

www.souratigroup.com

Martha's Vineyard Office
107 Beach Rd., Suite 202
P.O. Box 4458, Vineyard Haven, MA 02568
Phone: 508-693-9933, Fax: 508-693-4933

Nantucket Office:
35 Old South Road, Nantucket, MA 02554
Phone: 508-228-7888, Fax: 508-228-5511

October 8, 2013

Sheri Caseau, Water Resources Planner
Martha's Vineyard Commission
P.O. Box 1447
Oak Bluffs, MA 02557

Re: Nitrogen Loading for the Alliance Community Church
1 Ryan's Way
Map 56, Parcel 15.08
Oak Bluffs, MA

Dear Sheri,

Below are the proposed Nitrogen loading calculations for the Alliance Community Church project.

The proposed Title V wastewater flows for the church are as follows:

- 150 seat church x 6 gallons/seat-day = 900 gallons/day
- 3 bedroom apartment x 110 gallons/bedroom-day = 330 gallons/day
- 1,090 S.F. of meeting rooms (office space) x 0.075 gallons/S.F.-day = 82 gallons/day

Therefore, the total proposed Title V wastewater flow is 1,312 gallons/day, which is equivalent to 478,880 gallons/year. This is probably the worst case, because it assumes the same level of use every day.

Actual wastewater flows are estimated to be 60% of Title V design flows, making the actual flows 787.2 gallons/day or 287,328 gallons/year.

Wastewater Nitrogen Loading Calculations

Using a standard Title V sewage disposal system:

$$787.2 \frac{\text{gal}}{\text{day}} \times 365 \frac{\text{day}}{\text{year}} \times 3.785 \frac{\text{liter}}{\text{gallon}} \times 35 \frac{\text{mg Nitrogen}}{\text{liter}} \times \frac{\text{kg Nitrogen}}{1,000,000 \text{ mg}} = 38.06 \frac{\text{kg Nitrogen}}{\text{year}}$$

Incorporating Composting Toilets

Installing composting toilets throughout the building is estimated to reduce the Nitrogen loading by 60% to 15.22 kg Nitrogen/year.

Precipitation Nitrogen Loading Calculations

Roof:

$$7,609 \text{ ft}^2 \times 46.89 \frac{\text{in}}{\text{year}} \times 0.9 (\% \text{ of rain}) \times \frac{\text{ft}}{12 \text{ in}} \times 28.32 \frac{\text{L}}{\text{ft}^3} \times 0.75 \frac{\text{mg Nitrogen}}{\text{L}} \times \frac{\text{kg Nitrogen}}{1,000,000 \text{ mg}}$$
$$= 0.57 \frac{\text{kg Nitrogen}}{\text{year}}$$

Concrete Walkway:

$$2,402 \text{ ft}^2 \times 46.89 \frac{\text{in}}{\text{year}} \times 0.9 (\% \text{ of rain}) \times \frac{\text{ft}}{12 \text{ in}} \times 28.32 \frac{\text{L}}{\text{ft}^3} \times 0.75 \frac{\text{mg Nitrogen}}{\text{L}} \times \frac{\text{kg Nitrogen}}{1,000,000 \text{ mg}}$$
$$= 0.18 \frac{\text{kg Nitrogen}}{\text{year}}$$

Dirt Parking/Roadway:

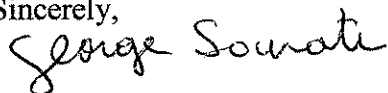
$$20,036 \text{ ft}^2 \times 46.89 \frac{\text{in}}{\text{year}} \times 0.6 (\% \text{ of rain}) \times \frac{\text{ft}}{12 \text{ in}} \times 28.32 \frac{\text{L}}{\text{ft}^3} \times 0.75 \frac{\text{mg Nitrogen}}{\text{L}} \times \frac{\text{kg Nitrogen}}{1,000,000 \text{ mg}}$$
$$= 1.00 \frac{\text{kg Nitrogen}}{\text{year}}$$

Total: $0.57 + 0.18 + 1.00 = 1.75 \frac{\text{kg Nitrogen}}{\text{year}}$

Therefore, the total expected nitrogen which will be released incorporating composting toilets will be 16.97 kg Nitrogen/year. According to the May 8, 2008 Martha's Vineyard Commission decision, DRI #603 Nova Vida Church, Section 3.2, under the Nitrogen Load heading, the limit for this parcel would be the pre-existing load that was about 17.9 kg of Nitrogen per year. I reviewed Bill Wilcox's calculations from May 8, 2008, and I agree with the pre-existing load of 17.9 kg of Nitrogen per year.

Please do not hesitate to contact me if you have any questions.

Sincerely,



George A. Sourati, P.E.