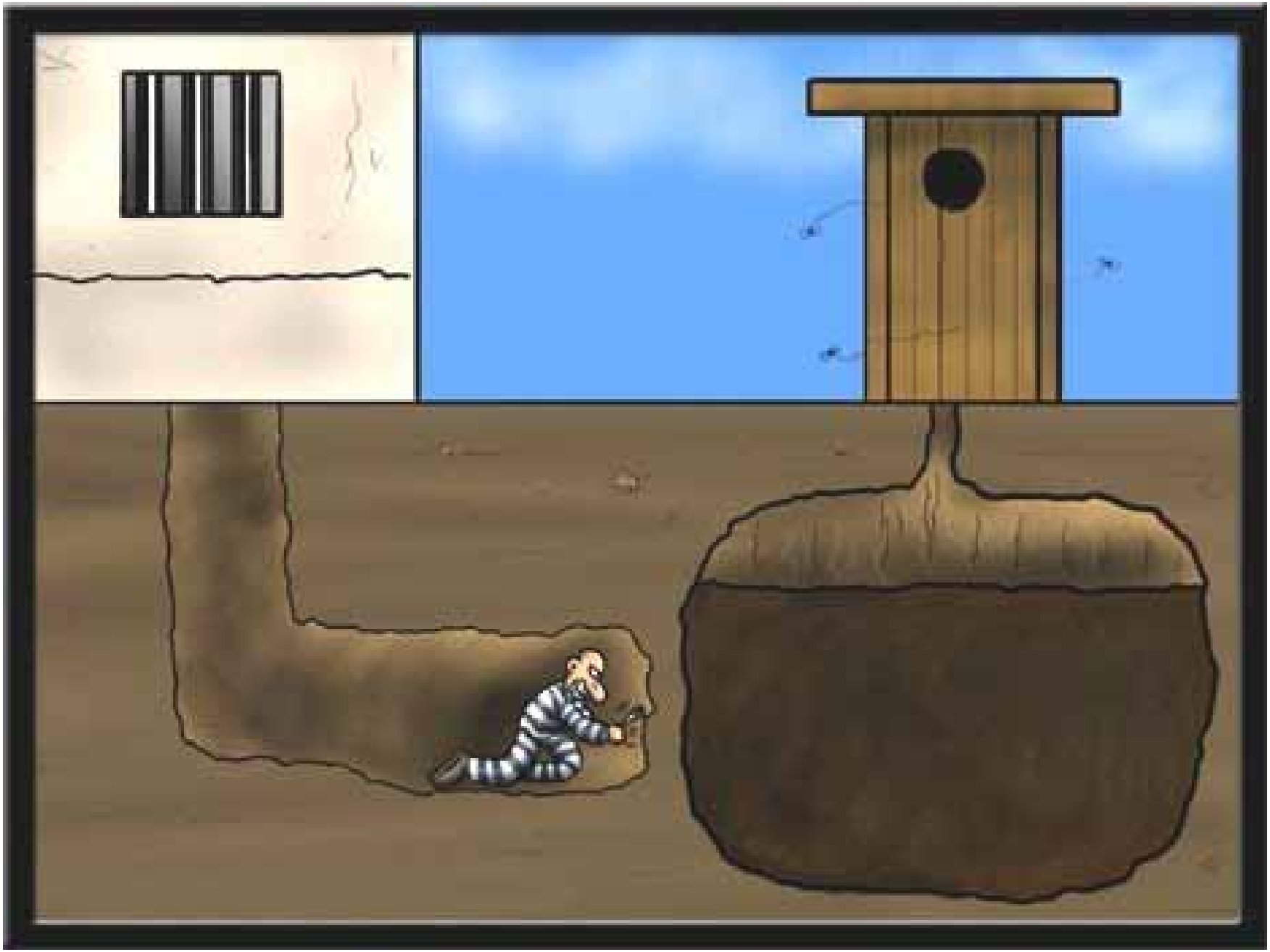
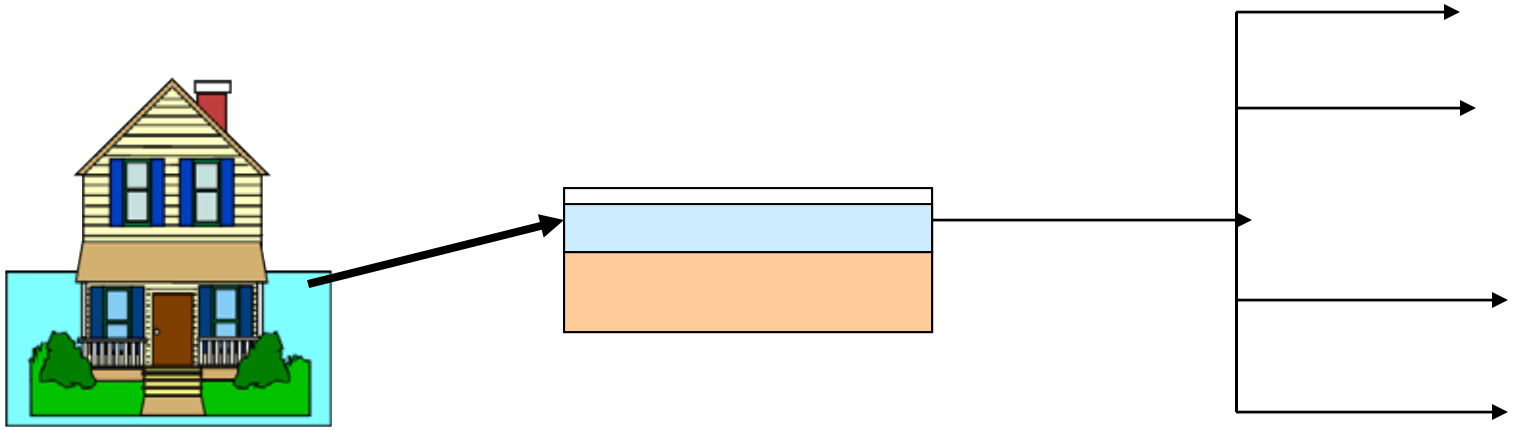


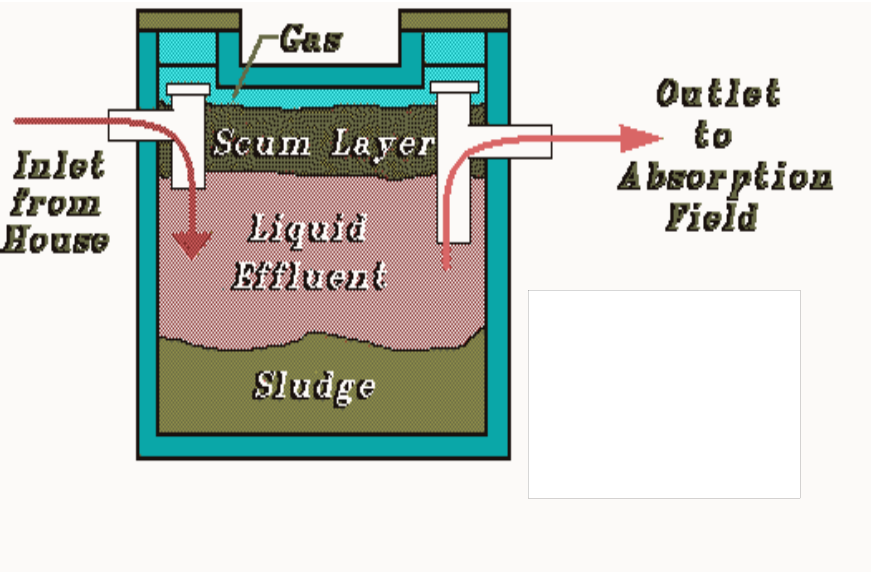
ON-SITE TREATMENT



SEPTIC TANK

LEACH FIELD

"CONVENTIONAL SYSTEM"



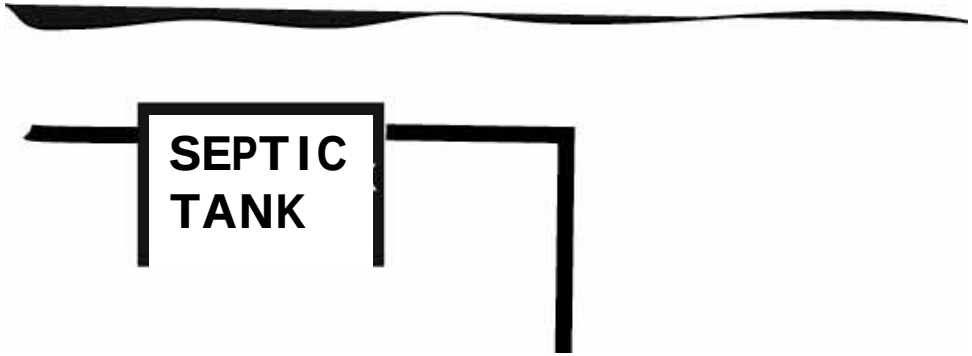
SCUM,
LIQUID,
SOLIDS

→ **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…

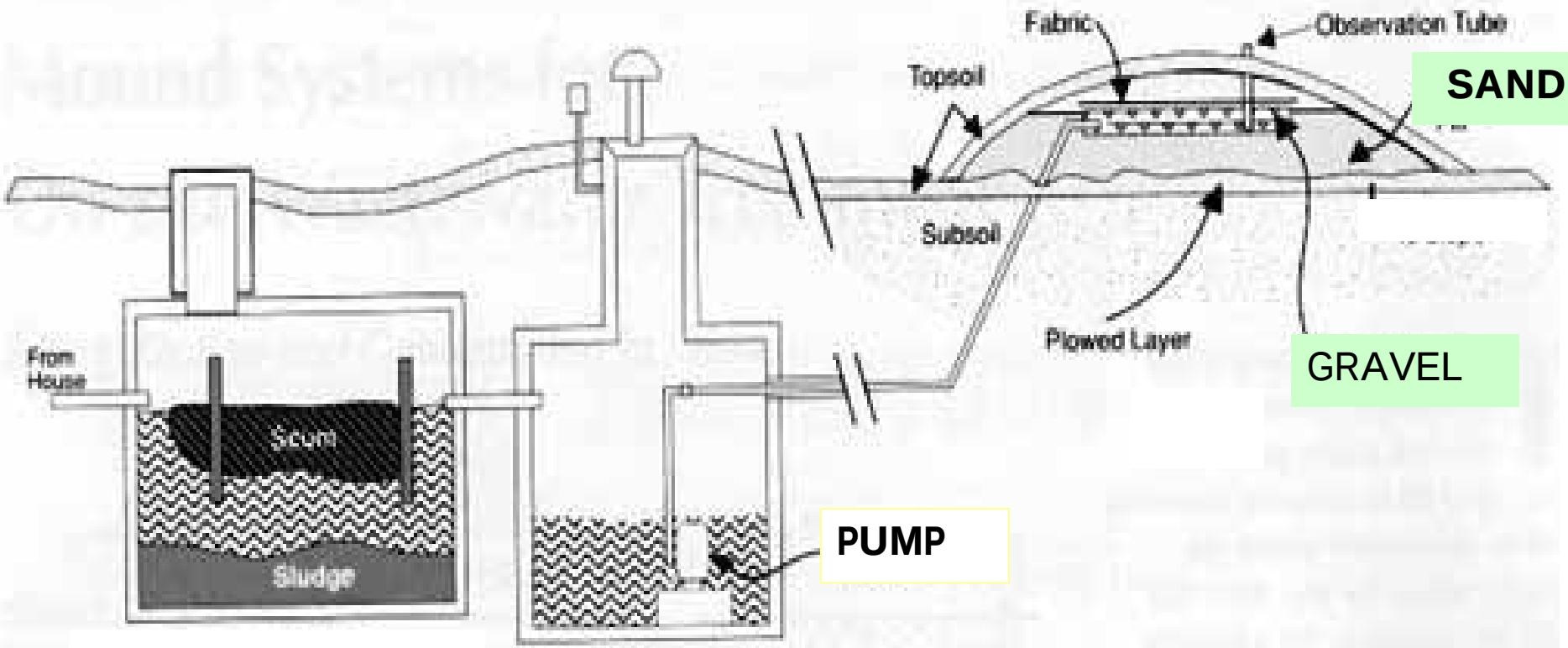
- TOO MUCH VOLUME TO TREAT
- POOR SOIL
- TOO SMALL A LOT
- HIGH WATER TABLE or ENVIRONMENTALLY SENSITIVE AREA

SOMETIMES CHAMBERS ARE INSTALLED INSTEAD OF LEACH FIELDS

ON-SITE OPTIONS

- **MOUND SYSTEM**

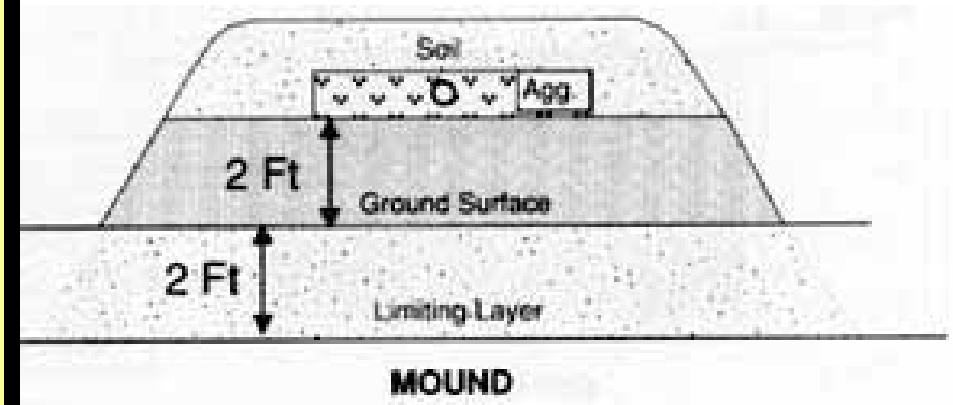
MOUND SYSTEM



MOUND SYSTEM

BUILD WHERE:

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



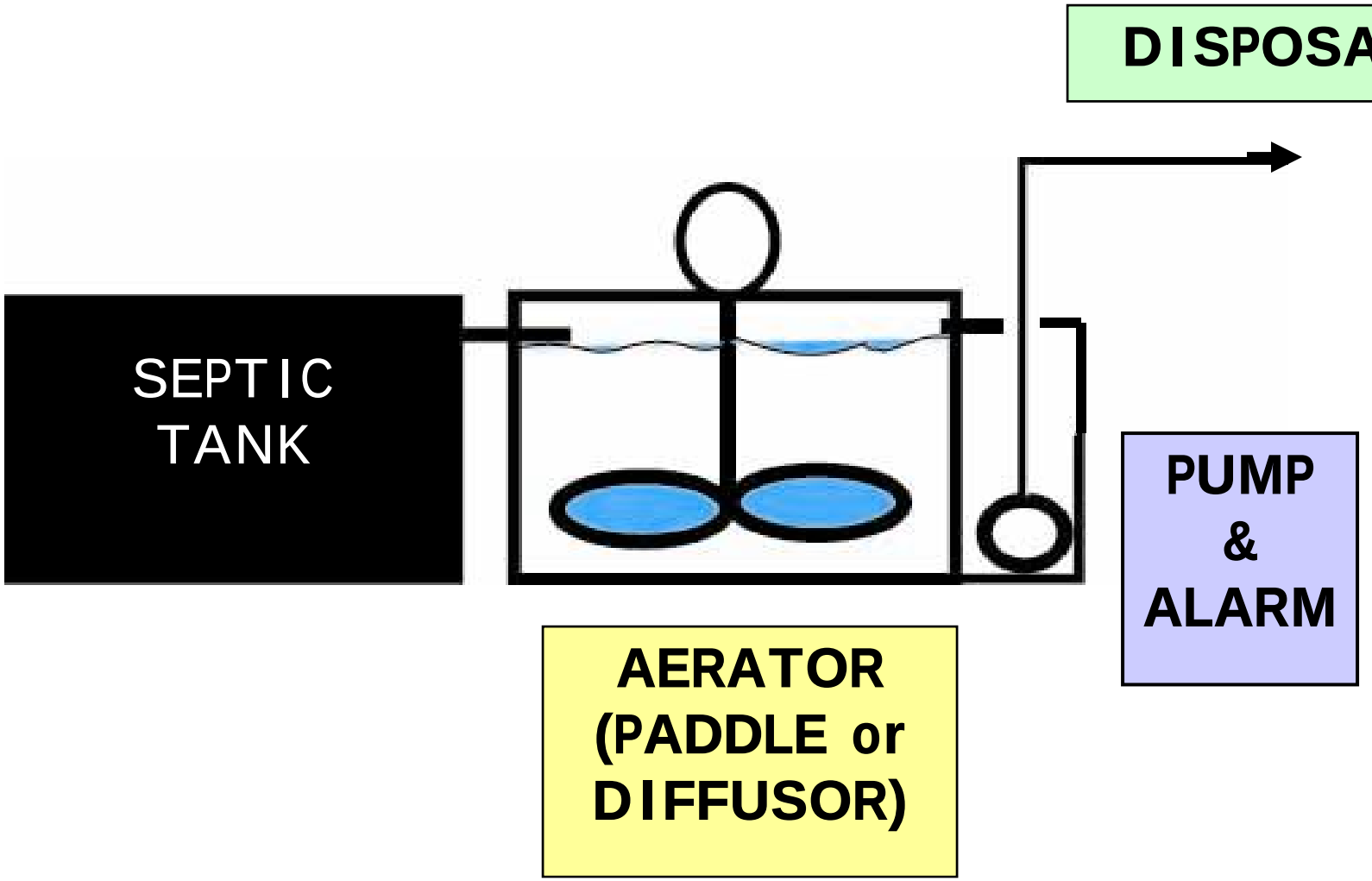
ON-SITE OPTIONS

SEPTIC TANK

- MOUND SYSTEM

- AEROBIC SYSTEM

AEROBIC SYSTEM



POTENTIAL PROBLEMS WITH AEROBIC SYSTEMS

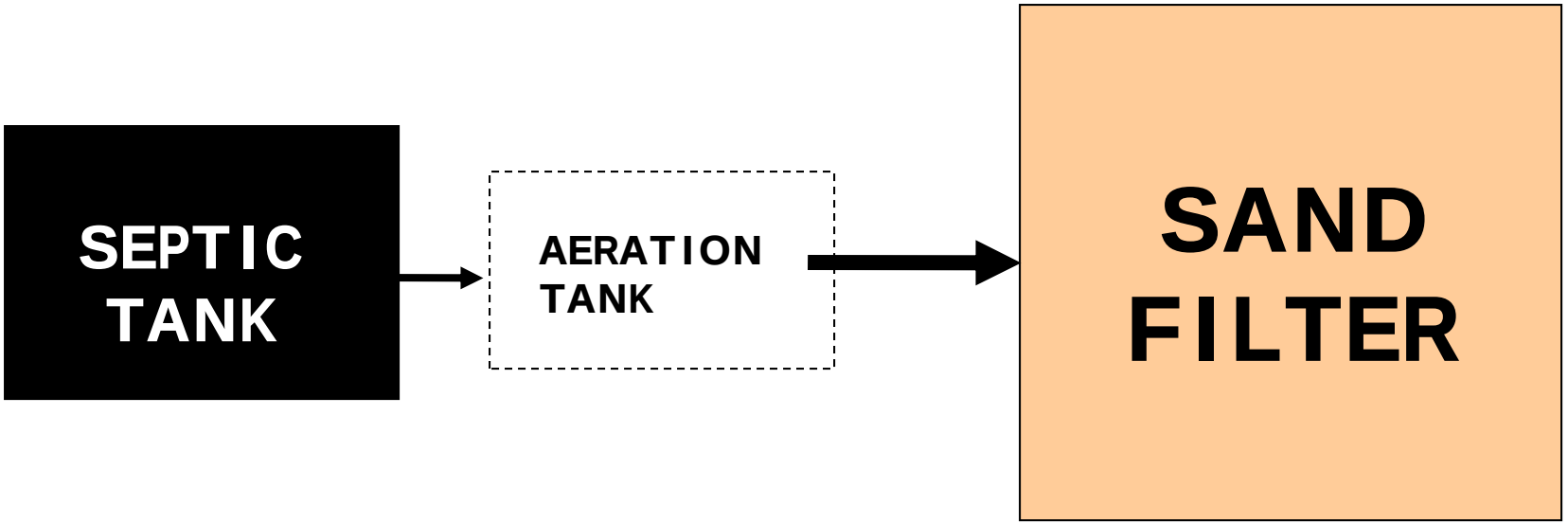
NEGLECTION FROM HOMEOWNERS

SOME STATES REQUIRE CERTIFIED OPERATORS TO MAINTAIN THESE UNITS

ON-SITE OPTIONS

- 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

- 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

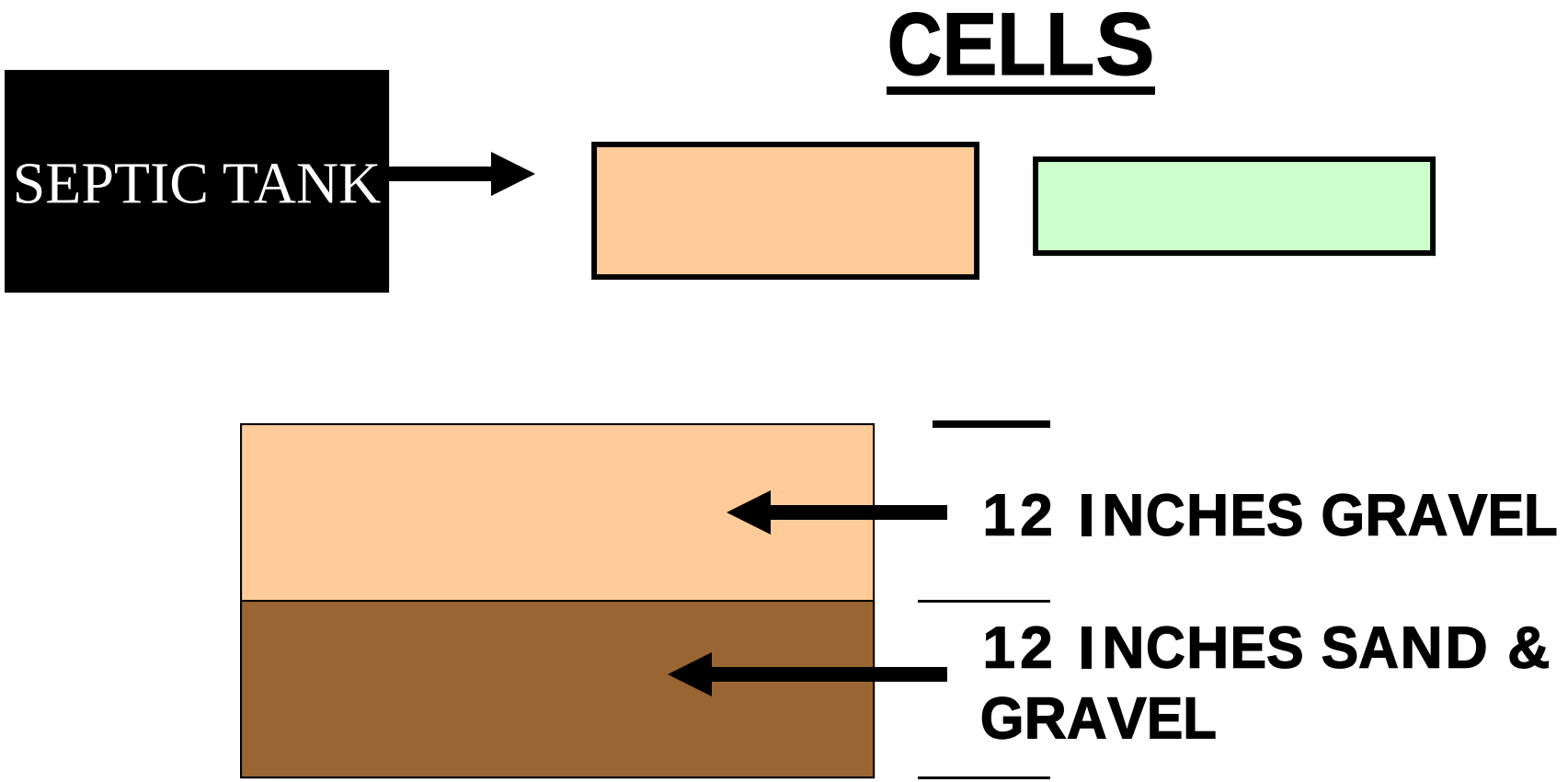
CONSTRUCTED WETLAND

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



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 HIBITAT 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

	1st CELL	2nd CELL
BOD/TSS	75%	90+%
FECAL COLIFORM	95%	99.9%
AMMONIA (NH_3)	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

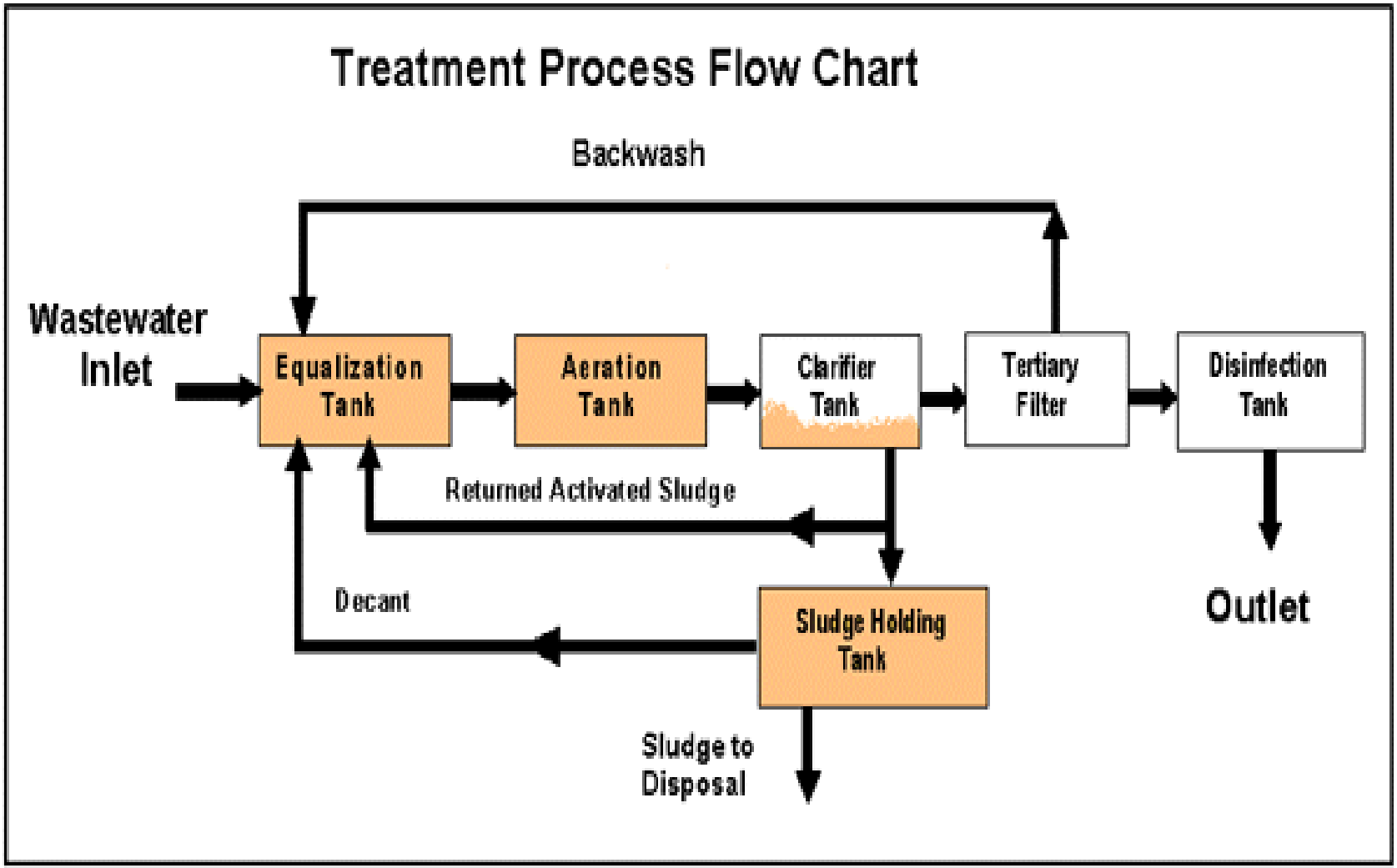
DRIP IRRIGATION TRENCHES

SPRAY IRRIGATION

CLUSTER SYSTEMS

SOME SMALL COMMUNITIES (OR SEVERAL HOUSEHOLDS) "CLUSTER" TOGETHER AND INSTALL A SMALL CENTRALIZED SYSTEM

PACKAGE TREATMENT PLANT



PACKAGE PLANT FLOW CHART