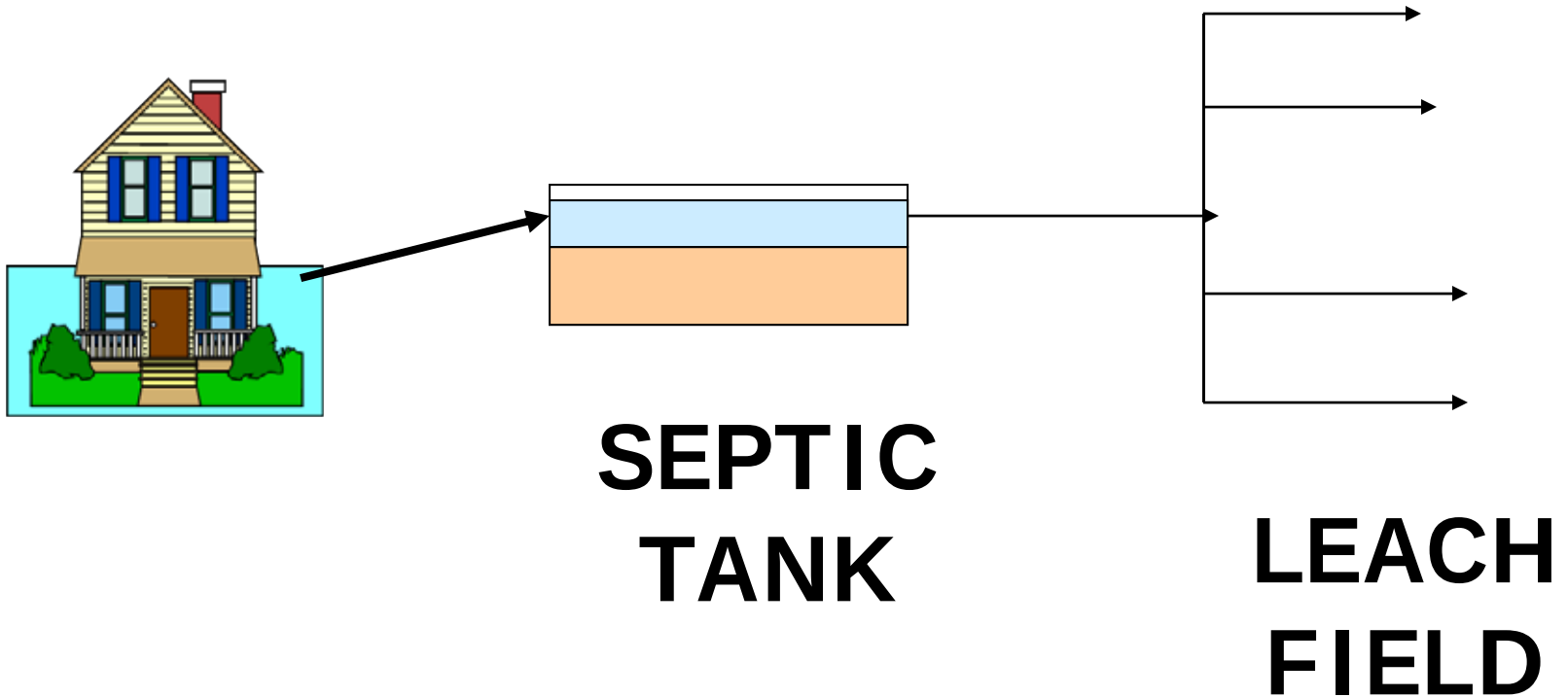
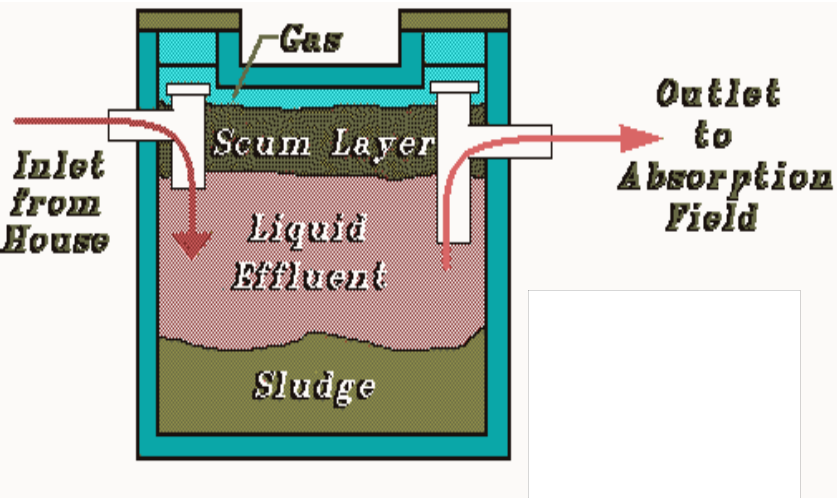


ON-SITE TREATMENT



“CONVENTIONAL SYSTEM”



SCUM,
LIQUID,
SOLIDS

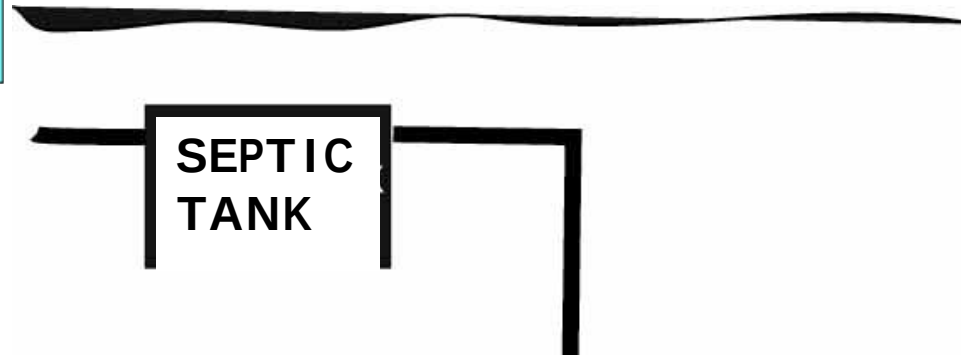
SEPTAGE

ANAEROBIC CONDITIONS IN
THE SEPTIC TANK,

AEROBIC CONDITIONS IN THE
LEACH FIELD



ON-SITE OPTIONS



**“ALL” OPTIONS BEGIN
WITH A SEPTIC TANK
(PRIMARY TREATMENT)**

ALTERNATIVE SYSTEMS NEEDED WHEN...

- **TOO MUCH VOLUME TO TREAT**
- **POOR SOIL**
- **TOO SMALL A LOT**
 - **HIGH WATER TABLE or
ENVIRONMENTALLY SENSITIVE
AREA**



**SOMETIMES
CHAMBERS
ARE
INSTALLED
INSTEAD OF
LEACH
FIELDS**

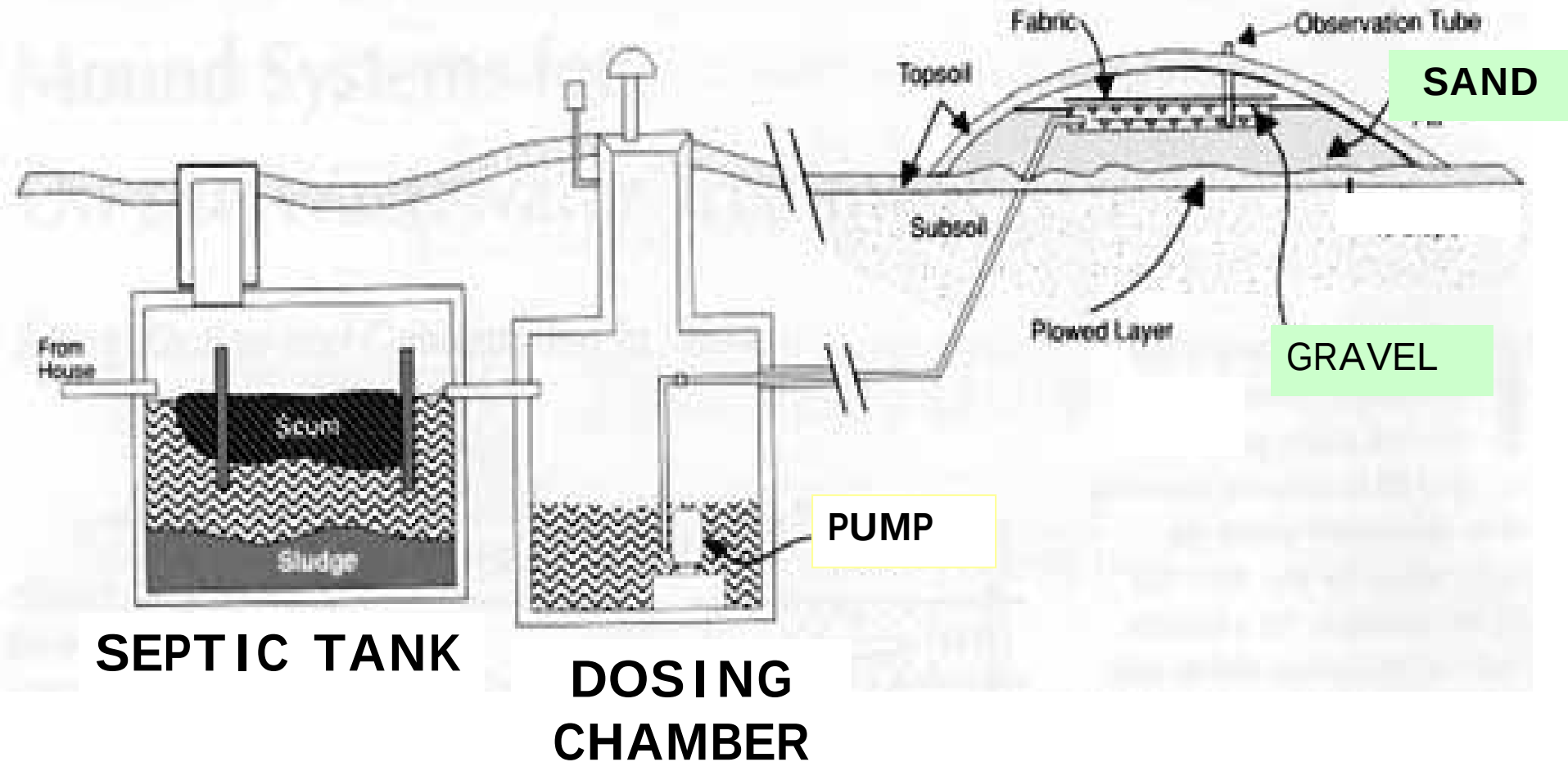


ON-SITE OPTIONS



- mound system

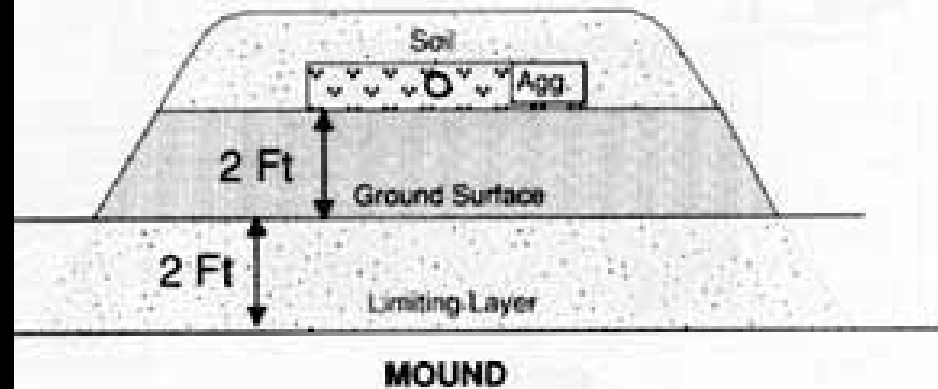
MOUND SYSTEM



MOUND SYSTEM

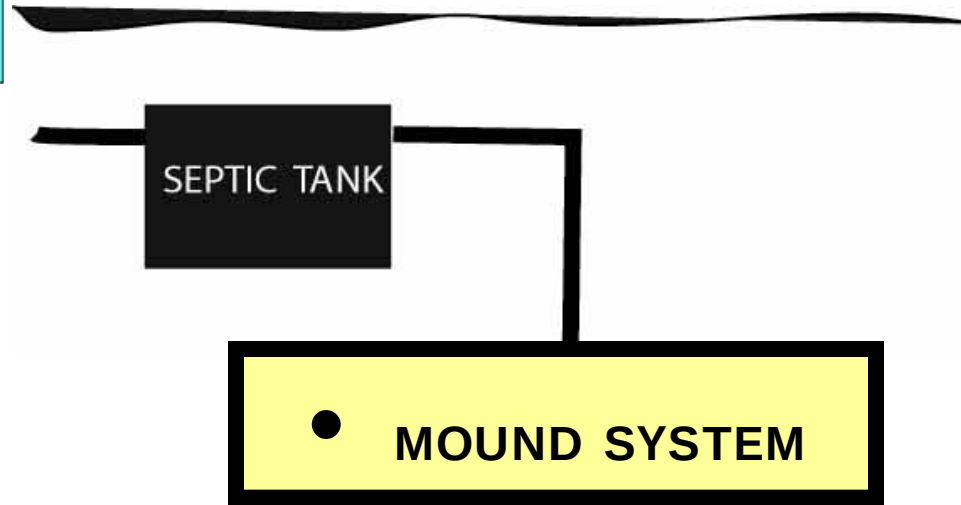
**BUILD
WHERE:**

- **<10 ft to
rock**
- **<1 inch/hr
percolation**



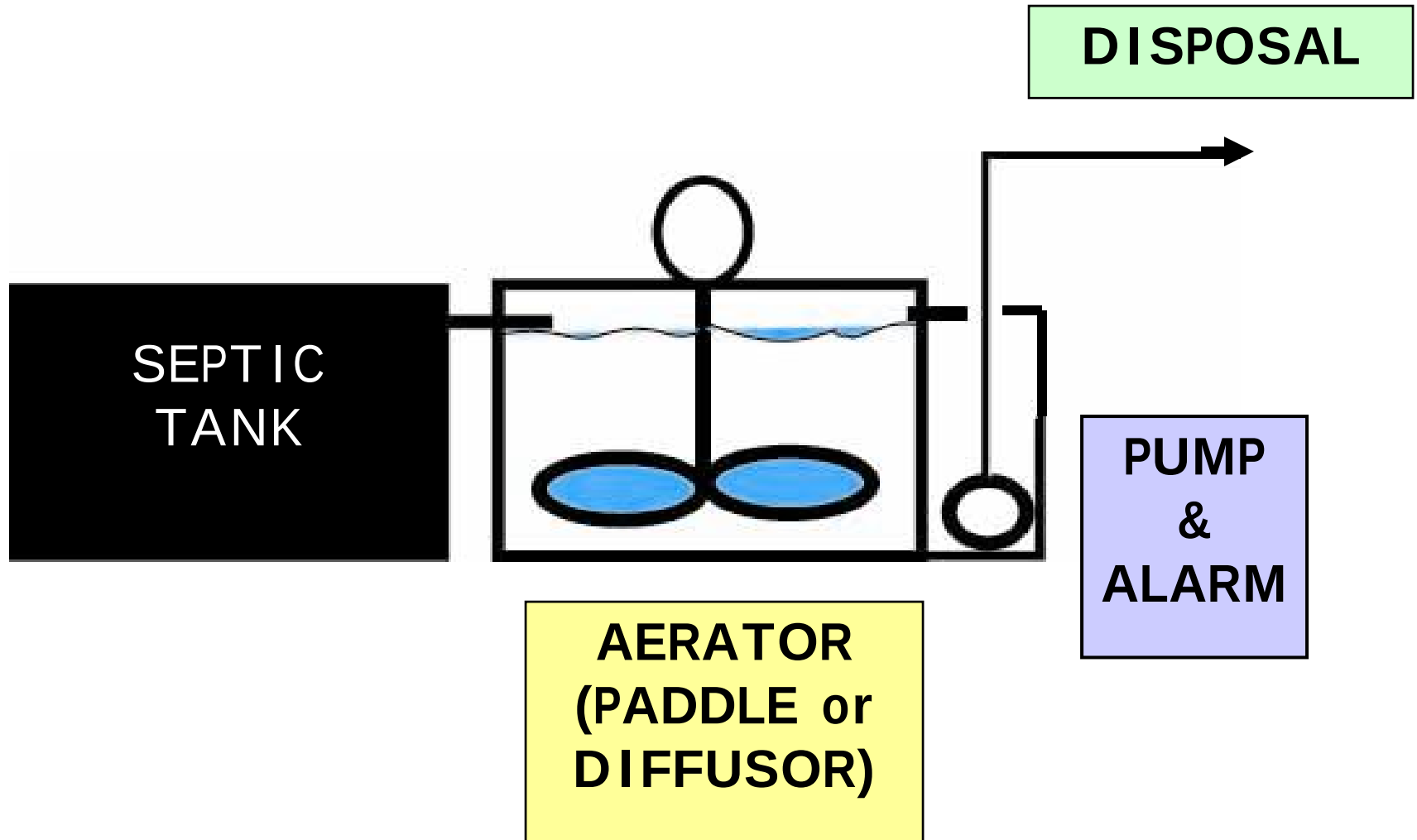


ON-SITE OPTIONS



- AEROBIC SYSTEM

AEROBIC SYSTEM



POTENTIAL PROBLEMS WITH AEROBIC SYSTEMS

**NEGLECTION FROM
HOMEOWNERS**

**SOME STATES REQUIRE
CERTIFIED OPERATORS TO
MAINTAIN THESE UNITS**



ON-SITE OPTIONS

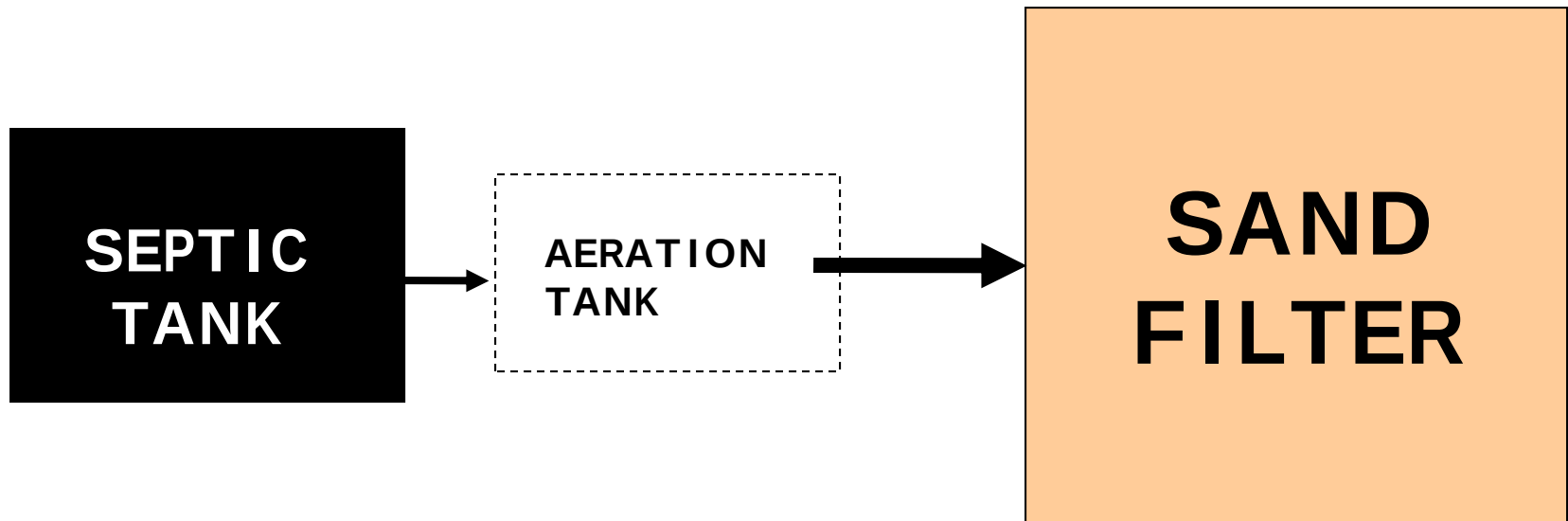
SEPTIC TANK

- MOUND SYSTEM

- AEROBIC SYSTEM

- SAND FILTER

SAND FILTERS



- FILTERS CAN BE ABOVE GROUND (OPEN FILTER) OR BELOW GROUND (BURIED FILTER)
- ACT LIKE MINATURE TRICKLING FILTER; SO, OPEN FILTERS MUST BE RAKED AND SAND REPLACED REGULARLY



ON-SITE OPTIONS

SEPTIC TANK

- MOUND SYSTEM

- AEROBIC SYSTEM

- SAND FILTER

- CONSTRUCTED
WETLANDS

CONSTRUCTED WETLANDS

•AKA - ROCK & REED FILTERS;
MICROBIAL ROCK PLANT FILTERS;
VEGETATED ROCK FILTERS;
VEGETATED SUBMERGED BED
WETLANDS; SHALLOW HORIZONTAL
FLOW WETLANDS; MICRO-
WETLANDS; ARTIFICIAL MARSH;
PHYTOREMEDIATION

•SPACE - AGE TECHNOLOGY

CONSTRUCTED WETLAND

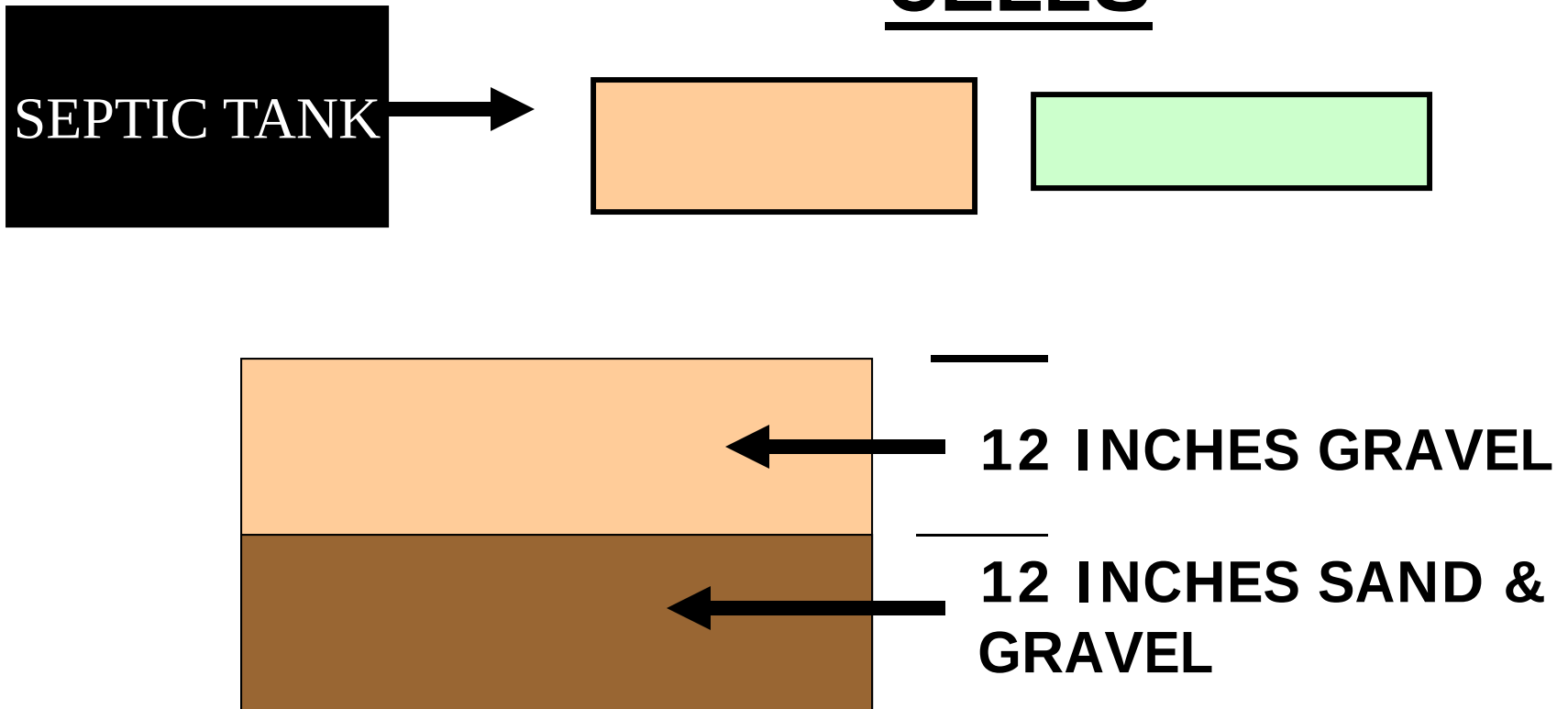
TWO TYPES:

- WATER FLOWS ON SURFACE;
- WATER FLOWS BENEATH THE SURFACE

PURPOSE IS TO ARTIFICIALLY
REPRODUCE WHAT ACTUALLY
HAPPENS IN A NATURAL
WETLAND

CONSTRUCTED WETLAND

CELLS





**DISTRIBUTION
PIPES INTO A
CONSTRUCTED
WETLAND**

CONSTRUCTED WETLAND







**VEGETATION: BULRUSHES, CATTAILS, REEDS,
RUSHES, SEDGES...SHOULD BE NATURAL
VEGETATION TO ADAPT WELL AND CONTROL
PESTS**



HOW CONSTRUCTED WETLANDS WORK

- PLANT ROOTS GIVE OFF OXYGEN TO AERATE THE WATER.**
- AEROBIC ORGANISMS ATTACH TO ROOTS AND GRAVEL**
- BACTERIA, FUNGI, PROTOZOAN, AND ENZYMES BREAK DOWN THE POLLUTANTS**

WATER LOSSES IN THE WETLANDS

**DEATH VALLEY, CA HAS AN
EVAPORATION RATE OF 150"/YR.**

**WHAT IS THE AVERAGE ANNUAL
EVAPORATION IN SOUTHERN
NEW MEXICO?**

ANS: 60 - 80 INCHES/YEAR

TRANSPIRATION

- ONLY 1% OF THE WATER TAKEN UP BY PLANTS IS NEEDED, THE REST IS “TRANSPIRED” TO THE AIR

- EXAMPLE: ONE CORN PLANT TRANSPIRES ABOUT 1/2 GALLON OF WATER PER DAY.
- A FIELD OF CORN TRANSPIRES ABOUT 400,000 GAL PER SEASON

EVAPOTRANSPIRATION

DIFFICULT TO TELL HOW MUCH
WATER IS LOST TO
EVAPORATION AND HOW MUCH
TO TRANSPIRATION, SO... THE
LOSSES ARE LUMPED TOGETHER
AND CALLED
“EVAPOTRANSPIRATION”

OTHER WATER LOVING PLANTS

- DEEP-ROOTED TREES CALLED *"PHREATOPHYTES"* (MEANING THEY TAKE WATER FROM THE WATER TABLE)

- TAMERISK (aka SALT CEDARS), COTTONWOOD ARE PHREATOPHYTES

CONSTRUCTED WETLANDS ARE GROWING IN POPULARITY.

**BENEFITS: INEXPENSIVE TO
CONSTRUCT; EASY TO MAINTAIN;
EFFICIENT AND RELIABLE; CAN
TOLERATE LOW OR HIGH FLOWS
AND VARYING CONTAMINANT
LEVELS; AESTHETICALLY PLEASING
AND PROVIDE A HABITAT FOR
WILDLIFE AND HUMAN
ENJOYMENT**

DISADVANTAGES OF CONSTRUCTED WETLANDS

- MAY REQUIRE LARGE LAND AREA
- NEW TECHNOLOGY AND ALL THE “BUGS” ARE NOT YET WORKED OUT
- BIOLOGICAL AND HYDROLOGICAL PROCESSES NOT WELL UNDERSTOOD
- MAY BE POSSIBLE PEST PROBLEMS

REMOVAL EFFICIENCIES of CONSTRUCTED WETLANDS

	<u>1st CELL</u>	<u>2nd CELL</u>
BOD/TSS	<u>75%</u>	90+%
FECAL COLIFORM	<u>95%</u>	99.9%
AMMONIA (NH₃)	40%	99.9%

IRRIGATION SYSTEMS

- DRIP TECHNOLOGY CAME FROM ISRAEL. SEPTIC TANK EFFLUENT MUST GO THRU A SERIES OF DISK FILTERS TO PREVENT NOZZLE CLOGGING**



DRIP IRRIGATION TRENCHES

SPRAY IRRIGATION



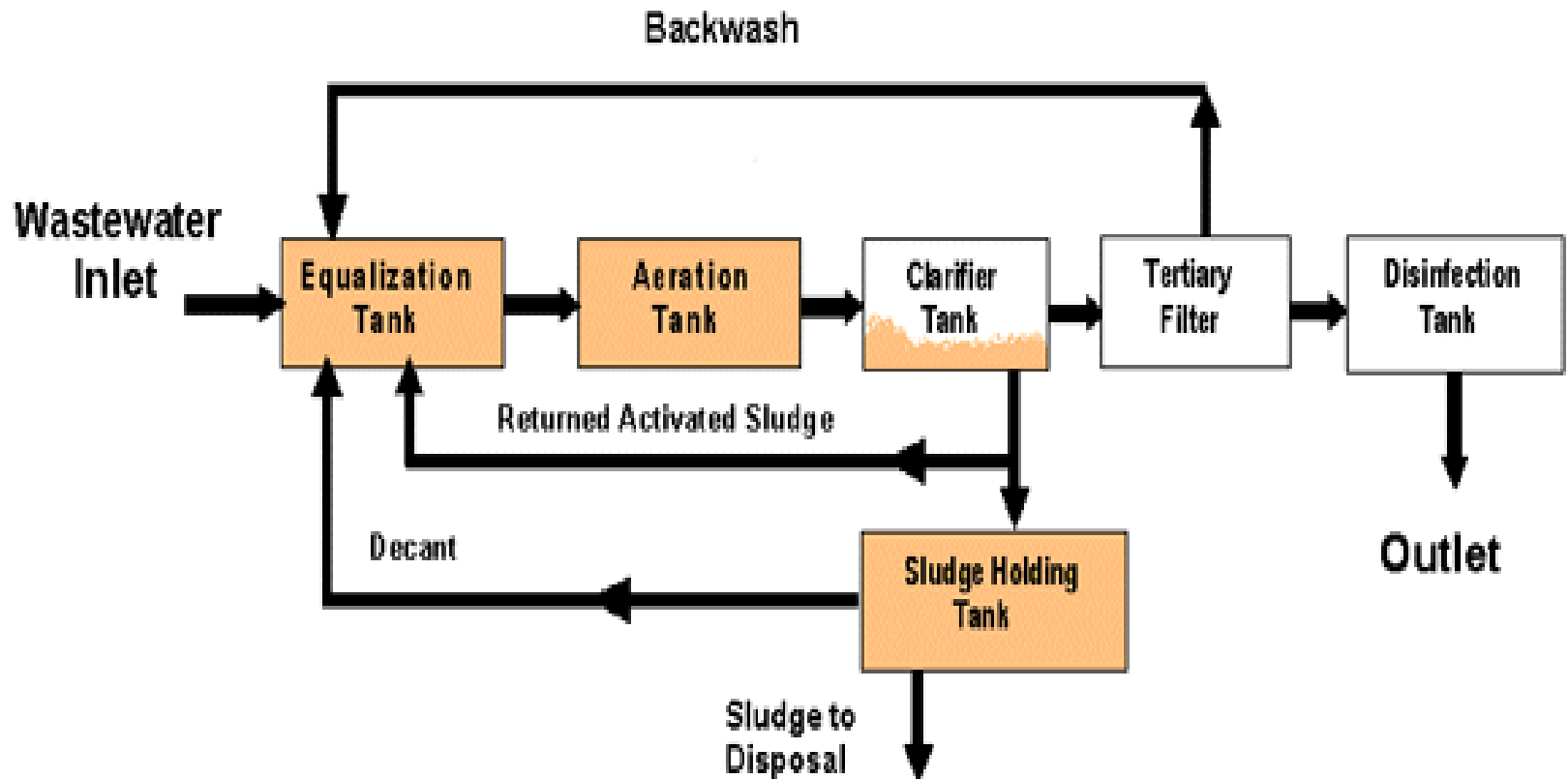
CLUSTER SYSTEMS

**SOME SMALL COMMUNITIES
(OR SEVERAL HOUSEHOLDS)
“CLUSTER” TOGETHER AND
INSTALL A SMALL
CENTRALIZED SYSTEM**



PACKAGE TREATMENT PLANT

Treatment Process Flow Chart



PACKAGE PLANT FLOW CHART