

Town of Bourne

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:

(Actual water load based on 2.5 people @ 55 gpd/person or 137.5 gpd/unit)

176 Scraggy Neck Road - Proposed Conditions

Number of Bedrooms (Title 5 Definition)	=	4	Bedrooms
Lot Size (in square feet of upland areas)	=	87,006	sq.ft.
Impervious Surfaces;**roof area=	4,317	sq.ft.	**Paved Area = - sq.ft.
Natural Area = lot area minus all impervious surfaces	=	82,689	sq.ft.
Lawn Area in sq. ft.	=	6,583	sq.ft.

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; or
 With IA Treatment = 7,911 mg NO₃-N day/bedroom
 Water from Title 5 design = 416.3 H₂O / day / bedroom

1a) Number of bedrooms	=	4	x 7911 =	31644.00 mg. NO ₃ -N / day
1b) Number of bedrooms	=	4	x 416 =	1664.00 L H ₂ O / day

Actual Nitrogen load = 6071.5 mg NO₃-N / day/ person (@ 35 ppm); or
 With IA Treatment = 3,296 mg NO₃-N / day/person (@ 19 ppm)
 Actual Water load = 173.5 L H₂O / day / bedroom

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

2a) Number of People	=	2.5	x 3296=	8240.00 mg. NO ₃ -N / day
2b) Number of People	=	2.5	x 208.2 =	520.50 L H ₂ O / 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 ₂ O load number sq. ft. of roof surface	X	0.2586 L / sq. ft.

3a) Roof surface	=	4317	sq. ft.	X	0.19395 =	837.28 mg NO ₃ -N
3b) Roof surface	=	4317	sq. ft.	X	0.2586 =	1116.38 L H ₂ O / day

NO ₃ -N load number sq. ft. of paved surface	X	0.388 mg / sq. ft.
H ₂ O load number sq. ft. of paved surface	X	0.2586 L / sq. ft.

4a) NO ₃ -N	=	-	sq. ft. paved surface X 0.388 mg / sq. ft.	0.00 mg NO ₃ -N
4b) H ₂ O	=	-	sq. ft. paved surface X 0.2586 L / sq. ft.	0.00 L H ₂ O

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

$$5) \text{ sq. ft. of lawn} = 6583 \times 0.933 = 6141.94 \text{ mg}$$

NATURAL AREA WATER LOADING

$$\text{Natural area} = \text{lot size} - \text{impervious surfaces} = 82689 \text{ sq. ft.}$$

$$6) \text{ Natural area} = 82689 \times \text{water recharge factor} = 11229.17 \text{ L} \\ \text{(0.1358 L / sq. ft. for Bourne)}$$

SUMMARY OF NITROGEN LOADING

Estimated Title 5 Nitrogen & Water Loading

7a) ADD the above NO₃N load

1a	(+)	3a	(+)	4a	(+)	5	
31644		837.28		0.00		6141.94	38623.22 mg NO ₃ -N / day

7b)

1b	(+)	3b	(+)	4b	(+)	6	
1664		1116.38		0.00		11229.17	14009.54 L H ₂ O / day

7c) DIVIDE 7a by 7b = 2.8 ppm NO₃-N*****

Actual Nitrogen & Water Loading

8a) ADD the above NO₃N load:

2a	(+)	3a	(+)	4a	(+)	5	
8240		837.28		0.00		6141.94	<u>15219.22</u> mg NO ₃ -N / day

8b) ADD the above water (H₂O) load:

2b	(+)	3b	(+)	4b	(+)	6	
520.5		1116.38		0.00		11229.2	<u>12866.04</u> L H ₂ O / day

8c) DIVIDE 8a by 8b = 1.2 ppm NO₃-N*****

FINAL CALCULATION ADD 7c & 8c (ppm) = 3.9 divide by 2 = 2.0 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*****