(III)

SURVEY DOCUMENT

STUDY ON THE DRAINAGE SYSTEM, MINERAL POTENTIAL AND FEASIBILITY OF MINING IN RIVER/ STREAM BEDS OF DISTRICT CHAMBA, HIMACHAL PRADESH.

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1) INTRODUCTION:

In pursuance of point 9.2 (Strategy 2) of "River/Stream Bed Mining Policy Guidelines for the State of Himachal Pradesh, 2004" was framed and notiofied vide notification No - Ind-II (E)2-1 2001 dated 28.2.2004 and subsequently new mineral policy 2013 has been framed. Now the Minstry of Environemnt, Forest and Climate Change, Govt of India vide notifications dated 15.1.2016, caluse 7(iii) pertains to preparation of Distt Survey report for sand mining or riverbed mining and mining of other minor minerals for regulation and control of mining operation, a survey document of existing River/Stream bed mining in each district is to be undertaken In the said policy guidelines, it was provided that District level river stream bed mining action plan shall be based on a survey document of the existing river stream bed mining in each district and also to assess its direct and indirect benefits and identification of the potential threats to the individual rivers/streams in the State.

This survey shall contain:-

a) District wise detail of Rivers/Streams/Khallas; and

b) District wise details of existing mining leases/ contracts in river/stream/khalla beds

Based on this survey, the action plan shall divide the rivers/stream of the State into the following two categories;-

a) Rivers/ Streams or the River/Stream sections selected for extraction of minor minerals

b) Rivers/ Streams or the River/Stream sections prohibited for extraction of minor minerals.

Based on the action plan as mentioned above, mining leases/ contracts shall be granted in accordance to the Himachal Pradesh Minor Minerals (Concession) and Minerals (Prevention of Illegal Mining, Transportation and Storage) Rules, 2015 and observing the Policy Guidlines. Accordingly, the survey report of the river beds/ parts of river beds of District Chamba has been prepared.The rivers/streams were studied based on the following parameters excluding the hill slope mining.

a) **Geomorphological studies:**

i)Place of origin

ii) Catchment area

iii) General profile of river stream

iv) Annual deposition factor

v) Replenishment

vi) Total potential of minor minerals in the river bed.

b) **Geological Studies:**

i)Lithology of catchment area

ii) Tectonics and structural behaviour of rocks.

c) **Climatic parameters:**

I) Intensity of rainfall

II) Climate zone

III) Temperature variation.

2) BRIEF HISTORY OF THE DISTRICT:

Chamba district in the state of Himachal Pradesh, in northern India. According to the 2001 Indian census the town is situated on the banks of the Ravi River (a major tributary of the Trans-Himalayan Indus River), at its confluence with the Sal River. Chambial were the Rulers of Chamba State [1] Chambials use suffix Varmans.

Though historical records date the history of the Chamba region to the Kolian tribes in the 2nd century BC, the area was formally ruled by the Maru dynasty, starting with the Raju Maru from around 500 AD, ruling from the ancient capital of Bharmour, which is located 75 kilometres (47 mi) from the town of Chamba. In 920, Raja Sahil Varman (or Raja Sahil Verma) shifted the capital of the kingdom to Chamba, following the specific request of his daughter Champavati (Chamba was named after her). From the time of Raju Maru, 67 Rajas of this dynasty have ruled over Chamba until it finally merged with the Indian Union in April 1948.

3.1 General

The Chamba district of the present form came into existence on 1st November 1966 which is bounded on north west by Jammu and Kashmir, on the north east and east by Ladakh area of Jammu and Kashmir state and Lahaul and Bara Bangal area of Himachal Pradesh, on the south east and south by the District Kangra of Himachal Pradesh and Gurdaspur District of Punjab. The district is Situated between north latitude 32° 11' 30" and 33° 13' 06" and east longitude 75° 49' 00" and 77° 03' 30". The area of the district is 6,522 sq. km with Chamba as its Headquarters. There are 1591 villages in the district. The district has been divided into 7 Sub divisions [Chamba, Churah, Pangi, Bharmaur, Dalhousie, Salooni, Chowari]

Total Population As Per 2011 census.	**5,19,080**	
Male Population	2,61,320	
Female Population	2,57,760	
Total Literates	3,23,842	
Male Literacy	186064	82.59 %
Female Literacy	137778	61.67 %
Geographical Area	**6,522 Sq. km.**	
Forest Area		6528 Sq. km.
Cultivated Area		**1175 Sq. km.**
Unusable Area		**2197 Sq. km.**
Range Altitude	609 to 6402 mts	1220 mtr. (Head Quarter)
Longitude	75 Degree 49 degree 00' (E)	77 Deg. 03 Deg. 30" (East)
Latitude	32 Degree 11 Degree 30' (N)	33Deg 13 Deg 06"(North)
Major Rivers	Ravi River	A Perennial river
Climate		
Rainy Season	From July to September	Temp. Approx. 32 degree C
Winter	October to February	Temp. Approx. 5-22 degree C
People & Culture		
Major Religions	Hindus, Sikhs and a number of Muslims also.	

Languages Spoken	Pahari(Chambyali), Punjabi, Hindi
Culture	Traditional and Pahari
Traditions	Religious
Art Forms	Chamba Rumal
Administrative Setup	
No. of Sub-Divisions	6
No. of Tehsils	7
No. of Sub-Tehsils	3
Development Blocks	7
Panchayats	283
Census Town	1 (Chamba) As per Census 2011

The district has varying altitude ranging from 609 to 6402 m above mean sea level, with some plain areas touching Pathankot district of Punjab in the south and Kangra district of H P in the South. In the East it touches Lahal Spiti district, in North with Jammu and Kashmir. The Ravi is the main river of Chamba district and is the heart and soul of the Chambyals. With its tributaries, it drains the whole of Chamba valley proper between Dhauladhar and Pangi range and thus commands the largest and most important part of the district. The river originates from Bara Bangahal area of Dhauladhar. The Main tributaries of Ravi are Budhil, Tundah, Beljedi, Sal, Siul, Siowa The river Chenab or Chandrabhaga rises from the mountains of Baralacha pass by two heads, the stream with its source on south-eastern side of the pass being called the Chandra and the other one which rises from north-western side is called the Bhaga. After the confluence of these two sister streams at Tandi, the river is generally known as Chenab. There are no large-sized lakes in Chamba district. However, a few water bodies namely Khajjiar Lake. The district with respect to revenue control has been divided into seven Tehsils and three sub-Tehsils. There are 283 Gram Panchayats.

3.2 Physiographical conditions

Introduction:-

The area in general is a part of the Lesser Himalaya. The lesser Himalaya, located in northwestern India in the States of Himachal Pradesh and Uttar Pradesh, in north-central India in the State of Sikkim, and in northeastern India in the State of Arunachal Pradesh, ranges from 1,500 to 5,000 metres in height. Terrains of the area are rugged and there is no. of steep sided valley and

very narrow spurs and having thick forest cover mainly of the deodar and kail etc. Soil cover of the entire area is very thin and acidic with increase in altitude. The main river of the district are Ravi, Budhil, Suil, and Tundahand main glaciers of the district is belongs to the Bara-Bhangal & Tantagiri-glacier area.

Chamba district can be divided into following four distinct zone as per elevation (Figure 3).

1. Above 5000 meters
2. 3000 – 5000 meters
3. 1000 – 3000 meters
4. Less than 1000 meters

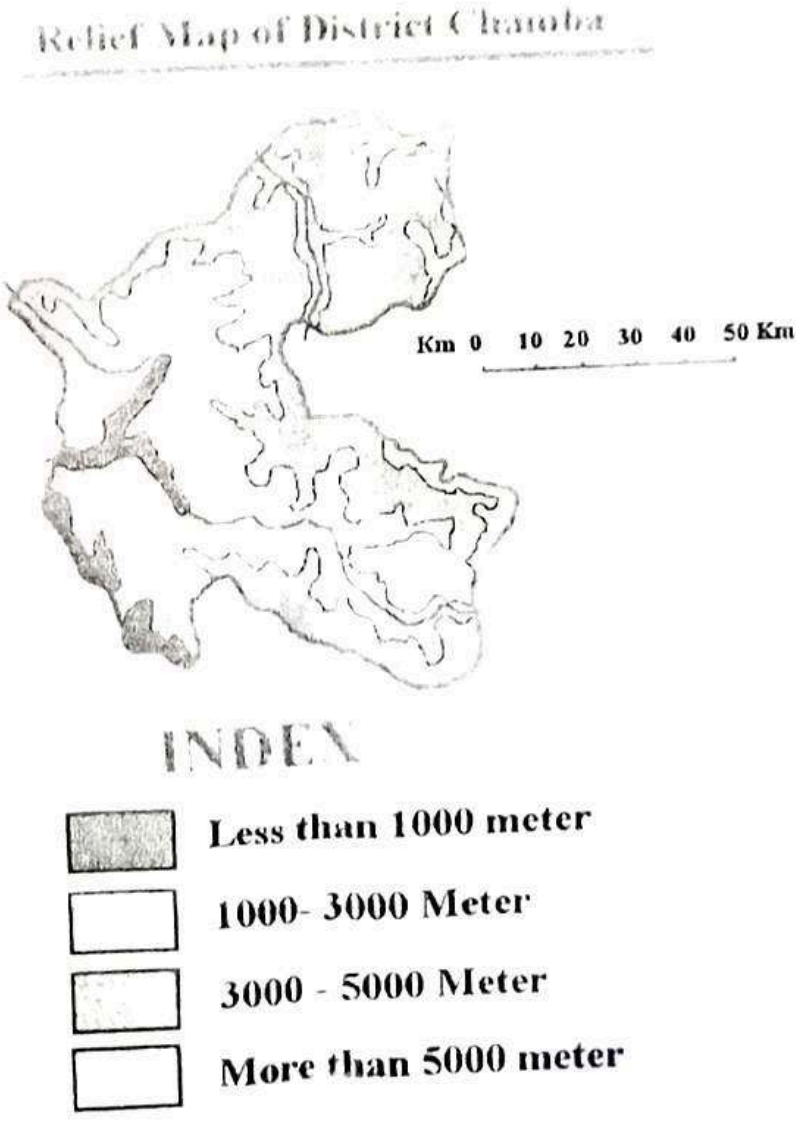
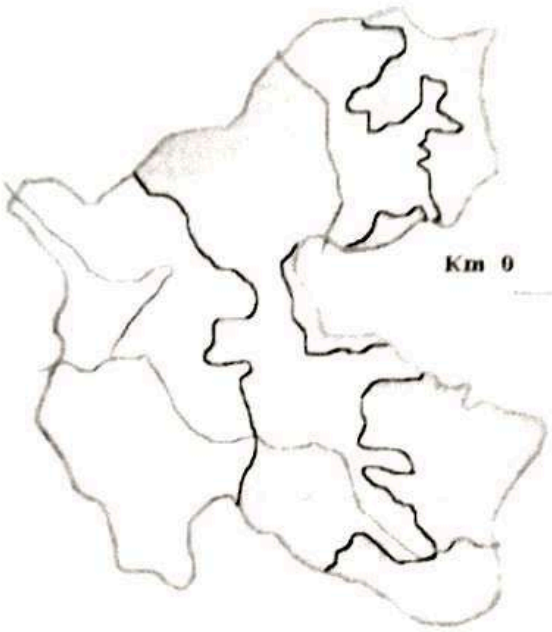


Figure 3: Relief Map of District Chamba.

The district can be divided into three distinct zones as per slope (Figure 4)

1. 400 - 600 meters/km
2. 250 - 400 meters/km
3. Less than 250 meters/km

Slope Map of District Chamba



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Slope (In Meter per Km

Less than 250

250 - 400

400 - 600

3.3 Climate:

This area is generally categorized in four seasons. Winter mainly starts from mid November and continues till mid March. December and January, February is severe cold months when the winter seasons are at its peak. The climate is comparatively hot from mid may to mid July. The rainy seasons are broadly very small from July to September. Where autumn seasons is generally last from September to mid November due to variation in altitude. There is also remarkable variation temperature as minimum temperature in highest area lies below 0 c during the months of winter and maximum temperature during the winter in this area lies between 5°c to 30°c and during summer the temperature various from15 c to 40c.

4) Fauna & Flora

4.1 Fauna

The district is rich in animals and birds which include some of the rare species. The animals and birds that are found in the district are- (1) Ghoral, (2) Kakar, (3) Kastura, (4) Aimu, (5) Ibex, (6) Blue mountain sheep, (7) Thar, (8) Black Bear, (9) Brown Bear, (10) Panther or Leopard, (11) Snow Leopard, (12) Wild Boar, (13) Spotted Deer of Chital, (14) Samber, (15) Porcupine, (16) Flying squirrel (17) Himalyan Pine Martin etc. Apart from the important game animals described above animals like Jackal, Monkey, Langoor, Fox etc. are also met within the area. There is a variety of birds in the district like Monal pheasant, Snow cock, Western horned tragopan, Juguriam, Pea-cock, Ring dove, Spotted dove, shikara, parrot, tawny eagle, green pigeon, pigeon, gritton vulture, tits, nut cracker, Pies, Wood peaker, Crow, Himalyan fly catcher, etc. which are found in the tract of this district.

4.2 Flora

This district is rich in flora. The following various species of plants and forest trees are generally found in Kangra district.

Table-1:

Vernacular Name	Botanical Name
Bil	Aegle marmelos
Neem	Azadirachta indica
Tun	Cedrela toone
Aam(cultivated)	Mangifera indica
Deodar	Mimosa rubicaulis
Kikar	Acacia arbaica
Khair	Acacia catech
Behera	Terminalia belerica
Harrer	Terminalia chebula
Kinu	Diospyross fomentosa
Toot(cultivated)	Morus alba
Palakh	Ficus rumphii
Pipal(cultivated)	Ficus religisa
Rumbal	Ficus glomerata
Khor, Akhrot	Juglans regia

5) Agriculture:

Main occupation of the community of area is agriculture. The Economy of District is mainly agrarian as most population of the District is directly dependent on agriculture and related activities. Due to diversity in the soil character and agro-climate condition which are quite best for the growing of the various types of the vegetables, fruits, cash crops etc., different types of the agriculture as well as horticulture products are produced here. The soil in the District is clay & clay loamy with or without gravel and soil depth varies with respect to hill slope angle. The moisture retention capacity of the area is poor due to the fact that the bed rocks are argillaceous. The main crops of Maize, Wheat, and Barley. Besides this many types of vegetable varieties are also produced and main vegetable varieties include potato, tomato, cabbage, and cauliflower etc. Large population of the area also depends upon the agriculture activities for livelihood and considerable proportion of the population of the area are being supported by the agriculture activities also.

6) **Horticulture:**

The horticulture condition that prevails in the area is not very supportive and suitable for the temperate fruits. The main horticulture crops of the district are Apple and is the 4th largest apple growing District in State of Himachal Pradesh. The topography and agro-climatic conditions of the District are quite suitable for the production of the various fruits. Horticulture plays an important role in the Socio-economic development and the prosperity of the inhabitants of the District. Fruits of various kinds depending upon the terrain, climatic condition and soil are grown in the District. The main varieties of the apple grown here are royal, red-rich, golden and Extreme red etc. Apart from this many other varieties of the fruits such as apricots, peaches, pears palm, cherry, walnuts etc arte also grown. The total production of both apple and fruits are increasing per year in comparison to last 4-decades. If we compare the total production of the last 3-4 decades in 1989-90, the total area under production was about **29141 heet**. And the total production was 2, 48,109 tonnes in comparison to the year 1967-68 where the total area under production was 10677heet and total production was 22,640 tonnes.

Area under each fruit and their production

Table-2

Almond	282	43
Walnut	1249	1182
Mango	3990	92
Grapes	2	5
Litchi	6	6
Malta	1	0
Gal gal	278	1518
Loquat	1	2
Almond	282	43
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Walnut	1249	1182
Mango	3990	92
Grapes	2	5
Litchi	6	6

Malta	1	0
Gal gal	278	1518
Loquat	1	2

7) **Land use pattern and Social aspect of the area:**

In Chamba District, there are several small and deep valleys spread in different parts with moderate to high elevations. Here the cultivation is possible only in small terrace, flood plain and the area is moderate to gentle sloping and also holdings the area in either in the river basin or high hilly area etc. In valley area the cultivation is mainly spread over large area. Area with high altitude is best for the growing orchards like's apples and other fruits such as almonds, Walnuts etc. Maximum area land are under the dense and thick forest cover and orchards. The main forests varieties are deodar, Chil, Pine, kail .Rai, ban etc and suitable altitude for the growth of this type of vegetation is 1600-1800m.

Land Use Pattern of District Chamba

Table-3:

S. No.	Category	Area
1	Land use Forest Cover	272
2	Barren & Uncultivated land	5.5
3	Permanent pasture	350.8
4	Other fallow land	11.8
5	Cultivable Land	44.8
TOTAL		**684.9**

8) **Forests:**

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 climatic condition prevailing in Himachal Pradesh and varying elevations are most suitable for the growth of forests.

In Chamba District, various important species of trees namely Deodar, Kail, Chil, Oak, Mohru and Kharu *etc* are found in the forests and the major forests produce are resin and medicinal herbs. The available resin in the District is being processed by two resin and turpentine factories at Bilaspur and Nahan. However, the medicinal herbs are being exported in raw from out of the District.

The forests in the District are mainly in the tract of outer Shiwalik to the mid Himalayas. The soil is generally sandy-loom and depth is shallow except in the areas having vegetation cover where it is fairly deep in the region above 1500 Mtrs. The soil is generally deep and contains a thin layer of leaf moulded species of Ban, Oak, Chil, Kail and Deodar In the lower elevation scrub forms are found while in the higher altitude Deodar, Kail etc. are available, hi the lower ranges with warmer aspects and sharp slopes with deep soil and favourable conditions, species of mixed forest of Bamboo and scrub are found.

9. **Rainfall of the area :-**

Rainy seasons broadly start from mid July and extend unto mid-September. During winter the rains are scarce and extend between 15th December to 15th February. The following table shows the quantum of rainfall during the year 2004-2005 and 2006 in district Chamba.

Table no. 1
Rain fall data -2004(inm.m)

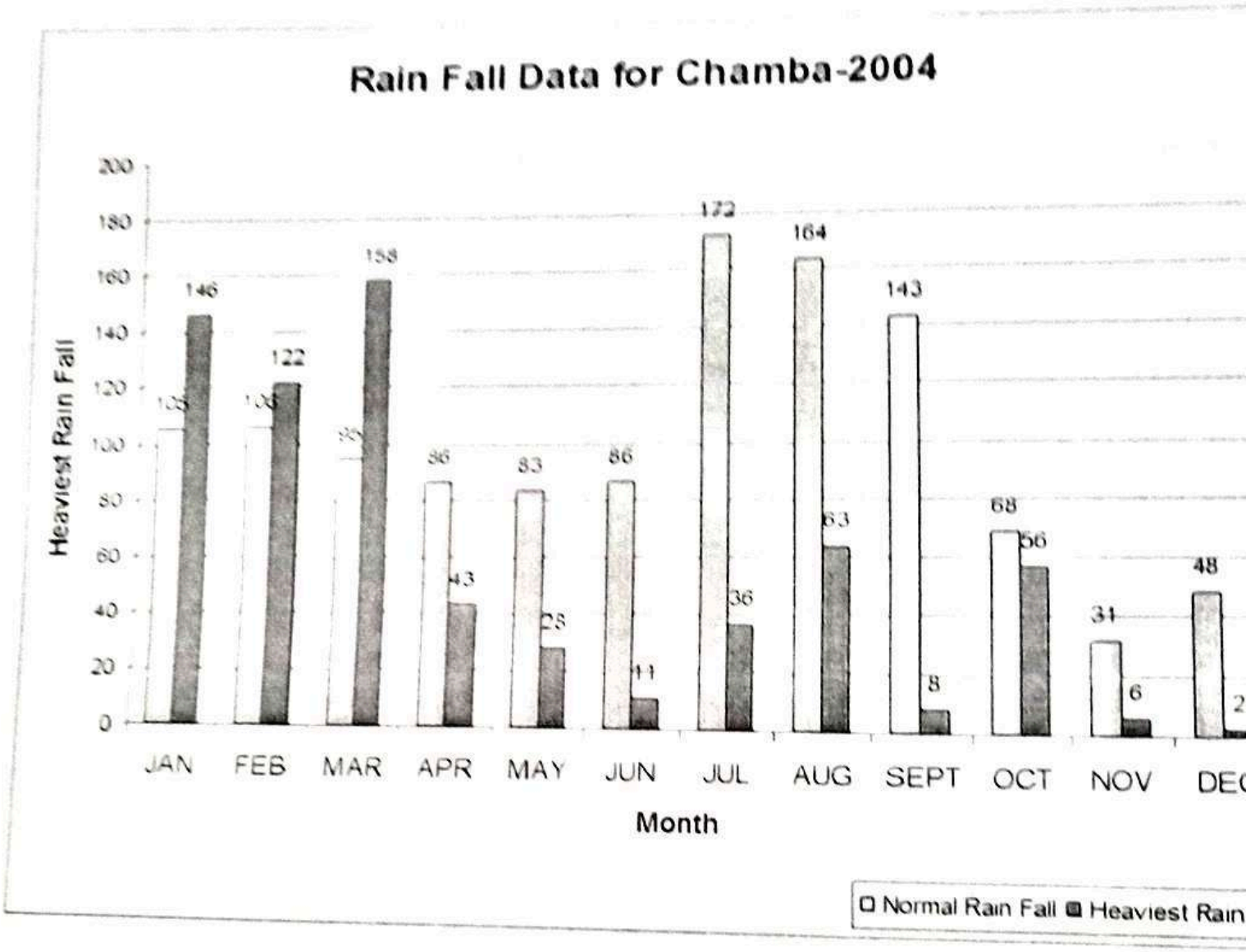


Table no 1

Rain fall data [illegible]

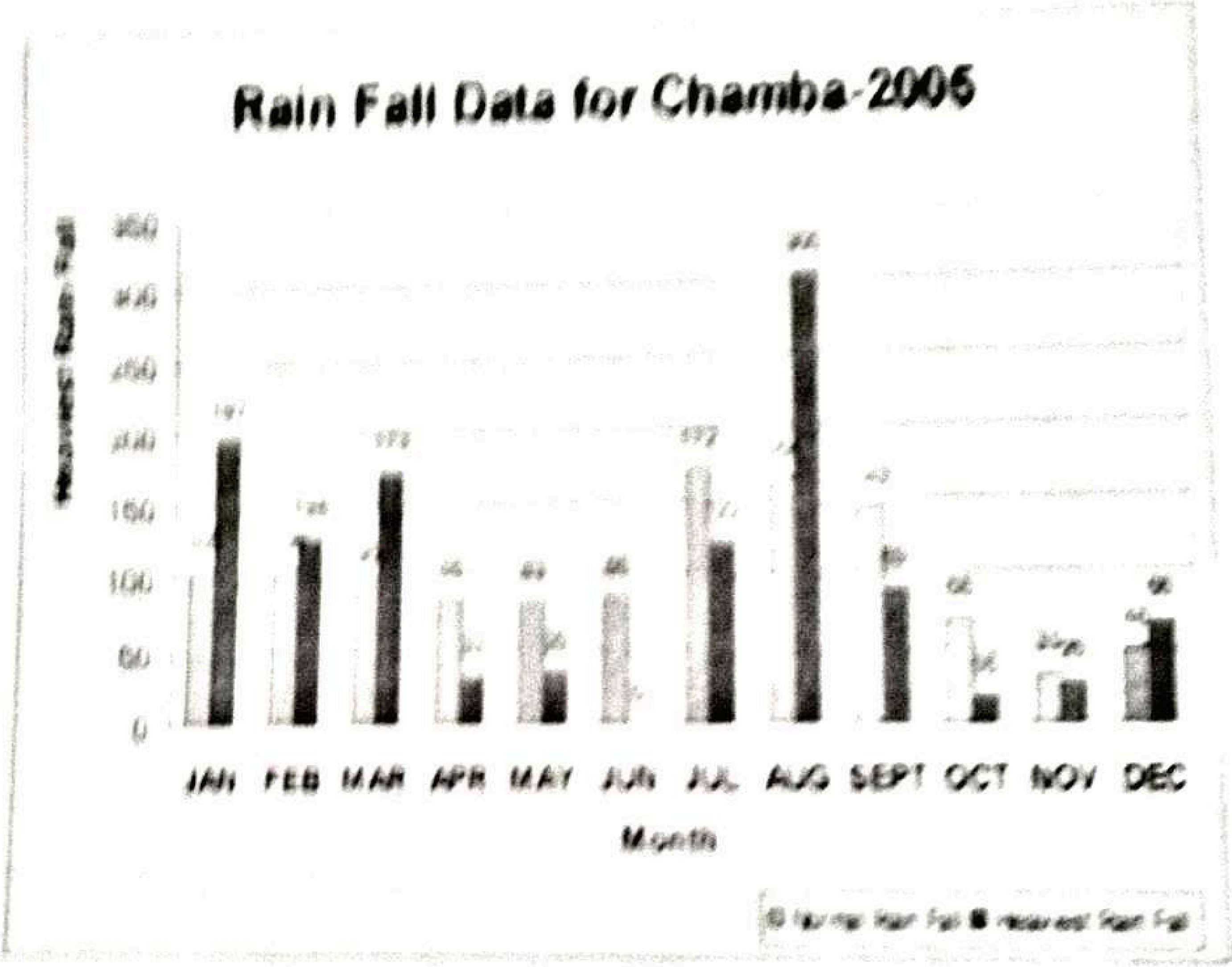
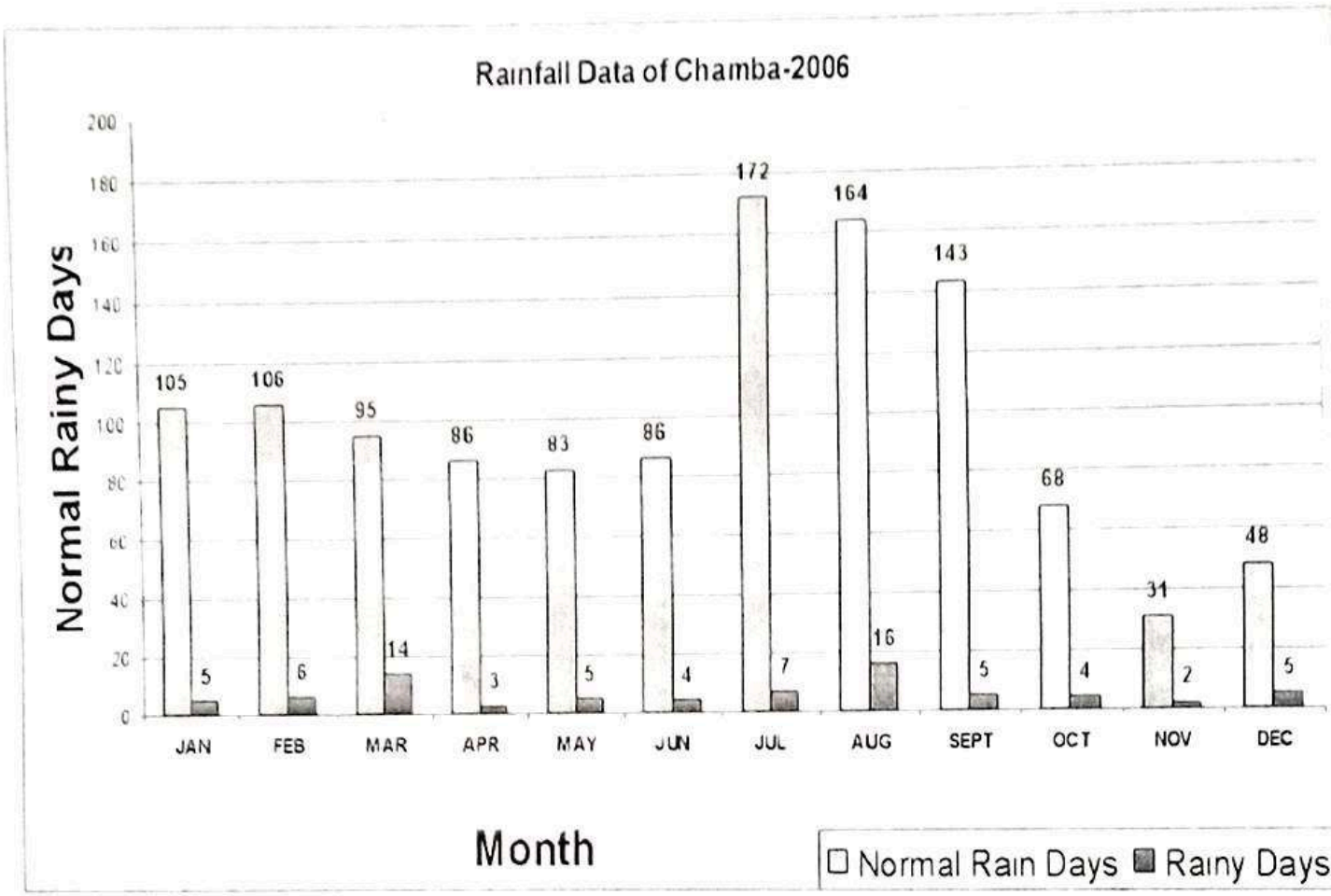


Table No.3
Rain fall data -2006(in m.m)



Drainage pattern of the area :-

The entire area possesses dendritic to sub-dendritic type of the drainage pattern with formation of small gullies. The Ravi River generally flows in westerly direction.

10. Fisheries:

Himachal Pradesh has mainly five rivers and numerous of its small and large tributaries/streams and also having very rich potential of fisheries. Also district Chamba has very vast and variegated fisheries resources due to extensive perennial river/streams, khads, and have vide varieties of species of fish.. River Ravi flows through this district. Its other tributaries are mainly **Budhil, Chirchind nala ,Tundah nala ,Saho nala and Suil river etc**. which comprises the total length of about km as whole within Himachal Pradesh up to Khari

Gugli and Mirror-Carps and Salmotrueta, Salmogair dineri, and weed fishes etc. Here fishing is mainly regulated by fisheries Legislation under the H.P. fisheries act, 1976.

11. Animal *Husbandry*

Animal husbandry is also the main occupation and wealth of the predominant population of the districts along with agriculture. The whole area in the District is hilly and mountainous with moderate to steep slope. As per the records of 1982, the total no. of livestock's in the District was **5, 69,132**. The production of wool has also increased for 1, 62,110 kgm/year. The production of wool has also been increased during last two decades.

Following are the main Livestock found in the district Chamba:-

1. Sheep
2. Goat
3. Horse & Ponies
4. Mules
5. Donkeys
6. Camels
7. Pigs
8. Dogs and Poultry etc.

Livestock Census of Himachal Pradesh

S. No.	Year	Production
1.	1987	22,44,813
2.	1992	21,65,034
3.	1997	20,01,826

12. Minerals:

Occurrence a number of economic rocks are found in the district but except limestone slate, and minor minerals like Sand.Stone and Bajri none have commercial significance. The availability of limestone, slate in the district is as under.

12.1 Lime Stone:

Limestone is a calcareous sedimentary rock composed of mineral calcite ($CaCO_3$) which upon calcinations yields lime (CaO) for commercial use Cement and Iron & Steel industries are the major consumers of limestone Himachal Pradesh has vast reserves of the limestone, spread over various locations.

The limestone occurrences of Sind Broh, about 6 kilometers North of Chamba (32 43 10.14'' 76 06 16'') in District Chamba, studied by the Geological Survey of India have revealed 400 million tones of cement grade limestone. The district wise details of the limestone deposits of all grades (including cement grade) in Himachal Pradesh are as given below in

Table No.-4

Table 4. Distirct wise details of Limestone Reserve
(In Million tonnes)

District	Proved	Probable	Possible	Total
Bilaspur	370	150	500	1020
Chamba	**400**	**850**	**100**	**1350**
Kangra	10	20	10	40
Kullu			120	120
Mandi	500	20	600	1120
Sirmour	150	200	1200	1550
Shimla		50	1600	1650
Solan	550	100	1000	1650
Lahaul & Spiti			1000	1000
Kinnauar			100	100
Total	1980	1390	6230	9600

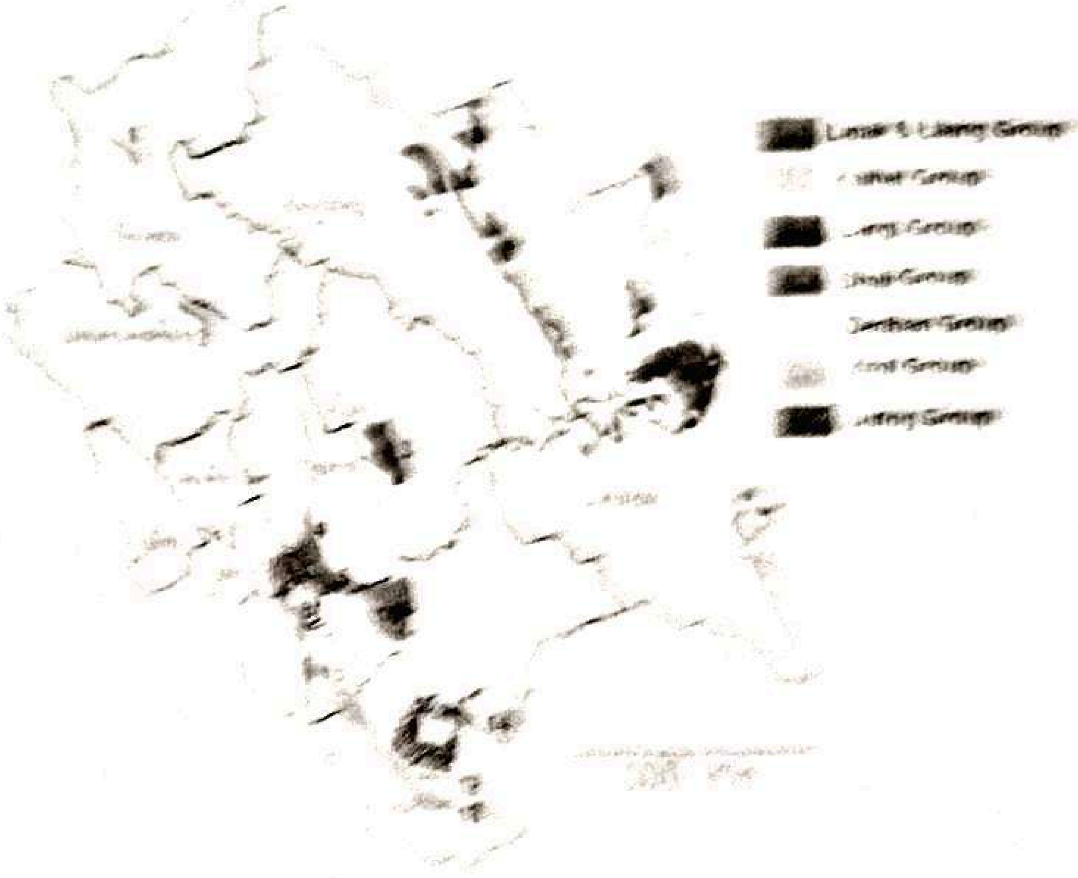
As seen from above table, Himachal Pradesh possesses huge

limestone of cement grade within the Lower Himalayan Zone. In addition it has sizeable reserve of chemical grade limestone. Dolomite occurs extensively and can find application in metallurgical industries. The Shali, the Deoban and the Larji are the principal Mesoproterozoic carbonate belts of great potential. The other belts with carbonate lithounits are Meso to Neoproterozoic Mandhali, the Basantpur-Kunihar, the Krol and the Jutogh. In the Higher Himalayan sector of Lahaul-Spiti and Kinnaur, the Early Carboniferous Lipak Formation and the Triassic-Early Jurassic Lilang Group are the important carbonate belts. The Early Carboniferous Kalhel limestone of Chamba is also a good source. The Palaeocene-Eocene Kakara and Subathu Formations contain significant proportion of carbonate rocks.

The distribution of important limestone bearing Formations are as [illegible]

Figure No. 3

Map Showing distribution of Limestone bearing horizons of Himachal Pradesh and also showing important limestone deposits of Himachal Pradesh



1. [illegible] Limestone
2. [illegible] Limestone
3. [illegible] Limestone
4. Sundernagar Limestone
5. [illegible] Limestone
6. Gagal Barmana Limestone
7. Bagga Bhalag Limestone
8. [illegible] Limestone
9. [illegible] Limestone
10. [illegible] Limestone
11. [illegible] Limestone
12. [illegible] Limestone
13. [illegible] Limestone
14. [illegible] Limestone

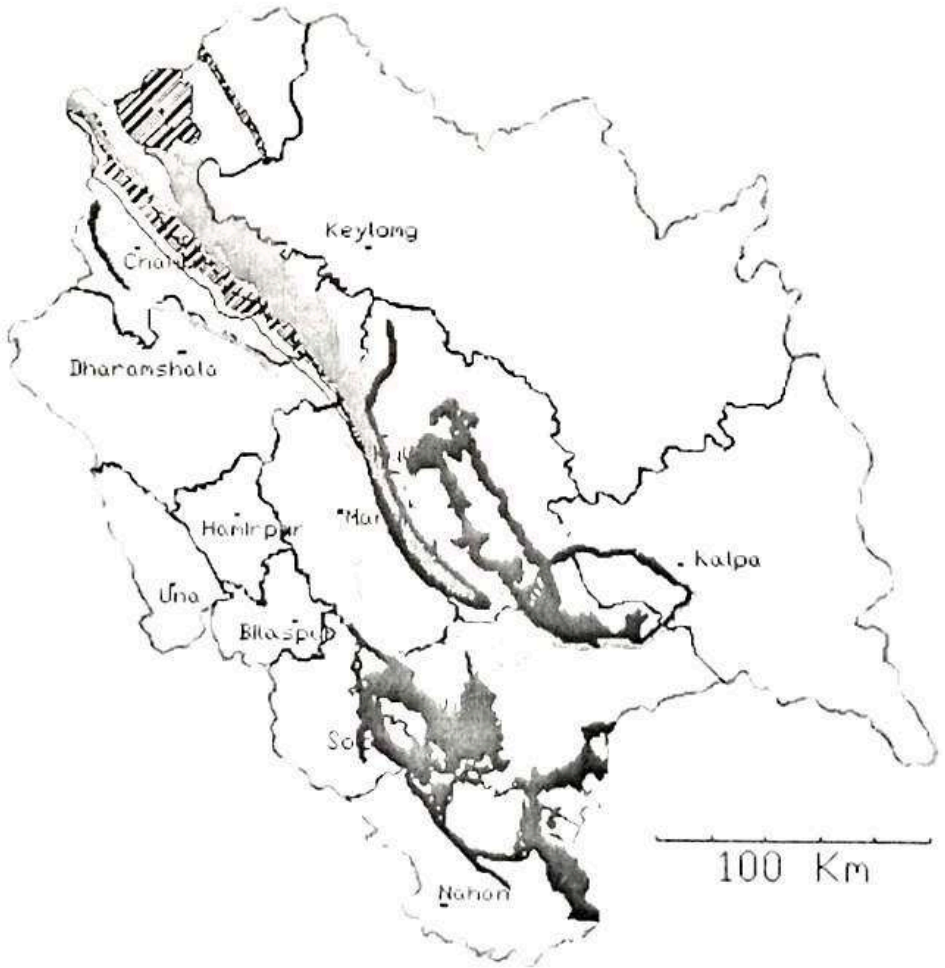
12.2 Slate:

Slate is a fine grained, hard, compact, cleavable rock derived from microcrystalline metamorphic rocks of clays and shale and possesses a cleavage that permits it to split readily into thin smooth sheets. Himachal Pradesh is known in the country for its good quality of slate, which find place in foreign market also because of its pleasing colour, durability and uniformity in thickness. The art of extraction of slates is known to the local people of the area since generation. The good quality thick bands of slates occur in Districts of Chamba, Kangra, Mandi, Kullu and to some extent in district of Shimla, Sirmour and Kinnuar, & Solan. The potential of slate in Chamba district occurs at Gehra and Tissa area.

Slates are confined to Kullu Group, Shimla Formation, Chamba Formation, Jaunsaur Formation & Katargali Formation. The distribution of slate bearing rocks is as given below in the Figure No.04

Figure No. 4

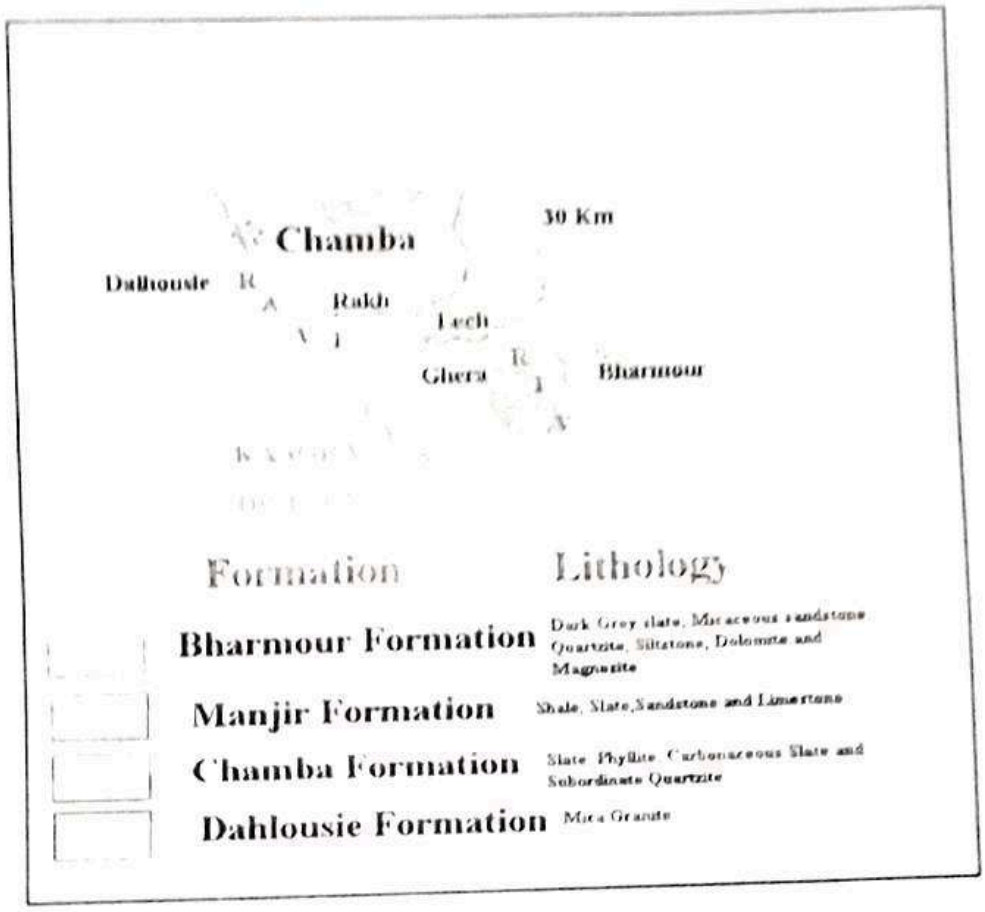
Figure Showing Slate bearing horizon of Himachal Pradesh



13 **GEOLOGY:-**

Geologically, Himachal Pradesh can be broadly divided into two major geotechnic zones viz. the Lesser Himalaya tectogen in the south and the Tethys Himalayan Tectogen in north. These two tectonic zones are juxtaposed with each other along a major tectonic break collectively designated as Main Central Thrust in the sense defined by Srikantia(1988). The oldest rocks are of undifferentiated Proterozoic age, comprising carbonaceous phyllite, schist, gneiss, quartzite and marble. The Chogthar dhar (undifferiated Proterozoic age) occurs as an intrusive body within the Chail Group minor aplite and basic veinlets. The Sundernagar group of rocks of Meso-Proterozoic age is represented by quartzite with basic flows. The Shali group of (Meso-Proterozoic) comprising Limestone, dolomite, slate & quartzite. The Subathu consist mainly, of olive green shales and Grey shales. At the top, a band of white quartzite exposed; this band of white quartzite has been taken as the marker, defining the top of the Subathu sequence. The thick sequences of brackish and fresh water sediments immediately succeeding the fossiliferous marine Subathu are classified as Dharamshala formation. The Dharamshala formations are widely exposed, in the Mandi parautochthon, further west in the autochthon, these rocks are exposed, in the core of the Sarkaghat anticline. The Shiwalik group of Middle Miocene of Early Pleistocene age comprises coarse clastic fluviatile deposits of sandstone, clay and conglomerates. The Quaternary sediments(older Alluvium and Newer Alluvium) along prominent channels consisting of sand, silt clay, pebbles and cobbles occurring along present channels of Middle to late Pleistocene and Holocene age.

14 Local Geology – The stratigraphic sequences established in the area in the Systematic mapping by Geologists of Geological Survey of India is given as



Channel deposits: - boulder, cobbles, Pebbles, sand, silt/clay

Terrace Deposits: - boulder, cobbles, Pebbles, sand, silt/clay

Bharmour Formation: - Dark Grey slate, Micaceous sandstone, Quartzite, Dolomite and Magnetite

Manjir Formation: - Shale, Slate, Sandstone and Limestone

Chamba Formation: - Slate, Phyllite, carbonaceous Slate and Subordinate Quartzite

Dalhousie formation: Mica Granite

Mandi Volcanic: - Basic Flow

Geological sequence of Chamba area

Kalhel Formation (Triassic)	Greyish blue, grey and yellow limestone and dolomite with interbedded grey orthoquartzite in the upper part Grey calcareous shale with interbeds of limestone in the basal part
Saloom Formation (Permian) ----------	Dark grey or black carbonaceous pyritous slates with thin lenticles of limestone at places There are discontinuous bands of varying thickness of amygdaloidal and massive lava flow of basaltic to andesitic composition ----------unconformity---------- ----------
Batal Formation (also called KatariGali) (Terminal Proterozoic)	Black carbonaceous phyllity with interbeds of quartzite Local limestone bed at the base with magnesite and scale of gypsum
Manjir Formation (Neoproterozoic) ----------	Polymictic diamictite-poorly sorted, lithologically heterogeneous, laminated or banded ----------unconformity---------- ----------
Chamba Formation (Salkhala Group) (Mesoproterozoic)	Dark Grey, thinly bedded laminated slates with subordinate bands

Methodology and Guiding principle -

The terrace of river/stream of the district has been covered and studied on the following principle of geology/ river bed mining.

1. The general geology of the area.

2. The presence of any major geological structure
3. Pattern of primary secondary/Tertiary
4. Total catchments of each stream.
5. Origin of river
6. General profile of river/stream/
7. Meandering Pattern
8. Bank Stability
9. Total potential of river bed in reference to minor mineral
10. General slope of the river/ stream

Morphogenetic regions

Besides above, following were also studied :-

1. *The presence of any WSS Schemes*
2. *Bridges*
3. *Agriculture fields*
4. *Bank protection Works*
5. *Plantation etc*
6. *Water supply & irrigation Scheme*
7. *Any other physical features of public importance etc.*

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

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

2.A stable river is able to consistently transport the flow of sediments produced by watershed such that its dimensions (width7 depth) pattern and vertical profile are maintained without aggrading (building up) or degrading (scouring).

3.The amount of the 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.

4.It is compulsive nature for the river to meander in their belts and therefore they will have to be provided with adequate corridor for meandering without let or hindrance. Any attempt to diminish the width of this corridor (floodway) and curb their freedom to meander would prove counterproductive.

5.Erosion and deposition is law of nature. The river/stream has to complete its geomorphologic cycle from young, mature to old age.

6.River capturing is unavoidable.

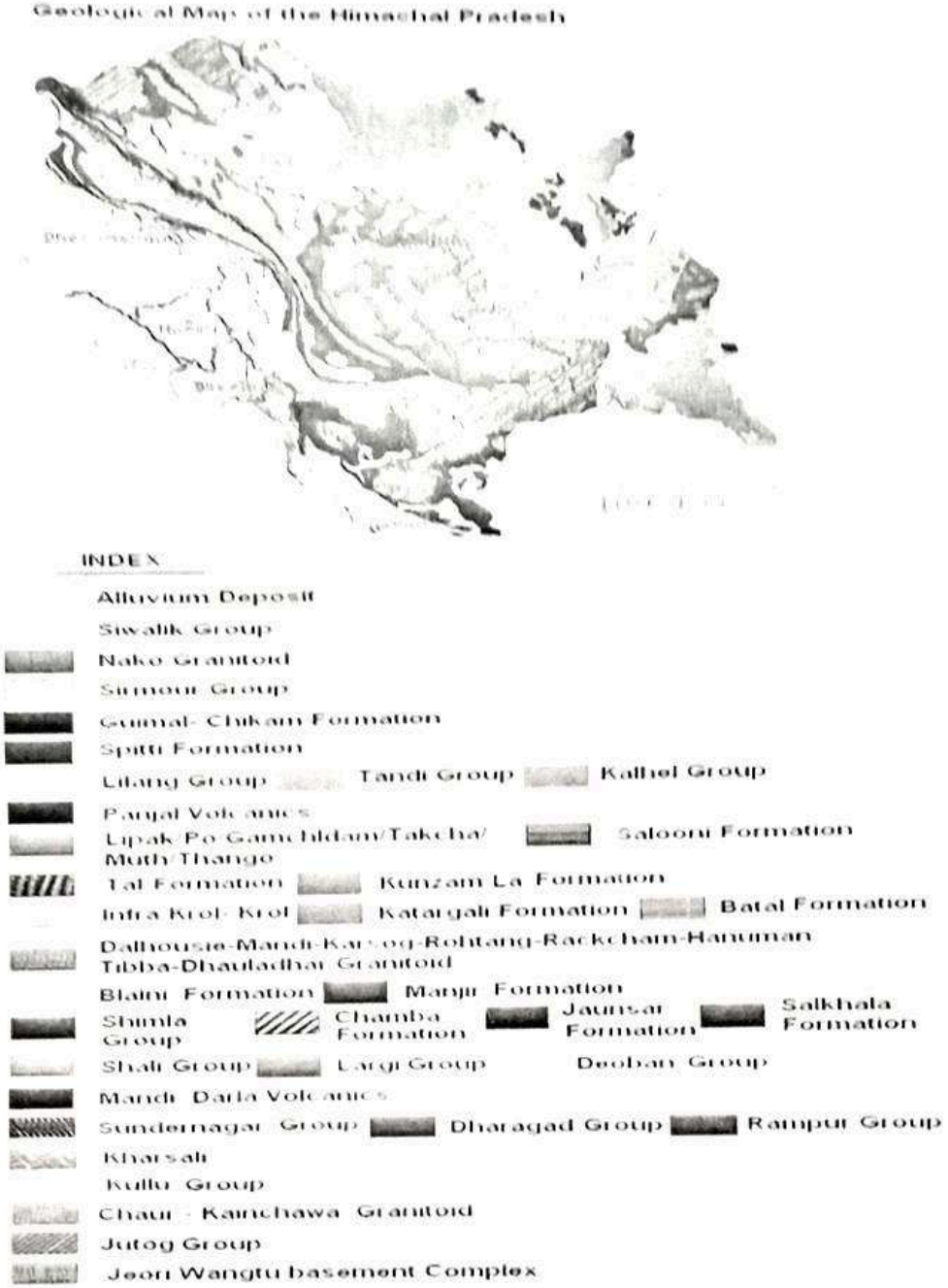
7.Erosion in upstream and deposition in downstream.

8.Tendency of the river/ stream towards grade.

9.Fundamentally, the lowest point of any stream is fixed by Sea Level.

10. The ratio between the width of meander belt and width of the stream decreases as the width of the stream increases.

Fig:- 5:



15. Over view of Mining Activity of District Chamba:

Mainly three types of minor mineral 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. As such the demand of minor minerals in the District started an increasing trend due to construction of Hydro projects. In order to meet the requirement of raw material for construction, the extraction of sand, stone and bajri is being carried

out exclusively from the river beds. The demand of sand is mainly met through by river borne sand whereas the demand of bajri grit is either met through river borne collection or through manufactured grit by stone crushers. The demand of dressed or undressed stone is met through the broken rock material from the hill slope.

The local residents used to lift gravel etc. from the river beds to meet out their bonafide requirement. however after coming into being the Himachal Pradesh Minor Minerals (Concession) and Minerals (Prevention of Illegal Mining, Transportation and Storage) Rules, 2015, the mining is regulated in accordace with the rules.

At present about 5 Nos of mining leases have been granted/executed under the ibid rules in the different parts of the District and the detail are tabulated below.

Table1 :-

Sub- Division wise break up of Mining Leases Granted /executed for collection of Stone, bajri and Sand in district Chamba. (H.P.)

	Name of the Party	Name of Stone Crusher Unit	Area (in Hects.)	Status of land.	Name of the River
1	Sh Parkash Chand S/o Sh Soorma Ram Vill & P.O. Kuni Chamba. (H.P.)	Sh Parkash Chand S/o Sh Soorma Ram Vill & P.O. Kuni Chamba. (H.P.)	0.114 Hectare	Govt Land.	(Hill Slope)
2	Sh Daljeet Sharma S/o Sh Satya Prakash V & P.O. Chhatrari, Chamba. H.P.	Sh Daljeet Sharma S/o Sh Satya Prakash V & P.O. Chhatrari, Chamba. H.P.	0.165 Hects	Govt Land.	(Hill Slope)
3	Sh Daljeet Sharma S/o Sh Satya Prakash V & P.O. Chhatrari, Chamba. H.P.	Sh Daljeet Sharma S/o Sh Satya Prakash V & P.O. Chhatrari, Chamba. H.P.	0.095 Hects	Govt Land.	(Hill Slope)
	Sh Neeraj Nayar S/o	Sh Neeraj	1.409	Govt. Land	(Hill

4	Sh. S.C. Nayar, Mohalla Bangotu, Chamba, H.P.	Nayar S/o Sh. S.C. Nayar, Mohalla Bangotu, Chamba, H.P	Hects		Slope)
5	Sh. Chanchal Nayar W/o Sh. S.C. Nayar, Mohalla Bangotu, Chamba, H.P.	Sh. Chanchal Nayar W/o Sh. S.C. Nayar, Mohalla Bangotu, Chamba, H.P	0.495 Hects.	Govt. Land	(Hill Slope)
6	M/s A.K. Slate Co., Vill. Jawari, Tehsil Churah, Chamba, H.P	M/s A.K. Slate Co., Vill Jawari, Tehsil Churah, Chamba, H.P	0.167 Hects.	Govt. Land	(Hill Slope)
7	Sh. D.S. Thakur S/o Sh. Kripa Ram, V & P.O. Kandla, Chamba, H.P.	M/s Thakur Stone Crusher, Kandla.	1.911 Hects.	Govt. Land	Siul River
8	Sh. D.S. Thakur S/o Sh. Kripa Ram, V & P.O. Kandla, Chamba, H.P	M/s Thakur Stone Crusher, Kandla	23-13-11 Bighas	Chamera Reservoir of NHPC, Stage-I	Siul River
9	Sh. Amar Chand S/o Sh. Laxmi Dhar, Vill. Lachori, P.O. Thakri Matti, Chamba, H.P	M/s A.C. Stone Cruhser, Lachhori,	0.748 Hects.	Chamera Reservoir of NHPC, Stage-I	Siul River
10	Sh. Amar Chand S/o Sh. Laxmi Dhar, Vill. Lachori, P.O. Thakri Matti, Chamba, H.P	M/s A.C. Stone Cruhser, Lachhori,	1.074 Hects.	Chamera Reservoir of NHPC, Stage-I	Siul River
11	Sh Pawan Kumar, S/oSh. Munshi Ram, Vill.Kolar Jolna, P.O. Jolna, Teh. Bhattiyat, Chamba, H.P	M/s Nagbintru Stone Crusher, Kolar Jolna	1.327 Hects.		(Hill Slope)
12	M/s Kartik Stone Crusher, Vill Machhetar, P.O.	M/s Kartik Stone Crusher,	05-06 Bighas	Private Land	(Hill Slope)

	Chanouta, The. Bharmour, Distt. Chamba, H.P.	Machhetar,			
13	Sh. Sunil Kumar, Vill. & P.O. Samleu, Teh.Dalhousie,Distt. Chamba, H.P	M/s Sunil Stone Crusher,	0.8174 Hects.	Private Land	Ravi River
14	Sh. Yogesh Kumar S/o Sh. Jarmo Ram, Vill.& P.O. kunr Tehsil & Distt. Chamba,	Sh. Yogesh Kumar S/o Sh. Jarmo Ram, Vill.& P.O. kunr Tehsil & Distt. Chamba,	0.3318 Hects.	Private Land	(Hill Slope)
15	Sh. Dhirij Kumar Mahajan, Vill. & P.O. Rajpura , Tehsil and Distt. Chamba HP	Sh. Dhirij Kumar Mahajan, Vill. & P.O. Rajpura , Tehsil and Distt. Chamba HP	3.7911 Hects.	Acquired by NHPC-I	Ravi River Bed
16	Sh. Rajinder Kumar S/o Sh. Bhillo Ram Vill. Airwan P.O. Sundla,Tehsil Salooni, Distt. Chamb h.p.	Sh Rajinder Kumar S/o Sh. Bhillo Ram Vill. Airwan P.O. Sundla TehsilSaloo ni, Distt.Chamb a, H.P.	13.2521 Hects.	Chamera Reservoir of NHPC, Stage-I	Siul River
17	Sh. Chatter Singh S/o Sh. Lehnu Ram, Vill. Jawari. P.O. Thaneikothi, Tehsil Churah, Distt.Chamba, H.P.	Sh. Chatter Singh S/o Sh. Lehnu Ram, Vill. Jawari. P.O. Thaneikothi, Tehsil Churah, Distt.Chamb a, H.P.	0.45896 Hectare	Private Land	Hill Slope
18	Smt. Rachya Devi, Vill.& P.O. Kunr, Tehsil & Distt. Chamba, H.P.	Smt. Rachya Devi, Vill.& P.O. Kunr, Tehsil & Distt. Chamba,	02-14 Bighas	Govt. Land	Hill Slope

19	Sh Amar Chand S/o Sh Laxmi Dhar, Vill Lacheri, P O Dhakri Matti, Chamba, H P	H P Sh Amar Chand S/o Sh Laxmi Dhar Vill Lacheri, P O Dhakri Matti Chamba, H P	16.1898 Hects.	Reservoir area of NHPC, Stage-	Siul Khad

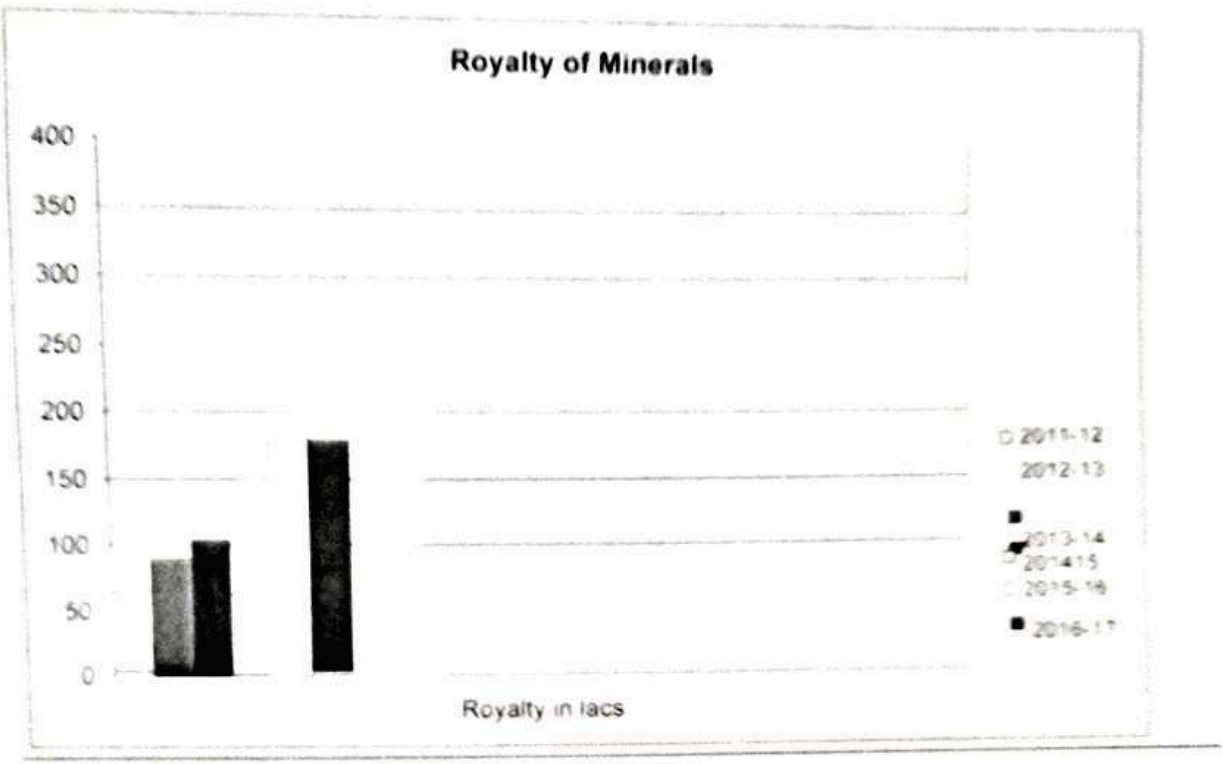
16. Detail of Royalty and Production of Minor Mineral of Chamba District

Mainly three types of minor mineral constituents such as sand stone and bajri are the main constituents required for the modern construction/developmental activities apart from other material like cement and steel As such the demand of minor mineral in the District started an increasing trend In order to meet the requirement of raw material for construction the extraction of sand, stone and bajri is being carried out exclusively from the river beds

The increase could be gauged from the fact that during 2011-12 the royalty receipt on minor mineral was merely 58,94,5281 which has now been increased to 1,76,07,418 The royalty received since 2011-12 onwards is tabulated in the following table

Table -6

Sr No.	Year	Royalty in lacs	Production of mineral (in Metric tonne)
1	2011-12	58.9	294726
2	2012-13	83.9	207834
3	2013-14	91.6	229130
4	2014-15	77.3	193395
5	2015-16	183.0	305060
6	2016-17	176.0	293455



17. Auction of Minor Mineral in Chamba District:

The grant of mineral concessions of minor minerals is regulated under the Himachal Pradesh Minor Minerals (Concession) and Minerals (Prevention of Illegal Mining, Transportation and Storage) Rules, 2015. Rule 28, 29 and 30 of **Himachal Pradesh Minor Minerals (Concession) and Minerals (Prevention of Illegal Mining, Transportation and Storage) Rules, 2015** defines the procedure for auction of minor minerals.

The auction is conducted by the Committee constituted by the Director of Industries and consists of following members:

Additional District Magistrate	Chairman
General Manager, DIC	Member
Mining Officer	Member

Other members are nominated by the Deputy Commissioner

Initially the river beds/khallas were identified by the Department and were being put to public auctions in various districts. Consent to put these beds on auction was invariably taken from the Revenue, PWD, I&PH and Forest Departments.

Vide notification dated 12/2/93, a District Level Committee under the Chairmanship of Deputy Commissioner was constituted to study the entire stretch of river beds and to identify which area is to be auctioned or not. Hence as per procedure of this Committee, the NOC of I&PH, PWD and Forest was essentially required for auctions of various river beds.

However, after the formulation of the Policy Guidelines for River/Stream bed Mining. Vide notification dated 24/8/2013, detailed survey of all the river bed/Khalla in each district was to be conducted by Geological Wing with respect to availability of mineral

etc. Based on this, Survey, the Mining Officer shall put up the proposal for auction of River/Stream/Khalla beds to the following Sub-Divisional Committee for its approval

1-	Sub Divisional Magistrate	Chairman
2-	Assistant Conservator of Forest/Range Officer	Member
3-	Representative of Environment Protection and Pollution Control Board	Member
4-	Executive Engineer PWD or his representative	Member
5-	Executive Engineer IPH or his representative	Member
6-	Mining Officer	Member Secretary

Only after the recommendations of this committee, the area shall be put to public auction.

17.1 Chamba Disrtriet :

The process of identification of site and auction of river beds is under process and some Constraints with regard to auction of miner mineral.

Constrains of the Department with regards to Auctions of the Minor Minerals :

In the Year 1952 Forest Department issued two notifications under the provision of Section 29 of Indian Forest Act (XVI of 1967) as applied to Himachal Pradesh. These notifications were:-

1. Notification No Ft (a) -1/52 dated 15-1-52 vide which the provision of Chapter IV of the Act was made applicable to all such Government lands in Bilaspur State which in the Second Land Revenue Settlement have been recorded as the property of the Govt. or over which the Govt has proprietary right .

2 Notification No Ft 29-245 -BB/49, dated 25/2/52 was made applicable to all forest lands or waste lands in Himachal Pradesh which are property of the Govt. or over where the Govt has proprietary right .

The Hon'ble Supreme Court of India in its oders dated **12/12/89** issued interim directions in the writ petition No 202 of 1995 titled as T.N. Godaverman Tirumulkpad versus Union of India and others. Apart from other directions it directed that all the ongoing activity within any forest in any State through out the country without prior approval of Central Government must cease forthwith.

With the applicability of Forest Department, notification dated 25/2/1952 and 15/1/1952, wherein all the waste land in the ownership of Govt. has been declared as forest land and thus attracted the provision of FCA, 1980. The Department of Industries which has the mendate to regulate the provision of Mines and Minerlas (Development & Regulation) Act, 1957 and Rules framed

18. PROCESS OF EROSION, TRANSPORTATION AND DEPOSITION:

IN THE RIVER BED:

EROSION, TRANSPORTATION AND DEPOSITION:

Water flowing through a stream performs three kinds of geologic actions. Moving water erodes material from the bed and sides of the channel, it transports the eroded material to a new location and then deposits it. Material deposited by streams is called **alluvium**. The ability of a stream to do work is a function of stream velocity and discharge.

18.1. EROSION:

Stream erosion is the detachment of material from the bed or sides of the channel. Approximately 95% of a stream's energy is used to overcome frictional effects imposed by the channel and internal molecular friction. This leaves only 5% of the stream's energy for vertical and lateral cutting. Flowing water erodes in three ways. First, flowing water dissolves materials from the channel contributing to stream's dissolve or, **Solution load**. Secondly, the impact of water, or **Hydraulic action** on the sides and bed of the channel dislodges materials and makes them available for transport as part of the stream load. Materials too heavy to suspend, scoot and roll across the bed, eroding the channel by **Abrasion** as a river winds its way from its source to its mouth. A number of processes of erosion take place such as:

1. **Corrosion** – This is the wearing away of the river channel by water + load (load = material carried in the river e.g. boulders, pebbles, sand etc)
2. **Attrition** – As the load is carried by the river, bits collide and these are further broken up.
3. **Solution** – This is where certain rocks (e.g. limestone) are dissolved by the river.

18.2 TRANSPORTATION:

A river moves its load by :-

(1) - Rolling large stones and boulders. **(Stream load).**

(2) - Carrying sand, mud and silt in suspension. **(Suspended load).**

comes primarily from ground water seepage into the stream. Suspended load is comprised of sediment suspended and transported through the stream. Turbulent flow suspends clay and silt in the stream. Suspended load comes from material eroded from the surface bordering the channel and deposited in the stream, as well as, erosion of the channel itself.

The **stream capacity** is the maximum load of sediment a stream can carry for a given discharge. As one might expect, stream capacity increases with increasing flow velocity. Increased water velocity imparts a greater frictional drag on bed to erode it. Turbulent flow occurs under higher velocity, thus increasing the water's ability to dislodge material from the bed or sides of the stream. **Stream competence** is the largest size material, the stream can move under a given discharge.

Bed load is that which is moved across the bed of the channel. Bed load is transported in two ways, **traction**, which is a scooting and rolling of particles along the bed. The second is **saltation**, a bouncing-like movement. Saltation occurs when particles are suspended in the stream for a short distance after which they fall to the bed, dislodging particles from the bed. The dislodged particles move downstream a short distance where they fall to the bed, again dislodging particles upon impact.

18.3 DEPOSITION: Deposition is the opposite of erosion. Deposition is where a river lays down or drops the sediment or material that it carryies. Rivers carry lots of different sediments, including rocks, boulders, silt, mud, pebbles and stones. Normally, a river has the power to carry sediment. If the force of a river drops, the river cannot carry sediment. This is when the river deposits its sediments.

18.4 Types of deposition:

There can be much evidence of deposition in a river. Some examples are:

1. Areas of pebbles, gravels, and stones.
2. Areas where mud and sand are deposited.
3. Large boulders and stones in the middle of a river.
4. Tree branches and trees in the river.
5. Pollution like cans, bottles, crisp wrappers and other rubbish.

(A) Upper Course: In the upper course,

Transportation is the movement of earth material, by water. The material transported through the stream is it's stream load. Stream load is composed of dissolved or solution load, suspended load, and bed load. The dissolved load comes primarily from ground water seepage into the stream. Suspended load is comprised of sediment suspended and transported through the stream. Turbulent flow suspends clay and silt in the stream. Suspended load comes from material eroded from the surface bordering the channel and deposited in the stream, as well as, erosion of the channel itself

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4. Tree branches and trees in the river.
5. Pollution like cans, bottles, crisp wrappers and other rubbish.

- The river channel is small, narrow and rough and usually shallow.
- The stones and rocks increase wetted perimeter.
- The volume of water is low as there are very few tributaries flowing into it.

Features such as:-

Interlocking Spurs, Pot holes and water falls or Gorges are developed in the upper course of a stream.

Interlocking Spurs:

Interlocking spurs are alternate hills in the river valley. The river does not have a high water volume at this point and even though it is fast flowing, the river cannot laterally erode (sideways) to remove the spurs. Because of this, the river has to flow around the spurs, eroding vertically.

Potholes:

As the river is vertically eroding in the Upper Course, potholes are created when larger pieces of load that the river cannot remove by traction are twisted around by eddy currents. The river is not strong enough here to pull the large boulder, and the obstruction creates a swirling motion in the water. Eventually, the boulder creates a pothole, by abrasion on the river-bed.

Waterfalls and Gorge:

In the Upper Course, the river is not only eroding vertically (down) but towards its source The river erodes the softer rock underneath the harder rock on top faster, and this means the level of the land along the river's course becomes lower over time and the waterfall retreats back towards the source.

(B) Middle Course: In the middle course:

- The river channel is wider and deeper.
- Its cross-section is asymmetrical.
- A steep river cliff develops on the concave bank and a gentle slip-off slope on the convex bank.

Features such as:

Meanders are developed in the middle course of the stream.

Meanders:

In the middle course, the amount of water and material in the river increases as more tributaries join in. The bed widens, its slope becomes gentler, and the water flows much more slowly as the river flows out of the mountains. As a slow-moving river cannot keep heavy material moving, piles of gravel form along the banks. At this stage, the river carries its load of sand, mud, and small stones suspended in water. It also begins to swing from side to side, cutting into some banks and drifting away from others. As there are no obstacles such as rapids, the river's course becomes smoother and more regular.A floodplain is a

close to the river. With repeated flooding, the materials that are deposited on the river banks accumulate to form floodplains. The path of the middle river is always changing as it cuts sideways into the land and starts to deposit its load. Loops, called meanders and oxbow lakes are typical features of this part of the river. During a storm, meanders stop river water flowing easily. This cause water to build up in places, and may lead to flooding

(c) Lower Course:

In the lower course:

- The river channel is the widest and the deepest.
- It has the largest volume of water and load because of the numerous tributaries flowing into it.
- There is lateral erosion along this course.

Features such as
Leves, Braided Channels, Deltas and oxbow lake are developed in the upper course of a stream.

Levees

In the monsoon, when the river volume is at its highest, the river is prone to flooding. As the river overflows its banks, friction with the floodplain slows down the flow. The loss of energy means load is deposited. The deposition is graded - this means that the larger particles are dropped first (being the heaviest) near the river bank edge and the smaller particles are taken further along the floodplain. The larger particles build up over repeated floodings to create a leveé, which increases the capacity of the river. However, after Monsoon when the river volume and energy is at its lowest, deposition occurs in the river channel, raising the bed. This means that the capacity of the river is lowered and flooding again will occur in the monsoon months, creating bigger leveés. This cycle raises the river higher than the landscape over time.

19. River System of District Chamba:

Drainage:

The entire area possesses dendritic to sub-dendritic type of the drainage pattern with formation of small gullies. The Ravi River generally flows in westerly direction.

To traversed the different locations along the Ravi river, Sal & Suil River and also along and its tributaries and catchment area. During visit to Chamba district, different traverses were taken to identify the mineable deposits in the catchment of above mentioned rivers.

The following are promising sites identified for collection/extraction of sand, stone and bajri from the all rivers and its tributaries flowing through the District Chamba.

A. Ravi River:-

It originate from the barabhangal glacier and leaves the district Chamba at place Kheri after ing flowing through almost entire district. There is increasing demand of river borne materials for construction of structure in whole area like other part of State and in this reference reconnaissance survey was made to identified the sites which can be best utilized for the extraction of minor minerals materials from these site for commercial, domestic and as well as other development activities. Following sites have been identified right from ***Holi to Rajpura*** area by keeping in view the potential and feasibility of sites after going through all parameters of environment safety and erosion etc.

1. *Holi Deposit*:-

This deposit is located about 300-400 metres downstream from Holi station on left bank. It comprises of rock fragment of small size mainly of slate, phyllite & sand and stone etc. This deposit is considerable for lifting of materials. There will be no possibility of degradation of environment in case this material is lifted from this site and pit out area after excavation will be replenished in rainy seasons for considerable thickness. Hence the site is recommended to put for auction.

2. Bagga-River deposit:-

This deposit is located downstream Bagga on both bank of river and is accessible from main road. The deposit mainly comprises of sand and stone with negligible proportion of bajri. The deposit is deposited in form of river bed. In case of lifting of materials from this site, there will be no side effect on environment in term of erosion and also the site being is term river bed will also be replenished during rainy season and flood time with in short spell of time. Hence the site is recommended to pout for auction on following condition:-

1. The collection of materials should be allowed from the side of water flow towards the banks of nalla.

3. Bakanipul to Kalsuin:-

This deposit is located in downstream **Rakh up to Kalsuin** and having bulk or

is also recommended for auction as it will not cause any adverse effect in terms of erosion when materials will be lifted from this area.

4. **Sach Nala deposit** - The mineral deposit is located on the right bank of Sach nala near upstream of Baloo and accumulated bulk of river-borne materials which can be best utilized for construction purpose by lifting from it manually. These materials varying in shape from sand to stone & bajri etc. Since area being replenishable to sufficient extent, hence ***recommended for purpose of mining lease***.

5. **Kuledh or Pukhri nala deposit:-** This deposit is located on Kuledh nala on both banks of Kuledh nala especially near the confluences point of this nal with Ravi River at Kiyani and having bulk or potentials of river-borne materials which can be utilized for construction purpose. These materials varying in shape from sand to stone & bajri etc. Materials are deposited in form of river bed in right bank of river Ravi on kuledh nala upstream. Since this deposit is extended for approximately 500 metrs upstream and is replenish able. Hence this area is also recommended for purpose of mining lease as it will not cause any adverse effect in terms of erosion when materials will be lifted from this area.

6. ***Balu to Parel and Tadoli to Udaipur, Salimar & Rajpura. Deposit:-***

The mineral deposit is located on the both side of river Ravi between area from balu downstream top Parel and also from Tadoli upto Rajpura. This deposit also is apart of previously auctioned area although it has been now segmented into two fraction like **Balu to Parel** and further **Tadoli to Rajpura**. However earlier it was a continuous single path for great extent before the construction of bridge near Parel downstream. This river bed deposit comprises of mine-borne deposit which is of different dimension varying from sand to boulder type. Here deposit is encounted in form of flood plain & channel bar. The proportion of boulder is maximum in comparison to sand and whole area is accessible through road and this entire pocket extends about 3-4 km l length and having width varying from 20-130 metres. Since the deposit is located on the both bank of Ravi river and also at some place the flow of river on the both banks is higher than flood plain and hence there is chance of overflowing of river flows towards the both banks during high floods seasons which can cause the damage to surroundings area in terms of property as well as life. So keeping in view the above narrated facts, the site is ***recommended for grant of mining lease*** subject to following terms & condition:-

1. No mining be carried out at the place along the river where the river bed is seen to be higher than river bed.

7. **Sherpur Deposit;-**

This deposit is located in both down and upstream of Sherpur on left bank of Ravi River and having bulk of river-borne materials which can be best utilized for construction purpose. These materials varying in shape from sand to stone & bajri etc. Materials are deposited in form of river bed in left bank of river Ravi. Since this deposit is extended for considerable (nearly about 500 meters) distances and is replenishable. Hence this area is also recommended for grant of mining lease as it will not cause any adverse effect in terms of erosion when materials will be lifted from this area manually.

8. <u>Khairi Deposit:-</u>

This deposit is located downstream near village khairi on right bank of Ravi River. The deposit is spread over sufficient length and is mainly consist of river-borne deposit & also materials derived from uphill side of surrounding nalla apart from Ravi River. The deposit comprises of sand, stone & bajri. However the proportion of stone & sand is maximum. Hence the site is ***recommended grant of mining lease***

(B) Saho nala Deposit:-

This deposit is located along Saho nala from Maredi upstream. The mineral deposit is deposited inform of river bed and this area was also being auctioned in the past. The deposit is approached through road at Maredi. Deposits are seen covered with overburden materials which is mainly consist of river-borne deposit mixed with materials derived from uphill side. Slope angle is vary gentle to moderate and banks are seems to stable. This deposit about 100-250 metres in length and consist of sand, stone & bajri and sandy materials can be extracted only through screening the suitability of materials, the site is recommended for auction prior to following condition.-

1. That mining of minor minerals be allowed in right bank of river only near Maredi

<u>C. Suil Nala deposit</u>

The Suil river is perennial river originating from Padri Gali at 3125 mtrs R.L. The Suil river originates at elevation of about 3125 m R.L. Other main tributaries of Suil nala are Sach nala and also Malen nala which meet the Suil khad near Ser at elevation of 906 mtrs R.L. Suil river join river Ravi near Chakloo. All these stream khads are also perennial.

4. <u>Surgani to Kandla deposit:-</u>

The mineral deposit is located near Surgani Downstream (from Surgani bridge) upto village Kandla (previous auctioned area) along the river bed in form of flood plain & Channel bars etc. It extends for great distance from Surgani bridge to kandla downstream upto Chamera reservoir area. The deposit can be extracted throughout the year except rainy seasons and deposit is connected through road both at Sugani & Kandla. width of riverbed is varies from 50-300 metrs. In this pocket. The mining is allowed only in left bank of suil nala except Surgani where mining can be done fron either banks of river. The available minor minerals deposit are in admixed form, comprises of sand, soil, silt, stone of different

dimensions. The available stone are of different sizes ranges from small pebbles to huge boulders is available in great proportion. Near the Kandla, if the material from the central raised portion is lefted, then it will deflect the flow of water flow toward the centre rather than left & right banks, thus reducing the impact of erosional activities on banks. It is, therefore, ***recommended that site is suitable for grant of mining lease*** subject to conditions -

1. Mining of minors mineral be allowed from central portion (near Kandla)
2. Mining be allowed in left bank of river near Surgani from (water flow towards banks)
3. No mining along the bank of river near kandla be allowed.

2.Salandari nala deposit:-

This deposit is located both upstream and downstream of Lachori bridge on both banks of Salandari nala. It is a part of reservoir area acquired by N.H.P.C. It comprises of rock fragment of small size mainly of slate, phyllite & sand and stone etc. This deposit is considerable for lifting of materials. There will be no possibility of degradation of environment in case this material is lifted from this site and pit out area after excavation will be replenished in rainy seasons for considerable thickness both by Suil river and as well as by Salandari nala itself. Because lifting of materials from these locations can also save the life of reservoir and will also help in desilting the reservoir area. Hence the site is recommended for grant of mining lease.

D. Golli Nalla deposit:- This deposit is located near village Golli on Chamba-Pathankot road Upstream. The deposit is accessible through road and can be lifted. The materials comprise of mainly boulder, sand. The proportion of **stone** is maximum. The deposit is restricted to very small extent. The collection/extraction of deposit will not cause any adverse impact if it is carried out in systematic way. The area is recommended to put for auction on following conditions:-

1. The collection of materials should be allowed from the side of water flow towards the banks of nalla.

E. Naini Khad:-

This deposit is located upstream near village Naimkhad on Chamba-Pathankot road. The deposit is of small little length and is mainly consist of river-borne deposit & also materials derived from uphill side of nallah. The deposit comprises of sand, stone & bajri. However the proportion of stone & sand is maximum. Hence the site is recommended to put for auction.

21. RAVI RIVER TRIBUTARIES :

The Bhadal, Suil , Tantgari and Baira Nala are important tributaries of Ravi. The Ravi is a trans-boundary river flowing through Northwestern India and Northeastern Pakistan. After the partition of India in August 1947, the waters of the Ravi River, along with five other rivers of the Indus system (Beas, Sutlej, Chenab, Jhelum and Indus), divided India and Pakistan under the Indus Water

Treaty, which was facilitated by the World Bank. Subsequently, Indus Basin Project has been developed in Pakistan and many Inter Basin Water Transfers, Irrigation, Hydropower and multipurpose projects have been built in India. The Ravi river forms the biggest sub-micro region of Chamba district. From Bara Bangal of Kangra district, it flows through Bara Bansu, Tretha, Chanota and Ulhansa. The Ravi river merges with the Chenab in Pakistan. The well known human settlement along the river are Barmaur, Madhopur and Chamba town. Its total length is 720 km.

21.1 Important Tributaries of river Ravi in District Chamba:

Catchment area of the Ravi River and its tributaries as given below in table-7

Table-7

	Catchment area of the Ravi River :		
Sr. No	**Name of the Khad**	**Area in Sq Km**	**%age of Total**
1	Suil Nala (Right Bank Tributatry of Ravi River)	200	12.4
2	Salandari Nala (Right Bank Tributatry of Ravi River)	50	5.1
3	Kiyani Nala (Right Bank Tributatry of Ravi River)	59	6.7
4	Saho Nala (Right Bank Tributatry of Ravi River	159	7.5
5	Sach Nala (left Bank Tributary of Ravi River)	40	6.3
6	Mehla Nala (left Bank Tributary of Ravi River)	24	6.3
7	Bakani Nala (left Bank Tributary of Ravi River)	12	4.1
8	Gehra Nala (left Bank Tributary of Ravi River)	12	3.3
9	Kurn Nala (left Bank Tributary of Ravi River)	12	2.9
10	Budal Nala (left Bank Tributary of Ravi River)	172	9.9
	Total Ravi River Catchment	**730**	**64.5**

Irrespective of it Chamba is drained by about 10 major and minor Rivers and tributaries of 3rd and more than 3rd order tributaries. In addition to this, about 400 small tributaries of 1st and 2nd order are also present. The Drainage system wise length of 10 tributaries is as given below in the table No.8. The table shows length of each river/ tributary in Chamba district in a upward order given below in Table-8

Table 8

Table showing length of Various Rivers and tributaries of Chamba District (length in km)

Sr. No.	River system of the Chamba District	Length in KM
1	[illegible] Nala (Right Bank Tributary of Ravi River)	80
2	[illegible] Nala (Right Bank Tributary of Ravi River)	6
3	[illegible] Nala (Right Bank Tributary of Ravi River)	5
4	[illegible] Nala (Right Bank Tributary of Ravi River)	16
5	[illegible] Nala (Left Bank Tributary of Ravi River)	7
6	[illegible] Nala (Left Bank Tributary of Ravi River)	4
7	[illegible] Nala (Left Bank Tributary of Ravi River)	5
8	[illegible] Nala (Left Bank Tributary of Ravi River)	5
9	[illegible] Nala (Left Bank Tributary of Ravi River)	6
10	[illegible] Nala (Left Bank Tributary of Ravi River)	35

11 CALCULATION OF MINERAL DEPOSITS AND ANNUAL DEPOSITION IN THE STREAM BED

The deposition in a river bed is more pronounced during rainy season although the quantum of deposition varies from stream to stream depending upon number of factors such as catchment lithology, discharge, river profile and geomorphology of the river course. The particle size may vary depending upon the stage of river i.e. youth, mature and old age. In Chamba District it is observed that annual deposition in various streams vary from 2 cms to 5 cms. However there are certain geomorphological features developed in the river bed such as channel bars, point bars etc. where annual deposition is much more even two to three metres. It is also important to mention here that there is a provision in the river/stream bed mining policy guidelines to allow collection of material

upto a depth of 1 metre where mineral concessions have been granted, but it is noticed that during flood season whole of the pit so excavated is completely filled up and as such the excavated area is replenished with new harvest of minerals.

In order to calculate the mineral deposits in the stream beds, the mineral constituents have been categorized as clay, silt, sand, bajri and boulder and there average %age is taken into account. It is observed in different rivers streams that % age of boulders varies from 30% to 40%, bajri from 20% to 35 %, sand from 20% 40% and silt and clay totalling from 10% 20 %. Boulder, bajri and sand are the resource mineral i.e. usable mineral and rest is taken as the waste.However during present calculation, the waste material i.e silt which vary from 10 to 20% in different streams has also been included in the total production. Further the Survey of India Topo-Sheets are used as base map to know the extent of river course. The mineral reserves have been calculated only upto 1.00 metre depth although there are some portions in the river beds such as channel bars, point bars and central islands where the annual deposition is raising the level of river bed thus causing shifting of the rivers towards banks resuting in to cutting of banks and at such locations, removal of this material upto the bed level is essential to control the river flow in its central part to check the bank cutting. While calculating the mineral potentials, the mineral deposits lying in the sub-tributaries of that particular stream/river has not been taken into consideration. Since these mineral deposits are adding annually to the main river, the mineral deposits will be much more.

23. Detail of the major Rivers flowing in the Chamba District with potential of their Catchment in respect to Mineral wealth.

23.1 Ravi River Catchment:

The Ravi is the principal river which receives almost the entire drainage of the district Chamba. The river rises from 5321 Meter above Mean Sea Level at Bada Bhangal. It has played a significant role in the development of peculiar hill culture which pervades the life of hill people living in the towns and surrounding villages since ages.

The key characteristic of the river and its major tributaries are described

Holi to Rajpura area by keeping in view the potential and feasibility of sites after going through all parameters of environment safety and erosion etc.

Photograph-1 - Showing Ravi River channel near Chamera Dam

The following mineral potentials have been calculated based on the %age of each mineral constituent like boulder, river borne bajri, sand upto a depth of one metre. The annual deposition of minor mineral in the river bed has been calculated by taking into consideration the annual deposition of about 5 Cms. The total potential is given below in the Table 10(a)

Table-9(a)

Name of River	Boulder	River borne Bajri	Sand	Total(in Metric tonnes)
Ravi River	45,,50,000	55,00,500	40,12,000	1,40,62500
Annual Replenishment				
	2,07130	3,42,840	2,07130	7,57,100

Recommendations:

meter in the river bed of Ravi river in Chamba District. Similarly, the annual deposition of minor mineral in the river bed is calculated approximately to the tune of 7,57,100 metric tones. It is, therefore recommended that mineral concession can be granted in the river bed of Ravi River , From Holi up to boarder of Chamba district near Khairi.

Total Potential of Ravi River:

A(1).Holi Deposit;-

This deposit is located about 300-400 metres downstream from Holi station on left bank. It comprises of rock fragment of small size mainly of slate, phyllite & sand and stone etc. This deposit is considerable for lifting of materials. There will be no possibility of degradation of environment in case this material is lifted from this site and pit out area after excavation will be replenished in rainy seasons for considerable thickness. Hence the site is recommended to put for auction.

2.Bagga-River deposit;-

This deposit is located downstream Bagga on both bank of river and is accessible from main road. The deposit mainly comprises of sand and stone with negligible proportion of bajri. The deposit is deposited in form of river bed. In case of lifting of materials from this site, there will be no side effect on environment in term of erosion and also the site being is term river bed will also be replenished during rainy season and flood time with in short spell of time. Hence the site is recommended to pout for auction on following condition -

1. The collection of materials should be allowed from the side of water flow towards the banks of nalla.

3.Bakanipul to Kalsuin -

This deposit is located in downstream **Rakh up to Kalsuin** and having bulk or potentials of river-borne materials which can be utilized for construction purpose. These materials varying in shape from sand to stone & bajri etc. Materials are deposited in form of river bed in right bank of river Ravi. Since this deposit is extended for few kilometres and is replenish able. Hence this area is also recommended for auction as it will not cause any adverse effect in terms of erosion when materials will be lifted from this area.

4.Sach Nala deposit - The mineral deposit is located on the right bank of Sach nala near upstream of Baloo and accumulated bulk of river-borne materials which can be best utilized for construction purpose by lifting from it manually. These materials varying in shape from sand to stone & bajri etc. Since area being replenishable to sufficient extent, hence ***recommended for purpose of mining lease***.

5.Kaludh at Pukhri nala deposit: This deposit is located on Kaludh nala on both banks of Kaludh nala especially near the confluence point of this nal with Ravi River at K[illegible] and having bulk of potentials of river borne materials which can be utilized for construction purpose. These materials varying in shape from sand to stone & bajri etc. Materials are deposited in form of river bed in right bank of river Ravi on Kaludh nala upstream. Since this deposit is extended for approximately 500 meter upstream and is replenish able. Hence this area is also recommended for purpose of mining lease as it will not cause any adverse effect in terms of erosion when materials will be lifted from this area.

6.Bala to Parol and Ladoh to Lalpur, Salimar & Rajpura Deposit:

This mineral deposit is located on the both side of river Ravi between area from Bala downstream up Parol and also from Ladoh upto Rajpura. This deposit also is apart of previously mentioned area although it has been now segmented into two fraction like **Bala to Parol** and further **Ladoh to Rajpura**. However earlier it was a continuous single path for great extent before the construction of bridge near Parol downstream. This river bed deposit comprises of river borne deposit which is of different dimension varying from sand to boulder type. Here deposit is encountered in form of flood plain & channel bar. The proportion of boulder is maximum in comparison to sand and whole area is accessible through road and this entire pocket extends about 3-4 km in length and having width varying from 150-180 meters. Since the deposit is located on the both bank of Ravi river and also at some place the flow of river on the both banks is higher than flood plain and hence there is chance of overflowing of river flows towards the both banks during high floods seasons which can cause the damage to surroundings area in terms of property as well as life. So keeping in view the above narrated facts, the site is ***recommended for grant of mining lease*** subject to following terms & conditions:

i. No mining be carried out at the place along the river where the river bed is seem to be higher than river bed.

8.Sherpur Deposit.

This deposit is located at both down and upstream of Sherpur on left bank of Ravi River and having bulk of river borne materials which can be best utilized for construction purpose. These materials varying in shape from sand to stone & bajri etc. Materials are deposited in form of river bed in left bank of river Ravi. Since this deposit is extended for considerable (nearly about 500 meters) distance and is replenishable. Hence this area is also recommended for grant of mining lease as it will not cause any adverse effect in terms of erosion when materials will be lifted from this area manually.

9. Khairi Deposit.

This deposit is located downstream near village Khairi on right bank of Ravi River. The deposit is spread over sufficient length and is mainly consist of river-borne deposit & also materials derived from uphill side of surrounding nalla apart from Ravi River. The deposit comprises of sand, stone & bajri. However the proportion of stone & sand is maximum. Hence the site is ***recommended grant of mining lease***.

(B)Saho nala Deposit:-

This deposit is located along Saho nala from Maredi upstream. The mineral deposit is deposited inform of river bed and this area was also being auctioned in the past. The deposit is approached through road at Maredi. Deposits are seen covered with overburden materials which is mainly consist of river-borne deposit mixed with materials derived from uphill side. Slope angle is vary gentle to moderate and banks are seems to stable. This deposit about 100-250 metres in length and consist of sand, stone & bajri and sandy materials can be extracted only through screening the suitability of materials, the site is recommended for auction prior to following condition,-

1. That mining of minor minerals be allowed in right bank of river only near Maredi

C. Suil Nala deposit

The Suil river is perennial river originating from Padri Gali at 3125 mtrs R.L. The Suil river originates at elevation of about 3125 m R.L. Other main tributaries of Suil nala are Sach nala and also Malen nala which meet the Suil khad near Ser at elevation of 906 mtrs R.L. Suil river join river Ravi near Chakloo. All these stream khads are also perennial

1.Surgani to Kandla deposit:-

The mineral deposit is located near Surgani Downstream (from Surgani bridge) upto village Kandla (previous auctioned area) along the river bed in form of flood plain & Channel bars etc. It extends for great distance from Surgani bridge to kandla downstream upto Chamera reservoir area. The deposit can be extracted throughout the year except rainy seasons and deposit is connected through road both at Sugani & Kandla. width of riverbed is varies from 50-300 metrs. In this pocket. The mining is allowed only in left bank of suil nala except Surgani where mining can be done fron either banks of river. The available minor minerals deposit are in admixed form comprises of sand, soil, silt, stone of different dimensions. The available stone are of different sizes ranges from small pebbles to huge boulders is available in great proportion. Near the Kandla, if the material from the central raised portion is lefted, then it will deflect the flow of water flow toward the centre rather than left & right banks, thus reducing the impact of erosional activities on banks. It is, therefore, ***recommended that site is suitable for grant of mining lease*** subject to conditions.-

1. Mining of minors mineral be allowed from central portion (near Kandla)
2. Mining be allowed in left bank of river near Surgani from (water flow towards banks)
3. No mining along the bank of river near kandla be allowed

2.Salandari nala deposit:-

This deposit is located both upstream and downstream of Lachori bridge on both banks of Salandari nala . It is a part of reservoir area acquired by N.H.P.C. It comprises of rock fragment of small size mainly of slate, phyllite & sand and stone etc. This deposit is considerable for lifting of materials. There will be no

possibility of degradation of environment in case this material is lifted from this site and pit out area after excavation will be replenished in rainy seasons for considerable thickness both by Sui river and as well as by Salandari nala itself. Because lifting of materials from these locations can also save the life of reservoir and will also help in desilting the reservoir area. Hence the site is recommended for grant of mining leave.

D. Gadli Nalla deposit - This deposit is located near village Gadli on Chamba-Pathankot road Upstream. The deposit is accessible through road and can be lifted. The materials comprise of mainly boulder, sand. The proportion of **stone** is maximum. The deposit is restricted to very small extent. The collection/extraction of deposit will not cause any adverse impact if it is carried out in systematic way. The area is recommended to put for auction on following conditions -

1. The collection of materials should be allowed from the side of water flow towards the banks of nalla.

E. Naini Khad:- This deposit is located upstream near village Naimkhad on Chamba-Pathankot road. The deposit is of small little length and is mainly consist of river-borne deposit & also materials derived from uphill side of nallah. The deposit comprises of sand, stone & bajri. However the proportion of stone & sand is maximum. Hence the site is recommended to put for auction.

Photograph-1and 2 - Showing Ravi River channel near Chamera Dam

23.2 Suil Nala Catchment:

Located in the Chamba Valley of Himachal Pradesh. the Suil is a perennial tributary of the Ravi river originating from the Padri gali The key characteristic of the river and its major tributaries are described below in the Table-**10, and 10(a)**

Table-10

Name of the Khad	**Length (in km)**	**Catchment Area (in Sq.km)**	**Average Width(in mtr)**
Suil Nala	40 Km	200 Sq Kmtrs	50 mtr
Origin of Binnu Khad	From Padri gali,3125 Meter above Mean Sea Level.		
Important tributaries of the catchment	Sach Nala and Malen Nala		

Important Villages near the bank.	From Origin to confluence: Saloont, Surhani,Sundla and Chakloo (Confluence point)
No. of leases or Concession given =3 **Total leased out area** =6-03-20 Hect.	

Geological Conditions:

The deposit is of small little length and is mainly consist of river-borne deposit & also materials derived from uphill side of nallah. The deposit comprises of sand, stone & bajri. However the proportion of stone & sand is maximum and during monsoon season the stream carries heavy sediment load and deposit it annually on the river bed. Hence the site is recommended to put for auction

Total Potential of Suil Nala.

On the basis of drainage analysis, No. of tributaries, average erosion in the river bed, the annual deposition of minor mineral in the river bed has been calculated by taking into consideration the annual deposition of about 4 Cms.The total potential of the Binnu Khad is given below in the table

Table 10(a)

Name of River	Boulder	River borne Bajri	Sand	Total
Suil Nala	15,44,400(45%)	12,01200(35%)	6,86,400	34,32,000
Annual Replenishment				
	77,220	600.60	34.3.20	1,71,600

Recommendations:

It is evident from the above table that about 34,32,000 metric tones of different sizes of minor minerals are available upto depth of one meter in the river bed of **Suil Nala** in Chamba District. Similarly the annual deposition of minor mineral in the river bed is calculated approximately to the tune of 1,71,600 metric tones. It is therefore recommended that mineral concession can be granted in the river [illegible] from Saloont up to Chakloo (Confluence point).

23.3 Salandari Nala Catchment:

Located in the Chamba Valley of Himachal Pradesh, the Salandari Nala is a perennial right bank tributary of the Salandari Nala originating from the **Raja ka Dera,** 2800 Meter above Mean Sea Level.

The key characteristic of the river and its major tributaries are described below in the Table-**11, and 11(a)**

Table-**11**

Name of the Khad	**Length (in km)**	**Catchment Area (in Sq.km)**	**Average Width(in mtr)**
Salandari Nala	6 Km.	50 Sq Kmtrs.	30 mtr
Origin of Salandari Nala	From the **Raja ka Dera**, 2800 Meter above Mean Sea Level		
Important tributaries of the catchment.	Garanda Nala (Right bank tributary), Salar Nala (Left bank tributary), Paprud Nala (Right bank tributary), Patech Nala (Left bank tributary),Dholera Nala (Right bank tributary), Chanden Nala(Left bank tributary), and Kohar Nala(Right bank tributary)		
Catchment area	50 Sq Kmtrs		
Important Villages near the bank.	From Origin to confluence Kolani, Gorat, Lahnga, Gaihr, Saperu, Richhiara,Gwal, Kand Bari, Holta, Kamlehr, Sornu, Nam, Jalrehr, Dharman, Odar, Sungal, Mat, Kot, Garh, Jandpur, Bhautni, Nagat, Bhuana, Biara, Labo, Khudli, Rakkar, Rajot, Karaur, Non, Gagoti, Machhol, Tikri, and rakh and Kilhi.		

No. of leases or Concession given = Nil

Total Area of Khad = 208-00-00Hect

Total leased out area = N.A.

Geological Conditions:

This deposit is located both upstream and downstream of Lachori bridge on both banks of Salandari nala . It is a part of reservoir area acquired by N H P C It comprises of rock fragment of small size mainly of slate, phyllite & sand and stone etc. This deposit is considerable for lifting of materials. There will be no possibility of degradation of environment in case this material is lifted from this site and pit out area after excavation will be replenished in rainy seasons for considerable thickness both by Suil river and as The boulder beds are considered the prominent source of river borne deposits and during monsoon season the stream carries heavy sediment load and deposit it annually on the river bed on the confluence with Ravi

Total Potential of Salandari Nala:

The following quantity of mineral potential has been calculated based on the percentage of each mineral constituent like boulder, river borne bazri and sand upto a depth of one metre.

The total potential of the Awa Khad is given below in the **Table -11(a)**

Table -11(a)

Name of River	Boulder	River borne Bajri	Sand	Total
Salandari Nala	1,00,000	1,50,000	1,50,000	4,00,000
Annual Replenishment.				
	7,000	8,000	9,000	24,000

Recommendations:

It is evident from the above table that abou4,00,000 metric tones of different

sizes of minor minerals are available upto depth of one meter in the river bed of Salandari Nala in Chamba District. Similarly the annual deposition of minor mineral in the river bed is calculated approximately to the tune of 2400 metric tones. It is therefore recommended that 2400 metric tones of mineral can safely be allowed to lift up to Confluence with Ravi River.

23.4 Kiyani Nala Catchment:

Located in the Chamba Valley of Himachal Pradesh, the **Kiyani Nala** is a perennial tributary of the Beas River originating from the Dawat Ki Dhar. The key characteristic of the river and its major tributaries are described below in the Table-**12 and 12(a).**

Table- 12:-

Name of the Khad	**Length (in km)**	**Catchment Area (in Sq.km)**	**Average Width(in mtr)**
Kiyani Nala	5 Km.	59 Sq.Kmtrs.	30 mtr.
Origin of Kiyani Nala .	From,2345 Meter above Mean Sea Level near Dawat Ki Dhar		
Important tributaries of the catchment	Kuledh Nala		
Catchment area	59 Sq Kmtrs.		
Important Villages near the bank.	From Origin to confluence: Pukari, Nanu and Kiyani(on the confluence with Ravi)		
No. of leases or Concession given =0 **Total leased out area = N.A.**			

Geological Conditions:

This deposit is located on Kuledh nala on both banks of Kuledh nala especially near the confluences point of this nal with Ravi River at Kiyani and having bulk or potentials of river-borne materials which can be utilized for construction

purpose. These materials varying in shape from sand to stone & bajri etc. Materials are deposited in form of river bed in right bank of river Ravi on kuledh nala upstream. Since this deposit is extended for approximately 500 metrs upstream and is replenish able. Hence this area is also recommended for purpose of mining lease as it will not cause any adverse effect in terms of erosion when materials will be lifted from this area.

Total Potential of Kiyani Nala .

On the basis of drainage analysis, No of tributaries, average erosion in the river bed, the annual deposition of minor mineral in the river bed has been calculated by taking into consideration the annual deposition of about 2 Cms. The total potential of the Kiyani Nala is given below in the **Table - 12(a).**

Table - 12(a)

Name of River	Boulder	River borne Bajri	Sand	Total
Kiyani Nala	75000	75000	1,00,000	2,50,000
Annual Replenishment				
	13000	7000	15000	35,000

Recommendations:

Since a no. of water supply as well as irrigation schemes exist along the bed of Kiyani Nala and adequate accumulation of minor minerals and is recommended for mineral concession.

23.5. Saho Nala Catchment:

Located in the Chamba Valley of Himachal Pradesh, the Saho Nala is a perenial tributary of the Ravi river originating from the Dalpa. The main characteristic of the river and its major tributaries are described below in the Table-**13 and 13(a)**

Table-13.

Name of the Khad	Length (in km)	Catchment Area (in Sq.km)	Average Width(in mtr)
Saho Nala	16 Km	159 Sq Kmtrs	25
Origin of Saho Nala	From north South trending ridge near Saho, 3500 Meter above Mean Sea Level		
Important tributaries of the catchment	Saho Nala,Meradi Nala, Chaminu Nala		
Catchment area	159 Sq Kmtrs		
Important Villages near the bank	From Origin to confluence Protha, Saho,Phuar, Barot ,sungal,Meradi		
No. of leases or Concession given -Nil Total leased out area - Nil			

Geological Conditions:

The saho Nala deposits are seen covered with overburden materials which is mainly consist of river-borne deposit mixed with materials derived from uphill side. The boulder beds are considered the prominent source of river borne deposits and during monsoon season the stream carries heavy sediment load and deposit it annually on the river bed.

Total Potential of Saho Nala .

On the basis of drainage analysis, No. of tributaries, and average erosion in the river bed, the annual deposition of minor mineral in the river bed has been calculated by taking into consideration the annual deposition of about 4 Cms. The total potential of the Saho Nala is given below in the **Table -13(a)**

Table -13(a):

Name of River	Boulder	River borne Bajri	Sand	Total
Saho Nala	1,50,000	1,50,000	1,00,000	4,00,000

Annual Replenishment	15,000	15,000	10,000	40,000

Recommendations:

This deposit is located along Sahe nala from Mareth upstream. The mineral deposit is deposited inform of river bed and this area was also being auctioned in the past. The deposit is approached through road at Mareth. Deposits are seen covered with overburden materials which is mainly consist of river borne deposit mixed with materials derived from uphill side. Slope angle is vary gentle to moderate and banks are seems to stable. Simularly the annual deposition of minor mineral in the river bed is calculated approximately to the tune of 40,000 metric tones. It is therefore recommended that 40,000 metric tones of mineral can safely be allowed to lift up to Confluence with Ravi River. This deposit about 100-250 metres in length and consist of sand, stone & bajri and sandy materials can be extracted only through screening the suitability of materials, the area is recommended for auction.

23.6. Sach Nala:

Located in the Chamba Valley of Himachal Pradesh, **Sach Nala** is a right bank tributary of the Ravi river originating from the Dalpa. The key characteristic of the river are described below in the Table-**14 and 14(a)**:

Table-14.

Name of the Khad	**Length (in km)**	**Catchment Area (in Sq.km)**	**Average Width(in mtr)**
Sach Nala	7 Km	40Sq Kmtrs	20 mtr
Origin of Sach Nala	From, 2431 Meter above Mean Sea Level Dalpa		
Point of Origin and Confluence with Ravi river	From, 2431 Meter above Mean Sea Level and Confluence with Neugal river at 905 mtr		

Catchment area.	40 Sq.Kmtrs.
Important Villages near the bank.	From Origin to confluence: Singi, Rinda,Sach and sultanpur
No. of leases or Concession given =Nil **Total leased out area = Nil**	

Total Potential of Sach Nala.

The following quantity of mineral potential has been calculated based on the percentage of each mineral constituent like boulder, river borne bazri and sand upto a depth of one metre

The total potential of the Tahal Khad is given below in the **Table -14(a):**

Table -14(a):

Name of River	Boulder	River borne Bajri	Sand	Total
Sach Nala	55000	35000	20000	1,10,000
Annual Replenishment.				
	6,200	3800	2000	12000

Recommendations:

It is evident from the above table that about 110000 metric tones of different sizes of minor minerals are available upto depth of one meter in the river bed of Sach Nala in hamba District. Similarly the annual deposition of minor mineral in the river bed is calculated approximately to the tune of 12000 metric tones. The stream width is narrow in major portion. The mineral deposit is located on the right bank of Sach nala near upstream of Baloo and accumulated bulk of river-borne materials which can be best utilized for construction purpose by lifting from it manually. These materials varying in shape from sand to stone & bajri etc. Since area being replenishable to sufficient extent, hence ***recommended for purpose of mining lease.***

23./ChakkiKhad:

Located in the Chamba Valley of Himachal Pradesh, the Chakki Khad is a tributary of the Beas river. It flows through Bhatiyat Chamba and part in kangra district and Punjab and joins Beas near Pathankot. It is fed by snow and rain stream from the Southern slopes of the Dhauladhar range .The key characteristic of the river and its major tributaries are described below in the Table-**15 and 15(a).**

Table-15.

Name of the Khad.	**Length (in km)**	**Catchment Area (in Sq.km)**	**Average Width(in mtr)**
Chakki Khad	8 Km.	55 Sq.Kmtrs.	50 mtr
Origin of **Chakki Khad.**	From, Southern slopes of the Dhauladhar range		
Important tributaries of the catchment.	Kalam trimath (Right bank tributary of Nakki Khad),Kalam Khad –II(Right bank tributary of Nakki Khad),Chakki-Siyan Khad (Right bank tributary of Nakki Khad) Hawar Khad (Right bank tributary of Nakki Khad(Right bank tributary of Nakki Khad)		
Catchment area.	55 Sq.Kmtrs.		
Important Villages near the bank.	From Origin to confluence: Bugoth, Chinian,Katli,Basa,Bojur Ka Basa,Jajri and Sanjinala, then entered the District Kangra.		
No. of leases or Concession given =nil Total leased out area =nil			

Geological conditions-

The Chakki Khad passes through rocks of upper Siwaliks containing boulder beds, and small lenses of clay and sand stone. This formation is considered the potential source of river borne deposites in the stream bed. The stream bed is occupied with huge deposits of gravel and sand. Near the confluence with Beas river this stream has developed a vast flood plain as the velocity of water of this stream during monsoon is checked at the confluence and sediment load is

deposited at this place forming vast flood plain.

Total Potential of Chakki Khad.

The following quantity of mineral potential has been calculated based on the percentage of each mineral constituent like boulder, river borne bazri and sand upto a depth of one metre.The total potential is given below in the **Table-15**

Table-15(a)

Name of River	Boulder (30%)	River borne Bajri (40%)	Sand (30%)	Total
Baliyana Khad	2,00,000	4,00,000	4,00,000	8,00,000
Annual Replenishment.				
	25,000	20,000	30,000	75,000

Recommendations:

It is evident from the above table that about 8,00,000 metric tones of different sizes of minor minerals are available upto depth of one meter in the river bed of Chakki Khad. in hamba District.Similarly the annual deposition of minor mineral in the river bed is calculated approximately to the tune of 75,000 metric tones. Keeping in view the significant amount of minor mineral lying in the river bed, it is recommended that minor mineral such as sand stone and bajri can be allowed to be lifted from this river bed.

23.8 Dehar Khad Catchment:

Located in the Chamba Valley of Himachal Pradesh, the Dehar Khad is a perenial tributary of the Beas river originating from near Pirigarh in Chamba district and entered the Kangra district at Kotla. The key characteristic of the river and its major tributaries are described below in the Table-**16, and 16(a).**

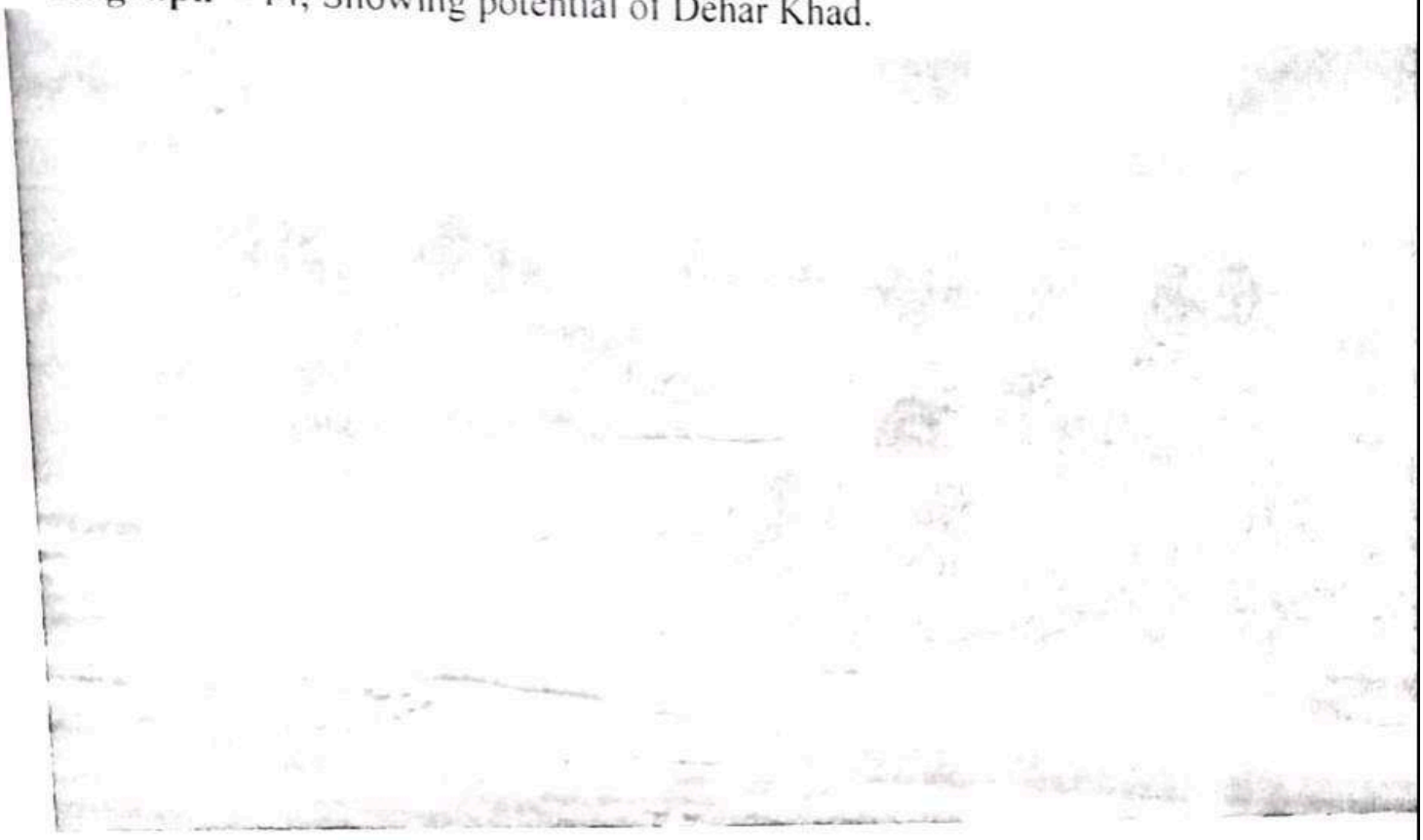
Table-16

Name of the Khad	Length (in km)	Catchment Area (in Sq.km)	Average Width(in mtr)
Dehar Khad.	10 Km.	85 Sq.Kmtrs.	100 mtr.
Origin of Dehar Khad.	From, 1324 Meter above Mean Sea Level near Pirigarh,		
Important tributaries of the catchment.	**Bhed Khad(Left bank tributary)**,Brahi Khad (Left bank tributary), Dhramman Khad(Left bank tributary of Brahi Khad), Chho Khad(Right bank tributary), and Kibber Khad(Left bank tributary)		
Catchment area.	85 Sq.Kmtrs.total		
Important Villages near the bank.	From Origin to confluence: Kamla.Harathi, Mankot, Sujanta, Dhumin, Khairna, Latehr, Kotla(Kangra)		
No. of leases or Concession given =1 Total leased out area =			

Geological Conditions:

The Dehar Khad cut its course all along its length through the rocks of Siwalik formation. The Siwalik Group comprises of sandstone, siltstone and clay/claystone alternations in the lower part, whereas the upper part is represented by conglomerates, pebbly bands and sandstone lenses, ranging in age from Middle Miocene to Lower Pleistocene.The river bed is occupied with recent deposits of minor minerals comprising sand, silt, gravel and pebbles of Newer Alluvium belonging to Quaternary age. These sediments are deposited in the shape of channel bars, piedmont bars, flood plains and alluvial fan deposits.The Alluvium consists of loose sand, silt, clay, pebble, gravel, boulder and kankar. It unconformably overlies different formations in different areas.

Photograph – 14, Showing potential of Dehar Khad.



Total Potential of Dehar River.

The following mineral potentials have been calculated based on the %age of each mineral constituent like boulder, river borne bajri, sand upto a depth of one metre. The annual deposition of minor mineral in the river bed has been calculated by taking into consideration the annual deposition of about 5 Cms. As seen in photographs the banks comprise of boulder beds are steep and stable in nature.

The total potential and annual replenishment is given below in the Table-16(a)

Table-16(a)

Name of River	Boulder (30%)	River borne Bajri (40%)	Sand	Total
Dehar River	3,02,000	4,36,000	3,02,000	10,40,000
Annual Replenishment.				
	30000	25000	35000	90,000

Recommendations:

It is evident from the above table that about 10,.40,000 metric tones of different sizes of minor minerals are available upto depth of one meter in the river bed of Dehar Khad in Chamba District.Similarly the annual deposition of minor mineral in the river bed is calculated approximately to the tune of 90,000 metric tones. It is therefore recommended that mineral concession can be granted in the river bed of Dehar Khad.

23.9 Kalam Trimth deposit:-

This deposit is located near Chowari bridge upstream and deposit is mainly comprises of sand, stone , bajri & clay matrix on both side of banks and of small areal extent maximum width showing tapering towards upstream & downstream side. This is also a part of previously auctioned area. If materials are lifted from banks, it will not cause any adverse impact. Moreover it will shift the flow of water toward centre causing less erosion of materials from banks. Hence site is recommended for auction.

23.10 Kalam Khad-II deposit:-

This deposit is situated both upstream & downstream of Kalam Khad near Parchhar and sand; stone is deposited during flood seasons. Here there is possibility of replenishment of the mineral/ materials annually during flood seasons. Therefore, the site is recommended to put auction subject to the condition that the spot where there is apprehension of bank-cutting may not be put to auction.

23.11 Chakki-Siyun Khad.-

The deposit lies both side of Chakki-Siyun Khad downstream the bridge. The minerals deposit ate in form of floods plain and main constituents are varying from sand to small/big boulder. There is no adverse impact on the area if the river-borne materials will be lifted from river bed with out any impact in form of bank cutting and also there would be maximum chance of replenishment during the flood seasons. Hence site is recommended to put for auction.

23.12 Hawar Khad:-

This deposit is located on the downstream of Hawar Khad near Taragargh. The minerals are deposited along the bed of the khad in form of floods plain and comprises of big boulder and matrix of fine assorted materials. The bank seen to be quite stable. If any case minor minerals are extracted from the bed, there is no possibility of any damage/ erosion of the bank. In view of above the site is recommended to put for auction.

23.13 Dudaman Khad deposit- This minor minerals deposit extends both upstream & downstream near Hatli industrial area. The whole of bed of this khad is minerals bearing containing big boulder, sand matrix & other rock fragments. The banks do not expose any bed rocks. There is also great

possibility of replenishment of materials. Hence lifting/ collection of materials will not cause any adverse impact on environment & damage to bank erosion. Hence site is recommended to put for auction.

23.14Patka Khad deposit:-

This deposit is located upstream of Patka Khad near village Panjla. The minor minerals are deposited in form of flood plain and consist of mostly sand. There is no apprehension of further bank cutting due to mining. The site is recommended to put for auction.

23.15 Channal Khad.-

This deposit is located on channel Khad upstream near Sihunta and having sufficient quantity of river borne materials in form of sand, stone and bajri. Here the stone are available in maximum proportion. Since the area is of sufficient aerial extents and is replenishable in month of monsoon/flood seasons. Therefore it is recommended to put for auction.

23.16 Sarahal Khad, Brahal, Thulel & Balana deposit -

These deposit is located on Thulel khad near Sarahal, Brahal, Balana and lies in upstream side of main road(Sihunta-Dramman road). The deposit consist of sand, stone, bajri (little proportion) and whole are is replenishable during flood season. These deposit also contains assorted materials admixed with clay matrix. Here the deposit is in form of flood plain and there will be no adverse impart on banks of Khad if the materials is lifted from these spot/area. Therefore the site recommended to put for auction subject to following conditions-

24. RECOMMENDATIONS OF CHAMBA KHAD/RIVER:

The River Stream recommended for concession is subject to following general condition of the policy. General conditions as per strategy-S of the *River/ stream* Bed Mining Policy Guidelines for the State of Himachal Pradesh Notified on 28.2.2013.

Conclusion:

Entire District was traversed in four different traverses and were inspected and studied thoroughly. During the traversing, it was observed that whole District was drained out in mainly two basins i.e. Ravi and Beas basin. The Three Rivers i.e. Ravi River, Suil River and their tributary i.e. Nallah/ Streams are drained out in Ravi basin whereas Chakki & Thulel khad and its tributaries drained out in Beas basin. During the inspection, it is observed that replenishment of the minor minerals in these rivers is more than that of its lifting/collection. The exploitation of minor minerals are depends upon the developmental works executed along the periphery of these river beds as most of the townships are located in pockets along the periphery of these river beds. Moreover these are very limited outlets from these rivers/ khads from where the minor minerals are to be lifted.

Almost all the river stream beds of the district have been defined as forest land and without prior approval from competent authorities for diversion of forest land for non-forestry use no mineral concessions shall be granted

Ministry of environment & Forest, Government of India. Therefore at present, all rivers/ stream beds falling in Chamba District are banned for lifting/ collection of minor minerals for want of "No objection Certificate" from Forest Department only hill slope mining mostly in private land are being carried out. The lifting/ collection of minor minerals shall be carried out from the central portions of the river beds, if allowed, so that proper and free flow channel the water be developed, which ultimately prevents bank erosion.

25. General Recommendations:

The part of river/stream beds recommended for grant of mineral concessions in this report are based on reconnaissaince survey conducted for whole of district Chamba, however before grant of any mineral concession in a particular river/stream bed, the guidelines contained in River/Stream bed mining policy are to be followed in addition to site specific conditions as specified bv the Joint Inspection Committee and recommendation thereof. In the ibid Policy Guidelines, following general conditions are mentioned.

1 No River/Stream bed mining shall be allowed without the recommendations of the Sub-Divisional Level Committee.

2 No River/Stream bed mining shall be allowed without getting clearance under Forest Conservation Act, 1980 if the area attracts the provisions of FCA, 1980.

3 No River/Stream bed mining shall be allowed within 75 meters from the periphery of soil conservation works, nursery plantation, and check dams or within the distance as recommended by the Sub-Divisional Committee, which ever is more.

4 No River/Stream bed mining shall be allowed within $1/5^{th}$ of its span or 5 meters from the bank or as specified by the Sub-Divisional Committee which ever more is.

5 No River/Stream bed mining shall be allowed within 250 meters U/S and D/S of Water Supply Scheme or the distance as specified by the Sub- Divisional Committee which ever is more.

6 No River/Stream bed mining shall be allowed within 200 meters U/S and 200

to 500 mts D/S of bridges depending upon the site-specific conditions.

7 No approach road from PWD road shall be allowed to River Stream beds mining, unless lessee contractor obtains written permission from XEN PWD for making road leading to all intake places from the PWD Roads.

8 No mechanical mining through mechanical excavator including any other earth moving machines like JCB, Bouldozer,Pocklain,Loders etc shall be carried out in river or stream Bed by the lease holder or permit holder or contractor as the case may be

9 No boulder cobbles hand broken road ballast shall be allowed to be transported outside the State from River Stream beds, so as to reduce pressure on the River Stream beds.

10 No digging of more than 3 feet shall be allowed in River Stream beds.

11 Every leaseholder shall supply in advance, the Registration Nos of vehicle engaged in transportation of mineral from mining area to his industrial unit. This would ensure checking of illegal vehicles carrying minerals.

12 Every lessee contractor shall ensure that his labou r does not involve in fish poaching.

13. No blasting shall be allowed in river stream beds.

26 General recommendations/conclusions:

During the preparation of the present report only 10 No.s of rivers streams has been studied in detail, as the rest of the streams rivers either have are very narrow at most of the places and as such are fit for grant of mineral concession for mineral based industries only in wider place. however it is also important to mention here that because of the regular demand of sand, stone and bajri for the developmetal activities in the respective areas, such streams are prone to illegal mining, as such if any person party applies for open sale of mineral on private land, the mining for open sale may be granted to meet out the local demands and Govt land on Public auction , or any exigency subject to the approval from the joint Inspection Committee These mineral concessions shall also reduce demand load and'll be helpful to minimmise illegal extraction of minerals, failure of which may result in to illegal mining at odd hours and shall be haphazard and more detrimental to the local ecology.

Irrespective of it following geoscientific considerations are also suggested to be taken into account during the river bed mining in a particular area:

1. Abandoned stream channels or terrace and inactive floodplains may be preferred rather than active channels and their deltas and floodplains.

2. Stream should not be diverted to form inactive channel.

3. Mining below subterranean water level should be avoided as a safeguard against environmental contamination and over exploitation of resources.

4. Large rivers and streams whose periodic sediment replenishment capacities are larger, may be preferred than smaller rivers.

5. Segments of braided river system should be used preferably falling within the lateral migration area of the river regime that enhances the feasibility of sediment replenishment.

6. Mining at the concave side of the river channel should be avoided to prevent bank erosion. Similarly meandering segment of a river should be selected for mining in such a way as to avoid natural eroding banks and to promote mining on naturally building (aggrading) meander components.

7. Continued riverbed material mining in a given segment of the river will induce seasonal scouring and intensify the erosion activity within the channel. This will have an adverse effect not only within the mining area but also both in upstream and downstream of the river course. Hazardous effects of such scouring and enhanced erosion due to riverbed mining should be evaluated periodically and avoided for sustainable mining activities.

8. Mining Lease (ML) areas should be demarcated on the ground with Pucca pillars so as to avoid illegal unscientific mining.

9. The auction shall be done as per the recommendation /approval of the Sub-Divisional Level Committee.