

**BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL PRINCIPAL  
BENCH, NEW DELHI**

**Original Application No. 1338/2024**

**IN THE MATTER OF:**

News item titled "A river lost unchecked discharge of industrial effluents and inadequate sewage treatment facilities have turned the Hindon' s water toxic" appearing in Down to Earth dated 16.11.2024

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**Next Date of Hearing : 19/03/2025**

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**ANUJ BHANDARI**

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Counsel for CPCB

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Place: New Delhi

Date:- 17.03.2025

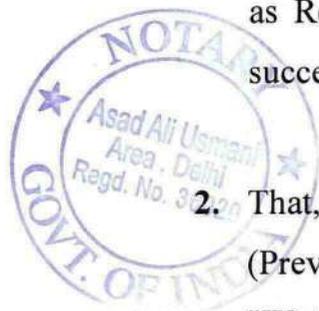
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**IN THE MATTER OF:**

News item titled "A river lost unchecked discharge of industrial effluents and inadequate sewage treatment facilities have turned the Hindon' s water toxic" appearing in Down to Earth dated 16.11.2024

**REPLY ON BEHALF OF CENTRAL POLLUTION CONTROL BOARD  
(CPCB), RESPONDENT NO. 1**

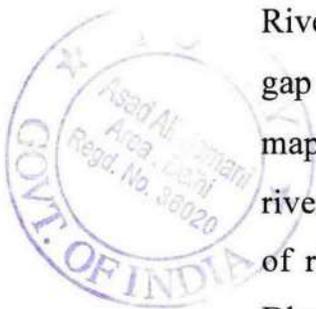
1. That Hon'ble NGT vide Order dated 27.11.2024 and Notice dated 12.12.2024 impleaded the Central Pollution Control Board (hereinafter referred as CPCB) as Respondent no. 02 in the instant matter. Thereby, the reply is made in succeeding paragraphs.



2. That, CPCB is a statutory Board constituted under Section 3 of the Water (Prevention and Control of Pollution) Act, 1974 (hereinafter referred to as "Water Act, 1974"). It performs functions under the Water Act, 1974, the Air (Prevention and Control of Pollution) Act, 1981 (hereinafter referred to as "Air Act, 1981") and the Environment (Protection) Act, 1986.
3. That the instant matter has been taken up over a news item which provides for allegations towards pollution crisis faced by Hindon River flowing through seven districts of Uttar Pradesh. It also alleges that, the river has become a toxic channel, receiving over 72,170 kilolitres per day of industrial effluents from 357 industries and 943 million litres per day of domestic sewage, with more than 220 MLD remaining untreated due to insufficient infrastructure. It also

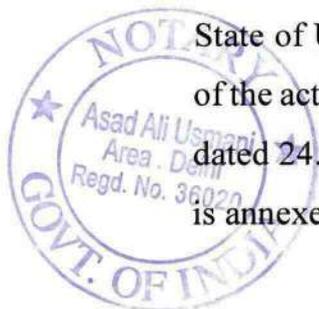
highlights that the Central Pollution Control Board has classified it as a "Priority I" river since 2015 with Biochemical Oxygen Demand levels rising alarmingly from 24-80 mg/l in 2015 to 54-126 mg/l in 2022 and the dissolved oxygen levels have reached zero in most parts. It further highlights that this deterioration is particularly evident in locations like Shimlana Mu village, where residents report over 100 cancer deaths in the last decade, with a cancer incidence rate of 1.3% - significantly higher than the national average of 0.1. Furthermore, the news alleges severe impacts of river pollution. For instance, communities along the river report high instances of cancer, liver problems, skin infections, jaundice, dental issues, and kidney stones. Environmental studies have revealed alarming levels of heavy metals in the water, including lead (179 times above limits), cadmium (9 times above limits), and chromium (123 times above limits).

4. That, in response, it is humbly submitted that a meeting was taken by Secretary, Department of Water Resources, River Development and Ganga Rejuvenation (DoWR, RD & GR), Ministry of Jal Shakti (MoJS) on October 20th, 2022 concerning rejuvenation and pollution abatement plan of River Hindon wherein it was decided that CPCB and NMCG may carry out the pollution source mapping of River Hindon and its tributaries from origin to its confluence with River Yamuna to identify the major issues for water quality deterioration and gap areas in sewage management. CPCB thus conducted pollution source mapping of river Hindon and its tributaries from origin to its confluence with river Yamuna during Nov, 2022-March, 2023 jointly with UPPCB. Monitoring of river Hindon was carried out at 34 locations, Kali-West at 21 locations, Dhamola at 4 locations, Krishni at 5 locations and Yamuna at 2 locations. A total of 55 adjoining drains of river Hindon (26), Kali-West (17), Dhamola (5), Krishni (4) and Yamuna (3). Ground water was also monitored at 31 locations.



5. That, based on the data collected during monitoring and the inventory of polluting sources, a report titled “Pollution Source Mapping of River Hindon & its Tributaries and Restoration Plan for Polluted Stretches” was prepared and forwarded to Secretary, Ministry of Jal Shakti, Chief Secretary, Government of Uttar Pradesh, Additional Chief Secretary, EF & CC Department, Government of Uttar Pradesh, Additional Chief Secretary, IIDC & Infrastructure and Industrial Development Department, Government of Uttar Pradesh, Chief Secretary, Government of Uttarakhand, Principal Secretary, EF & CC, Government of Uttarakhand, Secretary, Industrial Development Department, State of Uttarakhand Chairman , Uttarakhand Pollution Control Board, Director General, National Mission for Clean Ganga vide DO letter dated 11.08.2023. Copies of the D.O. letters are annexed as **Annexure I**. This report includes an analysis of the rivers and drains water quality, an inventory of polluting sources, a list of pollution hotspots, the performance of sewage treatment plants (STPs), groundwater quality. The report also includes a suggested action plan for industrial pollution control, sewage management, and river rejuvenation along with the names of concerned executing State Agencies. The detailed report is annexed as **Annexure II**. The same was also submitted to Hon’ble NGT by answering respondent herein as **Annexure III** to the report dated 09.07.2024 in Original Application no. 512/ 2024 in the matter of News Item titled “Irrigation dept files case against Noida villagers for dumping waste in Hindon” appearing in The Hindustan Times dated 12.03.2024.

It is humbly submitted that this Hon'ble Tribunal vide order dated 24.01.2025 in OA No. 512/2024 has directed Chief Secretary, State of U.P. to file fresh affidavit with regard to implementation of the action plan suggested in the report of CPCB. A copy of order dated 24.1.2025 passed by this Hon'ble Tribunal in OA 512/2024 is annexed herewith as **Annexure IV**.



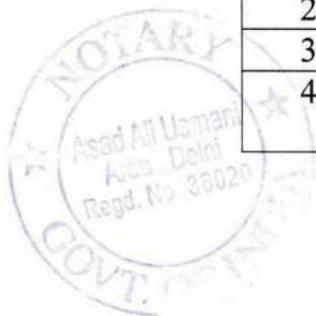
6. The salient findings of the above referred report are as follows:

- a. The Hindon river is a rain fed river. It originates in the Saharanpur district of Uttar Pradesh at a distance of about 3 to 4 km from the Barsani Falls inside the dense forest area of Upper Shiwalik region (lower Himalayas) and traverses through Muzaffarnagar, Meerut, Baghpat, Ghaziabad and Gautam Buddh Nagar districts before it joins Yamuna river in Greater Noida. Dhamola, Kali-West and Krishni are three major tributaries of river Hindon.
- b. The district wise status of river water quality w.r.t DO and BOD is given in table below:

District	Name of river	DO (mg/l)	BOD (mg/l)
Saharanpur	Hindon	0-10.08	7-369
	Dhamola	0- 13.86	1.6 -47
	Kali -west	0.7 - 10.2	1.1 - 6
Saharanpur & Shamli	Krishni	0	57 - 98
Muzaffarnagar	Hindon	0 -0.66	5.0 -13
	Kali -west	0 -5.3	5.0 -348
Meerut & Baghpat	Hindon	0 - 5.96	11 -163
	Krishni	0	16
	Kali West	0	138
Ghaziabad	Hindon	0 - 6.38	3.0 - 28
Gautam Budh Nagar	Hindon	0	9.0 - 66

- c. The river wise heavy metal concentration is given below:

S.No	Name of river	Cr	Cd	Pb
1.	Hindon	BDL-0.05	BDL-0.006	BDL-0.51
2.	Dhamola	BDL-0.01	BDL-0.06	BDL-0.01
3.	Kali -West	BDL-0.06	BDL-0.02	BDL-0.13
4.	Krishni	0.004-0.005	BDL	BDL



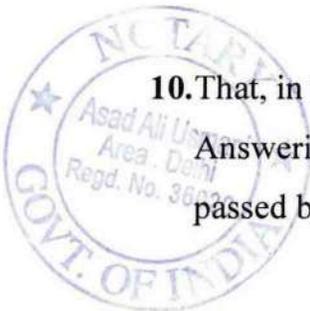
d. As per the report, solid waste dumping was observed in 23 out of total 52 drains monitored by CPCB during November, 2022 – March, 2023.

7. That, it is further humbly submitted that Hon'ble NGT vide its order dated 17.03.2023 in O.A. No. 859 of 2022 in the matter of *Abhisht Kusum Gupta vs State of Uttar Pradesh*, constituted a joint committee headed by Chief Secretary, Uttar Pradesh to take remedial action for control of pollution of Hindon without further delay and also to deploy field monitoring teams to assess the real ground situation.

8. That, with respect to industrial pollution, it is submitted that there are 375 Grossly Polluting Industries (GPIs) (Uttar Pradesh-365; Uttarakhand-10) having potential to discharge into river Hindon. During annual inspection 2023, 42 GPIs (UP-41; UK-01) were non-complying w.r.t discharge norms or not having valid consent to operate. State Pollution Control Boards of Uttarakhand and Uttar Pradesh issued show-cause notices to 31 non-complying GPIs (UK-01; UP-30) and closure directions to remaining 11 non-complying GPIs of Uttar Pradesh. The estimated wastewater discharge from 240 operational GPIs was 42.59 MLD having pollution load of 1.09 TPD in terms of BOD.

9. That, the answering respondent no. 1 craves leave of the Hon'ble Tribunal to file additional reply, if required, in future.

10. That, in the light of the above submissions, it is respectfully submitted that this Answering Respondent, i.e., CPCB, shall abide by any order(s) or direction(s) passed by this Hon'ble Court in the instant OA.



**(Dinabandhu Gouda)**  
Scientist 'F'

Central Pollution Control Board

उत्तर प्रदेश सरकार / उत्तर प्रदेश  
पर्यावरण, वन एवं जल विभाग  
राजधानी क्षेत्र, गान्धी स्मृति  
उत्तर प्रदेश पर्यावरण  
नियंत्रण बोर्ड  
राजधानी क्षेत्र, गान्धी स्मृति  
(Ministry of Environment, Forest & Climate Change, Govt. of U.P.)  
राजधानी क्षेत्र, गान्धी स्मृति  
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**AFFIDAVIT**

I, **Dinabandhu Gouda** working as Scientist 'F' in Central Pollution Control Board, Parivesh Bhawan, East Arjun Nagar, Delhi, the Respondent No. 1 in the above matter, do hereby solemnly affirm, declare on oath and state as under: -

1. That I, the deponent herein is well conversant with the facts and circumstances of the present case on the basis of the information derived from the official records, and hence, I am competent to verify, sign and swear this affidavit on behalf of the Respondent CPCB.
2. That the accompanying reply may be read part and parcel of the present affidavit as I am competent to swear this affidavit.
3. That the accompanying reply has been drafted and filed under my instructions and authority the contents thereof are true and correct on the basis of the record maintained during ordinary course of business of CPCB and available records and documents and the contents of the same are read over and explained to me and are not repeated herein for the sake of brevity.

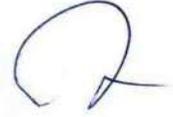


**DEPONENT**

**दीनबन्धु गौड़ा / Dinabandhu Gouda**  
प्रभागीय प्रमुख, डबल्यू क्यू एम-II / Division Head, WOM-II  
**केन्द्रीय प्रदूषण नियंत्रण बोर्ड**  
**Central Pollution Control Board**  
(पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय, भारत सरकार.)  
(M/o Environment, Forest & Climate Change, Govt. of India)  
परिवेश भवन, पूर्वी अर्जुन नगर, दिल्ली-110032  
Parivesh Bhawan, East Arjun Nagar, Delhi-110032

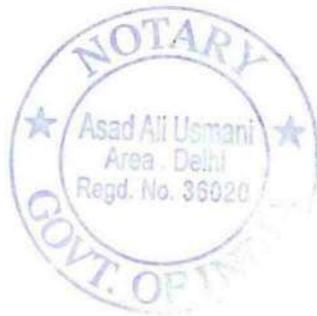
### VERIFICATION

Verified at Delhi on this day of 17 MAR 2025 that the contents of the above reply are correct and true on the basis of the records of the case as mentioned in the day-to-day affairs of the CPCB. Nothing has been concealed therefrom or mis- stated.



**DEPONENT**

दीनबन्धु गौड़ा / Dinabandhu Gouda  
 प्रभागीय प्रमुख, डिविजन एम-II / Division Head, WQM-II  
 केंद्रीय प्रदूषण नियंत्रण बोर्ड  
**Central Pollution Control Board**  
 (पर्यावरण, वन एवं जलवायु परिवर्तन विभाग, भारत सरकार)  
 (Mo Environment, Forest & Climate Change, Govt. of India)  
 परिवेश भवन, पूर्वी अर्जुन नगर, दिल्ली-110032  
 Parivesh Bhawan, East Arjun Nagar, Delhi-110032



**ATTESTED**

*AAU*

NOTARY PUBLIC DELHI (INDIA)

17 MAR 2025



तन्मय कुमार, भा.प्र.से.  
अध्यक्ष

Tanmay Kumar, I. A. S.  
Chairman



केन्द्रीय प्रदूषण नियंत्रण बोर्ड

पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय, भारत सरकार

CENTRAL POLLUTION CONTROL BOARD

MINISTRY OF ENVIRONMENT, FOREST & CLIMATE CHANGE, GOVT. OF INDIA

DO No. PJ-14099/36/2022-WQM-II-HO-CPCB-HO

August 11, 2023

*Respected Sir,*

Monitoring of River Hindon, its tributaries and drains was carried out during Nov-Dec, 2022 and Jan-Mar, 2023 by teams of officials from Central Pollution Control Board (CPCB), Uttar Pradesh Pollution Control Board (UPPCB) and Uttarakhand Pollution Control Board (UKPCB). Inventory of polluting sources was also prepared. Discussions were also held with officials from UPPCB, Central Ground Water Board, Central Public Works Department, Central Water Commission, Groundwater Department, U.P. and National Mission for Clean Ganga (NMCG) on 18/11/2022 and 20/01/2023 to identify the remedial measures for rejuvenation of River Hindon.

CPCB forwarded an interim report on River Hindon Pollution to NMCG & UPPCB on 09/01/2023 for necessary action. CPCB also communicated list of polluting drains to UPPCB vide letters dated 13/01/2023, 07/02/2023, 13/02/2023 and 20/03/2023 for necessary action.

I would also like to invite your attention to the meetings held under the Chairmanship of Secretary, Ministry of Jal Shakti on 20/10/2022 on River Hindon pollution and between Secretary, DoWR, RD & GR, MoJS and Secretary, Ministry of Environment, Forest & Climate Change (MoEF&CC) on 30/11/2022 as well as Committee constituted under Chairmanship of Chief Secretary, Government of Uttar Pradesh regarding pollution control in river Hindon, vide NGT order dated 17/03/2023 in OA No. 859/2022 in the matter of Abhisht Kusum Gupta vs State of Uttar Pradesh & Ors.

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Considering the importance of the matter, I solicit your kind attention and intervention in the matter. CPCB would be willing to provide any technical assistance as may be required.

*Sincere regards,*

Yours sincerely,

*Tanmay Kumar*  
11/8/22

(Tanmay Kumar)

Shri Manoj Singh,  
Additional Chief Secretary,  
Environment, Forest & Climate Change Department, Govt. of Uttar Pradesh,  
17, Rana Pratap Marg, Lucknow – 226001

Encl.: As above



'परिवेश भवन, पूर्वी अर्जून नगर, दिल्ली-110 032, भारत

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सत्यमेव जयते

## केन्द्रीय प्रदूषण नियंत्रण बोर्ड

पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय, भारत सरकार

**CENTRAL POLLUTION CONTROL BOARD**

MINISTRY OF ENVIRONMENT, FOREST & CLIMATE CHANGE, GOVT. OF INDIA

DO No. PJ-14099/36/2022-WQM-II-HO-CPCB-HO

August 11, 2023

Monitoring of River Hindon, its tributaries and drains was carried out during Nov-Dec, 2022 and Jan-Mar, 2023 by teams of officials from Central Pollution Control Board (CPCB), Uttar Pradesh Pollution Control Board (UPPCB) and Uttarakhand Pollution Control Board (UKPCB). Inventory of polluting sources was also prepared. Discussions were also held with officials from UPPCB, Central Ground Water Board, Central Public Works Department, Central Water Commission, Groundwater Department, U.P. and National Mission for Clean Ganga (NMCG) on 18/11/2022 and 20/01/2023 to identify the remedial measures for rejuvenation of River Hindon.

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CPCB, based on the data collected during monitoring & inventory of polluting sources, has prepared a report titled "Pollution Source Mapping of River Hindon & its Tributaries and Restoration Plan for Polluted Stretches" (copy enclosed) which incorporates water quality of river, list of hotspots, inventory of polluting sources, performance of STPs, groundwater quality & suggestive action plan incorporating measures for the industrial pollution control, sewage management as well as river rejuvenation. About 17 hotspots on river Hindon, its tributaries & drains have been identified for priority action. District-wise task force/executive committee may be constituted to carry out ground verification, inventory of polluting sources and to ensure pollution control measures being taken to restore the quality at these locations/stretches in a time bound manner.

Considering the importance of the matter, I solicit your kind attention and intervention in the matter. CPCB would be willing to provide any technical assistance as may be required.

Yours sincerely,

  
(Tanmay Kumar)

**Shri Manoj Singh**,  
Additional Chief Secretary,  
Environment, Forest & Climate Change Department, Govt. of Uttar Pradesh,  
17, Rana Pratap Marg, Lucknow – 226001

Encl.: As above

**Copy to,**

1. **Mrs. Leena Nandan,**  
Secretary,  
Ministry of Environment, Forest & Climate Change,  
Indira Paryavaran Bhawan,  
Jorbagh Road, New Delhi – 110003
2. **Shri Pankaj Kumar,**  
Secretary,  
Ministry of Jal Shakti,  
Shram Shakti Bhawan, Rafi Marg,  
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3. **Shri Durga Shanker Mishra,**  
Chief Secretary,  
Government of Uttar Pradesh,  
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Lucknow - 226001
- ✓ 4. **Shri Manoj Kumar Singh,**  
Additional Chief Secretary,  
IIDC, Infrastructure & Industrial Development Department,  
Block C, Lok Bhawan, Sarojini Naidu Marg,  
Lucknow - 226 001. (U.P.)
5. **Chairman,**  
Uttar Pradesh Pollution Control Board,  
Building. No. TC-12V, Vibhuti Khand, Gomti Nagar,  
Lucknow-226 010
6. **Shri G Asok Kumar,**  
Director General,  
National Mission for Clean Ganga,  
1<sup>st</sup> Floor, Major Dhyan Chand National Stadium,  
India Gate, New Delhi - 110002

13/8/23  
(Tanmay Kumar)



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DO No. PJ-14099/36/2022-WQM-II-HO-CPCB-HO

August 11, 2023

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CPCB forwarded an interim report on River Hindon Pollution to NMCG on 09/01/2023 for necessary action. CPCB vide letter dated 23/02/2023 asked to UKPCB to provide information of water polluting industries discharging into Kali-West through Shila Khala drain.

I would also like to invite your attention to the meetings held under the Chairmanship of Secretary, Ministry of Jal Shakti on 20/10/2022 on River Hindon pollution and between Secretary, DoWR, RD & GR, MoJS and Secretary, Ministry of Environment, Forest & Climate Change (MoEF&CC) on 30/11/2022 as well as Committee constituted under Chairmanship of Chief Secretary, Government of Uttar Pradesh regarding pollution control in river Hindon, vide NGT order dated 17/03/2023 in OA No. 859/2022 in the matter of Abhisht Kusum Gupta vs State of Uttar Pradesh & Ors.

CPCB, based on the data collected during monitoring & inventory of polluting sources, has prepared a report titled "Pollution Source Mapping of River Hindon & its Tributaries and Restoration Plan for Polluted Stretches" (copy enclosed) which incorporates water quality of river, list of hotspots, inventory of polluting sources, performance of STPs, groundwater quality & suggestive action plan incorporating measures for the industrial pollution control, sewage management as well as river rejuvenation. The Shila Khala drain discharging into river Kali-West from AIS Industrial area Jhabrera, Haridwar, has been identified for priority action. A task force/executive committee may also be constituted at district level to ensure ground verification, inventory of pollution sources and pollution control measures to restore water quality at these stretches/drains in a time-bound manner.

Considering the importance of the matter, I solicit your personal attention and intervention in the matter. CPCB would be willing to provide any technical assistance as may be required.

Yours sincerely,

  
(Tanmay Kumar)

Shri Ramesh Kumar Sudhanshu,  
Principal Secretary,  
Forest, Environment & Climate Change Department,  
Government of Uttarakhand,  
4 Subhash Road, Uttarakhand Secretariat, Dehradun-248001

Encl.: As above

**Copy to,**

1. **Mrs. Leena Nandan,**  
Secretary,  
Ministry of Environment, Forest & Climate Change,  
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Jorbagh Road, New Delhi-110003
2. **Shri Pankaj Kumar,**  
Secretary,  
Ministry of Jal Shakti,  
Shram Shakti Bhawan, Rafi Marg,  
New Delhi-110001
3. **Shri S. S. Sandhu,**  
Chief Secretary,  
Government of Uttarakhand,  
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Dehradun-248001, Uttarakhand
4. **Shri G Asok Kumar,**  
Director General,  
National Mission for Clean Ganga,  
1<sup>st</sup> Floor, Major Dhyan Chand National Stadium,  
India Gate, New Delhi-110002
5. **Chairman,**  
Uttarakhand Pollution Control Board,  
Gaura Devi Bhawan, 46 B IT Park Sahastradhara,  
Dehradun-248001, Uttarakhand
6. **Shri Vinay Shankar Pandey,**  
Secretary,  
Industrial Development Department,  
Government of Uttarakhand,  
4 Subhash Road, Uttarakhand Secretariat, Dehradun-248001

M.S. 11/8/23  
(Tanmay Kumar)



सत्यमेव जयते

**केन्द्रीय प्रदूषण नियंत्रण बोर्ड**  
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय, भारत सरकार  
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MINISTRY OF ENVIRONMENT, FOREST & CLIMATE CHANGE, GOVT. OF INDIA

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17, Rana Pratap Marg, Lucknow – 226001

Encl.: As above

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तन्मय कुमार, भा.प्र.से.  
अध्यक्ष  
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15/8/23  
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सत्यमेव जयते

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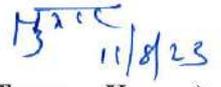
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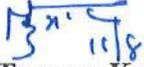
  
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National Mission for Clean Ganga,  
1<sup>st</sup> Floor, Major Dhyan Chand National Stadium,  
India Gate, New Delhi - 110002

  
(Tanmay Kumar)

**केन्द्रीय प्रदूषण नियंत्रण बोर्ड**

पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय, भारत सरकार

**CENTRAL POLLUTION CONTROL BOARD**

MINISTRY OF ENVIRONMENT, FOREST &amp; CLIMATE CHANGE, GOVT. OF INDIA

DO No. PJ-14099/36/2022-WQM-II-HO-CPCB-HO

August 11, 2023

Monitoring of River Hindon, its tributaries and drains was carried out during Nov-Dec, 2022 and Jan-Mar, 2023 by teams of officials from Central Pollution Control Board (CPCB), Uttar Pradesh Pollution Control Board (UPPCB) and Uttarakhand Pollution Control Board (UKPCB). Inventory of polluting sources was also prepared. Discussions were also held with officials from UPPCB, Central Ground Water Board, Central Public Works Department, Central Water Commission, Groundwater Department, U.P. and National Mission for Clean Ganga (NMCG) on 18/11/2022 and 20/01/2023 to identify the remedial measures for rejuvenation of River Hindon.

CPCB forwarded an interim report on River Hindon Pollution to NMCG on 09/01/2023 for necessary action. CPCB vide letter dated 23/02/2023 asked to UKPCB to provide information of water polluting industries discharging into Kali-West through Shila Khala drain.

I would also like to invite your attention to the meetings held under the Chairmanship of Secretary, Ministry of Jal Shakti on 20/10/2022 on River Hindon pollution and between Secretary, DoWR, RD & GR, MoJS and Secretary, Ministry of Environment, Forest & Climate Change (MoEF&CC) on 30/11/2022 as well as Committee constituted under Chairmanship of Chief Secretary, Government of Uttar Pradesh regarding pollution control in river Hindon, vide NGT order dated 17/03/2023 in OA No. 859/2022 in the matter of Abhisht Kusum Gupta vs State of Uttar Pradesh & Ors.

CPCB, based on the data collected during monitoring & inventory of polluting sources, has prepared a report titled "Pollution Source Mapping of River Hindon & its Tributaries and Restoration Plan for Polluted Stretches" (copy enclosed) which incorporates water quality of river, list of hotspots, inventory of polluting sources, performance of STPs, groundwater quality & suggestive action plan incorporating measures for the industrial pollution control, sewage management as well as river rejuvenation. The Shila Khala drain discharging into river Kali-West from AIS Industrial area Jhabrera, Haridwar, has been identified for priority action. A task force/executive committee may also be constituted at district level to ensure ground verification, inventory of pollution sources and pollution control measures to restore water quality at these stretches/drains in a time-bound manner.

Considering the importance of the matter, I solicit your personal attention and intervention in the matter. CPCB would be willing to provide any technical assistance as may be required.

Yours sincerely,

  
(Tanmay Kumar)

**Shri Ramesh Kumar Sudhanshu,**  
Principal Secretary,  
Forest, Environment & Climate Change Department,  
Government of Uttarakhand,  
4 Subhash Road, Uttarakhand Secretariat, Dehradun-248001

Encl.: As above

**Copy to,**

1. **Mrs. Leena Nandan,**  
Secretary,  
Ministry of Environment, Forest & Climate Change,  
Indira Paryavaran Bhawan,  
Jorbagh Road, New Delhi-110003
2. **Shri Pankaj Kumar,**  
Secretary,  
Ministry of Jal Shakti,  
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6. **Shri Vinay Shankar Pandey,**  
Secretary,  
Industrial Development Department,  
Government of Uttarakhand,  
4 Subhash Road, Uttarakhand Secretariat, Dehradun-248001

13/11/23  
(Tanmay Kumar)

**BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL**  
**PRINCIPAL BENCH, NEW DELHI**  
**Original Application No. 512 of 2024**

**In the matter of:**

News Item titled "Irrigation dept files case against Noida villagers for dumping waste in Hindon" appearing in The Hindustan Times dated 12.03.2024

**Index**

<b>Sr. No.</b>	<b>Particulars</b>	<b>Page No.</b>
1.	<b>Report of Central Pollution Control Board</b> in Original Application No. 512/2024 titled as News Item titled "Irrigation dept files case against Noida villagers for dumping waste in Hindon" appearing in The Hindustan Times dated 12.03.2024 in compliance to Hon'ble NGT order dated 10.05.2024	
2.	<b>Annexure – I</b> Filed Report in Original Application no. 859/ 2022 titled Abhisht Kumar Gupta Versus State of UP & Ors.	
3.	<b>Annexure – II</b> A copy of Hon'ble NGT order dated 10.05.2024	

*Ajit Kumar Vidyarthi*

(A. K. Vidyarthi)

Scientist 'F'

Central Pollution Control Board

Date: 09.07.2024

Place: Delhi

**Report**  
**on**  
**Dumping of Waste and Pollution in**  
**River Hindon**

**in Compliance to**

**Hon'ble NGT Order**  
**dated 10.05.2024**

**in the matter of**

**OA No. 512/2024**

## **Date of Inspection: 18 June, 2024**

### **1. Background**

This Original Application was registered suo-motu on the basis of a news item titled "Irrigation dept files case against Noida villagers for dumping waste in Hindon," which appeared in The Hindustan Times on 12.03.2024. The matter concerns waste dumping in the Hindon River in Noida, Uttar Pradesh. According to the article, the irrigation department has reported that villagers in Phase 3 of Noida are frequently dumping waste into the Hindon River, causing increasing pollution. The news item suggests violations of the Water (Prevention and Control of Pollution) Act, 1974, Solid Waste Management Guidelines, 2016, and the provisions of the Environment Protection Act, 1986.

### **2. Order of Hon'ble NGT Dated 10.05.2024**

The Hon'ble NGT in O.A. No. 512/2024, based on news item titled "Irrigation dept case against Noida villagers for dumping waste in Hindon," which appeared in The Hindustan Times on 12.03.2024; passed the following directions vide its order dated 10.05.2024

*"7. Hence, we implead following as respondents in this matter:*

- i. *Uttar Pradesh Pollution Control Board, through its Member Secretary, Building No. TC-12V, Vibhuti Khand, Gomti Nagar, Lucknow – 226 010*
- ii. *Central Pollution Control Board (CPCB), through its Member Secretary, Parivesh Bhawan, East Arjun Nagar, Delhi-110032*
- iii. *District Magistrate, Noida (G.B. Nagar), Room No. 133, Collectorate, Surajpur, Greater Noida:*

*9. Respondent No. 2 i.e. CPCB is directed to file a detailed comprehensive report in respect of dumping of waste and pollution in River Hindon."*

### **3. Introduction**

River Hindon originates from the lower Himalayas in Saharanpur district, Uttar Pradesh and flows 260 km through six districts, including Muzaffarnagar, Meerut, Baghpat, Ghaziabad and Gautambudh Nagar until its confluence with the river Yamuna.

The River Hindon enters Noida near the village of Chijarsi in the Gautam Buddha Nagar district of Uttar Pradesh, India. From there, it traverses between Noida and Greater Noida regions of Gautam Buddha Nagar before meeting into the Yamuna River near Village Tilwara in Greater Noida.

#### **4. Site Visit**

A team of officials from CPCB, UPPCB and Noida Authority, conducted monitoring of complaint sites near Village Garhi Chaukhandi dated 18.06.2024 and tracked river Hindon from complaint area to downstream to identify any illegal dumping site along river Hindon.

Names and designation of the officers present during the site visit have been enlisted hereunder:

- a. Sri Jagpal Singh, Sanitary Inspector, Health, Noida Auhtority.
- b. Shri Umesh Chandra, Assistant Project Engineer (Health), Health, Noida Authority
- c. Shri Arun Kumar, Assistant Project Engineer (Health), Noida Authority
- d. Dr. R.K Singh, Scientist 'D', Central Pollution Control Board
- e. Dr. Prabhat Ranjan, Scientist 'B', Central Pollution Control Board
- f. Shri Kishan Singh, Assistant Environmental Engineer, UPPCB, Noida

##### **4.1. Existing Status**

The team visited to Village Chaukhandi for survey/ monitoring of solid waste dumping and also inspected the area along the Hindon River. Solid waste dumping was observed along the river near village Garhi Chaukhandi and Behlolpur, specifically at latitude 28.60828 and longitude 77.4036, in front of Garhi Marghat. On the opposite bank of the river lies Village Haibatpur, though encroachment has been done in flood plain on the right bank as well but no dumping of solid waste was observed on the right bank; the issue was confined to Garh Marghat area of village Garhi Chaukhandi.

The joint team also enquired nearby residents and shop owners, who reported that unidentified vehicles were dumping construction and demolition waste at the site along the Hindon River. The officials from Noida Authority stated they had no information regarding the dumping and denied that the area was under their jurisdiction. According to the Noida Authority official, the area is a floodplain (Doob area) under the Irrigation Department's jurisdiction, and they had never received any complaints about unauthorized dumping there. Additionally, there was no GPS tracking system available in the waste transporting vehicles to track the route and specific dumping sites. As per estimate around 200 metric tonnes of waste (mostly C&D waste) was found dumped at the said site.



Figure 1. Solid waste dumped along river Hindon at Garhi Chaukhandi

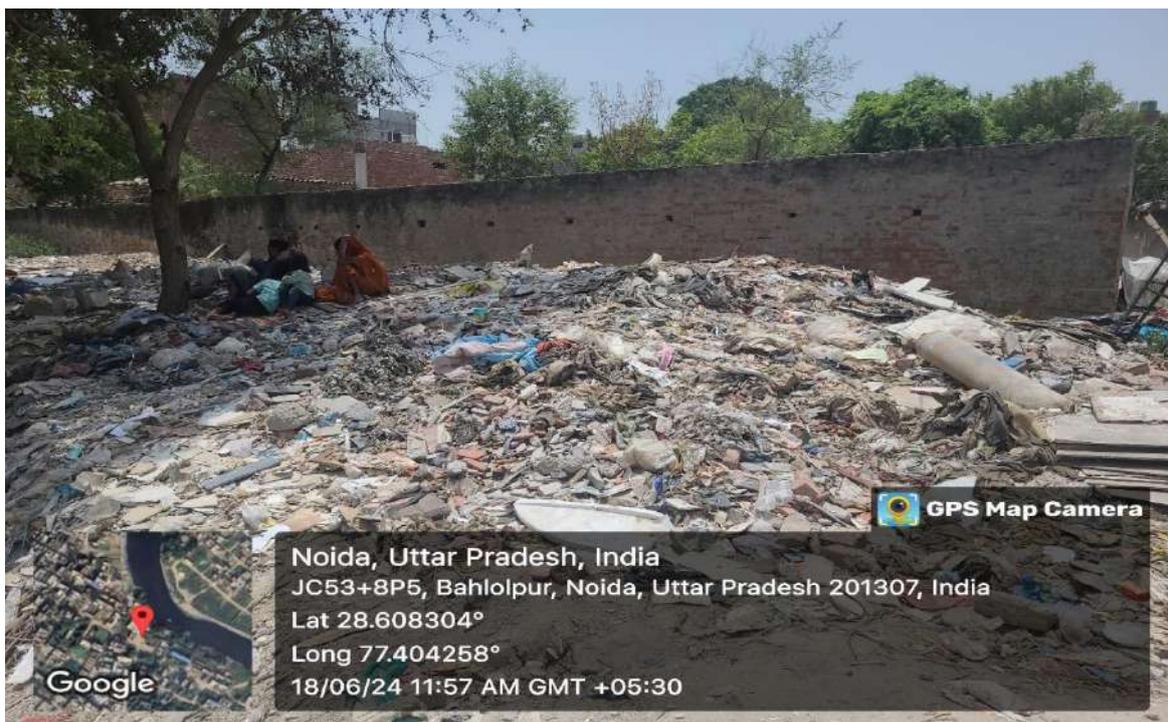


Figure 2. Solid waste dumped along river Hindon at Garhi Chaukhandi

In area around Garhi Chaukhandi, it was observed that several rag pickers have made temporary hutments in the area and are engaged in collection of municipal solid waste and recyclables.



Figure 3. Waste disposal in Village of Garhi Chaukhandi.



Figure 4. Waste Disposal in village Garhi Chaukhandi

#### 4.2. Monitoring of river water quality

To assess the impact of waste dumping on the Hindon River, water samples have been collected from the following locations:

- Upstream of the dumping site, under the flyover near Village - Chajarsi

- Downstream of the dumping under the flyover of Gaur City-1
- At the dumping location at Garhi Marghat, Village Garhi Chaukhandi



Figure 5. Sample collection at downstream of Solid Waste disposal site at flyover near Gaur City – 1

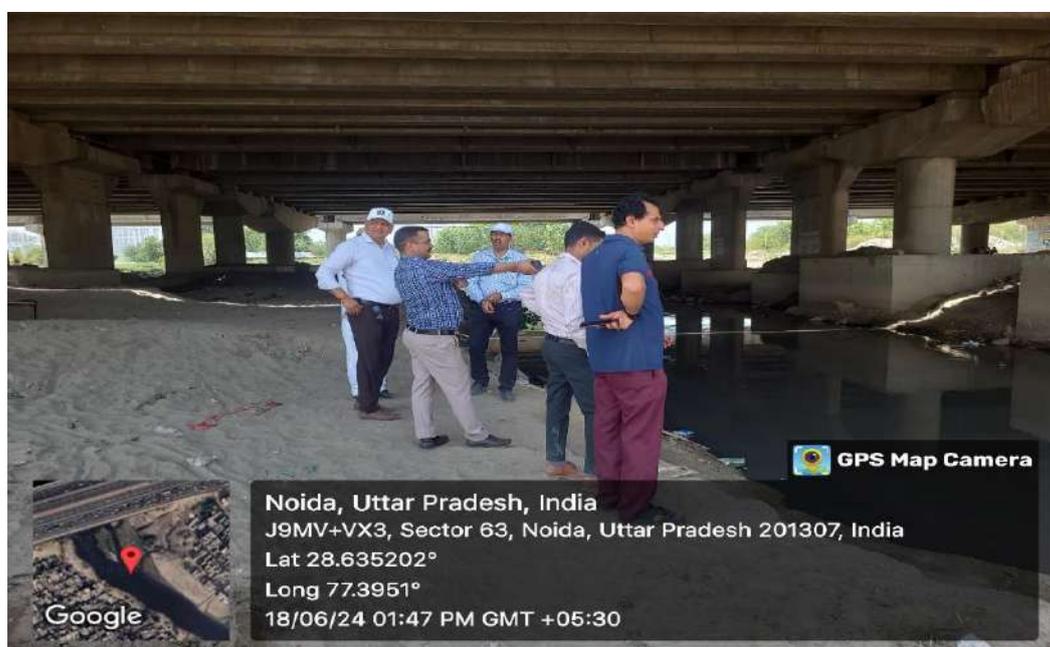


Figure 6. Joint monitoring Committee at sampling location near Village Chajarsi, upstream of Solid Waste Disposal site

The sample analysis results of the water sample collected from river Hindon is given as below:

Parametrs	At Garh Marghat, Garhi Chaukhandi (H1)	Downstream of Solid Waste Disposal Site at Flyover near Gaur City-1 (H2)	Upstream of Solid Waste Disposal Site at Village Chajarsi (H3)
Colour	BDL	BDL	BDL
pH	7.4	7.3	7.3
COD	132	231	149
BOD	58	74	45
TSS	57	103	158
TDS	1512	1276	1192
PO4-P	2.34	0.85	2.27
NO2-N	0.04	9.86	1.14
NO3-N	14.5	4.34	13.7
Sulphate	123	111	129

#### 5. Observations:

- Near Garh Marghat, Village Garhi Chaukhandi, along the Hindon River, a huge pile of solid waste, primarily consisting of construction and demolition (C&D) waste, has been dumped.
- The estimated amount of solid waste dumped in the Garhi Chaukhandi area along the Hindon River is around 200 metric tonnes.
- Several scrap dealers/rag pickers inhabit the Garhi Chaukhandi area, contributing to the accumulation of solid waste piles around the village.
- The encroachment in the flood plain of river Hindon was observed.
- The pollution level in terms of BOD (74 mg/L), COD (231 mg/L) and NO<sub>2</sub>N (9.86 mg/L) was found increased at Downstream of Solid Waste Disposal Site at Flyover near Gaur City-1 as compared to Upstream of Solid Waste Disposal Site at Village Chajarsi.
- Although entire stretch is polluted having BOD>40 mg/L and COD>130 mg/L with slight increase in pollution load at downstream locations may be due to discharge of untreated domestic wastewater/leachates from dumping site in river Hindon

#### 6. Recommendations:

The solid waste management plan needs to be formulated and implemented by State government agencies for the present sites with legacy solid waste management as well measures to avoid solid waste dumping in future. District Administration shall issue necessary

directions/ instruction to concerned authorities for removal and proper management of solid waste including construction and demolition waste as observed by the team dumped at Garh Marghat, Garhi Chaukhandi (Lat: 28.608304 and Long: 77.404258) in co-ordination with UPPCB. The person(s) responsible for dumping of waste shall be identified by Police and strict action shall be initiated. Further, the Noida authority and Police department may sensitize residents in and around Garhi Chaukhandi to be vigilant and immediately report in case of illegal transportation/dumping of wastes.

### **6.1 The concerned authority shall ensure following for the compliance of Construction and Demolition Waste Management (C&D WM) Rules, 2016:**

1. Noida Authority should issue detailed directions under rule 6(1) of the C&D WM Rules, 2016 to waste generators of in and around Garhi Chaukhandi with regard to proper management of construction and demolition waste.
2. As per the provisions of rule 6(4) of C&D WM Rules, 2016, Noida authority shall make arrangement and place appropriate containers for collection of waste also focussing in and around Garhi Chaukhandi and shall remove waste at regular interval or when they are filled, either through own resources or by appointing private operators.
3. As per rule 6(5) of C&D WM Rules, 2016, Noida authority shall get the collected waste including legacy waste and transport to appropriate sites for processing & disposal either through own resources or by appointing private operators.
4. As per rule 6(8) of C&D WM Rules, 2016, Noida authority shall keep track of the generation of C&D waste of the area, establish a data base and update once in a year.
5. As per rule 6(9) of C&D WM Rules, 2016, Noida authority shall device appropriate measures in consultation with expert institution for management of estimated 200 metric tonne of C&D waste dumped at Garh Marghat, Garhi Chaukhandi (Lat: 28.608304 and Long: 77.404258).
6. As per rule 8(1) of C&D WM Rules, 2016, UPPCB shall monitor the implementation of C&D WM Rules, 2016 by Noida authority. Annual report including the information regarding the management of C&D waste in the area, shall be submitted to CPCB and State Government.
7. Noida Authority shall ensure implementation of C&D rules, 2016 in the area for proper C&D waste management and removal & processing of legacy waste.

### **6.2 Other Recommendations for C&D Waste**

1. Installation of GPS tracking devices on all waste collecting vehicles to monitor their routes from generation to disposal point to prevent illegal dumping. Noida authority to set up a control room for real-time monitoring of vehicle movements, ensuring adherence to designated routes and regularly analyze GPS data to identify and address any irregularities in waste transportation.
2. Noida authority and Police shall take necessary actions for illegal dumping on waste generators/ waste collecting vehicles.

### 6.3. Management of Solid Waste observed dumped at Garhi Chaukhandi

NOIDA shall take necessary steps for implementation of Solid Waste Management Rules, 2016 including the following:

1. As per section 15(b) of SWM Rules, NOIDA shall arrange for door to door collection of segregated solid waste from all households including slums and informal settlements, commercial, institutional and other non-residential premises. multi-storage buildings, large commercial complexes, malls, housing complexes, etc.
2. As per rule 15(c) of SWM, 2016, Noida shall establish a system to recognise organisations of waste pickers of Garhi Chaukhandi through proper registration and facilitate their participation in solid waste management including door to door collection of waste
3. As per rule 15(h) of Solid Waste Management Rule (SWM), 2016, NOIDA shall set up material recovery facilities or secondary storage facilities with sufficient space for sorting of recyclable materials
4. As per rule 15(l) of SWM, 2016, NOIDA shall provide training to waste scrappers on proper waste handling, segregation, and the importance of environmental protection.
5. As per Rule 15 (g) of SWM Rules 2016, NOIDA shall direct waste generators not to litter i.e throw or dispose of any waste and to segregate the waste at source as prescribed under these rules and hand over the segregated waste to authorised the waste pickers or waste collectors authorised by the local body
6. As per Rule 15(zf) of SWM Rules 2016. NOIDA shall frame bye-laws and prescribe criteria for levying of spot fine for persons who litters or fails to comply with the provisions of these rules and delegate powers to officers or local bodies to levy spot fines as per the bye laws frame. NOIDA shall ensure implementation of SWM rules, 2016 in the area mentioned in Hon'ble NGT order dated 10.05.2024 in O.A. No.512/2024 for proper solid waste management and removal & processing of legacy waste.
7. As per Section 15(v) of PWM Rules, NOIDA shall facilitate construction, operation and maintenance of solid waste processing facilities and associated infrastructure on their own or with private sector participation or through any agency for optimum utilisation of various components of solid waste adopting suitable technology

### 6.4. The irrigation department, Govt. of Uttar Pradesh shall ensure following measures for restoration of river flow and vegetation of river Hindon.

- **Restoration of Flow:**
  - **Assessment and Planning:** Evaluate the current flow conditions of the Hindon River and identify factors affecting flow.
  - **Restoration of Flow:** Develop a detailed restoration plan to enhance and stabilize river flow. Design and implement measures to restore river flow.
- **Vegetation Development:**
  - **Catchment Area:** Initiate vegetation development in the catchment area of the Hindon River. Plant native trees, shrubs, and grasses to stabilize soil, reduce erosion, and improve water quality.

- **River Embankments:** Vegetate river embankments along the entire course of the Hindon River. Use native plant species to create a natural buffer that will enhance biodiversity and reduce erosion.
- **Check Dams for Freshwater Source:**
  - **Design and Construction:** Construct check dams in strategic locations within the catchment area to capture and store freshwater. This will help increase the water table and maintain river flow.
  - **Maintenance:** Regularly inspect and maintain check dams to ensure their effectiveness in capturing freshwater.

### 6.5 Waste Management and Pollution Control in River Hindon

- **Removal of Encroachments:**
  - **Survey and Documentation:** NOIDA and irrigation department shall identify and document all encroachments in the riverbed. [Action: NOIDA & Irrigation Department]
  - **Remove Encroachment:** NOIDA and irrigation department shall develop and execute a plan to remove encroachments and restore the riverbed to its natural state. [Action: NOIDA & Irrigation Department]
- **Desilting of River Bed:**
  - **Desilting Operations:** Irrigation department shall conduct desilting activities to remove accumulated sediment from the riverbed and use the desilted material for strengthening embankments and enhance embankment stability through vegetation. [Action: Irrigation Department]
- **Decentralized Low-Cost Treatment Systems:**
  - NOIDA and irrigation department shall explore and implement low-cost treatment systems like stabilization ponds, constructed wetlands, and oxidation ditches. Apply these systems in small towns, villages, or isolated drains to manage domestic wastewater efficiently. [Action: NOIDA & Irrigation department]
- **Action on Industries Discharging Effluent:**
  - UPPCB shall identify industries discharging untreated or partially treated effluent. Implement corrective measures and ensure compliance with environmental standards. [Action: UPPCB]
- **Inventory of Water Polluting Industries:**
  - **Survey:** UPPB shall conduct an inventory of non-GPI (Gross Polluting Industries) water-polluting industries in the catchment area, including metal recycling, processing, galvanizing, and painting industries. [Action: UPPCB]
  - **Regulation:** UPPCB shall ensure these industries adhere to pollution control norms and upgrade their treatment facilities. [Action: UPPCB]
- **Sewage Treatment Plant (STP) for Gaur City:**
  - GNOIDA shall develop and install an STP for the treatment of sewage discharges from Gaur City residential area. [Action: GNOIDA]

- GNOIDA shall regularly monitor the STP to ensure effective wastewater treatment. [Action: GNOIDA]

## 6.6 Long-Term Planning and Management

### • Sewage Management Plan:

- SMCG with NOIDA shall develop a comprehensive sewage management plan for current and future needs for the next 20 years. [Action: NOIDA, SMCG & NMCG]
- NOIDA shall periodically review, update, and adapt the plan to reflect changing circumstances, technological advancements, and evolving environmental standards. [Action: NOIDA, SMCG & NMCG]
- NOIDA shall ensure regular monitoring and evaluation to assess the plan's effectiveness and make necessary modifications. [Action: NOIDA, SMCG & NMCG]

A report titled “**Pollution Source Mapping of River Hindon & its Tributaries and Restoration Plan for Polluted Stretches**” was prepared by Central Pollution Control Board (CPCB) which covers the mapping of pollution sources and draft detailed plan for restoration of polluted stretch in River Hindon catchment area. The report was already filed before Hon’ble NGT, in Original Application no. 859/ 2022 titled Abhisht Kumar Gupta Versus State of UP & Ors. The report is annexed as **ANNEXURE I**. The report was considered in the same matter and the data has been referred in the trailing orders of Hon’ble NGT in Original Application no. 859/ 2022 titled Abhisht Kumar Gupta Versus State of UP & Ors.

The report on “Pollution Source Mapping of River Hindon & its Tributaries and Restoration Plan for Polluted Stretches” was also forwarded to Chief Secretary, Govt. of Uttar Pradesh on 11.08.2023.

The report includes river water quality assessment and pollution source mapping, action required for pollution abatement, groundwater quality assessment, status and performance of sewage treatment plants, status and distribution of grossly polluting industries including solid waste dumping into various drains in River Hindon catchment area, monitoring of drains and tributaries discharging in River Hindon. The report includes sewage management, waste management & river rejuvenation plan along with the names of concerned executing State Agencies.

### **Sewage management plan**

1. Sewage Treatment Plants (STPs) employing advanced treatment facilities such as Sequencing Batch Reactor (SBR), Extended ASP, and Moving Bed Biofilm Reactor (MBBR) should achieve a BOD removal efficiency of over 90%. Strict action should be taken against the STPs operating agency & disbursement of payment to the operating

agency shall be lined with performance in terms of BOD removal efficiency as well as comply with NGT norms. [Action: Jal Nigam, SMCG & NMCG]

2. STPs shall be operated with utilized capacity > 70%. The disinfection units installed at STPs should be operated properly and follow proper protocols and procedures to effectively disinfect the wastewater and meet the discharge standards for fecal coliform levels. [Action: UPPCB, Jal Nigam, SMCG & NMCG]
3. SMCG with UPJN shall develop a sewage management plan for each city/town/district addressing both present and projected requirements for the next 20 years. It should be periodically reviewed, updated, and adapted to address changing circumstances, technological advancements, and evolving environmental standards. Regular monitoring and evaluation of the plan's effectiveness will help identify any necessary modifications or improvements. [Action: Jal Nigam, SMCG & NMCG]
4. In case of small town, village or isolated drain, low cost decentralized treatment option such as waste stabilization pond (WSP) or constructed wetland may be considered to treat domestic wastewater. [Action: Jal Nigam, SMCG & NMCG]

#### **Solid Waste Management Plan**

1. Prohibition on dumping of municipal/industrial solid wastes and sludge on the active flood plain of river as well as into the river/drain itself. All the dumped waste along the river/drain should be removed immediately and disposed off safely. [Action: Municipal corporation/Nagar Nigam/Nagar Palika]
2. Installation of wire-net/geo-net at confluence point of drains with river. [Action: Municipal corporation/Nagar Nigam/Nagar Palika]

#### **River Restoration Plan:**

1. Improvement in stream flow in origin/dry stretches of rivers through vegetation development in catchment. Demarcation of flood plain of river and desilting of river bed. The desilted material should be used for strengthening the embankments and the embankments should be vegetated. [Action: District Administration, Forest Department and Irrigation Department]
2. A minimum water flow ~100-200 cusecs in river Hindon and ~50-100 cusecs in its tributaries such as Kali-West & Krishni including upper stretches of the rivers should be maintained to sustain river ecosystem and prevent significant ecological damage. The determination of minimum flow is a complex process that requires hydrological, ecological assessments, and stakeholder consultation. Therefore, a detailed study may be conducted in consultation with the relevant experts and stakeholders to establish appropriate minimum flow levels in river Hindon and its tributaries. [Action: UP Irrigation Department & CWC]
3. To maintain minimum flow, provision of freshwater intrusion from Ganga/Yamuna canal into Hindon River and its tributaries (Kali-West & Krishni) can be made. The suggested

locations from where freshwater may be discharged into river are [Action: Irrigation Dept. & CWC]:

4. Freshwater (1500 cusecs) is released in to river Hindon from Upper Ganga Canal near D/s of Meerut where river Hindon act as a channel to transfer freshwater from Upper Ganga Canal to Agra Canal. Freshwater from Upper Ganga Canal is discharged into river Yamuna from barrage on river Hindon at Ghaziabad which is further released into Agra Canal from Okhla Barrage on river Yamuna. A minimum of 200 cusecs of water should be retained in river Hindon in d/s of barrage at Ghaziabad. [Action: Irrigation Dept. & CWC]
5. State Pollution Control Boards (SPCBs) along with other concerned state agencies shall carry out inventory of existing wetlands and ponds along the rivers and at their origin and prepare action plan for their restoration and revival. Desilting/dredging of wetlands/ponds/drains shall also be carried out. The desilted material should be used for strentheging the enbankments and the embankments should be vegetated. [Action: SPCB, District Administration, Forest Department and Irrigation Department]
6. Rejuvenation and restoration of river stretches by constructing a series of Constructed Wetlands along the river bed and adjoining drains. Integration of drains carrying treated/untreated industrial and domestic wastewater with constructed wetlands will contribute to improving the quality of wastewater discharge into the river through drains. [Action: SPCB, Jal Nigam, Irrigation Dept., Forest Dept. & Technical Experts]
7. Encroachment along wetlands and river stretches has been reported through complaints and in NGT case (OA No. 859/2022 in the matter of Abhisht Kumar Gupta Vs State of Uttar Pradesh & Ors). The concerned District Administration may undertake a survey along with concerned state agencies and take necessary action for encroached wetlands/ponds/river stretches and develop an action plan. [Action: UPPCB, District Administration and UP Irrigation Dept.]
8. The jurisdiction of drains/rivers lies with the state flood control and irrigation department while certain areas fall under the jurisdiction of the Forest Department and Jal Nigam/Sansthan. Such agencies should undergo capacity building to ensure that river should not be polluted and should be trained for rivers/drains restoration plan. [Action: Forest Department, Irrigation Department, CWC, Jal Nigam and Jal Sansthan]
9. Check dams should be constructed in the upper stretch of the Hindon River (from its origin to Saharanpur u/s) to enhance the source of fresh water in river during non-monsoon periods. [Action: Minor Irrigation Department]
10. Construction and maintenance of recharge trenches with recharge shafts in downstream areas. Feasible structures for areas where groundwater levels are deeper than 20 mbgl (meters below ground level) or more. Successful implementation will result in recouping of groundwater level over time and will contribute to river flow. [Action: Irrigation Department & Ground Water Department]

11. Ensuring hydraulic and hydrological connectivity of the river with other water bodies (including groundwater) is important. Influent zones (where groundwater recharges the river) and effluent zones (where the river recharges groundwater) should be identified throughout the entire stretch of the river, for implementation of reach-wise recharge augmentation plan for continuous flow in the river. [Action: Central Water Commission, Ground Water Department and National Institute of Hydrology (NIH)]
12. Illegal abstraction of groundwater at domestic level for commercial purpose has been observed. Metering of household borewell in Class I cities and Class II towns & limitation on use. [Action: U.P. Ground Water Dept.]

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# **Pollution Source Mapping of River Hindon & its Tributaries and Restoration Plan for Polluted Stretches**



**CENTRAL POLLUTION CONTROL BOARD**  
**Ministry of Environment Forest & Climate Change**  
**Government of India**  
**(August, 2023)**

**Pollution Source Mapping of River  
Hindon & its Tributaries  
and  
Restoration Plan for Polluted  
Stretches**



**CENTRAL POLLUTION CONTROL BOARD**  
**Ministry of Environment Forest & Climate Change**  
**Parivesh Bhawan, East Arjun Nagar, Delhi- 110032**  
**(August, 2023)**

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## PREFACE

Various waterbodies in India, such as rivers, their tributaries, prominent streams as well as the adjoining wetlands, have been converted into either sewage artery for the increasing urban demographics, or tamed for infrastructural developments, thus continuing the legacy of ecological abstraction of the same. The impact of these practices, increases by manifold, when ideas such as river rejuvenation or restoration are disengaged from the tailor-made approaches that bifurcates the river into various segments and talks about segment-specific interventions.

River rejuvenation is an effort aimed at restoring overexploited and polluted rivers. It requires an understanding of requirements towards the restoration efforts from source to sink. Depending on the level of deterioration, river rejuvenation aims at a new sustainable healthy river ecosystem. River ecosystem serves a lot to ecological functioning, so it is essential to restore the damaged as well as polluted rivers back to their normal status. The continuing practice has been to restore the river health back to an accepted pristine state. To achieve this, the underlying premise is to prevent any direct entry of domestic sewage, industrial effluents and solid waste into the river to improve the river health. However, replacing such current practices with state-of-art scientific cum technical knowledge, and integration of the cross-sectoral understanding of the river's management can provide a glimpse of the pluriversal possibilities in rejuvenating the rivers.

Recent times calls for ensuring flow of a river as which is its identity and the most significant variable of a river system. Besides performing various functions, it gives self-cleaning and self-rejuvenation powers to a river. Thus, the river rejuvenation broadly includes ensuring environmental flow in the river during different seasons. However, despite the dynamicity of a river's physical form and its ecosystem, this is applicable only for perennial rivers that are fed by melting of the accumulated ice-cap/glaciers of the mountains along with rainfall. The other set of rivers are entirely rain-fed, land-locked receiving water from the annual rainfall alone. In non-rainy seasons, their flow is limited to the extent of inflow of water from seepage through the soil mass of its catchment. These rivers have an entirely different ecosystem such as river channel, riparian zone, flood plains and embankments. They receive water during monsoon that is stored for a longer duration and helps in recharging of nearby ground water aquifers, connected channels and wetlands, which in-turn helps in maintaining water availability in river during non-monsoon period. Therefore, for such rivers, the concept

of maintenance of different component of their eco-system is more important than the concept for ecological flows.

Further, the lucid understanding of aspects of sewage and industrial pollution control, is yet another challenge, since it is believed that controlling pollution discharge into the river is same as restoring the river water quality. In view of sewage management, the aspect of sewage generation is equated with the sewage treatment capacity to control pollution. But the challenge lies in not just bridging the widening gap between sewage generation and treatment capacity but to go beyond. Combating the challenge of outdated drainage and increasing pollution on the river, it is imperative to restrict the untreated sewage falling into the river not only by Interception, Diversion and Treatment (IDT) but also by using in-situ low-cost decentralized treatment systems. Effectively, it also means developing facilities to divert treated sewage for different purposes such as in irrigation to utilize nutrient value of sewage as well as industrial production thereby reducing burden on fresh water use.

Another facet of river pollution mentioned previously is the industrial pollution control that aim to stop discharge of wastewater generated from industrial processes into the river system. Indian industries characterize themselves with low-scale of operation and production, archaic technology, lack of cleaner technology, high freshwater consumption, high effluent generation and inadequate effluent treatment systems, in addition to unskilled personals that lack technical knowhow. Despite of existing regulatory measures, these outmoded systems have resulted in high effluent generation along-with discharge of partially treated or untreated effluent into the river system.

Therefore, the main focus in river restoration is the maintenance of ecological integrity and improving the river ecosystem by improving flow regime, water quality & sediment chemistry, increasing aquatic and riparian biodiversity, protecting river structure and floodplains. Thus, it can be considered as a way of enhancing the sustainability of river. Keeping in view the above aspects, the present concept of river restoration encompasses 2 prolonged approaches. First priority in water-quality assessment and management is to maintain and restore “the desirable level of river water wholesomeness” and thereafter, comes the fulfilment of “requirement for the best designated use” that has to be taken up at the second stage. It is to be realized that merely meeting bathing water quality, doesn’t equate with rejuvenation of polluted river or any of its stretch. The rejuvenated river should have functional as well as self-purification systems *i.e.* biological communities that have trophic cascades. Further, restoration of river ecosystem considers channel water ecosystem, the riparian

ecosystem, floodplain wetlands, floodplain forests and grasslands as well as development of vegetation on embankment. Such ecosystem restoration methods include planting appropriate plants on top of the riverbanks and bank slopes. Thus, riparian zones can be protected by the roots, stems and leaves of such plants. Further, Biodiversity Parks, restoration of wetlands and converting existing ponds to Constructed Wetlands for water quality improvement are yet another facets of the same.

Treatment of wastewater and bringing the polluted water to the level of bathing quality is just one among many remediation and/or restoration required for rejuvenation of river systems. Therefore, it is being believed that rejuvenation of polluted rivers cannot be achieved by treating wastewater using STP alone. Anthropogenic-mediated activities on the riverscape have been increasingly disrupting the ecological processes leading to further degradation of riverscapes resulting in loss/degradation in terms of function of river health and deterioration of water quality despite of treating waste water through STPs by spending millions of rupees annually. A reliable water quality monitoring system in combination with pollution load assessment of all drains discharging into the river forms the basis for planning targeted interventions to improve water quality, along with judicious water use and water conservation, paves the way for river.

To conclude, there is a need to bridge the gap between science and application to effectively implement an integrated approach for the rejuvenation of polluted rivers involving Nature Based Solution. Further, the long-accepted rejuvenation approach, considering returning rivers to a pre-development condition, is now physically or economically impractical and would require unacceptable limitations on current and future human activities. Also, in areas where rivers have been altered by human development for centuries, such as in India, the concept of a river's 'pre-development' condition is almost meaningless given the extent and duration of human induced alterations. Therefore, rejuvenation of polluted rivers requires bringing back the self-purification system of rivers so that the rivers can sustain the quality of water and start providing ecosystem services, they are destined to provide.

## CHAPTER – 1: BACKGROUND

A meeting was taken by Secretary, Department of Water Resources, River Development and Ganga Rejuvenation (DoWR, RD & GR), Ministry of Jal Shakti (MoJS) on October 20<sup>th</sup>, 2022 concerning rejuvenation and pollution abatement plan of River Hindon. It was decided in the meeting that CPCB and NMCG may carry out the pollution source mapping of River Hindon and its tributaries from origin to its confluence with River Yamuna to identify the major issues for water quality deterioration and gap areas in sewage management. Further, a meeting was held on November 30<sup>th</sup>, 2022 between Secretary, DoWR, RD & GR, MoJS and Secretary, Ministry of Environment, Forest & Climate Change (MoEF&CC) and CPCB was directed to focus on industries located in non-conforming areas and other than GPIs responsible for pollution in water bodies. Also, a committee has been constituted under the Chairmanship of Chief Secretary, Government of Uttar Pradesh, vide NGT order dated 17/03/2023 in OA No. 859/2022 in the matter of Abhisht Kusum Gupta vs State of Uttar Pradesh & Ors. regarding the action for pollution control and remediation of river Hindon having CPCB as member.

Further, to come out with measures for rejuvenation of the river Hindon and its tributaries, a committee has been constituted as per the minutes of the meeting comprising Divisional Head-WQM-II, CPCB as the Chairperson and representatives from Uttar Pradesh Irrigation and Water Department, Uttar Pradesh Pollution Control Board, National Institute of Hydrology, Roorkee, Central Ground Water Board, Central Public Works Department, Central Water Commission as well as Uttar Pradesh Jal Nigam (Rural), Ground Water Department, Uttar Pradesh and NMCG as members of the committee.

Meetings with the members of the Committee were conducted on November 18<sup>th</sup>, 2022 & January 20<sup>th</sup>, 2023 and members were requested to forward their actions points including activities that shall be undertaken towards rejuvenation of River Hindon. Summary of action points received from Committee members are as follows:

### **National Institute of Hydrology**

National Institute of Hydrology, Roorkee has carried few studies on the aspects of water quality of River Hindon and its tributaries. The following has been suggested by the institute:

- Municipal wastewater and industrial effluents discharging into River Kali and Krishni should also be treated before these rivers confluences River Hindon. Adequate width and

depth of flow should be maintained via structural interventions (like weirs and bunds), if needed.

- Also, ensuring the hydraulic and hydrological connectivity of the river with other water bodies (including groundwater) is important. Since, in the upper stretch of River Hindon, there may be contribution of groundwater to the river while in mid and downstream section, the groundwater table has been so much depleted due to excess exploitation of groundwater for agriculture and other activities that there may be little contribution of river water to groundwater. Therefore, influent and effluent sections in the river should be identified for implementation of reach-wise recharge augmentation plan for continuous flow in the river.
- Further, structural interventions are necessary to ensure the functioning of the river as a secure perennial river without obstructing terrestrial activities. In the Hindon basin, there are several stretches where the flow is stagnant. Some. Thus, for instance, weirs may be needed in river stretches with steep gradients to provide the necessary flow depths or flow velocities needed for river biota; or, embankments may be needed in regions that are susceptible to flooding during heavy storms; or bridges may be needed to secure river crossings for human and terrestrial animals.

### **Central Groundwater Board**

The board provided some strategies for revival of Hindon river and its tributaries:

- Groundwater levels are comparatively deeper owing to permeable nature in upstream area(s)/catchment. Due to its inherent character, it is conducive for groundwater recharge that will in turn contribute to increased base flow in the Hindon river. Suitable structures may include percolation tanks with stone pitching up-stream up to the highest flood level to avoid embankment erosion.
- Basin spreading method can be adopted wherein the natural floodwaters of the river in spate after monsoon are allowed to spread across large areas of land for infiltration into the underlying aquifer. Successful implementation will result in recouping of groundwater level over time and will contribute to river flow.
- Construction and maintenance of recharge trenches with recharge shafts in downstream areas. Feasible structures for areas where groundwater levels are deeper than 20 mbgl (meters below ground level) or more. Successful implementation will result in recouping of groundwater level over time and will contribute to river flow.

- Enhancing water use efficiency measures in sugarcane cultivated area(s) by successful adoption of drip irrigation will lead to saving in groundwater use from 45 – 60% and this will help in recouping of groundwater levels over time. Once the groundwater levels have reached above the bed of the river, groundwater will contribute to base flow and help in dilution of that stretch of river.
- Sewage and domestic wastes from towns and villages can be diverted to Sewage Treatment Plants. Diversion channels must be lined so as not to pollute groundwater. Once water has been treated and found to pass the quality checks, it can be utilized for recharging aquifer(s) or can be pumped into the river for increasing the flow.

### **Central Water Commission**

- The commission suggested for restoration and development of forests such as riparian buffers along the watershed lines wherein their vegetative zone may serve as a buffer to pollutants entering a stream from runoff, controls erosion, and provides habitat and nutrient input into the stream. Enhancement of the riparian buffer by re-planting native grasses, forbs, shrubs and trees is the first step in the recovery of the stream back to a more natural condition.
- Raising the water table is key requirement for restoring the perennial virgin flow in the lean season. Better practices such as Systematic Sugarcane Initiative(SSI) can help reduce water use in Sugarcane, the most water guzzling crop in the basin.
- Augmentation of water by storing rainwater and encouraging the recycle and reuse of water. Water augmentation looks to increase availability and supply of water by replacement of the current reduced amount of water. This can be done through active recharge of water and protection of water recharge areas. Harnessing rainwater and recharge of the water table allows for recharge through infiltration into aquifers.
- Better management of practices in line with urban river conservation norms. In the urban landscapes, works related to riverfront development, eco-park development, industrial and educational estate plantations, and avenue plantations etc. could be taken up. In this regard, the “River Centric Urban Planning Guidelines” published by Town and Country Planning Organization, Ministry of Housing and Urban Affairs, Govt. of India may be followed for devising certain strategies such as river ecology development plan by conservation of natural areas etc.

- Any diversion of water from River Hindon needs to be regulated in such a way that a minimum flow in the river can be maintained at various locations on the river. Further, encroachments along the river Hindon must be identified and restoration of its flood plain must be promoted to the extent feasible.

#### **Uttar Pradesh Pollution Control Board**

- A Project Proposal for “Water Quality Monitoring of Hindon River Basin” for the year 2022-27 in the State of Uttar Pradesh has been reported by UPPCB to National Mission for Clean Ganga towards monitoring of River Hindon, its tributaries namely Kali (west) & Krishna and their polluting sources to enable round the clock surveillance and timely action against the defaulter units discharging polluted effluent.
- This will include mapping and monitoring of the named rivers, drains, the Sewage Treatment Plants and industrial polluting sources in River Hindon basin. The estimated budget is **Rs. 21.22 Crore.**

## CHAPTER – 2: MONITORING PLAN

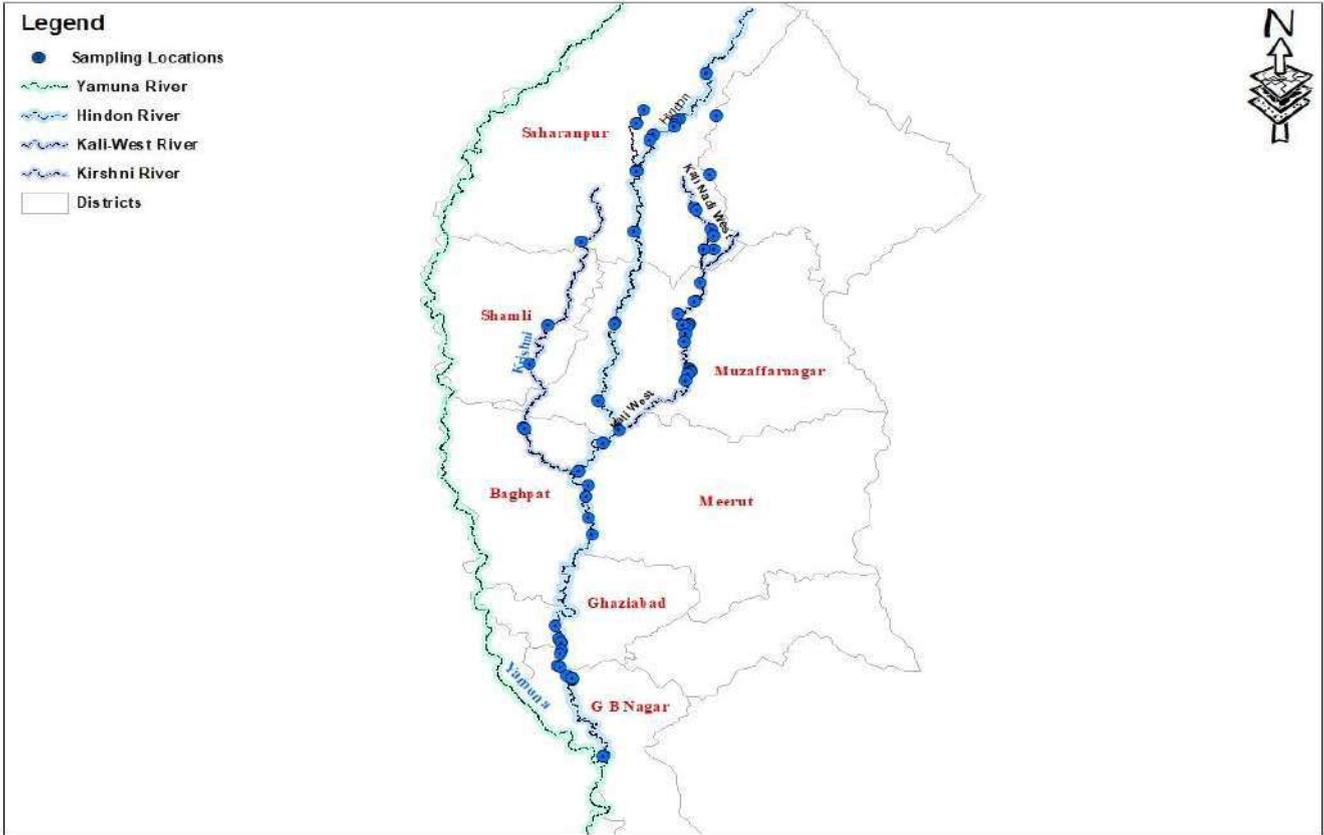
For the purpose of river water quality assessment and pollution mapping, joint monitoring and sampling of River Hindon, its tributaries namely River Kali-West, Dhamola & Krishna and the adjoining drains was carried out by joint teams of CPCB and UPPCB during November 02-16, 2022. The objectives of the pollution mapping were:

- a. Tracing and mapping the course of the rivers and identifying major adjoining drains/small streams discharging their content into the mentioned rivers.
- b. Characterization of water quality of rivers at various locations (River Hindon and its tributaries namely Rivers Kali-West and Krishna).
- c. Identification, quantification and characterization of major drains joining the rivers.
- d. Monitoring of STPs in Saharanpur, Muzaffarnagar and Ghaziabad districts for assessment of performance of sewage treatment plants.
- e. Groundwater monitoring.
- f. Survey of river system for the purpose of identification of possible sites for rejuvenation in River Hindon and its tributaries namely Rivers Krishna and Kali-West.

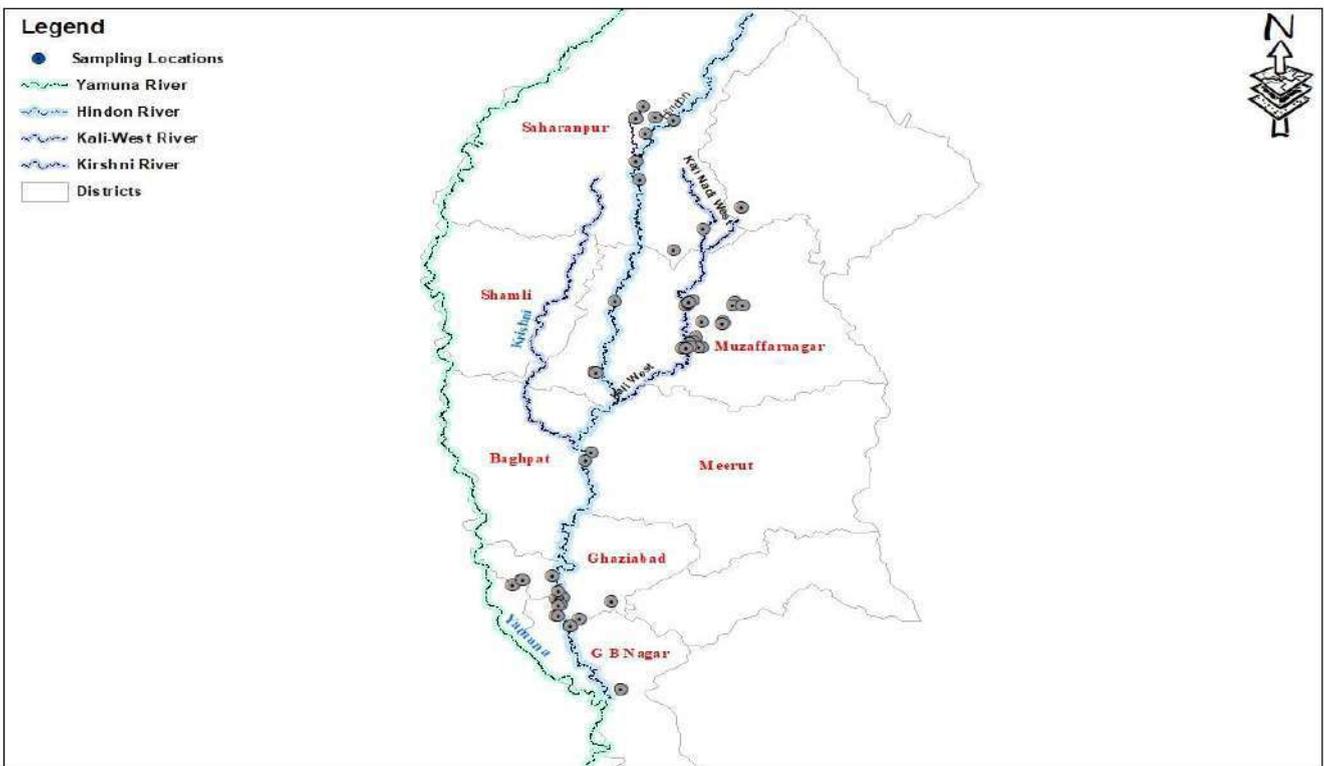
During monitoring, pollution in rivers and adjoining drains has been observed for which pollution source mapping of polluted river stretches/drains has been carried out jointly by teams of CPCB and UPPCB during January-March, 2023 wherein mapping, monitoring and sampling of river water, adjoining drains and groundwater were carried out.

Monitoring of river Hindon was carried out at 34 locations, Kali-West at 21 locations, Dhamola at 4 locations, Krishna at 5 locations and Yamuna at 2 locations. A total of 55 adjoining drains of river Hindon (26), Kali-West (17), Dhamola (5), Krishna (4) and Yamuna (3). Ground water was also monitored at 31 locations.

The sampling locations on rivers and adjoining drains are shown in **Map 1 & 2**, respectively.



**Map 1 Monitoring locations on Rivers Yamuna, Hindon, Kali-West and Krishna**



**Map 2 Drains adjoining Rivers Yamuna, Hindon, Kali-West and Krishna**

## CHAPTER – 3: RIVER WATER QUALITY ASSESSMENT AND POLLUTION SOURCE MAPPING

### 3.1 Catchment of river Hindon

River Hindon is an important tributary of Yamuna river, which flows between Ganges (right side) and Yamuna (left side) rivers for approx. 400 kilometres. Hindon originates in the Saharanpur district of Uttar Pradesh at a distance of about 3 to 4 km from the Barsani Falls inside the dense forest area of Upper Siwalik region (lower Himalayas) (Figures 1-2) and traverses through Muzaffarnagar, Meerut, Baghpat, Ghaziabad and Gautam Buddh Nagar districts before it joins Yamuna river in Greater Noida. It is purely a rain fed river with a catchment area of about 7,083 Sq. Kms. Dhamola, Kali-West and Krishni are three major tributaries of river Hindon.

Dhamola River originates from a pond in Sansarpur village, Saharanpur and flows for approximately 52 Kilometres before meeting the Hindon River at Village Sharakthal/Sadoli Hariya in Saharanpur district.

River Kali-West originates from a series of wetlands in Gangali and Kalahati villages in Saharanpur district of Uttar Pradesh. From its origin up to the confluence with Hindon river, it travels a distance of about 150 Kms through Saharanpur, Muzaffarnagar and Meerut districts. The significant drainage area of the river is about 750 Sq. Kms which mostly lies in plains.

River Krishni originates from a wetland situated at Savalpur Navada near Krishni village in Saharanpur district. River is dry from its origin to confluence with Thaska drain in Saharanpur district. It traverses approximately 152 Kms through the district of Shamli and confluences with river Hindon near Barnawa village in Baghpat district.

### 3.2 Criteria for identification of polluted stretches/hotspots

River locations/stretches having BOD>10 mg/l are considered as polluted. The adjoining drains having BOD>150 mg/l, COD>450 mg/l, Color>75 Hazen, Chloride>1000 mg/l, TDS>1000 mg/l, TSS>500 mg/l, NH<sub>3</sub>-N>50 mg/l, acidic pH (<5) which are not the typical characteristics of domestic drains and high metal concentrations (exceeding general discharge standards prescribed in Environmental (Protection) Rules, 1986) are considered polluted.

A total of 55 adjoining drains of river Hindon (26), Kali-West (17), Dhamola (5), Krishna (4) and Yamuna (3) and the district-wise status is given below:

District	No. of drains	Domestic	Industrial	Mixed	Tapped/Untapped/Dry/STP Outlet
Haridwar	1	-	-	1	Untapped-1
Saharanpur	12	5	-	7	Untapped-11, Dry-1
Shamli	2	-	-	2	Untapped-2
Muzaffarnagar	19	12	2	5	Untapped-17, Tapped-2
Meerut	2	-	1	1	Untapped-1, Dry-1
Baghpat	1		-	1	Untapped-1
Ghaziabad	14	5	-	9	Untapped-12, Tapped-1, STP outlet-1
Gautam Buddha Nagar	4	2	-	2	Untapped-4
Total	55	24	3	28	Untapped-49, Tapped-3, Dry-2, STP outlet-1

Based on BOD and COD values, the categorization of drains has been done.

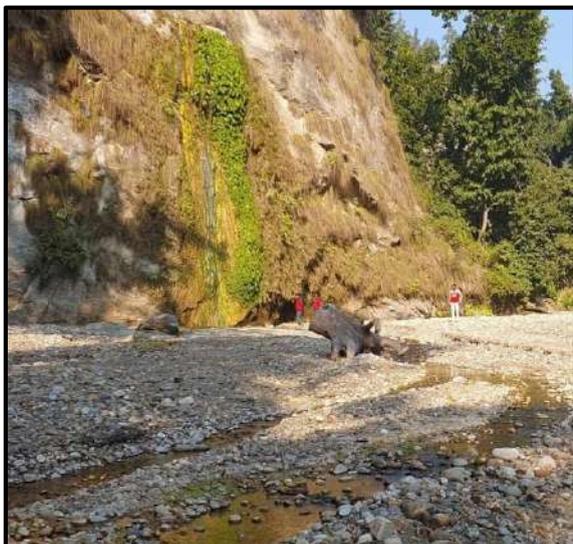
BOD (mg/l)	No. of drains	COD (mg/l)	No. of drains
0-50	11	0-250	16
51-100	15	250-500	18
101-150	4	501-1000	11
151-250	12	>1000	8
> 250	11	Dry/no significant flow	2
Dry/no significant flow	2		

### 3.3 Saharanpur and Shamli Districts

#### River Hindon

The water in the river is fed by small fresh water streams from its point of origin to Barsani Fall (**Figures 1-2**). Freshwater was observed at the origin, with meagre flow. The dissolved oxygen (DO) and biological oxygen demand (BOD) in the river at the Barsani waterfall were 10.8 mg/L and NIL, respectively. After travelling 5.5 Kms, there is pond fed by waterfall which has clean water full of fishes at Kaluwala Rao (**Figure 3**). Bunds have been constructed on the River Hindon at Pur ka Tanda, Saharanpur by the Irrigation Department to revive the river

(**Figure 4**). The river stretches up to 45 km before entering the city of Saharanpur. The river is mostly dry during the lean period; however, spring water was observed in some parts of this stretch.



**Figure 1 Barsani waterfall**



**Figure 2 River Hindon near origin**



**Figure 3 River Hindon at Kaluwala Rao**



**Figure 4 Bunds at Pur ka Tanda**

Stagnant, polluted wastewater (DO: NIL, BOD: 291 & 369 mg/l, & COD: 612 & 763 mg/l) was found in the river at Janta Bridge, Saharanpur-Dehradun road, Saharanpur (**Figure 5**), indicating that nearby industries, including Slaughter house-ALM Industries Ltd. and Pulp & Paper Industries namely Soofi Pulp and Board Mill, Anant Board Mill, Balaji Board Mill, Ekta Board Mill, and Krishna Board Mill, may be the potential source of discharge of untreated effluent into the river. In downstream (before confluence of Daya Sugar Mill drain), flow was observed in the river due to the contribution of sewage discharged from Gagelheri and Dinapur village. In River Hindon b/c of Daya Sugar Mill drain, the DO was NIL, and BOD was 80 mg/L. Daya sugar mill drain (dry) meets river Hindon at approx. 48.5 km downstream from

origin. In River Hindon a/c of Daya Sugar Mill drain, DO and BOD were NIL and 73 mg/L, respectively.

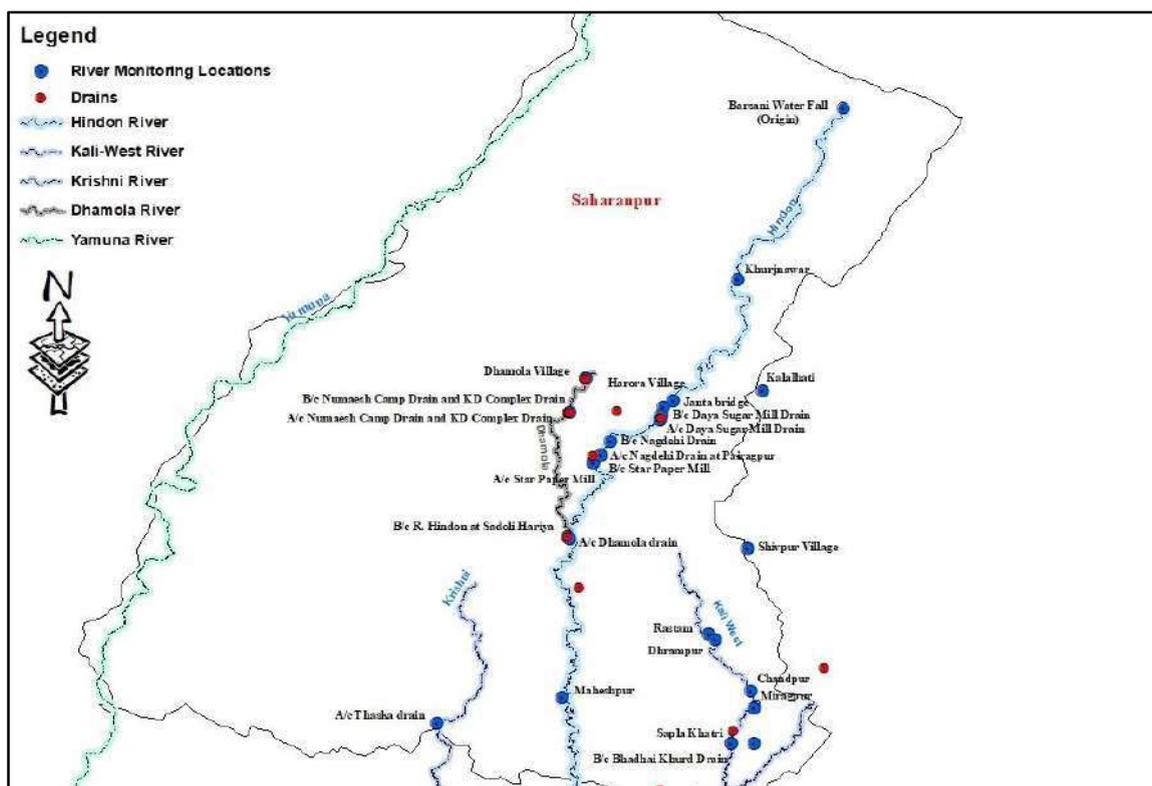


**Figure 5 River Hindon at Janta Road Bridge, Saharanpur-Dehradun Marg**

Further downstream, Nagdehi drain (Flow-0.74 MLD, BOD-34-237 mg/l & COD-103-349 mg/l) meets River Hindon. The river stretch b/c and a/c of Nagdehi drain was found dry. However, the river gained flow only after receiving effluent from the Star Paper Mill drain (Flow: 20.75-23.76 MLD, Color-75-107 Hazen, BOD: 61-198 mg/L, and COD: 181-338 mg/L). DO and BOD in the River Hindon a/c with Star Paper Mill drain were 0.8 mg/L and 61 mg/L, respectively. The monitoring locations on river Hindon and its tributaries Dhamola, Krishni and Kali-West along with adjoining drains in Saharanpur district are shown in **Map-3**:

Further downstream, Dhamola river (Flow-250.56 MLD, BOD-8 mg/l, COD-86 mg/l) meets River Hindon, and DO and BOD in River Hindon a/c with Dhamola river were NIL and 7-24 mg/L, respectively. Dhamola river carries sewage discharged from Madh village, Numaish camp area, Saharanpur city, Ram Nagar market area and treated sewage discharged from 38 MLD STP at Saharanpur near Mahilpur road and wastewater discharged from 21 industrial units.

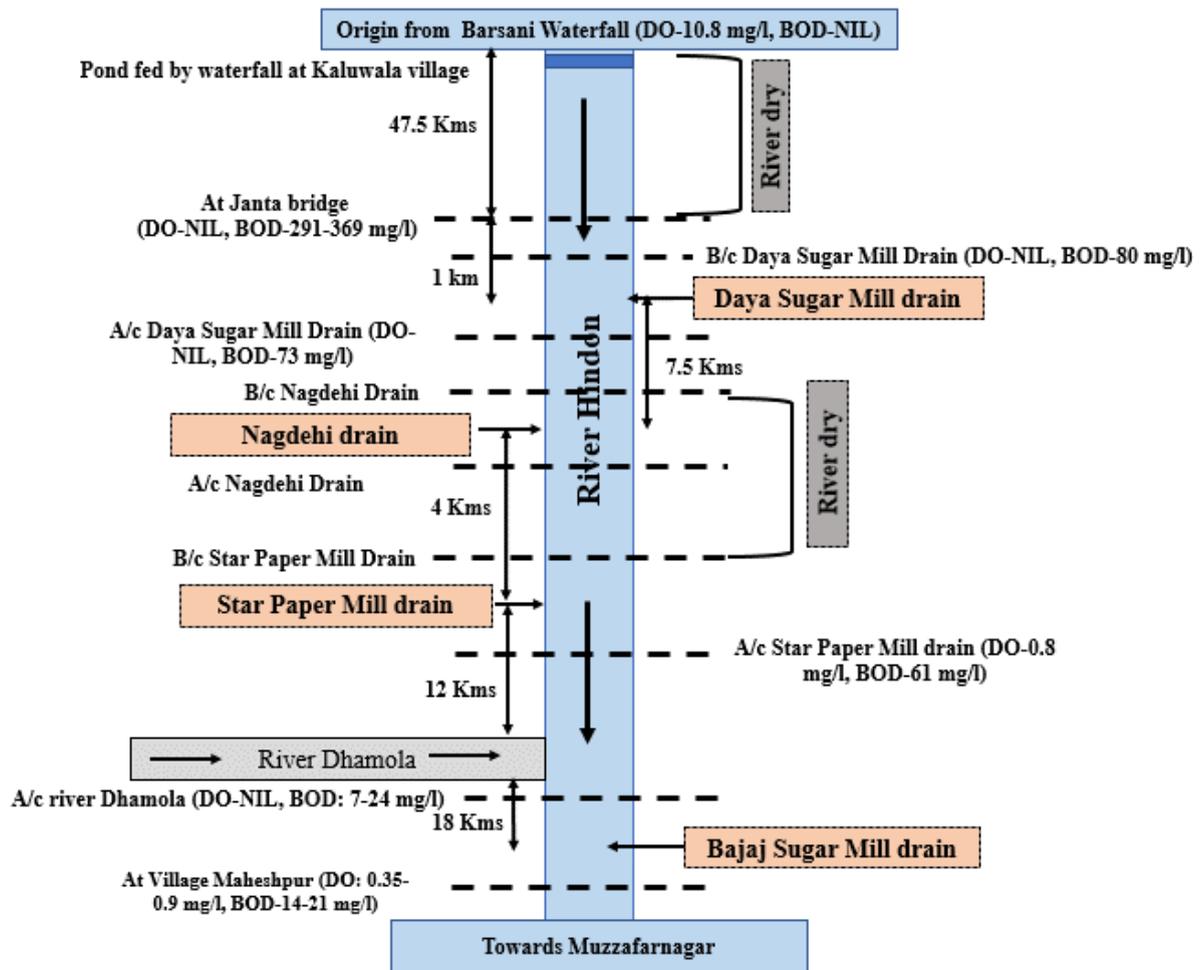
In downstream, Bajaj Sugar Mill drain (Flow-0.05 KLD, BOD: 20-74 mg/l and COD: 82-211 mg/l) meets river Hindon and DO & BOD in river Hindon a/c Bajaj Sugar Mill drain at Maheshpur village were 0.35-0.9 mg/l and 14-21 mg/l. The flow diagram depicting the Hindon River from its origin to village Maheshpur in district Saharanpur is shown in **Figure 6**.



**Map 3 Monitoring locations on river Hindon and its tributaries Rivers Dhamola, Krishni and Kali-West along with adjoining drains in Saharanpur district**

### Issues:

- Discontinuity of flow, dry stretch of river and encroachment of river bed at many places before confluence of Star paper mill drain.
- Pollution with high BOD level was observed in the Hindon River, specifically in the stretch from Janta Bridge to Maheshpur village (BOD exceeding 10 mg/l). The levels of DO and BOD in this stretch ranged from NIL to 0.9 mg/l and from 14 to 369 mg/l, respectively.
- High pollution level (BOD > 150 mg/l and Colour > 60 Hazen) in drains draining in to river Hindon:
  - **Nagdehi drain:** Nagdehi drain, also known as Nagdev River, flows for 55 kilometers before it joins Hindon River and carries both sewage and industrial effluent. High level of BOD (237 mg/l) was observed in the drain. UPPCB reported that three industrial units namely Jagdamba Gramodhyog Sansthan (Pulp & Paper) and Pashupati Dairy (P) Ltd. located on Dehradun Road and Bombay Hosiery (Textile) located at village Mohmmadpur, Kailashpur are operating in the catchment of the drain.



**Figure 6 Flow diagram of river Hindon from origin to village Maheshpur in Saharanpur district**

- **Star Paper Mill drain:** The Star Paper Mill drain is untapped and mixed drain carries industrial effluent from the Star Paper Mill and sewage from the Shantagarh area. The drain was found to have high levels of color-107 Hazen and BOD-198 mg/l.

### **River Dhamola**

Dhamola River originates from a pond in Sansarpur village, Saharanpur and flows for approximately 52 Kilometres before meeting the Hindon River at Village Sharakthal/Sadoli Hariya in Saharanpur (**Figure 7**), which was found dry.

The river is recharged by groundwater at Salempur Bhugdi village. Downstream, at a distance of approximately 3 Kms, the Madh village drain (Flow-1.71 MLD, BOD-17 mg/l & COD-100 mg/l), which carries sewage from the Madh village, meets the Dhamola River. After confluence of Madh village drain, the levels of DO and BOD in the river at Dhamola village were 8.04

mg/l & 1.6 mg/l in round I (17/12.2023) and 13.9 mg/l & 3 mg/l in round II (Feb 7-8; 2023) respectively (**Figure 8**).



**Figure 7 Origin of River Dhamola - Pond in Sansarpur village**



**Figure 8 River Dhamola at Dhamola village**

After flowing for approximately 27 Kilometres from its origin, two drains, namely the Numaesh Camp drain (domestic) (Flow-10 MLD, BOD-63-76 mg/l & COD-197-258 mg/l) and Kamdhenu Complex (KD Complex) drain (industrial) (BOD-28-204 mg/l, COD-142-545 mg/l, TSS-1066 mg/l, Cd-7.09 mg/l, Cu-15.95 mg/l & Fe-6.49-97.05 mg/l), discharge into the river. The levels of DO and BOD in the river before and after the confluence of these two drains were 0.36 mg/l and 23 mg/l as well as NIL and 42 mg/l, respectively.

Further downstream, two domestic drains, namely Paondhoi drain (domestic) (BOD-64 mg/l & COD-170 mg/l) and Kishanpur drain (domestic) (Flow-95 MLD, BOD-206 mg/l & COD-347 mg/l), meet the river, and the levels of DO and BOD in the river were 0.95 mg/l and 37 mg/l, respectively. The river was also monitored before its confluence with the Hindon River (after discharge of treated sewage from STP), and the levels of DO and BOD in the river were NIL and 8-47 mg/l, respectively. List of units provided by UPPCB in the catchment of river Dhamola is given below:

1. Shankar Board Mill, Saharanpur;
2. Arora Hosiery, Janta Road, Saharanpur;
3. Kamal Enterprises, Village Dhamola, Janta Road, Saharanpur;
4. General Textiles, Janta Road, Saharanpur;
5. Mak Hosiery, Tiparpur, Janta Road, Saharanpur;
6. Super Textile, Village Tiparpur, Janta Road, Saharnapur;

7. Shah Industries, 18 Medanta Complex, Janta Road, Saharnapur;
8. Ganpati Textile, Janta Road, Saharanpur;
9. Ekta Textile, Janta Road, Saharanpur;
10. Anmol Textile, Janta Road, Saharanpur;
11. Shalimar Cotton Dyeing, Saharanpur;
12. Siddharth Textile, Chilkana Road, Saharanpur;
13. Saharanpur Wools Ltd. Dehli Road, Saharanpur;
14. Atul Textile, Behat Road, Saharanpur;
15. Durga Textile, Janta Road, Saharanpur;
16. Garg Dyeing, Janta Road, Saharanpur;
17. J.J. Textile, Janta Road, Saharanpur;
18. Saharanpur Textiles Pvt. Ltd., Janta Road, Saharanpur;
19. Standard Engineering works, Industrial estate, Delhi road, Saharnapur;
20. Nagar Nigam, Pashubadhshala, Saharanpur
21. Deep Industries, I.E. Delhi Road, Saharanpur

The flow diagram depicting the Dhamola River from its origin to its confluence with the Hindon River is shown in **Figure 9**.

**Issues:**

- Pollution (BOD>10 mg/l) was observed in river Dhamola stretch from before confluence of Numaish Camp drain and KD Complex industrial drain to before confluence with river Hindon. DO and BOD in this stretch ranged as NIL-0.36 mg/l and 22-37 mg/l, respectively. River carries discharge of 21 industrial units (including industrial units discharging via Kamdhenu complex drain).
- Pollution due to drains (BOD>150 mg/l & COD>450 mg/l):
  - **Kishanpur drain:** Kishanpur drain is an untapped drain (domestic drain) which has a flow of around 95 MLD and carries domestic sewage from Saharanpur city and Ram Nagar market area. The drain has been found to have high levels of BOD (206 mg/l) which indicate discharge from industrial/commercial activities like dairy farming in to drain. Inventory of industrial units discharging into this drain is not available.

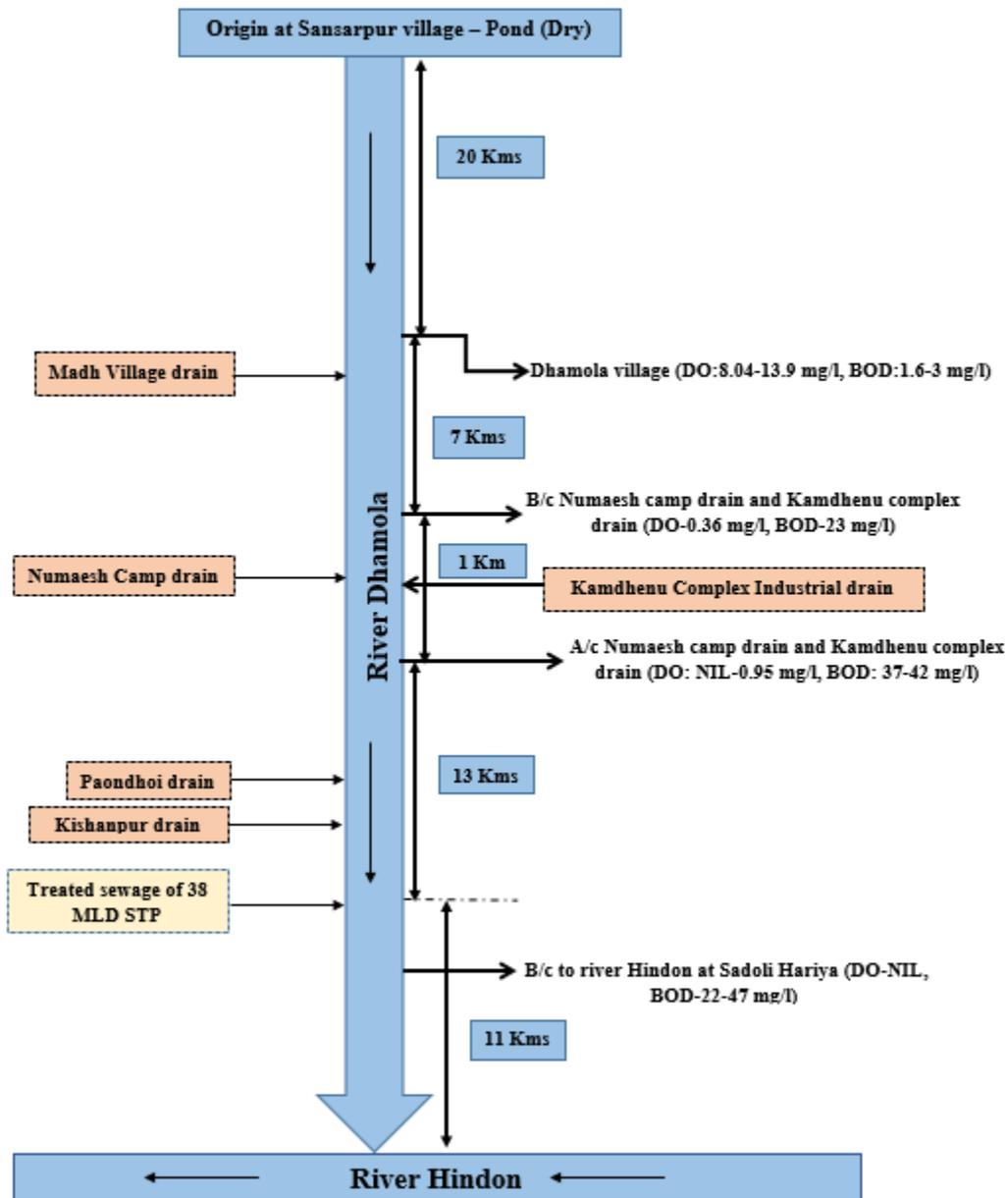


Figure 9 Flow diagram of river Dhamola from origin to confluence of river Hindon

- **Kamdhenu Complex Industrial drain:** Kamdhenu Complex Industrial drain is an untapped mixed drain that originates in Saharanpur city and carries untreated/partially treated industrial effluent from four textile units located on Janta Road in Saharanpur district and grey colored sewage from Balmiki Basti. The drain has been found to have high levels of BOD (204 mg/l) and COD (545 mg/l), as well as high concentrations of heavy metals, including Cd (7.098 mg/l), Cu (15.958 mg/l), and Fe (6.496-97.05 mg/l). The high concentrations of heavy metals such as Cd, Cu and Fe indicates that metal surface finishing industries are operating in the catchment of

Kamdhenu Complex Industrial drain. According to UPPCB, four textile units operate in the catchment area of the drain:

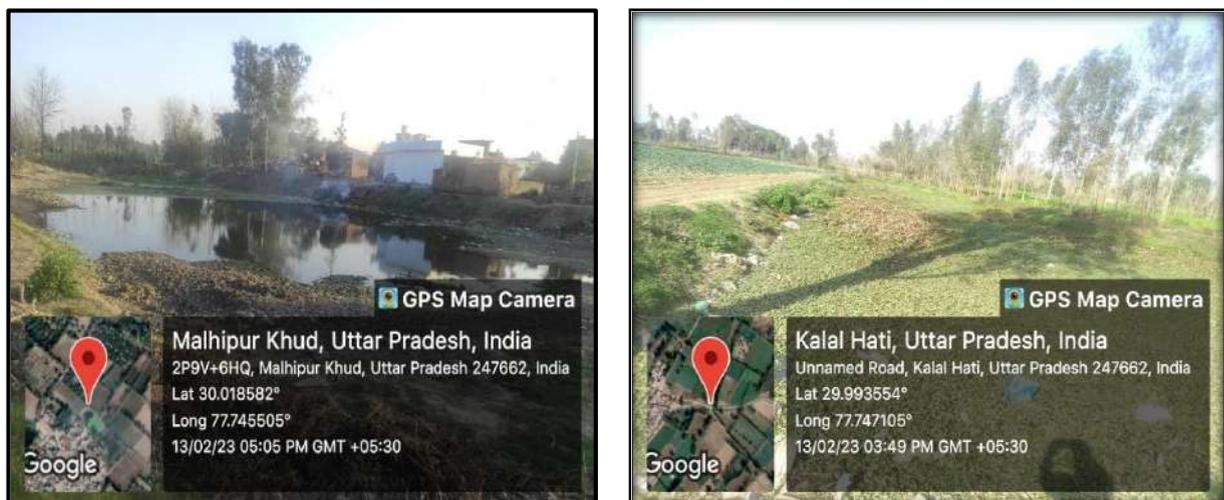
1. Durga Textile, Janta Road, Saharanpur
2. Garg Dyeing, Janta Road, Saharanpur
3. J.J. Textile, Janta Road, Saharanpur
4. Arora Hosiery, located on Janta Road in Saharanpur.

### **River Kali-West**

The Kali-West River originates from a series of wetlands in the villages of Gangali and Kalahati in Saharanpur (**Figure 10**). In downstream, at Shivpur village, the river flows into a pond which has become highly silted and polluted due to the discharge of sewage from nearby villages. However, the river channel/bed in the upper reaches, up to Dharpur village, is not distinct and is being encroached upon by farmers for farming and cultivation purposes.

The river begins to attain a continuous flow from Dharpur village, where DO and BOD in the river were found as 10.2 mg/l and 1.1 mg/l, respectively. Further downstream, freshwater from the Ganga canal is discharged into the river at Rastam village. In downstream, DO and BOD in the Kali-West River at Miragpur village were measured as 9.92 mg/l and 3 mg/l, respectively.

After confluence of Deoband drain (Flow-12.51 MLD, BOD-21 mg/l & COD-77 mg/l) near Fatehpur village, DO and BOD levels in the river at Sapla Khatri village (**Figure 11**) were 2 mg/l and 1.1 mg/l in round I (02/11/2022) and 0.7 mg/l & 6 mg/l respectively in round II (15/12/2023).



**Figure 10 River Kali-West origin from wetland at Gangali and Kalalhati**



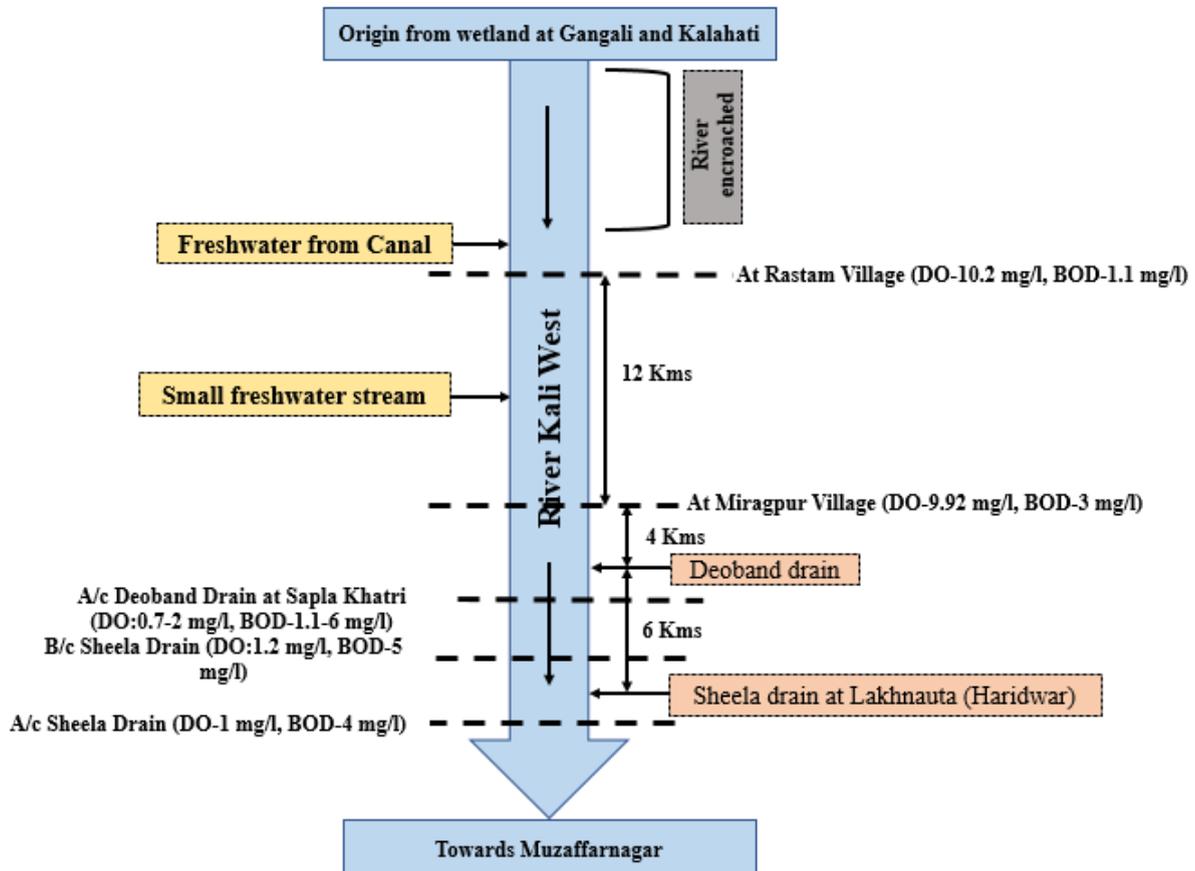
**Figure 11 River Kali-West at Sampla Khatri**

Further downstream, Sheela drain (Flow-20.04 MLD, BOD-365 mg/l and COD-702 mg/l) originates from Roorkee, Uttarakhand (Mixed drain) meets the river. Decrease in DO levels from 1.2 to 1 mg/l was observed in the Kali-West River, after confluence with Sheela drain. Flow diagram of river Kali West from origin to after confluence of Sheela drain is shown in **Figure 12**.

**Issues:**

- Pollution due to drains (BOD>150 mg/l & COD>450 mg/l):
  - **Sheela drain:** Sheela drain is an untapped mixed drain. The drain carries both industrial effluent and untreated sewage from nearby villages and the Roorkee city (Uttarakhand). Sheela drain was monitored at Lakhnauta, Uttarakhand before confluence of channel of Ganga canal with the drain. High BOD (365 mg/l) and COD (702 mg/l) were observed in the drain indicating industrial discharge. Freshwater from Ganga Canal is discharged into Sheela drain near Rasoolpur Fakerheri village near Uttarakhand-Uttar Pradesh border. Catchment of the drain includes Libaheri, Jhabrera, Tikkolakala, Kbalpura village/town of Uttarakhand. Industries located in the catchment area of the drain include:
    1. M/s Uttam Sugar Mills Limited Distillery Division, Libberheri, Dist. Haridwar. (Uttarakhand)
    2. M/s Uttam Sugar Mills Ltd., Khasra No.- 42, 45 etc, Vill. - Libberheri, Roorkee, District Haridwar

3. M/s Aroma Craft & Tissues Pvt. Ltd., Khasra No. 103, 104, Vill- Nurpur, Pargana- Manglore, Tehsil- Roorkee, District Haridwar
4. M/s Sagar Paper Mills Pvt. Ltd., Khasra No. 223, 225, 5th K.m., Manglore- Jhabrera Road, Latherdeva Hoon, Tehsil- Roorkee, Distt. - Haridwar
5. M/s Asahi India Glass Ltd.- AIS Industrial Estate, Jhabera Road, Latherdeva Hoon, Roorkee, District Haridwar
6. M/s Air Liquide North India Pvt. Ltd., Unit -I, AIS Industrial Estate, Jhanreda road Tehsil- Roorkee, District Haridwar
7. M/s Finolex Cable Limited, Plot no.: K1 & 2 AIS Industrial Estate, Latherdeeva Hoon, Manglaur Jhabrera Road, Tehsil- Roorkee, District Haridwar, Uttarkhand
8. M/s Carborundum Universal Ltd., Plot No. K-3, AIS Industrial Estate, Tehsil- Roorkee, District Haridwar
9. M/s Uttaranchal Pulp & Paper Mill Pvt. Ltd. Khasra No. – 29, 02<sup>nd</sup> Km stone Mangalore, Vill. – Mundet, Roorkee, District Haridwar, Uttarakhand
10. M/s Aadharshree Paper Mills Pvt. Ltd. Mangalore – Deoband road, Vill. – Mundet, Roorkee, District Haridwar, Uttarakhand
11. M/s Sagar Pulp & Paper Mills Ltd. Khasra No. 14/1, 2.5 Km. Mangalore – Deoband road, Vill. – Mundet, Roorkee, Dist. – Haridwar, Uttarakhand
12. M/s Gold Plus Glass Industry Ltd. Gold Plus Industrial Estate, Vill. – Thithola, P.O. – Landhora, Laksar Road, District Haridwar
13. Inwing Industries
14. UMRB Electronics
15. AIS Outglass
16. Saraswati Paints Pvt. Ltd.

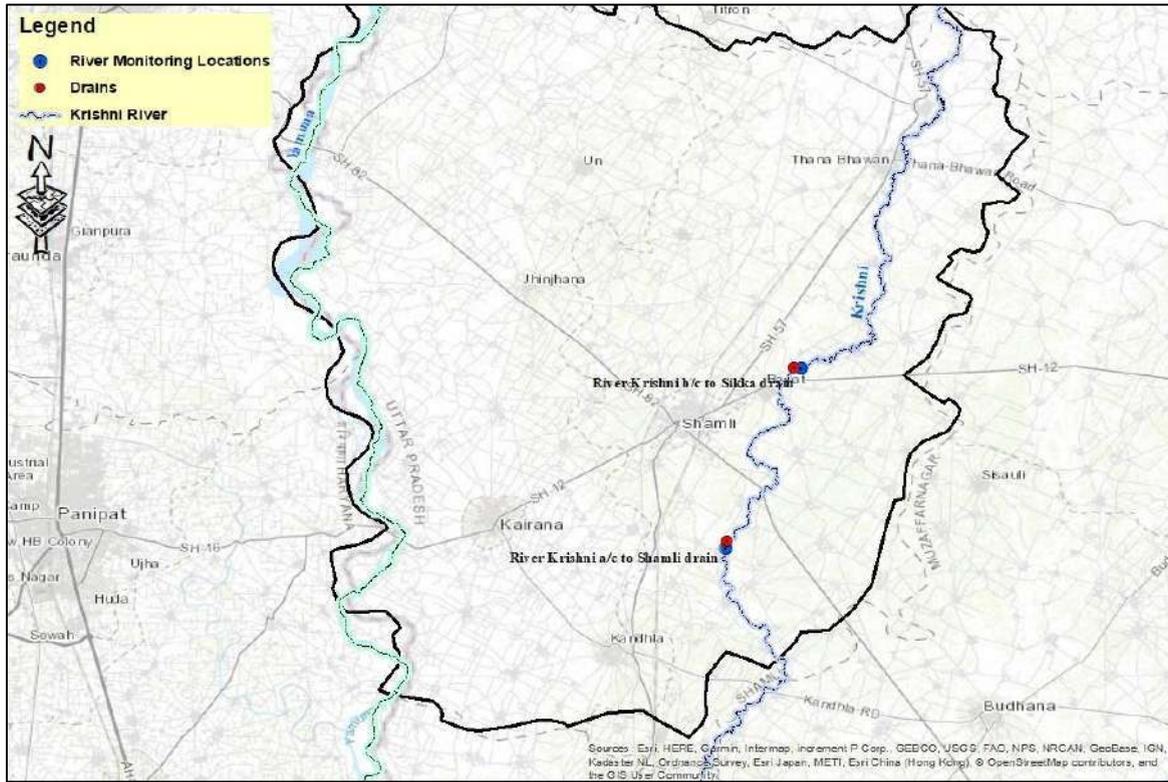


**Figure 12 Flow diagram of river Kali-West from origin to after confluence of Sheela drain in Saharanpur**

### River Krishni

River Krishni originates from a wetland situated at Savalpur Navada near Krishni village in Saharanpur district (**Figure 13**). Before the confluence of Thaska drain at Bhanera Khemchand village near Nanauta town, the river was observed dry.

River gained flow after confluence with Thaska drain (BOD-98 mg/L and COD-354 mg/L). Thaska drain meets river Krishni approx. 36 km downstream from the origin point of river. The DO and BOD levels in the river a/c of Thaska drain were found to be NIL and 98 mg/l, respectively (**Figure 14**). Thaska drain receives industrial effluent along with domestic sewage from nearby areas. In catchment of Thaska drain, there are three industries namely Kisan Sahkari Chini Mill (Sugar); S.M.C. Foods Ltd. (Dairy) & U.P. Co-Operative Sugar Factory (Distillery Unit) located at Nanauta, Saharanpur. Further at downstream, Sikka drain (untapped, mixed drain) (BOD-48 mg/L and COD 256 mg/L) confluence with river Krishni at approx. 75 Kms. DO, BOD and COD levels in river Krishni before confluence to Sikka drain were NIL, 57 mg/l & 228 mg/l respectively (**Map-4**).



**Map 4 Monitoring locations on river Krishni along with adjoining drains in Shamli district**

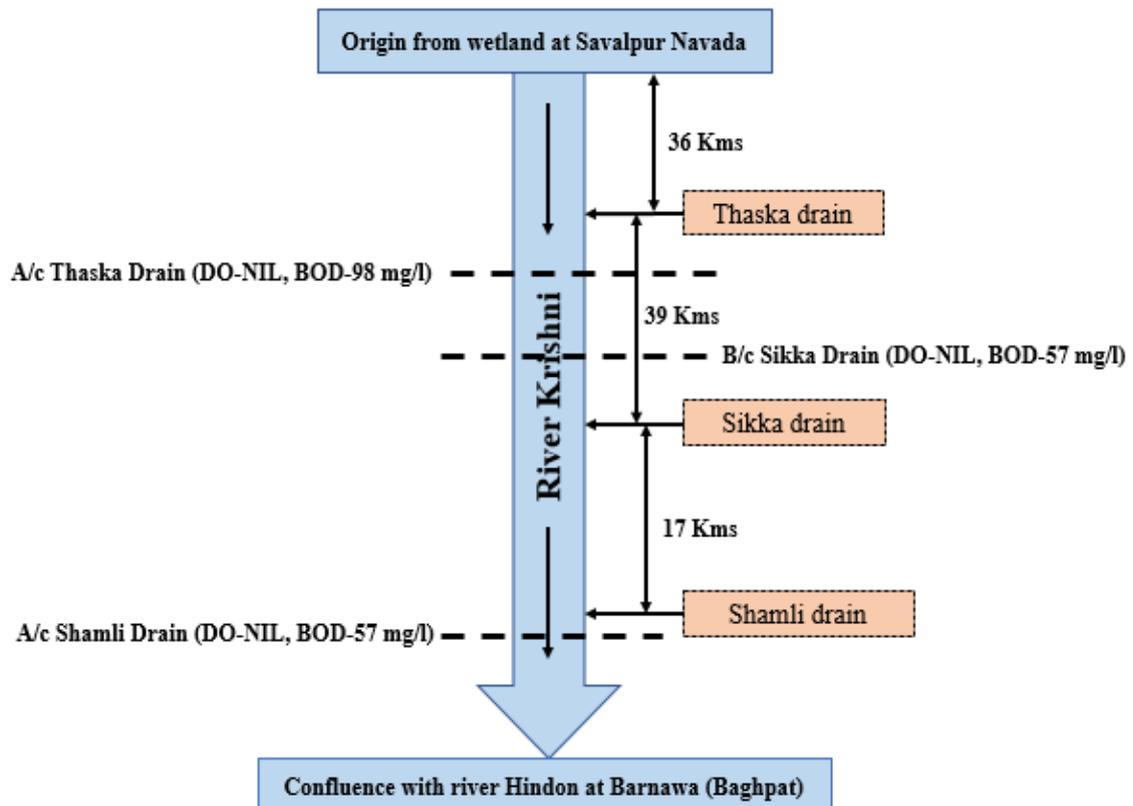


**Figure 13 River Krishni origin from wetland at Savalpur Navada**



**Figure 14 River Krishni A/c Thaska drain**

Thereafter, stagnant water was observed in river Krishni before confluence of Shamli drain with the river. Shamli drain (Flow-93.41 MLD, BOD- 48 mg/L & COD- 254 mg/L) discharges into river Krishni at approx. 92 Kms from origin. Water quality of river Krishni w.r.t. DO, BOD & COD after confluence to Shamli drain was NIL, 57 mg/l and 297 mg/l, respectively. Flow diagram of river Krishni from Origin to after confluence of Shamli drain is show in **Figure 15**.



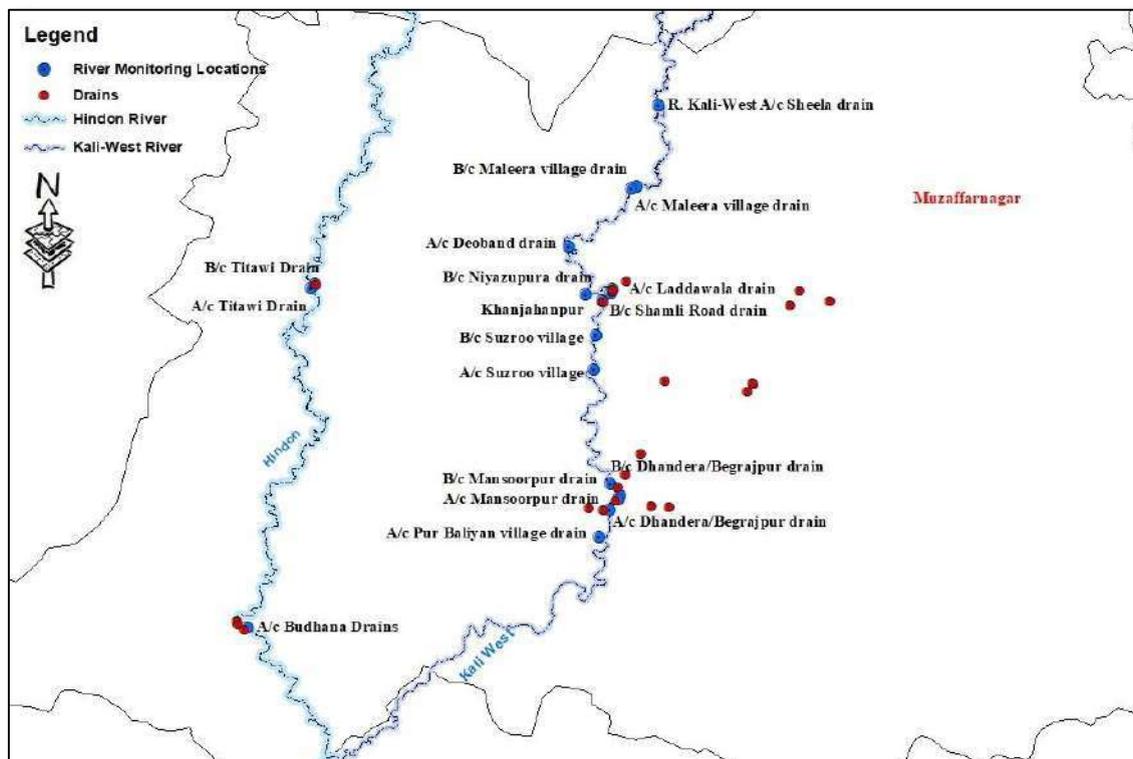
**Figure 15 Flow diagram of river Krishni from origin to after confluence of Shamli drain**

### 3.4 Muzaffarnagar District

In Muzaffarnagar district, water quality of two rivers namely river Hindon and its tributary Kali-West, their adjoining drains and STPs in the catchment were monitored. The monitoring locations on river Hindon and its tributary River Kali-West along with adjoining drains in Muzaffarnagar district are shown in **Map-5**:

#### River Hindon

After entering into Muzaffarnagar district, Titawi drain (Flow-2.34-4.93 MLD, BOD -190-197 mg/l and COD - 373-399 mg/l) meets the river near Titawi village at approximately 61.5 Kms downstream of Bajaj Sugar Mill drain (in Saharanpur district). Titawi drain carries domestic sewage from Titawi village along with effluent of Indian Potash Limited (Sugar Industry). DO and BOD in river b/c of Titawi village drain were 0.60-0.66 mg/l and 7-13 mg/l, respectively.



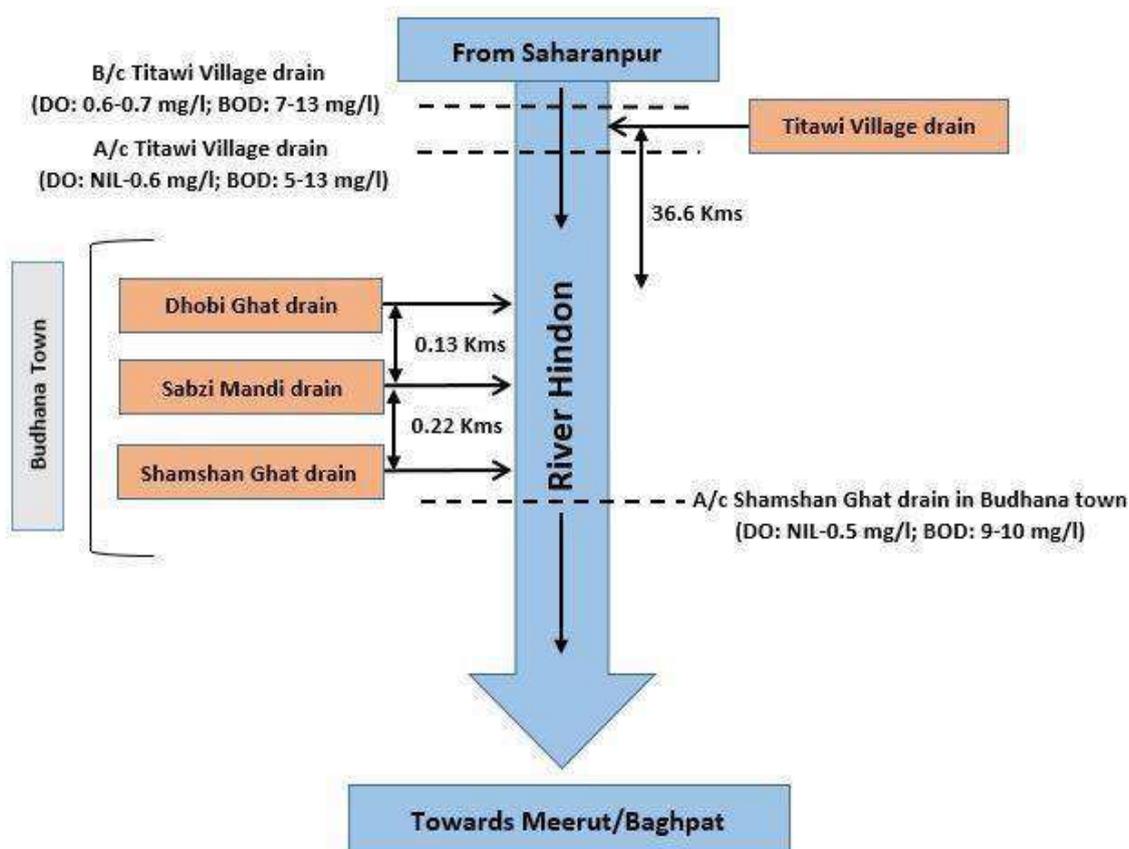
**Map 5 Monitoring locations on Rivers Hindon and its tributary River Kali-West along with adjoining drains in Muzaffarnagar district**

At approximately 36.6 Kms downstream, three drains namely Dhobi Ghat drain (BOD: 180-574 mg/l and COD: 455-1435 mg/l), Sabzi Mandi drain (BOD: 115-267 mg/l and COD: 273-

800 mg/l) and Shamshan Ghat drain (BOD: 130-159 mg/l and COD: 344 mg/l) meet river in Budhana town within a distance of 0.35 Kms. A STP of capacity 10 MLD is under construction at Budhana town to tap all these three drains. DO and BOD in river a/c of these three drains of Budhana town were NIL-0.5 mg/l and 5-13 mg/l, respectively. River Kali-West meets river Hindon after approximately 7.6 Kms downstream of confluence with Shamshan Ghat drain. The flow diagram of river Hindon depicting the river monitoring locations along with confluence points of drains with river Hindon are shown in **Figure 16**.

The major issues related to pollution in rivers and drains:

- Pollution (DO-NIL and BOD>10 mg/l) was observed in river Hindon near Titawi village, before and after confluence of Titawi drain. DO and BOD in this stretch were NIL-0.66 mg/l and 5-13 mg/l, respectively.



**Figure 16** Flow diagram of river Hindon depicting the river monitoring locations along with confluence points of drains with river Hindon

- Pollution (BOD>150 mg/l, COD>450 mg/l and TSS>500 mg/l) in drains:

- **Titawi drain:** Titawi drain (Flow: 2.34-4.93 MLD) is an untapped drain which carries sewage of Titawi village along with effluent of Indian Potash Limited (Sugar Industry). High level of BOD in the range 190-197 mg/l was found in Titawi drain.
- **Dhobi Ghat drain:** Dhobi Ghat drain is an untapped drain which carries domestic sewage of Peerwala Mohalla, Budhana. Flow in the drain could not be measured due to less flow. Wastewater containing high BOD (180-574 mg/l), COD (455-1435 mg/l) and TSS (1551 mg/l) was found in the drain. No industries have been identified in the catchment of the drain.
- **Sabzi Mandi drain:** Sabzi Mandi drain is an untapped drain which carries domestic sewage of Sabzi Mandi, Luhsana village and Mandwada village in Budhana. Flow in the drain could not be measured due to dumping of solid waste. Wastewater containing high BOD (115-267 mg/l), COD (273-800 mg/l) and TSS (771 mg/l) was found in the drain. No industries have been identified in the catchment of the drain.
- **Shamshan Ghat drain:** Shamshan Ghat drain is an untapped drain which carries domestic sewage of Sabzi Mandi, Luhsana village and Mandwada village in Budhana. Flow in the drain could not be measured due to dumping of solid waste. Wastewater containing high BOD (130-159 mg/l) and COD (344-368 mg/l) was found in the drain. No industries have been identified in the catchment of the drain.

The photographs of river and drain monitoring locations are shown in **Figure 17-22**.



**Figure 17 River Hindon b/c Titawi village drain**



**Figure 18 Titawi village drain**



**Figure 19 Dhobi Ghat drain**



**Figure 20 Sabzi Mandi drain**



**Figure 21 Shamshan Ghat drain**



**Figure 22 River Hindon a/c of three drains of Budhana town**

- Also, high iron concentration was observed in Titawi drain (12.89 mg/l), Dhobi Ghat drain (10.66-12.88 mg/l), Sabji Mandi drain (12.93 mg/l) and Shamshan Ghat drain (3.97 mg/l).

### **River Kali-West**

After entering the Muzaffarnagar district, Maleera village drain, which carries sewage from the Maleera village, meets the river Kali-West after approximately 18.8 Kms a/c of Sheela drain with river Kali-West. The DO and BOD levels in the river b/c with the Maleera Village drain were 5.3 mg/l and 5 mg/l, respectively (**Figure 23**).

Flow in Maleera village drain (BOD-54 mg/l and COD-187 mg/l) was less which could not be measured. After confluence of Maleera village drain, DO and BOD in the river were 4.7 mg/l and 6 mg/l, respectively. Further downstream (approximately 7.9 Kms a/c of Maleera village

drain), Badhai Khurd drain, carrying sewage from Deoband, Bahadurpur, Rankhandi, Thamana, Aakhlour, Badhai Kalan, Hoshiyarpur, Badhai Khurd, Said Nagla, Kacholli towns, and effluent from Triveni Engg. & Industries Ltd, Deoband (Sugar Industry), meets the river near Mimlana village. The DO and BOD levels in the river at Mimlana village were 4 mg/l and 7 mg/l, respectively (**Figure 24**). Further, at downstream, DO and BOD levels near Khanjahanpur village were 0.9 mg/l and 7 mg/l, respectively. Low level of dissolved oxygen in river was observed at Khanjahanpur village due to less flow and shallow depth of river (**Figure 25**).

In downstream, sewage from Niyazupura town (Flow: 17.1-17.5 MLD, BOD: 119-230 mg/l and COD: 398-552 mg/l) meets river (approximately 7.8 Kms a/c of Badhai Khurd drain) & DO and BOD in the river before confluence of Niyazupura drain were 0.4-0.7 mg/l and 6-12 mg/l, respectively (**Figure 26**). After confluence of Niyazupura drain, at approximately 0.12 Kms downstream, four domestic drains - namely Laddawala drain (Flow: 65.94-92.27 MLD, BOD: 163-259 mg/l and COD: 504-1150 mg/l), Shamli Road drain (BOD: 117-202 mg/l and COD: 291-694 mg/l), Krishnapuri drain (BOD-122 mg/l and COD-444 mg/l), Khadarwala drain (BOD-164 mg/l and COD-568 mg/l) - meet the river in the stretch of 1.4 Kms and contribute pollution in river Kali-West. Flow in Shamli Road drain, Krishnapuri drain and Khadarwala drain could not be measured as these drains were flowing via closed pipeline. The DO in the river after confluence of Lddawala drain become NIL, and BOD levels increase to 25-38 mg/l.



**Figure 23 River Kali-West b/c Maleera village drain**



**Figure 24 River Kali-West a/c Badhai Khurd drain near Mimlana village**



**Figure 25 River Kali-West a/c Badhai Khurd drain at Khanjahanpur village**



**Figure 26 River Kali-West b/c Niyazupura drain**

A Waste Stabilization Pond based Sewage Treatment Plant (STP) with a designed capacity of 32.5 MLD is installed near Suzroo village and Laddawala drain (Flow: 65.94-92.27 MLD, BOD: 163-259 mg/l and COD: 504-1150 mg/l), Khadarwala drain (BOD-164 mg/l and COD-568 mg/l), Krishnapuri drain (BOD-122 mg/l and COD-444 mg/l), and South Khalapar drain are partially tapped to STP. However, the STP was found non-complying with respect to treated sewage discharge norms and treated sewage is discharged into river via Suzroo village drain which carries sewage of Suzroo village. The colour of the treated sewage was observed green indicating high algal bloom. Nai Basti Khalapar drain (Flow-17.59 MLD, BOD-36 mg/l & COD-135 mg/l) meets Suzroo village drain, which ultimately meets the river at approximately 2.39 Kms a/c of Krishnapuri drain. Before confluence with river, the wastewater characteristics of the drain showed Flow-25.92 MLD, BOD-111 mg/l and COD-571 mg/l. After confluence with these drains in Suzroo village, the DO in the river become NIL, and BOD was 18 mg/l.

Further at downstream, the Dhandera drain meets river Kali-West at approximately 14.51 Kms a/c of Suzroo village drain. Prior to the confluence, the DO level in the river was NIL, and the BOD level was 26 mg/l. The Dhandera drain originates from upstream of the industrial cluster, nearly 9 Kms from Bhopa Road, in Muzaffarnagar where industrial units are mainly of Pulp and Paper sector. According to the information provided by the UPPCB, the treated effluent from the Tehri Pulp and Paper Limited is used for irrigation on their own land. Overflow from the land is discharged into the Dhandera drain, and the drain gains flow from this location onwards and at this location, Flow-0.58 MLD, BOD-20 mg/l, COD-90 mg/l, TDS-328 mg/l and TSS-190 mg/l were found in the drain. Further downstream, an irrigation canal from Chandpur village meets the Dhandera drain, which was dry at the confluence, with no fresh water being discharged into the drain. Dhandera drain was monitored downstream of Bhopa

Road, and flow of 19.3 MLD was observed with BOD-30 mg/l, COD-137 mg/l, TDS-1080 mg/l, and TSS-70 mg/l. The Dhandera drain was then monitored before confluence with Jatt Mujheda drain in upstream of 8 km Jansath road, near another industrial cluster, where a flow of 54.23 MLD was observed with high levels of pollution having BOD-948 mg/l, COD-2011 mg/l TDS-2808 mg/l and TSS-1188 mg/l.

Jatt Mujheda drain originates near one of the paper mill near Bhopa Marg in Muzaffarnagar, and it was dry upstream. It receives flow from the discharge of industrial units. The analysis results of the wastewater sample of Jatt Mujheda drain collected at downstream of paper mills showed a BOD of 103 mg/L, a COD of 280 mg/L, a TDS of 1096 mg/L, and a TSS of 272 mg/L. Drain contained very less flow which could not be measured. In downstream, Jatt Mujheda drain was monitored b/c with Dhandera drain. Flow of the drain was 8.06 MLD and the wastewater characteristics showed BOD-2230 mg/l, COD-4264 mg/l, TSS-1230 mg/l and TDS-4148 mg/l.

Dhandera drain a/c with Jatt Mujheda drain was monitored at Jansath Road and flow was 66.99 MLD, pH-5.9, Colour-146 Hazen, BOD: 922-1114 mg/l, COD: 2106-2413 mg/l, TDS: 3164-3548 mg/l, TSS: 924-1357 mg/l, Fe-26.72 mg/l, Pb-0.13 mg/l, Mn-3.31 mg/l & Zn-5.43 mg/l. Further downstream, Kukra drain meets Dhandera drain. Kukra drain carries sewage from the Sahawali and Sandhawali areas. According to information provided by UPPCB officials, a sewage treatment plant (STP) with a capacity of 22 MLD has been proposed to treat the untreated sewage of Kukra drain. The drain was monitored before confluence with the Dhandera drain near Sandhawali village (Flow-26.47 MLD). Analysis results showed BOD-62 mg/l, COD-219 mg/l, TDS-876 mg/l, and TSS-163 mg/l. The wastewater characteristics of the Dhandera drain a/c with Kukra drain at the Meerut-Haridwar Bypass Road were: BOD-495 mg/l, COD-2080 mg/l, TDS-2076 mg/l, and TSS-1838 mg/l.

In downstream, another drain carrying industrial effluent from Begrajpur industrial area meets Dhandera drain. Acidic fumes were detected in the vicinity of Begrajpur industrial area drain (Flow: 1.73-1.92 MLD). Analysis of the collected samples showed acidic pH (<2 – 2.3) and high levels of color (146 Hazen), BOD (936 mg/l), COD (474-3444 mg/l), TDS (2584-7884 mg/l) and metal concentration (Fe: 8.91-27.96 mg/l, Pb: 0.24-0.7 mg/l, Mn: 3.72-10.9 mg/l & Zn: 6.48-17.67 mg/l), indicating discharge from metal/battery processing/recycling units. Dhandera drain was monitored before confluence with river Kali-West and the wastewater characteristics showed BOD (547-968 mg/l), COD (1322-2214 mg/l), and TDS (1856-2452 mg/l). DO and BOD values in river Kali-West before confluence of Dhandera drain were NIL

and 26 mg/l (**Figure 27**). River Kali-West was monitored a/c of Dhandera drain and DO-NIL, BOD-348 mg/l, COD-1001 mg/l, TDS-1428 mg/l and Color-289 Hazen were found in river water (**Figure 28**).

Further downstream (at approximately 0.73 Kms a/c of Dhandera drain), Mansoorpur drain meets river Kali-West. Samples were collected from river Kali-West before and after the confluence with Mansoorpur drain, as well as from Mansoorpur drain before confluence with river Kali-West. Prior to the confluence, DO level in the river were NIL, and the BOD was 111 mg/L. Mansoorpur drain originates near Mansoorpur Sugar Mill Road area and carries sewage from the Mansoorpur Sugar Mill Road area. Two GPIs (Sir Shadi Lal Distillery & Chemical Works (ZLD) and D.S.M. Sugar) are located in the catchment of Mansoorpur drain. The Mansoorpur drain was monitored at three locations, starting at its origin, where the wastewater characteristics were BOD-60 mg/L, COD-222 mg/L, and TDS-480 mg/L. Flow at origin could not be measured as drain was covered. Thereafter, Mansoorpur drain was monitored near Husenpur Bopara village (Flow-3.13 MLD) and BOD, COD, and TDS levels were 571-579 mg/L, 1261-1426 mg/L, and 1000-2188 mg/L, respectively. Dumping of solid waste into the drain was observed at this location.



**Figure 27 River Kali-West before confluence  
Dhandera drain**



**Figure 28 River Kali-West after confluence  
with Dhandera drain**



**Figure 29 River Kali-West a/c Mansoorpur drain**



**Figure 30 River Kali-West a/c Pur Baliyan village drain**

Before confluence with river Kali-West, Mansoorpur drain had BOD-404 mg/L, COD-870 mg/L, and TDS-2024 mg/L, with a flow of 1 MLD. After the confluence, DO levels in the river were NIL, and the BOD levels were 65-87 mg/l (**Figure 29**). Further, in downstream, a drain carrying sewage from Pur Baliyan village (Flow ranged as 1.99 MLD) meets river Kali-West. Pur Baliyan village drain was monitored at its origin in Pur Baliyan village, where BOD-174 mg/L, COD-479 mg/L, and TDS-1328 mg/L. Before the confluence with the river, the flow rate was measured, and the BOD and COD levels were found to be 188-252 mg/L and 425-520 mg/L, respectively. Samples were collected from river Kali-West after confluence with Pur Baliyan village drain, and DO levels were NIL, while the BOD levels were 96-175 mg/L (**Figure 30**). The flow diagram of river Kali-West depicting the river monitoring locations along with confluence points of drains with river Kali-West are shown in **Figure 31**.

The major issues related to pollution in rivers and drains:

- Pollution (BOD>10 mg/l) was observed in river Kali-West before confluence of Niyazupura drain to after confluence of Pur Baliyan drain. DO and BOD in this stretch ranged as NIL-0.7 mg/l and 12-348 mg/l, respectively.
- Pollution (BOD>150 mg/l and Colour>60 Hazen) was observed in drains discharging into river Kali-West:
  - **Niyazupura drain:** Niyazupura drain is an untapped drain (Flow: ~17 MLD), which carries sewage of Niyazupura town. High levels of BOD (119-230 mg/l) and COD (398-552 mg/l) were found in the drain. However, inventory of industries in the catchment of the drain is not available (**Figure 32**).

- **Laddawala drain:** Laddawala drain carries sewage of Laddawala, Ramleela Tila, Abkari Mohalla and Hanumanpuri areas. The drain is tapped to 32.5 MLD STP via IPS-1 and the overflow (65.94-92.27 MLD) from the drain is directly discharged into the river. High levels of BOD (163-259 mg/l) and COD (504-1150 mg/l) were found in the drain. However, inventory of industries in the catchment of the drain is not available. Huge amount of municipal solid waste is dumped into river through Laddawala drain (**Figure 33**).
- **Shamli Road drain:** Shamli Road drain is an untapped drain which carries sewage of Shamli Road area. High levels of BOD (117-202 mg/l) and COD (291-694 mg/l) were found in the drain. Flow in the drain could not be measured as drain was flowing via closed pipeline and dumping of solid waste was observed (**Figures 34-35**). However, inventory of industries in the catchment of the drain is not available.
- **Suzroo village drain:** This drain (Flow: 25.92 MLD) carries combined sewage of Suzroo village and Nia Basti Khalapar along with treated sewage of 32.5 MLD STP, Muzaffarnagar (**Figures 37-40**). High level of COD (571 mg/l) was found in the drain. However, inventory of industries in the catchment of the drain is not available.

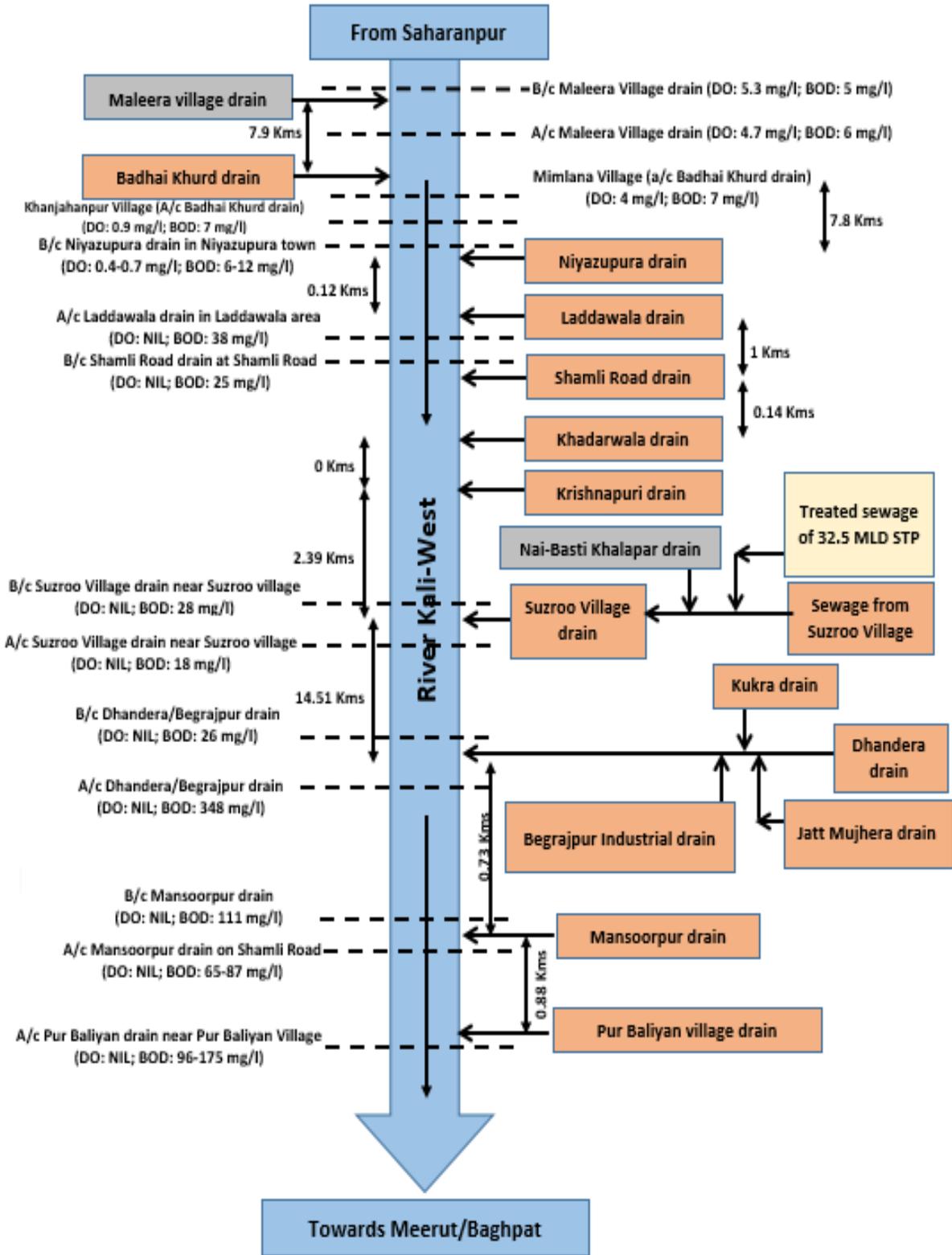


Figure 31 Flow diagram of river Hindon depicting the river monitoring locations along with confluence points of drains with river Hindon



**Figure 32 Confluence point of Niyazupura drain with river Kali-West**



**Figure 33 Dumping of municipal solid waste into river Kali-West through Laddawala drain**



**Figure 34 Shamli Road drain at origin  
(dumping of solid waste in drain)**



**Figure 35 Confluence of Shamli Road  
drain with River Kali-West**



**Figure 36 Dumping of solid waste in Khadarwala drain**



**Figure 37 Drain carrying sewage of Suzroo village**



**Figure 38 Discharge of treated sewage of 32.5 MLD STP into Suzroo village drain**



**Figure 39 Nai Basti Khalapar drain (2nd order drain of Suzroo village drain)**



**Figure 40 Confluence point of Suzroo village drain with river Kali-West**

- **Dhandera drain:** Dhandera drain (Flow: 112.13-148.18 MLD) carry effluents from industries located on Bhopa Road, Jolly Road, Jansath Road, Meerut Road and Begrajpur Industrial Area along with sewage of towns/colonies located at Bhopa Road, Jansath Road (via Dhandera drain), and Sahawali & Sandhawali villages (via Kukra drain) (**Figures 41-55**). High levels of color (146 Hazen), BOD (495-1114 mg/l) and COD (1322-2413 mg/l) were found in the drain before confluence with the river.
  - High pollution was observed in two subsidiary drains of Dhandera drain namely Jatt Mujheda drain (Flow: 8.06 MLD, BOD: 2230 mg/l, COD: 4264 mg/l) and Begrajpur Industrial drain (acidic pH (<2), Color: 146 Hazen, BOD: 936 mg/l, COD: 3444 mg/l). In catchment of Jatt Mujheda drain, there are industrial units comprising of Pulp & Paper (04 nos.) and Distillery (01 no.) units located on Jolly Road & Bhopa Road, Muzaffarnagar. Begrajpur Industrial drain carry effluent of Pharmaceutical (01 no.) and Dyeing industries (05 nos.) located in the Begrajpur industrial area.

UPPCB has submitted that following industries are located in the catchment of the Dhandera drain, Begrajpur Industrial drain, Kukra drain and Jatt Mujheda drain:

- **Dhandera drain:**

1. Aristo Craft Paper Mills Pvt. Ltd. Meerut Road, Muzaffarnagar (Pulp & Paper)
2. Bindals Papers Mills Ltd. Bhopa Road, Muzaffarnagar (Pulp & Paper)
3. D.L.S. Papers Pvt. Ltd., 10Km Meerut Road, Dhaulapul, Begrajpur, Muzaffarnagar (Pulp & Paper)
4. DDLs Paper Pvt. Ltd., Meerut Road, Begrajpur, Muzaffarnagar (Pulp & Paper)
5. Galaxy Papers Pvt. Ltd. Jolly Road, Muzaffarnagar (Pulp & Paper)
6. Garg Duplex & Paper Mills (P) Ltd. Bhopa Road, Muzaffarnagar (Pulp & Paper)
7. K.K. Duplex Pvt. Ltd., Jansath road, Muzaffarnagar (Pulp & Paper)
8. Krishnanchal Pulp & Papers Pvt. Ltd. (Formerly Prime Papers) Jolly Road, Muzaffarnagar (Pulp & Paper)
9. Mahalaxmi Craft & Tissues Bhopa Road, Jansath Muzaffarnagar (Pulp & Paper)
10. Meenu Papers (P) Ltd. Bhopa Road Muzaffarnagar (Pulp & Paper)
11. Orient Board & Paper Mill Pvt. Ltd. Jansath Road, Muzaffarnagar (Pulp & Paper)
12. Genus papers & Boards Ltd. (Unit-2), Jansath Road, Muzaffarnagar (Pulp & Paper)
13. Shakti Craft & Tissues, Jansath road, Muzaffarnagar (Pulp & Paper)
14. S.K. Paper Mills Pvt. Ltd., Jolly Road, Muzaffarnagar (Pulp & Paper)

15. Shri Bhageshwari Paper Mills (P) Ltd., Bhopa Road Unit-1 Muzaffarnagar (Pulp & Paper)



**Figure 41 Dhandera drain - Dry at origin**



**Figure 42 Dhandera drain originating from discharge of M/s Tehri Pulp & Paper Ltd.**



**Figure 43 Dhandera drain d/s M/s Tehri Pulp & Paper**



**Figure 44 Confluence of irrigation canal (from Chandpur village) with Dhandera drain**



**Figure 45 Dhandera drain near M/s Silvertan Papers Limited (Unit-1 & 2)**





**Figure 46 Jat Mujheda drain-Dry at origin**



**Figure 47 Sludge deposition in Jat Mujheda drain**



**Figure 48 Jat Mujheda drain after receiving discharge from M/s Bindals Duplex Ltd.**



**Figure 49 Jat Mujheda drain before confluence with Dhandera drain**



**Figure 50 Dhandera drain before confluence with Jat Mujheda drain**



**Figure 51 Confluence point of Dhandera drain and Jat Mujheda drain**

**Figure 52 Dhandera drain after confluence with Jat Mujheda drain**



**Figure 53 Sludge blanket formation observed in Dhandera drain at Jansath Road, Muzaffarnagar**



**Figure 54 Begrajpur Industrial area drain**



**Figure 55 Confluence of Begrajpur industrial drain with Dhandera drain**

16. Shri Bhageshwari Paper Mills (P) Ltd., Bhopa Road Unit-2 Muzaffarnagar (Pulp & Paper) Siddheshwary Ind. Pvt. Ltd., Jansath Road, Muzaffarnagar (Pulp & Paper)
17. Sidhballi Papers mills Ltd,) Bhopa Road, Muzaffarnagar (Pulp & Paper)
18. Silverton Paper Ltd. (Unit-1) Bhopa Road, Muzaffarnagar (Pulp & Paper)
19. Silverton Paper Ltd. (Unit-2) Bhopa Road, Muzaffarnagar (Pulp & Paper)
20. Silverton Pulp & Paper, Bhopa Road, Muzaffarnagar (Pulp & Paper)
21. Silverton Pulp & Paper (Unit-2), Bhopa Road, Muzaffarnagar (Pulp & Paper)
22. Shri Veer Balaji Paper Mills, Vill. Tigri, Bhopa Road, Muzaffarnagar (Pulp & Paper)
23. Suyash craft & papers ltd., Velhana, Muzaffarnagar (Pulp & Paper)
24. Tehri Pulp & Papers Ltd. Bhopa Road (Unit-1) Muzaffarnagar (Pulp & Paper)
25. Tehri Pulp & Papers Ltd. Bhopa Road (Unit-2) Muzaffarnagar (Pulp & Paper)
26. Tirupati Balaji Fibres Ltd. Bhopa Road, Muzaffarnagar (Pulp & Paper)
27. Al Noor Export, Jansath road Muzaffarnagar (Slaughter House and Meat Processing)
28. H.J. Tannery Pvt. Ltd. Jolly Road Muzaffarnagar (Tannery)
29. Rati Pushp Intermediates Pvt. Ltd., Jansath Road, Muzaffarnagar (Basic Chemicals & Derivatives)
30. Gulshan Polyoles Ltd., Jansath Road, Muzaffarnagar (Food Processing & Calcium Carbonate)
31. Saral Chemtech LLP, Jansath Road, Muzaffarnagar (Basic Chemicals & Derivatives)

• **Begrajpur Industrial drain:**

1. Magma Industries, Muzaffarnagar (Pharmaceutical)

2. Jain Processors, D-1, Industrial Area Begrajpur, Muzaffarnagar (Dyeing & Washing of Jeans)
3. Noor Fashion, K-19, UPSIDC Industrial Area, Begrajpur (Dyeing & Washing of Readymade Garments & Jeans)
4. Ayman Collection, D-8, Industrial Area, Begrajpur, Muzaffarnagar (Dyeing & Washing of Readymade Garments & Jeans)
5. Shakeel Jeans, Industrial Area, Begrajpur, Muzaffarnagar (Dyeing & Washing of Readymade Garments & Jeans)
6. Bright Wash, Industrial Area, Begrajpur, Muzaffarnagar (Dyeing & Washing of Readymade Garments & Jeans)

- **Kukra drain:**

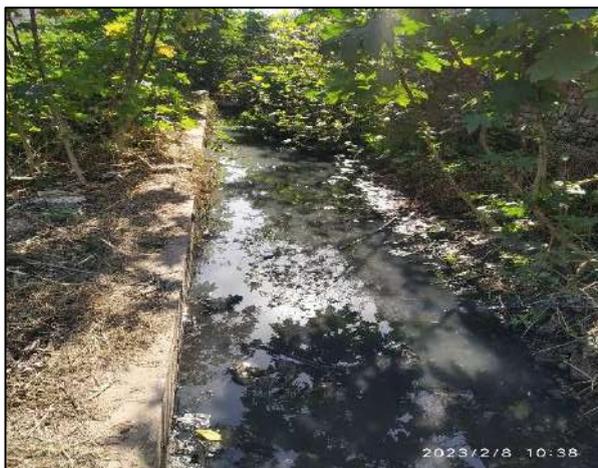
1. Aggarwal Duplex & Board Mills Ltd. Bhopa Road, Muzaffarnagar (Pulp & Paper)
2. Shakumbari Pulp & Paper Bhopa Road, Muzaffarnagar (Pulp & Paper)

- **Jatt Mujheda drain:**

1. Bindals Duplex Ltd, Bhopa Road (Unit-1), Muzaffarnagar (Pulp & Paper)
2. Bindals Duplex Ltd, Bhopa Road (Unit-2) Muzaffarnagar (Pulp & Paper)
3. Disha paper Industries, Jolly road, Muzaffarnagar (Pulp & Paper)
4. Parijat Paper Mills Ltd., Bhopa Road, Muzaffarnagar (Pulp & Paper)
5. Triveni Engg. Industries Ltd. Bilaspur (Alco Chemical Complex), Jolly Road, Muzaffarnagar (Distillery)

- **Mansoorpur drain:** Mansoorpur drain is an untapped drain which originates near Mansoorpur Sugar Mill Road area and carries sewage from the Mansoorpur Sugar Mill Road area. Acidic pH (4.9) and high levels of BOD (404-579 mg/l) and COD (870-1426 mg/l) were found in the drain. Two GPIs (Sir Shadi Lal Distillery & Chemical Works and D.S.M. Sugar) are located in the catchment of Mansoorpur drain. Dumping of solid waste in the drain was observed. The monitoring locations of Mansoorpur drain from origin to confluence with river Kali-West are shown in **Figures 56-61**.

- **Pur Baliyan drain:** Pur Baliyan drain (Flow-1.99-2.51 MLD) is an untapped drain which carries sewage from Pur Baliyan village. High levels of BOD (174-252 mg/l) and COD (425-520 mg/l) were found in the drain. Dumping of waste by animal husbandry units was observed in the drain. However, inventory of industries in the catchment of the drain is not available.



**Figure 56 Mansoorpur drain (origin) near D.S.M Sugar Mill market area**



**Figure 57 Deposition of sludge in Mansoorpur drain near National Highway-334**



**Figure 58 Yellowish coloured groundwater collected from borewell near Mansoorpur drain**



**Figure 59 Dumping of solid waste in Mansoorpur drain at Shamli Road**



**Figure 60 Mansoorpur drain near Husenpur Bopara village**



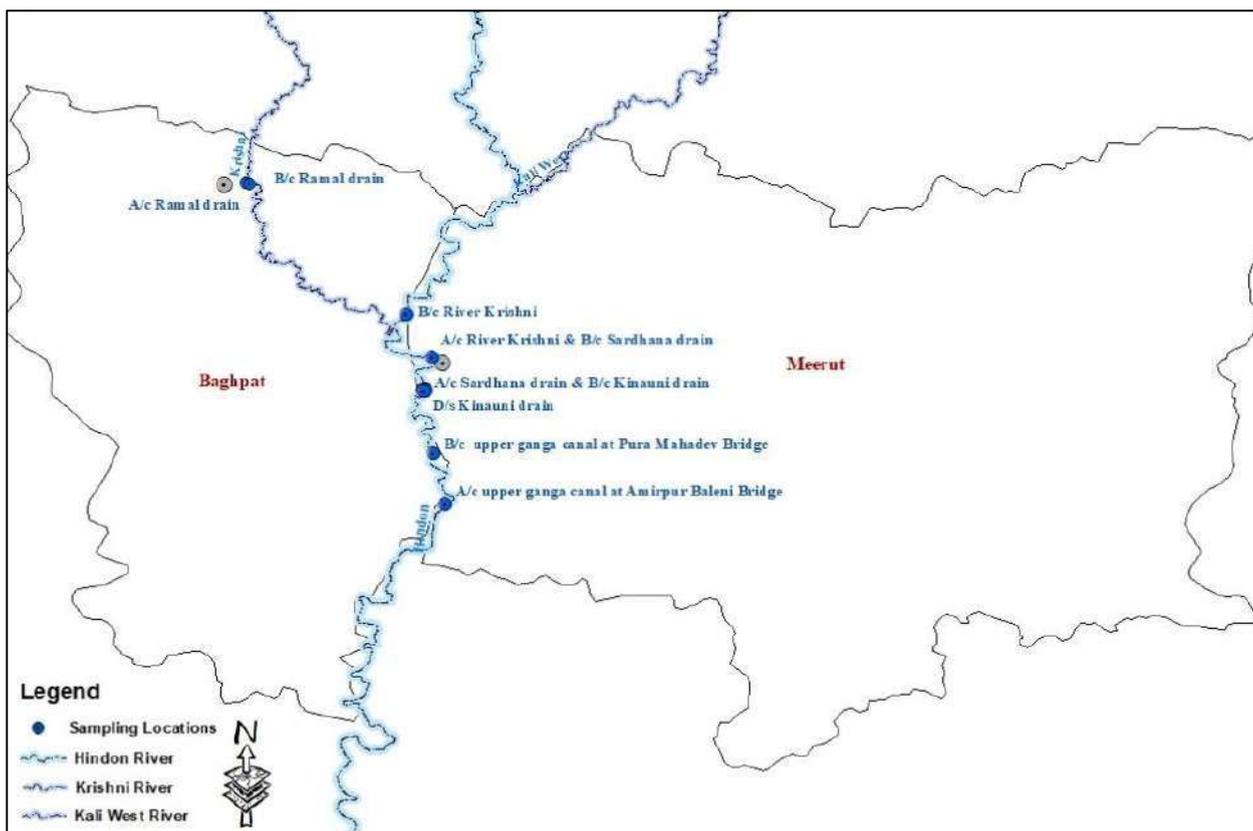
**Figure 61 Confluence of Mansoorpur drain with river Kali-West**

### 3.5 Meerut & Baghpat Districts

#### River Hindon

River flows at border of Meerut and Baghpat district. Two tributaries namely river Kali-west and Krishni confluence to river Hindon in Meerut & Baghpat districts, respectively. River also receives fresh water from upper Ganga canal. The flow diagram of river Hindon, Kali-West and Krishni depicting the river monitoring locations along with confluence points of drains with rivers is shown in **Figure 62**.

After entering into Meerut district, river Hindon was monitored before confluence with river Kali-West near Kutubpur village in Meerut district and DO & BOD in river were NIL and 11 mg/l, respectively. The DO was found to be NIL in the stretch of Meerut-Baghpat district before fresh water was released from Upper Ganga Canal. After confluence with river Kali-West near Pithlokar village, BOD in river Hindon increased to 123 mg/l (**Figure 63**). In downstream, river Krishni meet river Hindon near Barnawa village in Baghpat district. DO and BOD in river Krishni b/c with river Hindon & A/c Ramala drain (at Budhpur, Bhagpat) were NIL and 16 mg/l, respectively (**Figure 64**). Before and after confluence with river Krishni, BOD in river Hindon were 59 mg/l and 52-110 mg/l, respectively. Further, in downstream, Sardhana drain (BOD-263 & 460 mg/l and COD-770 & 1555 mg/l) meet river and increased the BOD of river to 147-163 mg/l (**Figure 65**). Further, in downstream, Kinauni drain was monitored. No flow was observed in the drain however the bed of the drain was wet indicating discharge through drain. DO and BOD in river Hindon after confluence of Kinauni drain were NIL and 140-163 mg/l, respectively (**Figure 66**). Further downstream, freshwater from Upper Ganga Canal was released into river Hindon near Pura village in Meerut District. 1500 cusec freshwater is released in river Hindon from Upper Ganga Canal near D/s Meerut where river Hindon act as a channel to transfer freshwater from Upper Ganga Canal to Agra Canal. The fresh water released from the Upper Ganga Canal is further discharged into River Yamuna from the barrage on the River Hindon in Ghaziabad, which is further discharged into the Agra Canal from the Okhla Barrage on River Yamuna. After intrusion of freshwater into river Hindon from Upper Ganga Canal, the DO in river Hindon increased from NIL to 5.96 mg/l and BOD decreased from 113 mg/l to 10 mg/l (**Figure 67**). The monitoring locations on River Hindon and its tributaries Rivers Krishni and Kali-West adjoining drains in Meerut and Baghpat districts are shown in **Map-6**:



**Map 6 Monitoring locations on River Hindon and its tributaries Rivers Krishna and Kali-West adjoining drains in Meerut and Baghpat districts**

### **River Kali-West**

River Kali-West was monitored before confluence with river Hindon at Riawali Nagla, Meerut and DO & BOD in river were NIL and 138 mg/l, respectively (**Figure 68**).

### **River Krishna**

In Baghpat district, Ramala drain (Flow-0.6 MLD, BOD-11 mg/l & COD-59 mg/l) meet the river near Gopalpur Khadana, Baghpat (**Figure 69**). Ramala drain originates in Kandhla town (Shamli) and carry effluent of M/s Ramala Sahkari Chini Mill and sewage of Kandhla town. Fly ash was dumped by the Sugar Mill along Ramala drain. DO in river was Nil in Baghpat stretch (**Figure 70**). BOD before and after confluence of Ramala drain was 16 mg/l. In downstream of Barnawa village, river Krishna meet river Hindon in Baghpat district.

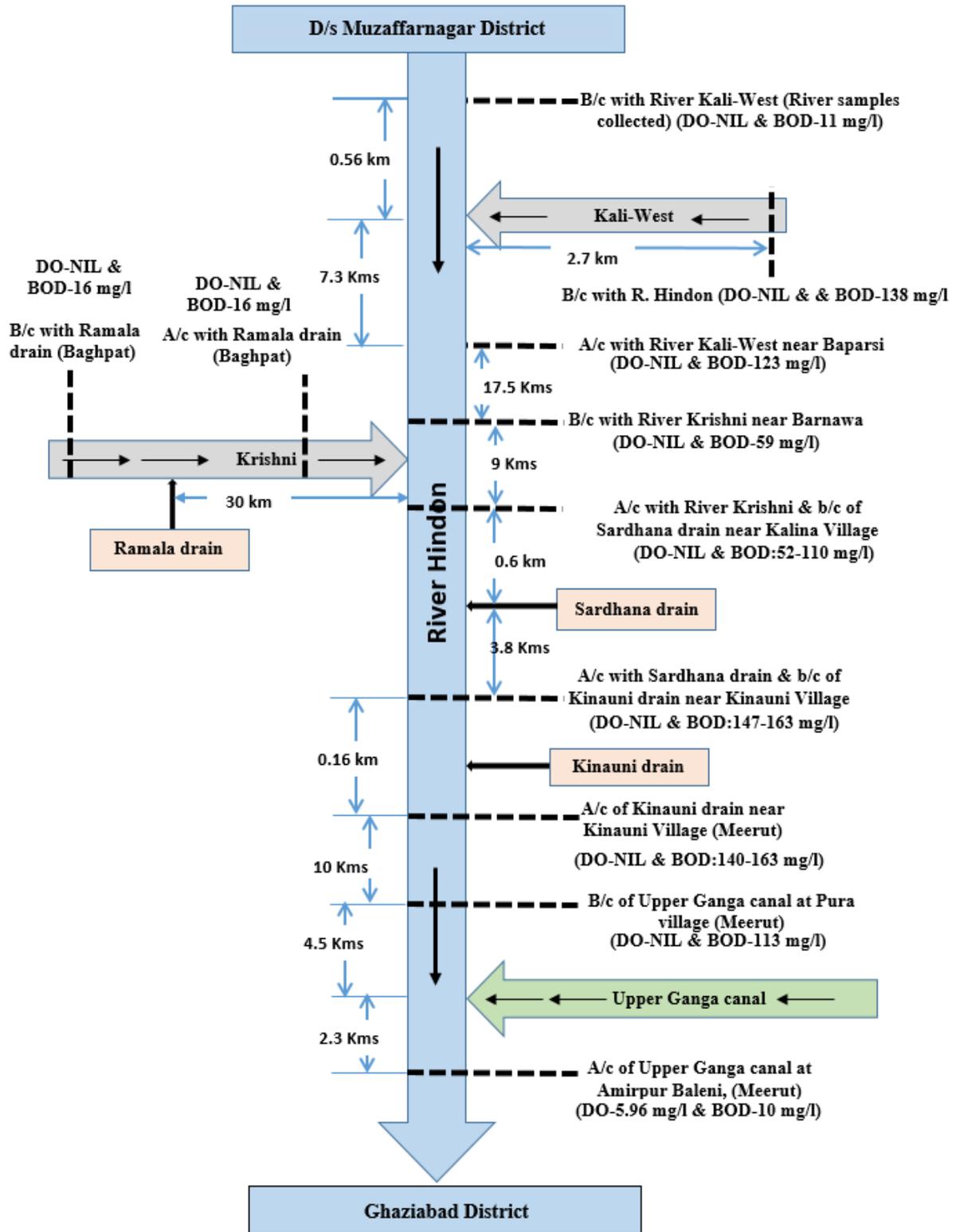


Figure 62 Flow diagram of river Hindon, Kali-West and Krishna depicting the river monitoring locations along with confluence points of drains with rivers

**Issues:**

- Pollution ( $BOD \geq 10$  mg/l) was observed in river Hindon before confluence with river Kali-West (Pithlokar village, Meerut) to before confluence with upper Ganga canal at Pura village. In this stretch, DO was observed as NIL and BOD ranged as 11-163 mg/l.
- Pollution ( $BOD > 150$  mg/l,  $COD > 450$  mg/l and  $Colour > 60$  Hazen) in drains:
  - **Sardhana drain:** Sardhana drain is an untapped drain which originates from a pond near Sardhana town, the pond was observed dry during monitoring. The drain carries sewage of Sardhana town and adjacent villages. Huge quantity of animal dung and municipal solid waste were found dumped in the drain (**Figure 71**). High color (05-370 Hazen), BOD (263-460 mg/l) and COD (770-1555 mg/l) were found in the wastewater of drain (**Figure 72**). Monitoring team reported dairy farming and operation of textile units in the catchment of drain. As per available inventory, following industries are operating the catchment of the drain:
    1. M/s Sardhana Paper, Sardhana Meerut road, Meerut (Paper)
    2. M/s Shri Babubali Trader, Village Madiyai Sardhana Meerut road, Meerut (Textile)
    3. M/s Shree Krishna Processing Khasra No. 1142 Badruddin Nagar, Nanu Tehsil, Meerut (Textile)
    4. M/s Sardhana Dairy, Meerut Road, Sardhana (Dairy)
  - **Kinauni drain:** Kinauni drain is an industrial drain of approx. 1.0 km length which originates from Kinauni and two industries are located in catchment of drain (**Figures 73-74**). During both visits bed of drain was found wet, no significant wastewater was observed to collect the sample, indicating intermittent discharge of effluent from industrial units which are:
    5. M/s Bajaj Hindustan ltd., Kinauni, Meerut (Sugar unit)
    6. M/s Bajaj Hindustan ltd., Kinauni, Meerut (Distillery unit)
- Pollution ( $BOD \geq 10$  mg/l) was observed in river Kali-West before confluence with river Hindon in Meerut district, DO was observed as NIL and BOD 138 mg/l in river Kali-West (**Figure 68**). River carrying domestic and industrial wastewater from Roorkee, Saharanpur and Muzaffarnagar district.
- Pollution ( $BOD \geq 10$  mg/l) was observed in river Krishni before confluence with river Hindon in Baghpat district.



**Figure 63 River Hindon after confluence with river Kali West**



**Figure 64 Ramala drain confluence with river Krishni**



**Figure 65 Eutrophication River Hindon After confluence of Sardhana drain/ before confluence of Kinauni drain**



**Figure 66 River Hindon after confluence of Kinauni drain**



**Figure 67 River Hindon after confluence of Upper Ganga canal at Amirpur Baleni**



**Figure 68 River Kali-West before confluence with river Hindon**



**Figure 69 Ramala drain near Gopalpur Khadana**



**Figure 70 River Krishni before confluence of Ramala drain**



**Figure 71 Sardhana drain covered with layer of cattle dung**



**Figure 72 Sardhana drain b/c of river Hindon near Kalina village**



**Figure 73 Kinauni Drain at Kinauni village**



**Figure 74 Kinauni Drain confluence with River Hindon**

### 3.6 Ghaziabad District

#### River Hindon:

River Hindon enters Ghaziabad district and Jawli drain (BOD-33-55 mg/l and COD-107-221 mg/l) meets river near Bhenara Khurd village. Jawli drain receives treated effluent of CETP installed at Tronica City, Ghaziabad. DO and BOD in river before confluence with Jawli drain were 1.03 mg/l and 3 mg/l, respectively. After confluence with Jawli drain, DO and BOD in river were 0.87-2.32 mg/l and 3-4 mg/l, respectively (**Figure 75**). Thereafter, Raj Nagar Extension drain (BOD: 36 mg/L and COD: 117 mg/L) meets river that carries treated sewage from Noon Nagar Morty STP (56 MLD) and untreated sewage of nearby areas. The DO and BOD of the river, before and after meeting the drain is 0.57 mg/L and 4 mg/L as well as 0.71mg/L and 4 mg/L, respectively. Subsequently, Karedha drain (BOD: 139-167 mg/L and COD: 529-538 mg/L) joins the river followed by Hindon Vihar left (Flow: 11.41-16.6 MLD; BOD: 181-302 mg/L and COD: 574-803 mg/L) and right (Flow: 7.85-15.65 MLD; BOD:168-639 mg/L and COD: 656-2018 mg/L) drains. The DO and BOD of the river, before and after meeting these drains is 0.85 mg/L and 5 mg/L as well as NIL mg/L and 13 mg/L, respectively (**Figure 76**). Thereafter, Kaila Bhatta drain (Flow: 33.97 MLD; BOD: 71 mg/L and COD: 278 mg/L) meets river Hindon and the DO and BOD downstream of this drain is observed to be 5.44 mg/L and 6 mg/L (**Figure 77**). Increased DO may be due to turbulence and churning of water release from barrage. Further, Arthala drain (BOD: 52 mg/L and COD: 208 mg/L) joins the river and the DO and BOD downstream of this drain is observed to be 6.4 mg/L and 5 mg/L (**Figure 78**). Further downstream, three drains namely Indirapuram Drain (BOD: 88 mg/L and COD: 285 mg/L), Pratap Vihar Drain (Flow-27.91 MLD; BOD: 102 mg/L and COD: 422 mg/L) and Rahul Vihar Drain (BOD: 176-206 mg/L and COD: 736-743 mg/L) meets the river. DO in river Hindon after confluence with these three drains ranged from NIL-2.25 mg/L whereas, BOD from 15-28 mg/L (**Figure 79**). Sampling locations are illustrated in **Map 7**. The flow diagram of Hindon river showing the river monitoring locations along with the confluence points of the drains with river is shown in the **Figure 80**.



**Figure 75 Hindon river downstream of Jawli drain**



**Figure 76 Hindon river upstream of Karedha drain**



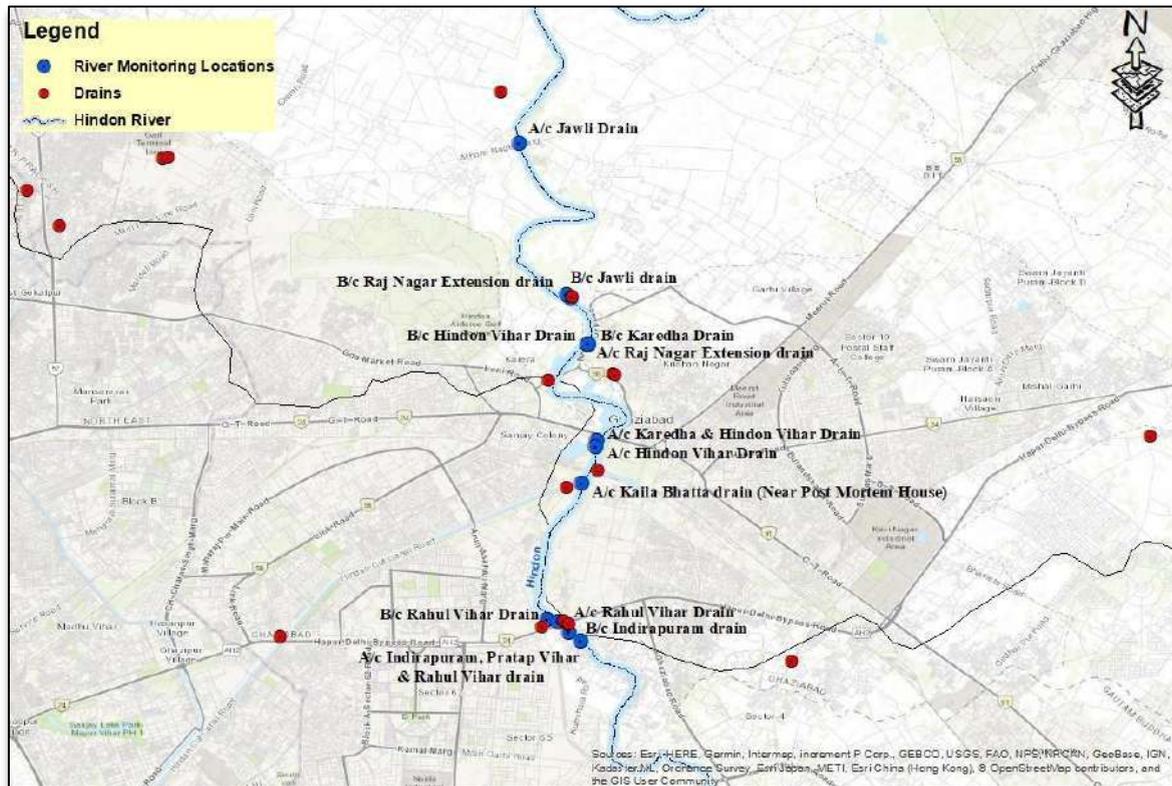
**Figure 77 Hindon river downstream of Kaila Bhatta drain**



**Figure 78 River Hindon downstream of Arthala drain**



**Figure 79 River Hindon at downstream of Indirapuram drain + Pratap Vihar drain + Rahul Vihar drain**



**Map 7 Monitoring locations on Rivers Hindon and its tributary River Kali-West along with adjoining drains in Ghaziabad district**

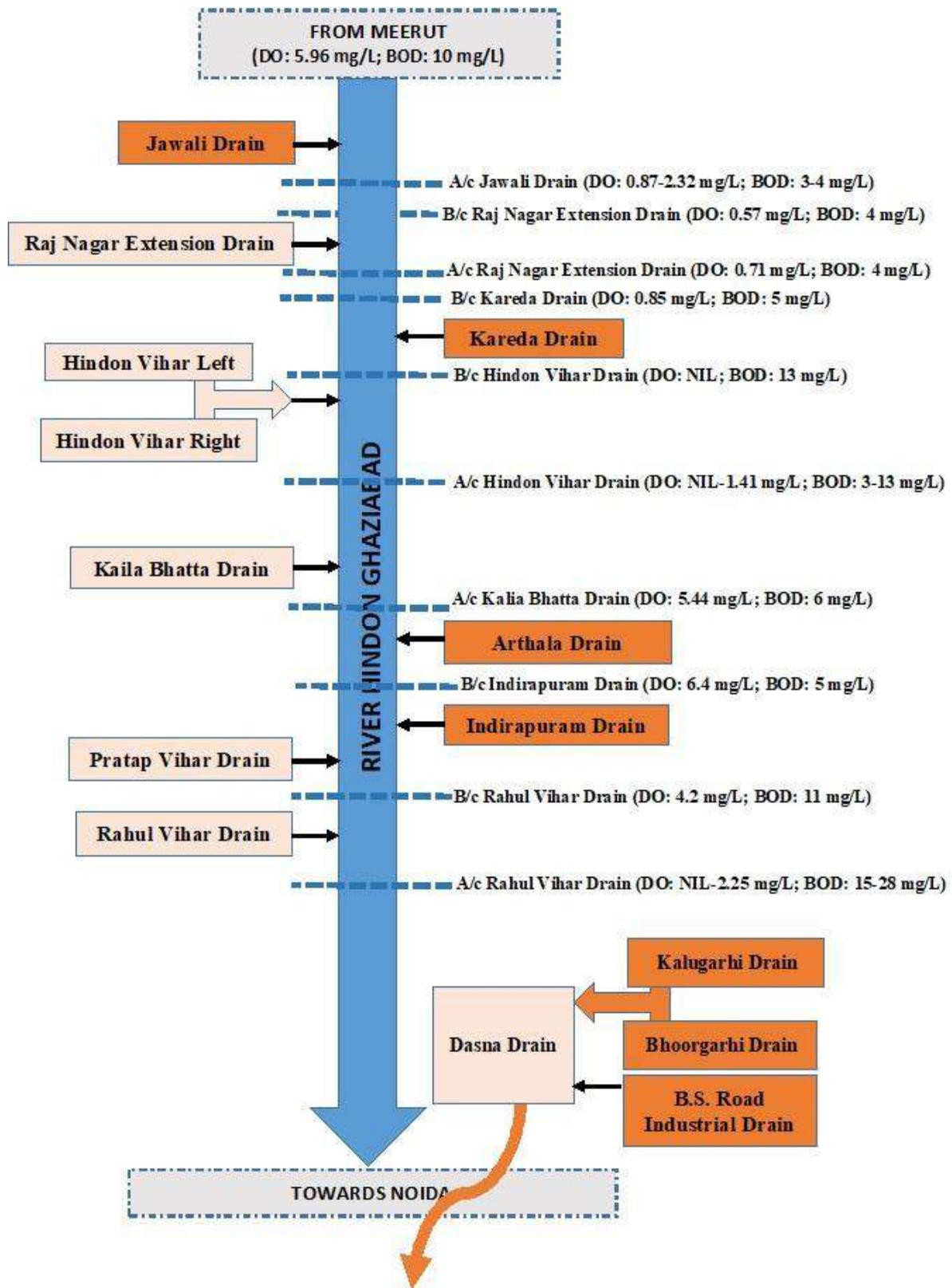


Figure 80 Flow diagram of River Hindon from Ghaziabad district to Noida district

**Issues:****River Hindon**

- Pollution (BOD>10 mg/l) was observed in River Hindon near Hindon Vihar and Rahul Vihar area, before and after confluence of Hindon Vihar and Rahul Vihar drains, respectively. DO and BOD in Hindon Vihar stretch (B/c and A/c of Hindon Vihar drain) were NIL and 13 mg/l, respectively, whereas, DO and BOD in Rahul Vihar stretch (B/c and A/c of Rahul Vihar drain) ranged from NIL-4.2 mg/l and 11-28 mg/l. Polluted stretch from U/s Karedha drain to D/s Hindon Vihar drain is identified.
- Pollution (BOD>150 mg/l, COD>450 mg/l, Colour>75 Hazen, TSS> 500 mg/L, Chloride >1000 mg/L, TDS>1000 mg/L and Heavy Metals > E(P)Act, 1986 discharge norms) was observed in drains discharging into river Hindon:
  - **Jawli Drain:** Jawli drain is an untapped drain which receives and carry treated effluent of CETP installed at Tronica City, Ghaziabad and sewage from nearby villages specifically Bhanera Khurd village (**Figure 81**). Therefore, the wastewater carried by this drain is mixed in nature that is ultimately discharged in River Hindon. High TDS ranging from 2216-4600 mg/L, Chloride-1049 mg/L (during first round) and Mn-4.056 mg/L (during second round) was observed. Industries in the catchment of Jawli drain comprise 43 GPIs including Textile dying (07), Yarn/Textile processing (36) and 1 Non-GPI that include a Yarn/Textile processing unit.
  - **Raj Nagar Extension Drain:** This is an untapped domestic drain that carry treated sewage from Noon Nagar Morty 56 MLD STP, and untreated sewage from open drains. High TDS 1020 mg/L was observed. However, agriculture activity around the sampling point and heaps of solid waste observed dumped in and around the drain.
  - **Karedha Drain:** This is an untapped mixed drain that carry sewage from Karedha area and probable effluent/wastewater discharge from industries in catchment of the drain (**Figure 82**). High BOD ranging from 158-167 mg/L (both rounds), COD ranging from 538-639 mg/L (both rounds), TSS-522 mg/L (during first round) TDS ranging from 1980-2376 mg/L (both rounds), Chloride-1039 mg/L (during first round), Pb ranging from 0.15-3.37 mg/L (both rounds), Fe ranging from 8.167-111.17 mg/L (both rounds) and Zn-6.32 mg/L (during first round) was observed. High metal concentration indicate discharge from metal/battery processing/recycling units. As per inventory, industries in the catchment of Karedha drain comprise 9 GPIs including Paper (01), Yarn/Textile processing (07) Metal Surface Treatment (01) and 1 Non-GPI that include a Textile -

Washing and digital printing of fabric unit. Additional paper printing, automobile service, furniture molding and fabrication, glass printing, MS wire drawing, electrical cable manufacturing and processing units reported by monitoring team.

- **Hindon Vihar Drain:** Hindon Vihar left and right are untapped concrete drains that conjoint together and form Hindon Vihar drain that ultimately discharges into the river Hindon. They carry domestic sewage from household of Hindon Vihar area. Large amount of cow dung observed in both drains. After joining of these two sub-drains, the sampling of the conjoint drain is not possible due to non-approachability.
  - Hindon Vihar Left drain: High BOD ranging from 181-302 mg/L (both rounds), COD ranging from 574-803 mg/L (both rounds), TDS-1344 mg/L (during first round) and TSS-601 mg/L (during second round) was observed (**Figure 83**).
  - Hindon Vihar Right drain: High BOD ranging from 168-639 mg/L (both rounds), COD ranging from 656-2018 mg/L (both rounds), TSS ranging from 639-4766 mg/L (both rounds), Fe-38.02 mg/L (during first round) and Pb-0.124 mg/L (during first round) was observed (**Figure 84**).
- **Kaila Bhatta Drain:** This is an untapped mixed drain that carry wastewater from Nava Jeevan Leprosy Colony, Madhopura area. High TDS-1736 mg/L was observed in this drain. Industries in the catchment of Kaila Bhatta drain comprise 12 GPIs including Pharmaceutical (02), Metal Surface Treatment (08), Textile (01), Tannery (01) and 3 Non-GPI including Pharmaceutical (01), Engineering (01) and Others paper board (01).
- **Arthala Drain:** This is an untapped mixed drain that carry wastewater from Arthala village and industrial units established in its catchment. High TDS-2256 mg/L, Fe-65.021 mg/L and Pb- 0.198 mg/L was observed in this drain. Industries in the catchment of Arthala drain comprise 1 GPI that include a Distillery and 1 Non-GPI that include a Metal Surface Treatment unit.
- **Indirapuram Drain:** This drain carries combined discharge from three STPs in Indirapuram i.e. 74 MLD, 56 MLD and 56 MLD (**Figure 85**). Sahibabad drain, a mixed drain which also carries wastewater of Sahibabad industrial area, is partially tapped to 74 MLD STP at Indirapuram. All three STPs located in Indrapuram are non-complying w.r.t. discharge standards. High Color-98 Hazen and TDS-1320 mg/L was observed.
- **Pratap Vihar Drain:** This is an untapped drain that carry domestic sewage from household of Pratap Vihar area of Ghaziabad (**Figure 86**). High Color-123 Hazen and foaming was observed in this drain.



**Figure 81 Jawali drain**



**Figure 82 Karedha drain**



**Figure 83 Hindon Vihar Left drain**



**Figure 84 Hindon Vihar Right drain**



**Figure 85 Indirapuram drain**



**Figure 86 Pratap Vihar drain**

- **Rahul Vihar Drain:** This is an untapped domestic drain that carry domestic sewage from household of Rahul Vihar area of Ghaziabad (**Figure 87**). High Color-145 Hazen (during first round), BOD ranging from 176-206 mg/L (both rounds), COD ranging from 736-743 mg/L (both rounds), TDS ranging from 2644-2784 mg/L (both rounds), TSS ranging from 550-734 mg/L (both rounds), Chloride ranging from 1213-1940 mg/L (both rounds), Fe ranging from 2.35-5.08 mg/L (both rounds) was observed.



**Figure 87 Rahul Vihar drain**

As per available inventory, following industries are located in the catchment of the Jawali drain, Karedha drain, Kaila Bhatta drain and Arthala drain:

**Jawali drain:**

1. J.B.S. Processors, G-104, Apparel Park, Sector D-1 (P3), Tronica City, Loni, Ghaziabad. (Textile Dyeing)
2. Ajay Veer Siroha, K-23, Apparel Park, Sector D-1 (P3), Tronica City, Loni, Ghaziabad. (Textile Dyeing)
3. Apex Udyog, I-4, Sec D-1, Apparel Park, Tronica City, Loni, Ghaziabad. (Yarn/Textile Processing)
4. Chacha Enterprises, J-4 Appral Park, tronca city, Loni, Ghaziabad. (Yarn/Textile Processing)
5. D.K. Jain, G-262, Sector D-1(P), Aparels Park, Tronica City, Loni, Ghaziabad. (Yarn/Textile Processing)
6. Denim Matching, G-141, Apparel Park, Sector D-1(P3), Tronica City, Loni, Ghaziabad (Yarn/Textile Processing)

7. Ekansh Textile, K-36, Sec D-1, Apparel Park, Tronica City, Loni, Ghaziabad. (Yarn/Textile Processing)
8. Excellent Apparels Pvt. Ltd., K-52, Sec D-1(P3), Tronica City, Loni, Ghaziabad. (Yarn/Textile Processing)
9. Ghan Shyam Textiles, K-19, Sector D-1(P), Aparels Park, Tronica City, Loni, Ghaziabad. (Yarn/Textile Processing)
10. Galaxi Garments, K-22, Apparel Park, Sector D-1(P3), Tronica City, Loni, Ghaziabad. (Yarn/Textile Processing)
11. Gulshan Rai Jain, G-82, Apparel Park, Sector D-1(P3), Tronica City, Loni, Ghaziabad. (Yarn/Textile Processing)
12. Gyan Chand & Sons, G-87, Apparel Park, Sector D-1(P3), Tronica City, Loni, Ghaziabad. (Yarn/Textile Processing)
13. Jai Mata Di Dyers, I-9, Sec D-1(P3), Tronica City, Loni, Ghaziabad. (Yarn/Textile Processing)
14. Jai Shri Dying, I-21, Apparel Park, Sector D-1(P3), Tronica City, Loni, Ghaziabad. (Yarn/Textile Processing)
15. Krish Garments (Old Name Sanjeev Kumar), G-109, Sec D- 1(P3), Apparel Park, Tronica City, Loni, Ghaziabad. (Yarn/Textile Processing)
16. Laxmi Bleach (New Name Mani Bhadra Processors), G-102, Sec D-1(P3), Apparel Park, Tronica City, Loni, Ghaziabad. (Yarn/Textile Processing)
17. Laxmi Processors, K-16, Sect-D-1, pocket-3, Appral Park, Tronica city, Loni, Ghaziabad. (Yarn/Textile Processing)
18. Om Prakash Sharma, J-11, Apparel Park, Sector D-1(P3), Tronica City, Loni, Ghaziabad. (Textile Dyeing)
19. Pooja Pahawa, K-11, Apparel Park, Sector D-1(P3), Tronica City, Loni, Ghaziabad. (Yarn/Textile Processing)
20. Puran Munjal, (New Name Adhunik Dyeing), H-12, Sector D- 1(P), Aparels Park, Tronica City, Loni, Ghaziabad. (Yarn/Textile Processing)
21. Quadri Processors, I-8, Sec D-1(P3), Apparel Park, Tronika City, Loni, Ghaziabad. (Yarn/Textile Processing)
22. R.R. Impex, G-261, Sector D-1(P), Aparels Park, Tronica City, Loni, Ghaziabad. (Yarn/Textile Processing)
23. Rachita Processors, K-33 & K-34, Sec D-1, Apparel Park, Tronica City, Loni, Ghaziabad. (Yarn/Textile Processing)

24. Rajeev Kumar, G-64, Sec D-1(P3), Apparel Park, Tronica City, Loni, Ghaziabad. (Yarn/Textile Processing)
25. Robest Infra Tech P Ltd., J-13, Apparel Park, Sector D-1(P3), Tronica City, Loni, Ghaziabad. (Yarn/Textile Processing)
26. Roop Trading Company, E-14, Sect-D-1, pocket-3, Appral Park, Tronica city, Loni, Ghaziabad. (Yarn/Textile Processing)
27. Roop Trading Company, K-9, sect- D-1, pocket-3, Appral Park, Tronica city, Loni, Ghaziabad. (Yarn/Textile Processing)
28. S.D. Garments, I-2, Sector-D-1, pocket-3, Appral Park, Tronica city, Loni, Ghaziabad. (Yarn/Textile Processing)
29. S.S. Hosiery (Old Name is National Industries), G-264, Apparel Park, Sector D-1(P3), Tronica City, Loni, Ghaziabad. (Textile Dyeing)
30. S.T. Traders, J-5, Appral Park, Tronca city, Loni, Ghaziabad. (Yarn/Textile Processing)
31. S.V.S. Fashion, J-22, Apparel Park, Sector D-1(P3), Tronica City, Loni, Ghaziabad. (Yarn/Textile Processing)
32. Sai Saran Garment, (New Name Lotus Knit Processing House), G- 108, Apparel Park, Sector D- 1(P3), Tronica City, Loni, Ghaziabad. (Yarn/Textile Processing)
33. Sandeep Tyagi, G-271, Sec D-1(P3), Apparel Park, Tronica City, Loni, Ghaziabad. (Yarn/Textile Processing)
34. Sanjeev kumar (Shyam Washing), G-81, Apparel Park, Sector D-1 (P3), Tronica City, Loni (Textile Dyeing)
35. Sara International, G-265-266, Apparel Park, Sector D-1(P3), Tronica City, Loni, Ghaziabad. (Textile Dyeing)
36. Shafali Dyeing, G-84, Sector D-1(P), Aparels Park, Tronica City, Loni, Ghaziabad. (Yarn/Textile Processing)
37. Shri Paras coloration (U.B. Dyeing), G-117, Sector D-1(P), Aparels Park, Tronica City, Loni, Ghaziabad. (Yarn/Textile Processing)
38. Siddhi Vinyak, G-103, Apparel Park, Sector D-1(P3), Tronica City, Loni, Ghaziabad. (Textile Dyeing)
39. Supreme Industries, J-2, Appral Park, Tronca City, Loni, Ghaziabad. (Yarn/Textile Processing)
40. Tiwari Feb, G-255, Apparel Park, Sector D-1(P3), Tronica City, Loni, Ghaziabad. (Yarn/Textile Processing)

41. Tusar Garments (Spectrum Dye Studio), J-3, Sector D-1(P), Aparams Park, Tronica City, Loni, Ghaziabad. (Yarn/Textile Processing)
42. Vaishali Hosiery, I-17, Sec D-1, Apparel Park, Tronica City, Loni, Ghaziabad. (Yarn/Textile Processing)
43. Vedanta Estate, I-11, Apparel Park, Sector D-1(P3), Tronica City, Loni, Ghaziabad. (Yarn/Textile Processing)
44. Vedanta Estate, (New Name A.N. Processors), I-12, Apparel Park, Sector D-1(P3), Tronica City, Loni, Ghaziabad. (Yarn/Textile Processing)

**Karedha drain:**

1. Ashoka Pulp & Paper Pvt. Ltd., 11, Loni Road Ind. Area, Mohan Nagar, Ghaziabad. (Pulp & Paper)
2. Laxmi Dyeing & Printing works Pvt.Ltd., S-81, Loni Road I.A., Mohan Nagar, Ghaziabad. (Yarn/Textile Processing)
3. Shahi Exports P Ltd., 30-Site-2, Loni Road Ind.area Mohan Nagar, Ghaziabad. (Yarn/Textile Processing)
4. A & A, S-50, Site-2, Loni Road Ind.area, Mohan Nagar, Ghaziabad. (Yarn/Textile Processing)
5. A.N. Fabric Dyers, 5/6, Site-2, Loni Road Mohan Nagar, Ghaziabad. (Yarn/Textile Processing)
6. N.G. Textiles., 13A/10, Site-2, Loni Road I.A., Mohan NGR, Ghaziabad. (Yarn/Textile Processing)
7. Non Stop Colour, S-3, Site-2, Loni Road I.A., Mohan Nagar, Ghaziabad. (Yarn/Textile Processing)
8. Sai Processing, 7/37, Site-2, Loni Road Ind. Area, Mohan Nagar, Ghaziabad. (Yarn/Textile Processing)
9. Sunny Prints, 5/7, Site-2, Loni Road, Ind.area, Mohan Nagar, Ghaziabad. (Yarn/Textile Processing)
10. Shivam Cotage P Ltd., S-110/1Site-2, Loni Road Ind. Area, Ghaziabad. (Metal Surface Treatment)

**Kaila Bhatta drain:**

1. Dev Tara Industries Ltd., Meerut Road Duhai, Muradnagar, Ghaziabad (Dyeing & Textile)

2. JKG, Kathuria Brothers, Leather section, A-12 Meerut Road Industrial Area, Ghaziabad (Tannery)
3. Agrawal Galvenizing, A-8/6, Sect.22 Meerut Road Ind. Area, Ghaziabad. (Metal Surface Treatment)
4. Albert David Ltd., B-12/13, Meerut Road, Ghaziabad (Pharmaceutical)
5. Chemo Pulp Tissues Pvt Ltd, A-4, sect-22, Meerut Road Industrial Area, Ghaziabad (Other)
6. Cosmos Auto India, 21 mainapur Meerut Road, Ghaziabad. (Metal Surface Treatment)
7. Hamdard (Wakf) Laboratories, (1 &2) B-2 & 3, Meerut Road, Ghaziabad. (Pharmaceutical)
8. Kathuria Brothers (Cycle section), A-12, Meerut Road Ind. Area. Ghaziabad. (Metal Surface Treatment)
9. Manohar Lal Hira Lal Ltd., 28 KM Stone Meerut Road, Duhai, Ghaziabad. (Metal Surface Treatment)
10. North Land Cycle Co. D-21, Meerut Road Ind. Area, Ghaziabad. (Metal Surface Treatment)
11. Ramsons Enterprises, D-21 Meerut Road Ind. Area, Ghaziabad. (Metal Surface Treatment)
12. Shri Ram Piston & Rings Ltd., Meerut Road Industrial Area, Ghaziabad (Engineering)
13. Techno Enterprises, A-13/12, Meerut Road Ind. Area, Ghaziabad. (Metal Surface Treatment)
14. Ultra Electropletores, 46 Meerut Road Ind. Area Ghaziabad. (Metal Surface Treatment)
15. Unichem Laborateries, C-31, Meerut Road Ind. Area Ghaziabad. (Pharmaceutical)

**Arthala drain:**

1. Mohan Meakin Ltd. Mohan Nagar Ghaziabad (Distillery)
2. Balaji wire Pvt. Ltd., 139-A, Anand Ind. Estate, Mohan Nagar, Ghaziabad. (Metal Surface Treatment)

**Dasna Drain:** It's a first order drain of River Hindon that discharges its content into the river in Noida-Greater Noida district. Two drains namely Bhoorgarhi – Kalugarhi Drain and B.S. Road Drain have been monitored that discharge their content into the Dasna drain in the Ghaziabad district.

- **Bhoorgarhi – Kalugarhi Drain:** Kalugarhi drain joins Bhoorgarhi drain and forms Dasna drain (**Figure 88**). This is an untapped mixed drain that carry untreated domestic sewage from Bhoorgarhi village and Kalugarhi village and industrial units established in its catchment. High Colour- 167 Hazen, TDS- 1552 mg/l and Fe-7.698 mg/l was observed. Industries in the catchment of this drain comprise 07 GPIs including Pulp & Paper (01), Tannery (02), Metal Surface Treatment (01), Slaughter Houses (03).
- **B.S. Road Drain:** This is an untapped mixed drain that carry untreated effluents and sewage from B.S. Road Industrial area and discharges into Dasna drain (**Figure 89**). High Fe-5.296 mg/l was observed. However, inventory of industries in the catchment of the drain is not available.



**Figure 88 Bhoorgarhi – Kalugarhi confluence drain**



**Figure 89 B.S. Road drain before confluence with Dasna drain**

As per available information, following industries are located in the catchment of the Dasna drain and Bhoorgarhi – Kalugarhi Drain:

**Dasna drain in Ghaziabad district:**

1. Amko Export, A-1, B.S. Road Ind. Area Ghaziabad. (Dyeing & Textile)
2. Batik India, D-13, Udyog kunj. Dasna, Ghaziabad. (Yarn/Textile processing)
3. Indian Textiles company, E-49, B.S. Road Ind. Area, Ghaziabad. (Yarn/Textile processing)
4. N.G. Tex Prints P.Ltd., E-13/2, Kavi Nagar Ind. Area, Ghaziabad. (Yarn/Textile processing)

5. A.B. Cycle Parts Pvt.Ltd., S-24, S.S. of G.T. Road Ind. Area, Ghaziabad. (Metal Surface Treatment)
6. A.C.E. Hardware, B-5, B.S. Road Ind. Area, Ghaziabad. (Metal Surface Treatment)
7. A.S.T. Pipes, B-33, B.S. Road Ind. Area, Ghaziabad. (Other)
8. Balaji Engineering works, 351, Pandav Nagar, Mehrauli, Ghaziabad. (Metal Surface Treatment)
9. Balaji Enterprises, B-22/1/15, B.S. Road Ind. Area, Ghaziabad. (Metal Surface Treatment)
10. Continental Carbon India Ltd., A- 14, S.S. of G.T. Road Cosmos Engine, Ghaziabad. (Other)
11. Component P Ltd., A-7, Electro Steel Compound, S.S. of G.T. Road, Ghaziabad. (Metal Surface Treatment)
12. Gourang Products Pvt. Ltd, GT Road, Industrial Area Ghaziabad. (Metal finishing)
13. J.D.M. Enterprises, C-223/1, B.S. Road Ind.area Ghaziabad. (Metal Surface Treatment)
14. Malik Niddles & allide products, C-108, B.S. Road Ind. Area Ghaziabad. (Metal Surface Treatment)
15. Manav Beverage P Ltd, C-128, BSR Ind.area, Ghaziabad. (Beverage)
16. Northern India cyco Parts, E-2, S.S. of G.T. Road, Ind. Area, Ghaziabad. (Metal Surface Treatment)
17. S.D. Industries (Old Name is S.D. Enterprises), E-124, B.S. Road Ind. Area, Ghaziabad. (Metal Surface Treatment)
18. S.S. Enterprises, 363, Pandav Nagar, B.S. Road Maharauli, Ghaziabad. (Metal Surface Treatment)
19. Sakshi Metal Works, D-1/A, Kavi Nagar Ind. Area, Ghaziabad. (Metal Surface Treatment)
20. Sara Exports, 35, S.S. of G.T. Road Ind. Area, Ghaziabad. (Chemical)
21. Shanti Nath Manufactures, A- 2/14, Kavi Nagar Ind. Area Ghaziabad. (Metal Surface Treatment)
22. Shital Industries, S-40, S.S. of G.T. Road Ind. Area, Ghaziabad. (Metal Surface Treatment)
23. Shivam Engineering, 282, S.S. of G.T. Road Industrial Area, Ghaziabad. (Metal Surface Treatment)
24. Shivam Fab Tech P Ltd., 22/9, S.S. of G.T. Road Ind. Area, Ghaziabad. (Metal Surface Treatment)

25. Shri Balaji Metal, E-17, Kavi Nagar Ind. Area, Ghaziabad. (Metal Surface Treatment)

26. Usha Cycle, S.S. of G.T. Road Ind.Area, Ghaziabad. (Metal Surface Treatment)

### **Bhoorgarhi – Kalugarhi Drain:**

1. Shri Ganga paper Mills Pvt. Ltd., Hapur Road Dasna, Ghaziabad. (Pulp & Paper)
2. Exclusive Leather, Khasra no.2751, Village Bhurgari, Dasna, Ghaziabad. (Tannery)
3. Triyash Enterprises, Khasra no.2751, Village Bhoor Gari, Dasna, Ghaziabad. (Tannery)
4. Futuro Components Pvt. Ltd. Dasna Hapur Road, Ghaziabad. (Metal Surface Treatment)
5. Al Naseer Export Pvt.Ltd., 2761, Bhoor Gari, Dasna, Ghaziabad. (Slaughter House)
6. International Agro Food, Vill. Bhoor gari, Dasna, Ghaziabad. (Slaughter House)
7. Karan Frozen Food, Bhoor gari, Dasna, Ghaziabad. (Slaughter House and Meat Processing)

### **River Yamuna**

**Shahdara drain:** It is a first order drain of River Yamuna that discharges its content into the river in NCT of Delhi near Okhla Barrage. Three drains namely Sahibabad Drain, Indirapuri drain and Banthala drain that discharge wastewater into Shahdara drain in Ghaziabad district have been monitored. Pollution (BOD>150 mg/l, COD>450 mg/l, Colour>75 Hazen, TSS>500 mg/L, Chloride >1000 mg/L, TDS>1000 mg/L and Heavy Metals > E(P)Act, 1986 discharge norms) was observed in drains discharging into river Yamuna:

- **Sahibabad Drain:** This drain carry mixed untreated/partially treated industrial effluent as well as domestic sewage into the recipient drain (**Figure 90**). The domestic sewage is from unauthorized and authorized colonies of Vaishali area whereas the industrial effluent is from industrial units established in its catchment. Further, solid waste was also observed being dumped nearby the drain. High BOD- 155 mg/L, COD- 489 mg/L, TDS-2408 mg/L and Fe-14.971 mg/l was observed Although, it is tapped into 74 MLD STP Indirapuram, however, the tapping boundary wall was found damaged and overflow was observed during the monitoring. Visually black coloured sewage was observed at the inlet of Indirapuram 74 MLD STP. Further, the STP is non-complying, indicating partially treated wastewater outflow from the same. Industries in the catchment of Sahibabad drain comprise 73 GPIs including Dairy (02), Engineering (01), Metal Surface Treatment (19), Pharma (01), Pulp & Paper (01), Slaughter house and Meat (06), Yarn/Textile processing

(41), Textile Dyeing (02) and 2 Non-GPIs including Metal Surface Treatment (01) and Yarn/Textile processing (01).

- **Indirapuri drain:** This is an untapped mixed drain that carry industrial effluent and sewage from its adjoining areas into Shahdara drain (**Figure 91**). Highly septic conditions evident from high gaseous formations and huge solid waste dumping was observed in the drain. High TDS-2112 mg/L, Mn-3.668 mg/l and Sulphate-182 mg/L was also observed. UPPCB has not provided any information about the industries located in the catchment of the drain.
- **Banthala drain:** This is an untapped mixed drain that discharge into Shahdara drain which finally meets river Yamuna (**Figure 92**). The wastewater characteristics of Banthala drain showed acidic pH-2.5 (during first round), high BOD ranging from 175-234 mg/L (both rounds), COD ranging from 460-673 mg/L (both rounds), TDS ranging from 1580-19352 mg/L (both rounds), TSS ranging from 756-833 mg/L (both rounds), Sulphate-471 mg/L (during first round), Cr-12.7 mg/L (during first round), Cu-52.2 mg/L (during first round), Fe ranging from 12.48-6035.98 mg/L (both rounds), Pb ranging from 0.27-2.4 mg/L (both rounds), Mn-58.2 mg/L (during first round), Ni-19.8 mg/L (during first round), Zn-791.2 mg/L (during first round) and Co-0.98 mg/L (during first round). UPPCB informed that no authorized units are running in catchment of Banthala drain but illegal industries are being operated in Loni area of Ghaziabad. Inspections and actions are being carried out by joint team of District Administration, Ghaziabad Development Authority, Electricity Department & UPPCB for closure of these units. During CPCB inspection, four unauthorized units carrying out metal processing treatment by using acids, one soap manufacturing unit & one garment washing unit without ETP were found operational. Locals informed that there are many more garment washing units located in catchment of Banthala drain. Dumping of municipal solid waste & animal waste by large number of dairy units in the drain was also observed.



**Figure 90 Sahibabad drain**



**Figure 91 Indirapuri drain**



**Figure 92 Bantthala drain carrying industrial effluent**

UPPCB has submitted the list of following industries which are located in the catchment of the **Sahibabad Drain**:

1. Shree Balaji Processors, (Old Name Hanuman Textiles), 1, Rajinder Nagar Ind. Area, Mohan Nagar, Ghaziabad. (Yarn/Textile processing)
2. Krishana Washing Service, 72/14, Rajinder Nagar Ind. Area, Mohan Nagar, Ghaziabad. (Yarn/Textile processing)
3. Prem Processors, 52 Rajinder Nagar Ind. Area, Mohan Nagar, Ghaziabad. (Yarn/Textile processing)
4. R.B. Enterpises, 180/2 & 180/4, Rajiender Nagar Ind. Area, Mohan Nagar, Ghaziabad. (Yarn/Textile processing)

5. Right Wash Udyog, 72/19, Rajinder Nagar Ind. Area, Mohan Nagar, Ghaziabad. (Yarn/Textile processing)
6. Krishna Enterprises (Old Name Vidhi Ventuer), Rajinder Nagar Ind. Area, Mohan Nagar, Ghaziabad. (Yarn/Textile processing)
7. Vardhman Engg. Works, 72/10-B, Gali No-6, Rajinder Ind. Area, Mohan Nagar, Ghaziabad. (Metal Surface Treatment)
8. Magnum Ventures Ltd, 18/41, Site-4 Sahibabad, Ghaziabad. (Pulp & Paper)
9. Aiden Jeans, B-49/5, Site-4 Ind. Area, Sahibabad, Ghaziabad. (Yarn/Textile processing)
10. Balaji Industry, Plot No. 7, Gali No. 1, Rajinder Nagar Ind. Area, Mohan NGR., Ghaziabad. (Yarn/Textile processing)
11. Beauty Art Prints India Pvt.Ltd.,54/4, Site-4, Sahibabad Ind. Area, Ghaziabad. (Yarn/Textile processing)
12. Colour Tuch, 56/28, Site-4, Sahibabad Ind. Area, Ghaziabad. (Yarn/Textile processing)
13. G.S.Das Apprarals Pvt.Ltd., 4/44, Site-4, Sahibabad Ind. Area, Ghaziabad. (Yarn/Textile processing)
14. Ganga Processors, 18/11, Site-4, Sahibabad Ind. Area, Ghaziabad. (Yarn/Textile processing)
15. Ganpati Creation, C-19/1, Site-4, Sahibabad Ind. Area, Ghaziabad. (Yarn/Textile processing)
16. Global Industries, A-38/1/9, Site- 4, Sahibabad Ind. Area, Ghaziabad. (Yarn/Textile processing)
17. Goyal Canvas Pvt.Ltd., 18/43, Site- 4, Sahibabad Ind. Area, Ghaziabad. (Yarn/Textile processing)
18. Goyal Processors, 42/50, Site-4, Ind. Area, Sahibabad, Ghaziabad. (Yarn/Textile processing)
19. Jyoti Dyeing, 18/8, Site-4, Sahibabad Ind. Area, Ghaziabad. (Yarn/Textile processing)
20. K.K. Industries, 7/5, Site-4, Ind Area, Sahibabad, Ghaziabad. (Textile Dyeing)
21. Kanhiya Enterprises, A-48/11, Site-4, Sahibabad Ind. Area, Ghaziabad. (Yarn/Textile processing)
22. Krishna Print Pvt. Ltd., A-47, Site- 4, Sahibabad Ind. Area, Ghaziabad. (Yarn/Textile processing)
23. M.A. Garments, 20/6/21, Site-4, Sahibabad Ind. Area, Ghaziabad. (Yarn/Textile processing)

24. M.J. Allied Enterprises, E-4, Site-4 Ind. Area, Sahibabad, Ghaziabad. (Yarn/Textile processing)
25. M.Y. Garments, 20/6/14, Site-4, Sahibabad, Ghaziabad. (Yarn/Textile processing)
26. Maha Shakti Threads mills, 56/12, Site-4 Sahibabad Ind. Area. Ghaziabad. (Yarn/Textile processing)
27. Mahalaxmi Dyers, 49/24, Site-4, Sahibabad Ind. Area, Ghaziabad. (Yarn/Textile processing)
28. Shri Mahaveer Enterprises, 28/1/15, Site-4, Sahibabad Ind. Area, Ghaziabad. (Yarn/Textile processing)
29. Nandni Processors, 4/27, Site-4, Sahibabad Ind. Area, Ghaziabad. (Yarn/Textile processing)
30. Neelam Tex Prints Pvt.Ltd., 41/1, Site-4, Sahibabad Ind. Area, Ghaziabad. (Yarn/Textile processing)
31. Pal Nit Fab, 54/14, Site-4, Sahibabad Ind. Area, Ghaziabad. (Yarn/Textile processing)
32. Pooja Processors, 62/2/3, Site-4, Sahibabad Ind. Area, Ghaziabad. (Yarn/Textile processing)
33. Ratan Garments, 56/29, Site-4, Sahibabad Ind. Area, Ghaziabad. (Yarn/Textile processing)
34. Ritika Enterprises, 18/32, Site-4, Sahibabad Ind. Area, Ghaziabad. (Yarn/Textile processing)
35. S.B. Feb Tech P Ltd., 28/1/24, Site-4, Sahibabad Ind. Area, Ghaziabad. (Yarn/Textile processing)
36. S.S. Prints, 56/14-15, Site-4, Sahibabad Ind. Area, Ghaziabad. (Yarn/Textile processing)
37. Sahibabad Printers, 182/3, G.T. Road, Mohan Nagar, Ghaziabad. (Yarn/Textile processing)
38. Shiv Kumar Pawan Kumar, 57/1/13, Site-4, Sahibabad Ind. Area, Ghaziabad. (Yarn/Textile processing)
39. Shiva Processors, 18/6, Site-4, Sahibabad Ind. Area, Ghaziabad. (Yarn/Textile processing)
40. Singhal Paulings Industries, 56/32, Site-4, Sahibabad Ind. Area, Ghaziabad. (Yarn/Textile processing)
41. SPD RAINBOW (Lavva Udyog), 56/17, Site-4, Sahibabd Ind. Area, Ghaziabad. (Yarn/Textile processing)

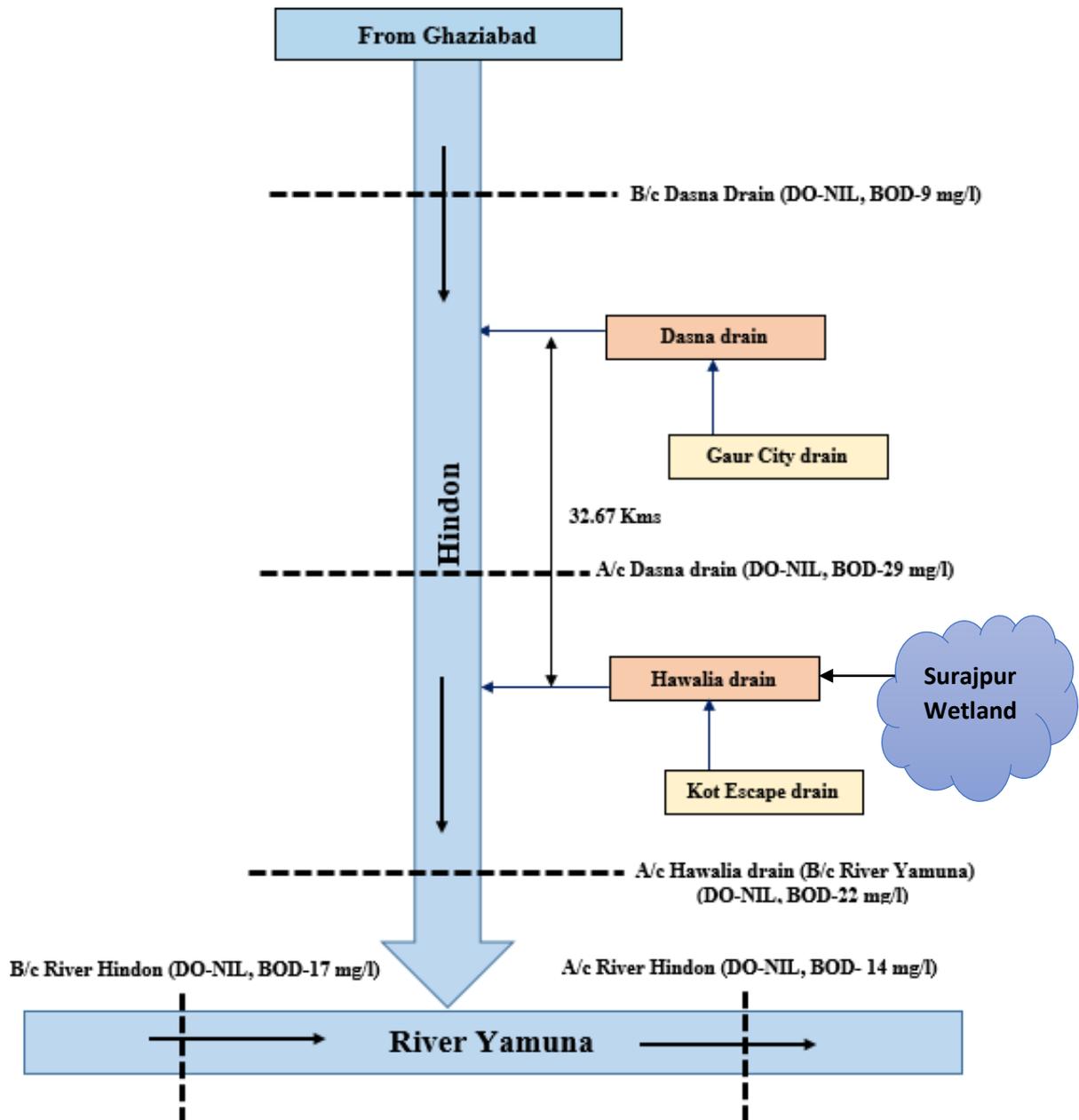
42. Tanzeem Dyeing 261, Rajaendra Nagar Ind. Area Ghaziabad. (Yarn/Textile processing)
43. V.S. Garments, 20/6/10, Site-4, Sahibabad Ind. Area, Ghaziabad. (Yarn/Textile processing)
44. Vaishno Garments, 20/6/3, Site-4, Ind Area, Sahibabad, Ghaziabad. (Textile Dyeing)
45. Ventkesh Enterprises, 48/1/7, Site-4, Sahibabad Ind. Area, Ghaziabad. (Yarn/Textile processing)
46. Versha Washing, 49/25, Site-4, Ind. Area, Sahibabad, Ghaziabad. (Yarn/Textile processing)
47. Advance Steel Tube Ltd. 45/3, Site-4, Sahibabad Ind. Area, Ghaziabad. (Metal Surface Treatment)
48. Ajay Industrial Corporation, 20/11, Site-4, Ind. Area, Sahibabad, Ghaziabad. (Metal Surface Treatment)
49. Anuradha Fabricators, 42/10, Site-4, Sahibabad, Ghaziabad. (Metal Surface Treatment)
50. Bharat Electronics Ltd., Bharat Nagar, Sahibabad Industrial Area, Ghaziabad. (Metal Surface Treatment)
51. Tata Steel Ltd., 23, Site-4, Sahibabad, Ghaziabad. (Engineering)
52. Dabur India Ltd, P-22, Site 4 Sahibabad, Ghaziabad. (Pharmaceutical)
53. Dream Bath, 28/1/21, Site-4, Sahibabad Industrial Area, Ghaziabad. (Metal Surface Treatment)
54. Empire Fastners, 48/1/22, Site-4, Sahibabad Ind. Area, Ghaziabad. (Metal Surface Treatment)
55. Ipsa Business India Pvt.Ltd., 57/1/17-18, Site-4, Sahibabad Ind. Area, Ghaziabad. (Metal Surface Treatment)
56. Machino Tech, 48/1/1-A, Site-4, Sahibabad Ind. Area, Ghaziabad. (Metal Surface Treatment)
57. National Engg. Works (Old Name Mange Ram), 115, Prakash Ind. Area, Sahibabad, Ghaziabad. (Metal Surface Treatment)
58. Paharpur-3 P, Plot No 19, Site-4, Sahibabad Ind. Area, Ghaziabad. (Metal Surface Treatment)
59. Rachna Metal Industries Pvt. Ltd., 18/42, Site-4, Sahibabad Ind. Area, Ghaziabad. (Metal Surface Treatment)
60. Rama Steel Tube Ltd., B-21, & B-3, Site-4, Sahibabad Ind. Area, Ghaziabad. (Metal Surface Treatment)

61. Regency Cycles P Ltd., 16/1-B- 3&4, Site-4, Sahibabad Ind. Area, Ghaziabad. (Metal Surface Treatment)
62. Sage Metal Ltd., B-7, Site-4, Shaibabad Ind. Area, Ghaziabad. (Metal Surface Treatment)
63. Shri Giri Raj Enterprises, 24-25, Prakash Ind. Estate, Sahibabad, Ghaziabad. (Metal Surface Treatment)
64. Singla Engrayours Pvt.Ltd., 7/26, Site-4, Sahibabad Ind. Area, Ghaziabad. (Metal Surface Treatment)
65. Sona Industry, Plot No- 56/7, Site- 4, Sahibabad Ind. Area, Ghaziabad. (Metal Surface Treatment)
66. Spark Electro P Ltd., A-48/9, Site-4, Sahibabad Ind. Area, Ghaziabad. (Metal Surface Treatment)
67. United Polygenious Pvt.Ltd., B- 13/1, Site-4 Sahibabad Ind. Area, Ghaziabad. (Metal Surface Treatment)
68. V.R.S. Food Ltd., (Vedram & Sons), Unit-1, B-56, Site-4, Sahibabad Ind. Area, Ghaziabad. (Dairy)
69. V.R.S. Food Ltd. (Vedram & sons), Unit-2, B-33, Site-4, Sahibabad Ind. Area, Ghaziabad. (Dairy)
70. Al-Aali Exports (P) Ltd., B-37, Site- 4, Ind. Area, Sahibabad, Ghaziabad. (Slaughter House and Meat Processing)
71. Arshiya Export Pvt. Ltd.) B-67, Site-4, Sahibabad, Ghaziabad. (Slaughter House and Meat Processing)
72. Fair Export (India) Pvt. Ltd., 20/1, Site-4 Ind. Area, Sahibabad, Ghaziabad. (Slaughter House and Meat Processing)
73. Firgo Riffico Alana Ltd., A-15, Site- 4, Sahibabad Ind. Area, Ghaziabad. (Slaughter House and Meat Processing)
74. Frigo Rifico Alana Ltd., Unit-2, A- 14/1, Site-4, Sahibabad Ind. Area, Ghaziabad. (Slaughter House and Meat Processing)
75. Mirha Export Pvt.Ltd., B-36, Site- 4, Sahibabad Ind. Area, Ghaziabad. (Slaughter House and Meat Processing)

### 3.7 Gautam Buddha Nagar District

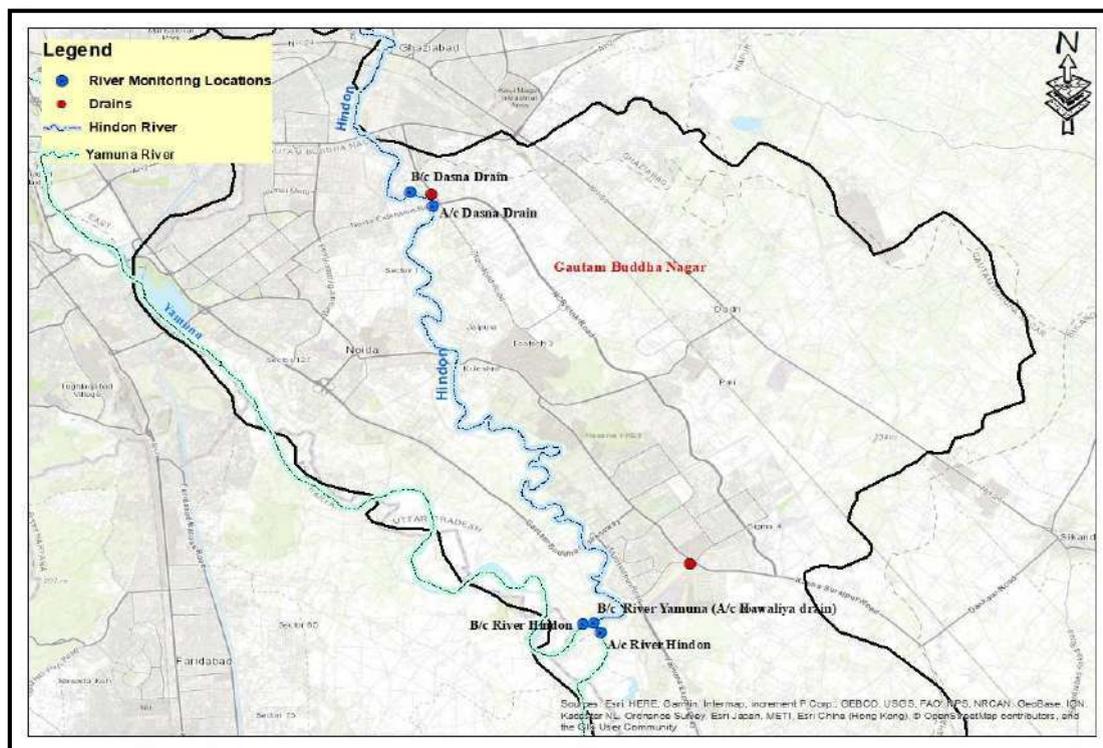
#### River Hindon

After entering into Gautam Buddha Nagar district, Dasna drain meets the river Hindon at Yusufpur village in Greater Noida which carries domestic sewage from Gaur City residential area (in Greater Noida-West) along with discharge of industrial and domestic wastewater of Ghaziabad district. The flow diagram of the Hindon river showing the river monitoring locations along with the confluence points of the drains is shown in the **Figure 93**.



**Figure 93** Flow diagram of river Hindon depicting the river monitoring locations along with confluence with river Yamuna

The monitoring locations on Rivers Hindon and Yamuna along with adjoining drains in Gautam Buddha Nagar district are shown in **Map-8**.



**Map 8 Monitoring locations on Rivers Hindon and Yamuna along with adjoining drains in Gautam Buddha Nagar district**

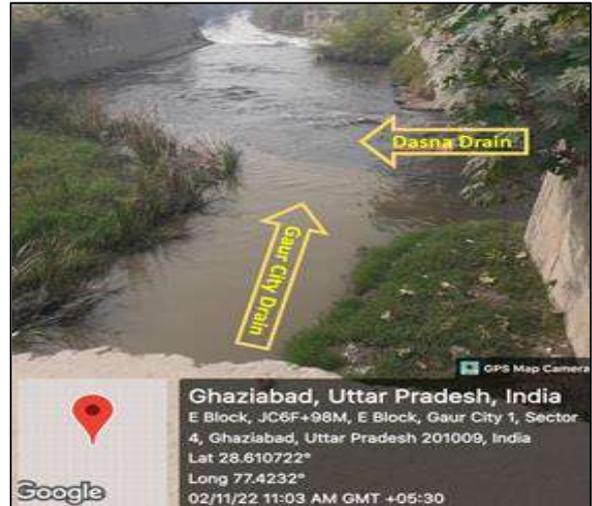
Dasna drain originates from district Ghaziabad which carries untreated sewage and treated industrial effluent coming from various industrial area and residential area of Distt. Ghaziabad. Dasna drain carry treated effluent of industrial units situated at G.T. Road and untreated sewage from nearby areas and enters Greater Noida West via G.T. Road. Gaur city drain, which carries domestic sewage of Gaur city area, also merges with the Dasna drain. Dasna drain meets river Hindon near Yusufpur village. Flow, BOD and COD in Dasna drain were 412.06 MLD, 73 mg/l and 356 mg/l, respectively. DO and BOD in river near under Hindon Bridge, Greater Noida were NIL-0.6 mg/l and 9 mg/l, respectively.

Hawalia drain originates from Surajpur Wetland, Surajpur (**Figure 98**). The domestic untreated sewage generated from Surajpur village and treated industrial effluent of Surajpur Industrial Area Site - C and Site – B, Site-V is being discharged in this drain. Some local drains i.e. Lohiakhar Nala, Palla Chithehara Nala, Dhoom Dujana drains and Sadopur drain also discharges into Hawaliya drain near Surajpur Wetland. Further, Domestic sewage of Udyog Vihar, Udyog Kendra and Ecotech –I, Industrial Area Site - IV, Udyog Vihar Extension,

Gamma-1, Knowledge Park- 1, 2 & 3, Sector-Omega-2, 4, Sector-P-3 & 4, goes to GNIDA STP (capacity- 137 MLD, 15 MLD, 20 MLD). Treated effluent from these STPs meets with Hawaliya drain through Kot Escape at village Kasna. Hawaliya drain ultimately meets in Hindon River at village Gharbara. In downstream, Hawaliya drain (BOD: 19 mg/l and COD: 97 mg/l) meet river in village Gharbara which is outlet of Surajpur wetland. DO and BOD in river a/c Hawaliya drain were NIL-22 mg/l, respectively. The photographs of river Hindon and drain monitoring locations are shown in **Figures 94-103**.



**Figure 94 Hindon River B/c Dasna drain**



**Figure 95 Dasna and Gaur city drain**



**Figure 96 Gaur city drain**



**Figure 97 Hindon A/c Dasna drain**

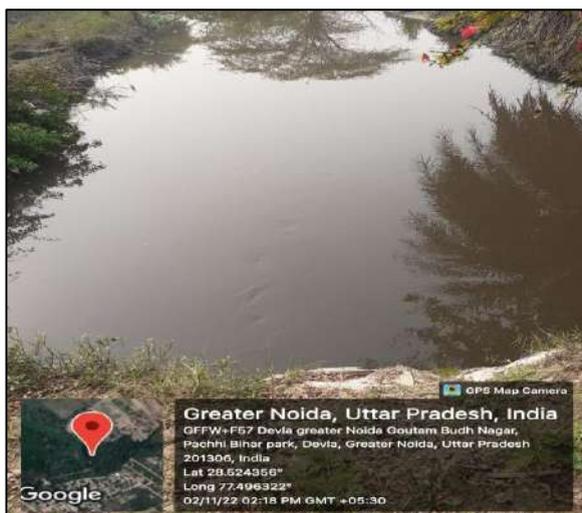


Figure 98 Inlet of Surajpur wetland

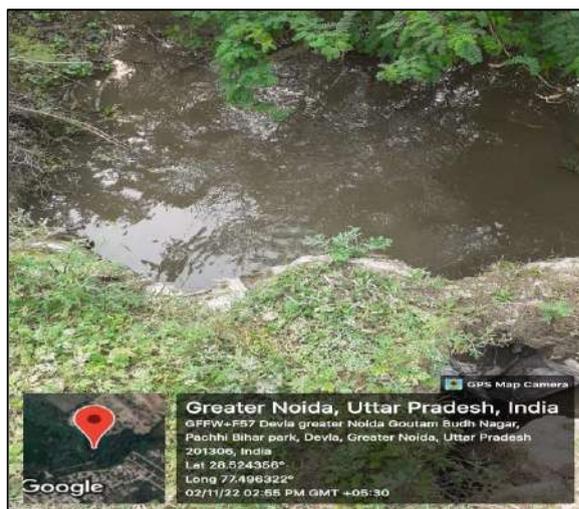


Figure 99 Outlet of Surajpur wetland (Origin of Hawaliya drain)



Figure 100 Hawaliya drain B/c Hindon river

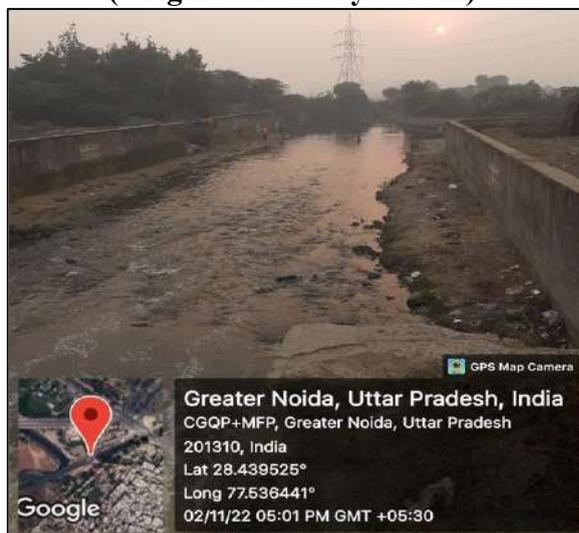


Figure 101 Kot escape canal drain

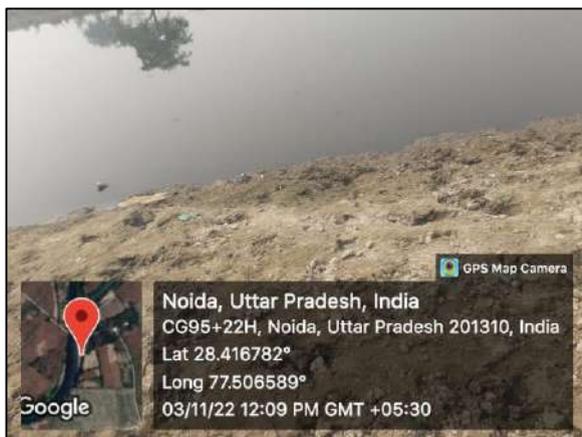


Figure 102 Hindon river A/c Hawaliya drain

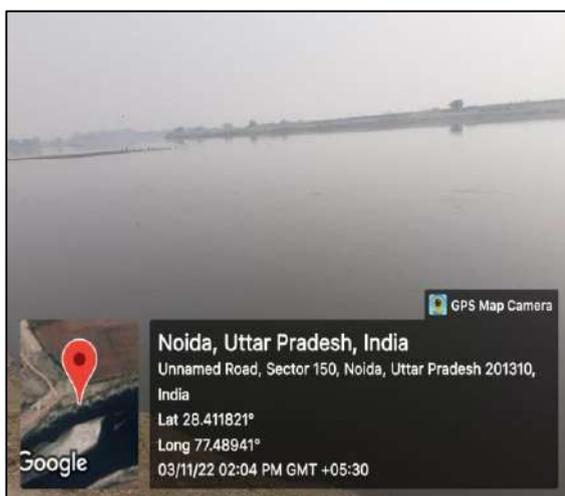


Figure 103 Hindon river B/c Yamuna river

**River Yamuna:**

Finally, Hindon meets with river Yamuna near village Gharbara, Greater Noida. Samples was taking before and after confluence with river Yamuna. DO was found NIL and BOD was 17 mg/l and 14 mg/l before and after confluence of river Hindon.

The photographs of river Yamuna monitoring locations are shown in **Figures 104-105**.



**Figure 104 Yamuna river B/c Hindon river**



**Figure 105 Yamuna river A/c Hindon river**

## CHAPTER-4: ACTION REQUIRED FOR POLLUTION ABATEMENT

### 4.1 Saharanpur and Shamli District

**Table 1 Action required to improve water quality of River Hindon and its tributaries namely Rivers Dhamola, Krishna and Kali-West in Saharanpur and Shamli districts**

Sl. No.	River	Tributary/ Drains/ Canal	Drain (Flow, BOD COD or any specific pollution)	Water quality of river stretch		Pollution sources		Key Issues	Action Points
				B/c (in case of drain)	A/c (in case of drain)	Industrial Unit (GPI/Non-GPI and Non-Conforming area)	STP/CETP/D omestic sewage from towns		
1.	Hindon (At origin)	Not available	Not available	B/c (in case of drain)	A/c (in case of drain)	No industrial unit identified	No sewage discharge	Inadequate flow in river	<ul style="list-style-type: none"> <li>• Restoration of flow to be considered.</li> <li>• Vegetation development in catchment of river Hindon along its course.</li> </ul>
2.	Hindon (at Kaluwala village) (~ 5.5 km)	Not available	Not available			No industrial unit identified	No sewage discharge	Pond is silted	<ul style="list-style-type: none"> <li>• Restoration of pond via desiltation.</li> <li>• The desilted material should be used for strengthening the embankments and the embankments should be vegetated.</li> </ul>

Sl. No.	River	Tributary/Drains/Canal	Drain (Flow, BOD COD or any specific pollution)	Water quality of river stretch		Pollution sources		Key Issues	Action Points
				B/c (in case of drain)	A/c (in case of drain)	Industrial Unit (GPI/Non-GPI and Conforming/Non-Conforming area)	STP/CEPT/D omestic sewage from towns		
3.	Hindon (at Pur ka Tanda) (~ 21 km)	Not available	Not available			No industrial unit identified	No sewage discharge	Dry stretch	<ul style="list-style-type: none"> <li>• Embankments of river Hindon should be vegetated all along the course.</li> <li>• Restoration of flow to be considered.</li> <li>• Increase in source of freshwater by making check dams</li> </ul>
4.	Hindon (at Khujnawar bridge and Harora village) (~ 46 km)	Not available	Not available	<ul style="list-style-type: none"> <li>• Bunds have been constructed on the River Hindon at Pur ka Tanda, Saharanpur by the Irrigation Department to revive the river</li> <li>• River is dry at this location</li> <li>• River was found dry.</li> </ul>		No industrial unit identified	No sewage discharge	<ul style="list-style-type: none"> <li>• Dry stretch</li> <li>• River bed encroached.</li> </ul>	<ul style="list-style-type: none"> <li>• Restoration of flow to be considered.</li> <li>• Removal of encroachment in river bed.</li> <li>• Increase in source of freshwater by making check dams.</li> </ul>
5.	Hindon (at Janta Road Bridge) (~ 47.5 km)	Not available		<p><b>Round I:</b> DO-NIL, BOD-291 mg/l, &amp; COD:763 mg/l</p> <p><b>Round II:</b> DO-NIL, BOD-369 mg/l &amp; COD: 612 mg/l (Stagnant polluted wastewater)</p>		Slaughter House and Board Mills namely Anant Board Mill, Balaji Board Mill, Ekta Board Mill, and Krishna Board Mill	No sewage discharge	<ul style="list-style-type: none"> <li>• High impact due to industrial discharge.</li> <li>• First polluted stretch observed at Janta Road Bridge, before that river stretch is dry.</li> <li>• River bed encroached.</li> </ul>	<ul style="list-style-type: none"> <li>• Action on industries discharging untreated/partially treated effluent in the catchment area.</li> <li>• Removal of encroachment in river bed.</li> </ul>
6.	Hindon	Sewage from Gagelheri and	Not available	DO-NIL, BOD-80 mg/l &	Not available	No industrial unit identified	Sewage from Gagelheri and Dinapur village	<ul style="list-style-type: none"> <li>• Untreated sewage discharge</li> </ul>	<ul style="list-style-type: none"> <li>• Decentralized low-cost treatment system like pond, stabilization</li> </ul>

Sl. No.	River	Tributary/Drains/Canal	Drain (Flow, BOD COD or any specific pollution)	Water quality of river stretch		Pollution sources		Key Issues	Action Points
				B/c (in case of drain)	A/c (in case of drain)	Industrial Unit (GPI/Non-GPI and Conforming/Non-Conforming area)	STP/CEPT/Domestic sewage from towns		
		Dinapur village through drains at U/s of Daya Sugar Mill		COD-305 mg/l				(water quality deteriorated) • River bed encroached.	Constructed oxidation ditches etc. • Removal of encroachment in river bed.
7.	Hindon	Daya Sugar Mill drain (~ 48.5 km*)	Dry	Not available	DO-NIL, BOD-73 mg/l & COD-292 mg/l	GPI-01 (Daya sugar Naya Bans, Saharanpur)			
8.	Hindon	Nagdehi drain (~ 56 km)	<b>Round I:</b> Dry <b>Round II:</b> BOD-34 mg/l & COD-103 mg/l <b>Round III:</b> Flow-0.74 MLD, BOD-237 mg/l & COD-349 mg/l	Dry	Dry	02 GPIs (Dairy & Textile) & 01 Non-GPI (Board Mill) ( <i>Conforming area</i> )  01 Unit (Board Mill)	Sewage under Saharanpur-Dehradun road bridge	• Drain water quality deteriorated due to industrial and untreated sewage discharge • River stretch dry. • River bed encroached.	• Removal of solid waste. • Decentralized low-cost treatment system like pond, Wetland, Constructed oxidation ditches etc. • Action on industries discharging untreated/partially treated effluent in the Nagdehi drain. • Desilting of river bed. • Removal of encroachment in river bed.
9.	Hindon	Star Paper Mill drain (~ 60 km)	<b>Round I:</b> Flow-23.76 MLD, BOD-61 mg/l, COD-181 mg/l &	Dry	<b>Round I:</b> DO-0.8 mg/l, BOD-61 mg/l & COD-181 mg/l	GPI-01 (Star Paper Mill) ( <i>Conforming area</i> )	Sewage from Shantagarh area	Impact due to industrial and untreated sewage discharge	• Decentralized low-cost treatment system like pond, Wetland, Constructed oxidation ditches etc. for

Sl. No.	River	Tributary/Drains/Canal	Drain (Flow, BOD COD or any specific pollution)	Water quality of river stretch		Pollution sources		Key Issues	Action Points
				B/c (in case of drain)	A/c (in case of drain)	Industrial Unit (GPI/Non-GPI and Conforming/Non-Conforming area)	STP/CEPT/Domestic sewage from towns		
			TDS-2796 mg/l <b>Round II:</b> BOD-83 mg/l, COD-195 mg/l, TDS-3404 mg/l & Chloride-1261 mg/l <b>Round III:</b> Flow-20.75 mg/l, <b>Color-107 Hazen,</b> BOD-198 mg/l, COD-338 mg/l, TDS-3024 mg/l & Chloride-1147 mg/l	Dry	(The only water source at this river location is discharge of Star Paper Mill drain, therefore, it has the same characteristic as of drain)				treatment of Star Paper Mill drain.
<b>River Dhamola</b>									
10.	Dhamola (Origin at Sansarpur village)	Not available	Not available	<ul style="list-style-type: none"> <li>Dhamola River originates from a pond in Sansarpur village</li> <li>Pond is dry</li> <li>The river is recharged by groundwater at Salempur Bhugdi village</li> </ul>	No industrial unit identified	No sewage discharge	Dry stretch	<ul style="list-style-type: none"> <li>Restoration of flow to be considered.</li> <li>Pond should be desilted and the desilted material should be used for strengthening the embankments and the</li> </ul>	

Sl. No.	River	Tributary/Drains/Canal	Drain (Flow, BOD COD or any specific pollution)	Water quality of river stretch		Pollution sources		Key Issues	Action Points
				B/c (in case of drain)	A/c (in case of drain)	Industrial Unit (GPI/Non-GPI and Conforming/Non-Conforming area)	STP/CEPT/Domestic sewage from towns		
11.	Dhamola	Madh Village drain (~ 20 km)	Flow-1.71 MLD, BOD-17 mg/l & COD-100 mg/l	<p><b>Round I:</b> DO-8.04 mg/l, BOD-1.6 mg/l &amp; COD- 7 mg/l</p> <p><b>Round II</b> DO-13.9 mg/l, BOD-3 mg/l &amp; COD-14 mg/l</p>	Not available	No industrial unit identified	Sewage from Madh village	-	<p>embankments should be vegetated.</p> <ul style="list-style-type: none"> <li>Embankments of river Dhamola should be vegetated all along the course.</li> <li>Decentralized low-cost treatment system like pond, Constructed Wetland, oxidation ditches etc.</li> </ul>
12.	Dhamola	Numaesh camp drain (~ 26 km)	<p><b>Round I:</b> Flow- 10 MLD, BOD-76 mg/l &amp; COD-197 mg/l</p> <p><b>Round II:</b> BOD-63 mg/l &amp; COD-258 mg/l</p>	<p><b>Round I:</b> DO-0.36 mg/l &amp; BOD-23 mg/l</p> <p><b>Round II:</b> DO-0.95 mg/l, BOD-37 mg/l &amp; COD- 117 mg/l</p>	A/c of both drains	No industrial unit identified	Sewage from Numaish Camp Area	<ul style="list-style-type: none"> <li>Impact due to industrial and untreated sewage discharge.</li> <li>First polluted stretch of river Dhamola.</li> </ul>	<ul style="list-style-type: none"> <li>Removal of solid waste.</li> <li>Decentralized low-cost treatment system like pond, Constructed Wetland, oxidation ditches etc.</li> </ul>
13.	Dhamola	Kamdhenu complex drain (~ 26 km)	<p><b>Round I:</b> BOD-204 mg/l, COD-545 mg/l,</p>	<p><b>Round II:</b> DO-NIL, BOD-42 mg/l</p>		04 Nos. GPIs (Textile)	Sewage from Balmiki Basti		<ul style="list-style-type: none"> <li>Action on industries discharging untreated/partially treated</li> </ul>

Sl. No.	River	Tributary/Drains/Canal	Drain (Flow, BOD COD or any specific pollution)	Water quality of river stretch		Pollution sources		Key Issues	Action Points
				B/c (in case of drain)	A/c (in case of drain)	Industrial Unit (GPI/Non-GPI and Conforming/Non-Conforming area)	STP/CEPT/Domestic sewage from towns		
			TSS-1066 mg/l, TDS-1496 mg/l, Cd-7.09 mg/l, Cu-15.95 mg/l & Fe-97.05 mg/l <b>Round II:</b> BOD-28 mg/l, COD-142 mg/l & Fe-6.49 mg/l		& COD-155 mg/l			<ul style="list-style-type: none"> <li>effluent into Kamdhenu Complex Drain.</li> <li>Removal of solid waste.</li> <li>Decentralized low-cost treatment system like stabilization pond, Constructed Wetland, oxidation ditches etc.</li> <li>New STP along with sewage network with future projection shall be installed.</li> </ul>	
14.	Dhamola	Paandhoi drain (~28 km)	BOD-64 mg/l & COD-170 mg/l	Not available	A/c of both drains at Sadoli Hariya	No industrial unit identified	Sewage from Saharanpur city	Impact due to untreated sewage discharge.	<ul style="list-style-type: none"> <li>Interception, diversion and treatment of sewage.</li> <li>Decentralized low-cost treatment system like stabilization pond, Constructed Wetland, oxidation ditches etc.</li> </ul>
15.	Dhamola	Kishanpur drain (~29 km)	Flow-95 MLD, BOD-206 mg/l & COD-347 mg/l	Not available	<b>Round I:</b> DO-NIL, BOD-22 mg/l & COD-126 mg/l <b>Round II:</b> DO-NIL, BOD-47 mg/l & COD-159 mg/l	No industrial unit identified	Sewage from Saharanpur city and Ram Nagar market area		<ul style="list-style-type: none"> <li>Decentralized low-cost treatment system like stabilization pond, Constructed Wetland, oxidation ditches etc.</li> </ul>
16.	Hindon	Dhamola (~52 km from origin)	Flow-250.56 MLD, BOD-8	Not approachable,	<b>Round I:</b> DO-NIL,	04 Nos. GPIs (Textile)	Sewage discharge from Madh village,	• River is polluted.	<ul style="list-style-type: none"> <li>Decentralized low-cost treatment system like stabilization pond.</li> </ul>

Sl. No.	River	Tributary/Drains/Canal	Drain (Flow, BOD COD or any specific pollution)	Water quality of river stretch		Pollution sources		Key Issues	Action Points
				B/c (in case of drain)	A/c (in case of drain)	Industrial Unit (GPI/Non-GPI and Conforming/Non-Conforming area)	STP/CETP/D omestic sewage from towns		
		to confluence of river Hindon)	mg/l, COD-86 mg/l	lean flow in river	BOD-7 mg/l & COD-92 mg/l <b>Round II:</b> DO-NIL, BOD-24 mg/l & COD- 95 mg/l		Numaish camp area, Saharanpur city and Ram Nagar market area	<ul style="list-style-type: none"> <li>Mixed impact from industrial and untreated sewage discharge.</li> </ul>	<p>Constructed Wetland, oxidation ditches etc. in river Hindon b/c and a/c of river Dhamola.</p> <ul style="list-style-type: none"> <li>Upgradation and ensuring compliance of 38 MLD STP at Saharanpur near Mahilpur Road.</li> <li>Action on industries discharging untreated/partially treated effluent into river Dhamola.</li> <li>New CETP with adequate capacity shall be installed for industrial clusters in catchment of river Dhamola &amp; KD Complex drain.</li> </ul>
17.	Hindon	Bajaj Sugar Mill drain (~ 90 km)	<b>Round I:</b> BOD-20 mg/l, COD-82 mg/l <b>Round II:</b> BOD-74 mg/l, COD-211 mg/l	Not applicable	At Village Maheshpur <b>Round I:</b> DO-0.9 mg/l, BOD-14 mg/l & COD- 77 mg/l <b>Round II:</b> DO-0.35 mg/l, BOD-21 mg/l & COD-83 mg/l	02 Nos. GPI (Bajaj Hindustan Sugar Mill & Distillery)	No sewage discharge	River is polluted	<ul style="list-style-type: none"> <li>Decentralized low-cost treatment system like stabilization pond, Constructed Wetland, oxidation ditches etc.</li> <li>Desiltation of drain.</li> </ul>

Sl. No.	River	Tributary/Drains/Canal	Drain (Flow, BOD COD or any specific pollution)	Water quality of river stretch		Pollution sources		Key Issues	Action Points
				B/c (in case of drain)	A/c (in case of drain)	Industrial Unit (GPI/Non-GPI and Conforming/Non-Conforming area)	STP/CEPT/Domestic sewage from towns		
<b>River Kali-West</b>									
18.	Kali-West (Originate from wetlands at Gangali and Kalahati village)	Not available	Not available	Wetland at origin is eutrophicated.	No industrial unit identified	No sewage discharge	River bed is silted and encroached by farmers	<ul style="list-style-type: none"> <li>Restoration of flow to be considered.</li> <li>Rejuvenation of wetland</li> <li>Desiltation of river bed and the desilted material should be used for strengthening the embankments and the embankments should be vegetated.</li> <li>Embankments of river Kali-West should be vegetated all along the course.</li> <li>Removal of encroachment in river bed.</li> </ul>	
19.	Kali-West (Shivpur village)	Not available	Not available	River feeds into a pond at Shivpur village. (water quality sample not collected)	No industrial unit identified	Domestic sewage from nearby villages	<ul style="list-style-type: none"> <li>Pond is highly silted and polluted due to discharge of sewage from nearby villages.</li> <li>River bed is encroached by farmers</li> <li>Inadequate flow in river</li> <li>Highly eutrophicated</li> </ul>	<ul style="list-style-type: none"> <li>Desiltation of pond.</li> <li>The desilted material should be used for strengthening the embankments and the embankments should be vegetated.</li> <li>Removal of encroachment in river bed.</li> </ul>	
20.	Kali-West (Dharampur)	Not available	Not available	Not available	No industrial unit identified	No sewage discharge	<ul style="list-style-type: none"> <li>River bed is encroached by farmers</li> <li>Inadequate flow in river</li> <li>Highly eutrophicated</li> </ul>	<ul style="list-style-type: none"> <li>Removal of encroachment in river bed.</li> <li>Desilting of river bed.</li> <li>The desilted material should be used for strengthening the embankments and the embankments should be vegetated.</li> </ul>	

Sl. No.	River	Tributary/Drains/Canal	Drain (Flow, BOD COD or any specific pollution)	Water quality of river stretch		Pollution sources		Key Issues	Action Points
				B/c (in case of drain)	A/c (in case of drain)	Industrial Unit (GPI/Non-GPI and Conforming/Non-Conforming area)	STP/CEPT/Domestic sewage from towns		
21.	Kali-West (u/s Rastam village)	Ganga Canal	Not available		DO-10.2 mg/l, BOD-1.1 mg/l & COD-6 mg/l were found in river Kali-West. • Fresh water discharged into river Kali-West from Ganga canal.	No industrial unit identified	No sewage discharge	River is not polluted	• Restoration of flow to be considered.
22.	Kali-West (Chandpur village) (~ 9 km)	Not available	Not available		A small fresh water stream joins the river 5 km upstream of the location. (water quality sample not collected)	No industrial unit identified	No sewage discharge	-	-
23.	Kali-West (Miragpur village) (~ 12 km)	Not available	Not available		DO-9.92 mg/l, BOD- 3 mg/l & COD-10 mg/l were found in river Kali-West.	No industrial unit identified	No sewage discharge	River is not polluted	-
24.	Kali-West	Deoband drain (~ 16 km)	Flow-12.51 MLD, BOD-21 mg/l & COD-77 mg/l	-	At Sapla Khatri village <b>Round I:</b> DO-2 mg/L, BOD-1.1 mg/L & COD-7 mg/l <b>Round II:</b> DO-0.7 mg/L, BOD-6	No industrial unit identified	Domestic sewage from Deoband town	Water quality of river Kali-West deteriorated in terms of dissolved oxygen	• Decentralized low-cost treatment system like pond, Constructed Wetland, oxidation ditches etc. on Deoband drain.

Sl. No.	River	Tributary/Drains/Canal	Drain (Flow, BOD COD or any specific pollution)	Water quality of river stretch		Pollution sources		Key Issues	Action Points
				B/c (in case of drain)	A/c (in case of drain)	Industrial Unit (GPI/Non-GPI and Conforming/Non-Conforming area)	STP/CEPT/Domestic sewage from towns		
25.	Kali-West	Sheela drain at Lakhnauta (Haridwar) (~ 22 km)  (Sheela drain was monitored at Lakhnauta, Uttarakhnad before confluence of channel of Ganga canal with the drain)	Flow-20.04 MLD, <b>BOD-365 mg/L, COD 702 mg/L</b>	<b>Round I:</b> DO-1.2 mg/L, BOD-5 mg/l & COD-28 mg/l	mg/L & COD-25 mg/l <b>Round I:</b> DO-1 mg/L, BOD-4 mg/L & COD-20 mg/l	12 (nos.) industries namely Finolex Kebles Roorkee, Carborandom Universal Ltd., Roorkee, Inwing Industries, Sagar Paper Mills, UMRB Electronics, ASAHI India Glass Ltd. (AIS), AIS outglass, Air Liquid India Facility, Roorkee, Aroma-Craft & Tissue Pvt. Ltd., Aadharshree Paper Mills Pvt. Ltd., Uttaranchal Pulp & Paper Pvt. Ltd., Saraswati Paints Pvt. Ltd.	Domestic sewage from nearby villages (Libaheri, Jhabrera, Tikkolakala, Kbalpura etc.) and Roorkee	Impact in terms of dissolved oxygen which might affect the aquatic life	<ul style="list-style-type: none"> <li>Action on industries discharging untreated/partially treated effluent into Sheela drain</li> <li>Decentralized low-cost treatment system like pond, Wetland, Constructed oxidation ditches etc. on Sheela drain b/c to river Kali-West.</li> </ul>
<b>River Krishni</b>									
26.	Krishni (Origin at Savalpur Navada)	Not available	Not available	<b>Round I:</b> DO-1.2 mg/L, BOD-5 mg/l & COD-28 mg/l	mg/L & COD-25 mg/l <b>Round I:</b> DO-1 mg/L, BOD-4 mg/L & COD-20 mg/l	No industrial unit identified	Sewage from surrounding village	-	<ul style="list-style-type: none"> <li>Restoration of pond via desiltation and floating wetlands.</li> </ul>

Sl. No.	River	Tributary/Drains/Canal	Drain (Flow, BOD COD or any specific pollution)	Water quality of river stretch		Pollution sources		Key Issues	Action Points
				B/c (in case of drain)	A/c (in case of drain)	Industrial Unit (GPI/Non-GPI and Conforming/Non-Conforming area)	STP/CEPT/Domestic sewage from towns		
					<ul style="list-style-type: none"> <li>The source of water is a spring that feeds the river Krishna</li> </ul>			<ul style="list-style-type: none"> <li>The desilted material should be used for strengthening the embankments and the embankments should be vegetated.</li> <li>Decentralized low-cost treatment system like pond, stabilization Wetland, Constructed Wetland, oxidation ditches etc.</li> </ul>	
27.	Krishni	Thaska drain (~ 36 km*)	BOD-98 mg/L, COD 354 mg/L	River dry before confluence	DO-NIL, BOD-98 mg/l & COD-354 mg/l (The only water source at this river location is discharge of Thaska drain, therefore, it has the same characteristic as of drain)	Conforming GPI-03 (Sugar, Milk processing, Distillery)	Sewage from Nanauta town to Village Bhanera Khemchand	<ul style="list-style-type: none"> <li>First polluted stretch observed D/s Thaska drain before that river is dry.</li> <li>Polluted stretch from D/s Thaska drain to D/s Shamli drain due to industrial and untreated sewage discharge.</li> <li>Drain was highly eutrophicated.</li> </ul>	<ul style="list-style-type: none"> <li>Removal of solid waste.</li> <li>Decentralized low-cost treatment system like pond, stabilization Constructed Wetland, oxidation ditches etc.</li> <li>Action on industries discharging untreated/partially treated effluent into Thaska drain.</li> <li>Constructed Wetland in Thaska drain B/c with river Krishna or in river Krishna A/c with Thaska drain.</li> </ul>
28.	Krishni	Sikka drain (~ 75 km*)	BOD-48 mg/L, COD 256 mg/L, TDS-1948 mg/L,	DO-NIL, BOD-57 mg/l & COD-228 mg/l	Not available	Non-conforming GPI-01 (Maruti papers Pvt. Ltd.)	Domestic sewage from Village Sikka and Jalalpur	<ul style="list-style-type: none"> <li>Decentralized low-cost treatment system like pond, stabilization Constructed Wetland, oxidation ditches etc.</li> </ul>	

Sl. No.	River	Tributary/Drains/Canal	Drain (Flow, BOD COD or any specific pollution)	Water quality of river stretch		Pollution sources		Key Issues	Action Points
				B/c (in case of drain)	A/c (in case of drain)	Industrial Unit (GPI/Non-GPI and Conforming/Non-Conforming area)	STP/CEPT/Domestic sewage from towns		
29.	Krishni	Shamli drain (~92 km*)	Flow-93.41 MLD, BOD-48 mg/L & COD- 254 mg/L	Not applicable	DO-NIL, BOD-57 mg/L & COD- 297 mg/l	Non-conforming GPI-02 (Distillery & Sugar);  Conforming GPI-01 (Pulp & paper)	Domestic sewage from Shamli town	<ul style="list-style-type: none"> <li>Decentralized treatment system like pond, Constructed Wetland, oxidation ditches etc.</li> <li>Action on industries discharging untreated/partially treated effluent into Shamli drain.</li> <li>New STP along with sewage network with future projection shall be installed.</li> <li>Proper tapping and diversion structure for tapping of drain.</li> <li>Constructed Wetland in Shamli drain B/c with river Krishni or in river Krishni A/c with Shamli drain.</li> </ul>	

## 4.2 Muzaffarnagar District

Table 2 Action required to improve water quality of river Hindon in Muzaffarnagar district

S. No.	River	Tributary/ Drains/Canal	Drain (Flow, BOD, COD or any specific pollution)	Polluted river stretch		Pollution sources		Key issues	Action Points
				B/c (in case of drain)	A/c (in case of drain)	Industrial Unit (GPI/Non-GPI and Non-Conforming area)	STP/CETP/ Domestic sewage from towns		
1.	Hindon	Titawi village drain (Untapped) 151.5 Kms	At Titawi village <b>Round I:</b> Flow-4.93 MLD, BOD-197 mg/l & COD-399 mg/l <b>Round II:</b> Flow-2.34 MLD, BOD-190 mg/l & COD-373 mg/l	At Titawi village <b>Round I:</b> DO-0.6 mg/l, BOD-13 mg/l & COD-51 mg/l <b>Round II:</b> DO-0.66 mg/l, BOD-7 mg/l & COD-47 mg/l	At Titawi village <b>Round I:</b> DO-NIL, BOD-5 mg/l & COD-36 mg/l <b>Round II:</b> DO-0.6 mg/l, BOD-13 mg/l & COD-54 mg/l	Indian Potash Limited, Titawi (Sugar Industry)	Domestic sewage from Titawi village	Impact observed- Insufficient dissolved oxygen in river	<ul style="list-style-type: none"> <li>Installed ETP shall be upgraded at Indian Potash Limited, Titawi to improve quality of treated effluent.</li> <li>Decentralized low-cost treatment system like stabilization pond, Constructed Wetland, oxidation ditches etc on Titawi village drain.</li> </ul>
2.	Hindon	Dhobi Ghat drain- Budhana town (Untapped) 188.1 Kms	<b>Round I:</b> BOD-180 mg/l & COD-455 mg/l <b>Round II:</b> BOD-574 mg/l, COD-1435 mg/l & TSS-1551 mg/l (Flow in the drain could not be measured due to less flow)	Not available	Not available	No industrial unit identified	Domestic sewage from Parsi Basti, Budhana	Industrial impact observed- Discharge of wastewater containing high BOD and COD in river through Dhobi Ghat drain	<ul style="list-style-type: none"> <li>Removal of solid waste.</li> <li>Action on industries discharging untreated/partially treated effluent into Dhobi Ghat drain.</li> <li>To expedite construction of 10 MLD Budhana STP &amp; tap Dhobi Ghat drain to the STP.</li> </ul>
3.	Hindon	Sabzi Mandi drain- Budhana town (Untapped)	<b>Round I:</b> BOD-115 mg/l & COD-273 mg/l <b>Round II:</b> BOD-267 mg/l, COD-800 mg/l & TSS-771 mg/l	Not available	Not available	No industrial unit identified	Domestic sewage from Sabji Mandi, Luhsana village, Mandwada	Industrial impact observed- Discharge of wastewater containing high	<ul style="list-style-type: none"> <li>Removal of solid waste.</li> <li>Action on industries discharging untreated/partially treated effluent into Sabzi Mandi drain.</li> </ul>

S. No.	River	Tributary/Drains/Canal	Drain (Flow, BOD, COD or any specific pollution)	Polluted river stretch		Pollution sources		Key issues	Action Points
				B/c (in case of drain)	A/c (in case of drain)	Industrial Unit (GPI/Non-GPI and Conforming/Non-Conforming area)	STP/CETP/ Domestic sewage from towns		
		188.2 Kms	<i>(Flow in the drain could not be measured due to dumping of solid waste)</i>			village, Budhana			<ul style="list-style-type: none"> <li>To expedite construction of 10 MLD Budhana STP &amp; tap Sabzi Mandi drain to the STP.</li> </ul>
4.	Hindon	Shamshan Ghat drain- Budhana town (Untapped) 188.4 Kms	<p><b>Round I:</b> BOD-130 mg/l &amp; COD-368 mg/l</p> <p><b>Round II:</b> BOD-159 mg/l &amp; COD-344 mg/l</p> <p><i>(Flow in the drain could not be measured due to dumping of solid waste)</i></p>	Not available	<p><b>Round I:</b> DO-NIL, BOD-9 mg/l &amp; COD-51 mg/l</p> <p><b>Round II:</b> DO-0.5 mg/l, BOD-10 mg/l &amp; COD-47 mg/l</p>	No industrial unit identified	Domestic sewage from Sabji Mandi, Luhsana village, Mandwada village, Budhana	<p>River impacted (Insufficient dissolved oxygen in river)</p> <p>Insufficient dissolved oxygen in river</p>	<ul style="list-style-type: none"> <li>Removal of solid waste.</li> <li>To expedite construction of 10 MLD Budhana STP &amp; tap Shamshan Ghat drain to the STP.</li> <li>Decentralized low-cost treatment system like stabilization pond, Constructed Wetland, oxidation ditches etc in river Hindon a/c of Shamshan Ghat drain.</li> <li>Constructed Wetland in river Kali-West A/c with three drains of Budhana namely Dhobi Ghat drain, Sabzi Mandi drain and Shamshan Ghat drain.</li> </ul>

Table 3 Action required to improve water quality of river Kali-West in Muzaffarnagar district

S. No.	River/Drain	Tributary/ Drains/ Canal	Drain (Flow, BOD, COD or any specific pollution)	Water quality of river stretch		Pollution sources		Key issues	Action Points
				B/c (in case of drain)	A/c (in case of drain)	Industrial Unit (GPI/Non-GPI and Conforming/ Non-Conforming area)	STP/CETP/ Domestic sewage from towns		
1.	Kali-West	Maleera village drain (Untapped) 40.8 Kms	BOD-54 mg/l & COD-187 mg/l <i>(Flow in Maleera village drain was less which could not be measured)</i>	DO-5.3 mg/l, BOD-5 mg/l & COD-9 mg/l	DO-4.7 mg/l, BOD-6 mg/l & COD-18 mg/l	No industrial unit identified	Sewage from Maleera village	River impacted (deterioration in dissolved oxygen)	Decentralized low cost treatment system like stabilization pond, constructed wetlands, oxidation ditches, etc. to treat wastewater of Maleera village drain.
2.	Kali-West	Badhai Khurd drain (Untapped) 48.7 Kms	At village Rankhandi, Saharanpur: <b>Round I:</b> Flow-41.85 MLD, BOD-45 mg/l & COD-161 mg/l  <b>Round II:</b> Flow-6.75 MLD, BOD-104 mg/l & COD-298 mg/l  B/c with river Kali-West, Muzaffarnagar: Flow-33.32 MLD, BOD-30 mg/l & COD-106 mg/l	Not available	At Mimlana village (DO-4 mg/l, BOD-7 mg/l & COD-19 mg/l)  At Khanjahanpur village (DO-0.9 mg/l, BOD-7 mg/l & COD-24 mg/l)	Triveni Engg. & Industries Ltd, Deoband (Sugar Industry) <i>(Conforming)</i>	Sewage from Deoband, Bahadurpur, Rankhandi, Thamana, Aakhlour, Badhai Kalan, Hoshiyarpur, Badhai Khurd, Said Nagla, Kachholli towns	River impacted (Low level of dissolved oxygen in river at Khanjahanpur village due to low flow and shallow depth)	Decentralized low cost treatment system like stabilization pond, constructed wetlands, oxidation ditches, etc. to treat wastewater of Badhai Khurd drain.
3.	Kali-West	Niyazupura drain (Untapped) 56.5 Kms	<b>Round I:</b> Flow-17.5 MLD, BOD-119 mg/l & COD-398 mg/l  <b>Round II:</b> Flow-17.07 MLD, BOD-230 mg/l & COD-552 mg/l	<b>Round I:</b> DO-0.4 mg/l, BOD-6 mg/l & COD-13 mg/l  <b>Round II:</b> DO-0.7 mg/l, BOD-12 mg/l & COD-32 mg/l	Not available	No industrial unit identified	Sewage from Niyazupura town	River impacted (Low level of dissolved oxygen in river due to low flow and shallow depth)	<ul style="list-style-type: none"> <li>Removal of solid waste.</li> <li>Decentralized low cost treatment system like stabilization pond, constructed wetlands, oxidation ditches, etc. to treat wastewater of Niyazupura drain.</li> </ul>

S. No.	River/Drain	Tributary/ Drains/ Canal	Drain (Flow, BOD, COD or any specific pollution)	Water quality of river stretch		Pollution sources		Key issues	Action Points
				B/c (in case of drain)	A/c (in case of drain)	Industrial Unit (GPI/Non-GPI and Conforming/ Non-Conforming area)	STP/CETP/ Domestic sewage from towns		
4.	Kali-West	Laddawala drain (Tapped with overflow) 56.6 Kms	<b>Round I:</b> Flow-92.27 MLD, BOD-163 mg/l & <b>COD-504 mg/l</b>  <b>Round II:</b> <i>Origin</i> (BOD-222 mg/l & COD-508 mg/l) & b/c river Kali-East (Flow-65.94 MLD, BOD-259 mg/l, COD-1150 mg/l & TSS-1230 mg/l)  <ul style="list-style-type: none"> <li>Inadequate tapping arrangement at Laddawala drain leads to overflow of sewage reaching to river Kali-West.</li> <li>Huge amount of municipal solid waste is dumped into river through Laddawala drain.</li> </ul>	Not available	DO-NIL, BOD-38 mg/l & COD-115 mg/l	No industrial unit identified	Sewage from Laddawala, Ramelela Tila, Abkari Mohalla, Hanumanpuri	Industrial impact observed (Discharge of wastewater containing high COD and solid waste in river through Laddawala drain)	<ul style="list-style-type: none"> <li>Complete tapping of Laddawala drain to 32.5 MLD STP.</li> <li>Removal of solid waste.</li> <li>Action on industries discharging untreated/partially treated effluent into Laddawala drain.</li> </ul>
5.	Kali-West	Shamli Road drain (Untapped) 57.6 Kms	<b>Round I:</b> BOD-202 mg/l & <b>COD-694 mg/l</b>  <b>Round II:</b> BOD-117 mg/l & COD-291 mg/l <i>(Flow in the drain could not be measured as drain was flowing)</i>	DO-NIL, BOD-25 mg/l & COD-60 mg/l	Not available	No industrial unit identified	Sewage from Shamli Road area	Industrial wastewater discharge (River stretch polluted-DO is NIL)	<ul style="list-style-type: none"> <li>Removal of solid waste.</li> <li>Action on industries discharging untreated/partially treated effluent into Shamli Road drain.</li> </ul>

S. No.	River/Drain	Tributary/ Drains/ Canal	Drain (Flow, BOD, COD or any specific pollution)	Water quality of river stretch		Pollution sources			Key issues	Action Points
				B/c (in case of drain)	A/c (in case of drain)	Industrial Unit (GPI/Non-GPI and Conforming/ Non- Conforming area)	STP/CETP/ Domestic sewage from towns			
6.	Kali-West	Khadarwala drain (Tapped with overflow) 57.8 Kms	<p><i>via closed pipeline and dumping of solid waste)</i></p> <p>BOD-164 mg/l &amp; <b>COD-568 mg/l</b></p> <ul style="list-style-type: none"> <li><i>Inadequate tapping arrangement at Khadarwala drain leads to overflow of sewage reaching to river Kali-West.</i></li> <li><i>Flow in the drain could not be measured as drain was flowing via closed pipeline.</i></li> </ul>	Not available	Not available	No industrial unit identified	Sewage from Krishnapuri and Khalapar towns	<p>Discharge of wastewater containing high COD and solid waste in river through Khadarwala drain</p>	<ul style="list-style-type: none"> <li>Complete tapping of Khadarwala drain.</li> <li>Removal of solid waste.</li> </ul>	
7.	Kali-West	Krishnapuri drain (Tapped with overflow) 57.9 Kms	<p>BOD-122 mg/l &amp; COD-444 mg/l</p> <ul style="list-style-type: none"> <li><i>Inadequate tapping arrangement at Krishnapuri drain leads to overflow of sewage reaching to river Kali-West.</i></li> <li><i>Flow in the drain could not be measured as drain was flowing via closed pipeline.</i></li> </ul>	Not available	Not available	No industrial unit identified	Sewage from Krishnapuri and Khalapar towns	<p>Discharge of wastewater containing high COD and solid waste in river through Khadarwala drain</p>	<ul style="list-style-type: none"> <li>Complete tapping of Krishnapuri drain.</li> <li>Removal of solid waste.</li> </ul>	

S. No.	River/Drain	Tributary/ Drains/ Canal	Drain (Flow, BOD, COD or any specific pollution)	Water quality of river stretch		Pollution sources		Key issues	Action Points
				B/c (in case of drain)	A/c (in case of drain)	Industrial Unit (GPI/Non-GPI and Conforming/ Non-Conforming area)	STP/CETP/ Domestic sewage from towns		
8.	Kali-West	Suzroo village drain (Suzroo village drain + Nai-Basti Khalapar drain + treated sewage of 32.5 MLD STP) (Untapped)	Flow-25.92 MLD, BOD-111 mg/l, COD-571 mg/l & Fe-26.8 mg/l	DO-NIL, BOD-28 mg/l & COD-103 mg/l	DO-NIL, BOD-18 mg/l & COD-72 mg/l	No industrial unit identified	Untreated sewage from Suzroo village drain, Nai-Basti Khalapar drain and treated sewage of 32.5 MLD Waste Stabilization Pond based STP	Polluted river stretch (DO is NIL)	<ul style="list-style-type: none"> <li>Tapping of sewage from Suzroo village &amp; Nai-Basti Khalapar to 32.5 MLD STP.</li> <li>Removal of solid waste.</li> <li>Ensuring compliance and upgradation of 32.5 MLD Waste Stabilization Pond based STP.</li> </ul>
9.	Suzroo village drain (Suzroo village drain + Nai-Basti Khalapar drain + treated sewage of 32.5 MLD STP) (Untapped)	Suzroo village drain (2 <sup>nd</sup> order & untapped)	Flow-6.48 MLD, BOD-63 mg/l & COD-224 mg/l	Not available	Not available	No industrial unit identified	Suzroo village	Untreated sewage discharged into river via Suzroo village drain	<ul style="list-style-type: none"> <li>Removal of solid waste</li> <li>Adoption of decentralized low cost treatment system like stabilization pond, constructed wetlands, oxidation ditches, etc. to treat wastewater of Suzroo village drain.</li> </ul>
		Nai Basti Khalapar drain (2 <sup>nd</sup> order & untapped)	Flow-17.59 MLD, BOD-36 mg/l & COD-135 mg/l	Not available	Not available	No industrial unit identified	Sewage from Nai-Basti Khalapar area	Untreated sewage discharged into river via Nai-Basti Khalapar drain	<ul style="list-style-type: none"> <li>Removal of solid waste.</li> <li>Adoption of decentralized low cost treatment system like stabilization pond, constructed wetlands, oxidation ditches, etc. to treat wastewater of Nai Basti Khalapar drain.</li> </ul>

S. No.	River/Drain	Tributary/ Drains/ Canal	Drain (Flow, BOD, COD or any specific pollution)	Water quality of river stretch		Pollution sources		Key issues	Action Points
				B/c (in case of drain)	A/c (in case of drain)	Industrial Unit (GPI/Non-GPI and Conforming/ Non-Conforming area)	STP/CETP/ Domestic sewage from towns		
10.	Kali-West	Dhandera drain (Untapped) 74.8 Kms	At origin (near Tehri Pulp & Paper Ltd.) Flow-0.58 MLD, BOD-20 mg/l & COD-90 mg/l <i>Drain at this location receive discharge from Tehri Pulp &amp; Paper Ltd. In downstream, an irrigation canal from Chandpur village meets Dhandera drain, which was found dry at the confluence, with no fresh water being discharged into the drain.</i>	DO-NIL, BOD-26 mg/l & COD-65 mg/l	DO-NIL, BOD-348 mg/l & COD-1001 mg/l	45 units in catchment of Dhandera drain (32), Jatt Mujhera drain (5), Kukra drain (2) & Begrajpur Industrial drain (6)	Sewage from towns/colonies located at Bhopa Road, Jansath Road, and Sahawali & Sandhawali villages (via Kukra drain).	Industrial impact observed (DO is NIL & significant increase in BOD and COD in river due to discharge of high BOD, COD, TSS & TDS bearing wastewater into river via Dhandera drain)	<ul style="list-style-type: none"> <li>Action on industries discharging untreated/partially treated effluent into Dhandera drain.</li> <li>Upgradation of ETPs installed in industries located in catchment of the drain.</li> <li>Series of CWs in Dhandera drain B/c with river Kali-West.</li> </ul>
			D/s Bhopa Road (near Silvertan Papers Ltd.) Flow-19.3 MLD, BOD-30 mg/l, COD-137 mg/l & TDS-1080 mg/l B/c Jatt Mujhera drain Flow-54.23 MLD, BOD-948 mg/l, COD-2011 mg/l, TDS-2808 mg/l & TSS-1188 mg/l						

S. No.	River/Drain	Tributary/ Drains/ Canal	Drain (Flow, BOD, COD or any specific pollution)	Water quality of river stretch		Pollution sources			Key issues	Action Points
				B/c (in case of drain)	A/c (in case of drain)	Industrial Unit (GPI/Non-GPI and Conforming/ Non-Conforming area)	STP/CETP/ Domestic sewage from towns			
11.	Dhandera drain (Untapped)	Jatt Mujhera drain (2 <sup>nd</sup> order & untapped)	<p><b>Round 1:</b> Flow-148.18 MLD, BOD-547 mg/l, COD-1322 mg/l &amp; TDS-1856 mg/l</p> <p><b>Round 2:</b> Flow-112.13 MLD, BOD-968 mg/l, COD-2214 mg/l, TDS-2452 mg/l &amp; TSS-1622 mg/l</p> <p><i>(Drain carry effluents from industries located on Bhopa Road, Jolly Road, Jansath Road, Meerut Road and Begraipur industrial area)</i></p>	Not available	Not available	05 non-conforming GPs (Pulp & Paper and Distillery)	No discharge of domestic sewage/STP/CETP	Industrial impact observed (discharge of high BOD, COD, TSS & TDS bearing wastewater into river via Jatt Mujhera drain)	<ul style="list-style-type: none"> <li>Action on industries discharging untreated/partially treated effluent into Jatt Mujhera drain.</li> </ul>	
			<p>At origin (D/s Bindal Duplex Pvt. Ltd.) BOD-103 mg/l, COD-280 mg/l &amp; TDS-1096 mg/l</p> <p><i>(Drain contained very less flow which could not be measured)</i></p>	Not available	Not available					
			B/c Dhandera drain Flow-8.06 MLD, BOD-2230 mg/l, COD-4264 mg/l,	Not available	Not available					

S. No.	River/Drain	Tributary/ Drains/ Canal	Drain (Flow, BOD, COD or any specific pollution)	Water quality of river stretch		Pollution sources		Key issues	Action Points
				B/c (in case of drain)	A/c (in case of drain)	Industrial Unit (GPI/Non-GPI and Conforming/ Non-Conforming area)	STP/CETP/ Domestic sewage from towns		
	Dhandera drain (Untapped) At Jansath Road (a/c with Jatt Mujhera drain)	-	TSS-1230 mg/l & TDS-4148 mg/l <b>Round 1:</b> Flow-66.99 MLD, pH-5.9, Colour-146 Hazen, <b>BOD-922 mg/l, COD-2106 mg/l, TSS-1357 mg/l, Fe-TDS-3548 mg/l, Fe-26.72 mg/l, Pb-0.13 mg/l, Mn-3.31 mg/l &amp; Zn-5.43 mg/l</b> <b>Round 2:</b> <b>BOD-1114 mg/l, COD-2413 mg/l, TDS-3164 mg/l &amp; TSS-924 mg/l</b> <i>(Formation of sludge blanket and solid waste deposition)</i>	Not available	Not available	32 non-conforming units (GPIs-29 & non-GPIs-3) comprising of Pulp & Paper, Slaughter House, Tannery, Pharmaceuticals & Food Processing industries	No discharge of domestic sewage/STP/CETP	Industrial impact observed (discharge of high BOD, COD, TSS, TDS and metals bearing wastewater into river via Dhandera drain)	• Action on industries discharging untreated/partially treated effluent into Dhandera drain.
	Dhandera drain (Untapped)	Kukra drain (2 <sup>nd</sup> order & untapped)	Near village Sandhawali (b/c with Dhandera drain) Flow-26.47 MLD, BOD-62 mg/l & COD-219 mg/l	Not available	Not available	02 non-conforming GPIs (Pulp & Paper)	Sewage from Sahawali & Sandhawali towns	Impact observed (discharge of untreated sewage into river via Kukra drain)	• To expedite construction of proposed 22 MLD STP to treat the sewage of Kukra drain & tap the drain to the STP.
	Dhandera drain (Untapped) (A/c Kukra drain at	-	<b>BOD-495 mg/l, COD-2080 mg/l, TDS-2076 mg/l &amp; TSS-1838 mg/l</b>	Not available	Not available	45 units in catchment of Dhandera drain (32), Jatt Mujhera drain (5), Kukra drain (2)	No discharge of domestic sewage/STP/CETP	Industrial impact observed (discharge of high BOD, COD, TSS &	• Action on industries discharging untreated/partially treated effluent into Dhandera drain.

S. No.	River/Drain	Tributary/ Drains/ Canal	Drain (Flow, BOD, COD or any specific pollution)	Water quality of river stretch		Pollution sources		Key issues	Action Points
				B/c (in case of drain)	A/c (in case of drain)	Industrial Unit (GPI/Non-GPI and Conforming/ Non-Conforming area)	STP/CETP/ Domestic sewage from towns		
	<i>Meerut-Hariwar Bypass Road</i>		<i>(Flow not measured due to unapproachable site)</i>						
12.	Dhandera drain (Untapped)	Begrapur Industrial Area drain (2 <sup>nd</sup> order & untapped)	B/c Dhandera drain <b>Round 1:</b> Flow-1.92 MLD, pH-2.3, Colour-146 Hazen, BOD-936 mg/l, COD-3444 mg/l, TDS-7884 mg/l, Fe-27.96 mg/l, Pb-0.24 mg/l, Mn-3.72 mg/l & Zn-6.48 mg/l <b>Round 2:</b> Flow-1.73 MLD, pH-<2, BOD-187 mg/l, COD-474 mg/l, TDS-2584 mg/l, Fe-8.91 mg/l, Pb-0.7 mg/l, Mn-10.9 mg/l & Zn-17.67 mg/l <i>(Acidic fumes felt in Begrapur Industrial Area drain)</i>	Not available	Not available	06 conforming non-GPIs (Pharmaceuticals & Dyeing)	No discharge of domestic sewage/STP/CETP	Industrial impact observed (discharge of highly acidic and high color, BOD, COD, TDS and metals bearing wastewater into river via Begrapur Industrial Area drain)	• Action on industries discharging untreated/partially treated effluent into Begrapur Industrial Area drain.
13.	Kali-West	Mansoorpur drain (Untapped) 75.5 Kms	<b>Round 1:</b> Near Husenpur Bopara village (pH-4.9, BOD-571 mg/l, COD-1426 mg/l & TDS-1000 mg/l)	Not available	<b>Round 1:</b> DO-NIL, BOD-65 mg/l & COD-293 mg/l	02 non-conforming GPIs (Sugar-01 & Distillery-01)	Sewage from Mansoorpur Sugar Mill Road area	Industrial impact observed on river (DO-NIL & high BOD/COD)	• Removal of solid waste. • Action on industries discharging untreated/partially treated effluent into Mansoorpur drain.

S. No.	River/Drain	Tributary/ Drains/ Canal	Drain (Flow, BOD, COD or any specific pollution)	Water quality of river stretch		Pollution sources		Key issues	Action Points
				B/c (in case of drain)	A/c (in case of drain)	Industrial Unit (GPI/Non-GPI and Conforming/ Non-Conforming area)	STP/CETP/ Domestic sewage from towns		
			<p>(Flow could not be measured due to deposition of solid waste)</p> <p><b>Round 2:</b> Origin (BOD-60 mg/l &amp; COD-222 mg/l)</p> <p>Near Husenpur Bopara village (Flow-3.13 MLD, <b>BOD-579 mg/l, COD-1261 mg/l, TDS-2188 mg/l</b>)</p> <p>B/c river Kali-West (Flow-0.98 MLD, <b>BOD-404 mg/l, COD-870 mg/l, TDS-2024 mg/l &amp; Fe-15.13 mg/l</b>)</p>	<p><b>Round 2:</b> DO-NIL, <b>BOD-111 mg/l &amp; COD-436 mg/l</b></p>	<p><b>Round 2:</b> DO-NIL, <b>BOD-87 mg/l &amp; COD-302 mg/l</b></p>				
14.	Kali-West	Pur Baliyan drain (Untapped)  76.4 Kms	<p><b>Round 1:</b> Flow-1.99 MLD, BOD-188 mg/l &amp; COD-425 mg/l</p> <p><b>Round 2:</b> Origin (BOD-174 mg/l, COD-479 mg/l &amp; TDS-1328 mg/l)</p> <p>B/c river Kali-West (Flow-2.51 MLD,</p>	Not available	<p><b>Round 1:</b> DO-NIL, BOD-175 mg/l &amp; COD-374 mg/l</p> <p><b>Round 2:</b> DO-NIL, BOD-96 mg/l &amp; COD-272 mg/l</p>	No industrial unit identified	Sewage from Pur Baliyan village	River impacted (DO is NIL & high BOD and COD)	<ul style="list-style-type: none"> <li>Removal of solid waste, animal waste &amp; cow dung at origin of the drain.</li> <li>Decentralized low-cost treatment system like stabilization pond, Constructed Wetland, oxidation ditches etc. in river Hindon in Pur Baliyan drain.</li> </ul>

S. No.	River/Drain	Tributary/ Drains/ Canal	Drain (Flow, BOD, COD or any specific pollution)	Water quality of river stretch		Pollution sources		Key issues	Action Points
				B/c (in case of drain)	A/c (in case of drain)	Industrial Unit (GPI/Non-GPI and Conforming/ Non- Conforming area)	STP/CETP/ Domestic sewage from towns		
			BOD-252 mg/l & COD-520 mg/l)						

### 4.3 Meerut and Baghpat Districts

Table 4 Action required to improve water quality of river Hindon in Meerut and Baghpat districts

Sl. No.	River	Tributary/ Drains/ Canal	Drains/Canal (Flow, BOD COD or any specific pollution)	Water quality of river stretch		Pollution sources		Key issues	Action Points
				B/c	A/c	Industrial Unit (GPI/Non-GPI and Conforming/ Non-Conforming area)	STP/CETP/D omestic sewage from towns		
1.	Hindon	Kali-West (~196.04 km)	Flow-285.24 MLD, DO-NIL, <b>BOD-138</b> <b>mg/l, &amp; COD-336</b> <b>mg/l</b>	<b>Round II:</b> DO-NIL, BOD-11 mg/l & COD-50 mg/l  (~195.43 km)	<b>Round II:</b> DO-NIL, <b>BOD-123</b> <b>mg/l &amp; COD-287</b> <b>mg/l</b>  (~203.49 km)	Discharge from industrial units located in the catchment of river Kali West.	Sewage discharged from Muzaafarnagar city and nearby town/villages	<ul style="list-style-type: none"> <li>High impact due to discharge of R. Kali-West carrying industrial and domestic wastewater (water quality deteriorated)</li> <li>Polluted stretch from b/c &amp; a/c of Kali West</li> </ul>	<ul style="list-style-type: none"> <li>Action on industrial units discharging untreated/partially treated effluent.</li> <li>Domestic sewage diverted to nearby STP.</li> <li>Treatment of domestic sewage of nearby villages by using decentralized low cost sewage treatment system.</li> <li>Constructed Wetland in river</li> </ul>

Sl. No.	River	Tributary/ Drains/Canal	Drains/Canal (Flow, BOD COD or any specific pollution)	Water quality of river stretch		Industrial Unit (GPI/Non-GPI and Conforming/Non-Conforming area)	Pollution sources		Key issues	Action Points
				B/c	A/c		STP/CETP/D omestic sewage from towns	STP/CETP/D omestic sewage from towns		
2.	Krishni	Ramala drain (Baghpat) (~118.57 Km)	At Budhpur village Flow-0.6 MLD, BOD-11 mg/l & COD-59 mg/l	<b>Near Budhpur village</b> DO-NIL, BOD-16 mg/l & COD-71 mg/l	<b>Near Gopalpur Khandwa</b> DO-NIL, BOD-16 mg/l, & COD-74 mg/l	<b>GPI-01 No.</b> M/s Ramala Sahkari Chini Mill (Conforming area)	Sewage discharging from Ramala village and Budhpur village and agricultural runoff and there is possibility of discharge from sugar Mill	<ul style="list-style-type: none"> <li>Untreated sewage discharge and agricultural runoff (water quality deteriorated).</li> <li>Polluted stretch from b/c &amp; a/c of Ramala drain.</li> </ul>	Kali-West B/c with river Hindon near Baparsi village, Meerut. Treatment of domestic sewage of nearby villages by using decentralize low cost sewage treatment system.	
3.	Hindon	River Krishni (Baghpat) (~223.13 km)	At Gopalpur Khadana (Baghpat) DO-NIL, BOD-16 mg/l, & COD-74 mg/l	Near Barnawa village (Baghpat) DO-NIL, BOD-59 mg/l & COD-185 mg/l (~221.13 km)	Near Kalina Village (Meerut) DO-NIL, BOD-52 mg/l & COD-159 mg/l (~230.43 km)	Discharge from industrial units located in the catchment of river Krishni.	Sewage discharging from nearby village	<ul style="list-style-type: none"> <li>River is polluted.</li> <li>Discharge of Untreated sewage.</li> <li>Polluted stretch from b/c &amp; a/c of river Krishni.</li> </ul>	Treatment of sewage of nearby villages by using decentralize low cost sewage treatment system.	
4.	Hindon	Sardhana drain at Kalina village (Meerut)	At Kalina Village <b>Round I:</b> Flow- 33.43 MLD, <b>Color-370 Hazen</b> <b>BOD-263 mg/l,</b> <b>COD-770 mg/l &amp; Fe-4.527 mg/l</b>	At Kalina Village <b>Round I:</b> DO-NIL, BOD-52 mg/l & COD-159 mg/l <b>Round II:</b>	At Kinauni Vill. (b/c of Kinauni drain) <b>Round I:</b> DO-NIL, BOD-147 mg/l & COD-268 mg/l	<b>GPIs-03</b> (Paper-01, &Textile-02) <b>Non-GPI-01</b> Dairy-01	<ul style="list-style-type: none"> <li>Discharge of sewage from Sardhana town, Kalina Village and nearby village</li> </ul>	<ul style="list-style-type: none"> <li>High impact due to discharge of industrial effluent and disposal of cattle dung,</li> </ul>	<ul style="list-style-type: none"> <li>Action on industries discharging untreated/partially treated effluent.</li> <li>Treatment of sewage of nearby</li> </ul>	

Sl. No.	River	Tributary/ Drains/Canal	Drains/Canal (Flow, BOD COD or any specific pollution)	Water quality of river stretch		Industrial Unit (GPI/Non-GPI and Conforming/ Non-Conforming area)	Pollution sources		Key issues	Action Points
				B/c	A/c		STP/CETP/D omestic sewage from towns	and Industrial effluents.		
		(~230.63 km)	At Kalina Village <b>Round II:</b> Flow- 16.85 MLD, Colour- 5 Hazen, <b>BOD- 460 mg/l,</b> <b>COD- 1555 mg/l,</b> <b>TSS-1173 &amp; Fe-10.74 mg/l</b>	DO-NIL, <b>BOD-110 mg/l &amp; COD-286 mg/l</b> (~230.43 km)	(~234.13 km) At Kinauni Vill. (a/c of Sardhana drain & Kinauni Drain-Dry)  <b>Round II:</b> DO-NIL, <b>BOD-163 mg/l &amp; COD-348 mg/l</b> (~234.63 km)	04(nos.) industries namely Sardhana Paper, M/s Shri Babubali Trader, M/s Shree Krishna Processing, & M/s Sardhana Dairy, Sardhana Road Meerut.	and Industrial effluents. • Drain was filled with Municipal Solid Wastes at various locations • Large number of dairy farm along drain and deposition of huge quantity of animal dung in the drain.	solid waste and sewage. • Polluted stretch from b/c & a/c of Sardhana drain.	villages by using decentralize low cost sewage treatment system. • Solid waste should be removed from the drain. • Cow dung and animal wastes should be removed from drain and follow up of guideline by dairy farms for disposal of animal dung. • STP of adequate capacity in Sardhana town. • Tapping of drains & inventory of industrial units in the catchment of drain. • Constructed Wetland in Sardhana drain B/c with river Hindon.	

Sl. No.	River	Tributary/ Drains/Canal	Drains/Canal (Flow, BOD COD or any specific pollution)	Water quality of river stretch		Pollution sources	Key issues	Action Points	
				B/c	A/c				
5.	Hindon	Kinauni drain (~234.51 km)	At Kinauni village <b>Round 1:</b> Dry <b>Round 2:</b> Dry	Near Kinauni village <b>Round 1:</b> DO-NIL, BOD-147 mg/l & COD-268 mg/l (~234.45 km) <b>Round 2:</b> Sampling not done	Near Kinauni village <b>Round 1:</b> DO-NIL, BOD-140 mg/l & COD-288 mg/l <b>Round 2:</b> DO-NIL, BOD-163 mg/l & COD-348 mg/l (~234.63 km)	Industrial Unit (GPI/Non-GPI and Conforming/ Non-Conforming area) <b>GPI-02 No.</b> (Conforming area) M/s Bajaj Hindustan Ltd, (Sugar Unit) Village Kinauni, Meerut M/s Bajaj Hindustan Ltd, (Distillery Unit) Village Kinauni, Meerut	No significant flow, bed of drain was wet indicating industrial discharge	-	Inventory of drains carrying domestic wastewater from Kinauni village and treatment of sewage by using decentralized low cost sewage treatment system.
6.	Hindon	Upper Ganga canal (~249.33 km)	Not available	Near Pura village <b>Round 1:</b> DO-NIL, BOD-113 mg/l & COD-215 mg/l (~244.73 km)	at Amirpur Baleni <b>Round 1:</b> DO-5.96 mg/l, BOD-10 mg/l & COD-30 mg/l (~251.63 km)	No industrial unit identified	Upper Ganga canal is a fresh water source from river Ganga.	<ul style="list-style-type: none"> <li>Small drains from Pura village discharging into river.</li> <li>Improvement observed in river water quality due to release of fresh water from Upper Ganga Canal.</li> </ul>	<ul style="list-style-type: none"> <li>Inventory of drains discharging from Pura village and Amirpur Baleni. and treatment of sewage by using decentralized low cost sewage treatment system.</li> <li>Constructed Wetland in river Hindon before intrusion of freshwater from the Upper Ganga Canal.</li> </ul>

## 4.4 Ghaziabad District

Table 5 Action required to improve water quality of river Hindon in Ghaziabad district

Sl. No.	River	Tributary/Drains/Canal	Drain (Flow, BOD COD or any specific pollution)	Polluted river stretch		Pollution sources		Key issues	Action Points
				B/c (in case of drain)	A/c (in case of drain)	Industrial Unit (GPI/Non-GPI and Conforming/ Non-Conforming area)	STP/CETP/ Domestic sewage from towns		
1	Hindon	Jawli drain (First Order) Untapped (Approx. 300.13 km)	<p><b>Round I:</b> BOD-33 mg/L, COD-107 mg/L, TDS-2216 mg/L Chloride-1049 mg/L</p> <p><b>Round II:</b> BOD-55 mg/L, COD-221 mg/L, TDS-4600 mg/L Mn-4.056 mg/L</p> <p>Flow could not be measured because depth measurement not possible/less flow</p>	Not available	<p><b>Round I:</b> DO: 2.32 mg/l BOD: 4 mg/l COD: 21 mg/l</p> <p><b>Round II:</b> DO: 0.87 mg/l BOD: 3 mg/l COD: 27 mg/l Pb: 0.25 mg/l</p>	<p>Total-44 43 GPIs: Textile dyeing (07), Yarn/Textile processing (36) 1 Non-GPI: Yarn/Textile processing (01)</p>	<p>Carries discharge of CETP Tronica city and sewage from nearby villages</p>	<ul style="list-style-type: none"> <li>• Polluted stretch due to industrial impact.</li> <li>• Low DO observed may be due to stagnant water of the river</li> </ul>	<ul style="list-style-type: none"> <li>• Removal of Solid waste</li> <li>• Action on industries in catchment of the drain</li> <li>• Upgradation and ensuring compliance of CETP Tronica city.</li> <li>• Constructed Wetlands on Jawali drain B/c with river Hindon.</li> </ul>
2	Hindon	Raj Nagar extension drain (First Order) Untapped (Approx. 307.09 km)	<p>Flow-48 MLD, BOD- 36 mg/L, COD- 117 mg/L TDS-1020 mg/L</p>	<p>DO: 0.57 mg/l BOD: 4 mg/l COD: 38 mg/l Pb: 0.15 mg/l</p>	<p>DO: 0.71 mg/l BOD: 4 mg/l COD: 30 mg/l Pb: 0.51 mg/l</p>	No industrial unit identified	Carries treated sewage from Noon Nagar Morty 56 MLD STP, and sewage from open drains	<p>Low impact observed due to untreated sewage discharge</p>	<ul style="list-style-type: none"> <li>• Removal of Solid waste.</li> <li>• Interception &amp; diversion of drain to Noon Nagar Morty 56 MLD STP before confluence of treated sewage.</li> </ul>

Sl. No.	River	Tributary/Drains/Canal	Drain (Flow, BOD COD or any specific pollution)	Polluted river stretch		Pollution sources		Key issues	Action Points
				B/c (in case of drain)	A/c (in case of drain)	Industrial Unit (GPI/Non-GPI and Conforming/ Non-Conforming area)	S/TP/CETP/ Domestic sewage from towns		
3	Hindon	Karedha Drain (First Order) Untapped (Approx. 309.44 km)	<p><b>Round I:</b> BOD-167 mg/l, COD-538 mg/l, TSS-522 mg/l, TDS-2376 mg/l, Chloride-1039 mg/l, NH<sub>3</sub>-N- 54 mg/l, Fe-111.17 mg/l, Pb- 3.37 mg/l, Zn- 6.315mg/l</p> <p><b>Round II (1<sup>st</sup> Occasion):</b> BOD-139 mg/L, COD-529 mg/L, TDS-2608 mg/L Pb- 0.251 mg/l</p> <p><b>Round II (2<sup>nd</sup> Occasion):</b> BOD-158 mg/L, COD-639 mg/L, TDS-1980 mg/L Fe-8.167 mg/l Pb- 0.149 mg/l</p> <p>(Flow measurement not possible because no straight line</p>	DO: 0.85 mg/l BOD: 5 mg/l COD: 22 mg/l	Not available	<p><b>Total – 10</b> 9 GPIs: Paper (01), Yarn/Textile processing (07) Metal Surface Treatment (01)</p> <p>1 Non-GPI: Textile (01) (Washing and digital printing of fabric)</p> <p>Paper printing, automobile service, furniture moulding and fabrication, glass printing, MS wire drawing, electrical cable manufacturing and processing units were observed operating in catchment of drain</p>	Sewage from Karedha area	<ul style="list-style-type: none"> <li>• Polluted stretch from U/s Karedha Hindon drain.</li> <li>• Mixed impact due to discharge of untreated sewage and industrial discharge.</li> </ul>	<ul style="list-style-type: none"> <li>• Ensuring compliance of Noon Nagar Mory 56 MLD STP.</li> <li>• Removal of Solid waste</li> <li>• Action on industries in catchment of the drain</li> <li>• Inventory of non-GPI water polluting industries in catchment of drain including metal recycling/processing /fabricating/galvanizing/painting/moulding.</li> <li>• Constructed Wetland on Karedha drain B/c with river Hindon.</li> </ul>

Sl. No.	River	Tributary/Drains/Canal	Drain (Flow, BOD COD or any specific pollution)	Polluted river stretch		Pollution sources		Key issues	Action Points
				B/c (in case of drain)	A/c (in case of drain)	Industrial Unit (GPI/Non-GPI and Non-Conforming area)	STP/CETP/ Domestic sewage from towns		
4	Hindon	Hindon Vihar Left (First Order) Untapped (Approx. 310.73 km)	stretch available and there was dumping of solid waste) <b>Round I:</b> Flow-11.41 MLD, BOD- 181 mg/l, COD- 574 mg/l, TDS-1344 mg/l <b>Round II:</b> Flow-16.6 MLD, BOD- 302 mg/l, COD- 803 mg/l, TSS-601 mg/l	<b>Round I</b> D/s Karedha + Hindon Vihar Drain DO: 1.41 mg/l BOD: 3 mg/l COD: 21 mg/l <b>Round II</b> D/s Hindon Vihar Drain DO: NIL BOD: 13 mg/l COD: 74 mg/l Fe-3.75 mg/l	<b>Round I</b> D/s Hindon Vihar Drain DO: NIL BOD: 13 mg/l COD: 60 mg/l Fe-4.77 mg/l	No industrial unit identified	Hindon Vihar left and right are concrete drains that conjoint together and form Hindon Vihar drain that ultimately discharges into the river Hindon after joining. After joining, the sampling is not possible due to non-approachability	Improvement in river water quality	<ul style="list-style-type: none"> <li>Removal of Solid waste</li> <li>Remediation using low-cost decentralized wastewater treatment systems such as series of constructed wetlands in both Hindon Vihar drains.</li> <li>Inventory of water polluting industries in catchment of both Hindon Vihar drains.</li> <li>Series of Constructed Wetlands in river Hindon A/c with Hindon Vihar drain.</li> </ul>
6	Hindon	Kaila Bhatta Drain (First Order) Untapped	Flow-33.97 MLD, BOD- 71 mg/l, COD- 278 mg/l, TDS-1736 mg/l	(Downstream Hindon Barrage) DO: 5.44* mg/l BOD: 6 mg/l	Not available	<b>Total-15</b> 12 GPIs: Pharmaceutical (02), Metal Surface	Carry sewage from Nava Jeevan Leprosy Colony, Madhopura area	<ul style="list-style-type: none"> <li>Action on industries in catchment of the drain</li> <li>Remediation using low-cost</li> </ul>	

Sl. No.	River	Tributary/Drains/Canal	Drain (Flow, BOD COD or any specific pollution)	Polluted river stretch		Pollution sources	Key issues	Action Points
				B/c (in case of drain)	A/c (in case of drain)			
		(Approx. 313.07 km)		COD: 22 mg/l *Increased DO maybe due to turbulence and churning of water release from barrage	Industrial Unit (GPI/Non-GPI and Non-Conforming area) Treatment (08), Textile (01), Tannery (01)  3 Non-GPI: Pharmaceutical (01), Engineering (01) and Others paper board (01)		decentralized wastewater treatment system on kaila Bhatta drain.	
7	Hindon	Arthala Drain (First Order) Untapped (Approx. 313.63 km)	BOD- 52 mg/l, COD- 208 mg/l, TDS-2256 mg/l, Fe-65.021 mg/l, Pb- 0.198 mg/l	Not available	<b>Total – 2</b> 1 GPI: Distillery- Mohan Meakin Ltd. Mohan Nagar Ghaziabad  1 Non-GPI: Metal Surface Treatment- Balaji wire Pvt ltd., 139-A, Anand Ind. Estate, Mohan Nagar, Ghaziabad.	-	<ul style="list-style-type: none"> <li>Action on industries in catchment of the drain.</li> <li>Remediation using low-cost decentralized wastewater treatment system on Arthala drain.</li> </ul>	
8	Hindon	Indirapuram Drain (First Order) Untapped (Approx. 316.86 km)	Colour- 98 Hazen, BOD- 88 mg/L, COD- 285 mg/L, TDS-1320 mg/L	Not available	No industrial unit identified	-	<ul style="list-style-type: none"> <li>Ensuring compliance and upgradation of all STPs whose wastewater is carried by Indirapuram drain.</li> <li>Action on industries in catchment of the Sahibabad drain**.</li> </ul>	

Sl. No.	River	Tributary/Drains/Canal	Drain (Flow, BOD COD or any specific pollution)	Polluted river stretch		Pollution sources		Key issues	Action Points
				B/c (in case of drain)	A/c (in case of drain)	Industrial Unit (GPI/Non-GPI and Conforming/ Non-Conforming area)	STP/CETP/ Domestic sewage from towns		
							<i>Indirapuram. All three STPs located in Indrapuram are non-complying w.r.t. discharge standards.)</i>		<ul style="list-style-type: none"> <li>Constructed on Indirapuram drain B/c with river Hindon.</li> <li>CETP of adequate capacity shall be installed.</li> </ul>
9	Hindon	Pratap Vihar Drain (First Order) Untapped (Approx. 317.03 km)	Flow-27.91 MLD, Colour- 123 Hazen, BOD- 102 mg/L, COD- 422 mg/L	Not available	No industrial unit identified	Domestic sewage from household of Pratap vihar area	-	<ul style="list-style-type: none"> <li>Remediation using low-cost decentralized wastewater treatment systems on Pratap Vihar drain.</li> <li>New STP along with sewage network with future projection shall be installed.</li> <li>Interception &amp; diversion of Pratap Vihar drain to STP.</li> </ul>	
10	Hindon	Rahul Vihar Drain (First Order) Untapped (Approx. 317.24 km)	<b>Round I</b> Colour- 145 Hazen <b>BOD- 206 mg/L,</b> <b>COD- 736 mg/L,</b> <b>TDS- 2664 mg/L,</b> TSS- 734 mg/L, <b>Chloride-1940</b> mg/L, Fe-3.254 mg/l <b>Round II</b>	Not applicable	Industrial impact observed but no industrial unit identified	Domestic sewage from household of Rahul Vihar area	<ul style="list-style-type: none"> <li>Integrated impact from untreated wastewater carried by prior drains namely Indirapuram, Pratap Vihar and Rahul Vihar drain</li> <li>Deterioration of water quality in stretch from U/s</li> </ul>	<ul style="list-style-type: none"> <li>Removal of Solid waste.</li> <li>Action on industries in catchment of the drain.</li> <li>Remediation using low-cost decentralized wastewater treatment systems on Rahul Vihar drain.</li> </ul>	

Sl. No.	River	Tributary/ Drains/ Canal	Drain (Flow, BOD COD or any specific pollution)	Polluted river stretch		Pollution sources		Key issues	Action Points
				B/c (in case of drain)	A/c (in case of drain)	Industrial Unit (GPI/Non-GPI and Conforming/ Non-Conforming area)	S/TP/CETP/ Domestic sewage from towns		
			BOD- 176 mg/L, <b>COD- 743 mg/L,</b> <b>TDS- 2784 mg/L,</b> TSS- 550 mg/L, <b>Chloride-1213</b> mg/L, Fe-5.084 mg/l  (Flow measurement not possible because no straight line stretch available and due to solid waste dumping)	U/s Rahul Vihar drain DO: 4.2 mg/l BOD: 11 mg/l COD: 45 mg/l	D/s Rahul Vihar drain DO: NIL <b>BOD: 28 mg/l</b> COD: 139 mg/l			to D/s Rahul Vihar drain	<ul style="list-style-type: none"> <li>Series of Constructed Wetlands in river Hindon A/c with Rahul Vihar drain.</li> </ul>
<b>11</b>	Dasna Drain (First Order)	Bhoogarhi – Kalugarhi Drain (Second Order) Untapped <i>Kalugarhi drain joins Bhoogarhi drain and forms Dasna drain</i>	Colour-167 Hazen BOD-97 mg/L, COD-329 mg/L, TDS-1552 mg/L, Fe-7.698 mg/l  Flow could not be measured because depth measurement not possible	Not available		<b>Total – 7</b>  07 GPIs: Pulp & Paper (01), Tannery (02), Metal Surface Treatment (01), Slaughter House (03)	Untreated sewage from households of Bhoogarhi village and Kalugarhi village	-	<ul style="list-style-type: none"> <li>Removal of Solid waste</li> <li>Action on industries in catchment of the drain.</li> <li>Remediation using low-cost decentralized wastewater treatment systems on Dasna drain.</li> </ul>
<b>12</b>	Dasna Drain (First Order)	B.S. Road Drain (Second Order) Untapped	BOD- 84 mg/L, COD- 259 mg/L Fe-5.296 mg/l	Not available		No industrial unit identified	Carry untreated sewage from B.S. Road Industrial area	-	<ul style="list-style-type: none"> <li>Removal of Solid waste.</li> </ul>

Sl. No.	River	Tributary/ Drains/ Canal	Drain (Flow, BOD COD or any specific pollution)	Polluted river stretch		Pollution sources		Key issues	Action Points
				B/c (in case of drain)	A/c (in case of drain)	Industrial Unit (GPI/Non-GPI and Conforming/ Non- Conforming area)	STP/CETP/ Domestic sewage from towns		
			Flow could not be measured because depth measurement not possible						<ul style="list-style-type: none"> <li>Inventorization of small-scale industrial units.</li> </ul>

Sl. No.	River	Tributary/Drains/Canal	Drain (Flow, BOD COD or any specific pollution)	Polluted river stretch		Industrial Unit (GPI/Non-GPI and Conforming/Non-Conforming area)	Pollution sources		Key issues	Action Points
				B/c (in case of drain)	A/c (in case of drain)		Domestic sewage from towns	STP/CETP/		
1	Shahdara drain (First Order of River Yamuna)	Sahibabad Drain (Second Order of River Yamuna) Tapped	Flow-111.81 MLD (overflow)** BOD-155 mg/L, COD-489 mg/L, TDS-2408 mg/L, Fe-14.971 mg/l  **97 MLD measured from tapping channel + 5 MLD approx. from Vaishali drain + 10% considered for overflow + 5 MLD approx. from Vaishali drain; Total 111.8 MLD  (97+5=102 MLD is tapped to 74 MLD Indirapuram STP and rest is discharged into Shahdara drain)	Not available	Not available	Total - 75  73 GPIs: Dairy (02), Engineering (01), Metal Surface Treatment (19), Pharma (01), Pulp & Paper (01), Slaughter house and Meat (06), Yarn/Textile processing (41), Textile Dyeing (02)  2 Non-GPI: Metal Surface Treatment (01), Yarn/Textile processing (01)	Domestic sewage of unauthorized and authorized colonies, and solid waste being dumped by the residents nearby	Carry mixed untreated effluent into recipient drain	<ul style="list-style-type: none"> <li>Removal of Solid waste.</li> <li>Action on industries in catchment of the drain.</li> <li>New STP along with sewage network with future projection shall be installed.</li> <li>CETP of adequate capacity shall be installed.</li> </ul>	
2	Shahdara drain (First Order of River Yamuna)	Indirapuri Drain (Second Order of River Yamuna) Untapped	BOD- 90 mg/L, COD- 242 mg/L, TDS-2112 mg/L, Mn-3.668 mg/l, Sulphate-182 mg/L	Not available	Not available	No industrial unit identified	Domestic sewage of unauthorized and authorized colonies, and solid waste being dumped by the residents nearby	Carry mixed untreated effluent into recipient drain	<ul style="list-style-type: none"> <li>Removal of Solid waste.</li> <li>Inventorization of small-scale industrial units.</li> <li>New STP along with sewage network with future projection shall be installed.</li> </ul>	

3	Shahdara drain (First Order of River Yamuna)	Banthala drain (Third Order of River Yamuna) Untapped <b>Location near receiving Industrial effluent</b>	<p><b>Round I:</b> pH-2.5 BOD- 234 mg/L, COD-460 mg/L TDS- 13060 mg/L TSS- 833 mg/L Sulphate-471 mg/L Cr-12.698 mg/l Cu-52.199 mg/l Fe-6035.98 mg/l Pb-2.398 mg/l Mn- 58.199 mg/l Ni-19.798 mg/l Zn-791.793 mg/l Co-0.98 mg/l</p> <p><b>Round II:</b> Flow-2.3 MLD pH-&lt;2 COD- 633 mg/L TDS- 19352 mg/L TSS- 756 mg/L Fe-15.86 mg/l Pb-0.265 mg/l</p>	Not available	<p>Illegal industrial units operating in the catchment of Banthala drain: Soap manufacturing unit (01) (Non-operational); Metal processing (04) treatment by using acids; Garment washing unit without ETP (01).</p> <p>**Ponding of wastewater near soap factory was observed. Samples of wastewater were collected and analysis results showed BOD-762 mg/l, COD-1748 mg/l, TSS-1118 mg/l, TDS-3004</p>	Solid waste dumping was observed.	Carry mixed untreated effluent into recipient drain	<ul style="list-style-type: none"> <li>• Removal of Solid waste.</li> <li>• Inventory of water polluting industries (GPIs &amp; non-GPIs).</li> <li>• Action on unauthorized industrial units.</li> <li>• Identification and action against the source of discharge of high metal bearing acidic effluent into Banthala drain.</li> <li>• Preparation of an action plan for interception, diversion and treatment of Banthala drain.</li> <li>• CETP of adequate capacity shall be installed.</li> </ul>
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4	Shahdara drain (First Order of River Yamuna)	Banthala drain (Third Order of River Yamuna) Untapped  <b>Location before confluence with Indirapuri drain</b>	<p><b>Round I</b> BOD- 175 mg/L, COD- 611 mg/L TDS- 1604 mg/L TSS- 862 mg/L Sulphate-136 mg/L Fe-12.483 mg/l</p> <p><b>Round II</b> BOD-119 mg/l COD- 673 mg/L TDS- 1580 mg/L TSS- 568 mg/L Sulphate-150 mg/L Fe-19.34 mg/l Mn-2.041 mg/l</p>	Not available	mg/l, Chloride-485 mg/l, Sulphate-650 mg/l and high concentrations of metals (Cr-2.378 mg/l, Cu-10.53 mg/l, Fe-1732 mg/l, Pb-0.724 mg/l, Mn-12.84 mg/l, Ni-12.84 mg/l and Zn-168.6 mg/l) which indicated that industries in the catchment discharge wastewater outside their premises which formed a pond of wastewater on land in the vicinity of Banthala drain			
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## 4.5 Noida & Greater Noida Districts

**Table 6 Action required to improve water quality of river Hindon in Noida and Greater Noida districts**

Sl. No.	River	Tributary/Drains/Canal	Drain/River (flow, BOD COD or any specific pollution)	Polluted river stretch		Pollution sources			Key issues	Action Points
				B/c (in case of drain)	A/c (in case of drain)	Industrial Unit (GPI/Non-GPI and Conforming/ Non-Conforming area)	STP/CETP/Domestic sewage from towns			
1.	Hindon (323.01 km)	Dasna Drain near Yusufpur village	Flow- 412.06 MLD BOD-73 mg/l COD-356 mg/l <i>(High organic load is contributed by Dasna drain i.e. 30.07 TPD)</i>	DO- NIL BOD-9 mg/l COD-48 mg/l	DO-NIL BOD-29 mg/l COD-93 mg/l	Conforming Area <b>GPI-01</b> (Pulp & Paper)/ <b>Non-GPI-03</b> (Metal Surface Treatment)	Sewage from Ghaziabad town	River water quality is deteriorating due to the impact of drain discharge into river which carried industrial and sewage discharge.	<ul style="list-style-type: none"> <li>Action on industries discharging untreated effluent in the catchment area.</li> </ul>	
2.	Dasna Drain	Gaur City (2 <sup>nd</sup> Order- Meets to Dasna Drain)	Flow- Not Measured due to unapproachable site BOD-90 mg/l COD-280 mg/l	<b>Not available</b>	<b>Not available</b>	<b>Not available</b>	Sewage from Gaur city's residential areas.	Impact was observed as high BOD due to sewage discharges.	<ul style="list-style-type: none"> <li>Action on industries discharging untreated effluent in the catchment area.</li> <li>STP may shall install for treatment of sewage discharges from Gaur City residential area.</li> <li>Series of Constructed Wetlands on Dasna drain B/c with river Hindon.</li> </ul>	

Sl. No.	River	Tributary/ Drains/Canal	Drain/River (flow, BOD COD or any specific pollution)	Polluted river stretch		Pollution sources		Key issues	Action Points
				B/c (in case of drain)	A/c (in case of drain)	Industrial Unit (GPI/Non-GPI and Conforming/ Non-Conforming area)	STP/CETP/Domestic sewage from towns		
3.	Hindon (355.68 km)	Hawaliya Drain	Flow- Not Measured due to unapproachable site BOD-19 mg/l COD-97 mg/l  <i>It originates from Surajpur wetland which carries industrial area site-B &amp; site-4 and residential areas like Gamma-I Knowledge park-II etc</i>	<b>Not available</b>	DO-NIL BOD-22 mg/l COD-74 mg/l	<b>Conforming Area</b> GPI-16 (Textile/Dyeing, Paper Mill, Tannery)/ <b>Non-GPI-47</b> (Metal Surface Treatment, Security Hologram Stickers, Dyeing, Paint & Varnishes, Yarn/Textile Processing, Anodizing, Beverage (Carbonated, Soft Drinks, Soda., Food Industry, Plastic Moulded Components with Electroplating, Rice Mill, Automobile, Slaughter House)	Sewage from Gr. Noida and nearby villages	Low Impact	<ul style="list-style-type: none"> <li>Action on industries discharging untreated effluent in the catchment area.</li> <li>Adoption of interim bio/phyto-remediation measures in the drain.</li> <li>Remediation of unchannellized sewage through Constructed Wetland system.</li> </ul>
4.	Hawaliya Drain	Kot Escape (2 <sup>nd</sup> Order)	Flow-Not Measured BOD-5 mg/l COD-57 mg/l	<b>Not available</b>	<b>Not available</b>	<b>Conforming Area</b> GPI-01 (Power Plant)	Sewage from NTPC dadri, Kot Village, kasana, omnicorn, Sigma, Xu and 137 MLD STP Kasana.	No Impact	<ul style="list-style-type: none"> <li>Remediation of unchannellized sewage through Constructed Wetland system.</li> </ul>
5.	Yamuna	Hindon (approx. 357.55 Km)	<b>Not available</b>	DO- Nil BOD- 17 mg/l COD-67 mg/l	DO- Nil BOD- 14 mg/l COD-52 mg/l	<b>Not available</b>	Discharge of River Hindon.	No Impact	No Action required

## CHAPTER-5: GROUNDWATER QUALITY ASSESSMENT

To assess groundwater quality, total 31 samples of groundwater were collected from borewell/ hand pumps and tube wells from six districts – Saharanpur (8 Samples), Muzaffarnagar (8 Samples), Meerut (3 Samples), Baghpat (2 Samples), Ghaziabad (7 Samples), and Noida/ Greater Noida (3 Samples) within 500 meters' radius of river Hindon and its tributaries. All samples were analysed for general parameters as well as heavy metals. The groundwater samples were compared with prescribed specification of ionic concentration in groundwater by WHO standards (1996). The determination of Physio-chemical parameters of groundwater samples was carried out by standard protocol given by APHA, 2012.

### 5.1 Criteria for Classification of Groundwater

The classification of groundwater is carried out on basis of Total Dissolved Solids (TDS), Total Hardness (TH) and sodium adsorption ratio (SAR). On the basis of TDS values, as TDS<300 mg/l, 300-600 mg/l, 600-900 mg/l, 900-1200 and >1200mg/l, designated as excellent good, fair, poor and unacceptable respectively (Ahouansou et al., 2018). Classification based on total hardness (TH) values, as TH<75 mg/l, 75-150 mg/l, 150-300 mg/l and >300mg/l, designated as soft, moderately hard, hard and very hard respectively (Sawyer and McCarty, 1967). The sodium adsorption ratio (SAR) calculated for all groundwater samples. It is an indicator of the suitability of water for use in agricultural irrigation, as determined from the concentrations of the Sodium, Calcium and Magnesium ratio. The value <10, 10-18, 18-26 and >26 suggest excellent, good, doubtful and unsuitable water quality for irrigation purpose. Groundwater quality index was calculated based on Ramakrishnaiah et al. 2009. For quality rating BIS standard as reference concentration were taken in calculation and for parameter where limits are in certain range, the higher value of the BIS standard was taken into consideration. The classification of groundwater is carried out district wise.

### 5.2 Saharanpur & Shamli Districts

8 groundwater samples collected from Saharanpur district. The analysis result are as follows;

### Physio-chemical Characterization

The pH of the groundwater in the study area varied from 7.0 to 7.6, all sample falls under neutral pH range of water (6.5 - 8.5). Colour was not found in any of the sample. COD varied from BDL to 35 mg/l, the high value of COD 35 mg/l found at Sadoli Hariya village, Saharanpur near river Dhamola b/c to river Hindon. The Chloride and Fluoride varies from 12 to 298 mg/l and BDL to 0.5 mg/l respectively.

The heavy metal concentration of As, Cd, Co, Cr, Cu, Ni and Pb were mostly below detectable limit or below WHO standard. Concentration of Fe varied from 0.067 to 34.23 mg/l and Mn from BDL to 1.53 mg/l.

### **TDS Classification**

The total dissolved solids content of groundwater varied from BDL to 1186 mg/l. 50% of the total groundwater samples are of excellent water quality (<300 mg/l), 12.5% of good water quality (300-600 mg/l), 25% of fair water quality (600-900 mg/l) and rest 12.5% under poor water quality (900 – 1200 mg/l), indicated that groundwater quality good to fair in terms of TDS (Table 7).

**Table 7 Classification of groundwater quality in Saharanpur and Shamli districts based on TDS**

TDS Value	Water Quality	No. of samples	Percentage of samples
<300	Excellent	4	50
300 - 600	Good	1	12.5
600 - 900	Fair	2	25
900 -1200	Poor	1	12.5
>1200	Unacceptable	0	0

### **Total Hardness Classification**

Groundwater classification based on total hardness (TH) values, 37.5% samples belongs to hard water and rest 62.5% samples comprises very hard water (Table 8). The result indicates that the groundwater quality in the study area is hard to very hard. Alkalinity has direct relation with hardness and pH of the groundwater. It ranged from 207 to 573 mg/l.

**Table 8 Classification of groundwater quality in Saharanpur and Shamli districts based on Total Hardness**

TH Value	Water Quality	No. of samples	Percentage of samples
<75	Soft	0	0
75-150	Moderately hard	0	0
150-300	Hard	3	37.5
>300	Very hard	5	62.5

### **SAR Classification**

SAR value for Saharanpur groundwater ranged from 0.2 to 2.9, thus indicating excellent water quality for irrigation purpose based on SAR value.

### **Groundwater Quality Index**

Groundwater quality index suggest that around 37.5% of sample collected is of excellent water quality, 25% of samples falls under poor water quality, whereas all other water quality like, good water, very poor and water unsuitable for drinking has equal share of 12.5% respectively (Table 9).

**Table 9 Water Quality Index of groundwater in Saharanpur and Shamli districts**

WQI value	Water quality	No. of samples	Percentage of samples
<50	Excellent	3	37.5
50-100	Good water	1	12.5
100-200	Poor water	2	25
200-300	Very poor water	1	12.5
>300	Water unsuitable for drinking	1	12.5

### **5.3 Muzaffarnagar District**

8 groundwater samples collected from Muzaffarnagar district. The analysis result are as follows;

#### **Physio-chemical Characterization**

The pH of the groundwater in the study area varied from 7.5 to 8.0, which falls under neutral pH range of water (6.5 - 8.5). Colour ranged from BDL to 78 Hazen. COD varied from BDL to 15 mg/l. The Chloride and Fluoride varies from 8 to 66 mg/l and 0.1 to 0.6 mg/l respectively.

The heavy metal concentration of As, Cd, Co, Cr, Cu, Ni and Pb were mostly below detectable limit or below WHO standard. Concentration of Fe varied from 0.01 to 7.9 mg/l and Mn from BDL to 1.34 mg/l.

### TDS Classification

The total dissolved solids content of groundwater varied from 207 to 907 mg/l. According to the classification criteria, 50% of the total groundwater samples are of excellent water quality (<300 mg/l), 12.5% of fair water quality (600-900 mg/l) and rest 12.5% of poor water quality (900 - 1200 mg/l), indicated that groundwater quality varies from excellent to fair in terms of TDS (Table 10).

**Table 10 Classification of groundwater quality in Muzaffarnagar district based on TDS**

TDS Value	Water Quality	No. of samples	Percentage of samples
<300	Excellent	6	75
300 - 600	Good	0	0
600 - 900	Fair	1	12.5
900 -1200	Poor	1	12.5
>1200	Unacceptable	0	0

### Total Hardness Classification

Groundwater classification based on total hardness (TH) values, 75% samples belongs to hard water and rest 25% samples comprises very hard water. The result indicates that the groundwater quality in the study area is hard to very hard. Alkalinity ranged from 182 to 544 mg/l (Table 11).

**Table 11 Classification of groundwater quality in Muzaffarnagar district based on Total Hardness**

TH Value	Water Quality	No. of samples	Percentage of samples
75	Soft	0	0
75-150	Moderately hard	0	0
150-300	Hard	6	75
>300	Very hard	2	25

### SAR Classification

SAR value for Muzaffarnagar groundwater ranged from 0.1 to 1.7, thus indicating excellent water quality for irrigation purpose based on SAR value.

### Groundwater Quality Index

Groundwater quality index suggest that around 50% of sample collected is of excellent water quality, 37.5% of good water quality and rest 12.5% of poor water quality (Table 12).

**Table 12 Water quality index of groundwater in Muzaffarnagar district**

WQI value	Water quality	No. of samples	Percentage of samples
<50	Excellent	4	50
50-100	Good water	3	37.5
100-200	Poor water	1	12.5
200-300	Very poor water	0	0
>300	Water unsuitable for drinking	0	0

### 5.4 Meerut District

3 groundwater samples collected from Meerut district. The analysis result are as follows;

#### Physio-chemical Characterization

The pH of the groundwater in the study area varied from 7.3 to 7.4 which falls under neutral pH range of water (6.5 - 8.5). Colour and COD of groundwater fall under BDL. The Chloride and Fluoride varies from 16 to 66 mg/l and 0.3 to 0.4 mg/l respectively.

The heavy metal concentration of As, Cd, Co, Cr, Cu, Ni and Pb were mostly below detectable limit or below WHO standard. Concentration of Fe varied from 0.405 to 2.28 mg/l and Mn from 0.043 to 0.059 mg/l.

#### **TDS Classification**

The total dissolved solids content of groundwater varied from 432 to 578 mg/l. According to the classification criteria, 100% of the groundwater samples comes under good water quality (300 – 600 mg/l) (Table 13).

**Table 13 Classification of groundwater in Meerut district based on TDS**

TDS Value	Water Quality	No. of samples	Percentage of samples
<300	Excellent	0	0
300 - 600	Good	3	100
600 - 900	Fair	0	0
900 -1200	Poor	0	0
>1200	unacceptable	0	0

**Total Hardness Classification**

Groundwater classification based on total hardness (TH) values, 100% of groundwater samples belongs to hard water. Alkalinity ranged from 266 to 419 mg/l (Table 14).

**Table 14 Classification of groundwater in Meerut district based on Total Hardness**

TH Value	Water Quality	No. of samples	Percentage of samples
<75	Soft	0	0
75-150	Moderately hard	0	0
150-300	Hard	3	100
>300	Very hard	0	0

**SAR Classification**

SAR value for Meerut groundwater ranged from 1.0 to 1.6, thus indicating all groundwater samples under excellent water quality for irrigation purpose based on SAR value.

**Groundwater Quality Index**

Groundwater quality index indicates that around 100% of sample falls under excellent water quality (Table 15).

**Table 15 Water Quality Index of groundwater in Meerut district**

WQI value	Water quality	No. of samples	Percentage of samples
<50	Excellent	3	100
50-100	Good water	0	0
100-200	Poor water	0	0
200-300	Very poor water	0	0
>300	Water unsuitable for drinking	0	0

## 5.5 Baghpat District

2 groundwater samples collected from Baghpat district. The analysis result are as follows;

### Physio-chemical Characterization

Both groundwater samples show pH of 7.7 which falls under neutral pH range of water (6.5 - 8.5). Colour and COD of groundwater fall under BDL. The Chloride and Fluoride varies from 14 to 18 mg/l and 0.2 to 0.3 mg/l respectively.

The heavy metal concentration of As, Cd, Co, Cr, Cu, Ni and Pb were mostly below detectable limit or below WHO standard. Concentration of Fe varied from 0.045 to 0.114 mg/l and Mn from 1.1 to 7.8 mg/l.

### **TDS Classification**

The total dissolved solids content of groundwater for both samples was 404 and 829. According to the classification of groundwater based on TDS (Ahouansou et al., 2018), 50% of the groundwater samples falls under good water quality (300 – 600 mg/l) and rest 50% under fair water quality (600 – 900 mg/l) (Table 16).

**Table 16 Classification of groundwater quality in Baghpat district based on TDS**

TDS Value	Water Quality	No. of samples	Percentage of samples
<300	Excellent	0	0
300 - 600	Good	1	50
600 - 900	Fair	1	50
900 -1200	Poor	0	0
>1200	unacceptable	0	0

### **Total Hardness Classification**

Groundwater classification based on total hardness (TH) values, as TH<75 mg/l, 75-150 mg/l, 150-300 mg/l and >300mg/l, designated as soft, moderately hard, hard and very hard respectively (Sawyer and McCarty, 1967). Thus, 50% belongs to moderately hard water and rest 50% samples comprises hard water. The result indicates that the groundwater quality in the study area is moderately hard. Alkalinity values were 79 and 112 mg/l (Table 17).

**Table 17 Classification of groundwater quality in Baghpat district based on Total Hardness**

TH Value	Water Quality	No. of samples	Percentage of samples
<75	Soft	0	0
75-150	Moderately hard	1	50
150-300	Hard	1	50
>300	Very hard	0	0

### **SAR Classification**

SAR values for Baghpat groundwater sample were 1.1 and 7.8, thus indicating groundwater samples under excellent water quality for irrigation purpose based on SAR value.

### **Groundwater Quality Index**

Groundwater quality index indicates that around 50% of sample falls under excellent water quality and rest 50% under good water quality (Table 18).

**Table 18 Water Quality Index of groundwater in Baghpat district**

WQI value	Water quality	No. of samples	Percentage of samples
<50	Excellent	1	50
50-100	Good water	1	50
100-200	Poor water	0	0
200-300	Very poor water	0	0
>300	Water unsuitable for drinking	0	0

## **5.6 Ghaziabad District**

7 groundwater samples collected from Ghaziabad district. The analysis result are as follows;

### **Physio-chemical Characterization**

The pH of the groundwater in the study area varied from 7.2 to 8.0 which falls under neutral pH range of water (6.5 - 8.5). Colour ranged from BDL to 37 Hazen. COD varied from BDL to 14 mg/l. The Chloride and Fluoride varies from 50 to 645 mg/l and BDL to 1.7 mg/l respectively.

The heavy metal concentration of As, Cd, Co, Cr, Cu, Ni and Pb were mostly below detectable limit or below WHO standard. Concentration of Fe varied from 0.029 to 8.35 mg/l and Mn from BDL to 0.174 mg/l.

### TDS Classification

The total dissolved solids content of groundwater varied from 431 to 1470 mg/l. According to the classification of groundwater, 43% of the total groundwater samples are of good water quality (300 – 600 mg/l), 28.5% of poor water quality (900 - 1200 mg/l) and rest 28.5% of unacceptable water quality (>1200 mg/l), indicated that groundwater quality good to unacceptable in terms of TDS (Table 19).

**Table 19 Classification of groundwater in Ghaziabad district based on TDS**

TDS Value	Water Quality	No. of samples	Percentage of samples
<300	Excellent	0	0
300 - 600	Good	3	43
600 - 900	Fair	0	0
900 -1200	Poor	2	28.5
>1200	Unacceptable	2	28.5

### Total Hardness Classification

Groundwater classification based on total hardness (TH) values, 57% samples belongs to hard water and rest 43% samples comprises very hard water. The result indicates that the groundwater quality in the study area is hard to very hard. Alkalinity has direct relation with hardness and pH of the groundwater. It ranged from 183 to 477 mg/l (Table 20).

**Table 20 Classification of groundwater in Ghaziabad district based on Total Hardness**

TH Value	Water Quality	No. of samples	Percentage of samples
<75	Soft	0	0
75-150	Moderately hard	0	0
150-300	Hard	4	57
>300	Very hard	3	43

### SAR Classification

SAR value for Ghaziabad groundwater ranged from 0.2 to 14.3, thus indicating 86% of sample under excellent water quality and 14% under doubtful water quality for irrigation purpose based on SAR value.

### Groundwater Quality Index

Groundwater quality index suggest that around 57.2% of sample collected is of excellent water quality, 14.3% of good water quality and rest 28.5% of poor water quality (**Table 21**).

**Table 21 Water Quality Index of groundwater in Ghaziabad district**

WQI value	Water quality	No. of samples	Percentage of samples
<50	Excellent	4	57.2
50-100	Good water	1	14.3
100-200	Poor water	2	28.5
200-300	Very poor water	0	0
>300	Water unsuitable for drinking	0	0

### 5.7 Gautam Buddha Nagar District

3 groundwater samples collected from Noida and Greater Noida in Gautam Buddha Nagar district. The analysis result are as follows;

#### Physio-chemical Characterization

The pH of the groundwater in the study area varied from 7.6 to 7.8 which falls under neutral pH range of water (6.5 - 8.5). Colour and COD of groundwater fall under BDL. The Chloride and Fluoride varies from 16 to 66 mg/l and 0.3 to 0.4 mg/l respectively.

The heavy metal concentration of As, Cd, Co, Cr, Cu, Ni and Pb were mostly below detectable limit or below WHO standard. Concentration of Fe varied from 0.034 to 10.71 mg/l and Mn from 0.033 to 0.2 mg/l.

#### **TDS Classification**

The total dissolved solids content of groundwater varied from 498 to 665 mg/l. According to the classification of groundwater based on TDS (Ahouansou et al., 2018), 66.66% of the groundwater samples falls under good water quality (300 – 600 mg/l) and rest 33.33% under fair water quality (600 – 900 mg/l) (**Table 22**).

**Table 22 Classification of groundwater in Gautam Buddha Nagar district based on TDS**

TDS Value	Water Quality	No. of samples	Percentage of samples
<300	Excellent	0	0
300 - 600	Good	2	66.66
600 - 900	Fair	1	33.33
900 -1200	Poor	0	0
>1200	Unacceptable	0	0

**Total Hardness Classification**

Groundwater classification based on total hardness (TH) values, 100% of groundwater samples belongs to hard water. Alkalinity has direct relation with hardness and pH of the groundwater. It ranged from 116 to 290 mg/l (Table 23).

**Table 23 Classification of groundwater in Gautam Buddha Nagar district based on Total Hardness**

TH Value	Water Quality	No. of samples	Percentage of samples
<75	Soft	0	0
75-150	Moderately hard	0	0
150-300	Hard	3	100
>300	Very hard	0	0

**SAR Classification**

SAR value for Noida and Greater Noida groundwater ranged from 2.8 to 6.6, thus indicating all groundwater samples under excellent water quality for irrigation purpose based on SAR value.

**Groundwater Quality Index**

Groundwater quality index indicates that around 66.66% of sample falls under excellent water quality and rest 33.33% under poor water quality (Table 24).

**Table 24 Water Quality Index of groundwater in Gautam Buddha Nagar district**

WQI value	Water quality	No. of samples	Percentage of samples
<50	Excellent	2	66.66
50-100	Good water	0	0
100-200	Poor water	1	33.33
200-300	Very poor water	0	0
>300	Water unsuitable for drinking	0	0

## 5.8 Overall Groundwater Quality

### Physio-chemical Characterization

The pH of the groundwater in the study area varied from 7.0 to 8.0 thus all groundwater samples falls under neutral pH range of water (6.5 - 8.5).

### TDS Classification

The total dissolved solids content of groundwater varied from BDL to 1470 mg/l. According to the classification of groundwater based on TDS (Ahouansou et al., 2018), 32.25% of the total groundwater samples are of excellent water quality (<300 mg/l), 32.25% falls under good water quality (300 – 600 mg/l), 16% of fair water quality (600 - 900 mg/l), 13% under poor water quality (900 - 1200 mg/l) and rest 6.5% of unacceptable water quality (>1200 mg/l), indicated that groundwater quality excellent to unacceptable in terms of TDS (Table 25).

**Table 25 Classification of overall groundwater quality based on TDS**

TDS Value	Water Quality	No of samples	Percentage of samples
<300	Excellent	10	32.25
300 - 600	Good	10	32.25
600 - 900	Fair	5	16
900 -1200	Poor	4	13
>1200	Unacceptable	2	6.5

### Total Hardness Classification

Groundwater classification based on total hardness (TH) values, as TH<75 mg/l, 75-150 mg/l, 150-300 mg/l and >300 mg/l, designated as soft, moderately hard, hard and very hard respectively (Sawyer and McCarty, 1967). Thus, 3.25% belongs to moderately hard water, 64.5% under hard water and rest 32.25% samples comprises very hard water. The result indicates that the groundwater quality in the study area is moderately hard to very hard. Alkalinity has direct relation with hardness and pH of the groundwater. It ranged from 79 to 573 mg/l (Table 26).

**Table 26 Classification of overall groundwater quality based on Total Hardness**

TH Value	Water Quality	No. of sample	Percentage of samples
<75	Soft	0	0
75-150	Moderately hard	1	3.25

TH Value	Water Quality	No. of sample	Percentage of samples
150-300	Hard	20	64.5
>300	Very hard	10	32.25

### **SAR Classification**

The sodium adsorption ratio (SAR) calculated for all groundwater samples. It is an indicator of the suitability of water for use in agricultural irrigation, as determined from the concentrations of the Sodium, Calcium and Magnesium ratio. The value <10, 10-18, 18-26 and >26 suggest excellent, good, doubtful and suitable water quality for irrigation purpose. SAR value for Ghaziabad groundwater ranged from 0.1 to 14.3, thus almost all groundwater samples under excellent water quality except one sample under doubtful water quality for irrigation purpose based on SAR value.

Colour ranged from BDL to 78 Hazen. COD varied from BDL to 35 mg/l. The Chloride and Fluoride varies from 8 to 648 mg/l and BDL to 1.7 mg/l respectively.

The heavy metal concentration of As, Cd, Co, Cr, Cu, Ni and Pb were mostly below detectable limit or below WHO standard. Concentration of Fe varied from 0.001 to 34.23 mg/l and Mn from BDL to 1.53 mg/l.

### **Groundwater Quality Index**

Groundwater quality index were calculated based on Ramakrishnaiah et al. 2009. For quality rating BIS standard as reference concentration were taken in calculation and for parameter where limits are in certain range, the higher value of the BIS standard was taken into consideration.

Groundwater quality index suggest that around 55% of sample collected is of excellent water quality, 19.3% of good water quality, 19.3% of poor water quality, 3.2% of very poor water quality and rest 3.2% of water unsuitable for drinking (**Table 27**).

**Table 27 Overall Water Quality Index of groundwater**

WQI value	Water quality	No. of samples	Percentage of samples
<50	Excellent	17	55
50-100	Good water	6	19.3
100-200	Poor water	6	19.3
200-300	Very poor water	1	3.2

>300	Water unsuitable for drinking	1	3.2
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## CHAPTER-6: SEWAGE TREATMENT PLANTS

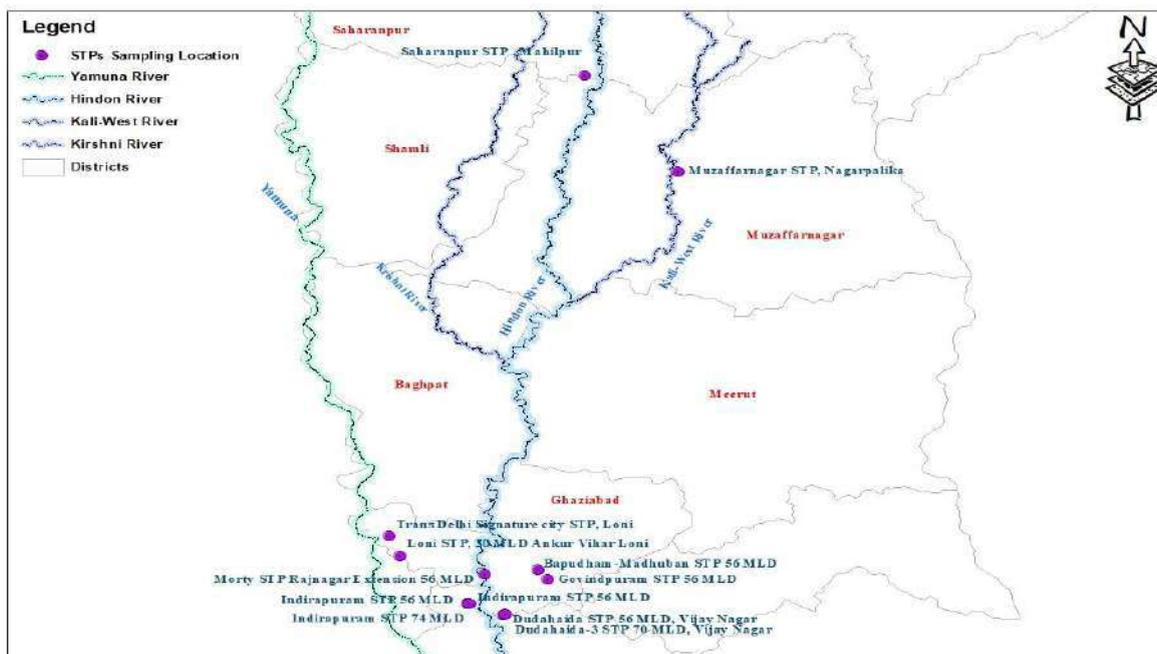
Hindon river originates from foot hills of Shivalik Range at Kaluwala village, Saharanpur and travels through cities like Saharanpur, Muzaffarnagar, Shamli, Meerut, Baghpat, Ghaziabad and Noida covering a distance of 300 km before it confluence with Yamuna in the downstream of Okhla barrage (NCR of Delhi). In course of flow from origin to confluence with river Yamuna, it has two major tributaries – Krishni and West Kali rivers.

For the treatment of the generated sewage 15 STPs with total installed capacity of 759.5 MLD have been installed. Utilized capacity of the commissioned STPs is approximately 495.4 MLD. The details of STPs in Hindon basin is provided in **Table 28**:

**Table 28 Details of STPs in Hindon basin**

<i>District/Town</i>	<i>No. of STPs</i>	<i>Designed capacity (MLD)</i>	<i>Utilized Capacity (MLD)</i>	<i>Discharge to Hindon</i>
<i>Saharanpur</i>	01	38	38	1
<i>Muzaffarnagar</i>	01	32.5	17	1
<i>Ghaziabad</i>	08	480	342.4	08
<i>Noida</i>	01	35	28	01
<i>Greater Noida</i>	04	174	70	04

STPs located in Hindon basin are receiving sewage with BOD ranging from 15 mg/l to 157 mg/l, COD ranging from 95 mg/l to 467 mg/l as compared to typical municipal wastewater (BOD: 200-250 mg/l, COD: 350-500 mg/l), As per inspections conducted in November, 2022, the STPs are mostly found non-complying with respect to the discharge norms. Weak strength sewage was received at inlet (BOD - 15 mg/l) of 56 MLD STP Bapudham, Ghaziabad. The compliance status of the STPs is tabulated in **Tables 29 and 30**. The map showing locations of STPs monitored in the Hindon basin are shown in **Map-9**.



**Map 9 Map showing STPs located in the Hindon basin (STPs located in Noida and Greater Noida are not shown)**

**Table 29 Compliance status of STPs in Ghaziabad**

S. No.	Name of STPs	Treatment Technology	Designed Capacity (MLD)	Utilized capacity (MLD)	Compliance Status as per NGT standards
1.	Indirapuram STP 74 MLD	SBR	74	74	NC w.r.t. BOD, COD, TSS, TN, FC
2.	Indirapuram STP 56 MLD	SBR	56	50	NC w.r.t. BOD, COD, FC
3.	Indirapuram STP 56 MLD	UASB	56	56	NC w.r.t. BOD, COD, TSS, TN, FC
4.	Dudahaida-3 STP 70 MLD, Vijay Nagar	UASB	70	70	NC w.r.t. COD, BOD, TSS, total nitrogen, FC
5.	Dudahaida STP 56 MLD, Vijay Nagar	SBR	56	56	NC w.r.t. COD & FC
6.	Morty STP Rajnagar Extension 56 MLD	SBR	56	22.5	Non-Complying w.r.t. FC
7.	Govindpuram STP 56 MLD	SBR	56	12.38	Complying
8.	Bapudham-Madhuban STP 56 MLD	SBR	56	1.5	Complying

**Table 30 Compliance status of STPs in Saharanpur and Muzaffarnagar districts**

S. No.	Name of STPs	Treatment Technology	Designed Capacity (MLD)	Utilized capacity (MLD)	Compliance Status as per NGT standards
1.	Saharanpur STP , Mahilpur	UASB	38	38	Non-complying w.r.t. COD, TSS, FC
2.	Muzaffarnagar STP, Nagar Palika	Oxidation Pond	32.5	17	Non-complying w.r.t. BOD, COD, TSS & FC

### Performance Assessment of the STP

In **Table 31**, values of BOD at outlet have been analysed against inlet BOD range. It can be observed from the table that out of 10 STPs, only 6 are achieving BOD less than 10 mg/l rest 4 were having outlet BOD higher than 10 mg/l. Out of 5 STPs have inlet BOD range 50 – 100 mg/l only 3 STPs were found to achieve outlet BOD less than 10 mg/l. Out of 4 STPs having inlet BOD greater than 100 mg/l only 1 was found to achieve BOD less than 10 mg/l (**Table 31**). It indicates that operation and maintenance of 5 STPs requires improvement.

**Table 31 Inlet BOD range and compliance of outlet BOD**

S. No	Inlet BOD	No.	Outlet BOD		
			≤10 mg/l	10-30 mg/l	>30 mg/l
1	10 -50	1	1	-	-
2	50 - 100	5	3	-	2
3	100 - 150	2	1	-	1
4	>150	2	-	1	1
<b>Total</b>		<b>10</b>	<b>5</b>	<b>1</b>	<b>4</b>

**Table 32** shows technology wise compliance for BOD of treated sewage. The median BOD value at inlet of SBR (6 no.) based STPs were 103.5 mg/l, where 4 STPs were found complying for BOD norms of 10 mg/l. Whereas, for UASB (3 no.) based STPs median BOD value at inlet was 119 mg/l and only 1 STP was complying for BOD norms of 10 mg/l, one OP based STP was found non-complying for BOD norms of 10 mg/l.

**Table 32 Technology wise distribution of STP**

Technology	Inlet BOD Range	Median BOD Value	Compliance for BOD of treated sewage (10 mg/l)	
			Complying	Non-complying
SBR (6)	15-157	103.5	4	2
UASB (3)	57-157	119	1	2
OP (1)	57	57	-	1
<b>Total</b>	-	-	<b>5</b>	<b>5</b>

The reduction in the BOD was found to range between 28.07 % and 97 %. Similarly, reduction in the COD was found to range from 20.12 % to 95 % and reduction in TSS was found to range between 63 % to 96 %. Technology wise performance of STPs w.r.t BOD, COD and TSS has been evaluated in the **Table 33, 34 & 35**, respectively.

**Table 33 Performance of STPs with respect to BOD removal efficiency**

S. No	Technology	Range of BOD Removal Efficiency			
		<50	50-70	70-90	>90
1	SBR (6)	1	1		4
2	UASB (3)		2	1	
4	OP (1)	1			
	<b>Total</b>	<b>2</b>	<b>3</b>	<b>1</b>	<b>4</b>

**Table 34 Performance of STPs with respect to COD removal efficiency**

S. No	Technology	Range of COD Removal Efficiency			
		<50	50-70	70-90	>90
1	SBR (6)	1	1	3	1
2	UASB (3)			3	
4	OP (1)	1			
	<b>Total</b>	<b>2</b>	<b>1</b>	<b>6</b>	<b>1</b>

**Table 35 Performance of STPs with respect to TSS removal efficiency**

S. No	Technology	Range of TSS Removal Efficiency			
		<50	50-70	70-90	>90
1	SBR (6)	-	1	2	3
2	UASB (3)	-	1	2	-
4	OP (1)	-	-	1	-
	<b>Total</b>	<b>0</b>	<b>2</b>	<b>5</b>	<b>3</b>

Discharge norm for Faecal Coliform (230 MPN/100ml) is not achieved in 8 STPs. No disinfection system was found at 3 STPs namely, Nagar Palika STP, Muzaffarnagar, 56 MLD STP (UASB) Indirapuram, Ghaziabad and 70 MLD STP Dudaheda, Ghaziabad. Hence to achieve the norms there is requirement of upgradation/optimization of the existing disinfection system or installation of new disinfection system (if no disinfection system is present). The relevant analysis data is provided at **Annexure-I**.

Few major observations with respect to operation and maintenance of STPs during monitoring are as follows:

***Saharanpur STP***

- Chlorination system was found non-operational.

***Muzaffarnagar STP***

- Two ponds of WSP/OP based STP not in use (STP operating on half capacity).
- No flowmeter at outlet of STP only V-notch at inlet however, no logbook is available for same.
- No disinfection system & no OCEMS installed.
- Household discharge points from nearby houses directly discharge to STP ponds.

***Ghaziabad STPs***

- **Very less flow** received at Govindpuram STP (14/56MLD), Bapudham STP (1.5/56MLD) and Morty Raj Nagar Extension STP (26/56MLD) due less sewerage network/household connections.
- No flow measuring device at outlet of Indirapuram (3 STPs), Bapudham STP, Dudahaida (02 STPs) and Govindpuram 56 MLD STP.
- No disinfection system at 56 MLD UASB STP Indirapuram and 70 MLD UASB STP Dudahaida.
- No OCEMS installed at Govindpuram and Bapudham 56 MLD STPs, Ghaziabad, 56 MLD SBR and UASB STPs at Indirapuram.

The action plan for the existing STPs installed in Saharanpur, Muzaffarnagar and Ghaziabad is attached as **Annexure-II**.

## CHAPTER-7: GROSSLY POLLUTING INDUSTRIES

CPCB organizes annual inspection of Grossly Polluting Industries (GPIs) in river Ganga main stem since 2017 through third party technical institutes and State Pollution Control Boards (SPCBs). Grossly Pollution Industries are defined as the industry which is discharging pollution load of equal to or more than 100 kg/day and/or handling hazardous chemicals as specified under the Schedule-I, Part-II of The Manufacture, Storage and Import of Hazardous Chemical Rules of 1989 under Environment (Protection) Act, 1986.

Year 2020 onwards, GPIs located in river Yamuna main stem including river Hindon sub-basin were included for annual inspection.

During 2021-22, total 373 GPIs operating in river Hindon stem states (Uttarakhand-10; Uttar Pradesh-363) were inventoried in consultation with concerned SPCBs. The state and sector-wise distribution of GPIs are shown in **Tables 36 and 37**.

**Table 36 State and sector wise distribution of GPIs (2021-22)**

Sector	Uttar Pradesh	Uttarakhand	Grand Total
Distillery	8	1	9
Food & Beverages	7	1	8
Others	4	0	4
Pharmaceutical	1	0	1
Pulp & Paper	45	6	51
Slaughter House	8	0	8
Sugar	13	2	15
Tannery	6	0	6
Textile	271	0	271
<b>Total</b>	<b>363</b>	<b>10</b>	<b>373</b>

**Table 37 District and sector wise distribution of GPIs (2021-22)**

Sector / District	Baghpat	G.B. Nagar	Ghaziabad	Hapur	Meerut	Muzaffarnagar	Saharanpur	Shamli	Hari-dwar	Total
Distillery	0	0	1	0	1	2	3	1	1	9
Food & Beverages	1	1	2	1	0	0	2	0	1	8
Others	0	0	4	0	0	0	0	0	0	4
Pharmaceutical	0	0	1	0	0	0	0	0	0	1
Pulp & Paper	2	2	3	0	0	34	2	2	6	51

Sector District	Bagh- pat	G.B. Nagar	Ghazi- bad	Hapur	Meerut	Muzaffar- nagar	Saha- ranpur	Shamli	Hari- dwar	Total
Slaughter House	0	0	4	0	0	1	3	0	0	8
Sugar	1	0	0	0	1	5	4	2	2	15
Tannery	0	2	3	0	0	1	0	0	0	6
Textile	3	15	230	4	2	0	17	0	0	271
<b>Total</b>	<b>7</b>	<b>20</b>	<b>248</b>	<b>5</b>	<b>4</b>	<b>43</b>	<b>31</b>	<b>5</b>	<b>10</b>	<b>373</b>

### Compliance status of GPIs in river Hindon: 2021-22

During annual inspections 2021-22, out of 373 GPIs, 258 (Uttarakhand-10; Uttar Pradesh-248) were found operational and 115 (Uttarakhand-0; Uttar Pradesh-115) were found non-operational (self-closed).

Out of 258 operational GPIs, 157 (Uttarakhand-09; Uttar Pradesh-148) were found complying and 101 GPIs (Uttarakhand-01; Uttar Pradesh-100) were found non-complying. Out of 101 non-complying GPIs, show-cause notices were issued to 84 GPIs (Uttar Pradesh-84) and closure directions were issued to 17 GPIs (Uttarakhand-01; Uttar Pradesh-17). The state, sector and district-wise compliance status of GPIs are shown in Tables 38, 39 & 40, respectively.

**Table 38 State wise compliance status of GPIs (2021-22)**

State	No. GPIs	Complying	Non-Complied		Self-Closed
			Show Cause	Closure	
Uttarakhand	10	09	0	01	0
Uttar Pradesh	363	148	84	16	115
<b>Total</b>	<b>373</b>	<b>157</b>	<b>84</b>	<b>17</b>	<b>115</b>

**Table 39 Sector wise compliance status of GPIs (2021-22)**

Sector	No. GPIs	Complying	Non-Complied		Self-Closed
			Show Cause	Closure	
Distillery	9	5	1	1	2
Food & Beverages	8	4	3	1	0
Others	4	1	2	0	1
Pharmaceutical	1	0	1	0	0
Pulp & Paper	51	49	0	0	2
Slaughter House	8	5	1	0	2

Sugar	15	11	4	0	0
Tannery	6	3	1	0	2
Textile	271	79	71	15	106
<b>Total</b>	<b>373</b>	<b>157</b>	<b>84</b>	<b>17</b>	<b>115</b>

**Table 40 District wise compliance status of GPIs (2021-22)**

District	No. GPIs	Complying	Non-Complied		Self-Closed
			Show Cause	Closure	
Baghpat	7	1	4	0	2
Ghaziabad	248	69	62	15	102
Hapur	5	1	2	0	2
Meerut	4	4	0	0	0
Muzaffarnagar	43	39	2	1	1
Saharanpur	31	21	7	0	3
Shamli	5	4	1	0	0
GB Nagar	20	9	6	0	5
Haridwar	10	9	0	1	0

**Pollution load discharge:**

During 2021-22, effluent discharge and BOD load in River Hindon basin by 258 operational GPIs was found 44.4 MLD and 1.87 TPD respectively. The sector and district-wise pollution load of GPIs is shown in **Tables 41 and 42**.

**Table 41 Sector-wise pollution load of GPIs (2021-22)**

Sector	No. GPIs	Effluent Discharge (KLD)	BOD load (kg/day)
Distillery	9	0	0
Food & Beverages	8	1676.74	360.7
Others	4	1453.55	51.47
Pharmaceutical	1	170.97	3.59
Pulp & Paper	51	22310.01	473.17
Slaughter House	8	1041.46	28.02
Sugar	15	10648.47	315.5
Tannery	6	87	1.81
<b>Total</b>	<b>373</b>	<b>44365.93</b>	<b>1873.45</b>
		<b>44.4 MLD</b>	<b>1.87 TPD</b>

**Table 42 District-wise pollution load of GPIs (2021-22)**

District	no of units	Discharge (KLD)	BOD load (kg/day)
Baghpat	7	820.35	47.56
Ghaziabad	248	6958.65	655.06
Hapur	5	492.4	10.29
Haridwar	10	2622	399.2
Meerut	4	1403	32.58
Muzaffarnagar	43	15711.11	402.72
Saharanpur	31	11545.63	210.98
Shamli	5	1976	51.41
GB Nagar	20	2836.79	63.69
<b>Total</b>	<b>373</b>	<b>44365.93</b>	<b>1873.49</b>
		<b>44.4 MLD</b>	<b>1.87 TPD</b>

**Annual inspections 2022-23**

During 2022-23, total 375 GPIs (Uttar Pradesh-365; Uttarakhand-10) were inventoried in consultation with concerned SPCBs (List attached as **Annexure-III**). The state, sector and district-wise distribution of GPIs are shown in **Tables 43 and 44**.

**Table 43 State and sector wise distribution of GPIs (2022-23)**

Sector	Uttar Pradesh	Uttarakhand	Total
Distillery	9	1	10
Food & Beverages	12	1	13
Others	3	0	3
Pharmaceutical	1	0	1
Pulp & Paper	47	6	53
Slaughter House	17	0	17
Sugar	13	2	15
Tannery	6	0	6
Textile	257	0	257
<b>Total</b>	<b>365</b>	<b>10</b>	<b>375</b>

**Table 44 District and sector wise distribution of GPIs (2022-23)**

District	Distillery	Food & Beverages	Others	Pharmaceutical	Pulp & Paper	Slaughter House	Sugar	Tannery	Textile	Total
Baghpat	0	1	0	0	2	0	1	0	3	7
Gautam Budh Nagar	0	6	0	0	3	0	0	2	25	36
Ghaziabad	1	2	3	1	3	13	0	3	204	230
Hapur	0	1	0	0	0	0	0	0	4	5

Haridwar	1	1	0	0	6	0	2	0	0	10
Meerut	1	0	0	0	0	0	1	0	2	4
Muzaffarnagar	3	0	0	0	35	1	5	1	0	45
Saharanpur	3	2	0	0	2	3	4	0	19	33
Shamli	1	0	0	0	2	0	2	0	0	5
<b>Total</b>	<b>10</b>	<b>13</b>	<b>3</b>	<b>1</b>	<b>53</b>	<b>17</b>	<b>15</b>	<b>6</b>	<b>257</b>	<b>375</b>

Inspection of these GPIs were carried out during February – June 2023. Inspection reports and action taken by SPCBs is under process.

In the year 2023, UPPCB provided a list of industries 412 (278 GPIs, 82 Non-GPIs & 42 industrial units closed/dismantled/surrendered/other) in river Hindon basin (**Annexure-IV**). The district-wise distribution of industrial units is shown in **Table 45**. Additionally, some other industrial units have also been reported which were identified by the monitoring teams during inspection.

**Table 45 Inventory of GPIs provided by UPPCB in the year 2023**

District	Number of GPIs			Number of non-GPIs			Total number of industrial units	Remarks
	Conforming	Non-conforming	Total	Conforming	Non-conforming	Total		
Saharanpur	37	0	37	12	0	12	49	-
Muzaffarnagar	0	43	43	6	3	9	52	-
Shamli	1	4	5	0	0	0	5	-
Meerut	5	0	5	1	0	1	6	-
Baghpat	1	0	1	0	0	0	1	-
Ghaziabad	169	0	169	10	0	10	179	Closed-12; Dismantled-23; Self-closed-4; Surrendered-1; Status not mentioned-2  *Total units in Ghaziabad=221 (179+42)
Greater Noida	18	0	18	50	0	50	68	-
<b>TOTAL</b>	<b>231</b>	<b>47</b>	<b>278</b>	<b>79</b>	<b>3</b>	<b>82</b>	<b>360</b>	-

The non-GPI units include Automobile, Anodizing, Beverage, Board Mill, Dairy, Yarn/Textile Processing, Dyeing, Food Processing, Galvanizing, Metal Surface Treatment, Pharma, Paint, Slaughter House, Tannery, Rice Mills, Plastic Moulding Component, Electronic & Engineering.

## CHAPTER-8: ACTION PLAN

### Industrial Pollution Control:

1. Textile, Sugar, Pulp & Paper, Distillery and Tannery units operating in the River Hindon basin shall implement the Charter for Water Recycling and Pollution Prevention in Textile/Sugar/ Pulp & Paper Industries (sector specific) in the Ganga River Basin". [Action: SPCB & concerned industrial units]
2. Inventory of unauthorized/unregistered industrial/processing units (water-polluting small and medium-scale industries, including board mills, dyeing/bleaching/printing/textile processing, paint, recycling/processing units for metal, battery including lead-acid, e-waste, and other hazardous waste). Closure/sealing of such units till they obtain CTO & have adequate functional effluent treatment system. [Action: SPCB, District Administration and Municipal Corporation]
3. Small & medium scale industries in industrial clusters (BOD>100 mg/l and COD>250 mg/l) shall not be permitted to operate using batch effluent treatment process until a continuous secondary biological wastewater treatment system is installed or they should be shifted on ZLD/dry process or should connect to CETP. [Action: NMCG, UPPCB & Industrial Development Corporation]
4. Installation of CETP for small-scale industrial units located industrial clusters in Hindon basin. [Action: NMCG, UPPCB & Industrial Development Corporation]

S. No.	District	Industrial Cluster	Type	No. of Units
1.	Saharanpur	Catchment of river Dhamola & KD Complex drain	Mixed	~15 (Textile) and others
2.	Ghaziabad	Roop Nagar & Arya Nagar (Loni)	Textile	~ 80
3.	Ghaziabad	Sahibabad Site-4	Mixed	~ 60
4.	Ghaziabad	Karedha Industrial Area	Mixed	~ 10 and many recycling/processing units
5.	Gautam Buddha Nagar	Surajpur Industrial Area	Mixed	~14 (Textile) and others

5. Immediate action should be taken to address pollution hotspots in drains/river stretches (attached as **Annexure-V**) caused by discharge of untreated/partially treated effluent by water polluting industries. SPCBs (UPPCB/UKPCB) shall prepare action plan in consultation with industries in catchment of hotspot drain/river stretches until water quality is improved (BOD < 10 mg/l in river and BOD < 150 mg/l & COD < 450 mg/l in drains). The SPCBs should collaborate with technical experts to devise action plan. [Action: SPCBs & Industries]
6. Collective accountability of industrial units in hotspot river stretch/drain should be fixed by UPPCB in case river/drain water characteristics indicate industrial pollution (BOD>150 mg/l and COD>450 mg/l in drain & BOD>10 mg/l in river. Compliance of industrial units should be checked in terms of drain wastewater characteristics. [Action: UPPCB, CPCB, CWC & Irrigation Dept.]

### **Sugar Mills**

**(Action: Sugar Units & SPCB; Timeline for proposed action plan: 3 months):**

1. Total Sugar Mills: 15 (6- standalone, 3- sugar with cogen, 5- Sugar refinery)
2. Augmentation of effluent treatment plants up to tertiary level.
3. Installation of CPU for treatment of weak strength effluent wherever high pressure boilers (above 45 kg/cm<sup>2</sup> g) are installed.
4. Installation of sulphur removal system in case of double sulphitation process.
5. Installation of flowmeters with totalizers at:
  - a. All fresh water abstraction points
  - b. Hot & cold water usage/recycling points
  - c. All effluent generation sources
  - d. Inlet & outlet of effluent treatment plant.
  - e. Treated effluent re-circulation line i.e. in-process or for irrigation purpose.
6. Preparation of Irrigation management plan duly vetted by reputed Agriculture University including total command area, type of soil and loading rate of water.
7. Provision of networking to supply the treated wastewater to farmers.
8. Limiting specific fresh water consumption-
  - a. Standalone & Sugar with co-gen: <55 Lit/tonne of cane crushed
  - b. Refinery & Refinery with co-gen: <80 Lit/tonne of cane crushed
9. Specific effluent discharge not to exceed:
  - a. Standalone & Sugar with co-gen: <135 Lit/tonne of cane crushed

- b. Refinery & Refinery with co-gen: <150 Lit/tonne of cane crushed
- 10. Action plan for proper handling, management and disposal of fly ash/ boiler including record keeping.
- 11. Identification of recipient drain and monthly monitoring by SPCB.
- 12. No dumping of fly ash near the banks of drains/rivers.
- 13. For sugarcane-growing farmers under their command area emphasis to adopt drip irrigation instead of flood irrigation method by setting annual target of covering 20% land for groundwater conservation.
- 14. Irrigation of all the command area by using drip irrigation method within five years.

### Distillery

#### (Action: Distillery Units & SPCB; Timeline for proposed action plan: 3 months):

1. Total Distilleries in Hindon Basin- 10 (2 reported non-operational)  
ZLD route: Incineration-7, Biocompositing-1  
CPU installed: 8  
MEE installed: 8
2. CPU for treatment of weak strength effluent to be installed
3. Limiting specific fresh water consumption- B & C Heavy: 8 to 10KL/KL of product, for cane syrup & sugarcane juice: 6 to 8 KL/KL of product
4. Specific spent wash generation rate not to exceed- 6 to 8 KL/KL of product, for cane syrup & sugarcane juice: 4 to 6 KL/KL of product
5. Mass flow meters with totalizers to be installed at inlet & outlet of MEE with connectivity with CPCB/SPCB server.
6. Identification of the recipient drain near the unit and monitoring on monthly basis by concerned SPCB.
7. Action plan for fly ash & boiler ash disposal.
8. In case of using incineration boiler ash for potash recovery proper record keeping of ash generation, management and handling to be maintained.
9. Installation of web camera at bio-compost yard & lagoon with connectivity with CPCB & SPCB server.
10. Restriction on lagoon capacity: not to exceed quantity of Concentrated Spentwash for 30 days in case of bio-compositing & 7 days in case of incineration.
11. Concentrated spent wash to maintain total solids as;  
In case of Bio-composting: 30%

In case of Incineration: 45-55%

12. Proper record keeping of operation and maintenance of ZLD systems including:

- i. MEE
- ii. CPU
- iii. Incineration /Bio-composting

13. Installation of piezometers at bio-compost yards to monitor ground water quality.

14. Fly ash & boiler ash disposal near water bodies should be restricted.

15. Distillery attached with Sugar mill to reuse treated water from Sugar mill.

### **Pulp & Paper Mills**

**(Action: Pulp & Paper Units & SPCB; Timeline for proposed action plan: 3 months):**

- Total no. of Pulp & Paper industries located in river Hindon basin: 51 (Operational- 47, non-operational- 4)
  - Wood based: 01
  - Agro based: 03
  - Waste paper based: 42
  - Market based pulp: 01
- Paper board making industries to be covered under the list of GPIs.
- No chemical pulping or wet strength pulping without chemical recovery plants (CRPs).
- Installation of flow meter at water intake / borewell, wastewater generation, treated effluent discharge and recycle line.
- Maintenance of record for water use, wastewater generation, water recycled and wastewater discharge.
- Upgradation of existing effluent treatment system up to tertiary level including installation of aerators (diffused/surface) and development of required MLSS level.
- Provision of Closed loop fibre recovery and backwater system.
- Replacement of paper machine shower nozzles with nozzles of specified diameter (0.6-0.8 mm).
- To achieve the treated effluent quality as per Charter norms:
  - Paper mills manufacturing chemical pulping:
    - pH -6.5-8.5; TSS- 30 mg/L; BOD- 20 mg/L; COD- 200 mg/L, TDS- 1800 mg/L, Colour- 250 PCU, AOX- 8 mg/L and SAR-10
  - RCF and Market Pulp based Paper mills:

pH -6.5-8.5; TSS- 30 mg/L; BOD- 20 mg/L; COD- 150 mg/L, TDS- 1600 mg/L, Colour- 150 PCU and SAR-8

- Achieve the specific fresh water consumption as given below:
  - Wood/Agro Based (bleached grades papers, paperboards & newsprint): 40 KL/MT
  - Agro Based (unbleached grades papers, paperboards & newsprint): 20 KL/MT
  - RCF and Market Pulp Based (bleached grades paper, paperboards & newsprint): 12 KL/MT
  - RCF and Market Pulp Based (unbleached grades of papers and paperboards): 8 KL/MT
  - Paper mills achieving ZLD: 2.5 KL/MT
- Achieve the specific effluent discharge as given below:
  - Wood/Agro Based (bleached grades papers, paperboards & newsprint): 30 KL/MT
  - Agro Based (unbleached grades papers, paperboards & newsprint): 15 KL/MT
  - RCF and Market Pulp Based (bleached grades paper, paperboards & newsprint): 8 KL/MT
  - RCF and Market Pulp Based (unbleached grades of papers and paperboards): 5 KL/MT
- Proper handling, management and disposal of plastic waste, solid waste including record keeping.
- Setting up of Environmental Management Cell (EMC) by individual units.

### **Textile Mills**

**(Action: Textile Units & SPCB; Timeline for proposed action plan: 3 months):**

- Textile wet processing steps generate effluent having high BOD (550-800 mg/l) and COD (1000-1500 mg/l). For treatment of effluent having such high organic load, biological treatment system of adequate capacity along with tertiary filtration system and capable of running round the clock is mandatory.
- Textile units performing wet processing like pre-treatment (desizing, scouring, mercerization and bleaching), dyeing & printing and finishing (including washing) of cotton and other fabric should have complete ETP comprising of secondary biological treatment units of adequate capacity operating on continuous basis or they should become member of CETP.

- In case, unit is a member of CETP, they should have Primary Effluent Treatment Plant (PETP) of adequate capacity to meet the inlet norms of concerned CETP.
- For standalone units operate in batches and effluent generation is not enough to run the ETP on continuous basis round the clock, in that cases unit has to stop the wet processing steps (pre-treatment, dyeing & printing and finishing) and may be shifted to the dry processes (knitting, weaving, spinning, finishing, stitching, etc.) and machinery used in wet processing like kier, jigger, winch and soft flow shall be dismantled.
  - SPCB shall ensure the dismantling of wet processing machinery and geotagged photographs shall be provided as an evidence. Consent of such units for wet processing shall be revised to dry process.
- Textile units should adopt the Charter for water recycling and pollution prevention in all aspects.

**Metal/Battery including Lead-acid/E-waste/Other Hazardous Waste Recycling/Processing Units [Action: Industrial Units, ULBs & SPCB; Timeline for proposed action plan: 3 months):**

- Inventory of unauthorized battery including lead-acid, metal (including surface treatment, anodizing, galvanizing & electroplating), e-waste and other hazardous waste recycling/processing units. Closure/sealing of such units till they obtain CTO & have adequate functional effluent treatment system or become the member of common treatment facility.
- The district-wise status of Authorized Recyclers/ Utilizers /Pre-processors/ Co-processors of Hazardous Waste available with CPCB:
  - Saharanpur – 08
  - Ghaziabad – 36 + 1 (TSDF)
  - Gautam Buddha Nagar - 9
- Development of common treatment facility for disposal of waste generated from above-referred units existing in cluster.
- Recycling and processing units (battery including lead-acid, metal-processing, e-waste and other hazardous waste) should be brought under the ambit of GPIs and subjected to annual inspections under the Namami Gange Programme and quarterly by SPCB.

### **Dairy/Cattle Farming**

**(Action: Dairy/Cattle farming Operator, ULBs & SPCB; Timeline for proposed action plan: 6-12 months):**

Cattle dung deposition observed in many drains namely Sardhana & Hindon Vihar drains contributing high BOD/COD.

1. Restriction of Dairy/Cattle farming operation along the bank of rivers/water bodies/drains.
2. Dairy cattle farms should not be located in flood prone areas, subject to flooding at 1-in-25-years or more frequent levels in order to avoid contamination of rivers/water bodies/drains.
3. Dairy cattle farms or Gaushalas shall follow the “Guidelines for Environmental Management of Dairy Farms and Gaushalas” issued by CPCB.
4. Dairy cattle farms should have adequate infrastructure by their own to ensure proper handling, treatment and disposal of solid wastes and wastewater or become the member of a common facility.
5. Concerned ULBs shall develop management plan for transportation and disposal of cattle dung/waste and shall impose user charges accordingly.
6. Frequent vigilance of dairy farms by ULBs to ensure no cattle dung/waste disposed into any nearby drain/river/water body.
7. Operation of the dairy without confined place for dumping of cattle dung/waste shall be restricted. Suggested methods to be adopted for disposal/utilisation of solid wastes (dung):
  - Composting/Vermicomposting
  - Biogas/Compressed biogas (CBG) production (anaerobic digestion)
  - Manufacturing of dung wood can be used as fuel
8. Hands on practical trainings on environment/waste management & treatment technologies, scientific feeding for enteric methane reduction, waste to wealth management programme, etc. should be provided to dairy workers/entrepreneurs by the local bodies/SPCB at regular intervals.

## **Sewage and Solid Waste Management:**

### **Sewage**

1. Sewage Treatment Plants (STPs) employing advanced treatment facilities such as Sequencing Batch Reactor (SBR), Extended ASP, and Moving Bed Biofilm Reactor (MBBR) should achieve a BOD removal efficiency of over 90%. Strict action should be taken against the STPs operating agency & disbursement of payment to the operating agency shall be lined with performance in terms of BOD removal efficiency as well as comply with NGT norms. [Action: Jal Nigam, SMCG & NMCG]
2. STPs shall be operated with utilized capacity > 70%. The disinfection units installed at STPs should be operated properly and follow proper protocols and procedures to effectively disinfect the wastewater and meet the discharge standards for fecal coliform levels. Action plan for existing STPs installed in Saharanpur, Muzaffarnagar and Ghaziabad is enclosed as **Annexure-II** [Action: UPPCB, Jal Nigam, SMCG & NMCG]
3. SMCG with UPJN shall develop a sewage management plan for each city/town/district addressing both present and projected requirements for the next 20 years. It should be periodically reviewed, updated, and adapted to address changing circumstances, technological advancements, and evolving environmental standards. Regular monitoring and evaluation of the plan's effectiveness will help identify any necessary modifications or improvements. [Action: Jal Nigam, SMCG & NMCG]
4. In case of small town, village or isolated drain, low cost decentralized treatment option such as waste stabilization pond (WSP) or constructed wetland may be considered to treat domestic wastewater. [Action: Jal Nigam, SMCG & NMCG]

### **Solid Waste**

1. Prohibition on dumping of municipal/industrial solid wastes and sludge on the active flood plain of river as well as into the river/drain itself. All the dumped waste along the river/drain should be removed immediately and disposed off safely.
2. Installation of wire-net/geo-net at confluence point of drains with river.

[Action: Municipal corporation/Nagar Nigam/Nagar Palika]

### River Restoration:

1. Improvement in stream flow in origin/dry stretches of rivers through vegetation development in catchment. Demarcation of flood plain of river and desilting of river bed. The desilted material should be used for strengthening the embankments and the embankments should be vegetated. [Action: District Administration, Forest Department and Irrigation Department]
2. A minimum water flow ~100-200 cusecs in river Hindon and ~50-100 cusecs in its tributaries such as Kali-West & Krishni including upper stretches of the rivers should be maintained to sustain river ecosystem and prevent significant ecological damage. The determination of minimum flow is a complex process that requires hydrological, ecological assessments, and stakeholder consultation. Therefore, a detailed study may be conducted in consultation with the relevant experts and stakeholders to establish appropriate minimum flow levels in river Hindon and its tributaries. [Action: UP Irrigation Department & CWC]
3. To maintain minimum flow, provision of freshwater intrusion from Ganga/Yamuna canal into Hindon River and its tributaries (Kali-West & Krishni) can be made. The suggested locations from where freshwater may be discharged into river are [Action: Irrigation Dept. & CWC]:

S. No.	District	Location
1.	Saharanpur	Ganga Canal into: <ul style="list-style-type: none"> <li>• River Kali-West near Rastam village</li> <li>• River Hindon near Maheshpur village</li> <li>• River Krishni near Bhanera Khemchand village</li> </ul>
2.	Saharanpur (U.P.) & Hardwar (Uttarakhand)	• Ganga Canal into Sheela drain of River Kali-West near Rasoolpur Fakerhery village near Uttarakhand-Uttar Pradesh border
3.	Muzaffarnagar	• Upper Ganga Canal into river Kali-West near Khatauli town
4.	Shamli	• Eastern Yamuna Canal into river Krishni near Salfa village
5.	Baghpat	• Upper Ganga Canal into river Hindon near Pura village via Jani Escape

4. Freshwater (1500 cusecs) is released in to river Hindon from Upper Ganga Canal near D/s of Meerut where river Hindon act as a channel to transfer freshwater from Upper

Ganga Canal to Agra Canal. Freshwater from Upper Ganga Canal is discharged into river Yamuna from barrage on river Hindon at Ghaziabad which is further released into Agra Canal from Okhla Barrage on river Yamuna. A minimum of 200 cusecs of water should be retained in river Hindon in d/s of barrage at Ghaziabad. [Action: Irrigation Dept. & CWC]

5. State Pollution Control Boards (SPCBs) along with other concerned state agencies shall carry out inventory of existing wetlands and ponds along the rivers and at their origin and prepare action plan for their restoration and revival. Desilting/dredging of wetlands/ponds/drains shall also be carried out. The desilted material should be used for strengthening the embankments and the embankments should be vegetated. [Action: SPCB, District Administration, Forest Department and Irrigation Department]
6. Rejuvenation and restoration of river stretches by constructing a series of Constructed Wetlands along the river bed and adjoining drains. Integration of drains carrying treated/untreated industrial and domestic wastewater with constructed wetlands will contribute to improving the quality of wastewater discharge into the river through drains. The suggested locations on rivers Hindon, its tributaries and adjoining drains for constructed wetlands/biodiversity park are attached as **Annexure-VI**. [Action: SPCB, Jal Nigam, Irrigation Dept., Forest Dept. & Technical Experts]
7. Encroachment along wetlands and river stretches has been reported through complaints and in NGT case (OA No. 859/2022 in the matter of Abhisht Kumar Gupta Vs State of Uttar Pradesh & Ors). The concerned District Administration may undertake a survey along with concerned state agencies and take necessary action for encroached wetlands/ponds/river stretches and develop an action plan. [Action: UPPCB, District Administration and UP Irrigation Dept.]
8. The jurisdiction of drains/rivers lies with the state flood control and irrigation department while certain areas fall under the jurisdiction of the Forest Department and Jal Nigam/Sansthan. Such agencies should undergo capacity building to ensure that river should not be polluted and should be trained for rivers/drains restoration plan. [Action: Forest Department, Irrigation Department, CWC, Jal Nigam and Jal Sansthan]
9. Check dams should be constructed in the upper stretch of the Hindon River (from its origin to Saharanpur u/s) to enhance the source of fresh water in river during non-monsoon periods. [Action: Minor Irrigation Department]

10. Construction and maintenance of recharge trenches with recharge shafts in downstream areas. Feasible structures for areas where groundwater levels are deeper than 20 mbgl (meters below ground level) or more. Successful implementation will result in recouping of groundwater level over time and will contribute to river flow. [Action: Irrigation Department & Ground Water Department]
11. Ensuring hydraulic and hydrological connectivity of the river with other water bodies (including groundwater) is important. Influent zones (where groundwater recharges the river) and effluent zones (where the river recharges groundwater) should be identified throughout the entire stretch of the river, for implementation of reach-wise recharge augmentation plan for continuous flow in the river. [Action: Central Water Commission, Ground Water Department and National Institute of Hydrology (NIH)]
12. Illegal abstraction of groundwater at domestic level for commercial purpose has been observed. Metering of household borewell in Class I cities and Class II towns & limitation on use. [Action: U.P. Ground Water Dept.]

### **Constitution of Committees:**

A Task Force/Executive Committee led by the District Magistrate at each district level, and comprising members from the UPPCB, Irrigation Department, Ground Water Department, Forest Department, Jal Nigam/Jal Sansthan and Municipal Corporations/Nagar Palikas etc., should be formed at each district level in catchment of river Hindon to carry out ground verification, inventory of polluting sources, formulation and implementation of action plan at district level.

A Supervisory Committee headed by the Additional Chief Secretary/Principal Secretary of the Department of Environment, Government of Uttar Pradesh, should be constituted having members from UPPCB, CPCB, NMCG, SMCG, Irrigation Department, Forest Department, CWC, Urban Development Department, Technical Expert (2 Nos.) etc. to review the progress made by district committees and to provide guidance to Executive committee. Executive Committee should meet on monthly basis and Supervisory Committee should meet on quarterly basis. [Action: UPPCB, Department of Environment, District Administration and concerned and concerned state stakeholder]

Item Nos. 09 &amp; 10

Court No. 1

**BEFORE THE NATIONAL GREEN TRIBUNAL  
PRINCIPAL BENCH, NEW DELHI**

Original Application No. 859/2022  
(I.A. Nos. 445/2024, 769/2023 & 632/2023)

Abhisht Kusum Gupta

Applicant

Versus

State of Uttar Pradesh &amp; Ors.

Respondent(s)

With

Original Application No. 512/2024

News Item titled "Irrigation dept files case against Noida villagers for dumping waste in Hindon" appearing in The Hindustan Times dated 12.03.2024

Date of hearing: 24.01.2025

**CORAM: HON'BLE MR. JUSTICE PRAKASH SHRIVASTAVA, CHAIRPERSON  
HON'BLE MR. JUSTICE SUDHIR AGARWAL, JUDICIAL MEMBER  
HON'BLE DR. A. SENTHIL VEL, EXPERT MEMBER**

Applicant: Mr. Sunil J. Mathews, Ms. Jyoti Chib, Mr. Samanwaya Rautray & Ms. Yashika Singh, Advs. for Applicant in OA 859/2022 (Through VC)

Respondent: Mr. Bhanwar Pal Singh Jadon, Adv. for the State of UP & UP PCB (Through VC)  
Mr. Raj Kumar, Adv. for CPCB  
Mr. Malak Bhatt, Ms. Neeha Nagpal & Ms. Sukamya Joshi, Advs. for Ghaziabad Nagar Nigam (Through VC)

**ORDER**

1. In the Original Application 859/2022, the Tribunal is considering the issue of pollution of river Hindon by the discharge of industrial effluents and untreated sewage and the failure of the authorities to prevent the pollution therein.

2. In terms of the earlier direction of the Tribunal dated 11.07.2024 and 14.10.2024, Chief Secretary, State of UP has filed the affidavit dated

13.10.2024. In that affidavit, the disclosure has been made about the removal of C&D waste from Garhi Chaukhandi and other various places along river Hindon but, but paragraph 6 of the affidavit states that the C&D waste has been transferred to the Collection Centre in Section 25, 64 and 72 of NOIDA. The details relating to the processing of C&D waste have not been disclosed. The affidavit further states about the solid waste that was choking various drains outfalling in river Hindon and its tributaries and the photographs have been placed on record as Annexure-3 but concerning the shifting and treatment of solid waste, no particulars have been disclosed. The details of seven drains which are out falling in river Hindon are disclosed as under:-

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<b>District</b>	<b>River</b>	<b>Drain</b>
<i>Saharanpur</i>	<i>Hindon</i>	<i>Nagdehi</i>
	<i>Dhamola</i>	<i>Numaesh Camp, Kamdhenu Complex</i>
<i>Muzaffarnagar</i>	<i>Hindon</i>	<i>Dhobi Ghat, Sabzi Mandi, Shamshanghat in Budhana Town</i>
	<i>Kali West</i>	<i>Niyazapurwa, Shamli Road, Khadarwala, Krishnapuri, Suzroo Villaage (I&amp;II), Nai Basti Khalapar, Mansoorpur</i>
<i>Meerut &amp; Baghpat</i>	<i>Hindon</i>	<i>Sardhana Drain at Kalina Village</i>
<i>Ghaziabad &amp; Hapur</i>	<i>Hindon</i>	<i>Karedha, Hindon Vihar Left, Hindon Vihar Right, Rahul Vihar</i>

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3. Most of these drains, i.e. 52 out of 55 are untapped and are discharging untreated sewage in river Hindon. The details of the water quality of river Hindon and its tributaries like Kali West and Krishni and their test reports have not been placed on record. The affidavit of the Chief Secretary further states about the plantation drive, but there is no disclosure about the survival rate, though the alleged plantation within 5 Km of river Hindon was done between 2021 and 2024. The report mentions the sewage generation in Hindon River Basin to be 943.63 MLD and the gap of 155.68 MLD and existing 19 STPs (with installed capacity of 921.0 MLD) but, the capacity utilization of these STPs and the report of treated water from these STPs have not been placed on record. It is not disclosed if these STPs are meeting the standards of requisite parameters. The report further discloses that there are 366 industries in the Hindon River Basin eight have been dismantled, and 358 are operational, out of which 30 are on Zero Liquid Discharge (ZLD). Though, as per the report, 123 units are non-compliant, no effective action is reflected against them. The report states about the passing of closure orders against 30 units under the Water (Prevention and Control of Pollution) Act, 1974 and the imposition of EC but there is no disclosure about recovery of EC and implementation of the closure order.

4. The CPCB along with its report dated 09.07.2024 filed in connected OA No. 512/2024 which relates to the dumping of waste in Hindon River, has enclosed the action plan titled "Pollution Source Mapping of River Hindon and its Tributaries and Restoration Plan for Polluted Stretches", which was prepared in August 2023. Learned Counsel for CPCB has informed that the said action plan was forwarded to the State of UP in the year 2023 itself. There is no disclosure about the timebound implementation of the said action plan. This action plan discloses the

status of 55 drains joining rivers Krishni, Kali West and Hindon, installed and utilised capacity of STPs, the performance of STPs, the status of industrial pollution control and the water quality of river Hindon and its tributaries. It has been disclosed in the report of CPCB that the rivers are anoxic, carrying high BOD and fecal coliform and not fit for bathing therefore, CPCB has proposed UP State to execute the action plan.

5. Learned Counsel for the State of UP submits that now a fresh affidavit of Chief Secretary, State of UP will be filed keeping in view the observations made above and also disclosing the timebound schedule for completing the action in pursuance to the action plan submitted by the CPCB. He submits that this affidavit will be filed within six weeks. He has submitted that for implementation of the action plan, prepared by the CPCB, Chief Secretary has already issued instructions to the concerned authorities on 06.11.2023.

6. Learned Counsel for CPCB also submits that though the STPs have been constructed, there is an issue relating to household connectivity with the STPs and unless the same is done, the capacity of the STP cannot be utilized to the fullest and the discharge of untreated sewage to the water channels will continue.

7. The Chief Secretary of State of UP will also respond to the above observation of the CPCB.

8. List on 06.05.2025.

Prakash Shrivastava, CP

Sudhir Agarwal, JM

Dr. A. Senthil Vel, EM

January 24, 2025  
Original Application No. 859/2022  
(I.A. Nos. 445/2024, 769/2023 & 632/2023)  
& Original Application No. 512/2024  
SN..

Item No. 02

Court No. 1

**BEFORE THE NATIONAL GREEN TRIBUNAL  
PRINCIPAL BENCH, NEW DELHI**

Original Application No. 1338/2024

News Item titled "A river lost unchecked discharge of industrial effluents and inadequate sewage treatment facilities have turned the Hindon's water toxic" appearing in Down to Earth dated 16.11.2024.

Date of hearing: 27.11.2024

**CORAM: HON'BLE MR. JUSTICE PRAKASH SHRIVASTAVA, CHAIRPERSON  
HON'BLE MR. JUSTICE ARUN KUMAR TYAGI, JUDICIAL MEMBER  
HON'BLE DR. A. SENTHIL VEL, EXPERT MEMBER**

**ORDER**

1. This original application is registered *suo-motu* on the basis of the news item titled "A river lost unchecked discharge of industrial effluents and inadequate sewage treatment facilities have turned the Hindon's water toxic" appearing in Down to Earth dated 16.11.2024.

2. The matter relates to the pollution crisis faced by Uttar Pradesh's Hindon river. As per the article, the 400-kilometre rain-fed river, emerging from the Shivalik Hills in Saharanpur and flowing through seven districts of Uttar Pradesh, supports a population of 19 million people along its banks. However, the river has become a toxic channel, receiving over 72,170 kilolitres per day of industrial effluents from 357 industries and 943 million litres per day of domestic sewage, with more than 220 MLD remaining untreated due to insufficient infrastructure

3. The news item highlights that the severity of the pollution is reflected in the river's consistently poor water quality metrics. The Central Pollution Control Board has classified it as a "Priority I" river since 2015, with Biochemical Oxygen Demand levels rising alarmingly

from 24-80 mg/l in 2015 to 54-126 mg/l in 2022. The dissolved oxygen levels have reached zero in most parts, leading experts to declare the river "practically dead" since the 1980s. This deterioration is particularly evident in locations like Shimlana Mu village, where residents report over 100 cancer deaths in the last decade, with a cancer incidence rate of 1.3% - significantly higher than the national average of 0.1

4. Furthermore, the news item sheds light on the severe impacts of river pollution. For instance, communities along the river report high instances of cancer, liver problems, skin infections, jaundice, dental issues, and kidney stones. Environmental studies have revealed alarming levels of heavy metals in the water, including lead (179 times above limits), cadmium (9 times above limits), and chromium (123 times above limits). Children are particularly vulnerable to these contaminants, facing higher risks from metal exposure through both ingestion and skin contact.

5. The above matter indicates violation of the Water (Prevention and Control of Pollution) Act, 1974, Solid Waste Management Rules, 2016 and the Environment Protection Act, 1986.

6. The news item raises substantial issues relating to compliance with the environmental norms and implementation of the provisions of scheduled enactment.

7. The power of the Tribunal to take up the matter *suo-motu* has been recognized by the Hon'ble Supreme Court in the matter of "*Municipal Corporation of Greater Mumbai vs. Ankita Sinha & Ors.*" reported in 2021 SCC Online SC 897.

8. Hence, we implead the following as respondents in the matter:

- i. Member Secretary, Central Pollution Control Board (CPCB)  
Parivesh Bhawan, East Arjun Nagar,  
Delhi-110032
- ii. Uttar Pradesh Pollution Control Board  
Building No. TC-12V, Vibhuti Khand, Gomti Nagar,  
Lucknow – 226010
- iii. Ministry of Environment, Forest and Climate Change  
(Regional Office)  
MoEF&CC Regional Office (CZ), 5th Floor, Kendriya Bhawan,  
Sector H, Aliganj, Lucknow – 226024, Uttar Pradesh
- iv. Chief Secretary, Government of Uttar Pradesh  
101, Lok Bhawan, U.P. Civil Secretariat,  
Vidhan Sabha Marg, Lucknow – 226001, Uttar Pradesh

9. Issue notice to the above respondents for filing their response/reply by way of affidavit at least one week before the next date of hearing. If any respondent directly files the reply without routing it through his advocate then the said respondent will remain virtually present to assist the Tribunal.

10. List on 19.03.2025.

Prakash Shrivastava, CP

Arun Kumar Tyagi, JM

Dr. A. Senthil Vel, EM

November 27, 2024  
Original Application No. 1338/2024  
A..

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Dhananjay Pandey <scdhananjaypandey1996@gmail.com>

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**Reply on behalf of Respondent No. 2 O.A. No.1338/2024. I am authorized by anuj bhandari adv.**

1 message

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**Dhananjay Pandey** <scdhananjaypandey1996@gmail.com>

Mon, Mar 17, 2025 at 7:26 PM

To: csup@nic.in, rocz-moef@nic.in, ms@uppcb.in

Advance service to the reply copy of other side respondents advocates.

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