



# USED WATER MANAGEMENT

26<sup>th</sup> June, 2025, Indore

Few case studies of planning and design by adopting  
low cost wastewater treatment systems

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- Introduction

- Swachh Bharat Mission-U-2.0
- Components of Used Water Management
- Treatment technologies
- Case studies
- Conclusions



# Gol's initiatives to achieve United Nations SDG-6

Swachh Bharat Mission-  
Urban-(SBM-U)  
2nd October 2014 to 2nd  
October 2019,

Swachh Bharat  
Mission(Urban) 2.0  
(SBM-U 2.0)  
1st October 2021  
to 1st October 2026



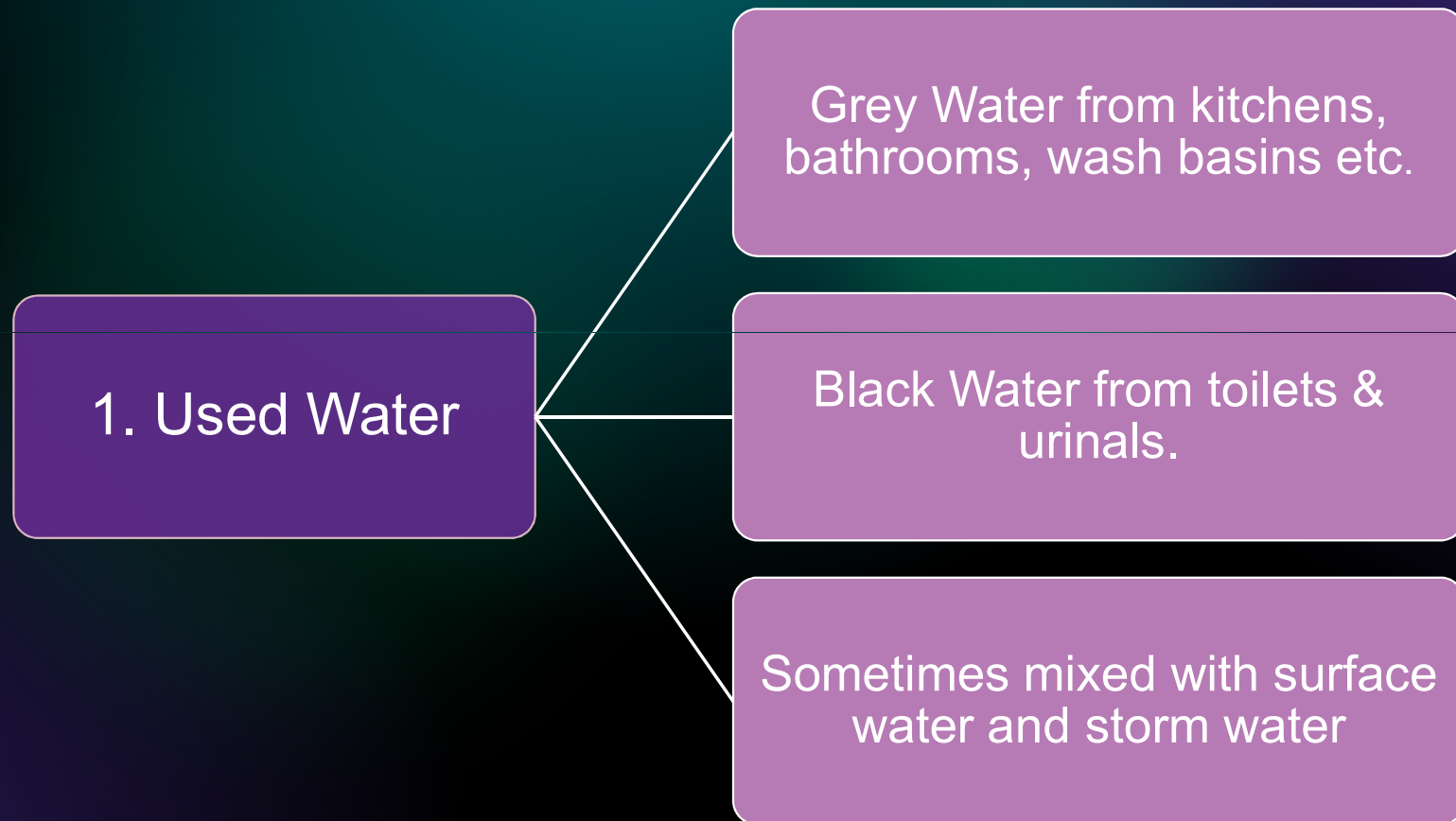
SDG-6- Clean  
Water and  
Sanitation

# Swachh Bharat Mission-Urban –2.0

(1st October 2021 to 1st October 2026)

- Launched by GoI- 1st October 2021
- Vision of creating- “Garbage Free Cities”
- Objectives- To achieve “Sustainable Sanitation and treatment of used water” and “Sustainable Solid Waste Management”
- “Used Water Management” aims that no untreated used water including faecal sludge is discharged into the open environment or water bodies,
- For towns having population less than 1 lakh

# Components of Used Water Management Systems



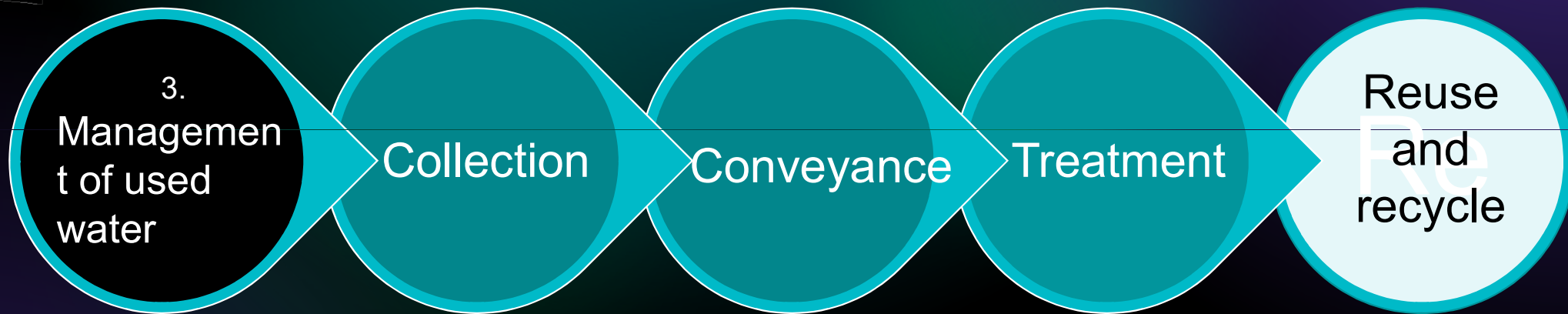
# Components of Used Water Management Systems

## 2. Quantity of Used Water

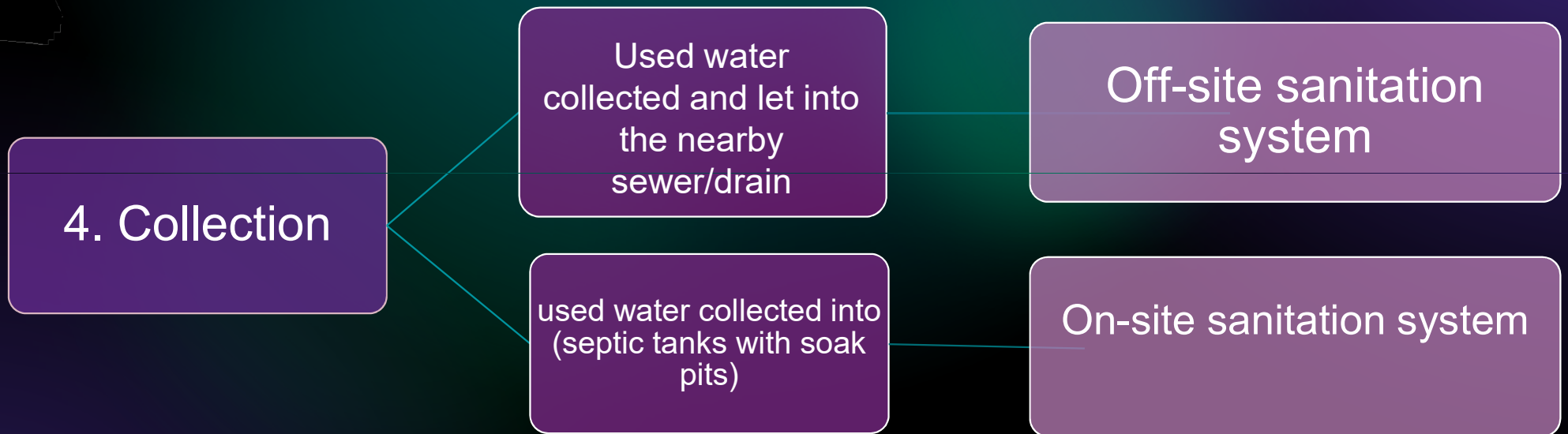
Gol/States/UTs endeavour to provide 135 lpcd potable water through various programmes

80% of water supply (108 lpcd) is expected as used water

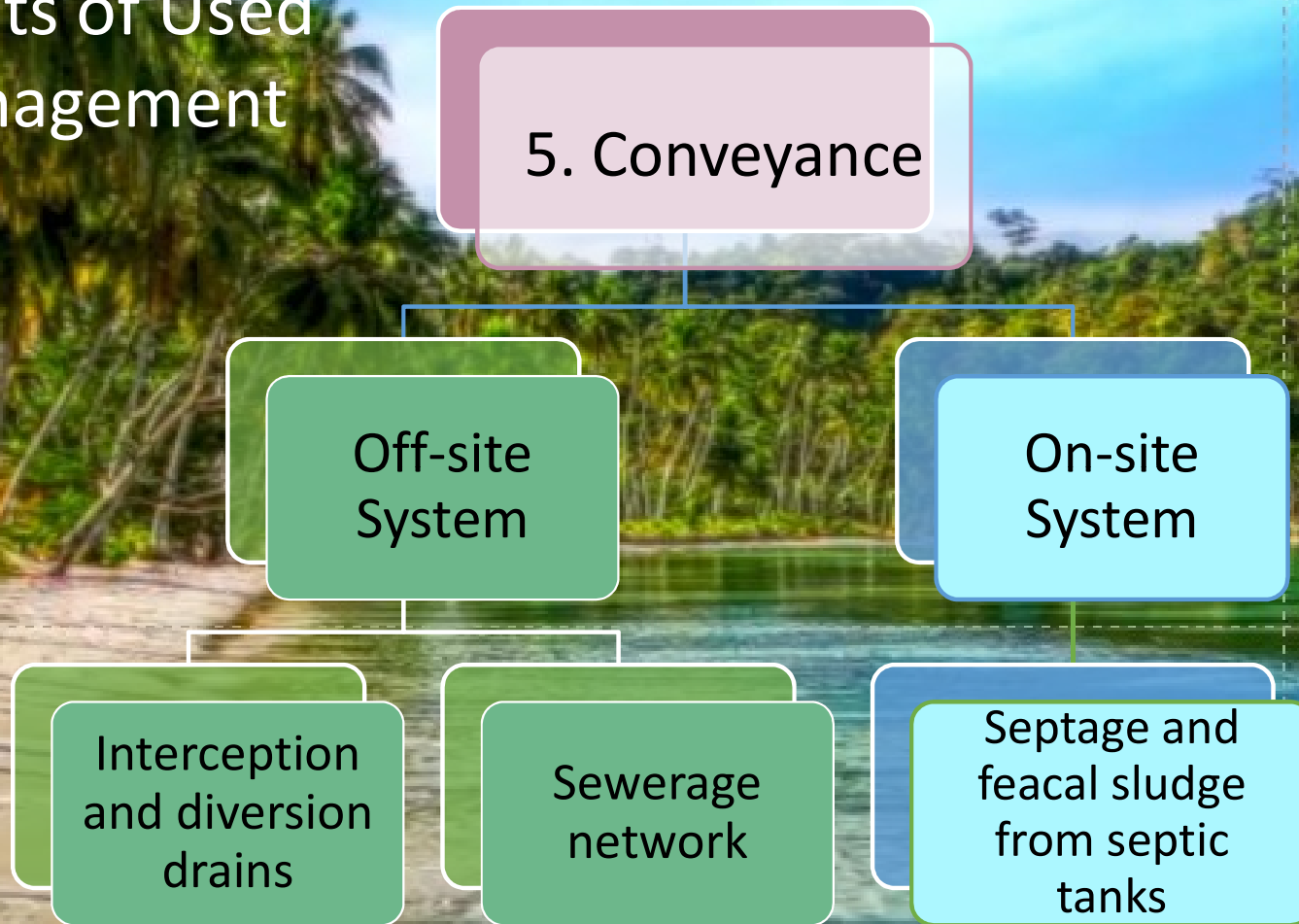
# Components of Used Water Management Systems



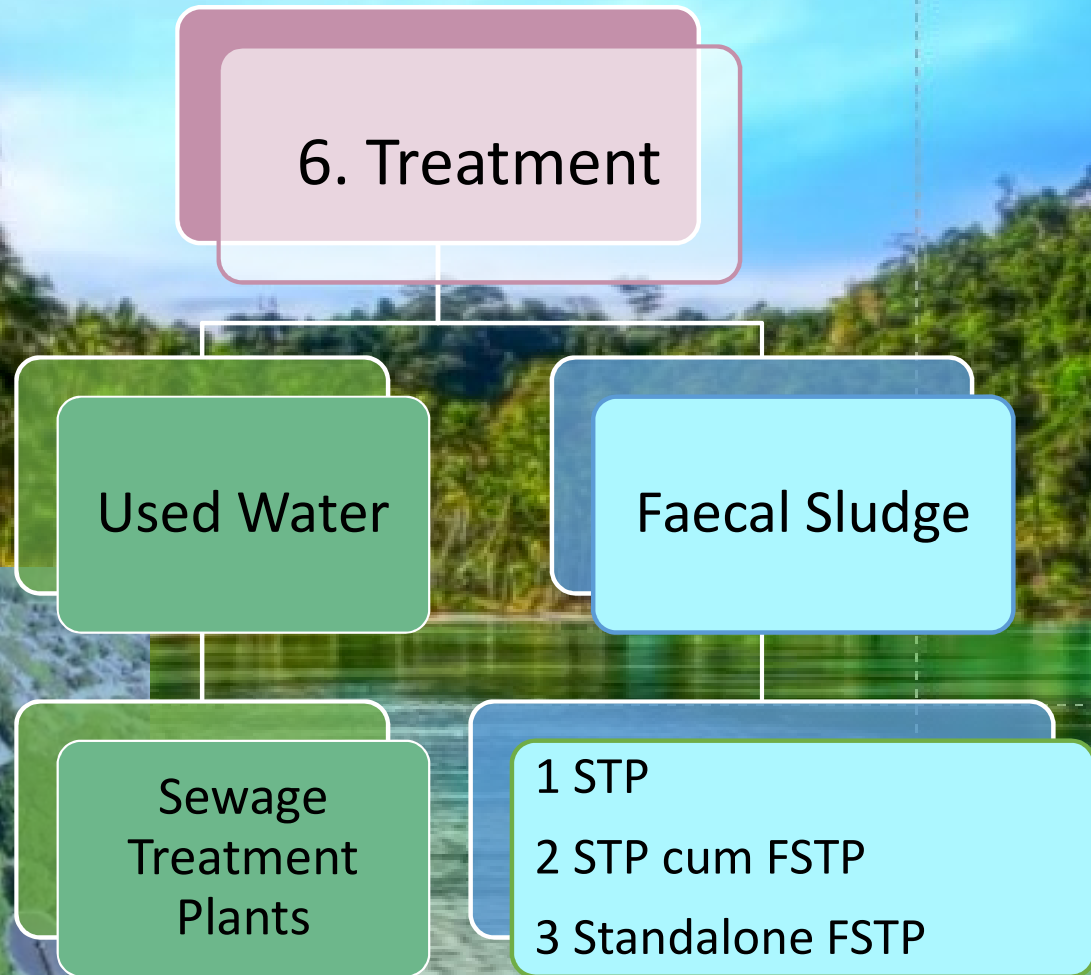
# Components of Used Water Management Systems



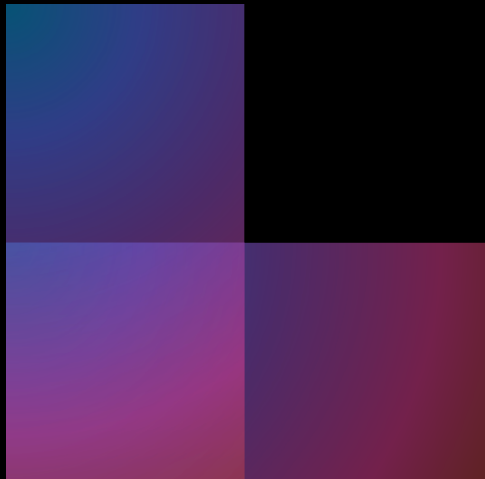
# Components of Used Water Management Systems



# Components of Used Water Management Systems



# Components of Used Water Management- 7. Recycle/Disposal



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1. Non-potable purposes like flushing toilets, gardening and greenbelt development etc.

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2. Agricultural purposes

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3. Horticulture purposes

---

4. Industrial purposes

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5. Municipal purposes like dust mitigation, road washing,

---

6 construction activity

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7. Water body rejuvenation

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# Components of Used Water Management- 7 Recycle/Disposal

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1. Non-potable purposes like flushing toilets, gardening etc.

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2. Agricultural purposes

---

3. Industrial

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Targeted to recycle and reuse at least 20% of treated usedwater

tion,

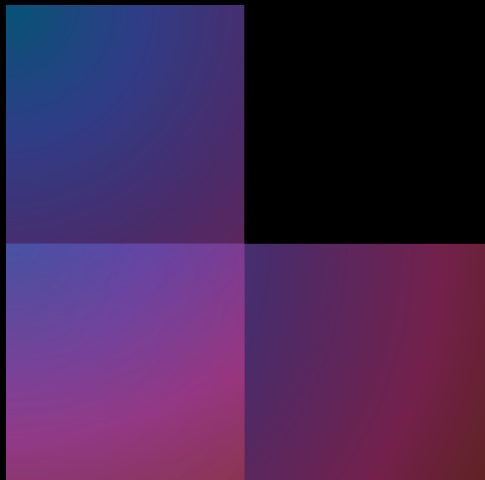
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6 construction activity

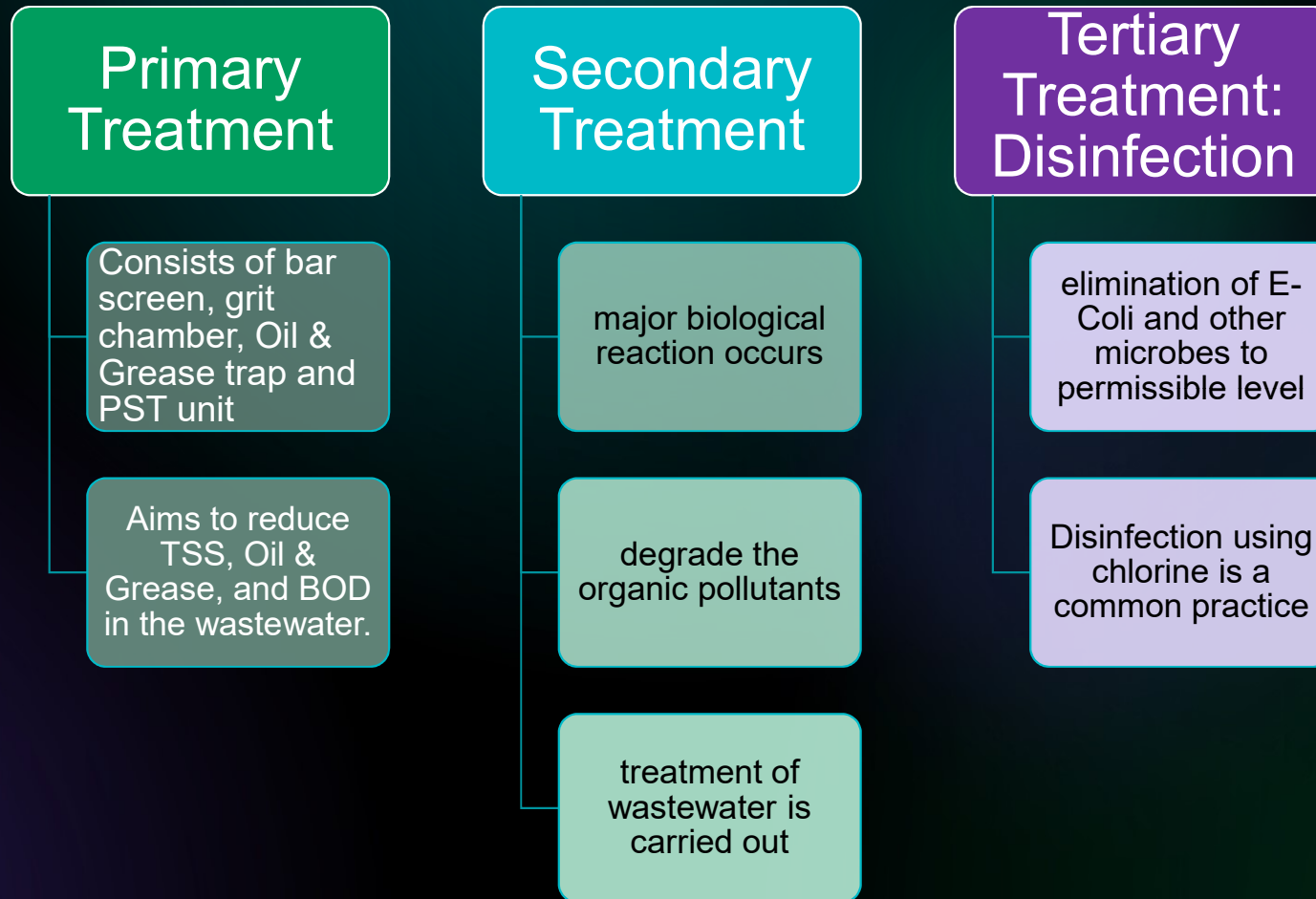
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7. Water body rejuvenation

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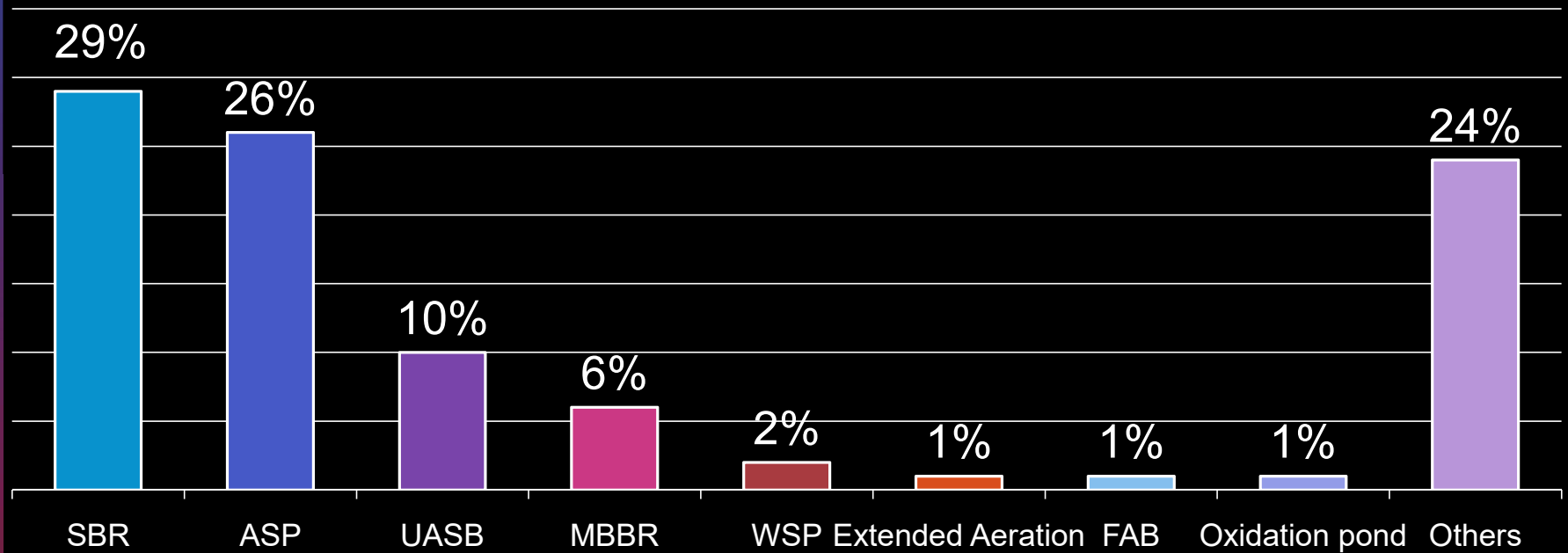


# Sewage Treatment Processes





## Trends of adoption of Used Water Treatment technologies in India- as per treatment capacity in mld





## Typical Sewage Concentrations for Design Purpose

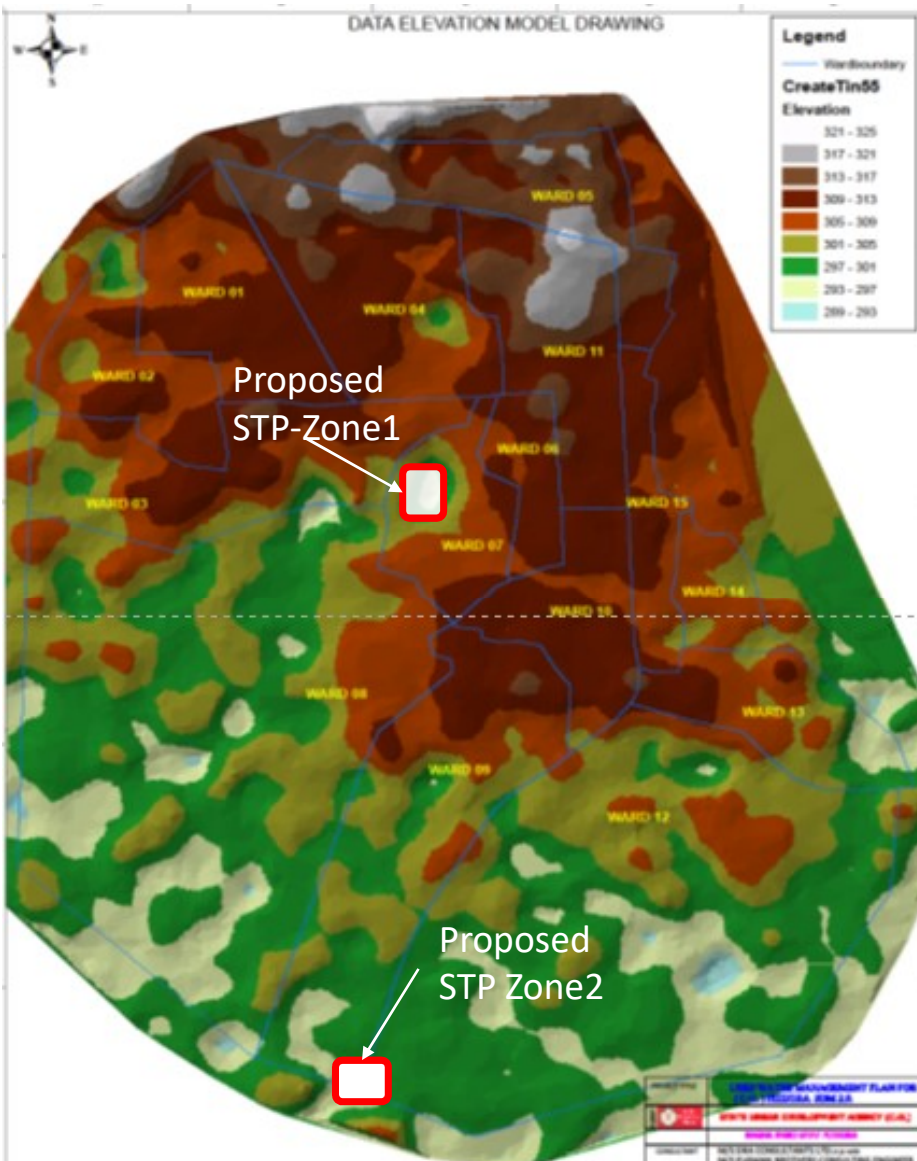
| SN | Item                          | Concentration<br>mg/l |
|----|-------------------------------|-----------------------|
| 1  | Biological oxygen demand, BOD | 250                   |
| 2  | Total Nitrogen                | 50                    |
| 3  | Nitrate Nitrogen              | 15                    |
| 4  | Total Suspended Solids        | 120                   |

## Design parameters of UWMP

| Water supply      | 135 lpcd          | Used water-108 lpcd      |
|-------------------|-------------------|--------------------------|
| Pumping main      | DI K-9            | HW C-140                 |
| STP               | Designed for 2026 | 56% of water supply rate |
| Wet well          | Designed for 2056 | 80% of water supply rate |
| Pumping machinery | Designed for 2026 | 80% of water supply rate |
| Influent BOD      | 250 mg/l          |                          |
| Effluent BOD      | 30 mg/l           |                          |

# Case study of Pithora- Principal features

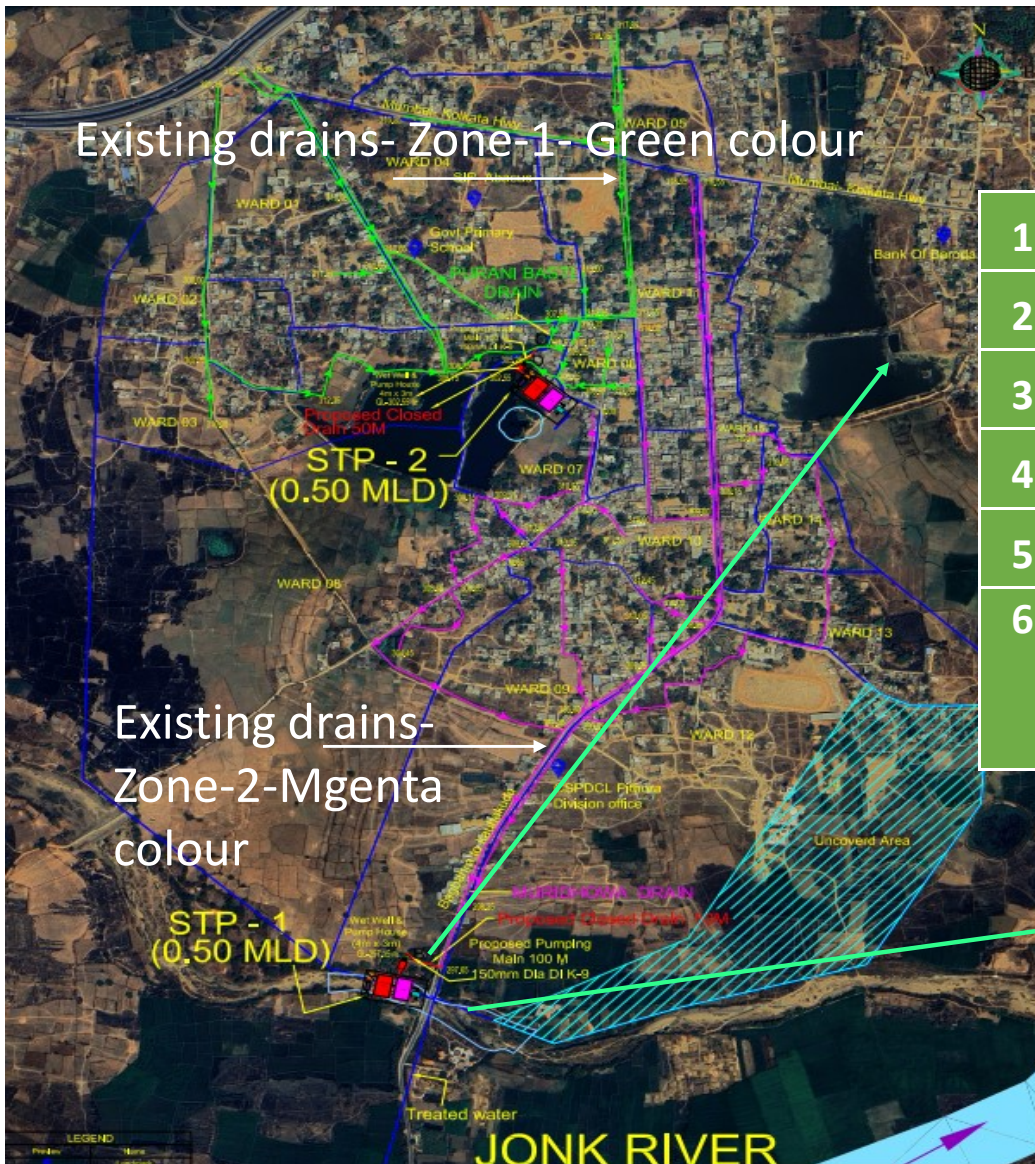
|                                         |                                                                                             |
|-----------------------------------------|---------------------------------------------------------------------------------------------|
| <b>Name of town</b>                     | <b>Pithora, District-Mahasamund, CG</b>                                                     |
| <b>Census population 2011</b>           | 8428                                                                                        |
| <b>Area covered under council</b>       | 2.758 km <sup>2</sup>                                                                       |
| <b>Population projected</b>             | 10212 (2026); 11995 (2041); 13779(2056)                                                     |
| <b>Number of Wards</b>                  | 15 Wards                                                                                    |
| <b>Areas to be benefitted</b>           | Ward no 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 (60%),13(60%),14 & 15                         |
| <b>Zones created</b>                    | Two                                                                                         |
| <b>Proposal</b>                         | There are existing drains. It is proposed to construct new drain connecting to proposed STP |
| <b>Treatment</b>                        | Two STPs, each of cap 0.5 MLD are proposed                                                  |
| <b>Construction Cost of the project</b> | 1.69 Cr                                                                                     |



## Identifying Location of Wetwell and Pumping Station/STP

### Pithora

- Inverse Distance Weighted (IDW) surface is created using ArcGIS
  - Light blue, light yellow colour indicate lower area
  - Hence likely spots for wet wells/ STPs
- Identified spots for wet well and STPs



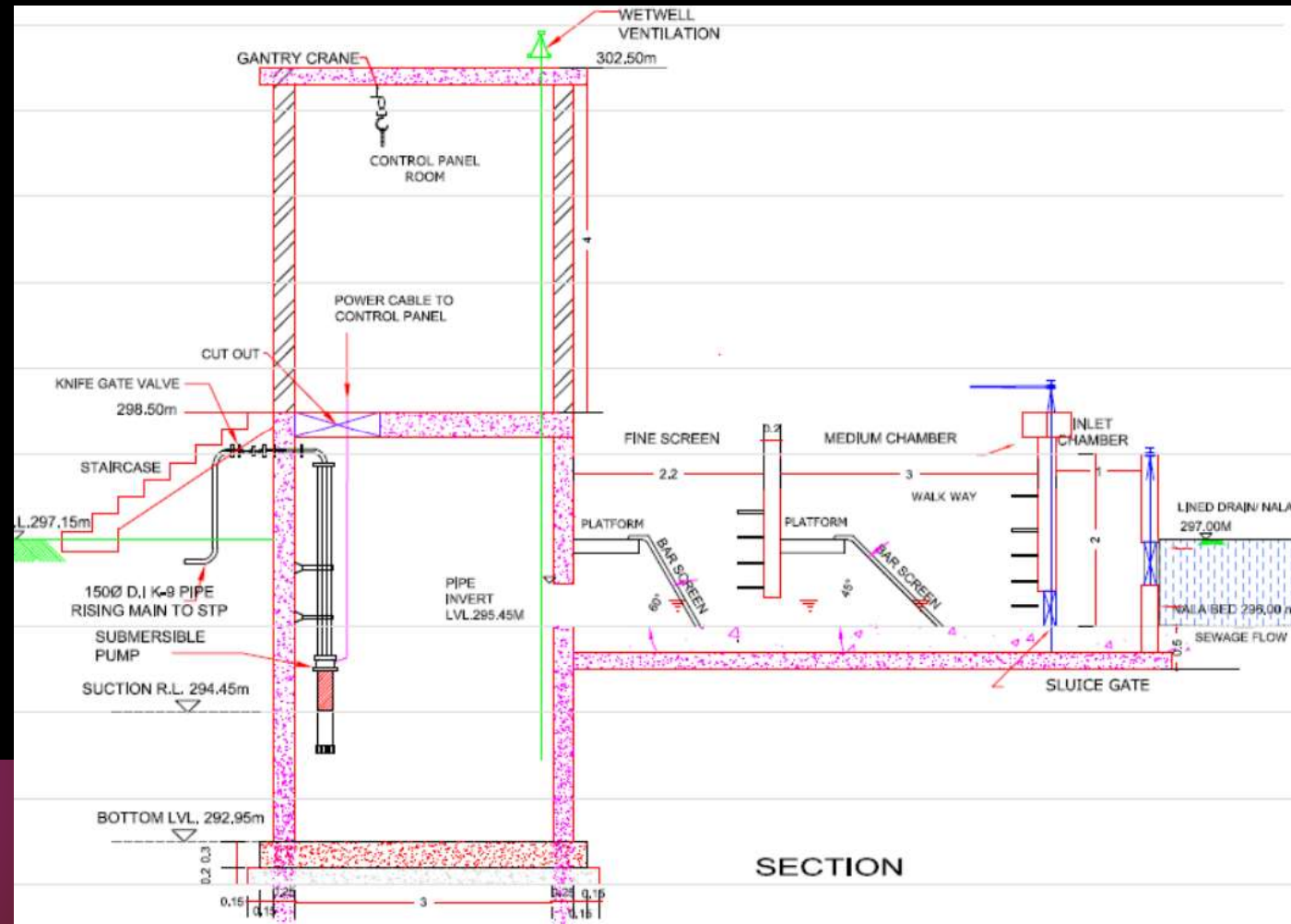
## Pithora-Zone-2, Works proposed

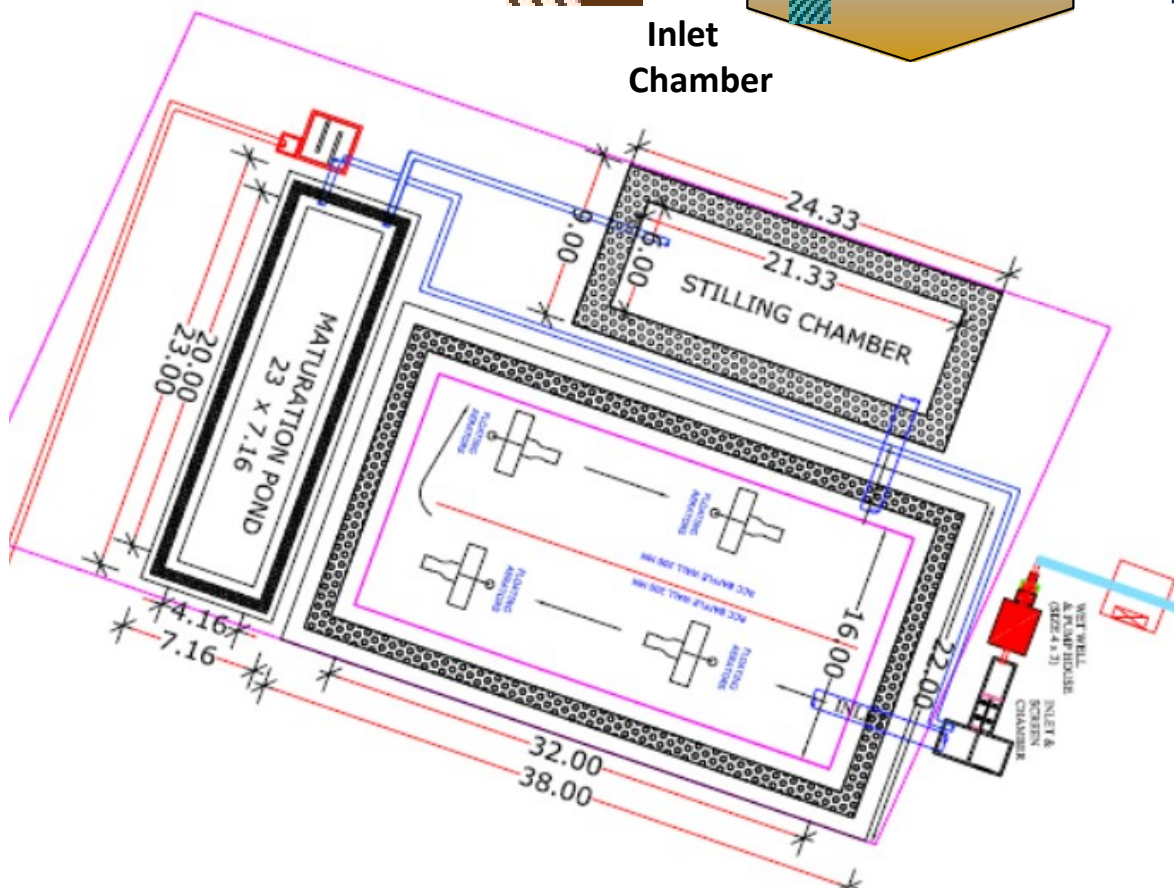
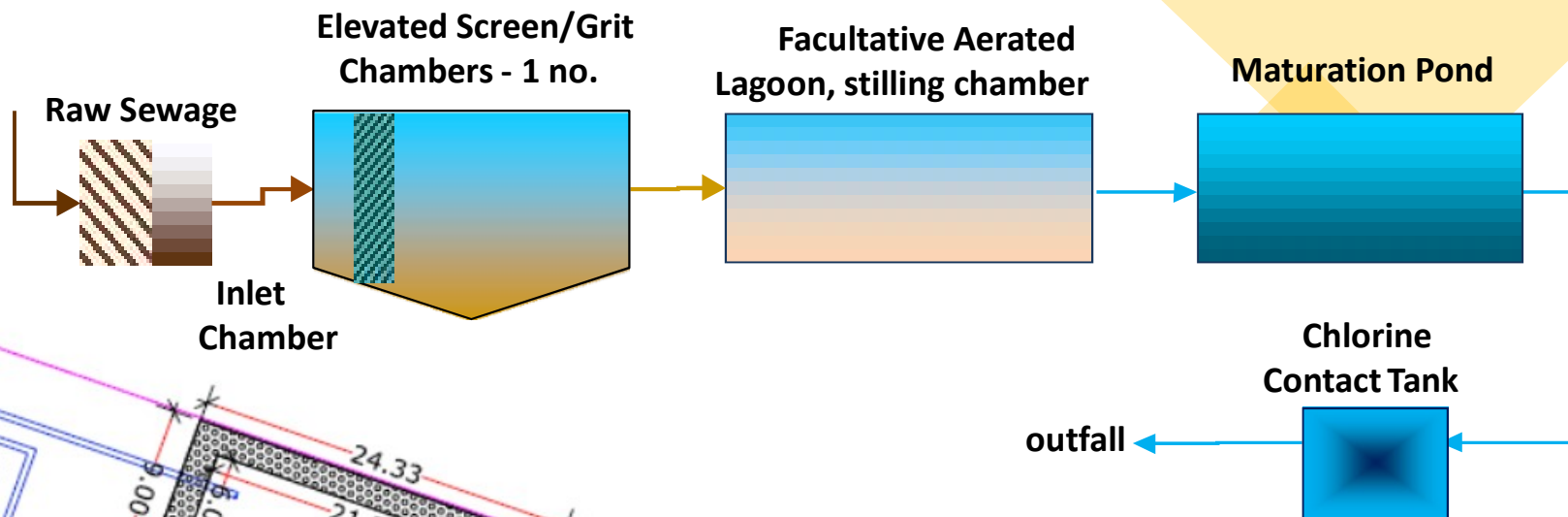
- 1 Construction of Closed Drain (Length 0.05 km)
- 2 Inlet & Screen Chamber for Wet Well
- 3 Wet well with overhead Pump House- 4 m x 3 m
- 4 Raw Sewage Pumping Machinery: 1 HP, 2 HP, 5 HP
- 5 Raw sewage P/M 150 mm DI K-9, length = 100 m
- 6 Facultative Aerated Lagoon of 0.50 MLD capacity comprising of stilling chamber, facultative aerated lagoons, aerators, maturation pond, chlorination tank



# Pithora-

## Wet well with overhead pump house, medium and fine screen



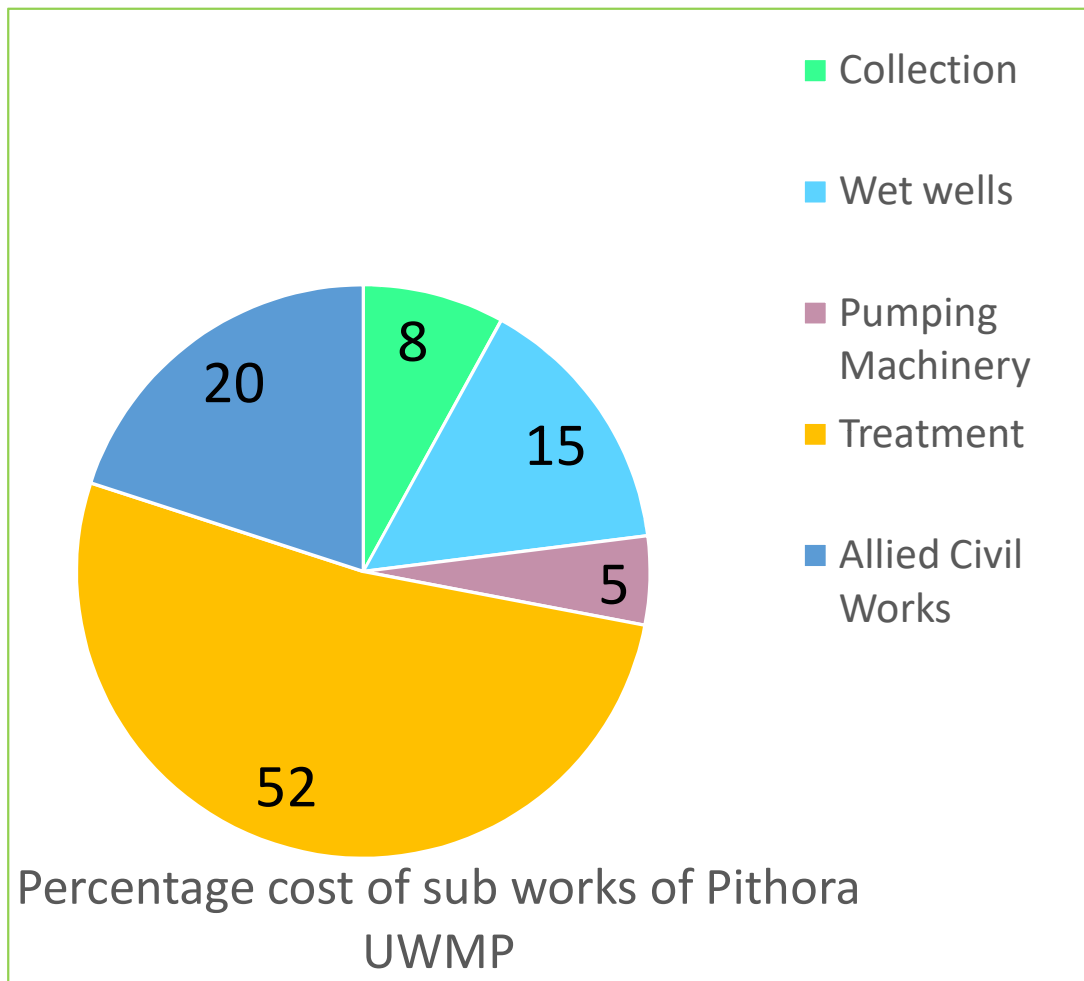


Pithora-

Proposed STP capacity- 0.5 MLD

Type- Facultative Aerated lagoon

## Estimated construction cost of Pithora UWMP



| SN | Particulars        | Amount (lakh) | % of total cost |
|----|--------------------|---------------|-----------------|
| 1  | Collection         | 12.5          | 8%              |
| 2  | Wet wells          | 25.2          | 15%             |
| 3  | Pumping Machinery  | 8.8           | 5%              |
| 4  | STPs               | 88.9          | 52%             |
| 5  | Allied Civil Works | 34.4          | 20%             |
|    | <b>Total</b>       | <b>169.8</b>  | <b>100%</b>     |

# Case study of Ramanujganj- Principal features

|                                         |                                                                                                                       |
|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| <b>Name of town</b>                     | <b>Ramanujganj, District-Balrampur-Ramanujganj, CG</b>                                                                |
| <b>Census population 2011</b>           | 11,893                                                                                                                |
| <b>Area covered under council</b>       | 6.6 km <sup>2</sup>                                                                                                   |
| <b>Population projected</b>             | 15,968 (2026); 21140 (2041); 27,912 (2056)                                                                            |
| <b>Number of Wards</b>                  | 15 Wards                                                                                                              |
| <b>Areas to be benefitted</b>           | All wards excluding ward 3                                                                                            |
| <b>Zones created</b>                    | one                                                                                                                   |
| <b>Proposal</b>                         | There are existing drains. It is proposed to construct new drain<br>And interceptor sewers connecting to proposed STP |
| <b>Treatment</b>                        | STPs of cap 1.5 MLD                                                                                                   |
| <b>Construction Cost of the project</b> | 3.66 Cr                                                                                                               |



## Ramanujganj UWMP,

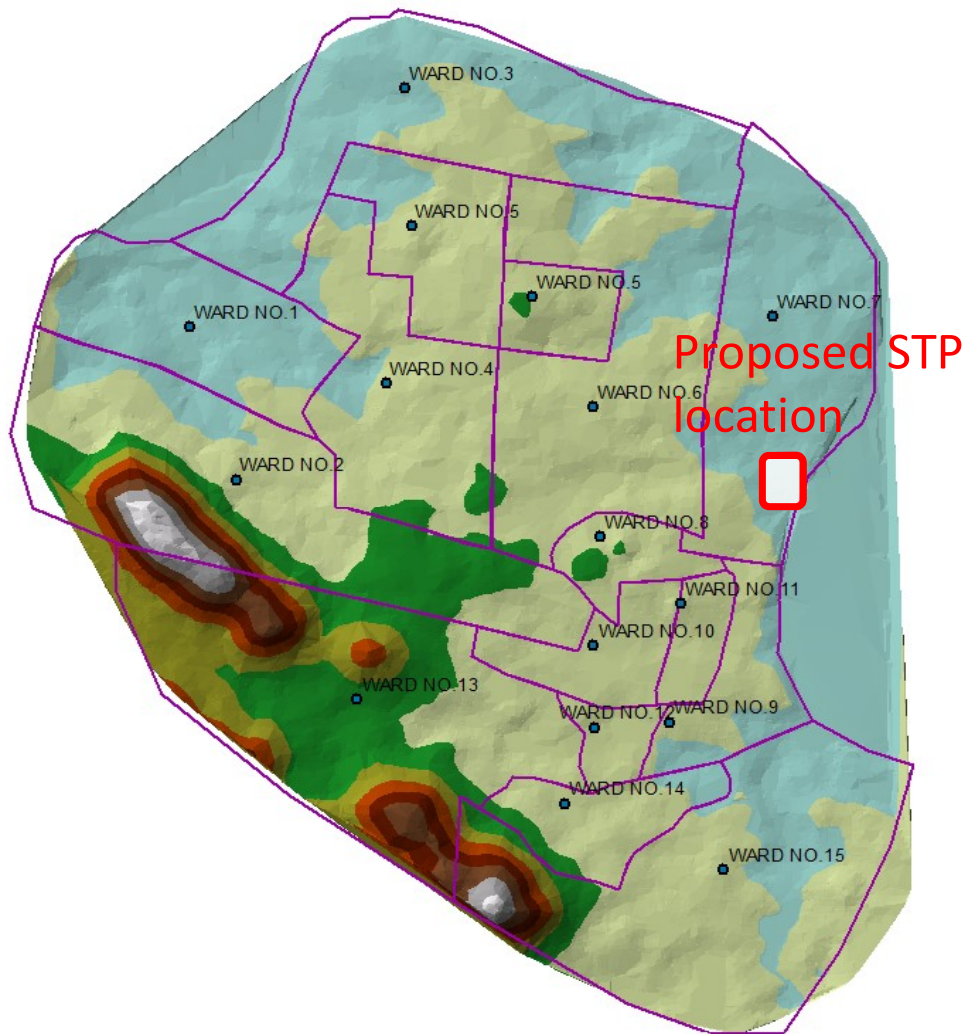
Balrampur-Ramanujganj District, CG

- Existing drains are discharging used water into local nalla which pollutes Kanhar river.
- Internal drains 1305 m of various sizes.
- Interceptor sewer of 900 m length (350/300 dia) is proposed to convey used water to proposed STP

## Ramanujganj UWMP,

Balrampur-Ramanujganj District, CG

Identifying Location of Wetwell and Pumping Station/STP



### Elevation

517.778 - 531

504.556 - 517.778

491.333 - 504.556

478.111 - 491.333

464.889 - 478.111

451.667 - 464.889

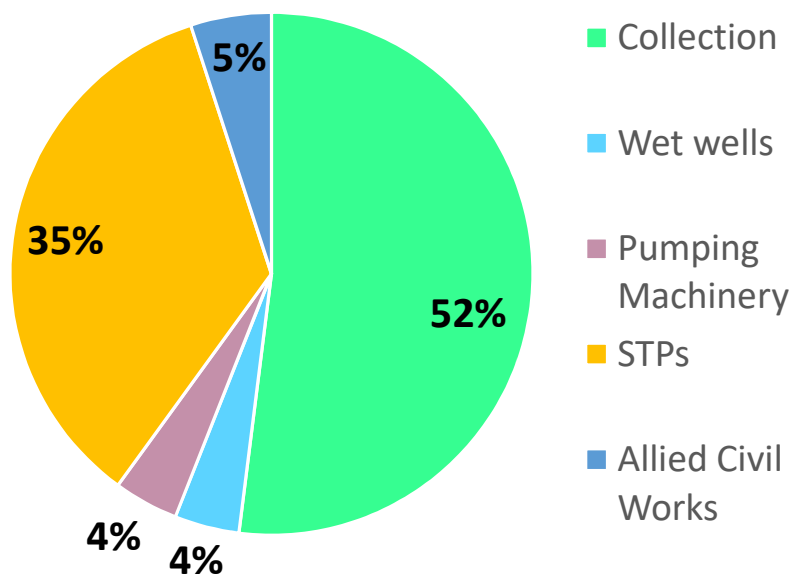
438.444 - 451.667

425.222 - 438.444

412 - 425.222

## Estimated construction cost of Ramanujganj UWMP

% of total construction cost



| SN    | Particulars        | Amount (lakh) | Percentage |
|-------|--------------------|---------------|------------|
| 1     | Collection         | 190.8         | 52%        |
| 2     | Wet wells          | 15.0          | 4%         |
| 4     | Pumping Machinery  | 14.5          | 4%         |
| 6     | STPs               | 128.5         | 35%        |
| 8     | Allied Civil Works | 16.9          | 5%         |
| Total |                    | 365.8         | 100%       |

# Case study of Manendragarh- Principal features

|                                  |                                                                                                                     |
|----------------------------------|---------------------------------------------------------------------------------------------------------------------|
| Name of town                     | Manendragarh, District-Balrampur-Ramanujganj, CG                                                                    |
| Census population 2011           | 33,071                                                                                                              |
| Area covered under council       | 20 km <sup>2</sup>                                                                                                  |
| Population projected             | 37,313 (2026); 40,451 (2041); 42,481 (2056)                                                                         |
| Number of Wards                  | 22 Wards                                                                                                            |
| Areas to be benefitted           | All wards                                                                                                           |
| Zones created                    | Three                                                                                                               |
| Proposal                         | Interception and diversion chamber 10 No, diversion weirs, interceptor sewer line along nalla of 4.7 km is proposed |
| Treatment                        | Waste stabilization pond type STPs of cap 2.5 MLD, 0.5 MLD and soak pits                                            |
| Construction Cost of the project | 8.64 Cr                                                                                                             |

## Case study of Manendragarh-

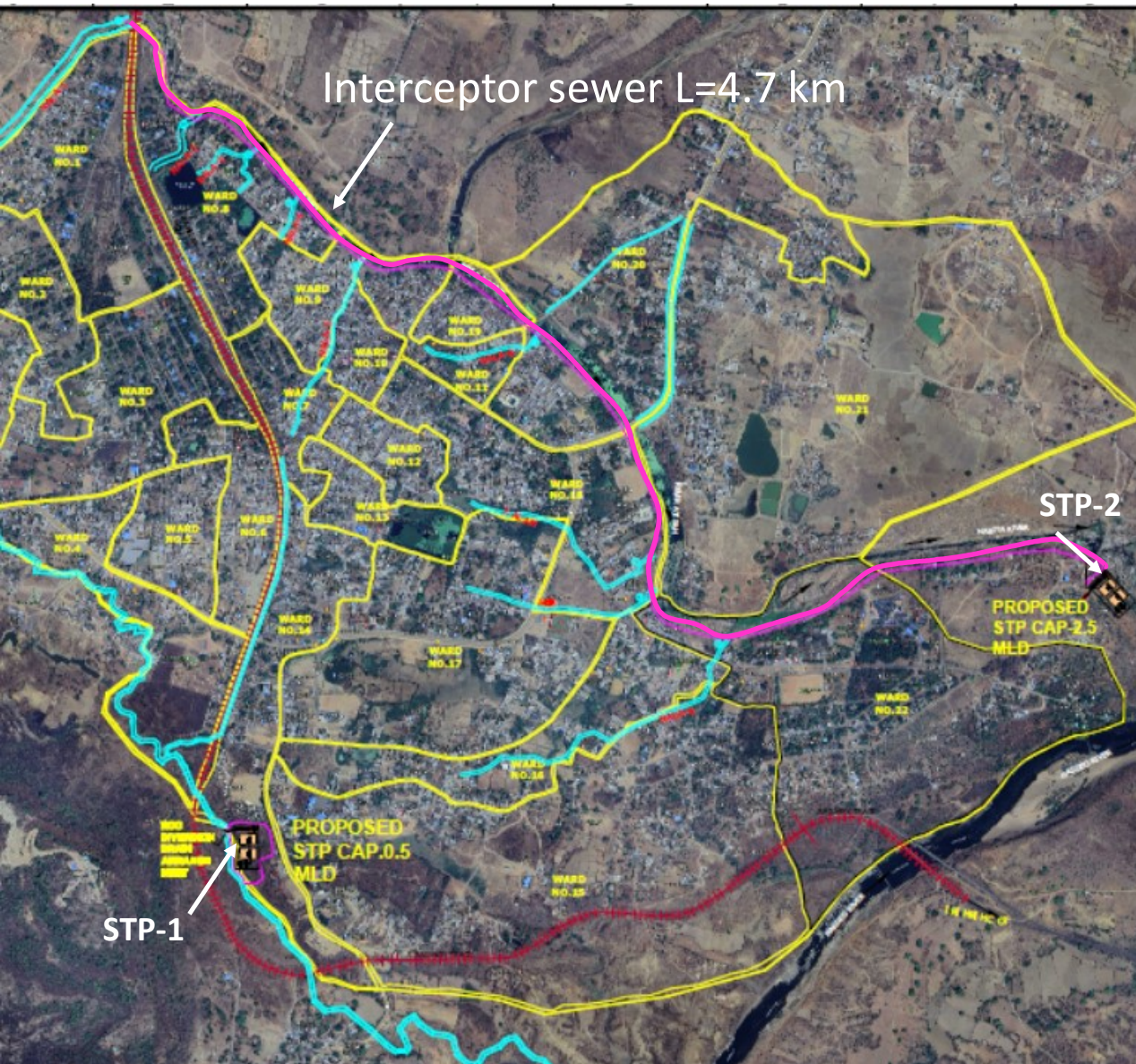


1 Three zones are created based on topography.

2. Zone-1-On South West side a weir is proposed to arrest used water from three wards, WSP of cap 0.5 MLD is proposed

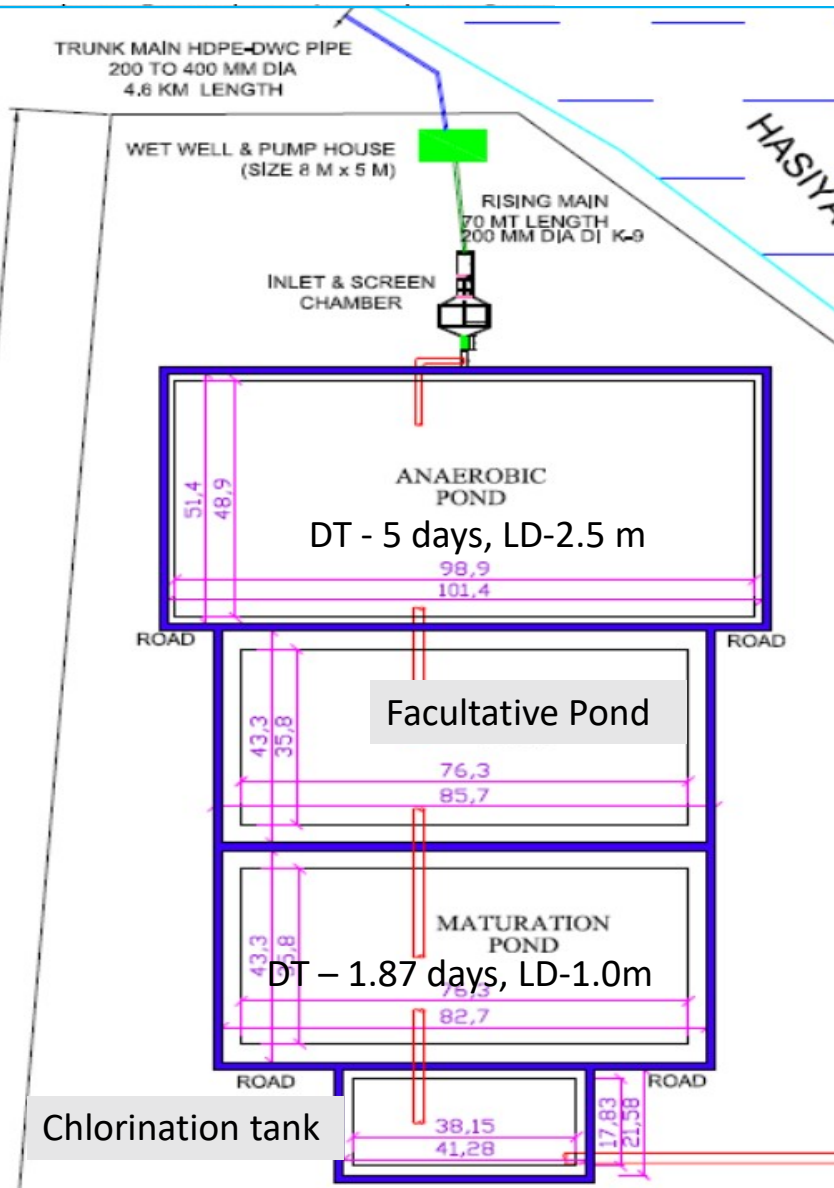
3 On North East side, used water from 10 nallas is disposed in Hasiya river. Interception and diversion chamber and interceptor sewer is proposed to collect and convey used water to WSP of cap 2.5 MLD

4. Slope of two wards is in opposite direction. So these wards are excluded from the proposal



## Manendragarh- Zone-2 Sub works

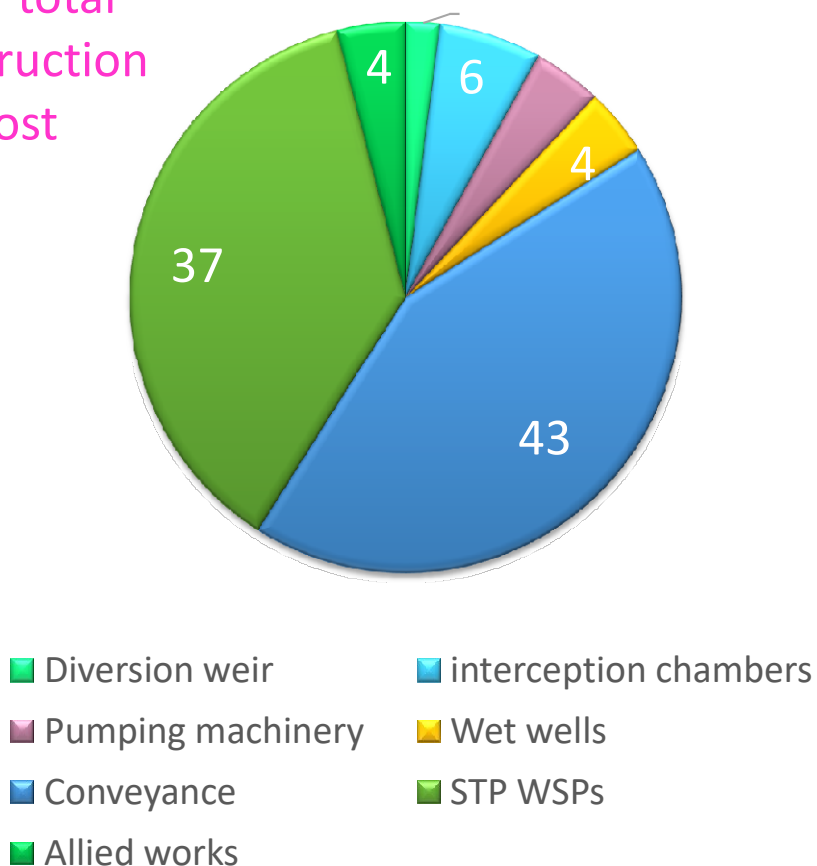
- (i) Interception & Diversion Chamber for Nallah Interception. (10 Nos)
- (ii) Interceptor Sewer Line along River Bank (4.7 KM)
- (iii) Wet Well with overhead Pump house near STP (10m x 5m )
- (iv) Raw Sewer Pumping Machinery
- (v) Rising Main, 200 mm DI- K-9, L= 70M
- (vi) Inlet Chamber, Screen Chamber & Grit Chamber.
- (vii) STP 2.5 MLD -Anaerobic Pond , Facultative Pond, Maturation Pond, Chlorination Pond



Details of 2.5  
MLD capacity  
Waste  
Stabilization  
Pond

## Estimated construction cost of Manendragarh UWMP

% of total  
construction  
cost



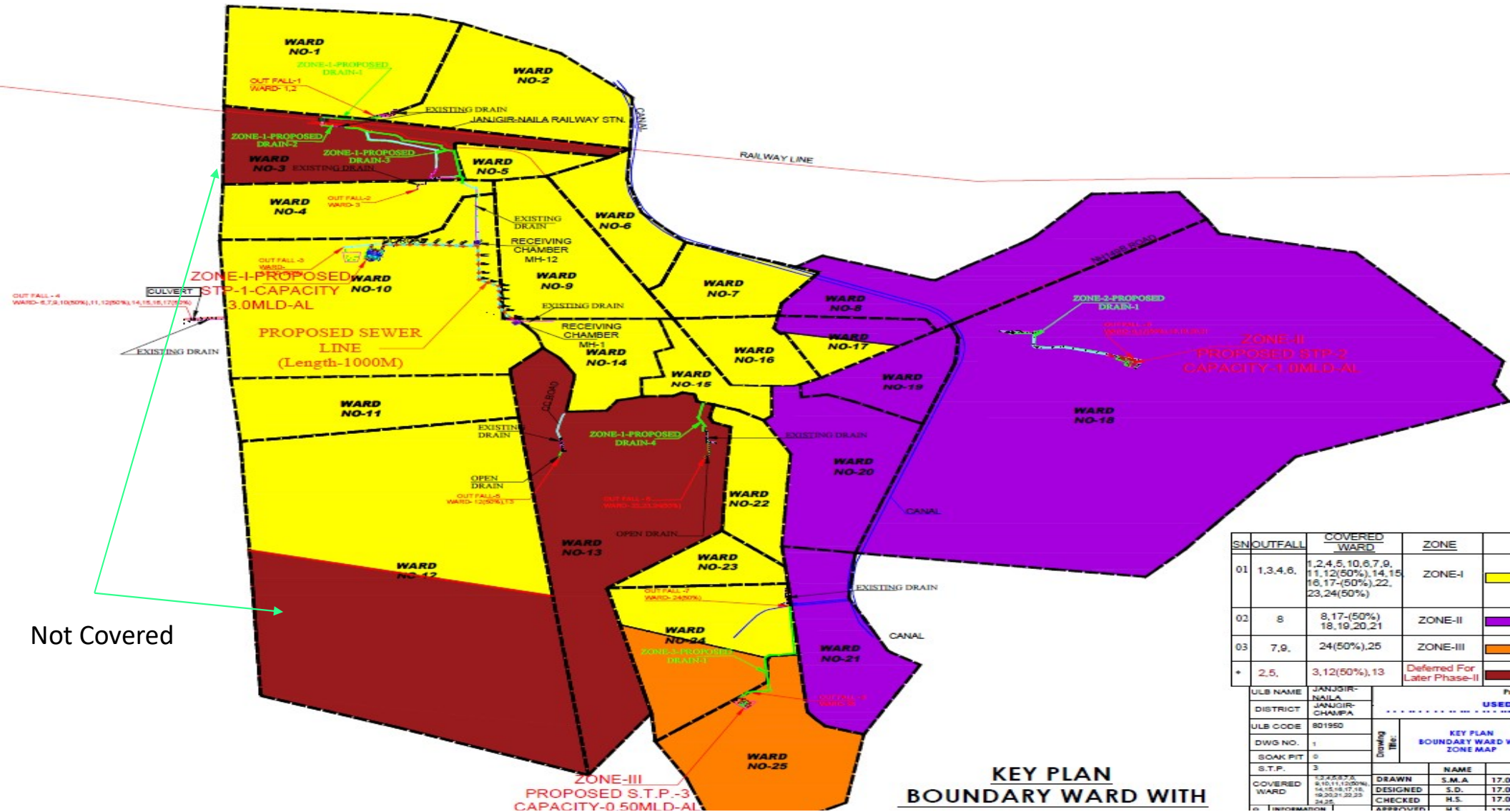
| SN    | Subwork                                                 | Cost in lakh | % of total cost |
|-------|---------------------------------------------------------|--------------|-----------------|
| 1     | Diversion weir                                          | 20.2         | 2               |
| 2     | Interception, diversion chambers, screen, grit chambers | 48.7         | 6               |
| 3     | Pumping machinery                                       | 36.4         | 4               |
| 4     | Wet wells                                               | 35.6         | 4               |
| 5     | Conveyance                                              | 369.1        | 43              |
| 6     | STP WSPs                                                | 319.7        | 37              |
| 7     | Allied works                                            | 34.5         | 4               |
| Total |                                                         | 864.3        | 100%            |

# **Case study of Janjgir Naila**

# Principal features

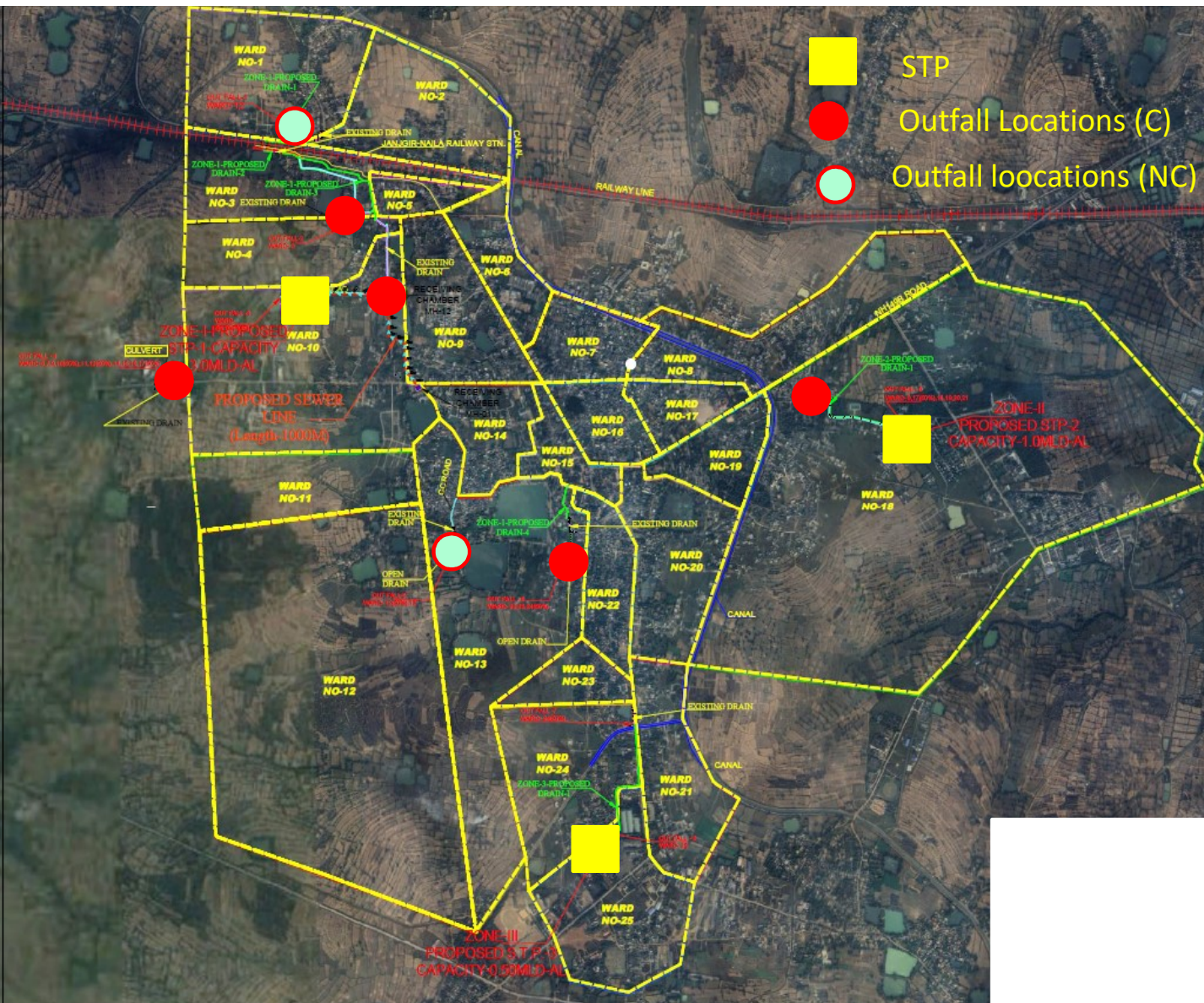
|                                         |                                                                                                                                  |
|-----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| <b>Name of town</b>                     | Janjgir Naila, District-Janjgir Champa, CG                                                                                       |
| <b>Census population 2011</b>           | 40,561                                                                                                                           |
| <b>Area covered under council</b>       | 19.36 km <sup>2</sup>                                                                                                            |
| <b>Population projected</b>             | 54873 (2026); 73530 (2041); 98243 (2056)                                                                                         |
| <b>Number of Wards</b>                  | 25 Wards                                                                                                                         |
| <b>Areas to be benefitted</b>           | 1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 12 (50%), 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25                                         |
| <b>Zones created</b>                    | Three                                                                                                                            |
| <b>Proposal</b>                         | There are existing drains. It is proposed to tap these drains using an Interceptor sewer and convey the used water to three STPs |
| <b>Treatment</b>                        | STPs of cap 3, 1 and 0.50 MLD                                                                                                    |
| <b>Construction Cost of the project</b> | 7.52 Cr                                                                                                                          |

## Identifying Location of Outfalls and STPs



| SN | OUTFALL  | COVERED WARD                                                | ZONE                        |
|----|----------|-------------------------------------------------------------|-----------------------------|
| 01 | 1,3,4,6, | 1,2,4,5,10,6,7,9,11,12(50%),14,15,16,17-(50%),22,23,24(50%) | ZONE-I                      |
| 02 | 8        | 8,17-(50%),18,19,20,21                                      | ZONE-II                     |
| 03 | 7,9,     | 24(50%),25                                                  | ZONE-III                    |
| +  | 2,5,     | 3,12(50%),13                                                | Deferred For Later Phase-II |

|              |                                              |      |
|--------------|----------------------------------------------|------|
| ULB NAME     | JANJIR-NAILA                                 | USED |
| DISTRICT     | JANJIR-CHAMPA                                |      |
| ULB CODE     | 801950                                       |      |
| DWG NO.      | 1                                            |      |
| SOAK PIT     | 0                                            |      |
| S.T.P.       | 3                                            |      |
| COVERED WARD | 13,22,23,24,15,16,17,18,19,20,21,22,23,24,25 |      |
| DATE         | 13/05/2023                                   |      |
| DRAWN        | S.M.A.                                       | 17.0 |
| DESIGNED     | S.D.                                         | 17.0 |
| CHECKED      | H.S.                                         | 17.0 |
| APPROVED     |                                              |      |

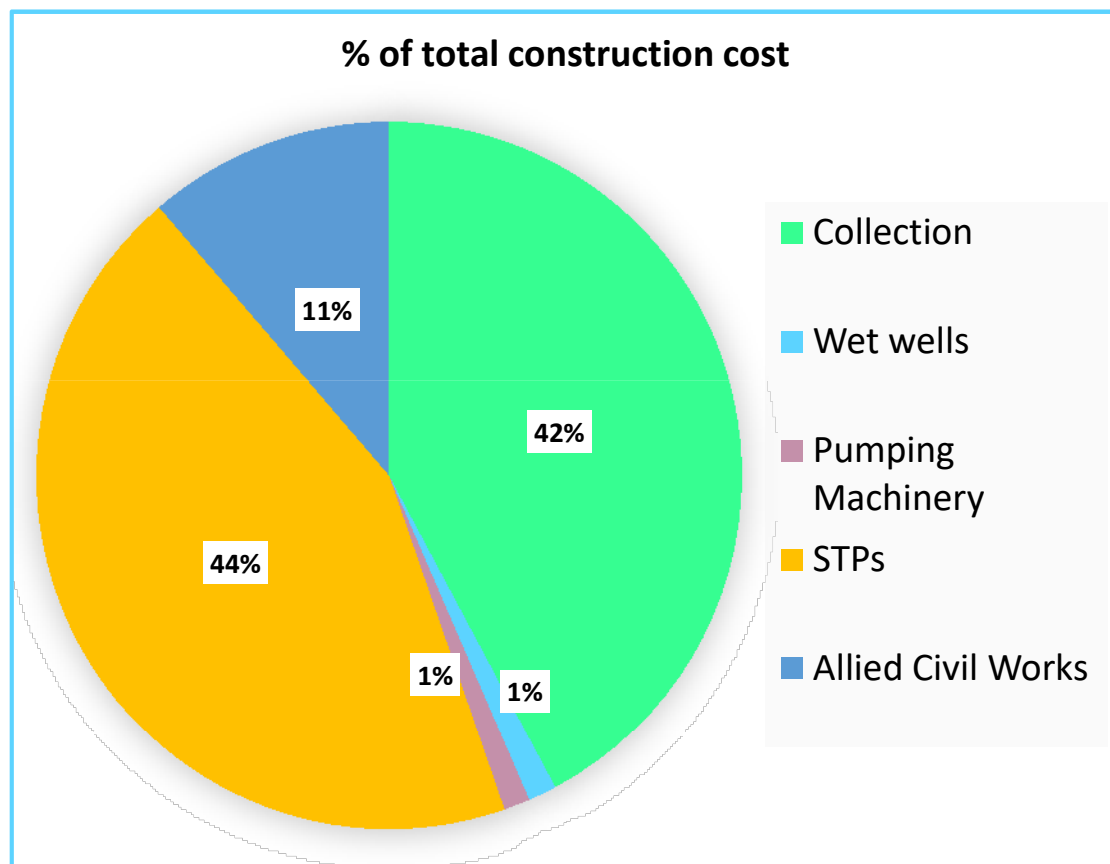


## Janjgir Naila UWMP,

Janjgir Champa District, CG

- Existing drains discharge used water into local nalla which pollutes Hasdeo river.
- Interceptor sewer of 1000 m length along with drains is proposed to convey used water to proposed STPs

## Estimated construction cost of Janjgir Naila UWMP



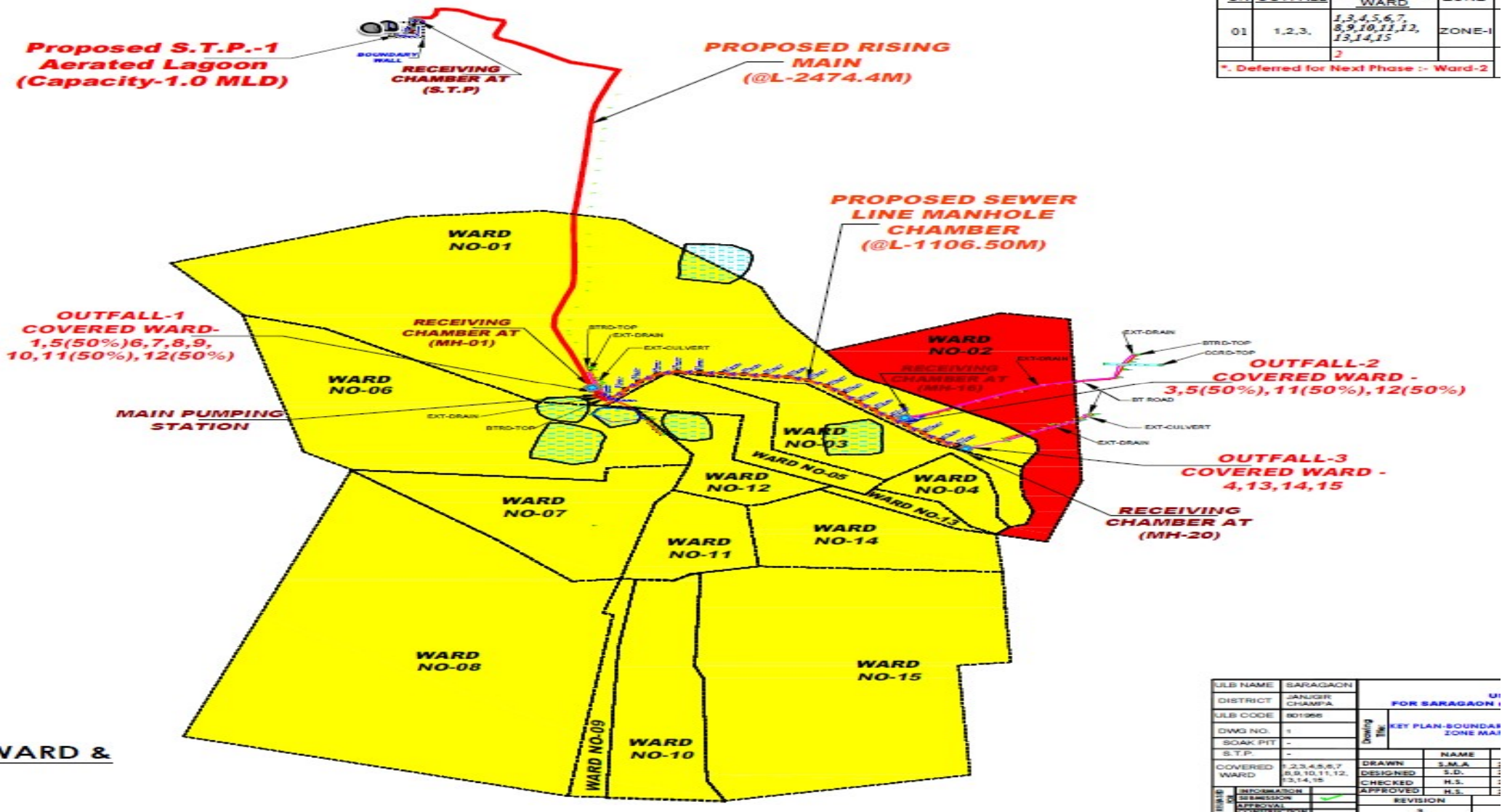
| SN    | Particulars        | Amount (lakh) | Percentage |
|-------|--------------------|---------------|------------|
| 1     | Collection         | 317.38        | 42%        |
| 2     | Wet wells          | 9.80          | 1%         |
| 4     | Pumping Machinery  | 9.00          | 1%         |
| 6     | STPs               | 331.07        | 44%        |
| 8     | Allied Civil Works | 85.09         | 11%        |
| Total |                    | 752.34        | 100%       |

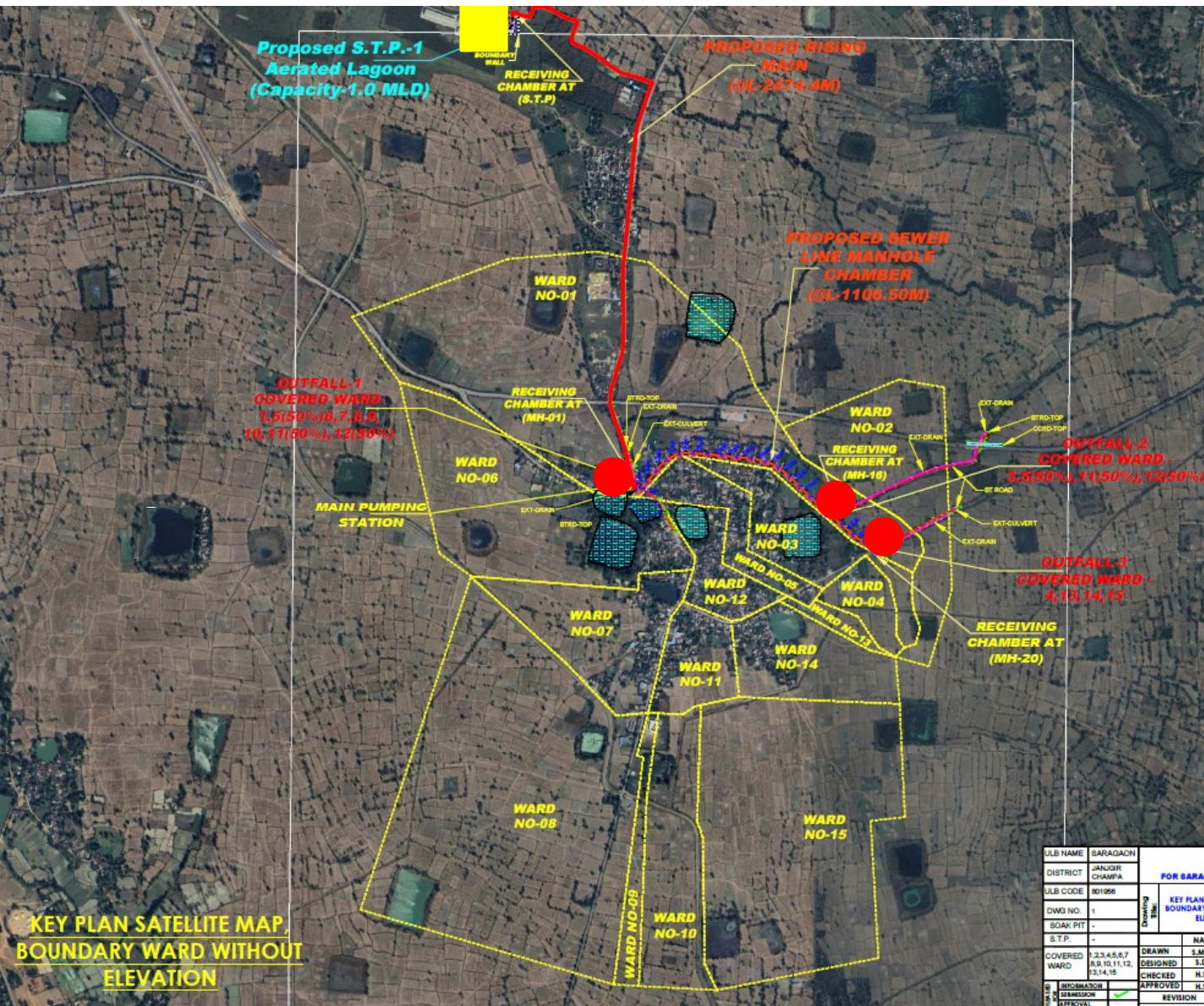
# **Case study of Saragaon Town**

## Principal features

|                                         |                                                                                                                                    |
|-----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| <b>Name of town</b>                     | Saragaon Town, District-Janjgir Champa, CG                                                                                         |
| <b>Census population 2011</b>           | 7,216                                                                                                                              |
| <b>Area covered under council</b>       | 14.77 km <sup>2</sup>                                                                                                              |
| <b>Population projected</b>             | 8897 (2026); 10929 (2041); 13362 (2056)                                                                                            |
| <b>Number of Wards</b>                  | 15 Wards                                                                                                                           |
| <b>Areas to be benefitted</b>           | All Except Ward 2                                                                                                                  |
| <b>Zones created</b>                    | One                                                                                                                                |
| <b>Proposal</b>                         | There are existing drains. It is proposed to tap these drains using an Interceptor sewer and convey the used water to proposed STP |
| <b>Treatment</b>                        | STP of cap 1 MLD                                                                                                                   |
| <b>Construction Cost of the project</b> | 2.44 Cr                                                                                                                            |

## Identifying Location of Outfalls and STPs





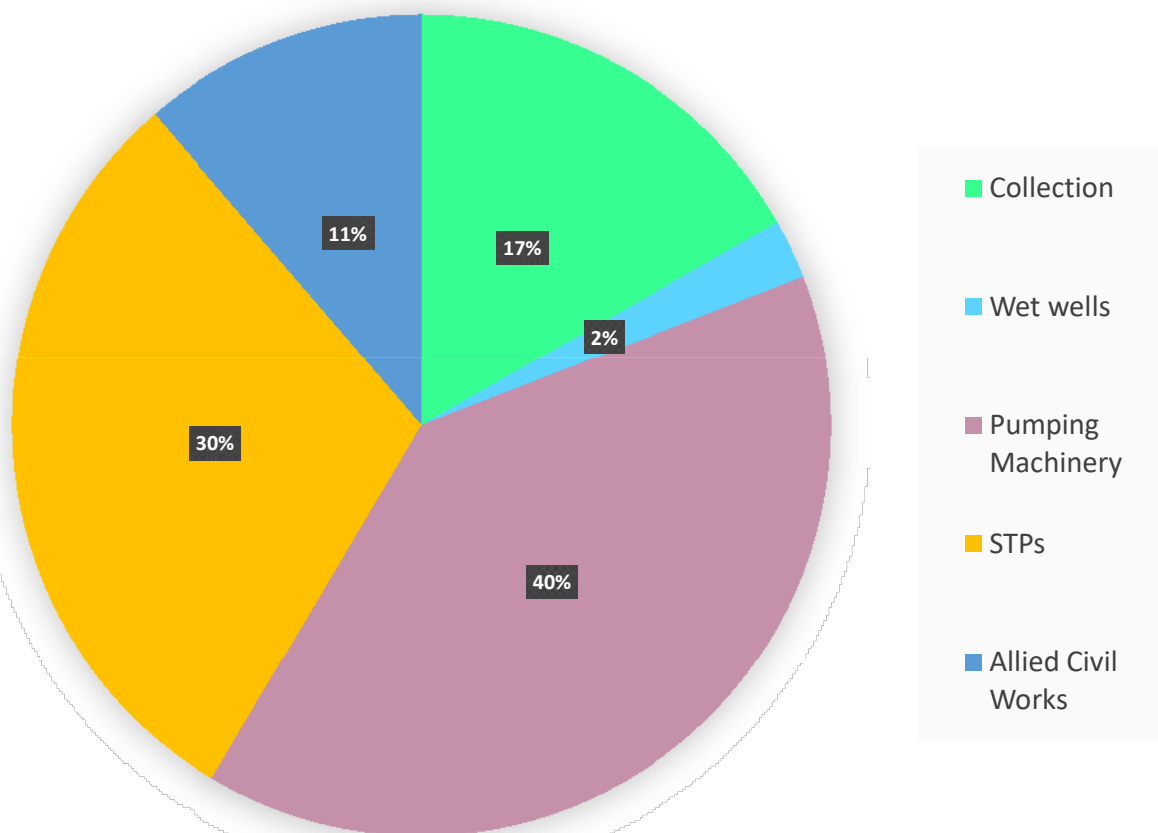
## Saragaon UWMP,

Janjgir Champa District, CG

- Existing drains discharge used water into local nalla which pollutes Hasdeo river.
- 3 outfalls are located
- In this case, interceptor sewer of 1106m length along with drains is proposed to convey used water to proposed STPs
- Due to unavailability of land, STP is located outside.

## Estimated construction cost of Saragaon Town UWMP

% of total construction cost



| SN    | Particulars        | Amount (lakh) | Percentage |
|-------|--------------------|---------------|------------|
| 1     | Collection         | 40.89         | 17%        |
| 2     | Wet wells          | 5.7           | 2%         |
| 4     | Pumping Machinery  | 96.17         | 39%        |
| 6     | STPs               | 73.57         | 30%        |
| 8     | Allied Civil Works | 27.61         | 11%        |
| Total |                    | 243.94        | 100%       |

## A) Sewage Treatment & Management (Nature based solutions)

- Engineered Natural Sewage Treatment System (ENSeTS) – TRL 7



1) Ordnance Factory Ambajhari Nagpur for **100 m<sup>3</sup>/d capacity (2016)**: Anaerobic system → Subsurface horizontal flow constructed wetlands → Tertiary treatment → Disinfection

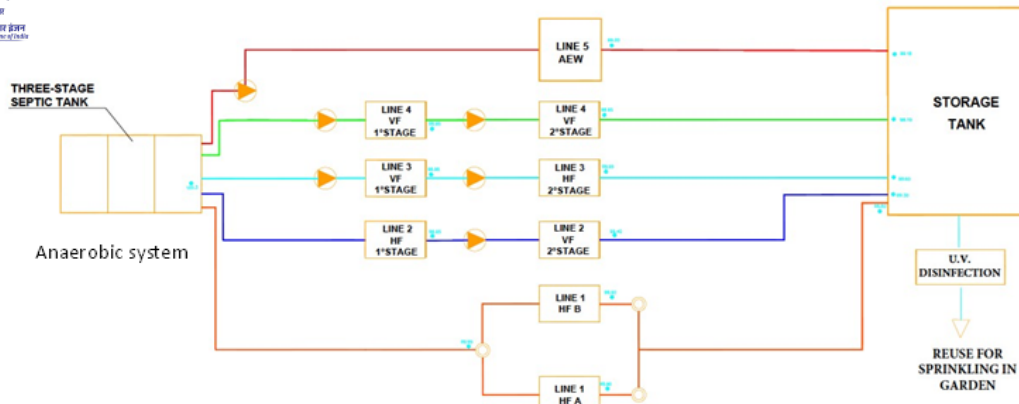


Implementation of Engineered Natural Sewage Treatment System (ENSeTS) is also underway in Lakshadweep Islands.

2) MOIL Ltd. Gumgaon, Nagpur for **150 m<sup>3</sup>/d capacity (2016)**: Anaerobic system → Subsurface horizontal flow constructed wetlands → Disinfection.

## A) Sewage Treatment & Management (Nature based solutions)

Continued...



3) Dayanand Park Nagpur for **100 m<sup>3</sup>/d capacity (2018)**: Anaerobic system → Combinations of horizontal & vertical flow constructed wetlands → Disinfection



4) Symbiosis International University (SIU), Pune for **50 m<sup>3</sup>/d capacity (2022)**: Improved Anaerobic system → Subsurface horizontal flow constructed wetlands → Disinfection.

## A) Sewage Treatment & Management (Compact treatment systems)

- Improved Moving Bed Biofilm Reactor (MBBR) – TRL 7

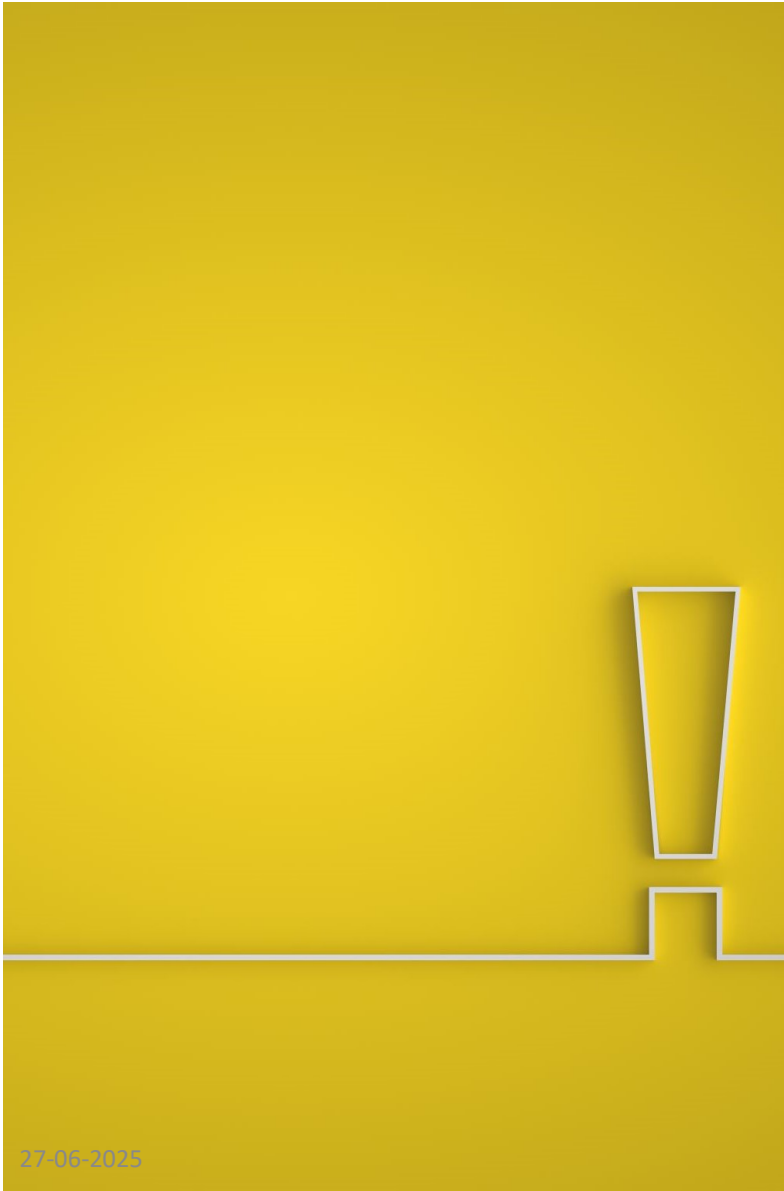


5) MIDC Butibori Nagpur for **50 m<sup>3</sup>/d capacity each (2023)**: Improved MBBR and SAFF → Settling → Multi-grade filter → Disinfection.

- Submerged Aerobic Fixed Film Reactor (SAFF) – TRL 8



6) NHDC Narmada Nagar, Madhya Pradesh for **450 m<sup>3</sup>/d capacity (2023)**: SAFF → Settling → Surface flow wetland → Disinfection.



Thanks..