

Letter of Transmittal



49 Herring Pond Road
Buzzards Bay, MA 02532
Tel: (508) 833-0070
Fax: (508) 833-2282

19 Old South Road
Nantucket, MA 02554
Tel: (508) 325-0044

To:
Town of Bourne
Board of Health
24 Perry Avenue
Buzzards Bay, MA 02532

HAND DELIVERY & Electronically

From:
Donald F. Bracken, Jr., PE
don@brackeneng.com
Bracken Engineering, Inc.

Re: 176 Scraggy Neck Road (Map 71, Parcel 1, Lot 2)

Enclosed: 7 total copies

Revised Application for Septic Variance Request – dated 8/22/2022

- BEI Cover Letter
- Revised Variance Request Letter from BEI
- Revised Nitrogen Loading Calculations – Existing & Proposed
- Horsley response letter from BEI dated 8/22/22
- Horsley Response letter from ECR dated 8-19-22
- Architectural Plans dated 7/21/22

Site and Sewage Disposal Plan Set in Bourne, MA, prepared by Bracken Engineering, Inc., dated May 16, 2022, revised 6/14/2022, revised 8/22/22

Cc: Client
File

Signed: Tina Yule

Date: August 23, 2022

MAIN OFFICE:

49 Herring Pond Road
Buzzards Bay, MA 02532
TEL: (508) 833-0070
FAX: (508) 833-2282

**NANTUCKET OFFICE:**

19 Old South Road
Nantucket, MA 02554
TEL: (508) 325-0044
www.brackeneng.com

August 22, 2022

Bourne Board of Health
Terri Guarino, RS, CHO
24 Perry Avenue
Bourne, MA 02532

**RE: Revised Variance Request Cover Letter
176 Scraggy Neck Road (Map 51.0, Parcel 1)**

Dear Members of the Board:

Pursuant to the last meeting for the above referenced project held on July 13, 2022 and a site meeting with Terri Guarino and Stephanie Fitch, we are submitting the following information to modify and supplement the pending variance application:

- Revise plans which reduce the number of bedrooms from 5 to 4.
- Revised Nitrogen Loading Calculations which reduce the proposed loading from 2.5 to 2.2 ppm
- Revised house plans to show 4 bedrooms
- Letter from this firm in response to the Horsley July 11, 2022 letter
- Letter from Environmental Consulting & Restoration, LLC in response to the Horsley July 11, 2022 letter

Thank you for your time and consideration on this matter. We look forward to reviewing this project with the Board of Health at the next scheduled Public Hearing. Should you have any questions regarding this project or require any further information please contact the undersigned at either 508-833-0070 don@brackeneng.com.

Sincerely,

BRACKEN ENGINEERING, INC.

A handwritten signature in black ink, appearing to read 'Donald F. Bracken, Jr.', is written over a horizontal line.

Donald F. Bracken, Jr., P.E.
President

cc: Marybeth & Steven Bisson
Glenn Wood Esq.

MAIN OFFICE:

49 Herring Pond Road
Buzzards Bay, MA 02532
TEL: (508) 833-0070
FAX: (508) 833-2282



NANTUCKET OFFICE:

19 Old South Road
Nantucket, MA 02554
TEL: (508) 325-0044
www.brackeneng.com

June 14, 2022

Revised August 22, 2022

Bourne Board of Health
Terri Guarino, RS, CHO
24 Perry Avenue
Bourne, MA 02532

RE: Variance Request
176 Scraggy Neck Road (Map 51.0, Parcel 1)

Dear Members of the Board:

On behalf of the homeowner, The Long Point Trust c/o Marybeth and Steven Bisson, Bracken Engineering, Inc. (BEI), is requesting a variance to the Town of Bourne Board of Health Regulations to replace an existing cottage with a new single-family dwelling at the above referenced location. Attached with this request are revised plans by this firm dated 8/22/22 and revised Architectural plans dated 7/21/22 to address some of the concerns raised by staff at a site meeting on July 19, 2022.

A Variance is Requested to the following Local Regulation:

150 FOOT SETBACK REG
TOWN OF BOURNE
BOARD OF HEALTH

"A 150 foot setback will be required for all leaching facilities from the edge of a wetland resource or watercourse, as defined in 310 CMR 15.01 Title V. Setback distance shall be measured during periods of highest ground or surface water conditions."

This Regulation was last amended on June 1, 1988. 310 CMR 15.01 refers to the "old" Title V in effect when the Board of Health adopted this Regulation. Section 15.01 does not have a definition for "wetland resource" but there is a definition for "watercourse" which includes "wetland". The definition reads as follows:

"Watercourse. Any natural or man-made stream, pond, lake, wetland, coastal wetland, swamp or other body of water and should include wet meadows, marshes, swamps, bogs and areas where ground water, flowing or standing surface water or ice provide a significant part of the supporting substrate for a plant community for at least five months of the year."

The only applicable resource area that a variance is required for this property is the Salt Marsh which is a coastal wetland and watercourse per the definition above. Based on the above definition, a coastal wetland must be considered as a "body of water". This is also confirmed in the old Title V 310 CMR 15.03 Location (7) Distances. (1)(2) for setbacks to Watercourses, footnote [2] "All distances shall be



measured from the average of the mean annual flood elevation in inland areas and from the Mean High Water in coastal areas.”

Although in our opinion, variances are not required for setbacks to coastal banks, we request the following variances from the 150-foot setback to the proposed Soil Absorption System (SAS) and Reserve Area (RA) to be consistent with past practices of the Board:

- SAS to the Salt Marsh southwest from 150' to 136' **(14' variance)**
- SAS to the Salt Marsh northeast from 150' to 101' **(49' variance)**
- SAS to Coastal Bank southwest from 150' to 65' **(85' variance)**
- SAS to Coastal Bank northeast from 150' to 57' **(93' variance)**
- RA to the Salt Marsh to the south from 150' to 134' **(16' variance)**
- RA to the Salt Marsh to the northeast from 150' to 119' **(31' variance)**
- RA to Coastal Bank southwest from 150' to 53' **(97' variance)**
- RA to Coastal Bank northwest from 150' to 69' **(81' variance)**

The coastal banks existing on-site consist mainly of well vegetated wooded areas (forested upland) subject to protection under M.G.L. c. 131, § 40 or Resource Areas protected under WPA Regulations at 310 CMR 10.00. These banks function exclusively as vertical buffers for storm waters. Please refer to the attached letter from Stan Humphries, Coastal Geologist with Environmental Consulting & Restoration, LLC (ECR) submitted with this request in response to the Horsley letter submitted to the Board dated July 11, 2022. This letter states that the proposed septic system will in no way adversely impact the coastal bank through erosion/destabilization.

The Regulation was based on the transport rates in glacial outwash soils to protect water bodies and resource areas that could be impacted by septic system contaminants based on actual groundwater flow. Since coastal banks are not associated with groundwater flow, they should not technically be applicable to the setback requirement.

Also, there are no Title V variances required with this application. The proposed system is located greater than 50' from a BVW, Salt Marsh and the top of any coastal bank. Note: the coastal bank setback is measured from the “most landward edge” of the “top” of coastal bank per 310 CMR 15.211: Minimum Setback Distances footnote (3).

In accordance with the Regulation, a Hydrogeologic study is not required because the SAS and RA are greater than 100 feet from a wetland or watercourse per the applicable definition. As required, this application includes the following documentation prepared by a Professional Engineer:

- Proposed site plan (3 Sheets) which includes: existing conditions information, proposed design information, septic system design and details, wetland resource areas and setbacks to septic system components;
- Soil Evaluation Form including groundwater monitoring information over a tidal cycle;
- Existing and proposed Nitrogen Loading Calculations.



Based on the submitted information, the variances should be granted because of the following:

- The new system will replace an existing cesspool located only 31' from the salt marsh and on the coastal bank. This cesspool provides no treatment, the bottom is only a few feet above the water table and is a direct contaminant source to the salt marsh;
- Nitrogen loading for the proposed 4-bedroom system is only 2.2 parts per million (PPM) well below the typical standard of 5 PPM. Please note that the proposed number of bedrooms has been reduced from 5 to 4 bedrooms as suggested by the Board's Agent;
- The system has been designed to include MicroFast denitrification system;
- The system includes the design of a Presby soil absorption system that is equivalent to a pressure distribution system;
- The system location is located at the highest portion of the lot and maintains a 7.7' separation to groundwater, where a minimum of 5' is required;
- A deed restriction shall be placed on the property limiting it to four bedrooms;

In summary, the upgraded system with the increased flow provides better protection of public health and safety and the environment than the existing system with no increase in flow. Given the size of the property and the facts and circumstances of this particular case, it would be manifestly unjust to apply strict adherence to this Regulation. Furthermore, not granting the variance would deprive the owner of reasonable use of the property when specifically evaluating this property with surrounding properties and previous approvals by the Board.

Thank you for your time and consideration on this matter. We look forward to reviewing this project with the Board of Health at the next scheduled Public Hearing. Should you have any questions regarding this project or require any further information please contact the undersigned at either 508-833-0070 don@brackeneng.com.

Sincerely,

BRACKEN ENGINEERING, INC.

A handwritten signature in blue ink, appearing to read 'Donald F. Bracken, Jr.', is written over a horizontal line.

Donald F. Bracken, Jr., P.E.
Presidentglenn

cc: Marybeth & Steven Bisson
Glenn Wood Esq.

MAIN OFFICE:

49 Herring Pond Road
Buzzards Bay, MA 02532
TEL: (508) 833-0070
FAX: (508) 833-2282



NANTUCKET OFFICE:

19 Old South Road
Nantucket, MA 02554
TEL: (508) 325-0044
www.brackeneng.com

August 22, 2022

Bourne Board of Health
Terri Guarino, RS, CHO
24 Perry Avenue
Bourne, MA 02532

RE: 176 Scraggy Neck Road (Map 51.0, Parcel 1) Response to Horsley letter July 11, 2022

Dear Members of the Board:

This letter is written in response to letter submitted to the Board dated July 11, 2022, by Scott W. Horsley who represents a group of abutters for the above referenced project.

The following are Mr. Horsley's comments in italics and my responses in red:

General Comments: The project site is highly constrained by wetland resources areas. In fact, the entire project site is within protected wetland resources areas including salt marsh, coastal bank, and land subject to flooding (100-year floodplain). The proposed project will significantly increase the wastewater design flow by a factor of five (from 110 gallons/day to 550 gallons/day).

This statement is not accurate and is misleading. The entire site is not within the protected resource areas listed. The site is within the jurisdictional buffer zones of the resource areas. Although there will be an increase in wastewater flow, the system has been designed to be significantly below the Board's standard of 5 parts per million (PPM) Nitrogen Loading rate. The proposed project is designed to have four bedrooms with a density of 21,752 sf of upland per bedroom, much greater than abutting properties in the area.

The proposed septic system does not comply with the minimum setback distances in the Bourne Health Regulations or in the Title 5 state regulations. My specific comments are as follows.

1. The project does not comply with Bourne Health Regulations: The regulations require a 150-foot setback from both wetlands or watercourses. They state, "a 150 foot setback will be required for all leaching facilities from the edge of a wetland resource or watercourse, as defined in 10 CMR 15.01 Title V". The regulations also require a hydrogeologic study for a variance of less than 100 feet.

The Applicant is seeking 4 variances to allow reduced setbacks to Salt Marsh, for reduction from 12 to 49 feet. However, the Applicant has not applied for variances to reduce the setbacks from the two Coastal Bank Wetland Resource Areas associated with this site.

The Bourne Board of Health Regulations stipulate that minimum setbacks are from "a wetland resource" or "watercourse". These are two separate terms, and the required setbacks apply to either. No matter how "watercourse" was defined in a previous version of Title 5, "wetlands" are defined in the Massachusetts Wetlands Protection Act (MGL Chapter 131, Section 40) and the Regulations promulgated thereunder at 310 CMR 10.00. "Coastal Banks" have always been considered wetlands



under these state laws, and certainly were upon the passage of the Bourne Health Regulations in 1988. Furthermore, the current version of Title 5 clearly identifies Coastal Banks as wetlands where septic system setbacks are required (310 CMR 15.211). Accordingly, the project cannot proceed without obtaining additional variances to reduce setbacks to the two Coastal Banks on this site. The Applicant also has not quantified impacts to the Coastal Bank in this application.

This statement is incorrect. The Regulation only refers to a wetland resource and watercourse per the old Title V which does include the word “wetland” in the definition of “watercourse.” As stated in the variance request, for setback requirements to a watercourse there is a footnote that specifies all distances shall be from the Mean High Water (MHW) in coastal areas. The intent of the regulation was to protect water resource areas that intersect with the water table. Coastal banks in this location are not impacted by the proposed septic system, see the attached report prepared by Stanley Humphries, Coastal Geologist. Nevertheless, the variance application will be revised to include the setbacks to the coastal banks shown on the plan. The Board has routinely granted this variance to coastal banks for repairs and new construction.

A Hydrogeologic Study is not required because we are over 100’ from the watercourse. There would be no purpose having a Hydrogeologic Study for being less than 100’ to a coastal bank to evaluate impacts on groundwater. The coastal banks in this situation are unrelated to groundwater flow, quality or potential impacts from the septic system.

2. The project does not comply with Title 5: Title 5 requires a minimum 50-foot setback from coastal banks (310 CMR 15.211). The applicant has shown a 50-foot setback from one coastal bank but not from the second coastal bank on the property. In fact, the proposed septic system is located between two coastal banks and well within the 50-foot setback of the second coastal bank (see figure 1 below).

This statement is also incorrect. Again, as stated in the variance request letter, the setback from the coastal bank is measured from the landward edge of the top of the coastal bank. There is no setback requirement in Title V to the toe of a coastal bank.

Variance Criteria are not met: The applicant is requesting a variance from the local health regulations but has not requested one from the Title 5 requirements. The criteria for issuing variances is two-fold and both must be met: 1) manifest injustice, and 2) same degree of environmental protection (see excerpt from Title 5 below).

As stated in the paragraph above, State Title V variances are not required.

I do not believe that either of these criteria are met with the current proposal. The Title 5 reference to manifest injustice below refers to preventing “substantially all beneficial use of the subject property”. The property currently has a one-bedroom cottage on the property. A smaller redevelopment project that would relocate a similar-sized structure with similar wastewater discharge that achieves some improved setbacks from wetlands and watercourses would be reasonable. Further, there is no manifest injustice “considering all of the relevant facts and circumstances of the individual case,” where the



subject property is held in common ownership with adjoining land at 178 Scraggy Neck Road and 180 Scraggy Neck Road, each of which already contains a single-family home.

Although a Title V variance is not technically required, the project would meet the criteria above. Beneficial use of the property is subjective and should be relative to the size, location, and value of the property. The property directly south of the locus (170 Scraggy Neck Road) has 6 bedrooms on 1.5 acres and the property to the east (168 Scraggy neck) has 4 bedrooms on 1 acre. This is typical for this area. The proposed development on this 7-acre lot is far less dense than abutting properties in the area. To suggest that the property should be limited to the existing one-bedroom flow is unreasonable when one considers the facts in this case which include replacing an old cesspool close to the marsh with a septic treatment system that produces a nitrogen load well below the Board's standard. Most importantly, this resource is a coastal bank with an elevation above the soil absorption system (SAS). There is no possible way that the SAS could impact this resource area.

The fact this property is in the same ownership as the abutting property has absolutely no relevance.

The proposed project includes a five-fold expansion of the septic system (from 110 gallons/day to 550 gallons/day). The applicant is suggesting that the use of an innovative and alternative (I&A) septic technology compensates for this increase in wastewater discharge. However, this is not true.

We disagree. If one compares the impact of the existing cesspool close to the marsh and the fact that the effluent will be treated and have a longer travel time to the marsh, there is a substantial benefit. This should not be a matter of comparing existing flows and nitrogen loading rates or volumes, the fact is the design complies with the town's nitrogen loading standards and this project would be approvable even if it was a vacant lot based on experience with this Board.

The proposed I&A septic technology has an estimated 19 mg N/liter effluent compared to a standard Title 5 system estimated at 26.25 mg N/liter (Massachusetts Estuary Project). To determine if the proposed project will provide "the same degree of environmental protection" I have prepared the following comparative nitrogen loading calculations (see Table 1 below). My analysis indicates that nitrogen loading will increase from 10,929 mg/day to 38,553 mg/day or by 262 percent. Therefore, the proposed project (including the I&A system) does not meet the criterion of "same degree of environmental protection".

The nitrogen loading rate used in Bourne per the Town's calculation sheet is 35 ppm not the 26.25 ppm used by Mr. Horsley in his calculation from another reference. This is an obvious attempt to make the numbers appear worse than they are, and these calculations should be disregarded. If we are going to compare the nitrogen loading of the existing system with the proposed system, then all factors for a comparison need to be considered. The existing cesspool is only 31' from the marsh with the bottom only a few feet above the water table. The bottom effluent loading rate based on 110 gallons per day (GPD) is about 2.2 GPD per square foot of untreated sewage. The proposed system at 440 GPD has a significantly lower loading of about 0.9 GPD per square foot of treated effluent. The cesspool results in a more direct flow path into the groundwater and to the marsh. There are minimal dilution factors between the cesspool and marsh. The flow from the proposed system which is over 100' from the marsh shall be well mixed over a much larger area between the SAS and the marsh. When the cesspool is removed and the new



system is installed, although there will be an increase in flow, there will be a significant reduction in the concentration of pollutants entering the marsh.

Again, this cannot be viewed as just a comparison of nitrogen loading as Mr. Horsley has done. Furthermore, the density of this project is one bedroom per 21,752 square feet of upland area which is much higher than most properties in this area including the properties that Mr. Horsley represents.

The proposed project would also compromise the horizontal setback and groundwater travel time to the regulated "watercourses" by one third (101 feet versus 150 feet). The Bourne Regulation states that the basis for this minimum setback is related to "contaminant transport rates".

It is understood that the longer the travel time the better the dilution for lowering the nitrogen concentration. The proposed system will allow better treatment and more protection to the groundwater than a system that is 150' from a watercourse.

In addition to the nitrogen, there are two additional contaminants of concern associated with wastewater discharges near coastal water and shellfishing areas - pathogens and contaminants of emerging concern (CECs). No additional treatment is proposed for these pollutants despite the fact that the project will result a five-fold increase in mass loading of these pollutants. Therefore, the proposed project does not meet the criterion of "same degree of environmental protection".

This is also an inaccurate statement. The Board does require additional treatment in the form of pressure dosing. We are proposing a Presby system which functionally is equivalent to pressure dosing. This proposed design is consistent with the variances approved in the past.

4. Summary:

A. *The proposed project does not meet the minimum setback requirements required by the Bourne Health Regulations or Title 5.*

An obvious statement considering we are asking for a variance to the local regulations.

B. *The applicant has applied for variances from the local health regulations but has not applied for a variance from Title 5.*

Not required based on my explanation above.

C. *The two-fold test for variances include: 1) manifest injustice, and 2) same degree of environmental protection. Neither of these criteria are satisfied.*

Not required due to the fact we do not need a state variance. However, as I responded above the project would meet this criterion.



D. The proposed project will increase nitrogen loading by 262% and will compromise the minimum horizontal setbacks required to maintain safe contaminant transport by 33%.

This is irrelevant because the project meets the Board's standard and is an improvement over existing condition. The actual loading increase is from the nitrogen loading 1.5 ppm to 2.5 ppm which is 67%,

Thank you for your time and consideration on this matter. We look forward to reviewing this project with the Board of Health at the next scheduled Public Hearing. Should you have any questions regarding this project or require any further information please contact the undersigned at 508-833-0070 don@brackeneng.com.

Sincerely,

BRACKEN ENGINEERING, INC.

A handwritten signature in black ink, appearing to read 'Donald F. Bracken, Jr.', is written above a horizontal line.

Donald F. Bracken, Jr., P.E.
President

cc: Marybeth & Steven Bisson
Glenn Wood Esq.

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:

176 Scraggy Neck Road (Existing Conditions)

Number of Bedrooms (Title 5 Definition)	=	1	Bedrooms
Lot Size (in square feet of upland areas)	=	87,006	sq.ft. Upland
Impervious Surfaces,**roof area=	985	sq.ft.	**Paved Area = - sq.ft.
Natural Area = lot area minus all impervious surfaces	=	86,021	sq.ft.
Lawn Area in sq. ft.	=	8,917	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 7911 mg NO₃-N / day/ bedroom with IA Treatment

Water from Title 5 design = 416.3 H₂O / day / bedroom

1a) Number of bedrooms = 1 x 14572 = 14572.00 mg. NO₃-N / day

1b) Number of bedrooms = 1 x 416 = 416.00 L H₂O / day

Actual Nitrogen load = 6071.5 mg NO₃-N / day/ bedroom: 3296 mg NO₃-N / day/ bedroom with IA Treatment

Actual Water load = 173.5 L H₂O / day / bedroom

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

2a) Number of bedrooms = 1 x 6071.5 = 6071.50 mg. NO₃-N / day

2b) Number of bedrooms = 1 x 173.5 = 173.50 L H₂O / day

IMPERVIOUS SURFACES (NITROGEN LOAD & WATER LOAD)

NO₃-N load number sq. ft. of roof surface X 0.19395 mg NO₃-N / sq. ft.

H₂O load number sq. ft. of roof surface X 0.2586 L / sq. ft.

3a) Roof surface = 985 sq. ft. X 0.19395 = 191.04 mg NO₃-N

3b) Roof surface = 985 sq. ft. X 0.2586 = 254.72 L H₂O / day

NO₃-N load number sq. ft. of paved surface X 0.388 mg / sq. ft.

H₂O load number sq. ft. of paved surface X 0.2586 L / sq. ft.

4a) NO₃-N = 0 sq. ft. paved surface X 0.388 mg / sq. ft. 0.00 mg NO₃-N

4b) H₂O = 0 sq. ft. paved surface X 0.2586 L / sq. ft. 0.00 L H₂O

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

$$5) \text{ sq. ft. of lawn} = 8917 \times 0.933 = 8319.56 \text{ mg}$$

NATURAL AREA WATER LOADING

$$\text{Natural area} = \text{lot size} - \text{impervious surfaces} = 86021 \text{ sq. ft.}$$

$$6) \text{ Natural area} = 86021 \times \text{water recharge factor} = 11681.65 \text{ L} \\ (0.1358 \text{ L / sq. ft. for Bourne})$$

SUMMARY OF NITROGEN LOADING

Estimated Title 5 Nitrogen & Water Loading

7a) ADD the above NO₃N load

1a	(+)	3a	(+)	4a	(+)	5
14572		191.04		0.00		8319.56
						23082.60 mg NO ₃ -N / day

7b)

1b	(+)	3b	(+)	4b	(+)	6
416		254.72		0.00		11681.65
						12352.37 L H ₂ O / day

$$7c) \text{ DIVIDE 7a by 7b} = 1.9 \text{ ppm NO}_3\text{-N}^{*****}$$

Actual Nitrogen & Water Loading

8a) ADD the above NO₃N load:

2a	(+)	3a	(+)	4a	(+)	5
6071.5		191.04		0.00		8319.56
						14582.10 mg NO ₃ -N / day

8b) ADD the above water (H₂O) load:

2b	(+)	3b	(+)	4b	(+)	6
173.5		254.72		0.00		11681.7
						12109.87 L H ₂ O / day

$$8c) \text{ DIVIDE 8a by 8b} = 1.2 \text{ ppm NO}_3\text{-N}^{*****}$$

$$\text{FINAL CALCULATION ADD 7c \& 8c (ppm)} = 3.1 \text{ divide by 2} = 1.5 \text{ ppm NO}_3\text{-N}$$

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 ***

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:

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=	4,786	sq.ft.	**Paved Area = - sq.ft.
Natural Area = lot area minus all impervious surfaces	=	82,220	sq.ft.
Lawn Area in sq. ft.	=	7,410	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 7911 mg NO₃-N / day/ bedroom with IA Treatment

Water from Title 5 design = 416.3 H₂O / day / bedroom

1a) Number of bedrooms = 4 x 7911 = 31644.00 mg. NO₃-N / day

1b) Number of bedrooms = 4 x 416 = 1664.00 L H₂O / day

Actual Nitrogen load = 6071.5 mg NO₃-N / day/ bedroom: 3296 mg NO₃-N / day/ bedroom with IA Treatment

Actual Water load = 173.5 L H₂O / day / bedroom

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

2a) Number of bedrooms = 4 x 3296 = 13184.00 mg. NO₃-N / day

2b) Number of bedrooms = 4 x 173.5 = 694.00 L H₂O / day

IMPERVIOUS SURFACES (NITROGEN LOAD & WATER LOAD)

NO₃-N load number sq. ft. of roof surface X 0.19395 mg NO₃-N / sq. ft.

H₂O load number sq. ft. of roof surface X 0.2586 L / sq. ft.

3a) Roof surface = 4786 sq. ft. X 0.19395 = 928.24 mg NO₃-N

3b) Roof surface = 4786 sq. ft. X 0.2586 = 1237.66 L H₂O / day

NO₃-N load number sq. ft. of paved surface X 0.388 mg / sq. ft.

H₂O load number sq. ft. of paved surface X 0.2586 L / sq. ft.

4a) NO₃-N = - sq. ft. paved surface X 0.388 mg / sq. ft. 0.00 mg NO₃-N

4b) H₂O = - sq. ft. paved surface X 0.2586 L / sq. ft. 0.00 L H₂O

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

$$5) \text{ sq. ft. of lawn} = 7410 \times 0.933 = 6913.53 \text{ mg}$$

NATURAL AREA WATER LOADING

$$\text{Natural area} = \text{lot size} - \text{impervious surfaces} = 82220 \text{ sq. ft.}$$

$$6) \text{ Natural area} = 82220 \times \text{water recharge factor} = 11165.48 \text{ L} \\ (0.1358 \text{ L / sq. ft. for Bourne})$$

SUMMARY OF NITROGEN LOADING

Estimated Title 5 Nitrogen & Water Loading

7a) ADD the above NO₃N load

1a	(+)	3a	(+)	4a	(+)	5
31644		928.24		0.00		6913.53 39485.77 mg NO ₃ -N / day

7b)

1b	(+)	3b	(+)	4b	(+)	6
1664		1237.66		0.00		11165.48 14067.14 L H ₂ O / day

$$7c) \text{ DIVIDE 7a by 7b} = \underline{2.8} \text{ ppm NO}_3\text{-N}^{*****}$$

Actual Nitrogen & Water Loading

8a) ADD the above NO₃N load:

2a	(+)	3a	(+)	4a	(+)	5
13184		928.24		0.00		6913.53 <u>21025.77</u> mg NO ₃ -N / day

8b) ADD the above water (H₂O) load:

2b	(+)	3b	(+)	4b	(+)	6
694		1237.66		0.00		11165.5 <u>13097.14</u> L H ₂ O / day

$$8c) \text{ DIVIDE 8a by 8b} = \underline{1.6} \text{ ppm NO}_3\text{-N}^{*****}$$

$$\text{FINAL CALCULATION ADD 7c \& 8c (ppm)} = \underline{4.4} \text{ divide by 2} = \underline{2.2} \text{ ppm NO}_3\text{-N}$$

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***



Environmental Consulting & Restoration, LLC



August 19, 2022

Bourne Board of Health
Terri Guarino, RS, CHO
24 Perry Avenue
Bourne, MA 02532

**RE: Response to Horsley letter July 11, 2022
176 Scraggy Neck Road (Map 51.0, Parcel 1)**

Dear Members of the Board:

Please accept this letter as a review of plan revisions to the May 16, 2022 *Proposed Conditions Plan* and a response to the July 11, 2022 letter submitted by Scott W. Horsley.

Environmental Consulting and Restoration, LLC (ECR) was retained by Bracken Engineering, Inc. to review updated modifications to the NOI application from LEC, recent plan revisions and opposition comments. This project review is based on my training and experience over the past 45+ years in coastal geomorphology and floodplain management.

The site generally consists of an upland promontory surrounded by a combination of Salt Marsh, Coastal Bank(s), and Land Subject to Coastal Storm Flowage. The upland comprises very stable glacial deposits, Carver coarse sand, 8 to 15 percent slopes and a variety of vegetation. The floodplain has been mapped by FEMA as a Zone AE (el. 15). The Coastal Banks have been properly delineated and characterized on the plan using the DEP Wetlands Policy 92-1 and the local wetlands bylaw regulation, section BRW 1.02(g). The function of these banks is exclusively limited to a vertical buffer for storm waters. Supplying sediment to any adjacent coastal beaches, dunes or barrier beaches is not a function of these banks. There are no signs or evidence of erosion on the slopes or bottom of these banks due to coastal flooding, stormwater runoff or groundwater breakout. The Coastal Banks are vegetated and very stable.

But for maintenance of an existing gravel driveway and restoration/mitigation plantings in a secondary Coastal Bank, no work is proposed directly in a resource area that is regulated by state and local wetland performance standards. All components of the proposed septic system will be located over 100 feet from Mean High Water (MHW), over 100 feet from the Salt Marsh, and over 50 feet from the two primary Coastal Banks, located east and west of the proposed system. The tops of these banks are located at elevations 3-5 feet above the soil absorption system (SAS) and the bottoms of the banks are located 2.5-3 feet above groundwater at the Salt Marsh/Coastal Bank boundary. Therefore, construction and performance of the septic system will not have an adverse impact on the delineated resource areas.

Mr. Horsley submitted a copy of the shoreline change map produced by MA Coastal Zone Management Office to bring attention to the receding shorelines. Mapping of MHW location along transects in sandy, unvegetated shorelines is the purpose of these maps. The map does not show any transect data landward of the Salt Marsh which abuts the bottom of the primary Coastal Bank flanking the west side of the property nor the embayment flanking the east side of the property. Mapping of historical shorelines within a Salt Marsh is highly suspect because of the dense vegetation and any future impacts of the redevelopment project (e.g., sewage disposal) that may be implied or otherwise are without merit.

In my professional opinion, the function of these Coastal Banks will be no less important than they currently are and, even with sea level rise, the septic system will be located well below any erosion impacts that may occur at the marsh/bank boundary or on the face of the banks. More importantly, the septic system install and future use will in no way adversely impact the CB through erosion/destabilization.

Upon review of this supplemental information, please contact me at (617) 543-1654 or stan@ecrwetlands.com with any questions or requests for additional information.

Sincerely,
Environmental Consulting & Restoration, LLC

Stan Humphries

Stan Humphries
Coastal Geologist