Sewage Treatment System

Classification

Individual Treatment System

Communal Treatment System

Centralized Treatment System

Individual Treatment System

1 premise 1 treatment plant

eg. House – septic tank

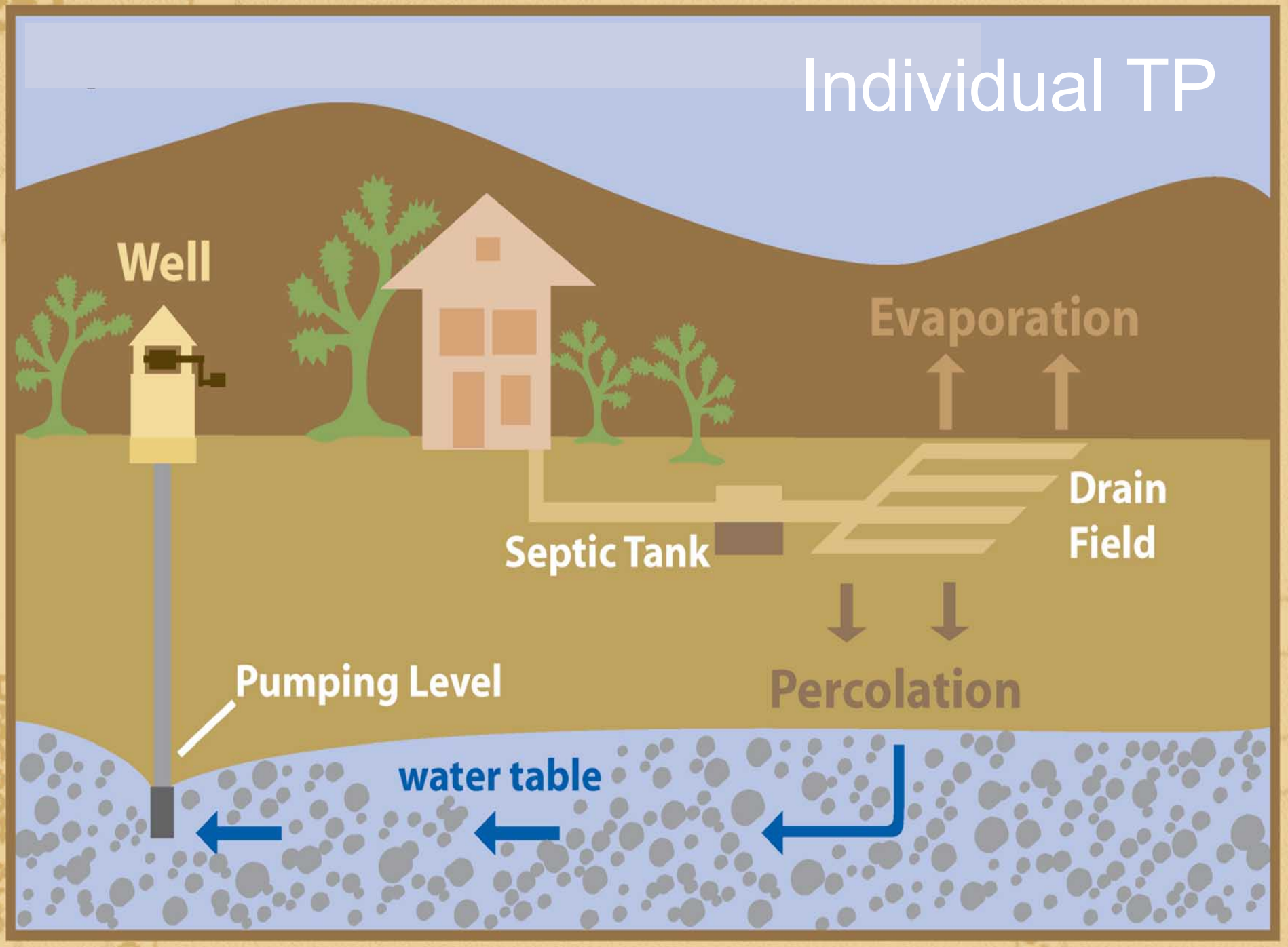
eg. School – imhoff tank

Old practice

Suitable in remote area

Owner is responsible for efficient operation and maintenance

Individual TP



Communal Treatment System

Common in Malaysia

Treats sewage from a community
eg. housing estate

Requires regular maintenance
(problem if too many plants)


Communal STP
N
Universiti Tekn
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image © 2011 DigitalGlobe
© 2010 MapIt
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Pointer 1°33'44.13" N 103°37'42.23" E elev 95 ft Streaming 100%
Eye alt 12950 ft

Centralized Treatment System

Cover large area eg. city, district

Extensive sewerage system
(need proper planning)

Easy to operate and maintain
(few in number)

Design considerations

Effluent quality meet Regulations

Costs (capital, operation and maintenance)

Design considerations

Proximity to residential areas
Access to plants
Wind direction
Land availability for future expansion and upgrading
Topography
Soil characteristics, geological and hydrological conditions
Power supply
Access to receiving waters
Ultimate disposal of sludge

Safety of STP

Protection of operator and public

Fencing

Hand rails

Warning sign

First aid equipment

‘No Smoking”

Protective clothing and equipment

Portable lighting equipment

Sewage Treatment Process/Plant

4 components

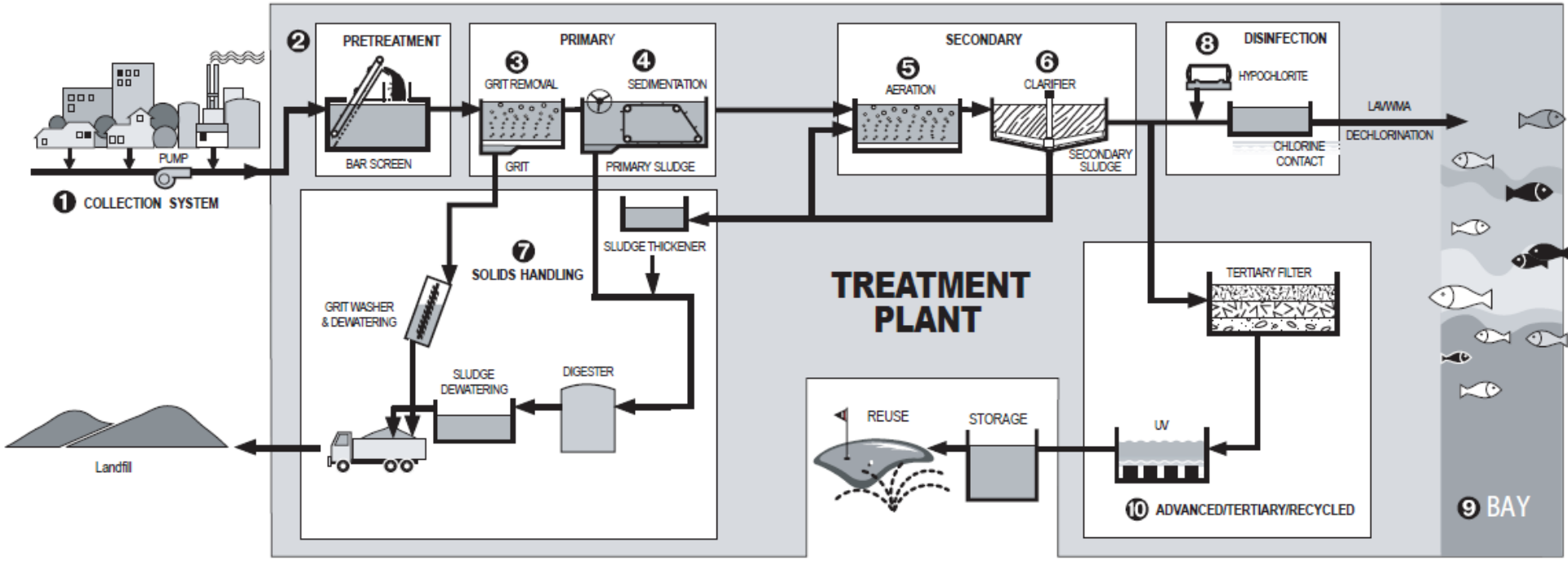
① Preliminary treatment/ Pre-treatment

② Primary treatment

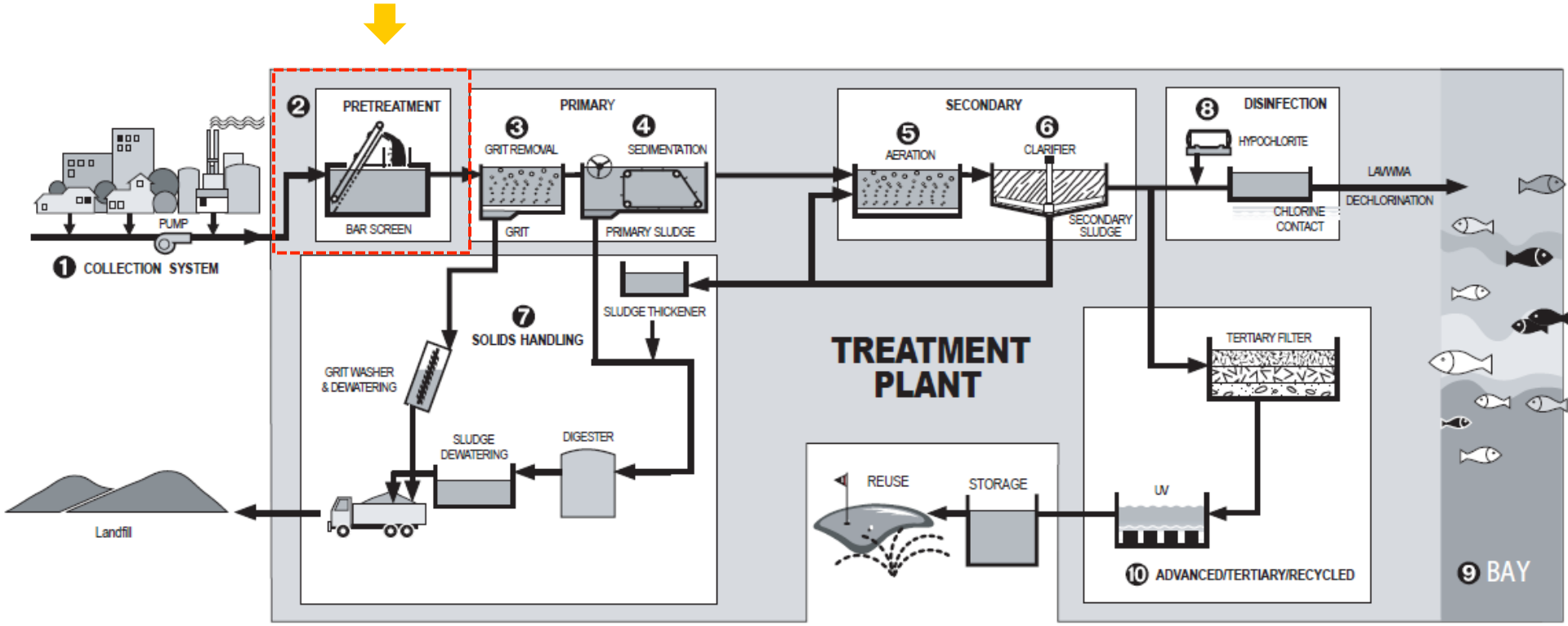
③ Secondary treatment

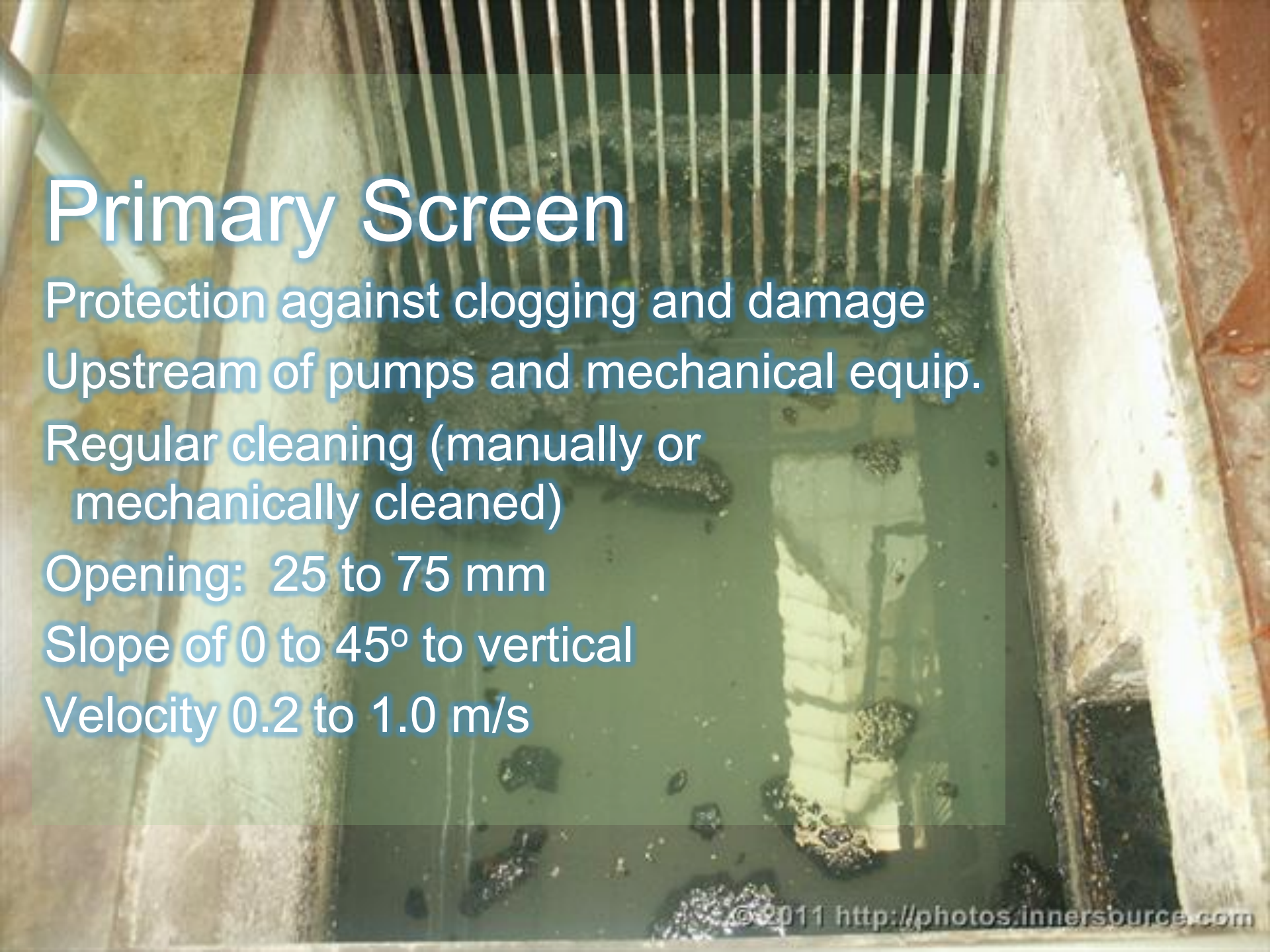
④ Treatment and disposal of sludge

Sewage Treatment Processes



Pretreatment – Bar Screen





Primary Screen

- Protection against clogging and damage
- Upstream of pumps and mechanical equip.
- Regular cleaning (manually or mechanically cleaned)
- Opening: 25 to 75 mm
- Slope of 0 to 45^{o} to vertical
- Velocity 0.2 to 1.0 m/s

Secondary Screen

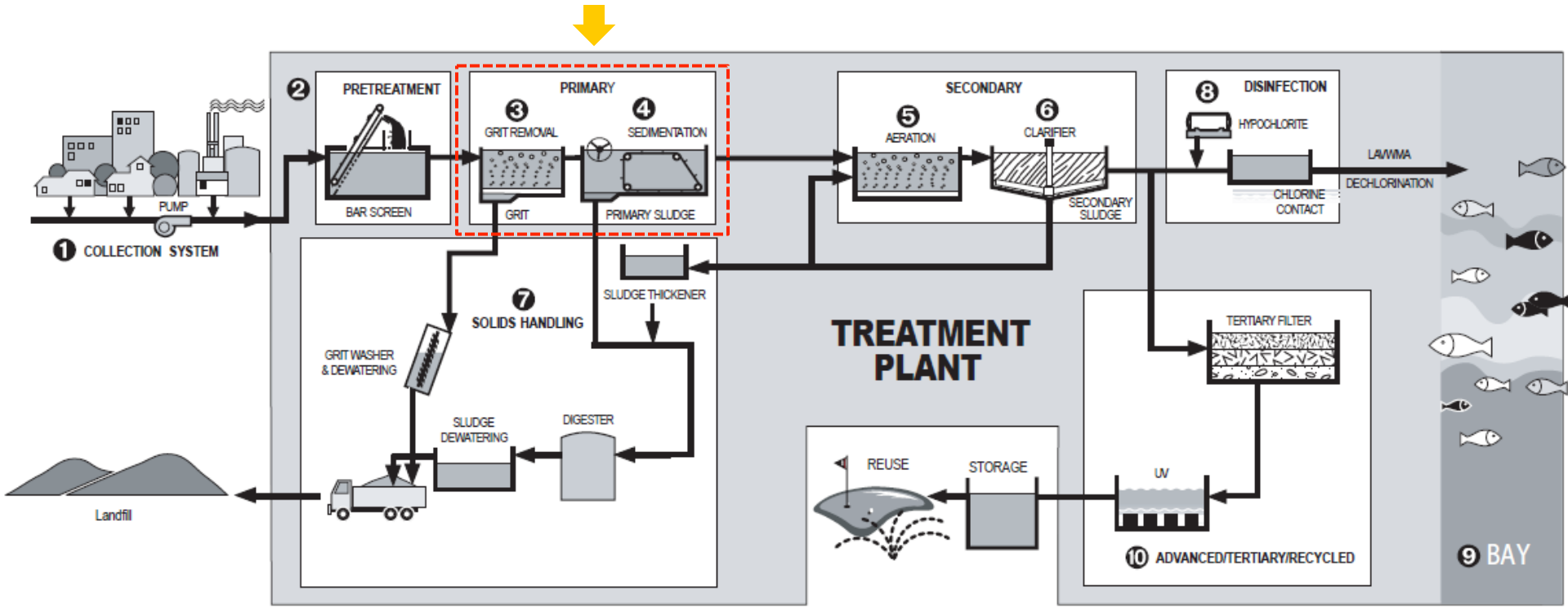
Clear opening: 12 mm max.

Slope 30 to 45^{o} to the vertical

How Screen Work

Screened residue

Primary – Grit Removal & Primary Sedimentation

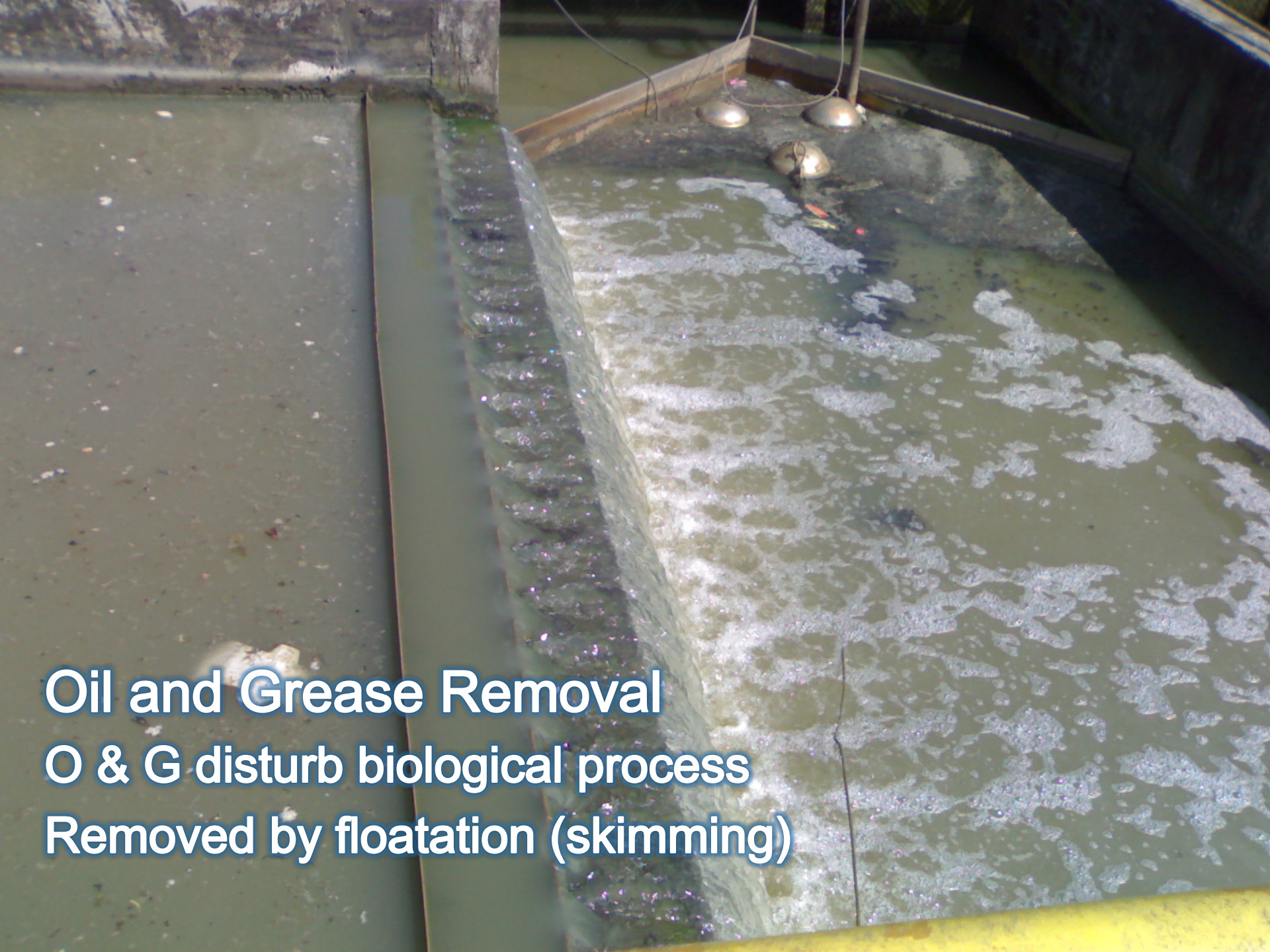


Grit Chamber

Grit: sand particles, broken glasses, metals etc.

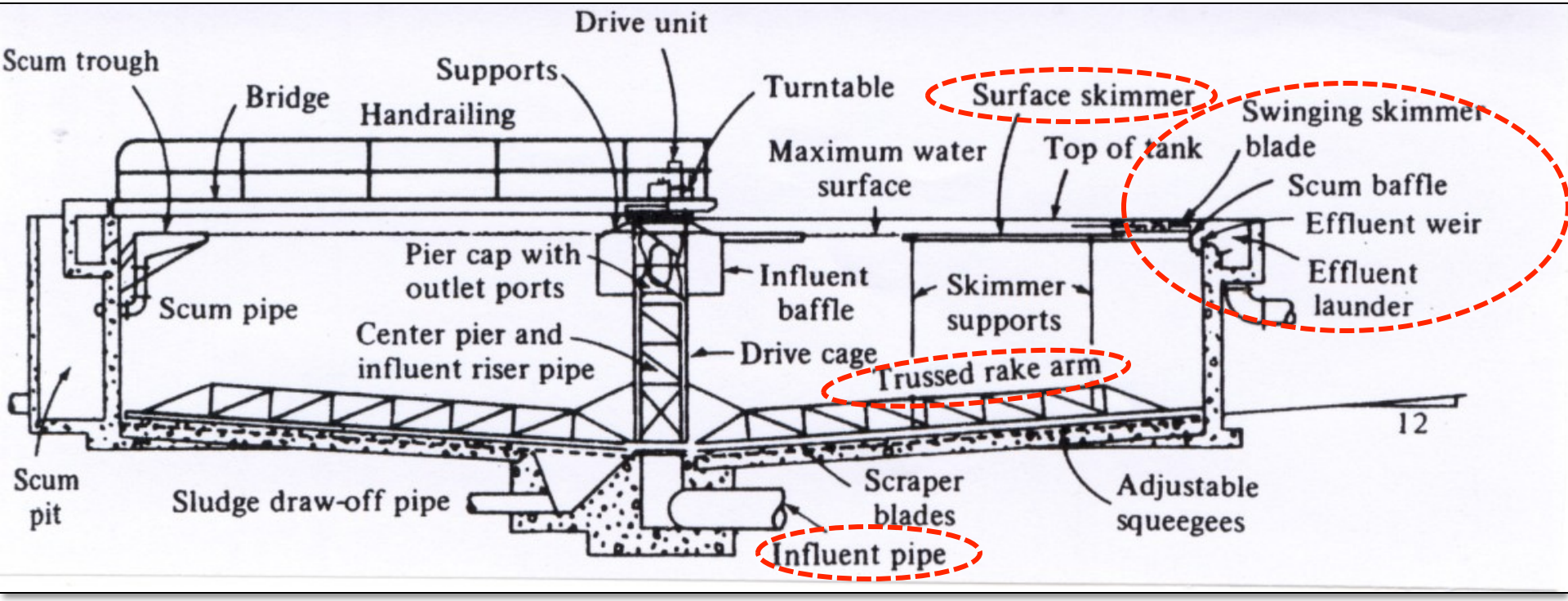
Removed due to abrasive action on impellers of pumps

Chamber: Horizontal velocity with/ without aeration


Oil and Grease Removal
O & G disturb biological process
Removed by floatation (skimming)

Primary Sedimentation Tank

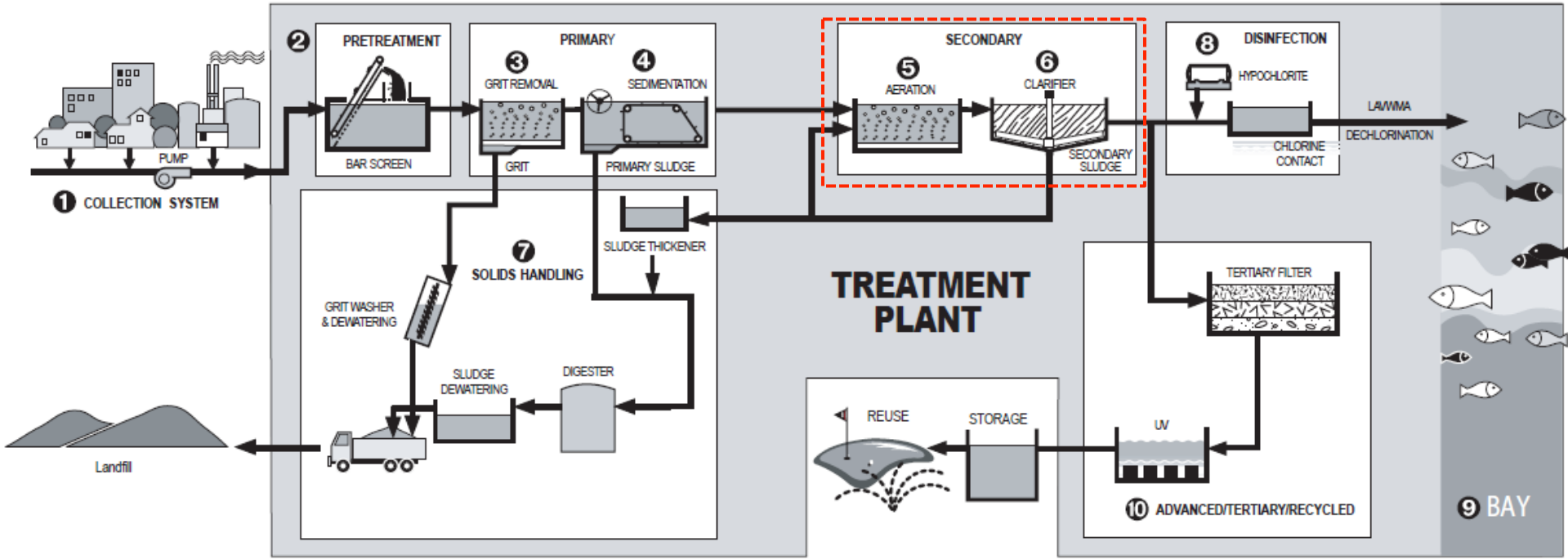
- Remove 60% to 70% "raw" suspended solids
- Remove 30% to 40% BOD
- Reduce organic loading
- Rectangular or circular tank
- Generate sludge


Drive unit
Scum trough
Supports
Bridge
Handrailing
Turntable
Surface skimmer
Swinging skimmer blade
Maximum water surface
Top of tank
Scum baffle
Effluent weir
Pier cap with outlet ports
Influent baffle
Skimmer supports
Effluent launder
Scum pipe
Center pier and influent riser pipe
Drive cage
Trussed rake arm
12
Scum pit
Sludge draw-off pipe
Scraper blades
Adjustable squeegees
Influent pipe


Scum baffle
weir

O&G Removal in Primary Sedimentation Tank

Secondary – Bioprocess & Secondary Sedimentation



Principles of Aerobic Biological Treatment

O_2

↓

microorganisms

Organics $\rightarrow$ $CO_2 + H_2O$ + new cells

Types of Biological Process

Suspended Growth

Microorganisms present and reproduce in suspension

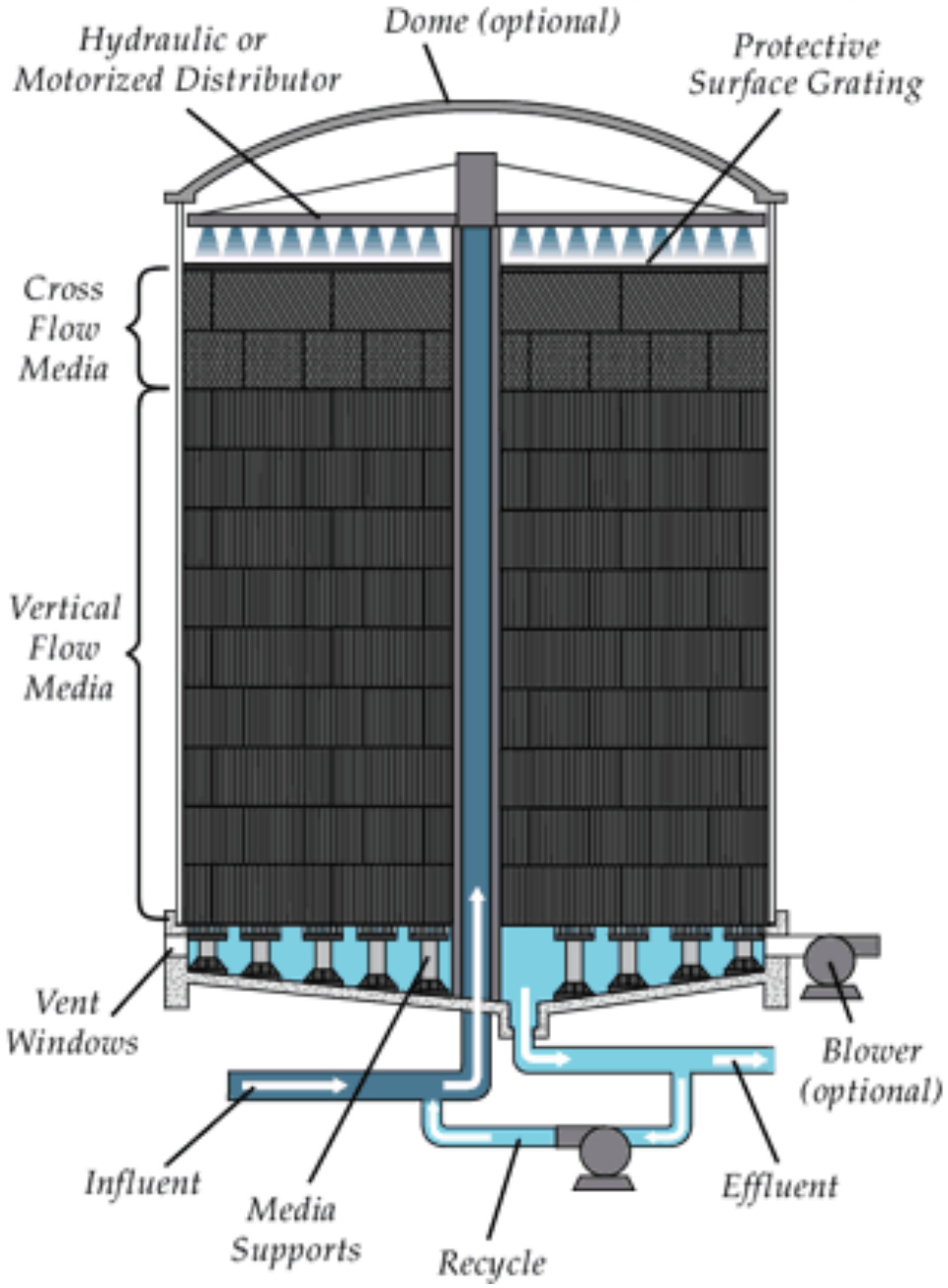
e.g. activated sludge, aerated lagoon

Attached Growth (or Fixed-film)

Microorganisms present and reproduce on media surface

e.g. trickling filter

Suspended growth

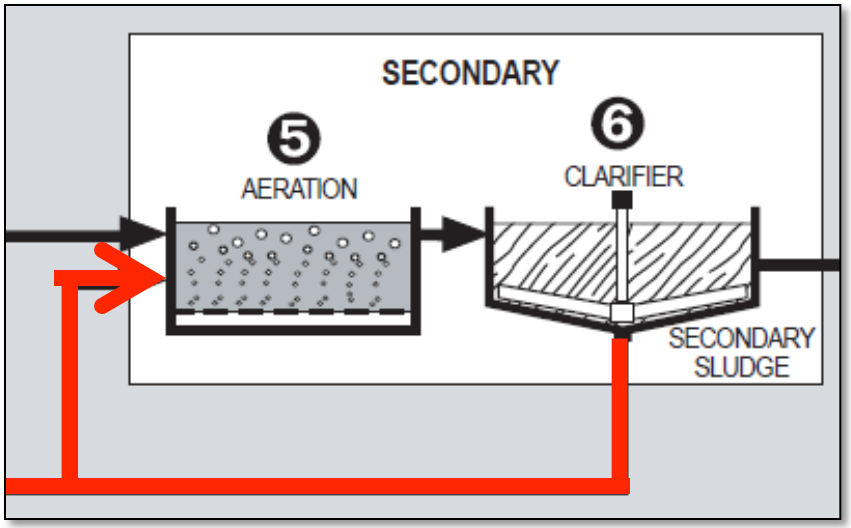


Attached growth

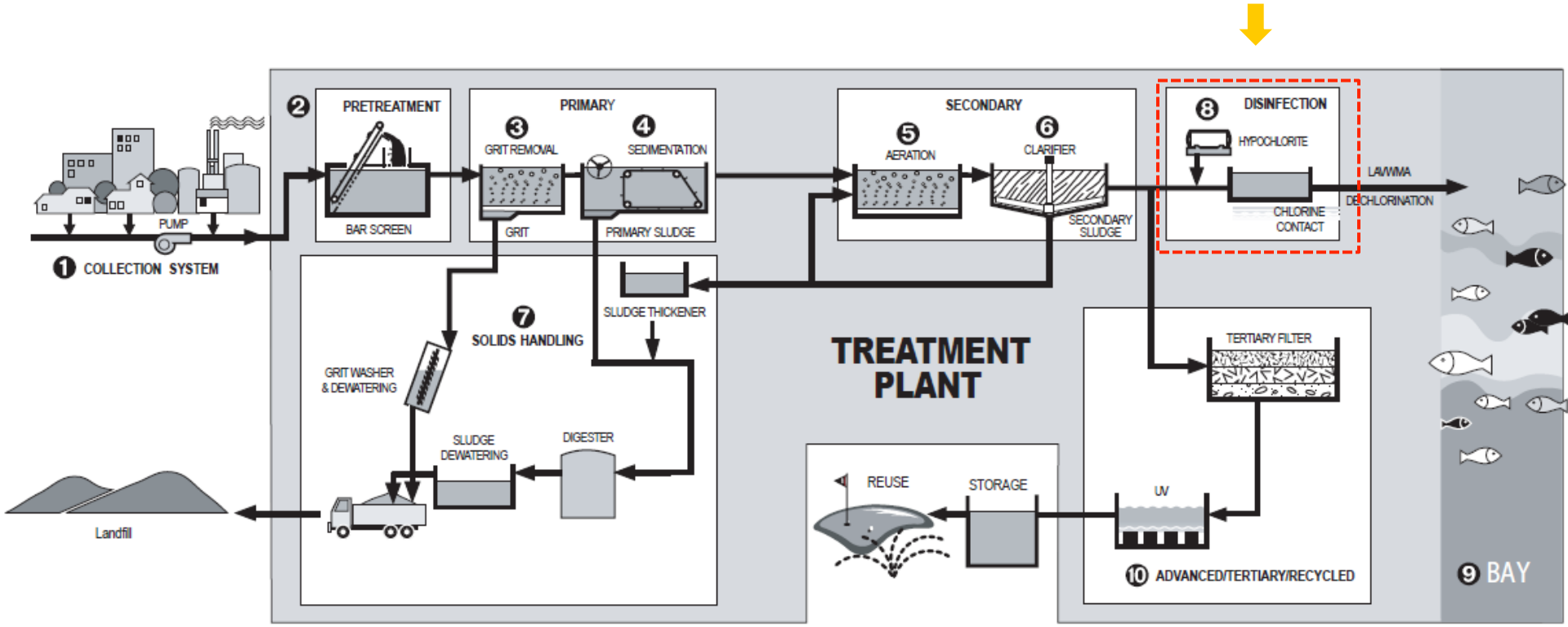
Secondary Sedimentation

Solids separation before final discharge

Sludge either return to aeration tank or channel to treatment



Disinfection



Disinfection

Destruction of disease causing organisms in sewage effluent

Required where discharge have a detrimental effect on receiving water - epidemic

Chlorination most common (others include ultra-violet, ozonation)

Operational skill required

Chlorination chamber required

Important Facilities

Balancing/Equalization tank

Flow measurement

Balancing/Equalization Tank

Stabilize flow and load - steady-state condition

Designed HRT of 1.5 hours at peak flow

Downstream of screens and grit chambers

Mixed and aerated to avoid septic conditions

Flow Measurement

To determine the actual flow

Open channel hydraulic structures

Weir and flume


Weir


Weir


Flume
Property of SCCLSD 2006