

WASTEWATER 101

Part 3

How is wastewater treated?

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Water Environment Federation**

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DISCLAIMER

Development and production of this material was made possible through funding from the US Centers for Disease Control and Prevention (CDC) to the Water Environment Federation (WEF) under Cooperative Agreement CK20-2003 (Improving Clinical and Public Health Outcomes through National Partnerships to Prevent and Control Emerging and Re-Emerging Infectious Disease Threats). This material is solely the responsibility of WEF and does not necessarily represent the official position of CDC.

TREATMENT FACILITY ALIASES

WWTP	wastewater treatment plant
WWTF	wastewater treatment facility
POTW	publicly-owned treatment works
WRRF	water resource recovery facility
WRP	water reclamation plant
WRF	water reclamation facility
CWF	clean water facility
STP	sewage treatment plant



Courtesy of Valley Sanitary District

Treatment stages

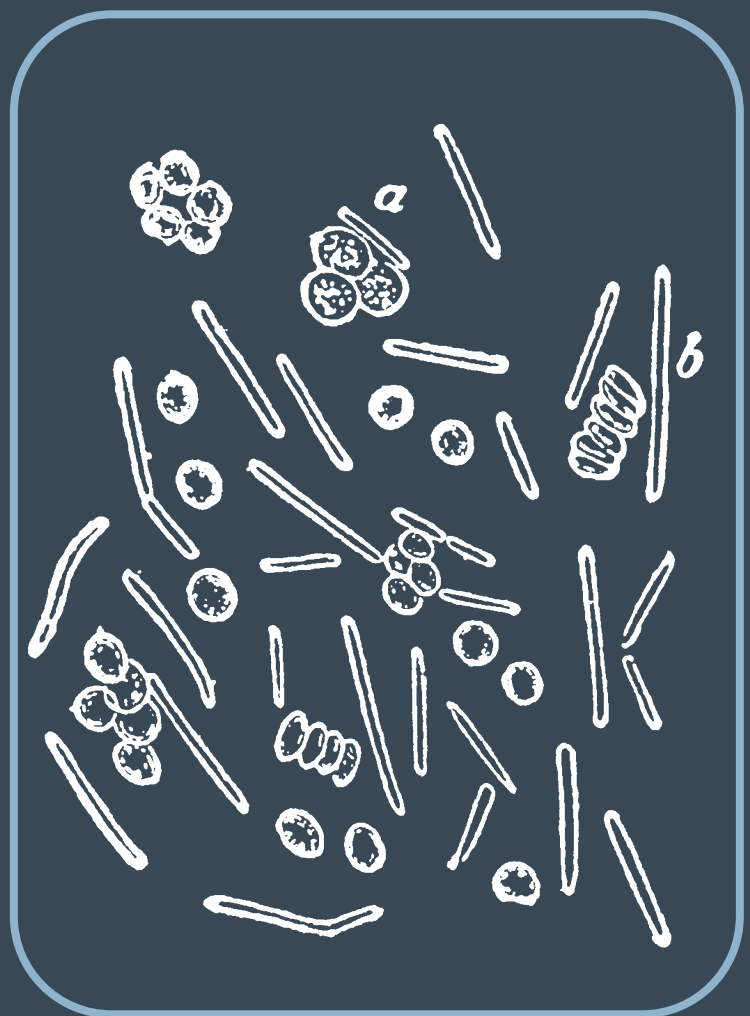
PRELIMINARY



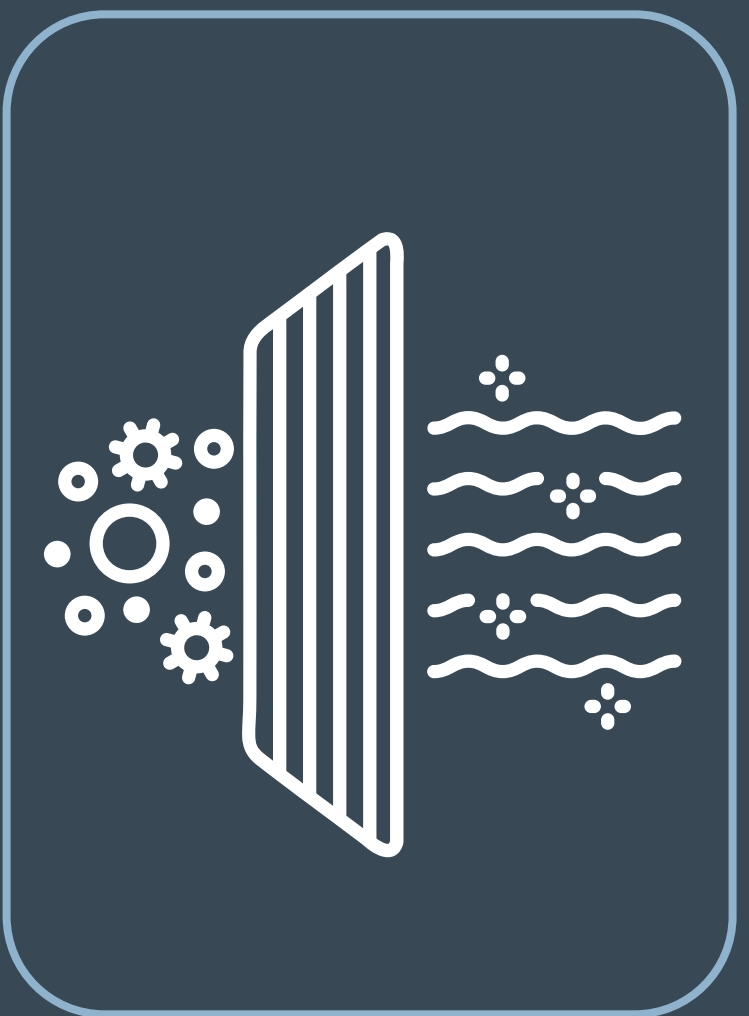
PRIMARY



SECONDARY



ADVANCED

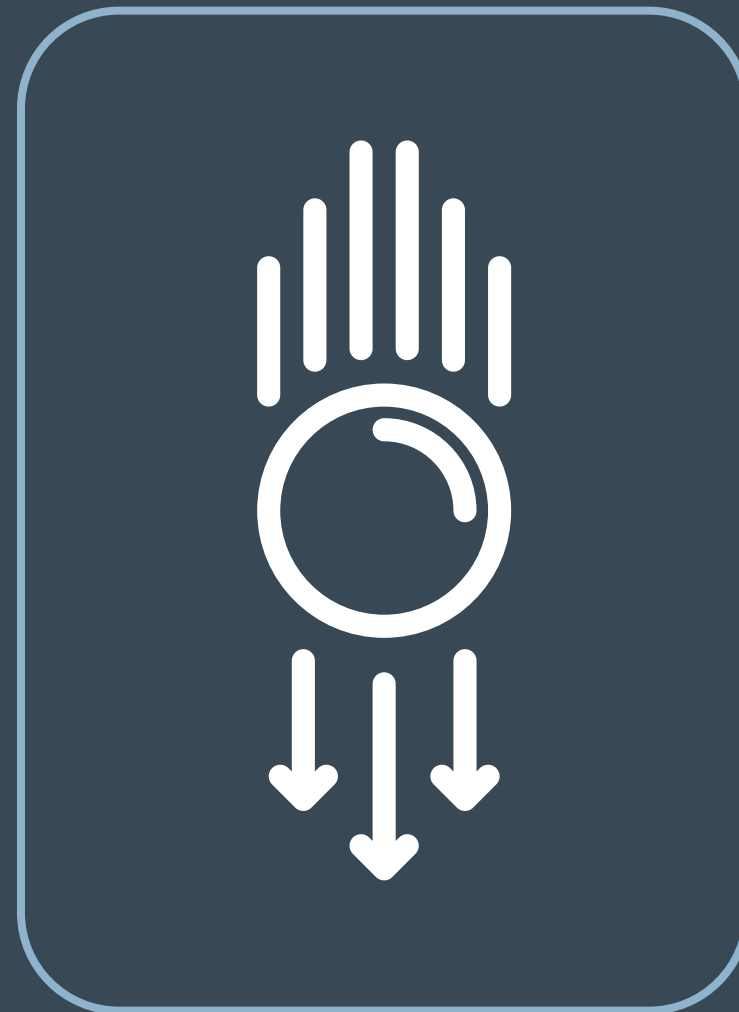


FINAL



Treatment types

PHYSICAL



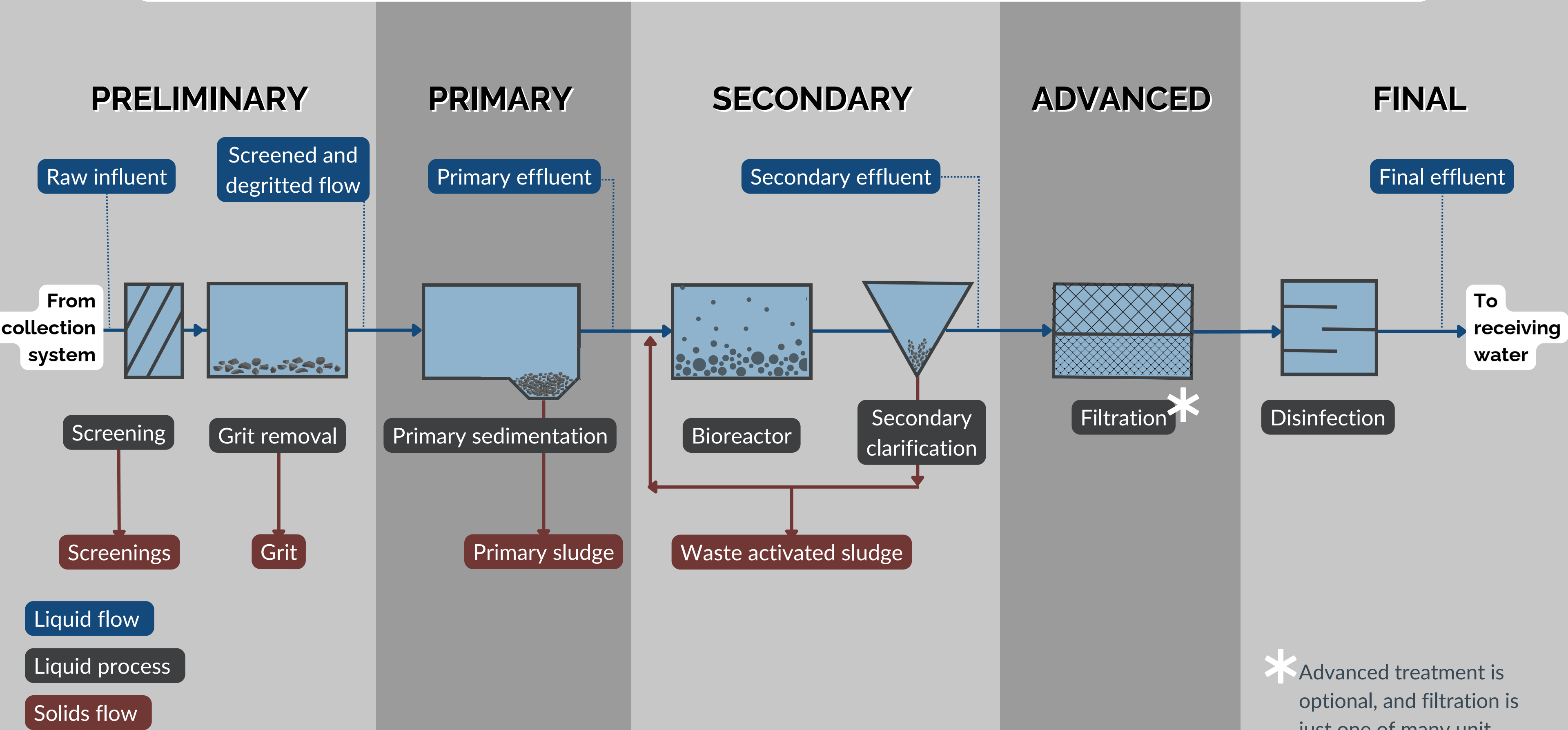
CHEMICAL



BIOLOGICAL



WASTEWATER TREATMENT PROCESS FLOW DIAGRAM



* Advanced treatment is optional, and filtration is just one of many unit processes that can be used

PRELIMINARY TREATMENT

1. Screening or comminution

Physical process to remove (or grind) solids that can damage downstream equipment

2. Grit removal

Physical process to remove coarse solids



PRIMARY TREATMENT

Primary sedimentation

Physical process that removes readily settleable solids and floating material

Chemicals can be added to enhance settling in a process known as CEPT (chemically-enhanced primary treatment)



SECONDARY TREATMENT

Biological treatment and clarification

Biological process that relies on microorganisms - usually “activated sludge” - to oxidize dissolved and particulate biodegradable constituents

Physical separation in secondary clarifiers is used to separate the microorganisms performing the treatment from the treated water



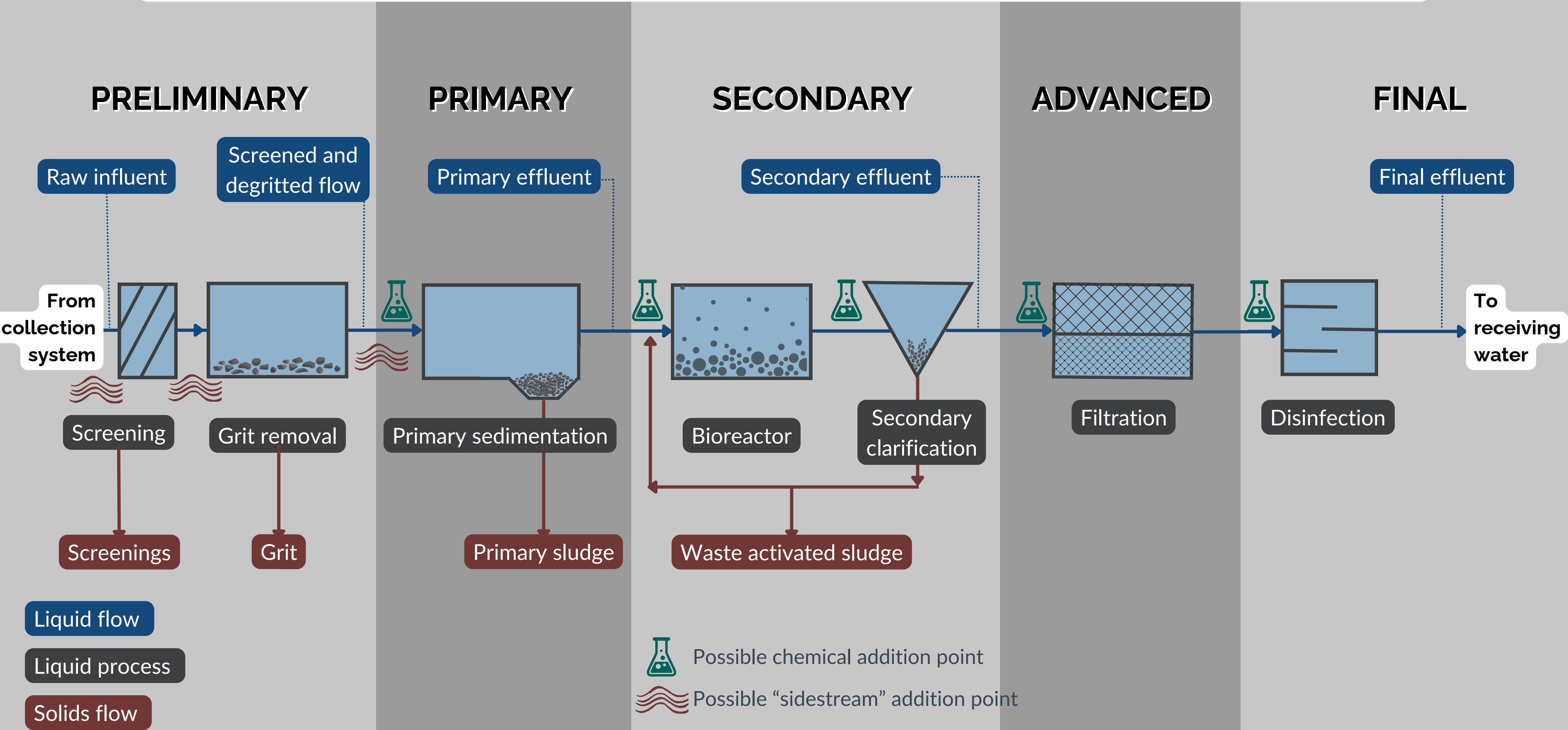
FINAL TREATMENT

Disinfection

Relies on chemical agents or radiation to achieve a target level of pathogenic organism inactivation



WASTEWATER TREATMENT PROCESS FLOW DIAGRAM





Upper Blackstone
Water Pollution

UPPER BLACKSTONE CLEAN WATER FACILITY



Kolar Park

Stickney Water Tower

Stickney Water Reclamation Plant

Stickney-Chicago, IL Water Tower

USGS Chicago Sanitary and Ship Canal D

110 Building

115 Building

STICKNEY WATER RECLAMATION PLANT

Google Earth

Searcy Water & Sewer Systems

SEARCY ADVANCED TREATMENT PLANT

TERMINOLOGY

RAW INFLUENT

Untreated wastewater at entrance to wastewater treatment facility that has yet to undergo any treatment

SCREENED & DEGRITTED FLOW

Wastewater that has **passed through preliminary treatment**; can be referred to as primary influent (if the facility has primary clarifiers)

PRIMARY INFLUENT/ EFFLUENT

Water flowing into or out of **primary treatment**

TERMINOLOGY

PRIMARY SLUDGE

Settled solids that are removed from primary sedimentation tanks (aka primary clarifiers)

SECONDARY EFFLUENT

Wastewater that has received preliminary, primary (if the facility has primary clarifiers) and **secondary treatment** but has not undergone any advanced treatment or been disinfected

FINAL EFFLUENT

Water that has received full treatment for discharge into a receiving water; sometimes just called **effluent**

TERMINOLOGY

PROCESS FLOW DIAGRAM (PFD)

Schematic of all the **unit treatment processes** showing flows in and out of each as well as chemical addition points and other pertinent information; can include both liquid and solids processes

PRELIMINARY TREATMENT

Physical treatment processes designed to remove coarse solids that can damage downstream equipment; usually consists of screening and grit removal; located at the “**headworks**”

PRIMARY TREATMENT

Physical (and sometimes chemical) treatment process that removes **readily settleable solids and floating material**

TERMINOLOGY

SECONDARY TREATMENT

Biological process designed to oxidize dissolved and particulate biodegradable constituents

ACTIVATED SLUDGE

Very common secondary treatment technology that relies on recycling settled microorganisms to an aerated tank for **biological treatment**

DISINFECTION

Chemical or radiation process that **inactivates pathogens** but does not sterilize the wastewater; may be performed seasonally

WHAT TO ASK YOUR UTILITY PARTNERS

- Do you collect a liquid or a sludge sample for wastewater surveillance?
- If liquid, do you collect it upstream or downstream of screening? Upstream or downstream of grit removal? Upstream or downstream of primary treatment?
- If sludge, does it represent a single clarifier, or combined primary sludge flows?
- Is there any septage added to your process upstream of where the sample is collected?
- Are there any chemicals added to your process upstream of where the sample is collected?
- Are there any solids processing sidestreams added to your process upstream of where the sample is collected?
- Do you have an equalization basin?

WASTEWATER TREATMENT RESOURCES FROM WEF



Design of Water Resource
Recovery Facility
MOP 8, 6th Edition
[accesswater.org](https://www.accesswater.org)



Municipal Resource
Recovery Design
Community
community.wef.org



WEFTEC
[weftec.org](https://www.weftec.org)



This was Part 3 of WASTEWATER 101: How is wastewater treated?

Other parts in the series include:

Part 1: What is wastewater?

Part 2: How is wastewater collected?

Part 4: Where does treated water go?

Part 5: How is water quality monitored?

Part 6: Who works in the wastewater sector?

Thank you!