2016

DISTRICT SURVEY REPORT

In respect of minor mineral quarries/deposits of District Patiala, Punjab

PREPARED BY:

District Level Environment Impact Assessment Authority (DEIAA)

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1. <u>INTRODUCTION</u>

The Government of India, Ministry of Environment, Forests and Climate change has made certain amendments in, Environmental Impact Assessment (EIA) Notification No. S.O.1533(E) dated 14.09.2006 issued by the erstwhile Ministry of Environment and Forest., vide notification no. S.O.141(E) dated 15.01.2016 and notification no. S.O. 190(E) dated 20.01.2016. These amendments led to the constitution of the District Level Environment Impact Assessment Authority (DEIAA) at district level for grant of environmental clearances for category B2 projects (B2 category projects pertaining to mining of minor minerals of lease area less than or equal to 5 hectares) for mining of minor minerals, for all the districts in the country. DEIAA comprises of following members:

1	District Magistrate or District Collector of the district	Chairperson
2	Senior most Divisional Forest Officer in the district	Member
3	An expert member to be nominated by the Divisional Commissioner or Chief Conservator of the Forest	Member
4	Sub-Divisional Magistrate or Sub-Divisional Officer of the district head quarter	Member Secretary

Ordinary sand other than sand use for prescribed purposes and some other minerals have been specified as minor mineral in Sec 3(E) of The Mines and Minerals (Development and Regulation) Act, 1957. The Central Government in addition to some other minor minerals have also declared the ordinary earth (used for filling or leveling purposes in construction or embankments, roads, railways and buildings) and brick earth as the minor minerals. The Government of Punjab vide notification no. S.O.22/P.A.9/1996/S.3/2008 dated 28.03.2008 have acquired the rights of ordinary clay, ordinary sand other than sand use for prescribed purposes, brick earth and ordinary earth (used for filling or leveling purposes in construction or embankments, roads, railways and buildings) in addition to some other minor minerals.. The DEIAA shall base its decisions on the recommendations of District Level Expert Appraisal Committee (DEAC). It comprises of following members

1.	Senior most Executive Engineer, Irrigation Department	Chairperson
2.	Senior most Sub-Divisional Officer (Forest)	Member
3.	A representative of Remote Sensing Department or Geology Department	Member
	or State Ground Water Department to be nominated by the District	
	Magistrate or District Collector	
4.	Occupational health expert or Medical Officer to be nominated by the	Member
	District Magistrate or District Collector	

5.	Engineer from Zila Parishad	Member
6.	A representative of State Pollution Control Board or Committee	Member
7.	An expert to be nominated by the Divisional Commissioner or Chief	Member
	Conservator of Forest	
8.	An expert to be nominated by the Divisional Commissioner or Chief	Member
	Conservator of Forest	
9.	An expert to be nominated by the Divisional Commissioner or Chief	Member
	Conservator of Forest	
10.	Senior most Assistant Engineer, Public Works Department	Member
11.	Assistant Director or Deputy Director or District Mines Officer or	Member-
	Geologist in the district in that order	Secretary

District Survey Report (DSR) is required to identify the areas of aggradations or depositions where mining can be allowed and identification of areas of erosion and proximity to infrastructural structures and installations where mining should be prohibited and calculation of annual rate of replenishment and allowing time for replenishment after mining in that area. The District Survey Report (DSR) shall form the basis for application for environmental clearance, preparation of reports and appraisal of projects. The Report shall be updated once every five years.

2. BRIEF HISTORYOF THE DISTRICT

Punjab is divided geographically into three regions, known as **Malwa** (a region of Punjab south of the river Sutlej), **Majha** (comprising districts of Amritsar, Pathankot, Gurdaspur and Tarn Taran.) and **Doaba** (the region of Indian Punjab between the rivers Beas and Sutlej). Patiala district falls in the Malwa region. Patiala was one of the famous erstwhile princely states of Punjab. After independence of India, the Patiala became the capital of erstwhile **Patiala and East Punjab States Union** (**PEPSU**). It was created by combining eight princely states of Patiala, Jind, Nabha, Kapurthala, Faridkot, Kalsia, Malerkotla and Nalagarh. Following the States Reorganisation Act 1956, the PEPSU was merged into Punjab State on 1st November 1956.

3. PHYSIOGRAPHY

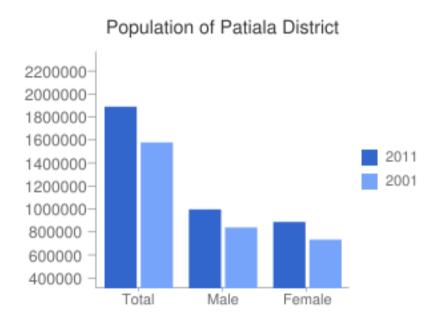
Patiala district forms the south-eastern part of the state, it lies between $29^0\,49^\circ$ and $30^0\,47^\circ$ north latitude, $75^0\,58^\circ$ and $76^0\,54^\circ$ east longitude. Elevation above sea level is $258\,\mathrm{m}=846\,\mathrm{ft}$. It is surrounded by the districts of Fatehgarh Sahib and S.A.S Nagar Mohali in the

North, Sangrur district in the west, Ambala and Kuruksetra districts of neighbouring state of Haryana in the east and Kaithal district of Haryana in the south.

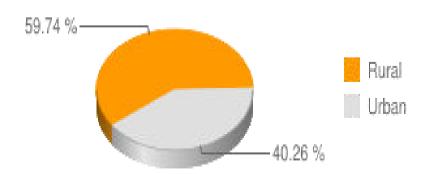
Connectivity to District Patiala: Patiala district is well connected by road and rail network. Patiala is about 250 kms from National capital New Delhi and 70 kms from State capital Chandigarh. The nearest railway junction is at Rajpura town and the nearest airports are at Mohali (70 kms), Amritsar (235 kms) and New Delhi (250 kms).

4. **DEMOGRAPHIC PROFILE**

Patiala district is spread over an area of 3325 sq. kms and it is fifth largest District of Punjab in terms of area.







Description	2011	2001
Actual Population	1,895,686	1,584,780
Male	1,002,522	845,230
Female	893,164	739,550
Population Growth	19.62%	17.84%
Area Sq. Km	3,325	3,325
Density/km2	570	499
Proportion to Punjab Population	6.83%	6.51%
Sex Ratio (Per 1000)	891	875
Child Sex Ratio (0-6 Age)	837	776
Average Literacy	75.28	69.30
Male Literacy	80.20	75.30
Female Literacy	69.80	62.50
Total Child Population (0-6 Age)	212,892	0
Male Population (0-6 Age)	115,917	0
Female Population (0-6 Age)	96,975	0
Literates	1,266,791	0
Male Literates	711,052	0
Female Literates	555,739	0
Child Proportion (0-6 Age)	11.23%	0.00%
Boys Proportion (0-6 Age)	11.56%	0.00%
Girls Proportion (0-6 Age)	10.86%	0.00%

5. <u>ADMINISTRATIVE SET UP</u>

No. of Sub Divisions	5	Patiala
		Nabha
		Rajpura
		Samana
		Patran
No. of Tehsils	5	Patiala
		Nabha
		Rajpura
		Samana
		Patran
No. of Sub-Tehsils	3	Bhadson
		Dudan Sadan
		Ghanour
Development Blocks	8	Patiala
		Nabha
		Rajpura
		Samana
		Patran
		Ghanour
		Sanour
		Bhunerheri
Panchayats	1012	

6. MAP OF PATIALA DISTRICT

7. **GEOLOGICAL AND MINERAL MAP OF PUNJAB**

8. RAINFALL & CLIMATE

The climate of Patiala district can be classified as tropical steppe, Semi-arid and hot which is mainly dry with very hot summer and cold winter except during monsoon. There are four seasons in a year. The hot weather season starts from mid March to last week of the June followed by the south west monsoon which lasts upto September. The transition period from September to October forms the post monsoon season. The winter season starts late in November and remains upto first week of March. The normal monsoon and annual rainfall of the district is 547 mm and 677 mm, respectively which is unevenly distributed over the area. The south west monsoon, sets in from last week of June and withdraws in end of September, contributing about 81% of annual rainfall. July and August are the wettest months. Rest 19% rainfall is received during non-monsoon period in the wake of western disturbances and thunderstorms. Generally rainfall in the district increases from southwest to northeast. The mean minimum and maximum temperature in the area ranges from 7.1° C to 40.4° C during January and May or June respectively.

Temperature & Rainfall in Patiala:

Month	Average Temperature Centigrade	Average Rainfall Millimeters
January	14	36
February	14	35
March	16	40
April	19	48
May	22	0
June	26	89
July	28	117
August	28	96
September	26	40
October	23	41
November	20	40
December	19	40

9. GEOMORPHOLOGY AND SOIL TYPES

The district area is occupied by Indo-Gangetic alluvial plain and consists of three types of region viz. the Upland plain, the Cho-infested Foothill Plain and the Floodplain of the Ghaggar river. The elevation of land ranges from 240 to 278 m amsl. Due to arid climate, the soils are light coloured. Tropical arid brown soils exist in the major parts of the district. Here soils are deficient in nitrogen, phosphorus and potassium. In Patran and Samana blocks, soils are arid brown soils occur. These are calcareous in nature and in most cases kankar layers occur.

Information on Soil for the District (Area in Hectares)

Sr.	Name of		Alluvial					Deficient
No.	Block							in Micro
		Loamy	Sandy	Loam	Silt	Clay	Affected	nutrient
		Sand	Loam		Loam	Loam		Zn, Mn,
								Fe, etc.
1	Patiala	420	25225	8452	8030	0	219	4261
2	Nabha	0	56760	4936	0	0	746	15611
3	Samana	1990	33837	3981	0	0	3	11943
4	Patran	0	4155	33239	0	2077	3	10388
5	Bhunerheri	24692	0	0	6350	4233	1044	328
6	Sanour	0	12963	7408	11110	5554	714	3825
7	Rajpura	2051	2032	408	30609	6123	219	398
8	Ghanour	0	0	10937	12262	9942	197	6113
		29153	134972	69361	68361	27929	3145	

10. LAND USE PATTERN (Area in Hectares)

Sub divisio n	Villa ge	Geogra phical area	Under Forest Area	Barr en Lan d	Unclu tivate d land	Perma nent Pasture s	Cultur able waste land	Under cultiva tion area	More than one time cultiva ted area	Total cultivat ed area
Patiala	374	114540	4790	1925	16325	0	1507	89993	87880	177873
Nabha	175	62442	4468	739	5842	12	473	50908	50607	101515
Rajpura	270	62164	1462	896	7757	0	1415	50634	48925	99559
Patran	97	46306	318	246	6061	0	1159	38522	34857	73379
Samana	96	36847	1376	198	3190	0	1987	30096	29734	59830
Total	1012	322299	12414	3884	39175	12	6541	260153	252003	512156

11. GROUND WATER SCENARIO

- Hydrogeology: The district is occupied by Indo-Gangetic alluvial plain of Quaternary age, and falls in Ghaggar basin. The ground water occurs in alluvium formations comprising fine to coarse sand, which forms the potential aquifers. In the shallow aquifer (up to 50m) ground water occurs under unconfined/water table conditions, where as in deeper aquifer, semi-confined/confined conditions exist. The traditional dugwells tapping the shallow aquifer are not in use and most of them have been abandoned, however, this aquifer is being tapped by the hand pumps and shallow tube wells, which are widely used for domestic purposes. The permeable granular zones comprising fine to mediumgrained sand and occasionally coarse sand and gravel. Their lateral and vertical extent is limited. The borehole data reveals that clay group of formations dominate over the sand group in the district area. Ground water in the district occurs in the alluvium under water table and semi confined to confined conditions.
- Water level behavior: The depth to water level ranges from 4.43 to 20.62 m bgl during pre monsoon period and 6.99 to 24.28 m bgl during post monsoon period. The seasonal fluctuation varies from 0.03 to (-) 3.66 m in the area. The long-term water level trend indicates average fall of 0.50 m/year. The long term water level trend is also showing little rise being 0.24 m/year around majauli, which is insignificant with respect to entire area.
- Ground water flow: The elevation of the water table in the district varies from 230 m to 300 m above mean sea level. The highest elevation is in the northeastern part and the lowest in the southwestern part and reflects the topographic gradients. The hydraulic gradient in the northern eastern part is steep, whereas, in the southwestern part, it is gentle. The overall flow of ground water is from northeast to south-west direction.
- Notified blocks of the district by Central Ground Water Board (CGWB): In Patiala district- Patiala, Patran and Sanour blocks have been notified for control and regulation of ground water.

Sr. No.	Block	Geographical	Depth of tube-	Water Table
		Area (ha)	wells (mtr)	(mtr)
1	Patiala	42261	40-60	13.50-19.55
2	Nabha	62442	40-60	15.26-21.54
3	Samana	39811	45-60	19.18-20.65
4	Patran	41552	45-75	25
5	Bhunerheri	36319	45-75	19.6-26.56
6	Sanour	37750	45-60	15.20-20.10
7	Rajpura	41031	40-60	9.60-18.94
8	Ghanour	33338	40-60	3.71-14.42

Block wise Ground Water Balance of District Patiala (Study Period 1995-97)

12. FOREST

The forests play a vital role in shaping the characteristic conditions of an area. Besides, these also influence the economic and social life of the people considerably. The forests provide valuable timber, medicinal herbs and raw material for industries and also provide employment and play a vital role in conserving the soil and ensure timely rains.

• Description of Land and Forest areas: The track forms a part of indo-Gangetic alluvial plain and is more or less flat terrain having general slope from north-east to south-west. Some of the Birs have streams, choes and nallah course passing through them namely Ghaggar, Markanda, Tangri, Patiala nadi, Sirhind Choe etc. These streams cause occasional floods, especially during the rainy season. The most affected forest areas by such flash floods include Bir Miranpur Ghogpur, Bir Moti Bagh and Bir Gurdialpura. All these streams merge with Ghaggar river in Patiala District except Sirhind Choe. In some of the Forest like Bir Bhunerheri, Bir Miranpur Ghogpur and Bir Gurdialpura, the floodwater receded after 1-3 months. Sirhind choe enters Patiala district near Bhadson and after flowing through Bir Agol enters Sangrur District towards the South-West.

Various landforms found in the district are alluvial plain, flood plain and palaeo channels. Alluvial plains constitute major portion of the district. Part of the alluvial plain is susceptible to local flooding and thus has good moisture. At place, it has salt encrustations. Flood plain is a sloping tract along the Ghaggar river and other small rivulets.

• <u>Distribution of Forest</u>: The Patiala district is divided into four major categories namely Birs or the Block forests, roadside, rail side, canal side and drain side. The distribution of areas is as follows:

Sr. No.	Category	Area (Ha)
1	Birs	2655.41
2	Road	3992.65
3	Rail	510.60
4	Canals	3958.31
5	Drains	200.00
		11316.97

- The Birs / Block Forests: The original vegetation in the Bir areas were of the dry tropical thorn and scrub forests which fall under the Sub-group 5-B (Northern Tropical Dry Mixed Deciduous Forests). The forest occurring in Patiala, Nabha, Samana and Bhadson forest ranges fall under the main forest type Saline and Alkaline Scrub Savannah sub-type E8 of Group 5-B.
- Strip Forest: It runs along roads, railways, canal and drains. Eucalypts exists in pure stands and in gaps of middle aged to mature. Kikar is slowly depleting on the roadsides because of unfavourable conditions. Natural regeneration of all species is scarce. Of late, apart from Shisham new species like Arjun, White Siris, Burma Neem, dek, Ailanthus, Jamoa, Jaman, Australian Kikar etc. have been introduced. This is done mainly to have mixtures of plantations and divergence.

The condition of the crop at most of the places is quite good, only the crops along the railways and drains have yielded poor results.

12.1 BLOCK FORESTS

In District Patiala, there are 12 birs / Block Forests:-

Sr.No.	Name of Village / Forest	Hadbast No.
1	Bir Kule Majra	Hadbast No. 143
2	Bir Majal Khurd	Hadbast No. 207 (New Hadbast No. 205)
3	Bir Kheri Gujjran	Hadbast No. 34
4	Bir Sanaur	Hadbast No. 121
5	Bir Kartarpura	Hadbast No. 119
6	Bir Miranpur	Hadbast No. 267
7	Bir Ghogpur	Hadbast No. 263 (New Hadbast No. 267)
8	Bir Bhunerheri	Hadbast No. 154
9	Bir Bhorey Agoul	Hadbast No. 167
10	Bir Gurdialpura	Hadbast No.
11	Bir Mallah Kheri	Hadbast No. 76
12	Bir Anniah Dherian	Hadbast No. 204

12.2 WILD LIFE SANCTUARIES

There are six wildlife sanctuaries in the district namely:

Sr.No.	Name	Area in Ha
1	Bir Moti Bagh	524.48 ha
2	Bir Dosanjh	540.68 ha
3	Bir Mehans	123.43 ha
4	Bir Bhadson	1064.80 ha
5	Bir Bhunerheri	661.66 ha
6	Bir Gurdialpura	620.53 ha

13. FAUNA AND FLORA

• <u>Fauna</u>: The district is rich in animals and birds and the following are mainly found in the district:-

Sr. No.	Animals	Birds
1	Blue Bull	Pigeon
2	Hog deer	Sparrow
3	Wild Boar	Parrot
4	Jackal	Wood Pecker
5	Common Mangoose	Peacock
6	Common Indian Hare	House Crow
7	Rhesus Monkey	Common Babbler
8	Jungle Cat	Kingfisher

• <u>Flora</u>: The district is rich in Flora. The following various species of plants and forest trees are mainly found in Patiala district:-

1	Khair	9 Karir	17 Drek
2	Reru	10 Tun	18 Burma Drek
3	Kikar	11 Lasura	19 Toot
4	Bel	12 Shisham	20 Khajoor
5	Neem	13 Safeda	21 Poplar
6	Kachnar	14 Bohar	22 Jamun
7	Dhak	15 Pipal	23 Ber
8	Amaltas	16 Amb	24 Bakain

14. HORTICULTURE

The topography and agro-climatic conditions of the district are quite suitable for the productions of various fruits and vegetables.

HORTICULUTURE PROFILE OF DISTRICT PATIALA

(YEAR 2014-15)

(Area in Hectares)

Sr.No.	Descriptions							
1	Geographical Area					3	22190	
2	Forest Area					1	2410	
3	Barren Land					4	240	
4	Non-Agriculture use					3	6600	
5	Net Area Sown					2	61400	
6	Cropping Intensity (%)					1	98.52	
7	Net Irrigated Area					2	61280	
8	Area under Fruits					2	337 Hac.	
	Kinnow		83	Guava	941	В	Ber	156
	Sweet Orange		25	Pear	114	Α	Amla	1
	Lemon		77	Peach	150	В	Banana	1
	Mango		376	Plum	14	C	Others	386
	Litchi		8	Grapes	5			
9	Area under Vegetable	es				1	5771 Hac	
	Potato	43	13	Cauliflo	ower 1012	V	Vater Melon	41
	Onion	19	85	Okra	344	V	ine Crops	796
	Garlic	41	7	Cabbag	e 872	R	Roots Crop	964
	Tomato	12	.52	Peas	1654	C	Others	226
	Brinjal	59	0	Musk M	Ielon 483			
10	Area under Flowers							
	1. Loose Flowers	80	Hac.	2. Cut	Flower	4	1.6 Hac	
	3 . Flower Seed		Hac.					
11	Govt. Garden & Nurser							2 Acre
	Govt. Garden & Nurser							22 Acre
	Govt. Garden & Nurser		Circular R	Road, Nab	ha, Patiala			2 Acre
	Baradari Garden, Patial							-
12	No. of Poly House / Ne	et H	ouse	69		Are	a	2.40 Lakh
							Sq. Mt.	
13	No. of Processing units		13			acity	39 Mt. Ton	
14	No. of cold Store		28		Cap	acity	116800 Mt.	
								Ton
15	Mushroom Growers			20 Unit			acity	508 Mt. Ton
16	No. of Bee Keeper			173		No	of Boxes	27000

15. **AGRICULTURE**

Agriculture is the main occupation of the people in the District, having different types of soil and agro-climate conditions which are quite suitable for the growing of various types of cereals, vegetables, fruits and other crops. The major crops grown in the district are Wheat, Paddy, Maize, Sugarcane, Oil seeds, sunflower and barley. Crop wise area is given below:

CROPS	2012-2013		2013-2014		2014-2015				
	Area	Yield	Prod	Area	Yield	Prod	Area	Yield	Prod
	(in			(in			(in		
	Ha)			Ha)			Ha)		
Wheat	234	4798	1123	232	4968	1153	233	4396	1024
Paddy(Rice)	233	3956	922	231	4153	959	230	3930	904
Maize	1	4149	4	1	4867	5	1	5447	5
Sugarcane	2	7613	15	3	7747	23	3	7476	22
(Gur)									
Oilseeds	1	1434	2	1	1431	1.4	1	1685	1.7
Sunflower	1	1631	1.6	1.3	1918	2.5	1	1946	2
Barely	1	3548	3	1	4458	4233	1	4069	4.1

Information on Rain-fed and Irrigated Area (in Ha)

Sr.	Name of	Rainfed	%	% Irrigated Area (Source Wise)					
No.	Block	Area							
				Canal Area	%	Tubewell	%	Any other area	%
1	Patiala	-	-	816	3	29349	97.2	-	-
2	Nabha	-	-	1262	3	49369	97.5	-	-
3	Samana	-	-	-	-	32997	100	-	-
4	Patran	-	-	-	-	36049	100	-	-
5	Bhunerheri		-	1600	5	33594	95.5	-	-
6	Sanour	-	-	990	3	27854	96.6	-	-
7	Rajpura	2503	8.7	550	2	25540	89.3	-	-
8	Ghanour	1496	5.8	822	3	23392	90.9	-	-

16. CROP DIVERSIFICATION

Crop Diversification refers to a shift from the regional dominance of one crop to regional production of a number of crops, to meet ever increasing demand of cereals, pulses, vegetables, fruits, oilseeds, fibres, fodder, grasses etc. It aims to improve soil health and to maintain dynamic equilibrium of the agro-ecosystem. In the instant case, crop diversification is intended to promote technological innovations for sustainable agriculture and enable farmers to choose crop alternatives for increased productivity and income.

The concerns relating to diversification of rice-wheat cropping systems area in the country came to fore when yield levels of these two most important food crops experienced stagnancy and net profit accruals showed diminishing trend. The problem got further aggravated due to depletion of water table in North-West plains zone comprising Punjab, Haryana and West Uttar Pradesh. Thus, dwindling ground water resource in these States due to excessive withdrawal of water for irrigation led to impurities in the water-a cause of attendant crop health effects.

The continuous cultivation of water guzzling crops like paddy due to frequent flood irrigation has resulted into depletion of ground water in the original Green revolution States namely; Punjab, Haryana and Western Uttar Pradesh. The continuous cultivation of rice wheat cropping system has witnessed the stagnancy in crop yield, infestation of weeds, contamination of ground water, incidence of pests-diseases and deterioration of soil health. Therefore, it is essential to diversify the area from paddy to alternate crops not only to improve soil fertility and arrest depletion of ground water but also to enhance the farm income.

The notified over-exploited and critical blocks based on recommendation of Central Ground Water Board of major paddy growing districts of each state. Three blocks namely Patiala, Patran and Sanour of Patiala district have been notified as over-exploited and critical blocks. At least 5% of area under paddy in notified blocks would be diverted towards alternate crops during 2016-17. In order to divert area to other alternate crops, it is proposed to motivate the farmers for cultivation of maize, kharif pulses (arhar, mungbean, uradbean, cluster bean), oilseeds (soybean, til) poplar based agro-forestry system (cultivation of rabi and kharif inter crops). It is also proposed to provide the assistance to the farmers for land development, farm mechanization, establishment of agro-based food processing units for value addition and marketing support to generate additional income and restore soil fertility.

17. <u>LIVE STOCKS</u>

The livestock is the main wealth next to agriculture of the predominant population of the district.

The district ranks third in the state in the population of cows and buffaloes. The important livestock of the district as per 19th Live stock census 2012(Tentative) was as under

1	Cattle	115637
2	Horse/Ponies	1197
3	Donkeys	161
4	Buffaloes	335167
5	Sheep(13268),Goat(15196),Piggery (3241)	31705
6	Mules	292

18. TOPOGRAPHY

The district forms a part of the Indo-Gangetic plain and consists of three types of region:-

- a. The Upland Plain
- b. The Cho-infested Foothill Plain
- c. The Floodplain of the Ghaggar River

Apart from this, the district has a complex drainage system consisting of canals and rivers.

18.1 Rivers:

The river Ghaghar is the most important water channel of the district. It is essentially a seasonal stream, remaining dry during most part of the year. However, during the rainy season, it remains in spate, often flooding the adjoining villages, causing damage to crops, livestock and at times to houses and human lives. A number of subsidiary rivulets join the Ghaggar River, the most important ones being the Tangri Nadi, Patiala-Wali-Nadi, Sirhind Choe and the Jhambowali Choe.

18.2 Canals:

Apart from the natural drainage line, the district also has three important canals- The Bhakra Main Line Canal, the Nawana Branch and the Ghaggar Link. These canals provide much needed irrigation water to the District. Before these canals were constructed, Patiala district was a water scarce area. These irrigation canals have helped to transform the parched fields into fertile, double-crop lands.

19. THE GHAGGAR RIVER

The Ghaggar is an intermittent river in India, flowing during the monsoon season. It originates in the Shivalik Hills of Himachal Pradesh at an elevation of 1927 Mtrs above mean sea level and flows through Punjab, Haryana, Rajasthan and Union Territory of Chandigarh. In Haryana, it flows through south-west of Sirsa and by-the-side of Talwara Jheel in Rajasthan. This seasonal river feeds two irrigation canals that extend into Rajasthan. The present-day Saraswati River originates in a submontane region (Ambala district) and joins Ghaggar near Shatrana in Punjab. A dried out channel of the Sutlej, joins the river Ghaggar near Sadulgarh (Hanumangarh), the Naiwal channel. The Ghaggar then joins with the dried up Drishadvati (Chautang) river. The wide river-bed (paleo-channel) of the Ghaggar suggests that the river once flows full of water, through the entire region, in the presently dried channel of the Hakra River, possibly emptying into the Rann-of- Kutch. It supposedly dried up due to the capture of its tributaries by the Indus and Yamuna rivers and the loss of rainfall in much of its catchment area due to deforestation and overgrazing

The Ghaggar-Hakra and the Sutlej: Many settlements of the Indus Valley Civilization era have been found along the Ghaggar and Hakra rivers. It has been shown by satellite imagery that at Ropar, the Sutlej River suddenly flows away from the Ghaggar in a sharp turn. The beforehand narrow Ghaggar river-bed itself suddenly becomes wider at the conjunction where the Sutlej should have met the Ghaggar river. And, there is a major paleo channel between the point where the Sutlej takes a sharp turn and the Ghaggar river bed widens.

• The Ghaggar-Hakra and the Yamuna: There are no Harappan sites on the present Yamuna River. However, painted Gray Ware sites excavated on the Yamuna channel, indicate that the river must have flown in that channel during 1000 - 600 BC. The distribution of the painted Gray Ware sites in the Ghaggar river valley indicates that during the ancient period, the Ghaggar River had already dried up partly.

• Subsidiary Rivulets :

Dhakansu Drain, Jacob Drain, Patiala Ki Rao, Jharmal Choe, Miranpur Choe, Bhagna Nadi, Marcanda River and Momian Drain joins Ghaggar River.

Historical Observations of quality of Ghaggar River:

The quality of Ghaggar River has been monitored by the CPCB under National Water Quality Monitoring Programme and provided for the period starting from 2004-2008. The results of Biochemical Oxygen Demand (BOD) parameter monitored during the above stated period at Mubarakpur (Punjab), Tiwana Village (Punjab), Chandarpur Siphon (Haryana), Sardulagarh (Punjab), Dabwali Road (Haryana), Ottu Weir (Haryana) and Ghaggar River entering in Rajasthan. In addition, the industrial and domestic wastewater discharges from the towns located along Ghaggar or its tributaries deteriorate the water quality of the river

- **Dhakansu Drain (PS8):** BOD concentration at Dhakansu Drain was 57 mg/l.
- **Jacob Drain:** BOD concentration at Jacob Drain is 76 mg/l and TSS level is four times above the prescribed standard. The Jacob Drain directly meets the Patiala River.
- Patiala River: A number of subsidiary rivulets join the Ghaggar River, the most important one being Patiala River. Patiala River meets the Ghaggar River at the upstream of Jharmal choe. This River also falls in the category of semi-arid region. At Patiala River, high BOD load was observed i.e. 32,228.26 kg/day.
- **Jharmal Choe (PS13):** Jharmal Choe received industrial and domestic sewage of Derabasi, Lalru and Zirakpur. BOD concentration at Jharmal Choe was 17 mg/l which is within the prescribed norms.

20. **DRAINAGE SYSTEM OF DISTRICT PATIALA**

21. <u>METHODOLOGY AND GUIDING PRINCIPLES</u>

The trace of each and every river/ stream was covered and studied on the following principles of Geology/River bed mining:

- The general geology of the area;
- The presence of any major geological structure;
- Origin of river;
- Pattern of primary / secondary/ tertiary streams;
- Total catchments:
- General profile of river/streams;
- Meandering Pattern;
- Bank stability;
- Total potential of river bed in reference to minor mineral;
- General slope of the river / stream;
- Morphogenetic regions.

In Addition to above, presence of the following objects were also studied:-

- The presence of any WSS Schemes
- Bridges
- Agriculture fields
- Bank protection works
- Plantation etc.

Following are the important guiding principles considered while recommending the river / stream bed or part of the river / stream bed for collection for minor minerals:-

• The production of aggregate area is a function of the availability of natural resources, the size of population, the economy of the area and various developmental and infrastructural works being undertaken in the area like road construction, hydroelectric projects etc. Further, being a low-value, high-volume mineral commodity, the prices are dramatically affected by transportation distances. If the distance increases, the transportation cost may increase much more than the cost of the aggregates.

- A stable river is able to consistently transport the flow of sediments produced by watershed such that its dimension (width and depth) pattern and vertical profile are maintained without aggrading (building up) or degrading (scouring down)
- The amount of boulders, cobbles, pebbles and sand deposited in riverbed equals to the amount delivered to the river from watershed and from bank erosion minus amount transported downstream each year.
- It is compulsive nature for river to meander in their belts and therefore they will have to be provided with adequate corridor for meandering without hindrance. Any attempt to diminish the width of this corridor (floodway) and curb their freedom to meander would prove counterproductive.
- Erosion and deposition is law of nature. The river/stream has to complete its geomorphological cycle from youth, mature to old age.
- River capturing is unavoidable.
- Erosion in upstream and deposition in downstream.
- Tendency of the river / stream toward grade.
- Fundamentally, the lowest point of any stream is fixed by Sea Level.
- The ratio between the width of meander belt and width of the stream decreases as the width of the stream increases.
- Formation, Bank erosion and Replenishment of any specific riverbed depends

 Primarily upon:
 - ➤ The Geology of the area;
 - ➤ River Profile:
 - Nature of source:
 - > Rainfall in catchments:
 - ➤ Morphogenetic region;
 - > Catchments geomorphology;
 - Efficiency of River / Stream (i.e erosive power);
 - The competency of the river / Stream (i.e transport heaviest stone);
 - The capacity of the River/Stream (i.e volume of transportation);
 - ➤ Hydraulic radius of the River / Stream (ratio between cross sectional area and length of wetted perimeter)

Secondarily upon:

- ➤ Geological structures;
- > Porosity of formation;
- > Run off in the catchments:
- > Forest cover;

In addition to above following man made factors are also involved:

- > Type of agriculture;
- Encroachment on flood plain leaving least space for meandering;
- Any barrier on river / stream bed i.e bands, dams and bridge foundations etc;
- > Throwing of debris into the river/stream course;
- > Drying up of river courses due to construction of dams, thereby reducing the efficiency and capacity of the river / stream.

The total potential of the river / stream bed is calculated up to the depth of one meter and in the workable span. Total potential or annual replenishment is not necessarily mineable. Mine ability depends upon the availability of approachable roads, distance from the general conditions of policy viz distances from WSS Schemes, bridges etc and overall on the market demand etc. Thus keeping these factors into consideration 60% of the total potential has been taken for the purpose of exploitation of minor minerals.

Method For calculation of Reserves:

For the calculation of total reserves of minor minerals available in the river bed, length, average width and depth of the river bed for which the exploitation is to be carried out / allowed under rule / prevailing instructions of the Govt. was taken into consideration. The volume thus obtained is multiplied with the bulk density which has been assumed as 2.2 for all types of minor minerals. Thus reserves up to particular datum line i.e one meter below the surface have been calculated.

Total reserves of minor minerals (M.T.)= Length x Width x Height i.e Depth x Density.

For the annual replenishment of minor mineral reserves, the average annual mean depth up to which the replenishment of minor mineral takes place annually, has been taken into consideration which depends upon the annual rainfall factor and geology of the catchments area.

22. OVERVIEW OF MINING ACTIVITIES IN THE DISTRICT

Mainly three types of minor minerals constituents such as sand, stone and bajri are required for any type of construction apart from other material like cement and steel. In earlier times, the houses / buildings were constructed in form of small dwellings with walls made up of mud plaster, stone and interlocking provided with wooden frames and there were negligible commercial as well as developmental activities resulting in less demand of building material. However with the passage of time, new vistas of developmental activities were started. The quantity of minor minerals consumption in a particular area is a thermometer to assess the development of the area. Thus with the pace of development activities, the consumption of minor minerals also increased. As such the demand of minor minerals in the district has started an increasing trend. In order to meet the requirement of raw material for construction, the extraction of sand is being carried out exclusively from the river beds. In Patiala district, the demand of sand (river borne collection) and of bajri / grit (river borne collection or through manufactured grit by stone crushers) is mainly met by the supply from other districts of Punjab. In district brick earth and ordinary earth mining is carried out with prior Environment Clearance (EC) to met the requirements of bricklines and for filling / leveling purposes respectively.

23. SAND MINING IN THE DISTRICT

In recent past, the Department of Industries and Commerce, Punjab used to auction the minor minerals of the river beds falling in the jurisdiction of Patiala District and different quarries were put to auction till year 2013.

Sr. No.	Year	No. of Quarries	Name of Quarries		Sand(Roya lty) in RS	quantity extracte
			QUARRY	AREA (IN ACRE)		d in MT
1	2005-2006	20	1 BADLI	12.55	10814565	720971
			2 SEKHUPURA	5.51		
			3 CHAMARU	53.51		
			4 SAUNTA	13.92		
			5 BADLA	12.08		
			6 KAPURI	16.60		
			(SEKHUPURA)		_	
			7 SAMSHPUR	22.36	_	
			8 BASMA	26.61		
			9 NANHERI	40.66		
			10 RAMPUR NEAR	40.44		
			CHAMARU			
			11 RAMPUR	12.81		
			KALAN			
			12 KAPURI	35.26		
			13 LOHGARH	1.00		
			14 UTSAR	34.62		
			15 JANDMOGALI	7.91		
			16 SARANGPUR	210.39		
			17 LACHRU	3.48		
			KHURD			
			18 TEPLA	93.00		
			19 BHAMBUA	20.13		
			20 RAJGARH	22.95		
2	2006-2007	20	-do-		8364000	418200
3	2007-2008	20	-do-		28456000	122280
4	2008-2009	20	-do-		35876328	1195877
5	2009-2010	20	-do-		27803825	926794

	2010 2011	11	OLIADDV	ADEA /INI	26442564	001410
6	2010-2011	11	QUARRY	AREA (IN	26442561	881418
			1 KADUDI	ACRE)		
			1 KAPURI	16.05		
			(SEKHUPURA)	0.5.50		
			2 BADLI	06.69		
			3 BADLA	8.85		
			4 SAEKHUPURA	3.47		
			5 BARKATPUR	2.71		
			6 TEPLA	42.09		
			7 RAJGARH	42.06		
			8 SAMSHPUR	15.76		
			9 RAMPUR	13.28		
			10 SONTA	6.09		
			11 NANHERI	37.35		
7	2011-2012	8	QUARRY	AREA (IN	4347000	1449000
				ACRE)		
			1 BADLI	5.82		
			2 BADLA	5.99		
			3 SAEKHUPURA	2.93		
			4 BARKATPUR	2.87		
			5 BASHMARA	4.60		
			6 SAMSHPUR	7.54		
			7 RAMPUR	10.91		
			8 SONTA	4.02		
8	2012-13	8	-do-	- 1	3042900	101430
9	2013-2014	1	QUARRY	AREA (IN	2269882	36611
				HA)		
			TEPLA	17.07		
10	2014-2015	1	QUARRY	AREA (IN	10270000	23616
				HA)		
			TEPLA	17.07		
		L	1	17.07		

Recommendations: The above mentioned quarries except Nanheri, Rajgarh, Tepla and Kapoori are not fit for grant of mineral concessions as the annual deposition is very insignificant and stream width is narrow in major portion. The other reason for less deposition is that Govt. of Haryana had built The **Kaushalya Dam** which is a 700 meter long and 34 meter high an earth-fill embankment dam on the Kaushalya river, which is a tributary of Ghaggar-Hakra River (modern remnant of ancient Sarasvati river), in Pinjore of Haryana state, India.

The Government of Haryana built this dam for providing 40 cusecs or 25 MGD (million gallons per day) of raw water to Panchkula city, recharge ground water, check flash floods, promote tourism and fisheries in reservoir area. Due to this dam, the flow of water has reduced drastically because of which the replenishment of sand has decreased. Apart from this, the Govt. of Punjab has proposed to build dam at village Chatt district Mohali.

23.2 Active Sand Quarries of the District

The Department of Industries and Commerce, Punjab hired a consulting agency namely Grass Root Research & Creation India (P) Ltd., Noida for conducting the Environment Impact Assessment and Environment Management Plan of Sand Mining Projects of District Patiala. On the basis of detailed survey report submitted by the said consulting agency, the projects were submitted to Expert Appraisal Committee (E.A.C) for environment clearance. Government of India, Ministry of Environment and Forests, I.A Division considered the proposal for environment clearance in the E.A.C meeting for the Project "Excavation of sand Quarry Nanheri, Rajgarh, Tepla and Kapoori" in favour of Mining Officer Patiala. Further for the Excavation of sand quarry Kapoori, the proposal has been sent to the Director, Ministry of Environment and Forests, Wildlife Division for the issuance of Environment Clearance Certificate as this quarry falls within 10 k.m. radius of Wildlife sanctuary Bhunerheri Bir. Any project or activity specified in Category 'B' will be treated as Category A, if located in whole or in part within 10 km from the boundary of: (i) Protected Areas notified under the Wild Life (Protection) Act, 1972, { There are Six Wildlife sanctuaries in the district and are mentioned at page no. 12 of District Survey Report (ii) Critically Polluted areas as notified by the Central Pollution Control Board from time to time, (iii) Notified Eco-sensitive areas, (iv) inter-State boundaries and international boundaries. Specific Condition (SC): If any Industrial Estate/Complex / Export processing Zones.

Sr. No.	Name of Quarry	Had Bast No.	Area in Ha	Khasra No.
1	2	3	4	5
1	Tepla Block Ghanour Tehsil Rajpura	149	17н07	753, 754, 755, 756, 757, 761, 762, 771, 772, 778, 779, 780, 829, 831, 852, 853, 2131/889, 2130/889, 894, 895, 1440, 1450, 1451, 1501, 1504, 1499, 1507, 1150, 1151, 1148, 1152, 1153, 1154, 1932/1183, 1182, 1197, 1181, 1198, 1203, 1218, 1219, 1241, 1934/1242, 1251
2	Rajgarh Block Ghanour Tehsil Rajpura	147	11H73	1189/1109, 1110, 1191/1112, 1108, 1111, 1190/1112, 1101, 1102, 1104, 1105, 1106, 1107, 1103, 1100, 1093, 1094, 1042, 1027/2, 1029/2, 1027/1, 1030/1, 992, 987, 988, 985, 986, 989, 980, 982, 983, 918, 900, 899, 901, 902, 903, 904, 908, 909, 910
3	Nanheri Block Ghanour Tehsil Rajpura	383	11H28	392, 393, 394, 395, 399, 400, 401, 417, 418, 379, 402, 403, 425, 378, 376, 377, 368, 369, 370/1, 947/280, 948/280, 163, 168, 165, 166, 161, 162, 876, 885, 630, 267, 270, 271, 274, 273, 846, 845, 848, 877, 623, 892min, 934, 887, 901
4	Kapoori Block Bhunerheri Tehsil Patiala	240	6 a63	27

The quarries mentioned above were put to e-auction vide No. G.L.G/5/G1/Auction/1085/2015/9543-B on 10.11.2015 for auction on 02.12.2015, but no bids were received for these quarries i.e Nanheri, Rajgarh, Tepla and Kapoori.

23.3 Recommendations: On the basis of the report submitted by Grass Root Research & Creation India (P) Ltd., it is recommended that the mineral concession can be granted for these quarries and mining is necessary in the river beds to control the floods occurring during monsoon season. Any project or activity specified in Category 'B' will be treated as Category A, if located in whole or in part within 10 km from the boundary of: (i) Protected Areas notified under the Wild Life (Protection) Act, 1972, { There are Six Wildlife sanctuaries in the district and are mentioned at page no. 12 of District Survey Report} (ii) Critically Polluted areas as notified by the Central Pollution Control Board from time to time, (iii) Notified Eco-sensitive areas, (iv) inter-State boundaries and international boundaries. Specific Condition (SC): If any Industrial Estate/Complex / Export processing Zones. A Mineral Concession holder has to abide by the provisions of The Mines and Minerals (Development and Regulation) Act, 1957 and The Punjab Minor Mineral Rules 2013 made thereunder.

23 BRICK EARTH MINING

Brick is a building material used to make walls, pavements and other elements in masonry construction. Traditionally, the term brick referred to a unit composed of clay, but it is now used to denote any rectangular unit laid in mortar. A brick can be composed of claybearing soil, sand and lime, or concrete materials. Bricks are produced in numerous classes, types, materials, and sizes which vary with region and time period, and are produced in bulk quantities. Two basic categories of bricks are fired and non-fired bricks. Fired bricks are one of the longest-lasting and strongest building materials, sometimes referred to as artificial stone, and have been used since circa 5000 BC. Air-dried bricks, also known as mudbricks, have a history older than fired bricks, and have an additional ingredient of a mechanical binder such as straw. Natural clay minerals, including kaolin and shale, make up the main body of brick. Small amounts of manganese, barium, and other additives are blended with the clay to produce different shades, and barium carbonate is used to improve brick's chemical resistance to the elements. Many other additives have been used in brick, including byproducts from papermaking, ammonium compounds, wetting agents, flocculents (which cause particles to form loose clusters) and *deflocculents* (which disperse such clusters). Some clays require the addition of sand or *grog* (pre-ground, pre-fired material such as scrap brick).

24.1 No. of Brick Klins in the District:-

Category of Brick Klin	Description	Number
A	Brick Klin of capacity 28 ghoris or more of	1
	kachi bricks	
В	Brick Klin of capacity 22 to 27 ghoris of	143
	kachi bricks	
С	Brick Klin of capacity below 22 ghoris of	2
	kachi bricks	
		146

24.2 Number of Brick Kilns Block Wise

Sr. No.	Name of Block	Number of Klins
1	Patiala	16
2	Nabha	30
3	Rajpura	17
4	Samana	23
5	Patran	16
6	Ghanour	15
7	Sanour	17
8	Bhunerheri	12
	Total	146

24.3 Recommendations:

In district Patiala, there are 8 development blocks. The earth in Block Ghanour, Rajpura and Bhunarheri is rich in alumina, silica and lime. Therefore, this earth is very useful as brick earth. In other blocks such as Patiala, Nabha, Samana, Patran and Sanour the earth is mostly sandy but in some villages/areas the earth is useful for bricks manufacturing.

The brick kilns require brick earth which is easily available in the district as they excavate upto 2-3 feet, it has no adverse effect on the environment. Any project or activity specified in Category 'B' will be treated as Category A, if located in whole or in part within 10 km from the boundary of: (i) Protected Areas notified under the Wild Life (Protection) Act, 1972, {There are Six Wildlife sanctuaries in the district and are mentioned at page no. 12 of District Survey Report} (ii) Critically Polluted areas as notified by the Central Pollution Control Board from time to time, (iii) Notified Eco-sensitive areas, (iv) inter-State boundaries and international boundaries. Specific Condition (SC): If any Industrial Estate/Complex / Export processing Zones. A Mineral Concession holder has to abide by the provisions of The Mines and Minerals (Development and Regulation) Act, 1957 and The Punjab Minor Mineral Rules 2013 made thereunder.

24 ORDINARY EARTH MINING

Ordinary earth is used for filling or leveling purposes in construction or embankments, roads, railways and buildings. In Patran block, there are sand dunes in villages like Butta Singh Wala, Kalvanu, Dedhna, Nanhera, Drauli, Tambu Wala, Ban Wala situated on left side of the Samana-Patran road. There are also sand dunes on the right side of this road i.e. village Dhuhar, Rampur Pandtan, Dugal kalan, Dugal Khurd, Jainpur. There are also

some sand dunes on Jhakkal road at Shelwala village. The remaining land is useful for brick earth.

In Samana Block, Village Dhanheta, Saundewala, Asmanpur, Fatehpur, Rajla, Kakra, Sehajpur Kalan, Sehajpur Khurd, Gajjewaz and Mavikalan have sand dunes. The land of block Sanour, Patiala and Nabha has mixed soil i.e. sandy and brick earth.

25.1 Recommendations:

The sandy land is less fertile and after excavation of top layer of sandy soil upto 3-4feet depth, fertile layer will come up and in this way crop production will rise and this will also save groundwater as the top sandy layer does not hold the water. This has no adverse effect on the environment. Any project or activity specified in Category 'B' will be treated as Category A, if located in whole or in part within 10 km from the boundary of: (i) Protected Areas notified under the Wild Life (Protection) Act, 1972, { There are six Wildlife sanctuaries in the district and are mentioned at page no. 12 of District Survey Report} (ii) Critically Polluted areas as notified by the Central Pollution Control Board from time to time, (iii) Notified Eco-sensitive areas, (iv) inter-State boundaries and international boundaries. Specific Condition (SC): If any Industrial Estate/Complex / Export processing Zones. A Mineral Concession holder has to abide by the provisions of The Mines and Minerals (Development and Regulation) Act, 1957 and The Punjab Minor Mineral Rules 2013 made thereunder.

25 ECONOMIC IMPACT OF MINING

The mining will generate direct and indirect employment during mining operations and most of the unskilled labour will be used for mining purposes and they will be paid more than minimum wages prescribed by State Govt. In general, there will be no adverse effect on human health as no blasting or handling of toxic material is involved. All the safety measures will be strictly followed to prevent occupational risk during excavation, loading and transportation. This will be a good source of revenue generation for the government as after getting the Environment Clearance, the minor concessioner will have to pay the Royalty, Price, Environment Management Fund and TCS which will enhance the revenue of the Central and State Government.