

# 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 (NO<sub>3</sub>-N) Use the information from your PLAN OF RECORD to provide the following:

### 4 Kennebec Avenue (Proposed Conditions) Rev 5/23/2022

Number of Bedrooms (Title 5 Definition) =	=	3	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 NO<sub>3</sub>-N / day / bedroom

Water from Title 5 design = 416.3 H<sub>2</sub>O / day / bedroom

1a) Number of bedrooms = 3 x 14572 = 21858.00 mg. NO<sub>3</sub>-N / day

1b) Number of bedrooms = 3 x 416 = 1248.00 L H<sub>2</sub>O / day

Actual Nitrogen load = 6071.5 mg NO<sub>3</sub>-N / day/ bedroom: 3296 mg NO<sub>3</sub>-N / day/ bedroom with IA Treatment

Actual Water load = 173.5 L H<sub>2</sub>O / day / bedroom

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

2a) Number of bedrooms = 3 x 6071.5 = 9107.25 mg. NO<sub>3</sub>-N / day

2b) Number of bedrooms = 3 x 173.5 = 520.50 L H<sub>2</sub>O / day

IMPERVIOUS SURFACES (NITROGEN LOAD & WATER LOAD)

NO<sub>3</sub>-N load number sq. ft. of roof surface X 0.19395 mg NO<sub>3</sub>-N / sq. ft.

H<sub>2</sub>O 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 NO<sub>3</sub>-N

3b) Roof surface = 992 sq. ft. X 0.2586 = 256.53 L H<sub>2</sub>O / day

NO<sub>3</sub>-N load number sq. ft. of paved surface X 0.388 mg / sq. ft.

H<sub>2</sub>O load number sq. ft. of paved surface X 0.2586 L / sq. ft.

4a) NO<sub>3</sub>-N = 0 sq. ft. paved surface X 0.388 mg / sq. ft. = 0.00 mg NO<sub>3</sub>-N

4b) H<sub>2</sub>O = 0 sq. ft. paved surface X 0.2586 L / sq. ft. = 0.00 L H<sub>2</sub>O

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

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

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

### SUMMARY OF NITROGEN LOADING

#### Estimated Title 5 Nitrogen & Water Loading

7a) ADD the above NO<sub>3</sub>N load

1a	(+)	3a	(+)	4a	(+)	5	
21858		192.40		0.00		1844.54	23894.94 mg NO <sub>3</sub> -N / day

7b)

1b	(+)	3b	(+)	4b	(+)	6	
1248		256.53		0.00		304.60	1809.13 L H <sub>2</sub> O / day

7c) DIVIDE 7a by 7b = 13.2 ppm NO<sub>3</sub>-N\*\*\*\*\*

#### Actual Nitrogen & Water Loading

8a) ADD the above NO<sub>3</sub>N load:

2a	(+)	3a	(+)	4a	(+)	5	
9107.25		192.40		0.00		1844.54	<u>11144.19</u> mg NO <sub>3</sub> -N / day

8b) ADD the above water (H<sub>2</sub>O) load:

2b	(+)	3b	(+)	4b	(+)	6	
520.5		256.53		0.00		304.599	<u>1081.63</u> L H <sub>2</sub> O / day

8c) DIVIDE 8a by 8b = 10.3 ppm NO<sub>3</sub>-N\*\*\*\*\*

FINAL CALCULATION ADD 7c & 8c (ppm) = 23.5 divide by 2 = **11.8** ppm NO<sub>3</sub>-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 AHIEVE THE 5 PPM NITRATE NITROGEN LEVEL\*\*\***