

# Wastewater Treatment Process

## Lecture 8-Raw water Intake and Screening

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# Overview of Wastewater Treatment

- Wastewater treatment is a multi-stage process designed to remove physical, chemical, and biological contaminants.
  - The objective is to protect public health and the environment.
  - Each treatment stage prepares wastewater for the next step.
  - Final effluent must meet regulatory quality standards.



# Main Stages of Treatment

- Wastewater treatment consists of a sequence of processes.

- Collection of wastewater
- Preliminary treatment
- Primary treatment
- Secondary (biological) treatment
- Tertiary (advanced) treatment
- Sludge processing
- Effluent discharge or reuse

- **Process order in a treatment plant:**

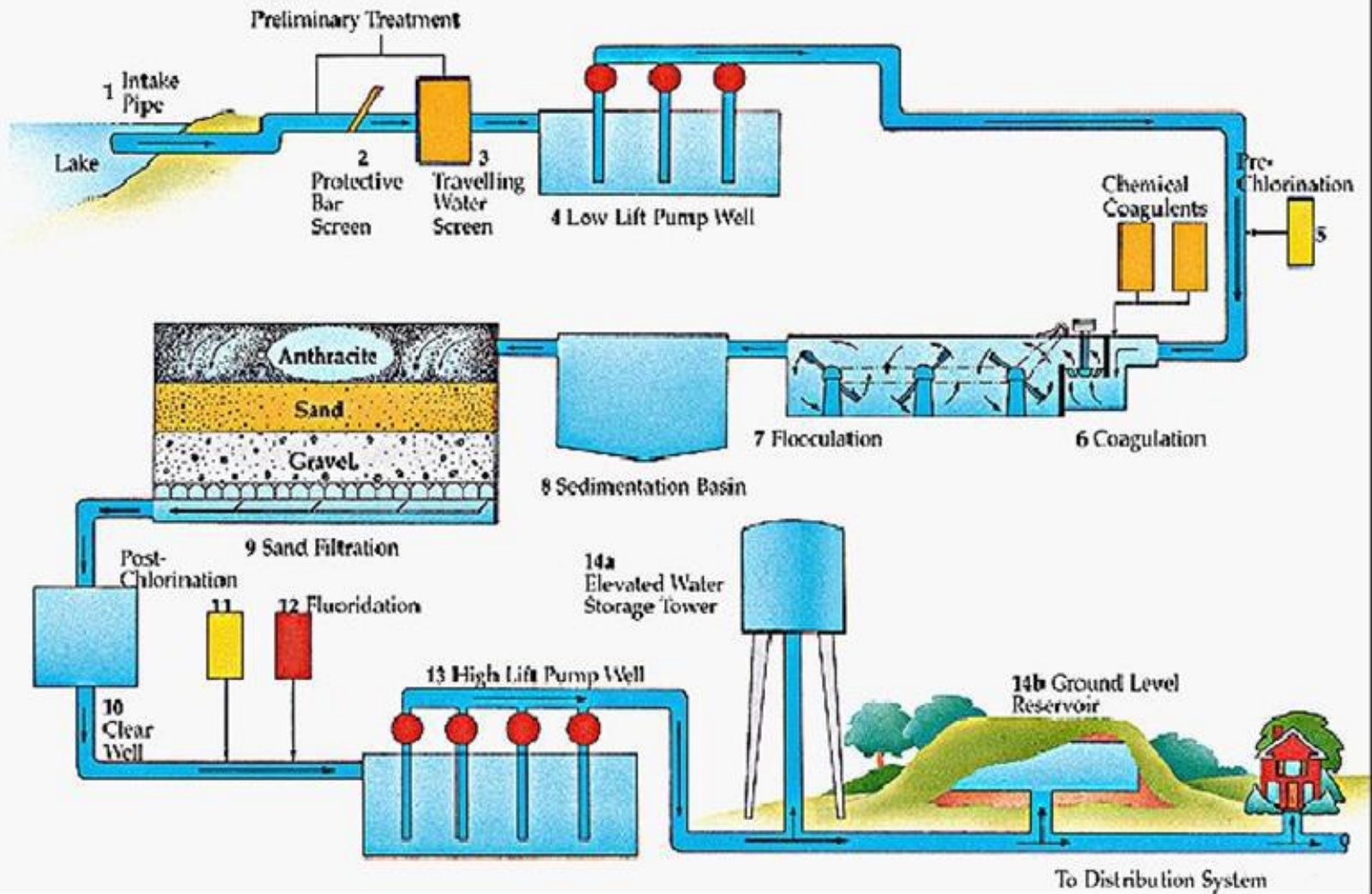
• **Screening → Grit removal → Coagulation → Flocculation → Sedimentation → Filtration → Disinfection**

# Collection of Wastewater

- Wastewater is collected from residential, commercial, and industrial sources.
  - Flow is conveyed through underground sewer networks.
  - Gravity flow is preferred to minimize energy consumption.
  - Pumping stations are required in flat or low-elevation areas.
  - Proper collection prevents leakage and groundwater contamination.



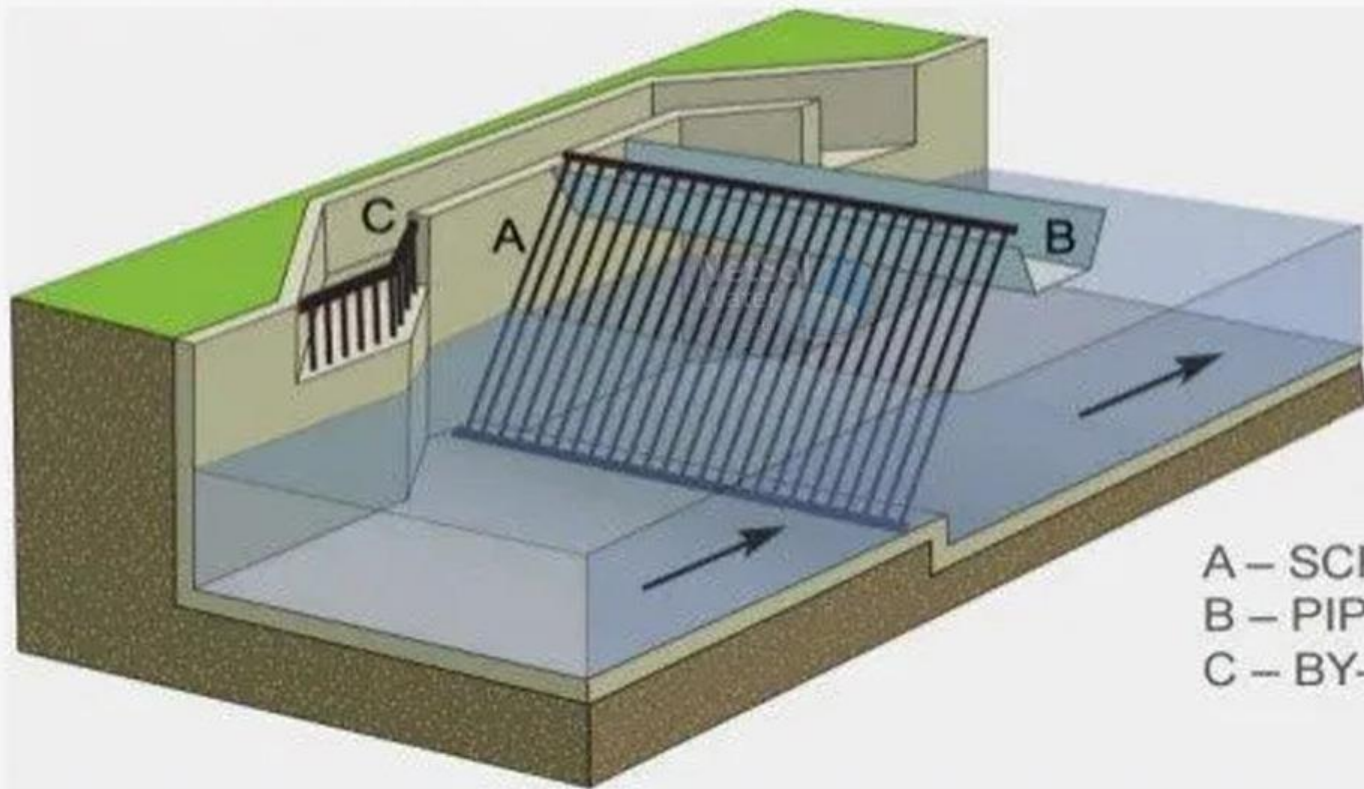
# Water Treatment Plant



# Preliminary Treatment

- Preliminary treatment removes large and coarse materials.
  - Screening eliminates rags, plastics, and debris.
  - Grit chambers remove sand, gravel, and stones.
  - Comminutors grind remaining solids into smaller particles.
  - This stage protects pumps and downstream equipment.

# Bar screens



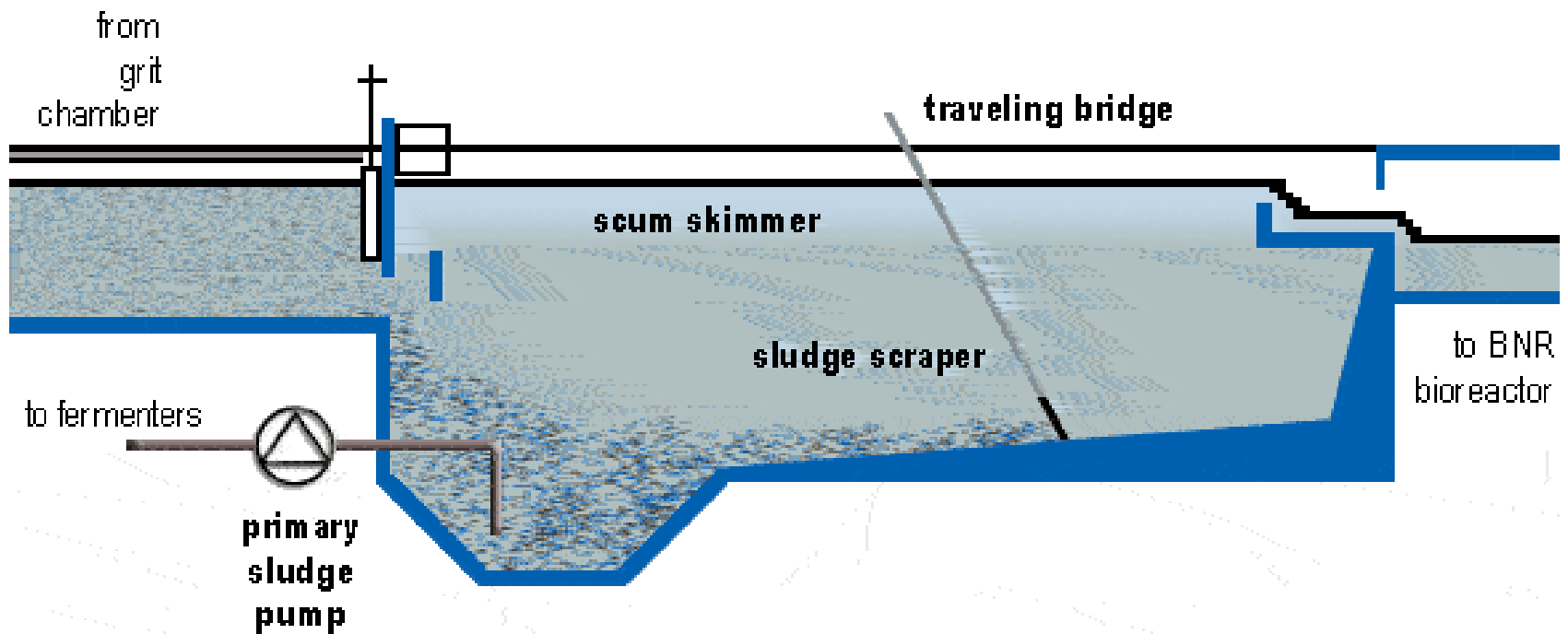
A – SCREEN  
B – PIPE  
C – BY-PASS PIPE

What is Screening Process in Waste Water Treatment

# Primary Treatment

- Primary treatment relies on physical sedimentation processes.
  - Wastewater flows slowly through sedimentation tanks.
  - Heavier suspended solids settle to the bottom as primary sludge.
  - Oil and grease float to the surface and are skimmed off.
  - Typically removes about 60% of suspended solids and 30% of BOD.

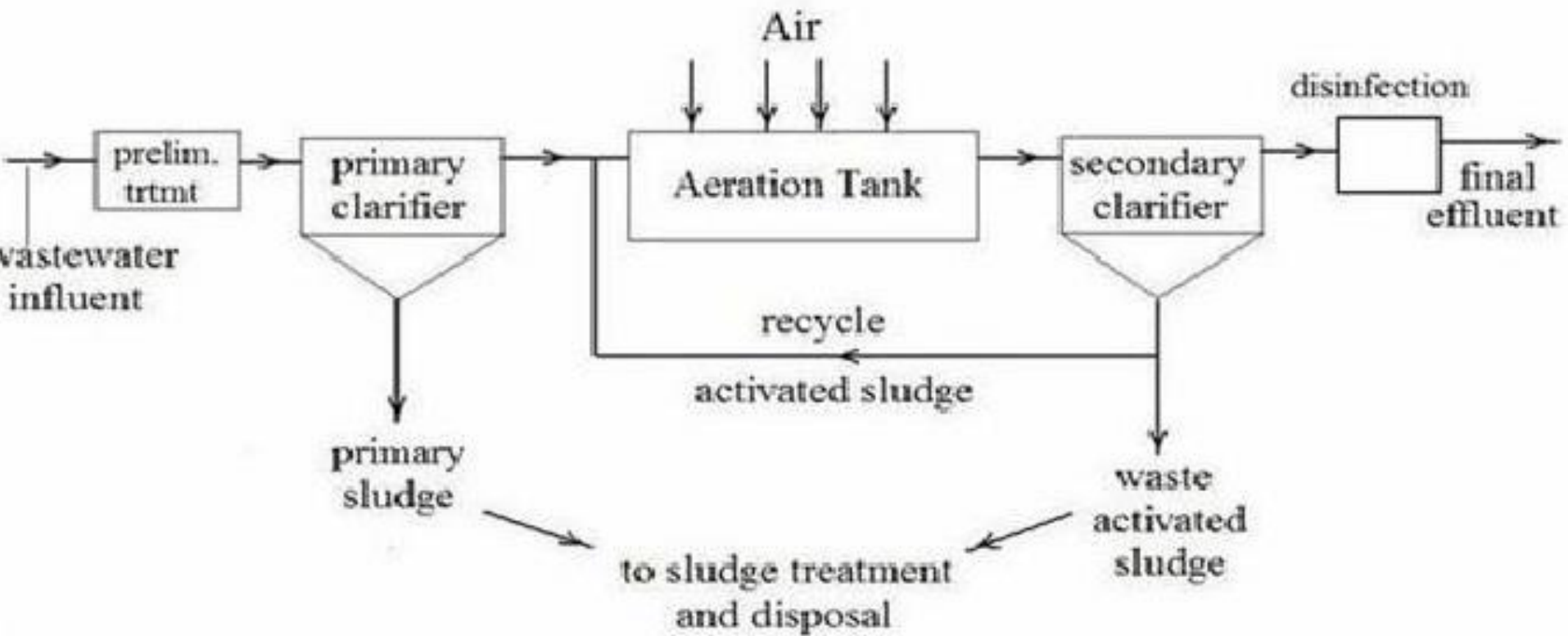
# Primary Sedimentation Tank



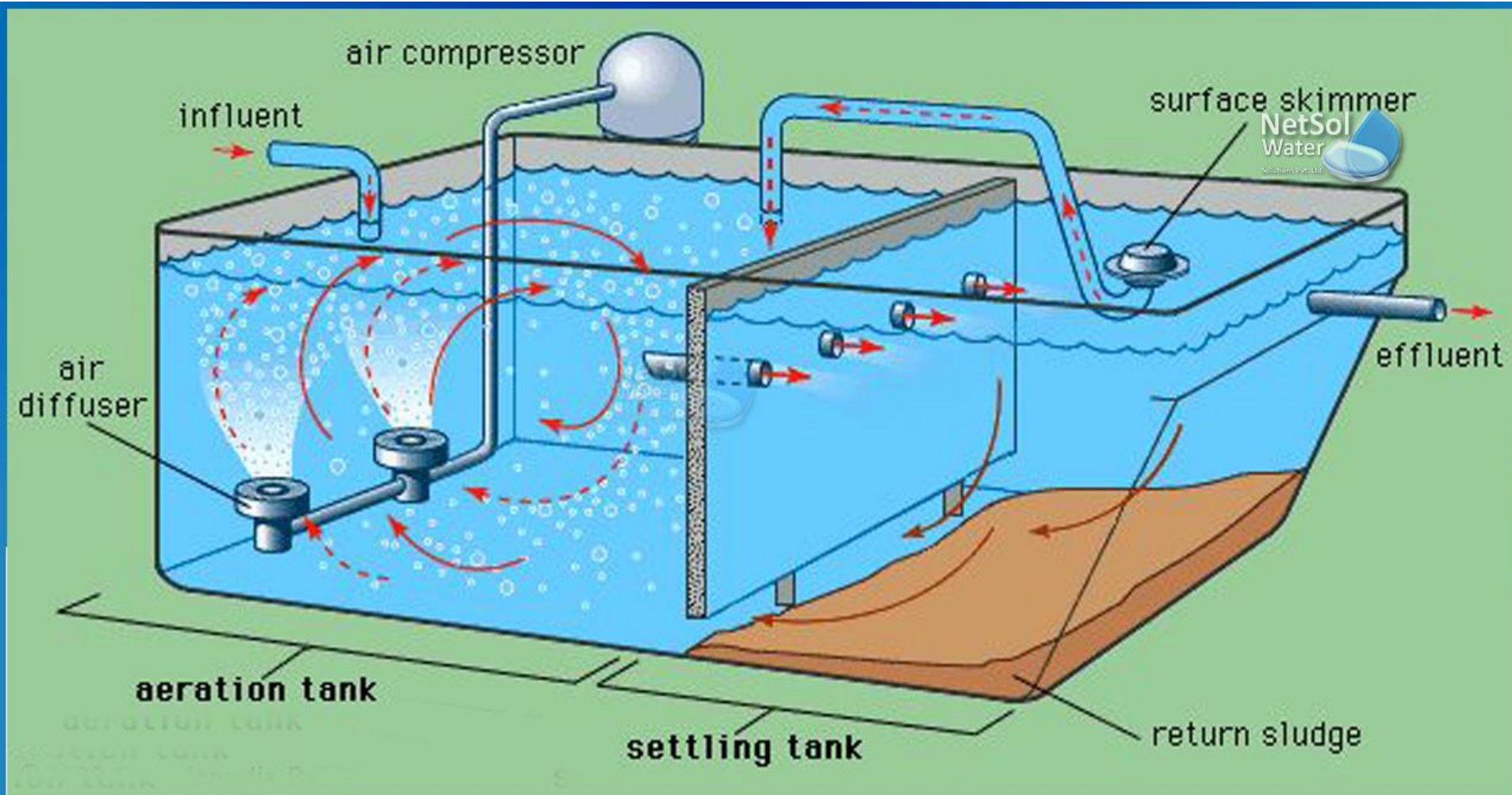
# Secondary (Biological) Treatment

- Secondary treatment removes dissolved and fine organic matter.
  - Microorganisms consume organic pollutants as a food source.
  - Aeration supplies oxygen to support microbial activity.
  - Common systems include activated sludge and trickling filters.
  - Produces biologically treated effluent and secondary sludge.





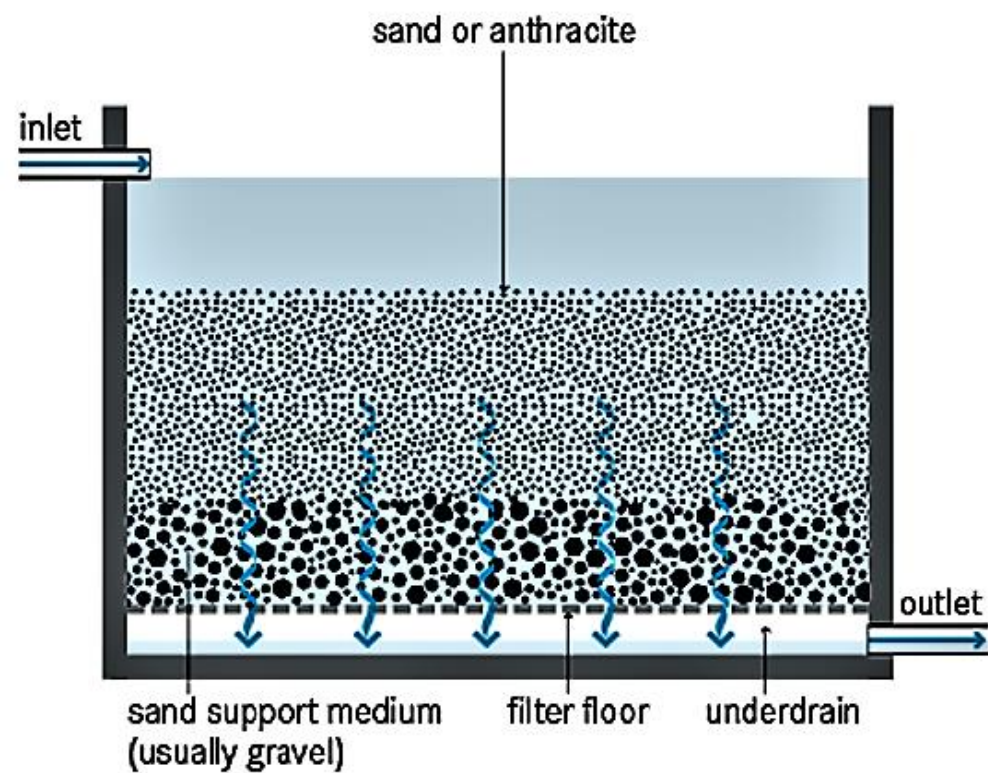
Activated Sludge Wastewater Treatment Flow Diagram



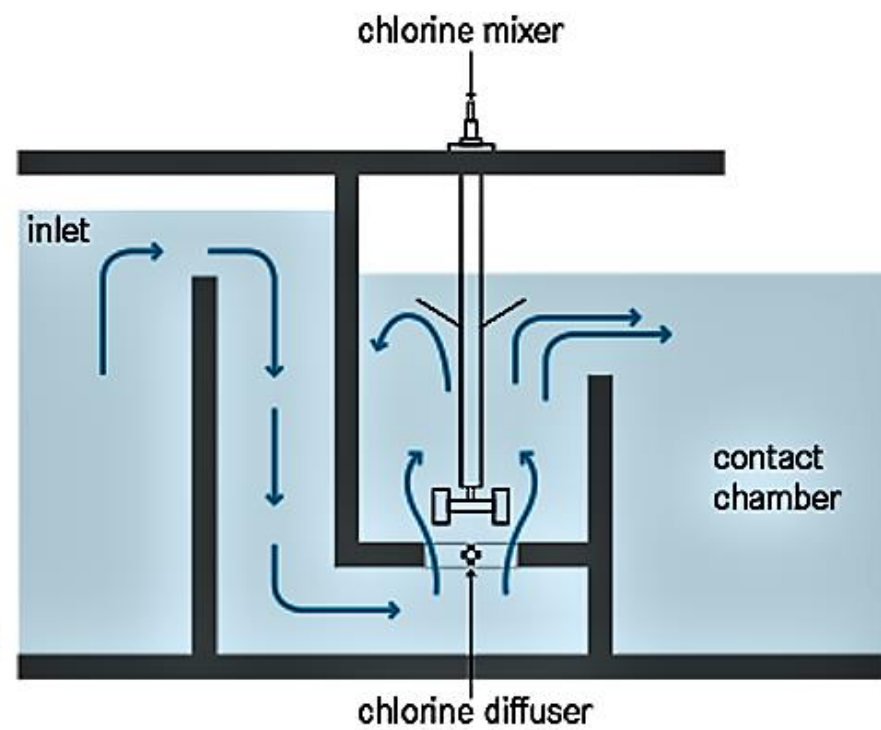
## What is Aeration Tank in Water Treatment

# Tertiary (Advanced) Treatment

- Tertiary treatment provides additional purification beyond secondary treatment.
  - Used when higher effluent quality is required.
  - Processes include filtration and adsorption.
  - Ion exchange may be used to remove specific ions.
  - Disinfection using chlorine, ozone, or ultraviolet radiation.



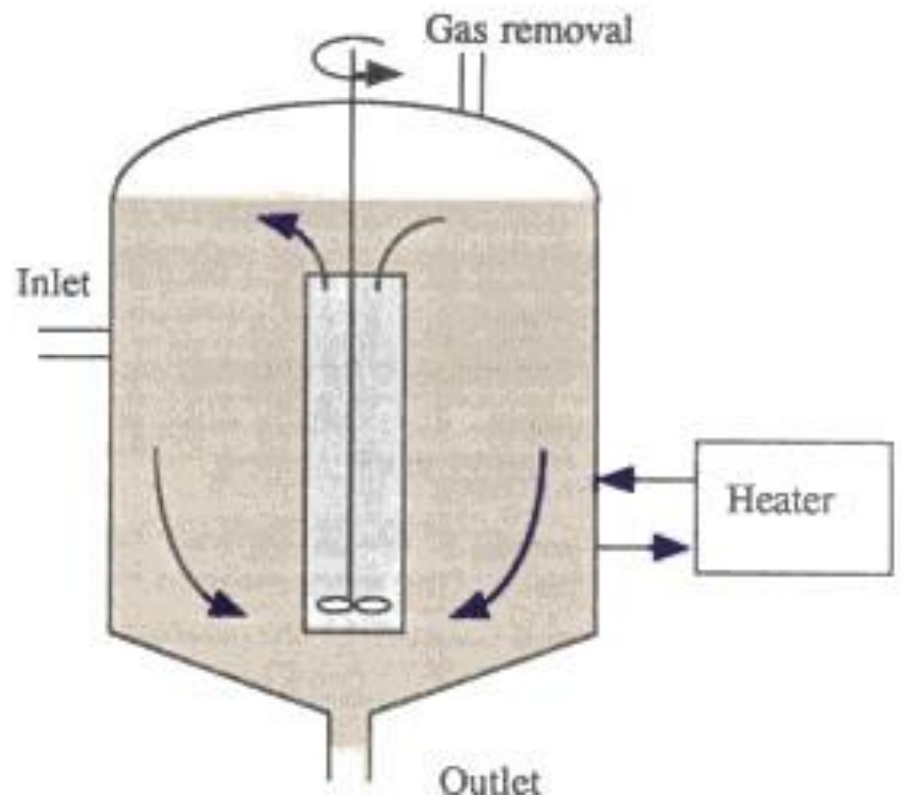
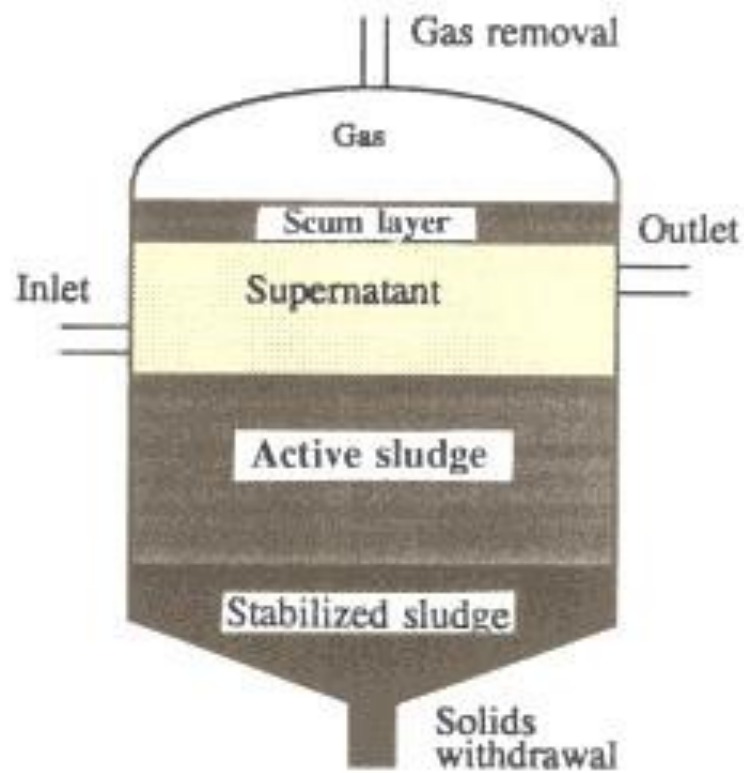
tertiary filtration (e.g. depth filtration)



disinfection (e.g. chlorination)

# Sludge Processing

- Sludge is generated during primary and secondary treatment stages.
  - Contains organic and inorganic solids.
  - Processing reduces volume and stabilizes organic matter.
  - Common steps include thickening, digestion, and dewatering.
  - Stabilized sludge can be disposed of or reused safely.



# Effluent Discharge and Reuse

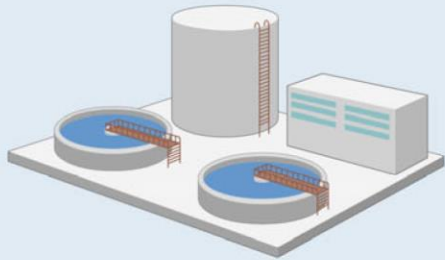
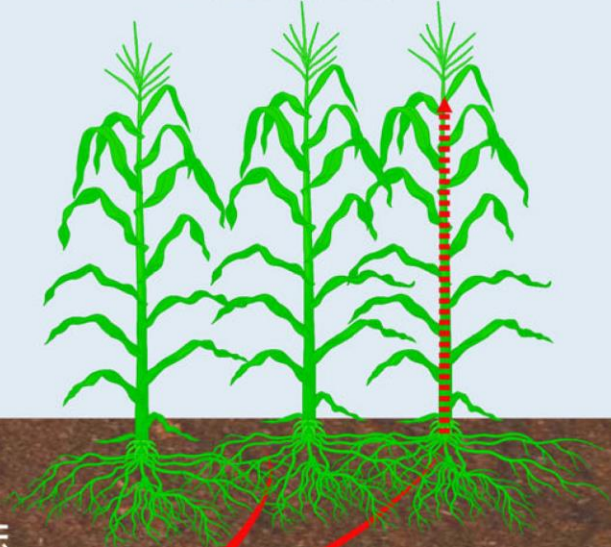
- The final product of treatment is treated effluent.
  - Effluent must meet environmental discharge standards.
  - It may be discharged to rivers, lakes, or seas.
  - Treated wastewater can be reused for irrigation.
  - Other reuse options include industrial use and groundwater recharge.



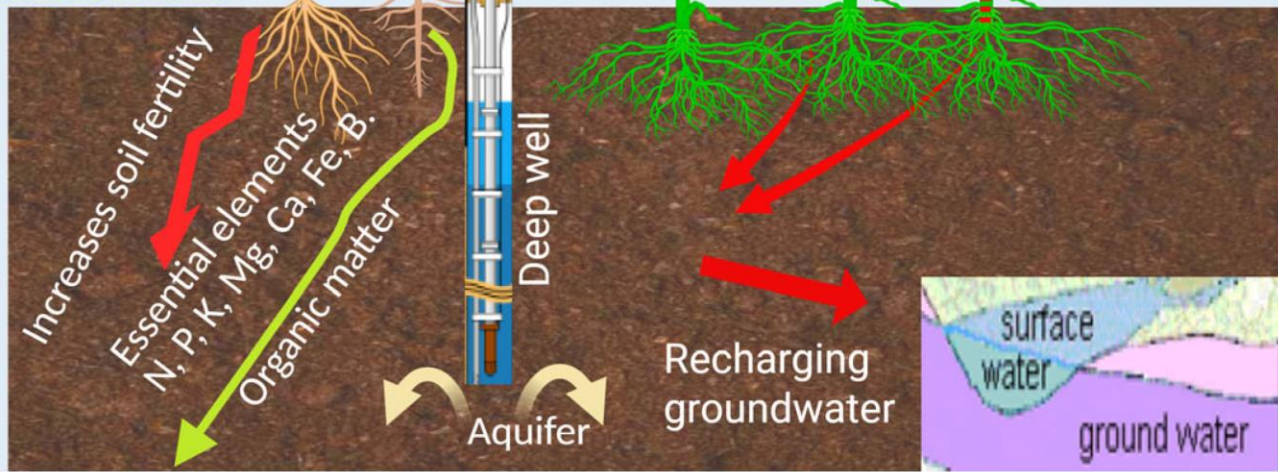
Irrigation using treated wastewater

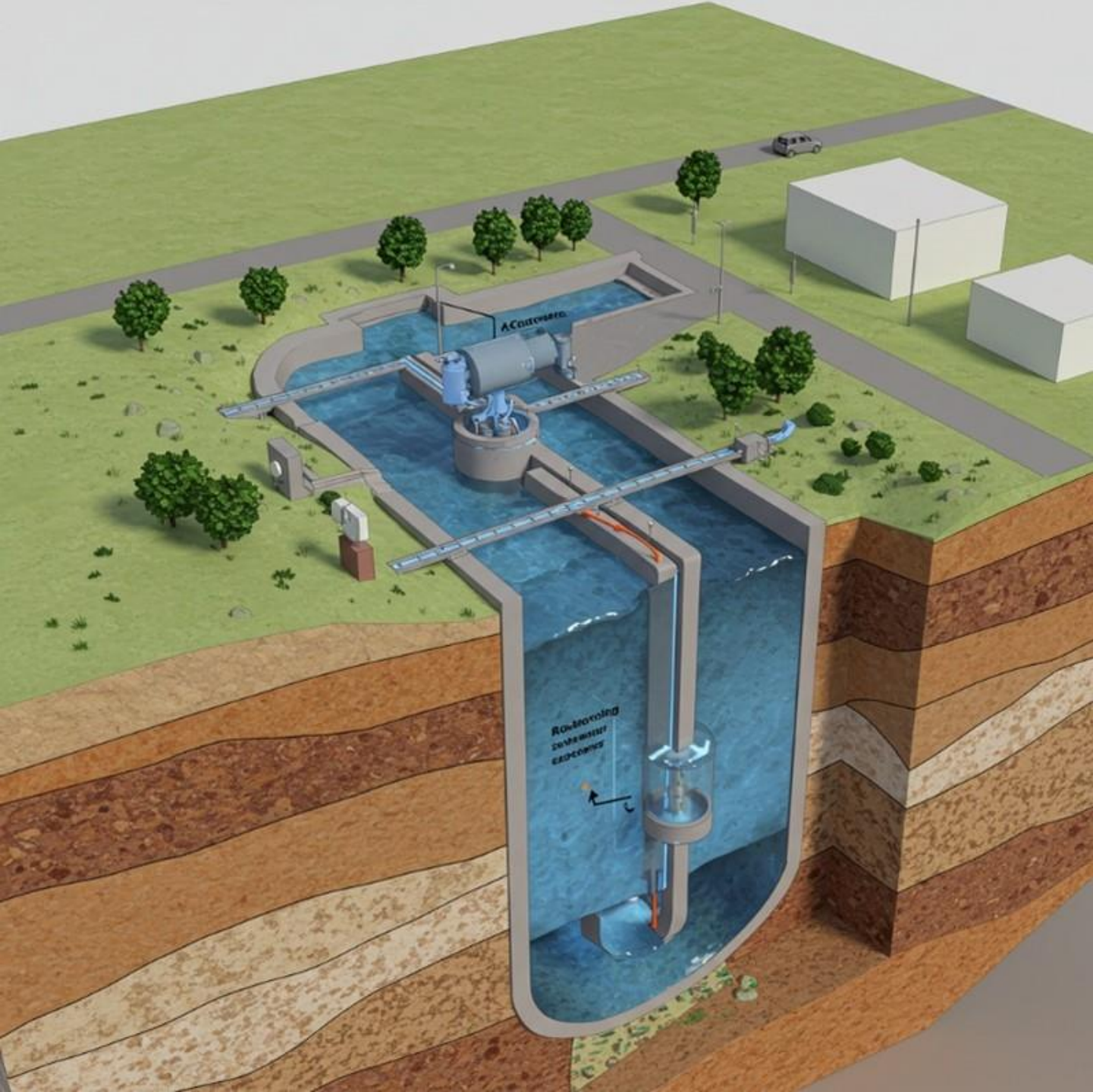


Support plant growth by supplying nutrient



Wastewater treatment processes





# Summary

- Wastewater treatment protects public health and the environment.
  - Each treatment stage plays a critical role in pollutant removal.
  - Proper operation ensures safe effluent and sustainable water management.