A Lifetime of Water Use

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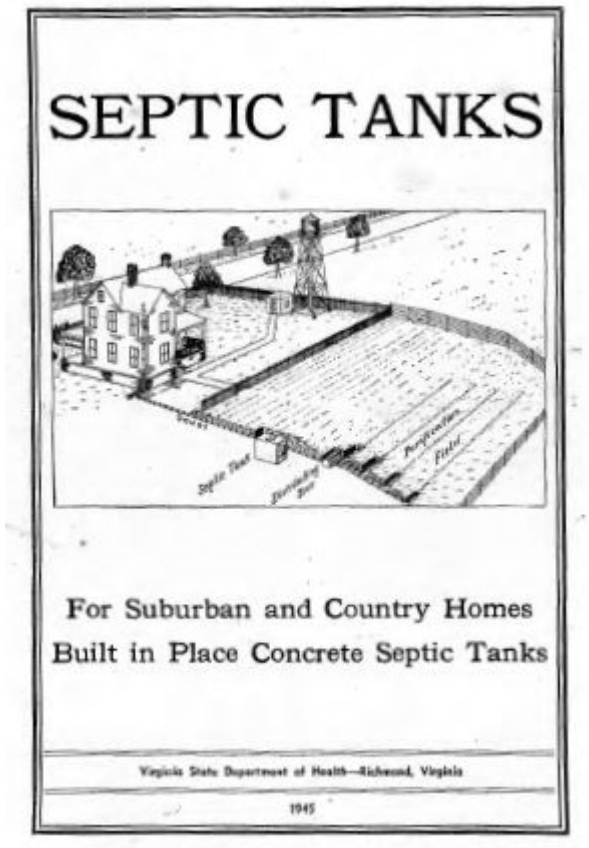
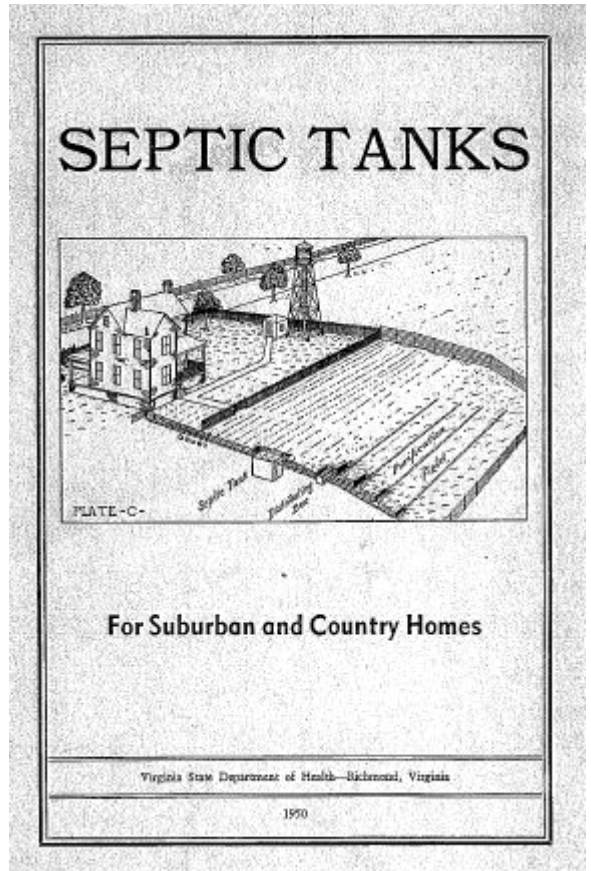
The materials being presented represent the speaker's own opinions and do NOT reflect the opinions of NOWRA.


1+2=3

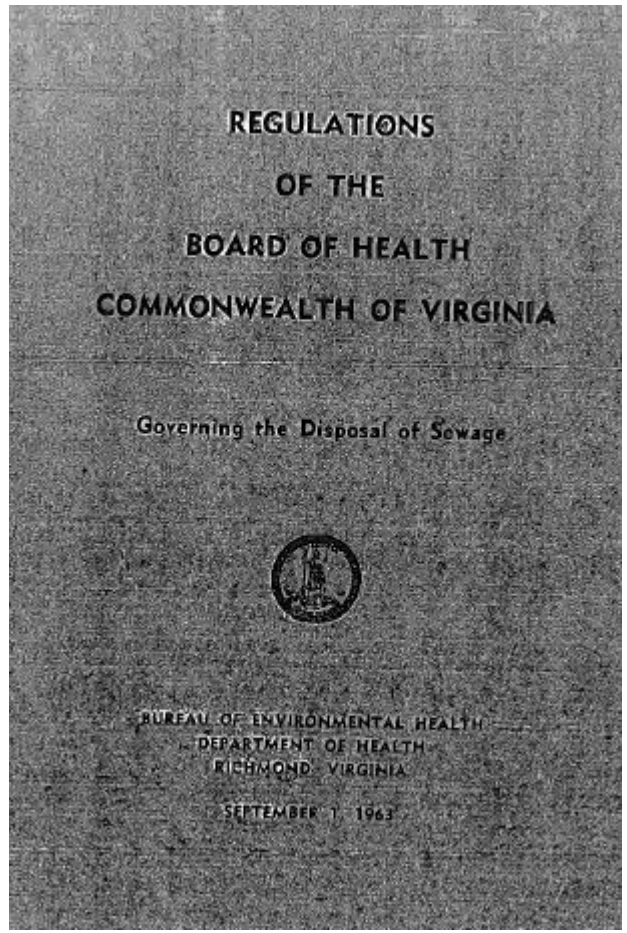
Drainfield Design



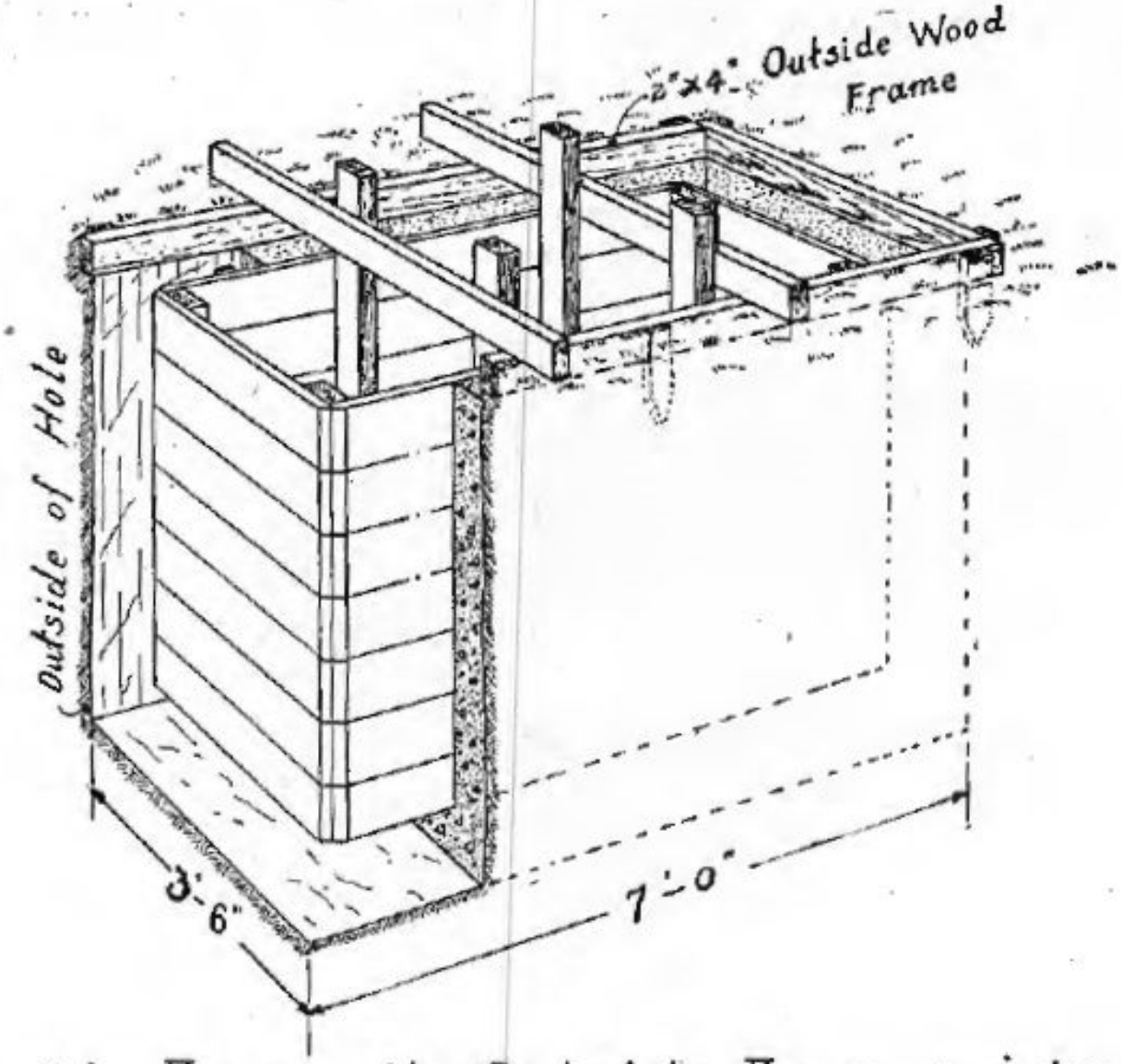
1945



1950



1963

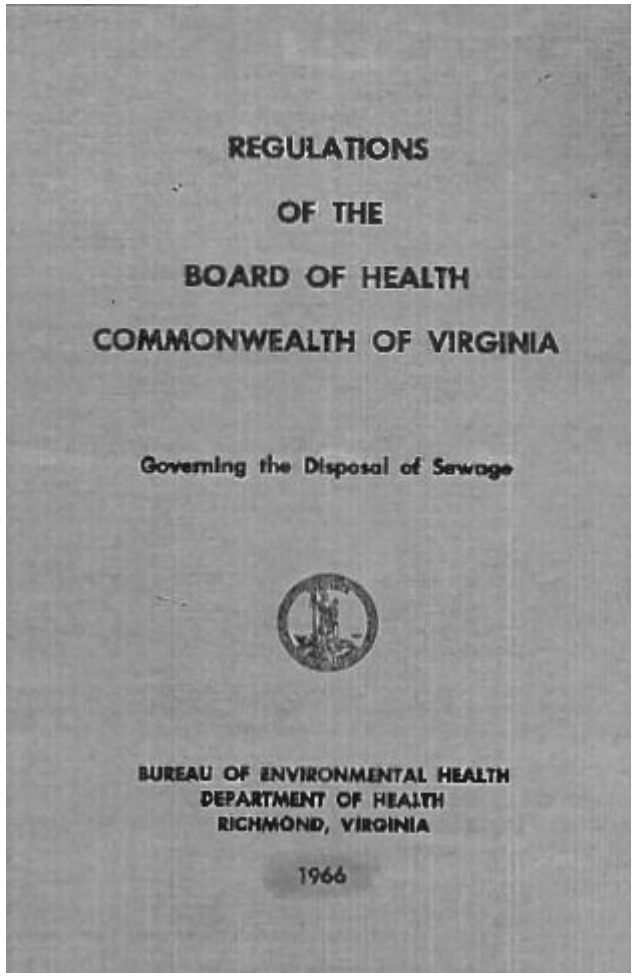


Inside Form, No Outside Form required.

PLATE - F -

A. WAGNER

	LIN. FT. 4" DRAIN TILE RECOMMENDED		
	Sandy Soils	Med'm Soils	Clay Soils
	200	300	500
	300	400	600
	400	500	800
	500	600	1000
	600	700	1200
	700	800	1500



1966

MADISON

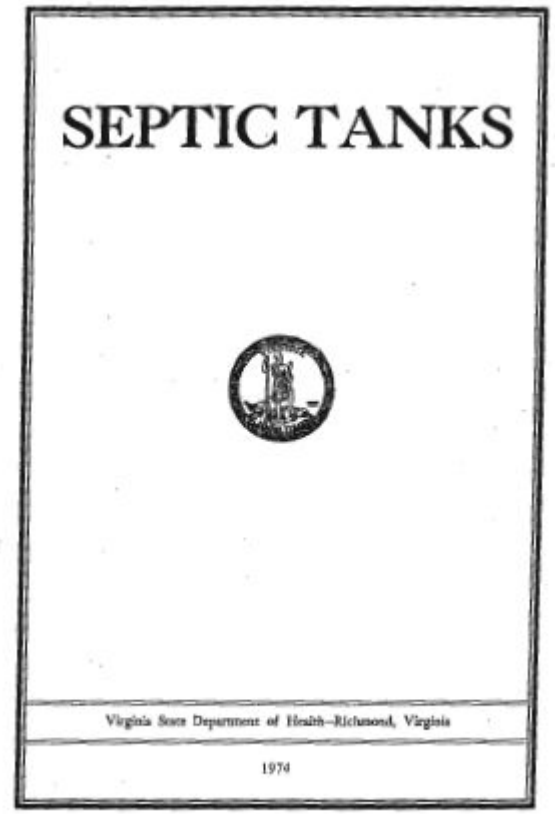
RULES
and
REGULATIONS
OF THE
BOARD OF HEALTH
COMMONWEALTH OF VIRGINIA

Governing the Disposal of Sewage

BUREAU OF ENVIRONMENTAL HEALTH
STATE DEPARTMENT OF HEALTH
RICHMOND, VIRGINIA

JULY 1, 1971

1971



1974

REGULATIONS
OF THE
BOARD OF HEALTH
COMMONWEALTH OF VIRGINIA

Governing the Disposal of Sewage

BUREAU OF ENVIRONMENTAL HEALTH
STATE DEPARTMENT OF HEALTH
RICHMOND, VIRGINIA

1980

1980

Fauquier Co.

Commonwealth of Virginia/State Board of Health

Sewage Handling & Disposal Regulations

Virginia Department of Health
109 Governor Street
Richmond, Virginia 23219
November 1982

1982

Commonwealth of Virginia
State Board of Health

Sewage Handling & Disposal Regulations

Virginia Department of Health
109 Governor Street
Richmond, Virginia 23219
May 1989

1989

Commonwealth of Virginia
State Board of Health

Sewage Handling and Disposal Regulations

July 1, 2000

Virginia Department of Health
1500 E. Main Street
Richmond, Virginia 23219

2000

Separation Distance from Trench Bottom to Free Standing Water

Percolation Rate Minutes/Inch	Distance From Trench Bottom Inches
5	2
17	3
46	12
90	18
120	20

Table 4.3.
Summary of Separation Distances between Systems Using Naturally Occurring Undisturbed Soils and Limiting Site Factors.

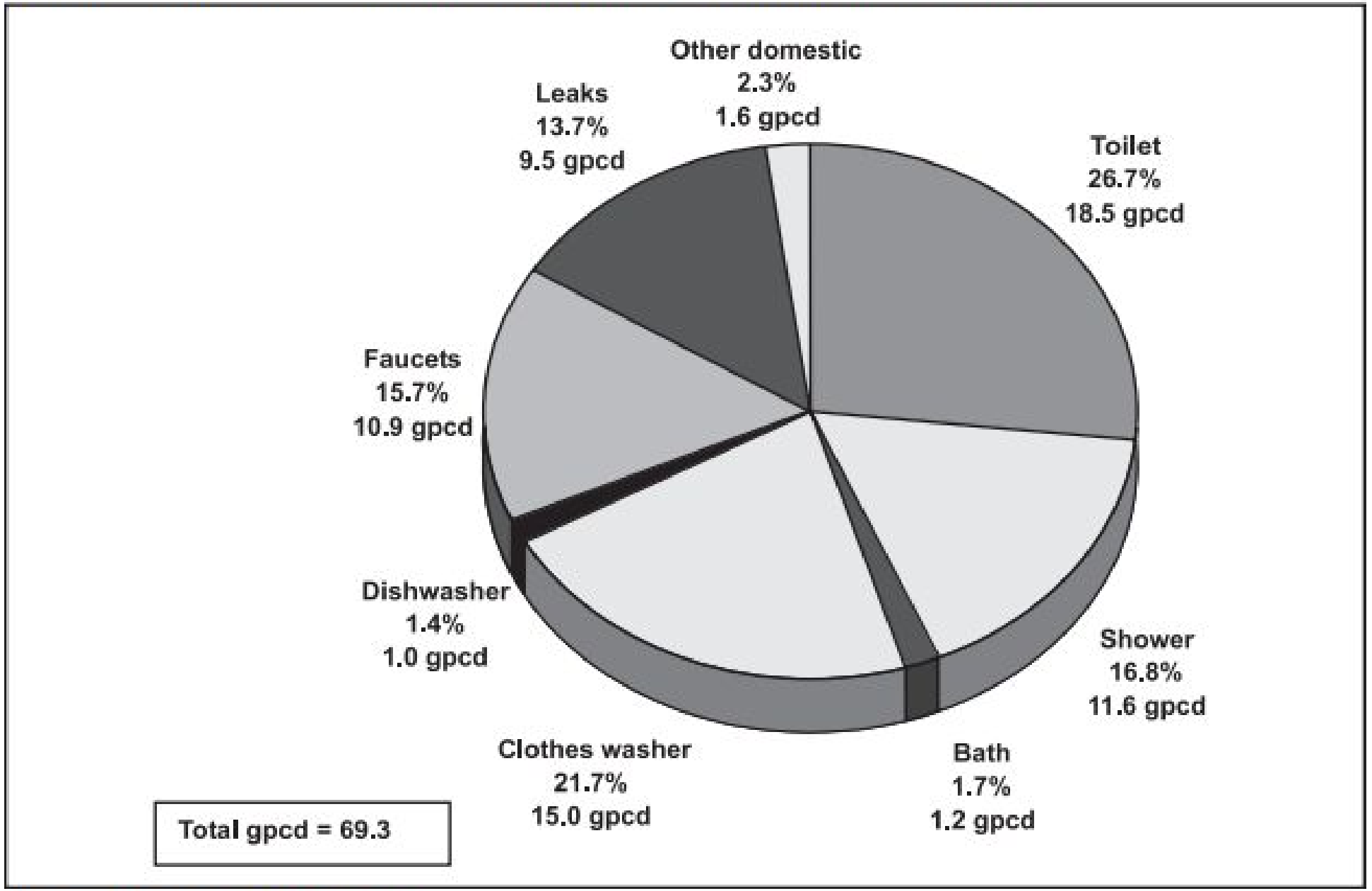
Site Factor	In-Ground System[1]		Shallow-Placed System[1]	
	Septic Tank Effluent	Secondary Effluent	Septic Tank Effluent	Secondary Effluent
Bed Rock	18"	12"	n/a	18"
Restriction	18"	12"	n/a	18"
Shrink-Swell Soil	18"	12"	n/a	18"
Slope	50%	50%	n/a	50%
Perc Rate	5-120 mpi	5-120 mpi	n/a	5-45 mpi
Water Table	18"	12"	n/a	12"

[1]The separation distances for in-ground and shallow-placed systems are measured from the trench bottom or other infiltrative interface vertically down to listed site factor.

Table 5.1.
Sewage Flows.

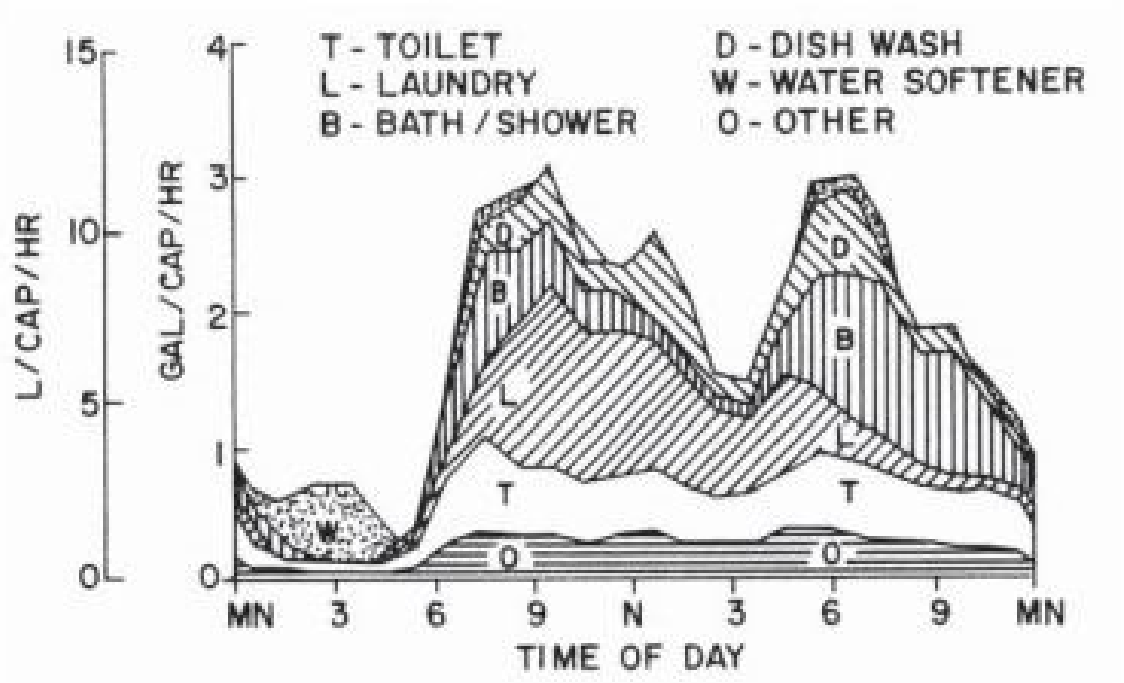
Discharge Facility	Design Unit	Flow (gpd)	BOD (#/day)	S.S. (#/day)	Flow Duration (Hour)
Dwelling[1]	per person total	75	0.2	0.2	24
Food preparation	--	15	--	--	--
Toilet facilities	--	20	--	--	--
Bathing facilities	--	20	--	--	--
Handwashing facilities	--	5	--	--	--
Laundering	--	15	--	--	--

Figure 3-2. Indoor water use percentage, including leakage, for 1,188 data logged homes[a]



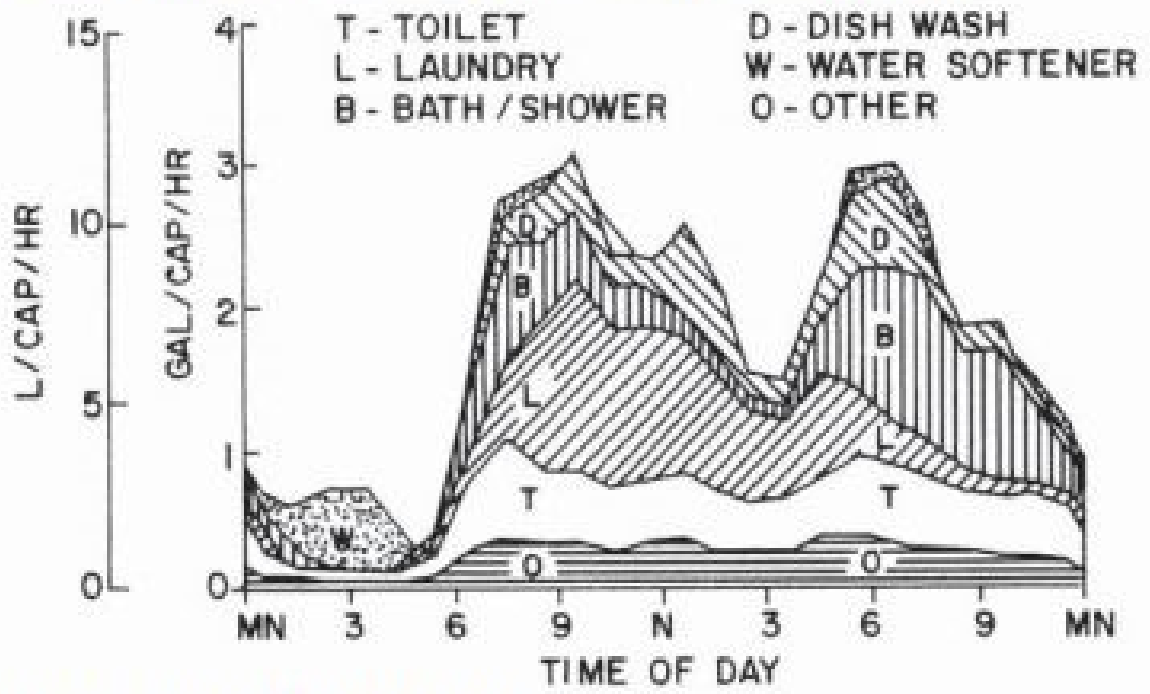
[a] gpcd = gallons per capita (person) per day
Source: Mayer et al. 1999.

Figure 3-3. Daily indoor water use pattern for single-family residence



Source: University of Wisconsin, 1978.

Figure 3-4. Peak wastewater flows for single-family home



Source: University of Wisconsin, 1978.

Table 4-33: Indoor water use comparisons between four study groups

Parameter	REUWS (gphd)	Standard (post-2001) study group	EPA post-retrofit group	High-efficiency new homes
N	1188	302	96	25
Mean ± 95% C.I. (gphd)	177 ± 5.5	140 ± 10.0	107 ± 10.3	105 ± 28
Median (gphd)	160	125	100	90
Percapita relationship (gphd=)	$87.41x^{0.69}$	$66.30x^{0.63}$	$50.21x^{0.77}$	$59.58x^{0.53}$
Household use for family of 3 (gphd)	187	132	117	107
Projected Percapita use for family of 3 persons (gpcd)	62.18	44.15	39.0	35.6

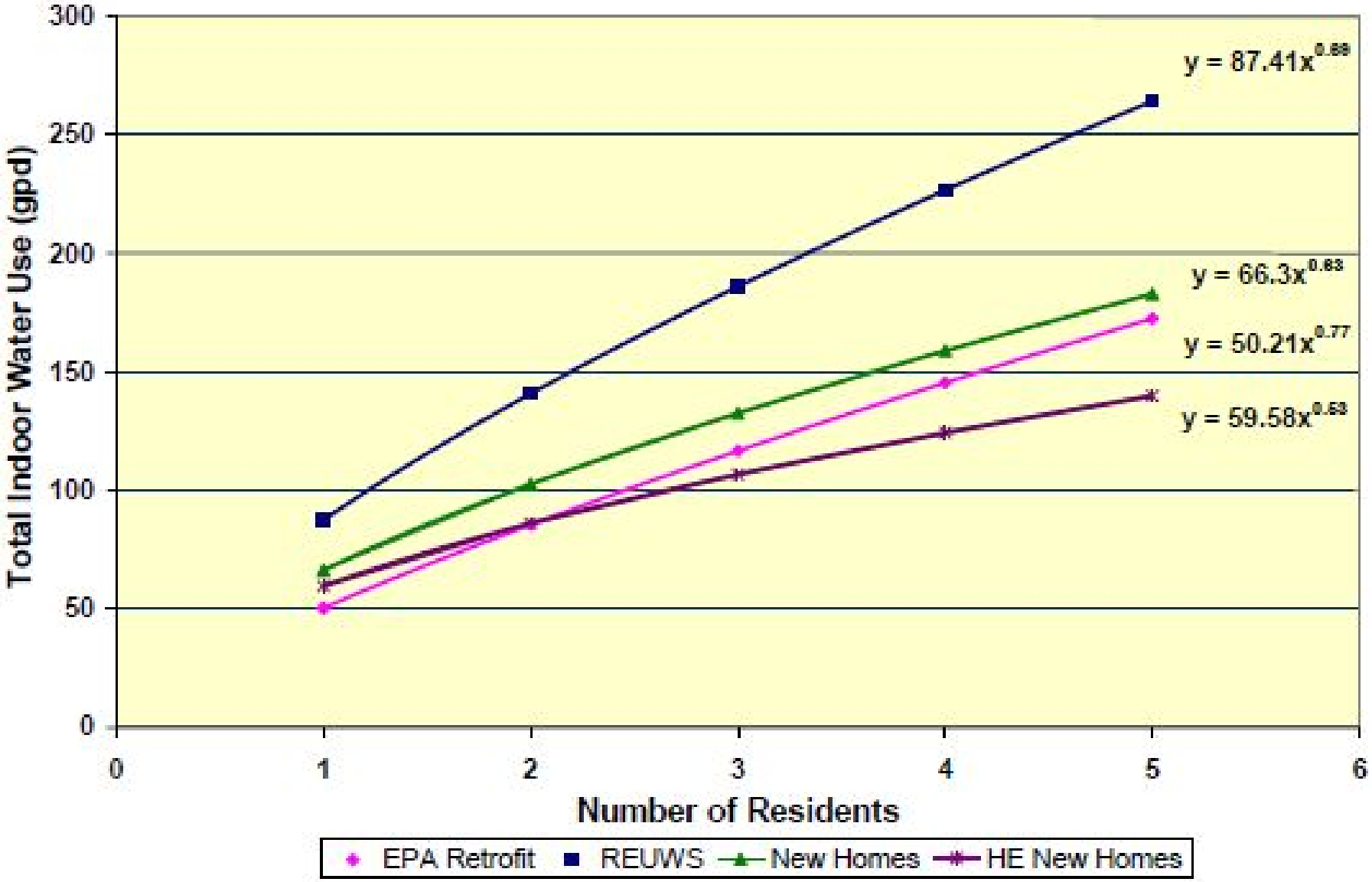


Figure 4-30: Comparison of indoor use versus residents

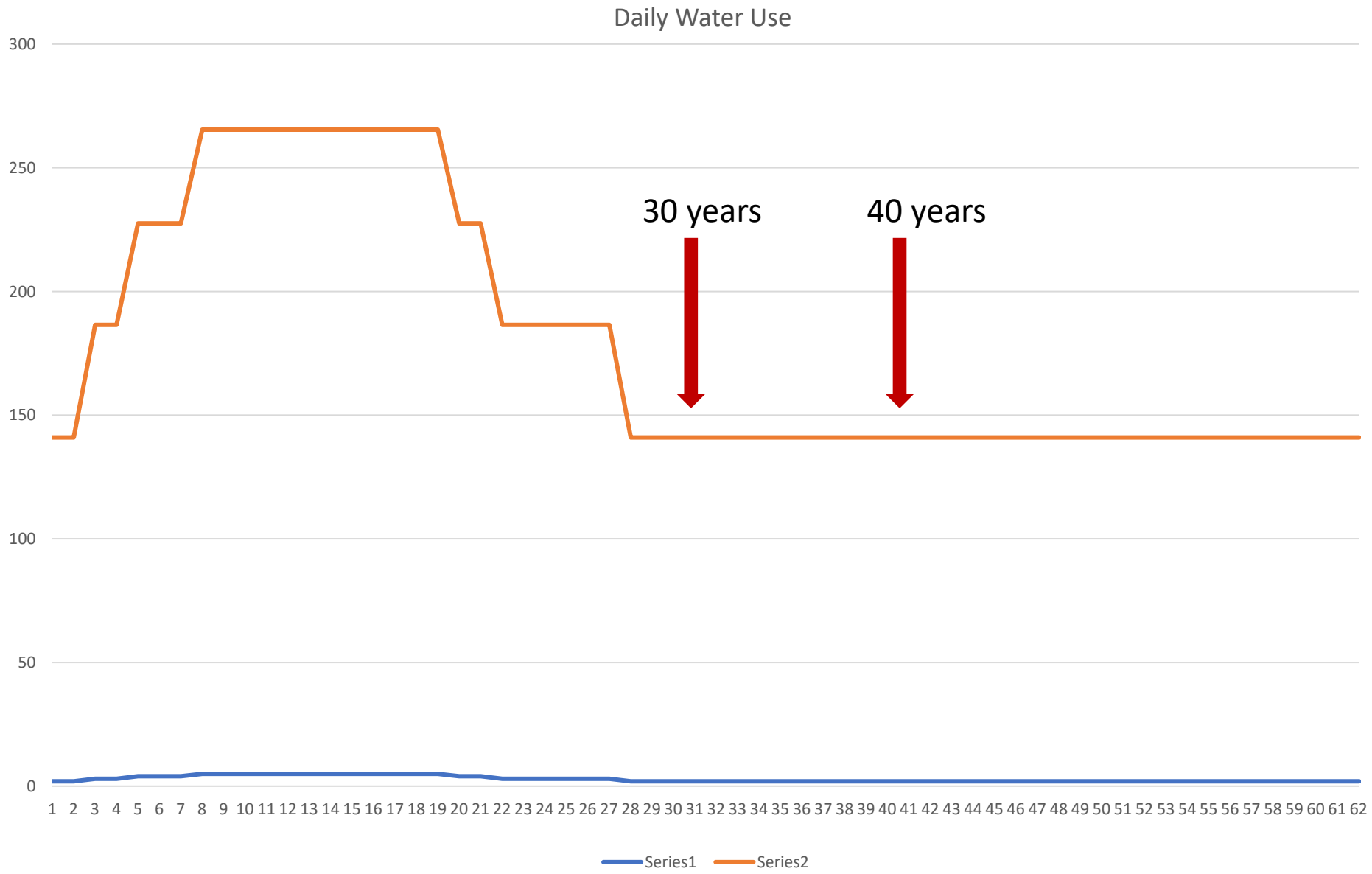
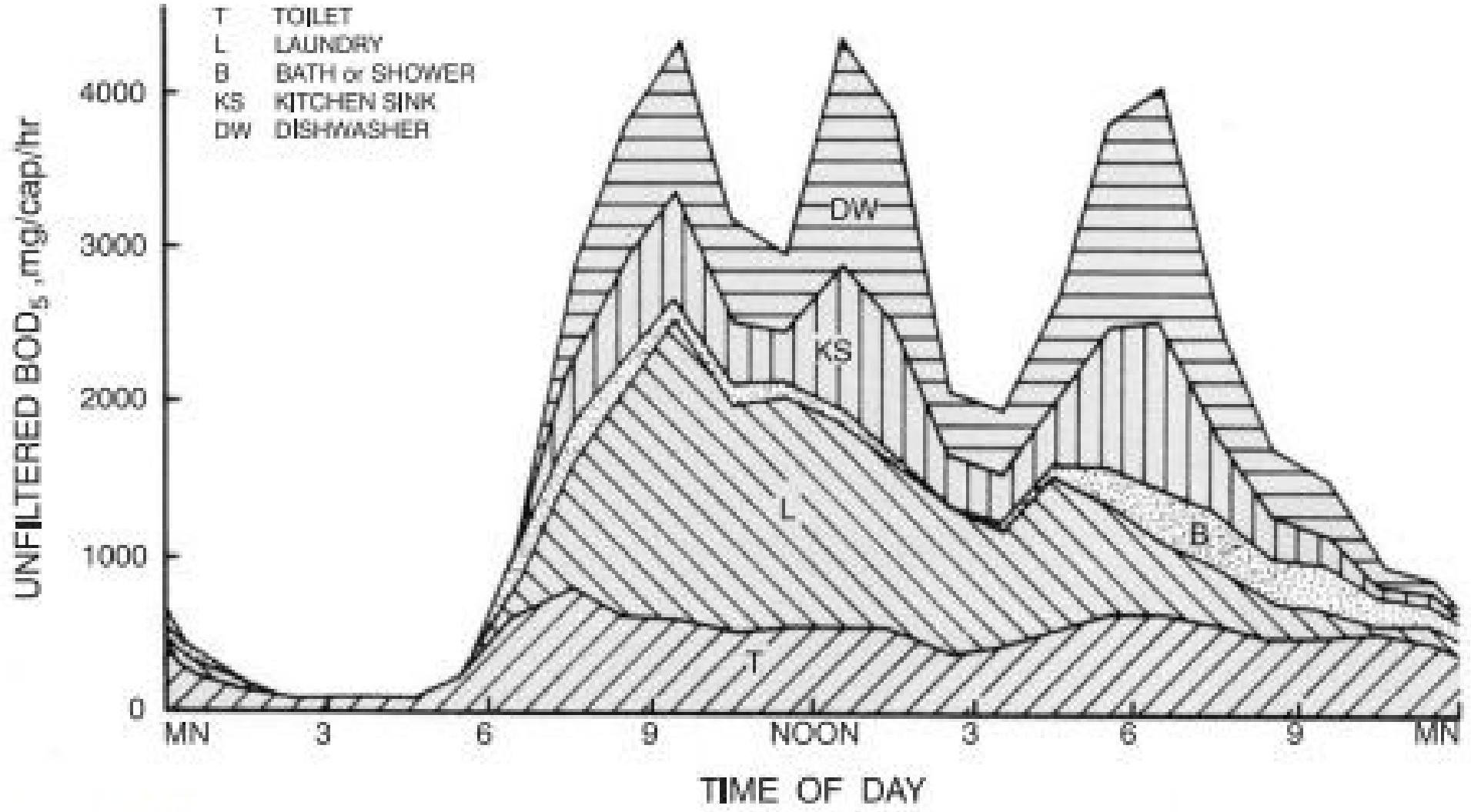
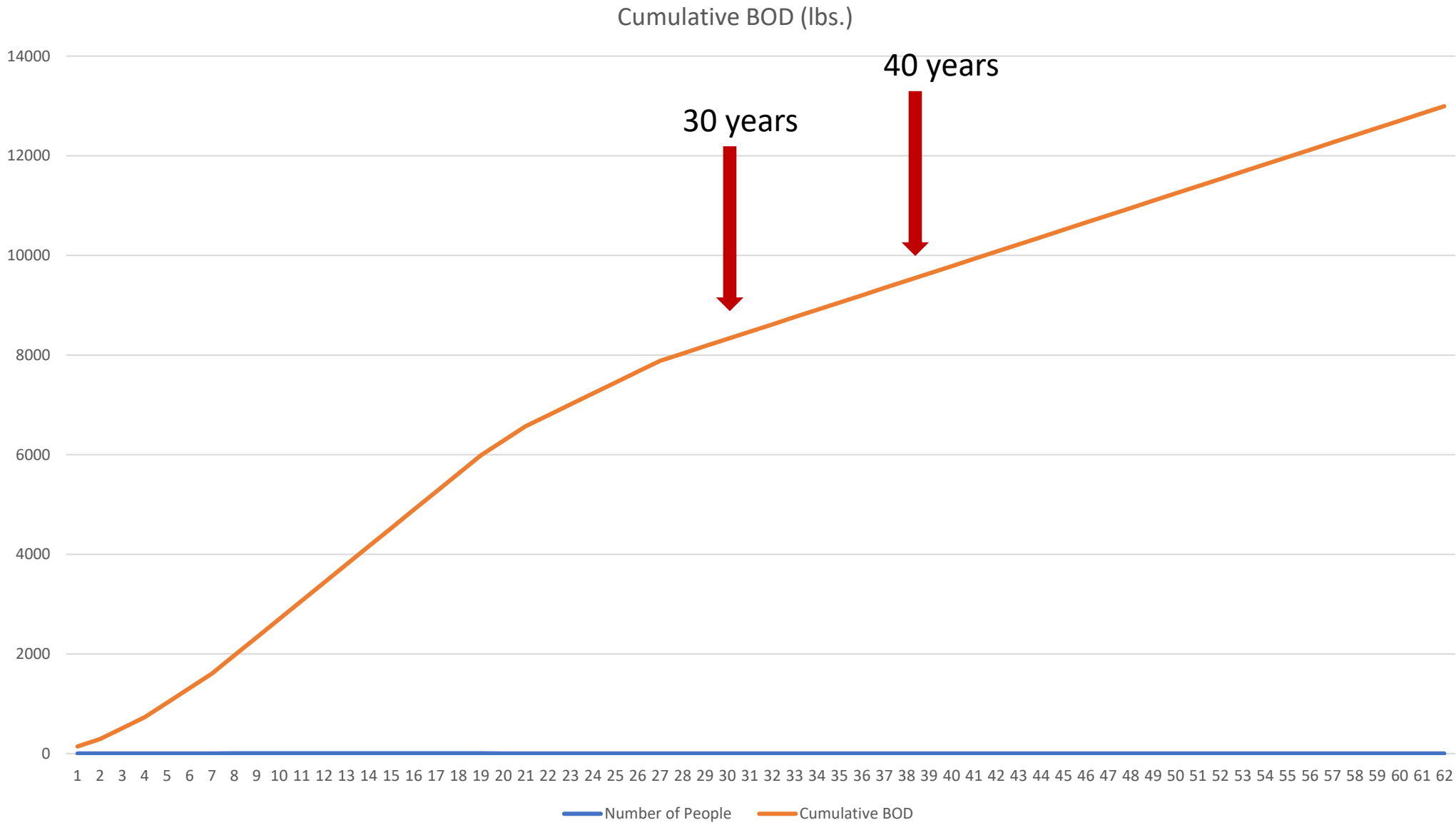

Daily Water Use
300
250
200
150
100
50
0
30 years
40 years
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62
Series1
Series2

Figure 3-5. Average hourly distribution of total unfiltered BOD_5



Source: University of Wisconsin, 1978.


Cumulative BOD (lbs.)
14000
12000
10000
8000
6000
4000
2000
0
30 years
40 years
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62
Number of People
Cumulative BOD

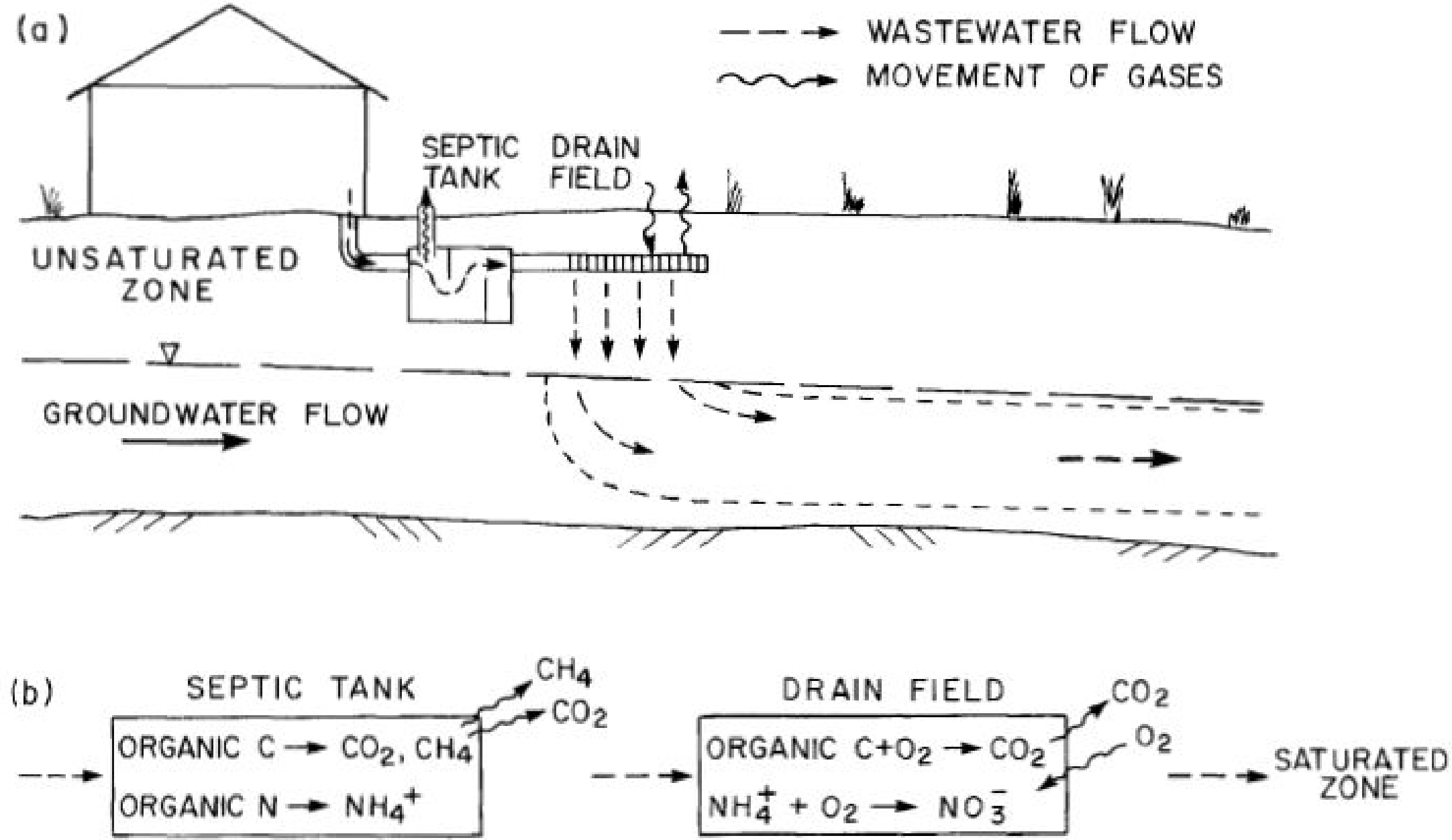


Fig. 1. (a) Schematic cross section of a conventional septic system, including septic tank, distribution pipe, and ground-water plume. (b) Sequence of simplified redox reactions in the two major zones of a conventional septic system: the septic tank and the drain field.

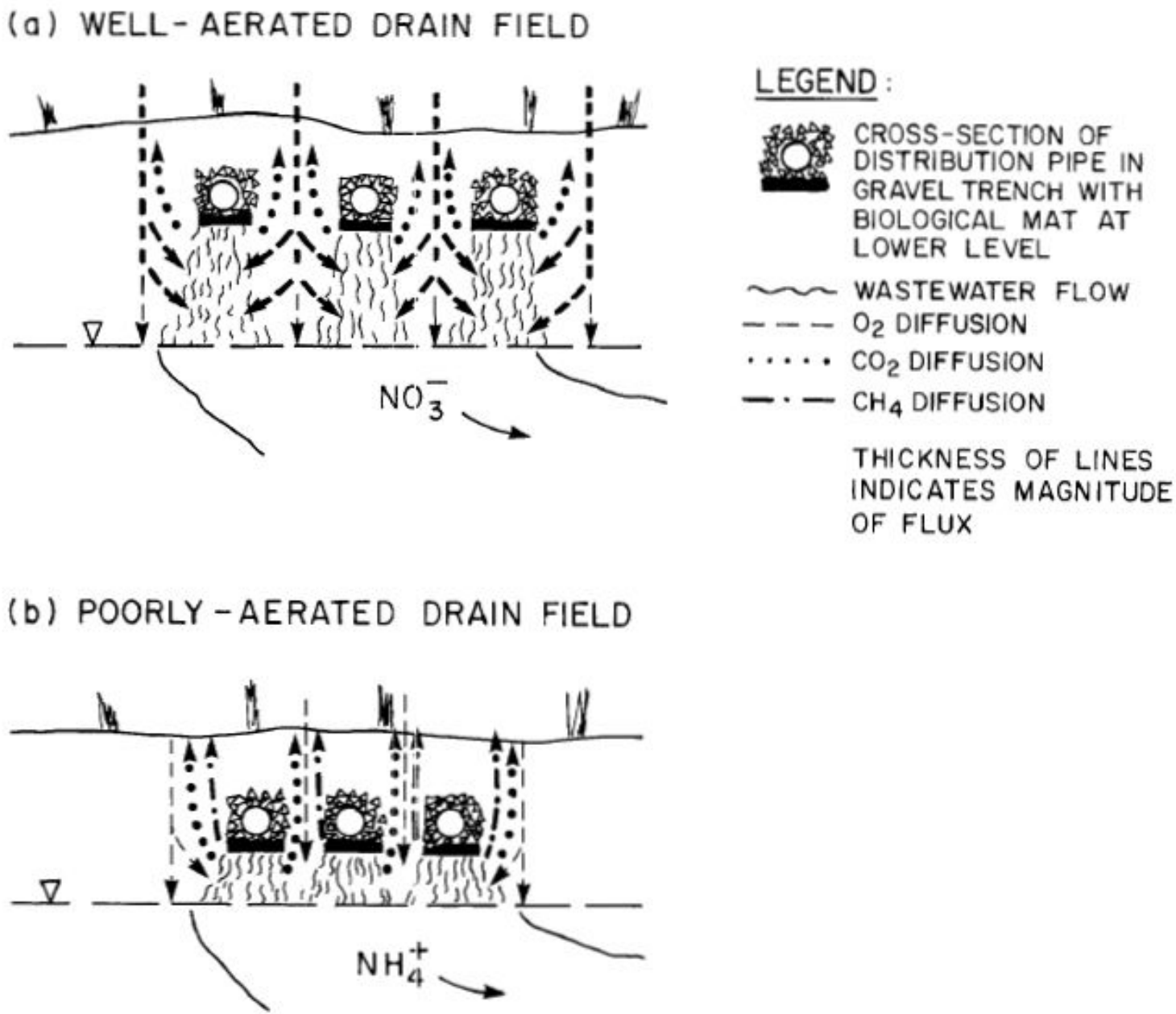
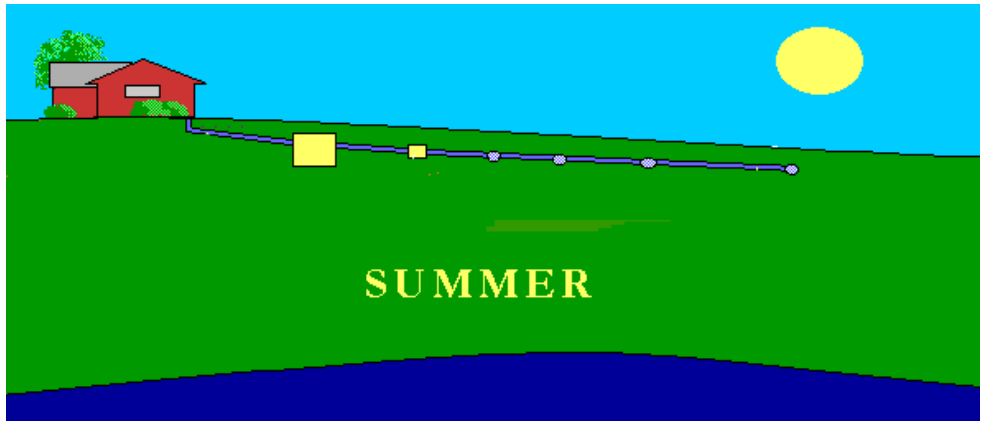


Fig. 2. Gas and water movement in the drain field of septic systems. (a) Well-aerated system, in which adequate O_2 enters the drain field and CO_2 and NO_3^- are produced. (b) Poorly aerated system, in which adequate O_2 does not enter drain field and CO_2 and CH_4 are produced.

Seasonal High Water Table



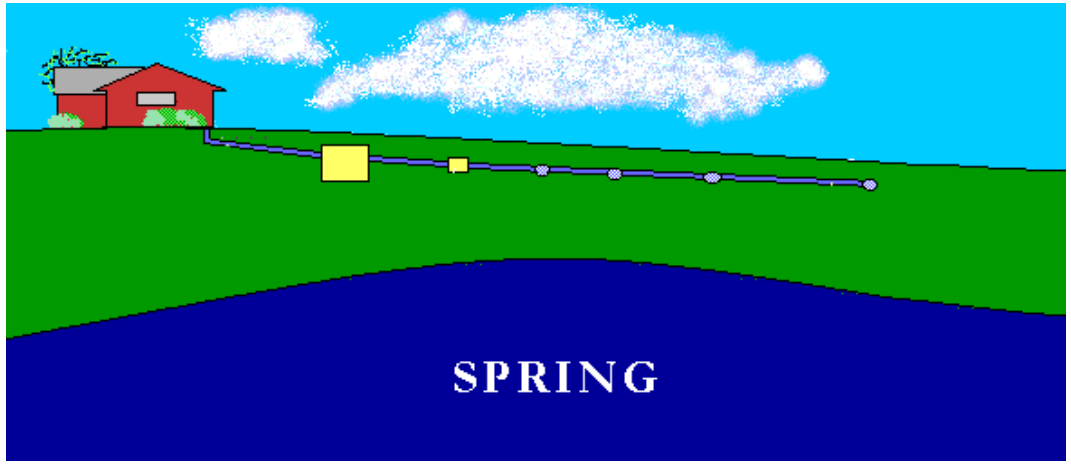
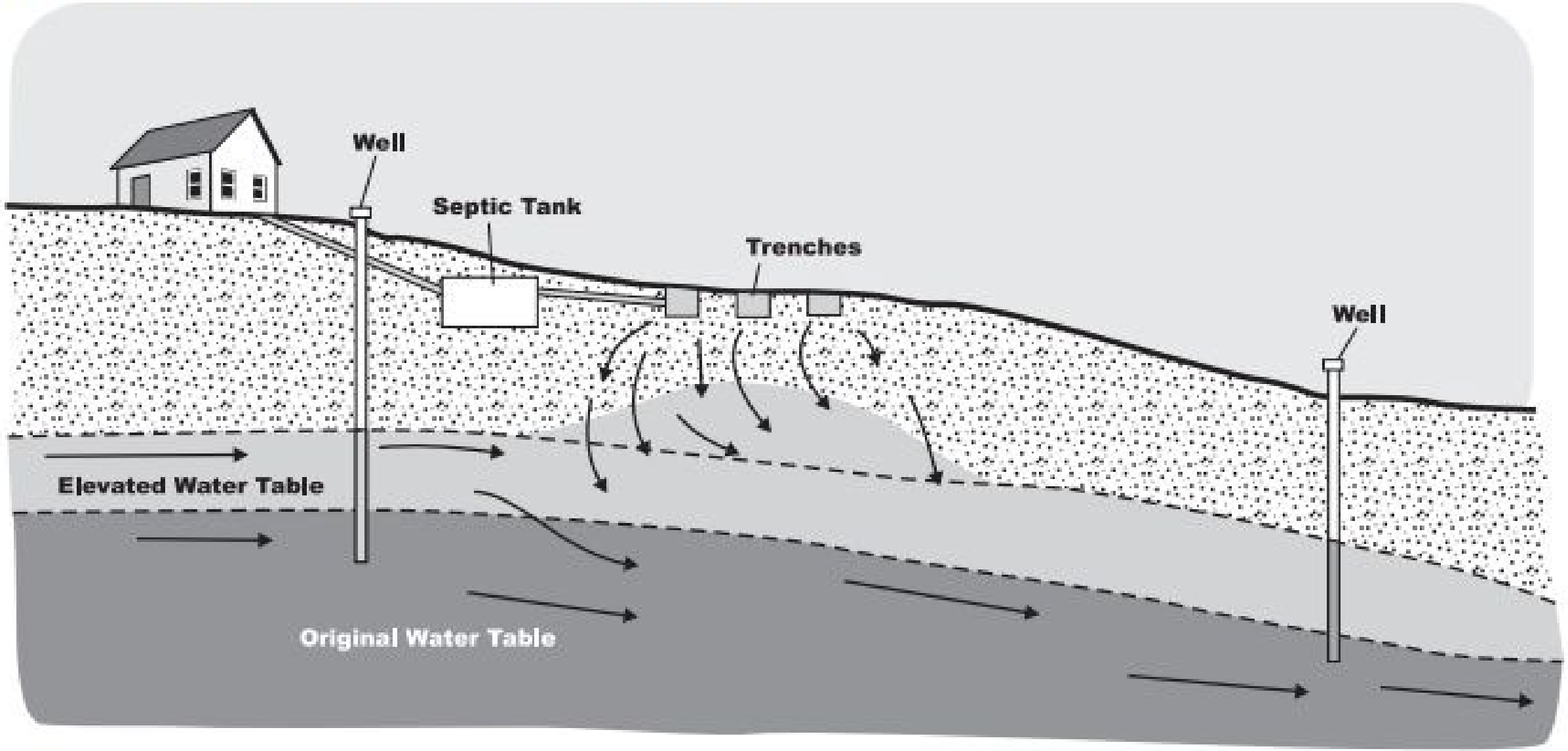


Figure 5-4. Effluent mounding effect above the saturated zone



Source: Adapted from NSFC diagram.

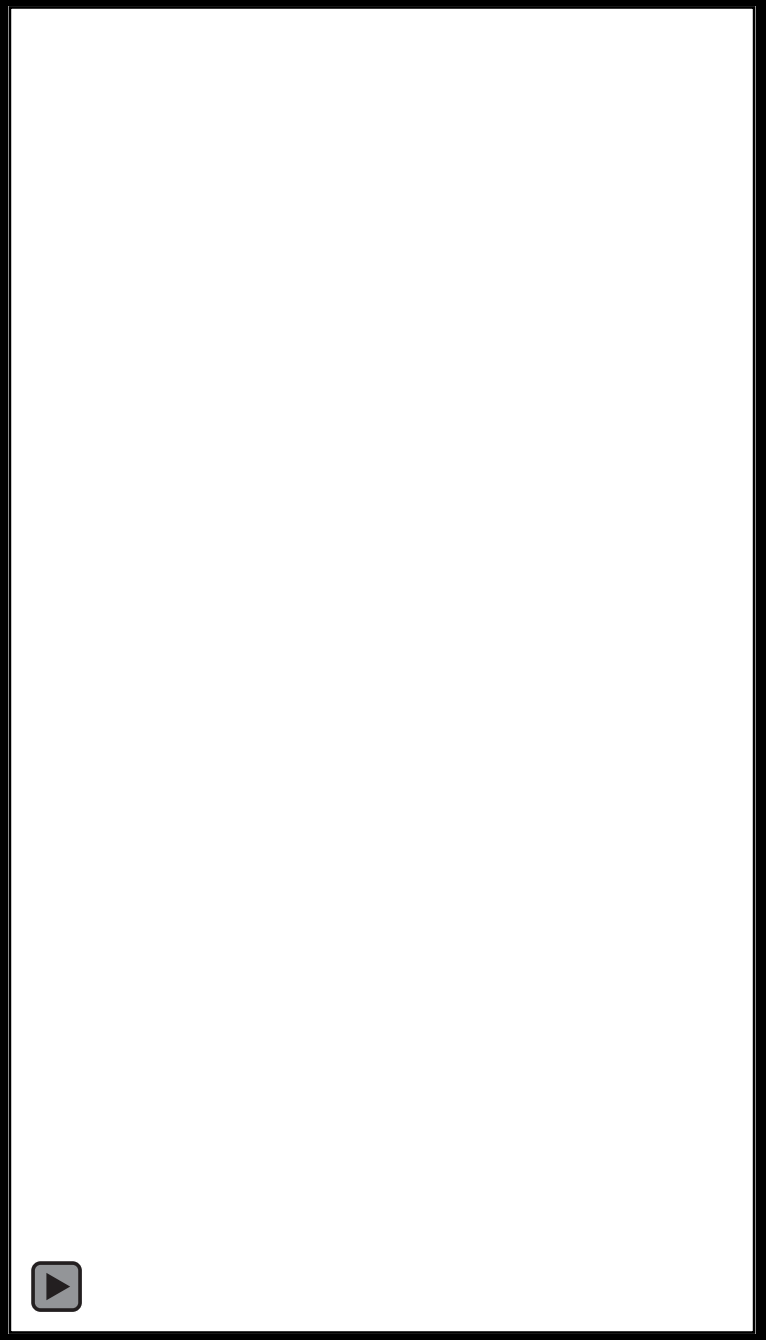
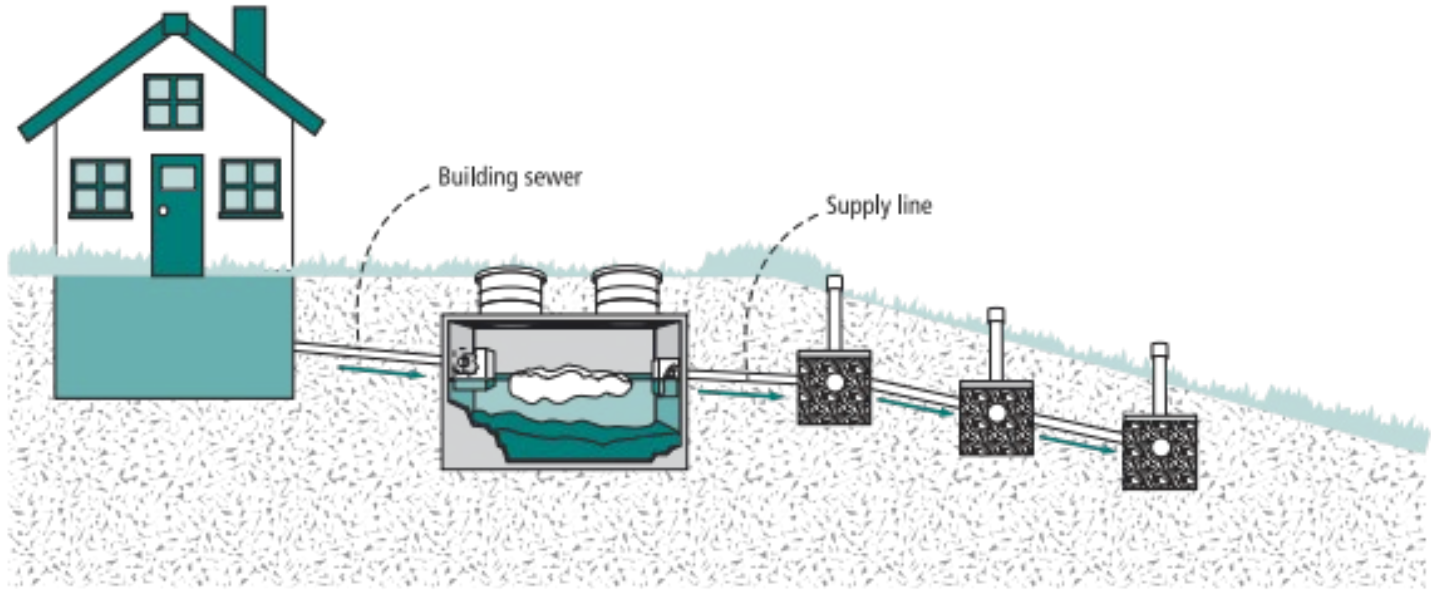


FIGURE 11.1 Distribution of Effluent



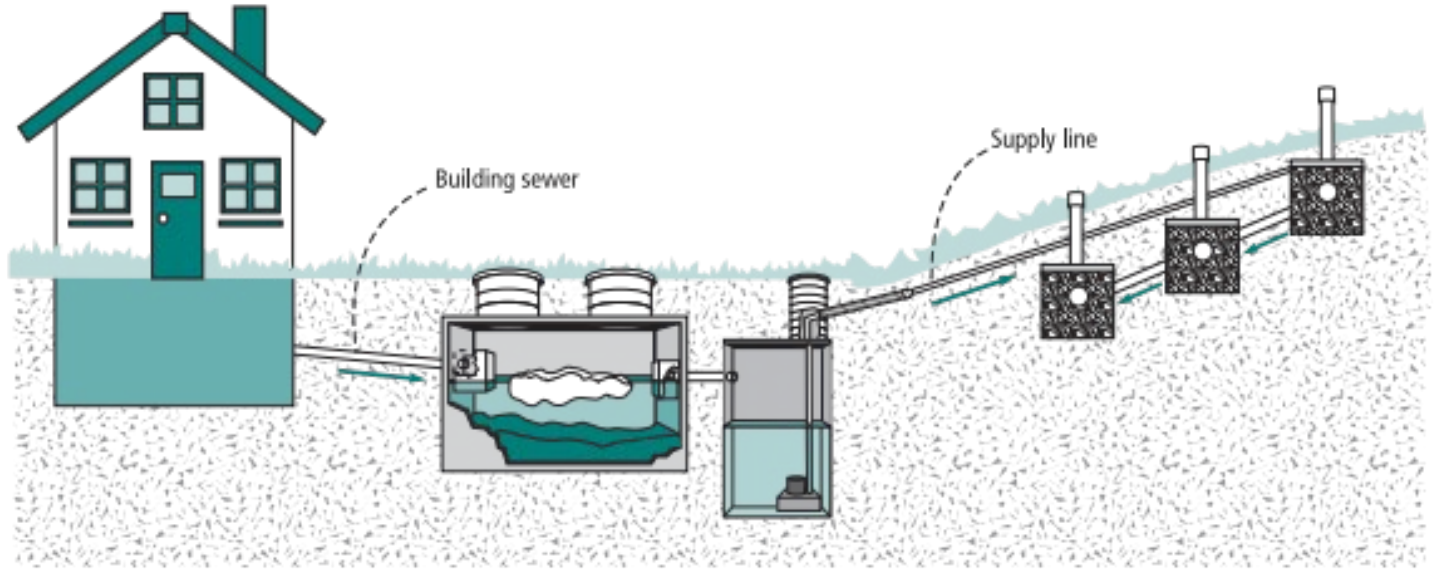
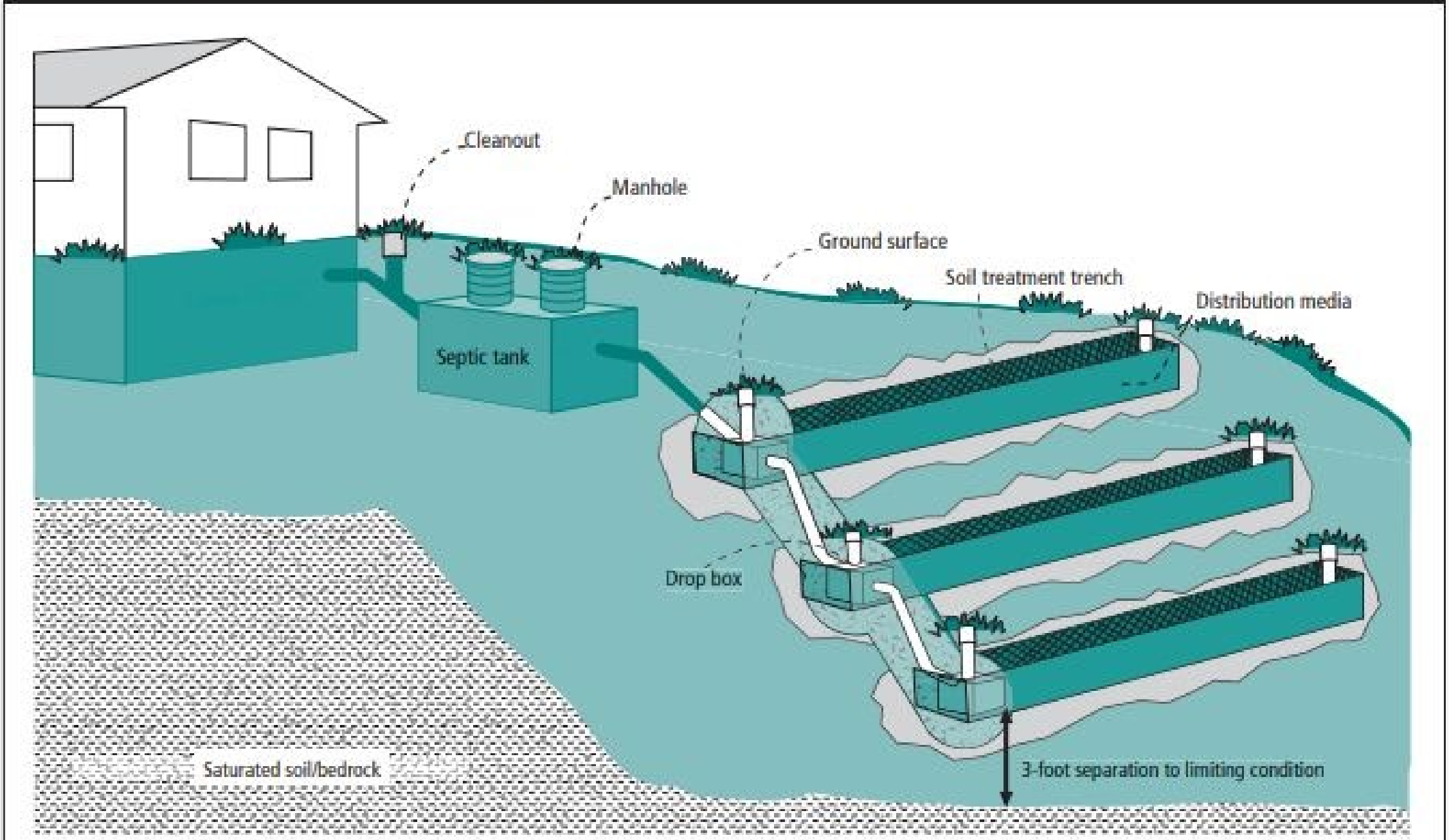
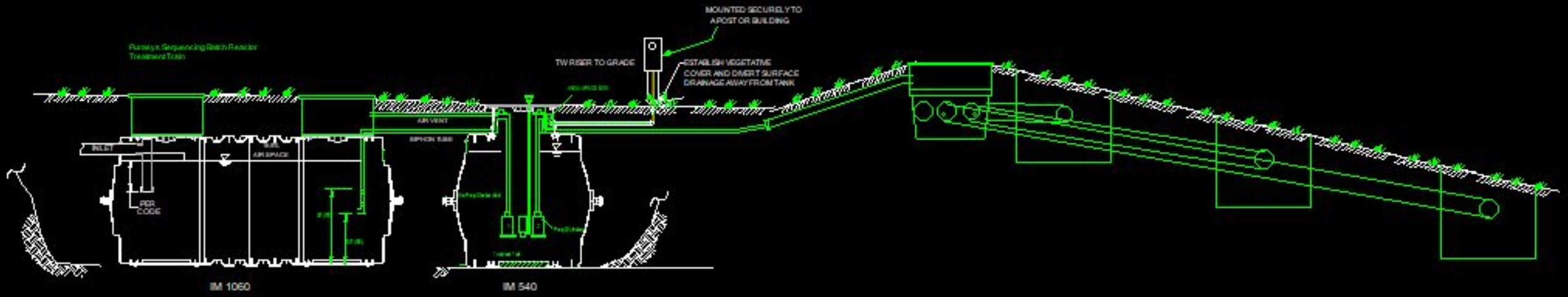


FIGURE 11.10 Serial Distribution Using Drop Boxes




MOUNTED SECURELY TO
A POST OR BUILDING
Puraxys Sequencing Batch Reactor
Treatment Train
TW RISER TO GRADE
ESTABLISH VEGETATIVE
COVER AND DIVERT SURFACE
DRAINAGE AWAY FROM TANK
AIR VENT
INLET
AIR SPACE
PER
CODE
IM 1060
IM 540


11105 Mt Hope Church Rd