

FINAL REPORT

OF THE

DELHI TOWN PLANNING COMMITTEE

ON THE

TOWN PLANNING

NEW IMPERIAL CAPITAL

With two maps on the scale of four inches to the mile within fold.



DELHI

SUPERINTENDENT GOVERNMENT PRINTING, INDIA
1913



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(FINAL REPORT) *T. H. H. C.*
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To

HIS EXCELLENCY THE VICEROY
AND GOVERNOR GENERAL OF INDIA.

Delhi, 20th March 1913.

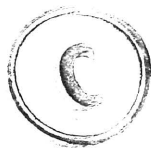
YOUR EXCELLENCY,

I have the honour to present the final report of the Delhi Town-Planning Committee on the town-planning of the New Imperial Capital. A plan of the lay-out is enclosed.

I have the honour to be,

Your Excellency's obedient servant,

GEORGE S. C. SWINTON, *Captain,*
Chairman, Delhi Town-Planning Committee.



ERRATA.

Page two, paragraph three, line twelve. *For* 'breadth' *read* 'length'.

Page three, paragraph four (*f*), line two. *For* 'south-west' *read* 'south-east'.

Page ten, section two, sub-section one. *For* 'may work with the best advantage into the lay out' *read* 'could work to the best advantage with the lay out'.

Page thirteen, section four, sub-section ten, line five, *delete* word 'anyhow'.

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FINAL REPORT ON THE TOWN PLANNING OF THE NEW IMPERIAL CAPITAL.

1.—Preliminary.

The Committee now propose to present the separate report on town planning which was promised in paragraph 1 of their report on the choice of a site for the new Imperial capital at Delhi.

In accordance with the programme detailed in the concluding paragraph of that report the Committee left Simla in the latter half of June. Mr. Brodie was the first to leave and on his way home visited Delhi, where he went over a portion of the ground. Captain Swinton and Mr. Lutyens left Simla a few days later and met Mr. Lanchester at Delhi. They had the advantage of learning his views and discussing plans with him before leaving for Europe.

From August to November the Committee were in England, but kept themselves continually in touch with India. Lengthy communications passed by every mail: and while certain work was carried out by the Committee at home, the officers at Delhi conducted the necessary investigations on the spot.

The whole railway problem was reviewed. The question of the afforestation of the ridge was considered. Arrangements were made for the rearing of suitable trees and plants for the avenues and parks of the new city. An elaborate preliminary estimate of the cost of the new city was drawn up by Mr. Ward and Mr. deMontmorency, ably assisted by Captain Roberts, Captain Sopwith and Mr. Parker. These preliminary estimates covered the ground of the cost of land, storm water drains, sewage and sanitary installation, irrigation, domestic water supply, roads, parks, buildings, lighting, tools and plant and establishment. The acquisition of land for the new site began.

During the interval there was one fresh development. In paragraph 10 of their report the Committee recommended the acquisition of the suburb of Paharganj, and in a tentative lay-out, which they put forward, it was condemned for demolition. On the receipt of the estimates of the land acquisition officer it was discovered that this suburb, although admittedly of poor character and appearance and insanitary, contained 15,000 inhabitants and was valued at a very large sum. This discovery raised serious complications; and the Committee were informed that the Government of India did not see their way to sanction its immediate demolition. It was held that it would be easier to deal with this area by including it in a general scheme for the improvement of the present city, the expenditure being spread over a number of years. The Committee were accordingly instructed to consider the possibility of aligning the main axis of their lay-out in a more easterly direction.

The Committee realise that the compulsory removal of great masses of population is a difficult matter requiring much care and tact; but they received with regret the news that Paharganj must remain for the present. It is to-day a poor class property; but it occupies such an advantageous position that it must rise in value. In the opinion of the Committee it would be wiser for the Government of India to obtain such control over it that no private interests can be created in it detrimental to the public welfare. The Committee would wish again to emphasise the vital importance of control of which mention was made in paragraph 10 of their earlier report.

Captain Swinton returned to Delhi on November 25th. Mr. Brodie and Mr. Lutyens did not arrive till nearly a month later. At the desire of His Excellency the Viceroy they visited Mandu, Indore, Lucknow and Cawnpore on their way from Bombay to Delhi. Since then the work has been continuous.

2.—A special report on the north site.

Towards the end of January the attention of the public was directed to the north site, or Durbar area, as a site for the new capital. This interest was evoked partly by a paper read by Sir Bradford Leslie before the Society of Arts in London and partly by a series of articles in the press from champions of this site. In paragraph 7 of their report on the choice of the site the Committee had already concluded that it was impossible to provide an area on the north site to suit the requirements of the new capital as communicated to them by the Government of India. The only possible basis, on which the question could be considered, was a modification of the conditions originally laid down. At the desire of His Excellency the Viceroy the Committee proceeded to review the conditions of size and area originally postulated by the Government of India and presented a separate report on the possibility of accommodating a city of half the size previously contemplated on the northern area.

3.—Principles to be kept in view.

There are certain general principles governing town planning in all countries and climates, though they must vary with the motif of the city. First and foremost among these the Committee put the need of foresight. There must be a readiness to meet every requirement of the future. Whatever eventualities the days to come may have in store, the new city must have at its hand the inherent power to command health, and a wealth of air spaces and room for expansion, which no lapse of time can deplete. A well-planned city should stand complete at its birth and yet have the power of receiving additions without losing its character. There must be beauty combined with comfort. There must be convenience—of arrangement as well as of communication. The main traffic routes must be parkways capable of extension both in width and breadth. Communications both internal and external should be above reproach. Where possible, there should be a presentation of natural beauties—hill, wood and water—and of monuments of antiquity and of the architectural splendours of modern times. Space is needed for recreation for all classes. The result must be self-contained yet possessing a latent elasticity for extension. The perfected whole should be obtainable with due regard to economy.

To all this must be added the special principles governing the town planning of a particular site. In the case of Delhi the Committee conceive the chief of these to be a realization of the dominant idea of the new Delhi and the adaptation of the scheme of the new city to physical conditions. Delhi is to be an Imperial capital and is to absorb the traditions of all the ancient capitals. It is to be the seat of the Government of India. It has to convey the idea of a peaceful domination and dignified rule over the traditions and life of India by the British Raj. The attention to be paid to physical conditions chiefly centres on making the new city one suited for a seven months' residence in a climate which varies during that period from a maximum shade temperature of 105 degrees Fahrenheit to a minimum winter shade temperature often approaching freezing point. Health in a land with a bad malarial record and violent variations in climate, rainfall and river flood levels has to be most specially safeguarded. The local drawbacks of dust, glare and barrenness have to be combated; and the provision of irrigation, without which no grass or trees can grow successfully in Delhi, must be arranged. The Committee now propose to show how their lay-out on the south site is governed by these principles.

4.—Description of the south site.

The general description of the south site, which was given in paragraph 9 of the report on the choice of a site, may now be presented in greater detail with a view of showing clearly how the lay-out on such a site can fulfil those principles which the Committee have set for their standard.

(a) The site of the proposed new city may be said to begin from the walls of the present city of Delhi and to extend from them in a southerly and south-westerly direction. On the eastern side the area will extend to the Jumna. The old high bank of the river on which are situated the remains of the cities of

Ferozshah Kotla and Indrapat and the buildings in the vicinity of Humayun's tomb, is far away from the present channel of the river from which it is separated by a considerable expanse of low-lying land locally known as the *Bela*.

On the west the natural limit of the area is the ridge. A cross-section of the ridge opposite Paharganj shows a rocky surface at an elevation of about 725 feet above mean sea level, rising to about 800 feet at the highest point and falling again to about 750 feet in a total width of 1,200 yards before the rock surface again disappears beneath the soil. The ridge continues southwards at the same apparent width, but gradually rises in height to a maximum of 865 feet at a point west of Tal Katora. A line drawn from this point to Safdar Jang's tomb and then due east to the river forms roughly the present southern boundary of the land required, though the tract southwards of this line is in every way suitable for building and will be available for expansion.

(b) The total area described as the site has a width of about $4\frac{1}{2}$ miles at its broadest part at the proposed southern boundary and narrows as it approaches the present town to a width of about $2\frac{1}{2}$ miles. The village of Malcha at the south-west corner of the site is $3\frac{1}{2}$ miles from the Ajmere gate of Delhi city while Nizamuddin's tomb at the south-east corner is $3\frac{3}{4}$ miles from the Delhi gate. If however it is considered necessary to adopt a restricted lay out of the nature considered in connection with the north site, the whole of this area will not be occupied by buildings at once but will be developed gradually. The size of the site.

(c) Looking from the centre of the site towards the river there is Shahjehan's Delhi on the left, and following down the river frontage Ferozshah's Delhi, Indrapat and Humayun's tomb fill the outlook in front, while outside the site itself Tughlakabad, Sini, Jehanpanah, Kila Rai Prithora, Lal Kot and the Kutb complete the panorama. The isolated buildings known as Safdar Jang's tomb, the Lodi mausoleums and the observatory of Jey Singh are within the site itself; the only portion of the older cities which lies within the boundaries of the site is an area of about $1\frac{1}{2}$ square miles starting on the west near the Turkoman gate of the present city and extending southwards from the Delhi gate to the edge of the old high river bank. This area is unoccupied by buildings at present, but much of it is rough and uneven with the scattered remains of the stones and foundations of old settlements. It will best be utilized partly for large institutions which require a considerable area of land around them and partly by being planted and treated as a natural wild park. The older Delhi.

(d) All the rest of the site with this exception consists of good land most of which is in continual use for agricultural purposes. The area has been largely cleared of trees so as to allow of unrestricted tillage; but it grows excellent crops, and where the villagers have allowed occasional trees to remain near a village site or mosque or in a walled garden the excellence of the tree growth is an earnest for the success of the avenues and parks in the new city. In a few places near to the present city the land has been spoilt by use of the underlying materials for brick burning; but it will not be difficult to bring these areas up to the level of the surrounding land before they are required for building purposes. The Committee have twice seen the ground under a smiling expanse of crops and feel the greatest confidence in the good qualities of the soil for the purposes of gardens, parks and arboriculture generally. This opinion is shared by Mr. Griessen, an expert landscape gardener who inspected the site. The unoccupied area.

(e) The natural fall of the country is at right angles to the base of the ridge and towards a shallow valley on the eastern boundary of the site; this valley falls in a southerly direction past the village of Kilokri and has its outlet into the river near Okhla. The Committee could wish for nothing better. The whole of the natural surface falls are very favourable for the disposal of sewage and storm water. From observations taken in September last, when a heavy fall of rain occurred amounting to eight inches in 12 hours, it appeared that the nullas or ravines connecting with the main valley were dry again within a period of eight hours from the time the rain ceased. The general fall of the country.

(f) It must not be supposed however that beside the ridge the only feature is a plain with a gentle slope to the south-west. Within the proposed area there are a number of places where the land or rocky eminences rise considerably above the surrounding surfaces. At Ugar Sain's Baoli there is a small plateau rising to a height of 720 feet. A rocky hillock at Raisina village, which is the Variations in the plain.

approximate centre of the building area, rises to 750 feet or about 40 feet above the country immediately surrounding it. A long ridge of high ground varying in height up to 760 feet surrounds on three sides a lower area of land lying to the south-west of the village of Kushak. A number of projecting ridges also outcrop between the western boundary of this hollow and the village of Malcha extending northwards at various altitudes generally above 750 feet towards the village and garden of Talkatora. These are a series of spurs from the main ridge itself. These variations make a pleasing break in the general level of the plain and offer great opportunities for advantageous town planning and the placing of important buildings.

The Main Ridge.

(g) The main ridge, a continuation of the historic Ridge on the north, starts from a suburb called Sadar Bazar, and stretches in a south-westerly direction. Its surface consists largely of bare quartzite weather worn rocks of a reddish colour rounded in contour, lying between vertical beds of some thickness. Many individual stones are of considerable bulk. Between the tilted layers of rock, and in pockets between stones, small patches of soil are to be found which support shrubs and bushes and throw up grass in the rainy season. At present the ridge is heavily grazed by numerous flocks of goats and sheep, and vegetation has little chance of successful existence. Here and there in the surface above Talkatora gardens and in other places, considerable areas of soil have accumulated in local depressions. A scheme has now been drawn up by an experienced forest officer for the afforestation of the ridge. This scheme provides for rough terracing to hold up soil and skilful treatment of the watercourses down which the surface waters escape. Irrigation to start arboriculture is possible from the drinking water-supply which will be delivered at a high level along the crest. It is anticipated that the stoppage of browsing will in itself conduce to the rapid growth of much natural wild vegetation, while the skilled arboricultural operations of the afforestation scheme will result in a complete reboisement of these hills. The lay-out provides for the construction of ridge drives along the higher portions which will be connected through to the existing roads on the north Ridge by a thoroughfare constructed through the Sadar Bazaar. The views from these high drives will be magnificent. The panorama of the present city, the new city and the monuments and cities of the past stretching below to the river as seen from the rough eminence past a foreground of rocks and trees should be one difficult to match for charm.

Physical conditions in relation to health.

(h) The villages on the site have, as compared with those in other areas near Delhi, a good past history in the matter of health. Where there has been malaria, it has been due to a localised cause such as the ponding up of storm water by artificial embankments for agricultural purposes or to local depressions which gave an opportunity for anopheline breeding. These local defects will disappear on the development of the site for the purposes of the new city. In other respects the site is excellent from the point of view of health. The subsoil water gives no cause for anxiety. The soil is a fine permeable loam. The slope for drainage of storm water or sewage is excellent. The site is sheltered from the cold north-west winds in the winter. The part of the site which will be closely built over is at a distance from any flooded areas and is free from water-logging.

The Cantonment area.

(i) To the south-west of Malcha, but on the other side of the ridge, lies the tract which has commended itself to the military authorities as being the area most eminently adapted for the purposes of a cantonment in the vicinity of Delhi. This offers wide expanses suitable for manœuvres and is a healthy site open to the wind in the warm season—a necessity for a station which will be occupied all the year. This area is most conveniently situated in regard to the proposed site for the new capital, as near Malcha the configuration of the ground makes it possible to provide without difficulty connecting roads with easy gradients between the two settlements.

Communications.

(j) The nature of the site is such that there is a possibility of the freest communication everywhere to the south for purposes of expansion. To the north there is no obstacle in communication with the Ajmere, Turkoman and Delhi gates of the present city, which are the three important gates in the south wall. On the east communication to the banks of the Jumna is everywhere unrestricted. To the west there are good means of communication with the

cantonment area to the south-west, and with the present city and civil lines to the north-west.

This amplification of the description of the site will, it is hoped, make it clear how far both time and nature have combined to secure on the south site the realization of many of the principles which the Committee had set up to be their guiding influence in planning the new capital. Time has stored up for the new city those splendid monuments of ancient empires and cities to convey the legacy of history and the imperial tradition. Nature has provided a varied scene of ridge and river, of plain and hill. Nature too has supplied that wide area for expansion, that facility of communication, and that excellence of soil and slope which give the potentiality for convenience and health. It now remains to set forth in what manner the Committee recommend that these gifts should be used in order to attain the consummation of the rest of their principles.

5.—Description of the lay-out.

(a) The central point of interest in the lay-out, which gives the motif of the whole, is Government House, the Council Chamber and the large blocks of Secretariats in which the Members of the Governor-General's Council administer the great departments of Government. This is the keystone of the rule over the Empire of India; this is the place of Government in its highest expression; this is the seat of the Governor-General in India and his Council. The central point.

This Governmental centre has been given a position at Raisina hill near the centre of the new city. This will be the centre of its life. So placed it commands views of the new city on every side and is viewed by all the inhabitants thereof. There is a wide outlook over its demesne—ridge, river and plain, the Delhi of to-day and the Delhis of the past.

Advantage is taken of the height of this hill and it is linked with the high ground behind so as to appear a spur of the ridge itself. Behind the hill a raised platform or forum would be built. This will be flanked by the large blocks of secretariat buildings and terminated at its western end by the mass of Government House and the Council Chamber, with its wide flight of steps, portico and dome. Thus the imagination is led from the machinery to the prime moving power itself.

The forum will be approached by inclined ways with easy gradients on both its north and south sides. The main access to it is from the east. The axis of the main avenue centres on the north-west gate of Indrapat nearly due east of Government House.

(b) Looking from the eastern end of the forum where the broad avenue enters the Governmental centre and where the great stairways are set, the view is towards the east. The height and mass of the Secretariats, with the dominating influence of Government House and the Council Chamber behind them to the west, look towards Indrapat, the site of the oldest of all the Delhis. It was on this too that Shahjehan faced the Delhi gate of the Fort and the Delhi gate of Shahjehanabad. Right and left the roadways go and weld into one the empire of to-day with the empires of the past and unite Government with the business and lives of its people. The reasons for sitting on Indrapat.

(c) Behind Government House to the west would be its gardens and parks flanked by the general buildings belonging to the Viceregal estate. Beyond these again on the ridge itself would be a spacious amphitheatre to be made out of the quarry from which much of the stones for roads and buildings may be cut. Above this and behind it will lie the reservoir and its tower which will be treated so as to break the sky line of the ridge. The general lay-out.

To the east of the forum, and below it, will be a spacious forecourt defined by trees and linked on to the great main avenue or park-way which leads to Indrapat. This forecourt might be adorned by fountains and contain decorative features emblematic of the various provinces of the Indian Empire.

Across this main axis, and at right angles to it, will run the avenue to the railway station. This will terminate in the railway station, the post office and business quarters at its northern end, and in the Cathedral at its southern extremity.

To the south-east will lie the park area in which stand the ancient monuments of Safdar Jang's Makhbara and the Lodi tombs. This area can be developed gradually as the city expands and has need of public institutions of various kinds. The axis running north-east from the secretariat buildings to the railway station and towards the Jama Masjid will form the principal business approach to the present city. At the railway station a *place* will be laid out around which will be grouped the administrative and municipal offices, the banks, the shops and the hotels. On this *place* the post office is placed in symmetrical relation to the railway station.

Processional route.

(d) The processional route will lead down from the railway station due south to the point where it is intersected by the main east to west axis. Here round a *place* will be gathered the buildings of the Oriental Institute, the Museum, the Library and the Imperial Record Office which will form what may be termed a centre of intellectual interest.

As an alternative a longer processional route can be used as the city develops, which will lead out from the Delhi gate of the Fort past the Delhi gate of the city, through the city park, south along the area occupied by the residences of the Indian Chiefs and Nobility. Before it reaches Indrapat it will be deflected to the commemorative column in the main park-way which goes west from Indrapat to the forum. The procession past the villas of the Chiefs with the views of the Jumna and Indrapat will combine to make this route one of peculiar interest.

Suburbs.

(e) To the south-west of the railway station will lie the houses of the local administration and the residences of the European clerks.

Between Talkatora garden and Paharganj will be the area proposed for allocation to the Indian clerks, the press and other Government establishments.

Due south of the forum the residence of His Excellency the Commander-in-Chief will be placed. Round about the Viceregal estate and the forum lies the ground destined for the residences of the Members of Council, the Secretaries and other officials of the Government of India.

To the south-west of Government House lies the club in a position easily accessible from the two main roads to cantonments and the avenue of the residential part of the city. To the south of the club a low ridge divides the tract into two portions. That to the west is well adapted for a golf-course, while the eastern side is designed for a race-course, the ridge itself offering unusual facilities for locating stands and seeing the races.

Jantar Mantar.

(f) The fire station with its tower will be built to balance the lofty observatory buildings of the Jantar Mantar in the position shown on the plan.

Avenues.

(g) The avenues range from 300 feet to 60 feet with the exception of the main avenue east of the Secretariat buildings where a park-way width of 440 feet has been allowed. The widths of the avenues depend on the varieties of trees selected. In all main avenues it is proposed to arrange for running water with fountains at intervals as features. The principal avenues in addition to the main avenues are those running at right angles to the main east to west axis. Others form part of a system running from the amphitheatre to the railway station and Commander-in-Chief's residence, and from both the latter to the commemorative column. These enclose the imperial centre and are the outer main sinews of the frame. The commemorative column lying on the axis between Indrapat and Government House is the focal point of the roads and avenues on the park-way. A ridge drive as shown on the plan will be laid out and its treatment is suggested by the construction of an approach to the Baoli Bhattiana along the adjoining masonry embankment.

Connections with the city and cantonment.

(h) Communications with the present city and Civil Lines will be by way of the avenue towards the Jama Masjid.

Inside the city this bifurcates, one branch leading towards the King Edward Memorial while the other goes north towards St. James' Church and the Kashmere gate. The present civil station and the new city will also be connected by broad roads running through the Sadr Bazar. Other communications appear on the plan. Communication with the Cantonment will be

established by roads from the Military settlement joining both the ridge road and the existing road from Delhi to Gurgaon.

(i) In laying out avenues and compounds it is essential that the design of the buildings and the actual lay-out of entrances to compounds should be determined before trees are planted as lines of trees and buildings are dependent on one another for effect. Foresight in planting trees.

(j) Sufficient areas have been provided for parks in the following Parks. places:—

(a) The Viceregal estate.

(b) The park-way from Indrapat to the Secretariats.

(c) The park round the Lodi tombs and Safdar Jang's Mausoleum.

(d) The park area to the south of the club containing the golf and race-course.

(e) The park between the new and the present city, roughly 1,000 yards in width.

(f) The afforested ridge.

(k) The lay-out has been designed within lines of deviation so as to give the greatest possible freedom, and provides for a city on a ten square mile basis: but the alignment of avenues and roads is equally suited to a restricted lay-out of the nature that was considered for the North Site. Reduced or extended lay-out.

(l) A lake which can be obtained by river treatment is shown on the plan. Water effect.
The lay-out has been made independent of the water effect, but the Committee think that its ultimate creation will enhance enormously the beauties and general amenities of the new capital: and it should and would become an integral portion of the design now submitted.

6.—Recommendations in regard to the treatment of special points.

Having set forth the general idea underlying the plan of the town and given a general description of the lay-out, the Committee feel that, without any desire to tie the hands of those who are to build and develop the new city, there are certain points of important detail, chiefly connected with engineering problems, in connection with which they wish to make recommendations. Their remarks will fall under the heads of—

I.—Water-supply and irrigation.

II.—Storm water drainage.

III.—Sewage system and refuse destruction.

IV.—Communications—

(a) Railways.

(b) Roads—their construction and surfaces.

(c) Tramways.

(d) Diversion of traffic.

(e) Through traffic routes.

V.—Parks and open spaces.

VI.—Arboriculture.

VII.—River treatment and water effects.

VIII.—Future development.

A map of the Engineering services forms an enclosure to the report.

I.—WATER-SUPPLY AND IRRIGATION.

Necessity for ample water-supply.

1. A healthy and beautiful city in the vicinity of Delhi must depend very largely on the provision of an abundant water-supply for domestic, sanitary and irrigational purposes.

Sources of supply.

2. Several sources have been investigated and estimated for: these include:—

(a) The subsoil water.

(b) The Jumna river (by gravitation).

(c) The Jumna river locally (by pumping).

(d) The Western Jumna Canal.

Purposes for which water from different sources is suitable.

3. Of these sources (a), (b) and (c) could provide water suitable not only for irrigation but also for a domestic water-supply, while (d) could provide water only for irrigation; the pollution of the canal water renders it unfit for drinking purposes, except by having recourse to filtration at a prohibitive cost. This question was gone into very fully at the time of the investigations preliminary to the installation of the present Delhi domestic water-supply in the seventies.

Subsoil water sources.

4. From the records of the subsoil water available it is apparent that this source cannot be relied upon at present to provide water in sufficient quantities locally. Mr. Hayden, the head of the Geological Department of the Government of India, was consulted and held out no hope of any large quantity of water being obtainable from deep borings.

Trial deep boring suggested.

5. A trial deep boring is not, however, an expensive matter, bearing in mind the importance of this subject, and valuable information might be obtained by such an experiment.

Mr. Hayden has kindly promised, on completion of the surveys, to send down a geologist, who would give a final report on the possibilities of finding subsoil water in quantity. As the surveys have now been completed, this offer might be accepted. Such a report would decide once and for all the possibilities of getting water from the rock.

Source of the Jumna river in its higher reaches.

6. The Jumna river in its higher reaches has been investigated and a scheme prepared in outline for a lengthy pipe line capable of delivering sufficient water both for domestic and irrigation purposes by gravitation.

The Committee reluctantly came to the conclusion that the heavy initial cost of such a scheme and the maintenance of so lengthy a pipe line (considerably over 130 miles) must put this source of supply out of court, especially bearing in mind that a large proportion of the water is required not for domestic but for irrigation purposes.

Western Jumna Canal source.

7. The Delhi branch of the Western Jumna Canal, as at present operated for irrigation purposes in this neighbourhood, is of necessity closed for periods of from 10 to 20 days in each month, the water being during these periods utilized in other branches of the canal which do not supply the neighbourhood of Delhi. The main canal is also closed altogether occasionally for even longer periods, in order to carry out necessary repairs, or on account of a lack of demand on the part of the farmers. This source could not, therefore, be relied upon, unless a special channel giving a regular supply should prove possible and capable of economical construction.

In any case the level of supply would only provide for the flow irrigation of so much of the area as lies below the 705 contour, and it would still be necessary to pump all water required for land lying above this level.

Source of the Jumna river locally.

8. The best source of supply hitherto investigated is that from the river Jumna close above Delhi, and it is recommended that the domestic water supply for the new city should be obtained from this source.

As the conditions, connected with the supply of domestic water, differ from those relating to water for irrigation purposes, it has been found necessary to recommend pumping stations at separate situations.

9. For the purpose of domestic supply it is recommended that the pumping station and intake works should be at the northern end of the ridge above the village of Wazirabad. Upstream of this point for a number of miles there are no villages abutting directly on the river on either bank, and those existing in the neighbourhood of the river do not contain many inhabitants. Pollution from this source, therefore, need not be feared, if the population and their arrangements are subjected to inspection from time to time. It is understood that, should any fear of pollution arise, there would be no difficulty in arranging for the evacuation of such villages.

Site for domestic water-supply pumping station recommended.

10. As at present arranged, the outfalls from the drainage of the Barari plain and the Najafgarh jhil drain might occasionally give cause for alarm; but these outfalls can quite easily be transferred to a point south of Wazirabad, where the line of a former mill race is still visible, passing under an old stone bridge near the mosque. This could be deepened and improved so as to provide a satisfactory outlet for these drains well down stream from the proposed intake; and in this way any reasonable cause for complaint would be avoided.

Suggested alteration of outfalls of Barari plain and Najafgarh jhil drains.

It may be argued that the position of the present intake is quite satisfactory, but the fact that it is placed below the outlet from the Najafgarh jhil drain which forms the natural escape for a portion of the storm water coming from populated districts outside the city, and also for a certain amount of sewage from the same areas, is in itself an argument for placing the new source of domestic water-supply in such a position as to be above suspicion. It should not be forgotten also that the present suburb of Sabzi Mandi and the proposed extensions of the existing city will drain into the Najafgarh jhil cut. It is also quite possible that the land around the present intake of the waterworks may be utilised for building purposes.

11. From the pumping station it is proposed to deliver the water, after settlement and filtration, to a reservoir on the ridge somewhere near the point marked 865 feet west of Talkatora garden: the rising main will be utilized also for purposes of distribution, so that the reservoir may be used both for storage and for balancing purposes.

Position of reservoir.

It is possible that a saving of permanent pumping head might be effected by siting the reservoir at some height lower than 865 feet, and the minimum height which will ensure efficient command should be investigated. In describing the lay-out a site was suggested at the western end of the main east to west axis where such a reservoir could be brought into effective relation with the main features of the design. This may be found feasible; but it should be borne in mind that the reservoir should be capable of delivering water all over the old city, as well as the new, so as to allow of a combined supply for both in the future from one system. This is a possibility which on grounds of efficiency and economy should not be overlooked.

12. Centrifugal pumps should be used for the low lift from the river, and pumps driven by engines of the direct triple expansion type for the high lift to the reservoir.

Pumps recommended for use for domestic water-supply.

13. With regard to the supply of water for irrigation purposes probably the best point for the establishment of the pumping station will be in the neighbourhood of, and somewhat to the south of, Indrapat; but this matter is to some extent affected by the question as to whether a water effect is to be provided, as in that event a pumping station on the edge of the lake would not be likely to fit in with the architectural scheme.

Site of pumping station for irrigation water-supply.

14. A better site from this point of view would be the Baoli of Ugar Sain to which a conduit from the river could be led. This arrangement would prove economical in rising main and pumping head.

Alternative site of pumping station near Ugar Sain's Baoli.

15. It may here be noted that the creation of a water effect by damming the river would mean a saving in static head of pumping, and would also render it easier in practice to ensure a permanent flow in any such conduit as that above mentioned, or in any locality close to a riverside pumping station. The water, being impounded, would display no tendency to wander away from the intake, which might easily happen in the case of the river bed as at present existing. Without some form of river treatment considerable labour and supervision would be necessary to ensure a continuous supply.

Some advantages gained by damming the river.

Position of
reservoirs.

16. From the pumping station it is proposed to deliver the water through rising mains at a velocity of about 3 feet a second to two reservoirs situated at a level of 750 on the base of the ridge near the villages of Malcha and Kalali ka Bagh respectively. The reservoirs in the case of the irrigation water need not be covered.

Pumps.

17. Pumps driven by engines of the direct acting triple expansion type are recommended for the irrigation water supply.

Distribution.

18. Common methods of irrigation in India are by open earthen channels; but in this case the Committee are strongly of opinion that the distribution must in all cases be effected through cast iron pipes. Owing to the varying levels of the ground and the necessity for good finish and appearance in the streets and avenues, and for reasons of public health and economy of pumped water the use of open water carriers for the purposes of distribution must be avoided.

Rising mains to
form portion of
distributing system.

19. The rising mains should in each case form a portion of the distributing system so that the greatest economy both in the cost of pipes and pumping may be attained.

Scouring to be
provided for.

20. Owing to the amount of fine silt which will at times be delivered, provision will have to be made in all pipes and reservoirs for the scouring out of deposits.

Necessity for high
rate of supply in
distribution over
small areas.

21. In the design of the distribution pipes, it must be borne in mind that, where the share of a consumer is not large, it is essential to give him a high rate of supply for a short time, rather than a low rate of supply for 12 or 24 hours, as otherwise the water will not run sufficiently rapidly over the garden and inefficient irrigation will result.

Compensating water
for the river from
the Ganges Canal.

22. It is clear from records that the available supply in the river Jumna is liable to fall to a very low figure. The possibility of having to increase this supply should therefore be considered. At present when the minimum seasonal supply in the river Jumna falls below a certain standard at Okhla, the Agra Canal gets compensating water from the Ganges Canal by the Jani escape and the Hindan river cut. It is possible to carry this water direct from the Jani escape into the Jumna river. Compensating water could be provided by this method without detriment to the Agra Canal. The cost would be about £75,000.

II.—STORM WATER DRAINAGE.

Facilities afforded
by the configuration
of the site.

1. The area selected as the site for the new city is, at the present time, well provided with surface water drainage in the form of nullas or valleys, which take the surplus water from the ridge and the land surrounding their course and lead it down towards the main drainage valley of the district, which has an outfall into the River near Kilokri.

It is proposed to make use of these valleys for the purpose of storm water courses as far as possible; but in most cases it will be found necessary to regularize their direction so that they may work with the best advantage into the lay-out of the streets in their vicinity.

Run-off to be
provided for.

2. Their sections will be designed to take a rainfall equal to 1-inch per hour from the ridge and the finished surfaces of carriage ways, and an average of $\frac{1}{2}$ an inch from other areas such as compounds, open spaces, etc. Should the ridge be terraced to keep back the water for tree growing, the run-off in that case also may be reduced from 1" to $\frac{1}{2}$ ".

Grading proposed.

3. With the object of reducing velocity to an average of 5 feet per second notched weirs will be provided at suitable situations and in this way the cost of stone pitching may be avoided except in the neighbourhood of closely built areas.

The storm water
outfall at Kilokri.

4. Whilst it is recommended that the sewer outfall should be taken eastwards to the river below Indrapat, the storm water outfall should follow the existing natural nulla which enters the river under the Bara Pula Bridge near Kilokri. This nulla ultimately must be brought to a regular section and straightened where necessary.

III.—SEWAGE SYSTEM AND REFUSE DESTRUCTION.

1. The natural surface gradients of the area proposed as the site of the new city are well arranged for the construction of a sewage system. It is proposed that the main branch sewers shall be laid in those streets which most nearly follow the valley lines where they travel eastwards from the base of the ridge, and ultimately join the main sewer which will be laid parallel to the out-fall drainage valley leading from the neighbourhood of the old city southwards to a point opposite to Indrapat, where it will travel eastwards in the direction of the proposed irrigation farm area on the *Bela* south of Indrapat. Ample land of a suitable character for sewage disposal can be obtained to which both the sewage from the new city area and also that from the old city can be delivered without pumping.

Facilities for economical water-borne sewage disposal presented by the site.

2. It will be seen that the proposed sewage disposal area lies below the recorded high flood mark of the river at this point; but as it is only flooded on rare occasions when most of the low-lying land in the neighbourhood is also under water, this does not in itself warrant the additional expenditure which would be incurred in providing the pumping plant necessary for raising the sewage to land beyond the reach of exceptional floods.

Expense of pumping on to land above flood line not justifiable.

3. The area of land required for sewage disposal purposes on this finely divided soil should be based on an average of 5,000 gallons of sewage per day per acre.

Rate per acre of sewage.

4. At the upper end of each branch sewer it will be necessary to provide automatic flushing chambers.

Automatic flushing.

5. The ventilation of the sewers will best be provided for by surface ventilator gratings in manhole covers as most of the roads will be wide, and the areas not closely built upon.

Ventilation of sewers.

When property is closely built over, or any manhole gives special cause for complaint, it will be possible to find a site where ventilators can be erected. Where these must be used, they should be made as inconspicuous as possible.

6. The question of maintenance of drains and sewers is one which gives rise to many disputes, sewers being usually maintainable by the public authority, whilst drains are maintainable at the cost of the owner directly. As, however, it is very desirable that everything in connection with old and new Delhi should be kept up in the most efficient manner, it is recommended that all drains and sewers within the new city without exception should be maintained at the cost of the public body. Their initial construction of course should be arranged for in accordance with regulations drafted so as to provide for this being carried out in the best possible manner.

Drains as well as sewers should be maintained by the public authority.

7. The whole of the sewage without exception should be water-borne and the drainage from houses, buildings and compounds generally should be arranged on the separate system.

The separate system alone should be used.

The roof water from the buildings, as well as all bath and other soiled water, should be taken into the house drains to assist in flushing the sewers.

8. The house drains will generally be laid to a gradient of 1 in 60 which even in large compounds enables an outfall to be given without requiring an undue depth of sewer. Disconnecting traps provided with fresh air inlets on the house side of the trap should in every case be fixed, and ventilator pipes must be provided at the upper end of each drain and carried to a safe distance above the eaves well clear of all openings communicating with the interior of the house.

House drains.

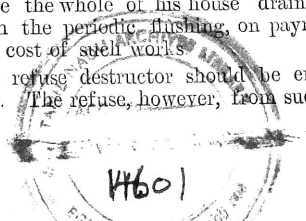
9. The regular flushing of all house drains is a matter which should receive special attention.

Periodical flushing of house drains.

In Liverpool all house drain connections throughout the city are flushed four times per annum free of charge and it is found that great benefit is derived from the systematic cleansing of all private drains in this way. It is also possible for any householder to have the whole of his house drain connections flushed at any time, apart from the periodic flushing, on payment of a small fee sufficient to cover the actual cost of such works.

10. It may be suggested that a refuse destructor should be erected for disposing of the refuse of the new city. The refuse, however, from such an area

Refuse destruction.



will be found somewhat difficult to dispose of by burning as owing to the small proportion of combustible material, and the large proportion of vegetable and other damp matter, it will be difficult in working the destructor to maintain a high temperature in the cells. This will lead to complaints. It is better on the whole to dispose of refuse in new Delhi by removing it to the country in quick moving vehicles, and using it there for agricultural purposes.

IV.—COMMUNICATIONS.

(a) Railways.

Existing station inconveniently situated.

1. The construction of the new capital at Delhi will necessitate the provision of additional railway facilities. The railway stations, as now situated, are badly placed for Delhi as it now exists, and are most inconveniently located to serve the area on which the new capital will be built, as well as the new cantonment and the anticipated expansion of the old Sadr Bazar and Pahargunj.

Need of a complete scheme.

2. It is imperative that a complete scheme of railway arrangements designed to serve the whole of the capital, both old and new, should be an essential feature of the lay-out of the Imperial City and this important matter should not be left to be settled when it is too late to deal with it.

Scheme of development advocated.

3. There is no need to embark at once on the whole of the works ultimately required for the improvement of the existing railway facilities so as to give to the future Delhi the railway accommodation it will be entitled to; it will be only necessary to proceed with this construction *pari passu* with the building of the new city and the extensions and the development of the trade and passenger traffic.

The scheme of the Railway Board.

4. A scheme has been prepared by the Railway Board, with whom the Committee have been in close communication, and the Committee are thoroughly in accord with it as now formulated.

Existing Railway Stations.

5. The scheme is briefly this. At the present time the East Indian Railway Station is the main station for Delhi. It is situated at the extreme north of the town. The other stations are Rohilla Sarai, Kishangunge and Subzimundi situated on the outskirts of the town, and Delhi Sadr on the west side of old Delhi.

Broad gauge trains to and from Bombay have no access to Rohilla Sarai and Kishangunge. Trains to and from the East Indian and Rajputana-Malwa Railways have no access to the important station of Delhi Sadr.

Description of the proposed scheme.

6. The scheme as now drawn out provides for a new terminal station which will be situated in the centre of the area covered by old Delhi, its probable extensions, the new city and the cantonment.

Into this terminus it will be possible to run every passenger train which will arrive at Delhi, whether on the broad gauge or metre gauge.

By no other means except by such a terminal arrangement is it possible to give to Delhi as a whole the important advantage of a central station into which all trains will run and from which all trains will depart.

Diversion of the Agra-Delhi Chord line.

7. The scheme also provides for a short diversion of the existing Agra-Delhi Chord line. This will be necessary so as to enable the Great Indian Peninsula and Bombay, Baroda and Central Indian Railways to run into the terminal station, and it will be advisable and financially sound to make this diversion because it will serve the new cantonment and the area within which old Delhi is to extend, and give an access which they do not now possess to trains from the west to all the stations now existing in Delhi.

It has also another advantage inasmuch as it enables access to be given to a large joint interchange yard at Delhi for all the Railways centering there; this is a necessity for which they have been pressing for many years, but which up to the present time it has not been found feasible to meet owing to the difficulties of the numerous directions in which these Railways approach Delhi.

The site of the terminal station.

8. With regard to the actual site for the terminal station it has been placed in a very central position on the main avenue from Government House to the

Jumma Musjid and will be a point where a number of important roads converge. At their junction round a large place will be located the principal shops, hotels and other important business establishments.

9. In this connection the Committee are of opinion that the opportunity should not be missed of dealing with the area lying between the city walls and the suburbs of Sadr Bazar and Paharganj in a comprehensive manner which will guarantee to the railway the land necessary for much improved accommodation in this neighbourhood. This will in the future be a very important area from both the railway and the municipal point of view, and advantage should be taken of the changes to obtain much more efficient means of communication by road to and from the city across the line to those districts in which the natural expansion of the old city is most likely to take place, i.e., to the west and south of the Sadr Bazar. Two main roads not less in width than 100 feet should also be provided between the Civil Lines and the site of the new city, one adjoining the city walls and connecting at its north end with the Rajpur road, and the other on the western side of the railway between the Mithai Bridge and the Paharganj suburb.

Need to foresee railway development and to provide land and cross communications.

10. Besides its convenient proximity to the new city, the terminal station will be very centrally situated for a large proportion of the inhabitants of the present city and its extensions. An imposing building adequately equipped in such a place will do much to assist in the development and finish of this centre. For it must be remembered that anyhow, wherever the new city may be placed, a new and important station will be necessary, and in any case a considerable expenditure will have to be incurred in bringing the railway accommodation of Delhi up to date. The traffic to and from the new city with its considerable permanent population, as well as the permanent population of the Cantonment are factors which will no doubt enable the railway authorities to justify the provision of first class accommodation for these centres as a necessary railway expenditure. It is incumbent on railway management more than on any other body perhaps to remember that a new capital is being created at Delhi. The terminal station will be the focal point of both the old city and the new, and will greatly influence the set of the population.

Station accommodation of good class required.

11. There is one point on which the Committee would like to lay stress. Considerable care must be exercised by those, who have the ultimate power of control, that the railways in the process of providing good accommodation are not allowed to interfere unduly with the equally important means of access and through communication by road between the different parts of the city and its suburbs.

Small savings to the railway administration should not be effected at the cost of inconvenience to civic institutions.

Railways seriously sever such communication unless kept low enough to prevent the necessity for unsightly bridges, which with their sloping approaches are often exceedingly expensive to construct and require very careful design. It is often found that savings which are comparatively small to the railway company involve very costly street improvements when the time comes to deal with through roads and means of communications.

(b) Roads, their construction and surfaces.

1. The proper proportion and arrangement of road surfaces to meet the particular requirements of any district is always difficult. In new roads, where the amount of traffic is not likely to be large, economy and appearance are both likely to be served by keeping down the width of wearing surface to a minimum, and by seeing that levels are accurately worked to, and that the quality of the materials and finish of the workmanship, particularly in the lines of curbs, are equal to the best British standard.

General requirements.

2. The carriage way surface should in every case in this new city be finished in an impervious material of the cheaper asphaltic character now much used in England on roads of the best class. These materials consist principally of local macadam, or other broken stone, bound together by an asphaltic mixture which fills the interstices in the finished road, and leaves the surface impervious to water. The Committee strongly recommend that experiments be made with some selected specifications, notes of which have been given to the Chief Engineer, with the object of ascertaining by practical experience the most suitable mixtures for the locality.

Carriage way surfaces.

When new roads are being constructed with water-proof surfaces, it will generally be found advisable not to finish the asphaltic surface until the road foundations and filling has had time for consolidation under traffic. Repairs and patches due to sinkages or other causes are much more noticeable in water-proof surfaces.

The use of kankar or other water-bound macadam, though undoubtedly the cheapest road surface material locally obtainable, cannot be recommended for use in the new city because of the necessity for frequent repairs and the cost of watering. Watering will in the case of kankar be absolutely necessary if the serious dust nuisance so prevalent in this country is to be obviated.

Dust nuisance.

3. Steps should be taken in connection with all roads and other open space surfaces to trap and retain dust as much as possible, and it is thought that this object might be assisted by the lowering of the grass margin adjoining roadway and footways a little below the neighbouring surfaces. If these grass areas could also be so levelled and arranged as to permit of their being occasionally covered completely by water, when being irrigated, the dust might be trapped permanently and added to the soil. It is also to be remarked that with wide grass strips and lines of well-irrigated trees, the amount of heat radiated from the road surfaces can be much reduced.

Surface drainage.

4. Many roadways are completely spoiled in appearance by the irregularity and unkempt condition of the nullas or surface water drains usually provided along the sides of the roads. In the new capital all deep open surface water drains should be avoided. In England it is customary to provide underground pipes for the removal of water from road surfaces. Where open side drains cannot be arranged outside the limit of the road, this course should be adopted, an outfall being given to the nearest surface water nulla.

Tar spraying and tar macadam.

5. Tar spraying the surface of roads already constructed in ordinary water-bound macadam is largely used in England at the present time as a means of improving the surface and reducing the dust nuisance, and gives satisfactory results. This can, therefore, be strongly recommended as a palliative in such cases. It is however expensive, and in India would probably cost two pence per square yard for each dressing. In many roads it is necessary to treat the surfaces once every year; where this is the case, it becomes cheaper, especially where new work has to be laid, to utilize bituminous materials in construction as in this way better surfaces are obtained.

Grading of roads.

6. With regard to the grading of the more important avenues and roads, it will be necessary in the interest of appearance to disregard the smaller irregularities of the existing ground, and to carry them through between important points and intersections in easy lines and gradients. Wherever possible it is desirable that convex surfaces in longitudinal section should be avoided, but where owing to the nature of the ground this is impossible, the alteration of level should be marked by a change of direction in the road, or by the placing of a building or other feature on the summit.

Cross sections.

7. The cross fall in roads having an asphaltic macadam surface should not exceed 1 in 48.

The plate at the end of this report illustrates the suggested cross-sections for a broad parkway and three typical avenues. In the case of the parkway and the 300 feet wide avenues, it is proposed to have an ornamental strip of water running through the broad grass plots. The level of the water in these channels will be below that of the roadways, the foot walks and the grass plots, so that they can be used for carrying off the surface water. The curbs at the edge of the water channels will be flush with the grass on either side; the result will be that should the channel overflow, the grass plots will themselves help to carry off the surface water.

It is understood that grass will not grow satisfactorily under well-grown trees, but as the trees will not be of a sufficient size to interfere with the growth of grass until they are about 15 years old, it is proposed to grow grass in the first instance under the young trees, and as soon as the trees interfere with the growth of grass, the strips of grass affected can be replaced by gravel or other suitable material.

8. The most satisfactory method of lighting the roads will be by lamps ^{Lighting.} suspended across the roadways between columns, which should be concealed as much as possible by being erected out of the way in the lines of trees.

(c) *Tramways.*

The Committee have not suggested any tramway routes through the new city, as they are of opinion that the conditions of traffic would not be likely to give a satisfactory return. It has to be borne in mind that in the summer months the resident population will be small, and that in any case many of the residents will utilize their own means of conveyance.

Should a necessity for public means of conveyance arise it will probably best be met by the provision of a motor omnibus service, as in this way capital expenditure on tramway lines would be avoided, and there would be no difficulty in laying up the omnibuses at those seasons when the traffic did not warrant their operations. If, however, a demand for tramways arises in the future, the roads are of ample width to accommodate them.

(d) *Diversion of traffic.*

There are three existing main roads through the site :—

- (a) The road from Delhi to Gurgaon *via* Malcha.
- (b) The road from Delhi to the Kutb *via* Safdar Jang.
- (c) The road from Delhi to Muttra.

With regard to the interference with the traffic on these three roads the Committee consider that the Gurgaon road can be diverted without inconvenience so as to follow a line lying parallel to, and near the base of, the Ridge. This alignment will lead the traffic almost direct to the neighbourhood of Paharganj, through which it has hitherto passed.

The traffic coming from the Kutb in the direction of Safdar Jang towards Delhi can be diverted near the latter in two directions. The first alternative will transfer it by a diversion running south of Arakpur Bagh Mochi and joining the same route which was proposed for the diversion of the Gurgaon road. The other route will be a diagonal connection with the Muttra road. The traffic along the Muttra road may be allowed to continue towards the Delhi gate, light traffic entering the Delhi Gate and slower and heavier traffic the Turkoman gate.

(e) *Through traffic routes.*

The road communications through the new City and also those linking it to the old have been mentioned more than once. It will be seen by reference to the plan that they are numerous. The greatest pains must be taken to ensure, that, though they are not made too wide at first, no traffic possible in the future will ever congest them.

It is a mistake and uneconomical to make a roadway unnecessarily wide, but it is even a bigger blunder not to take such steps that the roadway can be widened cheaply when required. This can always be arranged by keeping back the frontages of buildings and all permanent structures.

With the newer and speedier methods of locomotion which are being introduced a free run is essential, for it will enable places many miles apart to be more easily accessible than others but a short distance away, but separated by a congested area. The delay and danger caused by cross traffic should be kept in mind, and there should be ample space where crowded roads intersect.

Nothing will conduce more to the convenience and the amenities of greater Delhi than facilities for locomotion across it in every direction.

V.—PARKS AND OPEN SPACES.

Every effort must be made to ensure that the parks are a real feature. All over greater Delhi there is ample space for large parks and smaller recreation grounds of every description. Once trees have been planted and can be given a certain amount of water, some of these parks may be left for many

years in a wild state, requiring no costly upkeep, forming an area which will be dustless and pleasant to the eye and always available for expansion. The afforestation of the southern ridge has been already referred to. As it proceeds, one of the arguments that have been so freely used of late that some of the site is barren rock will speedily disappear. But the northern ridge must be considered also, for as soon as the linking road has been carried out, the drive along the crest from the Cantonments and Malcha to Hindu Rao's House and the Flagstaff Tower will become popular. Arrangements are now being made to protect its slopes, and, when to an unsurpassed sentimental and historic interest are added fine trees and shrubs and flowers, few places should have a stronger attraction.

The Kudsia and Roshanara Gardens, and indeed all the amenities of the northern site should also be jealously preserved. The coming of the Government of India to Delhi should mean no loss but pure gain.

When dealing with the detailed lay-out of the area intended to be devoted to minor officials, etc., care should be taken to see that ample air space and playing grounds for children is provided in the vicinity of these residences. It is now customary elsewhere in well-laid out neighbourhoods where the houses are small in character, to provide areas of at least as much as one acre for every ten acres of gross land developed, and open spaces of this character should invariably be provided in the vicinity. The same rule might well be applied to other areas; and everywhere open spaces in this proportion would be found useful both for ornamental purposes and for extension in future.

This should be particularly remembered when it comes to dealing with the western extensions of the Indian City and the quarters of the large railway staff which will be housed near the railway yards. In nearly all countries a feeling appears to prevail that the yards must be so big, so ugly and so smoky that nothing can be done to improve their amenities, and railway servants are prejudiced accordingly.

VI.—ARBORICULTURE.

The Committee have already drawn attention to the time for planting trees, and the importance of determining the design of buildings, and the actual entrances to compounds before lines of trees are planted as the lines of trees and buildings are dependent on one another for effect. Another important point is the kind of trees to be used for avenues. As has been remarked before the size of the special trees selected for the avenues determine the width of avenues in which they are to stand. For the purpose of getting the right effect from the design of an avenue both the size and shape of trees are of importance; and with this end in view the Committee have picked out 13 kinds of avenue trees out of a very large number, which will grow in Delhi, and arrangements are being made to grow them in readiness to plant out on the avenues. A deviation from the kind of tree selected to suit each avenue means a loss of a large general effect. The Committee would therefore point out that the matter is one of considerable importance.

In all countries there is a tendency to increase the number of trees and gardens in towns, and in Delhi, where trees give rest to the eye and assist in dissipating heat radiation and are quick in growth with irrigation, the afforestation of parks and compounds is likely to proceed apace. This must, however, advance on judicious lines and thought must be exercised to preserve lines of view, and not to conceal intended architectural effects. The general tree effects in new Delhi, it may be safely anticipated, will be very fine: the danger is that they may be obtained to the elimination of nearly all other effects.

VII.—RIVER TREATMENT AND WATER EFFECT.

The scheme of river improvement and water treatment shown on the plan is intended to provide for an improved and healthier river frontage from Wazirabad to a point below Indrapat.

The river below the railway bridge would be trained towards the city walls by means of groynes on the east side until the channel becomes parallel to the walls, and remains at a distance of about 300 yards from them.

The *Bela* would be raised to a level above the permanent lake level, and given a fall for the drainage of the surface towards the river.

The east side of the river where the land is low could be raised by the deposits from flood waters and the edge could be embanked above high flood level and planted with trees.

As excavated material will be required in considerable quantities for raising the *Bela* and for filling and levelling areas within the new city site, an ornamental bay could be formed clear of the main channel of the river opposite to the end of the main avenue by excavation. This would be so arranged that the water of the river could be excluded at those times when it is heavily charged with silt.

The level of the water would be maintained by means of Stoney or other sluices below Indrapat in the line of the permanent channel, and the free passage of silt-laden storm waters as well as the removal of the silt deposited in the permanent channel during periods of small flow would thus be provided for.

Investigations show that a maximum level of R. L. 672 for water, whilst not sufficiently high to affect prejudicially the low-lying land on the west bank above Wazirabad, would reduce the total quantity of excavation over the shallow area required for the formation of the bay near Indrapat. If in working up the scheme the cost permits the water surface may be reduced to a minimum of R. L. 666; if this prove possible, this reduction in level will remove any sub-soil water difficulties that may be urged against the scheme.

From the information available it appears likely that the present flow in the Jumna will meet the requirements of evaporation and percolation except during periods of exceptional low flow such as occurred during the month of June last year. On such occasions the water stored above the weir should be a very useful supplement to the Agra Canal supply, while the draining of the lake, should such a course become necessary, during the hottest portion of the year would not be unhealthy.

The improvement of the public health of the existing city of Delhi requires that the *Bela* should be raised and the river bed improved and made more permanent. Expenditure on these works if carried out as part of a larger scheme of general sanitary regeneration would help towards completion of this scheme also.

The total cost of this scheme including river training, excavation and deposit of material, provision of Stoney sluices, formation of roads and planting, it is considered, should not exceed £250,000.

The Committee are of opinion that the carrying out of the scheme outlined would be a great addition to the attraction of the new capital and they have, therefore, thought it well to include it in their plan as an important step towards the complete eventual development and embellishment of Delhi.

VIII.—DEVELOPMENT AND CONTROL.

The Committee have alluded to the case of Paharganj in paragraph 1 of their report. Before concluding their report, they would like again to draw attention to the advice offered in paragraph 10 of their former report on the choice of a site for the new Imperial capital. On that occasion certain recommendations were made for the acquisition of some lands for the extension of the present city of Delhi and the civil station, and for the control of other lands lying outside the limits both of the site of the new city and of these areas. In the former case the need is economic, civic and sanitary. Extensions there must be; and well-planned extensions fitting in with the scheme of communications which the Committee have delineated on their plan for the future complete development of the capital can now be obtained at a trifling expenditure on land acquisition. The environs of Delhi can now by such action be made a success. Left to themselves past experience would show that their regeneration and conversion into a sanitary and convenient suburb will at no distant date have become a crying need and one which it will be most expensive to effect.

In regard to control, the limits of the land now being acquired for the new city end near Safdar Jang's mausoleum. If the land beyond this remains uncon-

trolled it requires no great feat of imagination to predict that 50 years hence the expansion of the new capital in that direction may have become outflanked by the presence of numerous insanitary, but expensive, suburbs of the Paharganj type. The situation on the edge of the new cantonments and at the base of the new city is one where such a development might reasonably be expected to take place as a most ordinary expression of evolution.

7.—The newly appointed Committee who will carry out the construction.

The Committee esteem it as very fortunate that they have been in personal contact with most of the individual members of the newly appointed committee who will carry out the actual task of constructing Imperial Delhi; that one of their own members will work out in stone what for a year they have discussed on paper; and that so many of the officers, who have been associated with them, are re-engaged. They can therefore rely on continuity, and a carrying out of the ideas which they have endeavoured to express.

8.—Maps and Plans.

In the course of their deliberations many plans have been drawn.

With their first report, on the choice of a site, was printed a map explanatory of the gross areas which they considered the Government of India should purchase or control.

With their second special report, on the northern site, was issued a plan covering the whole of greater Delhi. The primary intention of this plan was to illustrate the position of possible northern and southern cities, but the Committee thought it also advisable to show on it the main through routes which they intended to recommend and which they relied on to ensure that nothing worthy of notice should be isolated, and that, however Delhi might expand, there should be channels of communication across it in every direction.

With this, their third report, they present their final plan or lay-out.

It should be looked at from two points of view. Where it deals with the new city which has to be built from its foundations, it embodies definite recommendations. All these lead up to a regularly formulated lay-out; but while some must be undertaken at once, as essential from the commencement, others will only become so as circumstances develop.

The Committee, however, hope that the Government of India will elaborate a policy by which these definite recommendations may eventually be carried out in their entirety.

But together with definite recommendations this Committee put forward suggestions. Without months of patient investigation into the conflicting interests and the value of the various properties which will be encountered it is impossible to lay down with any certainty the lines on which Delhi within the walls or the Sadar Bazar and other suburbs can be improved. The Committee are convinced that schemes for opening out are required combined with wide through traffic routes, and they have indicated certain roads. They hope that the Construction Committee will study these roads and endeavour to provide them; for it should never be forgotten that while compulsory improvements in crowded neighbourhoods are not only costly but unpopular, and moreover actually produce a more insanitary congestion—the tendency being for the dispossessed to huddle even closer into the side streets—on the other hand if easy access is given to fresh ground and better conditions, and traffic facilities are provided, it is possible to induce the people to move of their own free will. The Committee would point out that tempting people is more satisfactory than driving them. They also hope that in all their improvements the Construction Committee will bear in mind the paramount need for open spaces, not only for large parks but for small play grounds. These things are the essence of town planning.

A mass of notes, of tentative proposals and rough drawings, which have accumulated during the Committee's year of labour will be handed on for the information and the assistance of the Construction Committee.

9.—The help which the Committee have received.

It would be ungenerous of the Committee to close this report without placing on record their appreciation of the services of those who have assisted them. For seldom has such recognition been more thoroughly deserved. The circumstances were exceptional, for the Committee came from overseas and were very dependent on men with Indian training and local experience. They regret that they cannot acknowledge individually all the help which they have received not only from officials of every grade but from private persons—for assistance and useful criticism have come from many quarters, from Europeans and Indians alike. But they must mention by name those who have worked with them for a whole year. Mr. deMontmorency and Mr. Ward, both brought to the task an intimate acquaintance with the varying problems which have to be tackled. Their service has been most helpful to Delhi and quite invaluable to the Committee. Captain Roberts, Captain Sopwith, and Mr. Parker have laboured day in and day out to make the project a success.

The Committee trust that the Government of India will realize how much they owe to the loyal work of all these gentlemen.

GEORGE S. C. SWINTON,

JOHN A. BRODIE,

EDWIN L. LUTYENS,

Chairman.

Members.

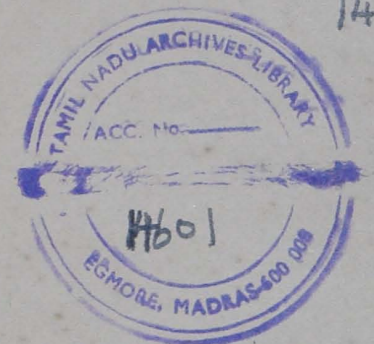
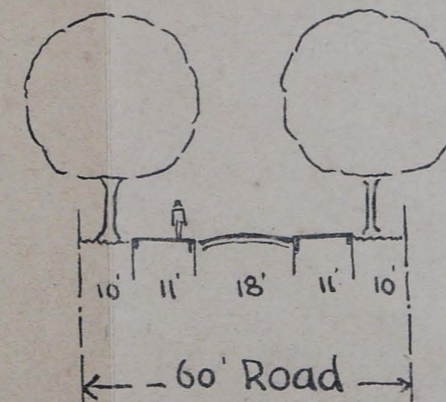
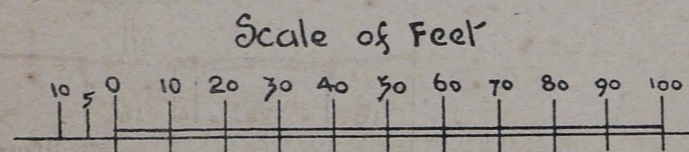
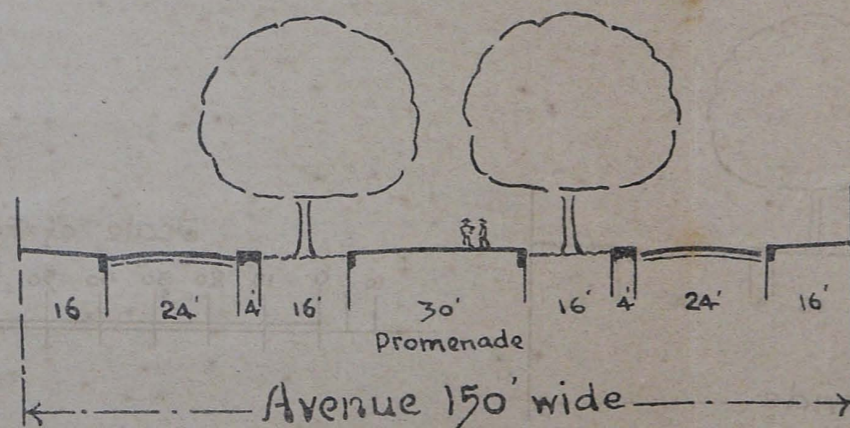
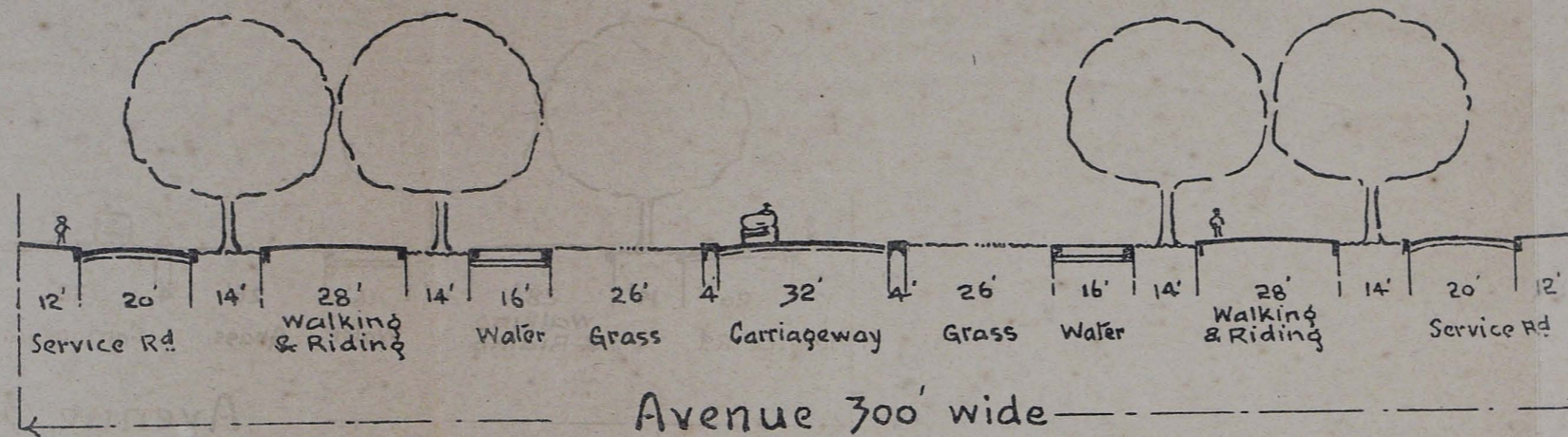
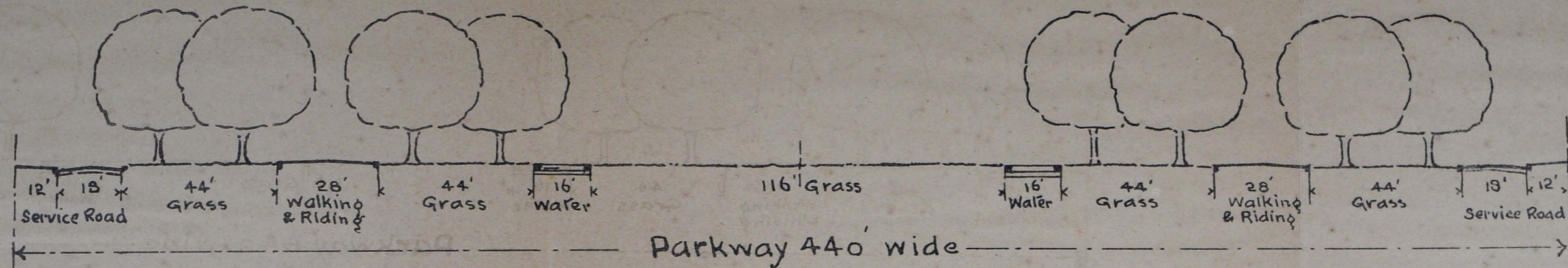
EXPERTS' CAMP, DELHI,

Dated 20th March 1913.



New Capital Delhi.

Typical Cross Sections of Avenues and Roads
to accompany the Report of the Town Planning Committee.



ACCOMPANIMENT TO THE FINAL REPORT
OF THE
DELHI TOWN PLANNING COMMITTEE
ON THE
TOWN PLANNING OF THE
NEW IMPERIAL CAPITAL.

MAP OF THE LAYOUT OF AVENUES AND ROADS

TOGETHER WITH

ALIGNMENT OF MAIN SEWERS

AND OF

RISING MAINS FOR DRINKING AND IRRIGATION WATER.

Scale four inches to a mile.

REFERENCES.

Arrangement of avenues and roads shewn in black.

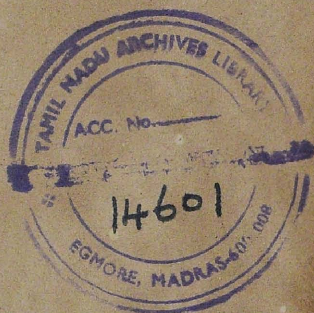
Rising main for drinking water shewn in blue.

Rising main for irrigation water shewn in red.

Main sewers shewn in green.

Storm water courses will follow the valleys regularized so far as is necessary to work in with the streets.

Main outfall is by the natural channel that enters the river near Kilokri.



DELHI

Mean Magnetic Declination $2^{\circ}14'$ East in 1912 (Decreasing by $1'$ annually).

3





5

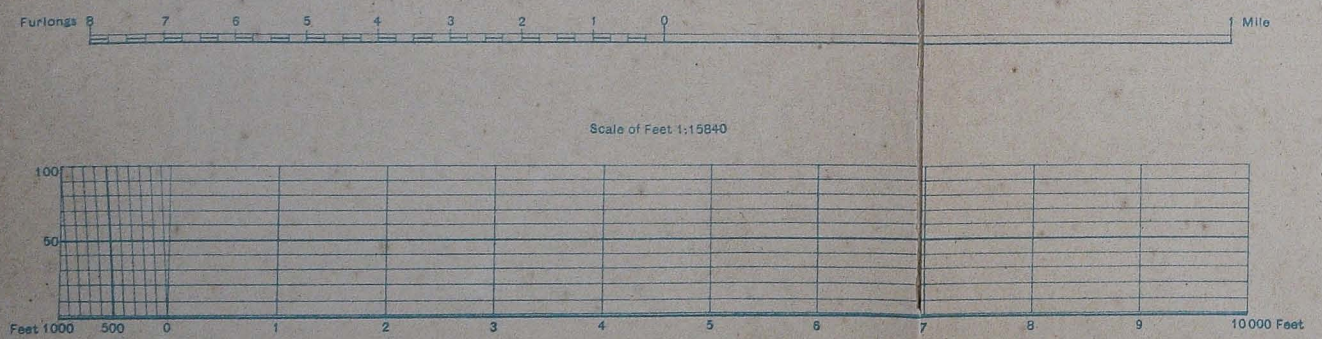






Specially prepared for the Home Department from the Delhi and Hissar Revenue Surveys, 1870-72,
revised in 1912, under the direction of Colonel S. G. Burrard, C.S.I., R.E., F.R.S.,
Surveyor General of India.

Scale 4 Inches to a Mile or 1:15840



IRRIGATION WATER ALTERNATIVE SITES FOR PUMPS, A & B.

- REFERENCES
- CIVIL LINES
- 1 Telegraph Office 1857
 - 2 No 1 Battery Right 1857
 - 3 do Left
 - 4 No 2 do Right
 - 5 do Left
 - 6 No 3 do
 - 7 No 4 do
- CITY
- 8 Spot where Genl Nicholson fell
 - 9 Delhi Sadr RS
 - 10 Tomb of Ghazi Khan
 - 11 Randi ki Masjid
 - 12 Grave of Shah Turkoman
 - 13 Kail Masjid
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 - 16 Zinat ul Masjid
 - 17 Sonahri Masjid
 - 18 King Edward VII Memorial
 - 19 Jain Temple
 - 20 Golden Mosque
 - 21 Yak burji Mosque
 - 22 Fatehpur Mosque
- FORT
- 23 Naqqar Khana
 - 24 Diwan i Amm
 - 25 Moti Masjid
 - 26 Diwan i Khas

HELIOGRAPHED AT THE SURVEY OF INDIA OFFICES, CALCUTTA.

Boundary Province or State	-----
Tahsil	-----
Village	-----
Limit of Cultivation	-----
Trig. Station or Point. Spirit Levelled Bench Mark.	△ Pir Gaib BM 655-24
Heights: Trigonometrical, Spirit Levelled, Relative	749 705.2 ft
Rock Outcrop	-----

SIGNED

GEORGE S.C. SWINTON, CHAIRMAN.

JOHN A. BRODIE, } MEMBERS.

EDWIN L. LUTYENS, }

20TH MARCH 1913.

ACCOMPANIMENT TO THE FINAL REPORT

OF THE

DELHI TOWN PLANNING COMMITTEE

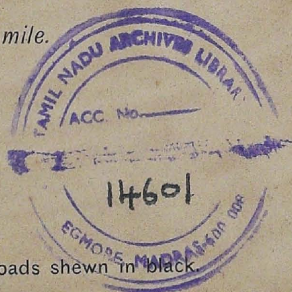
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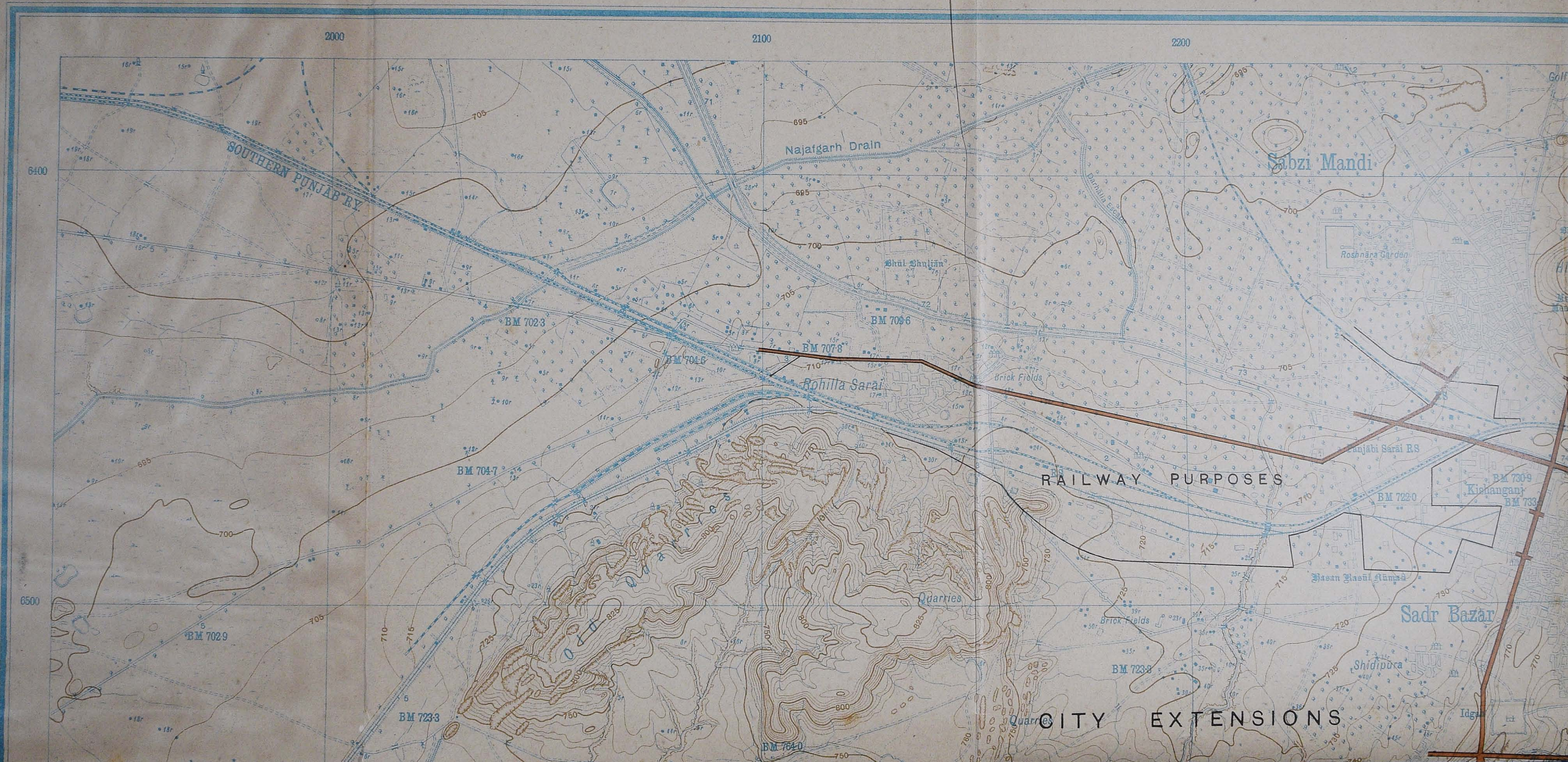
Scale four inches to a mile.



NOTE.—Arrangement of avenues and roads shewn in black.

Season 1912.

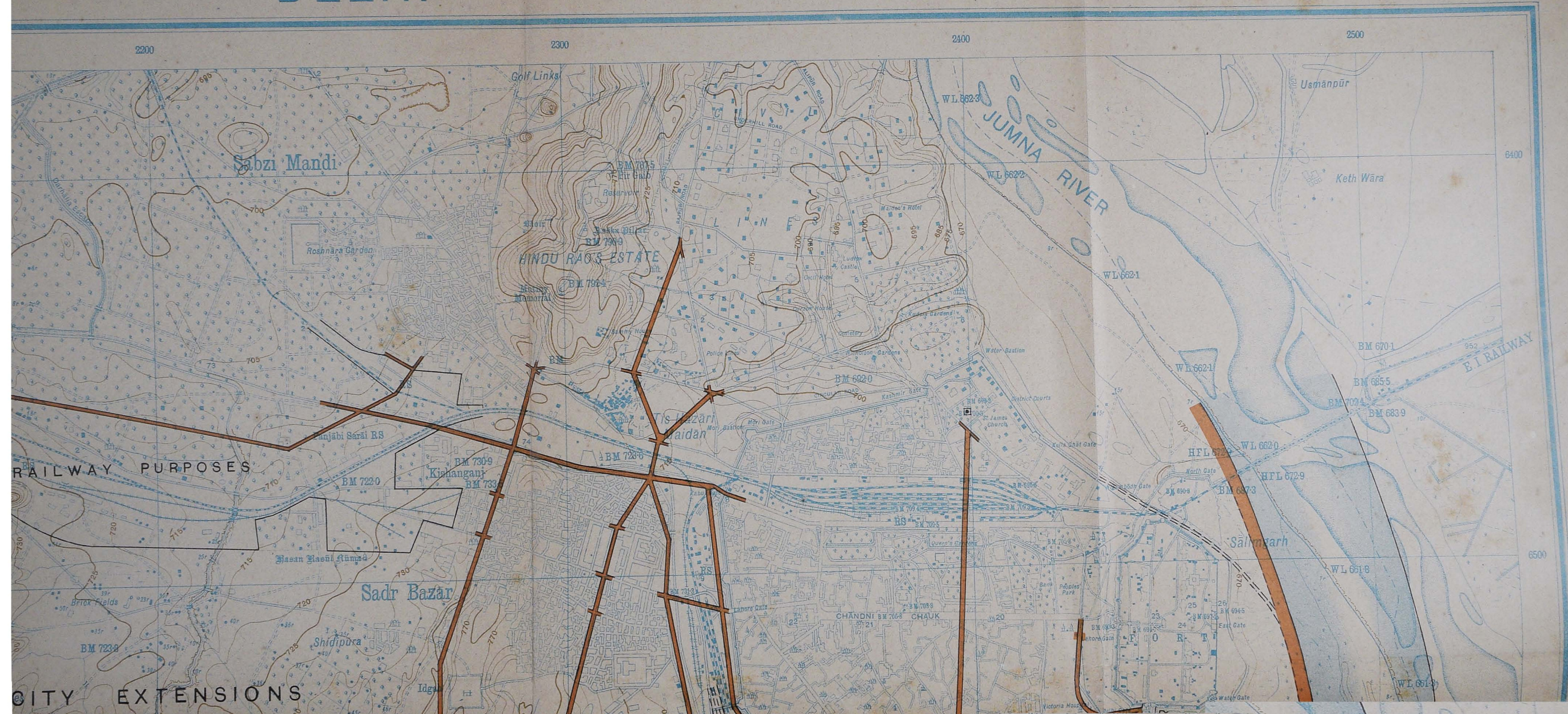
DELHI



2

DELHI

Mean Magnetic Declination $2^{\circ}-14'$ East in 1912 (Decreasing by $1'$ annually).

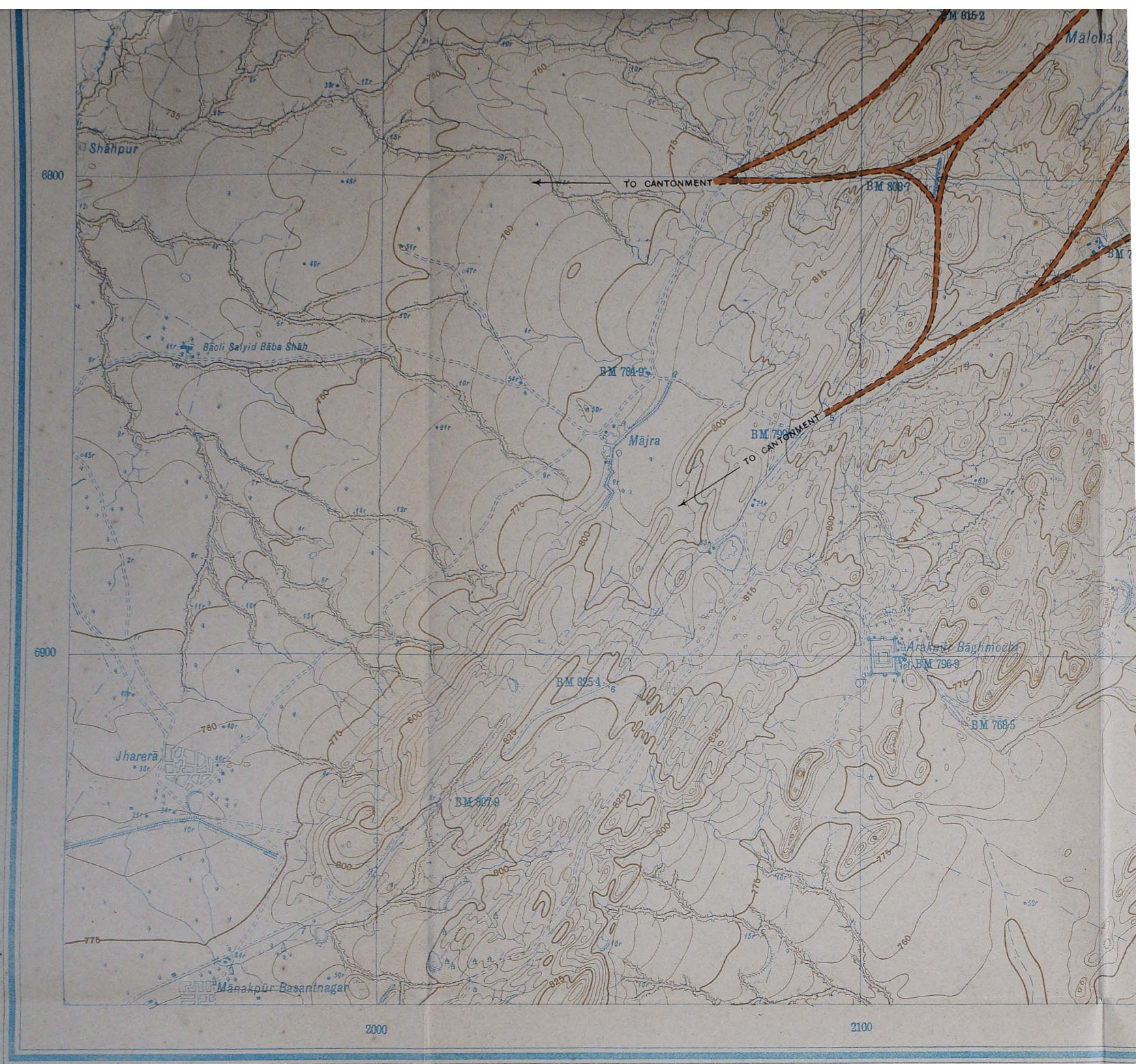


3





5



R.S. No. 1899, D 12 'N. C. 1500.

Railways - 5' 6" Gauge: Double Line. Single Line.	— — — — —
" Other Gauges: Double Line. Single Line.	— — — — —
Mineral Lines and Tramways. Telegraph Line.	— — — — —
Main Roads: Metalled, with Mile-stone. Unmetalled.	— — — — —
Cart-track. Camel-track.	— — — — —
Wells: Masonry lined with Depth of water level. Unlined.	— — — — —
Temple, Mosque, Tomb, Sati, Idgah, Graves.	— — — — —

Origin of survey.

Nigdu G. T. S. $\left\{ \begin{array}{l} \lambda \ 20^{\circ}50'23.5'' \\ L \ 76^{\circ}44'19.34'' \end{array} \right.$

The High Flood Level 672.9 on E. I. Ry. bridge over the Jumna of 5th August 1908, is the maximum ever recorded. The H. F. L. 662.3 at Okhla is that for the flood of 19th September 1906; other H. F. L. values are for the flood of 14th August 1910, which approximates to the maximum recorded values at the E. I. Ry. bridge over the Jamna and at Okhla.

Contours are approximate.

Contours north of the chain line 6,650 and east of chain line 2,100, and contours north of Najafgarh Drain and Southern Punjab Ry. and East of the Jumna River have been inserted from information supplied by the Irrigation Dept., through Mr. Ward, C.I.E., M.V.O., Supdt., Engineer.

The heights cut on the canal standard bench-marks at Delhi, Shadara and Okhla require to have 2.13 feet, 1.45 feet and 1.27 feet subtracted from them respectively, to reduce them to the Survey of India terms given on this map.

The Water Level values refer to the water surface of the river pegged out on the morning of 26th April 1912.

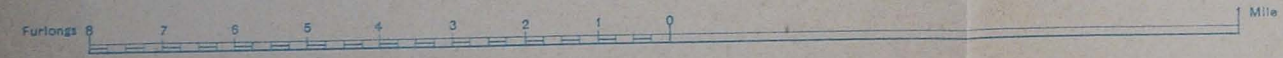
Those portions of rivers, streams, canals, lakes, &c., which generally contain water are shown in blue.

6

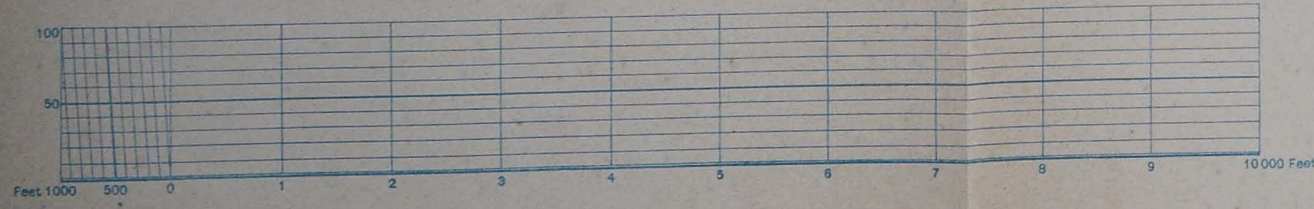


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Scale 4 inches to a Mile or 1:15840



Scale of Feet 1:15840



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