OPERATION & MAINTENANCE WASTEWATER LAGOON SYSTEMS

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WASTEWATER LAGOON SYSTEMS

- Provide secondary treatment of domestic wastewater by the action of bacteria stabilizing the organic matter in the wastewater.
- Meets the treatment standard required by Federal and Provincial authorities
- Withstands high flow and organic loading fluctuations
- Less costly than mechanical WWTPs.
- Less operator attention required than mechanical WWTPs.
- Relatively easy to maintain.

  Do require attention.

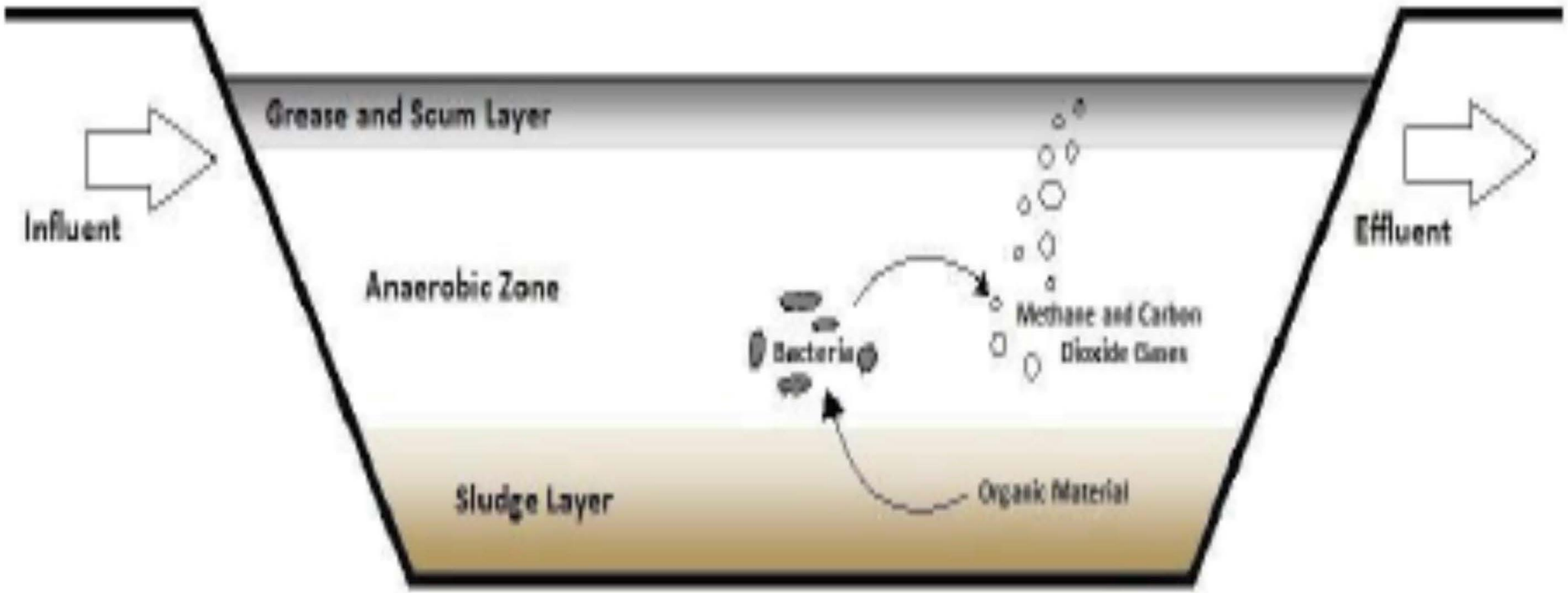
DISADVANTAGES of WASTEWATER LAGOONS

- Algae in effluent
- Less effective in removing Ammonia than other technologies
- Pond turnover and other odour issues
- Potential leakage concerns
- Long-term solids accumulation
- Larger foot-print required

TYPICAL LAGOON CONFIGURATION

- ANAEROBIC CELLS (2 cells or 4 cells) – 3 days of detention time
- FACULTATIVE CELL – 60 days of detention time
- STORAGE CELL – current standard is 1 year of storage

ANAEROBIC CELLS



Courtesy of Katherine Robles, WIDNR

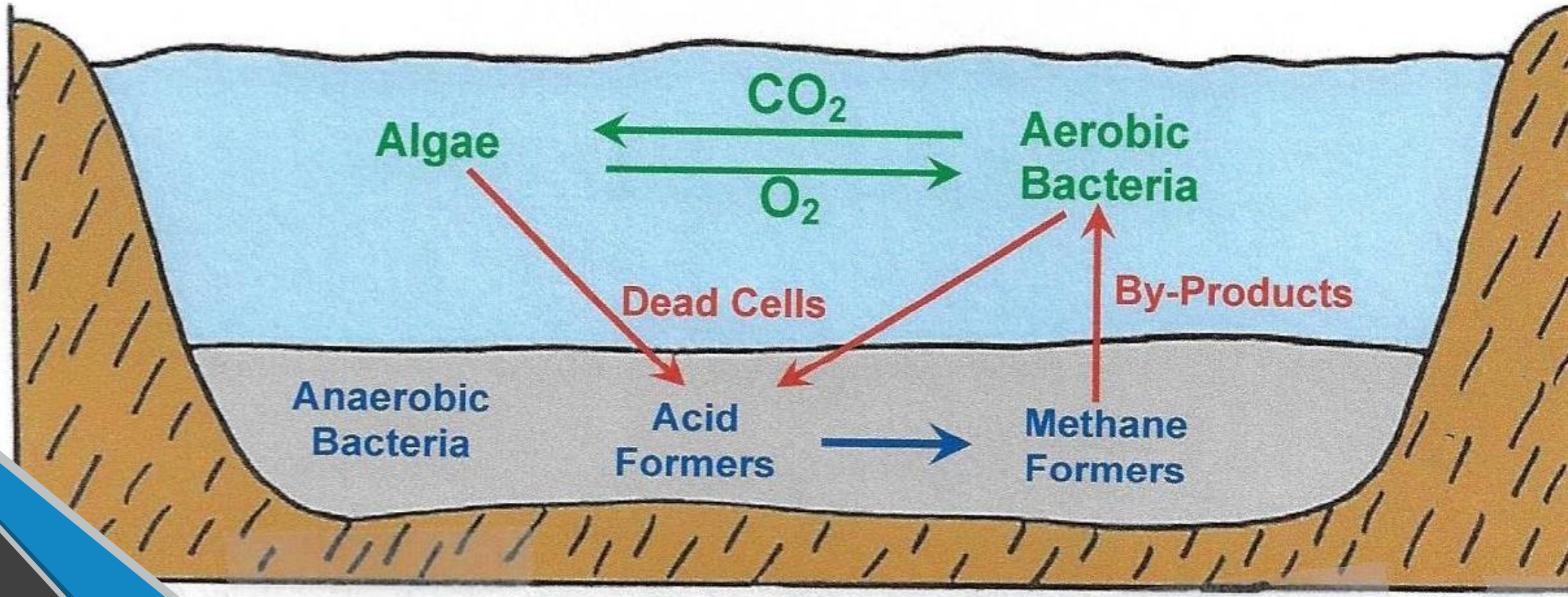
ANAEROBIC CELLS

- **ADVANTAGES**
  - Infrequent sludge removal
  - High degree of stabilization is possible
  - Low or no energy requirements
  - Ease of operation

ANAEROBIC CELLS

- **DISADVANTAGES**
  - Incomplete BOD_5 removal
  - Odours
  - Processes are sensitive to temperature

ACTIVITY IN FACULTATIVE PONDS



FACULTATIVE CELL

- Facultative cell is relatively shallow (2 meters), open to the sun and air
- Three layers of treatment in the cell:
  - Aerobic bacteria
  - Facultative bacteria
  - Anerobic bacteria
- Each decompose organic matter in three different zones

AEROBIC ZONE

- Bacteria uses dissolved oxygen to decompose organic waste by oxidation
- Oxygen comes from wind action and photosynthesis
- Algae reacts with sunlight to produce new cells, releasing oxygen as a by-product

FACULTATIVE ZONE

- At a depth of 600 mm, sunlight penertration is reduced in the cell and dissolved oxygen levels are lower.
- Facultative bacteria can decompose organic matter under these lower oxygen levels

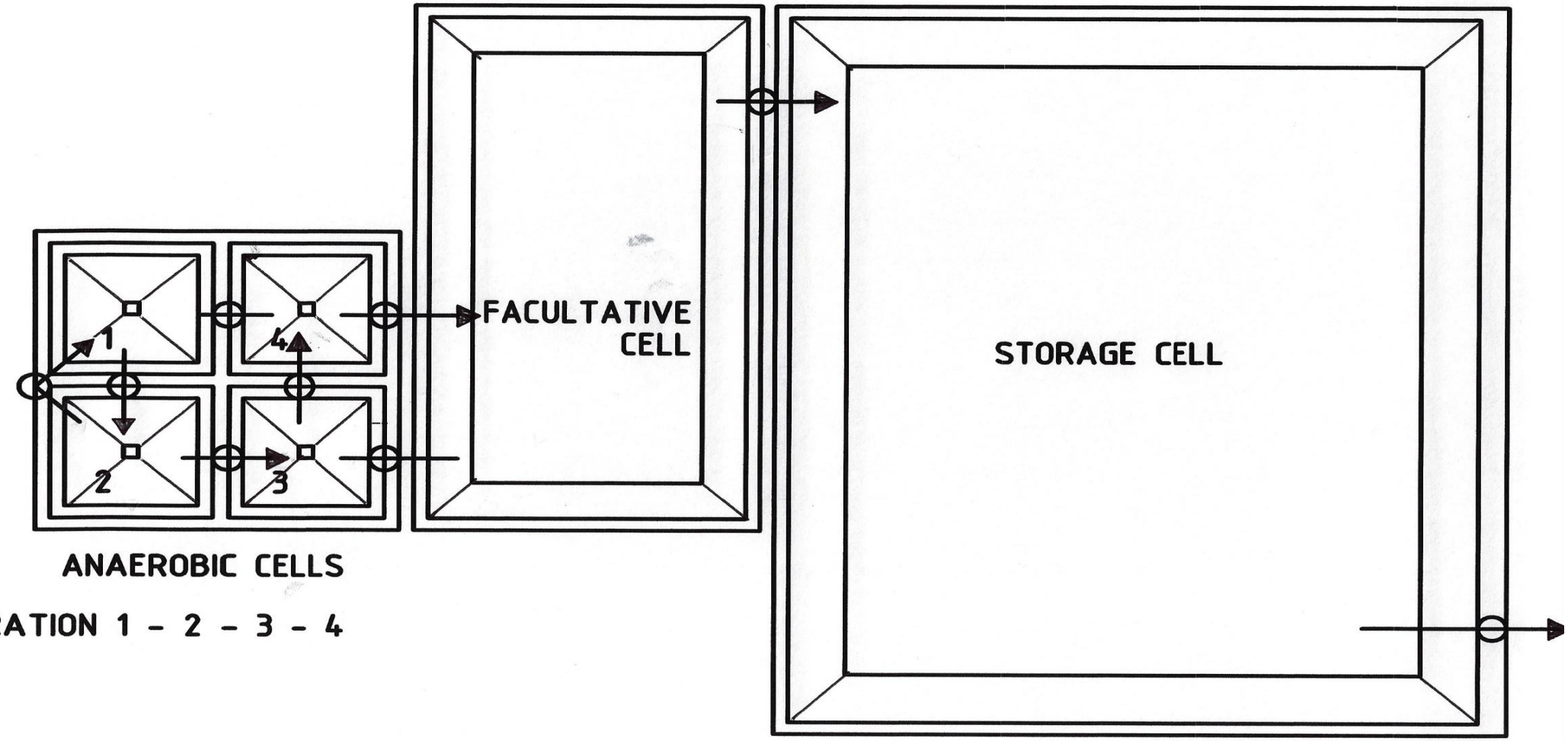
ANAEROBIC ZONE

- Wastewater solids, bacteria, and algae settle on the bottom of the cell and form a sludge layer
- Anaerobic digestion occurs where the bacteria converts organic matter into different volatile organic acids

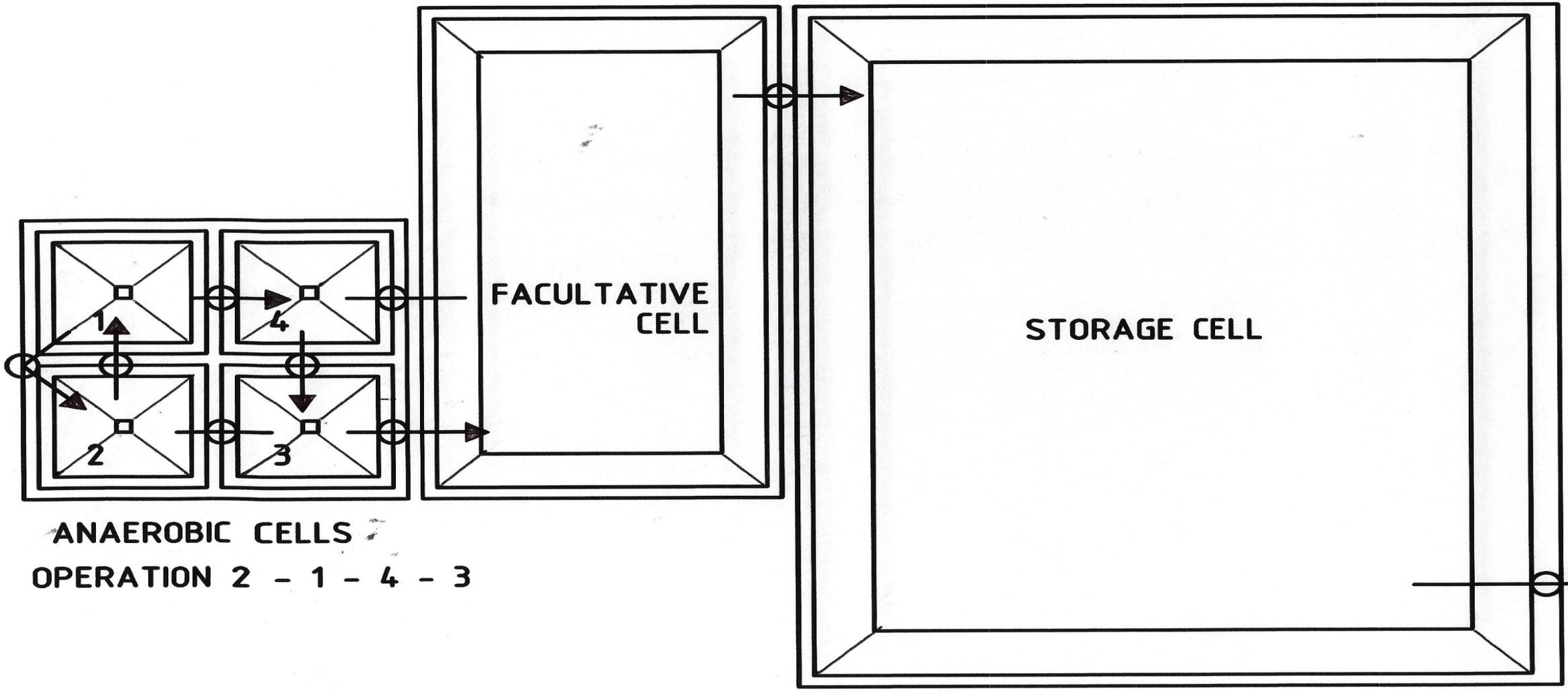
STORAGE CELL

- As the name implies, cell contains the wastewater for a predetermined period time, usually one year
- Key element of storage cell is ability to hold liquid
  - Clay liner must utilize a clay that demonstrates the ability to retain water
  - Synthetic liners are usually HDPE geomembranes

TYPICAL LAGOON OPERATION



ALTERNATIVE LAGOON OPERATION



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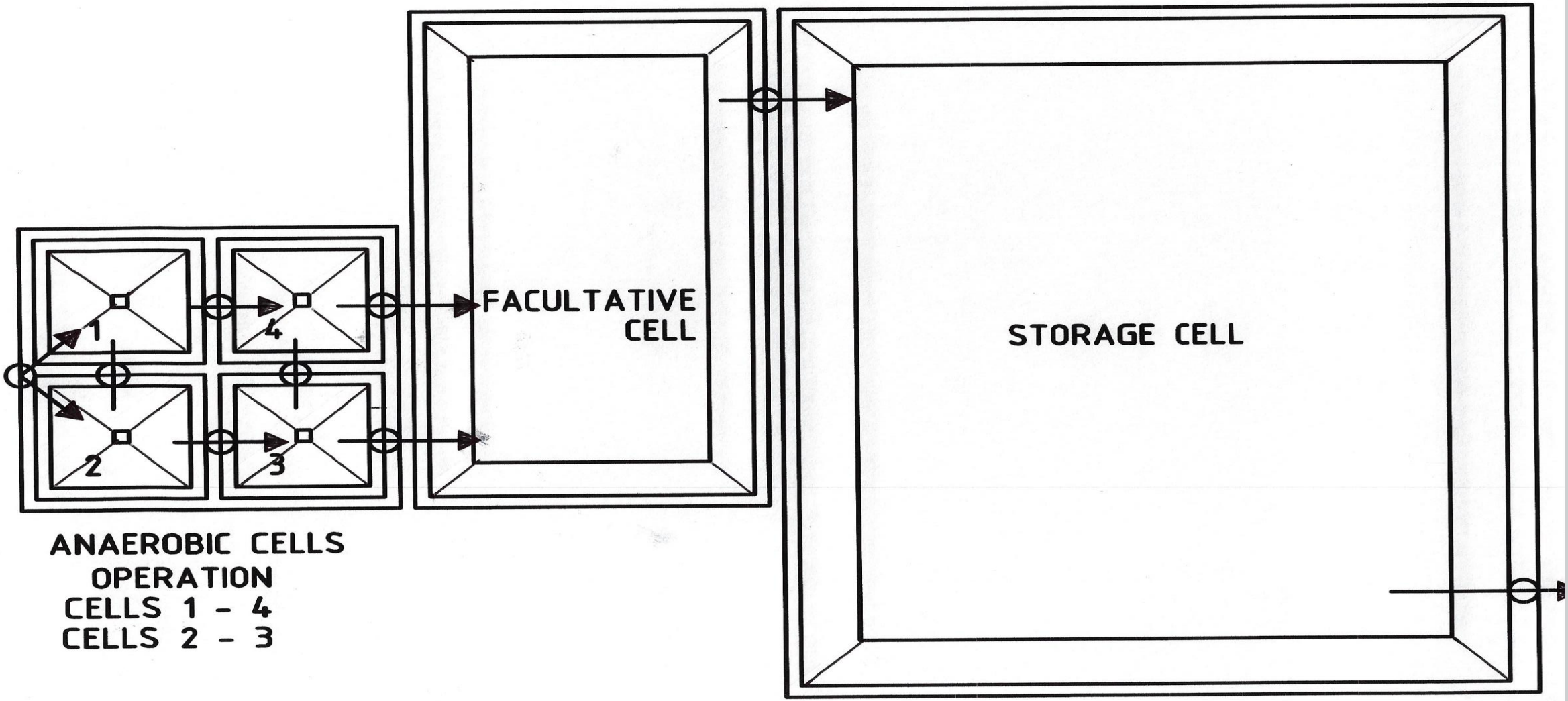

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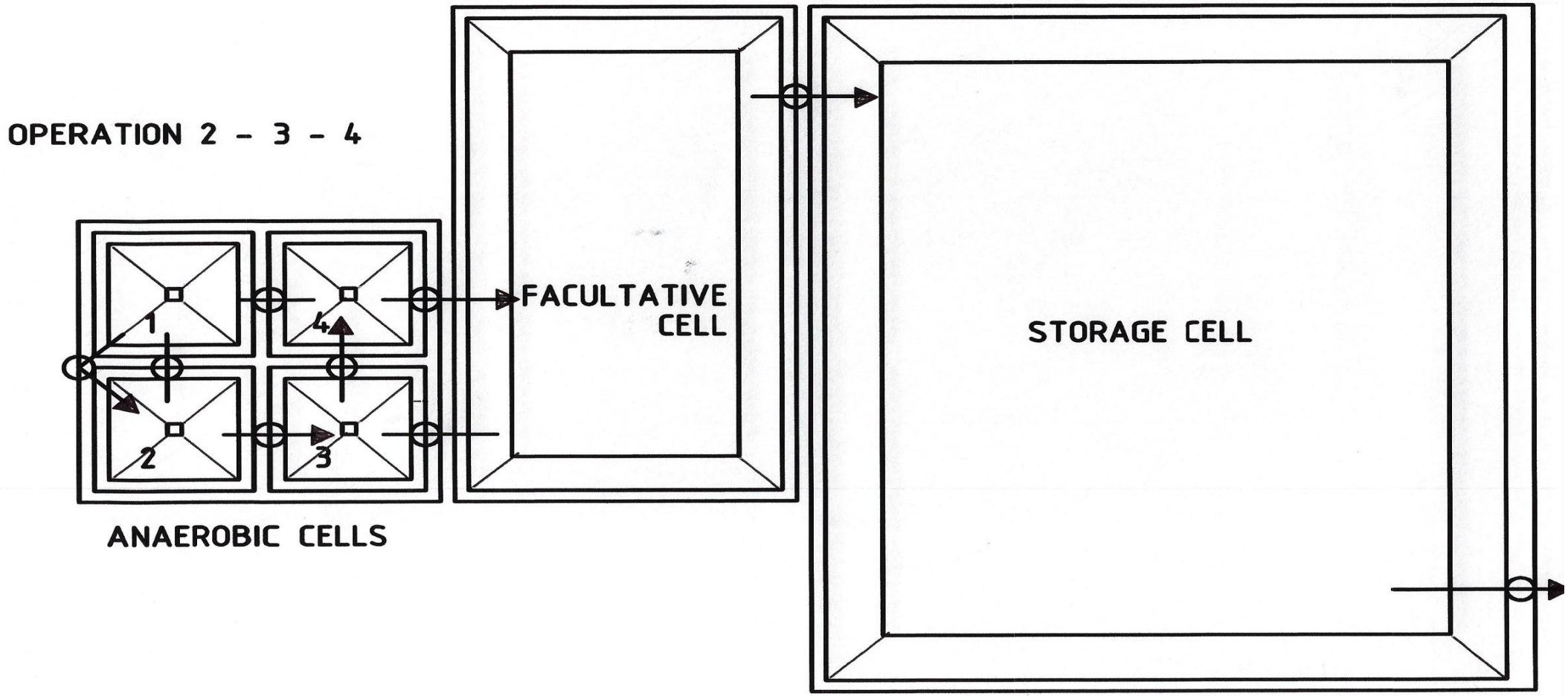

MAINTENANCE of WASTEWATER LAGOON SYSTEM

- Regular monitoring of influent and inter-cell flow (weekly)
- Remove duckweed and scum – facultative cell
- Cut grass, weeds, and shrubs along the berm
- Control cattails
- Maintain fence surrounding lagoon
- Control rodents and other animals

BIOCHEMICAL OXYGEN DEMAND (BOD)

- Measures the organic strength in the wastewater
- 5 day BOD test measures the amount of oxygen required in a five day period by the micro-organisms need to consume the organic matter in wastewater
- Normal domestic wastewater varies between 150 – 250 mg/L BOD
- Effluent standard is less than 25 mg/L

SUSPENDED SOLIDS (SS)

- Suspended solids removal is a important as BOD removal for preventing receiving stream pollution
- Normal domestic wastewater has similar SS and BOD levels (150 –250 mg/L)
- Effluent standard is less than 25 mg/L
- SS are difficult to remove from lagoon effluents due to the high concentration of algae in late summer and fall discharges

QUESTIONS?

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