

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:

Project Address: 3 Sunny Lane Bourne Date Prepared: 12/20/2022

Title and date of plan: Plan of Proposed sewage disposal system - 8-8-22

Existing Conditions

Number of Bedrooms (Title 5 definition)	=	<u>3</u>	BEDROOMS
Lot size (in square feet)	=	<u>6,365</u>	sq.ft.
IMPERVIOUS SURFACES **ROOF AREA	=	<u>953</u>	sq.ft.
**DRIVEWAY, TERRACE & PATIO	=	<u>783</u>	sq.ft.
Total Imperivous area		<u>1,736</u>	
Natural Area = Lot area minus all impervious surfaces	=	<u>4,629</u>	sq.ft.
Lawn area in Sq. ft	=	<u>4,468</u>	sq.ft.

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

Nitrogen from Title 5 design = 14,572 mg NO3-N/day/bedroom 35 mg/l

Water from Title 5 Design = 416.3 L H2O/day/bedroom

1a) Number of bedrooms =	<u>3</u>	x	14572 =	<u>43,716</u>	mg NO3-N/DAY
1b) Number of bedrooms =	<u>3</u>	x	416 =	<u>1,248</u>	L H2O/DAY

Actual Nitrogen Load = 6071.7 mg NO3-N/DAY/BEDROOM
 Actual Water Load = 173.5 H2O/DAY/BEDROOM FOR 2.5 PEOPLE PER DWELLING

*Note: this assumes 2.5 people /unit average occupancy withing the town.

2a) Number of bedrooms =	<u>3</u>	x	6,071.7 =	<u>18,215</u>	mg NO3-N/DAY
2b) Number of bedrooms =	<u>3</u>	x	173.5 =	<u>521</u>	L H2O/DAY

IMPERVIOUS SURFACE (NITROGEN LOAD & WATER LOAD)

NO3-N load number sq.ft. of roof surface x 0.1940 mg NO3-N
 H2O load number sq.ft of roof surface X 0.2586 L/sq.ft

3a) Roof surface =	<u>953</u>	x	0.1940 =	<u>184.9</u>	mg NO3-N/DAY
3b) Roof surface =	<u>953</u>	x	0.2586 =	<u>246.5</u>	L H2O

NO3-Nload number sq.ft. of paved surface x 0.3880 mg/sq.ft.
 H2O load number sq.ft of paved surface x 0.2586 L/sq.ft

4a) NO3-n sq.ft paved surfaces =	<u>783</u>	X	0.3880 mg/sq.ft. =	<u>303.8</u>	mg NO3-N/DAY
4b) H2O sq.ft paved surfaces =	<u>783</u>	X	0.2586 L/sq.ft =	<u>202.5</u>	L H2O

LAWN NITROGEN LOAD = 0.933 mg / sq.sf. Lawn surface

$$5) \text{ SF LAWN AREA} = \underline{4,468} \times 0.933 = \underline{4,168.1} \text{ mg}$$

NATURAL AREA WATER LOADING

Natural area = lot size - impervious surface = 1,736.0 sq.ft.

$$6) \text{ Natural area} = \underline{4,629} \times \text{water recharge factor} = \underline{628.6} \text{ L PER DAY}$$

(0.1358 L/sq. ft. for Bourne)¹

SUMMARY OF NITROGEN LOADING

ESTIMATED TITLE 5 NITROGEN AND WATER LOADING

7a) ADD THE NO3-N LOADING

1a	+	3a	+	4a	+	5	
<u>43,716</u>	+	<u>185</u>	+	<u>304</u>	+	<u>4168</u>	= <u>48,373</u> mg NO2-N / day

7b) ADD THE ABOVE WATER LOAD

1b	+	3b	+	4b	+	6	
<u>1,248</u>	+	<u>246</u>	+	<u>202</u>	+	<u>629</u>	= <u>2,326</u> L H2O/day

7c) DIVIDE 7a BY 7b = 20.80 ppm NO3-N *****

ACTUAL NITROGEN AND WATER LOADING

8a) ADD THE ABOVE NO3-N LOADING:

2a	+	3a	+	4a	+	5	
<u>18,215</u>	+	<u>185</u>	+	<u>304</u>	+	<u>4168</u>	= <u>22,872</u> mg NO2-N / day

8b) ADD THE ABOVE WATER (H2)) LOAD:

2b	+	3b	+	4b	+	6	
<u>521</u>	+	<u>246</u>	+	<u>202</u>	+	<u>629</u>	= <u>1,598</u> L H2O/day

8c) DIVIDE 7a BY 7b = 14.31 ppm NO3-N *****

FINAL CALCULATION ADD 7C & 8C (ppm) = 35.11 divided by 2 = 17.56 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*****

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.