranging from 10 to 60-meter pixel size. Its blue (B2), green (B3), red (B4), and near-infrared (B8) channels have a 10-meter resolution. Next, its red edge (B5), near-infrared NIR (B6, B7 and B8A) and short-wave infrared SWIR (B11 and B12) have a ground sampling distance of 20 meters. finally, its coastal aerosol (B1) and cirrus band (B10) have a 60 m pixel size.
- This Land use Land Cover Map is prepared with help of Sentinel 2A Satellite Image (downloaded from https://earthexplorer.usgs.gov/) with using tools Knowledge Base Classification of Arc GIS 10.8 and ERDAS Imagine 2016 Software.
- Ground validation for interpretation of the FCC imagery

The impacts on land environment would be in the form of permanent change in landuse pattern as well as direct and indirect impacts on surrounding land due to discharge of wastes on the land and unscientific means of disposal. Area statistics of land-use classes has been generated within 10 Km radius of mine lease area (Core zone and Buffer zone).

3.7.1Contour Map

Contours are lines that connect points of equal value (such as elevation, temperature, precipitation, pollution, or atmospheric pressure). Contour map is prepared by using surface tool which is present in Spatial analyst tool which can be achieved by using Arc GIS 10.8. The contour map of the study area is given as Figure-3.9.

Interpretation (Contour Map):-

- Project site and its surrounding area are situated on flat terrain. Contour elevation at project site varies within premises between about 212m AMSL to 214m AMSL.
- Map is showing maximum elevated contour of 230m AMSL in Southern part of Map.
- While lowest contour is located in North Western Part of the Map showing 210 m AMSL.
- Whitish portion of the map showing moderately flat terrain.
- Contour map comprising in 10 km buffer area from the project site is situated on Moderately Flat topography.
- Contour topography reveals that terrain is Flat and slopes towards North Western direction.
- Map is not showing dense contourswhile less dense contour occurs in whole Map.
- Contour map clearly demonstrates area is overlain by Alluvial terrain.

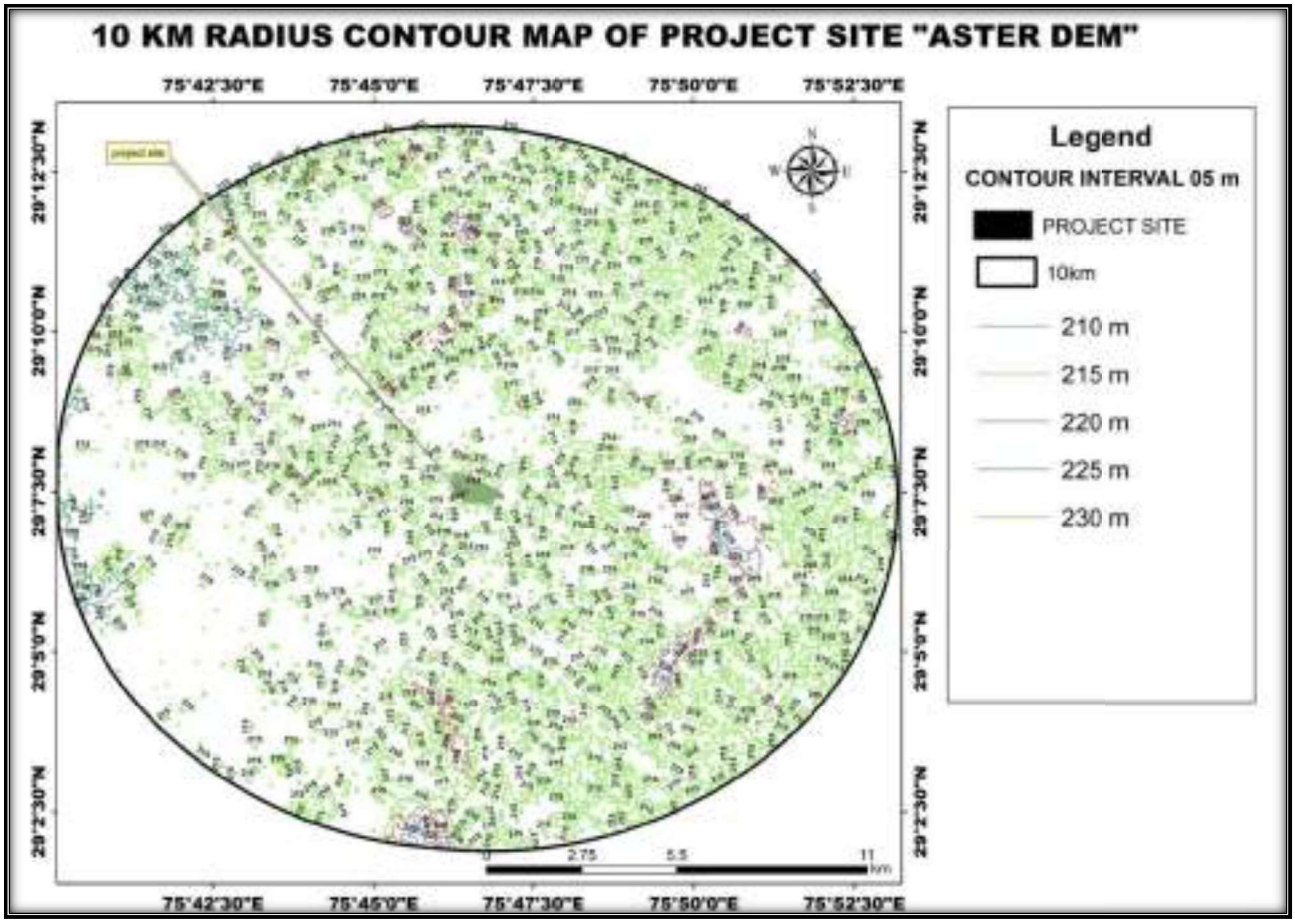


Figure 3.9: Contour Map of the Study Area

3.7.2 Drainage Map

The study area displays a variety of drainage pattern which is governed by the arrangement of lithological boundaries, drainage network and distribution of linear structural features such as faults, lineaments and thrusts.The drainage map of the study area is given as Figure-3.10 below-

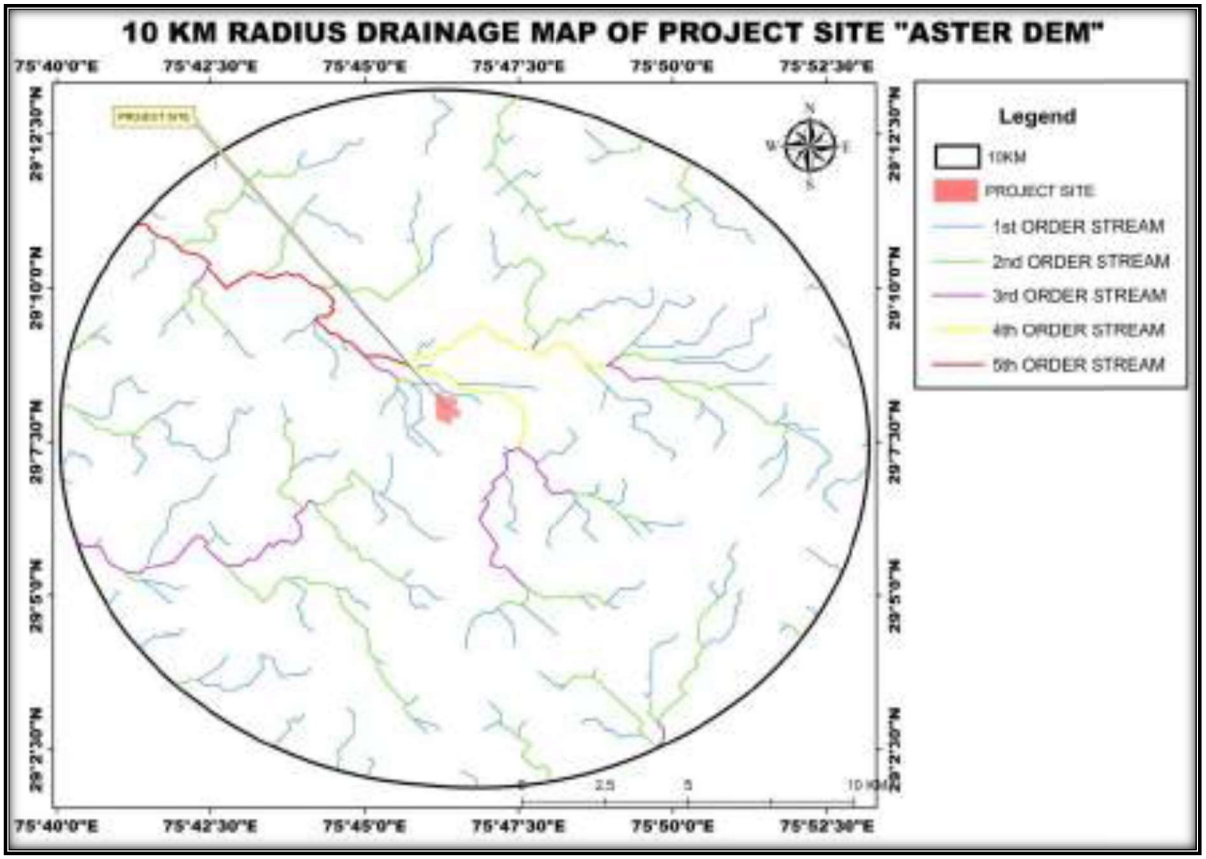


Figure 3.10: Drainage Map of the Study Area

Interpretation (Drainage Map):-

- This drainage map is prepared in10 km radius area from project site and covers about 350.70sqkm.
- After interpretation map reveals 5no's of Drainage Orders.
- The Lease area & Surrounding area sloping towards 5rd order drainage(Main Stream)
- First order drainage(blue color) having characteristic situated at high elevation with smallest distance in comparison with other drainage in its drainage Basin.
- While Fifth order drainage (red colour) situated at lowest elevation and having greater length than other drainage in its drainage Basin.
- First, Second, Third and Fourth order of drainage successively meet to Fifth order drainage which is the main channel of whole Catchment area and flows towards North West direction.
- Drainage map is showing dominantly Dendritic to sub dendritic drainage pattern.
- Drainage map clearly demonstrate area is overlain by Alluvial terrain.

3.7.3 Land Use Land Cover Map

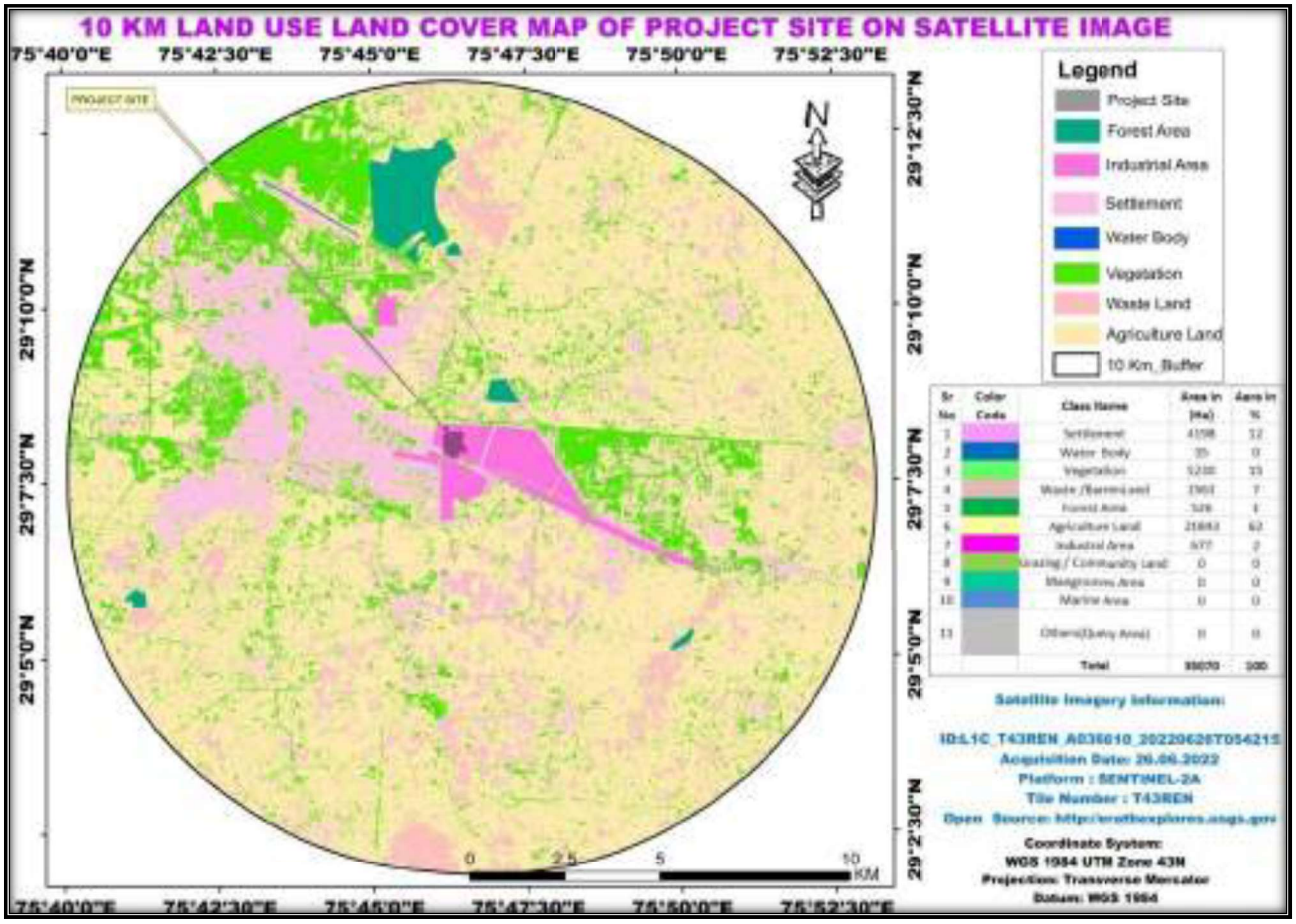


Figure 3.11: Land use land cover Map of the Study Area

Table 3.23: Description of Land Use

Sr No	Color Code	Class Name	Area in (Ha)	Aera in %
1		Settlement	4198	12
2		Water Body	35	0
3		Vegetation	5230	15
4		Waste /BarrenLand	2561	7
5		Forest Area	526	1
6		Agriculture Land	21843	62
7		Industral Area	677	2
8		Grazing / Community Land	0	0
9		Mangrooves Area	0	0
10		Marine Area	0	0
11		Others(Query Area)	0	0
		Total	**35070**	**100**

Interpretation (LULC Map):-

- 62 % of the land of the study area comprises of Agriculture land. This is an indicator why the Particulate matter is high in the region. **The loose unconsolidated soil contributes to the windblown dust and thereby increasing the particulate matter in the ambient air.**

3.8 Hydrogeology

3.8.1 Physiography

Hisar is the west central most district of Haryana state with a total geographical area of 3860 sq. Km and it lies between the north latitudes 28o 56' 00" to 29o 38' 30" and east longitudes 75o 21' 12" to 76o 18' 12". Hisar district is one of the 21 districts of Haryana state, India. Hisar city serves as the district headquarters. Hisar is one of the five cities belonging to Indus Valley Civilization.

As of 2011 it is the second most populous of the 21 districts of Haryana, after Faridabad. Hisar is also known as the steel city because of the Jindal Stainless Steel Factories. It is also the largest producer of galvanized iron in India.

The 2011 census the district had a population of 1,742,815 and gave it a ranking of 276th in India out of a total of 640 districts. The district has a population density of 438 inhabitants per square kilometer. Its population growth rate over the decade 2001-2011 was 13.38%. Hisar has a sex ratio of 871 females for every 1000 males and a literacy rate of 73.2%. Haryanvi is the most spoken dialect in the district. Hisar is 98% Hindu, only about 40,000 are Muslims rests are mostly Jain and Sikhs. The district is under control of Hisar division and administratively divided into nine community development blocks namely Agroha, Adampur, Barwala, Bass (Hansi-II), Hansi-I, Hisar-I, Hisar-II, Narnaund, and Uklana Mandi. The district has 05 towns namely Hisar, Hansi, Narnaund, Barwala and Uklana and 269 villages.

3.8.2 Hydrology and Drainage Network

The district falls in Ghaggar basin of Indo-Gangetic plains. The area is traversed by two artificial drains which are confined in Bass, Hansi-I, Narnaund and Barwala blocks. There are a total of 39 drains existing in the area, which run for a distance of 126.25 km.

There is no major river in the district yet there is a good network of canal irrigation system. The district is located in the arid zone of the State. Rainfall is scanty and unreliable. The sub soil water is deep and unfit for irrigation in most parts of the district. The area is irrigated by shallow tube wells and network of Bhakra Canal Systems and Western Yamuna Canal Systems. The main canals are the Fatehabad branch of Bhakra Canal, Barwala Branch, Balsamandh and Pabra Sub-branch of Barwala Link and Sirsa branch from Bhakra Main Line, Hisar major distributary and Deosar feeder of Western Yamuna canal System through Hansi branch.

3.8.3 Geomorphology

The geomorphology of Hisar district is classified into two major categories they are fluvial origin and Aeolian origin landforms. The fluvial originated landforms existed in this district are older deep alluvial plains, palaeo-channels etc. and the other landforms i.e., dune complex, eolian plain deep, interdunal flat and sand dunes fall under eolian originated landforms. The details of landforms of the Hisar district are shown in the below map.

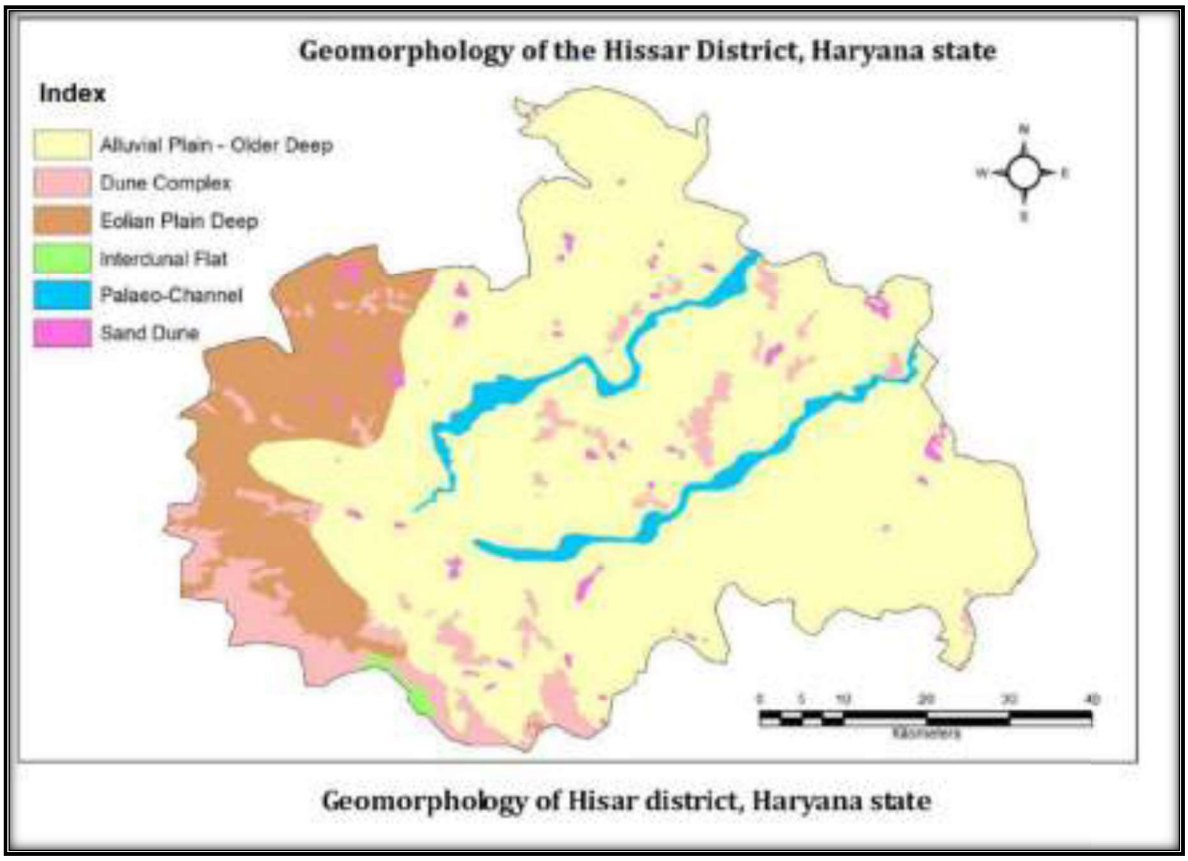


Figure 3.12: Geomorphology of Hisar District

3.8.4 Hydro -Geology

The district is occupied by geological formations of Quaternary age comprising of maximum area of older alluvium i.e., Ambala formation belonging to the vast Indus alluvial plains and small part of western part of district is occupied with aeolian deposits. The shallow aquifers, which are unconfined in nature, are being tapped chiefly by shallow tube-wells for irrigation. The deeper aquifers are underlined and over-lined by extensive impermeable clays with existence of saline groundwater. The geological formations of Hisar district is shown in below map:

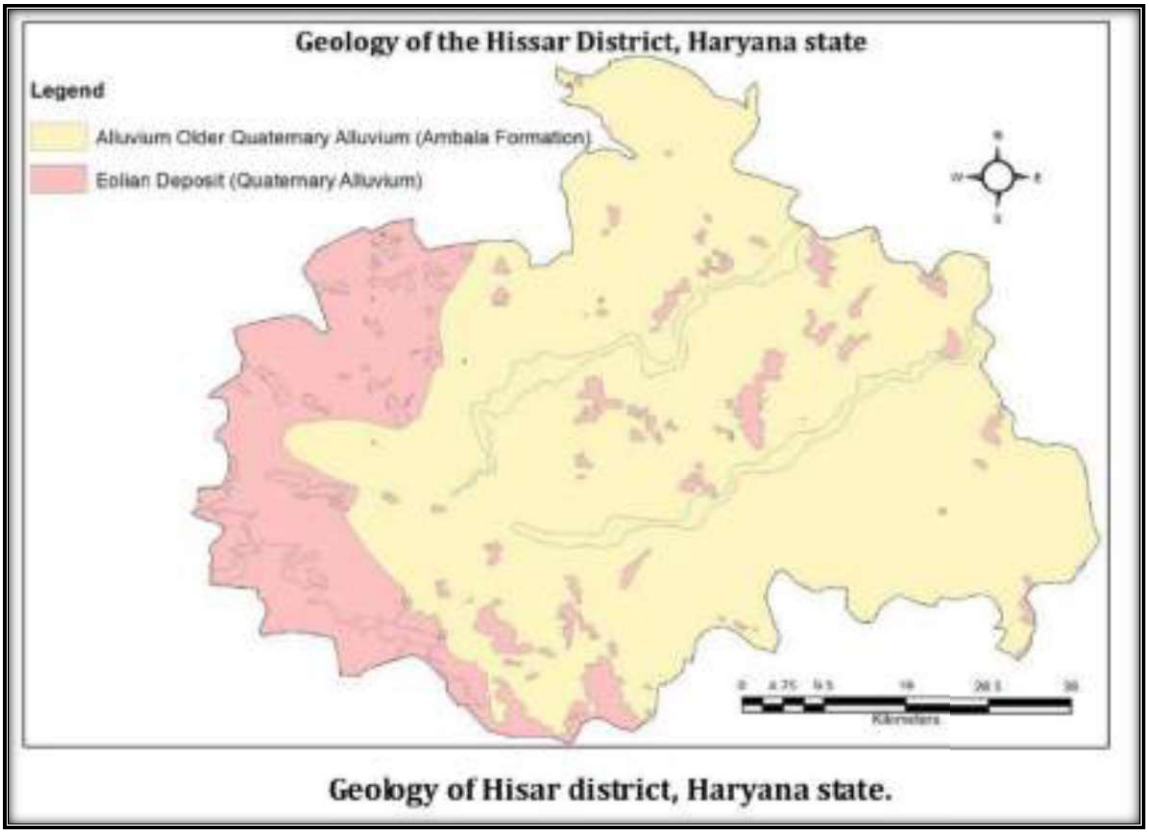
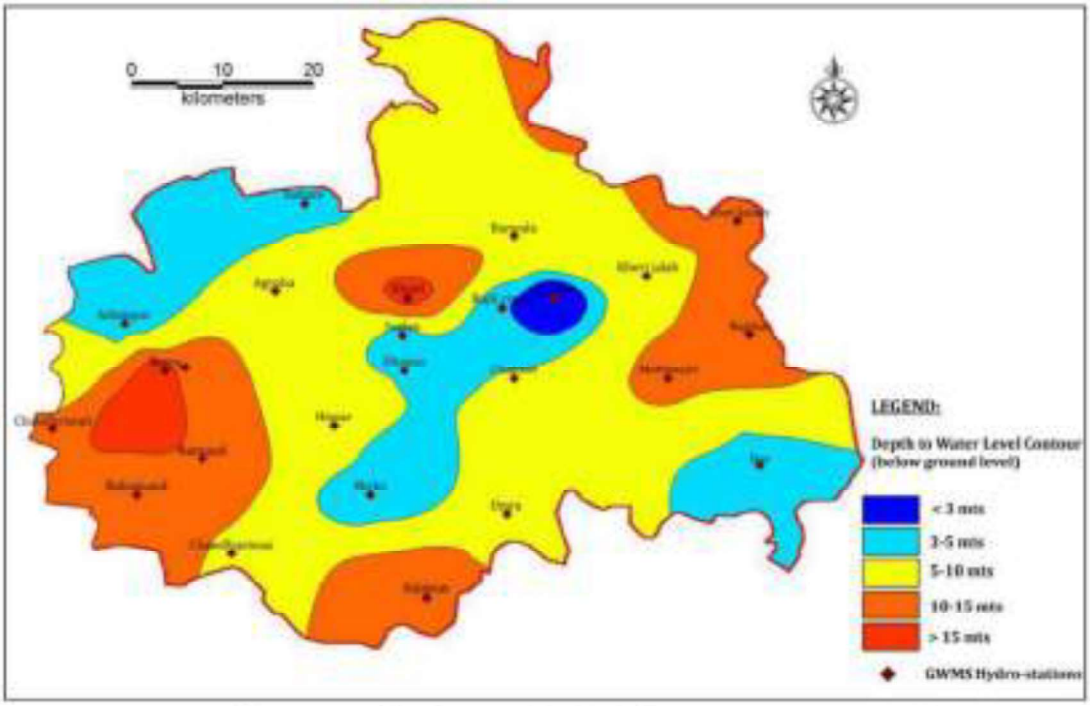


Figure 3.13: Geology of Hisar District

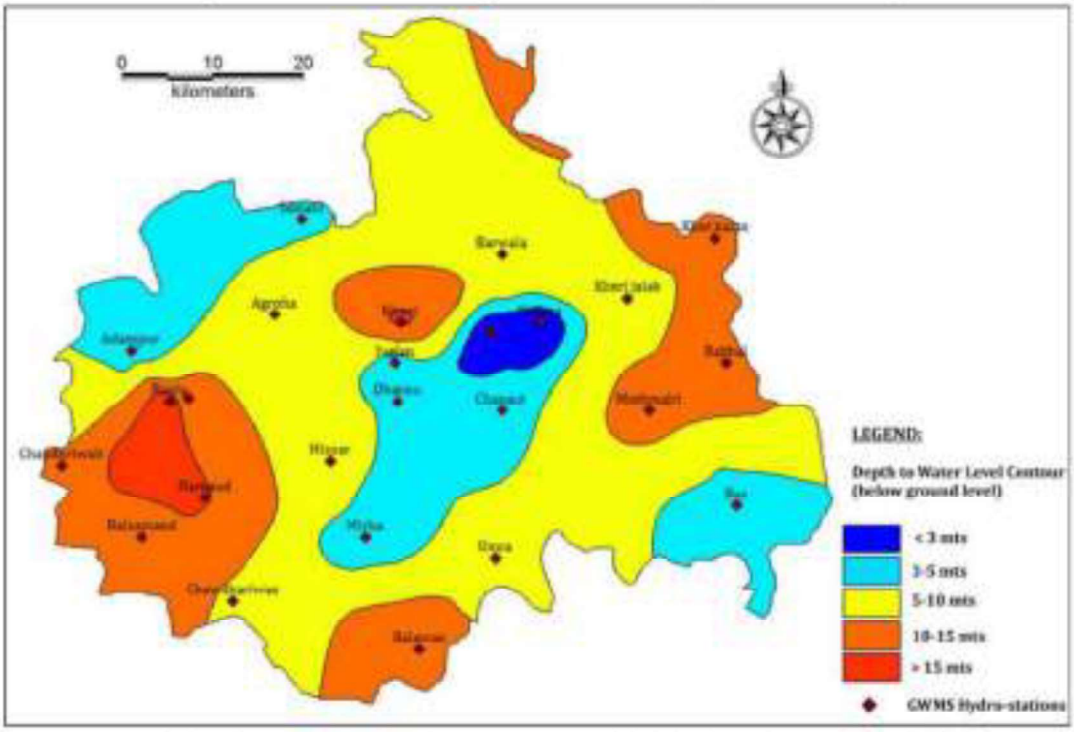
3.8.5 Water Level Behaviour:

Depth to water level in the district ranges from 1.50 mbgl at Gurana (Hansi block) to 17.88 mbgl at Basra (Adampur block) during pre-monsoon 2016 and post-monsoon, 2016 water levels ranges from 2.10 to 16.76 mbgl in respective locations. The depth to water level contour maps is generated for pre and post monsoon seasons for the entire district and water level fluctuations map are shown in following maps.

About 60% of the Ground Water Monitoring Wells are showing rising of water levels and remaining 40% shows declining in water levels. The water levels are declining seasonal fluctuation in south west part, north east part, south east and north western parts of the Hisar district. The water level data of pre and post-monsoon periods, 2016 and its seasonal fluctuations data for all Ground Water Monitoring Wells of Hisar district are given below



Depth to water level map of Hisar district, Pre-monsoon, 2016



Depth to water level map of Hisar district, Post-monsoon, 2016

Figure 3.14: Water Level depth pre-monsoon vs Post monsoon

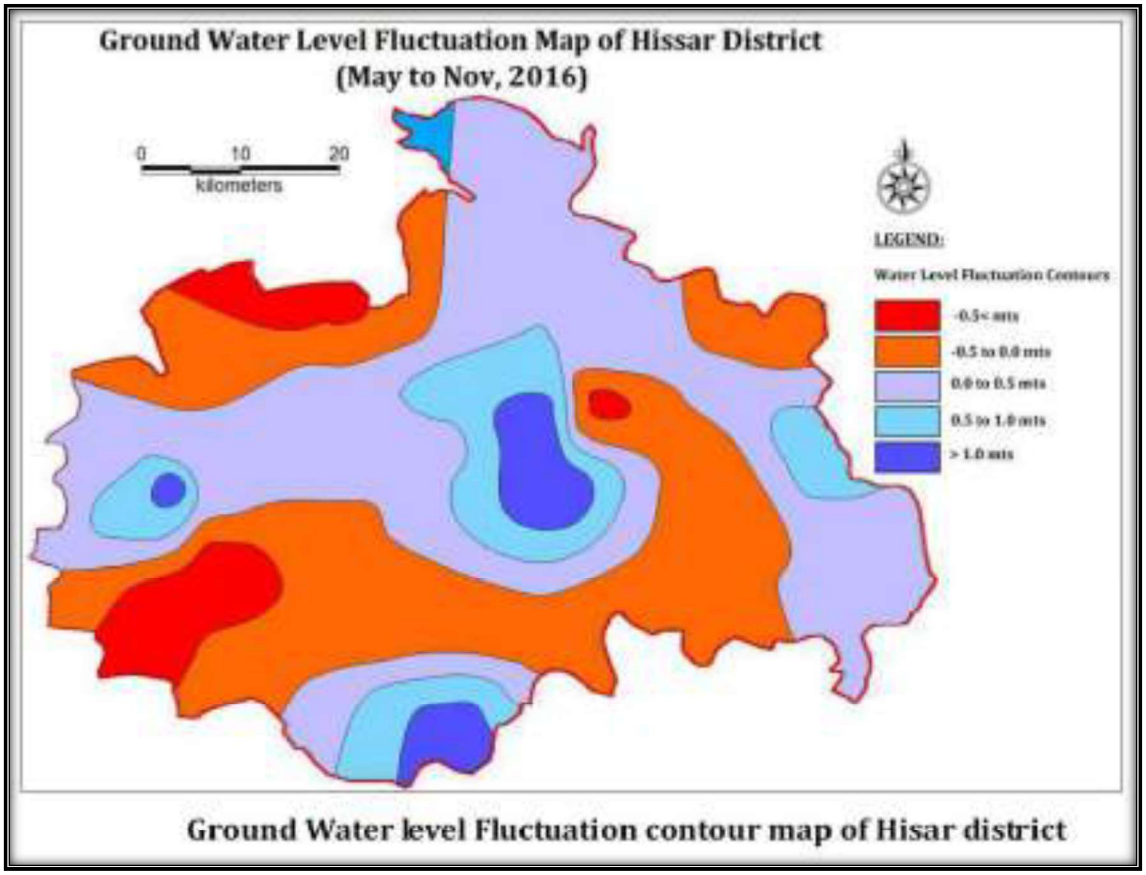


Figure 3.15: Water Level fluctuation Map of Hisar District

The long-term trend in the water level reflected by water level hydrographs is indicative of the change in groundwater storage in phreatic zone with time. Maximum ground water monitoring stations show rising trend and this may be due to local hydrogeological conditions prevailing in the area. Whereas hydrographs of few GWMS show declining trend which may be due to over exploitation of ground water and these areas require careful management of surface water and conjunctive use of surface water and ground water. For the rest of the stations, hydrograph neither indicate any substantial rise nor decline thus indicating that the storage (Dynamic) is being maintained at the normal level which is not disturbed by the present level of ground water development.

Source: Aquifer Mapping and Management Plan - Hisar District Haryana CGWB.

3.9Socio Economic Study

3.9.1Introduction: Socio-Economic Impact Assessment

Socio-Economic Impact Assessment (SEIA) refers to systematic analysis of various social and economic characteristics of human being living in a given geographical area (study area/impact area). The prime objective of SEIA is to identify and evaluate potential socio-economic and cultural impacts of a project on the lives & conditions of people, their families and communities. If the potential impacts are significant