Town of Bourne

CONSERVATION COMMISSION

EXISTING CONDITIONS - NO I/A

Nitrogen Loading Calculation Sheet for Residential Housing

The following calculation sheet is based upon Technical Bulletin 91-001 issued by the Cape Cod Commission and deals with nitrate nitrogen (NO_3-N). Use the information from your PLAN OF RECORD to provide the following:

Number of bedrooms (Title 5 definition) = 5 bedrooms
Lot size (in square feet) = 34,800 sq. ft.
Impervious surfaces; **Roof area = 3,280 sq. ft. **Paved area = 1,100 sq. ft.
Natural Area = lot area minus all impervious surfaces = 30,420 sq. ft.
Lawn area in sq. ft. = 11,160 sq. ft.

TITLE 5 FLOW = 110 GAL. / DAY PER BEDROOM
WASTEWATER FLOWS (NITROGEN LOAD & WATER LOAD)

Nitrogen from Title 5 design = 14,572 mg NO_3-N / day / bedroom
Water from Title 5 design = 416..3 L H_2O / day / bedroom
1a) Number of bedrooms = 5 X 14,572 = 72,860 mg. NO_3-N / day
1b) Number of bedrooms = 5 X 416 = 2,080 L H_2O / day
Actual Nitrogen load = 6071.5 mg NO_3-N / day / bedroom
Actual Water load = 173.5 L H_2O / day / bedroom
*Note: This assumes 2.5 people / unit average occupancy within the Town.

2a) Number of bedrooms = 5 X 6071.5 = 30,358 mg. NO_3-N / day
2b) Number of bedrooms = 5 X 173.5 = 868 L H_2O / day
IMPERVIOUS SURFACES (NITROGEN LOAD & WATER LOAD)

NO_3-N load number sq. ft. of roof surface X 0.19395 mg NO_3-N / sq. ft.
H_2O load number sq. ft. of roof surface X 0.2586 L / sq. ft.

3a) Roof surface = 3,280 sq. ft. X 0.19395 = 636.2 mg NO_3-N
3b) Roof surface = 3,280 sq. ft. X 0.2586 = 848.2 L H_2O

NO_3-N load number sq. ft. of paved surface X 0.388 mg / sq. ft.
H_2O load number sq. ft. of paved surface X 0.2586 L / sq. ft.

4a) NO_3-N = 1,100 sq. ft. paved surface X 0.388 mg / sq. ft. = 426.8 mg NO_3-N
4b) H_2O = 1,100 sq. ft. paved surface X 0.2586 L / sq. ft. = 284.5 L H_2O

LAWN NITROGEN LOAD = 0.933 mg / sq. ft. lawn surface

5) sq. ft. of lawn = 11,160 X 0.933 = 10,412.3 mg

NATURAL AREA WATER LOADING

Natural area = lot size - impervious surface = 30,420 sq.ft.

6) Natural area = 30,420 X water recharge factor = 4,131.0 L
(0.1358 L / sq. ft. for Bourne)[1]

SUMMARY OF NITROGEN LOADING

Estimated Title 5 Nitrogen & Water Loading

7a) ADD the above NO_3N load:

1a + 3a + 4a + 5
72,860 + 636.2 + 426.8 + 10,412.3 = 84,335.3 mg NO_3-N / day

7b) ADD the above water (H_2O) load:

1b + 3b + 4b + 6
2,080 + 848.2 + 284.5 + 4,131.0 = 7,343.7 L H_2O / day

7c) DIVIDE 7a by 7b = 11.5 ppm NO_3-N***

Actual Nitrogen & Water Loading

8a) ADD the above NO_3N load:

2a + 3a + 4a + 5
30,358 + 636.2 + 426.8 + 10,412.3 = 41,833.3 mg NO_3-N / day

8b) ADD the above water (H_2O) load:

2b + 3b + 4b + 6
868 + 848.2 + 284.5 + 4,131.0 = 6,031.7 L H_2O / day

8c) DIVIDE 8a by 8b = 6.9 ppm NO_3-N***

FINAL CALCULATION ADD 7c & 8c (ppm) = 18.4 divide by 2 = 9.2 ppm NO_3-N

This is the actual nitrate nitrogen load for the project as designed. The target for coastal areas is 5 ppm nitrate nitrogen. Certain critical embayments may require a LOWER figure to prevent degradation.

*****If your nitrate nitrogen load exceeds the target limit **USE A SECOND CALCULATION SHEET TO SHOW ALTERNATIVES IN TRYING TO ACHIEVE THE 5 PPM NITRATE NITROGEN LEVEL*****

[1] Water recharge factors for data line 6: @21' / yr. use 0.1358 in Bourne and Falmouth; @ 19" / yr. use 0.1228 for Mashpee & Sandwich; @ 18" / yr. 0.1164 for Barnstable, Dennis & Yarmouth; @ 17" / yr. use 0.1101 for Brewster & Harwich; @ 16" / yr. use 0.1031 for Chatham, Eastham, Orleans, Provincetown, Truro & Wellfleet.