MV 11579

May 11 2022

Martha's Vineyard Hospital – Navigator Homes Nitrogen Analysis

Acronyms:

MVH: Martha's Vineyard Hospital
NHMV: Navigator Homes of Martha's Vineyard, Inc.
WQMP: MVC Water Quality Management Policy v13 (1/12/18)

Site Conditions:

Locus lies entirely within the Sengekontacket Pond Watershed.
Adjusted Nitrogen Load Limit: 2.02 kg/acre/year per WQMP
Locus does NOT lie within Zone II of a municipal well
Total lot area: 27.53 acres

Project Notes:

Runoff Areas:

Roof area runoff to subsurface disposal:	90,820 sq ft
Roof area runoff to vegetated surface disposal:	0 sq ft
Impervious pavement to subsurface disposal:	0 sq ft
Impervious pavement to vegetated surface disposal:	94,006 sq ft
Pervious pavement to subsurface disposal:	0 sq ft
Pervious pavement to vegetated surface disposal:	0 sq ft

Waste Water Parameters:

Effluent strength: 8 mg/l (per MVC staff and Klean Tu)

Flow Estimates per WQMP:
  Green House Homes: (150 GPD/bedroom)(60%) = 90 GPD/bedroom
  Workforce housing: (67,700 GPY/unit)(90%) / 365 days/yr = 167 GPD/unit

Analysis:

$[N(r) + N(l) + N(w)] < N(a)$

N(r) Runoff N-load:
Roof runoff to subsurface disposal:
  (3.91 ft/yr)(90%)(90,820 sf)(28.32 l/cf)(0.75 mg/l) / (1M mg/kg)   = 6.79 kg/yr
Roof runoff to vegetated surface disposal:
  (3.91 ft/yr)(90%)(0 sf)(28.32 l/cf)(0.38 mg/l) / (1M mg/kg)   = 0.00 kg/yr
Impervious pavement runoff to subsurface disposal:
  (3.91 ft/yr)(90%)(0 sf)(28.32 l/cf)(1.50 mg/l) / (1M mg/kg)   = 0.00 kg/yr
Impervious pavement runoff to vegetated surface disposal:
  (3.91 ft/yr)(90%)(94,006 sf)(28.32 l/cf)(0.75 mg/l) / (1M mg/kg)   = 7.02 kg/yr
Pervious pavement runoff to subsurface disposal:
  (3.91 ft/yr)(65%)(0 sf)(28.32 l/cf)(1.50 mg/l) / (1M mg/kg)   = 0.00 kg/yr
Pervious pavement runoff to vegetated surface disposal:
  (3.91 ft/yr)(65%)(0 sf)(28.32 l/cf)(0.75mg/l) / (1M mg/kg)   = 0.00 kg/yr

N(r) total: = 13.81 kg/yr

N(l): Landscape N-load:

(120,000 sf)(3 lb/1000 sf)(20%) / 2.205 lb/kg = 32.65 kg/yr.

N(w): Waste water N-load:

Estimated flow:
  66 bedrooms @ 90 GPD/bedroom =   5,940 GPD
  32 units @ 167 GPD/bedroom =   5,344 GPD
  Total: 11,284 GPD

N(w) enhanced (Klean Tu) denitrification:
  (11,284 GPD)(3.785 l/gal)(8 mg/l)(365 days/year) / (1M kg/mg) = 124.71 kg/year

N(a): Allowable N-load:
  (2.02 kg/acre/yr)(27.53 acres) = 55.61 kg/yr

$[N(r) + N(l) + N(w)] < N(a)$
N total = 13.81 kg/yr + 32.65 kg/yr + 124.71 kg/yr = 171.17 kg/yr
Overage: 171.17 kg/yr – 55.61 kg/yr = 115.56 kg/yr