

DISTRICT SURVEY REPORT OF RIVER BED MINING OF UTTARKASHI, UTTARAKHAND,

In Compliance of Ministry of Environment, Forest and
Climate Change Notification No. 2827 dated: 25th July 2018



Complied by

District Task Force, Uttarkashi, Geology and Mining Unit, Uttarakhand

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1. Introduction

Uttarkashi district was created on February 24, 1960 out of what then constituted the parganas of Rawain and Uttarkashi of Rawain tehsil of erstwhile Tehri Garhwal district. It sprawls in the extreme north-west corner of the state over an area of 8016 sq. kms. in the rugged terrain of the mystic Himalayas.

Geographically the district lies in the northwestern part of Uttarakhand state. It is confined by North Latitude 30° 27' 18" and 31° 27' 42" and East Longitude 77° 48' 26" and 79° 24' 00" and falls in Survey of India Degree sheet Nos. 53E, F, I, J and M.

District Uttarkashi is bounded by Himachal Pradesh and China in the north, Tehri Garhwal district on the south, districts Chamoli and Rudraprayag on the east and district Dehradun on the west. Forest cover with 88.79% is the main landuse. The total population, of the district, is 3,30,086 out of which the male and female population is 1,68,597 and 1,61,489 respectively (Census, 2011). The population density is 41 persons/km² and the male, female sex ratio is 1000: 958. The overall literacy rate is 75.81%.

The district is important from religious point of view as the two holy rivers namely Ganga and Yamuna have their emerging points in this district. Uttarkashi district, the largest district of Uttarakhand, is also important from strategic point of view as it shares its NE boundary with China. Administratively the district is divided into four tehsils namely, Bhatwari, Dunda, Chinyalisaur, Mori, Barkot and Purola. Further it is divided into six developmental blocks viz: Mori, Purola, Naugaon, Bhatwari, Dunda and Chinyalisaur.

The district is named after its headquarters town Uttarkashi, an ancient place with rich cultural heritage and as the name suggests is the Kashi of north (Uttara) held almost as high a veneration as Kashi of the plain (Varanasi). Both the Kashi of the plain (Varanasi) as well as the Kashi of north are situated on the

banks of the river Ganga (Bhagirathi). The area which is held sacred and known as Uttarkashi, lies between the rivers Syalam Gad also known as the Varuna and Kaligad also known as the Asi. Uttarkashi District town lies high in the Himalaya range, and the district contains the source of both the Ganges and Yamuna rivers, which attract thousands of Hindu pilgrims. The town lies on the main route to Gangotri, has many Hindu temples, and is also considered an important Hindu pilgrimage centre.

The terrain and climate of Uttarkashi district provide uncongenial physical environment for human settlement. Yet undaunted by hazards and hardships this land was inhabited by hill tribes since ancient times bringing out the best in man his adaptive talents.

The upper Himalayas part of district Uttarkashi contains within itself varying geographic environments ranging from snow free valleys and outer hills to the high peaks with perpetual snow and glaciers. The terrain runs into series of ridges and valleys. Each ridge leads to another coiling up in seemingly unending chains. Most of the terrain is mountainous consisting of high rise ridges, hills and plateaus and flat pieces of land are rare.

Rishikesh, the nearest railway station is situated about 160 kms and ‘Jolly Grant Airport’ is the nearest Airport from Uttarkashi situated. At Chiniyalusaur Tehsil, about 35km from Uttarkashi town, Air-stripe is under construction nowadays.

2. Overview of Mining Activity in the District

Mainly three types of Minor Minerals constituents such as **sand**, **bajri** and **boulder** are required for any type of construction apart from other material like cement and steel. In the earlier time the mud houses/buildings were constructed with the use of mud. However with the passage of time, new techniques of development activities were started. As such the demand of Minor Mineral started on an increasing trend. In order to meet the requirement of raw material

for construction, the extraction of sand carried out manually / semi- mechanized process from the river beds.

The local residents used to lift sand, bajri and boulder etc. from the river beds to meet out their bonafide requirement. However, Uttar Pradesh Minor mineral Concession Rules-1963 which were adopted by state Govt. as such at the time of creation of Uttaranchal then promulgated, Uttarakhand Minor Mineral Concession Rule, 2001 and its amendments (time to time) for facilitating society to pick river bed material (RBM) legitimately to obtain mineral revenue keeping in view of guarding environmental aspects too. The mining is regulated in accordance with the rules.

3. The List of Mining Leases in Uttarkashi District with location, area and period of validity

Table 1: Details of Existing Mining Leases

S. No.	Name of lessee	Tehsil	Lot Location	River name	Area (in ha.)	Type of mineral	Period
1.	Shri Pratap Singh S/O Bhadu Singh	Chinyalisaur	Chinyali	Bhagirathi	2.463	Sand, Bajri & Boulder	30-01-2015 To 29-01-2020
2.	Shri Pratap Singh S/O Pal Singh, Nagni Badi	Chinyalisaur	Kotgari	Bhagirathi	0.924	Sand, Bajri & Boulder	28-10-2015 To 27-10-2020
3.	Shri Jagbir Singh Bhandari S/O Shri Kuhsal Singh	Barkot	Ponti	Yamuna	0.860	Sand, Bajri & Boulder	22-10-2016 To 21-10-2021
4.	Shri Rajender Singh	Chinyalisaur	Hitara	Bhagirathi	0.31	Sand, Bajri & Boulder	06-10-2018 To 05-10-2023

4. Details of Royalty or Revenue received in last three years

(Royalty from Govt. Agency, illegal mining, Stone Crusher, Retail Storage, Application Fees etc. are included)

Table 4: Royalty or Revenue received in last three years

S. No.	Financial year	Royalty (in ₹)
1.	2016-17	12,10,59,639.00
2.	2017-18	16,38,18,559.00
3.	2018-19	12,31,40,828.00

5. Detail of Production of river bed material (RBM) in last three years

Table 5: Production of RBM in Last three years,(Existing RBM Lots).

S.No.	Year	Production RBM (In MT)
1.	2016-17	75125.70
2.	2017-18	62588.33
3.	2018-19	152573.50

6. Process of Deposition of Sediments in the rivers of the District

The deposition in a river bed is more pronounced during rainy season although the quantum of deposition varies from stream to stream depending upon numbers of factors such as catchment, lithology, discharge, river profile and geomorphology of the river course. Where annual deposition is much more even two to three meters, 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. 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 toposheets are used as base map to know the extent of river course. The mineral reserves have been calculated only upto 1.0m to 1.5 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 resulting 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.

7. General Profile of the District

7.1. Administrative Setup

The district Uttarkashi is divided into six tehsils namely, Bhatwari, Dunda, Chinyalisaur, Mori, Barkot and Purola, two sub-tehsils, six blocks, two Nagar Palika Parisad and four Nagar Panchayats. The district covers 36 nyaya panchayats and 500 gram panchayats. It has 689 revenue villages.

7.2. People

Generally, the inhabitants of Uttarkashi district are the Aryans came from the different parts of northern India. Before the advent of the Aryans, the original inhabitants of this area were Kiratas, Uttara Kurus, Khasas, Tanganas, Kunindas and Pratanganas. However, with the passing of time pants and shirts, sarees and blouse, salwar and kurta are taking place especially in new generation.

The land of Uttarkashi district has been held sacred by Indians since ages where the seers and sages had found solace and spiritual aspirations and performed penances and where devas performed their sacrifices and Vedic language was

better known and spoken than elsewhere. People came here for learning Vedic language and speech. According to an account given in the Mahabharata, Jada Bharatha a great sage performed penances at Uttarkashi. the Kedar Khand of Skanda Purna refers Uttarkashi and the rivers Bhagirathi, Jahanavi and Bheel Ganga. The district of Uttarkashi was part of Garhwal Kingdom ruled by Garhwal dynasty that carried the cognomen 'Pal' which was changed to Sah during 15th century conferred by Sultan of Delhi perhaps Bahlul Lodi. In 1803 Gorkhas of Nepal invaded Garhwal and Amar Singh Thapa was made Governor of this region. The Gorkhas came into contact with the British power in 1814 as their frontiers in Garhwal became determinous with those of the British. The border troubles prompted the Britishers to invade Garhwal. In April, 1815 Gorkhas were ousted from Garhwal region and Garhwal was annexed as British district and was split up into eastern and western Garhwal. The eastern Garhwal was retained by the British Government. The western Garhwal, lying to the west of the Alaknanda river with the exception of the Dun was made over to the heir of Garhwal dynasty Sudarshan Sah.

This state came to be known as Tehri Garhwal and it was merged with the state of Uttar Pradesh in 1949 after India attained independence in 1947.

7.3. Religious Place

The district is named after its headquarters town Uttarkashi, an ancient place with rich cultural heritage and as the name suggests is the Kashi of north (Uttara) held almost as high a veneration as Kashi of the plain (Varanasi). Both the Kashi of the plain (Varanasi) as well as the Kashi of north are situated on the banks of the river Ganga (Bhagirathi). The area which is held sacred and known as Uttarkashi, lies between the rivers Syalam Gad also known as the Varuna and Kaligad also known as the Asi. The Varuna and the Asi are also the names of the rivers between which the Kashi of the plain lies. One of the holiest Ghats in Uttarkashi is Manikarnika so is the one by the same name in Varanasi. Both have temples dedicated to Vishwanath.

Gangotri and *Yamunotri* are two main shrines representing abode of 'Maa Ganga' and 'Maa Yamuna' respectively in this districts. In addition to these, there are countless temples belonging to different gods and goddesses. Religious Place situated on the bank of the rivers are also important in view of religion and faith.

7.4. Fairs and Festival

The people of Uttarkashi have been fond fair and festivals since very long, which bring them joy and amusement. The month of Baishakhi is the month of January fairs. Rapid change in socio-cultural life of people, the traditional customs are giving ground to the new urban culture.

7.5. District Uttarkashi at a glance

Table 6: District Uttarkashi at a glance

S.No.	Particular	Year	Unit	Statistics
1	Geographical features			
(A)	Geographical Data			
	i) Latitude			30°22'N
	ii) Longitude			73°51'- 79°27'E
	iii) Geographical Area	2016	Km ²	8016.05
(B)	Administrative Units			
	i) Tehsils	2015-16	No.	6
	ii) Sub-Tehsil	2015-16	No.	2
	iii) Community development block	2015-16	No.	6
	iv) Nyaya Panchayat	2015-16	No.	36
	v) Gram Panchayat	2015-16	No.	500
	vi) Villages	2015-16	No.	702
	vii) Colonized Revenue Villages	2015-16	No.	667
	viii) Non-inhabited villages	2015-16	No.	8
	ix) Forest villages	2015-16	No.	28
	x) City and municipal groups	2014-15	No.	6
	xi) Nagar Nigam	2014-15	No.	0
	xii) Nagar Palika Parishad	2014-15	No.	1
	xiii) Nagar Panchayat	2014-15	No.	5
	xiv) Cantonment Area	2014-15	No.	0
	xv) Census towns	2014-15	No.	0
	xvi) Lok Sabha Constituency	2014-15	No.	1
	xvii) Assembly Area	2014-15	No.	3
	xviii) Police Stations	2014-15	No.	7
2.	Population			
(A)	Sex-wise	2016	No. in '000	330086

	i) Male	2016	No. in '000	168597
	ii) Female	2016	No. in '000	161489
(B)	Rural Population	2016	No. in '000	305781
3.	Agriculture			
(A)	Land utilization			
	i) Total Area	2015-16	Hectare	812689
	ii) Forest cover	2015-16	Hectare	721664
	iii) Non Agriculture Land	2015-16	Hectare	29675.601
	iv) Cultivable Barren land	2015-16	Hectare	5327.338
3.1	Major crops			
A	Rice	2014-15	MT	16499
B	Wheat	2014-15	MT	13643
C	Mandua	2014-15	MT	9233
D	Others	2014-15	MT	4751
E	Pulses	2014-15	MT	4329
4.	Horticulture			
A	Potato	2015-16	MT	27927
5.	Forest			
	i) Forest	2015-16	SqKm	6924
6.	Livestock & Poultry			
	i) Total Livestock	2012	Nos.	365718
7.	Transport (Railways & Road)			
(A)	i) Length of rail line	2014-15	km	---
(B)	i) Total Length of Roads	2015-16	km	1188.73
	ii) Road constructed by PWD	2015-16	km	1030.38

8.	Communication			
(A)	i) Post offices	2015-16	Nos.	130
	ii) Telegraph Office	2015-16	Nos.	0
	iii) Telegraph Exchange	2015-16	Nos.	0
	iv) Telephone connection	2015-16	Nos.	1925
	v) Density of Telephone	2014-15	Nos./1000 person	45.95
	vi) Density of Telephone	2014-15	No. per km ²	2.176
	vii) PCO	2014-15	No.	302
	viii) Mobile	2014-15	No.	8640
9.	Public Health and Family Welfare			
(A)	i) Allopathic Hospital	2015-16	No.	20
	ii) Ayurvedic Hospitals	2014-15	No.	52
	iii) Homeopathic Hospitals	2014-15	No.	9
	iv) Unani Hospitals	2014-15	No.	-
	v) Primary Health Centres	2015-16	No.	12
	vi) Community health centers	2015-16	No.	4

	vii) Family and mother-child welfare centers	2014-15	No.	-
	viii) Family and mother-child welfare sub-centers	2015-16	No.	85
	ix) TB hospitals	2015-16	No.	1
	x) Leprosy Hospitals	2015-16	No.	1
	xi) Hospital for communicable diseases	2015-16	No.	-
10.	Banking commercial			
(A)	i) Commercial Bank	2015-16	Nos.	39
	ii) Rural Bank Branches	2015-16	Nos.	7
	iii) Co-Operative bank	2014516	Nos.	16
	iv) Co-operative Agriculture & rural development bank Branches	2015-16	Nos.	0
11.	Education			
(A)	i) Primary school	2015-16	Nos.	625
	ii) Middle schools	2015-16	Nos.	210
	iii) Secondary & Senior Secondary schools	2015-16	Nos.	124
	iv) Colleges	2015-16	Nos.	6
	v) University	2015-16	Nos.	0
	vi) Industrial Training Institutes	2015-16	Nos.	8
	vii) Polytechnic	2015-16	Nos.	4

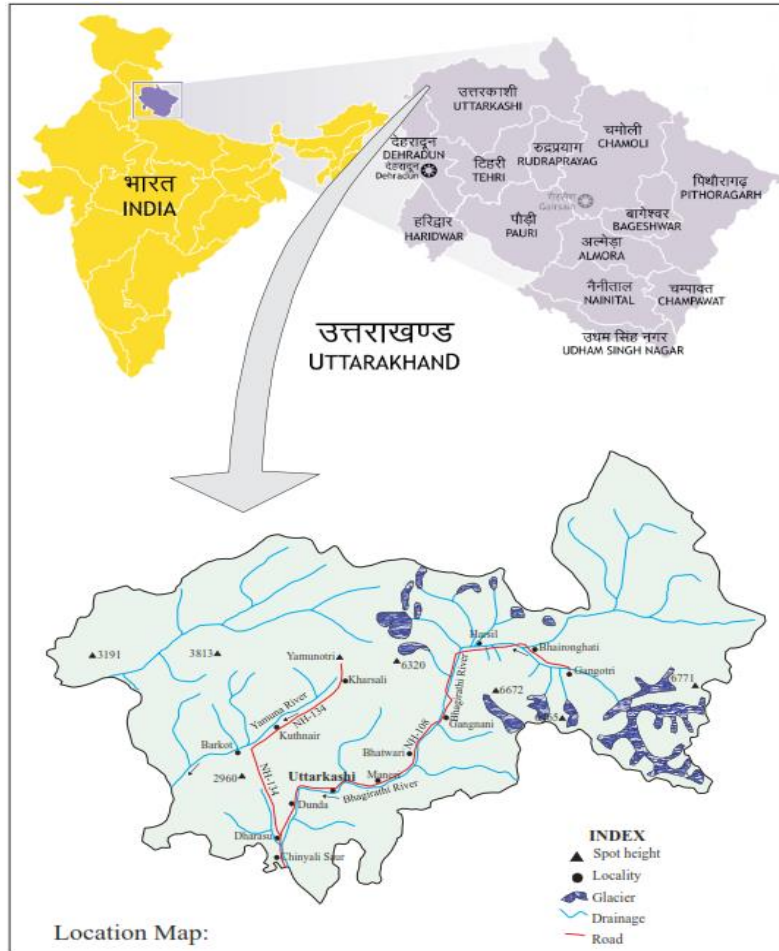


Figure 1 Location of District Uttarkashi with respect to adjoining districts

8. Land Utilization Pattern in the district: Forest, Agriculture, Horticulture, Mining etc.

Table 7: LAND USE AND LAND COVER IN DISTRICT UTTARKASHI (2018-19)

S.N.	District Name	Type of Land	AREA in Hect.
1-	Uttarkashi	*Forest Land	721664
2-		*Agriculture Land	35003
3-		*Horticulture Land	15285
		<i>*Source: bhuvan.nrsc.gov.in</i>	
4-		Mining Land	36.397

9. Physiography of the District

District Uttarkashi, is represented by highly rugged topography. The elevation in the area ranges from 800 to 7000m amsl. There are very sharp undulations owing to high mountains, narrow valleys and deep gorges. The northern and eastern parts are covered with snow throughout the year. There are a number of glaciers in these parts. Bhagirathi River originates from Gangotri Glacier at Gaumukh on the western slope of Chaukhumba. Yamuna River and Tons River originate from Bunderpoonch glacier. The prominent mountain peaks are Bunderpoonch, Gangotri, Kedarparvat, Kailashparvat and Shivling. The prevalent landforms are lateral moraines, end moraines, U-shaped glacier valleys, V-shaped fluvial valleys, river terraces and Denudational Structural Mountain.

The landforms, mappable on the present scale, are Glacial Valley (GL), River Terrace (RT), Terrace (T) and Denudational Structural Mountain (DSM). The thrusts, lineaments and landslides/Debris slide have a direct bearing with the geomorphology of the area.

9.1. Drainage

It is the land of Uttarkashi district that gives rise to two great and reverent rivers of India the Bhagirathi, called the Ganga and the Yamuna. The Ganga coming up in the glaciers 'gaumukh' traverses 128 kms. in Uttarkashi district before farther flowing down. The third important river of this district is Tons besides host of tributaries that drain these areas. Bhagirathi River, Yamuna River, Tons river and their tributaries of different order drains the district and having huge amount of 'river bed material' (RBM). The major rivers i.e. Bhagirathi, Yamuna and Tons are of antecedent type; whereas the drainage in the structurally disturbed area is of subsequent type. Prominent of the tributaries are Assiganga, Indravati, Khurmola, Hanuman Ganga, Jahnavi, Kamal, Rupin and Supin,. The main drainage patterns are dendritic, sub-dendritic, trellis, sub-rectangular and rectangular.

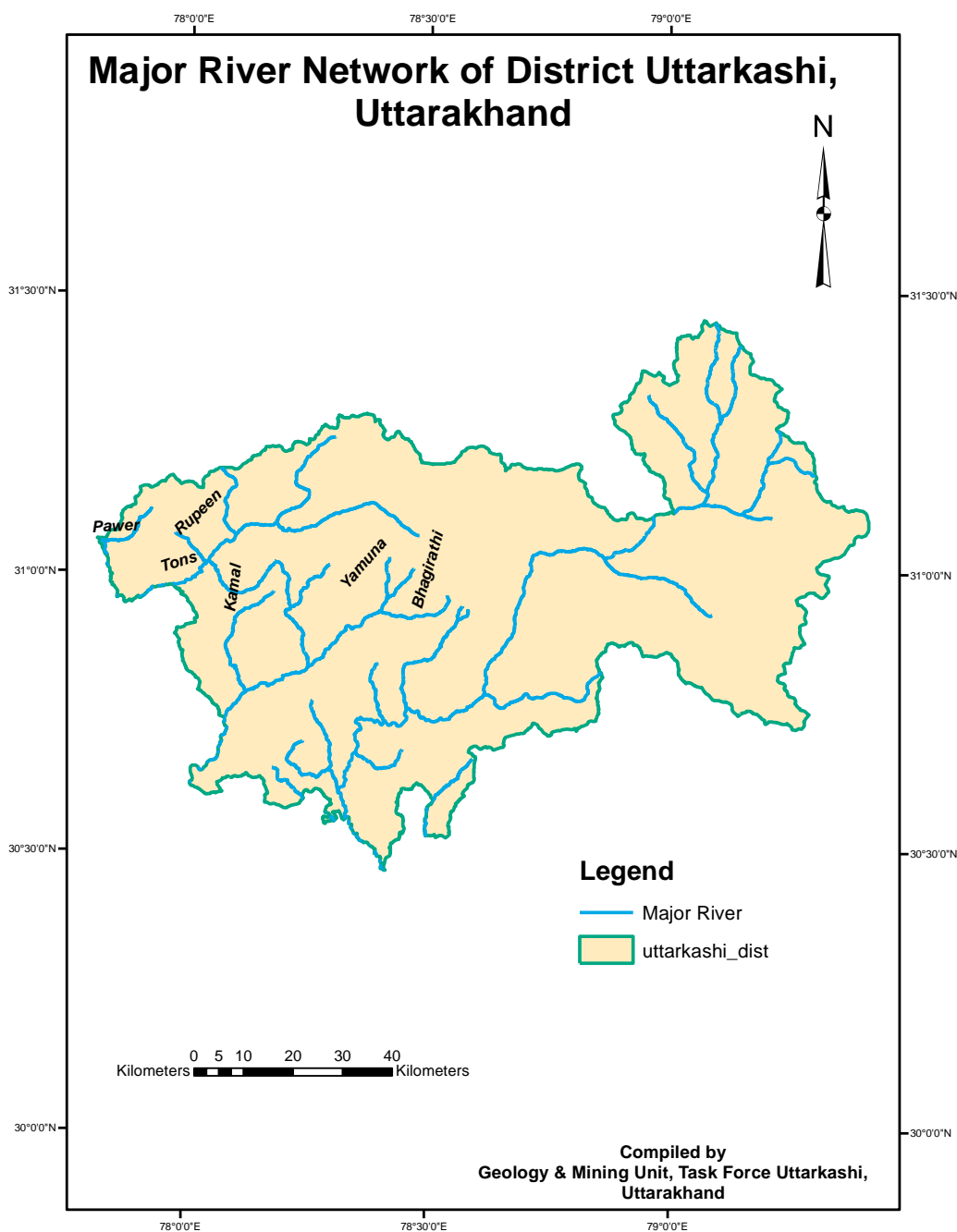


Figure 2 Major Rivers which passage through District Uttarkashi

9.2. Soil Types

The soils of Uttarkashi district can be broadly classified into two types, viz. soils of Central/Higher Himalaya and soils of Lesser Himalaya. The soils of Central Himalaya have been broadly classified under a) Soils of Summits, Ridge Tops and Mountain Glaciers, b) Soils of Side Slopes, c) Soils of Upper Glacio-Fluvial Valleys and d) Soils of Cliffs. Major soil type of the study area is Hilly Soil,

developed from graniteferous biotite, scetics granites, gnesiss, phyllites. These are brown to dark grayish in color and acidic in reaction. Soil type of the study area may be broadly subdivided into three soil types. Soils of the first type are moderately shallow, excessively drained, thermic, fine loamy, moderately eroded and slightly stony and are known as Dystric Eutrudepts. The second type, Lithic Udorthents, is characterised by very shallow, excessively drained, severely eroded and strongly stony, thermic loamy soils exposed on steep slopes with loamy and sandy surface. Typic Udorthents, the third major soil type, is moderately shallow, excessively drained, moderately eroded and slightly stony, loamy soils on moderate slopes with loamy surface.

The soils of the study area are basically the product of fluvial process of the river Bhagirathi and its tributaries (Assiganga & Indrawati etc.). The alluvial soil of the area is dry, porous, sandy, faint yellow and consists of clay and organic matter. Soils of the area are slightly acidic. The pH value of the soils varies depending upon the type of forests. The soil of oak forest is sandy loam. The pH values on all sites and depths ranged 5.80 to 6.27. The soil of pine forest is clay to sandy clayey loam.

9.3. Agriculture

Agriculture in these areas suffer from many constraints. The availability of cultivable land itself is the greatest restricting factor on the development of agriculture. It can be seen from the fact that as much as 88% of the area is either covered by forests or is barren and uncultivable. The land is low in fertility except in the valleys and even land is too few and far between. Shorter agricultural season, low temperature, high altitude, smallness of land holding, perpetual problem of soil erosion due to steep gradients etc. are other inhibiting factors effecting agriculture. The agriculture, therefore, does not offer too much hope for bringing about well-being to the people of the area.

9.4. Ground water Scenario

District Uttarkashi is mainly occupied by Himalayan Mountain ranges. Around 50% of the area is perennially covered under snow. Hence there is no scope of ground water development in the area. However, at lower reaches, there is scope of ground water development through hand pumps. For this, hydrogeological investigation is required at micro level so as to decipher the rock formation, which has sufficient secondary porosity like joints, fractures, lineaments etc. These discontinuous aquifers along with favourable physiographical set-up can help to develop ground water by hand pumps.

Besides, there are number of natural springs which can be utilized to cater the need for drinking and irrigation. There are numerous springs with sufficient discharge; the water of these springs can be channelized for irrigation. During non-monsoon period, the discharge of springs gets reduced. To augment the discharge and sustainability of these springs, small surface water reservoir can be developed at suitable locations on higher level. The reservoir can be developed by constructing gully plugs, check dams, gabion structures etc. at suitable places. These reservoirs will not only provide surface water availability but will also help in recharging the aquifers.

In Uttarkashi district, four valleys have been identified with sufficient thickness of valley fill deposits. Ground water in these valleys can be developed by constructing large diameter dug wells and shallow tube wells. The large diameter dug wells and shallow tube wells will be able to sustain the discharges between 250 to 1000 lpm.

10. Rainfall: month-wise

The climate varies from Sub-tropical monsoon type (mild winter, hot summer) to tropical upland type (mild and dry winter, short mild summer). The northern part of the district is perennially under snow cover; here the climate is sub-arctic type as the area is represented by lofty Himalayan Range.

Severe winter and comparatively higher rainfall are the characteristic features of the northern part. The district is represented by mainly four seasons viz. the cold winter season, (December to February), the hot weather season (March to May), southwest monsoon season (June to September) followed by post monsoon season (October to November).

Rainfall, spatially, is highly variable depending upon the altitude. Larger part of the district is situated on the southern slopes of the outer Himalayas, monsoon currents can penetrate through trenched valleys, the rainfall reaches its maximal in the monsoon season. About 75% of rain occurs in this zone during the monsoon season, June to September. August is the wettest month. Rainfall rapidly decreases after September and it is minimum in November. About 17% of the annual precipitation occurs in four winter months. The winter precipitation is in association with the passage of the western disturbances and is mostly in the form of snowfall, particularly at higher elevations. The precipitation during the pre-monsoon month, which is about 7% of the annual total and the post-monsoon months, is frequently associated with thunderstorms. The average annual rainfall is 1095.0, 1552.8, 1631.2, 1917.5, 1948.5, 2092.9 mm at the rainguage stations located at Dharasu, Uttarkashi, Rajgarhi, Jamuna Chetty, Rana and Kharsali, respectively.

Table 8: Rainfall data in five year (2014-2018)

Month		2014	2015	2016	2017	2018
January	R/F	30.2	45.1	8.5	52.2	18.1
	%DEP	-57	-36	-88	-26	-74
February	R/F	114.9	109.6	63.6	24.8	31.4
	%DEP	58	51	-13	-66	-57
March	R/F	91.1	116	56.4	75.9	35.3
	%DEP	7	37	-34	-11	-58
April	R/F	59.1	69.8	15.5	58.8	51.3
	%DEP	22	44	-68	21	6

May	R/F	91.8	52.4	50	153.4	63.4
	%DEP	-10	-49	-51	50	-38
June	R/F	63.1	96.3	166.5	178.2	162.6
	%DEP	-57	-35	13	21	10
July	R/F	468.7	389.3	430.9	426.7	381.3
	%DEP	23	2	13	12	0
August	R/F	224.6	311.2	354.6	179.9	338.2
	%DEP	-45	-23	-12	-56	-17
September	R/F	104.8	64.6	54	166.8	233.7
	%DEP	-51	-70	-75	-23	9
October	R/F	42.3	10.2	19.5	0	0.8
	%DEP	-29	-83	-67	-100	-99
November	R/F	0	5.9	0	0.2	35.8
	%DEP	-100	-56	-100	-98	169
December	R/F	24.9	24.9	7.3	37.1	0.3
	%DEP	0	-1	-71	49	-99

Source: Indian Meteorological Department

11. Geology and Mineral Wealth

District Uttarkashi is represented by the rocks of Lesser Himalaya, Central and Tethys Himalaya. The geological set up is very complex due to the repeated tectonic disturbances caused by different orogenic cycles.

11.1. Geology

Geology, amongst many derivatives, plays an important role in shaping the ground water scenario of an area. So, it becomes imperative to know the geology of District Uttarkashi. The geology, of the area, is highly complex, since the rock formations have undergone repeated tectonic activities. The geology, of the area, is explained with the help of supersequences, which are based on the chronology of the group of rocks. The brief description of the super sequences is as given below:

ARCHAEAN SUPERSEQUENCE

Central Crystallines Group

The central crystalline rocks are well exposed in the Higher Himalaya of Yamuna and Bhagirathi valleys of district Uttarkashi. The rocks of Central Crystalline Group form the oldest crystalline basement of the Himalaya. The gneisses, migmatites, crystalline schist, thick quartzite with conspicuous horizons of calc-silicates with psammite gneisses in the upper part form bulk of the metasediments.

Table 9: Geological formation of Central Crystalline along with lithology

Geological Formation	Lithology
Badrinath	Garnet, Sillimanite, Muscovite and kyanite, migmatites, calc-silicates. Leucogranite, pegmatite and garnet amphibolite.
Panduleshwar	Banded quartzite gneiss and interbedded quartz mica-schist, para-amphibolite
Joshimath	Garnet mica-gneiss, staurolite and kyanite-gneisses, garnet amphibolite.
Bhimgora Quartzite	White quartzite with gneiss and schist
Ragsi	Mica-schist.

PALAEOPROTEROZOIC

SUPERSEQUENCE Garhwal Group

The Garhwal Group forms the most extensive Group of rocks in district Uttarkashi. The rocks of palaeoproterozoic time-span are grouped in Garhwal Group. It forms the major part of the Lesser Himalaya and is represented by thick sequence of low-grade metasediments consisting of quartzite with pen contemporaneous mafic metavolcanics and carbonate rocks. Garhwal Group is limited in the north by the Main central Thrust and in the south by the Main Boundary Fault. In Lesser Himalaya, it is exposed in two tectonic linear zones separated by the rocks of Vaikrita Group. The northern zone forming the inner Lesser Himalaya, is exposed to the north of main exposure of the Vaikrita Group with which it is in tectonic contact-the North Almora Thrust and encloses outliers of Vaikrita Group of rocks. In the southern zone, it is of limited

distribution and is exposed between the Main Boundary Fault (MBF) and the South Almora Thrust. However, South Almora Thrust is out of the administration ambits of district Uttarkashi.

The Garhwal Group is divided into four geological formations, viz. Uttarkashi, Rautgara, Tejam and Berinag, chronologically.

The main rock types are quartzite, slate, limestone, dolomite, phyllite, intraformational conglomerate etc. These rocks are intruded by acid and basic igneous rocks.

MESOPROTEROZOIC TO NEOPROTEROZOIC SUPERSEQUENCE

Higher Himalaya

Vaikrita Group

Vaikrita group (Super sequence) of rocks represents the higher grade metamorphics of the Higher Himalaya pervasively penetrated by young Tertiary granite. The rocks comprising, this group, are micaceous schists, talcose rocks, phyllites and gneisses overlying mainly the granite gneisses. Vaikrita Group includes the metasedimentary exposed between the granite-gneisses constituting the Central Crystalline and the overlying Martoli Group and its equivalents.

In the Bhagirathi valley, the rocks of this group are exposed between Sukhi and Harsil. The rocks of this group, in Yamuna valley, are exposed north of Yamnotri, overlying the Central Crystalline with an apparent unconformity. The Gangotri Granitoid intrudes both the Vaikrita and Martoli Groups and includes biotite granite, tourmaline granodiorite, tourmaline aplite and pegmatite. In the Gangotri glacier basin, tourmaline granodiorite occurs in the form of laccolithic body intrusive into the black slates in the Bahgirathi peak region and form the Shivling 'massif'.

Lesser Himalaya

This supersequence, in Lesser Himalaya, is represented by two groups, viz. the older Jaunsar Group and the younger Dudatoli Group. These two groups are briefly described below.

Jaunsar Group:

The rocks of this group are continuously exposed in the outer Lesser Himalaya from the Tons Valley in the west to eastern boundary of the district and beyond. It is divided into three formations, viz. Mandhali, Chandpur and Nagthat.

The main rock types of Jaunsar Group are quartzite, slate, phyllite, siltstone, greywacke and sandstone.

Dudatoli Group:

The equivalent of Dudatoli Group, in Uttarkashi district, is the Jutogh Group. The oldest of the Jutogh Group Formation is dis-conformably overlies the Chandpur Formation. The main rock types are phyllites and quartzites.

NEOPROTEROZOIC TO PALAEOZOIC***SUPERSEQUENCE Tethys Himalaya:***

Martoli Group is represented by a thick sequence of unmetamorphosed to feebly metamorphosed rocks in district Uttarkashi. The rocks of this group are exposed in Tons and Bhagirathi River basins. The main rock types are silver grey phyllite with interbedded thin quartzite, garnetiferous grey phyllite, foliated quartzite with biotite bearing phyllite, thin laminated greenish grey, brown purple quartzite slate with thin calcareous lenses.

ORDOVICIAN TO CARBONIFEROUS***SUPERSEQUENCE***

The development of this supersequence is restricted to the Tethys Himalayan zone only. There is no record from Lesser Himalaya where the rocks of Martoli Group are unconformably overlain by the rocks of early Permian period. In the Tethys Himalaya this supersequence comprises the Sumana and Kanawar Groups. The rocks of the Sumana Group range in age from Early Ordovician to Devonian and it is divided into Ralam and Garbyan formations. The rock types are purple conglomerate, purple to greenish grey quartzite, quartzite with bands of calcilutite, calc-siltstone and brown dolomitic limestone with chlorite layers in the lower part. The sequence of limestone and black shale unconformably

overlying the Sumana Group constitute the Kanawar Group. The rock types are sandy dolomite, carbonaceous shale, limestone and quartzite, which conformably lie over the Sumana Group.

***LATE PERMIAN TO LATE TRIASSIC
SUPERSEQUENCE***

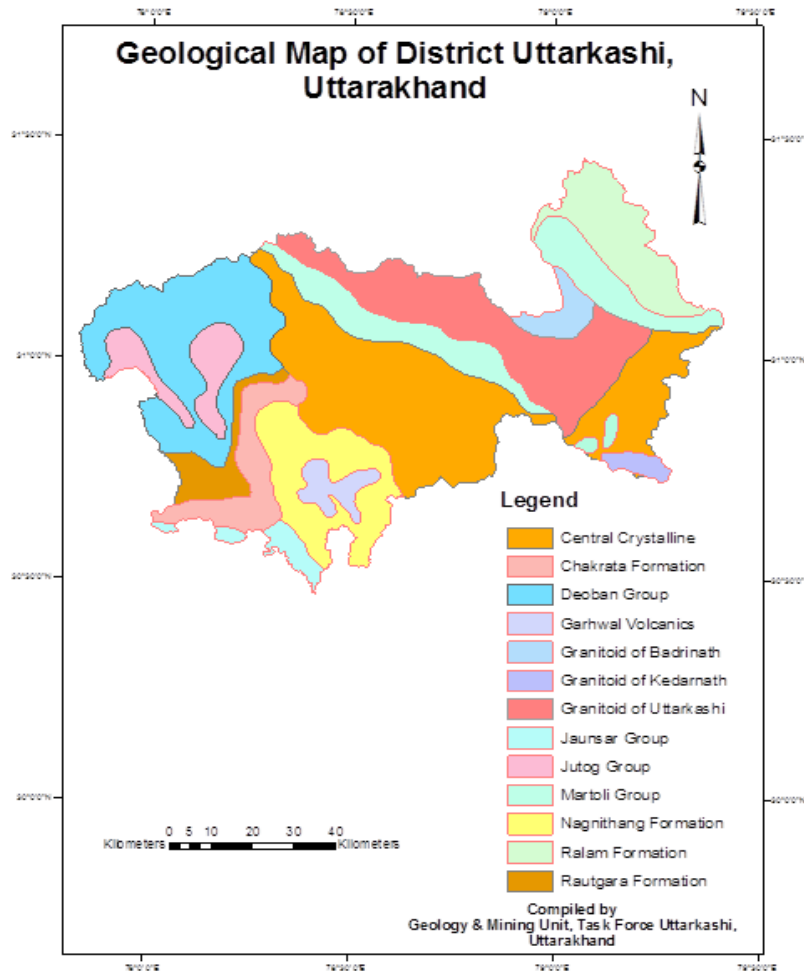


Figure 3: Geological Map of District Uttarkashi (Source: DGM:UP & GSI)

In district Uttarkashi only the rocks of Lower Lilang Group are exposed in its northeastern part. Chocolate limestone is the main geological formation of this group, which consists of limestone alternating with thin greenish black shales.

11.2. Mineral Wealth

In Uttarkashi district maximum mineral revenue is being generated from river bed material (minor mineral) in revenue as well as private land. These lots are

present in river Bhagirathi and river Yamuna. In Tons river, certain identified under processing RBM lots are existing in reserve forest area.

The deposition in a river bed is more pronounced during rainy season although the quantum of deposition varies from stream to stream depending upon numbers of factors such as catchment, lithology, discharge, river profile and geomorphology of the river course. Where annual deposition is much more even two to three meters, 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. 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 toposheetes are used as base map to know the extent of river course. The mineral reserves have been calculated only upto 1.50 meter 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 resulting 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.

In addition to the above:-

(a) Details of river or stream and other sand sources, District Uttarkashi

Name of River	Tehsil	Minable Area (in Ha.)
Bhagirathi	Dunda & Chinyalisaur	11.268

Yamuna	Barkot	11.662
Assi Ganga	Bhatwari	-
Kamal	Purola	-
Tons	Mori	13.467

(b) Availability of sand or gravel or aggregate resources, District Uttarkashi

Table 11: List of Identified and under process of leasing out River Bed Mining Lots (other than leased out lots) of District Uttarkashi

S. No.	Tehsil	Village or Name of Mining Lot	Name of the river	Area (in ha.)	Mineral Quantity (in Ton)
1.	Dunda	Matli-1	Bhagirathi	0.3910	7741.8
2.	Dunda	Badethi-1	Bhagirathi	0.22	7260
3.	Dunda	Badethi-Matli	Bhagirathi	3.265	64647
4.	Dunda	Badethi-2	Bhagirathi	0.080	2640
5.	Dunda	Matli-2	Bhagirathi	0.270	3564
6.	Dunda	Matli-3	Bhagirathi	1.085	9550
7.	Dunda	Singoti-1	Bhagirathi	0.30	3960
8.	Dunda	Singoti-2	Bhagirathi	0.637	8411
9.	Dunda	Singoti-3	Bhagirathi	0.234	4752
10.	Dunda	Ranari-1	Bhagirathi	0.400	7920
11.	Dunda	Ranari-2	Bhagirathi	0.40	7920
12.	Dunda	Astal-1	Bhagirathi	0.320	10560
13.	Dunda	Astal-2	Bhagirathi	0.400	7920
14.	Dunda	Astal-3	Bhagirathi	0.350	4620
15.	Dunda	KhattuKhal Madhyay Runavasus	Bhagirathi	0.411	2713
16.	Chinyali saur	Dharasu	Bhagirathi	0.232	2297
17.	Chinyali saur	Dharasu	Bhagirathi	0.301	9933
18.	Chinyali saur	Nagun Tok	Bhagirathi	0.681	22473
19.	Chinyali saur	Nagani Tok	Bhagirathi	0.611	20163
20.	Chinyali saur	Gailadi	Bhagirathi	0.330	10890
21.	Chinyali saur	Tulyara	Bhagirathi	0.350	11550
22.	Barkot	Kisala	Yamuna	0.100	1650
23.	Barkot	Than	Yamuna	0.120	1980
24.	Barkot	Dhakyatgaon	Yamuna	1.6750	55275
25.	Barkot	kotiyalgaon	Yamuna	3.00	181500
26.	Barkot	Barkot	Yamuna	0.301	8250

27.	Barkot	Barkot (Bagasu)	Yamuna	0.401	11000
28.	Barkot	Pounti	Yamuna	0.270	7128
29.	Barkot	Pounti	Yamuna	0.301	8250
30.	Barkot	Kisna	Yamuna	0.760	12533
31.	Barkot	Bagasu	Yamuna	1.326	22018
32.	Barkot	Kotiyalgaon	Yamuna	0.555	9156.99
33.	Barkot	Pifhiyara Madhyay Gangnani	Yamuna	0.075	2475
34.	Barkot	Pujargaon	Yamuna	0.602	15000
35.	Barkot	Sunara	Yamuna	0.971	16055
36.	Barkot	Sunara	Yamuna	0.195	3300
37.	Barkot	Pounti-3	Yamuna	0.560	9240
38.	Barkot	Naugaon	Yamuna	0.450	7425
39.	Mori	Pasa	Tons	1.695	55350
40.	Mori	Thalli	Tons	0.417	13612
41.	Mori	Devta Range Thadiyar Compartment No. Basla -1	Tons	3.2	138600
42.	Mori	Devta Range Thadiyar Compartment No. Basla -1	Tons	0.44	14520
43.	Mori	Devta Range Thadiyar Compartment No. Basla -1	Tons	1.00	22000
44.	Mori	Devta Range Thadiyar Compartment No. Basla -1	Tons	0.86	28380
45.	Mori	Sandra Range, Beat No. 5 Thadiyar	Tons	0.21	6930
46.	Mori	Devta Range, Bhasla Compartment 1,2 &3	Tons	1.7750	57915
47.	Mori	Sandra Range, Bainol Compartment No. 15 & 16	Tons	1.620	53460
48.	Mori	Devta Range, Bhasla Compartment 3	Tons	2.25	74250

(c) Details of Existing Mining Leases of sand and aggregates, District Uttarkashi**Table:- 14** Details of Existing Mining Leases of sand and aggregates, District Uttarkashi

S. No.	Lot Location	Area (in ha.)	Sanctioned Capacity (in tons)	Type of mineral	Period
Tehsil Chinyalisaur, River Bhagirathi					
1.	Chinyalisaur	2.463	70195	Sand, Bajri & Boulder	30-01-2015 To 29-01-2020
2.	Nagni bdi	0.924	24560	Sand, Bajri & Boulder	28-10-2015 To 27-10-2020
3.	Hitara	0.31	10247	Sand, Bajri & Boulder	06-10-2018 To 05-10-2023
4.	Ponti	0.860	18128	Sand, Bajri & Boulder	22-10-2016 To 21-10-2021

Table 15: Drainage system with description of main rivers in District Uttarkashi

S.No.	Name of River	Area drained (in sq.km.)	% Area drained in the District
1.	Bagirathi	9.945	0.124
2.	Yamuna	4.180	0.052
3.	Assi Ganga	0.85	0.01
4.	Kamal River	1.575	0.019
5.	Tons River	2.400	0.029

Table 16: Salient Features of Important Rivers and Streams, District Uttarkashi

S.No.	Name of the River or Stream	Total Length in the District (in Km)	Place of origin	Altitude at Origin
1.	Bagirathi	153	Gomukh	3890
2.	Yamuna	76	Yamunotri Glaciari	3293
3.	Assi Ganga	22	Dodital	3078
4.	Kamal River	35	Kedarkantha	1524
5.	Tons River	48	Bandarpunch Glaciari	6316

Table 17: Mineable Potential (Identified RBM deposits) with respect to River or Stream

S. No.	Portion of the River or Stream Recommended for Mineral Concession	Length of area recommended for mineral concession (in Km)	Average width of Area recommended for mineral concession (in meters)	Area recommended for mineral concession (in square meter)	Mineral Quantity in Ton	Mineable mineral potential (in metric tonne) (60% of total mineral potential)
	Tehsil Dunda Bhagirathi River					
1-	Matli-1	-	-	3910	12903.33	7742
2-	Badethi-1	-	-	2200	12100.00	7260
3-	Badethi-Matli	-	-	32650	107745.00	64647
4-	Badethi-2	-	-	800	4400.00	2640
5-	Matli-2	-	-	2700	5940.00	3564
6-	Matli-3	-	-	10850	15916.67	9550
7-	Singoti-1	-	-	3000	6600.00	3960
8-	Singoti-2	-	-	6370	14018.33	8411
9-	Singoti-3	-	-	2340	7920.00	4752
10-	Ranari-1	-	-	4000	13200.00	7920

11-	Ranari-2	-	-	4000	13200.00	7920
12-	Astal-1	-	-	3200	17600.00	10560
13-	Astal-2	-	-	4000	13200.00	7920
14-	Astal-3	-	-	3500	7700.00	4620
15-	KhattuKhal Madhyay Runavas	-	-	4110	4521.67	2713
16-	Chinyali	-	-	2320	3828.33	2297
17-	Dharasu	-	-	3010	16555.00	9933
18-	Nagun Tok	-	-	6810	37455.00	22473
19-	Nagani Tok	-	-	6110	33605.00	20163
20-	Gailadi	-	-	3300	18150.00	10890
21-	Tulyara	-	-	3500	19250.00	11550
22-	kisala	-	-	1000	2750.00	1650
23-	Than	-	-	1200	3300.00	1980
24-	Dhakyatgaon	-	-	16750	92125.00	55275
25-	Kotiyalgaon	-	-	3000	302500.00	181500
26-	Barkot	-	-	3010	13750.00	8250
27-	Barkot (Bagasu)	-	-	4010	18333.33	11000
28-	Paunti-1	-	-	2700	11880.00	7128
29-	Paunti-2	-	-	3010	13750.00	8250
30-	Kisna	-	-	7600	20888.33	12533
31-	Bagasu	-	-	13260	36696.67	22018
32-	Kotiyalgaon	-	-	5550	15261.67	9157
33-	Pifhiyara Madhyay Gangnani	-	-	750	4125.00	2475
34-	Pujargaon	-	-	6020	25000.00	15000
35-	Sunara	-	-	9710	26758.33	16055
36-	Sunara	-	-	1950	5500.00	3300
37-	Pounti-3	-	-	5600	15400.00	9240
38-	Naugaon	-	-	4500	12375.00	7425
39-	Tehsil Mori Tons River Pasa site	-	-	16950	92250.00	55350
40-	Thalli	-	-	4170	22686.67	13612
41-	Devta Range Thadiyal Compartment No. Bhasla -1	-	-	32000	231000.00	138600
42-	Devta Range	-	-	4400	24200.00	14520

	Thadiyar Compartment No. Bhasla -1					
43-	Devta Range Thadiyar Compartment No. Bhasla -1	-	-	10000	36666.67	22000
44-	Devta Range Thadiyar Compartment No. Bhasla -1	-	-	8600	47300.00	28380
45-	Sandra Range Thadiyar beat no 5	-	-	2100	11550.00	6930
46-	Devta Range, Bhasla Compartment 1,2 &3	-	-	17750	96525.00	57915
47-	Sandra Range, Bainol Compartment No. 15 &16	-	-	16200	89100.00	53460
48-	Devta Range, Bhasla Compartment 3	-	-	22500	123750.00	74250

**Table 18: Cumulative Mineable potential of River or Stream
(Identified and Existing RBM deposits)**

S. No.	River or Stream	Tehsil	Boulder (MT)	Bajari (MT)	Sand (MT)	Total Mineable mineral potential (in metric tonne) (60% of total mineral potential)
1. (a)	Bhagirathi	Identified RBM Deposits	-	-	-	231485
1. (b)	Bhagirathi	Existing RBM Mining lots	-	-	-	105002
TOTAL	Bhagirathi	1(a)+1(b)	-	-	-	336487
2. (a)	Yamuna	Identified RBM Deposits	-	-	-	37223
2. (b)	Yamuna	Existing RBM Mining lots	-	-	-	18128
TOTAL	Yamuna	2(a)+2(b)	-	-	-	55351

3.	Tons	Identified RBM Deposits	-	-	-	465017
3. (b)	Tons	Existing RBM Mining lots	-	-	-	0
TOTAL	Tons	3(a)+3(b)	-	-	-	465017

Table 19: Annual Deposition

(Mineable Mineral Potential of Identified and Existing Mining Lots)

S. No.	Lot Type	Boulder (MT)	Bajari (MT)	Sand (MT)	Total Mineable Mineral Potential (MT)
A	Existing RBM Lots	-	-	-	123130
B	Identified Lots	-	-	-	733725
TOTAL (A+ B)					856855

Table 20: River wise Cumulative data of mineable mineral potential

S. No.	River or Stream	Portion of the River or Stream Recommended for Mineral Concession	Length of area recommended for mineral concession (in Km) *	Average width of Area recommended for mineral concession (in meters)*	Area recommended for mineral concession (in square meter)	Mineable mineral potential (in metric tonne) (60% of total mineral potential) per annum
Identified RBM Lots in River Bhagirathi						
1-	Bhagirathi	Matli-1	-	-	12903.33	7742
2-	Bhagirathi	Badethi-1	-	-	12100.00	7260
3-	Bhagirathi	Badethi-Matli	-	-	107745.00	64647
4-	Bhagirathi	Badethi-2	-	-	4400.00	2640
5-	Bhagirathi	Matli-2	-	-	5940.00	3564
6-	Bhagirathi	Matli-3	-	-	15916.67	9550
7-	Bhagirathi	Singoti-1	-	-	6600.00	3960
8-	Bhagirathi	Singoti-2	-	-	14018.33	8411
9-	Bhagirathi	Singoti-3	-	-	7920.00	4752

10-	Bhagirathi	Ranari-1	-	-	13200.00	7920
11-	Bhagirathi	Ranari-2	-	-	13200.00	7920
12-	Bhagirathi	Astal-1	-	-	17600.00	10560
13-	Bhagirathi	Astal-2	-	-	13200.00	7920
14-	Bhagirathi	Astal-3	-	-	7700.00	4620
15-	Bhagirathi	KhattuKhal Madhyay Runavas	-	-	4521.67	2713
16-	Bhagirathi	Dharasu	-	-	3828.33	2297
17-	Bhagirathi	Dharasu	-	-	16555.00	9933
18-	Bhagirathi	Nagun Tok	-	-	37455.00	22473
19-	Bhagirathi	Nagani Tok	-	-	33605.00	20163
20-	Bhagirathi	Gailadi	-	-	18150.00	10890
21-	Bhagirathi	Tulyara Madhe Sunargaun Tok	-	-	19250.00	11550
Existing RBM Mining Lots in River Bhagirathi						
1-	Bhagirathi	Chinyalisaur	-	-	116997	70195
2-	Bhagirathi	Nagni badi	-	-	40933	24560
3-	Bhagirathi	Hitara	-	-	17078	10246.50
Total RBM lots in Bhagirathi					560816.30	336487
Identified RBM Lots in River Yamuna						
1-	Yamuna	Kisala	-	-	2750.00	1650
2-	Yamuna	Than	-	-	3300.00	1980
3-	Yamuna	Dhakyatgaon	-	-	92125.00	55275
4-	Yamuna	Kotiyalgaon	-	-	302500.00	181500
5-	Yamuna	Barkot	-	-	13750.00	8250
6-	Yamuna	Barkot (Bagasu)	-	-	18333.33	11000
7-	Yamuna	Paunti	-	-	11880.00	7128
8-	Yamuna	Paunti 2	-	-	13750.00	8250
9-	Yamuna	Kisna	-	-	20888.33	12533
10-	Yamuna	Bagasu	-	-	36696.67	22018
11-	Yamuna	Kotiyalgaon	-	-	15261.67	9157
12-	Yamuna	Pifhiyara Madhyay Gangnani	-	-	4125.00	2475
13-	Yamuna	Pujargaon	-	-	25000.00	15000

14-	Yamuna	Sunara-1	-	-	26758.33	16055
15-	Yamuna	Sunara-2	-	-	5500.00	3300
16-	Yamuna	Paunti-3	-	-	15400.00	9240
17-	Yamuna	Naugaon	-	-	12375.00	7425
Existing RBM Mining Lots in River Yamuna						
1-	Yamuna	Ponti	-	-	30213	18128
Total River Yamuna			-	-	650606.30	390364
Identified RBM Lots in River Tons						
1-	Tons	Pasa	-	-	92250.00	55350
2-	Tons	Thalli	-	-	22686.67	13612
3-	Tons	Devta Range Thadiyar Compartment No. Bhasla -1, Bhasla-2 & Mora-2	-	-	231000.00	138600
4-	Tons	Devta Range Thadiyar Compartment No. Bhasla -1	-	-	24200.00	14520
5-	Tons	Devta Range Dhadiyal Compartment No. Bhasla -1	-	-	36666.67	22000
6-	Tons	Devta Range Dhadiyal Compartment No. Bhasla -1	-	-	47300.00	28380
7-	Tons	Sandra Range Thadiyar	-	-	11550.00	6930
8-	Tons	Devta Range, Bhasla Compartment 1,2 &3	-	-	96525.00	57915
9-	Tons	Sandra Range, Bainol Compartment No. 15 &16	-	-	89100.00	53460
10-	Tons	Devta Range, Bhasla Compartment 3	Tons	-	123750.00	74250
Total River Tons			-	-	775028.34	465017
Total RBM Lots in District (updated Sep,2019)			-	-	1986451	1191868

* (Shape of lots' are irregular therefore length & width not mentioned)

12. General recommendations

During the preparation of the present report prominent rivers/ streams has been studied in detail, as the rest of the streams/rivers either have very insignificant annual replenishment/ approachability problem or are very narrow at most of the places and as such are not fit for grant of mineral concession for mineral based industries, however it is also important to mention here that because of the regular demand of sand, stone and bajri for the developmental activities in the respective areas, such streams are prone to illegal mining, It is suggested that the auctions of quarries be done regularly to meet out the local demand subject to the approval from the joint Inspection Committee as Uttarakhand Minor Mineral Concession Rule, 2001(as amended time to time). These mineral concessions shall also reduce demand load and will be helpful to minimize 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 geo-scientific considerations are also suggested to be taken into account during the river bed mining in a particular area:

1. RBM lots should be allocated on actual area rather than revenue plot area.
2. Restricted area for RBM picking on Upstream and Downstream distance from motor/Suspension bridges, should be based on field parameters and vulnerability assessment of bridges rather than fixing an arbitrary distance from bridges for the lots to promote lessees and restrict illegal picking.
3. Assessment of RBM Quantity and delineation of lot should be prepared and monitored in 'DRONE PLATFORM' in a digital spatial environment.
4. Demarcation on the ground with geo-fencing way to avoid illegal unscientific mining.
5. Abandoned stream channels or terrace and inactive floodplains may be favoured rather than active channels and their deltas and floodplains.

6. Stream should not be diverted to form inactive channel.
7. Mining below subterranean water level should be avoided and monitored to safeguard environment and environmental contamination and over exploitation of resources.
8. Large rivers and streams whose periodic sediment replenishment capacities are larger, may be preferred than smaller rivers.
9. 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.
10. Mining at the convex 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.
11. 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.
12. Mining area should be demarcated on the ground with defined pillars' sites so as to prevent illegal and unscientific mining.
13. It is recommended that Sub Divisional Level Committee may take into consideration all its relevant aspects / data while scrutinizing and recommending the application for EC to the concerned Authority.

14. The *DSR datasets* need to be organised in *GIS environment*. As in every five year it is obligatory to update. Therefore, it will be easier and more accurate to understand changing scenario of lots in *GIS platform* for supplementary planning, execution monitoring and as well considering other *techno-socio-economic-environmental and legal* issues related to excavation of the RBM. Then it will be possible to lease out all RBM lots.



Dy. Director/Geologist

Dist Uttarkashi