MARTHA'S VINEYARD
SOURCE WATER PROTECTION PROJECT

2003

THE MARTHA'S VINEYARD COMMISSION

PROJECT CONDUCTED 2002-3

PREPARED FOR:

MASSACHUSETTS EXECUTIVE OFFICE OF
ENVIRONMENTAL AFFAIRS
MASSACHUSETTS WATERSHED INITIATIVE

And

DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF RESOURCE PROTECTION

PROJECT NUMBER 2002-10/MWI

MARTHA'S VINEYARD SOURCE WATER PROTECTION PROJECT

0210-MWI

June 19, 2003

PREPARED BY:

THE MARTHA'S VINEYARD COMMISSION
JO-ANN TAYLOR, PRINCIPAL INVESTIGATOR and PROJECT MANAGER

PREPARED FOR:

MASSACHUSETTS EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENVIRONMENTAL PROTECTION

MASSACHUSETTS EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS
Ellen Roy Herzfelder, Secretary

DEPARTMENT OF ENVIRONMENTAL PROTECTION
Edward P. Kunce, Acting Commissioner

BUREAU OF RESOURCE PROTECTION
Cynthia Giles, Assistant Commissioner

DIVISION OF MUNICIPAL SERVICES
Steven J. McCurdy, Deputy Director

DIVISION OF WATERSHED MANAGEMENT
Glenn Haas, Director

ACKNOWLEDGEMENTS

Jo-Ann Taylor, Coastal Planner for the Martha's Vineyard Commission, was principal investigator and project manager. Other Martha's Vineyard Commission staff was involved. William Wilcox, Water Resources Planner, contributed to data analysis and assessment. Cindy Tyminski provided GIS and other cartographic services.

Town water personnel were instrumental in providing data on consumption, in overall development of the project, and in review of the draft report. Deacon Perrotta, Superintendent for the Tisbury Water Works and the Oak Bluffs Water District, and Fred Domont, Superintendent for the Edgartown Water Department, were instrumental, and their office staffs were helpful and cooperative.

EOEA's Islands Watershed Team provided support and cooperation, until its termination in February of 2003. Watershed Team Leader Patti Kellogg was a particularly helpful resource.

This project was funded by and carried out in partnership with the Massachusetts Executive Office of Environmental Affairs and the Massachusetts Watershed Initiative. The contents do not necessarily reflect the views and politics of EOEA or the Department, nor does the mention of trade names or commercial products constitute endorsement or recommendation for use.

TABLE OF CONTENTS

INTRODUCTION.....6

EXECUTIVE SUMMARY.....8

PRIORITIZED RECOMMENDATIONS.....9

TASK 1. LAND USE INVENTORY AND EVALUATION.....11

LAND USE INVENTORY – POTENTIAL THREATS.....12

NITRATE-LOADING EVALUATION.....15

EVALUATION OF EXISTING PROTECTIONS IN PLACE, RECOMMENDATIONS FOR REGULATION OR ACQUISITION.....23

CONCLUSIONS.....25

EDUCATION EFFORTS.....26

TASK 2. LONG TERM WATER SUPPLY NEEDS.....27

DEMAND PROJECTIONS AND FUTURE SUPPLY OPTIONS.....28

GREENLANDS AND STATE FOREST, EVALUATION OF PROTECTIONS AND RECOMMENDATIONS.....37

CONCLUSIONS.....40

TASK 3. CONTINGENCY PLAN FOR PUBLIC WATER SYSTEMS, MOA AND EMERGENCY CONTINGENCY PLAN.....41

TASK 4. ISLAND WATERSHED TEAM MEETINGS.....47

REFERENCES.....48

APPENDIX A – MAPS 49

MAP A-1 DRINKING WATER RESOURCES
MAP A-2 LAND USES IN TISBURY ZONE II
MAP A-3 LAND USES IN LAGOON-STATE FOREST ZONE II
MAP A-4 LAND USES IN FARM NECK ZONE II
MAP A-5 LAND USES IN WINTUCKET-QUENOMICA ZONE II
MAP A-6 LAND USES IN MASHACKET-LILY ZONE II
MAP A-7 LAND USES IN ZONE II's ON MARTHA'S VINEYARD
MAP A-8 POTENTIAL HAZARDS

APPENDIX B – POTENTIAL HAZARDS.....50

APPENDIX C – NITROGEN LOADING CALCULATIONS
MVC MODEL.....54

APPENDIX D – REPORTS FROM DEP NITROGEN MODEL.....65

APPENDIX E – EXISTING TOWN REGULATIONS FOR ZONE II's.....72

APPENDIX F – MANAGEMENT PLAN FOR GREENLANDS.....112

APPENDIX G – D.E.P. POLICY 9504.....116

FIGURES

FIGURE 1 – GROUNDWATER FLOW.....7

FIGURE 2 – LOCUS FOR ZONE II's ON MARTHA'S VINEYARD.....11

FIGURE 3 – TISBURY WATER WITHDRAWAL.....34

FIGURE 4 – OAK BLUFFS WATER WITHDRAWAL.....34

FIGURE 5 – EDGARTOWN WATER WITHDRAWAL.....34

TABLES

TABLE 1 – RESULTS FROM DEP'S NITROGEN LOADING MODEL.....15
TABLE 2 – RESULTS FROM MVC NITROGEN LOADING MODEL.....15
TABLE 3 – CENSUS FIGURES.....17
TABLE 4 – 2001 PUBLIC WELL STATISTICS.....20
TABLE 5 – TRANSMISSIVITY AND SLOPE VALUES.....21
TABLE 6 – SUMMARY STATISTICS FOR THE 3 WATER DEPARTMENTS.....29
TABLE 7 – PROJECTED CONSUMPTION.....31
TABLE 8 – CURRENT & PROJECTED WITHDRAWAL - PEAK MONTH.....32
TABLE 9 – PROJECTED ANNUAL WITHDRAWAL REQUIREMENTS.....33
TABLE 10 – CURRENT & PROJECTED AVERAGE DAILY
WITHDRAWAL DURING PEAK WEEK.....35
TABLE 11 – PRESENT-DAY PERMITTED WITHDRAWALS.....36

TABLE C.1 – TISBURY ZONE II, DEP MODEL.....55
TABLE C.2 – TISBURY ZONE II, MVC MODEL.....56
TABLE C.3 – LAGOON-STATE FOREST ZONE II, DEP MODEL....57
TABLE C.4 – LAGOON-STATE FOREST ZONE II, MVC MODEL....58
TABLE C.5 – FARM NECK ZONE II, DEP MODEL.....59
TABLE C.6 – FARM NECK ZONE II, MVC MODEL.....60
TABLE C.7 – WINTUCKET-QUENOMICA ZONE II, DEP MODEL....61
TABLE C.8 – WINTUCKET-QUENOMICA ZONE II, MVC MODEL...62
TABLE C.9 – MASHACKET-LILY ZONE II, DEP MODEL.....63
TABLE C.10 – MASHACKET-LILY ZONE II, MVC MODEL.....64

INTRODUCTION

A number of immediate and long-term issues relate to the regional water supplies for Martha's Vineyard. The entire Island of Martha's Vineyard has been designated a federally protected sole source aquifer. The water supply for the Island consists entirely of groundwater sources. All surface waters on the Island are salt ponds or brackish. Therefore, it is imperative to keep up the water quality of the groundwater resource. Since the Martha's Vineyard Commission produced its Water Quality Management Plan for Martha's Vineyard in 1977 and its Water Resources Protection Planning Project plan in 1993, much new information has become available regarding delineation of the Zone II's. It is important to take advantage of that information to assess the adequacy of the resource protection in place and planned.

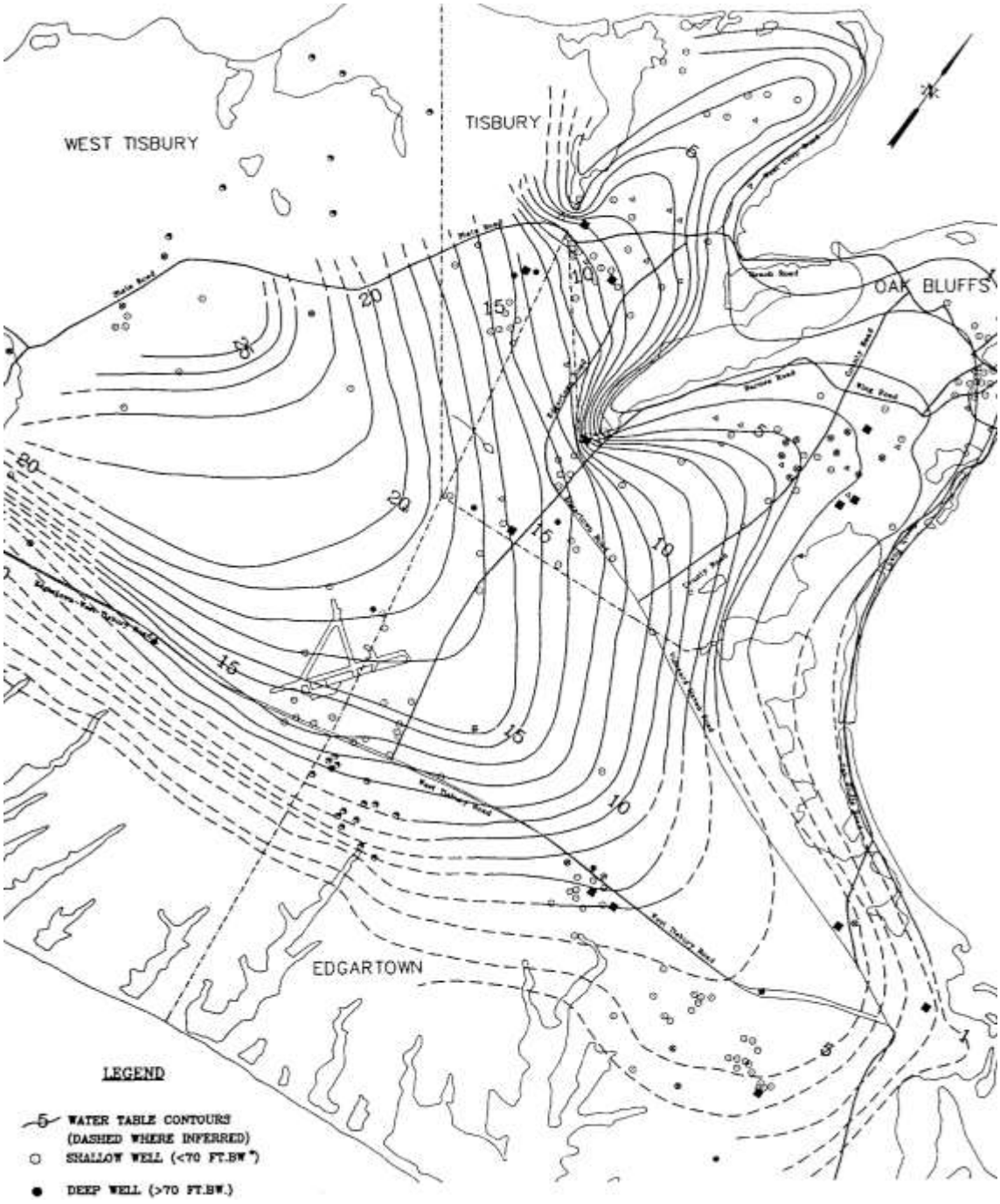
It is also imperative to plan for delivery. In particular, it is imperative to plan for future well field development for the major municipal water supplies serving the more densely populated towns of Tisbury, Oak Bluffs and Edgartown. Population density in the three large towns precludes the option of individual private wells such as serve the residents of the three lesser-developed towns. The municipal supply wells are the only option for the residents of the three larger towns.

The outwash plain is a deposit of bedded sands and gravels that has tremendous potential for yielding water supply. It extends to a depth of 70 feet below sea level in the center of the State Forest and has an estimated transmissivity of 14,000 square feet per day[1]. A deeper secondary aquifer extends from 90 to 160 feet below sea level, with a transmissivity of 2,500 square feet per day. The two are separated by 20 feet of silty sand. The high iron content of the secondary aquifer limits its usefulness for water supply.

Groundwater flow in the outwash plain has a large west to east component such that water recharged in West Tisbury could flow into Oak Bluffs, Tisbury or Edgartown. Figure 1 illustrates groundwater flow as defined by Whitman and Howard[2] in 1994. Groundwater flow is perpendicular to the trend of the contour lines and it is clear that the Manuel F. Correllus State Forest and the area to the north and west is truly a regional aquifer. For reference, the airport shown is surrounded on the west, north and east by the State Forest, which is also identified on Map A-1. It is fortunate that the area is largely low density residential or held in conservation by the Department of Environmental Management, the towns, the Martha's Vineyard Land Bank and other conservation groups.

[1] David Delaney, U.S.G.S., 1980, Groundwater Hydrology of Martha's Vineyard Massachusetts, Atlas HA-618

[2] Whitman and Howard, Inc., 1995, "A Numerical Groundwater Flow Model and Zone II Delineation for the Farm Neck Well – Oak Bluffs, Massachusetts"



GROUNDWATER CONTOURS

TAKEN FROM WHITMAN & HOWARD, INC., 1994[3]

Figure 1

[3] Whitman & Howard, Inc., 1994, A Numerical Groundwater Flow Model and Zone II Delineation for the Farm Neck Well, Oak Bluffs, Massachusetts

EXECUTIVE SUMMARY

The MVC has assembled detailed local data to support the Massachusetts Source Water Assessment Program regarding potential water quality impacts within the Zone II's associated with the well fields for the towns of Edgartown, Oak Bluffs and Tisbury. The land use data was reviewed along with existing local protections in order to assess the effectiveness of the existing protection in place. Land use evaluations included nitrogen-loading assessment within the Zone II's and potential hazard identification. Recommendations have been made to the towns regarding the status of protection in place, in order to develop local bylaws and/or health regulations to protect the water supply. Initiation of a regular inspection program is recommended. Assurance of adherence to best management practices at all sites within the Zone II's where hazardous chemicals or large volumes of waste are handled is crucial to protection of water resource quality. The identified potential threats to water quality support the need for water supply contingency plans and for bringing additional source sites into production in the near future as possible replacements. The MVC has worked to improve emergency response by development of a contingency plan between Edgartown, Oak Bluffs and Tisbury in the event of emergency or contamination problems.

The MVC has addressed long-term water supply needs by comparing buildout/demand projections with the capacities of the existing fields and the need for future development of new well fields. Options were reviewed regarding development of remaining potential sites for new wells, and it was determined that this should probably take place within the Greenlands and the Manuel F. Correllus State Forest. The MVC has addressed management of these protected lands (Greenlands and State Forest) and provided assistance to prioritize lands for protection and control. Protection and management of these areas was assessed and recommendations made regarding any long term needs. The trend toward siting wells where the Zone II's would be protected by the Manuel Correllus State Forest and low-density residential uses was identified in 1993 (Wilcox). At that time the State Forest Well, the Wintucket well and the proposed Manter well were all recently sited to take advantage of this built-in protection. Given the groundwater flow within the aquifer and the location of towns with public water supply on the down-gradient side of these protected or low-density residential areas, this trend should be encouraged in siting future supply wells.

Tisbury and Oak Bluffs are close to buildout and their future needs should be directed toward redundancy in response to contamination. Those needs may be best met by planning with the Town of West Tisbury for potential well sites within the Greenlands property. The Management Plan already has identified such use as appropriate. Perhaps the Towns could work with the Town of West Tisbury on long-term planning for West Tisbury, Tisbury, Oak Bluffs and Edgartown, with the possibility for shared infrastructure. The Town of Edgartown has much more potential for growth, as does the Town of West Tisbury. Those two towns should be planning for future supply needs to meet anticipated demand greater than the existing capacity for Edgartown wells and

perhaps greater than the use of private wells as is currently practiced in West Tisbury. The Town of West Tisbury has purchased the Greenlands property for that purpose. The Town of Edgartown has entered into discussions with the Department of Environmental Protection regarding a land transfer for land in the State Forest, understanding that executing such a transfer will not be an easy task. The Town of Edgartown should also consider working with the Towns of Tisbury, West Tisbury and Oak Bluffs toward use of the Greenlands property for future water supply. The towns and DEM should also be planning to secure easements through the State Forest for installation of water supply lines, particularly regarding use of the Greenlands property for water supply for the down-Island towns.

M.V.C. has identified recommendations and prioritized them as follows:

PRIORITIZED RECOMMENDATIONS
(in order of urgency)

ESTABLISH an overall management plan for the State Forest, including establishment of specific procedures or Memoranda of Agreement regarding the transfer of land for new public water supplies and for easements to install water supply lines (D.E.M and State Forest Advisory Committee) Continue to pursue the established proposal by the Town of Edgartown for a land transfer (Edgartown Water Department). Consider amendment to the Greenlands Management Plan to include more details regarding potential establishment of water supply wells for West Tisbury and for other towns (West Tisbury Conservation Commission).

UPGRADE protections associated with the Manuel F. Correllus State Forest and the Greenlands property (West Tisbury Conservation Commission and M.V.C.). Recommendations include amendments to the Greenlands Water Resource Protection District (West Tisbury Planning Board) and adoption of regulations for the State Forest District of Critical Planning Concern (M.V.C. and town boards).

MAINTAIN protections associated with the Zone II's for the existing public water supplies (Planning Boards, Boards of Health).

ESTABLISH long term plans for future water supply (M.V.C. and town Water Departments and District). The Towns of Tisbury and Oak Bluffs, nearly at buildout, should focus their attention on redundancy plans in response to potential future contamination of supplies that appear to be adequate for buildout. The Town of Edgartown has much greater potential for growth, and may have needs for future supply beyond the capacity of the existing Edgartown wells).

ENSURE enforcement of existing and amended regulations; ensure adherence to Best Management Practices at all sites within Zone II's where hazardous chemicals or large volumes of waste are handled (Building and Zoning Inspectors).

DEVISE a tracking database for land uses within the Zone II's that pose potential risk to the integrity of the water supplies. Develop an inspection program/methodology for periodic inspections of sites where hazardous materials are stored and/or used for sites that generate hazardous wastes (M.V.C. and town Boards of Health).

ON-GOING sampling of observation wells at the three landfill sites that are located within the Zone II's for Farm Neck, Sanborn and Mashacket is important to provide an early warning should a threat to water quality develop. Sampling should continue at regular intervals of no more than 6 months. The data collected from these wells should be distributed to the Boards of Health and Water Departments for their evaluation (M.V. Refuse District, Oak Bluffs-Tisbury Refuse District and 3 Boards of Health).

CONTACT town highway departments and Mass DPW about road salt applications along roadways within the Zone II's to remind them of the locations that are within Zone II's and to assure that practices provide optimum protection of water quality (M.V.C. and Water Departments and District).

ESTABLISH a Memorandum of Agreement and a Contingency Plan between Tisbury, Oak Bluffs and Edgartown for response to emergency or contamination problems (Town Water Departments and District).

CONTINUE to refine assessments of nitrogen loading for the existing Zone II's. Continue to research modeling software appropriate for the task (M.V.C.).

CONTINUE to catalog potential hazards within the Zone II's. The locations and dates of installation of underground fuel storage tanks, and the type of tank design and construction, should be made a part of the MassGIS database and should be part of the planning and emergency response repertoire for the towns (M.V.C., town Boards of Health and Fire Departments, MassGIS). The Towns may consider restricting fuel delivery to those USTs registered with the Fire Departments (town Fire Departments).

CONSIDER potential need for and options to provide water supply to areas with a development pattern that may not be compatible with continued private well water supplies. Possible areas to evaluate include the Arbutus Park, Ocean Heights and southern Katama Plains areas (Edgartown boards and M.V.C.).

CONTINUE public education about groundwater protection by placing the map of Vineyard Zone II's on the Vineyard Conservation Partnership's (or M.V.C.'s future) website, with a discussion about the sensitivity of groundwater to inappropriate activities, particularly those associated with household chemicals, pesticides and fertilizers (Water Departments and M.V.C.)

ADD nitrogen-loading evaluation for review of Developments of Regional Impact within Zone II's to address groundwater protection (M.V.C.).

TASK ONE
LAND USE INVENTORY AND EVALUATION

The Martha's Vineyard Commission has identified and assessed water quality impacts associated with the well fields for the Towns of Edgartown, Oak Bluffs and Tisbury. Land uses in the Zone II's have been mapped in GIS format and the detailed land use data provided to the Towns and to DEP to support its source water assessment program. Land use information generated was the basis for a thorough evaluation of the adequacy of the existing water resource protection regulations and bylaws in place. This involved an examination of local land use policies and regulations to enhance water resource protection. Local regulations were evaluated to ensure that the minimum criteria specified in the Department's Source Approval Regulations (310 CMR 22.2) are met and revisions proposed, as appropriate. Figure 2 illustrates the Zone II's on Martha's Vineyard in their locational context.

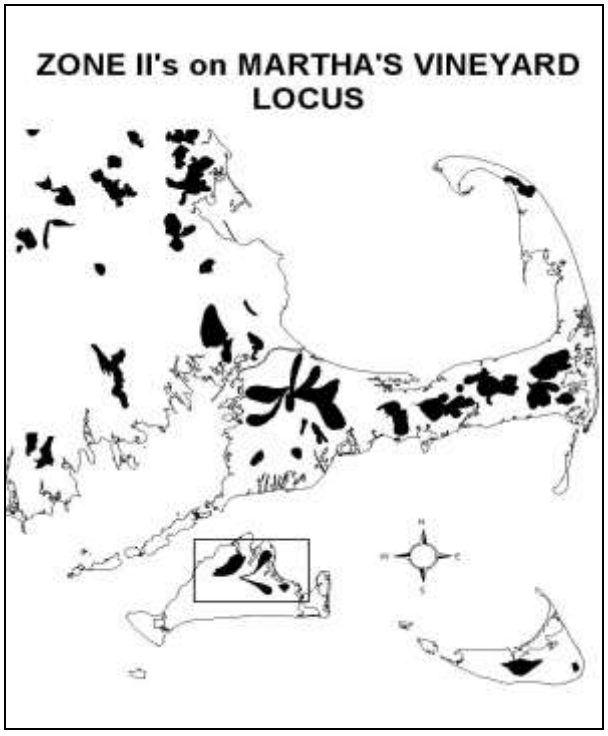


Figure 2

LOCUS FOR ZONE II's ON MARTHA'S VINEYARD

LAND USE INVENTORY – POTENTIAL THREATS

A land-use inventory was conducted to identify potentially threatening groundwater contamination sources in the Zone II's to the Town wells. Land uses were identified from the Mass GIS 1999 Mac Connell Land Use database, field checked by MVC staff. Mass GIS layers identifying individual contaminant sources were also used. It was discovered that the MassGIS database layer with underground storage tanks includes no information for Martha's Vineyard. This should be corrected, ideally by a cooperative effort between the towns, the Martha's Vineyard Commission and Mass GIS. Data was mapped in GIS format and recorded with Assessors' Map and Parcel identification. Land uses are illustrated for each Zone II on Maps A-2 through A-6, and for all Zone II's on Map A-7. The Zone II's are identified, along with Zone I and Point Water Source for each well. Mac Connell land use information is color-coded on the maps. Potential threats are identified on Map A-8, followed by Appendix B, a table identifying specific hazards by map and lot number.

TISBURY ZONE II

A single Zone II was used for all three wells in the Town of Tisbury, including 2,521.2 acres. Potential hazards within the Zone II are mostly of an agricultural nature, including: Nip'n'Tuck Farm, Heather Gardens, Daylily Farm, part of Chicama vineyard, Tashmoo Farm, and the abandoned septage lagoons. Much of the landfill is within the Zone II, with the exception of a small area between the large lobes. Several commercial uses are located on 36.25 acres in the Zone II, including Carroll's Trucking, Wooden Tent Photo, and Jasny veterinarian. These hazards are illustrated on map A-8 and listed in table form in Appendix B. According to the land use base, there are 1,146 houses in the Zone II.

Sanborn Way Well:

This well is situated just to the east of the Town landfill. The landfill has been capped. A Park'n'Ride facility is presently located there. Land use intensity near the well is high, although the portion of the Zone II within the Town of Oak Bluffs and the area to the west within Tisbury are less intensely used. Its approved capacity is 826,560 gpd.

West Spring Street Well:

This well is sited just to the west of the intensive business district along State Road. The majority of land in the vicinity is vacant or low density residential, with a significant portion held in conservation or by the Town. Its approved capacity is 708,480 gpd.

Manter Well:

The Manter Well, with an approved capacity of 1.728 mgd, is locate to the west of the other wells, farther from the most land intense uses, but closer to the septage lagoons abandoned in 1999. The well is not currently in service.

ZONE II's FOR THE TOWN OF OAK BLUFFS

There are two Zone II's in Oak Bluffs, for four individual wells. The Lagoon-State Forest Zone II includes the Lagoon Pond Well, the State Forest Well and Well #4. The Farm Neck Zone II is for the Farm Neck well alone. Land uses are identified on Maps A-2 and A-3 in Appendix 2 and individual hazards are displayed on Map A-6 and listed in table form in Appendix B.

Lagoon-State Forest Zone II

The Lagoon-State Forest Zone II is treated as a single Zone II, including 2,443.1 acres. Land use may be described as rural agricultural, with the exception of the Commonwealth Electric Company headquarters and a sand and gravel operation that is also the site of the White Brothers asphalt plant. Farms within the Zone II include Whippoorwill Farm (vegetables), Norton Farm (vegetables), Thimble Farm (small fruits and commercial greenhouse) and Chicama Vineyard (grapes). Much of the Zone II is within Oak Bluffs Water District land, conservation land or the Manuel F. Correllus State Forest. Most of the 641 houses are located in the Town of West Tisbury.

The Lagoon Pond well, located near the head of Lagoon Pond, has an approved capacity of 792 mgd. The State Forest well (also sometimes referred to as Well #3), is located on 58 acres of Water District land adjacent to the Manuel F. Correllus State Forest, and has an approved capacity of 1.584 mgd. Well #4, located approximately 500 feet west of Well #3, has an approved capacity of 1.44 mgd. Well #4 is not yet in service.

Farm Neck Zone II

The Farm Neck Well has an approved capacity of .465 mgd. The Zone II includes 1,147.9 acres. The Farm Neck Well is located close to the center of Oak Bluffs and includes a variety of high intensity land uses. North of the well site, residential density is high (less than ½ acre per lot). According to the land use base, there are 1,482 houses in the Zone II. A number of automotive uses are located within the Zone II, including BenDavid's Auto Body, Bink's Auto Repair, Buddy's Auto Repair, Leite's Auto Salvage, Jay's Auto Body and Leonardo's Auto Graveyard. The Martha's Vineyard Regional High School is located within the Zone II, as well as a number of other non-residential uses located on high school property, including Martha's Vineyard Ice Arena and Martha's Vineyard Community Services (counseling, child care, etc.). The Oak Bluffs Landfill is located within the Zone II. The landfill has been capped. A transfer station is presently located on the site, as well as the Town Barn and abandoned septage lagoons. Also located within the Zone II are: the Catholic Cemetery, a sign maker, White Brothers Gravel Pit, part of Farm Neck Golf

Course, and several town ball fields (no fertilizer applied). The residential density is low to the east of County Road and south of the Landfill (between 1 and 3 acre lot sizes).

ZONE II's IN THE TOWN OF EDGARTOWN

Two Zone II's serve for the Town of Edgartown's four wells. Land uses are identified on maps A-4 and A-5. Potential hazards are illustrated on map A-6 and listed in table form in Appendix B.

Wintucket-Quenomica Zone II

The Wintucket and Quenomica wells are located near the head of Edgartown Great Pond. The Wintucket Well has an approved capacity of 1 mgd and the Quenomica well 1.3 mgd. The Zone II includes 898.3 acres. The vast majority of land within this Zone II is held by the Town or is within the Manuel F. Correllus State Forest. There is some low-density residential use in the southeastern quadrant, identified in yellow on the land use map, including some 170 houses. To the east of that use, the Mac Connell land use for 1999 shows forest use, and the assessors parcels indicate a subdivision. Much of that land is in the process of being developed as a golf course (not shown in the 1999 database), with the frost bottom area indicated in beige to remain open.

Mashacket-Lily Zone II

This Zone II includes 1,366.9 acres. The Mashacket and Lily Pond wells each have an approved capacity of 1 mgd. The Mashacket well is sited off Clevelandtown Road, near the Edgartown Landfill, which has been capped. The Edgartown Sewage Treatment Plant is sited to the northwest of the well, within the Zone II. According to plant records, the average flow is 159,62 gpd, with a Nitrogen concentration of 2.4 mg/l. The Lily Pond well is located near the wetlands associated with Lily Pond. A large amount of land north of the Edgartown-Vineyard Haven Road is held in conservation by the Sheriff's Meadow Foundation. The eastern end of the Lily Pond lobe of the Zone II is zoned commercial (B-II district). Forty-six commercial properties occupy 20.25 acres. Uses allowed are primarily retail and service uses although conditionally permitted uses include some uses that are not desirable within a Zone II. Uses of some concern include: Vineyard Veterinary Clinic, and the MSPCA. The Square Rigger restaurant is the high volume sewage producer. A portion of the driving range for the Edgartown Golf Club is situated in the eastern part of the Zone II. Farming activities within the Zone II include: Morning Glory Farm (vegetables), Sweetened Water Farm (horses). Farming activities occupy 115.4 acres, including 31.4 acres of vegetable row crops and 84.0 acres of pasture. This Zone II also includes large areas of low density and high-density residential use. Of the 2,466 parcels in the Zone II, 1,530 are residential. Although not found in the 1999 land use data, a golf course is being developed on land included near the western tip of the Zone II, in the area shown as forest with subdivision lots on the assessors' parcels.

NITRATE-LOADING EVALUATION

A nitrate-loading evaluation was made for existing and projected land uses within the Zone II's for the town wells. Massachusetts DEP's nitrogen loading model was utilized. Land use was determined as detailed in the preceding section. The model allows for adjustment of a number of factors. Occupancy was adjusted for all areas to reflect 2000 U.S. Census figures as well as local data regarding seasonal occupancy. Lawn size and fertilizer rates were adjusted based on previous MVC field studies. The model generated a report for each Zone II, including a summary of inputs and a number of calculations. The full text of the reports for three of the five Zone II's is appended to this document. The calculated results are summarized below for each of the five Zone II's. The nitrogen calculations should indicate the present load and the load at buildout.

RESULTS FROM DEP's NITROGEN LOADING MODEL

Zone II	Present Load (mg/l)	Buildout Load (mg/l)	Recharge (in/yr)
Farm Neck	17.84	18.89	3
Lagoon-State Forest	1.84	1.88	21
Mashacket-Lily	4.47	5.72	16
Tisbury	3.15	3.80	16
Wintucket-Quenomica	.54	.65	34

Table 1

RESULTS FROM MVC MODEL

Zone II	Present Load (mg/l)	Buildout Load (mg/l)	Recharge (in/yr)
Farm Neck	2.95	3.10	22
Lagoon-State Forest	1.12	1.14	22
Mashacket-Lily	3.21	3.87	22
Tisbury	1.66	1.97	22
Wintucket-Quenomica	0.41	0.56	22

Table 2

The difficulty with the DEP calculations is apparent in the recharge values, as well as the nitrogen loading values. Recharge should be approximately 22 inches per year. In the DEP model, the recharge calculation was included as a check. Several of the calculations are reasonably close to 22 inches, but two are obviously far off. The calculation of 3 inches for recharge of the Farm Neck Zone II and the calculation of 34 inches for recharge of the Wintucket-Quenomica Zone II are clearly not anywhere near the actual recharge value of 22 inches. There may be a problem with the inputs or with the fit of those Zone II's to the model. For instance, according to the Zone II report for Farm Neck[4], Whitman and Howard noted that the combined pumping rate of the two Farm Neck Wells (two wells approximately 100 feet apart) approximates 700 gpm, and the rated pump capacity is 850 gpm (1.2 mgd); that because the Town pumps the two wells alternately, the Town agreed to the .465 mgd rate. If the 1.2 mgd rate were used for the DEP model, the nitrogen values would decrease and the recharge value would increase. The Zone II report also noted, from the pumping test and well logs, multiple layers of fine silty sand and clay, along with unusually low specific yield values for an unconfined sand and gravel aquifer. These are unusual circumstances that could explain why the DEP model produced unrealistic calculations for the Farm Neck Zone II. Similarly, the calculations for the Wintucket-Quenomica Zone II may not be considered to be reliable. The DEP model generated a recharge calculation of 34 inches. The nitrogen calculations for existing load and load at buildout may not be used for planning. The specific inputs to the model should be examined to identify unusual circumstances that might have influenced the model results.

Although the nitrogen loading calculations are not acceptable, the reports do include valuable data regarding land use within the Zone II's and potential land use at buildout. The reports for the Tisbury, Lagoon-State Forest and Mashacket-Lily Zone II's are printed in Appendix D. It is worth noting that the DEP model generated for the Mashacket-Lily Zone II a calculation of 5.72 mg/l for nitrogen load at buildout. This value would trip the 5.0-mg/l trigger for the DEP planning threshold for protection and the DEP drinking water standard for increased nitrate monitoring in public water supplies. The DEP model also calculated a recharge of 16 inches, which is fairly reasonable but rather low. The MVC model used a recharge value of 22 inches and derived nitrogen-loading values of 3.21 mg/l existing load and 3.87 mg/l at buildout.

Perhaps another nitrogen loading program would be better suited to the particular Zone II's of Martha's Vineyard. The Martha's Vineyard Commission has compared the DEP model to nitrogen loading calculations as used by MVC for estuarine watersheds in a number of previous studies. The Martha's Vineyard Commission also continues to explore other modeling options, including various other computer models available.

[4] Whitman & Howard, Inc., 1994, A Numerical Groundwater Flow Model and Zone II Delineation for the Farm Neck Well, Oak Bluffs, Massachusetts

Nitrogen Models Used:

Two models were used to estimate present day and future nitrogen loading and resulting concentration at the supply wells. The models are the "Martha's Vineyard Commission Model" (MVC) and the "DEP Type Model". ***Both models are based on a growth projection that is described in Task One.*** The models take into account nitrogen from wastewater, turf, farming activities and from recharging rainwater. The sources and the assumptions used in their estimation are described below. As surface water quality is not addressed in this document, the models do not identify and calculate potential phosphorus loading. Nitrogen loading evaluation spreadsheets may be found in Appendix C.

Wastewater:

Septic system source nitrogen is based on an assumption of treatment to yield an effluent with 35 milligrams per liter of total nitrogen after the leaching system. Wastewater loading in the MVC Model is derived from population estimates for year round and seasonal dwelling units. The present day housing situation is strongly bimodal with an off-season population of about 15000 for the winter months and a summer population that averages over 85000. This bimodal population feature is expected to continue into the foreseeable future with a very gradual shift toward increasing year round dwellings and decrease in summer-only residences. Models that do not take this phenomenon into account seriously over estimate nitrogen loading.

The MVC population/wastewater model is derived from the 2000 US Census figures for average number of occupants in year-round dwellings in each Town and the number of total dwellings that are in use on a year round basis. The census identifies occupied and unoccupied dwellings that allow a characterization of each Town's population characteristics and resulting wastewater generation. The census produced the following population and year-round versus seasonal dwelling percentages. These numbers are assumed to apply to the residences within the Zones of Contribution.

Town	*Number of year round occupants*	*Percentage of total dwellings year round*	*Percentage of total dwellings year seasonal*
Edgartown	2.35	39.4%	60.6%
Oak Bluffs	2.33	43.9%	56.1%
Tisbury	2.21	64.5%	35.5%
West Tisbury	2.38	58.5%	41.5%

Table 3

To calculate wastewater loading, it is assumed that each person consumes 60 gallons of water per day and after evaporative losses and plant uptake, 48 gallons per person are recharged to the groundwater at an average concentration of 35 mg/l of total nitrogen. The year round houses are assumed to be occupied by the number of year round occupants shown in Table 3, for 365 days. In addition, the year round homes are assumed to have a guest

population equal to the year round average number of occupants for an additional 25 days.

The seasonal population is a very difficult number to estimate. It is generally accepted that seasonal use is more intensive based not only on observation but on the logic that a renter or summer home owner in a tourist area is more likely to have guests or to pair up with another family or relatives to meet the high rental costs. This is supported by a survey of seasonal residents by the Oak Bluffs Planning Board in 1995 that found an average of 4.77 occupants per seasonal dwelling. No other surveys exist to verify this figure in the other Towns. We assume that the summer population is in the seasonal dwellings for a period of 75 days. To compensate for the increasing use of summer residences on weekends and for short vacations during the spring and fall, we also assume that the seasonal residences are in use at the year-round occupancy rate for another 25 days.

For the DEP wastewater loading rates, we use Title 5 flow derived from an assumption of an average of both two and three bedrooms per dwelling. There is a trend in new seasonal houses toward large numbers of bedrooms; however, there are no known figures on the actual average number of bedrooms per dwelling on Martha's Vineyard. Nitrogen concentration in the wastewater effluent in the DEP Type Model is also assumed to be 35 milligrams per liter.

Commercial wastewater flows are based on water use records.

The Edgartown Sewage Treatment Plant is sited in the Mashacket public supply well Zone of Contribution. The loading rate is derived from flow records averaged over the year. The plant has a design capacity of 750000 gallons per day and a permit guidance limit of 2200 kilograms of nitrogen per year. No other treatment facility discharges are situated within the Zones of Contribution for the public-supply wells. The records show a strong seasonal pattern in the discharge rate with the summer average about three times the winter average and spring and fall flows in the middle between the extremes. The average daily discharge rate at this time is 159662 gallons per day. Currently nitrogen concentration in the effluent is averaging 2.4 milligrams per liter. The flow is projected to increase to a maximum average of 385000 gallons per day with a similar nitrogen concentration.

Turf:

Turf areas are based on actual measurement in the case of golf course areas. Lawn sizes have been surveyed in the Edgartown Great Pond watershed (Wilcox, 1999) and in the Farm Pond watershed (Dripps and Wilcox unpublished data 1998). The Edgartown survey found the average lawn size was 2700 square feet with a trend toward larger sizes for the large seasonal dwellings near the shore. In addition, from visual inspection, it was clear that lawn fertilization practices did not follow the agronomic fertilization rate of 3 pounds of actual nitrogen per 1000 square feet. Many lawns were clearly either fertilized once a year or never. The Farm Pond watershed survey found lawn size to range from 400 square feet in the dense areas to 2400 square feet in the

areas zoned for 0.5 and 1.5 acres. There was a similar pattern of lower level of lawn care practices. Accordingly, the models assume an average of 2700 square feet for Edgartown and 2400 square feet for Oak Bluffs. We have no information for Tisbury and West Tisbury and 5000 square feet per dwelling is assumed. Fertilization practices are assumed to average 1.5 pounds of actual nitrogen per 1000 square feet with a 25 percent leaching rate.

Farms:

Farm areas are determined by actual measurement of the area. Row crops are assumed to receive an average agronomic fertilization rate of 150 pounds of actual nitrogen per acre. Pasture and hay fields are assumed to receive an annual fertilization of 40 pounds of actual nitrogen per acre with a 33 percent leaching rate. The lower average rates are justified by the general practice of reseeding every 5 to 7 years with a legume-grass seed mix that requires no nitrogen until the legume runs out.

Farm animals are assumed to produce nitrogen at the following rates: cattle at 162 pounds per animal per year; horses at 118 pounds per animal per year and chickens at 1.3 pounds per animal per year. The nitrogen is assumed to leach to the groundwater at a rate of 25 percent of the annual production.

Recharge:

Recharge to the groundwater is assumed to mix evenly with the nitrogen sources by the time it is drawn into the supply well. The precipitation recharge rate is based on the USGS (1978) estimate of 22.2 inches or 1.85 feet per year. Recharging water is assumed to add nitrogen at a rate of 0.05 milligrams per liter from the natural soil cycles and the excess nitrogen from acid precipitation. This is derived from the apparent background nitrogen from 5559 well water samples analyzed by the Barnstable County Lab (Frimpter 1988).

Nitrogen Concentration at the Well Head:

The average estimated nitrogen concentration at the wellhead is calculated by summing all nitrogen loading and dividing by the recharge over the entire zone of contribution plus the wastewater discharge volume. This figure is an estimate only as the ZOC area is derived by assumptions of maximum pump rate for 180 days with no recharge. Neither condition is likely to occur on Martha's Vineyard where seasonal population swings lead to maximum water withdrawals during July and August. August, on average, is one of the wetter months of the year although much of this precipitation replaces soil moisture deficit and is transpired back into the atmosphere. Groundwater level reaches a low point during the period from September to February and a high point in spring to early summer (Wilcox, 2003). In Table 4, the approved withdrawal rates for the wells are shown and compared with the actual average daily withdrawal over the number of days in use.

2001 Public Supply Well Statistics

Town	**Well Id.**	**Approved daily pump rate gpd x 10^6**	**# Days pumped/year 2001**	Average Daily withdrawal'01: **gpd x10^6**
Oak Bluffs	Farm Neck	0.465	225	0.328
	Lagoon	3.816	225	0.328
	State Forest	W/above	306	0.562
Edgartown	Mashacket	2.0	157	0.291
	Lily	W/ above	108	0.146
	Wintucket	2.3	282	0.43
	Quenomica	W/ above	255	0.485
Tisbury	Sanborn	3.26	300	0.514
	Tashmoo/W. Spring	W/ above	241	0.389

Table 4

Identification of Potential Public Well Quality Impacts:

Potential groundwater quality threats in addition to the widely dispersed on-lot wastewater systems and other residential sources are identified in Map A-7 and listed in table form in Appendix B. These land uses include landfills, wastewater treatment facilities, junkyards and generators of hazardous wastes, farms and golf courses.

The lower average annual and daily withdrawal rates resulting from wide swings in seasonal rates at the public supply wells create an operational zone of influence that is in dynamic equilibrium at a smaller area than is included in the ZOC. Pump rates used to estimate the smaller influence areas are the average daily withdrawal figures in Table 4. Only as a prioritization tool, the smaller zone of influence that is more likely the actual operational condition for each well is plotted on Map A-8. Large sources near to the well site that are not offset by the recharge from a smaller contributory area pose a larger but not quantifiable risk than those further out from the withdrawal. Pump rates used to estimate the smaller influence areas are the average daily withdrawal numbers in Table 4. The MVC calculated areas of influence for the public supply wells existing at the time (Smith, 1986) following the method of Bear (1979). Pump test data was used to determine transmissivity by eight different methods to obtain a reasonable number. From this information, the down gradient stagnation point (L) and width (W) of a parabola can be determined. By the formulae:

$$L == \frac{Q}{2(pi)*(T)*(i)}$$

where: T= Transmissivity
I= slope in feet per foot

$$W == 2(pi)*L$$

The major axis of an ellipse can be determined from the amount of area required to recharge the amount of water drawn by the well using the USGS recharge figure of 1.85 feet per year. This allows the parabola to be closed to an ellipse. The formula used is:

$$a \text{ (major axis)} == \frac{\text{Area}}{W*(pi)}$$

While not as precise as the modeling employed to devise the Zones of Contribution, these calculations provide some basis for looking at smaller, operational zones of influence to identify the presence of nearby threats. Transmissivity and slope values used were as follows:

TRANSMISSIVITY AND SLOPE VALUES

Well Name	Town	Transmissivity GPD/ft	Slope ft/ft
Farm Neck	Oak Bluffs	200000	0.00125
State Forest	Oak Bluffs	250000*	0.001
Manter Well	Tisbury	350000	0.001
Sanborn	Tisbury	300000*	0.002
Tashmoo/ W.Spring	Tisbury	300000*	0.002
Wintucket/Quenomica	Edg.	221000**	0.001 (est.)
Lily Pond	Edgartown	275000	0.002
Mashacket	Edgartown	350000	0.001

*At the time, no pump tests available, these are estimates
** From D. L. Maher 1989

Table 5

On Map A-8, sites receiving large amounts of fertilizer, high volume wastewater sources, hazardous materials sites and high-density residential areas are highlighted.

The Oak Bluffs Lagoon Pond well includes the following uses within the operational zone of influence:

A small livestock operation.
A golf driving range (restricted to use of slow release fertilizers)
A portion of two fruit farms.

The Oak Bluffs State Forest well includes the following uses within the operational zone of influence:

None

The Oak Bluffs Farm Neck well includes the following uses within the operational zone of influence:

A junkyard.
A landfill (capped).
A small portion of a golf course.
A sand/gravel company site.

Some moderate to high-density residential area.

The Tisbury West Spring Street/Tashmoo well includes the following uses within the operational zone of influence:

A small livestock operation.

The Tisbury Sanborn well includes the following uses within the operational zone of influence:

A very small area of capped landfill.
A former septage disposal lagoon.
A very small area of sand/gravel borrow pit.
A small, organic lily farm.
A moderate area of moderate density residential.

The Edgartown Lily Pond well includes the following uses within the operational zone of influence:

A phone company commercial site.
Moderate density residential area.

The Edgartown Mashacket well includes the following uses within the operational zone of influence:

A capped landfill.
A substantial area of vegetable farm.
A small area of moderate density residential.

The Edgartown Wintucket/Quenomica wells include the following uses within the operational zone of influence:

A small area of moderate density residential.

EVALUATION OF EXISTING PROTECTIONS IN PLACE

Protection measures in place and protected lands within the Zone II's for the existing town wells were identified and evaluated. The full texts of the regulations for the towns are included in Appendix D.

Tisbury:

The Town is in compliance with the Massachusetts Wellhead Protection Regulations 310 CMR 22.21(2). The Town has adopted a Water Resources Protection District, which is regulated through the zoning by-laws. The Groundwater Protection District covers the Zone II that has been approved for Tisbury.

For added protection, Tisbury may wish to consider adoption of a Board of Health regulation or general by-law to prohibit floor drains in commercial and industrial buildings. Under 310 CMR 22.21(a)(8), municipalities are required to prohibit existing floor drains in commercial and industrial facilities. Since zoning only addresses future uses, a Board of Health regulation or general by-law should be used. Examples may be found in Appendix E, in the Oak Bluffs and Edgartown Board of Health regulations.

Oak Bluffs:

The Town of Oak Bluffs is in compliance with Massachusetts Wellhead Protection Regulations 310 CMR 22.21(2). The Oak Bluffs Groundwater Protection District By-law includes and adequately protects the Farm Neck and Lagoon-State Forest Zone II's. In addition, the Town has a Board of Health regulation prohibiting floor drains in commercial and industrial facilities.

Edgartown:

The Town's Board of Health Groundwater Protection Regulation meets the Massachusetts Wellhead Protection Regulations 310 CMR 22.21(2).

West Tisbury:

The West Tisbury Zoning By-laws include Section 6.6 Greenlands Water Resource Protection District. There is presently no public water supplier for the Town. Private wells provide all water service. However, the Town purchased the land known as the Greenlands, for aquifer protection now and as a future water supply resource. The Management Plan, printed as Appendix E, also takes into consideration the future demands of the property to produce water for the other towns on the Island.

Delineation of the District:

The area designated for the Greenlands Water Resource Protection District was suggested from the M.V.C. estimate for the Zone of Contribution[5] in 1987, based on a well pumping 1,000,000 gallons per day. Because there are no supply wells in existence or proposed, there has not been a Zone II delineation approved by D.E.P. The present District boundary is probably adequate for planning purposes, but it may be advisable to revisit the estimates, considering technological and other advancements that have been made since 1987. The Greenlands property itself includes portions of four of the five existing Zone II's for the public water supplies of the larger down-Island towns. The District includes much more of the areas of those Zone II's, particularly the Tisbury Zone II. In the absence of a more refined Zone II specific to the Greenlands property for a hypothetical supply well, it may be advisable to use the known Zone II delineations north of the State Forest. This area is very close to the area of the existing District. Such a boundary amendment should not create undue hardship, and could potentially save the water supplies of the other towns from contamination.

Provisions of the Regulations:

The provisions of the District regulations appear to be in conformance with the requirements of the Water Management Act.

[5] M.V.C. (Russell Smith), 1987, Determination Zone II for Future Greenlands Wells

CONCLUSIONS

The presence of capped landfills within the Zones of Contribution and also within the smaller operational zones of influence for the Sanborn, Mashacket and Farm Neck wells warrants continued vigilance to detect groundwater impacts to these wells. The Farm Neck well operational zone of influence also includes the BFI solid waste handling facility located at the site of the landfill. The Oak Bluffs Town DPW building is also within the operational zone.

In addition, the location of septage disposal lagoons within the ZOCs but not the operational zones of influence of the Farm Neck and Sanborn wells are also of some concern. The presence of a small portion of golf course within the Farm Neck ZOC and an organic golf course within the Quenomica well ZOC are worthy of attention. The Edgartown Wastewater Treatment Facility and leaching beds are within the ZOC of the Mashacket well. The Oak Bluffs Wastewater Treatment Facility (but not the leaching beds) is within the ZOC of the Farm Neck well.

Preparation of potential hazard databases and initiation of a regular inspection program are recommended. Assurance of adherence to best management practices at all sites within the ZOCs where hazardous chemicals or large volumes of waste are handled is crucial to protection of water resource quality. The identified potential threats to water quality support the need for water supply contingency plans and for bringing additional source sites into production in the near future as possible replacements.

The trend toward siting wells where the ZOCs would be protected by the Manuel Correllus State Forest and low density residential uses was identified in 1993 (Wilcox). At that time the State Forest Well, the Wintucket well and the proposed Manter well were all recently sited to take advantage of this built-in protection. Given the groundwater flow within the aquifer and the location of Towns with public water supply on the down-gradient side of these protected or low-density residential areas, this trend should be encouraged in siting future supply wells.

EDUCATION EFFORTS

At one time, there was an Island-wide Water Resource Protection Committee, which would have been the ideal unit to coordinate education efforts regarding the proposed amendments. In the absence of such a group, the staff of the Martha's Vineyard Commission have informed the towns of the proposed amendments and provided technical assistance regarding the proposals. Education efforts were further coordinated through the Public Education and Outreach Committee of the reconstituted "Watershed Team" that has become the local replacement for the E.O.E.A. Watershed Team in the wake of termination of the Mass. Watershed Initiative.

Continued public education about groundwater protection is important. The map of Vineyard Zone II's might be placed on the Vineyard Conservation Partnership's (or M.V.C.'s future) website, with a discussion about the sensitivity of groundwater to inappropriate activities, particularly those associated with household chemicals, pesticides and fertilizers. Education efforts might include signage, such as "Entering a Public Water Supply Area" and the creation of an informational brochure that could be mailed to all households and businesses within the Zone II's, to increase awareness of inappropriate activities.

TASK TWO
LONG TERM WATER SUPPLY NEEDS

Long-term water supply needs were addressed by comparing build-out/demand projections with the capabilities of the existing well fields and assessment of the need for future development of new well fields. Options were reviewed, primarily development of remaining potential sites for new wells, particularly the Greenlands and the Manuel F. Correllus State Forest. Protection and management of these areas was assessed and recommendations made regarding any long-term needs. The M.V.C. explored the feasibility of using these areas for development of well fields, and assisted in development of agreements necessary to allow for future use of these areas for water supply wells.

DEMAND PROJECTIONS AND SUPPLY OPTIONS

Build-out/demand projections were compared with projected capacities of the existing fields and options for development of new fields were examined, particularly focusing on the Greenlands and the Manuel F. Correllus State Forest.

LONG TERM NEEDS

In order to assess long-term needs, it was necessary to compare water demand projections with the capacities of the existing water supply wells.

Water Withdrawal Statistics:

Water consumption on Martha's Vineyard is strongly seasonal corresponding with the annual influx of seasonal residents and visitors. The increased water demand reflects a six-fold increase in population from 14,901 residents during the winter months to over 80,000 residents during the peak summer months of July and August. Although there is increased population beginning in April with weekend visitors, progressing to a growing resident population in mid-May, the peak population as indicated by water withdrawal records, occurs in July.

The Tisbury, Oak Bluffs and Edgartown Water Departments provided the data compiled in Table 6. In this Table, the data is broken down to an average daily withdrawal for the maximum week and the maximum month. The peak withdrawals all occur during the month of July and, occasionally, August. The statistics illustrate the nature of use of a product in a strongly seasonal system: the demand rises to a strong one-day peak that usually occurs within the peak week and month.

Summary Statistics for the Three Water Departments

Town	Year	Max. Day mgd	Avg. Day in Max.Week mgd	Avg. Day in Max. Month mgd
Edgartown	1998	2.095	1.936	1.554
	1999	2.573	2.277	2.056
	2000	2.194	1.903	1.694
	2001	2.249	2.008	1.737
'98-'01 Average		**2.278**	**2.031**	
Oak Bluffs	1998	2.423	2.128	1.796
	1999	2.796	2.405	2.160
	2000	2.264	1.997	1.78
	2001	2.172	1.768	1.585
	2002	2.555	2.392	2.014
'98-'01 Average		**2.414**	**2.075**	
Tisbury	1998	1.756	1.374	1.148
	1999	2.714	1.747	1.487
	2000	1.561	1.315	1.164
	2001	1.827	1.306	1.107
	2002	2.029		1.55
'98-'01 Average		**1.965**	**1.436**	

Table 6

Water Demand Projections:

Projection of water requirement into the future based on the predicted residential growth within each Town is based on the assumption that there is a strong correlation between the number of residences in a Town and the level of activity during the peak summer period that determines the demand for water. Population growth in the future is uncertain and projections are very much an inexact science. The future population in a resort such as the Vineyard depends on uncertainties that relate to the future economy and changes in popularity of this resort destination compared to others that cannot be reliably predicted.

Projecting the year-round population and related residential growth over the near term can at least be based on recent growth in that segment as indicated by the Census. Those figures are based on similar methodology and have an historical record that provides a platform for projection. Also, the number of residences at buildout can be derived from the available land and probable zoning requirements. These factors relate directly to the water

demand in the future. However, the most important determinant of water demand is the seasonal population that has not been accurately measured by a survey and can only be estimated by the number of seasonal dwellings (as counted by the Census) and an estimate of the probable average number of occupants in these dwellings.

Projection of the peak day water use will yield a much higher peak-day demand figure than projection of the average day within either the maximum week or month. The water systems must be sized to have capacity to meet the peak day water need. While all three are projected in the discussion below, the projection of the average day within the peak week is considered to provide a probable highest future demand.

Comparison of the projected maximum withdrawal with the permitted extraction for the public supply wells can be employed to make a determination of the sufficiency of the water system in terms of extraction. The underlying requirement is that the system can deliver the required water while maintaining an excess capacity to address unexpected growth and unplanned demand for short-term events such as fire control.

Peak Month Projections Based on Population Growth

This measure is useful as a broad overview but does not take into account short-term events or weekends where population and water use may spike. A reasonable approach to projecting future peak water demand is to relate present day water withdrawal figures to the total number of residential dwellings even though the peak consumption includes a large commercial contribution. The assumption is that the number of residences is strongly correlated with commercial activity and a projection of the residential population segment provides a proportional basis for projecting the commercial portion and the peak water demand into the future. The logic is that residential growth is a good proxy for commercial activity and the two together determine the peak water demand. Residential population is linked to the seasonal economy through employment in the service and construction industries. The economy is in turn a prime determinant of commercial activity.

The methodology used to project the peak month water demand is to determine the average water consumption per residence served and to derive a future peak water demand based on the projected buildout residential count. This approach works best in Oak Bluffs where virtually the entire Town is now served by public water supply. It is more difficult in Edgartown where about 38 percent of the residences are not now served by public water supply but some parts may be served in the future. Tisbury's water supply has some characteristics of both Oak Bluffs and Edgartown. The area east of Lake Tashmoo is fully served while the area west comprising 24 percent of the residences is not served.

Table 7

Projected Daily Water Consumption Using 2000 Peak Month

Town	July 2000 Water Use Gal X 10^6	July 2000 water use/day Gal X 10^6	July 2000 residences total	July 2000 % served	July 2000 residences served	July 2000 Water/residence	Buildout residences	Buildout residence served	Buildout Water/residence	July Buildout water use/day Gal X 10^6
Edgartown	52.522	1.694	4360	0.62	2700	627.4074	6676	4339	627	2.7208038
Edgartown-High							6676	5675	627	3.558225
Oak Bluffs	55.178	1.78	3820	1	3616	492.2566	4640	4640	492	2.28288
Tisbury	36.1	1.16	2720	0.76	2075	559.0361	3721	2828	559	1.58082964
Tisbury-High							3721	3051	559	1.705509

Projected Daily Water Consumption Using Average Peak Week 1998-2001

	Average Daily use during peak week								
Edgartown	2.031			2700	752.2222	6676	4339	752.222	3.264192147
Edgartown-High						6676	5675	752.222	4.26885985
Oak Bluffs	2.392			3616	661.5044	4640	4640	661.504	3.06937856
Tisbury	1.436			2075	692.0482	3721	2828	692.048	1.957111744
Tisbury-High						3721	3051	692.048	2.111438448

Projected Daily Water Consumption Using Average Peak Day 1998-2001

	Average Daily use during peak day								
Edgartown	2.278			2700	843.7037	6676	4339	843.704	3.661169138
Edgartown-High						6676	5675	843.704	4.7880202
Oak Bluffs	2.414			3616	667.5885	4640	4640	667.589	3.09761296
Tisbury	1.965			2075	946.9880	3721	2828	946.988	2.678082064
Tisbury-High						3721	3051	946.988	2.889260388

Notes:

Assumption is that total water drawn is proportional to the number of residences served.
Water drawn per residence includes commercial, unaccounted loss and distribution loss.
Assumes that percentage served remains the same as buildout progresses.
Areas in Edgartown likely to be tied into the water system include Ocean Heights/Arbutus Park and the Katama area.
As there is a greater housing density in those areas the percentage served by Town water will increase- we estimate to 65%.
High water consumption figures are based on 90% service in Edgartown and 82% in Tisbury

In Edgartown, areas that are likely to be provided with public water supply in the future include Arbutus Park and Ocean Heights off the Vineyard Haven Road and portions of Katama extending out to Mattakeset. In Tisbury, there is potential for extension of the water supply into the R-50 zoning district to the West of Tashmoo Pond. To address the potential that some parts of Tisbury and Edgartown may be added into the system increasing the percentage of the residences that are served, the following approach is used. For Edgartown we make two projections in Table 7, one assumes that the same percentage of the future residences will be served as there is today. The other assumes that the percentage served will rise from 62 to 85 percent. For Tisbury, a similar methodology is used to project the same percentage served (76 percent) as well as an increased service area to provide public water to 82 percent of the residences.

The results for the average daily withdrawal during the peak month are included in Table 7 and summarized in Table 8 below.

Current (2000) and Projected Average Daily Water Withdrawal During Peak Month

Town	Current Avg. Daily in peak month in mgd	Projected Avg. Daily in peak month-HIGH	Projected Avg. Daily in peak month-LOW
Tisbury	1.16	1.706	1.581
Oak Bluffs	1.78	2.283	2.283
Edgartown	1.694	3.558	2.721

Table 8

The projected maximum month is used to estimate the monthly withdrawal for the remainder of the year assuming the same proportional distribution as occurs today in Table 9 and Figures 3-5. In actuality, there has been a tendency toward a gradual increase in the population during the shoulder season, April, May, September and October and the projected figures are probably low for those months.

Projected Annual Water Withdrawal Requirement- Public Supplies In Millions of Gallons						
Month	Edgartown 2000 Withdrawal	Edgartown Projected Withdrawal	Oak Bluffs 2000 Withdrawal	Oak Bluffs Projected Withdrawal	Tisbury 2000 Withdrawal	Tisbury Projected Withdrawal
Jan	14.834	23.8219	18.081	23.1893	15.12	20.5251
Feb	11.894	19.1006	16.071	20.6114	13.6	18.4617
Mar	12.259	19.6867	16.31	20.9179	13.46	18.2717
Apr	15.362	24.6698	16.772	21.5105	12.95	17.5794
May	23.491	37.7242	24.257	31.1101	17.46	23.7016
Jun	35.168	56.4762	39.071	50.1094	25.02	33.9641
Jul	52.522	84.345	55.178	70.767	36.1	49.005
Aug	38.384	61.6408	40.399	51.8126	25.19	34.1949
Sep	31.377	50.3883	31.361	40.2212	21.22	28.8057
Oct	20.305	32.6078	23.734	30.4394	16.74	22.7242
Nov	10.178	16.3448	15.895	20.3857	12.9	17.5115
Dec	10.738	17.2441	15.497	19.8752	12.66	17.1857
TOTAL	**276.512**	**444.05**	**312.626**	**400.95**	**222.42**	**301.931**

Table 9

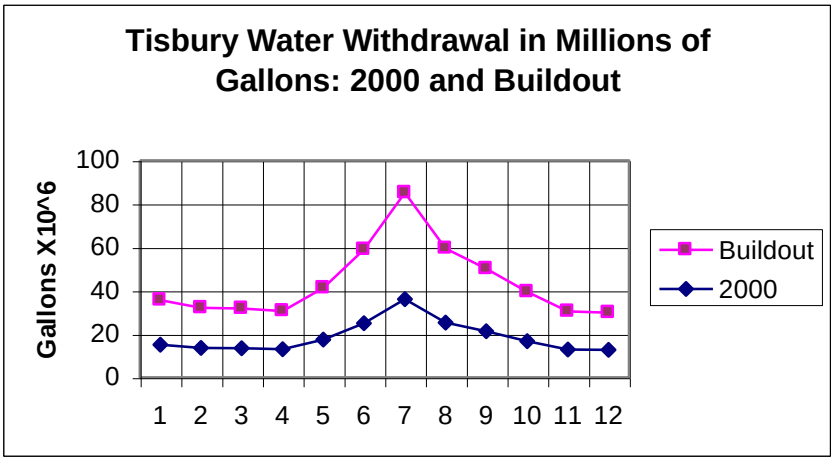


Figure 3

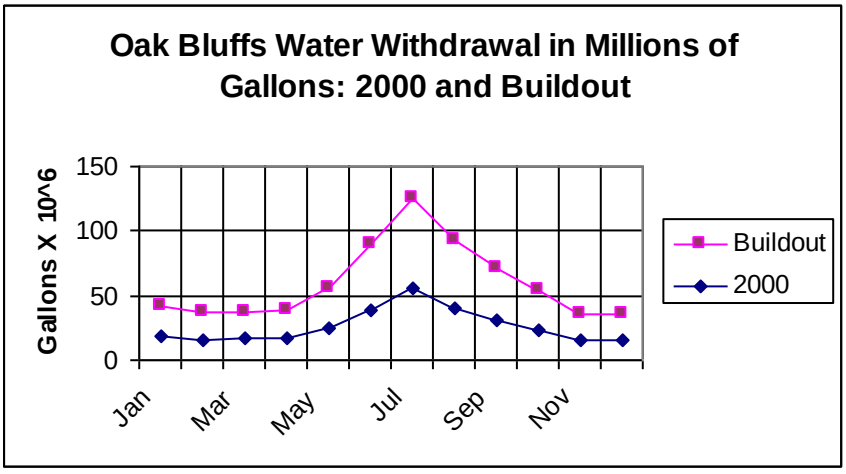


Figure 4

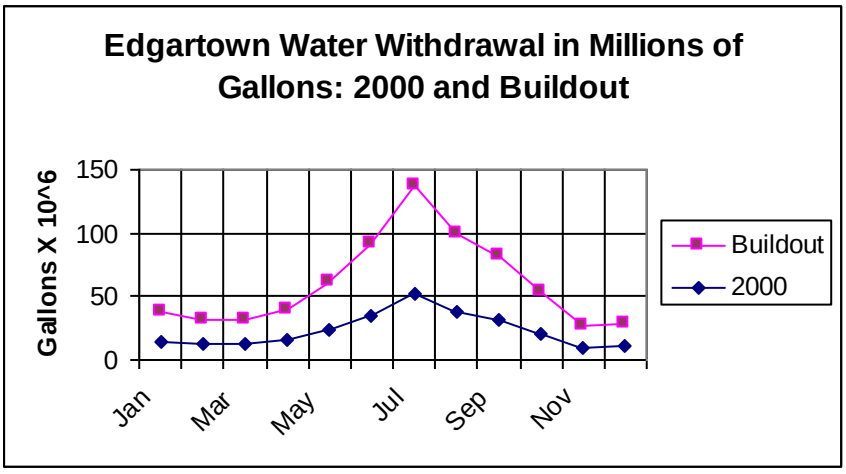


Figure 5

Projected Maximum One-Week Water Withdrawal:

The average daily water requirement during the peak week provides a larger starting point for projection. In order to bring more statistical reliability to the starting figure, the average daily use during the peak week water consumption for the period from 1998 through 2001 is used. These starting point water use figures are:

Edgartown	2.031 mgd
Oak Bluffs	2.392 mgd
Tisbury	1.436 mgd

Current (2000) and Projected Average Daily Water Withdrawal During Peak Week

Town	Current Avg. Daily in peak week in mgd	Projected Avg. Daily in peak week-HIGH	Projected Avg. Daily in peak week-LOW
Tisbury	1.436	2.111	1.957
Oak Bluffs	2.392	3.069	3.069
Edgartown	2.031	4.269	3.264

Table 10

Projected Maximum One-Day Water Withdrawal:

Peak one-day withdrawals are subject to a large number of variables such as the weather and coincidence of attractions such as a one-day event and its relationship to a weekend or holiday. Projecting based on a single year's peak day as a starting point is risky as variables could combine to create enhanced or reduced peak day water consumption as a starting point. For this reason, we use the average of the peak day water use during the 1998 through 2001 period as a starting point for projections.

Maximum daily withdrawal in Oak Bluffs in 2000 occurred on July 20 in the Lagoon Pond well, July 15 in the Farm Neck well and June 10 in the State Forest well. This reflects demand as well as operational decisions. The peak day withdrawal from the three sources combined in 2000 was 2.264 million gallons (mgd). In 2002, the peak day pumping amounted to 2.555 mgd. The average of the four-year period is 2.414 mgd. If projected to increase by the same percentage as the increase in residences, the projected maximum day withdrawal would be 3.098 million gallons based on the average data.

The Maximum one-day withdrawal in Edgartown from all wells in 2000 was 2.194 million gallons. In 1999, the peak was 2.573 mgd. The average peak day requirement over the 1998 to 2001 period is 2.278 mgd. If the four-year average figure were projected to increase by the same percentage as the

increase in residences, the projected maximum day withdrawal would range from 3.661 to 4.788 million gallons.

The maximum one-day withdrawal in Tisbury in 2000 was 1.561 mgd and in 2001, 1.827 mgd. The average peak-day withdrawal for the 1998 to 2001 period is 1.965 mgd. If the four-year average figure were projected to increase by the same percentage as the increase in residences, the projected maximum day withdrawal would range from 2.678 to 2.889 million gallons.

Summary:

Comparison of the projected water demand with the currently permitted withdrawal allows a determination of the potential for new well sites to increase system capacity. Current Permitted withdrawal is summarized in Table 11 below.

Present-Day Permitted Water Withdrawal (All Wells Combined)

TOWN	PERMITTED TOTAL WITHDRAWAL
Edgartown	4.3 million gallons per day
Tisbury	3.26 million gallons per day
Oak Bluffs	4.28 million gallons per day

Table 11

The projection of Edgartown's maximum average daily water withdrawal during the peak month indicates that demand will be between 2.72 and 3.56 million gallons. The projection of Edgartown's maximum average daily water withdrawal during the peak week indicates that demand will be between 3.3 and 4.3 million gallons. The peak-day demand as projected by the average of the 1998-2001 peak-day water consumption indicates that demand could spike to a maximum of 3.7 to 4.8 million gallons. The average figures based on the month and week demands are less than or equal to the permitted withdrawal but the peak day projection approaches and exceeds the current permitted withdrawal.

The Oak Bluffs projection is for 2.28 million gallons on average during the peak month and 3.1 mgd on average based on the peak week and average peak-day figures. All figures are less than the currently permitted water withdrawal.

The average daily withdrawal during the peak month in Tisbury is projected between 1.58 and 1.71 million gallons per day. The projection based on the peak week is for 2.0 to 2.1 mgd. The peak-day projections range from 2.7 to 2.9 million gallons per day. All figures are less than the currently permitted water withdrawal.

GREENLANDS AND STATE FOREST
EVALUATION OF PROTECTIONS AND RECOMMENDATIONS

A thorough evaluation was made of the adequacy of the existing water resource protection regulations and bylaws regarding protection of the water resources in the Greenlands and the Manuel F. Correllus State Forest.

In addition to the regulatory recommendations, a land acquisition or conservation program is suggested for the area in Edgartown just east of the State Forest and in Tisbury, Oak Bluffs and West Tisbury north of the State Forest.

The Martha's Vineyard State Forest Aquifer Protection District:

In 1986, the Martha's Vineyard Commission held a public hearing regarding designation of the District, following nomination of the entire outwash plain and the coastal ponds at its southern extremity. The MVC reduced the scope of the proposal to include only that portion of the proposal that lay within the State Forest. The MVC designated the Aquifer District as lands lying in the area of the State Forest within the Towns of Edgartown and West Tisbury. Information available to the MVC showed that the District was of regional concern and that uncontrolled development could seriously damage groundwater resources. The MVC recognized that the District is presently protected by its being held in fee by the Department of Environmental Management (DEM). However, the MVC felt that, should DEM ever relinquish title to the area, that there would be advantages to having development proceed in a controlled manner "In considering the possibility of inappropriate or uncontrolled development within the Aquifer District should DEM ever relinquish ownership of the area, the Commission finds that so critical are these lands and waters and the values they create and support that to maintain and enhance the health, safety and general welfare of Island residents and visitors, and for present and future generations, special development controls within the District must be adopted". The MVC found that the Aquifer District meets the specific qualification of the drinking water resource district. Such an area must be important to the protection of a regional aquifer, recharge zone or surface water supply in order to be accepted as a drinking water resource district. The fact that the area is owned by DEM, has no development on it, and recharges the Island's only drinking water aquifer was seen as adequate reason to further protect it as a water resource. The MVC guidelines for development were adopted as follows:

- That density of dwellings in the area shall not exceed the allowable density permitted by Town zoning in effect on the date of the decision.
- That an annual growth rate control on new building permits of one twentieth of the maximum number of permits allowed under the density guidelines would be established.

No town regulations to meet the guidelines were ever adopted.

Additional Regulations Suggested for this Area:

Current regulations offer no limitation beyond residential use of the area. Aside from Health regulations and zoning by-laws now in place, there are no specific exclusions of other potentially hazardous land uses (see discussion of existing water supply protective regulations). At the time of adoption of a water protection district for the Town of Edgartown, it would be advisable to include the land within the State Forest in that town. Similarly, the existing water protection district in West Tisbury, designed to protect the Greenlands property, could be expanded to include State Forest land within the Town of West Tisbury. The groundwater lying under the State Forest is truly a regional resource as is flows from there into Edgartown, Oak Bluffs, Tisbury and West Tisbury. This added layer of protection could alternatively be put into place through adopting regulations for the MVC-designated district.

The Greenlands:

The Greenlands property is a 380-acre parcel of land situated at the northeast edge of the State Forest. It is situated at the head of the glacial outwash plain. As defined by the U.S. Geological Survey, groundwater flows from this part of the outwash plain into Tisbury, Oak Bluffs and Edgartown. The Greenlands parcel was acquired by the Town of West Tisbury with funding assistance through the Division of Conservation Services. The land was acquired for aquifer protection now and as a future water supply resource. The land is to be managed under the supervision of the West Tisbury Conservation Commission, who approved a management plan in 1982. At this time, the site is used only for passive recreational use in the form of hiking and horseback riding.

Management Plan Summary:

The Management Plan states "The Management of the Greenlands as a water supply resource makes it incumbent upon West Tisbury's Conservation Commission to make sure that any use of Greenlands will not jeopardize the potability of the water for present and future Island people." The Plan goes on to say that the use of the site as a water resource "…also takes into consideration future demands of the property to produce water for other Island towns." The land to be used for water supply could be conveyed to the West Tisbury Water Commissioners (when and if that Commission is formed), from which other towns could purchase water. The towns using the site for water supply would be required to provide proof of need, of having taken water conservation measures within the towns and to have exhausted all water supply sites within the town. The County Commissioners are set up to arbitrate any disputes between a town desiring water from the site and the West Tisbury Conservation Commission (or Water Commissioners). The Management Plan for the property is included as Appendix E.

Another possible use of the site as described in the Plan is for agricultural purposes. The limitations to be put on such usage are that the farming be organic, environmentally sound and not harmful to the aquifer.

Potential Water Supply:

In July of 1982, a 100 foot deep six-inch well and two two-inch diameter observation wells were drilled on the site[6]. On July 21, a pump test was performed and water level measurements made to determine potential yield from the aquifer at the site. A transmissivity of 16,000 square feet per day was determined. Sieve analysis was performed on soils at the 80 and 90-foot levels from which an estimated range of transmissivity from 12,500 to 30,000 square feet per day was calculated. The estimated yield was determined to be up to 1200 gallons per minute. The site clearly has great potential for use as a water supply.

Protection of Potential Future Water Supply:

During the 1982 pump test, water was withdrawn at the rate of 50 gpm from the six-inch diameter well with two nearby observation wells measured at regular intervals to establish the drawdown curve for the wells over time. This information was used to determine the approximate transmissivity of the aquifer at 150,000 gallons per day per foot. A review of the data by Michael Frimpter, Chief, Mass. Office USGS Water Resources Division, led him to suggest that "…a water supply capable of yielding about 1,000,000 per day could be developed in the so-called Greenlands area…"[7].

The Greenlands property itself includes portions of four of the five Zone II's on the Island. The area designated for the Greenlands Water Resource Protection District is a larger area suggested from the M.V.C. estimate[8] in 1987.

The provisions of the District regulations appear to be in conformance with the requirements of the Massachusetts Wellhead Protection Regulations.

[6] M.V.C. (Russell Smith), 1982, "Assessment of the Aquifer Underlying the Greenlands Property, West Tisbury"
[7] Frimpter, Michael, 1982, Letter to J. Lerner, Director, Division of Conservation Services—Water Resources Division, USGS
[8] M.V.C. (Russell Smith), 1987, Determination Zone II for Future Greenlands Wells

CONCLUSIONS

Tisbury and Oak Bluffs are close to buildout and their future needs should be directed toward redundancy in response to contamination. Those needs may be best met by planning with the Town of West Tisbury for potential well sites within the Greenlands property. The Management Plan already has identified such use as appropriate. Perhaps the Towns could work with the Town of West Tisbury on long-term planning for West Tisbury, Tisbury, Oak Bluffs and Edgartown, with the possibility for shared infrastructure.

The Town of Edgartown has much more potential for growth, as does the Town of West Tisbury. Those two towns should be planning for future supply needs to meet anticipated demand greater than the existing capacity for Edgartown wells and perhaps greater than the use of private wells as is currently practiced in West Tisbury. The Town of West Tisbury has purchased the Greenlands property for that purpose. The Town of Edgartown has entered into discussions with the Department of Environmental Protection regarding a land transfer for land in the State Forest, understanding that executing such a transfer will not be an easy task. Procedures are detailed in the D.E.P. Policy #9504, printed in Appendix F. The towns and DEM should also be planning to secure easements through the State Forest for installation of water supply lines, particularly regarding use of the Greenlands property for water supply for the down-Island towns.

TASK THREE
CONTINGENCY PLAN FOR PUBLIC WATER SYSTEMS

A contingency plan was developed between Edgartown, Oak Bluffs and Tisbury in the event of emergency or contamination problems. The following is a draft Memorandum of Agreement for Mutual Aid, which could form the basis of such an agreement.

MEMORANDUM OF AGREEMENT FOR MUTUAL AID by and between:
The Tisbury Board of Water Commissioners,
The Oak Bluffs Water District Commissioners, and
The Edgartown Board of Water Commissioners

WHEREAS, water supply infrastructure with sufficient capacity and reliability is essential to the public health, safety and welfare and to the region's economy,

WHEREAS, the parties to this agreement have in the past seen the wisdom of connecting the water supply distribution systems to provide mutual support,

WHEREAS, such interconnections and water distribution facilities may be used to transfer water between communities in order to provide short term emergency supplies in the event of a loss of supply due to distribution system failure or loss of water sources due to contamination or other causes,

NOW THEREFORE, the parties to this agreement, having determined that the public health, safety and welfare will be benefited by their cooperation as hereinafter set out; and in order to assure adequate water service during temporary disruptions of service caused by failure of sources or distribution systems, do mutually agree as follows:

I. COOPERATIVE INTENT

The parties to this agreement intend to proceed cooperatively in managing and operating their water supply systems in order to assure a reliable, high quality water supply during short term emergencies as defined herein.

Tisbury Water Commissioners will continue to provide water to those areas of Oak Bluffs that are mutually agreed upon at a rate that is adjusted annually to meet required operating expenses,

II. WATER SUPPLY EMERGENCIES

The parties hereby agree to establish mutual policies and procedures for meeting water supply needs during unanticipated supply disruptions of a short term, emergency nature, such as those caused by equipment

failure, fire, flood, chemical contamination, or other disasters. Such policies and procedures shall be described in an Emergency Contingency Plan that shall be distributed to local officials in both communities.

For the purposes of this Agreement, "short term emergency" shall mean a period of not more than 2 days.

It is not the intent of this Agreement that these policies and practices be construed to apply to water transfers for the purposes of meeting seasonal drought or other long term water needs, unless specified upon separate mutual agreement of the parties.

III. ACTIVATION OF EMERGENCY TRANSFERS

Any water transfer needed to meet a short-term emergency shall be activated by the Superintendent of the communities involved. Said officials shall immediately notify their respective elected water supply officials and their respective Selectmen that an emergency exists and that a transfer has been activated.

Upon activation of an emergency transfer, the parties involved shall immediately notify the Department of Environmental Protection (DEP), consistent with the provisions of M.G.L. Chapter 21G (Water Management Act) and DEP regulations and policies.

No provision of this Agreement shall be construed to supercede the provisions of M.G.L. Chapter 21G or the pertinent regulations of the DEP.

For the purposes of this Agreement, the following terms shall have the meanings set out below:

"Superintendent" shall mean the highest-ranking staff member with direct responsibility for managing the operations of a municipal water supply system.

"Elected Water Supply Officials" shall mean the local elected officials with overall responsibility for managing a local water supply system. This may include the Board of Water Commissioners or the Water District Commissioners, depending upon the particular structure in each community.

IV. EMERGENCY TRANSFERS FOR MORE THAN TWO DAYS

Any transfer lasting more than 2 days shall require the approval of the Board of Selectmen or where a Water District exists, the approval of the Water Commissioners. In considering a request to provide emergency transfer for a period in excess of 2 days, the Selectmen or Water Commissioners shall consult with the Superintendents with respect to the adequacy of the supplies to provide the transfers as well as to provide water sufficient to the needs within the community to cover all costs to the system providing support.

V. CORRECTING THE EMERGENCY PROBLEM

The party experiencing the water emergency shall act expeditiously to mitigate and remove the causes of the emergency condition.

VI. PRICE OF WATER TRANSFERRED DURING AN EMERGENCY

It is agreed that there will be no charge for emergencies of 2 days or less duration.

Unless otherwise specified by separate agreement, the price of water transferred during an emergency in excess of 2 days shall be the same as the commodity rate charged to residential customers within the provider's regular service area. The party experiencing the emergency shall be responsible for paying any excess costs incurred by the party supplying the transfer of water. These may include reasonable costs associated with the transfer for start-up such as line flushing, valve switching, excess pumping or other operational costs associated with the transfer.

VII. ADDITIONAL CONNECTIONS

The parties agree that priority should be given to creating or enlarging interconnections between the water systems in the region in order to provide for water transfers under emergency conditions.

VIII. UPDATING THE EMERGENCY CONTACTS

The parties agree to keep the emergency response plan current by informing each other of any changes in names and phone numbers of the people to be contacted in an emergency.

IX. PERIOD OF AGREEMENT

This Memorandum of Agreement shall become effective upon its approval by the elected officials. It shall remain in effect for a period of five years therefrom.

This Memorandum of Agreement may be extended upon mutual agreement of the parties

IN TESTIMONY THEREOF, the undersigned parties:

_____ _____

Chairman, Tisbury Water Commissioners Date

_____ _____

Chairman, Oak Bluffs Water District Date

_____ _____

Chairman, Edgartown Water Commissioners Date

The Department of Environmental Protection developed a Handbook for Water Supply Emergencies. The 38- page handbook is available for download from the D.E.P. website, at http://www.state.ma.us/dep/brp/dws/standard.htm. Included is the following excerpt regarding preparation of an emergency response plan:

GUIDELINES FOR PREPARING AN EMERGENCY RESPONSE PLAN

A good Emergency Response Plan (ERP) is an essential component of a well-managed water system. The ERP will contain detailed procedures to allow the water system to respond quickly and effectively to water supply emergencies. The ERP will help the water system provide a continuous supply of safe drinking water to its customers and ensure a safe working environment for its employees. The process of developing an ERP can contribute greatly to meeting these goals.

The level of effort that should be put into the development of an ERP depends on the size and complexity of the system as well as the hazards identified and the vulnerability of critical elements of the water system. Hazard identification and vulnerability assessment is simply a matter of identifying vital components of the water system and considering incidents that could impact them.

Components that might be vulnerable and could result in diminished availability or quality of water, and therefore should be considered in an Emergency Response Plan, include:

- Watersheds
- Aquifers
- Sources (including emergency supplies and interconnections)
- Dams
- Transmission Systems (especially if there is no redundancy)
- Distribution Systems
- Treatment Systems
- Water Storage Tanks
- Chemical Storage Tanks
- Personnel
- Power systems
- Pumping Systems
- Transportation Systems
- Communication Systems
- Computer and Control Systems

In the development of an Emergency Response Plan, the water system should consider the impacts that the following incidents could have on the above components:

- Bacterial Contamination
- Chemical Contamination
- Equipment Failures
- Water main breaks
- Fires/Explosions
- Fuel Spills
- Chemical Spills/Leaks
- Transportation Spills
- Vandalism/Terrorism
- Power Outages
- Floods
- Droughts
- Hurricanes
- Ice storms
- Tornadoes
- Earthquakes

After the potential hazards that the water system might experience and the vulnerability of the water system's components have been identified, the planning team can develop the ERP. The ERP must detail what actions should be taken to respond to both potential and actual emergencies in a manner that will ensure continuity of essential services, minimize the duration of the emergency, and protect the safety of its employees. The ERP must be specific in addressing who will respond to the emergency, what actions are required, where key items can be located, when actions should be taken, and how the public will be notified. Such details may include:

- Identification of an emergency response team.
- Method of contacting water system personnel during an emergency.
- Delineation of responsibilities and organizational structure.
- Designation of personnel to release information to the public.
- Development of background material for news release (see Attachment F).
- Protocol for determining what conditions would prompt a water system to discontinue use of a water source.
- Procedures for restricting water use.
- Procedures for providing alternate sources of water to the customer.
- Prioritization of customers' need for water service.
- Directory of key personnel and agencies including Department of Environmental Protection, Emergency Response Agencies, local Fire Department, local Police Department, local Board of Health, Newspapers, Radio Stations, Television Stations.
- Identification of customers with special needs such as schools, hospitals, dialysis centers, nursing homes, large institutions and commercial uses.
- Identification of contractors that can provide materials, equipment, or services and timeframes for implementation.
- Identification of necessary security measures.

The process of developing an ERP may identify additional actions that can be taken by the water system in order to be better prepared for an emergency. The following are examples of actions that the water systems might take in order to be better prepared for an emergency:

- Modify the design and operations of facilities.
- Determine the time needed to obtain necessary materials during an emergency incident.
- Acquire redundant components that can be built into the system, available on site, or available from identified contractors.
- Establish mutual aid agreements that identify the amount of water available and are reviewed periodically.
- Inventory activities in Zone I/II, Zone A/B, Interim Wellhead Protection Areas (IWPA) and the watershed of Class B drinking water river intakes.
- Review data from Source Water Protection Program (SWAP).
- Establish liaison with organizations and people responsible for activities that may have serious impacts on the water system.
- Establish liaison with local spill response and other emergency response planning agencies.
- Exercise isolation valves, emergency connections, and other stand-by equipment.
- Provide emergency response training.
- Periodically review and update the ERP.
- Compile Material Data Safety Sheet (MSDS) information of all chemicals used.
- Develop and update detailed water system map that identifies type, size and location of mains and valves.
- Determine costs associated with recommended improvements and seek funding.

- Identify a phased approach to reduce water consumption during drought related water shortages and identify triggering criteria for the various phases of reduced consumption.

Once the initial ERP has been completed, it must be tested and assessed. Staff must to be trained on how to use the document. The ERP must be readily available. Drills should be conducted periodically to assess its effectiveness. The ERP should be reviewed and updated annually.

Resources to Assist in Preparation of Emergency Response Plan:

- Emergency Planning for Water Utility Management; AWWA Manual M19, American Water Works Association, Denver, CO.
- Planning Guidance for Emergency Contingency Plans, State of Connecticut, Department of Environmental Protection; State of Connecticut, Department of Health Services; State of Connecticut, Department of Public Utility Control; State of Connecticut, Office of Consumer Counsel; State of Connecticut, Office of Policy and Management.
- Back to Basics Guide to Emergency Planning, Elroy F. Spitzer, AWWA.
- Drought Management Planning, AWWA.
- A Guide to Lawn and Landscape Water Conservation, Commonwealth of Massachusetts; Executive Office of Environmental Affairs.
- Early Warning Monitoring to Detect Hazardous Events in Water Supplies, An ILSI Risk Science Institute Workshop Report, December 1999, Thomas M. Brosnan, Editor.

TASK FOUR
ISLAND WATERSHED TEAM MEETINGS

EOEA's Islands Watershed Team provided support and cooperation, until its termination in February of 2003. Watershed Team Leader Patti Kellogg was a particularly helpful resource. Meetings were conducted with the Watershed Team to report progress and discuss findings.

The Project Manager met with the Watershed Team on January 15, 2003. She updated the group on progress with the project, primarily regarding data-gathering efforts.

The Project Manager met with the Watershed Team on February 28, 2003. She gave an update to the group and particularly focused on the need to acquire rights to use the State Forest lands for future well sites.

After termination of the EOEA's Watershed Initiative program, the local partners agreed to regroup and take over some, if not all, of the functions of the EOEA group. The Project Manager met with the local "Watershed Team" group, as loosely reconstituted (and as yet unnamed), on April 18, 2003. She discussed with the group the educational component of the project. She noted that there had been in place an Island-wide Water Resource Protection Committee, long since disbanded. It was determined that the Public Education and Outreach subcommittee would be approached regarding dissemination of findings.

The Project Manager met with the local "Watershed Team" group at the conclusion of the project to discuss the final findings and conclusions.

REFERENCES

Bear, J. (1979) Hydraulics of Groundwater. McGraw-Hill Book Co., NY 569pp.

Dripps, W. and W. Wilcox (1998) Nitrogen Loading Study for Farm Pond, Oak Bluffs. MV Commission. Unpublished.

Frimpter, M., J. Donahue and M. Rapacz (1988) A Mass Balance nitrate Model for Predicting the Effects of Land Use on Groundwater Quality in Municipal wellhead Protection Areas. Cape Cod Aquifer Management Project

Smith, R. (1986) Public Drinking Water Resource Protection on MV Commission

Wilcox, W. (1999) Edgartown Great Pond: Nutrient Loading and Recommended Management Program. MV Commission/DEP 604(b)

Wilcox, W. (2003) Water Table Level Data and Some Interpretations. MV Commission.

Maher, D. L. (1989) The Final Report on the Construction of a 24" by 18" Gravel Packed Well and the Related Prolonged Pump Test at Wintucket Site #3. Edgartown Water Co.

MVC-EOEA buildout data (2001) unpublished

M.V.C. (Russell Smith), 1982, "Assessment of the Aquifer Underlying the Greenlands Property, West Tisbury"

Frimpter, Michael, 1982, Letter to J. Lerner, Director, Division of Conservation Services—Water Resources Division, USGS

M.V.C. (Russell Smith), 1987, Determination Zone II for Future Greenlands Wells

David Delaney, U.S.G.S., 1980, Groundwater Hydrology of Martha's Vineyard Massachusetts, Atlas HA-618

Whitman and Howard, Inc., 1995, "A Numerical Groundwater Flow Model and Zone II Delineation for the Farm Neck Well – Oak Bluffs, Massachusetts"

M.V.C. (William Wilcox), 1993, Water Resources Protection Project

APPENDIX A

MAPS

APPENDIX B
POTENTIAL HAZARDS

				POTENTIAL HAZARDS	
MAP	LOT	TOWN_ID	HAZARDS	hazard_description	HAZ_TYPE
11	46.1	W. Tisbury	AGRI	NIP N' TUCK	FARM
11	46.2	W. Tisbury	AGRI	NIP N' TUCK	FARM
11	46.2	W. Tisbury	AGRI	NIP N TUCK FARM	FARM, HORSES, COWS,PIGS
11	82.2	W. Tisbury	AGRI	FARM	FARM,COWS
9	1.1	W. Tisbury	COMM	Chicama	vineyard
9	3.0	W. Tisbury	AGRI	Chicama	vineyard
11	22.0	W. Tisbury	AGRI	HEATHER GARDENS	PLANT NURSERY
11	21.0	W. Tisbury	AGRI	HEATHER GARDENS	PLANT NURSERY
10	16.0	W. Tisbury	COMM	M. JASNY	VET
11	72.0	W. Tisbury	AGRI	FARM	FARM
10	36.0	W. Tisbury	AGRI	DAYLILY FARM	PLANT NURSERY
9	4.0	W. Tisbury	COMM	Chicama	vineyard
16	0	W. Tisbury	AGRI	VINEYARD GARDENS	PLANT NURSERY
16	223.0	W. Tisbury	AGRI	WHIPORWHILL FARM	FARM, VEGETABLE
8A	1	Tisbury	MUNI	Tisbury Elementary School	school
23A	18	Tisbury	COMM	cemetary	CEMETERIES
23A	25	Tisbury	COMM	SUN	trucking terminal
22C	1	Tisbury	COMM	trucking terminal	trucking terminal
22C	6	Tisbury	COMM	trucking	trucking
39A	8	Tisbury	AGRI	Tashmoo Farm	farm
22C	7.1	Tisbury	COMM	Watercourse?	Landscape construction
22B	1.1	Tisbury	COMM	excavation	excavation
22A	16	Tisbury	COMM		auto repair
22A	11	Tisbury	MUNI	landfill	landfill
39A	9	Tisbury	AGRI	Tashmoo Farm	farm
22A	6	Tisbury	COMM		borrow pit
20A	5	Tisbury	MUNI	TISBURY LANDFILL/PARKING	LANDFILL/PARKING
22A	4.3	Tisbury	COMM		woodworking
20A	6	Tisbury	MUNI	TISBURY LANDFILL/PARKING	LANDFILL/PARKING
20A	5.1	Tisbury	MUNI	TISBURY LANDFILL/PARKING	LANDFILL/PARKING
20A	4	Tisbury	MUNI	TISBURY LANDFILL/PARKING	LANDFILL/PARKING
22A	4.4	Tisbury	COMM		woodworking
22A	4.5	Tisbury	COMM		woodworking
20A	5.2	Tisbury	MUNI	TISBURY LANDFILL/PARKING	LANDFILL/PARKING
20A	3	Tisbury	MUNI	TISBURY LANDFILL/PARKING	LANDFILL/PARKING
20A	5.3	Tisbury	MUNI	TISBURY LANDFILL/PARKING	LANDFILL/PARKING
20A	2	Tisbury	COMM		CEMETERIES
19A	19	Tisbury	RESI	Hillside Village	Instensive residential
50A	3	Tisbury	AGRI	Kingsbury Farm	farm
50A	2	Tisbury	AGRI	Kingbury Farm	farm
42A	18	Tisbury	AGRI		INACTIVE SEPTAGE LAGOONS
19A	20	Tisbury	COMM	Carroll's Trucking	trucking terminal
51A	2	Tisbury	COMM	WOODEN TENT PHOTO	PHOTO STUDIO/DEVELOPMENT
19A	24	Tisbury	COMM	ABC oil	OIL COMPANY
19A	25	Tisbury	COMM	ABC oil	OIL COMPANY
19A	26	Tisbury	COMM	ABC oil	OIL COMPANY
18A	7	Tisbury	RESI	MV Family Campground	CAMPGROUND
17A	1	Tisbury	AGRI	Norton's Farm	farm

45A	1	Tisbury	AGRI	Chicama	vineyard
46A	1	Tisbury	AGRI	Chicama	vineyard
12	141	Oak Bluffs	COMM	Sea View Hill Cemetary	CEMETERIES
11	233	Oak Bluffs	COMM	White Brother's Construction	construction
11	232	Oak Bluffs	COMM	White Brother's Construction	construction
11	130	Oak Bluffs	COMM	BenDavid's AUTO BODY	AUTO BODY REPAIR
17	9.1	Oak Bluffs	COMM	BINKS AUTO REPAIR	AUTO REPAIR
17	105	Oak Bluffs	AGRI	DeBettencourt's Cut Flowers	field
16	39	Oak Bluffs	COMM	Buddy's Auto Repair	Auto Repair
16	8	Oak Bluffs	COMM	SIGNS	WOODWORKING
16	39.1	Oak Bluffs	COMM	Buddy's Auto Repair	Auto Repair
20	151	Oak Bluffs	COMM	Farm Neck Golf course	golf course
21	27	Oak Bluffs	COMM	LEITE'S JUNKYARD	junkyard
21	26	Oak Bluffs	COMM	LEITE'S JUNKYARD	junkyard
21	98	Oak Bluffs	COMM	JAY'S	AUTO BODY
21	30	Oak Bluffs	COMM	LEITE'S JUNKYARD	junkyard
21	28	Oak Bluffs	COMM	LEITE'S JUNKYARD	junkyard
21	97.3	Oak Bluffs	COMM	JAY'S	AUTO BODY
21	29	Oak Bluffs	COMM	LEITE'S JUNKYARD	junkyard
21	37	Oak Bluffs	COMM	LEITE'S JUNKYARD	junkyard
21	86	Oak Bluffs	COMM	White Brother's Pit	sand and gravel
21	85	Oak Bluffs	COMM	Leonardo's Junkyard	Junkyard
21	84	Oak Bluffs	COMM	Leonardo's Junkyard	Junkyard
21	87	Oak Bluffs	COMM	White Brother's Pit	sand and gravel
21	83	Oak Bluffs	COMM	Leonardo's Junkyard	Junkyard
21	82	Oak Bluffs	COMM	Leonardo's Junkyard	Junkyard
29	157	Oak Bluffs	MUNI	Oak Bluffs Landfill	Landfill
29	155	Oak Bluffs	MUNI	Oak Bluffs Landfill	Landfill
29	158	Oak Bluffs	COMM	Leonardo's Junkyard	Junkyard
29	156	Oak Bluffs	MUNI	Oak Bluffs Landfill	Landfill
25	14	Oak Bluffs	AGRI		INACTIVE SEPTAGE LAGOONS
29	1	Oak Bluffs	COMM	Farm Neck Golf course	golf course
30	25	Oak Bluffs	COMM	Farm Neck Golf course	golf course
29	161	Oak Bluffs	MUNI	Oak Bluffs Landfill	Landfill
29	165	Oak Bluffs	AGRI	INACTIVE SEPTAGE LAGOONS	SEPTIC
29	164	Oak Bluffs	AGRI	INACTIVE SEPTAGE LAGOONS	SEPTIC
29	162	Oak Bluffs	MUNI	Oak Bluffs Landfill	Landfill
29	163	Oak Bluffs	MUNI	Oak Bluffs Landfill	Landfill
29	2	Oak Bluffs	COMM	Farm Neck Golf course	golf course
26	6	Oak Bluffs	RESI	MV Family Campground	CAMPGROUND
34	44	Oak Bluffs	COMM	Farm Neck Golf course	golf course
40	4	Oak Bluffs	AGRI	Norton's Farm	farm
40	3	Oak Bluffs	AGRI	RED HILL FARM	FARM
40	6	Oak Bluffs	AGRI	WIND FARM DRIVING RANGE	GOLF COURSE
40	11	Oak Bluffs	MUNI	COM ELECTRIC	ELECTRIC COMPANY
39	3	Oak Bluffs	AGRI	Thimble Farm	farm
41	7.1	Oak Bluffs	RESI	Island Elderly Housing	high density
41	7	Oak Bluffs	RESI	Island Elderly Housing	high density
51	2	Oak Bluffs	INDU	Goodale's	gravel pit
51	3	Oak Bluffs	INDU	Goodale's	gravel pit
50	30	Oak Bluffs	MUNI	MV ICE ARENA	ICE ARENA
55	2	Oak Bluffs	MUNI	MVRH	high schools

48	78	Oak Bluffs	MUNI	MVHS	HIGH SCHOOL SEPTIC
55	4	Oak Bluffs	MUNI	MVHS	HIGH SCHOOL SEPTIC
56	20	Oak Bluffs	AGRI	MAHONEY'S	NURSERY
56	13.3	Oak Bluffs	COMM		FUNERAL HOME
54	1.1	Oak Bluffs	INDU	goodale's	gravel pit
54	2	Oak Bluffs	INDU	goodale's	gravel pit
54	1	Oak Bluffs	INDU	goodale's	gravel pit
13	5.111	Edgartown	COMM	EDGARTOWN GOLF CLUB	GOLF CLUB
12B	151.4	Edgartown	COMM		AUTO REPAIR
21	35	Edgartown	COMM	MSPCA AND VET CLINIC	VET
21	37	Edgartown	COMM	NEW ENGLAND TELEPHONE	TELEPHONE
20A	65.2	Edgartown	AGRI	DONAROMA'S	PLANT NURSERY
20A	65.12	Edgartown	AGRI	DONAROMA'S	PLANT NURSERY
21	89	Edgartown	COMM	COTTLES	LUMBER YARD
20C	154	Edgartown	MUNI	Edgartown Elementary School	school
20C	168	Edgartown	COMM		CEMETERIES
20C	134	Edgartown	AGRI	Norton Field	farm
20C	163	Edgartown	MUNI	Edgartown Elemantary School	school
20C	165	Edgartown	COMM		CEMETERIES
21	155	Edgartown	AGRI	Sweeten Water Farm	horse farm
20C	167	Edgartown	MUNI	EDGARTOWN FIRE, POLICE	FIRE AND POLICE
22	52	Edgartown	COMM	McIntosh Motors	auto repair
28	4	Edgartown	MUNI	Edgartown Waste Water	waste water treatment
28	224	Edgartown	AGRI	Morning Glory Farm	Farm
28	5.1	Edgartown	AGRI	Morning Glory Farm	Farm
28	53.2	Edgartown	AGRI	Morning Glory Farm	Farm
28	54	Edgartown	MUNI	EDGARTOWN LANDFILL	CAPPED LANDFILL
28	55.2	Edgartown	MUNI	EDGARTOWN LANDFILL	CAPPED LANDFILL
28	57	Edgartown	MUNI	EDGARTOWN LANDFILL	CAPPED LANDFILL
27	5	Edgartown	AGRI	Morning Glory Farm	farm
28	55.1	Edgartown	MUNI	EDGARTOWN LANDFILL	CAPPED LANDFILL
28		Edgartown	MUNI	EDGARTOWN LANDFILL	CAPPED LANDFILL
37	46	Edgartown	AGRI	GREAT POND FARM	SHEEP FARM
29	51	Edgartown	COMM	EDGARTOWN MARINE	BOATYARD
36	18.11	Edgartown	AGRI	RED HILL FARM	HAY FARM
36	18.12	Edgartown	AGRI	RED HILL FARM	HAY FARM
37	10	Edgartown	AGRI	GREAT POND FARM	SHEEP FARM
37	11	Edgartown	AGRI	GREAT POND FARM	SHEEP FARM
37	12	Edgartown	AGRI	GREAT POND FARM	SHEEP FARM
37	13	Edgartown	AGRI	GREAT POND FARM	SHEEP FARM
37	102.1	Edgartown	AGRI	MORNING GLORY FARM	FARM
37	14	Edgartown	AGRI	GREAT POND FARM	SHEEP FARM
37	73.1	Edgartown	AGRI	MORNING GLORY FARM	FARM
37	15	Edgartown	AGRI	GREAT POND FARM	SHEEP FARM

APPENDIX C
NITROGEN LOADING CALCULATIONS
MVC MODEL

The following pages include Lotus-derived spreadsheets with the nitrogen loading calculations from the MVC model, as referenced in Task One.

DEP Type Model Tisbury Now			Assumes flow equal to an average of 2 bedrooms/dwelling											
	DWELLINGS								2 bedroom loading			3 bedroom loading		
Source	Number	Seasonal	Year Roun	Days	Pop.	Water Use gallons	Convert liters	N Conc.	Load milligrams	Load Kilograms	N Conc. mg/l	Load kilograms	concentrati mg/l	
Septic														
	1146	407	739											
Year round				365	2.48	92023800	3.5E+08	35	1.2E+10	12190.85		18286.28		
Year rnd. guests				25	2.48	0	0	35	0	0	0	0	0	
Summer				75	4.77	0	0	35	0	0	0	0	0	
Shoulder season				25	2.48	0	0	35	0	0	0	0	0	
	Number		Sq. Ft/res	Fert/1000s.f.				Leach loss						
Lawns	1146		5000	1.5				0.25		974.4898		526.2245		
Farms	85		3702600	3.444				0.4		2313.243		2313.243		
Golf	7		304920	3.5				0.25		121		121		
Pasture	43.9		1912284	1				0.33		266.1922		266.1922		
								mg/l						
Precipitatio	2521.2		1.1E+08				5.8E+09	0.05		287.6631		287.6631		
Other (Hors	6									80.27211		80.27211		
Other (STP)				365	0	0	0	2.4	0	0		0		
Commercial				365	9930	3624450	13718543	35	4.8E+08	480.149		480.149		
TOTAL LOAD										16733.86		22381.02		
Dilution											2.736397		3.558505	
DEP Type Model Tisbury Buildout			Assumes flow equal to an average of 2 bedrooms/dwelling											
	DWELLINGS								2 bedroom loading			3 bedroom loading		
Source	Number	Seasonal	Year Round	Days	Pop.	Water Use gallons	Convert liters	N Conc.	Load milligrams	Load Kilograms	N Conc. mg/l	Load kilograms	concentrati mg/l	
Septic														
	1495	531	964											
Year round				365	2.48	1.2E+08	4.5E+08	35	1.6E+10	15903.43		23855.14		
Year rnd. guests				25	2.48	0	0	35	0	0	0	0	0	
Summer				75	4.77	0	0	35	0	0	0	0	0	
Shoulder season				25	2.48	0	0	35	0	0	0	0	0	
	Number		Sq. Ft/res	Fert/1000s.f.				Leach loss						
Lawns	1495		5000	1.5				0.25		1271.259		686.4796		
Farms	85		3702600	3.444				0.4		2313.243		2313.243		
Golf	7		304920	3.5				0.25		121		121		
Pasture	43.9		1912284	1				0.33		266.1922		266.1922		
								mg/l						
Precipitatio	2521.2		1.1E+08				5.8E+09	0.05		287.6631		287.6631		
Other (Hors	6									80.27211		80.27211		
Other (STP)				365	0	0	0	2.4	0	0		0		
Commercial				365	9930	3624450	13718543	35	4.8E+08	480.149		480.149		
TOTAL LOAD										20743.2		28110.14		
Dilution											3.334189		4.359137	

Table C 1

Tisbury Now													
Martha's Vineyard Commission Model													
	DWELLINGS												
Source	Number	Seasonal	Year Round	Days	Pop.	Water Use gallons	Convert liters	N Conc.	Load milligrams	Load Kilograms	N Conc. mg/l		
Septic													
	1146	407	739										
Year round				365	2.3	29785594	1.1E+08	35	3.9E+09	3945.847			
Year rnd. guests				25	2.3	2040109	7721813	35	2.7E+08	270.2635			
Summer				75	4.77	6986085	26442331	35	9.3E+08	925.4816			
Shoulder season				25	2.3	1122851	4249990	35	1.5E+08	148.7497			
	Number		Sq. Ft/res	Fert/1000s.f.				Leach loss					
Lawns	1146		5000	1.5				0.25		974.4898			
Farms	85		3702600	3.444				0.4		2313.243			
Golf	7		304920	3.5				0.25		121			
Pasture	43.9		1912284	1				0.33		286.1922			
								mg/l					
Precipitatic	2521.2		1.1E+08				5.8E+09	0.05		287.6631			
Other (Hors	6									80.27211			
Other (STP)				365	0	0	0	2.4	0	0			
Commercial				365	9930	3624450	13718543	35	4.8E+08	480.149			
TOTAL LOAD										9833.351			
Dilution											1.661563		
Martha's Vineyard Commission Model													
TisburyBuildout													
	DWELLINGS												
Source	Number	Seasonal	Year Round	Days	Pop.	Water Use gallons	Convert liters	N Conc.	Load milligrams	Load Kilograms	N Conc. mg/l		
Septic													
	1495	531	964										
Year round				365	2.3	38856425	1.5E+08	35	5.1E+09	5147.505			
Year rnd. guests				25	2.3	2661399	10073395	35	3.5E+08	352.5688			
Summer				75	4.77	9113610	34495013	35	1.2E+09	1207.325			
Shoulder season				25	2.3	1464801	5544272	35	1.9E+08	194.0495			
	Number		Sq. Ft/res	Fert/1000s.f.				Leach loss					
Lawns	1495		5000	1.5				0.25		1271.259			
Farms	85		3702600	3.444				0.4		2313.243			
Golf	7		304920	3.5				0.25		121			
Pasture	43.9		1912284	1				0.33		286.1922			
								mg/l					
Precipitatic	2521.2		1.1E+08				5.8E+09	0.05		287.6631			
Other (Hors	6									80.27211			
Other (STP)				365	0	0	0	2.4	0	0			
Commercial				365	9930	3624450	13718543	35	4.8E+08	480.149			
TOTAL LOAD										11741.23			
Dilution											1.968629		

Table C 2

DEP TYPE MODEL			Assumes both 2 and 3 bedroom avetage wastewater flow.								2 bedroom loading			3 bedroom loading	
LGP/St. Forest Now									N Conc.		Load	Load	N Conc.	Load	concentrati
Source	Number	Seasonal	Year Round	Days	Pop.	Water Use gallons	Convert liters				milligrams	Kilograms	mg/l	Kilograms	mg/l
Septic	641	288	353											10228.19	
				365	2.57	51472300	1.9E+08		35		6.8E+09	6818.793			
Year round				0	2.57	0	0		35		0	0		0	
Year rnd. guests				0	4.77	0	0		35		0	0		0	
Summer				0	2.57	0	0		35		0	0		0	
Shoulder season									Leach loss						
Number		Sq. Ft/res	Fert/1000s.f.						0.25			545.068		261.6327	
Lawns	641	5000	1.5						0.4			2468.367		2468.367	
Farms	90.7	3950892	3.444						0.25			198.7857		198.7857	
Golf	11.5	500940	3.5												
									mg/l						
Precipitatio	2443.1	1.1E+08					5.6E+09		0.05			278.7521		278.7521	
TOTAL LOAD												10309.77		13435.73	
Dilution													1.78683		2.288943
DEP Type Model			Assumes both 2 and 3 bedroom average wastewater flow.											3 bedroom loading	
LGP/St. Forest Buildout															
Source	Number	Seasonal	Year Round	Days	Pop.	Water Use gallons	Convert liters		N Conc.		Load milligrams	Load Kilograms	N Conc. mg/l	Load kilograms	concentrati mg/l
Septic	666	300	366												
				365	2.57	53479800	2.0E+08		35		7.1E+09	7084.737		10627.1	
Year round				0	2.57	0	0		35		0	0		0	
Year rnd. guests				0	4.77	0	0		35		0	0		0	
Summer				0	2.57	0	0		35		0	0		0	
Shoulder season									Leach loss						
Number		Sq. Ft/res	Fert/1000s.f.						0.25			566.3265		271.8367	
Lawns	666	5000	1.5						0.4			2468.367		2468.367	
Farms	90.7	3950892	3.444						0.25			198.7857		198.7857	
Golf	11.5	500940	3.5												
									mg/l						
Precipitatio	2443.1	1.1E+08					5.6E+09		0.05			278.7521		278.7521	
TOTAL LOAD												10596.97		13844.85	
Dilution													1.834191		2.355097

Table C 3

NITROGEN LOADING MODELS

Martha's Vineyard Commission Model

Lagoon/State Forest Now

	DWELLINGS				Pop.	Water Use	Convert	N Conc.	Load	Load	N Conc.
Source	Number	Seasonal	Year Round	Days		gallons	liters		milligrams	Kilograms	mg/l
Septic											
	641	288	353								
				365	2.35	14515189	54939989	35	1.9E+09	1922.9	
Year round				25	2.35	994191	3763013	35	1.3E+08	131.7055	
Year rnd. guests				75	4.77	4953263	18748102	35	6.6E+08	656.1836	
Summer				25	2.35	813429	3078829	35	1.1E+08	107.759	
Shoulder season								Leach loss			
	Number		Sq. Ft/res	Fert/1000s.f.				0.25		545.068	
	641		5000	1.5				0.4		2468.367	
Lawns	90.7		3950892	3.444				0.25		198.7857	
Farms	11.5		500940	3.5							
Golf								mg/l			
							5.6E+09	0.05		278.7521	
Precipitatio	2443.1		1.1E+08								
										6309.52	
TOTAL LOAD											1.115629
Dilution											

MVC Model

Lagoon/State Forest Buildout

	Dwellings				Pop.	Water Use	Convert	N Conc.	Load	Load	N Conc.
Source	Number	Seasonal	Year Round	Days		gallons	liters		milligrams	Kilograms	mg/l
Septic											
	666	300	366								
				365	2.35	15081304	57082734	35	2.0E+09	1997.896	
Year round				25	2.35	1032966	3909776	35	1.4E+08	136.8422	
Year rnd. guests				75	4.77	5146448	19479307	35	6.8E+08	681.7758	
Summer				25	2.35	845154	3198908	35	1.1E+08	111.9618	
Shoulder season								Leach loss			
	Number		Sq. Ft/res	Fert/1000s.f.				0.25		566.3265	
	666		5000	1.5				0.4		2468.367	
Lawns	90.7		3950892	3.444				0.25		198.7857	
Farms	11.5		500940	3.5							
Golf								mg/l			
							5.6E+09	0.05		278.7521	
Precipitatio	2443.1		1.1E+08								
										6440.707	
TOTAL LOAD											1.138193
Dilution											

Table C 4

DEP TYPE MODEL											2 bedroom	loading		
Farm Neck	Now	Assumes both 2 and 3 bedroom average wastewater flow.					Water Use	Convert	N Conc.	Load	Load	N Conc.	3 Bedroom	Loading
	Source	Number	Seasonal	Year Round	Days	Pop.	gallons	liters		milligrams	Kilograms	mg/l		mg/l
	Septic													
		1482	831	651									23647.7	
	Year round				365	2.19	1.2E+08	4.5E+08	35	1.6E+10	15765.13			
	Year rnd. guests				0	2.19	0	0	35	0	0			
	Summer				0	4.77	0	0	35	0	0			
	Shoulder season				0	2.19	0	0	35	0	0			
									Leach loss					
		Number		Sq. Ft/res	Fert/1000s.f.				0.25		604.898		604.898	
	Lawns	1482		2400	1.5				0.4		133.3517		133.3517	
	Farms	4.9		213444	3.444				0.25		1296.429		1296.429	
	Golf	75		3267000	3.5				0.25		98.77551		98.77551	
	other turf	20		871200	1				mg/l					
								2.6E+09	0.05		130.9727		130.9727	
	Precipitatio	1147.9		50002524										
											18029.56		25912.13	
	TOTAL LOAD											5.873037		7.863829
	Dilution													
DEP Type	Model										2 bedroom	loading		
Farm Neck	Buildout	Assumes both 2 and 3 bedroom average wastewater flow.					Water Use	Convert	N Conc.	Load	Load	N Conc.	3 Bedroom	Loading
	Source	Number	Seasonal	Year Round	Days	Pop.	gallons	liters		milligrams	Kilograms	mg/l		mg/l
	Septic													
		1588	891	697									25339.1	
	Year round				365	2.19	1.3E+08	4.8E+08	35	1.7E+10	16892.74			
	Year rnd. guests				0	2.19	0	0	35	0	0			
	Summer				0	4.77	0	0	35	0	0			
	Shoulder season				0	2.19	0	0	35	0	0			
									Leach loss					
		Number		Sq. Ft/res	Fert/1000s.f.				0.25		604.898		604.898	
	Lawns	1482		2400	1.5				0.4		133.3517		133.3517	
	Farms	4.9		213444	3.444				0.25		1296.429		1296.429	
	Golf	75		3267000	3.5				0.25		98.77551		98.77551	
	other turf	20		871200	1				mg/l					
								2.6E+09	0.05		130.9727		130.9727	
	Precipitatio	1147.9		50002524										
											19157.16		27603.53	
	TOTAL LOAD											6.175538		8.256053
	Dilution													

Table C 5

		NITROGEN LOADING MODELS										
	Martha's Vineyard Commission Model											
Farm Neck	Now											
		DWELLINGS										
	Source	Number	Seasonal	Year Round	Days	Pop.	Water Use gallons	Convert liters	N Conc.	Load milligrams	Load Kilograms	N Conc. mg/l
	Septic											
		1482	831	651								
	Year round				365	2.33	26558451	1.0E+08	35	3.5E+09	3518.331	
	Year rnd. guests				25	2.33	1819072	6885188	35	2.4E+08	240.9816	
	Summer				75	4.77	14276835	54037821	35	1.9E+09	1891.324	
	Shoulder season				25	2.33	2324600	8798611	35	3.1E+08	307.9514	
		Number		Sq. Ft/res	Fert/1000s.f.				Leach loss			
	Lawns	1482		2400	1.5				0.25		604.898	
	Farms	4.9		213444	3.444				0.4		133.3517	
	Golf	75		3267000	3.5				0.25		1296.429	
	other turf	20		871200	1				0.25		98.77551	
									mg/l			
	Precipitatio	1147.9		50002524				2.6E+09	0.05		130.9727	
											8223.014	
	TOTAL LOAD											2.947634
	Dilution											
MVC Model												
Farm Neck	Buildout											
		Dwellings										
	Source	Number	Seasonal	Year Round	Days	Pop.	Water Use gallons	Convert liters	N Conc.	Load milligrams	Load Kilograms	N Conc. mg/l
	Septic											
		1588	891	697								
	Year round				365	2.33	28458044	1.1E+08	35	3.8E+09	3769.979	
	Year rnd. guests				25	2.33	1949181	7377650	35	2.6E+08	258.2178	
	Summer				75	4.77	15297985	57902874	35	2.0E+09	2026.601	
	Shoulder season				25	2.33	2490867	9427931	35	3.3E+08	329.9776	
		Number		Sq. Ft/res	Fert/1000s.f.				Leach loss			
	Lawns	1588		2400	1.5				0.25		648.1633	
	Farms	4.9		213444	3.444				0.4		133.3517	
	Golf	75		3267000	3.5				0.25		1296.429	
	other turf	20		871200	1				0.25		98.77551	
									mg/l			
	Precipitatio	1147.9		50002524				2.6E+09	0.05		130.9727	
											8692.467	
	TOTAL LOAD											3.102373
	Dilution											

Table C 6

DEP Type Model Wintucket Now			Assumes flow equal to an average of 2 bedrooms/dwelling											
	DWELLINGS								2 bedroom loading		N Conc.	3 bedroom loading		
Source	Number	Seasonal	Year Round	Days	Pop.	Water Use gallons	Convert liters	N Conc.	Load milligrams	Load Kilograms	mg/l	Load kilograms	concentrati mg/l	
Septic														
	170	103	67					35	1.8E+09	1808.416		2712.624		
Year round				365	1.64	13651000	51669035	35		0			0	
Year rnd. guests				25	1.64	0	0	35		0			0	
Summer				75	4.77	0	0	35	0	0			0	
Shoulder season				25	1.64	0	0	35	0	0			0	
								Leach loss						
	Number		Sq. Ft/res	Fert/1000s.f.				0.25		78.06122		78.06122		
Lawns	170		2700	1.5				0.4		0			0	
Farms	0		0	3.444				0.25		0			0	
Golf	0		0	3.5				0.33		0			0	
Pasture	0		0	1										
								mg/l						
Precipitatio	898.3		39129948				2.0E+09	0.05		102.494		102.494		
Other (Hors	0									0			0	
Other (STP)				365	0	0	0	2.4	0	0			0	
Commercial				365	0	0	0	35	0	0			0	
TOTAL LOAD										1988.971		2893.18		1.359971
Dilution											0.946432			
DEP Type Model Wintucket Buildout			Assumes flow equal to an average of 2 bedrooms/dwelling						2 bedroom loading		N Conc.	3 bedroom loading		
	DWELLINGS													
Source	Number	Seasonal	Year Round	Days	Pop.	Water Use gallons	Convert liters	N Conc.	Load milligrams	Load Kilograms	mg/l	Load kilograms	concentrati mg/l	
Septic														
	241	146	95					35	2.6E+09	2563.696		3845.544		
Year round				365	1.64	19352300	73248456	35		0			0	
Year rnd. guests				25	1.64	0	0	35		0			0	
Summer				75	4.77	0	0	35	0	0			0	
Shoulder season				25	1.64	0	0	35	0	0			0	
								Leach loss						
	Number		Sq. Ft/res	Fert/1000s.f.				0.25		110.6833		110.6833		
Lawns	241		2700	1.5				0.4		0			0	
Farms	0		0	3.444				0.25		0			0	
Golf	0		0	3.5				0.33		0			0	
Pasture	0		0	1										
								mg/l						
Precipitatio	898.3		39129948				2.0E+09	0.05		102.494		102.494		
Other (Hors	0									0			0	
Other (STP)				365	0	0	0	2.4	0	0			0	
Commercial				365	0	0	0	35	0	0			0	
TOTAL LOAD										2776.853		4058.701		1.879244
Dilution											1.307907			

Table C 7

Martha's Vineyard Commission Model												
Wintucket Now												
	DWELLINGS									Load	Load	N Conc.
Source	Number	Seasonal	Year Round	Days	Pop.	Water Use gallons	Convert liters	N Conc.		milligrams	Kilograms	mg/l
Septic								Leach loss				
	170	103	67					0.25	35	3.7E+08	365.3264	
Year round				365	2.35	2757701	10437897	0.4	35	25022355	25.02235	
Year rnd. guests				25	2.35	188883.6	714924.4	0.25	35	2.3E+08	234.3561	
Summer				75	4.77	1769059	6695890	0.33	35	2.3E+08	234.3561	
Shoulder season				25	2.35	290516.4	1099605		35	38486160	38.48616	
	Number		Sq. Ft/res	Fert/1000s.f.				Leach loss				
Lawns	170		2700	1.5				0.25			78.06122	
Farms	0		0	3.444				0.4			0	
Golf	0		0	3.5				0.25			0	
Pasture	0		0	1				0.33			0	
								mg/l				
Precipitatio	898.3		39129948				2.0E+09	0.05			102.494	
Other (Hors	0					0	0				0	
Other (STP)				365	0	0	0	2.4	0		0	
Commercial				365	0	0	0	35	0		0	
TOTAL LOAD											843.7462	
Dilution												0.407838
MVC Model												
Wintucket Buildout												
	DWELLINGS									Load	Load	N Conc.
Source	Number	Seasonal	Year Round	Days	Pop.	Water Use gallons	Convert liters	N Conc.		milligrams	Kilograms	mg/l
Septic												
	241	146	95						35	5.2E+08	517.9039	
Year round				365	2.35	3909446	14797253		35	35472868	35.47287	
Year rnd. guests				25	2.35	267770.3	1013511		35	3.3E+08	332.2343	
Summer				75	4.77	2507902	9492409		35	54559792	54.55979	
Shoulder season				25	2.35	411849.7	1558851		35			
	Number		Sq. Ft/res	Fert/1000s.f.				Leach loss				
Lawns	241		2700	1.5				0.25			110.6633	
Farms	0		0	3.444				0.4			0	
Golf	0		0	3.5				0.25			0	
Pasture	0		0	1				0.33			0	
								mg/l				
Precipitatio	898.3		39129948				2.0E+09	0.05			102.494	
Other (Hors	0					0	0				0	
Other (STP)				365	0	0	0	2.4	0		0	
Commercial				365	0	0	0	35	0		0	
TOTAL LOAD											1153.328	
Dilution												0.555355

Table C 8

DEP Type Model Mashacket/Lily Now			Assumes both 2 and 3 bedroom average wastewater flow.							2 bedroom loading			3 bedroom loading	
	DWELLINGS													
Source	Number	Seasonal	Year Round	Days	Pop.	Water Use gallons	Convert liters	N Conc.		Load milligrams	Load Kilograms	N Conc. mg/l	Load kilograms	concentrati mg/l
Septic														
	1530	927	603											
Year round				365	1.64	1.2E+08	4.7E+08		35	1.6E+10	16275.75		24413.62	
Year rnd. guests				25	1.64	0	0		35	0	0		0	
Summer				75	4.77	0	0		35	0	0		0	
Shoulder season				25	1.64	0	0		35	0	0		0	
	Number		Sq. Ft/res	Fert/1000s.f.				Leach loss						
Lawns	1530		2700	1.5				0.25			702.551		702.551	
Farms	41.2		1794672	3.444				0.4			1121.243		1121.243	
Golf	5.9		257004	3.5				0.25			101.9857		101.9857	
Pasture	62.6		2726856	1				0.33			408.1009		408.1009	
								mg/l						
Precipitatio	1366.9		59542164				3.1E+09	0.05			155.9601		155.9601	
Other (Hors	20										267.5737		267.5737	
Other (STP)				365	159662	58276630	2.2E+08	2.4		5.3E+08	529.3849		529.3849	
Commercial				365	46011	16794015	63565347	35		2.2E+09	2224.787		2224.787	
TOTAL LOAD											21787.33		29925.21	
Dilution												5.632179		7.29727

DEP Type Model Mashacket/LilyBulldout			Assumes both 2 and 3 bedroom average wastewater flow.							2 bedroom loading			3 bedroom loading	
	DWELLINGS													
Source	Number	Seasonal	Year Round	Days	Pop.	Water Use gallons	Convert liters	N Conc.		Load milligrams	Load Kilograms	N Conc. mg/l	Load kilograms	concentrati mg/l
Septic														
	2242	1359	883											
Year round				365	1.64	1.8E+08	6.8E+08		35	2.4E+10	23849.82		35774.73	
Year rnd. guests				25	1.64	0	0		35	0	0		0	
Summer				75	4.77	0	0		35	0	0		0	
Shoulder season				25	1.64	0	0		35	0	0		0	
	Number		Sq. Ft/res	Fert/1000s.f.				Leach loss						
Lawns	2242		2700	1.5				0.25			1029.49		1029.49	
Farms	41.2		1794672	3.444				0.4			1121.243		1121.243	
Golf	5.9		257004	3.5				0.25			101.9857		101.9857	
Pasture	62.6		2726856	1				0.33			408.1009		408.1009	
								mg/l						
Precipitatio	1366.9		59542164				3.1E+09	0.05			155.9601		155.9601	
Other (Hors	20										267.5737		267.5737	
Other (STP)				365	385000	1.4E+08	5.3E+08	2.4		1.3E+09	1276.529		828.915	
Commercial				365	46011	16794015	63565347	35		2.2E+09	2224.787		2224.787	
TOTAL LOAD											30435.49		41912.78	
Dilution												6.923327		8.848351

Table C 9

NITROGEN LOADING MODELS

Martha's Vineyard Commission Model

Mashacket/Lily Now

	DWELLINGS				Pop.	Water Use	Convert	N Conc.	Load	Load	N Conc.
Source	Number	Seasonal	Year Roun	Days		gallons	liters		milligrams	Kilograms	mg/l
Septic											
	1530	927	603								
				365	2.35	24819305	93941070	35	3.3E+09	3287.937	
Year round				25	2.35	1699952	6434320	35	2.3E+08	225.2012	
Year rnd. guests				75	4.77	15921535	60263010	35	2.1E+09	2109.205	
Summer				25	2.35	2614648	9896441	35	3.5E+08	346.3754	
Shoulder season								Leach loss			
	Number		Sq. Ft/res	Fert/1000s.f.				0.25		702.551	
Lawns	1530		2700	1.5				0.4		1121.243	
Farms	41.2		1794672	3.444				0.25		101.9857	
Golf	5.9		257004	3.5				0.33		408.1009	
Pasture	62.6		2726856	1							
								mg/l			
Precipitatic	1366.9		59542164				3.1E+09	0.05		155.9601	
Other (Hors	20									267.5737	
Other (STP)				365	159662	58276630	2.2E+08	2.4	5.3E+08	529.3849	
Commercial				365	46011	16794015	63565347	35	2.2E+09	2224.787	
TOTAL LOAD										11480.31	
Dilution											3.212281

MVC Model

Mashacket/LilyBuildout

	DWELLINGS				Pop.	Water Use	Convert	N Conc.	Load	Load	N Conc.
Source	Number	Seasonal	Year Roun	Days		gallons	liters		milligrams	Kilograms	mg/l
Septic											
	2242	1359	883								
				365	2.35	36369204	1.4E+08	35	4.8E+09	4818.01	
Year round				25	2.35	2491041	9428592	35	3.3E+08	330.0007	
Year rnd. guests				75	4.77	23330772	88306973	35	3.1E+09	3090.744	
Summer				25	2.35	3831399	14501844	35	5.1E+08	507.5645	
Shoulder season								Leach loss			
	Number		Sq. Ft/res	Fert/1000s.f.				0.25		1029.49	
Lawns	2242		2700	1.5				0.4		1121.243	
Farms	41.2		1794672	3.444				0.25		101.9857	
Golf	5.9		257004	3.5				0.33		408.1009	
Pasture	62.6		2726856	1							
								mg/l			
Precipitatic	1366.9		59542164				3.1E+09	0.05		155.9601	
Other (Hors	20									267.5737	
Other (STP)				365	385000	1.4E+08	5.3E+08	2.4	1.3E+09	1276.529	
Commercial				365	46011	16794015	63565347	35	2.2E+09	2224.787	
TOTAL LOAD										15331.99	
Dilution											3.867271

Table C 10

APPENDIX D
REPORTS FROM DEP NITROGEN LOADING MODEL

The full text of reports generated by the DEP model are printed for the Tisbury, Lagoon-State Forest and Mashacket-Lily Zone II's. Reports generated for the Farm Neck and Wintucket-Quenomica Zone II's are not printed. The results are not considered acceptable for those Zone II's, and the reports might be misleading.

NO3: DEP NITROGEN LOADING MODEL
Horsley & Witten, Inc.

Date: 12/27/2002
File: C:\PROGRA~1\NITROG~1\TISBURY.NO3
Run title: TISBURY
Prepared by: JO-ANN TAYLOR
Department or Firm: MVC
Zone II location: MARTHA'S VINEYARD
Date of zoning data used for buildout: 1999

MODELED NITROGEN CONCENTRATIONS

Existing: 3.15 mg/l
After buildout: 3.80 mg/l

ANALYSIS

	Water mgd	Water %	Nitrogen lb/yr	Nitrogen %
Septic systems	0.22	6.7	23218.4	61.4
Sewer leakage	0.00	0.0	0.0	0.0
Treatment plant	0.00	0.0	0.0	0.0
Precipitation	3.04	93.3	2782.1	7.4
Surface Water	0.00	0.0	0.0	0.0
Lawn Fertilizer			5665.5	15.0
Agriculture			5856.5	15.5
Golf courses			266.8	0.7
Landfill			0.0	0.0
TOTAL	3.26	100.0	37789.2	100.0

Calculated recharge: 16 in/year

INPUT VALUES

1. RESIDENTIAL		
Single family houses	1146	houses
with sewers	0	houses
Multi-family units	11	units
with sewers	0	units
Average occupancy	2.48*	people/unit
N waste per person	5.9	lbs/person/day
Lawn area per house	5000	square feet
Lawn fertilizer rate	3	lbs N/1000 sq ft/year
percent leached	25	%
2. COMMERCIAL AND INDUSTRIAL		
Total land area	36.25	acres
All business water	9930	gal/day
Sewered business water	0	gal/day
All municipal water	0	gal/day
Sewered municipal water	0	gal/day
Septic N concentration	35	mg/l
3. AGRICULTURE		
Crop A area	85	acres
ferilizer rate	150	lbs N/acre/year
percent leached	40*	%
Crop B area	17.7	acres

fertilizer rate	40	lbs N/acre/year
percent leached	33*	%
Range/pasture area	26.2	acres
fertilizer rate	40	lbs N/acre/year
percent leached	33*	%
Number of cattle		
N production	162	lbs N/animal/year
percent leached	25	%
Number of horses	6	horses
N production	118	lbs N/horse/year
percent leached	25	%
Number of fowl		
N production	1.3	lbs N/bird/year
percent leached	25	%

4. OTHER NITROGEN SOURCES

Landfill area	9.4	acres
leaching rate	0	lbs N/acre/year
Golf course area	7	acres
fertilizer rate	3.5	lbs N/1000 sq ft/year
percent leached	25	%
STP flow rate	0	gal/day
N concentration		

5. HYDROLOGICAL DATA

Zone II area	2521.2	acres
Approved pumping rate	3.26	mgd
Pct surface water	0	%
Surface N conc		
Precipitation N conc	0.3	mg/l

6. FUTURE DEVELOPMENT

Single family houses	349	houses
with sewers	0	houses
Multi-family units	0	units
with sewers		
Business water use	1155	gal/day
sewered water use	0	gal/day
Point source flow	0	gal/day
N concentration		

TITLE 5 ALLOCATION

Available nitrogen load (after buildout)	11895.8	lbs/year
Residential allocation	100.0	%
available N load	11895.8	lbs/year
max. new residences	647	units
Commercial allocation	0.0	%
available sewage flow	0	gal/day

*Changed default value requires justification for DEP approval.

NO3: DEP NITROGEN LOADING MODEL
Horsley & Witten, Inc.

Date: 2/24/2003
File: untitled
Run title: LAGOON-STATE FOREST
Prepared by: JO-ANN TAYLOR
Department or Firm: MVC
Zone II location: MARTHA'S VINEYARD
Date of zoning data used for buildout: 1999

MODELED NITROGEN CONCENTRATIONS

Existing:	1.84 mg/l
After buildout:	1.88 mg/l

ANALYSIS

	Water mgd	Water %	Nitrogen lb/yr	Nitrogen %
Septic systems	0.09	2.5	10098.6	46.2
Sewer leakage	0.00	0.0	0.0	0.0
Treatment plant	0.00	0.0	0.0	0.0
Precipitation	3.72	97.5	3403.0	15.6
Surface Water	0.00	0.0	0.0	0.0
Lawn Fertilizer			2502.7	11.4
Agriculture			5439.3	24.9
Golf courses			438.3	2.0
Landfill			0.0	0.0
TOTAL	3.82	100.0	21881.9	100.0

Calculated recharge: 21 in/year

INPUT VALUES

1. RESIDENTIAL		
Single family houses	641	houses
with sewers	0	houses
Multi-family units	0	units
with sewers	0	units
Average occupancy	2.57*	people/unit
N waste per person	5.9	lbs/person/day
Lawn area per house	5000	square feet
Lawn fertilizer rate	3	lbs N/1000 sq ft/year
percent leached	25	%
2. COMMERCIAL AND INDUSTRIAL		
Total land area	3.19	acres
All business water	0	gal/day
Sewered business water	0	gal/day
All municipal water	0	gal/day
Sewered municipal water	0	gal/day
Septic N concentration	35	mg/l
3. AGRICULTURE		
Crop A area	90.655	acres
fertilizer rate	150	lbs N/acre/year
percent leached	40*	%

Crop B area		
fertilizer rate		
percent leached	25	%
Range/pasture area		
fertilizer rate		
percent leached	25	%
Number of cattle		
N production	162	lbs N/animal/year
percent leached	25	%
Number of horses		
N production	118	lbs N/horse/year
percent leached	25	%
Number of fowl		
N production	1.3	lbs N/bird/year
percent leached	25	%
4. OTHER NITROGEN SOURCES		
Landfill area	0	acres
leaching rate		
Golf course area	11.5	acres
fertilizer rate	3.5	lbs N/1000 sq ft/year
percent leached	25	%
STP flow rate	0	gal/day
N concentration	0	mg/l
5. HYDROLOGICAL DATA		
Zone II area	2443.1	acres
Approved pumping rate	3.816	mgd
Pct surface water	0	%
Surface N conc	0	mg/l
Precipitation N conc	0.3	mg/l
6. FUTURE DEVELOPMENT		
Single family houses	25	houses
with sewers	0	houses
Multi-family units	0	units
with sewers	0	units
Business water use	0	gal/day
sewered water use	0	gal/day
Point source flow	0	gal/day
N concentration	0	mg/l

TITLE 5 ALLOCATION

Available nitrogen load (after buildout)	36277.0	lbs/year
Residential allocation	100.0	%
available N load	36277.0	lbs/year
max. new residences	1918	units
Commercial allocation	0.0	%
available sewage flow	0	gal/day

*Changed default value requires justification for DEP approval.

NO3: DEP NITROGEN LOADING MODEL
Horsley & Witten, Inc.

Date: 2/24/2003
File: C:\PROGRA~1\NITROG~1\MASHACKE.NO3
Run title: MASHACKET-LILY
Prepared by: TAYLOR
Department or Firm: MVC
Zone II location: MARTHA'S VINEYARD
Date of zoning data used for buildout: 1999

MODELED NITROGEN CONCENTRATIONS

Existing: 4.47 mg/l
After buildout: 5.72 mg/l

ANALYSIS

	Water mgd	Water %	Nitrogen lb/yr	Nitrogen %
Septic systems	0.25	12.6	26990.1	77.5
Sewer leakage	0.00	0.0	0.0	0.0
Treatment plant	0.16	8.0	1168.0	3.4
Precipitation	1.59	79.4	1451.5	4.2
Surface Water	0.00	0.0	0.0	0.0
Lawn Fertilizer			1120.4	3.2
Agriculture			3888.3	11.2
Golf courses			224.1	0.6
Landfill			0.0	0.0
TOTAL	2.00	100.0	34842.6	100.0

Calculated recharge: 16 in/year

INPUT VALUES

1. RESIDENTIAL

Single family houses	1530	houses
with sewers	0	houses
Multi-family units	0	units
with sewers	0	units
Average occupancy	1.64*	people/unit
N waste per person	5.9	lbs/person/day
Lawn area per house	2700*	square feet
Lawn fertilizer rate	.735*	lbs N/1000 sq ft/year
percent leached	25	%

2. COMMERCIAL AND INDUSTRIAL

Total land area	20.25	acres
All business water	46011	gal/day
Sewered business water	0	gal/day
All municipal water	0	gal/day
Sewered municipal water	0	gal/day
Septic N concentration	35	mg/l

3. AGRICULTURE

Crop A area	41.2	acres
fertilizer rate	150	lbs N/acre/year
percent leached	40*	%

Crop B area	45.4	acres
fertilizer rate	40	lbs N/acre/year
percent leached	33*	%
Range/pasture area	17.2	acres
fertilizer rate	40	lbs N/acre/year
percent leached	33*	%
Number of cattle		
N production	162	lbs N/animal/year
percent leached	25	%
Number of horses	20	horses
N production	118	lbs N/horse/year
percent leached	25	%
Number of fowl		
N production	1.3	lbs N/bird/year
percent leached	25	%

4. OTHER NITROGEN SOURCES

Landfill area	25.8	acres
leaching rate	0	lbs N/acre/year
Golf course area	5.88	acres
fertilizer rate	3.5	lbs N/1000 sq ft/year
percent leached	25	%
STP flow rate	159662	gal/day
N concentration	2.4	mg/l

5. HYDROLOGICAL DATA

Zone II area	1366.9	acres
Approved pumping rate	2	mgd
Pct surface water	0	%
Surface N conc		
Precipitation N conc	0.3	mg/l

6. FUTURE DEVELOPMENT

Single family houses	712	houses
with sewers	0	houses
Multi-family units	0	units
with sewers	0	units
Business water use	3635.4	gal/day
sewered water use	0	gal/day
Point source flow	0	gal/day
N concentration		

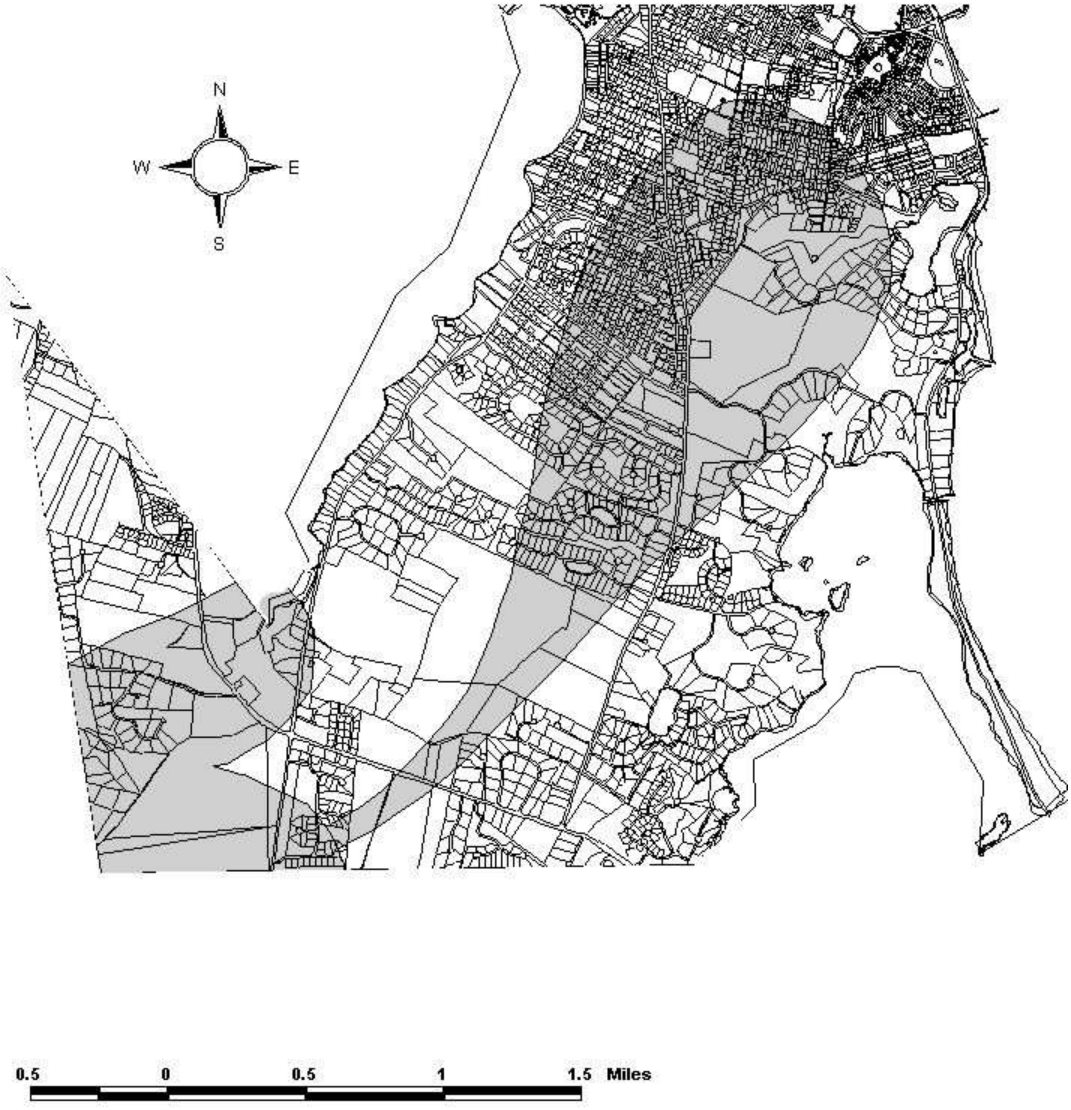
TITLE 5 ALLOCATION

Available nitrogen load (after buildout)	-4361.0	lbs/year
*** Nitrogen load is already too high. There is nothing to allocate under Title 5.		
Residential allocation	100.0	%
available N load	-4361.0	lbs/year
max. new residences	-429	units
Commercial allocation	0.0	%
available sewage flow	0	gal/day

*Changed default value requires justification for DEP approval.

APPENDIX E
EXISTING TOWN REGULATIONS

OAK BLUFFS
GROUNDWATER PROTECTION DISTRICT
(includes shaded lots)



Notice of Public Hearing
Oak Bluffs Planning Board

Under Chapter 40A of the MGL the Oak Bluffs Planning Board Will hold a public hearing on Monday June 22, 1998 at 7:00 pm in the Community Room of the Oak Bluffs School. The purpose of this hearing is to consider the following proposed amendment to the Oak Bluffs Zoning Bylaw and Zoning Map. A copy of the proposed overlay district map is available for inspection in the Office of the Town Clerk.

> Article: To see if the Town will vote to amend the Oak Bluffs Zoning Bylaw and Zoning Map by deleting Section IV of the Zoning Bylaw and substituting in its place the following:

IV. OAK BLUFFS GROUNDWATER PROTECTION DISTRICT

1. PURPOSE OF DISTRICT

The purpose of this Groundwater Protection District is:

a. to promote the health, safety, and general welfare of the community by ensuring an adequate quality and quantity of drinking water for the residents, institutions, and businesses of the Town of Oak Bluffs;
b. to preserve and protect existing and potential sources of drinking water supplies;
c. to conserve the natural resources of the Town; and
d. to prevent temporary and permanent contamination of the environment.

2. SCOPE OF AUTHORITY

The Groundwater Protection District is an overlay district superimposed on the zoning districts. This overlay district shall apply to all new construction, reconstruction, or expansion of existing buildings and new or expanded uses. Applicable activities or uses in a portion of one of the underlying zoning districts which fall within the Groundwater Protection District must additionally comply with the requirements of this district. Uses that are prohibited in the underlying zoning districts shall not be permitted in the groundwater Protection District.

3. DEFINITIONS

For the purposes of this section, the following terms are defined below:

Aquifer: Geologic formation composed of rock, sand or gravel that contains significant amounts of potentially recoverable water.

Groundwater Protection District[i]: The zoning district defined to overlay other zoning districts in the Town of Oak Bluffs. The groundwater protection district may include specifically designated recharge areas.

Impervious Surface: Material or structure on, above, or below the ground that does not allow precipitation or surface water to penetrate directly into the soil.

Mining: The removal or relocation of geologic materials such as topsoil, sand, gravel, metallic ores or bedrock.

Potential Drinking Water Sources[ii]: Areas which could provide significant potable water in the future.

Recharge Areas: Areas that collect precipitation or surface water and carry it to aquifers. Recharge areas may include areas designated as Zone I, Zone II or Zone III.

Toxic or Hazardous Material: Any substance or mixture of physical, chemical, or infectious characteristics posing a significant, actual, or potential hazard to water supplies or other hazards to human health if such substance or mixture were discharged to land or water of the Town of Oak Bluffs. Toxic or hazardous materials include, without limitation, synthetic organic chemicals, petroleum products, heavy metals, radioactive or infectious wastes, acids and alkalis, and all substances defined as Toxic or Hazardous under Massachusetts General Laws (MGL) Chapter 21C and 21E and 310 CMR 30.00, and also include such products as solvents and thinners in quantities greater than normal household use.

4. ESTABLISHMENT AND DELINEATION OF GROUNDWATER PROTECTION DISTRICT

For the purposes of this district, there are hereby established within the town certain groundwater protection areas, consisting of aquifers or recharge areas which are delineated on a map. This map is at a scale of 1 inch to 600 feet and is entitled "Groundwater Protection District, Town of Oak Bluffs," dated May 26, 1998 this map is hereby made a part of the town zoning bylaws and is on file in the Office of the Town Clerk.

5. DISTRICT BOUNDARY DISPUTES

If the location of the District boundary in relation to a particular parcel is in doubt, resolution of boundary disputes shall be through a Special Permit application to the Special Permit Granting Authority (SPGA). Any application for a special permit for this purpose shall be accompanied by adequate documentation.

The burden of proof shall be upon the owner(s) of the land in question to show where the bounds should be located. At the request of the owner(s), the town may engage[iii] a professional engineer (civil or sanitary), hydrologist, geologist, or soil scientist to determine more accurately the boundaries of the district[iv] with respect to individual parcels of land, and shall charge the owner(s) for all the cost of the investigation.

6. **USE REGULATIONS**

In the Groundwater Protection District the following regulations shall apply:

A. **Permitted Uses**

The following uses are permitted[v] within the Groundwater Protection District, provided that all necessary permits, orders, or approvals required by local, state, or federal law are also obtained:

(a) conservation of soil, water, plants and wildlife;

(b) outdoor recreation, nature study, boating, fishing, and hunting where otherwise legally permitted;

(c) foot, bicycle and/or horse paths, and bridges;

(d) normal operation and maintenance of existing water bodies and dams, splash boards, and other water control, supply and conservation devices;

(e) maintenance, repair, and enlargement of any existing structure, subject to Section B (prohibited uses) and Section C (special permitted uses);

(f) residential development, subject to Section B (prohibited uses) and Section C (special permitted uses);

(g) farming, gardening, nursery, conservation, forestry, harvesting, and grazing, subject to Section B (prohibited uses) and Section C (special permitted uses);

(h) Construction, maintenance, repair, and enlargement of drinking water supply related facilities such as, but not limited to, wells, pipelines, aqueducts, and tunnels. Underground storage tanks related to these activities are not categorically permitted.

B. **Prohibited Uses**

The following uses are prohibited[vi],[vii]:

(a) [viii] landfills and open dumps as defined in 310 CMR 19.006;

(b)[ix,x] storage of liquid petroleum products, except the following:

1. normal household use, outdoor maintenance, and heating of a structure;
2. waste oil retention facilities required by statute, rule or regulation;
3. emergency generators required by statute, rule or regulation;
4. treatment works approved under 314 CMR 5.00 for treatment of ground or surface waters;

provided that such storage, listed in items 1 through 4 above, is in freestanding containers within buildings or above ground with secondary containment adequate to contain a spill the size of the container's total storage capacity;

(c) [ix],[xi] landfilling of sludge or septage, unless such storage is in compliance with 310 CMR 32.30 and 310 CMR 32.31;

(d) [ix] storage of sludge and septage, unless such storage is in compliance with 310 CMR 32.30 and 31 CMR 32.31;

(e) [ix], [xii] storage of deicing chemicals unless such storage, including loading areas, is within a structure designed to prevent the generation and escape of contaminated runoff or leachate;

(f) storage of animal manure unless covered or contained in accordance with the specifications of the United States Soil Conservation Service;

(g) earth removal, consisting of the removal of soil, loam, sand, gravel, or any other earth material (including mining activities) to within 4 feet of historical high groundwater as determined from monitoring wells and historical water table fluctuation data compiled by the United States Geological Survey, except for excavations for building foundations, roads, or utility works;

(h) [ix],[xiii] facilities that generate, treat, store, or dispose of hazardous waste subject to MGL
21C and 310 CMR 30.00 as amended, except for;

1. very small quantity generators as defined under 310 CMR 30.000;
2. household hazardous waste centers and events under 310 CMR 30.390;
3. waste oil retention facilities required by MGL Chapter 21, Section 52A;
4. water remediation treatment works approved by DEP for the treatment of contaminated ground or surface waters;

(i) automobile graveyards and junkyards, as defined in MGL Chapter 140B, Section 1;

(j) non-sanitary treatment works which discharge to the ground and that are subject to 314 CMR 5.00, except the following:

1. the replacement or repair of an existing treatment works that will not result in a design capacity greater than the design capacity of the existing treatment works;
2. treatment works approved by the Massachusetts Department of Environmental protection designed for the treatment of contaminated groundwater;

(k) storage of hazardous materials, as defined in MGL Chapter 21E, unless in a free standing container within a building or above ground with adequate secondary containment adequate to contain a spill the size of the container's total storage capacity;

(l) stockpiling and disposal of snow and ice containing deicing chemicals if brought in from outside the district;

(m) storage of commercial fertilizers, as defined in MGL chapter 128, Section 64, unless such storage is within a structure designated to prevent the generation and escape of contaminated runoff or leachate;

C. **Uses and Activities Requiring a Special Permit**

The following uses and activities are permitted only upon the issuance of a Special Permit by the Special Permit Granting Authority[xiv] (SPGA) under such conditions as they may require:

(a)[xiii,xv] enlargement or alteration of existing uses that do not conform to the Groundwater Protection District;

(b)[xvi] those activities that involve the handling of toxic or hazardous materials in quantities greater than those associated with normal household use, permitted in the underlying zoning (except as prohibited under Section B). Such activities shall require a special permit to prevent contamination of groundwater;

(c) any use that will render impervious more than 15% or 2,500 square feet of any lot, whichever is greater. A system for groundwater recharge must be provided which does not degrade groundwater quality. For non-residential uses, recharge shall be by stormwater infiltration basins or similar system covered with natural vegetation, and dry wells shall be used only where other methods are infeasible. For all non-residential uses, all such basins and wells shall be preceded by oil, grease, and sediment traps to facilitate removal of contamination. Any and all recharge areas shall be permanently maintained in full working order by the owner.

7. **PROCEDURES FOR ISSUANCE OF SPECIAL PERMIT**

A. The Special Permit Granting Authority (SPGA)[xvii] under this bylaw shall be the Oak Bluffs Planning Board. Such special permit shall be granted if the SPGA determines, in conjunction with the Board of Health, the Conservation Commission, Highway Department and Water District that the intent of this bylaw as well as its specific criteria, are met. The fee for this permit is $250.00. The SPGA shall not grant a special permit under this section unless the petitioner's application materials include, in the SPGA's opinion, sufficiently detailed, definite, and credible information to support positive findings in relation to the standards given in this section. The SPGA shall document the basis for any departures from the recommendations of the other town boards or agencies in its decision.

B. the SPGA may grant the required special permit application, the SPGA shall transmit one copy to the Board of Health, the Conservation Commission, Highway Department and Water District for their written recommendations.[xvii] Failure to respond in writing within 35 days of receipt by the Board shall indicate approval or no desire to comment by said agency. The necessary number of copies of the application shall be furnished by the applicant.

C. The SPGA may grant the required special permit only upon finding that the proposed use meets the following standards, those specified in Section 6 of this bylaw, and any regulations or guidelines adopted by the SPGA. The proposal use must:

1. in no way, during construction or thereafter, adversely affect the existing or potential quality or quantity of water that is available in the Groundwater Protection District;
2. be designed to avoid substantial disturbance of the soils, topography, drainage, vegetation, and other water-related natural characteristics of the site to be developed.

D. The SPGA may adopt regulations to govern design features of projects. Such regulations shall be consistent with subdivision regulations adopted by the municipality.[xviii]

E. The applicant shall file eight (8) copies of a site plan and attachments. The site plan shall be drawn at a proper scale as determined by the SPGA and be stamped by a professional engineer. All additional submittals shall be prepared by qualified professionals. The site plan and its attachments shall at a minimum include the following information where pertinent:

1. a complete list of chemicals, pesticides, herbicides, fertilizers, fuels and other potentially hazardous materials to be used or stored on the premises in quantities greater than those associated with normal household use;
2. for those activities using or storing such hazardous materials, a hazardous materials management plan shall be prepared and filed with the Hazardous Materials Coordinator, Fire Chief, and Board of Health. The plan shall include:
   (a) provisions to protect against the discharge of hazardous materials or
   wastes to the environment due to spillage, accidental damage, corrosion, leakage, or vandalism, including spill containment and clean-up procedures;
   (b) provisions for indoor, secured storage of hazardous materials and wastes with impervious floor surfaces;
   (c) evidence of compliance with the Regulations of the Massachusetts Hazardous Waste Management Act 310 CMR 30, including obtaining an EPA identification number form the Massachusetts Department of Environmental Protection.
3. proposed down-gradient location(s) for groundwater monitoring well(s), should the SPGA deem the activity a potential groundwater threat.

F. The SPGA shall hold a hearing, in conformity with the provision of MGL Chapter 40A, Section 9, within 65 days after the filing of the application and after the review by the Town Boards, Departments, and Commissions.

Notice of the public hearing shall be given by publication and posting and by first-class mailings to "parties of interest" as defined in MGL Chapter 40A, Section 11. The decision of the SPGA and any extension, modification, or renewal thereof shall be filed with the SPGA and Town Clerk within 90 days following the closing of the public hearing. Failure of the SPGA to act within 90 days shall be deemed as a granting of the permit. However, no work shall commence until a certification is recorded as required by MGL Chapter 40A Section 11.

G. Written notice of any violations of this bylaw shall be given by the Building/Zoning Inspector to the responsible person as soon as possible after detection of a violation or a continuing violation. Notice to the assessed owner(s) of the property shall be deemed notice to the responsible person. Such notice shall specify the requirement or restriction violated and the nature of the violation, and may also identify the actions necessary to remove or remedy the violations and preventive measures required for avoiding future violations and a schedule of compliance. A copy of such notice shall be submitted to the Building Inspector, the Board of Health, Conservation Commission, Town Engineer/Department of Public Works, and Water District. The cost of containment, clean-up, or other action of compliance shall be borne by the owner(s) and operator(s) of the premises.

For situations that require remedial action to prevent adverse impact to the water resources within the Groundwater Protection District, the Town of Oak Bluffs, the building Inspector, the Board of Health, or any of their agents may order the owner(s) or operator(s) of the premises to remedy the violation. If said owner(s) and or operator(s) do not comply with said order, the Town of Oak Bluffs, the Building Inspector, the Board of Health, or any of their agents, if authorized to enter upon such premises under the terms of the special permit or otherwise, may act to remedy the violation. The remediation cost shall be the responsibility of the owner(s) and

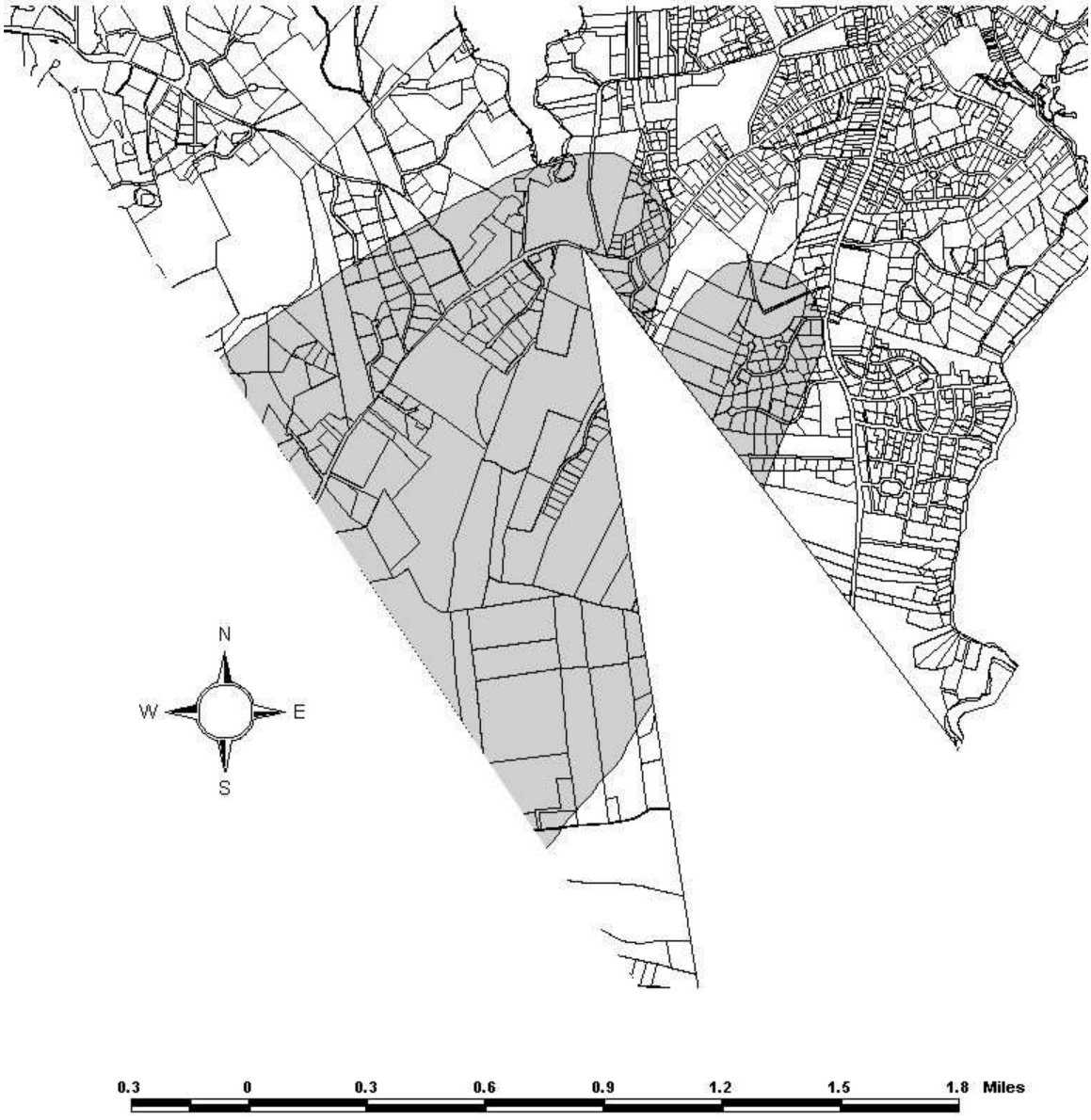
operator(s) of the premises.

8. **SEVERABILITY**

A determination that any portion or provision of this overlay protection district is invalid shall not invalidate any other portion or provision thereof, nor shall it invalidate any special permit previously issued thereunder.

FOOTNOTES

TISBURY
GROUNDWATER PROTECTION DISTRICT
(includes shaded lots)



09.11 GROUNDWATER PROTECTION DISTRICT (Special Overlay District[s])

01. Purpose of District:

The purpose of this Groundwater Protection District is:

a. to promote the health, safety, and general welfare of the community by ensuring an adequate quality and quantity of drinking water for the residents, institutions, and businesses of the Town of Tisbury;
b. to preserve and protect existing and potential sources of drinking water supplies;
c. to conserve the natural resources of the town; and
d. to prevent temporary and permanent contamination of the environment.

02. Scope of Authority

The Groundwater Protection District is an overlay district superimposed on the zoning districts, i.e. Residential District Ten (Zoning Map symbol R-10), Residential District Twenty (Zoning Map symbol R-20),

09.11 GROUNDWATER PROTECTION DISTRICT (Special Overlay District[s]), CONT.

02. Scope of Authority, cont.

Residential District Fifty '(Zoning Map symbol R-50), Residential District Three Acres (Zoning Map symbol R3A) and Business District Two (Zoning Map B-2). This overlay district shall apply to all new construction, reconstruction, or expansion of existing buildings and new or expanded uses. Applicable activities or uses in a portion of one of the underlying zoning districts which fall within the Groundwater Protection District must additionally comply with the requirements of this district. Uses that are prohibited in the underlying zoning districts shall not be permitted in the Groundwater Protection District.

03. Definitions

For the purposes of this section, the following terms are defined below:

Aquifer: Geologic formation composed of rock, sand or gravel that contains significant amounts of potentially recoverable water.

Groundwater Protection District: The zoning district defined to overlay other zoning districts in the Town of Tisbury. The groundwater protection district may include specifically designated recharge areas.

Impervious Surface: Material or structure on, above, or below the ground that does not allow precipitation or surface water to penetrate directly into the soil.

Mining: The removal or relocation of geological materials such as topsoil, sand, gravel, metallic ores or bedrock.

Potential Drinking Water Sources: Areas which could provide significant potable water in the future.

Recharge Areas: Areas that collect precipitation or surface water and carry it to aquifers. Recharge areas may include areas designated as Zone I, Zone II or Zone III.

09.11 GROUNDWATER PROTECTION DISTRICT (Special Overlay District[s]), CONT.

03. Definitions, cont.

Toxic or Hazardous Material: Any substance or mixture of physical, chemical, or infectious characteristics posing a significant, actual or potential hazard to water supplies or other hazards to human health if such substance or mixture were discharged to land or water of the Town of Tisbury. Toxic or hazardous materials include, without limitation, synthetic organic chemicals, petroleum products, heavy metals, radioactive or infectious wastes, acids and alkalis, and all substances defined as Toxic or Hazardous under Massachusetts General Laws (MGL) Chapter 21C and 21E and 310 CMR 30.00, and also include such products as solvents and thinners in quantities greater than normal household use.

04. Establishment and Delineation of Groundwater Protection District

For the purposes of this district, there are hereby established within the town, certain groundwater protection areas, consisting of aquifers or recharge areas which are delineated on the Zoning Map entitled Ground Water Protection Overlay District (Zoning Map symbol G.P.O.D.). This map is at a scale as "noted". This map is hereby made a part of the town zoning bylaws and is on file in the Offices of the Planning Board and Town Clerk.

05. District Boundary Disputes

If the location of the District boundary in relation to a particular parcel is in doubt, resolution of boundary disputes shall be through a Special Permit application to the Special Permit Granting Authority (SPGA). Any application for a Special Permit for this purpose shall be accompanied by adequate documentation.

The burden of proof shall be upon the owner(s) of the land in question to show where the bounds should be located. At the request of the owner(s), the town may engage a professional engineer (civil or sanitary), hydrologist, geologist, or soil scientist to determine more accurately the boundaries of the

09.11 GROUNDWATER PROTECTION DISTRICT (Special Overlay District[s])CONT.

05. District Boundary Disputes, cont.

district with respect to individual parcels of land, and shall charge the owner(s) the total cost of the investigation.

06. Use Regulations

In the Groundwater Protection District the following regulations shall apply:

06.01 Permitted Uses

The following uses are permitted within the Groundwater Protection District, provided that all necessary permits, orders, or approvals required by local, state, or federal law are also obtained:

a. conservation of soil, water, plants, and wildlife;
b. outdoor recreation, nature study, boating, fishing, and hunting where otherwise legally permitted;
c. foot, bicycle and/or horse paths, and bridges;
d. normal operation and maintenance of existing water bodies and dams, splash boards, and other water control, supply and conservation devices;
e. maintenance, repair, and enlargement of any existing structure, subject to Section 06.02 (prohibited uses) and Section 06.03 (special permitted uses);
f. residential development, subject to Section 06.02 (prohibited uses) and Section 06.03 (special permitted uses);
g. farming, gardening, nursery, conservation, forestry, harvesting, and grazing, subject to Section 06.02 (prohibited uses) and Section 06.03 (special permitted uses);
h. construction, maintenance, repair, and enlargement of drinking water supply related facilities such as, but not limited to, wells, pipelines, aqueducts, and tunnels. Underground storage tanks related to these activities are not categorically permitted.
i. Municipal Wastewater Treatment facilities which discharge outside the Groundwater Protection District.

09.11 GROUNDWATER PROTECTION DISTRICT (Special Overlay District[s])CONT.

06.02 Prohibited Uses

The following uses are prohibited:

a. landfills and open dumps as defined in 310 CMR 19.006;
b. storage of liquid petroleum products, except the following:

1. normal household use, outdoor maintenance, and heating of a structure;
2. waste oil retention facilities required by statute, rule, or regulation;
3. emergency generators required by statute, rule or regulation;
4. treatment works approved under 314 CMR 5.00 for treatment of ground or surface waters;

provided that such storage, listed in items 1 through 4 above, is in free-standing containers within buildings or above ground with secondary containment adequate to contain a spill the size of the container's total storage capacity;

c. landfilling of sludge or septage, unless such storage is in compliance with 310 CMR 32.30 and 310 CMR 32.31;
d. storage of sludge and septage, unless such storage is in compliance with 310 CMR 32.30 and 310 CMR 32.31;
e. storage of deicing chemicals unless such storage, including loading areas, is within a structure designed to prevent the generation and escape of contaminated runoff or leachate;
f. storage of animal manure unless covered or contained in accordance with the specifications of the United States Soil Conservation Service;
g. earth removal, consisting of the removal of soil, loam, sand, gravel, or any other earth material (including mining activities) to within 4 feet of historical high groundwater as determined from monitoring wells and historical water table fluctuation data compiled by the United States Geological Survey, except for excavations for building foundations, roads, or utility works;
h. facilities that generate, treat, store, or dispose of hazardous waste subject to MGL 21C and 310 CMR 30.000, as amended, except for;

09.11 GROUNDWATER PROTECTION DISTRICT (Special Overlay District[s], CONT.

06.02 Prohibited Uses, cont.

1. very small quantity generators as defined under 310 CMR 30.000;
2. household hazardous waste centers and events under 310 CMR 30.390;
3. waste oil retention facilities required by MGL Chapter 21, Section 52A;
4. water remediation treatment works approved by DEP for the treatment of contaminated ground or surface waters;

i. automobile graveyards and junkyards, as defined in MGL Chapter 140B, Section 1;
j. non-sanitary treatment works which discharge to the ground and that are subject to 314 CMR 5.00, except the following:

1. the replacement or repair of an existing treatment works that will not result in a design capacity greater than the design capacity of the existing treatment works;

2. treatment works approved by the Massachusetts Department of Environmental Protection designed for the treatment of contaminated groundwater;

k. storage of hazardous materials, as defined in MGL Chapter 21E, unless in a free standing container within a building or above ground with adequate secondary containment adequate to contain a spill the size of the container's total storage capacity;
l. stockpiling and disposal of snow and ice containing deicing chemicals if brought in from outside the district;
m. storage of commercial fertilizers, as defined in MGL Chapter 128, Section 64, unless such storage is within a structure designated to prevent the generation and escape of contaminated runoff or leachate;

09.11 GROUNDWATER PROTECTION DISTRICT (Special Overlay District[s])CONT.

06.03 Uses and Activities Requiring a Special Permit

The following uses and activities are permitted only upon the issuance of a Special Permit by the Special Permit Granting Authority(SPGA) under such conditions as they may require:

a. enlargement or alteration of existing uses that do not conform to the Groundwater Protection District;

b. those activities that involve the handling of toxic or hazardous materials in quantities greater than those associated with normal household use, permitted in the underlying zoning (except as prohibited under Section .02). Such activities shall require a Special Permit to prevent contamination of groundwater;

c. any use that will render impervious more than 15% or 2,500 square feet of any lot, whichever is greater. A system for groundwater recharge must be provided which does not degrade groundwater quality. For non-residential uses, recharge shall be by storm water infiltration basins or similar system covered with natural vegetation, and dry wells shall be used only where other methods are unfeasible. For all non-residential uses, all such basins and wells shall be preceded by oil, grease, and sediment traps to facilitate removal of contamination. Any and all recharge areas shall be permanently maintained in full working order by the owner.

06.04 Procedures for Issuance of Special Permit

01. The Special Permit Granting Authority (SPGA) under this bylaw shall be the Tisbury Planning Board. Such Special Permit shall be granted if the SPGA determines that the intent of this bylaw, as well as its specific criteria, are met. The SPGA shall not grant a Special Permit under this section unless the petitioner's application materials include, in the SPGA's opinion, sufficiently detailed, definite, and credible information to support positive findings in relation to the standards given in this section. The special permit application

06.04 Procedures for Issuance of Special Permit, cont.

shall be accompanied with a fee. The SPGA shall document the bases for any departures from the recommendations of the other town boards or agencies in its decision.

02. Upon receipt of a complete Special Permit application, the SPGA shall transmit one copy to the Board of Health, the Conservation Commission, the Department of Public Works and Tisbury Water Works Commissioners for their written recommendations. Failure to respond in writing within in 35 days of receipt by the Board shall indicate approval or no desire to comment by said agency. The necessary number of copies of the application shall be furnished by the applicant.

03. The SPGA may grant the required Special Permit only upon finding that the proposed use meets the following standards, those specified in

Section 6 of this Bylaw, and any regulations or guidelines adapted by the SPGA. The proposal use must:

a. in no way, during construction or thereafter, adversely affect the existing or potential quality or quantity of water that is available in the Groundwater Protection District; and

b. be designed to avoid substantial disturbance of the soils, topography, drainage, vegetation, and other water-related natural characteristics of the site to be developed.

.04 The SPGA may adopt regulations to govern design features of projects. Such regulations shall be consistent with subdivision regulations adopted by the municipality.

.05 The applicant shall file eight (8) copies of a site plan and attachments. The site plan shall be drawn at a proper scale as determined by the SPGA and be stamped by a professional engineer. All additional submittals shall be prepared by qualified

09.11 GROUNDWATER PROTECTION DISTRICT (Special Overlay District[s]), CONT.

06.04 Procedures for Issuance of Special Permit, cont.

professionals. The site plan and its attachments shall at a minimum include the following information where pertinent:

a. a complete list of chemicals, pesticides, herbicides, fertilizers, fuels, and other potentially hazardous materials to be used or stored on a premises in quantities greater than those associated with normal household use;

b. for those activities using or storing such hazardous materials, a hazardous materials management plan shall be prepared and filed with the Hazardous Materials Coordinator, Fire Chief, and Board of Health. The plan shall include:

1. provisions to protect against the discharge of hazardous materials or wastes to the environment due to spillage, accidental damage, corrosion, leakage, or vandalism, including spill containment and clean-up procedures;

2. provisions for indoor, secured storage of hazardous materials and wastes with impervious floor surfaces;

3. evidence of compliance with the Regulations of the Massachusetts Hazardous Waste Management Act 310 CMR 30, including obtaining an EPA identification number from the Massachusetts Department of Environmental Protection;

c. proposed down-gradient location(s) for groundwater monitoring well(s), should the SPGA deem the activity a potential groundwater threat.

.06 The SPGA shall hold a hearing, in conformity with the provision of MGL Chapter 40A, Section 9, within 65 days after the filing of the application and after the review by the Town Boards, Departments, and Commissions.

09.11 GROUNDWATER PROTECTION DISTRICT (Special Overlay District[s]),CONT.

06.04 Procedures for Issuance of Special Permit, cont.

Notice of the public hearing shall be given by publication and posting and by first-class mailings to "parties of interest" as defined in MGL Chapter 40A, Section 11. The decision of the SPGA and any extension, modification, or renewal thereof shall be filed with the SPGA and Town Clerk within 90 days following the closing of the public hearing. Failure of the SPGA to act within 90 days shall be deemed as granting of the permit. However, no work shall commence until a certification is recorded as required by MGL Chapter 40A Section 11.

.07 Written notice of any violations of this bylaw shall be given by the Zoning Enforcement Officer as soon as possible after detection of a violation or continuing violation. Notice to the assessed owner(s) of the property shall be deemed notice to the responsible person. Such notice shall specify the requirement or restriction violated and the nature of the violation, and may also identify the actions necessary to remove or remedy the violations and preventive measures required for avoiding future violations and a schedule of compliance.

The cost of containment, clean-up, or other action of compliance shall be borne by the owner(s) and operator(s) of the premises. For situations that require remedial action to prevent adverse impact to the water resources within the Groundwater Protection District, the Zoning Enforcement Officer may order the owner(s) or operator(s) of the premises to remedy the violation. If said owner(s) and/or operator(s) does not comply with said order, the Zoning Enforcement Officer will enter the premises under the terms of the special permit or otherwise, may act to remedy the violation. The remediation cost shall be the responsibility of the owner(s) and operator(s) of the premises.

.08 Severability

A determination that any portion or provision of this overlay protection district is invalid shall not invalidate any other portion or provision thereof,

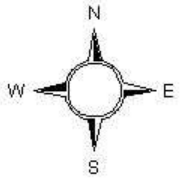
09.11 GROUNDWATER PROTECTION DISTRICT (Special Overlay District[s])CONT.

06.04 Procedures for Issuance of Special Permit, cont.

nor shall it invalidate any special permit previously issued thereunder.

(Adopted Section 09.11: April 13, 1999 - Acting on Article 14)

EDGARTOWN
GROUNDWATER PROTECTION DISTRICT
(includes shaded lots)



TOWN OF EDGARTOWN

BOARD OF HEALTH

GROUNDWATER PROTECTION REGULATION

ARTICLE	TITLE	PAGES
I.	TITLE, NEED AND PURPOSE	9
II.	SCOPE OF AUTHORITY	10
III.	DEFINITIONS	10
IV.	GROUNDWATER PROTECTION ZONES	12
V.	OVERVIEW OF TOWN OF EDGARTOWN AND ITS USES OF AQUIFER	13
VI.	ESTABLISHMENT AND DELINEATION OF GROUNDWATER PROTECTION AREAS	13
VII.	PROHIBITIONS	13
VIII	CONDITIONAL PROHIBITIONS	15
IX.	EFFECTIVE DATES FOR ALL FACILITIES	15
X.	PENALTIES	16
XI	SEVERABILITY	16

TOWN OF EDGARTOWN GROUNDWATER PROTECTION REGULATION

DECEMBER 14,1998

ARTICLE I: TITLE, NEED AND PURPOSE

This regulation shall be known and referred to as:

1.1 Town of Edgartown, Massachusetts Groundwater Protection Regulation.

1.2 As all public and private water supplies are obtained from the same aquifer, it is necessary that a Groundwater Protection Regulation be established for each public water supply well in the town. This need is supported by the fact that the EPA has determined that the entire Island of Martha's Vineyard, including Chappaquiddick, is within the boundaries of a sole source aquifer designation. This means that the Vineyard's aquifer is the sole source of drinking water for the Island's residents and visitors; that there are no viable alternate sources of water in case of contamination; and that such contamination would pose a serious public health hazard.

1.3 The purpose of this Groundwater Protection Regulation is to:

* promote the health, safety and general welfare of the Town of Edgartown by ensuring an adequate quality and quantity of drinking water for all residents, visitors and businesses of the town
* preserve and protect existing and potential sources of drinking water supplies.
* conserve the natural resources of the Town; and prevent temporary and permanent contamination of the environment.

1.4 And whereas:

. siting of land uses that have the potential to release hazardous waste, petroleum products, or other contaminants significantly increases the risk of contamination; and

. poor management practices, accidental discharges, and improper maintenance of these facilities may lead to the release of pollutants; and

. discharges of hazardous wastes, leachate, pathogens, and other pollutants have repeatedly threatened surface and ground water quality throughout Massachusetts; and surface and ground water resources in the Town of Edgartown contribute to the town's drinking water supplies;

therefore, the Town of Edgartown adopts the following regulation, under its authority as specified in Article II of this regulation as a preventative measure for the purposes of:

preserving and protecting the Town of Edgartown’s drinking water resources from discharges of pollutants; and

minimizing the risk to public health and the environment to the Town due to such discharges.

ARTICLE II - SCOPE OF AUTHORITY

2.1 The Edgartown Board of Health (BOH) adopts this regulation pursuant to authorization granted by M. G. L. c. Ill s.31 and S.I 22. The regulation shall apply, as specified herein to all applicable facilities within the Zone Us and/or the Interim Wellhead Protection Areas (IWPA), whichever is the accepted area of protection around the drinking water resources of the town.

These regulations supersede all Zone II and/or Interim Wellhead Protection Area regulations adopted by the Board of Health prior to the effective date.

The effective date of this regulation is December 14, 1998.

2.2 The Groundwater Protection Regulation shall apply to all new construction, reconstruction or expansion of existing buildings change of use and new or expanded uses. Applicable activities or uses in a portion of one of the underlying zoning districts which fall within the Groundwater Protection Areas must additionally comply with the requirements of this regulation. Uses that are prohibited in the underlying zoning districts shall not be permitted in the Zone II's as herein after established.

ARTICLE III- DEFINITIONS

3.1 For the purposes of this regulation, the following words and phrases shall have the following meanings:

Aquifer: Geologic formation composed of rock, sand, or gravel that contains significant amounts of potentially recoverable water.

Commercial Fertilizers: Any substance containing one or more recognized plant nutrients which is used for its plant nutrient content and which is designed for use, or claimed by its manufacturer to have value in promoting plant growth. Commercial fertilizers do not include unmanipulated animal and vegetable manure's, marl, lime, limestone, wood ashes, and gypsum.

Department: The Massachusetts Department of Environmental Protection.

Discharge: The accidental or intentional disposal, deposit, injection, dumping, spilling, leaking, incineration, or placing of toxic or hazardous material or waste upon or into any land or water so that such hazardous waste or any constituent thereof may enter the land or waters of the Commonwealth. Discharge includes, without limitation, leakage of such materials from failed or discarded containers or storage systems and disposal of such materials into any on-site leaching structure or sewage disposal system.

Hazardous or Toxic Materials: Any substance or mixture of physical, chemical, or infectious characteristics posing a significant, actual or potential hazard to water supplies or other hazards to human health if such substance or mixture were discharged to land or water of the Town of Edgartown. Toxic or hazardous materials include, without

limitation, synthetic organic chemicals, petroleum products, heavy metals, radioactive or infectious wastes, acids and alkalis, and all substances defined as Toxic or Hazardous under Massachusetts General Laws (MGL) Chapter 21C and 21E and 310 CMR 30.00, and also include such products as solvents and thinners in quantities greater than normal household use.

Historical High Groundwater Table Elevation: A groundwater elevation which is determined from monitoring wells and historical water table fluctuation data compiled by the United States Geological Survey.

Impervious Surface: Material or structure on, above, or below the ground that does not allow precipitation or surface water to penetrate directly into the soil.

Interim Wellhead Protection Areas (IWPA): For public supply wells or wellfields that lack a Department approved Zone II, the Department will apply an interim wellhead protection area. This interim wellhead protection area shall be a one-half mile radius measured from the well or wellfield for sources whose approved pumping rate is 100,000 gpd or greater. For wells that pump less than 100,000 gpd, the IWPA radius is proportional to the well's approved daily volume following the IWPA Chart as referenced in Division Water Supply Policy 92-01.

Landfill: A facility established (in accordance with a valid site assignment) for the purpose of disposing solid waste into or on the land, pursuant to 310 CMR 19.006.

Mining: The removal or relocation of geologic materials such as topsoil, sand, gravel, metallic ores, or bedrock.

Non-Sanitary Wastewater: Wastewater discharges from industrial and commercial facilities containing wastes from any activity other than collection of sanitary sewage, including, but not limited to, activities specified in the Standard Industrial Classification (SIC) Codes set forth in 310 CMR 15.004(6).

Open Dump: A facility which is operated or maintained in violation of the Resource Conservation and Recovery Act 42 U. S. C. 4004(a)(b), or the regulations and criteria for solid waste disposal.

Recharge Areas: Areas that collect precipitation or surface water and carry it to aquifers. Recharge areas may include areas designated as Zone I, Zone II or Zone III.

Septage: The liquid, solid, and semi-solid contents of privies, chemical toilets, cesspools, holding tanks, or other sewage waste receptacles, septage does not include any material which is a hazardous waste, pursuant to 310 CMR 30.000.

Sludge: The solid, semi-solid, and liquid residue that results from a process of wastewater treatment or drinking water treatment. Sludge does not include grit, screening, or grease and oil which are removed at the headworks of a facility.

Treatment Works: Any and all devices, processes and properties, real or personal, used in the collection, pumping, transmission, storage, treatment, disposal, recycling, reclamation, or reuse of waterbome pollutants, but not including any works receiving a hazardous waste from off the site of the works for the purpose of treatment, storage, or disposal.

Use of Toxic or Hazardous Material: The handling, generation, treatment, storage, or management of toxic or hazardous materials.

Very Small Quantity Generator: Any public or private entity, other than residential, which produces less than 27 gallons (100 kilogram's) a month of hazardous waste or waste oil, but not including any acutely hazardous waste as defined in 310 CMR 30.136.

Waste Oil Retention Facility: A waste oil collection facility for automobile service stations, retail outlets, and marinas which is sheltered and has adequate protection to contain a spill, seepage, or discharge of petroleum waste products in accordance with M. G. L. c. 12 s. 52A.

Other sources for definitions are:

U.S. Geological Survey Water-Supply Paper 1988
Groundwater and Wells Second Edition Published by Johnson Division, St. Paul Minnesota 55112 1986 Page 885 (Glossary)

ARTICLE IV - GROUNDWATER PROTECTION ZONES

4.1 The recharge areas of existing wells are divided into three zones - Zone I, Zone II and Zone III. Each zone has a different level of significance in terms of well head protection and the boundaries of each are determined as follows:

ZONE I - the area requiring the most stringent protection, is a circle around the well with a diameter of 400 feet for wells with DEP approved yields of 100,000 gallons per day (gpd) or greater, which applies to all public wells. Under the Massachusetts Drinking Water Regulations, 310 CMR 22.21 (1)4, requires that the Edgartown Water Department own, or control through conservation restrictions, the entire Zone I. In addition, only those activities directly related to the water supply system are allowed within the Zone I.

ZONE II - the area of an aquifer which contributes water to a well under the most severe pumping and reel-large conditions that can be realistically anticipated (180 days of pumping at safe yield with no recharge from precipitation), as defined in 310 Code of Massachusetts Regulations (CMR) 22.00

ZONE III - the land area beyond the area of Zone II from which surface water and ground-water drain into Zone II, as defined in 310 CMR 22.00.

IWPA (See definitions on page 11)

4.2 To protect groundwater recharge areas for private wells and future public wells land use controls are also addressed in this regulation.

ARTICLE V - OVERVIEW OF TOWN OF EDGARTOWN AND ITS USES OF AQUIFER

5.1 The Town of Edgartown located at the eastern extreme of the Island has a net land area of 26.8 square miles with ground surface elevations throughout town varying between sea level and Elev. 80.
The aquifer slopes west to east with the zone of contribution extending into the Town of West Tisbury in
the Martha's Vineyard State Forest. The year round population is approximately 3,000 with an estimated
additional 10,000 seasonal residents. Although primarily a low density residential town, there is a dense
mercantile and hotel area along Main Street and on the harbor.

5.2 The Edgartown Water Department serves about 2,000 of the estimated 3,800 housing units. The
average summer day demand is about 1.0 million gallons. That leaves about 1500 or one-third outside
the municipal water distribution system which are served by private wells.

5.3 Edgartown has a municipal sewer system and treatment plant that serves about 400 customers who,
for the most part, are located in the densely populated downtown area. The treated effluent from the
Wastewater Plant is discharged to the ground as are all wastewaters from the individual subsurface
wastewater disposal systems that serve the remainder of the population.

ARTICLE VI - ESTABLISHMENT AND DELINEATION OF GROUNDWATER PROTECTION AREAS

6.1 Under this regulation, there are hereby established within the Town certain groundwater protection
areas, consisting of aquifers or recharge areas which are delineated on maps which can be viewed at the
office of the Edgartown Board of Health during normal business hours.

Figure 1. Wintucket/Quenomica Wells Groundwater Protection Area.

Figure 2. Meshacket Well Groundwater Protection Area.

Figure 3. Lily Pond Well Groundwater Protection Area.

ARTICLE VII - PROHIBITIONS

A. Notwithstanding any land uses which are otherwise permitted by local, state, and/or other federal
laws, the siting of any of the following is prohibited in the Zone 11 or IWPA:

1. landfills,

2. open dumps,

3. automobile graveyards and junkyards,

4. sludge and septage monofils,

5. stockpiles (disposal) of chemically treated snow and ice that have been removed from highways and roadways outside the Zone II,

6. petroleum, fuel oil and heating oil bulk stations and terminals, including, but not limited to, those listed under Standard Industrial Classification (SIC) Codes 5171 and 5983. SIC Codes are established by the U. S. Office of Management and Budget and maybe determined by referring to the publication. Standard Industrial Classification and any subsequent amendments.

B. Facilities for the treatment or disposal of non-sanitary wastewater are prohibited, with the following exceptions:

1. Replacement or repair of an existing system is exempt if the existing design capacity is not
exceeded; and

2. Treatment works approved by the Department and designed for the treatment of contaminated
ground or surface waters and operated in compliance with 314 CMR 5.05(3) or 5.05(13); and

3. Publicly owned treatment works

C. Facilities that generate, treat, store, or dispose of hazardous waste are prohibited, with the following
exceptions:

1. treatment works for the restoration of contaminated ground or surface waters in compliance with M. G. L. c. 21E and 310 CMR 40.000.

D. Removal of soil, loam, sand, gravel, or any other mineral substances within four feet of the historical
high groundwater table elevation is prohibited with the following exceptions:

1. substances which are removed and redeposited within 45 days of removal on site to achieve a final grade greater than four feet above the historical high water mark; and

2. excavations for the construction of building foundations or the installation of utilities.

E. Land uses that result in impervious cover of more than 15 or 2500 square feet of any lot, whichever is greater, are prohibited; unless a system of artificial recharge of precipitation is provided that
will not result in the degradation of groundwater quality.

ARTICLE VIII-CONDITIONAL PROHIBITIONS

The storage of certain waste materials, chemicals, and petroleum products is prohibited except if contained in accordance with the following requirements.

1. Storage of sludge and septage is prohibited unless storage is in compliance with 310CMR32.00.

2. Storage of roadway de-icing chemicals (sodium chloride, chemically treated abrasives, or other chemicals) and the storage of chemical fertilizers are both prohibited, unless the storage is in a structure that prevents the generation and release of contaminates or contaminated runoff.

3. Storage of animal manure is prohibited unless covered or contained in accordance with the standards and guidelines of the Natural Resource Conservation Service.

4. Storage of liquid hazardous materials, as defined in M. G. L. c. 21E, and/or liquid petroleum products is prohibited unless the materials are stored.

a. above ground level, and

b. on an impervious surface, and

c. in containers (or above ground tanks) within a building, or, outdoors in covered containers (or above ground tanks) designed and operated to hold either 10 of the total possible storage capacity of all container's storage capacity, whichever is greater.

These storage requirements shall not apply to the replacement of existing tanks or systems for the keeping, dispensing or storing of gasoline provided the replacement is performed in a matter consistent
with state and local requirements.

5. Compliance with all provisions of this regulation must be accomplished in a manner consistent with Massachusetts Plumbing, Building and Fire Code requirements.

ARTICLE IX-EFFECTIVE DATES FOR ALL FACILITIES

The effective date of this regulation is December 14,1998 , which shall be identical to the date of adoption of the regulation.

1. As of the effective date of the regulation, all new construction and/or applicable change of use within the Town of Edgartown shall comply with the provisions of this regulation.

2. Certification of conformance with the provisions of this regulation by the Board of Health shall be prior to issuance of construction and occupancy permits.

The Building Inspector has been notified of this regulation.

ARTICLE X-PENALTIES

Failure to comply with provisions of this regulation will result in the levy of fines of not less than $100.00, but no more than $300.00. Each day's failure to comply with the provisions of this regulation shall constitute a separate violation.

ARTICLE XI-SEVERABILITY

Each provision of this regulation shall be construed as separate to the end that, if any provision, or sentence, clause or phrase thereof, shall be held invalid for any reason, the remainder of that section and all other sections shall continue if full force and effect.

SECTION 3A FLOOR DRAIN REGULATION

FLOOR DRAIN HEALTH REGULATION

EDGARTOWN BOARD OF HEALTH

Section L PURPOSE OF REGULATION

Whereas:

floor drains in industrial and commercial facilities are often tied to a system leading to a leaching structure (e.g. dry well, cesspool, leach field) or a septic system; and

poor management practices and accidental and/or intentional discharges may lead petroleum and other toxic or hazardous materials into these drainage systems in facilities managing these products; and

improper maintenance or inappropriate use of these systems may allow the passage of contaminates or pollutants entering the drain to discharge from the leaching structure or septic system to the ground ; and

discharges of hazardous wastes and other pollutants to floor drains leading to leaching structures and septic systems have repeatedly threatened surface and ground water quality throughout Massachusetts: and surface and ground water resources in the Town of Edgartown contribute to the town's drinking water supplies; the Town of Edgartown adopts the following regulation, under its authority as specified in Section II, as a preventative measure for the purposes of: preserving and protecting the Town of Edgartown’s drinking water resources from discharges of pollutants to the ground via floor drains, and minimizing the threat of economic losses to the Town due to such discharges.

Section II. SCOPE OF AUTHORITY

The Town of Edgartown Board of Health adopts the following regulation pursuant to authorization granted by M.G.L. c. 111 s.31 and s.122. The regulation shall apply, as specified herein, to all applicable facilities, existing and new, within the Town of Edgartown.

Section III. DEFINITIONS

For the purposes of this regulation, the following words and phrases shall have the following meanings:

Commercial and Industrial Facility: A public or private establishment where the principal use is the supply, sale, and/or manufacture of services, products, or information, including but not limited to: manufacturing, processing, or other industrial operations; service or retail establishments; printing or publishing establishments; research and development facilities; small or large quantity generators of hazardous waste; laboratories; hospitals.

Department: The Massachusetts Department of Environmental Protection.

Discharge: The accidental or intentional disposal, deposit, injection, dumping, spilling, leaking, incineration, or placing of toxic or hazardous material or waste upon or into any land or water so that such hazardous waste or any constituent thereof may enter the land or waters of the Commonwealth. Discharge includes, without limitation, leakage of such materials from failed or discarded containers or storage systems and disposal of such materials into any on-site leaching structure or sewage disposal system.

Floor Drain: An intended drainage point on a floor constructed to be otherwise impervious which serves as the point of entry into any subsurface drainage, treatment, disposal, containment, or other plumbing system.

Leaching. Structure: Any subsurface structure through which a fluid that is introduced will pass and enter the environment, including, but not limited to, drywells , leaching catch basins, cesspools, leach fields, and oil/water separators that are not water-tight.
Oil/Water Separator: A device designed and installed so as to separate and retain petroleum based oil or grease, flammable wastes as well as sand and particles from normal wastes while permitting normal sewage or liquid wastes to discharge into the drainage system by gravity. Other common names for such systems include MDC traps, gasoline and sand traps, grit and oil separators, grease traps, and interceptors.

Toxic or Hazardous Material: Any substance or mixture of physical, chemical, or infectious characteristics posing a significant, actual, or potential hazard to water supplies or other hazards to human health if such substance or mixture were discharged to land or water of the Town of Edgartown. Toxic or hazardous materials include, without limitation, synthetic organic chemicals, petroleum products, heavy metals, radioactive or infectious wastes, acids and alkalis, and all substances defined as Toxic or Hazardous under Massachusetts General Laws (MGL) Chapter 21C and 21E or Massachusetts Hazardous Waste regulations (310 CMR 30.000), and also include such products as solvents, thinners, and pesticides in quantities greater that normal household use.

Use of Toxic or Hazardous Material: The handling, generation, treatment, storage, or management of toxic or hazardous materials.

Section IV. PROHIBITIONS

With the exception of discharges that have received (or have applied and will receive) a Department issued permit prior to the effective date of this regulation, no floor drain(s) shall be allowed to discharge, with or without pretreatment (such as an oil/water separator), to the ground, a leaching structure, or septic system in any industrial or commercial facility if such floor drain is located in either:

A. an industrial or commercial process area,

B. a petroleum, toxic, or hazardous materials and/or waste storage area, or

{C. a leased facility without either A or B of this section, but in which the potential for a change of use of the property to a use which does have either A or B is, in the opinion of the Board of Health or its agent, sufficient to warrant the elimination of the ground discharge at the present.}

Section V. REQUIREMENTS FOR EXISTING FACILITIES

A. The owner of a facility in operation prior to the effective date of this regulation with a prohibited (as defined under Section IV) floor drain system shall:

1. disconnect and plug all applicable inlets to and outlets from (where possible) applicable leaching structures, oil/waste separators, and/or septic systems;
2. remove all existing sludge in oil/water separators, septic systems, and where accessible, leaching structures. Any sludge determined to be a hazardous waste shall be disposed of in accordance with state hazardous waste regulations (310 CMR 30.000). Remedial activity involving any excavation and/or soil or groundwater sampling must be performed in accordance with appropriate Department policies;

3. Alter the floor drain system so that the floor drain shall be either:

a. connected to a holding tank that meets all applicable requirements of Department policies and regulations, with hauling records submitted to the Edgartown Board of Health at the time of hauling;

b. connected to a municipal sanitary sewer line, if available, with all applicable Department and local permits; or

c. permanently sealed. {Any facility sealing a drain shall be required to submit for approval to the Board of Health a hazardous waste management plan detailing the means of collecting, storing, and disposing any hazardous waste generated by the facility, including any spill or other discharge of hazardous materials or wastes.}

B. Any oil/water separator remaining in use shall be monitored weekly, cleaned not less than every 90 days, and restored to proper conditions after cleaning so as to ensure proper functioning. Records of the hauling of the removed contents of the separator shall be submitted to the Board of Health at the time of hauling.

C. Compliance with all provisions of this regulation must be accomplished in a manner consistent with Massachusetts Plumbing, Building, and Fire code requirements.

D. Upon complying with one of the options listed under Section V.A.3., the owner/operator of the facility shall notify the Department of the closure of said system by filing the Department's UIC Notification Form {which may be obtained by calling 617-292-5770} with the Department, and sending a copy to the Edgartown Board of Health.

Section VI. EFFECTIVE DATES FOR ALL FACILITIES

The effective date of this regulation is the date posted on the front page of the regulation, which shall be identical to the date of adoption of the regulation which is December 14,1998.

A. Existing Facilities:

1. Owners/Operators of a facility affected by this regulation shall comply with all of its provisions within {120} days of the effective date;

2. All applicable discharges to the leaching structures and septic systems shall be discontinued immediately through temporary isolation or sealing of the floor drain.

B. New Facilities:

1. As of the effective date of the regulation, all new construction and/or applicable change of use within the Town of Edgartown shall comply with the provisions of this regulation.

2. Certification of conformance with the provisions of this regulation by the Board of Health shall be required prior to issuance of construction and occupancy permits.

3. The use of any new oil/water separator shall comply with the same requirements as for existing systems, as specified above in Section {V. B.}

Section VII. PENALTIES

Failure to comply with provisions of this regulation will result in the levy of fines of not less than $100.00, but no more than $300.00. Each day's failure to comply with the provisions of this regulation shall constitute a separate violation.

Section VIII. SEVERABILITY

Each provision of this regulation shall be construed as separate to the end that, if any provision, or sentence, clause or phase thereof, shall be held invalid for any reason, the remainder of that section and all sections shall continue in full force and effect.

SECTION 6.6 GREENLANDS WATER RESOURCE PROTECTION DISTRICT

6.6-1 Purpose

To protect the groundwater resources of the Greenlands property, and the head of the Martha's Vineyard Sole Source Aquifer, as an existing and future water supply resource.

6.6-2 Applicability

A. Boundaries
The map entitled Greenlands Water Resource Protection District, Town of West Tisbury, dated March 15, 1996, is on file with the Town Clerk, and delineates the boundaries of the district. A reduction of this map is attached to this bylaw for informational purposes only and is not the official map of the district.

B. Boundary Disputes
If the location of the recharge area for Zone II areas of public supply wells or the Greenlands property itself is challenged by an applicant, the Planning Board shall resolve the boundary dispute. Any application shall be accompanied by adequate documentation. The burden of proof shall be upon the owner(s) of the land in question to show where the bounds should be properly located. At the request of the owner(s), the Planning Board may engage a professional engineer, hydrologist or geologist to determine more accurately where the boundary should lie with respect to the individual parcels of land and may charge the owner(s) for all or part of the cost of this investigation pursuant to Section 9.5 of this bylaw.

C. Exemptions
The following materials, activities and facilities are exempt from the provisions of the Greenlands Protection District:

1. Household waste including garbage, trash and domestic sanitary sewage.

2. Wastes generated from growing agricultural crops or manure returned to the soil as fertilizer and applied at recommended agronomic rates.

3. Manure generated by the equivalent of three (3) or fewer large animals (horses or cows.)

4. Hazardous materials which are or will be displayed for sale at retail establishments, in compliance

with labeling requirements

5. Hazardous materials or wastes in normal household volumes for strictly residential use.

6.6-3 Allowable Uses

Any residential, recreational, agricultural, retail or wholesale businesses, light industrial or open space use permitted in the underlying zoning districts (RU, MB), subject to the regulations and restrictions of Sections 6.6-4 and 6.6-5.

6.6-4 Prohibited Uses

The following uses are found to pose significant threats to the quality of the groundwater and are prohibited within the boundaries of the District:

A. Landfills, open dumps, auto recycling, auto junk and salvage yards, landfilling of sludge or septage with the exception of disposal of brush, stumps and demolition debris as currently regulated by the Board of Health.

B. Underground storage tanks for any hazardous waste for commercial or residential purposes.

C. Businesses and industries, not agricultural, that dispose of or process wastewaters on-site unless holding a Groundwater Discharge Permit on the date of the original adoption of these regulations.

D. Trucking terminals, bus terminals, car washes, motor vehicle fuel sales, and commercial fuel storage and sales.

E. Outside storage of commercial fertilizers or manures, unless exempted by Subsection 6.6-2(C) or conducted in a manner that prevents escape of contaminated runoff or leachate.

F. Earth removal to within four (4) feet of the historical high groundwater level, unless the materials removed are replaced within 45 days to achieve a final grading greater than four (4) feet above historical high groundwater level.

G. Storage of liquid petroleum products of any kind, except:

1. For normal household use or for the heating of a structure as further regulated by the Board of Health.

2. Waste oil retention facilities as required by G.L. 21, Section 52a.

3. Storage for emergency generators required by statute, rule, or regulation.

All new or replacement fuel storage systems must be approved for spill containment by the Board of Health prior to issuance of a permit by the Fire Chief. Those systems located in the District will be required to provide approved containment adequate to hold a spill the size of the containers' capacity plus ten (10) percent.

H. Treatment or disposal works for non-sanitary waters subject to 314 CMR 5.00 except:

1. Treatment works approved by the DEP for the treatment of contaminated groundwater.

2. Treatment works which would result in a clearly indicated net improvement in groundwater quality recharging the District as regulated by the Board of Health.

I. Uses of any kind that involve hazardous wastes or hazardous materials in excess of normal household volumes unless granted a Special Permit as described in Subsection 6.6-5(C).

6.6-5 Uses Allowed by Special Permit

A. General Provisions

1. A Special Permit is required for uses listed in Subsections 6.6-5(B) and (C) which are considered to pose a threat to groundwater quality if not properly designed, installed, and maintained.

2. The Planning Board is the Special Permit Granting Authority within the Greenlands District.

3. There are two types of Special Permits for the District. Special Permit #1 applies to uses which do not involve hazardous wastes or materials. In order for the Planning Board to grant a Special Permit #2, the application must first be reviewed by the Board of Health, which may recommend conditions of approval. Board of Health recommendations and conditions shall be binding on the Planning Board.

4. Upon submission of an application for a Special Permit under this Article, the Planning Board reserves the right to hire independent consultant(s), pursuant to Section 9.5 of this bylaw, whose services shall be paid for by the Applicant(s), to evaluate the proposal. Such consultants may include professional engineers, geologists, hydrologists, and/or other specialists.

B. Special Permit #1: Uses Involving No Hazardous Wastes or Materials
The following uses require Special Permit #1:

1. The application of fertilizers for non-domestic or non-agricultural purposes in accordance with state and federal standards.

2. Any use that will render impermeable more than 2,500 square feet or 15 percent of any lot, whichever is greater. To the extent feasible, runoff from impervious surfaces shall be recharged on the site by being diverted to areas covered with vegetation for infiltration. Dry wells and infiltration basins will only be used where other methods are not feasible, and shall include oil, grease and sediment traps to remove contaminants. All recharge areas shall be maintained in full working order by the owner(s).

3. Enlargement or alteration of existing uses that do not conform with this overlay district.

C. Special Permit #2: Uses Involving Hazardous Wastes or Materials
Upon a favorable recommendation by the Board of Health, the Planning Board may grant a Special Permit #2, with appropriate conditions, for:

1. Uses Involving Hazardous Wastes
Non-agricultural businesses and industries that generate, use, treat, store, process or dispose of hazardous wastes (subject to G.L. 21C and 310 CMR 30.00). Such permits shall be limited to the following, unless the Board is provided with sufficient documentation to assure that the requirements of Subsections 6.6-5(D), (E), and (G) will be met:

   a. Very Small Quantity Generators as defined in 310 CMR 30.00 which store no more than 100 kilograms (220 pounds) on site at any one time.

b. Household Hazardous Waste collection centers or events pursuant to 310 CMR 30.390.

c. Waste Oil Retention Facilities required by G.L. Chapter 21, Section 52a.

2. Uses Involving Hazardous Materials
Uses involving hazardous materials, in compliance with the handling requirements in Subsection 6.6-5(D) below. The owner(s) must provide the board with a complete plan for recycling or disposing of all wastes generated by the use of hazardous materials.

D. Special Requirements for Hazardous Wastes and Hazardous Materials
The above-ground storage of hazardous materials (Appendix A in 105 CMR 670.00 and those listed as toxic or hazardous in G.L. 21E) and hazardous wastes (G.L. Chapter 32C) must be in product tight containers arranged in an orderly manner with wastes stored separately from unused materials, meeting the following general requirements:

1. All materials must be stored on an impervious surface within covered structures which are designed to contain spills of not less than 110% of the volume stored and to prevent flow of any product to exposed soils, floor drains or outside drains. Basement areas may be considered to meet this requirement; storage areas must be clearly marked with signs indicating the dedicated nature of the area;

2. Containers of all non-waste hazardous materials must be labeled with the product name(s) or chemical(s), health hazards associated with the chemical(s) and target organ effects from exposure; and

3. The volume of hazardous wastes stored on-site is limited to 100 kilograms (220 pounds) unless greater volumes are specifically permitted by the Planning Board.

Records and receipts for proper disposal of all hazardous wastes must be kept on site and available for inspection by the Board of Health or its agent.

E. Submission Requirements
The applicant shall file six (6) copies of a site plan prepared by a qualified professional with the Planning Board, accompanied by adequate documentation provided by a professional engineer, professional geologist or hydrologist. The site plan shall include, at a minimum, the following information as appropriate to the section under which a Special Permit is sought:

1. Runoff recharge features and provisions to prevent loss of recharge.

2. Provisions to control soil erosion and sedimentation, soil compaction and to prevent seepage from sewer pipes.

3. Provisions to remove contaminants from runoff generated on the property.

4. The nature and volumes of hazardous materials or wastes including hazardous materials safety data sheets. All provisions to meet the requirements in Subsection 6.6-5(D), including spill retention and cleanup and measures to prevent escape of hazardous materials or wastes as appropriate.

F. Procedures
The Planning Board shall distribute copies of all application materials to the Board of Health and the

Conservation Commission, each of which shall review the application and shall submit recommendations and comments to the Planning Board. For Special Permit #2, Board of Health recommendations are binding. Failure of boards to make recommendations within 35 days of distribution of the applications shall be deemed to be lack of opposition. One copy of the application materials shall be retained by the Town Clerk for viewing by the public during office hours.

G. Standards

The Planning Board shall not grant a Special Permit under this section unless the petitioner's application materials include sufficiently detailed, definite, and credible information to support positive findings that the application meets the following standards:

1. The proposed use will not adversely affect the existing or potential quality or quantity of water available in the District.

2. The proposed use will be designed to avoid substantial disturbance of the soils, topography, drainage, vegetation, and other water-related natural characteristics of the site that affect the recharge or flow of groundwater.

6.6-6 Non-conforming Uses

Non-conforming uses which were lawfully existing, begun or in receipt of a Building or Special Permit prior to the first publication of notice of public hearing for this bylaw may be continued. Such non-conforming uses may be extended or altered, as specified in G.L. Chapter 40A, Section 6, provided that there is a finding by the Planning Board that such change does not increase the danger of groundwater pollution from such use.


Greenlands Water Resource District
West Tisbury
SCALE: 1 : 25000
KEY
Residential dwelling
Approximate ground water flow
MVC estimated 20C for a Greenlands well IMGD
Prepared by the Martha's Vineyard Commission under a DPW/EPA 604(b) Grant 91/93.
GREENLANDS
TOWN OF
WEST TISBURY
MARTHA'S VINEYARD • MASSACHUSETTS
GREENLANDS
PREPARED BY: THE MARTHA'S VINEYARD COMMISSION
DATE: JUNE 1986 REVISED: MARCH 1995
N
W
E
S

APPENDIX F
MANAGEMENT PLAN FOR GREENLANDS

Approved 8/31/82
by Commission
M. Littlefield
W. Marks
T. Merriman II
J. Millett
J. Alley

To: Joel A. Lerner

From: West Tisbury Conservation Commission

Subject Greenlands Management Plan

Date: August 30, 1982

The West Tisbury Conservation Commission's Greenlands Management Plan reflects the input of all the Town's Boards, the Martha's Vineyard State Forest Committee, the Martha's Vineyard Commission, the Duke's County Extension Service, the Department of Environmental Management's Division of Forest and Parks, the Division of Conservation Services and the interested public.

This plan is consistent with the purpose of West Tisbury's Open Space Plan and the Management Plan of Martha's Vineyard State Forest.

The most important focus of the West Tisbury Conservation Commission's Greenlands Management Plan is the utilization of lands for aquifer protection as a present and future water supply resource. All other management uses of this parcel are of secondary import.

The management of Greenlands as a water supply resource makes it incumbent upon West Tisbury's Conservation Commission to make sure that any use of Greenlands will not jeopardize the potability of the groundwater for present and future Island people. Therefore, any use of or access to Greenlands will come under the purview of the Conservation Commission and/or its duly appointed "Greenlands" manager.

Management as a Water Resource

The first order of management will be to designate those areas of Greenlands most suitable for well-field placement because, but not limited to, factors such as proximity to population centers, points of access, geographical location relative to existing public water supply systems, topographic advantage and utility tie-in. By defining potential well-field sites, the West Tisbury Conservation Commission will be better able to make sure that other uses of Greenlands will not create conflict at some future date.

The management of Greenlands as a water resource also takes into consideration future demands of the property to produce water for other Island towns. At such time in history, the West Tisbury Conservation Commission or its designated agent will establish the necessary well-field site(s) so that the same can be surveyed and conveyed in title to West Tisbury's Water Commissioners with appropriate easement for water lines. Such conveyance of land shall take place only after the Town(s) desiring to purchase water by arrangement with West Tisbury have, to the satisfaction of West Tisbury's Conservation Commission and its Greenlands manager, provided adequate proof of need, explored all viable sources of water within their respective Town bounds, and have taken water conservation measures to minimize water waste.

If at any future date there is a conflict between a Town desiring to have ss to Greenlands water by arrangement and West Tisbury's Conservation Com- ion, such conflict shall be resolved by arbitration through the Duke's ty Commissioners and/or its designated representative(s).

gement of Passive Recreation

Passive recreation represents a complimentary use of the Greenlands parcel. ong as such use will not endanger the underground aquifer. Passive recrea- shall include activities such as hiking, bicycling, horseback riding, bird ing, etc. No motorized vehicles will be permitted except for emergency or ol purposes. No camping shall be permitted. No new roads, trails or paths l be created through or into Greenlands except by permission of the Town's ervation Commission. However, maintenance of existing roads, trails and shall be permitted.

Manny Correllus of the State Forest Advisory Committee has indicated that djacent State Forest bicycle path runs along the Greenlands parcel to the and to the south. Mr. Correllus expressed that Greenlands will provide a nient place for bicyclists to stop and venture into. Mr. Correllus has stated that there was no need for redundant bicycle trails to be located n Greenlands. Mr. Correllus indicated at a meeting on 23 June 1982 that xisting network of roads, trails and paths provided adequate access to and gh Greenlands for recreation and fire protection pruposes. Mr. Correllus has expressed that the passive recreational use of Greenlands would augment e compatible to uses allowed in the State Forest which are in effect to the c good.

ement of Access

Since access to any given property has considerable impact on its character, absolutely necessary that the West Tisbury Conservation Commission carefully e the access points to Greenlands.

Access to Greenlands from the east will probably be provided by a land swap en DEM's Division of Forest and Parks (see 1 July 1982 Memorandum from rt A. Bliss to Joel Lerner) and the Town of West Tisbury. Since this swap e made possible by trading a 15-acre piece of Greenlands coming under the ement purview of the West Tisbury Conservation Commission, to be consistent, ccess road the 15 acres is traded for should also be subject to management West Tisbury Conservation Commission or its agent.

The access point from the east shall be restricted in use by West Tisbury's vation Commission to only those property owners of current record. These of current record may pass on such rights to use the restricted access controlled by West Tisbury's Conservation Commission (please see William Memorandum of 23 June 1982 meeting).

ccess to Greenlands from the west is presently being investigated by the nd if successful, will provide another point of entry to Greenlands for e recreation purposes. The use and management of this westerly access point y nearby public accomodation (i.e. bicycle parking etc.), will come under nagement of the West Tisbury Conservation Commission.

Management of Possible Agricultural/Horticultural Use

According to the surface soil analysis performed by William Wilcox of the Duke's County Extension Service, there are some sections of Greenlands which may be suitable for agricultural purposes. After conducting several on-site inspections of Greenlands by the Town's Conservation Commission members, it was noted that much of the property is abundant with stands of blueberries, huckleberries and blackberries. The presence of such a harvestable resource has led to the decision that careful farming of the natural berry crop may be a reasonable form of plant husbandry. It was also noted, that because of recent development pressure in West Tisbury, that such natural berry crops are becoming a scarcity in the Town and therefore should be valued accordingly as a potential marketable resource.

Another possible marketable resource considered appropriate for Greenlands is the production of honey from beehives. This application will probably enhance the use of the land for berry production.

Other possible farming techniques may be permitted on a limited and experimental basis if they are organic, environmentally sound and considered not potentially harmful to the aquifer and ambient environment. Any farm use of Greenlands will be subject to conditions placed and monitored by the West Tisbury Conservation Commission or their designated Greenlands manager. If any farming technique is considered harmful to the aquifer or ambient environment, the West Tisbury Conservation Commission reserves the management right to have the technique's use immediately terminated.

Forms of horticulture may be permitted if they are considered consistent with preserving the integrity of the aquifer and shall be regulated by the West Tisbury Conservation Commission.

Any revenues generated from the lease of Greenlands for any use whatsoever shall go into the West Tisbury Conservation Commission's Conservation Fund for the purpose of managing and/or improving Greenlands.

Management of Greenlands

The West Tisbury Conservation Commission may find it necessary to have the Geeenlands parcel managed, and may do so by having an agent represent their interests by appointment of the present Conservation Commission membership or its Chairman. Such an appointment of a Greenlands manager shall be subject to arrangement by contract with the West Tisbury Conservation Commission.

* * * *

The above Greenlands Management Plan has been voted upon and approved by the West Tisbury Conservation Commission. Any deletion, amendment or addition to the same may take place only upon written agreement.

APPENDIX G
D.E.P. POLICY 9504
PWS CONTROL OF ZONE I
WITHIN PUBLICLY CONTROLLED LANDS

PWS CONTROL OF ZONE I WITHIN PUBLICLY OWNED LANDS

BRP Policy # 95-04 **Policy, SOP or Guidance # 9504**
August 7, 1996

Policy 95-04 applies where the Zone I is located within property owned by a federal, state or municipal entity ("governmental entity") and used for conservation, water supply or other purposes. In such cases, public water suppliers (PWS) may meet the requirement in 310 CMR 22.21(1)(b) 5. for Zone I ownership or control through use of the following instruments (in order of preference):

1. **EASEMENT AND CONSERVATION OR WATERSHED RESTRICTION:**
(a) **Easement:** A grant to PWS of a right of access to and across Zone I in order to install, operate, monitor, repair, maintain a public water supply system within Zone I and perform other activities within Zone I necessary for the system's compliance with 310 CMR 22.00 **AND** the right to install, operate, monitor, repair and maintain a PWS system and perform other activities within Zone I necessary for the system's compliance with 310 CMR 22.00; AND.

(b) **Conservation Restriction or Watershed Preservation Restriction:** The restriction is imposed by governmental entity on property located within Zone I restricting activities and uses to be made of such property and runs in favor of PWS. The easement and the restriction may be created in one document.

Note: In order for the restriction to run with the land, the PWS must either own land that is benefited by the restriction (e.g., adjacent land), or be a "governmental body" within the meaning of M.G.L.c. 184, s.26 (in which case, owning benefited land is not required).

2. **EASEMENT AND RESTRICTION (BY AGREEMENT):**
(a) A grant to PWS of a right of access to Zone I in order to install, operate, monitor, repair and maintain a PWS within Zone I and to perform other activities necessary for system's compliance with 310 CMR 22.00 and right to install, operate, monitor, repair and maintain a PWS system within Zone I and perform other activities within Zone I necessary for system's compliance with 310 CMR 22.00; AND

(b) An agreement from governmental entity in favor of PWS to restrict activities and uses made of property located within Zone I so as to be consistent with the use of the area as a public water supply (compliance with 22.21(1)(b)5.).

Note: A restriction by agreement will be required in cases where the PWS either does not own land that is benefited by the restriction (e.g., adjacent land), or is not a "governmental body" within the meaning of M.G.L.c. 184, s.26.

3. **LONG TERM LEASE**:

A long term lease from the governmental entity, as lessor, to PWS, as lessee, whereby PWS has possession of property comprising the Zone I and right to install, operate, monitor, repair and maintain a PWS system within Zone I and perform other activities necessary for system's compliance with 310 CMR 22.00. The minimum time period for such a lease would be 30 years. Such a long-term lease shall be renewable and shall prohibit any activity inconsistent with the use of the area as a public

water supply. The long-term lease shall not be renewed if the well is no longer serving as a source a public drinking water.

4. **CONTRACTUAL AGREEMENT OR "MOU":**

A contractual agreement or memorandum of understanding ("MOU") between the PWS and the governmental entity owning the property, providing for :

(a) an agreement giving PWS access to and across Zone I in order to install, operate, monitor, repair and maintain a PWS system within a Zone I and perform other activities within a Zone I necessary for system's compliance with 310 CMR 22.00; and right to install, operate, monitor, repair and maintain a PWS system within Zone I and perform other activities within Zone I necessary for system's compliance with 310 CMR 22.00; AND

(b) the restriction of all activities and uses within Zone I inconsistent with the use of the area as a public water supply, and containing provisions regarding renewal of MOU.

Note 1. DEP approval of the instrument establishing control must be obtained before construction of the well begins. Early consultation with regional DEP office (before execution of the instrument) is strongly encouraged.

Note 2. Some of the options for transfer of property and/or change of use of publicly owned property may require legislative action. For example, a change in use of lands subject to Article 97 of the Massachusetts Constitution requires legislative approval. When legislation exists regarding the particular site, a copy of such legislation should be submitted with the instrument establishing PWS control. Such legislation should provide that the property interest conveyed will revert to the governmental entity if, after a predetermined time, the property is no longer used for the purposes for which it was conveyed.

Note 3. PWS interested in siting wells on state-owned land should refer to the "EOEA Article 97 Land Disposition Policy". Individual state agencies may also have their own land disposition policies, such as the "Department of Environmental Management Policy & Procedures for the Disposition of Land, Water or Interests Therein" or the "Department of Fisheries, Wildlife and Environmental Law Enforcement Land Disposition Policy." PWS interested in well sites with a Zone I with an agricultural Preservation Restriction (APR) should be aware of the Department of Food and Agriculture's document entitled, "Considerations for Determining When to Support a Release a Property From an APR".

Note 4. DEP recommends that PWS obtain subordination agreement(s) from any prior interest holders.

Note 5. Restrictions on activities within Zone I need not apply to allowable passive recreational uses as provided for in Policy 94-03A (Section 3).

APPROVED:
EFFECTIVE:

_____

Arleen O'Donnell, Assistant Commissioner

Bureau of Resource Protection

ZoneIpub.296
POLICY\POL95-04.DFT
WS-96.006

[i] The Massachusetts Dept. of Environmental Protection (DEP) defines three specific types of recharge areas - Zone I, Zone II and Zone III - to which certain regulations may apply (See Section 6B). If these zones are a part of the District, the following definitions should be included:

Zone I: The 100 to 400 foot protective radius around a public water system well or wellfield which must be owned by the water supplier or controlled through a conservation restriction.

Zone II: The area of an aquifer which contributes water to a well under the most severe pumping and recharge conditions that can be realistically anticipated (180 days of pumping at safe yield with no recharge from precipitation), as defined in 310 CMR 22.00.

Zone III The land area beyond the area of Zone II from which surface water and groundwater drain into Zone II, as defined in 310 CMR 22.00.

[ii] Sand and gravel areas that lie within medium to high yield aquifers are potential sources. Municipalities should conduct a hydrological study prior to defining an area as a potential water supply.

[iii] The district boundary is defined by hydrogeologic research, testing and field analysis; therefore, a professional engineer, hydrologist, geologist or soil scientist may define or redefine the recharge boundary; however, the Zone II district boundary and methodology must be approved by DEP. Licensing of these professionals is not required.

[iv]For disputes which may arise related to Zone II areas, (if included in the District) the following provision would be appropriate: The determination of the location and extent of Zone II shall be in conformance with the criteria set forth in 310 CMR 22.00 and in the DEP's Guidelines and Policies for Public Water Systems.

[v]Only uses related to the operation and maintenance of the public water supply are permitted in the Zone I defined in 310 Code of Massachusetts Regulations 22.00.

[vi] The boundary of the district to which these prohibitions apply should be specifically indicated. DEP requirements (310 CMR 22.21) apply to Zone II, or Zone III if the criteria of 310 CMR 22.21(1)(f) have been met.

[vii] Federal and State agencies and counties are not subject to local zoning regulations. This is a long established principle, recently reinforced by decisions of the Mass Supreme Judicial Court (SJC). The state has never delegated the power to regulate activities on state properties, or the properties of its' political subdivisions in its' zoning enabling act and amendments.

[viii] It may be the preference of counsel to include an "as of effective date" clause in relation to all prohibitions which reference state or federal statutes.

[ix] This could be supplemented through a Board of Health Regulation or other non-zoning bylaw.

[x] Note that 310 CMR 22.21 allows for the replacement of existing tanks or systems for the keeping, dispensing or storing of gasoline consistent with state and local requirements.

[xi] The intent of this regulation is to prohibit the placing of sludge and septage in monofills.

[xii] Uncovered storage of salt in water supply areas is forbidden by MGL Chapter 85 Section 7A.

[xiii] Includes most vehicular maintenance facilities, dry cleaners, print and photo processing operations as well as many industrial uses. However, refer to MGL Chapter 40A, Section 9 and Chapter 21D, Section 21.

[xiv] This bylaw identifies, in Section 6C a standard governed uses/activities and conditions for a special permit. None of the special permit requirements are mandated by 310 CMR 22.21 except Chapter vi.

xv Local conditions will affect how extensive this and similar provisions may become. If there are many industrial and commercial uses in a Groundwater Protection district, and their expansion is probable, specific conditions for expanding and altering their operations should be included in the bylaw.

[xvi] Provision not required for new source approval under 310 CMR 22.21(2) or Water Management Act Permits.

[xvii] MGL Chapter 40A, Section 9 specifies that the SPGA must be one of the following; Board of Selectman; Board of Appeals; or Planning Board. Applications should be routed to and reviewed by all town boards, departments and commissions having an interest in or responsibility for review and approval of actions taken by the applicant.

[xviii] The SPGA is encouraged to adopt regulations to administer this bylaw. The SPGA should consider including performance and/or design standards in such regulations. This may mean changing other regulations such as those for subdivisions.