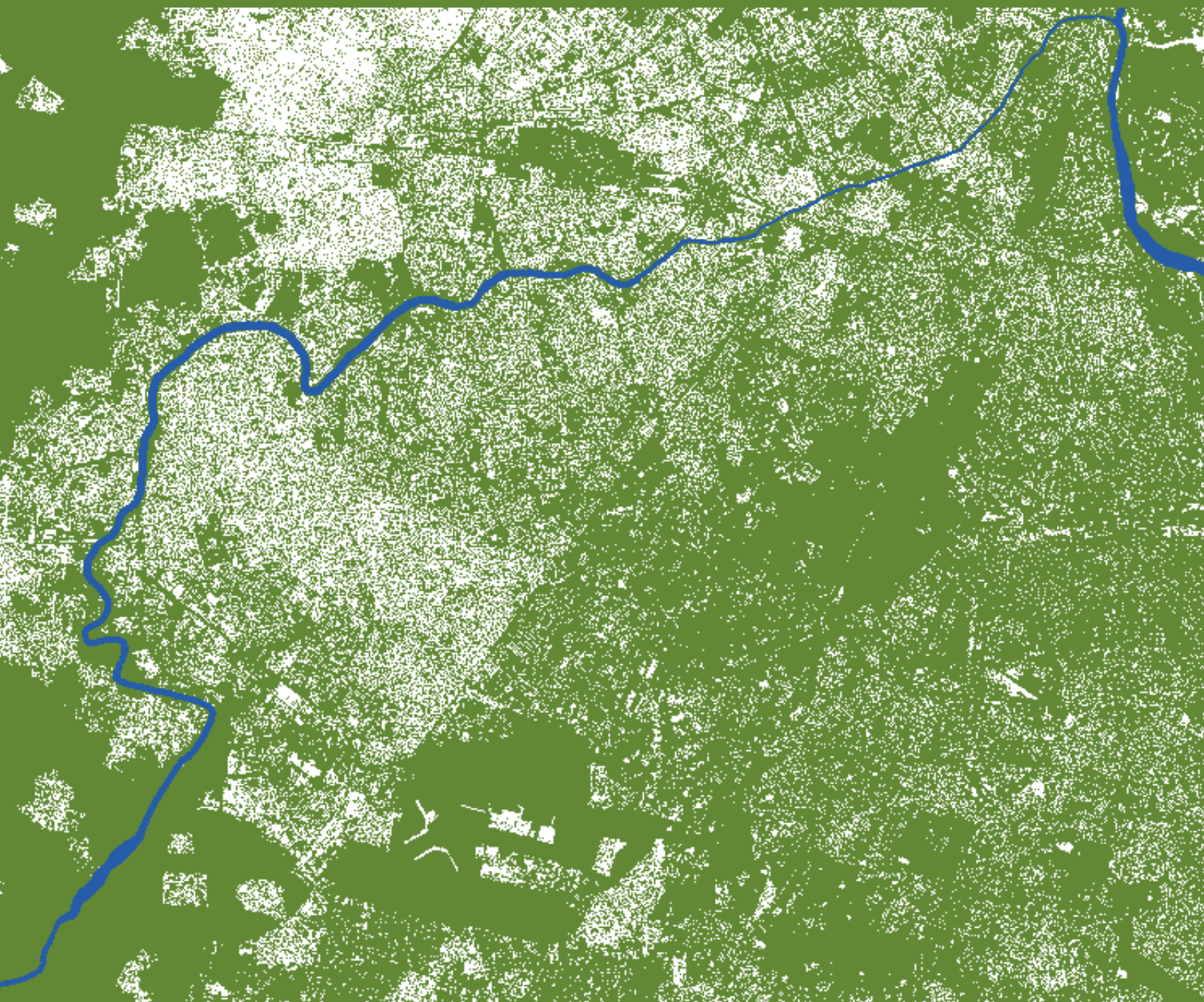
CITY LEVEL PROJECTS

REJUVENATION OF NAJAFGARH WATERWAY

Vision for Delhi (West Zone)



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Ministry of Urban Development, Government of India
Delhi Development Authority
Government of National Capital Territory of Delhi
North Delhi Municipal Corporation
East Delhi Municipal Corporation
South Delhi Municipal Corporation
New Delhi Municipal Council
Geospatial Delhi Limited
Delhi Metro Rail Corporation
Delhi Urban Shelter Improvement Board
BSES Rajdhani Power Limited
BSES Yamuna Power Limited
RWA

Preface

The city of Delhi, capital of this vast land of diversities, is a city laden with layers of history, a place where civilizations have lived, prospered and perished over centuries. The modern city today, built over and around a rich tapestry of heritage, presents an opportunity at every turn, to allow for co-existence of the past, present and the future. In order to understand this multidimensional urban spectrum and attempt to plan the future, various city level studies have been initiated by the DUAC. I hope that these studies will help the planners of modern day Delhi to carefully articulate urban space, structure, form and environment and sensitively address future requirements.

I convey my thanks to all the Consultants and Members of the Commission who have tirelessly worked on this research project to bring out this document. I also take this opportunity to place on record my sincere appreciation of the efforts of Secretary and other staff of DUAC for providing the necessary administrative support to make this happen.

I fondly hope that the authorities of the local, state and national government take these studies seriously and implement, in right earnest, the suggestions given herein.

March, 2015

Prof. Dr. P.S.N. Rao
Chairman, DUAC

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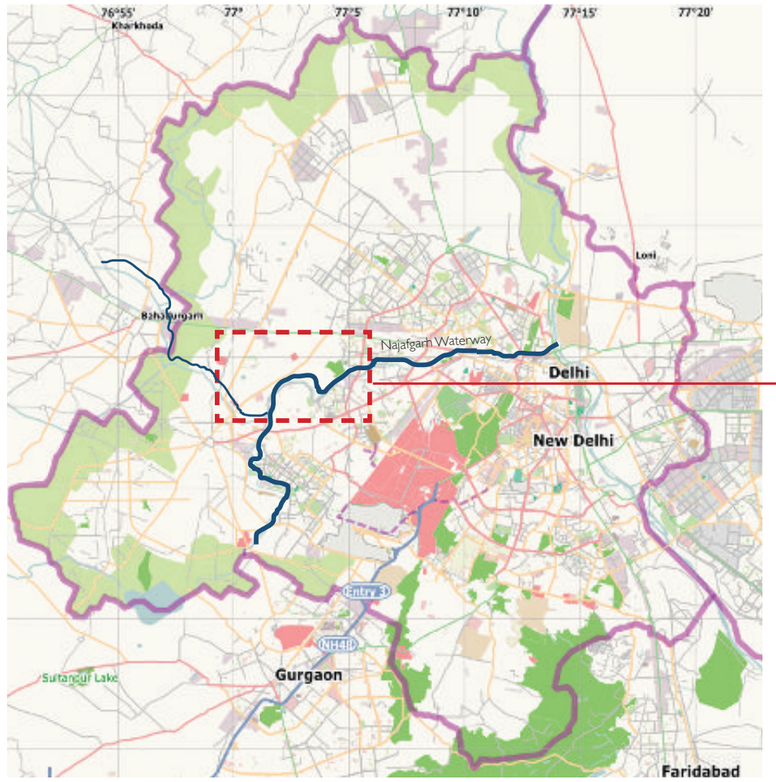
Summary

Delhi's waterscape heritage is unique as it has a continual natural water system and there is a huge potential for pedestrianisation and urban connections along these waterways. The aim is to channelize pedestrian movement within the city, using the existing waterways, greens, historic and transit features of the city in order to enhance connectivity within the urban fabric. The endeavour is to create a pedestrian-friendly city.

The project re-imagines part of Najafgarh Waterway in West Delhi. It starts from Vikaspuri and ends at Mundka. The aim of the design is to provide a continuous pedestrian and cyclable trail system along the waterway that complements the existing context and proposes various activities that supplement the facilities found in the neighbouring communities. These include a monumental park around Hast Minar; Dilli Haat – a shopping hub; a festival ground and sports grounds. The project site will be stitched into city's waterway system. This is a 11 km long trail.

Within the project, by adopting a strategy that accepts and embraces flood levels especially in the middle stretch of Najafgarh Waterway, seasonal activities like urban farms and weekly markets are proposed. Such an approach yields a design enabling a reading of nature that provides ecological education and encourages a healthy respect for water management. Pedestrian bridges are proposed for people to cross over the banks of the waterway.

Design proposals have been done with a compendium of conceptual drawings and details with 3D photorealistic images, that can be used as pilot projects to be applied on other waterways of Delhi.



CONTEXT

Section 1

- Aims and Objectives
- Drain channels in Delhi
- Najafgarh Waterway
  - Historic Overview of Najafgarh
  - Najafgarh Flood Data
- Current DDA Proposal for Drains of Delhi

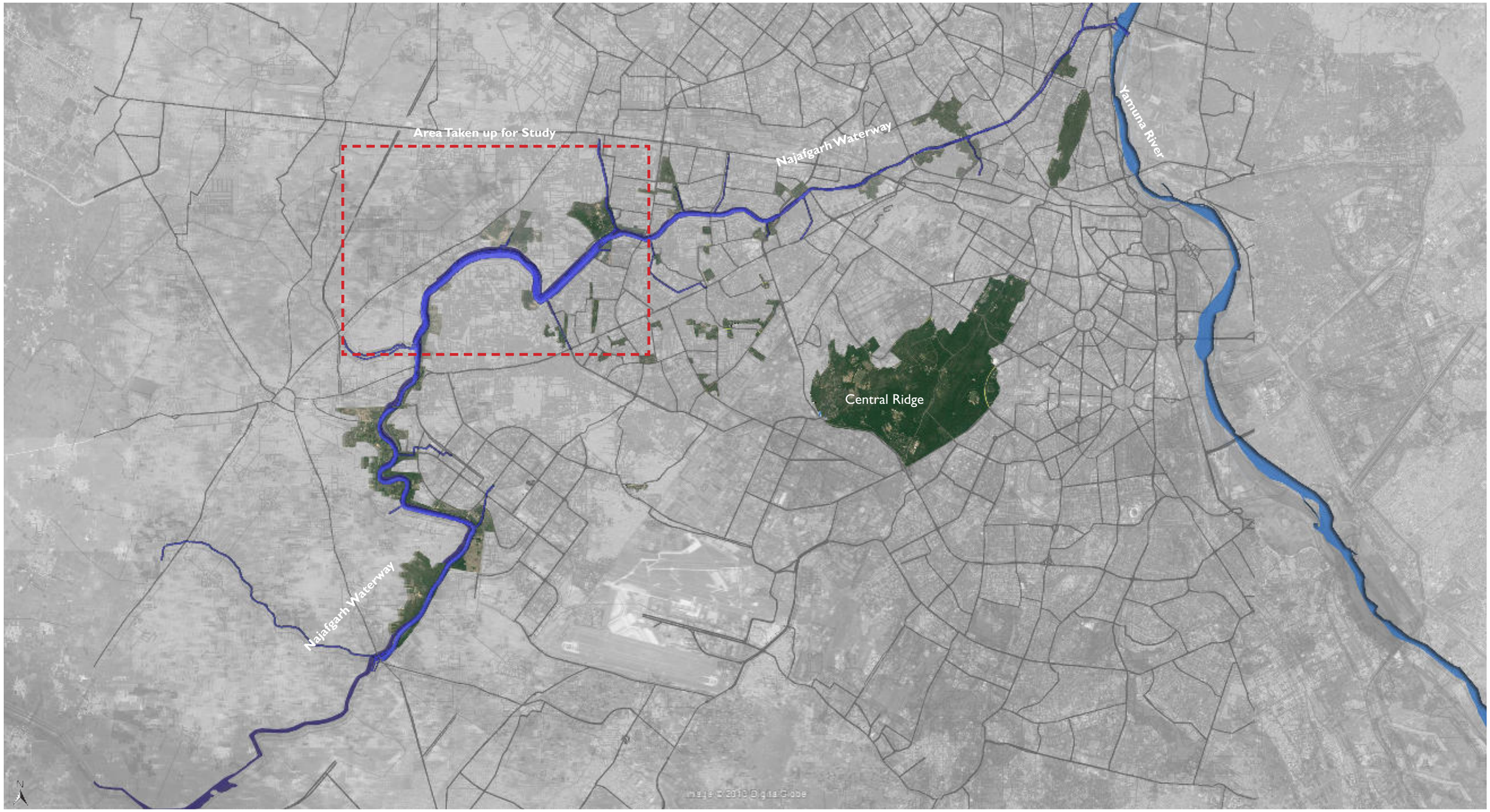
1.1 Aims and Objectives

Aim

Establishing a greenway pedestrian connection along the **NAJAFGARH waterway**

Objectives

- To create a continuous pedestrian trail system connecting the edges of Najafgarh Waterway with green zones along the waterway.
- To create environmentally sustainable public amenities such as toilets.
- To create and rejuvenate Hast Minar Park, to designate a defined green space for the monument and revive its heritage value.
- Detail landscape design of various potential Nodes along Najafgarh Waterway
- Use DEWATS system to clean black/grey water from Najafgarh Waterway to fresh water which can be used for irrigation.
- Create E-rickshaw trail for people to go to different places on the edge of Najafgarh waterway.
- Water Taxi as an alternative mode of transport for people to cross from one edge of Najafgarh waterway to the other with designated water taxi stands and spill out spaces.
- Najafgarh Edgefront Development along its tributaries by developing edge condition along the waterway and by introducing seasonal programmes like urban farms, weekly markets and other spaces such as entrance plazas, festival grounds and a Dilli Haat.



Source: Google Earth

1.2 Drain channels in Delhi

Delhi is a city with a natural Drainage Pattern. Delhi's topography created a drainage system that carried rain and storm water from the higher elevations of the west to the Yamuna in the east.

Natural Drainage System

The city has been divided into six drainage zones (i) Northern Zone, (ii) Western Zone, (iii) Central North West and South East Zone, (iv) Central South and South East Zone, (v) East Zone and (vi) South Zone. The length of natural drain in the city is 350 km carrying discharge of 1000 m^3.

Natural drains in Delhi

Natural Drainage Channels/Catchments for Delhi

S.No.	Catchment	Location	Length of main drain (km)	Drainage channels	Discharge (cumecs)
1	Alipur	North	140	Supplementary Bhiwana Escape – No. 6 drain – New Drain	141 33
2	Kanjhawala	West	120	Mungeshpur	52
3	**Najafgarh**	**Central-North, West and South-West**	**105**	**Najafgarh Palam Bhupania-Chudania (from Haryana)**	**283 86 40**
4	Khushak-Barapulla	Central-South and South-East		Khushak and Barapulla drains ('nullah')	120
5	Trans Yamuna	East	45	Shahdara outfall – Ghazipur Trunk drain No. 1	158 86
6	Mehrauli	South	5		

Source: Dept. of Urban Development, Govt. of Delhi
Consultant : IL&FS Ecosmart Limited

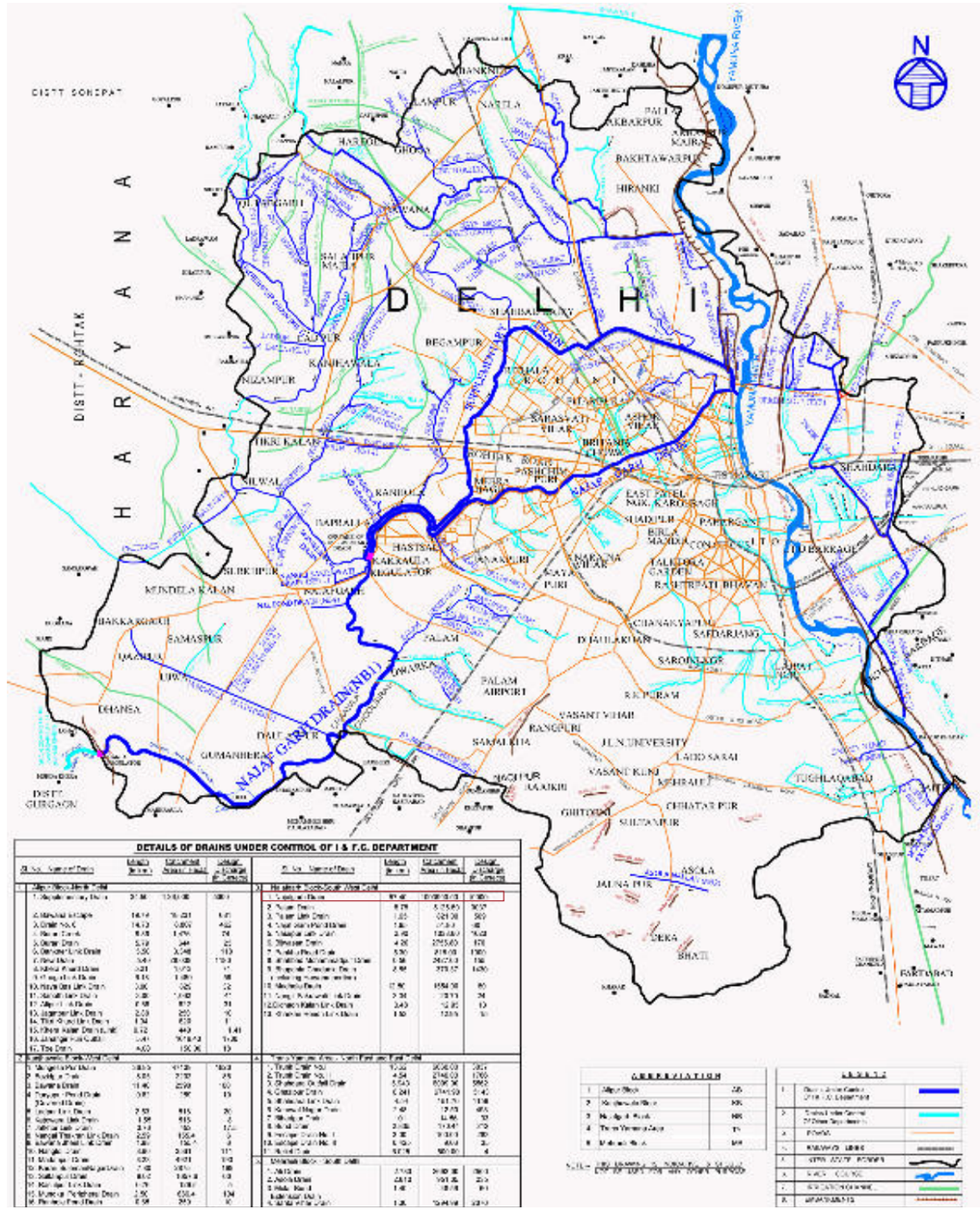
Existing Drains in Delhi under MCD

S.No.	Zone	Number of Drains	Total Length of drains (km)
1	Central	41	47
2	South	127	102
3	Sadar–Paharganj	10	4.5
4	Karol Bagh	47	23
5	City Zone	10	8.6
6	Civil Lines	77	339
7	Shahdara South	174	134
8	Shahdara South	197	135
9	Narela	84	83
10	Rohini	142	180
11	West	185	410
12	**Najafgarh**	**202**	**228**
	Total	1296	1694.1

Man-made Drainage System

The total length of drains is 1700 kms spread over 12 municipal zones. There are around 1300 drains with 339 km in Civil Lines Area and 5 kms in Paharganj Sadar Area. In 90% of these drains, the discharge is comparable to a range of weak to strong domestic sewage.

Man-made drains in Delhi



Source: Irrigation and Flood Control Department, Govt. of Delhi

1.3 Najafgarh Waterway

- Previously known as River Sahibi
- It gets this name from the once famous and huge Najafgarh Jheel (lake) near the town of Najafgarh in southwest Delhi, now within urbanized Delhi.
- The Delhi Government channelized it for better flood management during the monsoon in 1977.
- It is the largest basin in terms of its catchment area, which is 615 km long, and takes care of the water discharged from rural and urban areas of Delhi.
- Presently, according to TERI, the Najafgarh Drain is the largest sewage-carrying drain in the capital.
- Najafgarh Drain is 41 km long and is fed by 22 smaller feeder drains.

Direction of flow of Sahibi River

Najafgarh as a Natural Water Habitat

- The drain attracts many species of birds and is perhaps the only bird sanctuary within a drain.
- Many migratory birds visit this area during various seasons.
- It is also a natural habitat for various small mammals who are dependent on natural water to sustain themselves.

Najafgarh is a natural habitat for many migratory birds

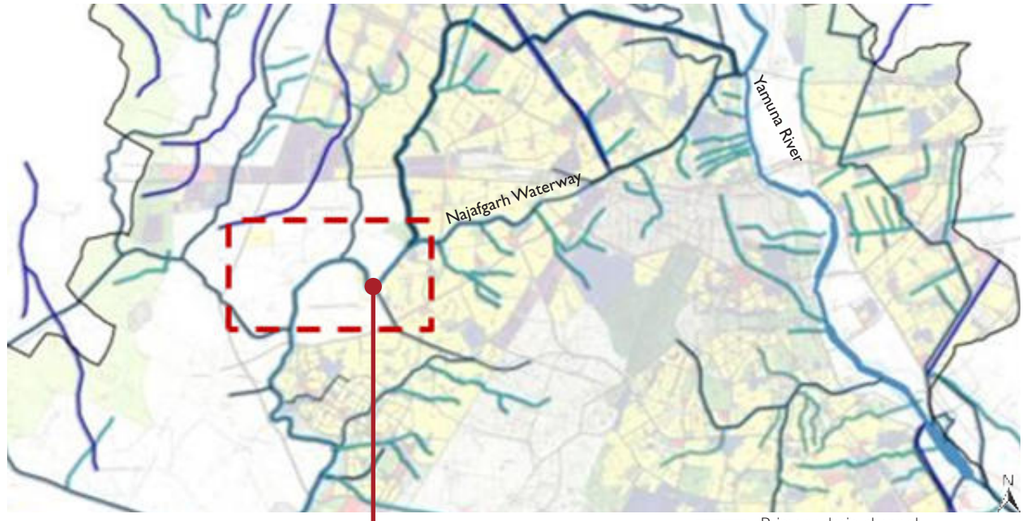
Najafgarh Basin shown in the Map of Delhi

1.3.1 Historic Overview of Najafgarh

- It is named after the Kiledar (Fort Administrator) Najaf Khan Baloch (1733-1782) of the Mughal dynasty during the 18th century. Khan was a powerful Persian noble in the later Mughal court and later this place became the stronghold of the Rohilla Afghan chieftain Zabita Khan.
- It was here that the Battle of Najafgarh was fought on August 25, 1857 between Indian and British soldiers as part of the first war of Indian Independence. At least, 800 people died in the battle, and it was the first victory for the British in the uprising.
- A small settlement of the Mughal troops settled here. Najafgarh is now one of the most populous electoral regions in the National Capital Region of India (NCR). It is surrounded by 70 villages bordering Haryana. The borders are 10 to 15 kilometers from the main Najafgarh Market.

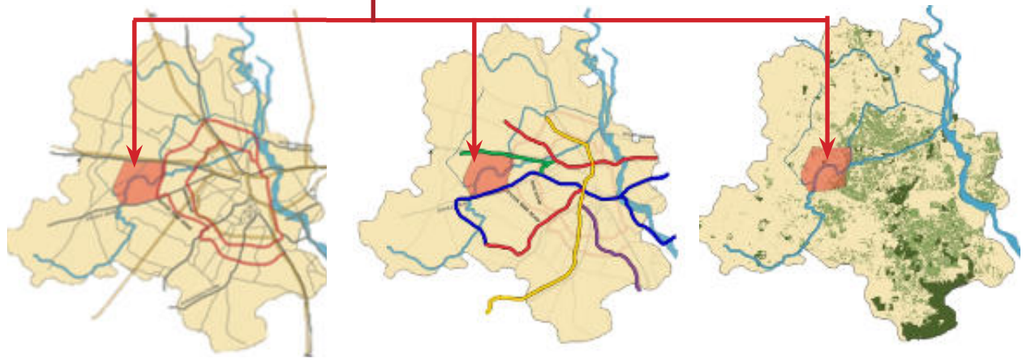
Mirza Najaf Khan Korai Baloch, the commander-in-chief of the Mughal Army, after whom Najafgarh is named

Najafgarh Context on Delhi's City System



Najafgarh Waterway on Delhi's Drain network

Primary drain channel
Secondary drain channel
Irrigation channels



Area of study on Delhi's city road network

Area of study on Delhi's city Metro network

Area of study on Delhi city's natural greens

1.3.2 Najafgarh Flood Data

- Najafgarh Drain is a part of Sahibi River which originates from arid/semi-arid areas in Rajasthan, Haryana and Delhi.
- The designed capacity of Najafgarh was only 900 cusecs in 1964. The drain flooded in 1967, 1975 and 1976 **with the most major flood occurring in 1977.**
- The maximum level of the Yamuna river on 7th August 1977 was 205.85 m (675.29 ft). The Yamuna was above its designated capacity.
- At that time, Najafgarh Drain was carrying a discharge of 6000-6500 cusecs for a number of days, against its designed capacity for 3000 cusecs
- The excess discharge resulted in overflowing; the banks were raised with sandbags.
- Adjoining areas remained underwater for about three and a half months and were free from submersion only in the second week of November.

Efforts Undertaken to Reduce Flooding

- Channelising and lining has been undertaken in the supplementary drain to cater for a design discharge of 5000 cusec. The proposal for phase II and III are under consideration.
- The construction of Ajmeripura Dam on Sahibi River in Rajasthan, Masani Barrage in Haryana, and the remodelling of Najafgarh Drain, including the construction of a supplementary drain has reduced flooding in Delhi.

According to the Irrigation and Flood control Department, Government of Delhi, the measures taken are as follows:

1. On-channel storage of rain water in stormwater drains:

- Rain water is being impounded in 30 km length of Najafgarh (NG) Drain from Dhansa to Kakrola Regulator (by I&FC) by closing the gates at Kakrola.

6.5 km of the NG Drain has also been deepened, impounding 155 MG water annually and a further 2.3 km is proposed to be deepened by 1.5 m.
The Mungeshpur drain has been regraded in 12.5 km impounding 4 MG water.

2 Artificial Recharge Trenches:

- 49 nos (cost approx. 1.0 lac each) in bed of Mungeshpur drain in North West Delhi in 7.3 km; 27 nos. in borrow-area of Mundela Bund in 6.32 km, 11 nos. in Khera Khurd storm water drain in 1.65 km, 32 nos. in abandoned reach of Burari escape drain in 4.85 km, in consultation with the Central Ground Water Authority (CGWA) has been provided.

3 Check Dam:

- 23 Check Dams have been constructed in Asola Wild Life Bird Sanctuary in the hilly area of Delhi. These check dams have proved very effective in flood protection and ground water recharge.

4 Development and Deepening of Village Ponds:

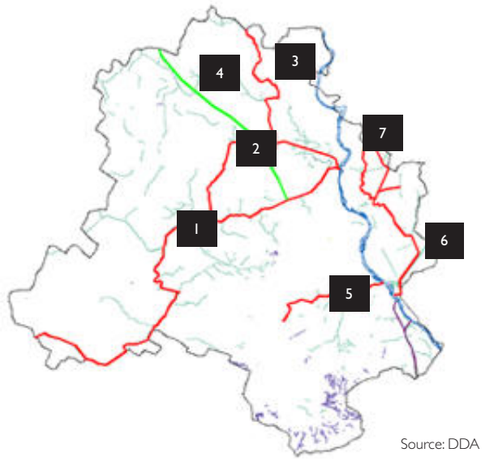
- 150 ponds/johars have been developed and deepened all over Delhi, which will impound 300 MG water. 175 ponds are in the pipeline for development.

5 Providing Retention Basins

- It is necessary to allocate certain areas to be used as retention basins for detaining excess water in order to prevent flooding in low-lying areas, roads, and streets. The abandoned course of Bawana Escape Drain at Haranki (near River Yamuna) has been developed by the I&FC Department in an area of 5800 sq m, impounding river Yamuna's flood waters. The Yamuna's floodwater is also diverted into Bhalswa Lake. The Mungeshpur Drain, the NG Drain and the SD Drain are also used for retention.

Source: Irrigation and Flood control Department, Govt. of Delhi

1.4 Current DDA Proposal for Drains of Delhi



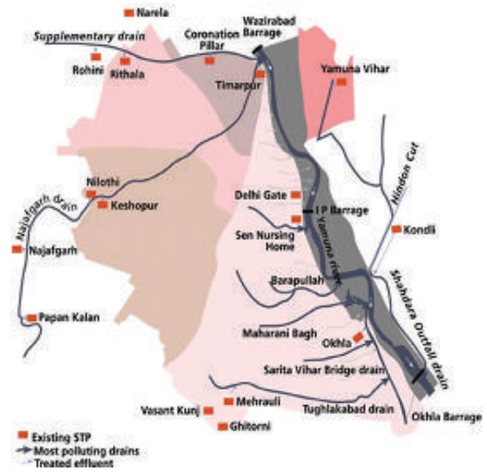
Source: DDA

Length of Drains specified below:

1. **Najafgarh Length = 58 km**
2. Supplementary Drain Length = 25 km
3. New Drain Length = 18 km
4. Western Yamuna Canal Length = 23 Km
5. Barapullah Drain Length = 15 km
6. Shahdara Drain Length = 25 km
7. Gokalpur Drain Length = 8 km

Current DDA proposal for laying Interceptor Drains

- Laying of interceptor sewerage system along Najafgarh, Supplementary & Shahdara drains.
- Laying of interceptor sewers along the 58 km long Najafgarh Waterway
- Protection of river water and drain water from untreated effluent
- The sewage from 1500 unauthorized colonies, answered areas, rural villages and JJ clusters will be treated before it is permitted to reach all major drains.
- It will improve the water quality in Delhi's drains.



Map showing the laying of Interceptor Drains by DDA

Source: DDA

News regarding the laying of Interceptor Drains by Delhi Jal Board
Source: The Hindu

Image showing the existing condition of Najafgarh Waterway

MAPPING AND SITE ANALYSIS

Section 2

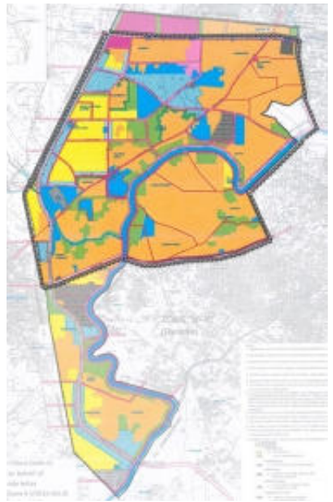
- Location of Site
- Area of Study
- Existing Circulation Networks
- Existing Land Use Patterns
- Study of Najafgarh Waterway
- Precincts of Najafgarh Waterway
- Site Analysis of Najafgarh Waterway

2.1 Location of Site

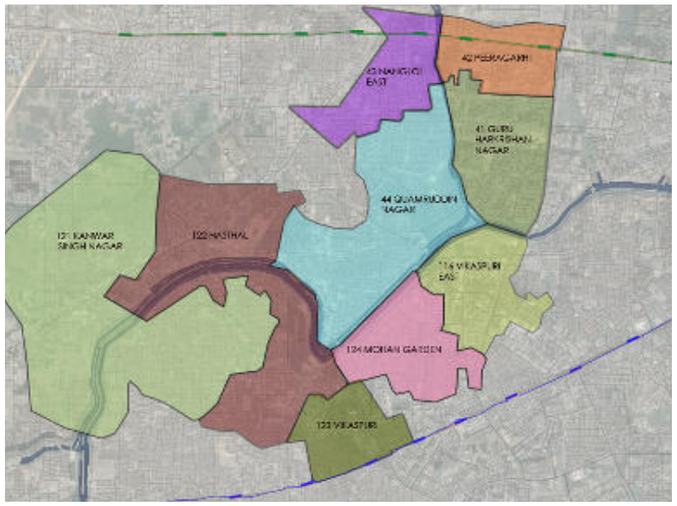
Najafgarh Waterway

- This channelized waterway within the National Capital Territory of Delhi (NCT), should not be considered merely as a drain (Najafgarh Drain), but as a continuation of the Sahibi River, and an elongation of the Najafgarh Jheel.
- During the 1960s and before, the rain-fed Sahibi River, which originates in the Jaipur District of Rajasthan, entered Delhi near Dhansa and spilled its overflow into the Najafgarh Jheel (lake) Basin.
- This water then continued to flow on the other side, forming a tributary of the River Yamuna.
- The area of study of the Najafgarh Waterway lies in **Zone K1 of Delhi Masterplan 2021** which is a part of Zone K also known as Dwarka subcity with an area of **3652 ha.**

Delhi Map showing Zone K1



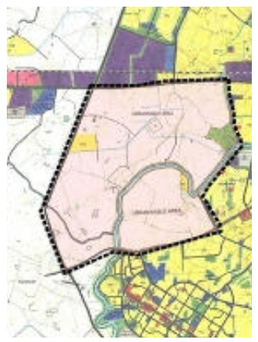
Part of Zone K1 marked on the Delhi Masterplan Map, which has been taken up for study



MCD Wards covered under area of study

Key points mentioned in the Delhi Masterplan for Zone K1 related to natural water systems

- TOPOGRAPHY of Zone K1 has a gentle slope towards Najafgarh Drain causing the flow of all natural drainage to the main drain.
- NAJAFGARH DRAIN: Length of the drain in this zone is around 21.2 km and length of Najafgarh Drain covered in our area of intervention is around 11 km.
- ENVIRONMENT: For reducing the pollution level; the creation of green area, open spaces, and management of natural resources has been considered, in this zonal plan.



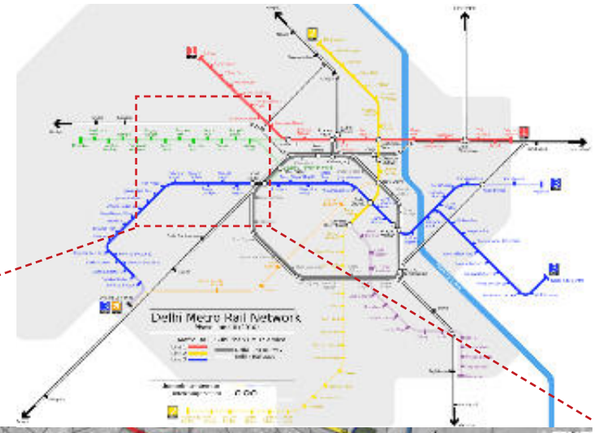
Delhi Urbanizable Area in K1 zone according to the Delhi Masterplan

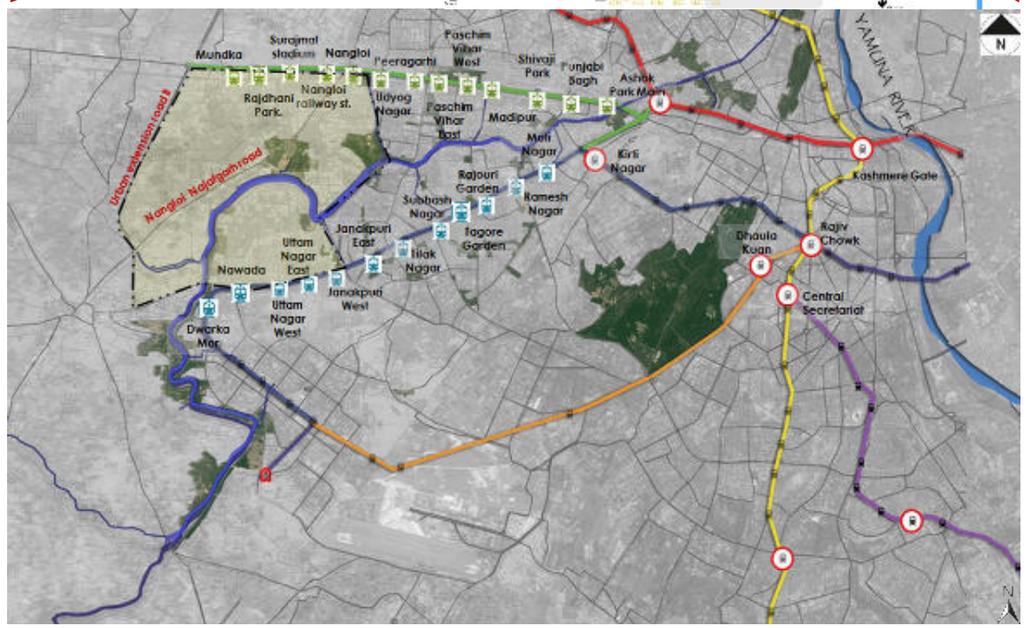
Ward list:

- Ward no. 121: Kanwar Singh Nagar
- Ward no. 122: Hasthal
- Ward no. 123: Vikaspuri
- Ward no. 124: Mohan Garden
- Ward no. 116: Vikaspuri East
- Ward no. 41: Guru Harkishan Nagar
- Ward no. 42: Peeragarhi
- Ward no. 43: Nangloi East
- Ward no. 44: Quamuddrin Nagar

2.2 Area of Study

- The Green and Blue Metro lines mark the extent of the area under consideration.
- The main Green Line Metro stations which bound the area of intervention are Mundka, Surajmal Stadium, Nangloi, Nangloi Railway Station etc., and main Blue Line Metro stations are Nawada, Uttam Nagar West and East and Janakpuri West and East.





Area of Intervention in Delhi Metro Map

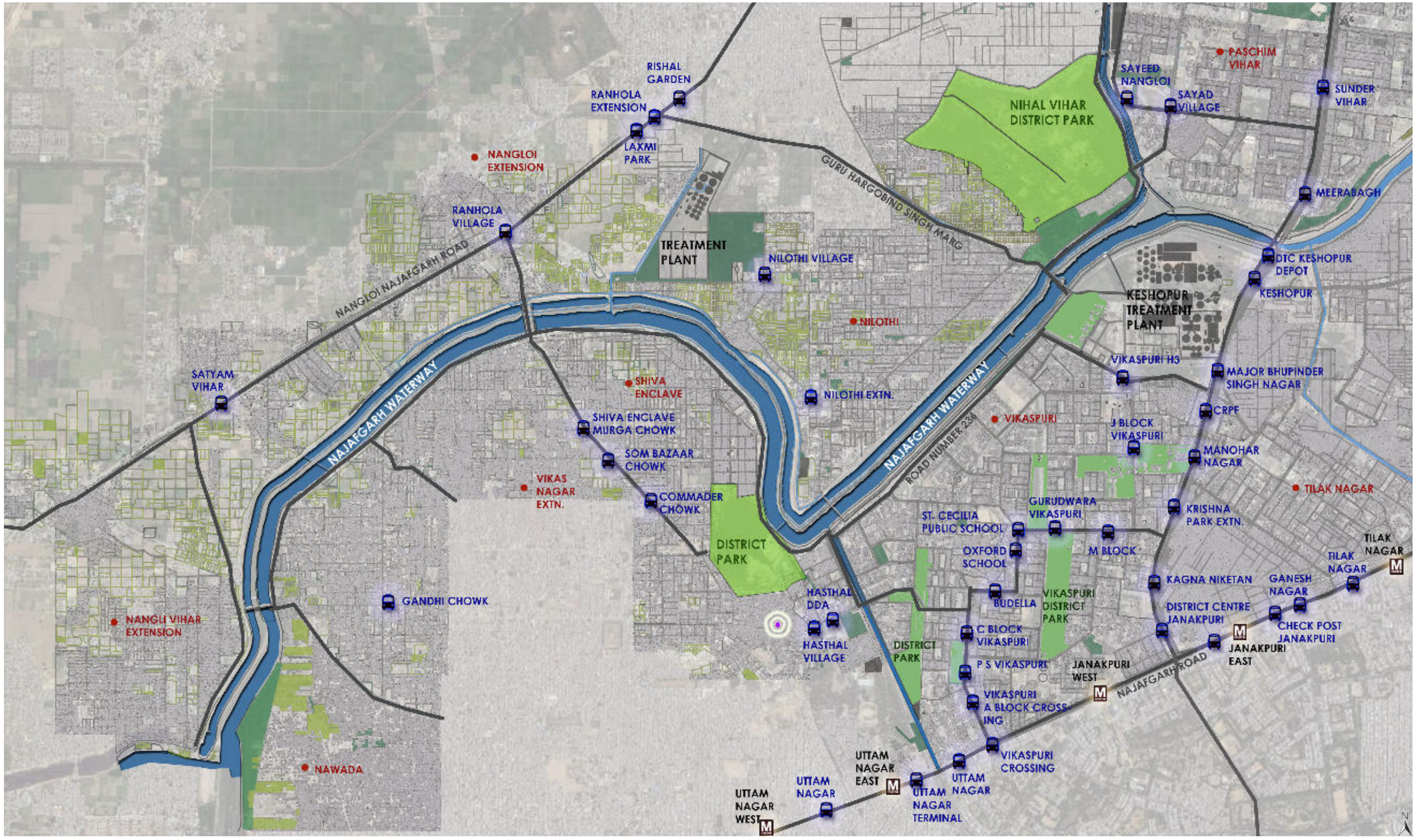
Summary of the Masterplan Report on Najafgarh Waterway

- The bed slope of the drain should be regarded to 1 in 7800, 1 in 6000 and 1 in 3000 from 1 in 12000, in the reaches between the outfall of Tilak Nagar to outfall of Paschim Puri drain, outfall of Paschim Puri drain to Rohtak Road Bridge and Rohtak Road Bridge to Bharat Nagar Bridge respectively. The bed width of the drain should also be increased to 120' and 72' from 95' and 65' in the reaches between outfall of Tilak Nagar Drain to Rohtak Road Bridge and Rohtak Road Bridge to Bharat Nagar Bridge respectively. The reach between Rohtak Road Bridge and Bharat Nagar Bridge should be lined.
- The drain should invariably to be desilted to the design section every year as it gets heavily silted up by 3'-4' at various reaches all through.
- The bridges to be constructed at a future date should preferably be single span without any intermediate pier-well type inlet structures.

Bird's eye view of the Najafgarh Waterway

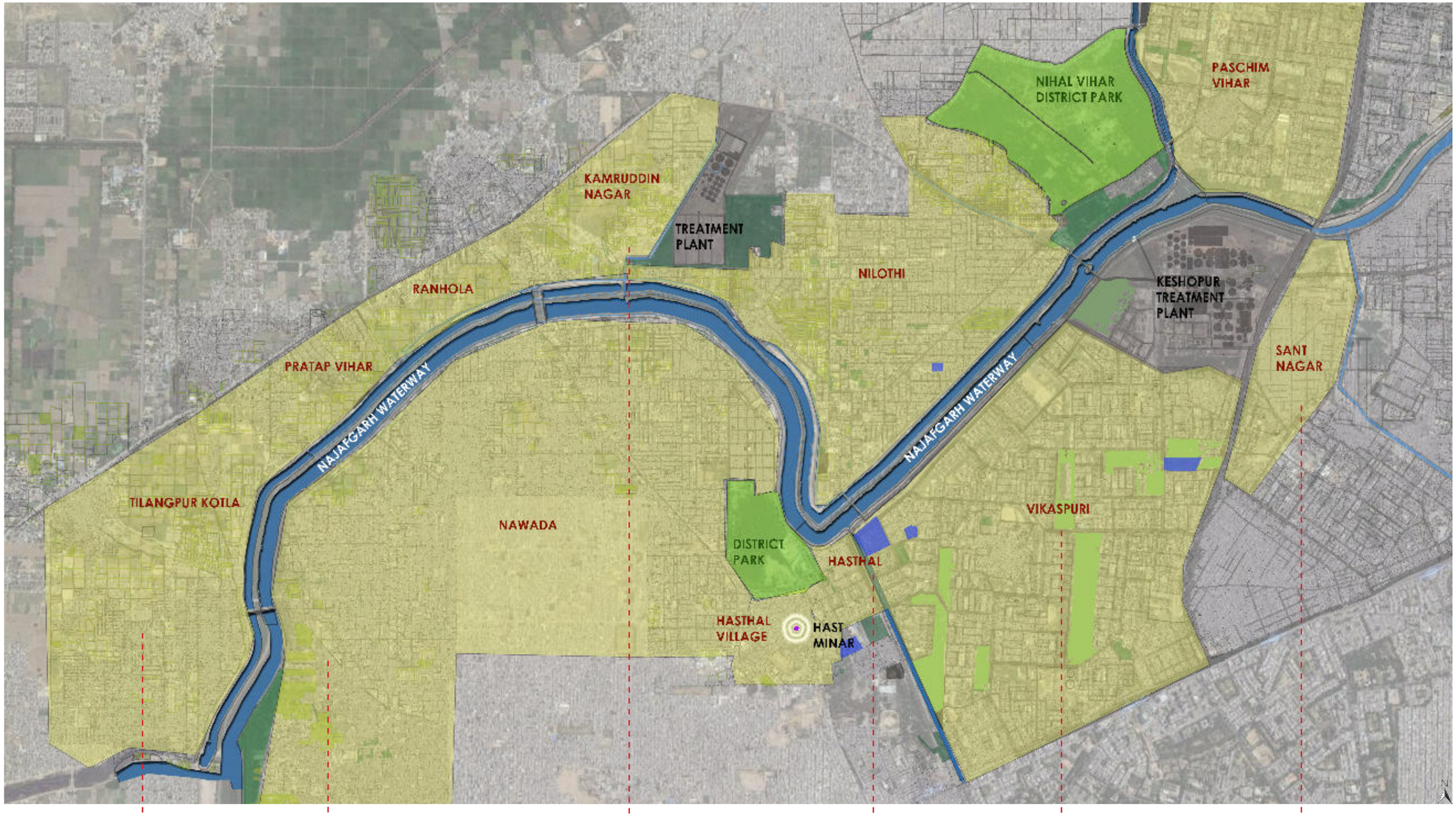
Source: Google Images

2.3 Existing Circulation Networks



Map showing the existing bus stops near the Najafgarh Waterway

2.4 Existing Land Use Patterns




Rajiv Ratan Awas Yojna, Phase, Baprola


Nawada local market area


Nangloi area


Hast Minar, Hasthal Village

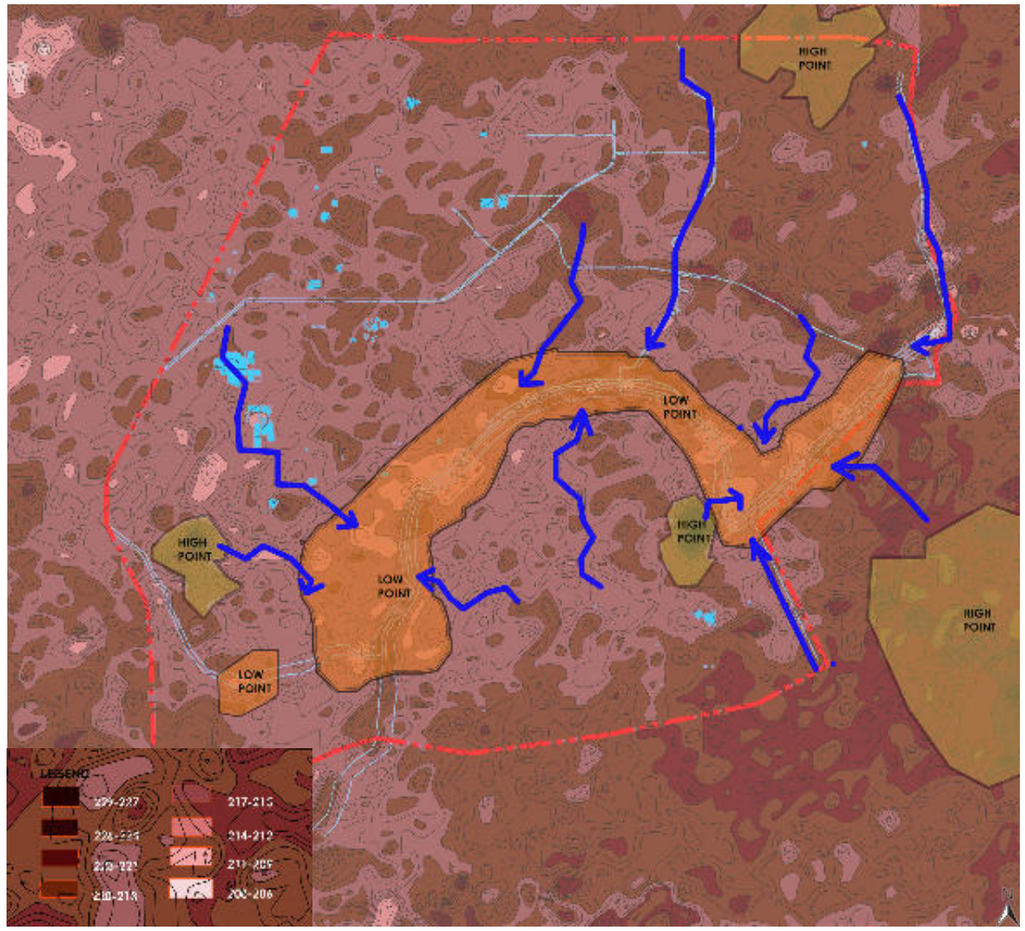

Housing area in Vikaspuri


Market near Sant Nagar

MAPPING AND SITE ANALYSIS

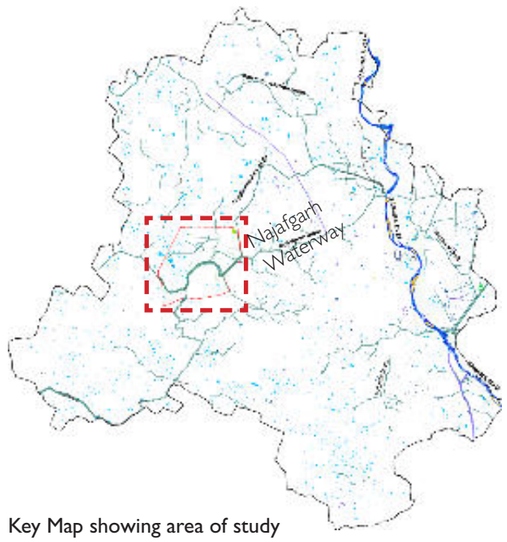
2.5 Study of Najafgarh Waterway

Contour Study of Najafgarh Waterway

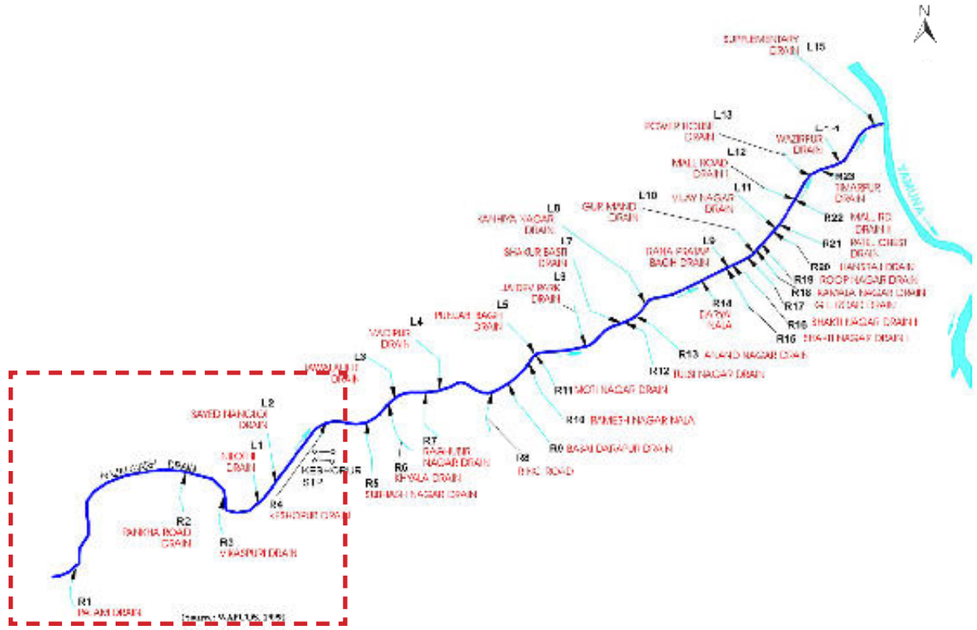


Key Points

- The lowest point of the area is towards the Najafgarh Waterway between the Vikaspuri and Nangloi area.
- The high points in the map are near Hast Minar area i.e. Hastal Village.
- There are various natural waterbodies at the lower points.
- The secondary drains and other subsidiary channels, all flow into the Najafgarh Waterway.
- As reflected in the map, the higher gradients are on the right side of the Najafgarh waterway.
- The Metro roads i.e. Green and Blue Metro lines are at the higher gradients flowing in the waterway.



Key Map showing area of study



Tributaries/supplementary drains which flow into Najafgarh Waterway

Flow regime of Najafgarh Drain

- Najafgarh Drain (NjD) is the largest among all the surface drains joining the river in the NCT. The sewered catchment area is around 374 sq km.
- There are fifteen secondary drains on the left hand side, out of which Supplementary Drain (180 mld), Nangloi Sayed Drain (98 mld) and Shakurbasti Drain (74 mld) are considered the major drains.
- The Supplementary Drain needs special mention because of its large catchment area, high flow and BOD load. It brings treated flow from several STPs as well as untreated sewage from residential areas in the north.
- On the right hand side, there are 23 major secondary drains including Dariyai Nala (98 mld), Palam Drain (68 mld), Pankha Road Drain (54 mld) and Keshopur Drain (51 mld) which carry major flow.
- The aggregate measured flow from these secondary drains is 946 mld.
- In addition there are non-point sources of wastewater from habitations along the drain. It is estimated that the total flow of wastewater joining NjD from the NCT is around 1550 mld.

Images of supplementary drains which flow into Najafgarh Waterway

Flora and Fauna in Najafgarh Waterway

Existing Trees:

Acacia leucophloea–Reonja

Acacia nilotica/arabica–Babul/Kikar

Eucalptus globulus–Eucalptus

Prosopis juliflora–Vilaithi Kikar

Azadirachta indica–Neem

Ficus elastica–Indian Rubber

Existing Shrubs:

Carissa spinarum–Sinhala

Zizyphus nummularia–Jharber

Leucaena leucocephala–Wild Tamarind

Existing Water Plants

Eichornia crassipes–Water Hyacinth

Lemna minor–Duckweed

Leptochloa chinesis–Water Grass

Proposed and Retained Trees:

Ficus religiosa–Peepal

Azadirachta indica–Neem

Cassia fistula–Amaltas

Anthocephalus cadamba–Kadamb

Alstonia scholaris–Saptaparni

Mimosops elengi–Maulsari

Delonix regia–Gulmohar

Terminilia catappa-Indian Almond

Tamarindus indica–Tamarind, Imli

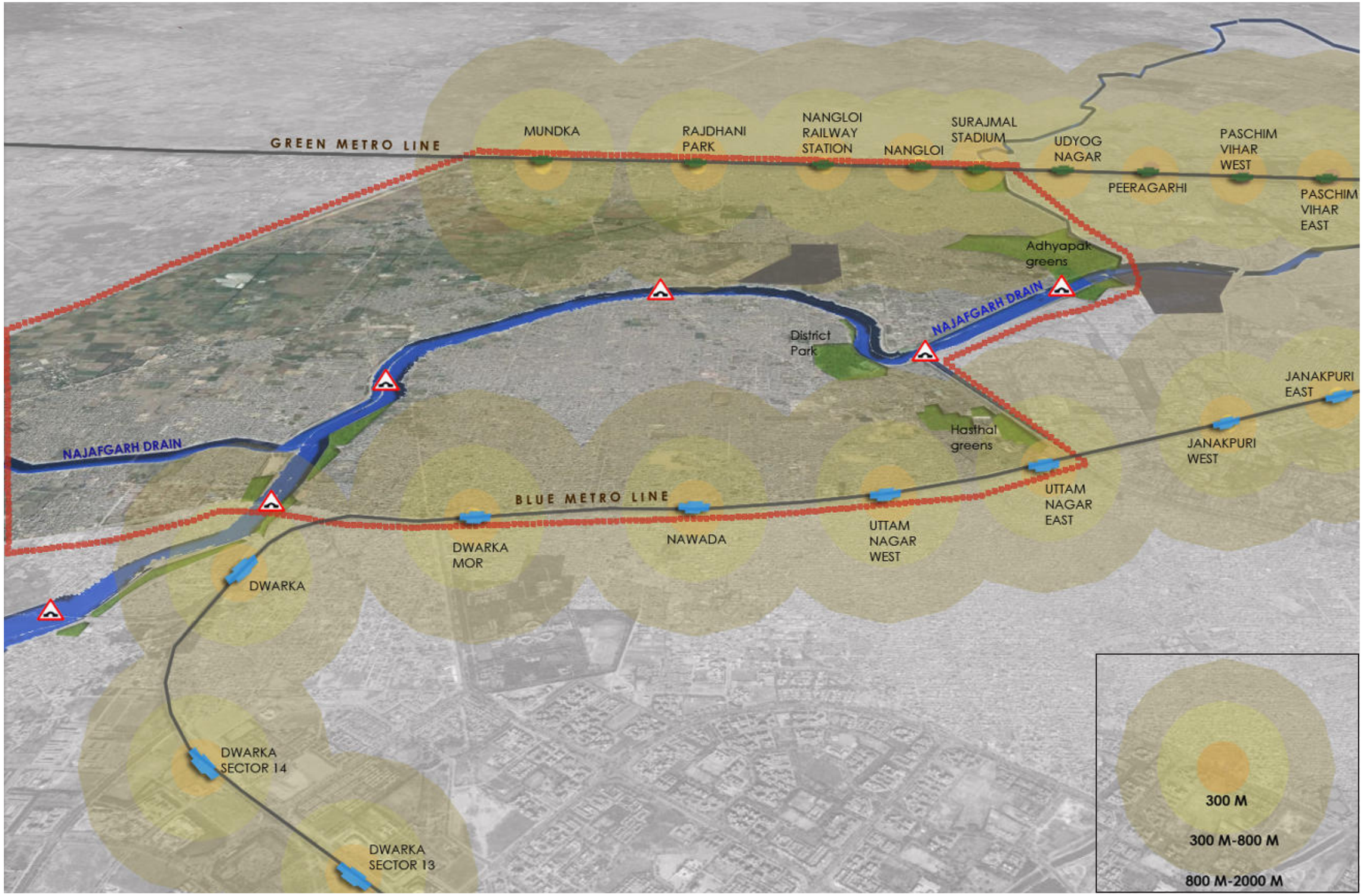
Proposed and Retained Shrubs:

Lagestroemia speciosa–Jarul

Tabernaemontana coronaria–Chandni

Thevetia peruviana–Yellow Oleander

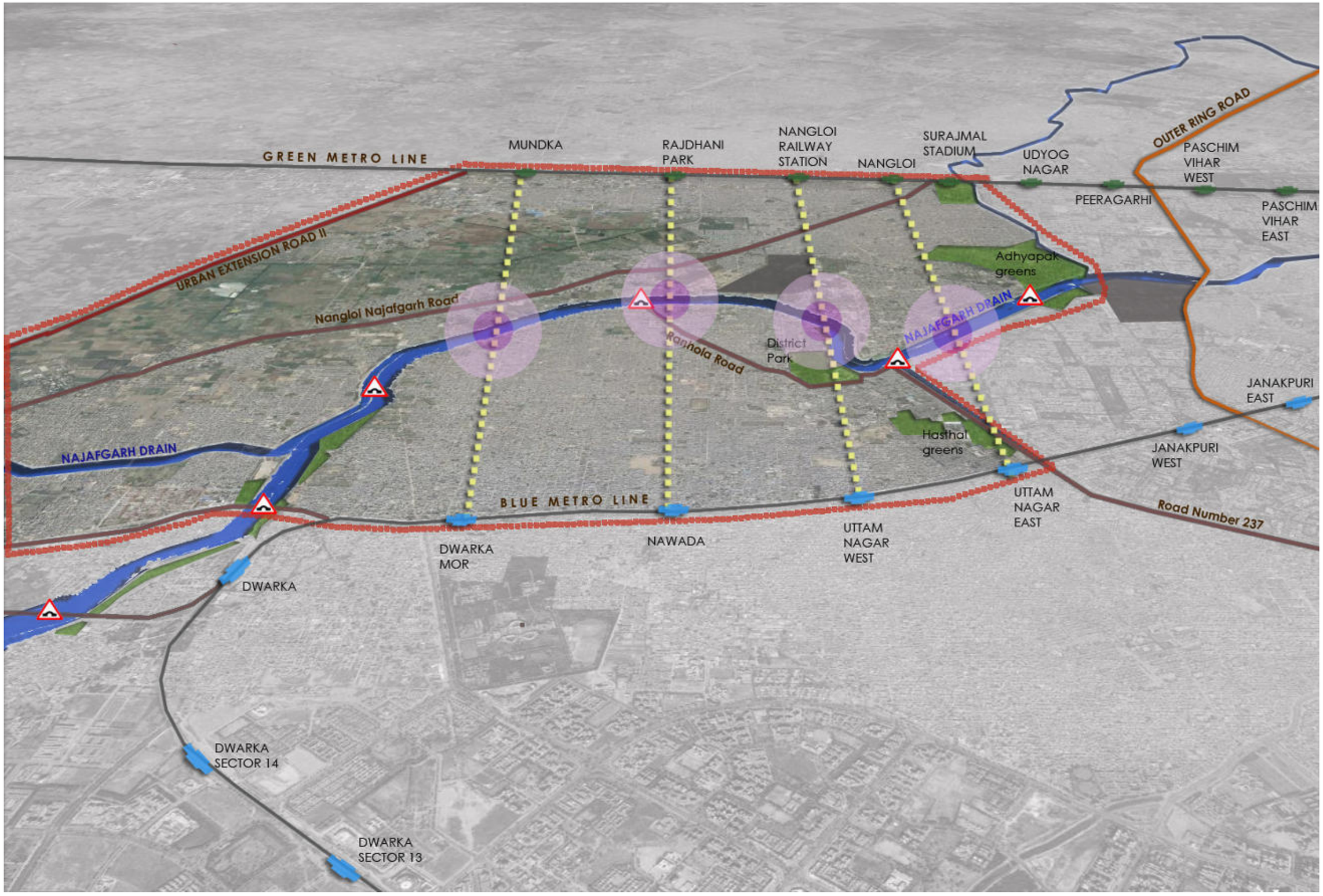
2.6 Precincts of Najafgarh Waterway



Key Map showing Existing Infrastructure of Najafgarh Waterway

Influence Zones categories

MAPPING AND SITE ANALYSIS



Key Map showing Existing Infrastructure with Proposed Connections of Najafgarh Waterway

2.7 Site Analysis of Najafgarh Waterway

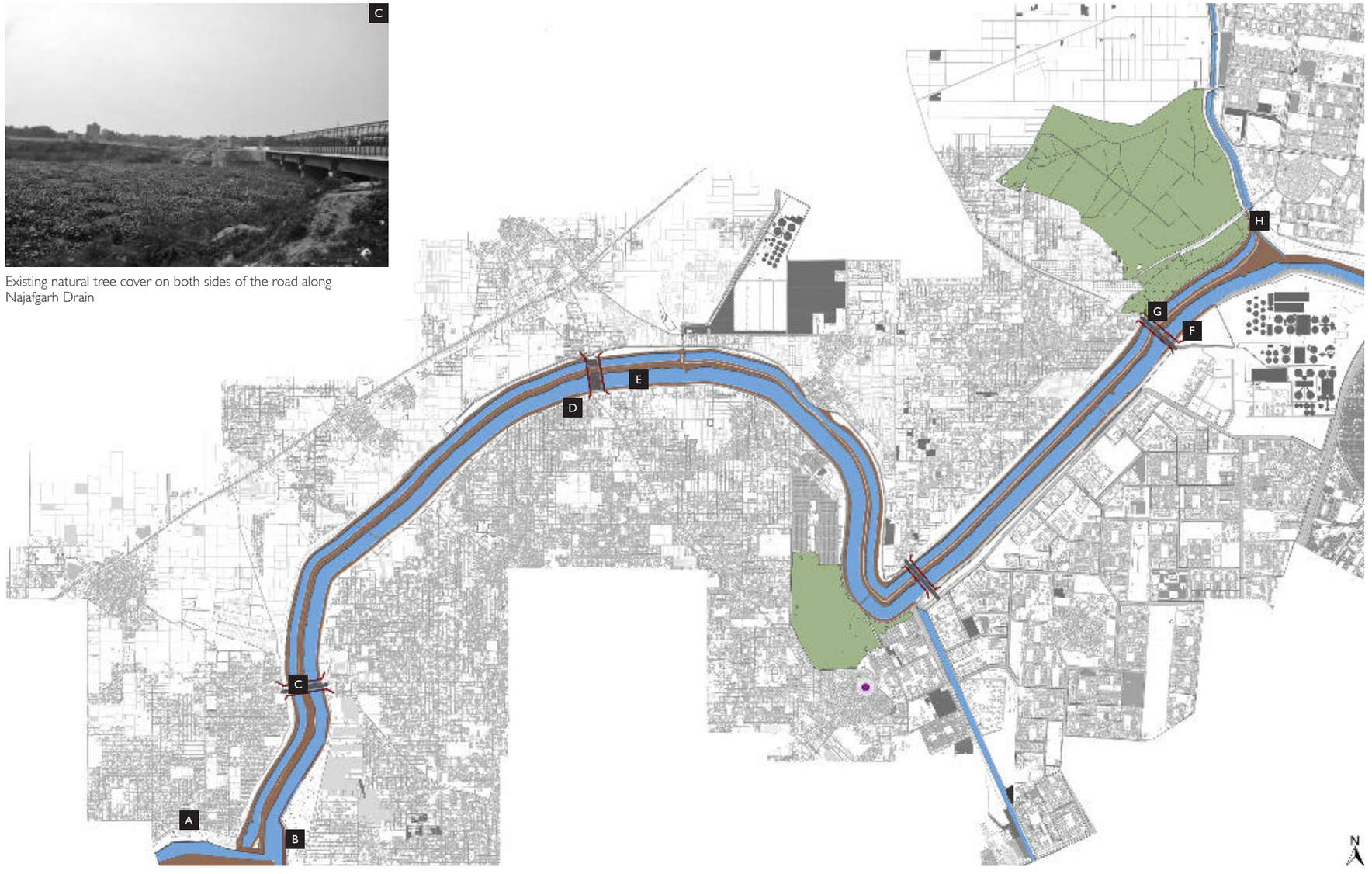
End of Vehicular Bridge connecting Najafgarh Metro Depot

Existing natural tree cover on both sides of the road along Najafgarh Drain

Holy Convent Senior Secondary School at one end of Vehicular Bridge

St. Thomas Marthoma Church on the road along Najafgarh

Existing natural tree cover on both sides of the road along Najafgarh Drain



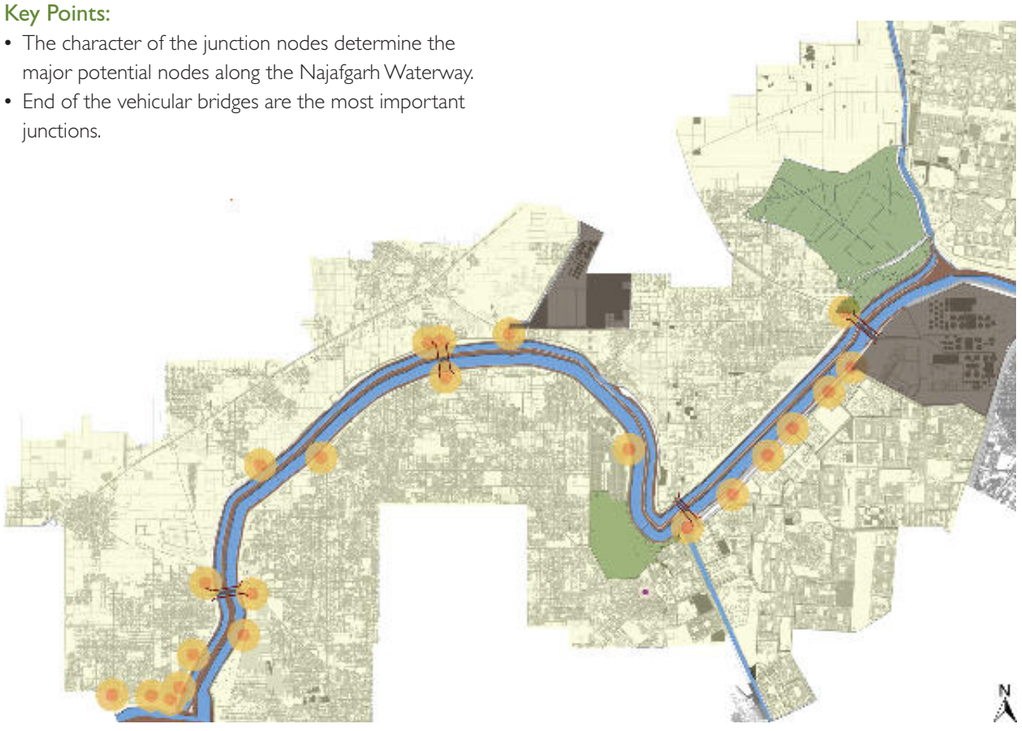
Merging point of secondary channel to Najafgarh main waterway

Secondary channel running along Najafgarh waterway

Green stretch along Najafgarh junction

Key Points:

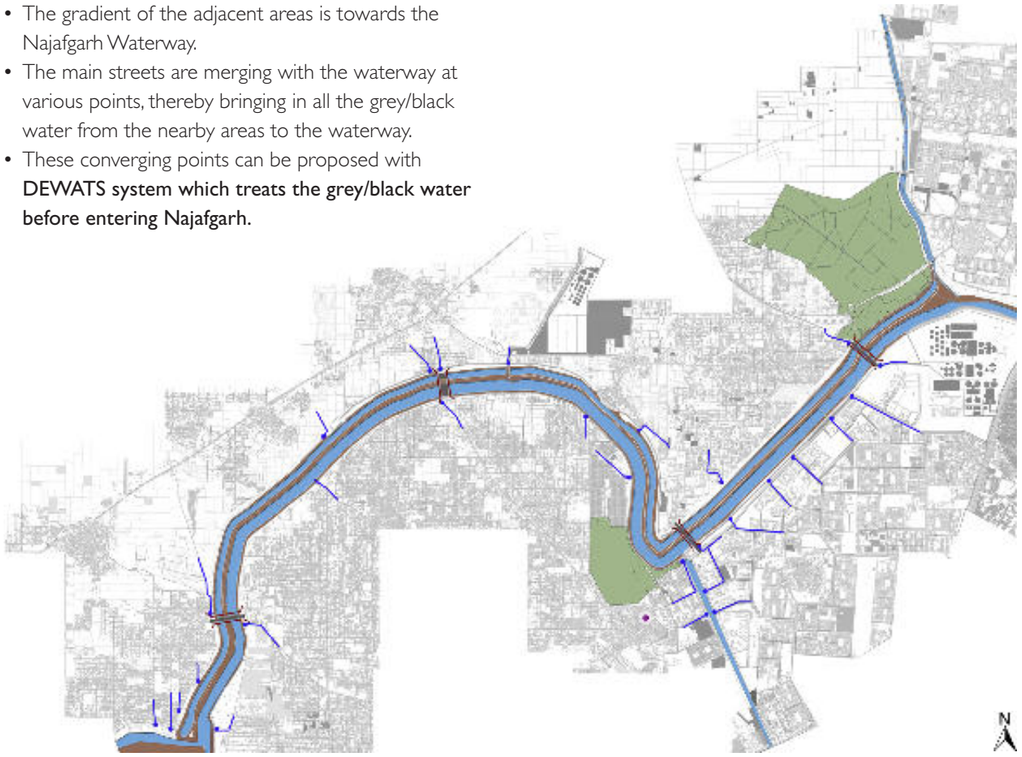
- The character of the junction nodes determine the major potential nodes along the Najafgarh Waterway.
- End of the vehicular bridges are the most important junctions.



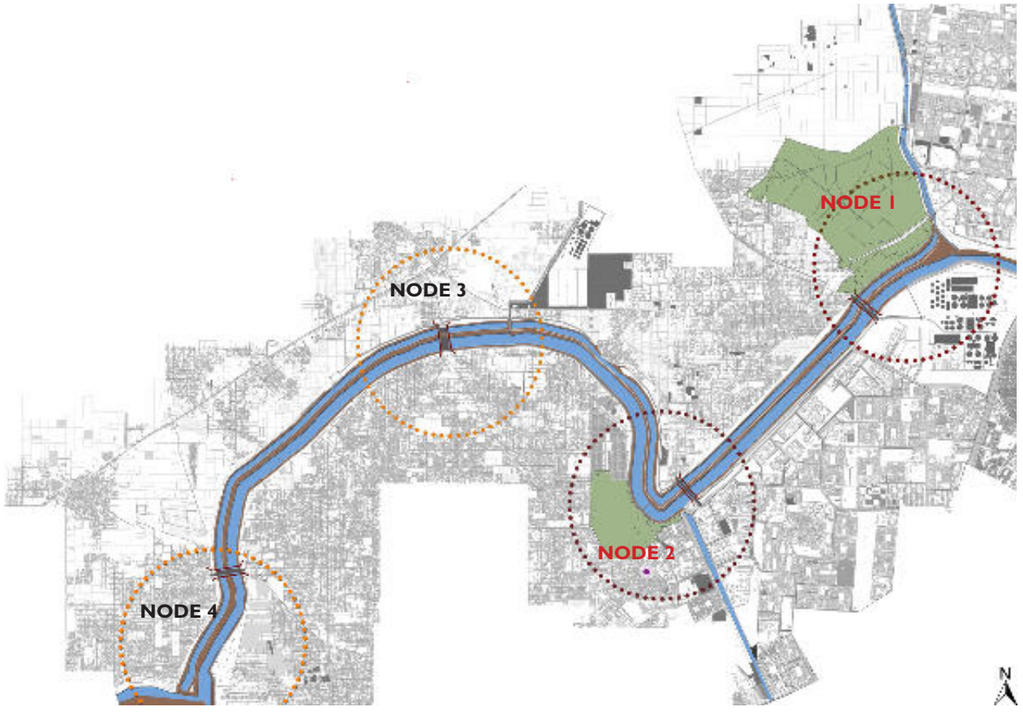
Map showing existing junction nodes of the main roads to the Najafgarh Waterway

Key Points:

- The gradient of the adjacent areas is towards the Najafgarh Waterway.
- The main streets are merging with the waterway at various points, thereby bringing in all the grey/black water from the nearby areas to the waterway.
- These converging points can be proposed with **DEWATS system which treats the grey/black water before entering Najafgarh.**



Map showing existing natural drainage drop points and flow lines to the Najafgarh Waterway

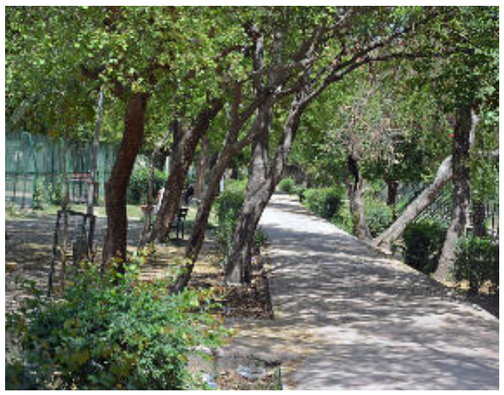


Map showing identification of activity nodes along the Najafgarh Waterway

Key Points:

- Node 1 is determined by Adhyapak Park Greens with vehicular bridges connecting the edges of Najafgarh Waterway.
- Node 2 is characterized by a large District Park and Hast Minar, and it acts as a connector node to Hast Minar.
- Node 1 and Node 2 are taken up for study in this phase.
- The character of the Node 3 and 4 are basically connector nodes.

Adhyapak Greens-Nihal Vihar Greens defining NODE 1



DDA District Park defining NODE 2

Hast Minar monument defining NODE 2

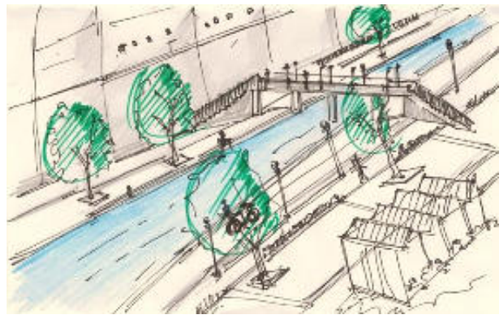
DESIGN PROPOSAL

Section 3

- The Approach
- Waterway Edge Design Proposal
- Flood Control Approach
- Programme of Activities
- Proposed Activities on Najafgarh Stretch
- Proposed Overall sketch of Najafgarh Waterway
- Node 1 of Najafgarh Waterway
  - Analysis and Proposal of Node 1 of Najafgarh Waterway
- Node 2 of Najafgarh Waterway
  - Analysis of Node 2 of Najafgarh Waterway
  - Hast Minar Park
- Central Stretches of Najafgarh Waterway

3.1 The Approach

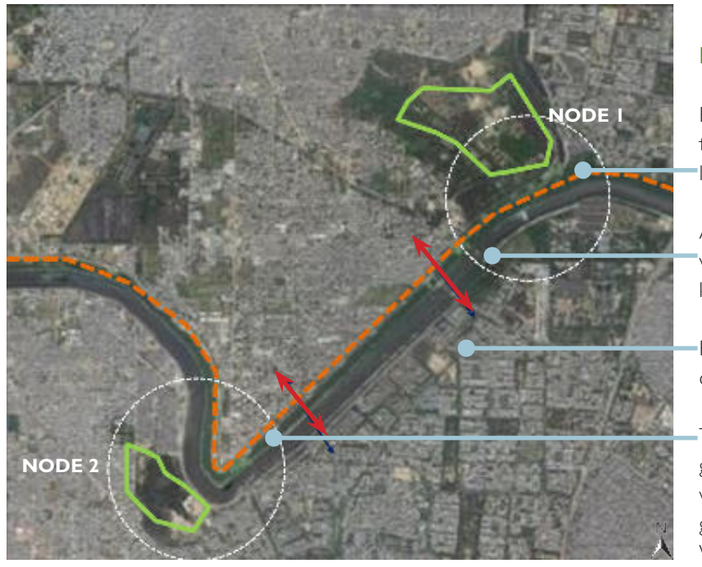
1. Greenway Connection Along Najafgarh Waterway Stretch



Possible activities along the Greenway:

1. Waterfront walkways and cycle tracks, thereby reducing vehicular movement.
2. Small scale commercial activities along the walkways.
3. Social infrastructure development.
4. Gathering place (OAT).
5. Ghat development.
6. Play ground development.
7. Park development.

2. Identification and a Development of Potential Nodes Along Najafgarh Waterway



Proposed Activities:

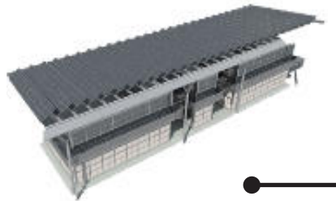
Rejuvenating the edges by activating the edges with entrance plazas and lighting

Activate the nodes by proposing various activities like restaurants, food kiosks, Dilli Haats etc.

Pedestrian bridge connection to cross over the Najafgarh Edges.

To retain the existing huge chunks of green by introducing pedestrian trails within them, thereby maintaining the green character of the Najafgarh Waterway.

3. Details of Proposed Activities such as Toilet Block and Pedestrian Bridge

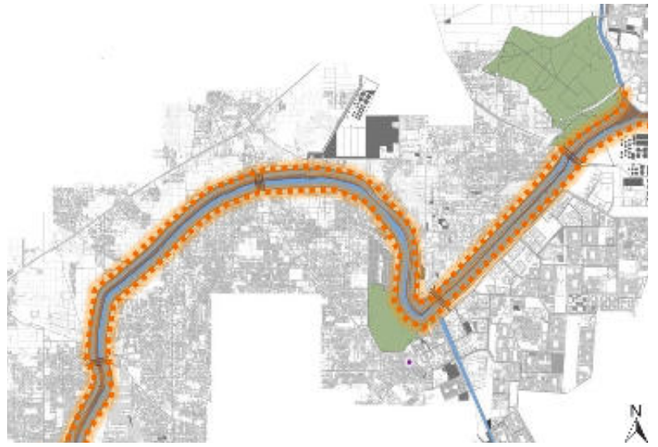


Proposed energy efficient toilet block with solar panel roofing and rain water pipe, enabling rain water harvesting

Proposed bridge design for pedestrians and cyclists to cross over the Najafgarh waterway

4. Green route sections along natural secondary drains/tributaries within the urban fabric

3.2 Waterway Edge Design Proposal



Plan showing the treatment of edges of Najafgarh waterway

Types of Ghats

A Stepped paved edge of the waterway with shady trees i.e. Ghat system for visitors/pedestrians.

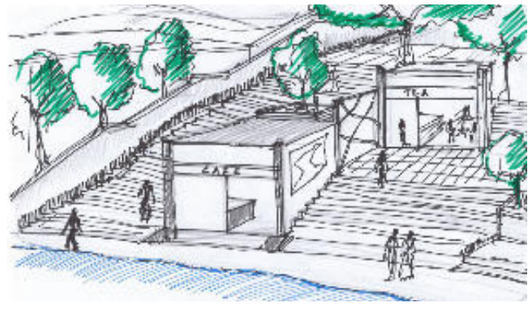
B Stepped paved edge of the waterway with shady trees and a combination of green and an interactive green space on the upper edge.

C Waterway edge with shade and flowering trees on the slope with a combination of green and an interactive green space on the upper edge.

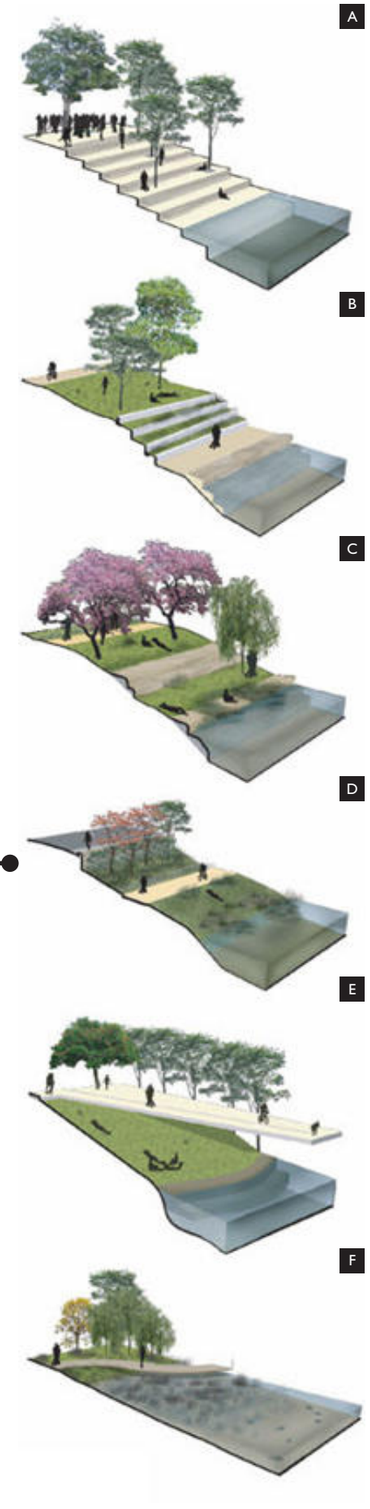
D Waterway edge with shade and flowering trees on the upper edge and lower edge, a segregated cycle/ pedestrian track with dense green buffer on water edge.

E Waterway edge with a sloped lawn on the edge, and a pedestrian/cycle bridge for people to cross over from one edge to the other.

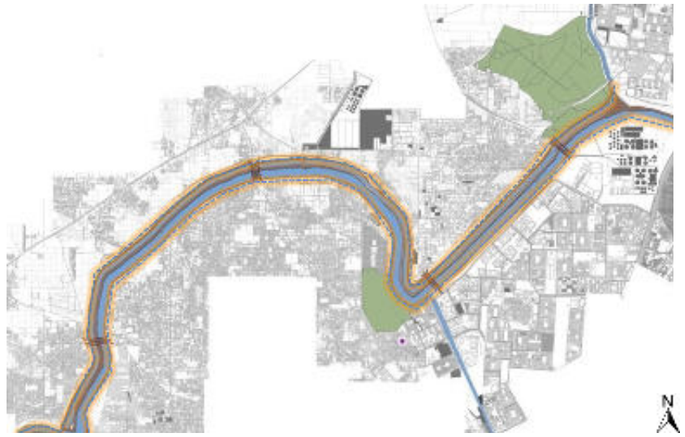
F Waterway edge with defined path for cyclists and pedestrians with lawns and plantation of trees.



Sketch showing Waterway Edgefront



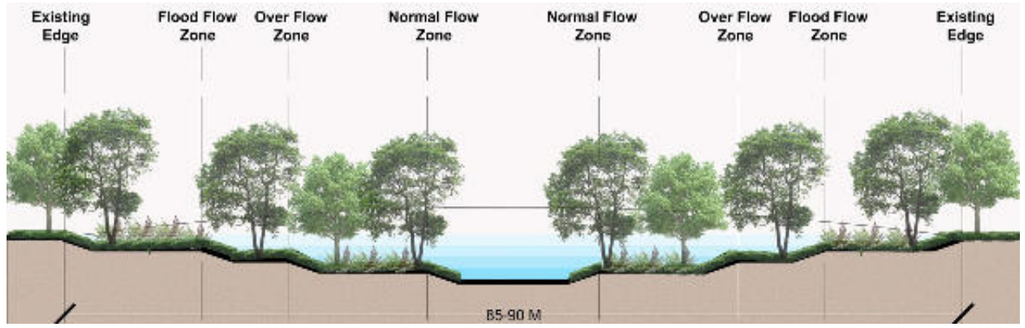
3.3 Flood Control Approach



Plan showing the edges of Najafgarh Waterway

Key Points:

- Flood control measures include cutting and filling of the topography in steps which binds the edges of the waterway and controls the water from overflowing on to the edges.
- Another measure is to create dense plantation on the stepped topography to reduce the overflow water to the edges of the waterway.



Section showing the proposed edges in steps of the waterway by cut and fill method

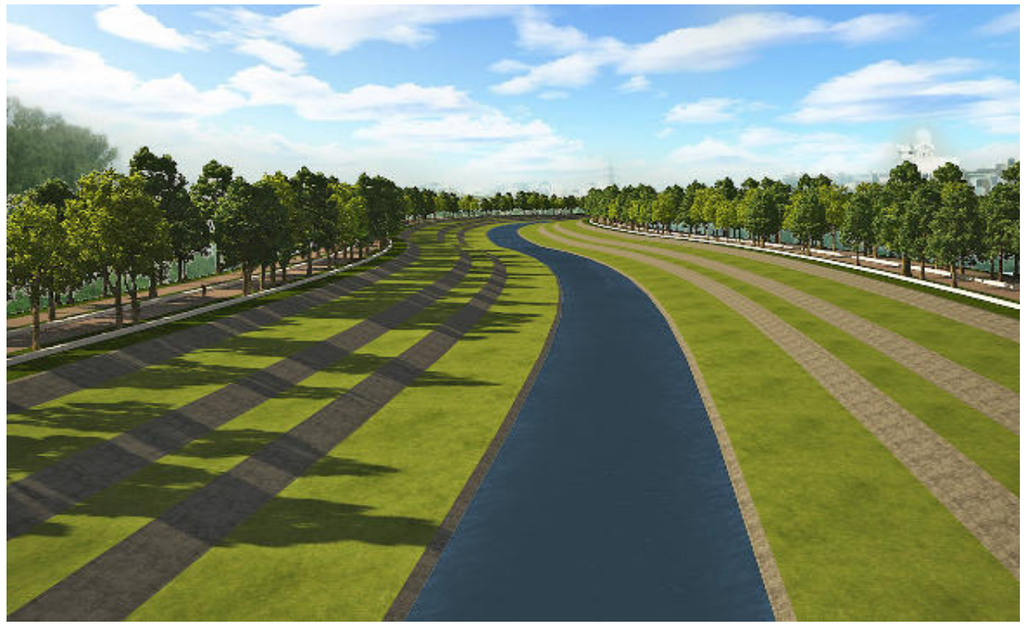
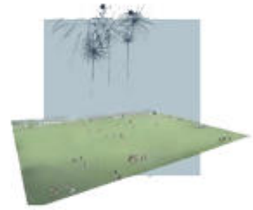


Image showing the proposed stepped edges of the waterway

3.4 Programme of Activities

BOARDWALKS

A network of elevated trails will be proposed for pedestrian/cyclists to cross over from one edge of waterway to other.



EVENT SPACE

Public open spaces are provided along the river for spontaneous programs.

COMMERCIAL

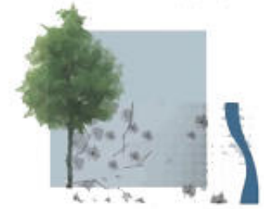
Site becomes a district that creates job opportunities: money generating landscape where people can shop, play and relax.

BIODIVERSITY

Biodiversity parks provides habitat for various flora and fauna.These are depicted by dense plantation.

CONTROLLED FLOODING

Water is welcomed through engineered landform.It provides opportunities for programs and refuge for wild species



ARBORETUM

Plant communities are diversified,which creates opportunities for the public to learn more about plant species

URBAN AGRICULTURE

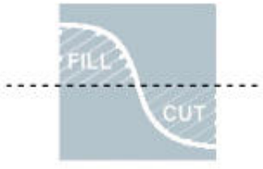
Urban agriculture in the neighbourhood brings healthy and sustainable food access to needed populations.

URBAN REFORESTATION

Green space will be maximized to promote walking and exercising along waterway to make it a healthier place

AQUATIC

A mature ecological matrix is formed with wetland plant species that improves overall water quality and stabilize banks



BALANCED CUT & FILL

Balanced earth work is the key.Cut and fill are limited on site to create green mounds as stormwater management tools

TERRACES

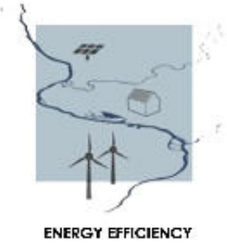
Terraced landform keeps soil on slope and it provides opportunity for urban agriculture and dynamic programs

BANK STABILIZATION

Bank is stabilized through sustainable way-planting trees.The root system of plants will keep soil from being washed away

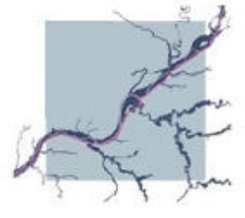
HERITAGE

Heritage character is retained by awaring people by open spaces displaying about its significance



ENERGY EFFICIENCY

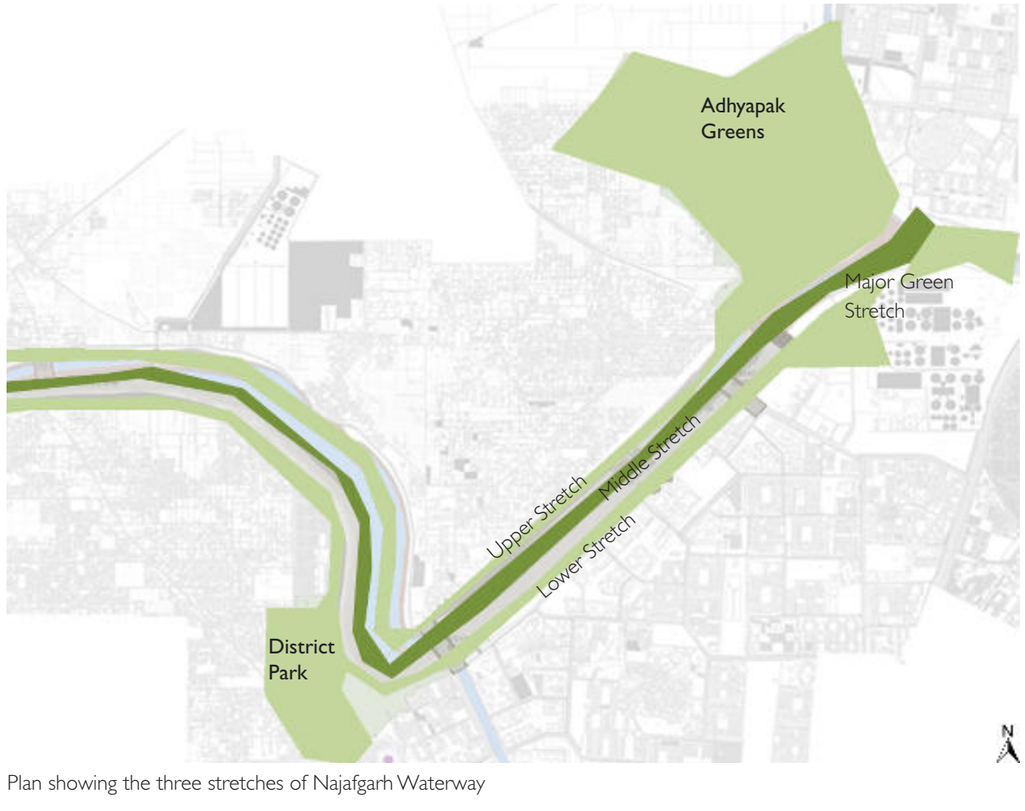
Water harvesting and solar energy can be used as sources of power as they are natural energy resources.



CULTURAL AND HISTORY

Cultural and natural history of the site is represented through design,which has the potential to increase public awareness about waterway

3.5 Proposed Activities on Najafgarh Stretch



Plan showing the three stretches of Najafgarh Waterway

Edge Lower Stretch-*Reference Images*

Sculpture Park

Landscape Boulevard

Water taxi stand

Water taxi stand

Upper Stretch-*Reference Images*

Kiosks on the edge

Hawker zone

Landscape promenade

Timber Deck Walkway

Dilli Haat

Major Green Stretch-*Reference Images*

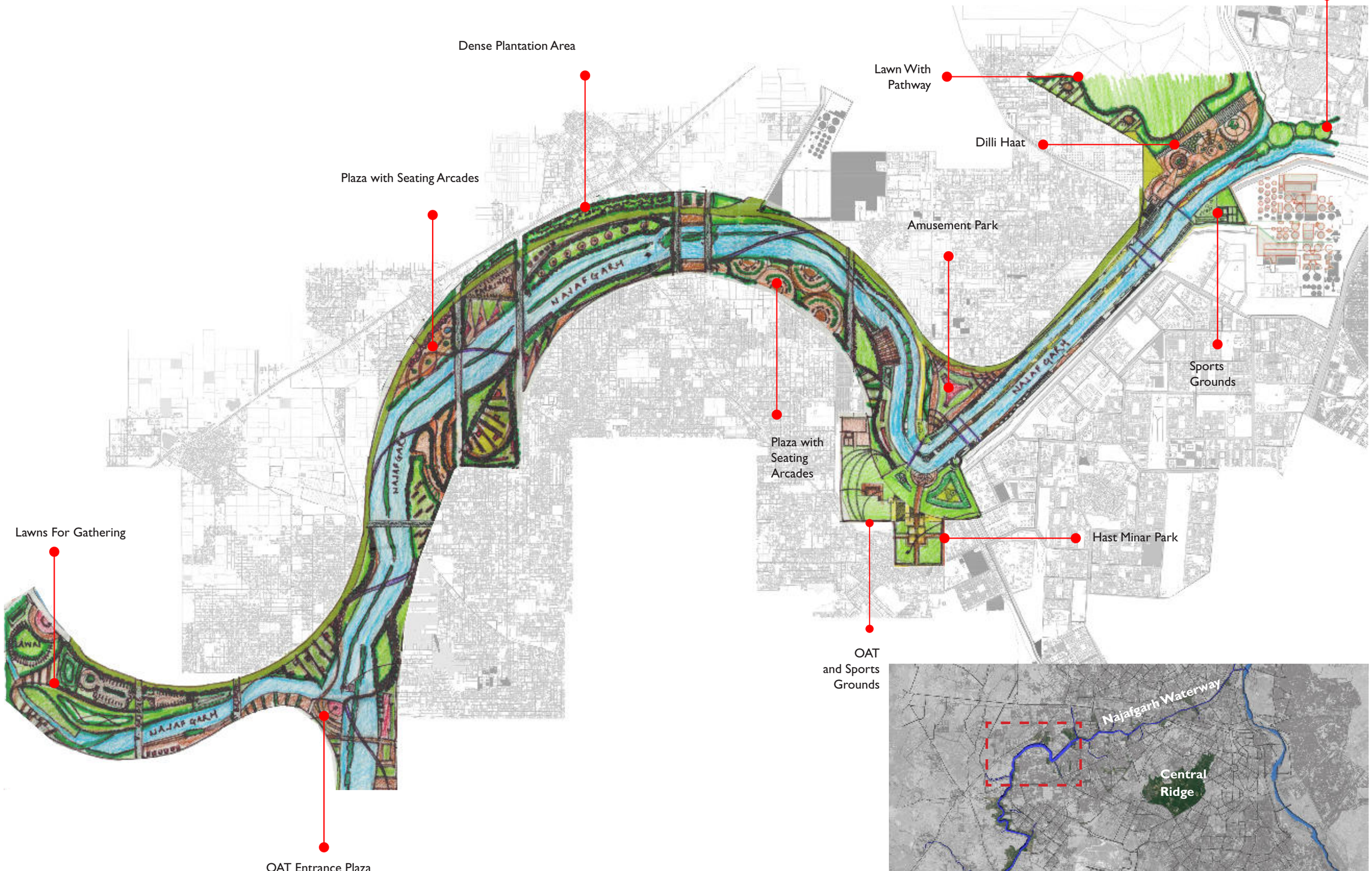
Circular green lawns which can be used for festivals like Chhath Puja, etc. Otherwise they can be used as interactive green spaces.

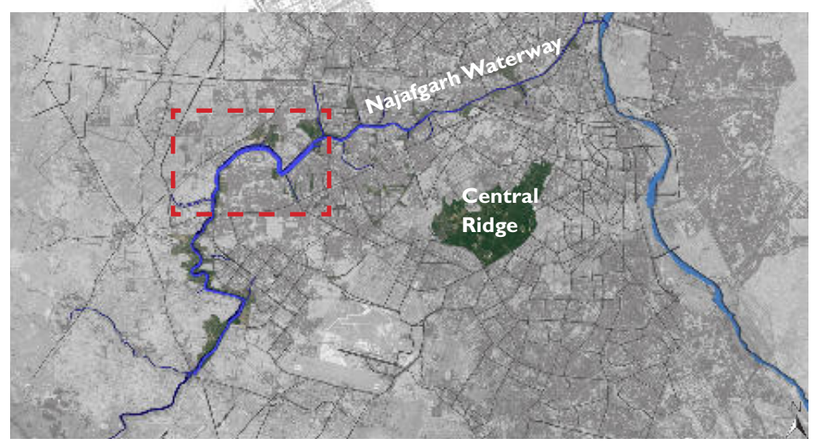
Middle Stretch-*Reference Images*

Urban farms

Weekly markets

3.6 Proposed Overall sketch of Najafgarh Waterway





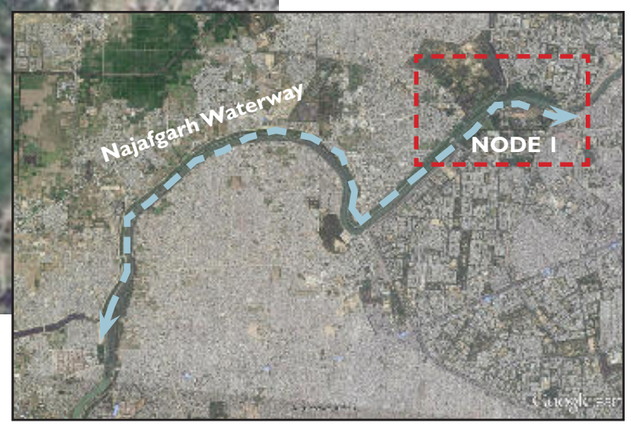
Key Plan showing Najafgarh Waterway

3.7 Node 1 of Najafgarh Waterway

Google map showing the existing condition of area of Node 1 of Najafgarh Waterway

Key Issues:

- There are many green unmaintained spaces which are in bad condition.
- The existing plantation and nursery area within Adhyapak Greens are in bad state. These can be relocated to other part of Adhyapak Park. The prevailing space can be used as an interactive community space.
- The middle stretch which come under the flood prone area can be revitalized with seasonal activities.
- The huge green chunks which are presently dead spaces can be enhanced with activities catering to the surrounding neighbourhood.
- The Treatment Plant is located near Najafgarh Waterway which would be segregated with green buffer zone.

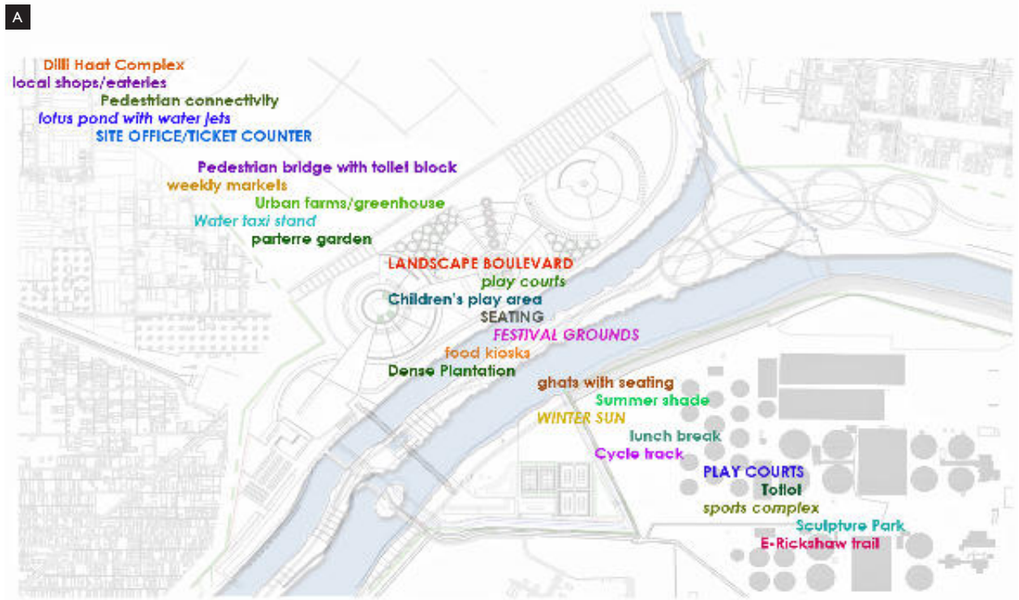


Google map showing the existing condition of Najafgarh Waterway

3.7.1 Analysis and Proposal of Node 1 of Najafgarh Waterway

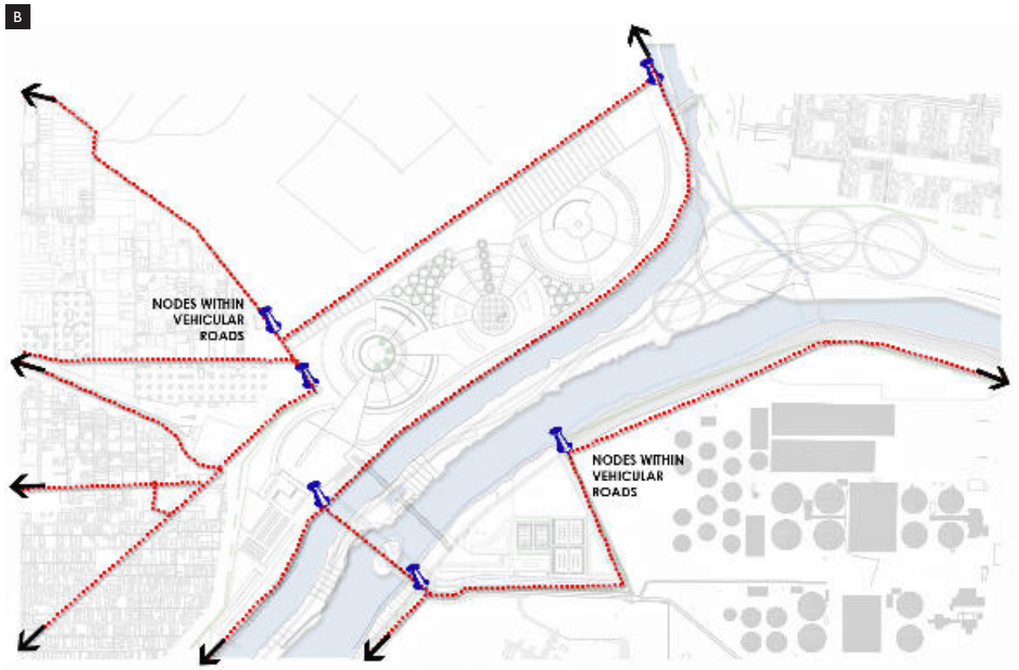
Analysis For Node 1 of Najafgarh Waterway

A



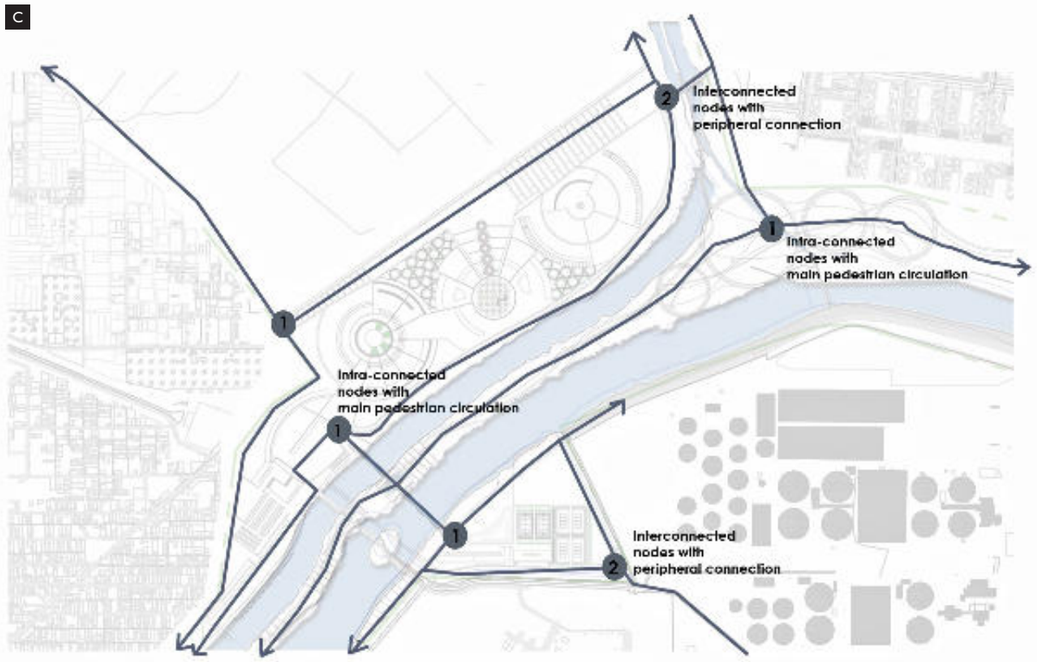
LANDSCAPE PROGRAM

B



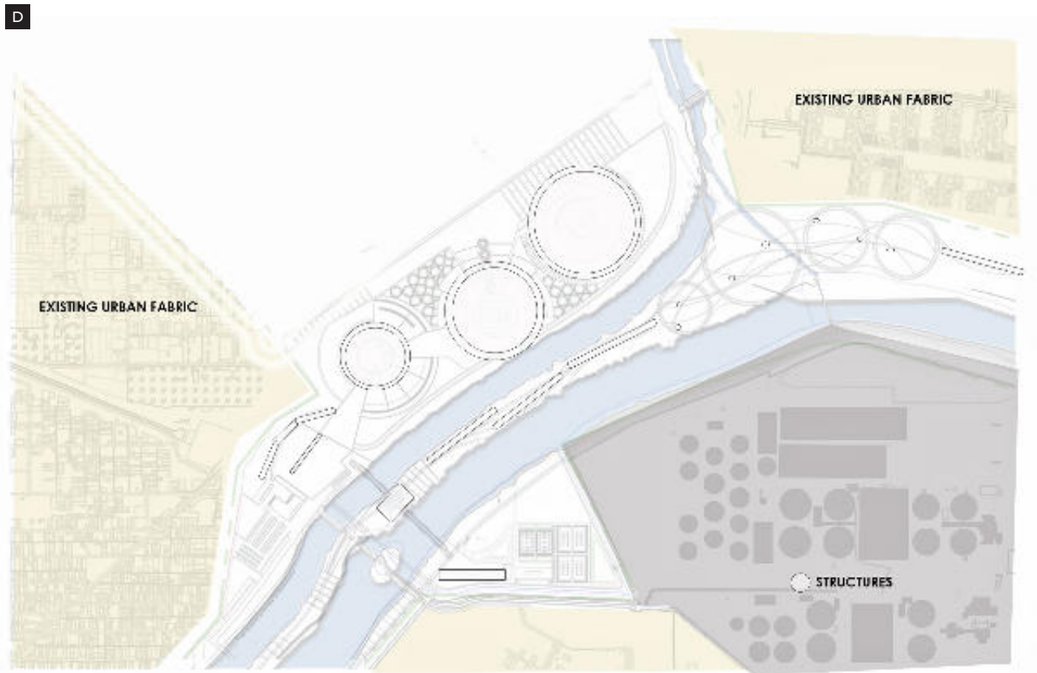
VEHICULAR CIRCULATION

C



PEDESTRIAN CIRCULATION

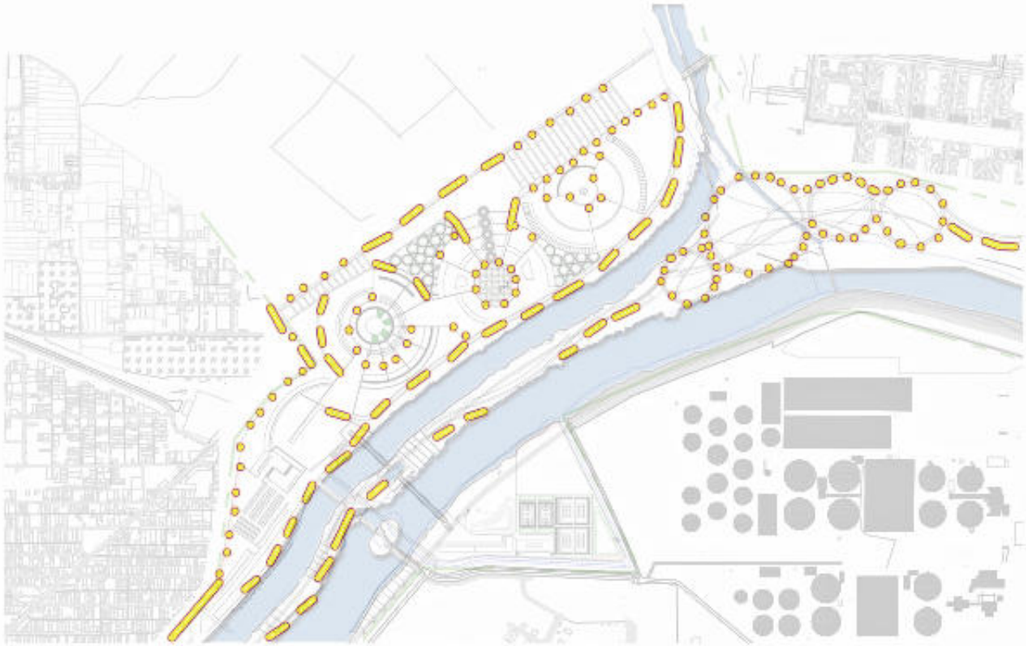
D



STRUCTURES

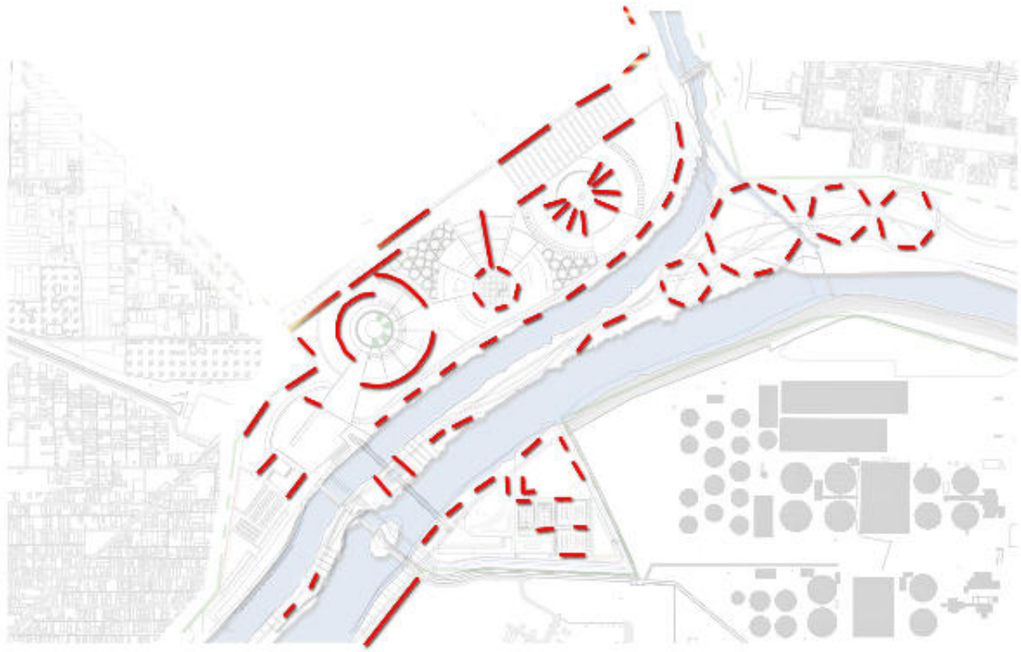
DESIGN PROPOSAL

E



LIGHTING PROGRAM

F



SEATING PROGRAM

G

HIERACHY OF TREES

H

UNDERSTORY PLANTING

Design Proposal For Node 1 of Najafgarh Waterway

Plan showing design proposal for Node 1 of Najafgarh Waterway

Key Points:

1. Upper Northern Stretch:

The **DILLI HAAT area is divided into three circles** with three different concepts i.e.

(a) First circle is defined by **lotus pond with water jets** as central feature

(b) Second circle is defined by **chess board paving with combination of hard and soft areas with seating**

(c) Third circle is defined by **Clock Tower/Sculpture with restaurant seating**

Other activities like water taxi stand and timber deck with open restaurant seating is also proposed.

2. Middle Stretch:

In this stretch, seasonal activities like weekly markets and urban farms can be proposed.

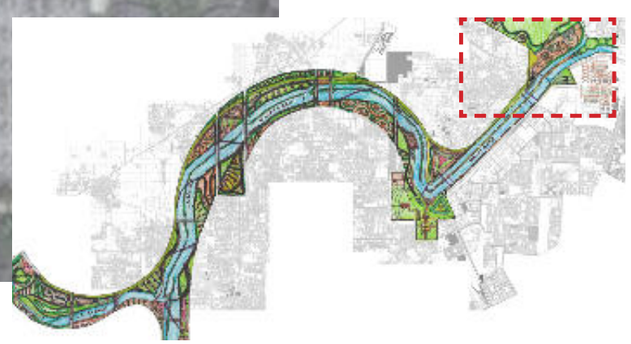
(a) At the end of the stretch, festival grounds are given for gatherings which can also be used as green interactive spaces like parks/gardens (designed as per neighbourhood capacity)

3. Bottom Southern Stretch:

In this stretch, recreational activities for neighbourhood are proposed.

(a) Dense plantation buffer is given between the Najafgarh Waterway and Keshopur Treatment Plant.

(b) Children's play area and playcourts are given for neighbourhood.



Key Plan showing Najafgarh Waterway

Views of Node 1 of Najafgarh Waterway

Aerial View showing design proposal for Node 1 of Najafgarh Waterway

Views of Node 1 of Najafgarh Waterway

View showing Dilli Haat shops with shaded pathway and grass paver main walkway

View of central courtyard consisting of chessboard paving with seating and shaded structures placed on central axis

View showing food kiosks at regular intervals with brick seating and planters

View showing food kiosks and grass paver main pathway along shaded walkway and Dilli Haat shops

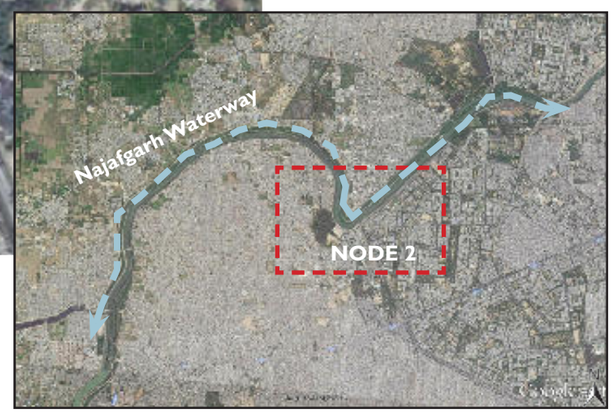
View showing lotus ponds with seating encircling around the main water feature consisting of fountain jets

3.8 Node 2 of Najafgarh Waterway

Google map showing the existing condition of area of Node 2 of Najafgarh Waterway

Key Issues:

- The huge chunk of green on the map is a District Park which is in very bad condition with improper pathways for pedestrians/cyclists making it a place for illegal activities.
- The monument i.e. Hast Minar is in neglected state. The settlement (Hasthal Village) around this monument is in very close proximity with margins of about 1m–1.5m.
- The edge of Najafgarh Waterway is not maintained and is left as a scrub area with plantations like Kikar Trees.
- There is no pedestrian access from one edge of the waterway to the other.
- The middle stretch of the waterway is in a very bad condition and can be used as a interactive space.



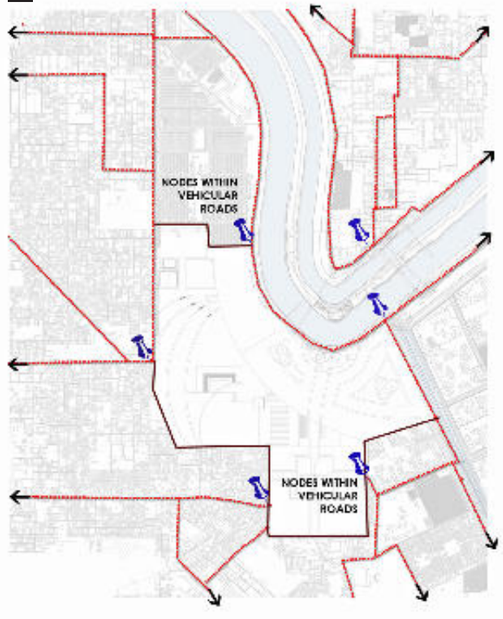
Google map showing the existing condition of Najafgarh Waterway

3.8.1 Analysis of Node 2 of Najafgarh Waterway

A

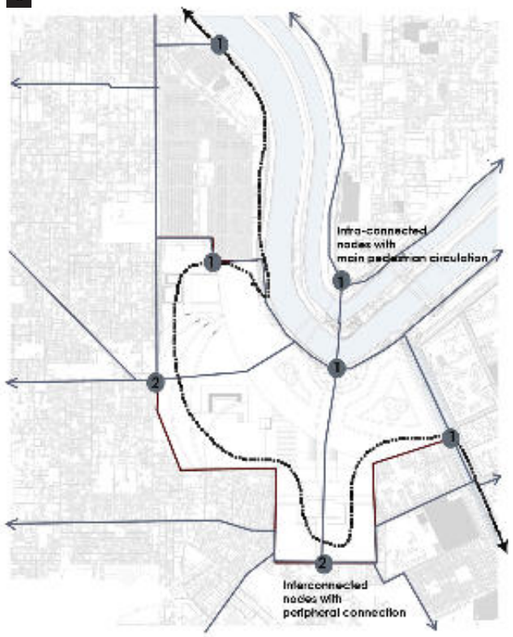
LANDSCAPE PROGRAM

B



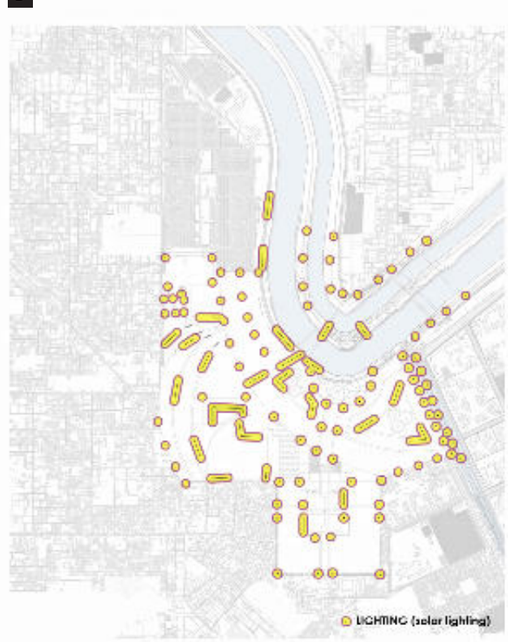
VEHICULAR CIRCULATION

C



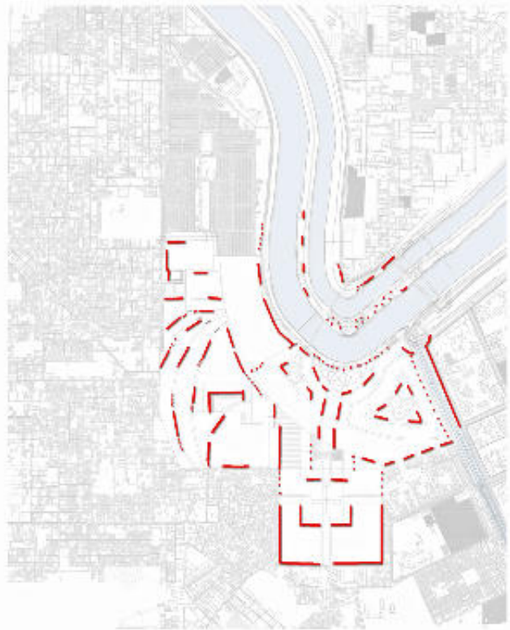
PEDESTRIAN CIRCULATION

D



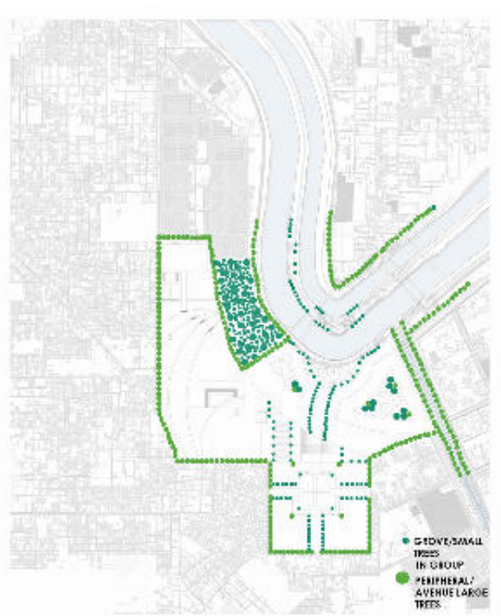
LIGHTING PROGRAM

E



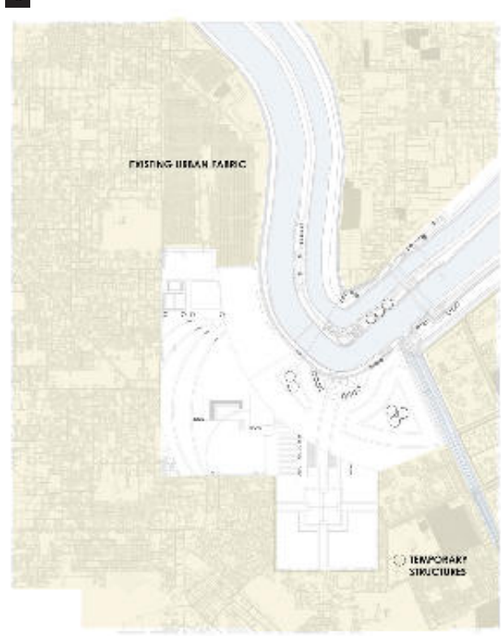
SEATING

F



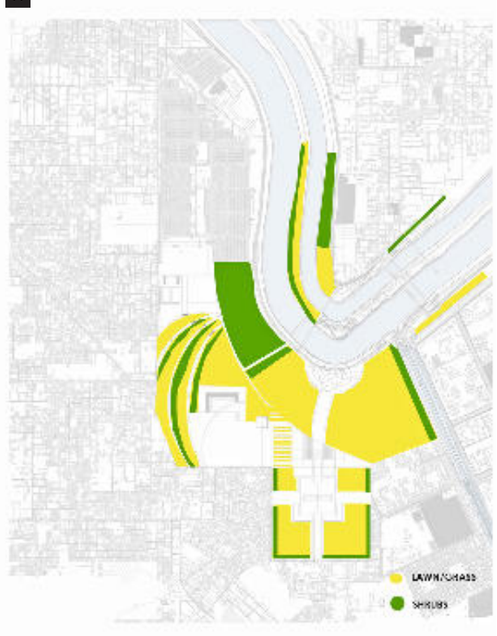
HIERACHY OF TREES

G



STRUCTURES

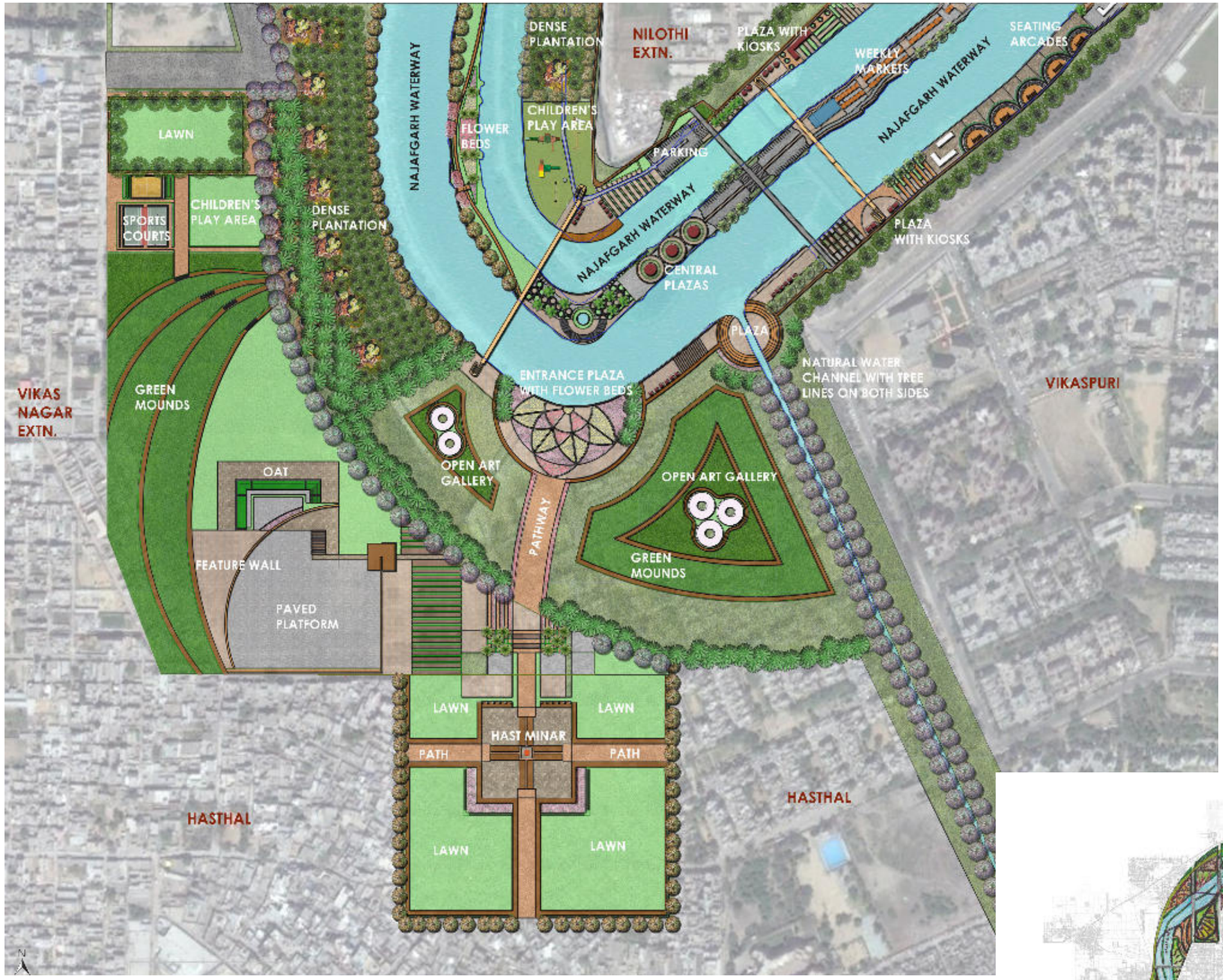
H



UNDERSTORY PLANTING

DESIGN PROPOSAL

Design Proposal for Node 2 of Najafgarh Waterway



Plan showing design proposal for Node 2 of Najafgarh Waterway

Key Points:

1. Upper Northern Stretch:

(a) Entrance plaza with kiosks at the end of proposed pedestrian bridge. Other activities like a **children's play area and a dense plantation of native trees which acts as a reserve forest** are proposed.

(b) Parking spaces are also proposed at the ends of the existing vehicular bridge.

2. Middle Stretch:

(a) **Seasonal activities like weekly markets and urban farms are proposed as it is in flood prone area.**

(b) Central pedestrian plazas acting as interactive gathering spaces defined aesthetically with seating arcades, tree planters and waterbodies.

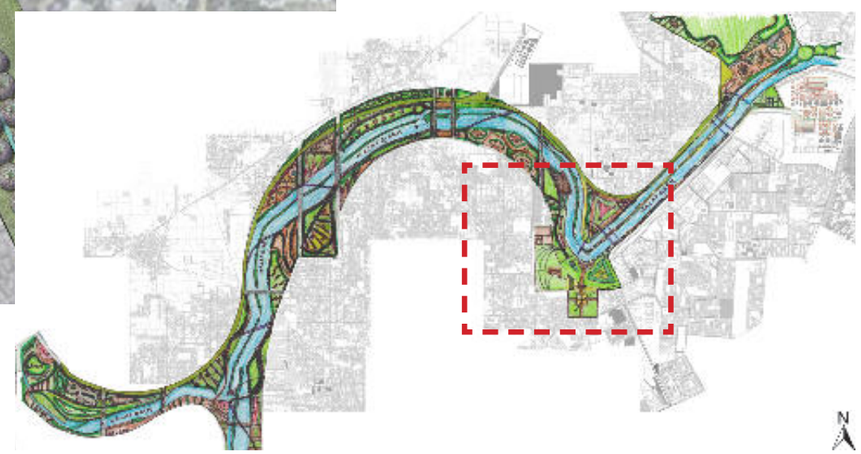
3. Bottom Southern Stretch:

(a) **Hast Minar Park is a proposed green space for Hast Minar monument** which is designed on the Chaharbagh concept and will act as a hub for visitors.

(b) There are open art galleries which will display information related to Hast Minar monument and can be economically sustainable as it will also display works of various professionals which will generate revenue.

(c) The District Park is divided into two main spaces i.e. **OAT and playfields separated by a green mound buffer.**

(d) An entrance plaza with English parterres/flower beds and natural pathways will link the pedestrian bridge to the Hast Minar Park.



Key Plan showing Najafgarh Waterway

3.8.2 Hast Minar Park

Hast Minar

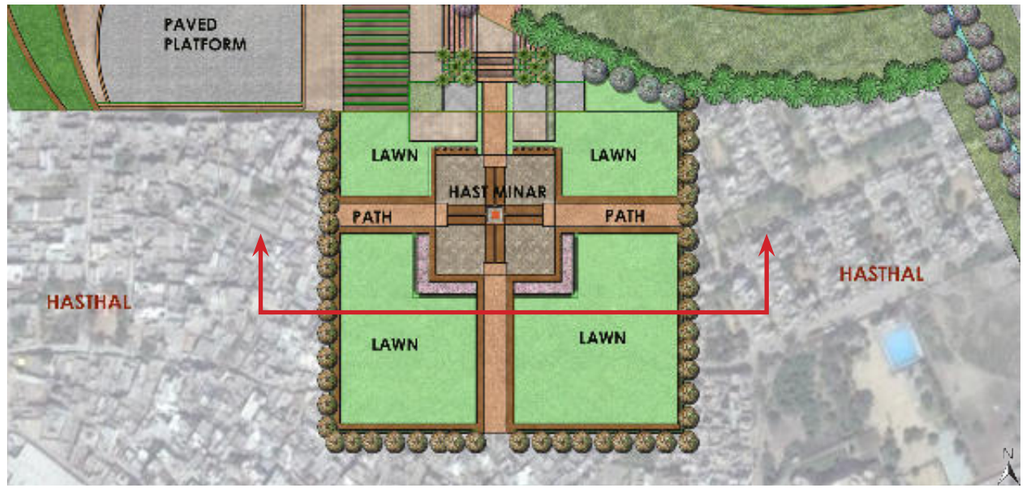
1. It is situated in Hastsal Village on Najafgarh Road near Uttam Nagar.
2. It is a 17 meters high, three-storeyed tower, built of bricks and red sand stone and stands on an octagonal platform.
3. This minaret was built by the Mughal Emperor Shahjahan in the 1650s. It is said to have been used as a hunting lodge.
4. The minaret was used as a tower to shoot from, and its premises as a resting place.
5. The distance between the boundary of the premises and the minaret is less than 2 m.
6. Beyond that are the walls of local houses.
7. The minaret and its premises are currently being used as dumpyards.
8. Even though, it is made of stone, the structure is weak.

Hast Minar

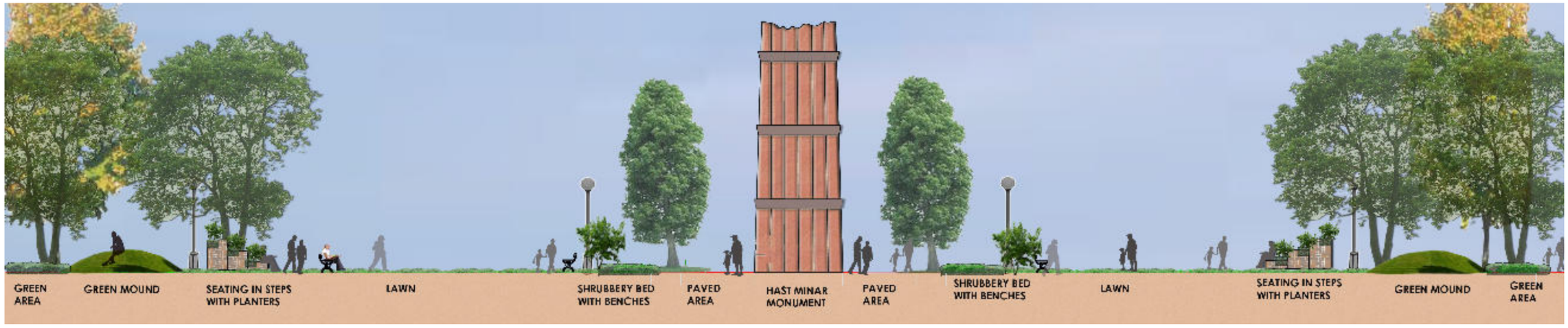
Key Plan showing the location of Hast Minar

Locked doorway, as access to Hast Minar is not allowed.

The top of Hast Minar is in bad condition



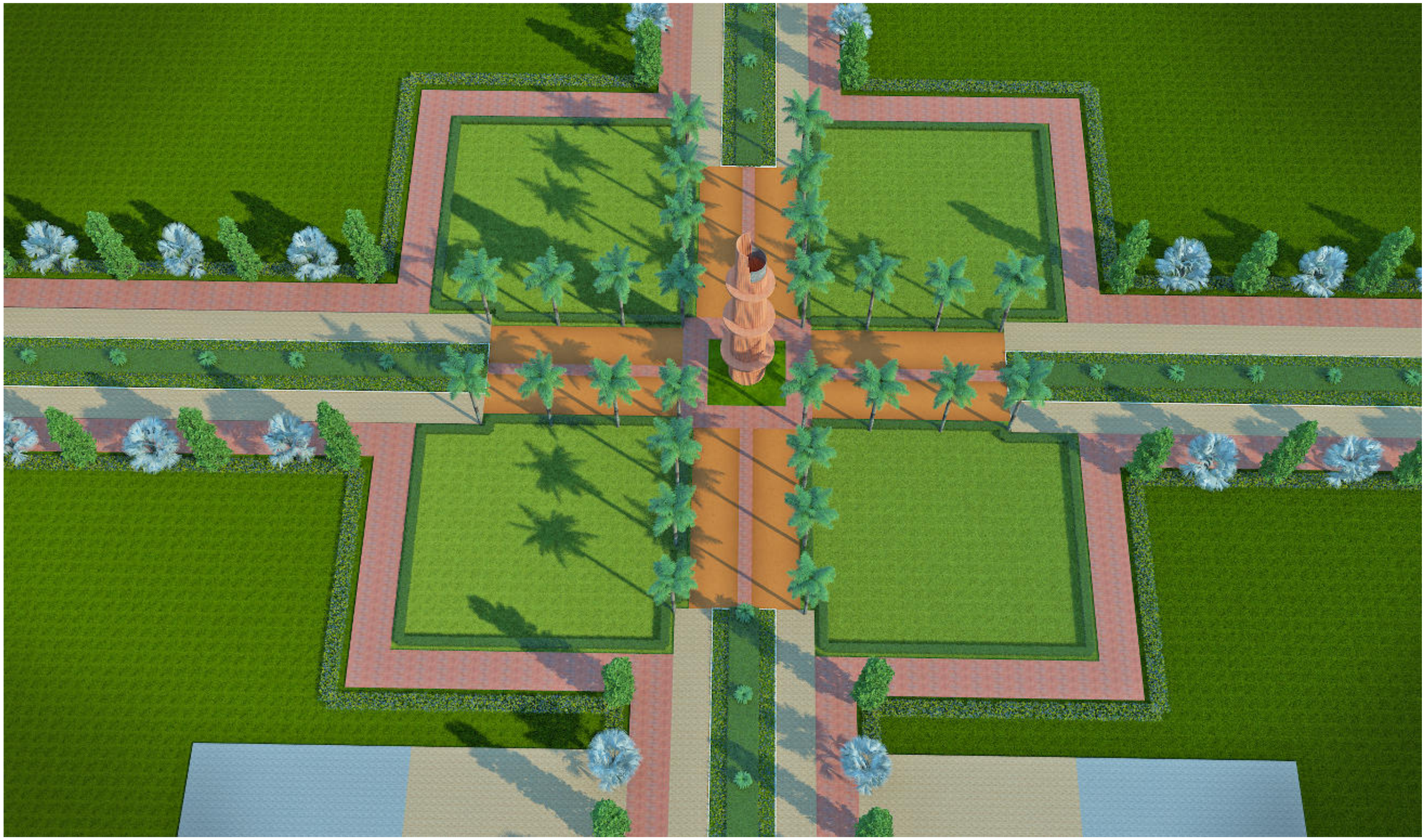
Plan of Hast Minar Park



Section through Hast Minar Park

DESIGN PROPOSAL

Views of Node 2 of Najafgarh Waterway



Aerial view showing Hast Minar Park which is in the concept of Chaharbagh

DESIGN PROPOSAL

Views of Node 2 of Najafgarh Waterway

View showing Hast Minar Park with avenue of trees and a central green vista

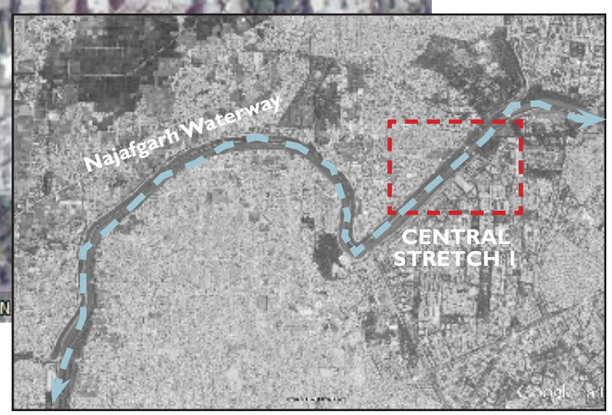
Another view showing Hast Minar Park with avenues of trees and a central green vista

View showing Hast Minar with a Palm Court around the monument

View showing a line of palms along the paved pathway with a central flower bed

3.9 Central stretches of Najafgarh Waterway

Google map showing the existing condition of the area of Central stretch 1 of Najafgarh Waterway



Google map showing the existing condition of Najafgarh Waterway

Plan showing design proposal for Central Stretch 1 of Najafgarh Waterway

Key Points:

1. Upper Northern Stretch:
Various proposed activities like an Entrance Plaza with a Hawker Zone, Landscape Promenades /Boulevards with hard and soft areas with kiosks, Parterre Garden etc.

2. Middle Stretch

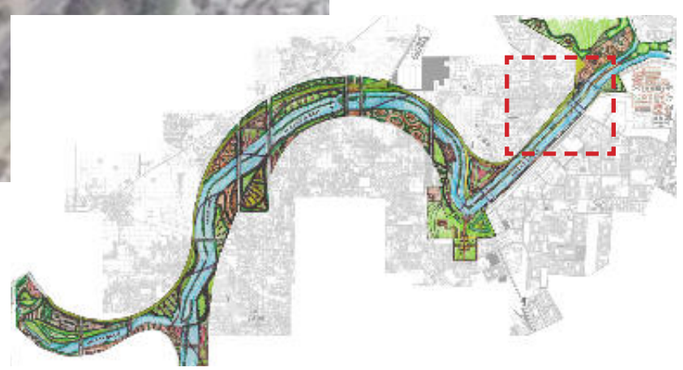
(a) **Seasonal activities like weekly markets and urban farms** are proposed as it is in a flood prone area. Other proposed spaces like water taxi stand, parking spaces for four-wheelers and E-rickshaws.

(b) **A designated E-rickshaw trail** has been proposed for the convenience of visitors to the waterway.

3. Bottom Southern Stretch

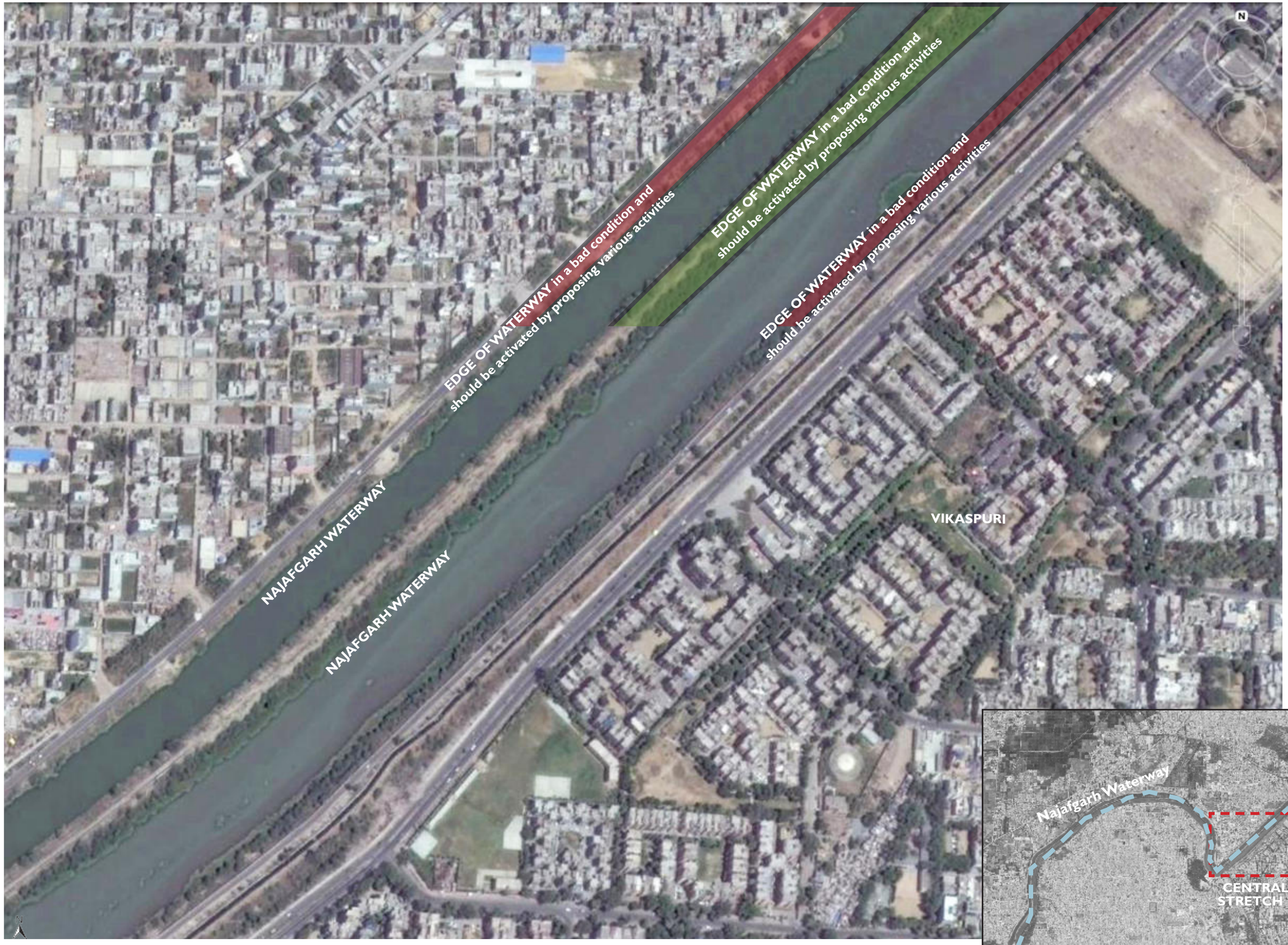
(a) Landscape boulevard with an avenue of flowering trees is allocated for pedestrians/cyclists.

(b) Various proposed spaces like a **Entrance Plaza with a Hawker Zone, Sculpture Park, Landscape Promenade /Boulevards with hard and soft areas kiosks.**

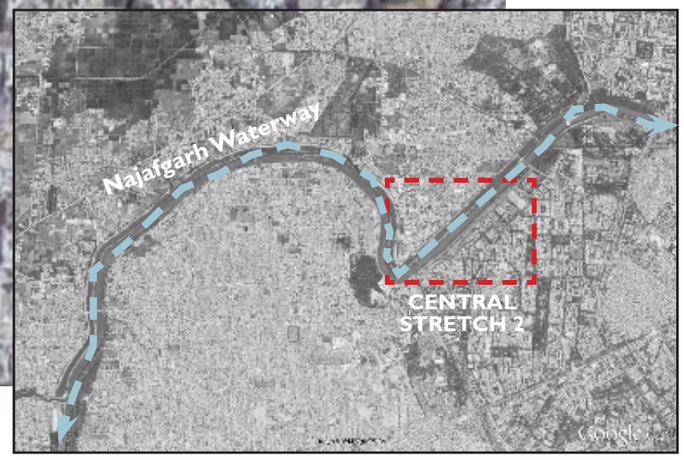


Key Plan showing Najafgarh Waterway

DESIGN PROPOSAL



Google map showing the existing condition of area of Central stretch 2 of Najafgarh Waterway



Google map showing the existing condition of Najafgarh Waterway

Plan showing design proposal for Central Stretch 2 of Najafgarh Waterway

Key Points:

1. Upper Northern Stretch:
Various proposed activities like a Boulevard, Entrance Plaza with Hawker Zone, Seating Arcades, Landscape Promenades/Boulevards with hard and soft areas with kiosks, Parterre Garden etc.

2. Middle Stretch

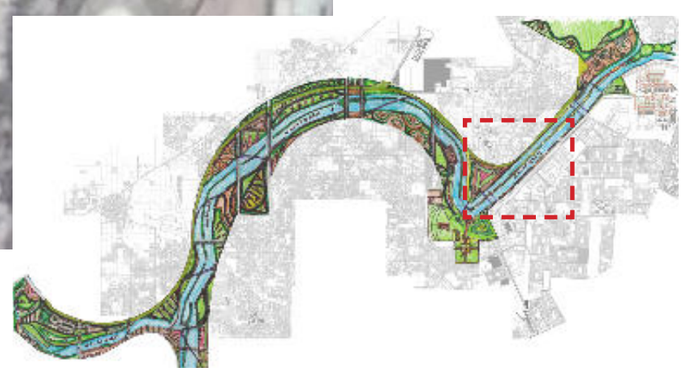
(a) **Seasonal activities like weekly markets and urban farms** are proposed as it is in a flood prone area. Other activities like Landscape Boulevards, water taxi stand, parking spaces for four wheelers and E-rickshaws.

(b) **A designated E-rickshaw trail** has been proposed for the convenience of the visitors to the waterway.

3. Bottom Southern Stretch

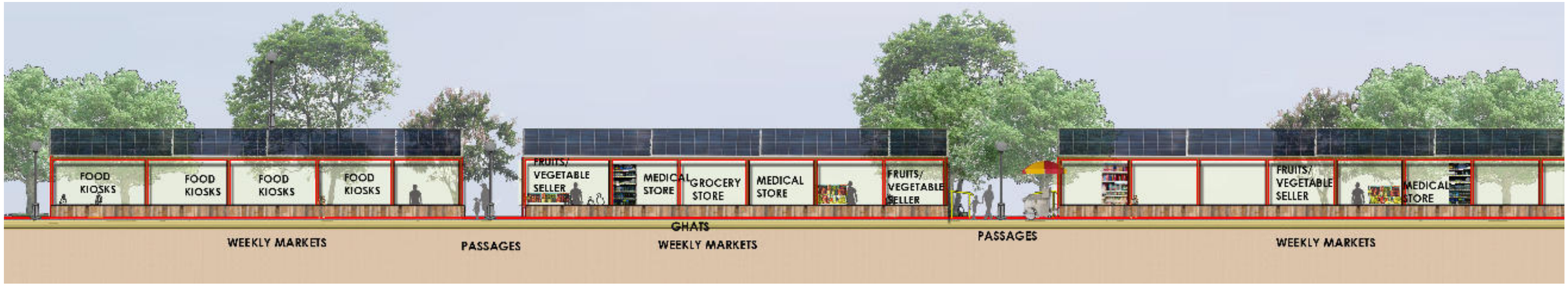
(a) Landscape boulevard with an avenue of flowering trees is allocated for the pedestrians/ cyclists.

(b) Various proposed activities like **Entrance Plaza with Hawker zone, sculpture Park, Landscape Promenade /Boulevard with hard and soft areas with kiosks.**

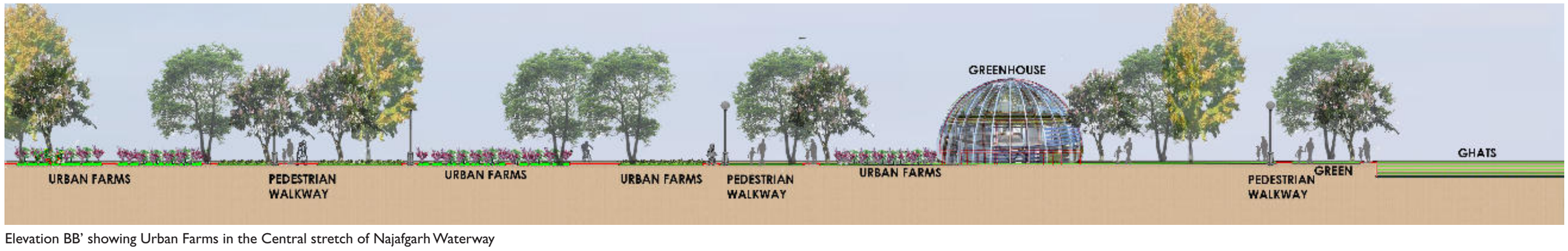


Key Plan showing Najafgarh Waterway

DESIGN PROPOSAL

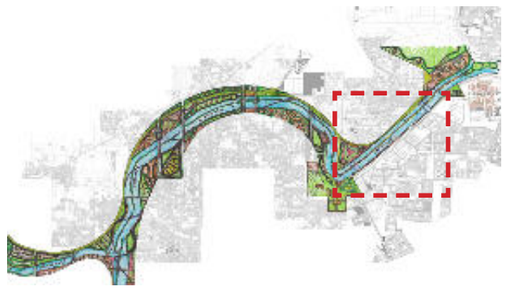


Elevation AA' showing weekly markets in the Central stretch of Najafgarh Waterway

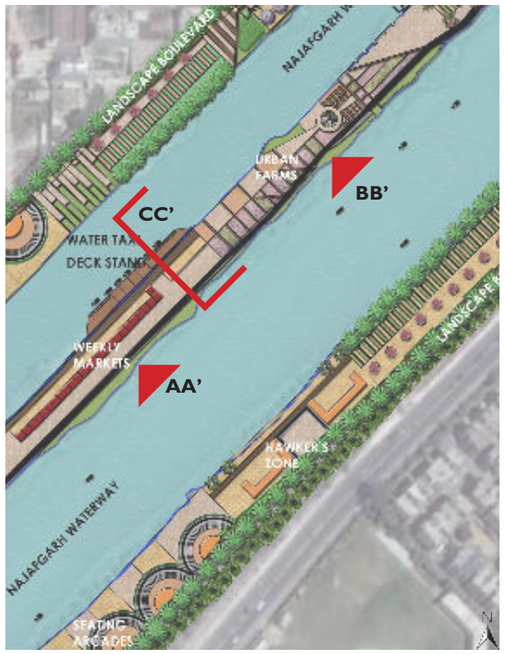


Elevation BB' showing Urban Farms in the Central stretch of Najafgarh Waterway

Sectional Elevation CC' showing Water Taxi Stand in the Central stretch of Najafgarh Waterway



Key Plan showing Najafgarh Waterway



Key Plan showing part of Central Stretch of Najafgarh Waterway

Key Points:

- In the Central Stretch, many seasonal activities like weekly markets and urban farms are proposed as it comes under flood prone zone.
- To interconnect the two banks of the Najafgarh Waterway, apart from the pedestrian bridge, provision has been made for water taxis with stands.

LANDSCAPE DETAILS

Section 4

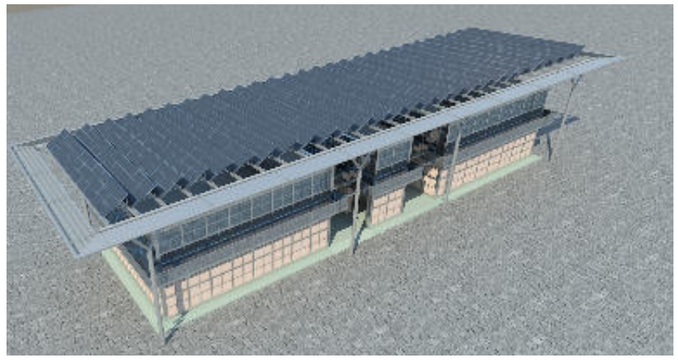
- Structural Constraints of Toilet Block
- DEWATS System
- Toilet and Bridge Design
- Before/After
- Secondary Channel Section
- Green Route Sections

Section 5

- Future Intervention

4.1 Structural Constraints of Toilet Block

Structure of Toilet Block



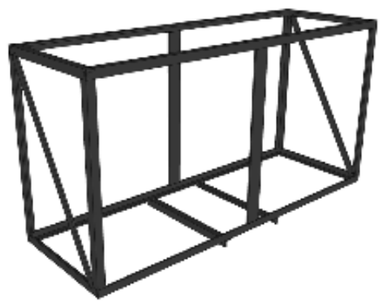
Recycling of Materials

- Reducing waste, i.e. diverting waste from landfill.
- Saving primary resources, i.e. substituting primary production.
- Saving energy and associated greenhouse gas emissions through less energy intensive reprocessing.

Components of Block:

Mud Wall

- Mud is a natural material readily available.
- Mud can be used for the foundation system.

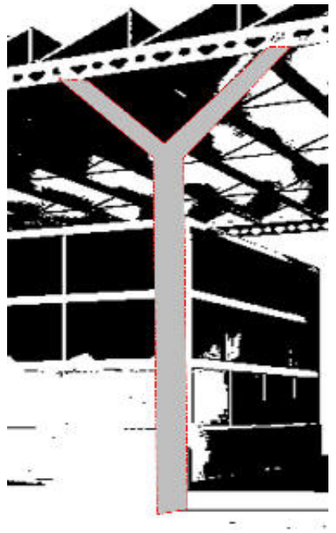


Steel Frame Box

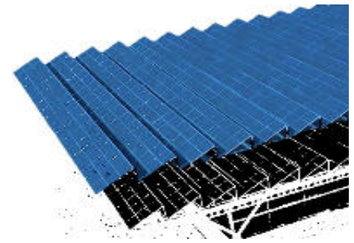
- Steel beams, channels and other structural members can be recycled from iron/steel scrap and they are made from iron/steel channels.

Glass Windows/Doors

- Recycled glass from scrap glass material to make windows, doors and balconies for cleaning windows that are at a height.



RAIN WATER PIPE which acts as a structural member for the Toilet block. These pipes collect the rain water from the roof which can be used for flushing and washing.



SOLAR PANEL ROOF which acts a roofing for the toilet block which harvests the solar energy

DEWATS SYSTEM under the toilet block to convert grey/black water to fresh water which again can be used for flushing and irrigation

Environmental Sustainability

Energy Efficiency is achieved by:

- Collecting rain water through rain water pipes.
- Solar panels and solar lights are provided so that solar energy can be used in place of electricity.
- DEWATS system: toilet water can be recycled for irrigation and W.C.

Economic Sustainability

- Space for advertisements on the façade of the block which would generate revenue for maintenance.
- Renting out of kiosks to third party vendors.

Other Activities Surrounding the Block:

The activities surrounding the Toilet Block are cycle stands, E-Rickshaw Parking, Central Courtyard with a pathway on the central axis with seating for people under shade trees. There are food and other kiosks which cater to visitors.

Cycle stand

E-Rickshaw Parking

Central Pathway within courtyard and seating

4.2 DEWATS System

Rain Water Harvesting Pits:

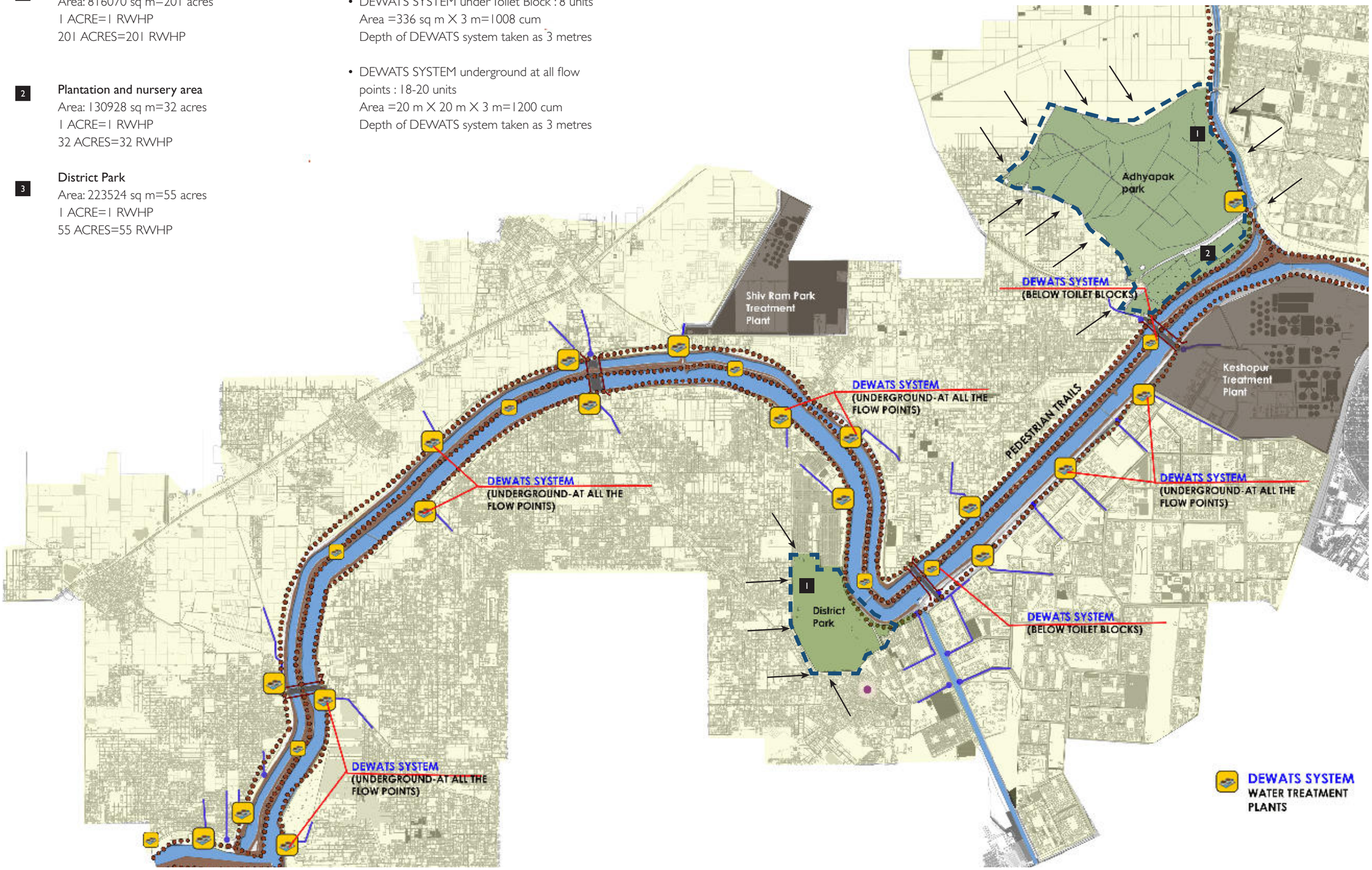
1 **Adhyapak Park**
Area: 816070 sq m=201 acres
1 ACRE=1 RWHP
201 ACRES=201 RWHP

2 **Plantation and nursery area**
Area: 130928 sq m=32 acres
1 ACRE=1 RWHP
32 ACRES=32 RWHP

3 **District Park**
Area: 223524 sq m=55 acres
1 ACRE=1 RWHP
55 ACRES=55 RWHP

DEWATS System

- DEWATS SYSTEM under Toilet Block : 8 units
  Area =336 sq m X 3 m=1008 cum
  Depth of DEWATS system taken as 3 metres
- DEWATS SYSTEM underground at all flow points : 18-20 units
  Area =20 m X 20 m X 3 m=1200 cum
  Depth of DEWATS system taken as 3 metres

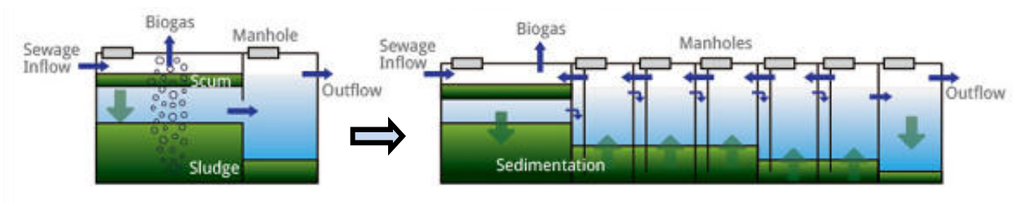


Location of DEWATS system in the overall Najafgarh Waterway Plan

DEWATS System

DEWATS System is a system which converts black/grey water i.e. sewage water (from surrounding areas) to freshwater which is suitable for irrigation and for recharging water bodies. The DEWATS capacity is calculated according to the population density in the surrounding areas of the lake/greens.

Different Processes Involved in DEWATS System

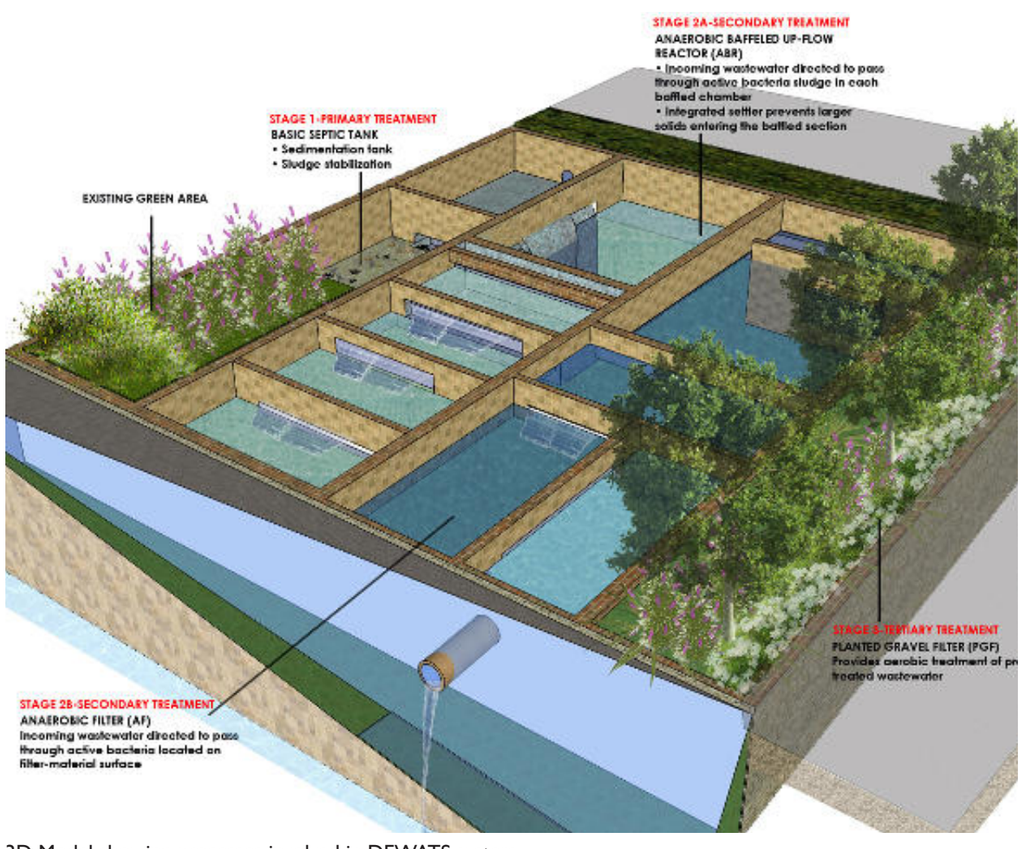


1. Settler

2. Anaerobic Baffled Reactor

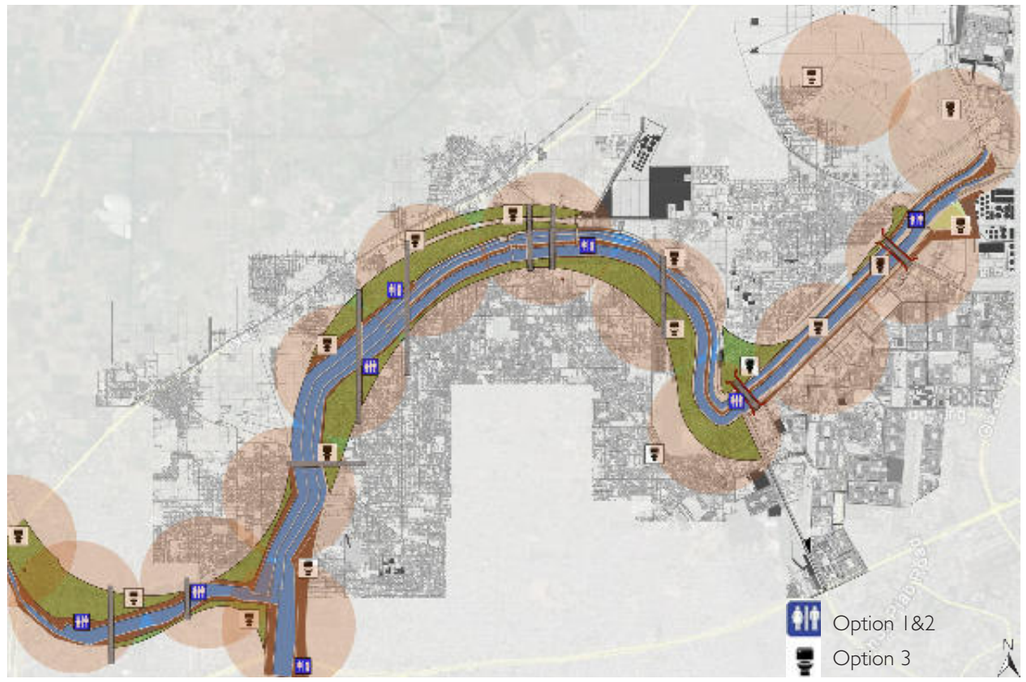
3. Anaerobic Filter

4. Planted Gravel Filter



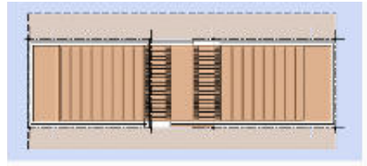
3D Model showing processes involved in DEWATS system

4.3 Toilet and Bridge Design

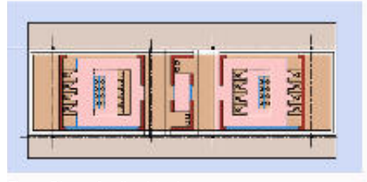


Plan showing different types of Toilets Blocks

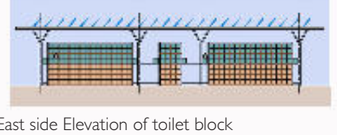
Option 1& 2- Consolidated Unit Toilet Block



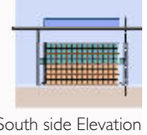
Roof Plan of toilet block



Floor Plan of toilet block



East side Elevation of toilet block

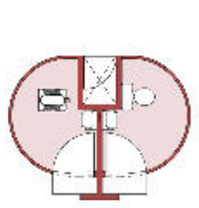


South side Elevation

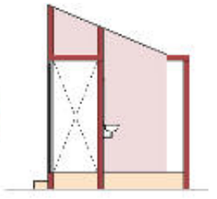
East side Section of toilet block

South side Section

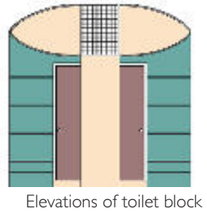
Option 3 -Single Unit Toilet Block (Installed By DUAC)

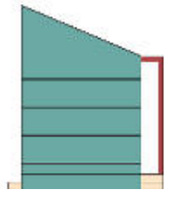


Plan of toilet block

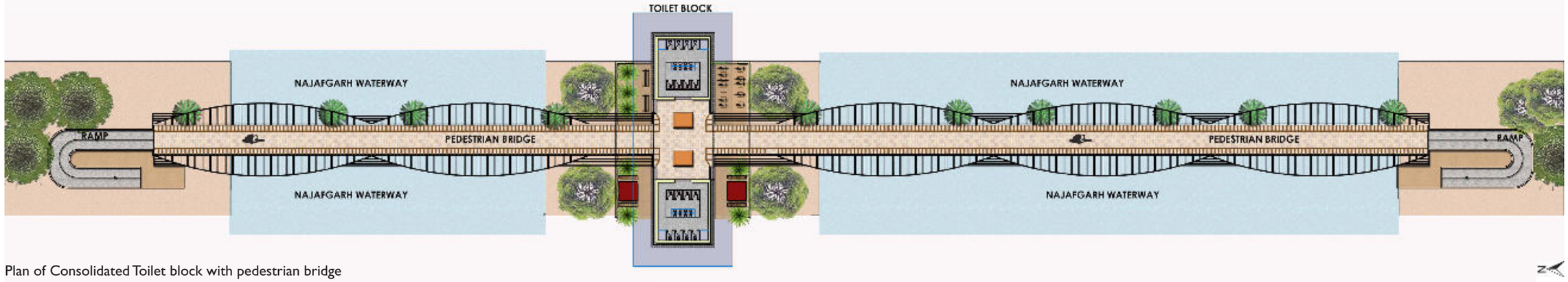


Section of toilet block





Elevations of toilet block



Plan of Consolidated Toilet block with pedestrian bridge

Schematic elevation of Consolidated Toilet block with pedestrian bridge

Key Points:

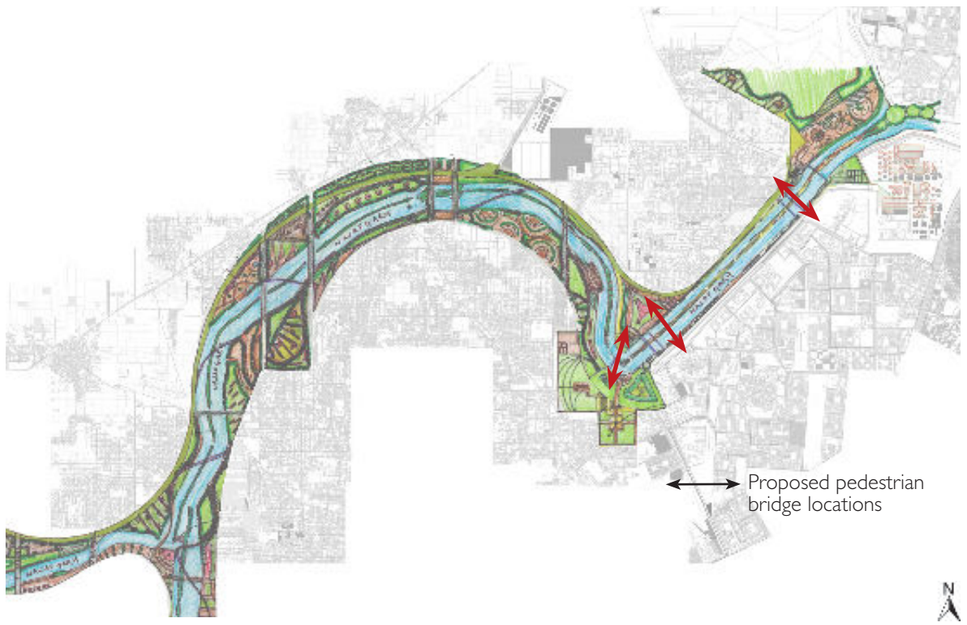
- The Toilet block is a consolidated block which has both male/female toilets with a capacity of 7-8 people (in each block).
- The proposed pedestrian bridge can be used for both pedestrians and cyclists, and is used to cross over from one edge of the waterway to the other.

Solar Panel Orientation

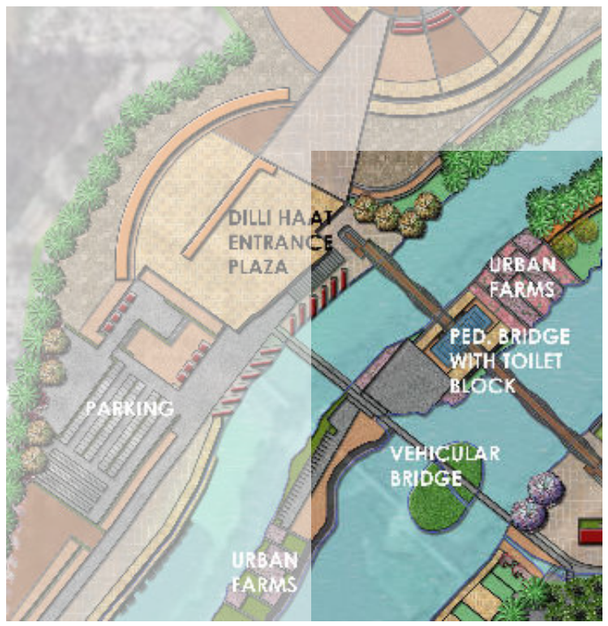
- Tilt angle of solar panel in New Delhi, India: Winter: 54 degrees; Summer:13 degrees.
- In India, as anywhere in the northern hemisphere, solar panels should face southwards.
- At Delhi the declination is only 0.41 east.

How to Determine the true South

- There is an easy method to determine the true south: At solar noon, by definition, the sun shines from true south and thus the shadow cast by any object at solar noon will be along true south to true north.



Key Plan showing pedestrian bridges of Najafgarh Waterway



Part Plan of Najafgarh Waterway

LANDSCAPE DETAILS

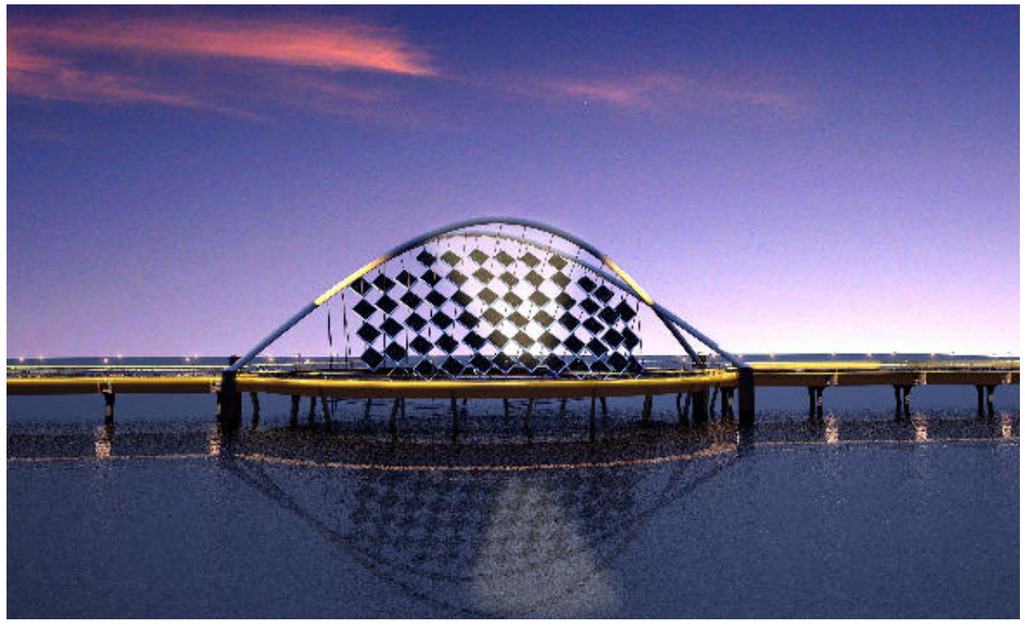
Toilet Block Structure

Nightview showing elevated pedestrian bridge, toilet block and kiosks

LANDSCAPE DETAILS

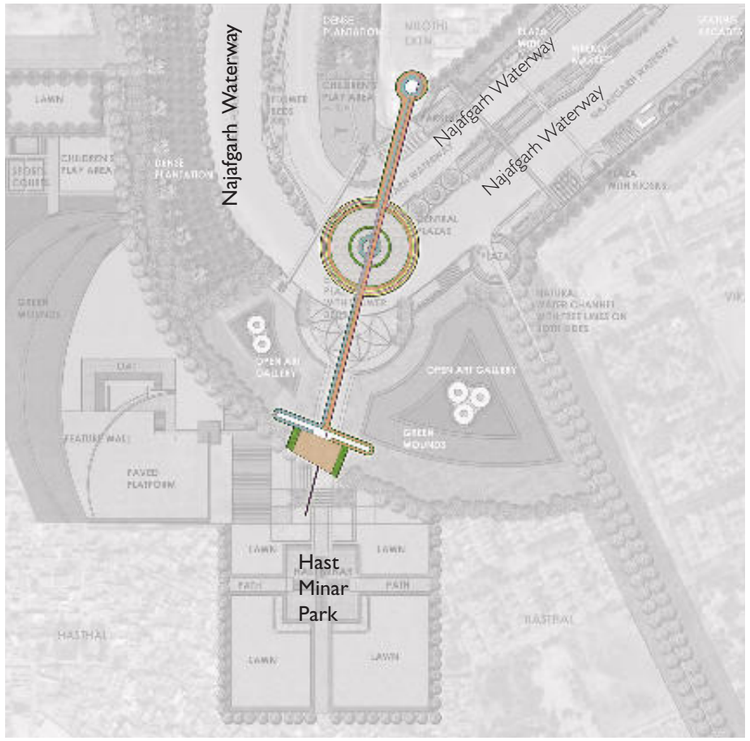
Pedestrian Bridge in Node 2

View showing elevated walkway and cycle track running parallel along the bridge



View showing structure of the elevated bridge with solar panels on both sides placed in the frame

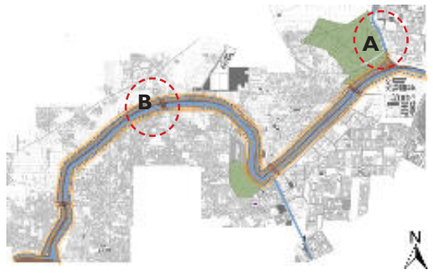
View showing elevated walkway in pedestrian bridge



Plan showing pedestrian bridge in Node 2 of Najafgarh Waterway

4.4 Before/After

A- Existing situation of secondary channel to Najafgarh Waterway



Key plan of edge of Najafgarh Waterway

B- Existing situation of edge of Najafgarh Waterway

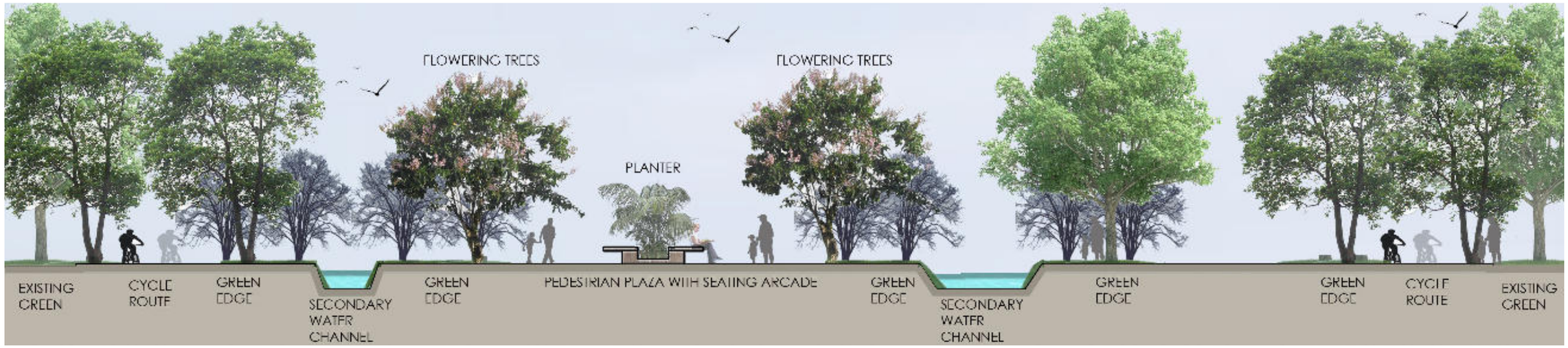
A- Proposed situation of secondary channel to Najafgarh Waterway

B- Proposed situation of edge of Najafgarh Waterway

LANDSCAPE DETAILS

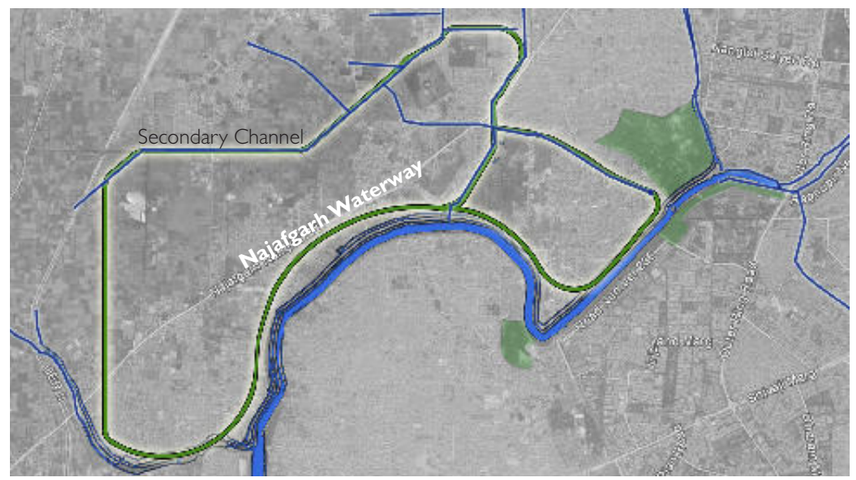
4.5 Secondary Channel Section

Existing section of secondary channels to Najafgarh Waterway



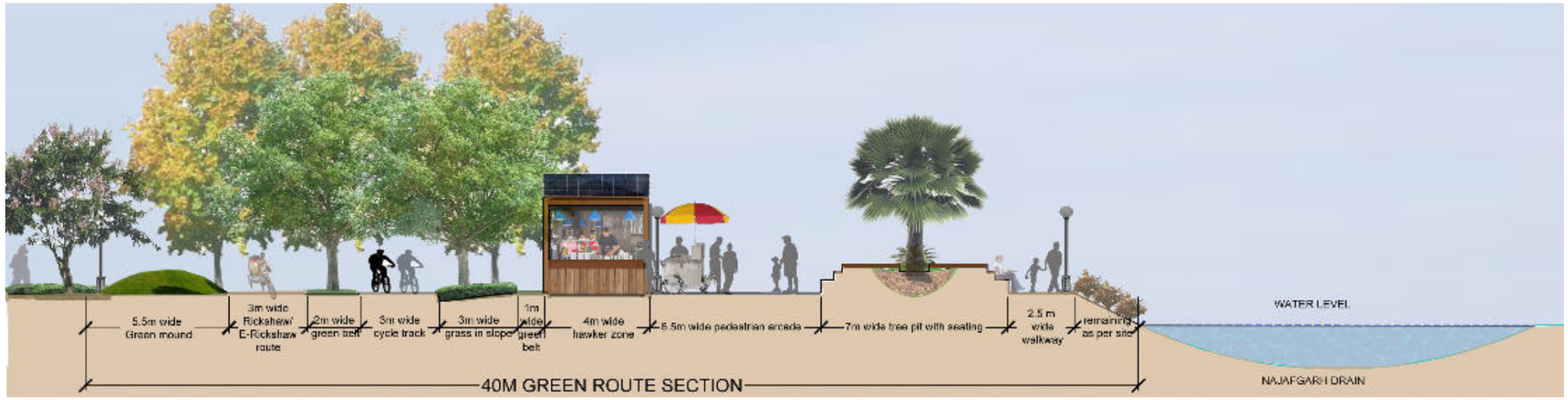
Proposed section of secondary channels to Najafgarh Waterway

Reference image for proposed greenway along secondary channel to Najafgarh Waterway



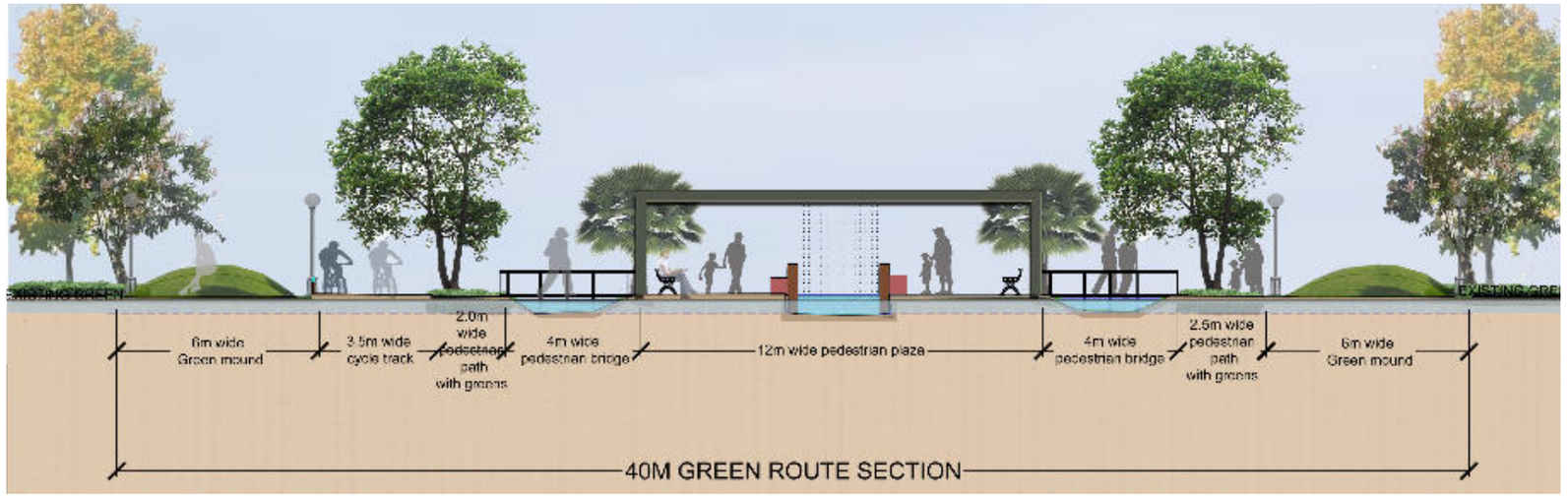
Key plan of Najafgarh Waterway showing secondary channels and tributaries to the Waterway

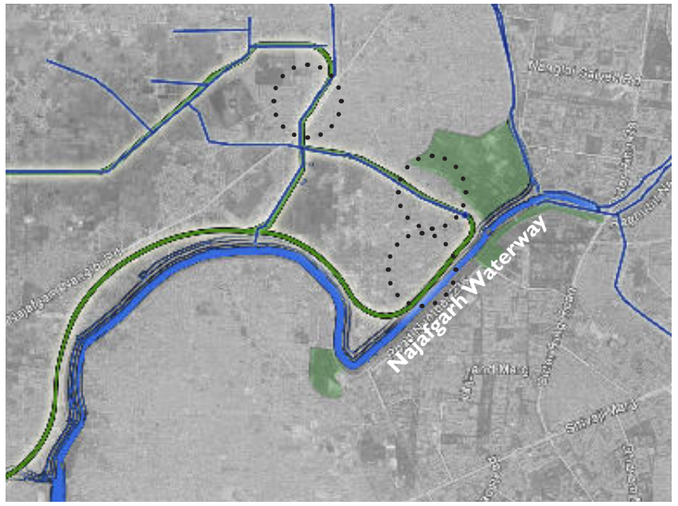
4.6 Green Route Sections



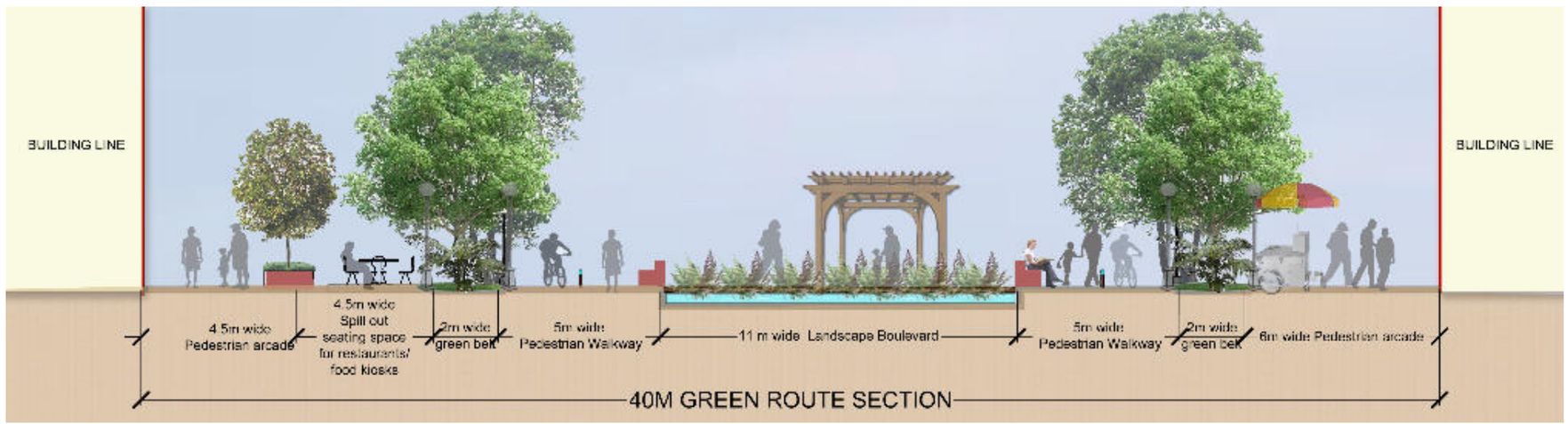
Green Route

- The Green Route has been established on the Natural Drainage Channels/Tributaries which would encourage pedestrian and cyclist trails along the channels making them active and inviting.





Key plan of Najafgarh Waterway showing secondary channels and tributaries to the Waterway

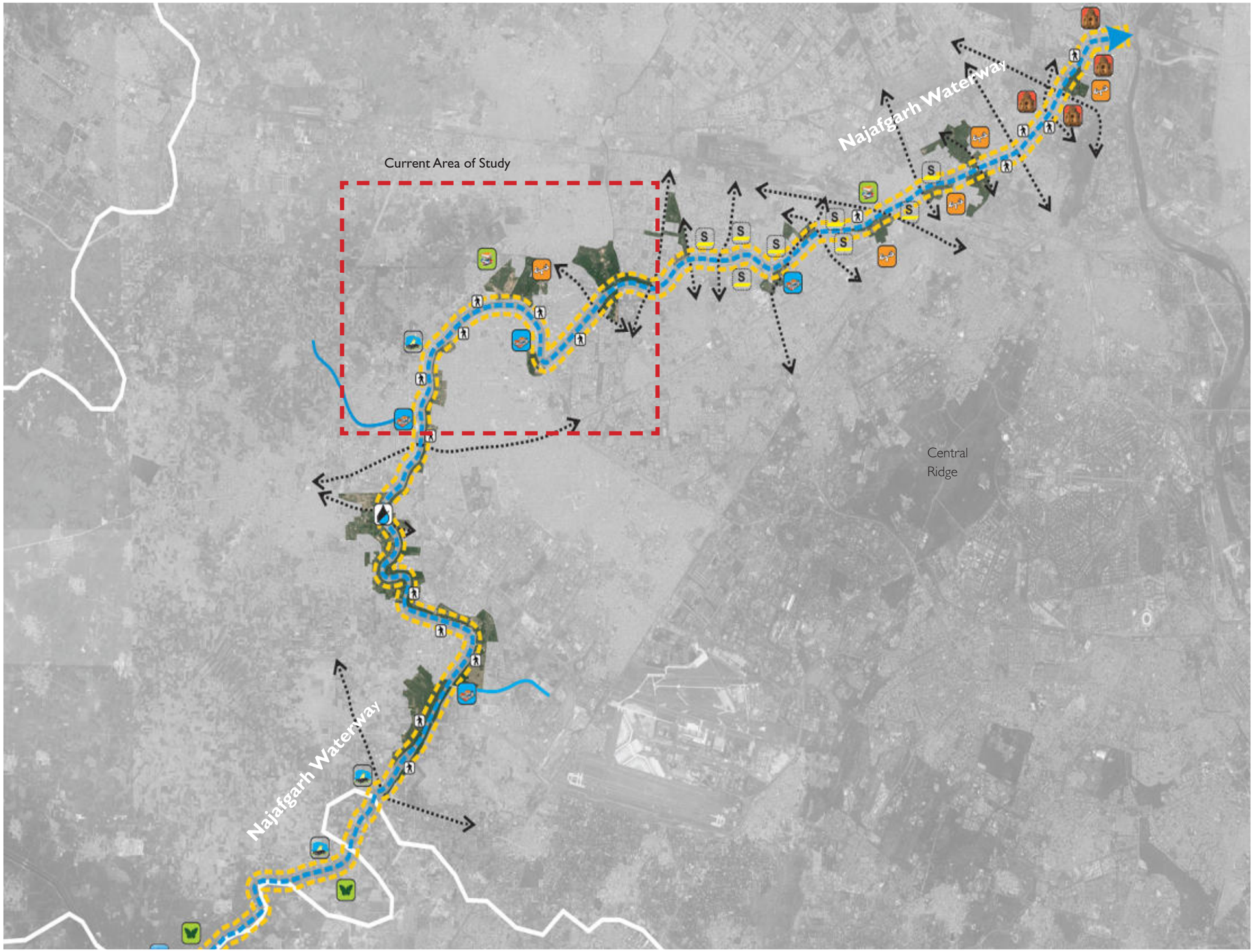


Key Proposed Elements:

- The activities proposed in the green route include spill out areas, pedestrian/cyclists pathways, seating arcade, E-Rickshaw trails, hawker zones, green mounds and plazas.
- All the activities are defined by proper lighting with avenues of trees.
- Food kiosks and public conveniences to be provided for the public with spill out seating space.

LANDSCAPE DETAILS

5 Future Intervention



Plan showing the whole stretch of Najafgarh Waterway with proposed activities

Approach for Najafgarh Waterway

- The entire stretch of Najafgarh Waterway can follow the similar scheme as demonstrated in the design proposal for a small stretch of waterway.
- It can have the same proposed activities like pedestrian walkways with avenue trees, cycle tracks, parking spaces, playgrounds, open display centres, water treatment plants and other similar activities.

LEGEND

- Cycle Track
- Parking
- Institutional Area
- Water Storage
- Playground
- Pedestrian
- Plantation
- Heritage Walk
- Water Treatment Plant
- Solar Plants
- Soft Areas
- Bio Diversity
- Water Purification

(An ISO 9001 : 2008 Certified Organisation)

Delhi Urban Art Commission

The Delhi Urban Art Commission was set up by an Act of Parliament in 1973 to "advise the Government of India in the matter of preserving, developing and maintaining the aesthetic quality of urban and environmental design within Delhi and to provide advice and guidance to any local body in respect of any project of building operations or engineering operations or any development proposal which affects or is like to affect the skyline or the aesthetic quality of the surroundings or any public amenity provided therein".

(An ISO 9001 : 2008 Certified Organisation)

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