CHAPTER - IV

GEOLOGICAL EVOLUTION OF UTTAR PRADESH, TOPOGRAPHY, DRAINAGE, SOIL TYPES, GEOLOGY OF ALIGARH AND SURROUNDING AREAS, INCIDENCE OF REH SOILS IN U.P., INCIDENCE OF REH IN ALIGARH DISTRICT

4.1. GEOLOGICAL EVOLUTION OF UTTAR PRADESH

The State of Uttar Pradesh (Latitude 23°52' N to 31°28' N and 77°4' E and 84°38' E Longitude), is the most populous state of India, and is unique in various respects in the entire subcontinent. The state represents almost entire Indian stratigraphic column. Right from Archean (Bundelkhand gneissic complex), Palaeozoic (Kumaun-Garhwal and Bundelkhand), Mesozoic (Kumaun-Garhwal, partly in Lalitpur district), Tertiary (Kumaun-Garhwal) up to Recent (the Indo-Gangetic alluvial plains) all formations are found.

A large part of the vast shallow Vindhyan Basin possibly extended up to the Lesser Himalayas with several cycles of chemical and clastic sedimentation. A part of Gondwana basin (Singrauli coalfield), was developed in faulted troughs in the southern table-land.

The Himalayan province, is divided into four physiographic-lithotectonic units :- (i) The Outer Himalaya comprising fluvial and lacustrine deposits of the Siwalik Supergroup (Middle
GEOLOGICAL EVOLUTION OF UTTAR PRADESH

FIG. 3. DIAGRAMMATIC REPRESENTATION OF THE GANGA TROUGH SHOWING THE MAIN BASIN BETWEEN THE PENINSULAR HIGHLANDS IN SOUTH AND THE HIMALAYAN REGION IN NORTH. EXTENSION OF THE PENINSULAR AND THE HIMALAYAN SEDIMENTARY FORMATIONS CAN BE SEEN BELOW THE ALLUVIUM.
Miocene-Pliocene age), (ii) The Lesser Himalaya comprising massive pile of highly folded and faulted sedimentary strata (Precambrian and Palaeozoic age), (iii) The Greater Himalaya, comprising crystalline axis of the mighty mountain chain, with enormous pile (10-12 km) of meso-to Kata-grade schists and gneisses with younger intrusives, and (iv) The Tethys Himalaya comprising fossiliferous sediments (Algonkian to Lower Eocene age). The Ganga Basin occupies the central part of the state.

4.1.1. The Ganga Basin

The Indo-Gangetic plain represents a great depression related to deep fracture within the sub-crust and is not merely synclinal fore-deep (Fig. 3). It has a sedimentary cover of more than 25000 ft. in the northern part.

Aeromagnetic survey (1962, 1964) of the basin revealed three prominent faults - Moradabad, Lucknow and Patna whereas basement ridges divide it into four sectors.

Fuloria (1969) recognised eight major lithostratigraphic units within the basin and postulated the presence of marine Mesozoic and Paleogene sequence.

4.1.2. Structural Framework

Along the western margin of the basin there is a subsurface fault striking NE-SW. It is in continuation with the
'Great Boundary Fault' of Rajasthan which separates Aravallis from Vindhyanas. The tectonic boundary, probably, extends up to Kalka and Simla in the west. The Monghyr-Saharsa ridge of the Satpura Orogenic belt demarcates the eastern boundary of the basin.

Along the northern boundary is the Himalayan Frontal Fault with folded Siwalik sub-province in the north. The southern margin of the Gangetic plane is bordered by the table-land of Bundelkhand massif and Vindhyan basin.

The major tectonic boundaries are controlled by the major basement lineaments, configuration and the thickness of the alluvium (Fig. 4). The peninsular orogenic belts, such as, Satpura, Aravalli and Delhi, continue along the basement with shelves and depressions progressively deepening northwards. They were filled up with Vindhyan and Paleogene sediments.

There are two cycles of sedimentation separated by an angular unconformity. The older cycle comprises siltstone, metasandstone and limestone-orthoquartzite-shale association while the younger cycle comprise alluvial sands, silts and clays. In a deep well at Ujhani, rocks below unconformity were encountered at a depth of 2062 m. They have been dated at 1040-1045 ma (Precambrian age). Their age and lithology are similar to those of Vindhyans.
4.1.3. Geology and Geomorphology of Indo-Gangetic Plain

Aligarh is situated in the Ganga-Yamuna 'doab' (Inter-reverine) of the Great Indo-Gangetic plains. In the foothills of the Siwalik range Siwalik sediments end and older alluvium extend southward up to the foothills of the Aravallis, Vindhyan and the Bundelkhand massif. The Older Alluvium, generally, form some high terraces are found above the flood level. They also show some 'caliche' or 'kankar' composed of carbonate of lime developed in them.

The Newer Alluvium are the Recent pluvial/fluvial sediments deposited over the eroded surface of the Older Alluvium. They consist of gravels, sand and sandy clays near the river channels and silt at the flatter parts and the deltas.

The upper Ganga plain, has more or less uniform topography. The soils, largely homogeneous, have some Usar patches roughly located along belts roughly parallel to river coarses.

4.2. TOPOGRAPHY, DRAINAGE, SOIL TYPES AND GEOLOGY OF
ALIGARH AND SURROUNDING AREAS

4.2.1. Topography

The topography is generally flat. The alluvial plain is drained by the rivers Ganga in the north-east and Yamuna in the
north-west (Fig. 5), with a gentle slope towards south and south-east. The homogeneity is broken at Iglas, Khair and some western parts by sand ridges alternating with depressions. The level rises from the low Yamuna flood plains in the west towards the centre and then descends eastward into a slight depression formed by Kali Nadi. Farther east, the land again rises and merges into the Ganga flood plains.

The highest and the lowest elevations in the area are 640 ft. above M.S.L. in the northwest 2622 fts. above M.S.L. in the south, respectively.

4.2.2. Drainage System

The drainage system is an important feature of the Aligarh landscape (Fig. 6). The Kali Nadi is the only important line of natural drainage while the Ganga and the Yamuna barely touch the periphery of the study area. There are also a number of small seasonal streams like Neam, Karon, Sengar and Rind.

The Ganga takes a south-easterly course along the northern boundary of Aligarh district. There is a belt of recent 'khadar' alluvium along the course of the river, which, during rainy seasons, shifts from one side to another over a belt of 5 to
6 kms. This has been remedied partly by constructing a lower Ganga canal at Narora. The areas along the river are very fertile but remain water-logged during the floods.

The Yamuna

An important tributary of the Ganga, Yamuna flows towards south making a minor loop. The adjacent lands are, generally, flat, low-lying plains with gentle slope. Its span varies from about 390 m during the rainy season to about 150 m in summer months. Similarly, the velocity of flow also varies from about 11 km/hour during rainy season to 3 km/hour at other times. The river banks are very fertile.

Kali Nadi

Kali Nadi, also called as Kalindri has southerly course. It is perennial, with narrow valleys, markedly high banks and variable span. It is joined by Neem Nadi on its left bank.

Karon Nadi

Karon Nadi, also called as Karwan, is a seasonal stream which flows from north to south through Khair, Iglas, and Hathras taking a south-east course before joining the Yamuna.
near Agra city. In its upper course it has a broad basin with a good deal of low ground on either sides.

Neem Nadi

Neem Nadi is another small seasonal stream and is a tributary of Kali Nadi. Its bed has been deepened further to improve the drainage and its water is used for irrigation purposes.

Sengar Nadi

Sengar is a tributary of Yamuna. Its origin can be traced to the great Adhwa Jhil of the central depression. It flows southwards and then takes a turn towards Hathras. The river also transports a good amount of water from a large artificial drain cut at Lehtoi. It is a seasonal river.

Rind Nadi

Rind Nadi or Arind is another seasonal river originating at the central low lands between two branches of Ganga canal. It flows southward in the south-easterly direction.
4.3. SOIL TYPES

The soils of Aligarh are alluvial and have been divided geologically, into two broad subdivisions:-(i) Khadar, newer alluvium and (ii) Bhangar, older alluvium. They bear several local names and new names are assigned for even slight variation in the properties.

Khadar Soils: - The Khadar soils are relatively rich in plant nutrients, occupying narrow siltation tracts of rivers and their tributaries. They are deficient in organic matters, specially, phosphorus. They have immature profiles with sandy to silty-loam texture. Devoid of concretions, they have a fair proportion of lime and other soluble salts and are neutral to alkaline (pH > 8). The Yamuna Khadar soils, however, have submature profile abundant clays and concretions and very high lime and other soluble salts.

These are related to poor drainage system. The Trans-Yamuna Khadar differs in having a relatively mature profile, with average lime content. Their texture is loamy. Frequent siltation adds to their fertility.

Bhangar Soils: - Extensive in areal spread, Bhangar soils occur in inter-fluvial zones. Their profiles are somewhat mature and have variable colours. Soluble salts and lime
are, generally, low and show neutral reaction in low lying areas which are prone to water-logging. Illuviation is common throughout.

According to a survey of Ailgarh district, six types of soils were recognised (U.P. Agriculture Department, 1951). The are :-

(1) Aligarh Type I       Ganga Khadar
(2) Aligarh Type II      Eastern uplands
(3) Aligarh Type III     Central lowlands
(4) Aligarh Type IV      Western uplands
(5) Aligarh Type V       Trans-Yamuna (stiff loam)
(6) Aligarh Type VI      Yamuna Khadar

(1) Aligarh Type-I Soil - Ganga Khadar

Ganga Khadar soils are recent alluvial deposits brought in by the Ganga during rainy season. They occupy a long narrow belt. They are sandy to silty with loam texture and colour varying from light grey to ash grey.

The Ganga Khadar areas have imperfect drainage with little lateral or downward movement of ground water resulting in springs within one to two meters of the surface. This causes wide-spread salt efflorescence on the surface, specially, during the summer months. Their pH is above 8.
(2) Aligarh Type II Soil - Eastern Uplands

The Eastern uplands soils are found around Atrauli bearing a narrow depression in the south and a thin belt of Ganga Khadir in the north-eastern part. The surface soil is light brown to reddish in colour. The sub-soil is dark coloured. Texturally, they are sandy loam to loam. The surface soil, up to 25 cm, being well drained, is loamy and can be easily cultivated. They show higher degree of leaching than those found at other places. The lime is low but magnesia is high. Iron nodules occur almost everywhere in the sub-soil. The saline efflorescence is insignificant.

(3) Aligarh Type III Soil - Central Lowlands

The central lowlands soils occupy the eastern part of the area beyond G.T. Road up to Sikandra Rao covering the central low lying tract. It forms a north-south belt, parallel to the course of Ganga. The drainage is poor. Abundant jhils and swamps dot the area indicating water-logging. The soils are, generally, sticky in nature. They are from clayey-loam to clayey in texture and have colour varying from grey, ash grey to dark grey and black when moist. Generally, there is an underlying layer of kankar made up of nodules which, at places, cement together forming a stiff impenetrable layer.
These kankar rocks are very often used as building material. The clay content decreases due to sub-soil horizon being unimpregnable. The sodium salts deposited on the surface form 'ren'. During hot season it presents a sight of white salt-infested land. Southward an alkaline low magnesia soil, locally called 'chicknot', occurs.

(4) Aligarh Type IV Soil - Western Uplands

Locally known as 'bhur' these cover the largest area on the map, occupying the upland, which includes the tehsils of Iglas, Hathras, western part of Koil and almost 75 per cent of Khair. It extends from G.T. Road in the east to the Patwaha nala in the west except the Karwan valley which has a very narrow strip of stiffer soil. The area is artificially drained by a 'Ganda nala', joined in by numerous natural and artificial drainage lanes. Large scale development of Usar is significantly absent.

They have sandy texture, brown to reddish brown colour and low calcium clay content due to leaching. Soil erosion is indicated by ridges.

(5) Aligarh Type V Soil - Trans-Yamuna Khadar (Stiff Loam)

A narrow (9 km wide) belt of trans-Yamuna Khadar soils,
is roughly parallel to the Yamuna Khadar on the eastern side of the river. Occupying flat regions as stiff loamy soil, they merge with the ridges of bhur in the south. The texture of these soils vary from good quality loam to sandy loam but remain slightly stiff. The clay content is greater in the middle sub-soil than those in the top and bottom layers. The bottom layers are more sandy (78% sand) and finely textured. The colour of the top soil is ash-grey and that of the sub-soil rather dark. They are more compact with abundant kankar nodules, specially in the top and the bottom layers. The water retaining capacity of these soils is poor. The organic matter and nitrogen content is average. The iron content increases with depth. Leaching raises alkalinity in the bottom soils. Magnesia is more abundant than lime. The percentage of soluble salt is not very high. The dominant salts of bicarbonates are concentrated mainly in the top layers decreasing, gradually, with depth. These soils have a good exchange status but the calcium saturation is rather low.

(6) Aligarh Type VI Soil - Yamuna Khadar

The Yamuna Khadar forms a sandy tract along the extreme north-western part with width varying from 9.65 km in the north to about 3.2 km in the south along the river beds of the Ganga. These get over-flooded when Yamuna is in spate.
The soils are sandy to silty loam in texture. Though relatively poorer in sand they are richer in clay than the other types of soils. The soils are rather hard and difficult to till, especially, when dry. When wet, they get puddled up. The ground water-table is unusually near the surface and during the monsoon months it remains virtually on the surface itself. The soils are alkaline with pH, usually, 8. The alkalinity and bad physical characters render the soils unfit for normal agricultural use. The soils have sufficient lime but magnesia exceeds the lime except in the bottom layers, which are sodimised. The sulphates are higher in the surface layer but deeper down carbonates increase.

4.4. GEOLOGY OF ALIGARH AREA

Lying between Himalayas and Peninsular India, the area forms a part of the Sindhu-Ganga alluvial plain located in the Ganga-Yamuna 'doab' (inter-riverine). The alluvium is of Quaternary age. They form the largest alluvial plain in the world. It represents a rapidly sinking basin with sediments deposited almost exclusively under the fluvial conditions. The alluvium was brought from the Himalayan ranges by the Ganga river system (Dutt, 1968; Singh, 1975). The deposition started with the uplift of Siwaliks during the Middle Pliocene-Pleistocene period.
The alluvium at Aligarh consists chiefly of the various grades of sand, silt and clay. Beds of very coarse sand and gravel are, generally, uncommon. Also associated with fine grained strata are the kankar (calcium carbonate) zones of secondary origin. A generalised succession of soil horizons is as follows :-

| 379.36 meters |  
|----------------|------------------|
| Surface clay   | Clay with fine sand and kankar |
| Clay with fine sand and kankar | Sand, fine to medium gray (micaceous) |
| Sand, fine to medium gray (micaceous) | Clay, yellow with kankar |
| Clay, yellow with kankar | Kankar mixed with yellow clay |
| Kankar mixed with yellow clay | Clay yellow with kankar |
| Clay yellow with kankar | Gravels (siliceous kankar with yellow clay) |
| Gravels (siliceous kankar with yellow clay) | Gravels calcareous |
| Gravels calcareous | Gravels with yellow clay |
| Gravels with yellow clay | Gravels calcareous with fine sand |
| Gravels calcareous with fine sand | Clay yellow with Gravels |
| Clay yellow with Gravels | Clay, sand with kankar |
| Clay, sand with kankar | Sand, fine to medium with quartz gravels and very little clay |
| Sand, fine to medium with quartz gravels and very little clay | Sand medium with gravels and clay |
| Sand medium with gravels and clay | Clay sand with red calcareous clay |
| Clay sand with red calcareous clay | Clay red |
| Clay red | Vindhyan Red shales with malachite encrustations (Fig. 8) |
**LITHOLOGY** | **DEPTH THICKNESS IN MTS**
---|---
SURFACE CLAY & KANKAR | 0 00 - 6 60
CLAY WITH FINE SAND & KANKAR | 6 60 - 1 10
FINE SAND TO MEDIUM GRAINED MICACEOUS | 1 10 - 6 72
CLAY YELLOW WITH KANKAR | 6 72 - 9 99
KANKAR MIXED WITH YELLOW CLAY | 9 11 - 2 12
CLAY YELLOW WITH KANKAR | 2 12 - 3 97
GRAVELS (SILICIOUS KANKAR) WITH YELLOW CLAY | 3 97 - 3 31
GRAVELS CALCARIUS | 3 31 - 1 01
GRAVELS WITH YELLOW CLAY | 1 01 - 1 26
GRAVELS CALCARIUS WITH FINE SAND | 1 26 - 1 27
CLAY, YELLOW WITH GRAVELS | 1 27 - 3 69
CLAY, SAND WITH KANKAR | 3 69 - 3 73
SAND, FINE TO MEDIUM WITH QUARTZ GRAVELS AND VERY LITTLE CLAY | 3 73 - 3 65
SAND MEDIUM WITH GRAVELS AND CLAY | 3 65 - 3 68
CLAY SAND WITH RED CALCARIUS CLAY | 3 68 - 1 01
RED CLAY | 1 01 - 1 79
UPPER VINDHYAN RED SHALES WITH MALACHITE ENCRUSTATION CLAY | 1 79 - 1 31

**FIG 8** LITHOLOGICAL LOGS SHOWING GENERALISED GEOLOGY AT ALIGARH RAILWAY STATION DRILLING DONE ON 16 6 76 - 25 6 76

SOURCE CGWB LUCKNOW (UP)
According to Eduard Suess, the great Austrian geologist, the plain represents a 'fore-deep' in front of the resistant mass of the Peninsula when the Tethyan sediments were thrust southward and compressed against them. Thus, this 'fore-deep' was the remnant of the sea of Tethys, out of which the Himalayas were uplifted. This depression was, gradually, filled up by the sediments brought down by the Himalayan rivers in the north and Peninsular rivers in the south. This view was supported by Misra (1981).

Burrard (1921), on the basis of physical and geodetic considerations, concluded that Indo-Gangetic plains occupy a 'rift-valley' formed due to sinking of a portion of the earth's surface with pari passu deposition. According to him the sub-crustal crack or rift extended from surface far down into the crust (32 km), which was subsequently filled up by the alluvium. Burrard's views are not in full agreement with the geological observations. Most geologists view Indo-Gangetic depression as a true fore-deep, a downwarp of the Himalayan foreland of variable depths, thrusting into flat plains by alluviations. According to geologists, vigorous deposition of sediments and consequent depression gave rise to this vast tectonic trough.

A third, relatively recent view, invokes a sag in the crust in the north of the drifting Indian subcontinent. The crumpling and uplifting of the sediments accumulated in the
Tethyan sea gave rise to a mountain system. Once formed, the depression was filled with sediments brought down by the rivers from Himalayas and Peninsular India.

Regarding the age of formation, it is believed, that the Indo-Gangetic depression must have come into existence during the later stages of Himalayan orogeny. The depression, probably, began to form in the Upper Eocene and attained its maximum during the third upheaval in the Middle Miocene. Since then the sediments filled it gradually forming a level plain with a very gentle seaward slope. The broad uniformity of detritus suggests a subsiding trough since the Pleistocene times. Continuous uplift of the Himalayan mountains would rejuvenate the young streams, thereby, increasing their carrying capacity. This would lead to rapid filling of the depression during Middle-Pleistocene to Recent. Oldham on the basis of geological observations, estimated maximum depth of the trough to be about 4,600 meters near its northern limit from where the floor rises up to its southern edge where it merges with the Vindhyan uplands of the Deccan.

The gravity, magnetic and seismic surveys of the Indo-Gangetic plains suggest thickness of the alluvial cover ranging from 1000 m to 2000 meters. Glennie (1932), on the basis of geodetic observations estimated a thickness of about 1950 meters. His earlier (1921) estimation gave a value of more than 3000 meters.
The magnetic surveys reveal a number of local 'highs' and 'lows', all of which slope steeply towards the north. A number of borings done for artesian wells up to a depth of 1606 meters. In 130 borings carried out for ground water surveys the depth at which the bed rock was encountered ranged widely between 100 meters to 400 meters.

Aero-magnetic surveys gave the depth of basement rocks at about 7000 meters and the geophysical data gave a depth of 6000-7500 meters.

The data collected by the Geological Survey of India for Bihar region shows that the thickness varies from 1800 meters to less than 3000 meters.

During the 1976 drilling operation by the Central Ground Water Board at the Aligarh railway station, red Sirbu shales of Upper Vindhyan age were encountered at 379.36 meters below the ground level (Fig. 8).

Thus there is no unanimity regarding the origin and thickness of the Indo-Gangetic alluvial deposits.

4.5. INCIDENCE OF 'REH' OR 'USAR' IN UTTAR PRADESH

In ancient India (2500 BC), salt-affected soils were referred to as 'usar' or 'reh' meaning salt (Raychaudhari and Govindarajan, 1970). All such soils were later classified as Solonchak or Solonetz in the U.S.S.R., the U.S.A. and India.
(Venkataramiah, 1941; Raychaudhuri and Tripathi, 1953; and Raychaudhuri and Sinha, 1957). According to Richards (1954), saline, sodic and saline-sodic were three distinct classes of soil. Agarwal et al. (1979) gave equivalents of the local names (Table-1).

Table-1: Soil Classes and equivalent local types.

<table>
<thead>
<tr>
<th>Class</th>
<th>EC mhos/cm</th>
<th>pH</th>
<th>Local Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saline soils</td>
<td>4</td>
<td>8.5</td>
<td>Thur, Uippu, Shora, Solu, Pokkali, Khar and Karl.</td>
</tr>
<tr>
<td>Sodic soils</td>
<td>4</td>
<td>8.5</td>
<td>Usar, Rakkar, Bara, Chopan, Karl.</td>
</tr>
<tr>
<td>Saline sodic</td>
<td>variable</td>
<td></td>
<td>Usar, Kallar, Karl, Chopan, Bari, Reh, Choudu, Kshar, and Jougu.</td>
</tr>
<tr>
<td>soils</td>
<td>4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In Uttar Pradesh about 75% population is dependent on agriculture to earn their livelihood. The state comprises 54 districts and 29437 thousand hectares area.

A vast tract 1.2 million hectares, are lying waste due to development of reh and an equally large area affected with soil salinity. The worst affected districts are Aligarh, Mainpuri, Etah, Farrukhabad, Etawah, Kanpur, Fatehpur, Unnao, Hardoi, Lucknow, Rai Bareli, Azamgarh, Sultanpur and Allahabad (Fig. 9).
4.6. INCIDENCE OF REH IN ALIGARH DISTRICT

Out of 30,000 hectares area in Aligarh district about 15 per cent is Usar and is not suitable for agriculture. Another 5 per cent (7,000 hectares) of cultivated land is suffering from salinity and alkalinity (Table-2).

Wide-spread Reh (Usar) development is found in Sikandra Rao, Hasampa, Akrabad, Jawan and Chandaus blocks. Dhanipur and Lodha blocks too have wide stretches of such lands. However, Iglas, Gonda, Gangiri and Mursan are affected less and have some unculturable closely spaced sand hills.
<table>
<thead>
<tr>
<th>Blocks</th>
<th>Area</th>
<th>Use of Reh, uncult. lands</th>
<th>Culturable Land</th>
<th>Current Fallow</th>
<th>Other Fallow</th>
<th>% of Reh, uncult. lands of total area</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Atrauli</td>
<td>28597</td>
<td>1066</td>
<td>383</td>
<td>506</td>
<td>593</td>
<td>3.72</td>
</tr>
<tr>
<td>2. Gangiri</td>
<td>34951</td>
<td>439</td>
<td>1098</td>
<td>1108</td>
<td>906</td>
<td>1.25</td>
</tr>
<tr>
<td>3. Bijauli</td>
<td>25308</td>
<td>1605</td>
<td>676</td>
<td>809</td>
<td>855</td>
<td>6.34</td>
</tr>
<tr>
<td>4. Iglas</td>
<td>25661</td>
<td>453</td>
<td>202</td>
<td>602</td>
<td>361</td>
<td>1.76</td>
</tr>
<tr>
<td>5. Gonda</td>
<td>29575</td>
<td>421</td>
<td>136</td>
<td>997</td>
<td>313</td>
<td>1.42</td>
</tr>
<tr>
<td>6. Jawan</td>
<td>31278</td>
<td>4163</td>
<td>763</td>
<td>721</td>
<td>1185</td>
<td>13.30</td>
</tr>
<tr>
<td>7. Dhanipur</td>
<td>29394</td>
<td>2050</td>
<td>744</td>
<td>717</td>
<td>1153</td>
<td>6.97</td>
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<tr>
<td>8. Lodha</td>
<td>29110</td>
<td>1621</td>
<td>281</td>
<td>646</td>
<td>768</td>
<td>5.56</td>
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<td>9. Khair</td>
<td>32015</td>
<td>1428</td>
<td>926</td>
<td>656</td>
<td>654</td>
<td>4.46</td>
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<tr>
<td>10. Chandaus</td>
<td>326676</td>
<td>2997</td>
<td>1194</td>
<td>440</td>
<td>395</td>
<td>9.17</td>
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<td>11. Tappal</td>
<td>37255</td>
<td>890</td>
<td>1786</td>
<td>983</td>
<td>829</td>
<td>2.38</td>
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<td>12. Akrabad</td>
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<td>3914</td>
<td>812</td>
<td>728</td>
<td>711</td>
<td>14.30</td>
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<tr>
<td>13. Sikandra Rao</td>
<td>26478</td>
<td>4019</td>
<td>603</td>
<td>792</td>
<td>746</td>
<td>15.17</td>
</tr>
<tr>
<td>14. Hasayan</td>
<td>29004</td>
<td>4387</td>
<td>1157</td>
<td>864</td>
<td>874</td>
<td>15.12</td>
</tr>
<tr>
<td>15. Mursan</td>
<td>22889</td>
<td>153</td>
<td>72</td>
<td>255</td>
<td>127</td>
<td>0.66</td>
</tr>
<tr>
<td>16. Sasni</td>
<td>26562</td>
<td>1255</td>
<td>375</td>
<td>350</td>
<td>242</td>
<td>4.72</td>
</tr>
<tr>
<td>17. Hathras</td>
<td>23290</td>
<td>677</td>
<td>162</td>
<td>421</td>
<td>352</td>
<td>2.90</td>
</tr>
</tbody>
</table>

Total area of the blocks: 190611, 31538, 11371, 11595, 11064, 6.42
Total city area: 11576, 815, 300, 403, 289, 7.40
Total area of district: 502187, 11671, 32353, 11671, 11998, 6.44