Martha's Vineyard
Water Resource Management Policy for Developments of Regional Impact

Final Report

This project was made possible by a Smart Growth Technical Assistance Grant from the Executive Office of Environmental Affairs (ENV 06 POL 01).

Martha's Vineyard Commission
June 2006

Table of Contents

1. Introduction

The water quality of Martha's Vineyard's coastal ponds is very important to the Island's environment, quality of life, and economy. However, coastal pond quality is increasingly threatened by the effects of excessive nitrogen, coming largely from wastewater. The groundwater over a substantial portion of the Vineyard (approximately two thirds) eventually flows into a coastal pond. Developments that may be far back in the watershed and 10 to 20 years travel time away from a pond will have some impact when the nitrogen from the area reaches the down-gradient coastal water.

All major developments on Martha's Vineyard are reviewed by the Martha's Vineyard Commission as Developments of Regional Impacts.

With financial assistance from the Executive Office of Environment Affairs – Smart Growth Technical Assistance Grant, the Martha's Vineyard Commission has prepared a draft "MVC Policy for DRI Review - Water Quality". This policy is based on, but is an improvement of, past practices by the Commission in DRI review. It was prepared by a subcommittee of the Commission that has worked with MVC staff for over a year.

Committee members included MVC Commissioners: John Breckenridge (Oak Bluffs), Mimi Davisson (Oak Bluffs), Chris Murphy (Chilmark), Megan Ottens-Sargent (Aquinnah), Doug Sederholm (Chilmark) and Paul Strauss (Oak Bluffs) as well as MVC Staff: Mark London, Christine Flynn, Bill Veno and Bill Wilcox.

On June 26, 2006, the subcommittee adopted the draft policy for consideration by the full Commission, after due public consultation.

The policy will be used by the Commission in the review of Developments of Regional Impact and has been structured to allow integration of results from the Mass Estuaries Project, currently analyzing the water quality and nitrogen loading limits of various Vineyard coastal ponds. The policy can also serve as a model for Vineyard towns in their consideration of the possibility of adding criteria related to environmental water quality.

2. Background

Nitrogen is the nutrient that limits the growth of microscopic and macroscopic plants in marine ecosystems. When provided in increasing amounts, growth increases. Growth of plants becomes problematic when:

1. The microscopic plankton interfere with light penetration leading to a decline in eelgrass or
2. Large amounts of macroscopic algae break loose and drift into eelgrass beds, shellfish habitat, onto swimming beaches or accumulate in deeper water and
3. When microscopic and/or macroscopic take up oxygen from the water column as they respire or decay

All coastal ponds on Martha's Vineyard have been shown to be nitrogen sensitive. Sources of nitrogen include:

- Wastewater
- Fertilizer applied to farm fields, golf courses or landscapes
- Stormwater runoff
- Acid precipitation

The dominant sources often vary with the ratio of watershed area to pond area. Where there are large watersheds, the potential for the wastewater and fertilizer sources to predominate increases. When the watershed is smaller, acid precipitation becomes more likely to be the major source. The watershed ratios for Vineyard Ponds are included in Table 1.

Table 1: Watershed to Pond Ratios

Pond	***Pond Area***	***Watershed Area***	***Ratio***
	Acres	*Acres*	***Watershed/pond***
Menemsha	*790*	*1793*	*2.3*
Squibnocket	*603*	*1340*	*2.2*
Edgartown Great	*544 to 895*	*4851*	*6.7*
Tashmoo	*269*	*2638*	*9.8*
Lagoon	*543*	*3901*	*7.2*
Sengekontacket	*726*	*4472*	*6.2*
Tisbury Great	*662 to 801*	*10992*	*15.0*
Chilmark Pond	*146 to 242*	*3159*	*16.3*
Oak Bluffs Harbor	*34*	*368*	*10.8*
Oyster	*208*	*2656*	*12.8*
Katama	*1695*	*2800*	*1.7*
Cape Pogue	*1530*	*708*	*0.5*
Pocha	*208*	*863*	*4.1*
James	*55 to 38*	*435*	*9.4*
Farm	*34*	*420*	*12.4*

These sources fall in two fundamental management categories: those that are manageable locally such as wastewater, stormwater and fertilizer sources and those that require state, regional or national management such as smoke stack and auto emissions that produce acid precipitation.

3. Establishment of Interim Nitrogen-Loading Limits

Pond systems have a certain level of tolerance for nitrogen contributions from their watersheds and from precipitation. The amount of nitrogen that can be tolerated is proportional to the rate at which the water in the pond system is exchanged for new water by tidal circulation. The goal for our ponds is to establish a total nitrogen concentration limit of less than 0.4 parts per million that has been found yield a water quality condition suited growth of eelgrass. The Buzzard's Bay National Estuaries Project developed a formula to identify the quantity of nitrogen that a pond could accept and still meet various water quality goals. It takes into account the desired water quality goal, pond characteristics and the tidal exchange rates to produce a nitrogen-loading limit for a coastal pond. The formula requires information on the amount of water carried by the tides and the volume of the pond basin.

Using this formula, the MVC has produced interim nitrogen-loading limits for the following ponds:

- Edgartown Great Pond
- Sengekontacket
- Tisbury Great Pond
- Chilmark Pond
- Menemsha
- Squibnocket
- Tashmoo
- Lagoon Pond
- Oak Bluffs Harbor

These interim loading limits are included in Table 1 in the Policy included in Appendix A.

Ponds for which we have rough estimates of the nitrogen-loading limit include:

- Cape Pogue
- Poucha Pond
- Katama Bay
- James Pond
- Oyster Pond

The formula simplifies the circulation in a pond by assuming that tidal exchange is relatively uniform throughout the system. However, most systems have coves or restricted circulation areas that require greater time to flush than does the area nearer to the inlet. These differences are not considered fully. In addition, the formula is best suited to ponds that are tidal throughout the year. It does not apply as well to ponds such as those on the south shore of the Vineyard that are opened to the ocean by pond managers to allow access for herring or to raise the salinity for oysters, blue

claw crabs and soft shell clams. This is because these ponds are tidal for as little as 7 days after a channel is cut across the beach to the ocean allowing them to drain down to sea level and become tidal. Depending on wave action and wind direction the inlet may be closed and the pond is no longer tidal as it refills with groundwater and stream flow. When the pond height reaches 3 to 5 feet above sea level, pond managers cut the pond open to the ocean again. These ponds may be open to the ocean only 3 or 4 times each year because of the 60 to 90 days required to rebuild the head that allows a successful inlet to be established. These ponds do not fit into the Buzzard's Bay formula because of their irregular flushing period that varies within the year and from year to year. These ponds include:

- Edgartown Great Pond
- Oyster Pond
- Tisbury Great Pond
- Chilmark Pond
- James Pond

The loading limits produced by the Buzzard's Bay formula are seen as interim guidance that is taken into consideration along with water quality data on the ponds to determine the urgency of nitrogen control in the review of development proposals. At this time, local boards do not utilize these guidelines in their review of proposed development. As a result, the guidelines are only applied to the small fraction of the total development that occurs on Martha's Vineyard. The Massachusetts Estuaries Project will produce far more scientifically valid nitrogen guidance that is derived from a computer modeling of each pond system to produce the will be incorporated into the Policy developed under this grant and, it is expected, into local level project review.

4. Analysis of MVC Precedents and Best Practices

Growth management that is related to water resource quality at the local level includes:

- Town Boards of health through their oversight of wastewater treatment requirements under Title 5.
- Town Planning Boards through their subdivision review and through changes to Town zoning including density requirements.

At the regional level, water resource related policy and regulations are enforced by:

- The Martha's Vineyard Commission through its review of Developments of Regional Impact and Districts of Critical Planning Concern.

The MVC has utilized interim nitrogen loading limits in its review of DRI projects and implemented requirements for wastewater denitrification and for slow releases nitrogen-source fertilizers. This process began with the 1999 review of the Vineyard Golf Club DRI that was located in the watershed of Edgartown Great Pond a south shore coastal pond with a history of water quality problems. The nitrogen-loading limit was developed by the MVC using a methodology similar to the Buzzard's Bay formula. Conditions included:

1. The Vineyard Golf Club is required to manage the course as an organic golf course. The use of organic fertilizers releases nitrogen at a slow rate that offers the best opportunity for

the nitrogen to be absorbed by the grass and incorporated into vegetation instead of leaching into the groundwater and flowing to the Great Pond.
2. The Course is required to monitor its impact by the installation of 4 pairs of groundwater monitoring wells and by placement of suction lysimeters.
3. The Course has an overall limit of 2.54 kilograms of nitrogen per acre per year.
4. Wastewater disposal from the clubhouse and restaurant was required to denitrify the effluent to meet the nitrogen-loading limit. As a result the Course elected to pay for extension of the wastewater collection system to tie into the Wastewater Treatment Facility thereby reducing effluent nitrogen by over 90%.
5. A Golf Club Review Committee was established to oversee the products used for fertilizing and for pest management.

The MVC reviewed two other golf course proposals but approved only the Vineyard Golf Club. The Down-Island Golf Club that followed the Vineyard Golf Club attempted to address nitrogen-loading concerns through upgrading existing wastewater systems including a small package treatment plant that would treat the Club's wastewater as well as the wastewater from the High School and the Ice Arena. The offset proposals were not considered to be reliably adequate by the MVC and the proposal was denied.

Island Elderly Housing-Hillside Village:
This project is located in the watershed of the Lagoon Pond, a nitrogen sensitive salt pond with a history of water quality problems. The project proposal was for 5 new bedrooms on a site where there were already 44 bedrooms. The project was approved with conditions that required the new units as well as some existing units to be tied into a wastewater denitrification system (BioClere) to produce a net nitrogen loading from the site after construction that was equal to or less than the existing loading before the project. The loading limit of 13.25 kilograms per acre per year was applied to the review process.

Island Elderly Housing- Woodside Village:
This project is located in the watershed of the Lagoon Pond, a nitrogen sensitive salt pond with a history of water quality problems. The project site is also in the Southern Woodlands DCPC. The site already housed 72 units on adjoining lots. Two proposals were made for three lots on this site, the first for two buildings with 14 bedrooms and the second for an additional 5 bedrooms. The proposals were approved using denitrifying wastewater treatment and were also required to set aside 2.5 acres to provide dilution to meet the DCPC requirement of 3 milligrams per liter maximum concentration in the groundwater. The loading limit of 13.3 kilograms per acre per year was achieved.

Bridge Housing project:
This 60-bedroom affordable housing project is located in the Tashmoo Pond watershed a nitrogen-sensitive coastal pond with a history of water quality problems. A nitrogen-loading limit of 12.9 kilograms per acre per year was applied to the approval conditions for this project. The project was required to drill four observation wells to determine groundwater flow path and to be used to monitor groundwater quality before and after construction. In addition, the Applicant was required

to distribute their wastewater along the entire length of the up gradient property line to allow dilution of wastewater nitrogen before it reached down-gradient drinking water wells. After further consideration, the applicant chose to denitrify the entire wastewater flow to reduce the nitrogen loading to eliminate the risk to down gradient wells.

Problems with the existing DRI review and conditioning system:

1. The formula requires selection of a target water quality goal to determine the amount of allowable nitrogen. The only choices acceptable to the Commission were the "Excellent" or "Average" target water quality goals. The Average water quality choice results in a near doubling of the limit over what the Excellent target would allow. In most cases the Average goal was used but for those ponds that are very tolerant of nitrogen loading, the Excellent load limit was utilized. For the south shore great ponds, the Reduced water quality target was suggested because the formula is not as valid for the circulation pattern in these systems and the choice of Average or Excellent resulted in very low nitrogen loading limits.
2. In the past once the limit is calculated, the load per acre was determined by dividing this number by the total acreage in the watershed. This calculation produces a gross nitrogen-loading limit in that it doesn't take into account the present day load going into the system and partly compensates for this by allocating a load to both open space and road rights of way that produce virtually no nitrogen. In some pond systems like the south shore great ponds and Lagoon Pond, the present day nitrogen load is nearly equal to (or exceeds) the loading limit. By applying the gross loading limit, the expectation is that the existing load will be brought under control at some point in the future so that it will meet the per acre loading limit. However there is no mechanism to ensure that this will happen. The Massachusetts Estuaries project may offer the incentive for Town and MVC action to implement the necessary action.

5. Preparation of Policy

The MVC Water Quality Policy sub-committee met beginning in October 2004 and continuing through the last meeting on June 26, 2006. The Committee considered all aspects of the nitrogen load limit methodology from load limit calculation, to assignment of the load limit to a particular project to the calculation of nitrogen loading limits. The Committee reviewed and has modified the nitrogen loading limit determination and allocation process as follows:

1. The water quality goal should always be Excellent or Average water quality except for the south shore ponds.
2. For the south shore ponds, an average water quality goal is developed that calls for the Average water quality target for those time periods when the ponds are tidal and refilling and for the Reduced target for those periods when the ponds are near full capacity and non-tidal.
3. Before calculating a per acre loading limit the nitrogen load from acid precipitation should be removed from the total nitrogen-loading limit for the entire watershed. This yields the available nitrogen loading that can be distributed to the watershed. The available nitrogen

remaining is expected to be added at buildout by sources that are manageable at the local level.

4. When calculating the available load per acre, the acreage in the watershed that is in open space and road rights of way is included to yield a conservative load limit per acre for the developable watershed.
5. The MVC staff evaluated water department meter records to determine that the average house produces 167 gallons of wastewater effluent per day. The Committee agreed to the use of this figure as an interim flow rate until better information becomes available. The Committee derived a nitrogen load for an average residence of 4.4 kilograms of nitrogen per year when the effluent is treated by an on-site alternative nitrogen-removing technology.

The Committee considered the water quality data for each pond, presence of eelgrass and the current nitrogen load compared to the load limit. This was done to further clarify the degree of threat to each pond beyond the Buzzard's Bay formula. The Committee recognized the inherent weaknesses in the Buzzard's bay formula when applied to some of our ponds but believes that the nitrogen loading issue is of sufficient magnitude that some action is required in the interim until the Massachusetts Estuaries Project (MEP) produces more accurate loading limits.

These considerations were used to place each pond in one of three categories.

1. Quality Waters: In these ponds, eelgrass bed coverage is close to historical extent or loss is no more than 25%; the average total organic nitrogen concentration is equal to or less than 0.38 mg per liter and the current nitrogen-load is well below the Critical Nitrogen-Loading Limit.
2. Compromised Waters: These ponds include tidal ponds with limited tidal action that display symptoms of eutrophication associated with excess nitrogen such as declining fish and shellfish harvests, turbidity, low dissolved oxygen and wrack algae. This category also includes ponds that do not fit precisely into the Buzzard's Bay Model for calculating Critical Nitrogen-Loading Limits. It further includes ponds where we do not yet have enough data to thoroughly assess the water quality condition but which exhibit some symptoms of water quality.
3. Impaired Waters: In these ponds, eelgrass coverage has decreased in excess of 25% of past coverage and/or total organic nitrogen exceeds the 0.38 mg per liter threshold and/or the current nitrogen load is close to or exceeds the Critical Nitrogen-Loading Limit.

6. Identification of Possible Districts of Critical Planning Concern and Zoning Modifications

DCPC Process: Nominations of Critical Districts may be made by boards of selectmen, town planning boards, boards of health, or conservation commissions, of any of the towns on the Island. They may also be made upon petition by any seventy-five (75) taxpayers of the Island, or by the Commission itself. If the MVC agrees to consider the nominated area as a Critical District, then a special moratorium will take effect within the area being considered. The Commission will decide to consider a nominated area as a Critical District within forty-five (45) days of receipt of a

nomination. If an area being nominated is not considered as a possible Critical District, the Commission will return the nomination to the nominator with reasons why it is not being considered.

The Commission will hold a public hearing and then take a vote to designate or not to designate. The designation vote must be taken within sixty (60) days of voting acceptance for consideration.

- If the area is designated as a Critical District, the vote will include guidelines for development of the District. The guidelines will be incorporated into the designation decision.
- If the area is not designated as a Critical District by the Commission, then the district moratorium will end. The nomination may not be reconsidered for designation until one year after the original acceptance for consideration, unless two-thirds of the Commission members vote for early reconsideration.

Four town boards; the Board of Selectmen, the Planning Board, the Conservation Commission, and the Board of Health are responsible for proposing regulations. Prior to the town vote to adopt the regulations, the Commission will hold a public hearing to determine conformance of the proposed regulations with the guidelines in the designation. The proposed regulations must then be voted by a two-thirds majority of the town meeting.

If the town has not submitted proposed regulations within six months, the Commission may adopt regulations for the District. Otherwise, the town may take up to one year to adopt regulations. If, one year after designation, the Commission has not adopted or approved regulations for any part of the District, then the designation for that part of the District is terminated, and no part of that area may again be designated for a period of one year.

Drawbacks to this approach to implementing nitrogen limits include the requirement for 2/3-majority vote at Town Meeting. Without a carefully orchestrated public education campaign, regulations of this sort that will cost the voters money are very difficult to pass. The MVC may adopt regulations if a Town has not proposed them. However this creates an adversarial situation that is not desirable.

Brief Review of Existing DCPCs with Water Related Regulations: Existing Districts of Critical Planning Concern are included in maps in Appendix B. Many Districts were nominated and put in place decades ago before there was a clear understanding of the nitrogen issue. At the time, it was clear that the ponds were fragile and were affected by nitrogen from wastewater but there was no method developed to determine how to limit the nitrogen impact. DCPCs in place that incorporate water quality concerns include:

The Coastal District:

This District was put in place in the mid-1970s when it was clear that wastewater was a threat to coastal pond quality but the exact nature of the threat and its scale were not clear. The purpose of the coastal district is to prevent flood damage, maintain water quality, assure adequate water supply, prevent pollution, promote wildlife habitat and protect wetland areas.

This district includes the land below 10 feet elevation and within 500 feet of the inland edge of marsh or dune grass and includes the perimeter of all coastal ponds. Within this area, housing density is limited by a requirement for spacing of 300 feet between adjacent septic system wastewater disposal areas and by a requirement for additional distance between the base of the leaching area and the water table that effectively requires setback from the edge of the ponds. The required interval between adjoining wastewater systems reduces the density of nitrogen sources within the District and reduces nitrogen loading.

Amendments to this DCPC to further reduce nitrogen sources would only have limited effect on the ponds because this District does cover the vast majority of the watersheds of the coastal ponds that are determined by the areas that contribute groundwater or stream input. Only if this District were increased to cover a substantial portion of the watershed would this DCPC prove effective for nitrogen management.

Sengekontacket Pond District (Oak Bluffs only):
This District is limited to the area along the Pond within the Town of Oak Bluffs. It establishes a requirement for a monitoring well for each septic system installed within the District. The requirement may be waived if other nearby monitoring wells exist. Development in the District is required to have 60000 square feet for each single-family residence that reduces housing density and therefore nitrogen loading from wastewater, stormwater and landscape sources. This DCPC is substantially less than the area of the actual watershed of Sengekontacket Pond and provides no limitation on nitrogen loading (as does the Coastal DCPC).

The Lagoon Pond District (Tisbury and Oak Bluffs):
Areas within 1500 feet of the shoreline of this pond in the Town of Oak Bluffs are required to have 15,000 square feet for each bedroom. Smaller pre-existing lots are allowed a maximum of 3 bedrooms. Septic systems are required to be pumped every 3 years. A septic system inspection program is called for, to be managed by the Board of Health. The regulations also call for stormwater management. Guidelines for Conservation Commission pier regulations are included. This DCPC could have some positive effect on water quality if wastewater disposal systems were required to address nitrogen management either through individual on-site nitrogen reducing system s or through requirements for cluster treatment systems.

The State Forest Aquifer Protection District:
This DCPC was designated but guidelines and regulations were never completed. The nomination recognized the Forest's strategic importance in that it is located over a significant portion of the main aquifer of the Vineyard. The intent of the nomination was to assure that the Correllus State Forest would be protected from any uses that might affect groundwater water quality. This goal is being carefully carried out by the Division of Conservation and Recreation.

The Southern Woodlands District (Oak Bluffs only):
This DCPC includes a portion of the Lagoon and Sengekontacket watersheds in Oak Bluffs. Within this District nitrogen loading cannot produce a concentration in the groundwater that exceeds 3

parts per million or a nitrogen concentration in either pond that will exceed 1.0 part per million. Within the area that it covers, this regulation has a significant effect on potential nitrogen loading. As with the other DCPCs, it only addresses a portion of the watershed.

Cape Poge Pond District (Edgartown only):
This DCPC sets up a DCPC advisory committee to advise the Planning Board on Special Permits and to propose wildlife management and recreation guidelines. This District has potential to be modified to better address water quality protection in this pond.

Edgartown Ponds District (Edgartown only):
This District covers the area around the south shore coastal ponds and sets up a 700-foot wide border around the shore of these ponds where regulations on use are imposed. Within the first 100 feet uses are strictly limited to fishing, conservation, agriculture and only minor expansion of pre-existing structures is allowed. In the next 200 feet, a single-family dwelling is allowed as well as non-habitable structures. In the following, the underlying zoning regulations are applied. This District does not coincide with the watershed of the ponds but could be enhanced to require further wastewater treatment than is permitted within the existing health code.

Squibnocket Pond District (Chilmark only):
This District covers the majority of the watershed for this Pond within the Town. Within the first 500 feet inland from the shoreline, uses are restricted to paths, small-scale view cuts, agricultural uses and paths and roads. In the remainder of the District, one single-family residence and permitted non-habitable structures are allowed. On lots of 6 acres or more area, a secondary dwelling may be permitted. These regulations address nitrogen loading through density limitations. Modification may be necessary to require wastewater denitrification based on the results of the Massachusetts Estuaries Project.

Possible modifications to DCPC regulations: It is possible to adopt either MVC or MEP nitrogen loading limits within Health Board regulations for the Districts. This approach might require cluster systems with advanced nitrogen removal capability for all existing systems and proposed systems or only for new projects that exceed a threshold. DCPC regulations could also be modified to require lot size density reduction or single residence denitrification systems.

- Adoption of an interim requirement for wastewater denitrification systems for all new systems and for replacement/upgrade systems through the Health Board regulations. This approach might not get the loading down to the loading limit but would produce a 40% plus/minus reduction in wastewater nitrogen loading from those systems upgraded. It might be revised when the MEP results are available.
- Reduction in zoning density to reach an estimated acreage where the average nitrogen released from a single family residence would meet the nitrogen loading limit for the watershed the DCPC is within.

One drawback to modifying DCPC regulations is that they will require ratification at Town Meeting where a 2/3 vote is necessary. This can be difficult if the groundwork and support for the need for

the regulations have not been carefully and thoroughly carried out. Board of Health regulations require a public hearing process before adoption but do not require a 2/3 vote of Town Meeting as do any changes to zoning or DCPC regulations.

Another substantial drawback to using existing DCPCs to manage nitrogen loading to the coastal ponds is the fact that the existing Districts do not cover the entire watershed, and typically only include a small fraction of the watershed area. Finally, DCPCs carry a development moratorium that proceeds while the guidelines are worked into proposed regulations, approved by the MVC and adopted at Town Meeting. The moratorium can extend over a period of up to a year.

Possible nomination of new Districts: As described in the beginning of this section, Districts can be nominated by taxpayers or by Town Boards. Once in place, implementation of the regulations is left to the appropriate Town board(s). Two approaches have been identified for further discussion:

1. **Nomination of the Island:** This District would only produce regulations for those portions of the Vineyard that are within the watershed of a coastal pond. The north shore that contributes water to Vineyard Sound and those areas that drain to the ocean without passing through a coastal pond would be removed from regulation. The District would focus on nitrogen management through wastewater regulations. One drawback to this approach is that the entire Vineyard would be tied up in a development moratorium for a period of time. This will present challenges to building public support due to the extent of the regulations and the varying requirements of each pond. Some Towns would be considering regulations for as many as six coastal pond watersheds (Edgartown). When the entire Town of Aquinnah was nominated as a District, a committee was set up to hear variance requests to allow certain development projects to go forward. A similar process could be established for the outwash plain watershed area but this would create a large bureaucracy. Another drawback to this approach is that the acceptable nitrogen load is different for each pond and regulations would either be developed in a general fashion for the entire area (e.g. all septic systems must use denitrifying technology) or the regulations would be varied according to watersheds.
2. Another approach would be to **nominate pond watersheds** based on the degree of threat and the manifestation of water quality problems or as the ponds complete the Massachusetts Estuaries Project process. This approach would allow more specific regulations to address the varying needs of the ponds and would not necessarily produce the same scale of development moratorium allowing more focused and effective public education and administration of the process.

Changes to Town regulations:

DCPCs are added to Town zoning as overlay districts often with their own section and regulations within the Town zoning bylaws. Similarly, the Towns with public supply wells have developed overlay district regulations to protect these water resources. An overlay district (instead of a DCPC) is a possible approach to developing Town zoning regulations that would

address the specific area of a watershed. Zoning regulations could be developed to limit housing density that would reduce nitrogen loading or to require cluster development that would set the stage for the use of small-scale sewage treatment plants to reduce the nitrogen from wastewater. Zoning changes require a 2/3 vote that will require careful building of public understanding and support.

The Boards of Health can also adopt new regulations that enhance their existing requirements for wastewater treatment. This could lead to individual lot denitrification systems or small-scale treatment facilities. Another option is for the Boards to adopt the MVC interim nitrogen loading limits for certain watersheds or to adopt similar limits when released by the Massachusetts Estuaries Project. The Boards of some of the Towns adopted new regulations to implement the wastewater density limits imposed by the Coastal District DCPC. A similar approach could be followed for watershed areas. Health Board regulations can be adopted by vote of the Board after a public hearing. This capability is far easier than zoning changes but puts the weight of the decision on only three Board members.

Boards of Health see their regulatory mandate as coming directly from Title 5, the State Sanitary Code. The presence of language in the Nitrogen Sensitive Areas (section 15.215) that supported Boards taking action to address nitrogen issues is a crucial aspect of developing effective action at the local level through health Boards. It appears that the Boards do not yet see the health of coastal ponds as being an important part of their mandate to protect public health. It is clear that all coastal ponds are sensitive to nitrogen to some degree. Inclusion of all coastal ponds in the Commonwealth as designated nitrogen sensitive areas seems a logical step that should at the very least come about as result of the Massachusetts Estuaries Project.

Summary of Possible Regulatory Modifications:

Three approaches to managing nitrogen loading issues associated with our coastal ponds seem to warrant careful consideration. Two of these are quite similar in that they involve creation of overlay districts by means of either pond watershed Districts of Critical Planning Concern or by creation of a Town zoning overlay district within the zoning bylaws. One advantage to a DCPC is that the use of the MVC powers allows a wider scope to the regulations than might be possible through Town zoning. The third approach is the adoption of Health Board regulations that could proceed from a DCPC process or by adoption within the usual Town level process.

7 Overview of the Policy

The Policy was discussed, edited and unanimously recommended out of the Water Quality Policy sub-committee for consideration by the full Commission at its meeting of June 26, 2006. The Policy is attached in Appendix A.

The Policy is broken down into five sections:

- The introduction provides background information and an explanation of the threat to our coastal ponds. It includes a table listing the ponds covered by the policy, their characteristics and critical nitrogen load limit. This table also provides a brief summation of the water quality, eelgrass and current nitrogen loading that are used to characterize the degree of threat to water quality in each pond system. This is followed by a discussion of the planned classification system for the degree of threat to each pond.
- The Goals and Objectives section lays out the purpose of the policy.
- The Policy itself is then presented. This includes the basic nitrogen reduction requirements that the Commission might require. Options to off set excess nitrogen loading are described.
- Examples of hypothetical projects are provided to give applicants an idea of how the policy would be followed. The methodology and parameters used to calculate the expected nitrogen loading from a proposed project are provided. This section also includes the requirements for maintaining alternative-technology, nitrogen-reducing wastewater systems.
- The policy then provides a brief Fresh Resource Policy section that provides some basic guidance for projects that are near fresh water ponds or will require a large volume of groundwater.

We expect that the policy will be modified in the not too-distant future to insert nitrogen-loading requirements that arise from the Massachusetts Estuaries Project or to expand on nitrogen loading mitigation options that will assist in implementing some of the recommendations that develop from the MEP report. This type of change to the policy is expected to occur within the 1 to 5 year time horizon as pond reports are completed by the MEP. We also expect that the fresh resource requirements may be altered as more information on the water quality and/or limitations of these resources become clear.

APPENDIX A

Water Quality Policy Recommended for Commission Discussion and Approval

DRAFT Awaiting Approval of the Full Martha's Vineyard Commission

MVC POLICY FOR DRI REVIEW
2. Water Quality

This policy gives guidance to applicants seeking approval of Developments of Regional Impact (DRIs) by the Martha's Vineyard Commission with respect to water quality. The aim is to ensure that new projects do not cause excessive nitrogen loading and further deterioration of water quality in the Vineyard's fragile coastal ponds. This document describes the procedure to determine the acceptable level of nitrogen loading, how excess levels can be mitigated, and other measures to ensure water quality. It also deals with freshwater ponds, groundwater, and large water withdrawals.

This policy is one of a series prepared to help Applicants and members of the public understand how the Martha's Vineyard Commission evaluates proposed Developments of Regional Impact (DRI), as mandated by its enabling legislation, Chapter 831 of the Acts of 1977 as amended.

The Commission is mandated to weigh the benefits and detriments of certain proposals to determine whether they should be approved, approved with conditions, or denied. Consult the Commission's website (www.mvcommission.org/DRI) or office (508-693-3453) to obtain the other documents. This policy reflects MVC practices in reviewing subdivisions and development over the past generation. It is set forth in order to assist Applicants in preparing proposals that address the Commission's concerns.

The Commission will use this policy during review of the benefits and detriments of the proposal (used a basis for approval or denial) and to formulate conditions that may be attached to the approval of an application. It should therefore be used by the Applicant to help design proposals and could serve as the basis of special provisions, or "offers", to offset anticipated detriments. Applicants are invited to consult the MVC's DRI Coordinator and Commission staff for help in identifying which policies apply to their project.

This policy is generally a good indication of the Commission's concerns and can help the Commission evaluate the merits of a proposal. However, the Commission weighs the overall benefits and detriments of all aspects of each proposal on its own merits. Based on the particular circumstances of each proposal, the Commission could deny a project that respects some or even all of the policy or might approve one that does not meet all parts of the policy. The Commission recognizes that there might be special circumstances whereby deviations from the policy are appropriate.

Table of Contents

Note: Sections 2-5 deal with nitrogen loading from wastewater, stormwater, and landscaping.

The preparation of this policy including related research was funded in part by a Smart Growth Technical Assistance Grant from the Executive Office of Environmental Affairs.

Cover:

1. INTRODUCTION

The Importance of Coastal Ponds: Martha's Vineyard is ringed by Great Ponds – coastal saltwater ponds larger than 10 acres in area – that are vital to the Island's environment, character and economy. The15 tidal and 8 brackish ponds comprise a total of over 10 square miles of waters.

- The ponds are highly productive of shellfish (e.g. bay scallops, soft-shelled clams, oysters, quahogs) and fin fish (e.g. herring, tautog, Atlantic cod, tomcod and winter flounder), important to our commercial fishing industry.
- They offer a wide range of recreational opportunities, including boating and sport fishing, so important to the Vineyard's visitor-based economy.
- They have over 290 miles of shoreline, important environmental resources, favorite spots for beach activities, prime locations for real estate and view sheds for many to enjoy.

The future health of our ponds is dependent on maintaining water quality. An excellent indicator of good water quality is the presence of eelgrass beds, which provide an essential habitat for young fish and shellfish.

The Threat of Excess Nitrogen: Over the past generation, increasing nutrient inputs in each watershed – in particular from housing and commercial development – has led to deterioration in the water quality in the Vineyard's coastal ponds. (A pond's watershed is the area of land that drains into the pond, either through runoff or groundwater flow.) Nitrogen is a nutrient that, in limited amounts is important to supporting life in a pond. But when excessive nitrogen is produced in the coastal pond's watershed – from acid rain, septic systems, and fertilizer – it ends up in the pond and can destroy important aquatic life.

In a coastal pond, excess nitrogen has some or all of the following effects:

- Microscopic plants living in the water, called phytoplankton, increase dramatically, causing the water to become cloudy and, in extreme cases, green or brown.
- Slime algae increases on the surfaces of pilings, rocks, and eelgrass blades.
- Drift algae, particularly the bright green types, grow to excess, break loose, and wash into shore, or into eelgrass beds where they collect in unhealthy and unsightly piles.
- The growth of microscopic plants reduces light penetration to plants like eelgrass, which can no longer photosynthesize and therefore decline. The presence of healthy eelgrass is an important indicator of healthy water. In the past 20 years, eelgrass beds have nearly disappeared from Edgartown Great Pond and Sengekontacket Pond, and are in decline in Tashmoo and Lagoon Ponds.
- The excess plant material takes oxygen out of the water, both at night during respiration and as they die and decay. This lack of oxygen leads to stress and death of marine organisms by reducing fish habitat, by killing immobile organisms like

quahogs and by causing chemical reactions in the bottom sediment that release more nutrients.

- The pond's ecosystem shifts to one where filter feeders (clams, oysters and scallops) are replaced by organisms that eat decaying plants (worms and snails). Such a transition can destroy recreational and commercial fishing and shell fishing opportunities.

The ultimate result can be an odorous, unattractive pond devoid of valuable fish or shellfish. (For more background information, please consult the MVC's website at www.mvcommission.org, including: "Wrack Algae", "Epiphytes" and "Water Quality and Nutrient Loading")

Existing Department of Environmental Protection regulations are designed to protect human health, and do not adequately protect coastal ponds. Wastewater coming out of a septic field may have a nitrogen level of 35 parts per million (ppm) that is diluted on site to the point that it meets DEP Drinking Water Standards (10 ppm), yet still exceeds the usually lower limit required to protect the health of coastal ponds.

Therefore, the Martha's Vineyard Commission seeks greater nitrogen reduction than required by the towns or the Commonwealth under Board of Health regulations.

Critical Nitrogen-Loading Limits for Vineyard Watersheds: The Martha's Vineyard Commission has calculated interim nitrogen-loading limits for most coastal ponds and watersheds. These limits were calculated using a model developed by the Buzzard's Bay National Estuaries Project. This formula is most effective with tidal ponds with a high degree of flushing. There is no Critical Nitrogen-Loading Limit for those watersheds that flow directly into the ocean.

Table 1: Analysis of Vineyard Watersheds		
	Nitrogen Load Limit *(kilograms per acre per year)*	***Symptoms Associated With Excessive Nitrogen***
Tidal Ponds (Pond area; watershed area in acres)		
Menemsha (665; 1793)	*12.9*	*Eelgrass extensive, TON low (0.33 to 0.39 mg/l), N-load low*
Pocha (210: 863)	*5.4**	*No historical eelgrass, TON high (0.42 to 0.46 mg/l), N load unknown*
Cape Pogue (1520; 708)	*53.4**	*Eelgrass extensive, TON variable (o.34 to 0.56), N-load probably low*
Katama Bay (1700; 2800)	*16.5**	*Eelgrass extensive, TON unknown, N-load unknown*
Tashmoo (269; 2638)	*5.6*	*Eelgrass down 40%, TON high at south end (0.39 to 0.50 mg/l), N-load low*
Sengekontacket (726; 4492)	*4.1*	*Eelgrass no longer present, TON variable (0.34 to 0.56 mg/l), N-load low*
Lagoon (544; 3916)	*3.4*	*Eelgrass down 54%, TON high at south end (0.36 to 0.43 mg/l), N load near limit*
Oak Bluffs Harbor (34; 375)	*8.3*	*Eelgrass history unknown, TON high (0.36 to 0.41), N-load near limit*
Farm (34; 422)	*1.2**	*Eelgrass extensive, TON high (0.53 to 0.61 mg/l), N-load over limit*
Non-Tidal Ponds		
Edgartown Great (720 ;4851)	*2.20*	*Eelgrass patchy, TON high (0.49 to 0.61 mg/l), N-load below limit*
Oyster (208; 2656)	*0.5**	*Eelgrass history unknown, TON high (0.53 mg/l), N load unknown*
Tisbury Great (731; 10974)	*0.8*	*No eelgrass, eelgrass history unknown, TON high (0.55 to 0.83 mg/l), N load below limit*
Chilmark (194; 3173)	*0.2*	*No historical eelgrass, TON high (0.58 to 0.76 mg/l), N load high*
Squibnocket (603; 1303)	*0.1*	*No historical eelgrass, TON high (0.72 to 1.12 mg/l), N load high*
James (46; 435)	*0**	*Eelgrass history unknown, no existing eelgrass, TON high (0.81 mg/l), N-load unknown probably too high*
**Note: These limits are estimates and should be applied with caution* *TON – Total Organic Nitrogen* *N load – current nitrogen loading*		

The Critical Nitrogen-Loading Limits vary from watershed to watershed because of the varying sizes of ponds, the areas of the watersheds, and the degree of tidal flushing. For example, some ponds such as Sengekontacket are fully tidal whereas others, such as Oyster Pond, are only opened to the sea for a few weeks each year. The Massachusetts Estuaries Project is conducting a detailed study of most of the Vineyard's coastal ponds, which will likely lead to revision of the interim Nitrogen-Loading Limits used in this policy.

Classification of Vineyard Watersheds: The Martha's Vineyard Commission has also established a classification system for coastal waters based on an analysis of their current water quality as well as the nitrogen concentration in the pond in relation to the Critical Nitrogen-Loading Limits. Several criteria were used to indicate impairment:

- In a pond that historically had eelgrass, the reduction of 25% or more of the extent of eelgrass beds.
- A total organic nitrogen level greater than the threshold concentration (0.38 mg per liter) which compromises the survival of eelgrass and is associated with production of phytoplankton and algae;
- In a tidal pond, a calculated nitrogen load greater than the interim-loading limit for that pond as calculated using the Buzzard's Bay Model.
- Symptoms of water-quality problems associated with excess nitrogen such as a decline of fish or shellfish harvest, turbidity.

Based on these criteria, the Vineyard's water bodies and their watersheds were classified into four categories.

A. Ocean Watersheds
   - Watersheds that drain directly to the ocean without first passing through a coastal pond.

B. Quality Waters
   - Eelgrass bed coverage is close to historical extent or loss is no more than 25%; and
   - Average organic nitrogen concentration is equal to or less than 0.38 mg per liter; and
   - Current nitrogen-load is well below the Critical Nitrogen-Loading Limit.

C. Compromised Waters

1. Tidal ponds with limited tidal action that display symptoms of eutrophication associated with excess nitrogen such as declining fish and shellfish harvests, turbidity, low dissolved oxygen and wrack algae.
2. These ponds do not fit precisely into the Buzzard's Bay Model for calculating Critical Nitrogen-Loading Limits.
3. Ponds where we do not yet have enough data to thoroughly assess the condition but which exhibit some symptoms of water quality.

D. Impaired Waters
   - Eelgrass coverage has decreased in excess of 25% of past coverage; and/or
   - Total organic nitrogen exceeds the 0.38 mg per liter threshold; and/or
   - The current nitrogen load is close to or exceeds the Critical Nitrogen-Loading Limit.

Table 2: Classification of Vineyard Watersheds				
	Category A: Ocean Waters	***Category B: Quality Waters***	***Category C: Compromised Waters***	***Category D: Impaired Waters***
Ocean Watersheds				
Tidal Ponds				
Menemsha				
Cape Pogue				
Pocha				
Katama Bay				
Tashmoo				
Sengekontacket				
Lagoon				*
Oak Bluffs Harbor				*
Farm				*
Non-Tidal Great Ponds				
Edgartown Great				
Oyster				
Tisbury Great				
Chilmark				
Squibnocket				
James				
** Seriously Impaired Waters*				

2. GOALS AND OBJECTIVES

Goal: The overall goal of the Water Quality Policy is to ensure that new projects do not cause deterioration of water quality in the Vineyard's fragile coastal ponds by calculating a project's nitrogen load and providing guidance toward mitigating excessive nitrogen loading.

Objectives:
The following are general objectives of this policy.

- Ensure that the water quality in our coastal waters continues to provide a sustainable basis for recreational use and for the commercial and recreational harvest of fish and shellfish.
- Maintain eelgrass beds in tidal coastal ponds or re-establish them where those were present in the recent past.
- Ensure that the overall nitrogen loading in each watershed is kept below the critical threshold needed to maintain or restore eelgrass in tidal ponds and to maintain water quality in the brackish ponds.
- Provide nitrogen-loading limits that are appropriate for the seriousness of the impairment in the watershed.

The following actions may be required in order to meet the nitrogen-loading guidance for a watershed.

- Reduce wastewater flow and, where necessary, utilize available technology to reduce the nitrogen concentration.
- Avoid concentration of runoff by discharging stormwater from impervious surfaces into vegetated areas sized to handle the expected flows. Vegetated infiltration areas should be shaped to disperse runoff evenly to allow maximum nutrient uptake.
- Minimize maintained landscape and maximize use of natural vegetation or native and low maintenance plant materials.

.

3. POLICY

A DRI project should respect the following principles.

3.1 Conform to All Existing Regulations

All projects must meet current town and Department of Environmental Protection (DEP) regulations including:

- Board of Health regulations, Title 5 or special regulations adopted by the Town where the project is located;
- DEP regulations for Zone II Areas of Contribution of public supply wells.

3.2 Limit or Mitigate Nitrogen Loading On Site

3.2.1 Overall Policy: Nitrogen from all man-made sources associated with a DRI – including wastewater disposal, stormwater runoff, and landscaping – should be kept within the guidance for the watershed within which the project is located. The nitrogen loading must be limited or mitigated, depending on the project watershed, as follows.

A. Ocean Waters: There is no nitrogen-loading limit on projects in this watershed.

B. Quality Waters: The nitrogen loading from the project must meet the established Nitrogen-Loading Limit for the watershed. For projects with pre-existing nitrogen loads, the total proposed nitrogen loading must meet the Nitrogen-Loading Limit.

C. Compromised Waters: The nitrogen-loading limit for the project is the less restrictive of the following criteria:

- Meet the Nitrogen-Loading Limit for the watershed, or
- Implement the Basic Nitrogen-Reduction Techniques (described below).

D. Impaired Waters: The nitrogen-loading limit for the project is the more restrictive of the following criteria:

- Meet the Nitrogen-Loading Limit for the watershed, or
- Implement the Basic Nitrogen-Reduction Techniques (described below).

The nitrogen load on the property should first be reduced using the Basic Nitrogen-Reduction Techniques. If it is not possible to reduce the nitrogen load to the guidance level, the remaining nitrogen load must be offset either with off-site reduction within the same watershed, or the Commission might consider a mitigation contribution to offset nitrogen loads. (The amount of the mitigation contribution, if appropriate, would be determined during the DRI review process.) For projects with pre-existing nitrogen loads, the total proposed nitrogen loading must meet the nitrogen limit.

3.2.2 <u>Basic Nitrogen-Reduction Techniques:</u> Basic Nitrogen-Reduction Techniques require the following measures.

- For residential projects:
    - The maximum number of bedrooms permitted on a property is calculated on the basis of four bedrooms for each main house, and two bedrooms for each guest house, which is allowed on the property according to existing zoning regulations, but in no case more than the equivalent nitrogen loading from 4 bedrooms per acre.
    - The calculation of the number of bedrooms in units of affordable housing (permanently restricted to 80% of Area Median Income) is then increased by 50%.
    - The Commission might consider additional bedrooms beyond these limits provided the nitrogen loading from the additional bedrooms are completely offset using the techniques described in this policy.

Nitrogen loading figures and limitations described are based on the average estimated wastewater flow from water department water meter records. This figure is 167 gallons per day. The nitrogen released from a wastewater denitrifying system at 19 milligrams per liter and 167 gallons per day yields 4.4 kilograms of nitrogen from the average residence.

- For commercial, office, and institutional projects where flow is 100 gallons per day or less (60% of the residential design flow limit as described above), denitrify the wastewater.
- For all projects, installation of a wastewater system nitrogen reduction facility or use of other techniques (e.g. composting toilets), to reduce at least 40% of the nitrogen, which is the highest amount of nitrogen reduction currently possible with commonly available systems. For all projects, the Commission might consider increasing the nitrogen-loading limit for in-town, smart growth locations by up to 50%. For all projects, implementing the following nitrogen-reduction landscaping practices:
    - Maintained landscape areas (fertilized lawns and gardens) are limited to a maximum area of 10% of the property area up to 4000 square feet.
    - Only slow release, water-insoluble nitrogen source fertilizers are used in the maintenance of landscaping.
    - Impervious surfaces for parking, buildings and other purposes are limited to a maximum of 25% of the site area.
    - Stormwater is dispersed into natural vegetated swales or infiltration areas sized to handle the 25-year, 24-hour storm, unless demonstrably not feasible.

3.3 Mitigate Excess Nitrogen Loading Off Site

If it is not feasible to reduce or eliminate the nitrogen on site to meet the targets outlined in 3.2.1, the Commission may consider excess nitrogen load offset from a project by reducing an equivalent amount on another site within the same watershed.

This can be done by:

- Putting another property into permanent conservation, provided the mitigation site currently contributes no nitrogen and is taken out of development potential by the use of a conservation restriction or other legal instrument that permanently removes the potential nitrogen loading to the watershed; or
- Reducing the nitrogen loading on another site by at least an amount equal to the excess nitrogen from the proposed project by means such as: connecting the site to a sewer system, installing a package treatment plant, or installing a denitrification system.

In both cases:

- The mitigation site must be situated in a location where its nitrogen load enters the pond at a similar location to the proposed project or a point more distant from its inlet; or
- The mitigation site is located within a different sub-watershed of the same pond where the project site lies but is presently experiencing a more severe nitrogen-loading problem as calculated from land use within the sub-watershed or indicated by water quality symptoms.

3.4 Use Monetary Mitigation to Offset Impacts That Cannot Be Adequately Reduced Through Physical Means

If it is not possible to reduce the nitrogen to the levels set in this policy, either on site or on another site, the Commission may consider a monetary contribution of an amount that would offset the excess nitrogen. This contribution shall be made before any occupancy permit is issued for the project. These funds shall be used exclusively for studies or actions that contribute to improving the water quality in the pond in which watershed the project is located, and may be accumulated and used as required.

3.5 Do Not Increase the Nitrogen Loading of Previously Developed Sites Beyond the Limits in this Policy

If there is additional development of an already developed site, the total nitrogen loading of the property shall not exceed the nitrogen-loading limits in this policy.

If the previously developed site already exceeds the nitrogen-loading limits in this policy, the total nitrogen loading of the property shall not be increased.

4. APPLICATION OF THE POLICY

This section describes the keys steps for designing a project in accordance with the Water Quality Policy. Applicants are encouraged to consult the staff of the Martha's Vineyard Commission for assistance in application of the policy to their properties. The steps are:

- Step 1: Calculate the property's Nitrogen Load Limit.
- Step 2: Calculate the Projected Nitrogen Loading of the proposal
- Step 3: Modify the proposal, if necessary, to meet the limits as much as possible.
- Step 4: Offset the excess nitrogen loading either with off-site mitigation or with monetary mitigation.
- Step 5: Obtain a facility maintenance agreement.

Step 1: Calculate the Property's Nitrogen Load Limit

The nitrogen load limit for the property is calculated by multiplying the area of the property by the loading limit per acre of the watershed within which the project is located (see table 1).

Example

- *A 12-acre lot in the Tisbury Great Pond watershed would have a limit of 12 acres x 0.8 kg/acre/year = 9.6kg/year*
- *A 12-acre lot in Lagoon Pond watershed would have a limit of 12 acres x 3.4 kg/acre/year = 40.8 kg/year*

For projects located within the watersheds of Compromised or Impaired Waters, the nitrogen load must also be calculated on the basis of the Basic Nitrogen-Reduction Techniques with respect to the permissible number of bedrooms. The load from a house after nitrogen reduction is 1.1 kilogram/ acre/year for each bedroom (4.4 kg for a four-bedroom house and an additional 2.2 kilograms kg for a two-bedroom guesthouse if allowed under zoning).

Table 3: Calculation of Number of Permissible Bedrooms in Residential Projects

Note: This limit is used for Compromised and Impaired Waters.

1) Calculate the number of main houses and guesthouses allowed on the property under existing zoning regulations, with a maximum of one house per acre.

2) Calculate the number of bedrooms based on four bedrooms for each permitted main house and two bedrooms for each permitted guesthouse.

Example

- *A 12-acre lot in an area with 3-acre zoning where one guesthouse is permitted on each lot could have 4 main houses with 4 bedrooms and 4 guesthouses with 2 bedrooms, for a total of 24 bedrooms.*
- *If this were to be developed as one property, it would have 24 bedrooms available for the main and guesthouse.*

- *The total nitrogen loading limit would be 24 bedrooms x 1.1 kg/year/bedroom = 26.4 kg/year*
- *If it were to be developed under a Comprehensive Permit (40B) as, say, 8 houses, it would still have 24 bedrooms available for use in all the houses, or three bedrooms each. If two of the houses were affordable (permanently restricted to 80% AMI or less) the project would be entitled to three additional bedrooms (six bedrooms x 50%). Additional bedrooms would need to be offset as described in section xx.*
- *A 4-acre lot in an area with ¼ acre zoning would be calculated on the basis of one 4-bedroom house per acre or a total of 16 bedrooms.*

Note that the calculations in this example are only to illustrate this policy and should not be taken to imply that the Commission or the town boards would approve such projects.

Examples:

- *If the 12-acre property used in the example was located in the Tisbury Great Pond watershed (Compromised Waters), the nitrogen-loading limit would be the greater of the two limits (9.6 and 26.4 kg/year) namely 26.4 kg/year* If the 12-acre property in the example was located the Lagoon Pond watershed (Impaired Waters), the nitrogen-loading limit would be the lower of the two limits (40.8 and 26.4 kg/year), also 26.4 kg/year.

Step 2: Calculate the Projected Nitrogen Loading of the Proposal

The projected nitrogen loading from the proposed project is calculated by estimating the likely wastewater and stormwater infiltration volume and the landscaping contribution using the methodology described in table 3.

Table 4: Nitrogen Loading Calculation Methodology for DRIs

Calculate the total of the three components

All Projects	*Commercial Projects*	*Residential Projects*

Wastewater	• *Multiply the total flow by a nitrogen concentration of 35 milligrams of nitrogen per liter (mg/l).* • *If on-site wastewater denitrification is proposed, the nitrogen concentration shall be assumed to be 19 mg/l unless reliable information is provided to demonstrate otherwise.* • *The wastewater component is excluded if a town sewer serves the project.*	• *Calculate the total flow by computing 60% of the design flow as determined by Title 5 methodology. This figure is then converted to an annual nitrogen load by multiplying by the appropriate value from column 1.*	• *Calculate the total annual flow by multiplying the number of houses by 167 gallons of wastewater per day for each dwelling unit to be created. This figure is then converted to an annual nitrogen load by multiplying by the appropriate value from column 1. (See Table 3 for current census figures.)*
Lawn & Landscape	• *The "landscaped area" is the total area of turf, herbaceous plants and shrubs.* • *Multiply the landscaped area by 1.36 kilograms of nitrogen per 1000 square feet; then multiply by 20% to calculate the nitrogen that will leach to the groundwater.* • *If part of the site is planned and permanently restricted to use exclusively native or low-maintenance varieties of shrubs and trees with no turf, those portions of the landscape are assumed to receive no nitrogen.*	• *The landscaped area is assumed to include the entire property outside the building, parking and other structures' footprint unless clearly designated natural and landscaped areas are identified.* • *These areas are assumed to receive 1.36 kilograms of nitrogen per year per 1000 square feet of area of which 20% will leach to the groundwater*	• *The landscaped area for the project must be clearly indicated on the plans, will form a binding part of the project approval, and may not be subsequently increased without approval of the modification by the Martha's Vineyard Commission.*

Stormwater

- *Stormwater nitrogen sources must be calculated for all commercial projects and for residential projects where the impervious surfaces comprise more than 10%[1] of the property area or the residential area exceeds 10 acres in area. Impervious surfaces are intended to include the footprint of all structures, driveways, parking areas and roads whether paved or not. For small residential projects (development area less than 10 acres) where stormwater runoff will be infiltrated through vegetated areas and will contribute a limited amount of nitrogen to the groundwater, the MVC may assume no additional nitrogen load.*
- *For projects where infiltration of stormwater is proposed through a vegetated area sized to accommodate 25-year storm events, the calculated stormwater volume for all impervious areas (paved and roof) shall be based on 90% of the annual precipitation (90% of 46.9 inches) applied to the impervious area. Runoff volume for roads and parking areas that are surfaced with hardener, gravel or RAP shall be assumed to amount to 65% of the annual precipitation (65% of 46.9 inches) applied to this area. The nitrogen concentration shall be assumed to be 0.75 mg/l for paved areas and 0.38 mg/l for roof water where the runoff is infiltrated in a vegetated area.*
- *For projects with impervious areas utilizing stormwater catch basins and infiltration systems or similar systems, the calculated stormwater flow will be 90% of the annual precipitation (90% of 46.9 inches) and the nitrogen concentration in the recharging water shall be assumed to be 1.5 mg/l for paved areas and 0.75 mg/l for roof areas that are infiltrated using dry wells, infiltrator units or other rapid infiltration technology. If roof water can be infiltrated through vegetated areas, method 2 above shall be used to calculate the nitrogen load.*
- *Alternatively, stormwater volume may be calculated using accepted methodologies such as TR-20 (Computer Program for Project Formulation-Hydrology, USDA SCS 1983), TR-55 (Urban Hydrology for Small Watersheds, USDA SCS, 1986) or TR-55 Microcomputer Program Version 2.0, 1990 or updated versions of these methods. The nitrogen load will then be calculated using this volume and the appropriate nitrogen concentrations as above.*

Nitrogen Attenuation in Fresh-Water Wetlands: Nitrogen loading may be attenuated from projects where a fresh water wetland is situated between the site and the nitrogen limited pond. The attenuation that may be allowed is up to 30% of the calculated project load. The fresh wetland must be clearly situated in the groundwater flow path. If the Applicant or the MVC chooses, a hydrological study may be performed to demonstrate that the nitrogen bearing groundwater will pass through the fresh wetland.

Step 3: Modify the Proposal, if Necessary, to Meet the Guidance as Much as Possible

If the projected nitrogen loading level exceeds the loading limit, the following techniques may be used to reduce the nitrogen loading from the proposal.

1. Reduce the scale of the project.
2. Use additional nitrogen-reduction wastewater technologies beyond the on-site nitrogen reduction (e.g. composting toilets, cluster package plant, connection to municipal sewer), provided they are approved by the local Board of Health and meet the requirements of the Department of Environmental Protection.

3. Reduce the landscaped area of the property (i.e. turf, herbaceous plants and shrubs) and increase the area that remains in native and low-maintenance landscaping.

The nitrogen loading should then be recalculated using the new figures.

Step 4: Offset the Excess Nitrogen Loading Either with Off-site Mitigation or with Monetary Mitigation.

If a project cannot meet the nitrogen-loading limit set forth in this policy on the property of the proposal, the Commission may consider a proposal to offset the nitrogen loading elsewhere within the same watershed as described in Section 3.3 of this policy.

The offset must be in the same watershed as the proposed project in a portion of the watershed that will add nitrogen at a similar location or at a location further removed from the inlet to the pond in question. The offset could also be within a different sub-watershed that is deemed to have an equal or worse water quality condition than the sub-watershed that the project impacts

For projects where offsite mitigation is not possible, the Commission may consider a contribution to a mitigation fund that will be utilized to offset the excess nitrogen loading through cost-effective solutions elsewhere within the watershed.

Step 5: Maintenance of Nitrogen-Reduction Systems:

To assure performance, all nitrogen-reduction systems require ongoing maintenance and monitoring. The applicant must demonstrate to the Commission that a maintenance contract with the manufacturer or a certified treatment plant operator will remain in force over the design life of the system (see Table 5).

Table 5: Maintenance Requirements for Nitrogen Reduction Systems

The applicant should enter into a maintenance contract with the manufacturer or a certified treatment plant operator, to remain in force over the design life of the system, which meets the following requirements.

- *Quarterly effluent testing until the system meets the required nitrogen concentration for four consecutive quarters.*
- *Annual effluent testing once the required nitrogen concentration has been met. Should an annual test fail to meet the standard, a retest is required. Continued failure to meet the nitrogen concentration standard will require a return to quarterly testing until 4 consecutive tests meet the required concentration.*
- *If a system cannot be modified to meet the required standard for nitrogen concentration after four consecutive quarterly test results, it will be deemed to have failed. A failed system must be upgraded with additional system components or replaced with a new system.*
- *A copy of the maintenance contract as well as all test results should be provided to the local Board of Health and to the MVC.*

5. FRESH SURFACE WATERS AND GROUNDWATER

The following policies apply to fresh surface waters and groundwater.

5.1 Location of Leaching Systems: No subsurface wastewater disposal systems should be located within 300 feet of the high-pond shoreline.

Setting wastewater leaching systems back from the shore allows increased soil adsorption, which limits phosphorus entering the ponds. The Applicant may demonstrate by a groundwater study that the groundwater flow from the proposed site does not flow to the pond or to a tributary to the pond. Wastewater treatment may be used to remove nutrients from the wastewater if a project must be located within the 300-foot setback. The Commission may require a phosphorus loading evaluation to assure that the project as proposed will not have a detrimental impact on the pond.

Runoff generated by the project must be infiltrated outside the 300 foot set back. Infiltration through vegetated areas is preferred. Necessary topographic survey and design shall be provided to support the capacity of the proposed infiltration area to meet the 25-year, 24-hour storm.

5.2 Groundwater Withdrawal: Ensure that large groundwater withdrawals do not negatively impact the aquifer, the hydrology of nearby fresh surface waters, or wetlands.

Projects that will require in excess of 50% of the annual recharge for their lot over the course of a year or an average amount in excess of 10,000 gallons per day for a period of 30 days or more shall demonstrate by a suitably designed hydrogeologic study that the project as proposed will not adversely affect groundwater levels in existing wells in the vicinity, cause intrusion of saltwater into the aquifer or impact the hydrology of nearby fresh surface waters or wetlands. Groundwater recharge is assumed to be 22.2 inches per year on average as per the USGS.

6. GLOSSARY

Compromised Waters: The water quality in these ponds displays variability from year to year as well as within the pond system from location to location in a given year. In some years, the Total Organic Nitrogen (TON) content might be at acceptable levels while in other years, it exceeds the threshold.

Denitrify or denitrification: A chemical process in which nitrogen is converted to nitrate and then stripped of its oxygen to release the nitrogen to the atmosphere as nitrogen gas.

Great Ponds: South Shore coastal pond that exceeds 10 acres in area and that is periodically open to the ocean allowing tidal circulation for only a portion of the year.

Nitrogen attenuation: The natural processes that take place in wetlands whereby nitrogen in the groundwater is taken up into internal nitrogen cycles of plants and bacteria and effectively removed from the groundwater and therefore from the nitrogen load to a down gradient coastal water. Where the nitrogen load from a proposed project will pass through a fresh water wetland before entering a coastal pond, a portion of the nitrogen load will be attenuated by the wetland system.

Nitrogen-Reduction Systems: Wastewater treatment facilities that employ denitrification to reduce the overall nitrogen concentration in wastewater effluent. Current systems reduce levels from 35 parts per million to 19 ppm. Nitrogen-reduction systems can range in size from a single-family system to a full-scale public wastewater treatment facility.

Tidal Pond: A costal pond connected to the ocean in which the surface level rises and falls, reflecting the tides.

Total organic nitrogen (TON). A laboratory analyses that includes both dissolved and particulate forms of nitrogen. It is a measure of the organic matter in a water column of a pond that may reduce sunlight penetration and lower dissolved oxygen content. It is a significant indicator of the potential for eelgrass health that is considered an indicator of the health of the pond.

MARTHA'S VINEYARD COMMISSION
BOX 1447 OAK BLUFFS MA 02557
PHONE: 508-693-3453 FAX: 508-693-7894
E-MAIL: INFO@MVCOMMISSION.ORG
WEBSITE : WWW.MVCOMMISSION.ORG

APPENDIX B

Districts of Critical Planning Concern

The Figures that follow are also available on the Martha's Vineyard Commission's Interactive Map website. They graphically display the DCPCs in each of the Towns. The procedure to link to these maps is provided on page 39.

The key for the mapping units for each town is as follows. The maps may include Town overlay zoning districts that are not DCPCs. These are indicated with an asterisk.

Aquinnah:

CoDi	Coastal District
RdDi	Road District
SpDi	Special Places District
Wild	Wild and Scenic North Shore
FlDi	Flood Plain District*
BiPl	Building Permit Limitation
GHCD	Gay head Cliffs District
AqDi	Aquinnah District (town wide)

Chilmark:

CoDi	Coastal District
RdDi	Road District
SpDi	Special Places District
Wild	Wild and Scenic North Shore
MTDi	Meetinghouse Road Tiasquam River District
MNSP	Menemsha Nashaquitsa and Stonewall Ponds District
SqPn	Squibnocket Pond District

Edgartown:

CoDi	Coastal District
RdDi	Road District
FlPZ	Flood Plain Zone*
SpDi	Special Places District
CaPD	Cape Poge Pond District
EPAD	Edgartown Ponds District
KACD	Katama Airport District
SFARD	State Forest Aquifer District
SuWD	Surface Water District

Oak Bluffs:

CoDi	Coastal District
RdDi	Road District
FlDi	Flood Plain District*
SpDi	Special Places District
CoPD	Copeland Plan District
LaPD	Lagoon Pond District
OBHD	Oak Bluffs Harbor District

Oak Bluffs (con't):

SkPD	Sengekontacket Pond District
SoWD	Southern Woodlands District

Tisbury:

CoDi	Coastal District
RdDi	Road District
SpDi	Special Places District
WnSNSD	Wild and Scenic North Shore
FlPD	Flood Plain District*
GRWPD	Groundwater Protection*
FlSD	Flood and Storm District*

West Tisbury:

CoDi	Coastal District
RdDi	Road District
SpDi	Special Places District
Wild	Wild and Scenic North Shore
FlDi	Flood Plain District*
DFMD	Dr. Fishers Mill
DFRD	Dr. Fishers Road
SFRD	State Forest Aquifer District

LINKS FOR DIGITAL VERSIONS:

1. Go to the MVC website at the following address**:** **http://www.mvcommission.org/**
2. At the MVC website click on "Vineyard Interactive Map" located just below the main menu with the lighthouse in the picture.
3. At the interactive site, click on the italic I symbol adjacent to the "Town Boundary" menu choice on the right. Once this is highlighted, you can click on Town you want to view on the small-scale map.
4. This will produce a blow up of the Town of interest. Click on Overlay Zoning Districts on the right side menu. This will load the layers of the zoning districts in that Town. The key above identifies the color-coded map units.