

Town of Bourne

Conservation Commission

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 (NO₃-N) Use the information from your PLAN OF RECORD to provide the following:

4 Kennebec Avenue (Proposed Conditions) - 2 Bedroom Design Flow

Number of Bedrooms (Title 5 Definition) =					2	Bedrooms	
Lot Size (in square feet of upland areas)	=				3,235	sq.ft.	
Impervious Surfaces;**roof area=		992	sq.ft.	**Paved Area	=	-	sq.ft.
Natural Area = lot area minus all impervious surfaces	=				2,243	sq.ft.	
Lawn Area in sq. ft.	=				1,977	sq.ft.	
I/A System?	=				Yes		

TITLE 5 FLOW = 110 GAL./ DAY PER BEDROOM

WASTEWATER FLOWS (NITROGEN LOAD & WATER LOAD)

Nitrogen from Title 5 design = 14,572 mg NO₃-N / day / bedroom

Water from Title 5 design = 416.3 H₂O / day / bedroom

1a) Number of bedrooms = 2 x 14572 = 14572.00 mg. NO₃-N / day

1b) Number of bedrooms = 2 x 416 = 832.00 L H₂O / day

Actual Nitrogen load = 6071.5 mg NO₃-N / day/ bedroom: 3296 mg NO₃-N / day/ bedroom with IA Treatment

Actual Water load = 173.5 L H₂O / day / bedroom

*Note: This assumes 2.5 people / unit average occupancy within the Town

2a) Number of bedrooms = 2 x 6071.5 = 6071.50 mg. NO₃-N / day

2b) Number of bedrooms = 2 x 173.5 = 347.00 L H₂O / day

IMPERVIOUS SURFACES (NITROGEN LOAD & WATER LOAD)

NO₃-N load number sq. ft. of roof surface X 0.19395 mg NO₃-N / sq. ft.

H₂O load number sq. ft. of roof surface X 0.2586 L / sq. ft.

3a) Roof surface = 992 sq. ft. X 0.19395 = 192.40 mg NO₃-N

3b) Roof surface = 992 sq. ft. X 0.2586 = 256.53 L H₂O / day

NO₃-N load number sq. ft. of paved surface X 0.388 mg / sq. ft.

H₂O load number sq. ft. of paved surface X 0.2586 L / sq. ft.

4a) NO₃-N = 0 sq. ft. paved surface X 0.388 mg / sq. ft. = 0.00 mg NO₃-N

4b) H₂O = 0 sq. ft. paved surface X 0.2586 L / sq. ft. = 0.00 L H₂O

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

$$5) \text{ sq. ft. of lawn} = 1977 \times 0.933 = 1844.54 \text{ mg}$$

NATURAL AREA WATER LOADING

$$\text{Natural area} = \text{lot size} - \text{impervious surfaces} = 2243 \text{ sq. ft.}$$

$$6) \text{ Natural area} = 2243 \times \text{water recharge factor} = 304.60 \text{ L} \\ (\text{0.1358 L / sq. ft. for Bourne})$$

SUMMARY OF NITROGEN LOADING

Estimated Title 5 Nitrogen & Water Loading

7a) ADD the above NO₃N load

1a	(+)	3a	(+)	4a	(+)	5	
14572		192.40		0.00		1844.54	16608.94 mg NO ₃ -N / day

7b)

1b	(+)	3b	(+)	4b	(+)	6	
832		256.53		0.00		304.60	1393.13 L H ₂ O / day

7c) DIVIDE 7a by 7b = 11.9 ppm NO₃-N*****

Actual Nitrogen & Water Loading

8a) ADD the above NO₃N load:

2a	(+)	3a	(+)	4a	(+)	5	
6071.5		192.40		0.00		1844.54	<u>8108.44</u> mg NO ₃ -N / day

8b) ADD the above water (H₂O) load:

2b	(+)	3b	(+)	4b	(+)	6	
347		256.53		0.00		304.599	<u>908.13</u> L H ₂ O / day

8c) DIVIDE 8a by 8b = 8.9 ppm NO₃-N*****

FINAL CALCULATION ADD 7c & 8c (ppm) = 20.9 divide by 2 = **10.4** ppm NO₃-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*****