MARINA REGULATIONS

REPORT OF THE
STATE DEPARTMENT OF HEALTH

House Document No. 8

COMMONWEALTH OF VIRGINIA
Department of Purchases and Supply
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COMMONWEALTH OF VIRGINIA

DEPARTMENT OF HEALTH
RICHMOND, VA. 23219

December 19, 1973

The Honorable Linwood Holton
Governor of Virginia

Members of the General Assembly
of Virginia

Gentlemen:

The State Department of Health is pleased to present the report on Marina Regulations, as directed by House Joint Resolution 191 of the 1973 General Assembly. This study was done by the Virginia Military Institute Research Laboratory under contract with the Department of Health.

The State Board of Health, at its meeting on November 30, 1973, reviewed the report, giving particular attention to the recommendation for modifications in the current marina regulations. As a result, our staff is now preparing changes for consideration by the Board at its next meeting.

Sincerely,

Mack I. Shanholtz, M. D.
State Health Commissioner

VMIRL PROJECT MRS

MARINA REGULATIONS STUDY

A REPORT TO THE
DEPARTMENT OF HEALTH
COMMONWEALTH OF VIRGINIA

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SUMMARY AND CONCLUSIONS

Waste disposal in or near water supply sources and recreational waters, involving human excreta, poses a serious water quality problem in terms of possible health effects. In marine environments, health problems associated with domestic wastewater disposal could extend to shellfish harvesting areas. Water quality problems originating with pleasure boat operation are subtle as the relative amount of pollution contributed by recreational watercraft is much less than land based discharges. However, the extreme mobility of these vessels and the increasing numbers of such, suggests that serious water pollution problems will exist, if not now, certainly in the near future.

The Virginia General Assembly recognizing the need for preservation of the State's marine resources in 1966 adopted House Joint Resolution No. 59, creating a commission to study the conservation and development of these resources. The Commission noted within a section of their report entitled, Pollution and Water Quality, that a serious water pollution problem exists at marinas and other places where boats are moored (1). The State Health Department Bureau of Shellfish Sanitation has ordered the condemnation of many shellfish harvesting beds in such areas, as directed by the Federal Food and Drug Administration, due to actual or potential hazards from such discharges, regardless of values of biological contamination obtained from sampling and testing programs. Thus, a valuable part of the state economy, the commercial seafood industry is being threatened with serious curtailment. However, recreational uses of the Tidal Waters of Virginia have also become an important part of the state economy. The apparent conflict between commercial and recreational uses of marine resources should not exist, as each use requires a high degree of water quality. Thus, proper regulation of watercraft pollution is necessary for maximum development of Virginia's marine resources. An important factor for proper regulation of possible sources of pollution at places where boats congregate will be the presence of adequate on-shore sanitary facilities.

The Marine Resources Study Commission recommended that the State Health Department be given authority over the sanitary facilities at marinas and other places where boats congregate.

The need for close regulation of on-shore sanitary facilities at locations where boats congregate has been recognized as a critical factor in the control of water pollution resulting from boating activity (10). The Virginia State Health Department has proposed and adopted a set of rules and regulations for sanitary and sewage facilities at marinas and other places where boats are moored (3). The rules and regulations were adopted in 1969, following an intensive study of available information and existing practices.

The conclusions section of the James River comprehensive Water Quality Management Study, 1973 states that although vessel pollution is a relatively minor problem on a study wide basis, ". . . Marinas and port facilities continue to serve as waste accumulators and create problems for sustained recreational and shellfishery uses (5)." However, due to the large number and mobility of pleasure boats, many states, including Virginia, have adopted laws relating to watercraft pollution control. Apparently though, only three states have adopted regulations governing sanitary and sewerage facilities at marinas and other places where boats are moored. Of these three, only Virginia has a significant shellfish industry. As pleasure boat registrations rise and watercraft pollution laws are tightened, the waste loads received by on-shore disposal facilities, at places of boat moorings and

services, should increase. Holding tanks for on-board toilets may lead to a need for new or additional on-shore disposal capacity (Table 1). There seems to be evidence attesting to the fact that deterioration of water quality can result from congregation of pleasure watercraft and from existing on-shore wastewater disposal systems that are systems that are not functioning properly (6). Thus, it seems that regulation of on-shore sewage facilities at these locations where boats congregate is a critical problem and needs sufficient consideration, especially in areas featuring commercial seafood industries.

The State Health Department developed minimum requirements for sanitary and sewerage facilities in order to resolve the conflict between recreational and seafood uses of state waters. The Rules and Regulations listing these minimums were adopted following a public hearing. However, various marina owners and boat users later objected to the Rules and Regulations declaring them to be too severe and unrealistic. They maintained that they did not receive sufficient notice of the public hearing and stated that they had not been properly represented in the matter. As a result of the controversy, the General Assembly adopted House Joint Resolution No. 193, directing the Health Department to conduct an extensive review of the Rules and Regulations. The State Health Department decided to have an independent study done by an outside agency as part of this review. VMI Research Laboratories, Inc. (VMIRL) was retained by the State Health Department to conduct the independent study.

A part of the VMIRL Study involved on-site data and water sample collection at selected marinas dispersed throughout sections of the coastal area of Virginia (Figure 1). Two cadet laboratory assistants visited marinas on weekdays and over weekends, to record data concerning the size, services and use of the marina facilities. Water samples were taken for bacteriological testing at laboratories of the Bureau of Shellfish Sanitation. A summary of some of the data collected during these visitations is given in Table 2. Certain bacteriological data is presented in Figures 2 to 7. The information secured through this phase of the VMIRL study indicates that a water quality problem with respect to bacteriological indicators does exist at many marinas. In many instances, median fecal coliform MPN values exceeded a level of one hundred (Table 2). The presence of high levels of fecal coliforms suggests the presence of human wastes. Total coliform median values were five to ten times those values of fecal coliforms obtained from identical samples. A total coliform MPN value of 70 is sufficient to cause condemnation of shellfish harvesting areas for which this median value occurs. Coliform values in marina areas were generally considerably higher than those found for surrounding waters through the Shellfish Bureau Shoreline Survey (Table 3). In many cases, as boating activity increased at a marina facility, the average count of fecal coliforms, associated with human waste discharges, also increased (Figures 2 to 7). Bacteriological increases appeared to be more evident in locations of large numbers of watercraft with marine toilet capavility. Thus, direct discharge from boats apparently occurs at marinas.

Observations of on-shore toilet conveniences indicated a variable usage which appears to depend on the type of boating activity at the mooring facility. The type of boating activity varied considerably from marina to marina. Intense use and overcrowding of facilities were infrequently observed, for only short periods, in cases where many watercraft were being docked at the same time, usually in the evenings. In most marinas, use of sanitary facilities were minimal and a low percentage of moored vessels remained occupied for extended periods, in fact, no more than ten (10) percent on the average. However, a higher percentage, approaching

thirty (30) percent extended occupancy of moored boats were observed occasionally at a few large marinas. Many of those boats occupied for day long periods had marine toilet capability. As holding tank regulations are enforced usage of on-shore sanitary facilities should increase markedly.

The lack of well located, clean, properly maintained toilet conveniences was more noticeable, than extensive use of those facilities, at marinas and boat moorings. Visits to a few scattered boat launching ramps indicated that toilet facilities are almost completely absent at these sites.

From discussions with owners of vessel mooring and service facilities, it was evident that the vast majority believed that the Rules and Regulations adopted by the Health Department were unfair and unrealistic. The marina owners objected to the estimated per capita occupancy levels used for the minimum requirements and did not believe dormitory standards to be applicable to marinas. However, standards adopted by the State Health Department call for approximately thirty-five (35) percent of the facilities required by dormitory schedules. Marina owners stated that, from their observations of usage of existing facilities, they objected to the minimum requirements for sanitary facilities. These observations were necessarily based on current conditions and do not anticipate the expected increase in use of on-shore facilities following enforcement of one hundred (100) percent retention of on-board wastes.

Marina owners were apprehensive about pump-out requirements and equipment and the possible need to expand existing disposal systems, due to various reasons such as, lack of available space, unfavorable soil conditions and financial hardships.

A second phase of the VMIRL study involved questionnaires mailed to facilities listed as marinas and moorings by the Bureau of Shellfish Sanitation. The return of questionnaires sent to facilities listed as marinas approached the fifty (50) percent mark. The questionnaire results indicated that a very wide range of services and facilities were available at the small boat harbors and moorages classified as marinas. The typical marina represented by the results of the questionnaire has forty (40) slips and provides bathroom facilities for each sex. Most of the owners of these places were familiar with the Rules and Regulations adopted by the Health Department. A few owners noted objections to being classified as a marina and most did not agree with the minimum sanitary and sewage requirements and some did not wish to provide pump-out equipment. There seemed to be some confusion on what would be required in the way of pump-out equipment and the cost of it. A few questionnaires were returned with the statement that the owner would be forced, or had already been forced, to go out of business due to the financial strain of meeting the new requirements.

Complaints of financial hardships imposed by regulation of sanitary facilities do not appear to be realistic in themselves in considering the large financial investments which the majority of marina users have in their watercraft. Financial considerations cannot, of course, be used as an excuse to continue pollution of water resources.

In order to clear up many of the questions concerning the problems which would be encountered when watercraft pollution control laws go into effect and on-shore disposal facilities are closely regulated, VMIRL made visits to the states of New York and Michigan. The environmental regulatory agencies of each

state cooperated fully with VMIRL and provided tours of many different marina facilities. In addition, much written information was obtained, but most importantly, an insight into problems associated with regulation of programs concerning watercraft and on-shore pollution control, was obtained through lengthy personal conversation with various regulatory officials. The regulatory agencies and officials in each state were extremely courteous and helpful.

The regulatory programs in each state are working programs even though a minimum of personnel are assigned to operate them with most only on a part time basis due to other responsibilities. The regulatory program utilized by the State of Michigan is very comprehensive and highly organized. The marina facilities which provide in excess of ten (10) transient or temporary mooring slips are required to provide extensive sanitary and sewage facilities. A few marinas of this type were visited and all conformed to these requirements. A high percentage of Michigan's watercraft have complied with holding tank requirements. Most large marinas in Michigan with fifty or more slips provided some form of pump-out equipment with a total of 172 pump-out stations throughout the State. Most of the marina areas exhibited remarkably good water quality from an aesthetic viewpoint.

The majority of Michigan marina sanitary and pump-out facilities utilize direct connection to existing collection systems and the next most widely used form of disposal consists of permanent and portable on-shore holding tanks. Although many septic tanks are used for disposal at mooring facilities, the majority of the ones observed in Michigan were not functioning due to the unusually high water level in the Great Lakes and holding tanks were placed into use. In discussions with marina owners it was determined that portable holding tanks were adequate if a proper tank design were utilized. On-shore holding tanks for wastewater disposal were also observed in the State of New York. A wide variety of toilet conveniences ranging from outdoor privies to tiled rooms with flush toilets were observed during the trip. The average condition of the sanitary facilities viewed in the States of New York and Michigan was fair to good. The marina owners in general noted that their facilities were not overcrowded during high boat-use periods. The New York and Michigan marinas visited were characterized by approximately one toilet per sex for about fifty (50) seasonal boat slips. However, although a few marinas in the states of New York and Michigan possessed very good facilities many of the marinas observed during the visitation, which were composed of seasonal slips, did not have adequate sanitary facilities. Apparently, adequate sanitary facilities were developed at these sites from the local demand for them. A somewhat non-uniform system of requirements has thus developed, as a result of a lack of standard requirements, for marinas composed entirely of seasonal slips.

Through conversations with boat owners in each state, the general opinion seemed to be that holding tanks did not cause serious on-board problems and that pump-out facilities were available and usable. A wide variety of pump-out facilities were observed in both states, ranging from home-made pumps and portable pumps with small storage tanks to quite sophisticated arrangements of multiple pump-out units. Only a few pump-out stations utilized the same on-shore disposal systems for sanitary facilities at the site of mooring and service facilities. However, these combined facilities received only small amounts of pump-out wastewater. Separate disposal, from sanitary wastewater, would be required for pump-out wastes, due to the toxic nature of the various inhibitors, unless direct connection to a municipal sewerage system is available. Apparently, portable holding

tanks for pump-out wastewater will be required in the absence of municipal collection systems. Pump-out charges varied from $1.50 to $5.00 with an average of $3.50 for pump-out and rinse, which from personal observation, normally takes five minutes at the most.

The last phase of the VMIRL study involved inquires sent to thirty-three jurisdictions thought to have need for laws relating to marina regulations. A summary of the twenty responses is given in Appendix D. From the response to this regulation inquiry, it appeared that many states had adopted, or were proposing to adopt, watercraft pollution control laws. Only the States of Michigan and Washington had developed on-shore regulations for mooring facilities. The regulations adopted by the State of Michigan are somewhat similar to those adopted by the State of Virginia, but are not as stringent in most respects as are Virginia's.

The State of Michigan requires a minimum number of sanitary facilities for a certain number of transient slips only. In addition, a facility must possess a given number of slips to qualify as a marina. Since Michigan's program appears to be working effectively, the comparison indicates that perhaps some modification of Virginia's Rules and Regulations should be made. However, the State of Michigan is primarily concerned with protecting recreational waters, while Virginia must consider protection of shellfish areas as well. Thus, an exact parallel may not be drawn.

In response to questions concerning occupancy figures and code requirements for sanitary and sewage disposal design capacity, the majority of responding officials favored utilizing occupancy levels equal to or greater than thirty (30) percent, closely paralleling the Virginia regulations. These officials also favored using special recreational standards over other choices such as dormitory standards, although estimates of sewage volumes remain similar to Virginia values.

In summary, the VMIRL study results suggest a definite need for regulation of on-shore sanitary and sewerage facilities as first suggested by the 1967 Marine Resources Study Commission and recently concluded by the Water Control Board study of the James River area. Coliform counts are extremely high in the vicinity of congregations of watercraft in marina locations throughout the coastal area of the State.

Although increased usage of on-shore sanitary facilities is anticipated, present usage levels suggest that the minimum requirements proposed by the State Health Department may be excessive. For states in which protection of recreational waters is of prime concern, one toilet convenience per sex for every fifty (50) seasonal boat slips currently appears to be adequate. Due to the necessity of maintaining water quality sufficient to permit shellfish harvesting, minimum on-shore sanitary requirements for Virginia marinas may necessarily be somewhat more restrictive. From observations of usage, the sanitary facilities problem does not appear to lie with the exact number of toilets provided per a given number of moored vessels, but seems to be more a problem of proper location and maintenance of toilet conveniences.

Pump-out wastes cannot be placed in existing septic tanks receiving sanitary wastes from on-shore toilets. Thus, a method of handling the expected increase in on-shore wastewater volumes and disposing of this and the toxic pump-out wastes appears to be the portable holding tank with controlled scavenger collection. Other methods of wastewater disposal from marina areas, such as, connection to

regional sewerage systems or cooperatively funded lagoons or treatment plants, do not appear to be practical. Answers to the problem of on-shore sewage disposal must be found or water quality problems arising from recreational boat usage will persist. Proper regulation of on-shore sanitary and sewage disposal facilities will unquestionably help to solve these problems and restore the waters of areas in which boats congregate to a satisfactory level of water quality.

VMIRL recommends that minimum requirements remain within the Rules and Regulations governing marinas and other places where boats are moored. Certain changes are suggested for the Rules and Regulations, based on information compiled in this survey, as listed under the recommendations section. Minimum toilet conveniences are adjusted somewhat and the definition of which facility should be classified as a marina is narrowed.

VMIRL feels that minimum requirements are necessary to provide uniform regulation necessary to help improve existing water quality conditions. These minimums must be sufficient to protect shellfish harvesting areas from possible pollution, which may occur from overcrowding, due to the anticipated increase in usage of on-shore sanitary facilities. If step increases above these minimums could be practically implemented, then the required minimums could be lessened so as not to pose an unfair burden on those marinas where current boat usage does not warrant extensive facilities. Enforcement of such a scheme does not seem currently possible.

The optimum definition of a marina would appear to be that which could somewhat restrict the application of the Rules and Regulations, limiting step increases, above the required minimum sanitary and sewage disposal facilities, to those marinas where the amount and type of boat use necessitates such increases. Many marina owners have stated that, if the majority of moored boats are owned by people living close by, then there is no need for increased sanitary and sewage disposal capacity based on the number of moored boats. If detailed information, concerning both addresses of boat owners and on-board toilet facilities, were required to be submitted by marina owners, then perhaps variances could be granted to the required minimum facilities, based on this information.

INTRODUCTION

"Whereas, the commercial seafood and fisheries industry are an important and unique part of the economy of Virginia and should be encouraged and developed; and

Whereas, the recreational uses of the tidal waters of Virginia are constantly expanding and are an important part of the economy of Virginia and should also be encouraged and developed; and

Whereas, the rapidly expanding recreational uses of the tidal areas of Virginia have graphically brought into focus many conflicts between the commercial and recreational interests; and

Whereas, these conflicts must be resolved to the mutual benefit of each so that neither group will be unnecessarily regulated and restricted; so that proper conservation practices will be applied as to all marine resources; and so that all the marine resources of Virginia will be utilized to the maximum degree possible for the benefit of all; now, therefore, be it

Resolved by the House of Delegates, the Senate of Virginia concurring, That there is hereby created a Commission to be known as the Marine Resources Study Commission (1)."

The Report of the Marine Resources Study Commission, 1967, recommended that the Health Department be given broader and clearer authority over sewage facilities at marinas and other places where boats congregate and suggested that it ". . . adopt by regulation, minimum requirements for sewerage facilities adequate to serve the number of slips and people which the marina or boat facility is designed to accomodate (1)." This recommendation was incorporated into the Health Laws of Virginia, Section 32-63.1 (2). Rules and regulations regarding sanitary and sewage facilities at marinas and other places where boats were moored was adopted in 1969 following a detailed study of all existing information and data in this area (3). Opposition to these Rules and Regulations developed from marina owners and pleasure boat users who thought the regulations to be unreasonable. The Health Department was directed by the General Assembly through House Joint Resolution 191, 1973, to conduct an extensive review of the Rules and Regulations and to prepare a report of its findings and conclusions. VMI Research Laboratories, Inc. (VMIRL) was retained by the Health Department to conduct an independent study of marina regulations during the Summer of 1973. A comprehensive study concerning sanitary and sewage facilities at marinas was proposed and carried out by VMIRL.

In order to meet the expected pollution control problems dealing with waste disposal from watercraft, the Environmental Protection Agency has published information dealing with marine sanitation devices under the authority of the 1972 Water Pollution Control Act (PL: 92-500). The text of this discussion, as published in the Federal Register, Volume 37, Number 22, reviews alternatives and noted that wastewater holding tanks with on-shore pump-out and disposal offered

the most effective control possibilities (7). The State Water Control Board held a series of public hearings regarding boat pollution on Virginia waters during 1972 and subsequently developed Regulation 5 - Control of Pollution from Boats (4). This Regulation, a part of Section 62.1-44.33, State Water Control Law, essentially provides for no discharge on on-board liquid wastes from most vessels into surrounding State waters. Holding tanks must be provided and pumped-out to on-shore facilities. The site of the majority of these pump-out facilities would be naturally located at places where boats congregate and various services are provided, such as, small boat harbors, moorages and marinas. Thus, a marked increase in the usage of on-shore sanitary and sewerage facilities is anticipated in the future for marinas. Regulation of these facilities will be critical factor in the quality of surrounding waters, and of great importance to the seafood industries in Virginia's coastal areas.

Certain minimum requirements concerning on-shore sanitary and sewerage facilities were incorporated into the Rules and Regulations adopted by the Health Department to provide the uniform regulation necessary to balance recreational and seafood water resources uses and quality requirements. The VMIRL study was directed toward determining the reasonableness of these minimum requirements based on in-field observations and comparisons to existing programs.

DESCRIPTION OF THE PROJECT

VMI Research Laboratories (VMIRL) an independent research organization and the research arm of the Virginia Military Institute, was retained by the State Health Department to conduct a study of the Regulation of sanitary and sewage facilities at marinas. A contract was drawn up and approved following a meeting between the Project Director, Dr. C. M. Sawyer, and a steering committee consisting of representative of the Water Control Board, during May, 1973. A comprehensive study was proposed and implemented by VMIRL which involved: on-site sampling and data collection at selected marinas to observe existing facilities and water quality, questionnaires sent to marinas and other places where boats were moored, inquiries mailed to other states regarding rules, regulations, policies and laws and visits to the States of New York and Michigan to observe regulation programs and facilities (Appendix A).

Over 500 questionnaires were mailed out to marina and boat mooring addresses complied by VMIRL from information secured from the Bureau of Shellfish Sanitation and additional sources such as boating publications. The mailing list was programmed and catalogued on the VMI computer. The questionnaires concerned information relating to the size, use, services, waste-disposal, boat type and occupancy and other pertinent data concerning each marina and mooring facility (Appendix C).

In order to identify the existing problem , two cadet research assistants worked in the field, at various Virginia marina locations, from Memorial Day to Labor Day, collecting water samples and information similar to that listed on the questionnaires. The samples were conveyed to shellfish sanitation laboratories for bacteriological tests. The cadet assistants worked generally within the Chesapeake Bay System (Appendix B).

The Project Director and a research assistant, a biology graduate, visited many Virginia marine boating facilities and personally discussed the study with concerned owners. In addition, several fresh water marinas were visited and water samples taken for analysis at the VMI Sanitary Engineering Laboratory. A week-long trip through the States of New York and Michigan was made in order to study facilities at marinas in states with an established program of watercraft pollution control. Environmental regulatory agencies within these states cooperated fully with VMIRL to make these visitations highly informative and worthwhile.

A form letter requesting information concerning existing or planned rules, regulations and policies was mailed to all continental states with significant shoreline and to the States of Alaska and Hawaii. In addition, inquires were made to several Canadian Provinces (Appendix D).

Progress report meetings between the steering committee and VMIRL personnel were held at the end of June and July, 1973. At these meetings, the schedule, direction and emphasis of the study were discussed and clarified.

The objective of this study involved compiling the information necessary to formulate a report which would conclude whether the existing regulation of on-shore sanitary facilities at marinas and other places where boats are moored are reasonable and adequate. In addition, this report would include recommendations regarding possible changes in the proposed rules and regulations and any alternatives that may exist.

FIELD STUDY RESULTS

Selected marinas were subjected to visits by cadet laboratory assistants. The facilities were selected so as to be as widely dispersed in geographic location as possible and to cover a broad range of harbor conditions and moorage uses (Figure 1). Data concerning: the number and type of watercraft located at each marina, types of services available, on-shore facilities, use of vessels and services, etc., were recorded. In addition, water samples were collected at fixed sampling stations at many of the marinas where water quality conditions would permit representative readings. The sampling stations were carefully located so as to provide a representative picture of water quality conditions in each marina (Figures 8 to 13).

Most marinas were visited during one weekday, Saturday and Sunday and some were surveyed on certain holidays. A summary of some of the data collected from each visit are listed in Table 2. The bacteriological data presented in Table 2 represents the median result of all tests on samples withdrawn from the various water sampling stations on a given day. The bacteriological data is shown graphically for various marinas to illustrate the change in bacteriological conditions at these marinas from weekday to weekend summer boating activity (Figures 2 to 7). The relative increase in the median fecal coliform concentration at many marina and mooring areas closely parallels increased boating activity as shown by these graphical illustrations. Coliform tests were previously conducted, on four (4) samples of water withdrawn from the Little Wicomico River at the location of the Krentz Marina and Marine Railway in Northumberland County, by Froehling and Robertson, Inc. The median total and fecal coliform values were reported as MPN values of 12 and 1.8, respectively, for samples taken near the water surface at the end of March, 1972. The results obtained from the VMIRL sampling program in the same area are listed in Table 2. The VMIRL samples were taken near the beginning of June, 1973. The obvious differences seem to reflect the result of increased boating activity and decreased dilution which takes place from early spring to early summer at most marinas. In areas where a high concentration of boats in excess of 24 feet in length existed, the increase in coliform counts seemed to be more pronounced. Discussions of existing conditions at each marina, on which test results were plotted, are included in Appendix B.

In general, the total and fecal coliform concentrations in boat mooring areas were significantly higher than that obtained from bacteriological tests on surrounding water (Table 3). The lack of adequate flushing action due to the recessed location of many of these harbor areas will tend to magnify the problem originating from on-shore and marine toilet discharges. Poor soil conditions resulting from lack of proper drainage and a space limitation for drain fields in an obvious problem at many marinas. Although, on-shore sewage disposal problems appear to exist at many of the boat mooring and service facilities at the present time, this problem is not proper justification for continuing to provide limited sanitary and sewerage facilities at these sites.

Observations of sanitary facilities and their usage at marinas indicated that they are not, in general, currently heavily utilized. However, many of these facilities are poorly located and maintained. Shower facilities were seldom observed in use. In most cases, regardless of marina size, where a minimum of one urinal and one water closet were provided for men and two water closets existed for women, there were few observed cases of overcrowding which made boat users wait to use sanitary facilities. Minimum facilities of this type may suffice for anticipated

increases in use when on-board holding tank concepts are enforced. Problems of overcrowding were noted in certain cases where only one water closet was provided to serve both men and women. In a few cases, heavy use developed near sunset as many boats were being moored.

The occupancy level of moored watercraft was not found to be extensive in most cases, with approximately ten (10) percent of the vessels occupied by an average of two persons per boat. However, at some few marinas, boat occupancy ran as high as fifty (50) percent on a weekend. Periodic heavy use of this type may require additional sanitary facilities above that required to serve average occupancy. The number of people occupying larger vessels such as day or night cruisers was highly variable as some craft are seldom used and others are in continuous use. In general, occupied vessels over thirty-five (35) feet in length averaged four (4) persons per boat. The period of occupancy appears to depend to a great extent on the manner of boat usage, whether for social or recreational usage. Several marina owners stated that occupancy is related to the distance the boat owner must travel from his home. They noted that in cases where boat owners lived near a marina, occupancy was very low. However, it would be expected that even boat owners from nearby areas would utilize marina sanitary facilities if the need arose.

Although, several marina owners stated their intention of constructing dockside pump-out equipment to service on-board holding tanks, only two facilities of this type were observed by the student assistants. Visits to sites of boat moorings and public boat ramps were characterized by the noted absence of toilet conveniences in these locations. A few persons operating mooring and launching facilities stated that using state waters for waste discharge was acceptable, failing to recognize that this procedure would be contrary to the existing law.

The Project Director visited many marinas and talked with several marina owners and managers concerning on-shore sanitary and sewerage facilities. Most marina owners expressed dissatisfaction with the Rules and Regulations adopted by the Health Department, stating that the minimum sanitary requirements, based on dormitory specifications, even at thirty five (35) percent occupancy, were not realistic. In addition, the owners did not agree with the occupancy values of persons per boat as listed for sewage treatment facilities in the Rules and Regulations. Also, several owners expressed apprehension concerning a requirement for dockside pump-out facilities as they did not have information on available equipment. However, information of this type is being published (10). In addition, many were concerned over the possible effects of pump-out waste, which contain chemical inhibitors, on existing disposal systems.

Visits were made to several freshwater marinas, mainly in the Smith Mountain Lake area. Owners of marinas on the Lake were generally in favor of strict holding tank requirements for pollution control of watercraft. A portable pump-out unit was available at Smith Mountain Yacht Club and other marina owners were interested in pump-out equipment.

Many owners of marinas in areas where wastewater collection systems are not available expressed concern over the necessary expansion of existing drain fields, for septic tanks, as available land was severly limited at the sites of most mooring facilities. Other owners of marinas did not feel that they should be forced to meet the same requirements as certain other vessel mooring and service facilities due to the large difference in usage of watercraft. However, owners of larger marinas did not wish to be placed at an unfair economic advantage due to

be placed at an unfair economic advantage due to a large variation in sanitary and sewage requirements. As proper sewage disposal is an absolute necessity, workable answers to all of these existing problems must be found and should be incorporated in existing Regulations.

The results of the field studies reinforced the belief of most authorities, that a water quality problem exists at most marinas, as shown by bacteriological indicator tests of water samples. A need for regulation of on-shore sanitary and sewage facilities was clearly shown, not only from the results of tests on water samples, but also shown from the lack of properly located and maintained maintained sanitary facilities at many mooring facilities. The majority of the bathrooms visited were only fair in condition with many not as clean as similar facilities located at service stations. A total lack of adequate toilet facilities was evident at a few small mooring facilities and public boat launching ramps. The majority of boat owners interviewed stated that they would rather use on-shore toilet conveniences if available and clean. Observed levels of moored watercraft occupancy and noted levels of usage of sanitary facilities indicated that a minimum number of properly located toilets will currently suffice. However, sanitary facilities are in general not now as accessible or well maintained as they should be for optimum use.

The problem of limited sewage disposal capacity at many marina and mooring facilities is possibly the most critical water quality problem at the current time. Increased usage of on-shore toilets and the addition of pump-out wastewater cannot be handled by most existing individual disposal systems due to lack of proper capacity. Regulation of on-shore sewage disposal facilities must answer these problems in order to protect the water resources in many coastal areas and resolve the conflict resulting from maintaining recreational uses and protecting the valuable seafood industry in Virginia.

MARINA QUESTIONNAIRE RESULTS

A questionnaire concerning boating and mooring facilities, services provided, existing sanitary and sewage facilities, boating activity and information concerning regulations was developed by VMIRL to provide an indication of the relative magnitude of various elements comprising the use of boat moorages and marinas. The mailing list of existing marinas and boat moorings was obtained from the results of a 1970 field study conducted by the Health Department's Bureau of Shellfish Sanitation. The mailing lists were catalogued on the digital computer located at VMI in order to develop readily retrievable addresses. Corrections for many of the addresses listed from the 1970 study were necessary. Corrected addresses were obtained from boating publications if possible and if not available in this source, telephone calls to marinas or owners were made.

Of the 237 questionnaires sent to mooring facilities, most previously listed as marinas by the Shellfish Bureau, 111 of these were returned. This excellent response and fine cooperation by marina owners, allowed VMIRL to compare questionnaire information to the data obtained from the 1970 survey to provide a representative indication of changes in facilities. Returned questionnaires indicated that most marina facilities had not undergone major revisions from their condition listed in the Shellfish Bureau information. Only a few marinas had significantly increased docking or mooring capacity, from that originally reported, with a corresponding increase in sanitary facilities also indicated. Several additional marinas were planning to expand in the future.

The typical marina replying to the VMIRL questionnaire consisted of 40 slips of which the vast majority are seasonal or permanent slips for long term mooring of boats which are almost evenly divided between lengths less than and more than twenty four (24) feet (Table 15). The results summarized from the returned questionnaires are listed by county or city in Tables 4 through 15. From this summary, an average marina seems to possess at least one toilet convenience for both men and women.

Definite records concerning pleasure boat use and activity do not seem to exist at the majority of marinas. Some marina owners chose not to answer questions relating to boating activity due to lack of information and some expressed the view that this type of information was not provided because it did not relate to on-shore sanitary facilities. Of those who did estimate weekend use of pleasure craft, values ranging from five (5) to fifty (50) percent use of moored boats were noted, with an average value of twenty (20) percent. Estimates of the number of boats of various sizes in the area of marinas were in close agreement with the numbers reported in the 1970 Shellfish Bureau study.

Over sixty (60) percent of the marina owners returning questionnaires, answered that they were familiar with the Health Department Rules and Regulations. In addition, in excess of fifty (50) percent indicated that they had read the guidelines for implementing marina regulations as released by the Health Department. Less than sixteen (16) percent indicated that they planned to install pump-out facilities. Less than ten (10) percent of the returned questionnaires indicated that pump-out facilities currently existed.

Approximately one third of the returned questionnaires were accompanied by remarks or comments. Many comments related to objections to the Rules and Regulations adopted by the Health Department, repeating the opinions voiced personally by marina owners, previously visited, who thought the Rules and Regulations to be too severe. A few owners of mooring and service facilities indicated that they would be forced to go out of business if they had to comply with the Rules and Regulations concerning sanitary and sewage disposal facilities. Many of those owning mooring or docking facilities consisting of fifteen (15) or less slips objected to being classified as a marina, as they provided a minimum amount of service for the boats, and all boat owners lived but a short distance (ten miles or less) from the mooring and docking facility. Several questionnaires contained remarks relating to pump-out requirements which indicated that many marina owners were not familiar with available equipment and desired additional information on technical and cost data. More than a few marina owners were concerned with methods of disposal of pump-out wastes as they felt that the toxic nature of this wastewater would adversely affect existing septic tanks.

The questionnaire response suggests that detailed information, concerning current pump-out equipment and methods of disposal of pump-out wastes, should be somewhat more available to marina owners in order to answer many of the existing questions.

The questionnaires provided a great deal of valuable information concerning available facilities at marinas and a few other places where boats are moored. Immediately, the questionnaire results suggests that the definition of a marina facility should be clarified and perhaps modified to eliminate many small mooring areas currently listed as marinas. Slightly over three hundred (300) questionnaires were sent to addresses listed by the Shellfish Bureau as mooring facilities other than marinas and less than fifteen (15) percent of these were returned. The information obtained from the mooring facilities was not sufficiently complete to tabulate. Confusion as to the intent of the study, lack of interest and insufficient addresses, combined to limit the response in this area.

VISITS TO NEW YORK AND MICHIGAN

Dr. C. M. Sawyer, the Project Director and Stuart Morgan, Research Assistant, representing VMIRL and Mr. Les Balderson, representing the Virginia State Water Control Board, visited the States of New York and Michigan during the period July 16 to July 22, 1973. The purpose of the trip involved personal observation of on-shore sanitary facilities in states with existing programs of watercraft pollution control. The cooperation of environmental regulatory agencies within these states made these visitations highly successful.

On the morning of the seventeenth, the visiting group met with officials of the New York State Department of Environmental Conservation and discussed the objectives of the visit and organized an itinerary to visit as many representative marinas and mooring facilities as possible. Several marinas on Lake George and several around Lake Cuygandaga were visited as well as a few along the Hudson River between Schenectady and Albany. Although no minimum regulations exist in New York for sanitary and sewerage requirements, the facilities observed by the visiting group were generally adequate and most were properly maintained. However, in a few instances, a lack of adequate toilet conveniences were evident and malfunctioning septic tanks were noticed.

The Yardarm Marina situated on Lake George possessed a well designed pump-out unit. The pump-out unit was observed in operation with an Environment One grinder pump. A dockside flexible pump-out hose was maintained under vacuum and delivered wastes from the mooring and service area to an on-shore holding tank. Wastewater from the holding tank and on-shore sanitary facilities was pumped through a force main to a remote septic tank system at a higher elevation. Systems of this type are somewhat expensive, costing in excess of $5,000 dollars, but offer the optimum solution to sewage disposal due to land limitations at the mooring and service area.

A total of eight marinas and two public beaches were visited in New York. The on-shore facilities visited at these locations were highly diversified in physical make-up, however six of the marina facilities provided at least one toilet facility per sex for about fifty slips. Sanitary facilities at three of the marinas were not conveniently located. Septic tank disposal of sanitary wastewater was used in most marinas although pump-out wastes were placed into holding tanks, whenever direct connection to a collection system was not available. Marina owners stated that their sanitary facilities were not subjected to overcrowding periods of heavy boat use. At public beaches an average of one toilet fixture and one shower per hundred bathers was utilized.

After two days in New York, the visiting group flew to Michigan and met with officials there on the nineteenth of June. At the meeting with officials of the Michigan Department of Natural Resources, including representatives of the Division of Waterways, the Department of Public Health and the Water Resources Commission, a discussion of the laws, rules and regulations utilized by these various agencies to regulate marinas took place. During the discussion, the fact was noted that watercraft pollution control and regulation of on-shore facilities are closely related and must be coordinated between the various agencies involved.

Michigan regulatory officials stated that ninety-five percent of the registered pleasure boats with marine toilet capability had complied with holding tank

regulations. A total of one hundred and seventy-two (172) pump-out units were in operation and most were either connected to central sewerage systems or to holding tanks. A schedule of the minimum number of sanitary facilities for transient slips had been developed from field experience. Requirements relating to the toilet fixtures necessary to serve seasonal or permanent slips were developed at the discretion of local health officers. The Michigan officials were extremely courteous and very informative.

A total of eight (8) marinas in Western Michigan located near White Lake on Lake Michigan were visited. The marinas were composed of fifty (50) seasonal and ten (10) transient slips on the average. All but one of those eight Western Michigan marinas possessed at least one toilet per sex. Five (5) of the eight (8) marinas contained shower facilities. A number of different pump-out facilities were seen at these marinas. Four marinas utilized direct connection to central disposal systems and the remaining mooring and service facilities utilized portable holding tanks which were eventually hauled to a discharge point in a central system. The septic tank facilities normally used at several marinas for disposal, were inoperational due to the high water level in the Great Lakes.

Four (4) marinas located along Lake St. Clair near the City of Detroit were subjected to detailed visits. Several of the marinas in the Detroit area were very large and over 1500 slips were counted at the four marinas. Nearly two hundred (200) transient slips were noted. Sanitary facilities at the sites of these transient slips were adequate, but the marinas containing large numbers of seasonal slips did not appear to have adequate numbers of, or properly located, toilet conveniences.

A few pump-out units were observed in operation. The average time for pump-out and rinse of an on-board, twenty-five (25) gallon, holding tank was less than five (5) minutes. Several marina owners stated that, although they doubted the effectiveness of holding tanks for pollution control, they would provide adequate pump-out units and absorb the cost as part of their service. The general opinion of most marina owners was that a minimum charge of $4.00 per pump-out and rinse must be charged to pay for operation of pump-out facilities. Boat users who were interviewed, expressed the view that holding tanks did not present a serious problem from either a financial or operational point of view. Pump-out facilities in the areas visited seemed to be available to boat users. Large portable holding tanks were in use at several marinas for disposal of pump-out wastewater.

In summary, the visits to the States of New York and Michigan helped to clear up a great deal of misinformation developed from hearsay about the regulatory programs for watercraft pollution control and marina regulation utilized in each state. The programs do seem to be working effectively without inconveniencing boat users and driving marinas out of business. Regulatory officials state that they do not have problems of obtaining compliance with the laws and regulations, although, additional regulatory personnel could be assigned to certain responsibilities within the various programs, in order to balance work loads.

REGULATIONS INQUIRY RESULTS

The study of on-shore sanitary and sewage regulations at marinas and boat moorings was conducted by VMIRL from May through August 1973. During this time, a form letter requesting detailed information about such regulations was sent to thirty-three (33) jurisdictions all of which had significant water frontage. The jurisdictions contacted included thirty (30) states, the Virgin Islands, Puerto Rico and the Province of Ontario, Canada. There were twenty (20) replies. A list of those jurisdictions which responded is included in this report as Appendix D. Of those responding only a limited number had regulations that were comprehensive enough to make a comparison with the existing Virginia Health Department Regulations. Excerpts from those regulations which provided some degree of comparison are included in Appendix D. It is readily apparent from this listing that even among those areas which have marina sanitary regulations only the States of Michigan and Washington have regulations governing on-shore waste disposal. The Province of Ontario has specified minimum convenience requirements for tourist and camping facilities which are similar to some plumbing code schedules (Table 17). The lack of specific guidelines in the other jurisdictions would seem to indicate wide discretionary authority in the health departments to regulate on-shore facilities. Some of these departments do have internal policy directives however, such as those of New York, South Carolina and Massachusetts (Table 18).

Michigan's current regulations were adopted under the "Water Craft Pollution Act of 1970." Section 8 of that Act allows for State Health Department inspection of on-shore facilities and the Health Department Regulations set the standards for sanitary facilities. Regulation 325.2587 charts the minimum number of toilets, urinals, lavatories and showers required at the marina. These figures closely parallel Virginia's existing criteria, however, there are significant differences in that there are no minimums for marinas with less than ten (10) slips and all the minimums are for transient slips. Virginia's minimum requirements are for all slips and there is no minimum cut-off. A comparison of Virginia's and Michigan's minimum requirements is included in this report in Table 16. Michigan's regulation 325.2589 clearly spells out the type of on-shore treatment that is required and the order of preference of the approved types. Virginia's regulation notes a preference for disposal into a public sewer but allows Health Department approval for disposal systems if a public sewer is not available.

Washington State Regulations governing minimum sanitary facilities were limited to moorings for fifteen (15) or more watercraft. These regulations were also less stringent than Virginia's in that sewage pump-out facilities are only required if the marina has twenty-five (25) or more moorings.

Six regulatory officials responded to questions concerning what estimated boat usage and code requirements should be used to formulate sanitary and sewage facility requirements. Four of these officials indicated that thirty (30) percent occupancy or higher should be utilized for a design basis. Four officials indicated that campground or recreational codes should form the basis of minimum sanitary requirements. Two officials noted that twenty-five percent or less occupancy figures would be used for minimum requirements. Also, two officials advocated use of dormitory standards to set sanitary requirements.

Although Virginia's current regulations are more stringent than those surveyed, this alone should not be an absolute basis for modification. The development of

on-shore marina sanitary regulations is new and Virginia must be concerned with protection of its seafood industry.

Michigan is the only state which has operated under comprehensive guidelines for any period of time. An on-site inspection of some of Michigan's marinas and a review of their standards with Michigan State officials indicated that their program is working, effectively. This makes for a strong argument for lessening Virginia's standards to agree with a workable program, but the State of Michigan is primarily concerned with maintaining recreational water quality. The Michigan program may not be directly extrapolated to the needs of Virginia, as shellfish harvesting waters must possess no more than a national water quality standard MPN value of 70 total coliforms.

RECOMMENDATIONS

I. Although the Rules and Regulations adopted by the State Health Department were developed from an extensive review of available information, the results of the VMIRL study suggest that some modifications can be made in the Regulations which will provide the most equitable balance between recreational uses of coastal waters and proper protection for the seafood industry.

The following changes are recommended for the Rules and Regulations governing sanitary and sewerage facilities at marinas and other places where boats are moored:

A. Marina - any installation operating under public or private ownership which provides dockage or moorage for fifteen (15) or more boats capable of being equipped with a marine toilet, and provides supplies and services for these boats, either on a rental or fee basis or for the convenience of the public.

B. Other places where boats are moored - any installation operating under public or private ownership which provides dockage, moorage, mooring or launching for boats either on a rental or fee basis, or for the convenience of the public.

C. Sanitary facilities - privies, water closets, urinals, lavoratories and showers.

D. Marine toilet means any toilet on or within any boat.

E. Toilet means equipment designed or used for defecation or urination by humans.

F. Seasonal slips - (permanent moorage space) - docking or moorage space in which a boat is kept for an extended period equal to a normal boating season.

G. Transient slips - (temporary moorage space) - docking or moorage space in which a boat is kept for a short period less than a normal boating season.

H. Pump-out facility - any device or method for removing sewage from a holding tank connected to a marine toilet or from a self-contained marine toilet.

I. Sewage - all human body waste and any liquid waste containing animal or vegetable matter in solution or suspension or chemicals in solution.

Section V:

A. At marinas

1. The location of sanitary facilities should be convenient and easily identified. Separate buildings from service or sales offices or outside

entrances for which access is available at all times shall be provided for these facilities. Minimum sanitary facilities should be so located so as to be no further than 500 feet walking distance from the most remote of the moored boats that they are intended to serve.

2. All marinas should provide a minimum of one water closed and lavatory per sex.

3. A marina containing more than twenty-five (25) seasonal slips, but less than one hundred (100) seasonal slips designed for boats capable of being equipped with marine toilets should provide a minimum of: one water closed and urinal for men and two water closets for women, a lavatory for each sex and a pump-out facility.

4. Marinas containing more than one hundred seasonal slips or one hundred and fifty (150) transient slips should provide one (1) additional water closet, lavatory and shower for each sex for each additional 50 slips or fraction thereof and one additional men's urinal for each one hundred (100) additional seasonal or transient slips or fraction thereof.

5. In addition to the above requirements, a marina containing more than ten transient slips should provide minimum sanitary facilities according to the chart below:

Number of Transient Slips	Water Closets		Urinals	Lavatories		Showers	
	Men	Women	Men	Men	Women	Men	Women
10- 25	1	1	1	1	1	1	1
25- 50	1	2	1	2	2	2	2
51- 75	2	3	1	2	2	2	2
75-100	2	4	2	3	3	3	3
101-150	3	5	2	3	3	3	3

6. If restaurants, motels, laundries, etc. are provided, the sanitary facilities for these businesses shall be in addition to the facilities for the marinas. If the sanitary facilities for the marina are in the same building with a business, such as a restaurant, then extra fixtures will be required to account for usage of the marina patrons.

B. Other Places Where Boats Are Moored: (Exclude kyaks and canoes)

At other places where boats are moored, sanitary facilities shall be furnished. The walking distance to those facilities should meet the requirements in "Section A" unless modified following an on-site inspection. Facilities furnished may be a pit privy for up to ten moorings. For more than ten moorings, the minimum sanitary facilities will be evaluated for each installation.

VI. PUMPING FACILITIES:

Pump-out facilities are required at service areas of all marinas for pumping the contents of holding tanks and recirculating toilets. The pumping facilities shall discharge the tank contents to a public sewer system

or to facilities which will provide satisfactory disposal. Hoses used in connection with a pump-out facility that are situated so as to be permanently or temporarily submerged in the waters of the docking area should be maintained under vacuum (any pressure less than atmospheric).

VII. SEWAGE TREATMENT FACILITIES:

If access to a public sewerage system is available, connection to such system shall be utilized as a means of disposal. If a public system is not available, a satisfactory system shall be provided by owner. The following means of disposal are listed in order of preference:

1. Discharge to a public sewerage system by means of a gravity line or a force main.

2. Stored in an on-shore holding tank which shall be watertight and so positioned, or movable to such a site that it can be easily serviced in a sanitary manner.

3. Stored in a portable, watertight dockside holding tank which can be easily removed for servicing in a sanitary manner.

4. Discharged to a private sewerage disposal system. Where a private sewerage disposal system is provided, plans and specifications shall be submitted for construction in accordance with the State Water Control Law and rules and regulations of the State Health Department.

a) For a design basis, the following should be used as maximum sewage flow:

Boats slips, moorings, or berths	30 gallons per capita per boat per day
Boats under 24' in length	2 persons per boat
Boats under 35' in length	3 persons per boat
Boats over 35' in length	4 persons per boat or actual capacity
Launching ramp	2 persons per trailor per parking space provided

b) Add 25% increase to each of the above designations to account for visitors.

c) Where restaurants and motels will be connected to the marina sewage disposal facilities:

Motels - 65 gallons per person per day or a minimum of 130 gallons per room per day

Restaurants - 50 to 180 gallons per seat per day (each installation will be evaluated according to conditions).

d) The occupancy level of boats used for design of sewage disposal facilities will be one-third those levels listed for maximum sewage flow. However, additional facilities to provide capactiy up to the maximum will be required, if the need arises, as determined by the local health directors concerned.

VIII. VARIANCES

A variance from these Rules and Regulations may be granted by the Director of Engineering of the Health Department for provision of facilities which will accomplish the intent of these Rules and Regulations, although such facilities may not conform explicity to minimum requirements set forth herein. A variance granted by the Director must be obtained in writing, following submission of required information, prior to installation and use of facilities which do not conform to minimum requirements set forth herein.

Location (City-County)	Number of Vessels	Occupancy (Man-days per day)	Average Loadings (lbs./day or no./day) BOD	Susp. Solids	Total Coliforms $(10)^{+12}$
Charles City	193	15	2	2	4.5
Chesterfield	1,915	144	23	30	43.2
Chesapeake	1,915	144	22	29	43.2
Colonial Heights	278	21	3	4	6.3
Dinwiddie	1.981	149	3	4	44.7
Franklin	63	5	1	1	1.5
Goochland	249	19	1	1	5.7
Greensville	163	12	2	2	3.6
Hanover	629	47	7	9	14.1
Henrico	2,032	153	23	30	45.9
Hampton	2,664	201	31	40	60.3
Hopewell	535	40	6	8	12.0
Isle of Wight	495	37	6	7	11.1
James City	552	42	6	8	12.6
Nansemond	659	50	8	10	15.0
New Kent	328	25	4	5	7.5
Newport News	2,394	180	28	36	54.0
Norfolk	3,509	264	40	51	79.2
Petersburg	399	30	5	6	9.0
Portsmouth	1,429	108	16	21	32.4
Powhatan	55	4	1	1	1.2
Prince George	444	33	5	7	9.9
Richmond	1,917	144	22	29	43.2
Southampton	183	14	2	3	4.2
Surry	282	21	3	4	6.3
Sussex	78	6	1	1	1.8
Suffolk	160	12	2	2	3.6
Virginia Beach	4,143	312	48	62	93.6
Williamsburg	132	10	2	2	3.0
York	1,834	138	21	27	41.4

Table 1:

Estimated Waste Loads Contributed by Recreational Vessels to the Waters of the James River and Hampton Roads Bay, 1970. (From Table V-1, James River Comprehensive Water Quality Management Study, State Water Control Board, Volume VII-2).

Marina Name	Av. No. Boats	Median Weekday Values No. of Coliforms Samples	Total	Fecal	Median Saturday Values No. of Coliforms Samples	Total	Fecal	Median Sunday Values No. of Coliforms Samples	Total	Fecal
Beach Bay	33	5	1100+	1100+	5	1100+	460			
Broad Creek	350	18	1100	43	17	1100	43			
Holiday Harbor	108	No samples taken								
Irvington	33	6	1100	625	6	240	350	6	121	43
Jetts	30	8	43	43	8	450	93			
Kinsale	40	5	460	43						
Kinsale		5*	1100*	240*						
Kinsale		5	1100	240						
Kings Creek	33	5	1100	43	5	460	150	5	1100	93
Krentz	27	6	346	150	6	136	41	6	1100	33
Locklies	22				5	93	23	5	240	23
Lynnhaven and Long Cr.	138	10	1100	49	10	460	93	10	1100	33
Marina Cove	73	8	167	68	8	1100+	23			
ME Clark	38				5	1100	93	5	460	93
Narrows	70	6	70	52	6	460	89			

Table 2: Median Bacteriological Data Obtained from Field Sampling Program VMIRL Marina Regulations Project, 1973

Marina Name	Av. No. Boats	Median Weekday Values No. of Coliforms Samples	Total	Fecal	Median Saturday Values No. of Coliforms Samples	Total	Fecal	Median Sunday Values No. of Coliforms Samples	Total	Fecal
Olversons	94	13	1100	43	13	1100	93	13	1100	93
Poquoson	83	10	1100+	1100+	10	1100	122	10	1100+	43
Rapp. Riv. C. C.	30	5	160	3.6	5	1100	240	5	240	43
Sarahs Creek	30	6	350	79	6	460	68	6	240	122
Smith Point	53	11	93	93	11	460	75	5	1100	240
Spencer's	46	5	1100	15	5	460	240	5	1100	43
Tides Inn										
Wachapreaque	30	7	930	930	7	210	39	7	230	93
White Heron	52	5	1100+	1100	5	1100+	1100+			
White Point	40	7	240	23						
White Point		7*	240*	23*						
White Point		7	460	93						
Willoughby Bay	44	12	1100	1100	9	460	43	12	780	59
Willoughby Bay	37**									
Windmill Pt.	70**									

Table 2: (Continued)

* Fourth of July Week

** Labor Day

Marina Name	Av. No. Boats	Median Weekday Values No. of Coliforms Samples	Total	Fecal	Median Saturday Values No. of Coliforms Samples	Total	Fecal	Median Sunday Values No. of Coliforms Samples	Total	Fecal
Wormley Cr.	54	5	93	23	5	240	23	5	240	93
Yeocomico	35	7	240	15						
Yeocomico		7*	93*	43*						
Yeocomico		7	240	43						
York River Yacht Haven	128	7	150	43	7	1100	240	7	460	460

Table 2: (Continued)

* Fourth of July Week

** Labor Day

Marina No.	Marina Name	Shellfish Growing Area	Median Fecal Coliform MPN Data: Shellfish Bureau Shoreline Survey No. Samples	Shellfish Bureau Shoreline Survey MPN	VMIRL - MRS Field Studies No. Samples	VMIRL - MRS Field Studies MPN
1	Beach Bay	71	61	23	5	460
2	Broad Creek	33	34	9.1	17	43
3	Holiday Harbor					
4	Irvington	20	24	9.1	6	350
5	Jetts	10	53	3.6	8	93
6	Kinsale	7	77	9.1	5	240
7	Kings Creek	88	30	3.6	5	150
8	Krentz	7	77	9.1	6	41
9	Locklies	31	35	3.6	5	23
10	Lynnhaven	70	127	23	10	93
11	Long Creek	71	61	23	10	93
12	Marina Cove	54	93	23	8	23
13	ME Clark	31	35	3.6	5	93
14	Narrows	37	34	3.6	6	89

Table 3: A Comparison of Median Fecal Coliform Values Obtained from Bureau of Shellfish Sanitation Shoreline Survey Data and Weekend and Holiday Data Obtained from Field Studies of VMIRL Project MRS, 1973

Marina No.	Marina Name	Shellfish Growing Area	Median Fecal Coliform MPN Data Shellfish Bureau Shoreline Survey No. Samples	MPN	VMIRL - MRS Field Studies No. Samples	MPN
15	Olversons	7	77	9.1	13	93
16	Poquoson	53	129	3.6	10	122
17	Rapp. Riv. Y. C.	20	24	9.1	5	240
18	Sarahs Creek	46	50	43		
19	Smith Point	10	53	3.6	11	75
20	Tides Inn	20	24	9.1	4	780
21	Wachapreaque	97	15	460	7	93
22	White Heron	71	61	23	5	1100^{+}
23	White Point	7	77	9.1	7	23
24	Willoughby Bay	67	65	23	9	43
25	Windmill Pt.	18	32	3.0		
26	Wormley Cr.	52	65	3.6	5	23
27	Ycocomico	7	77	9.1	7	43
28	York River Yacht River	46	50	43	7	240

Table 3: (Continued)

VMI RESEARCH LABORATORIES
VIRGINIA MILITARY INSTITUTE
LEXINGTON, VIRGINIA

County or City Mooring Data		Accomac	Bedford	Chesterfield
	Total Slips:	104	428	
	Covered Slips:	6	151	0
	Seasonal Slips:	62	376	15
	Transient Slips:	0	0	0
Public Toilets:				
	Men:	1	16	3
	Women:	1	18	3
Public Lavatories:				
	Men:	1	8	1
	Women:	1	9	1
Public Showers:				
	Men:	0	7	1
	Women:	0	6	1
Boats less than 24':				
	Total:	65	282	12
	% used weekday:	0	0	0
	% used weekend:	8	20	20
Boats over 24':				
	Total:	34	75	0
	% used weekday:	0	0	0
	% used weekend:	0	15	0
Services:	No. w/fuel:	2	7	1
	water:	3	4	1
	electricity:	4	4	1
	pump-out:	0	1	0
Wastewater disposal:	Septic tanks:	1	7	2
	direct connection:	0	0	0
	other:	0	0	0
	Number of Marinas:	6	8	3
	Number of Moorings:	0	0	0

Table 4 A Part of the Data Summary Obtained From Questionnaires Returned From Marinas and Mooring Facilities, VMIRL Project MRS, 1973.

VMI RESEARCH LABORATORIES

VIRGINIA MILITARY INSTITUTE
LEXINGTON, VIRGINIA

County or City	Dickenson	Essex	Fanquier
Mooring Data			
Total Slips:	200	77	0
Covered Slips:	0	57	-
Seasonal Slips:	190	60	-
Transient Slips:	0	0	-
Public Toilets:			
Men:	2	4	2
Women:	2	5	2
Public Lavatories:			
Men:	1	2	1
Women:	1	2	1
Public Showers:			
Men:	2	4	-
Women:	2	4	-
Boats less than 24':			
Total:	180	51	-
% used weekday:	-	-	-
% used weekend:	50	45	-
Boats over 24':			
Total:	15	33	-
% used weekday:	-	-	-
% used weekend:	-	45	-
Services: No. w/fuel:	-	2	-
water:	-	2	-
electricity:	-	2	-
pump-out:	-	1	-
Wastewater disposal: Septic tanks:	-	2	1
direct connection:	-	-	-
other:	-	-	-
Number of Marinas:	1	2	1
Number of Moorings:	0	0	0

Table 5 : A Part of the Data Summary Obtained From Questionnaires Returned From Marinas and Mooring Facilities, VMIRL Project MRS, 1973.

County or City Mooring Data		Franklin	Gloucester	Isle of Wight
	Total Slips:	95	129	25
	Covered Slips:	0	10	0
	Seasonal Slips:	50	94	20
	Transient Slips:	0	0	0
Public Toilets:				
	Men:	6	5	1
	Women:	7	5	1
Public Lavatories:				
	Men:	3	3	1
	Women:	3	3	1
Public Showers:				
	Men:	4	6	0
	Women:	4	6	0
Boats less than 24':				
	Total:	95	70	18
	% used weekday:	0	-	-
	% used weekend:	10	3	20
Boats over 24':				
	Total:	0	35	2
	% used weekday:	0	-	-
	% used weekend:	0	5	0
Services:	No. w/fuel:	2	2	0
	water:	1	4	1
	electricity:	2	4	1
	pump-out:	0	0	0
Wastewater disposal:	Septic tanks:	2	4	1
	direct connection:	0	0	0
	other:	0	0	0
	Number of Marinas:	2	4	1
	Number of Moorings:	1	2	0

Table 6 : A Part of the Data Summary Obtained From Questionnaires Returned From Marinas and Mooring Facilities, VMIRL Project MRS, 1973.

VMI RESEARCH LABORATORIES

VIRGINIA MILITARY INSTITUTE
LEXINGTON, VIRGINIA

County or City		King George	Lancaster	Mathews
Mooring Data				
	Total Slips:	25	180	155
	Covered Slips:	3	88	85
	Seasonal Slips:	25	147	109
	Transient Slips:	0	0	0
Public Toilets:				
	Men:	1	7	14
	Women:	2	7	14
Public Lavatories:				
	Men:	1	7	7
	Women:	1	7	7
Public Showers:				
	Men:	1	1	8
	Women:	1	1	8
Boats less than 24':				
	Total:	20	85	4
	% used weekday:	-	-	-
	% used weekend:	30	50	10
Boats over 24':				
	Total:	5	92	149
	% used weekday:	-	-	-
	% used weekend:	-	45	25
Services:	No. w/fuel:	1	4	3
	water:	1	4	3
	electricity:	1	4	3
	pump-out:	0	0	0
Wastewater disposal:	Septic tanks:	-	3	3
	direct connection:	-	0	0
	other:	-	1	1
	Number of Marinas:	1	4	5
	Number of Moorings:	0	3	0

Table 7 : A Part of the Data Summary Obtained From Questionnaires Returned From Marinas and Mooring Facilities, VMIRL Project MRS, 1973.

VMI RESEARCH LABORATORIES

VIRGINIA MILITARY INSTITUTE
LEXINGTON, VIRGINIA

County or City		Mecklenburg	Middlesex	Nansemond
Mooring Data				
	Total Slips:	63	465	23
	Covered Slips:	0	124	0
	Seasonal Slips:	63	371	23
	Transient Slips:	0	80	0
Public Toilets:				
	Men:	10	19	1
	Women:	10	22	1
Public Lavatories:				
	Men:	5	10	1
	Women:	5	12	1
Public Showers:				
	Men:	20	30	-
	Women:	20	30	-
Boats less than 24':				
	Total:	63	207	12
	% used weekday:	-	-	-
	% used weekend:	25	16	10
Boats over 24':				
	Total:	0	262	11
	% used weekday:	-	-	-
	% used weekend:	0	16	10
Services:	No. w/fuel:	0	6	1
	water:	0	7	1
	electricity:	0	7	1
	pump-out:	0	0	0
Wastewater disposal:	Septic tanks:	1	7	1
	direct connection:	0	1	0
	other:	0	0	0
	Number of Marinas:	1	8	1
	Number of Moorings:	1	2	1

Table 8 : A Part of the Data Summary Obtained From Questionnaires Returned From Marinas and Mooring Facilities, VMIRL Project MRS, 1973.

VMI RESEARCH LABORATORIES

VIRGINIA MILITARY INSTITUTE
LEXINGTON, VIRGINIA

County or City	New Kent	Northampton	Northumberland
Mooring Data			
Total Slips:	68	72	322
Covered Slips:	0	0	224
Seasonal Slips:	58	50	254
Transient Slips:	10	17	9
Public Toilets:			
Men:	1	3	17
Women:	1	1	18
Public Lavatories:			
Men:	1	3	8
Women:	1	1	9
Public Showers:			
Men:	0	1	24
Women:	0	1	25
Boats less than 24':			
Total:	10	26	45
% used weekday:	-	-	-
% used weekend:	20	13	9
Boats over 24':			
Total:	58	46	250
% used weekday:	-	-	-
% used weekend:	40	8	14
Services: No. w/fuel:	1	1	7
water:	1	1	7
electricity:	1	1	6
pump-out:	0	0	0
Wastewater disposal: Septic tanks:	1	2	3
direct connection:	0	0	0
other:	0	0	4
Number of Marinas:	1	3	7
Number of Moorings:	0	1	0

Table 9 : A Part of the Data Summary Obtained From Questionnaires Returned From Marinas and Mooring Facilities, VMIRL Project MRS, 1973.

VMI RESEARCH LABORATORIES

VIRGINIA MILITARY INSTITUTE
LEXINGTON, VIRGINIA

County or City		Pittsylvania	Prince George	Prince William
Mooring Data				
	Total Slips:	75	103	368
	Covered Slips:	30	42	26
	Seasonal Slips:	50	61	325
	Transient Slips:	0	0	0
Public Toilets:				
	Men:	2	3	4
	Women:	2	4	3
Public Lavatories:				
	Men:	1	2	2
	Women:	1	2	2
Public Showers:				
	Men:	2	6	2
	Women:	2	6	2
Boats less than 24':				
	Total:	12	40	103
	% used weekday:	-	-	-
	% used weekend:	-	22	28
Boats over 24':				
	Total:	20	59	265
	% used weekday:	-	-	-
	% used weekend:	-	20	21
Services:	No. w/fuel:	1	2	3
	water:	1	2	3
	electricity:	1	2	3
	pump-out:	0	0	0
Wastewater disposal:	Septic tanks:	1	2	1
	direct connection:	0		1
	other:	0	0	1
	Number of Marinas:	1	2	3
	Number of Moorings:	0	0	0

Table 10: A Part of the Data Summary Obtained From Questionnaires Returned From Marinas and Mooring Facilities, VMIRL Project MRS, 1973.

VMI RESEARCH LABORATORIES

VIRGINIA MILITARY INSTITUTE
LEXINGTON, VIRGINIA

County or City	Newport News	Portsmouth	Va. Beach
Mooring Data			
Total Slips:	238	342	231
Covered Slips:	0	2	20
Seasonal Slips:	203	300	92
Transient Slips:	0	20	0
Public Toilets:			
Men:	3	7	8
Women:	3	10	9
Public Lavatories:			
Men:	3	4	5
Women:	3	5	6
Public Showers:			
Men:	0	6	3
Women:	0	6	3
Boats less than 24':			
Total:	171	64	108
% used weekday:	-	-	-
% used weekend:	24	-	17
Boats over 24':			
Total:	91	268	102
% used weekday:	-	-	-
% used weekend:	23	-	26
Services: No. w/fuel:	3	3	4
water:	1	5	5
electricity:	0	4	5
pump-out:	0	1	0
Wastewater disposal: Septic tanks:	1	0	2
direct connection:	1	2	4
other:	1	1	0
Number of Marinas:	3	5	6
Number of Moorings:	0	1	1

Table 11 : A Part of the Data Summary Obtained From Questionnaires Returned From Marinas and Mooring Facilities, VMIRL Project MRS, 1973.

VMI RESEARCH LABORATORIES

VIRGINIA MILITARY INSTITUTE
LEXINGTON, VIRGINIA

County or City		Pulaski	Richmond	Stafford
Mooring Data				
	Total Slips:	266	54	35
	Covered Slips:	33	34	0
	Seasonal Slips:	210	54	35
	Transient Slips:	17	0	0
Public Toilets:				
	Men:	7	2	2
	Women:	8	2	2
Public Lavatories:				
	Men:	4	1	1
	Women:	4	1	1
Public Showers:				
	Men:	6	2	1
	Women:	6	2	1
Boats less than 24':				
	Total:	243	34	26
	% used weekday:	-	-	-
	% used weekend:	11	-	10
Boats over 24':				
	Total:	22	20	9
	% used weekday:	-	-	-
	% used weekend:	0	-	10
Services:	No. w/fuel:	4	1	1
	water:	1	1	1
	electricity:	1	1	1
	pump-out:	1	0	0
Wastewater disposal:	Septic tanks:	2	1	1
	direct connection:	0	0	0
	other:	2	0	0
	Number of Marinas:	4	1	1
	Number of Moorings:	1	0	0

Table 12 : A Part of the Data Summary Obtained From Questionnaires Returned From Marinas and Mooring Facilities, VMIRL Project MRS, 1973.

VMI RESEARCH LABORATORIES

VIRGINIA MILITARY INSTITUTE
LEXINGTON, VIRGINIA

County or City		Surry	Westmoreland	York
Mooring Data				
	Total Slips:	10	428	175
	Covered Slips:	0	242	69
	Seasonal Slips:	6	335	161
	Transient Slips:	0	15	0
Public Toilets:				
	Men:	1	19	6
	Women:	1	20	7
Public Lavatories:				
	Men:	1	10	3
	Women:	1	10	3
Public Showers:				
	Men:	0	20	4
	Women:	0	20	4
Boats less than 24':				
	Total:	10	106	90
	% used weekday:	-	-	-
	% used weekend:	-	6	10
Boats over 24':				
	Total:	0	321	100
	% used weekday:	-	-	-
	% used weekend:	0	11	16
Services:	No. w/fuel:	1	7	2
	water:	0	9	3
	electricity:	0	8	3
	pump-out:	0	0	0
Wastewater disposal:	Septic tanks:	0	3	1
	direct connection:	0	2	1
	other:	0	0	0
	Number of Marinas:	1	9	3
	Number of Moorings:	0	0	1

Table 13 : A Part of the Data Summary Obtained From Questionnaires Returned From Marinas and Mooring Facilities, VMIRL Project MRS, 1973.

VMI RESEARCH LABORATORIES

VIRGINIA MILITARY INSTITUTE
LEXINGTON, VIRGINIA

County or City		Norfolk	Chesapeake	Hampton
Mooring Data				
	Total Slips:	282	50	245
	Covered Slips:	0	0	21
	Seasonal Slips:	197	23	194
	Transient Slips:	0	20	0
Public Toilets:				
	Men:	8	5	11
	Women:	9	6	12
Public Lavatories:				
	Men:	4	2	6
	Women:	4	3	7
Public Showers:				
	Men:	6	5	3
	Women:	6	5	3
Boats less than 24':				
	Total:	110	27	18
	% used weekday:	-	-	-
	% used weekend:	25	-	12
Boats over 24':				
	Total:	157	23	215
	% used weekday:	-	-	-
	% used weekend:	11	25	23
Services:	No. w/fuel:	3	2	3
	water:	4	2	6
	electricity:	4	2	5
	pump-out:	0	0	0
Wastewater disposal:	Septic tanks:	1	1	3
	direct connection:	3	0	4
	other:	0	0	1
	Number of Marinas:	4	2	8
	Number of Moorings:	2	1	1

Table 14 : A Part of the Data Summary Obtained From Questionnaires Returned From Marinas and Mooring Facilities, VMIRL Project MRS, 1973.

VMI RESEARCH LABORATORIES

VIRGINIA MILITARY INSTITUTE
LEXINGTON, VIRGINIA

County or City		TOTALS	PER MARINA
Mooring Data			
	Total Slips:	5,365	41
	Covered Slips:	1,267	10
	Seasonal Slips:	4,213	30
	Transient Slips:	188	1
Public Toilets:			
	Men:	201	2
	Women:	218	2
Public Lavatories:			
	Men:	101	1
	Women:	119	1
Public Showers:			
	Men:	175	1
	Women:	175	1
Boats less than 24':			
	Total:	2,252	17
	% used weekday:	-	-
	% used weekend:	20	20
Boats over 24':			
	Total:	2,737	21
	% used weekday:	-	-
	% used weekend:	17	17
Services:	No. w/fuel:	80	-
	water:	73	-
	electricity:	82	-
	pump-out:	4	-
Wastewater disposal:	Septic tanks:	61	-
	direct connection:	20	-
	other:	12	-
	Number of Marinas:	111	-
	Number of Moorings:	19	-

Table 15 : A Part of the Data Summary Obtained From Questionnaires Returned From Marinas and Mooring Facilities, VMIRL Project MRS, 1973.

Rule 4. (1) A marina furnishing boat docking facilities for in excess of ten transient customers shall provide minimum toilet facilities in accordance with the following table:

Number of Boat Slips	Number of Toilets		Number of Urinals	Number of Lavatories		Showers
	M	F		M	F	
10-25	1	1	0	1	1	2
26-50	2	2	0	2	2	2
51-80	2	3	1	3	3	4
81-125	2	4	2	4	4	4
126-200	3	5	2	5	5	6
201-250	3	6	3	6	6	8
251-300	4	7	3	7	7	8

A. At Marinas

The building or buildings housing the sanitary facilities shall be conveniently located; but, in no case, should the facilities be more than 200 feet walking distance from the shore end of any dock they are intended to serve. The minimum facilities to be made available will vary with the size and type of installation according to the chart below:

Number of Slips or Moorings**	Water Closets		Urinals	Lavatories		Showers	
	Men	Women	Men	Men	Women	Men	Women
1-20	1	1	1	1	1	1	1
21-40	1	2	1	2	2	2	2
41-60	2	3	2	2	2	2	2
61-80	3	4	2	3	3	3	3
81-100	3	5	3	3	3	3	3

**For more than 100 slips, there should be provided:
1 additional water closet, lavatory and shower for each sex for each additional 40 slips or fraction thereof and 1 additional men's urinal for each 100 additional slips or fraction thereof.

Table 16: A Comparison of Schedules of Minimum Sanitary Facilities Utilized by the Health Departments of Michigan (Top Chart) and Virginia (Bottom Chart)

TABLE I

Item No.	Column 1 Number of Persons	Column 2 Minimum Number of Flush Toilets or Privy Seats	Column 3 Minimum Number of Washbasins
1	Up to 20	2	2
2	21 to 40	4	4
3	41 to 60	6	4
4	61 to 80	8	4
5	81 to 100	8	6
6	101 to 120	10	8

TABLE II

Item No.	Column 1 Number of Persons	Column 2 Minium Number of Washbasins	Column 3 Males Part 1 Minimum Number of Flush Toilets and Privies	Column 3 Males Part 2 Minimum Number of Urinals	Column 4 Females Minimum Number of Flush Toilets and Privies
1	Up to 20	2	1	0	1
2	21 to 50	4	2	1	2
3	51 to 80	4	3	1	3
4	81 to 120	4	3	2	4
5	121 to 210	6	4	2	4
6	211 to 300	6	4	2	5
7	301 to 390	8	5	3	6

Table 17:

Minimum Toilet Convenience Requirements as Listed in Ontario Regulation 390/72 a Regulation Made Under the Tourism Act.

MARINAS
REST ROOM FACILITIES AND SEWAGE FLOW

1. Population:
   a. 3 persons per boat
   b. 2 persons per trailer parking space where access ramp provided

2. Sewage flow:
   a. 5 gallons per person per day

3. Fixtures (based on total population):

	Male	Female
a. Water closets	1 per 150 persons	1 per 150 persons
b. Lavatories	1 per 150 persons	1 per 150 persons
c. Showers	1 per 300 persons	1 per 300 persons

Notes:

*1. A minimum of two water closets and two lavatories are normally required for each side of the rest room except in unusual conditions.

2. Urinals may be substituted for up to 1/3 of the water closets required on the male side of the rest room.

3. Automatic laundry facilities are not allowed except where connected to a municipal sewage system or where treatment facilities approved by the Department of Public Health are installed.

*Memorandum of 9/24/69 calls for minimum of one toilet per sex.

Table 18: Internal Policy Directive of Massachusetts Department of Public Health

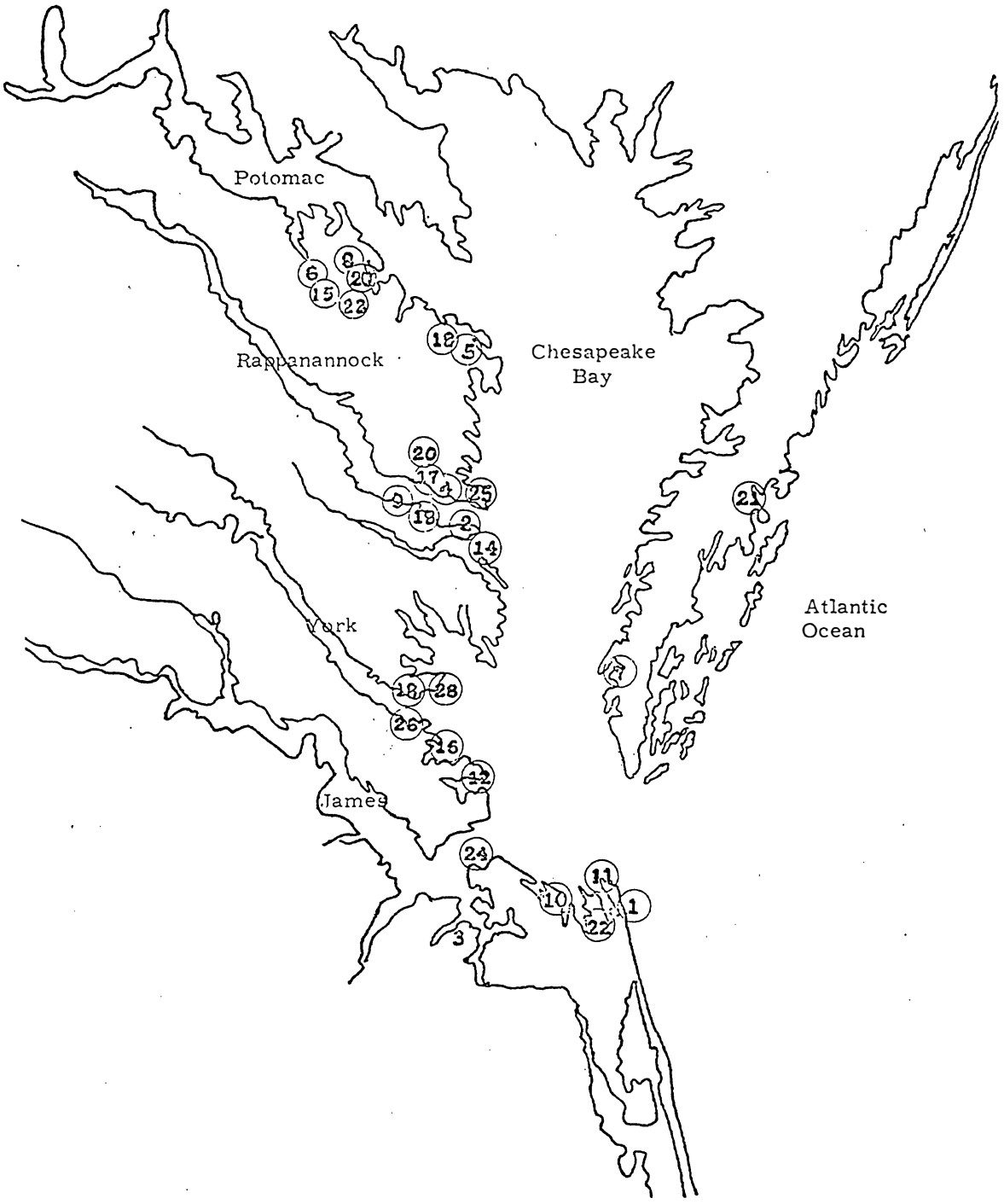

Figure 1: Location Diagram Showing the Marinas Visited During the Field Studies Portion of VMIRL Project MRS, 1973 (These Numbers Correspond to the Marina Listing in Table 3)

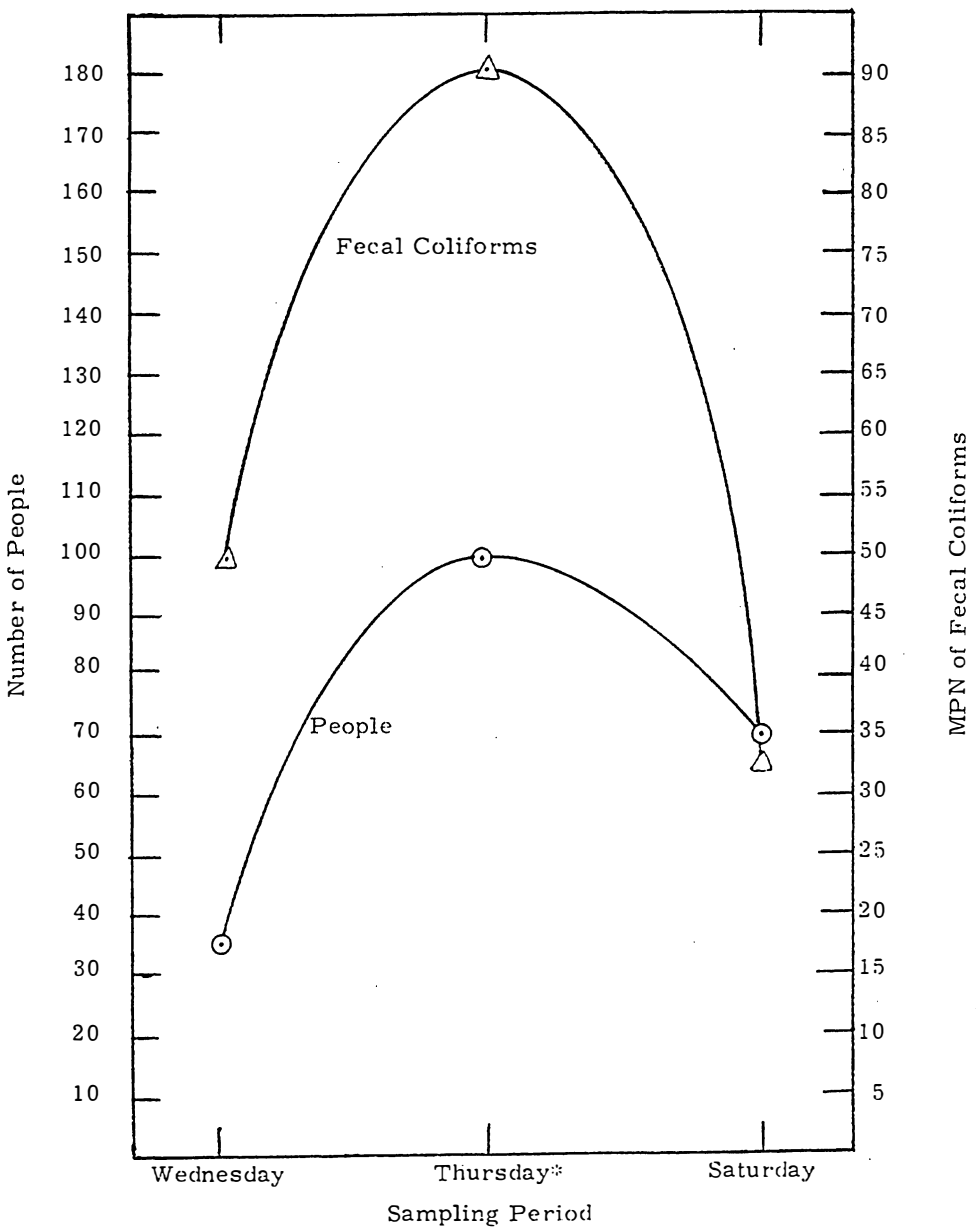

Figure 2: Median data obtained from field studies at the Lynnhaven and Long Creek Marinas, VMIRL Marina Regulations Project, 1973

*Fourth of July

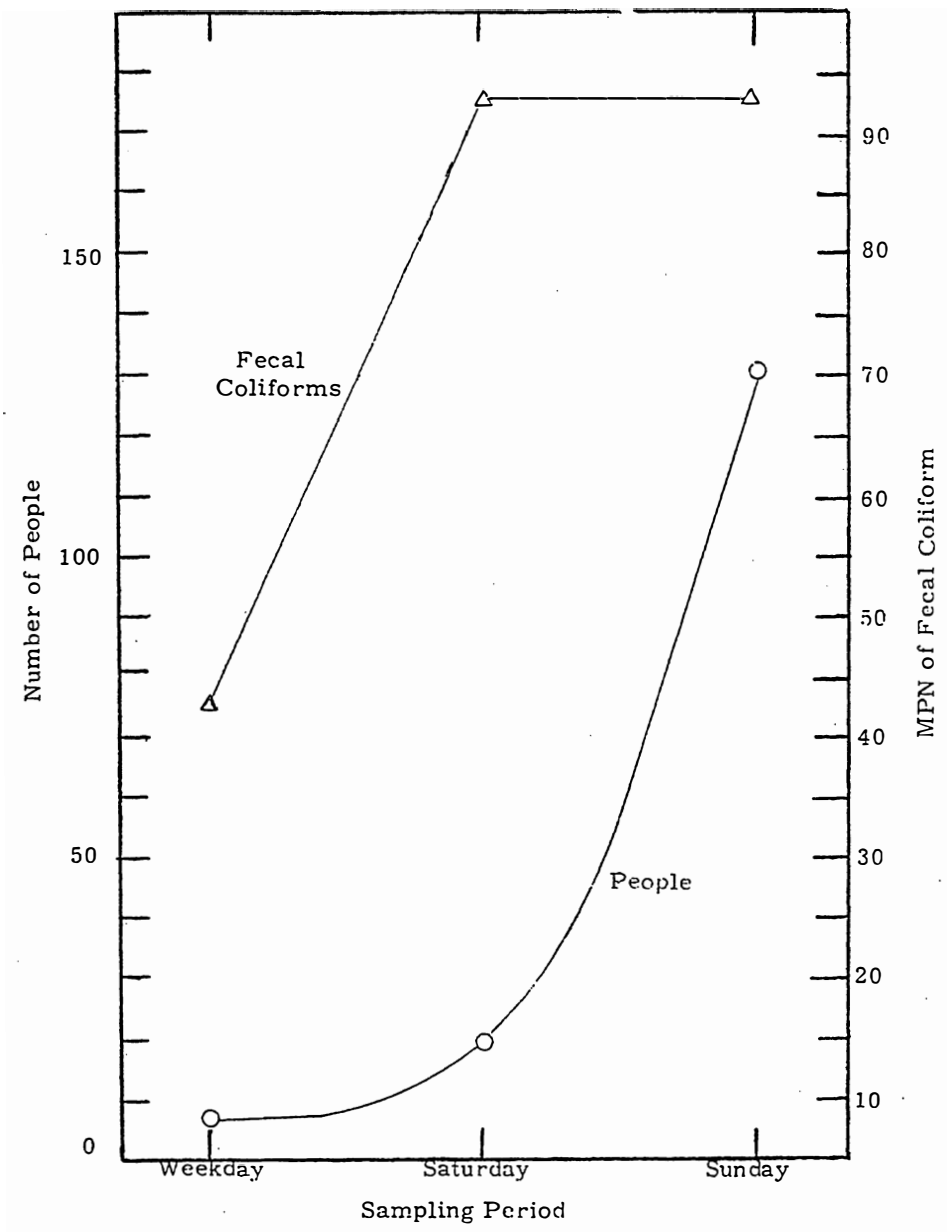

Figure 3 : Average Data Obtained from Field Studies at Olverson's Marina, VMIRL Marina Regulations Projects, 1973

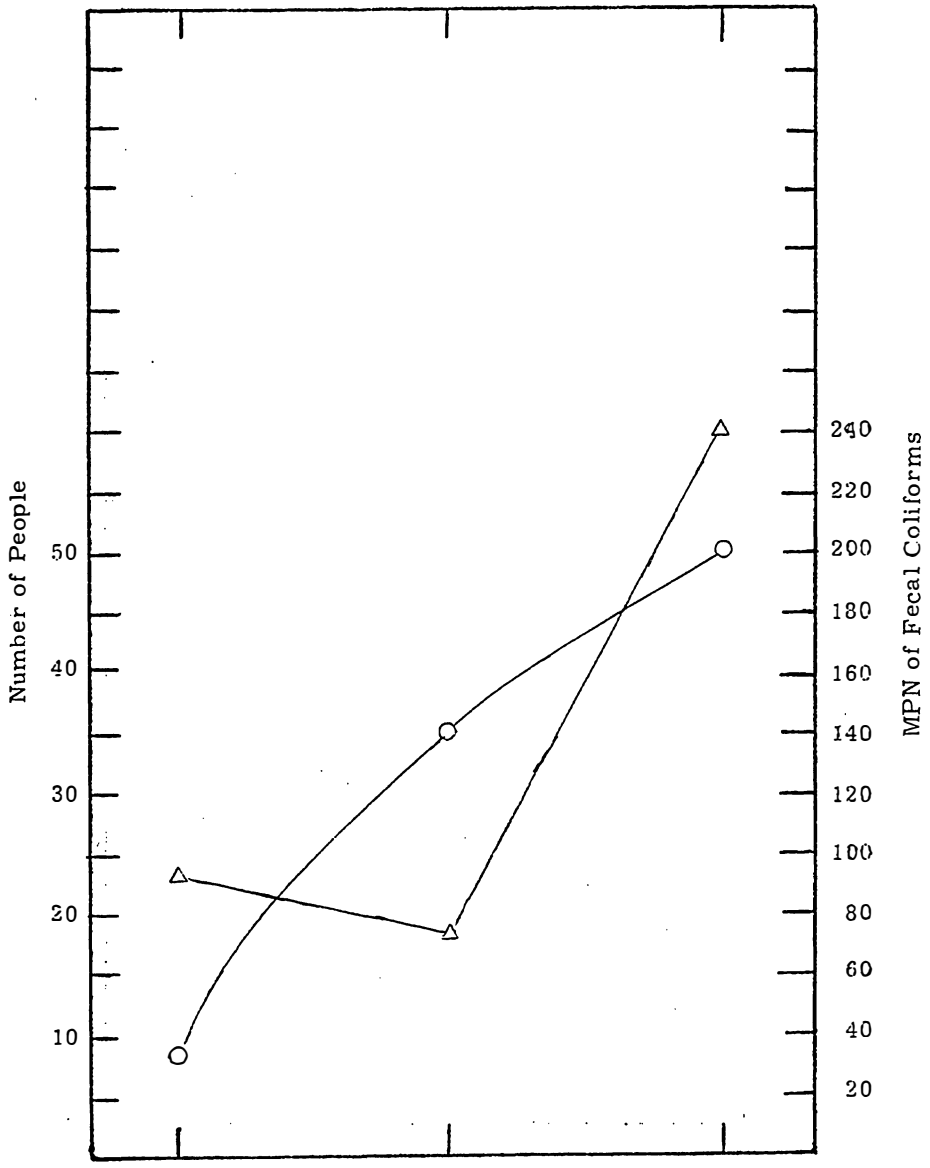

Figure 4 : Average Data Obtained from Field Studies at the Smith Point Marina, VMIRL Marina Regulations Project, 1973

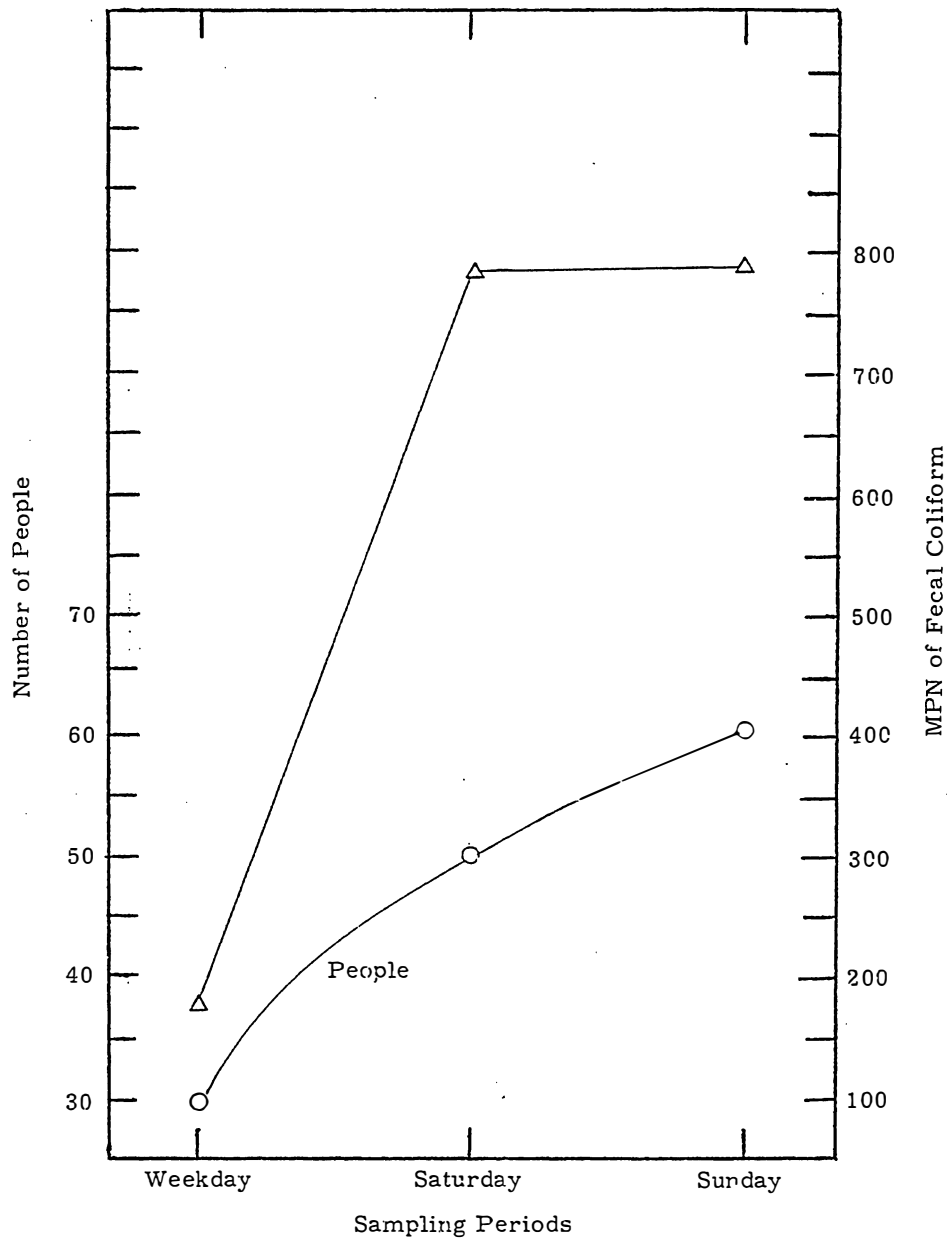

Figure 5 : Average Data Obtained from Field Studies at The Tides Inn Marina, VMIRL Marina Regulations Project, 1973

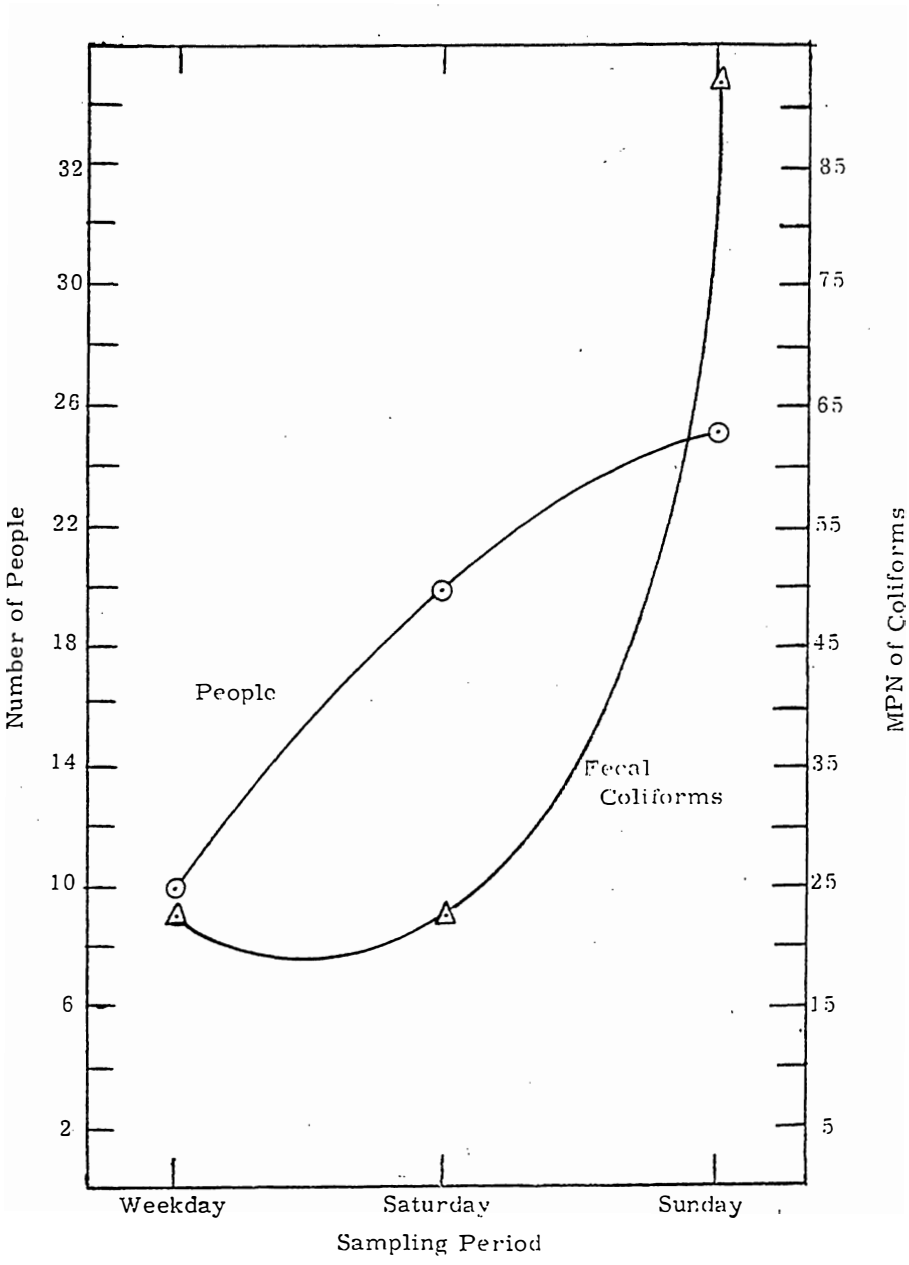

Figure 6: Median data obtained from field studies at Wormley Creek Marina, VMIRL Marina Regulations Project, 1973

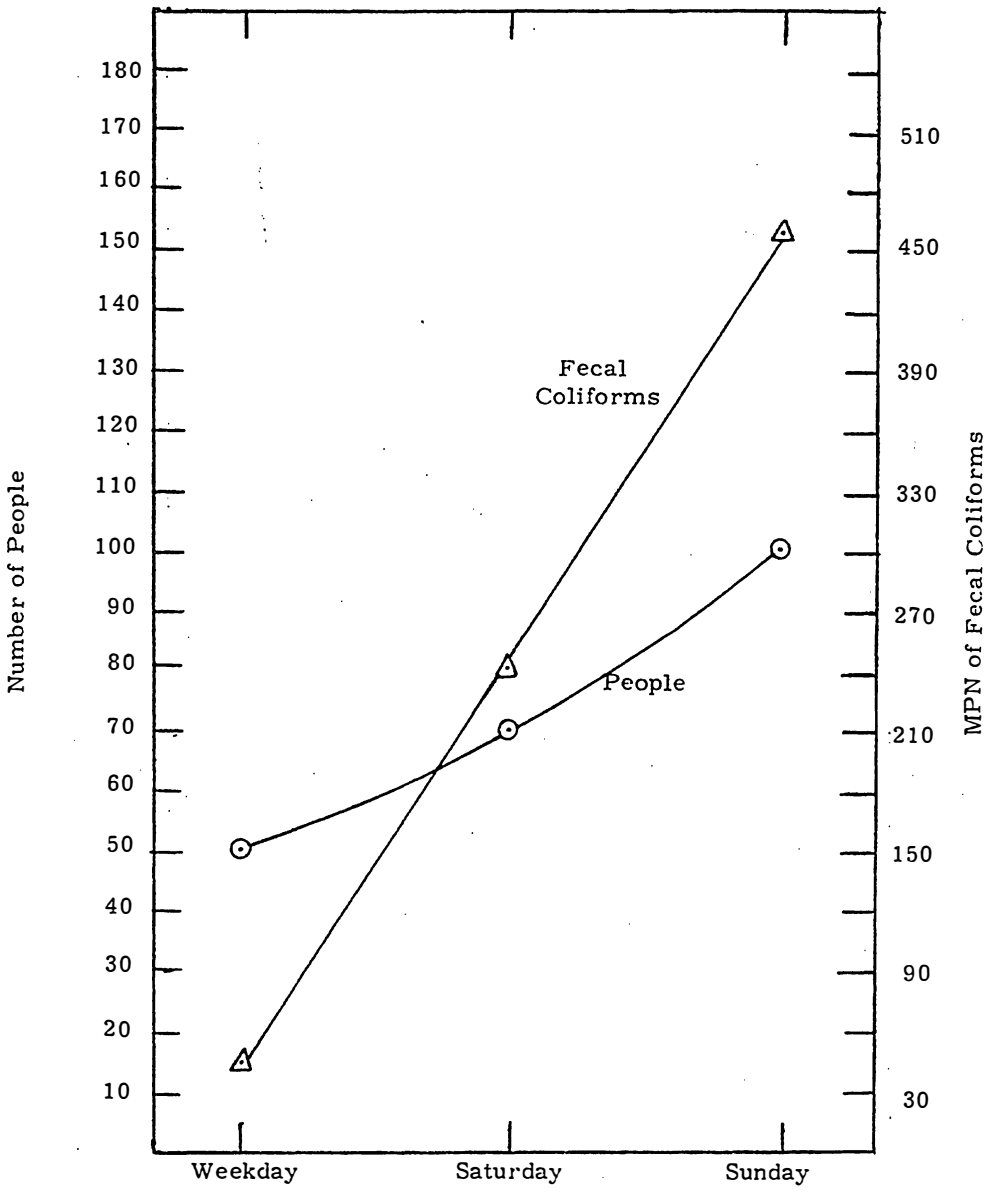

Figure 7: Median data obtained from field studies at the York River Yacht Haven, VMIRL Marina Regulations Project, 1973

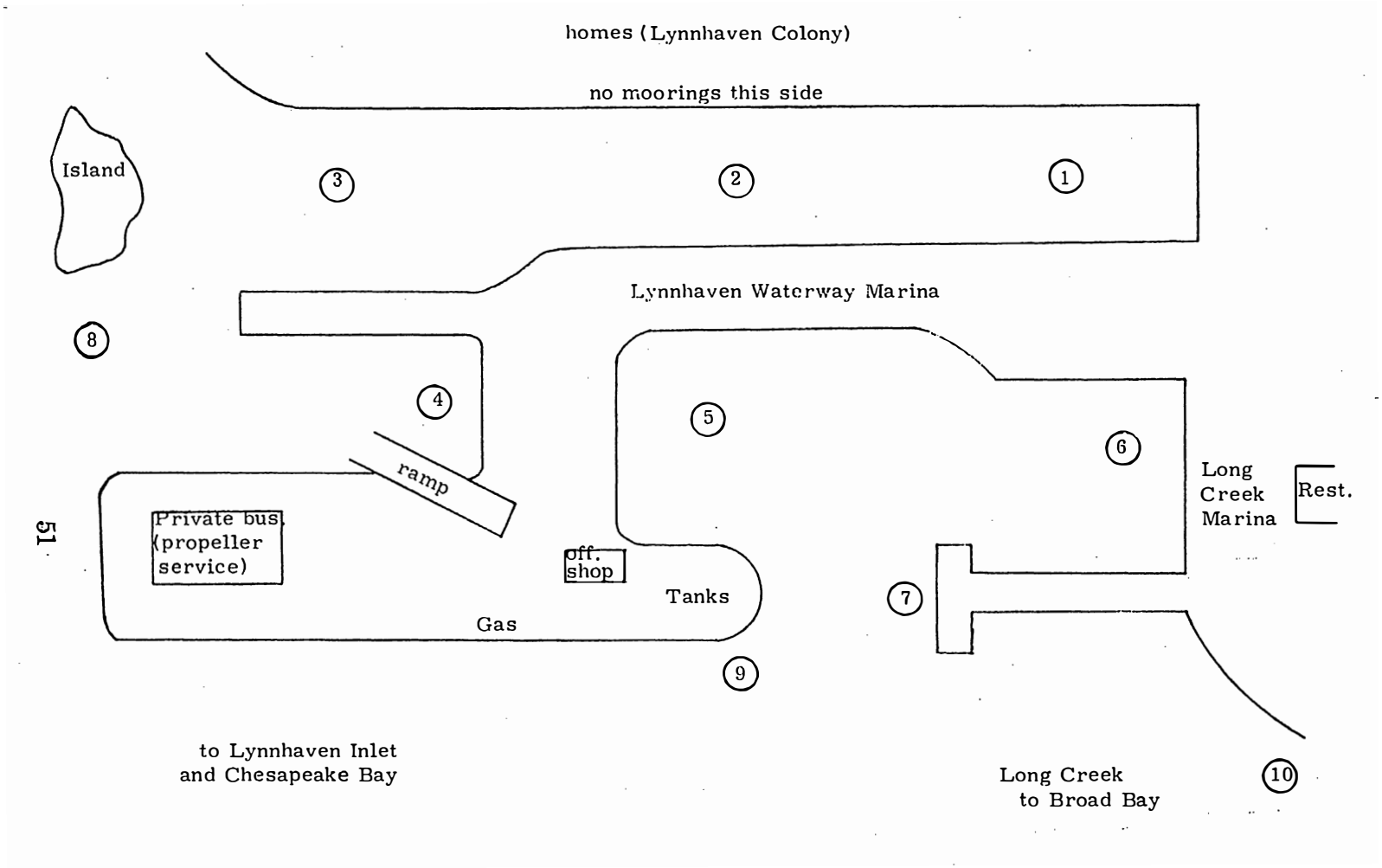

Figure 8: Sketch of Sampling Stations Utilized at the Lynnhaven and Long Creek Marinas, VMIRL Project MRS, 1973

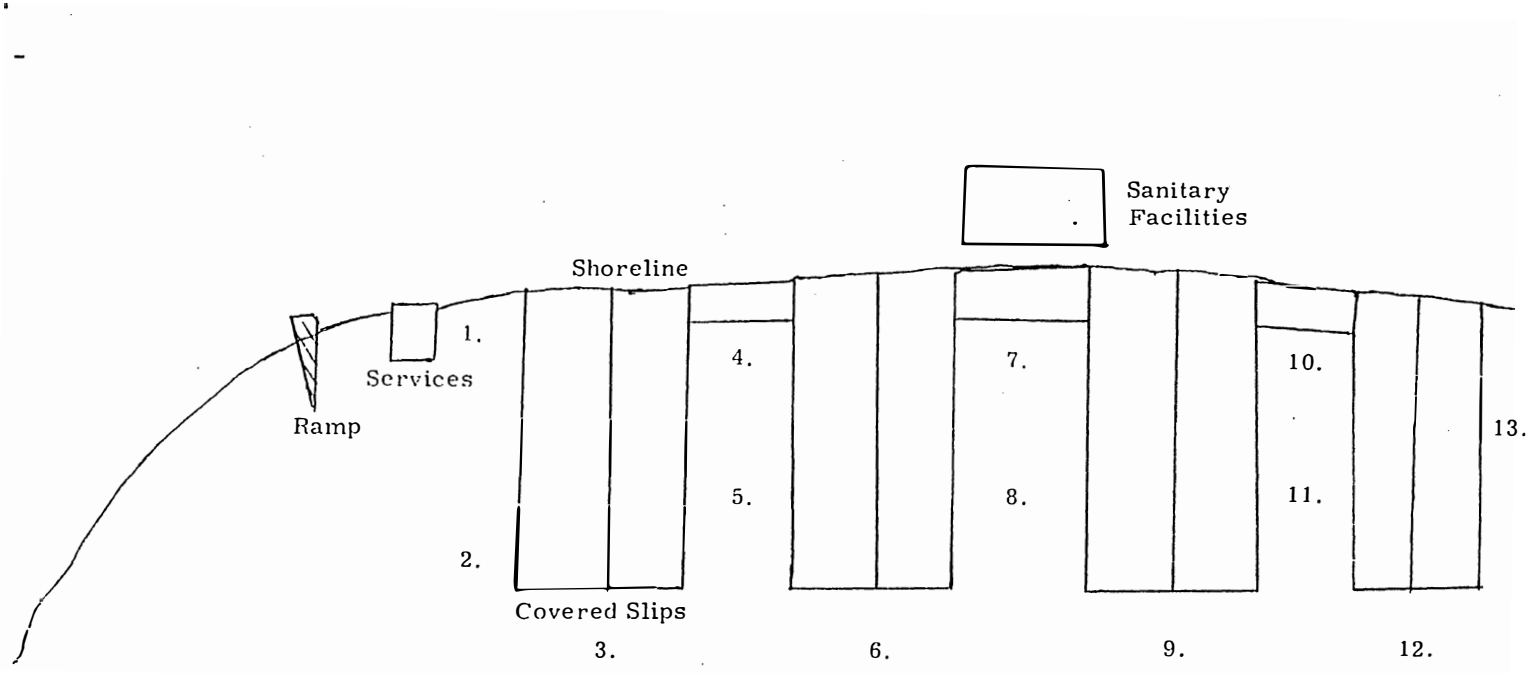

Figure 9: Sketch Showing Sampling Locations, Numbered 1 to 13, Utilized at Olversons Marina, VMIRL Marina Regulations Project, 1973

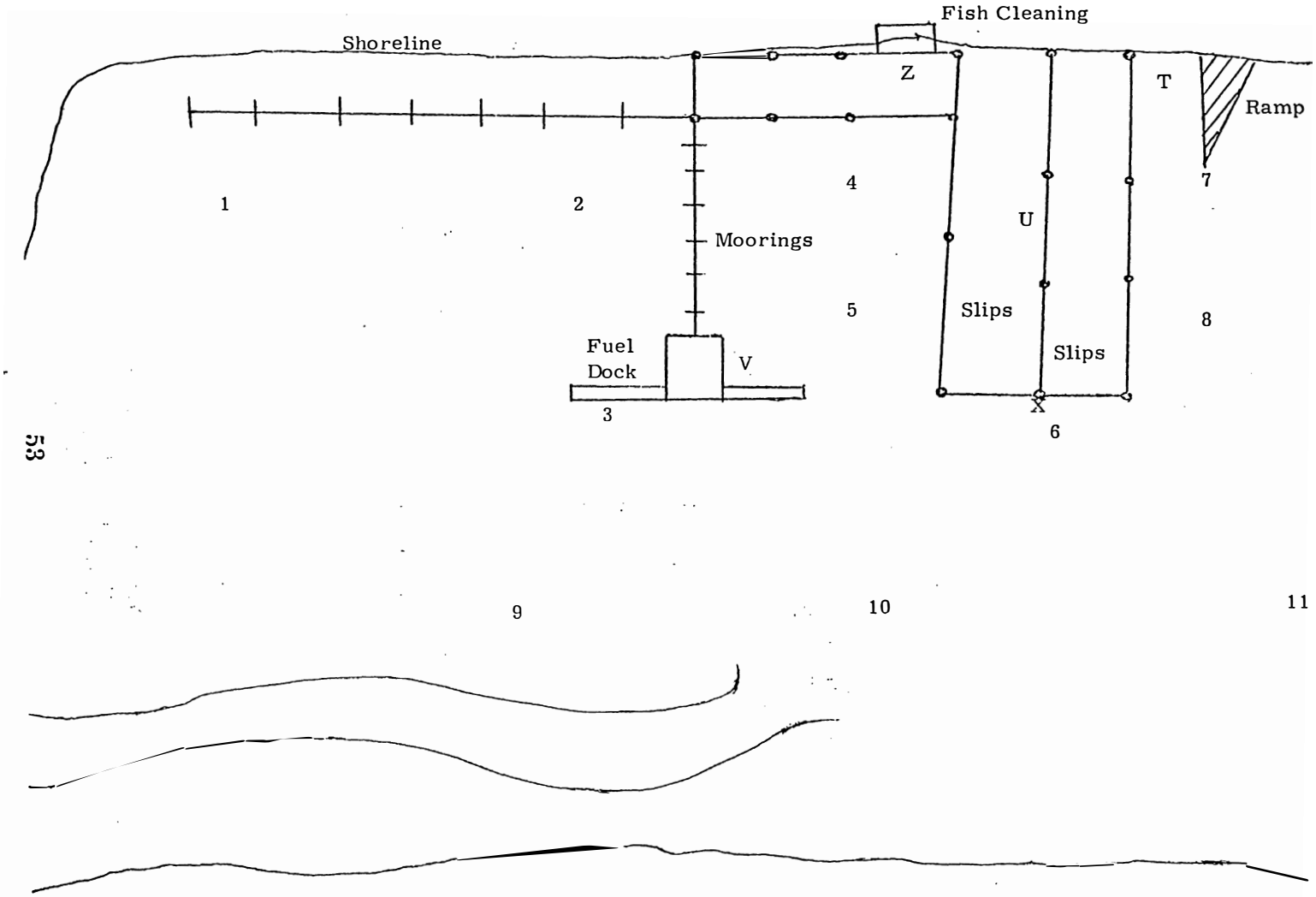

Figure 10: Sketch Showing Sampling Locations (1 to 11) and Some Special Sampling Points (T to X) Utilized at the Smith Point Marina Area, VMIRL MRS Project, 1973

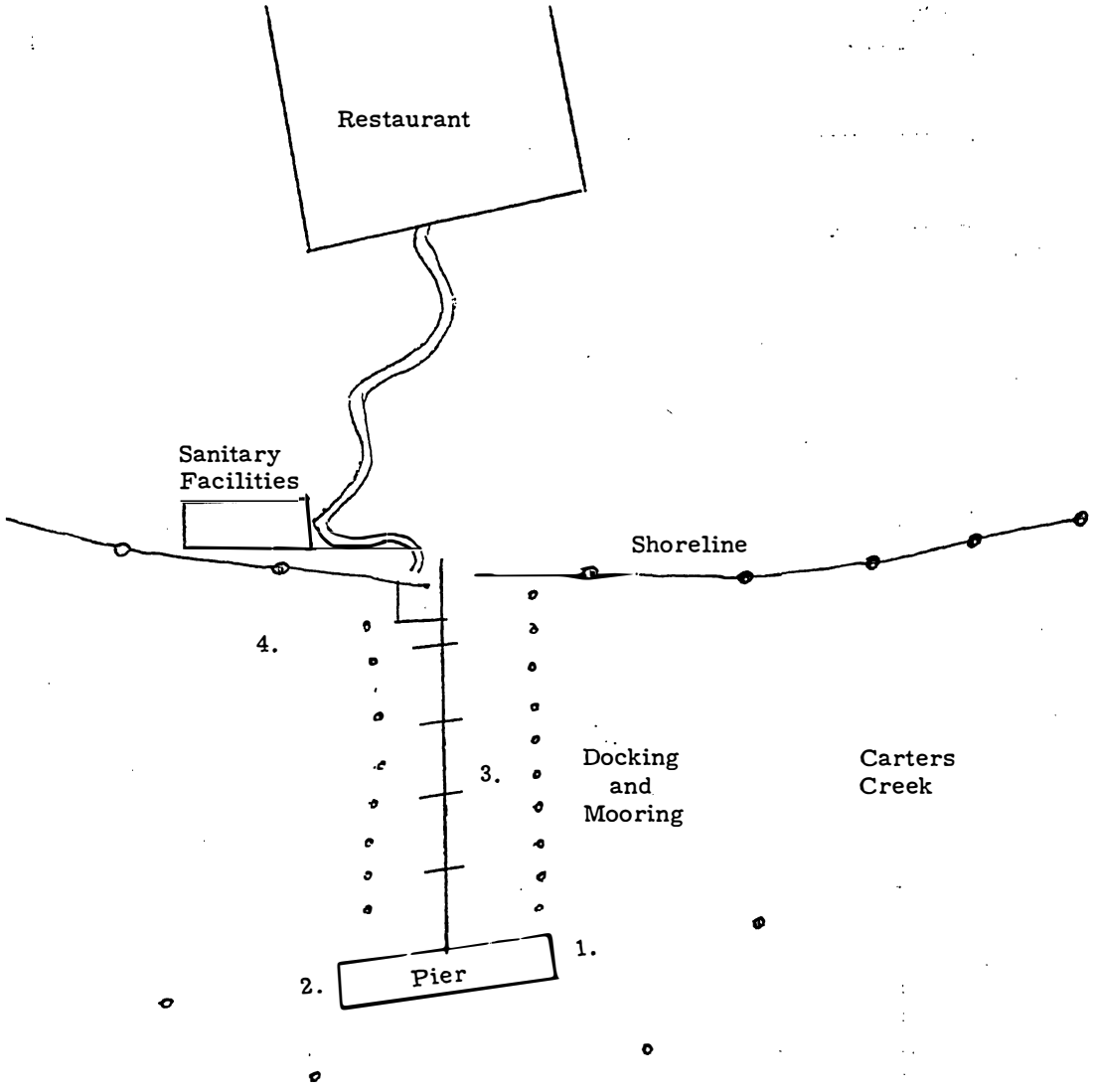

Figure 11: Sketch Showing Sampling Locations, Numbered 1 to 4, Utilized at the Tides Inn Marina, VMIRL Marina Regulations Project, 1973

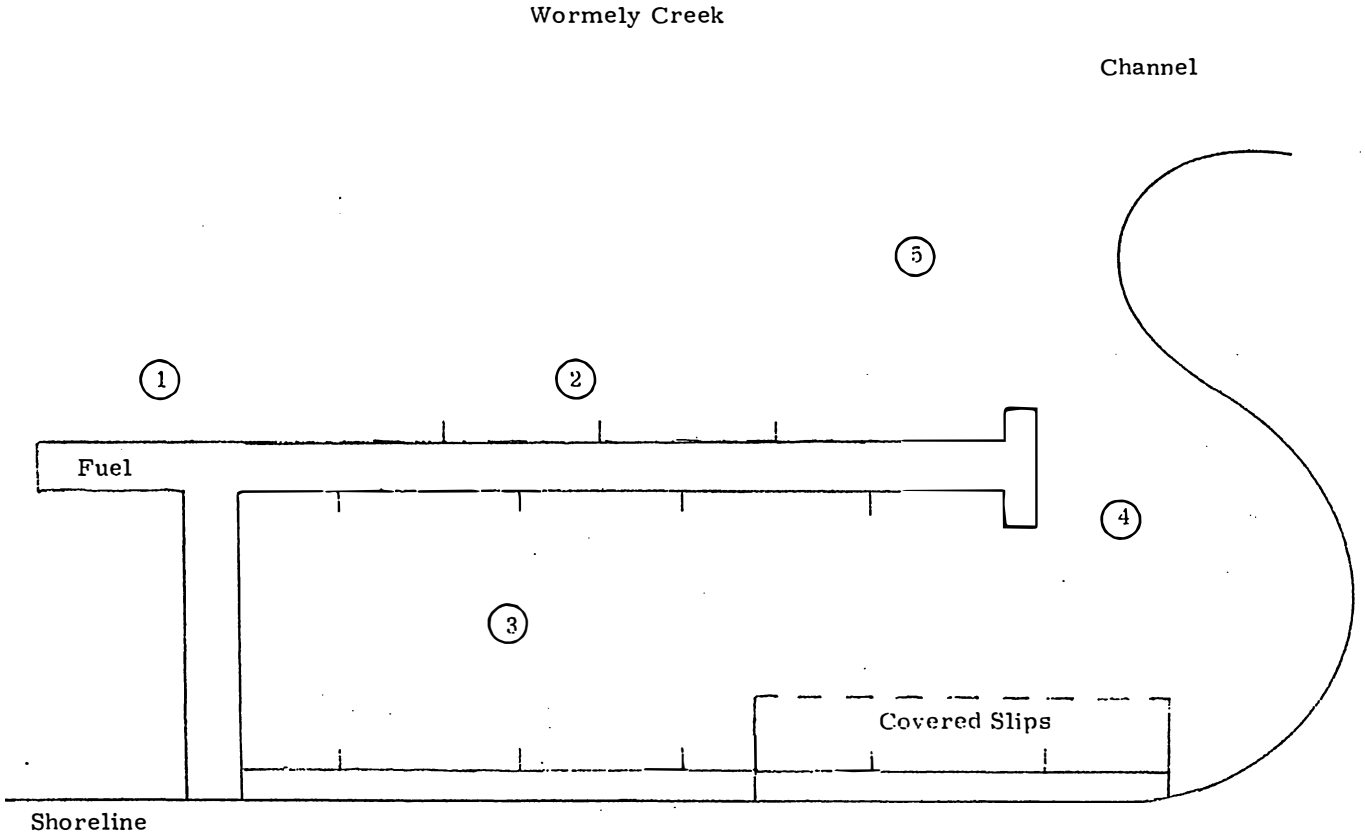

Figure 12: Sketch of Sampling Stations Utilized at the Wormely Creek Marina, VMIRL Project MRS, 1973

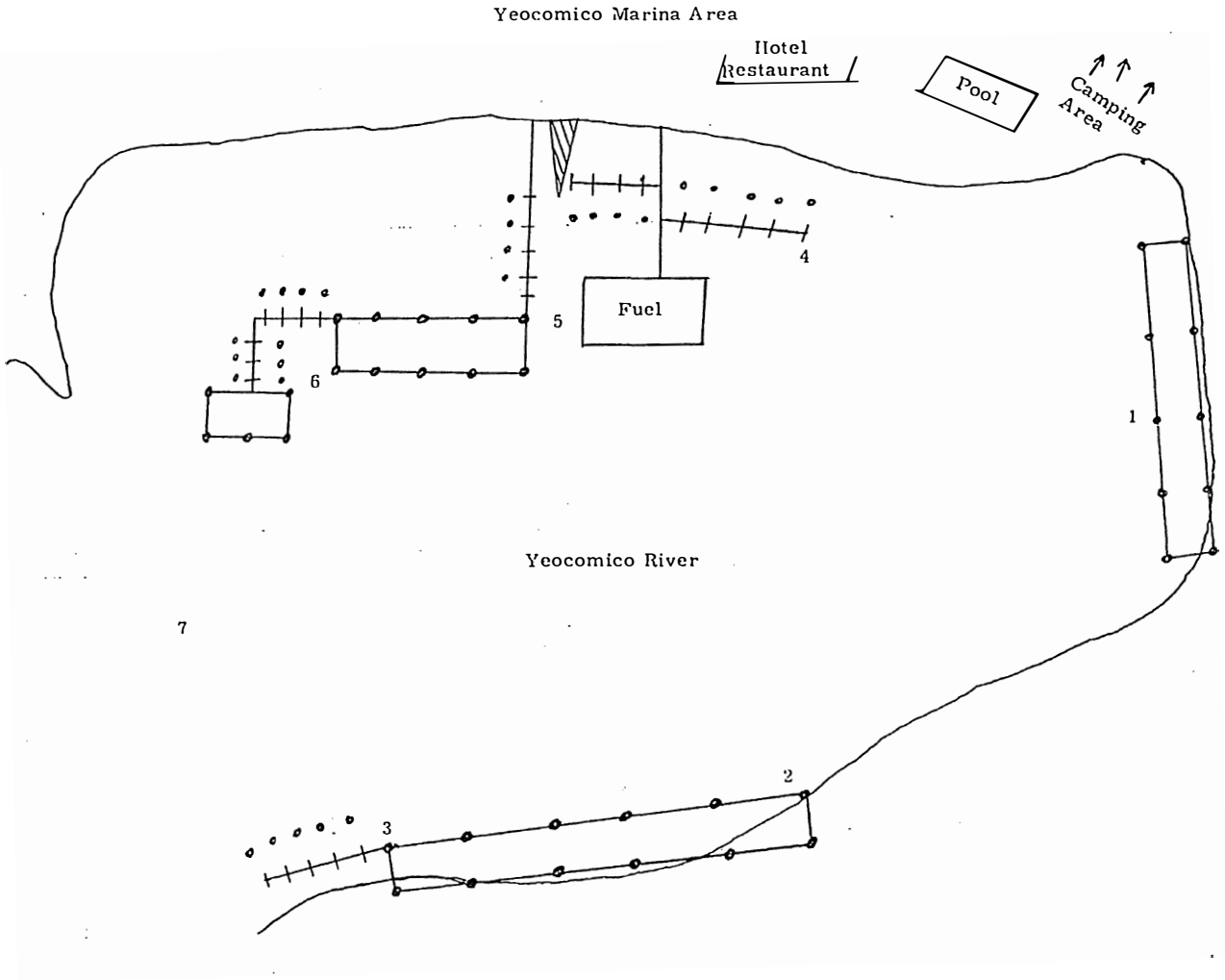

Figure 13: A Schedule Showing the Location of Sampling Stations 1 Through 7 Utilized at the Yeocomico Marina, VMIRL Project MRS, 1973

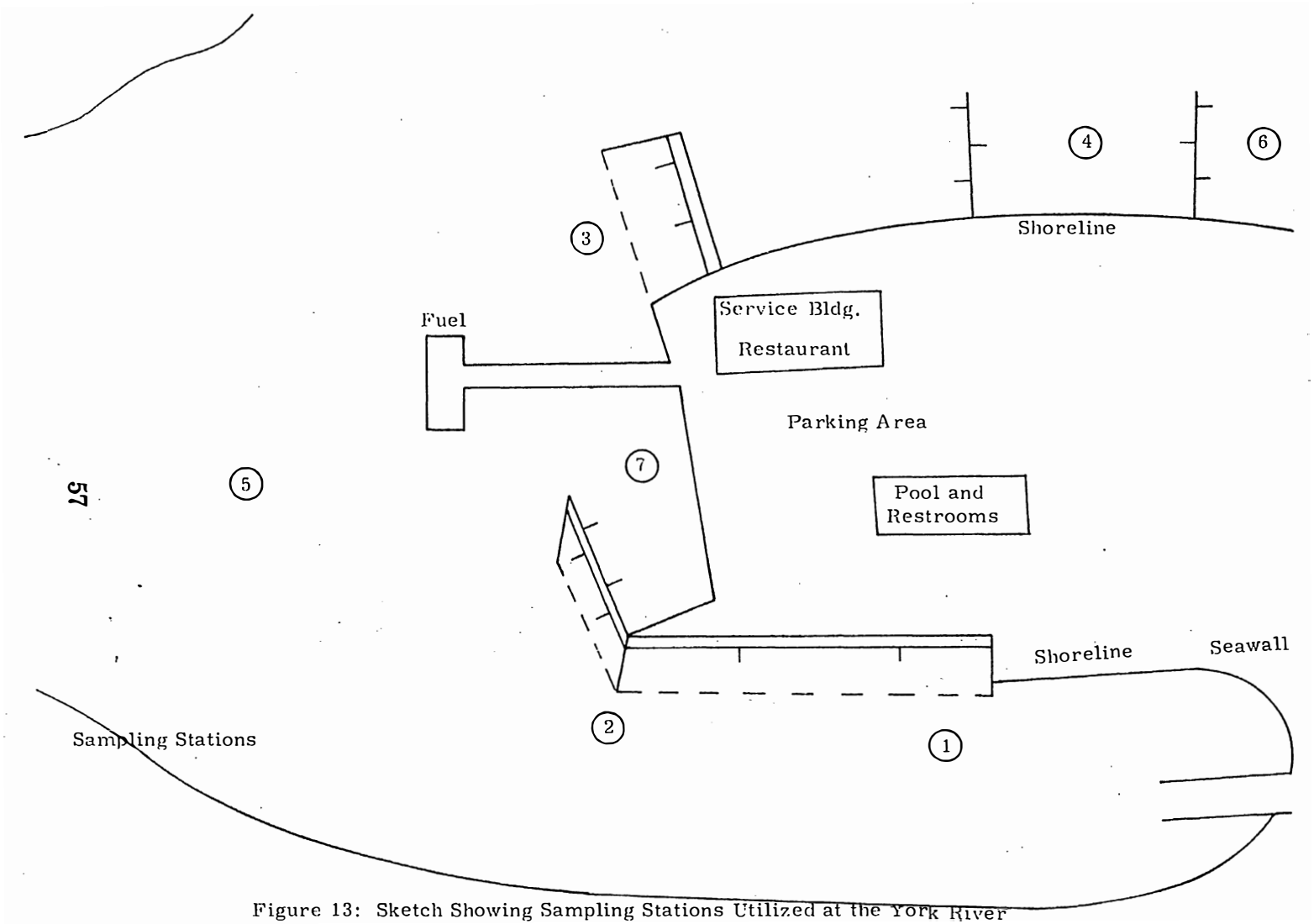

Figure 13: Sketch Showing Sampling Stations Utilized at the York River Yacht Haven Marina, VMIRL Project MRS, 1973

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APPENDIX A

VMI RESEARCH LABORATORIES
VIRGINIA MILITARY INSTITUTE
LEXINGTON, VIRGINIA
24451

CONTRACT PROPOSAL FOR A STUDY OF WATER QUALITY REGULATION OF MARINAS

Parties: The parties to this contract shall be the Virginia Health Department, Division of Engineering and the VMI Research Laboratories, Inc. (VMIRL).

Purpose and Scope of Work: VMIRL shall undertake a study of regulation of marinas as required by House Joint Resolution 191 as outlined below:

1. Approximately twenty selected sites, consisting of one or more marinas, as recommended by the Bureau of Shellfish Sanitation and approved by VMIRL will be visited by VMIRL investigators during June, July and August, 1973 and will include Memorial and Labor Day weekends. The visits to each marina will include a weekday and at least one weekend day.

   a) Information regarding boat moorings, boat occupancy, sanitary facilities and factors which may influence population at marinas will be gathered and recorded on standard forms.

   b) Water samples will be taken at each marina and transported to either the Bureau of Shellfish Sanitation Laboratories or the VMIRL Sanitary Engineering Laboratory and tested for bacteriological content using coliform tube tests. VMIRL will utilize sampling procedures as recommended by the Bureau of Shellfish Sanitation and expects the Bureau to conduct the majority of the analytical tests.

2. Existing information regarding State marina facilities, selected waterway bacteriological data and marina laws and regulation will be reviewed and summarized.

   a) The VMIRL will prepare a questionnaire to be sent to known marina operators in the Commonwealth. The questionnaire will be followed up by on site visits to selected marinas.

   b) A map showing location and dispersion of marinas will be prepared.

   c) Pertinent Federal and State laws and regulations will be surveyed and discussed. Virginia State laws and regulations will be examined for adequacy.

d) Technical and economical aspects of on-board holding and/or treatment and pump-out facilities will be examined from available information.

e) The project director will visit marina water quality regulation facilities in the States of Michigan and New York and discuss adequacy of regulation programs with regulatory personnel. In addition, the project director will talk personally with as many marina owners as possible in the duration of this study.

3. A final report will be completed and submitted on or prior to October 31, 1973. Progress reports will be made at pre-arranged meetings with the marina regulation steering committee on or about the end of June and July, 1973.

a) The final report will present the collected data and information in summarized form utilizing tables and graphs wherever possible and will be appropriately bound. At least 100 copies will be provided by VMIRL.

b) The final report will include study conclusions and recommendations regarding marina water quality regulation and alternatives.

c) The progress reports will involve verbal discussions with the steering committee concerning the direction and schedule of the study.

Contract Price: The contract is to be preformed on a cost-reimbursible basis with a maximum limitation of $11,000 including both direct and indirect costs. Direct costs consists of salaries, supplies, travel, communications, reports and miscellaneous costs. Indirect costs include overhead, social security and unemployment. An estimated budget is attached. Payments to VMIRL shall be made on the submission of monthly vouchers to the Virginia Health Department, Division of Engineering beginning 30 June 1973.

Proposed Budget

Water Quality Regulation of Marinas

Item	Cost
Salaries:	
1. Project Director 1 @ $10/hr.	$2000
2. Law student 1 @ $5/hr.	500
3. Laboratory Assistants @ $3/hr.	3000
Overhead @ 40% salaries	2200
Estimated travel of 6,000 miles @ $0.10/mile plus per diem total of $650	1250
Computer time @ $80/hr.	200
Laboratory supplies	300
Social Security (5.8% salaries)	319
Unemployment (1% salaries)	55
Telephone, postage and report production	326
Total	$10150

HOUSE JOINT RESOLUTION NO. 191

Directing the State Department of Health to make a study and report on the necessary rules and regulations governing sewerage facilities at marinas.

Offered January 12, 1973

Patron--Mr. Middleton

Referred to the Committee on Health, Welfare and Institutions

Whereas, the State Board of Health is empowered and directed by statute to adopt and promulgate all necessary rules and regulations establishing minimum requirements as to the adequacy of sewerage, facilities at marinas; and

Whereas, the minimum facilities required are in excess of those in other states and excessive in the opinion of experts in the field; and

Whereas, legislative proposals now before the General Assembly involving changes in the State Health Department's regulation of marinas cannot be given, in the thirty day Session, the thoughtful study and deliberate attention which their importance demands; now, therefore, be it

Resolved by the House of Delegates, the Senate concurring, That the State Department of Health shall conduct an extensive review of rules and regulations governing sanitary and sewerage facilities at marinas and other places where boats are moored and to consider any proposals for changes, and, after due and careful consideration, to prepare and present to the General Assembly not later than December one, nineteen hundred seventy-three a report of its findings and conclusions, with recommendations for such legislative changes, if any, the Department may deem desirable and proper.

APPENDIX B

VMI RESEARCH LABORATORIES

VIRGINIA MILITARY INSTITUTE
LEXINGTON, VIRGINIA
24451

MARINA REGULATION STUDY
ACTIVITY DATA FORM

Note: Give time and date (for each value for multiple visits)

Marina Name_____City/County_____

Name of Adjacent Waterways_____

Weather Conditions_____

Boating Information

Total No. Boats in Slips or Moorings _____ Total No. Boats in Area____
No. Under 24 Ft._____ No. 24-35 Ft._____ No. over 35 Ft._____
No. Rowboats_____ No. Sailing Craft_____ No. Outboards_____
No. Inboards_____ No. Pleasure Boats_____ No. Work Boats _____
No. Houseboats_____

Background Activity

No. of Cars in Area_____ No. of People in Area_____
No. of Boats Using In-Out Facilities: In_____ Out_____
No. People Swimming/Fishing in Area_____
No. People Camping in Area (Trailer, Tent, Etc.) _____

Occupancy Data

No. of People on Moored Boats_____
No. of People on Boats in Waterway_____
No. of Boats Occupied at Night_____

Type of Activity (note any activities which may influence water quality

_____

_____

FIELD STUDIES - A PARTIAL SUMMARY OF MARINA CONDITIONS

Broad Creek is located on the south bank and near the mouth of the Rappahannock River. Approximately ten separately owned marinas are in operation within this creek. These marinas predominantly accommodate pleasure boats ranging in size from twenty to fifty feet, and working boats ranging in size from twenty to thirty-five feet. Boats are repaired both on dry dock as well as in the water at many of the marinas. One marina had two boats about forty feet in length under construction in the water. Many empty boat trailers were present on weekends at a couple of the marina areas in this creek indicating that small boat owners use launching facilities provided, to gain access to other waterways. Boats were coming and going, to and from, this creek on weekends.

As far as occupancy of moored boats is concerned, with the exception of one marina, most boat owners boarded their boats only when getting ready to take them out of their slips.

Boating facilities were plentiful. Ramps, railways, and hoists existing throughout the creek. Water and electricity was available to almost all of the covered slips. Around two hundred covered slips were available for pleasure craft.

Three of four docks existed exclusively for twenty to thirty-five foot working boats. Fuel and oil could be obtained from almost every marina, and marine supplies could be purchased from several marinas.

A six foot deep channel had to be navigated four tenths of a mile through the Rappahannock River to enter Broad Creek . . . poor tidal flow conditions. The water was almost stationary at the ends of the creek.

Bathrooms were not easily accessible, not easily found, and not very clean for the most part. Very few, if any, showers were available to boaters.

The 1970 Health Department Shoreline Study, noted at the time, a few septic tank drain fields that could (pollution questionable) inadvertenly contribute to the pollution of this creek.

The weather was good for boating when data was collected from this marina

Smith Point Marina is located on Tabs Creek which is off of the Little Wicomico River. All boats present were pleasure craft; eighty percent ranging in size from twenty-four to fifty foot in length the other twenty percent were under twenty foot in length.

As far as occupancy of boats is concerned, on weekdays there wasn't much activity, however, on Sunday about thirty to fifty people occupied moored boats during the day. The owner knows of only one boat occupied overnight, and stated that of all the boaters using his marina, this couple is the only one apparently not using the sanitary facilities. People were cleaning fish in a sink which allowed the polluted effluent to drain directly into Tabs Creek. This marina was busiest on Sunday morning around 0930 hours at which time boats were preparing (re-fueling, boarding boats, fixing bait (chum) and rigs, using bathrooms) to go

out on fishing trips.

Forty-two covered slips were present with running water and electricity available to all slips. A ramp, fuel and oil, along with a very limited amount of marine supplies were available to boaters.

A small semi-twisting channel makes this marina accessible from the Little Wicomico giving it fair tidal flow conditions.

The sanitary facilities consisted of two showers, two toilets, and one urinal. These bath house facilities were kept very clean, however, it was necessary to ascend a rather steep hill to reach them from boat slips. Once to the crest of the hill the restrooms were easily located, however a visiting boat perhaps refueling, would not know where to look for these sanitary facilities.

The marina dumped its waste into a two thousand gallon septic tank with its drainfield two hundred feet from high tide at an elevation of eight feet.

The weather was warm on all three visits, however, it is interesting to note that winds varied from ten to twenty knots.

White Point Marina is located on the mouth of White Point Creek which runs into the Shannon Branch of the Yeocomico River. Sizes of boats present varied, however all slips were built to hold boats over thirty-five feet. All boats present were of the pleasure craft class; a few of which were ski, or speed boats, many of which were intermediate size cabin cruisers, and about three or four as large as fifty feet.

Apparently local people own boats kept at this marina as they were never occupied except when people were embarking or disembarking prior to or after a cruise. Very few people (two or three) were present on land at this marina area.

A railway, repair shop, marine supplies, and fuel, along with oil were available to boaters. There were forty-seven covered slips along with eleven open slips all of which had access to running water and electricity.

This marina area had swift movement of water flow during tidal changes. Some type of fishery is located within a half a mile down stream to this marina which could attribute to high coliform counts on weekdays.

Seven toilets, one urinal, and six showers are kept immaculately clean for boaters and employees as well. However these sanitary facilities are located a good walking distance from boating slips.

Good boating weather prevailed for each data gathering visit.

Narrows Point Marina is located in Hills Bay which runs into the Chesapeake Bay. Large cabin cruisers occupied all of the covered slips. A few large sailboats are moored along the back of the covered slip buildings. This is definitely a social-type marina where boat owners reside on moored boats for extended periods.

Approximately fifteen people were present aboard moored boats on a normal weekday. Over one hundred people were aboard moored boats on a typical weekend. Finally, over two hundred people were aboard moored boats on Saturday and Sunday of Labor Day weekend! Transient slips were available which could encourage

overnighters.

Numerous facilities were available as entertainment to people owning moored boats. A restaurant with three dining rooms seating as many as three hundred and fifty people at one time, a motel having forty rooms with a swimming pool available to motel guests, tennis courts, and finally children's playground equipment. Refrigerators are available to boats renting covered slips.

There were forty covered slips and forty transient slips both of which had excess to running water and electricity. Fuel and oil, up to fifty foot hauling, a hoist, and ice and bait were also available.

A swift current of water flushed the marina area with tidal change . . . excellent flow conditions.

Sanitary facilities were never crowded and always clean however they were not centrally located (with respect to both covered slips and transient slips). Trash cans were located about every six boat slips and emptied quite frequently.

A sixty thousand gallon capacity swimming pool was set up so that it could be drained into Hills Bay. This marina had its own jet aeration package treatment plant, with effluent conveyed into a drain field one hundred fifty feet from high tide at a three foot elevation, according to the Virginia State Health Department 1970 Shoreline Survey.

The weather was conducive to socializing aboard or cruising aboard boats when this marina was visited.

Olversons Marina is located along the east bank of Lodge Creek which is off of the South Branch of the Yeocomico River. This marina is occupied predominantly by twenty-four to thirty-five foot cabin cruisers. Three or four boats present were as big as fifty feet. All boats present could be categorized as pleasure craft.

On weekdays very few people boarded moored boats. However on a weekend . . . fifty to sixty people could be observed aboard moored boats.

The one hundred covered slips available for mooring boats all had access to running water and electricity. The only facilities other than slips was a refueling station and boat launching ramp.

The tidal flow conditions were good.

Ten toilets, three urinals, and eight showers were present for boaters use. These facilities were centrally located, well marked, and very clean.

The weather was excellent for boating all three surveillance visits.

King's Creek Marina

There is no wastewater treatment plant in the area. The owner's summer house and public restrooms are located on the dock. When the toilets are flushed the waste is discharged directly into the water below. The channel is fairly deep and has good tidal action since the marina is located near the mouth of King's Creek and Chesapeake Bay.

Lynnhaven Waterway and Long Creek Marinas

Excellent tidal action. Both marinas border Long Creek which is a fairly deep channel that connects Lynnhaven Inlet (directly off Chesapeake Bay) and Broad Bay. An area of intense boating activity. Swimming and fishing mostly west of marina.

York River Yacht Haven

There is good tidal action on the marina side where sample stations 3, 4, 5, and 6 are located. Many large pleasure boats use this area so the channel is fairly deep. The other sample stations are somewhat sheltered as to tidal flow. York River Yacht Haven is definitely a "social" marina.

Wormley Creek Marina

Wormley Creek is a small creek off the southern bank of the York River. The channel has been dredged into the marina and dredging operations were in process around the marina at the time of the survey. The creek is not very deep, therefore contributing to little tidal flow in the marina area itself. Most of the boats moored here are of the sailing class and belong to people who live in the area and up the creek. The water is too shallow further upstream in the creek to allow the owners to dock their boats behind their homes.

Sarah's Creek Marina

Sarah's Creek Marina is located about 1/4 mile from York River Yacht Haven on Sarah's Creek. The water is fairly deep in the channel and the tidal flow in the center is very good. However, by looking at the sample station sketch of the marina, it can be seen that station areas 1, 2, 4, and 5 are not subject to good tidal action during an average tide.

White Heron Motel and Yacht Club
Beach Bay Marina

Both marinas are located at the southernmost end of Broad Bay. White Heron is actually on Broad Bay whereas Beach Bay Marina is located on a small creek approximately 1/4 mile east of White Heron. Because of their situation, neither marina receives an appreciable amount of tidal flow. This is especially true for Beach Bay Marina where the water around the eastern most docks is practically stagnant. This is verified by the turbidity of the water as compared to the other samples taken.

It was brought to my attention that homes to the north of both these marinas are not on the city sewer system and therefore have septic tanks and drain-tile fields. Possible leakage from the drain-tile fields could influence coliform levels.

APPENDIX C

VMI RESEARCH LABORATORIES

VIRGINIA MILITARY INSTITUTE
LEXINGTON, VIRGINIA
24450

11 June 1973

PROJECT MRS

MEMORANDUM TO: All Owners of Boat Mooring Facilities

SUBJECT: Independent Research Study Concerning Boat Pollution Control Legislation

1. VMI Research Laboratories (VMIRL) has been contracted to conduct studies and prepare a report, concerning aspects of Regulation 5 of Section 62.1 - 44.33 of the State Water Control Law, involving control of pollution from boats.

2. VMIRL is an independent research organization and the research arm of the Virginia Military Institute. This study has been authorized by House Joint Resolution No. 191 and has been contracted through the State Health Department.

3. A segment of the study involves on-site sampling and data collection which will be carried out by VMI cadet lab assistants, who will visit many different mooring facilities throughout the State.

4. A second part of the study will concern updating existing information concerning boat mooring facilities.

5. Enclosed you will find data forms which we would like for you to fill out as fully as possible. We know, of course, that each facility is somewhat different from another, therefore, the data forms are in a general format and it will not be possible to answer all of the questions in most cases. Please do the best that you can and return the forms to us in the enclosed self-addressed, stamped envelope.

6. If your mailing address does not agree with the one we have used, please indicate the proper address at the beginning of the data forms. Thank you for your cooperation and I hope that the results of this study will answer many of the questions which have arisen concerning boat pollution legislation.

Sincerely,

C. M. Sawyer

C. M. Sawyer
Project Director

VMI RESEARCH LABORATORIES

VIRGINIA MILITARY INSTITUTE
LEXINGTON, VIRGINIA
24451

MARINA REGULATION STUDY
BASIC DATA FORM DATE_____

Marina Name_____City/County_____ State Route #____

Owners Name_____Owners Address_____

Boating Facilities

Total No. of Slips or Moorings ____ Boat Storage Capacity ____
No. Permanent Slips ____ No. Rental Slips ____ No. Covered Slips ____
No. Slips-Boats Under 24 Ft. ____ Slips-Boat 24 to 35 Ft.____
Slips-Boat Over 35 Ft. ____ No. Work Boat Slips ____

Services Provided (No. or Check as Applicable)

Fuel - Gas Pumps ____ Diesel Pumps ____ Other ____
Repairs - Engines ____ Hulls ____ Other ____
In-Out-Service - Ramps ____ Railway ____ Hoist ____
Utilities for Slips - Water ____ Electricity ____
Waste Removal (Describe)_____
Supplies - Food ____ Marine _____ Other____
Restaurant/Motel - (Approx. No. Seats/Rooms) _____
Laundry - (Describe)_____
Other - _____

Sanitary Facilities

No. Rest Rooms - Employees ____ Boaters/Public ____
No. Toilets ____ No. Urinals ____ No. Showers ____
Pump Out Facilities for Boats ____ Other Facilities _____

Wastewater Treatment and Disposal

Septic Tanks ____ Package Treatment Plant (Describe)_____
Municipal Sewers - Direct Connection ____ Storage and Hauling _____
Other Treatment Facilities (Chlorination, Sand Filter, etc.) _____

Effluent Discharge - To Receiving Water ____ To Lagoon ____ Subsurface ___

Water Supplies

Well ____ Municipal System ____ Other ____.

MARINA DATA FORM CONTINUED:

Boating Information-Saturday or Sunday (Circle Correct Day)

Total No. Boats in Slips or Moorings ____ Total No. Boats in Area____
No. Under 24 Ft.____ No. 24-35 Ft.____ No. over 35 Ft.____
No. Rowboats____ No. Sailing Crafts____ No. Outboards____
No. Inboards____ No. Pleasure Boats____ No. Work Boats____
No. Houseboats____ No. Rental or Transient Boats____

Background Activity-Saturday or Sunday (Circle Correct Day)

No. of Cars in Area____ No. of People in Area____
No. of Boats Using In-Out Facilities: In____ Out____
No. People Swimming/Fishing in Area____
No. People Camping in Area (Trailer, Tent, Etc.)____

Occupancy Data

Day and Time	No. of People On Moored Boats	No. of People On Boats in Waterway
1. Saturday		
Noon	____	____
6 p.m.	____	____
9 p.m.	____	____
2. Sunday		
Noon	____	____
6 p.m.	____	____
9 p.m.	____	____

Regulation Information

1. Are you familar with Regulation 5 of Section 62.1-44.33 of the State Water Control Law involving control of pollution from boats. Yes__ No__
2. Have you read the 1970 Procedure for Implementation of Marina Regulations distributed by the State Health Department. Yes___ No___
3. Have you seen State Water Control Board Guidelines for Approved Sewage Retention Devices and for Pumpout Facilities. Yes___ No___
4. Do you have pumpout facilities at your marina. Yes___ No___
5. Do you plan to construct pumpout facilities during 1973. Yes___ No___
6. Do you desire more information concerning Regulation 5. Yes___ No___
   Do you desire technical and cost information relating to sewage retention and pumpout facilities. Yes___ No___.

Additional Comments:

VMI RESEARCH LABORATORIES

VIRGINIA MILITARY INSTITUTE
LEXINGTON, VIRGINIA
24451

15 June 1973

PROJECT MRS

MEMORANDUM TO: All Owners of Boat Mooring Facilities Who Received VMIRL Questionnaire Dated June 11

SUBJECT: Error in Study Objective

1. A questionnaire and covering letter has been mailed out to owners of marinas concerning an independent research study which VMIRL is conducting as authorized by House Joint Resolution 191.

2. The objective of the study as outlined in Paragraph 1 of the June 11 mailing was not stated correctly.

3. Enclosed you will find a corrected copy of the June 11 cover letter and a corrected copy of the second page of the data form.

4. The Project Director apologizes for the mix-up and sincerely hopes that this error has not inconvenienced those receiving the incorrect forms.

5. VMIRL wishes to thank you for your consideration in this matter involving confusion of study areas.

6. Please complete the corrected data forms as previously requested.

Sincerely,

C. M. Sawyer

C. M. Sawyer
Project Director

VMI RESEARCH LABORATORIES
VIRGINIA MILITARY INSTITUTE
LEXINGTON, VIRGINIA
24451

15 June 1973

PROJECT MRS

MEMORANDUM TO: All Owners of Boat Mooring Facilities

SUBJECT: Independent Research Study Concerning Regulation of Sanitary and Sewage Facilities at Places Where Boats are Moored

1. VMI Research Laboratories (VMIRL) has been contracted to conduct studies and prepare a report, concerning aspects of the regulation of sanitary and sewage facilities at places where boats are moored as provided for by Title 32, Chapter 4, Article 1, Section 32-63.1 of the Code of Virginia.

2. VMIRL is an independent research organization and the research arm of the Virginia Military Institute. This study has been authorized by House Joint Resolution No. 191 and has been contracted through the State Health Department.

3. A segment of the study involves on-site sampling and data collection which will be carried out by VMI cadet lab assistants, who will visit many different mooring facilities throughout the State.

4. A second part of the study will concern updating existing information concerning boat mooring facilities.

5. Enclosed you will find data forms which we would like for you to fill out as fully as possible. We know, of course, that each facility is somewhat different from another, therefore, the data forms are in a general format and it will not be possible to answer all of the questions in most cases. Please do the best that you can and return the forms to us in the enclosed self-addressed, stamped envelope.

6. If your mailing address does not agree with the one we have used, please indicate the proper address at the beginning of the data forms. Thank you for your cooperation and I hope that the results of this study will answer many of the questions which have arisen concerning boat pollution legislation.

Sincerely,

C. M. Sawyer
Project Director

MARINA DATA FORM CONTINUED

Boating Information-Saturday or Sunday (Circle Correct Day)

Total No. Boats in Slips or Moorings _____ Total No. Boats in Area _____
No. Under 24 Ft. _____ No. 24-35 Ft. _____ No. over 35 Ft. _____
No. Rowboats _____ No. Sailing Crafts _____ No. Outboards _____
No. Inboards _____ No. Pleasure Boats _____ No. Work Boats _____
No. Houseboats _____ No. Rental or Transient Boats _____

Background Activity-Saturday or Sunday (Circle Correct Day)

No. of Cars in Area _____ No. of People in Area _____
No. of Boats Using In-Out Facilities: In _____ Out _____
No. People Swimming/Fishing in Area _____
No. People Camping in Area (Trailer, Tent, Etc.) _____

Occupancy Data

Day and Time	No. of People On Moored Boats	No. of People On Boats in Waterway
1. Saturday		
Noon	_____	_____
6 p.m.	_____	_____
9 p.m.	_____	_____
2. Sunday		
Noon	_____	_____
6 p.m.	_____	_____
9 p.m.	_____	_____

Regulation Information

1. Are you familar with the rules and regulations governing sanitary and sewage facilities at places where boats are moored as adopted by the State Health Department? Yes ___ No ___
2. Have you read the 1970 Procedure for Implementation of Marina Regulations distributed by the State Health Department? Yes ___ No ___
3. Have you seen State Water Control Board Guidelines for Approved Sewage Retention Devices and for Pumpout Facilities? Yes ___ No ___
4. Do you have pumpout facilities at your marina? Yes ___ No ___
5. Do you plan to construct pumpout facilities during 1973? Yes ___ No ___
6. Do you desire more information concerning regulations on sanitary and sewage facilities at boat moorings? Yes ___ No ___
7. Do you desire technical and cost information relating to sewage retention and pumpout facilities? Yes ___ No ___

Additional Comments

VMI RESEARCH LABORATORIES
VIRGINIA MILITARY INSTITUTE
LEXINGTON, VIRGINIA
24451

1 August 1973

PROJECT MRS

MEMORANDUM TO: All Owners of Boat Mooring Facilities Who Have Received VMIRL Questionnaire Dated June 18th and Have Not Replied

SUBJECT: Request for Return of Questionnaire

1. A questionnaire and covering letter has been mailed out to owners of marinas concerning an independent research study which VMIRL is conducting as authorized by House Joint Resolution 191.

2. The objectives of the study were outlined in our letter of June 18.

3. If you have not replied to the previous questionnaire as of this date, please do so as soon as possible as this information is needed in order that we may make recommendations based on representative data.

4. We are enclosing additional copies of the questionnaire for your use, please provide as much information as possible. VMIRL thanks you for your cooperation in this study which we hope will provide fair and just answers concerning regulation of on-shore sanitary facilities.

Sincerely,

C. M. Sawyer
Project Director

APPENDIX D

VMI RESEARCH LABORATORIES
VIRGINIA MILITARY INSTITUTE
LEXINGTON, VIRGINIA
24451

2 July 1973

The Virginia State Health Department has adopted a set of rules and regulations governing sanitary and sewerage facilities at marinas and other places where boats are moored. VMI Research Laboratories (VMIRL), an independent research arm of Virginia Military Institute, has been contracted to conduct a study, concerning the practicality of these regulations. This study was requested by the State Legislature.

A part of the VMIRL study concerns a comparison of the rules and regulations adopted by the Virginia Health Department with any similar current or proposed regulations concerning marinas and other places where boats are moored or concentrated, which are being utilized by other state health departments or environmental regulatory agencies.

If at all possible, we wish to request that you provide us with the information requested on the following data form or refer this request to the proper agency. The form can be returned in the enclosed stamped, self addressed envelope.

Thank you for your kind consideration in this matter.

Sincerely,

C. M. Sawyer

C. M. Sawyer
Project Director

VMI RESEARCH LABORATORIES
VIRGINIA MILITARY INSTITUTE
LEXINGTON, VIRGINIA
24451

Project MRS

Marina Regulations Comparison Form

1. Name of Agency and State_____

2. Name and Business Address of Responding Official:

_____

_____

3. Does your agency have current rules and regulations governing sanitary facilities at marinas and other places where boats are moored or concentrated? Yes___ No___

4. Is your agency in the process of adopting or proposing such rules and regulations? Adopting___ Proposing___

5. On what state code section are these regulations based?_____

_____

6. Where can VMIRL* obtain a copy of these regulations?_____

_____

Do these regulations cover public boat ramps? Yes___ NO___

8. On what form of usage would you base toilet and shower requirements at marinas and boat moorings?

Domestic (private)___, Motel-Hotel___,Domitory___,Other_____

9. On what percentage boat occupancy should sanitary and sewage facilities requirements at marinas be based?

5-10%___ 10-15%___, 15-20%___, 20-25%___, 25-30%___, Over 30%___

10. Additional Comments:

* All copying and mailing costs can be charged to:
VMI Research Laboratories, Project MRS, Virginia Military Institute,
Lexington, Virginia 24450

VMI RESEARCH LABORATORIES

VIRGINIA MILITARY INSTITUTE
LEXINGTON, VIRGINIA

Response To Marina Regulations Questionnaire

	State	Responding Official	Rules & Regulations
1.	California	Mr. John M. Gaston, Water Sanitation Section, California Department of Health, Berkeley, California 94704	Proposing Rules for Vessel Sanitation
2.	Delaware	Mr. Lee Beetschen, Manager Water Resources, Department of Natural Resources & Environmental Control, Dover, Delaware 19901	None
3.	Florida	Mr. Donald P. Schiesswohl, Department of Pollution Control, 2562 Executive Center Circle East, Montgomery Bldg., Tallahassee, Florida 32301	None
4.	Hawaii	Mr. Shinji Soneda, Executive Officer, Division of Environment Health, Hawaii Department of Health, P.O. Box 3378, Honolulu, Hawaii 96801	Existing (For Small Boat Harbors or DOT)
5.	Indiana	Mr. Oral H. Hert, Technical Secretary, Stream Pollution Control Board, 1330 W. Michigan Street, Indianapolis, Indiana	None
6.	Maryland	Mr. S. W. Fowler, Division of General Sanitation, 610 N. Howard Street, Baltimore, Maryland 21201	None
7.	Michigan	Mr. John E. Vogt, Chief, Bureau of Environmental Health, Michigan Department of Public Health, 3500 North Logan Street, Lansing, Michigan 48914	Existing (Cover All Aspects)

Response to Regulations Questionnaire (Cont'd.)

8.	Mississippi	Mr. Clyde X. Copeland, Advisory Sanitarian, P.O. Box 1700, Jackson, Mississippi 39205	Limited (Covers Ross Barnett Reservoir)
9.	Missouri	Mr. Jack K. Smith, P.E., Executive Secretary, Missouri Clean Water Commission, Department of Public Health and Welfare, 1014 Madison Street, P.O. Box 154, Jefferson City, Missouri 65101	None (Act Regarding Marine Toilets)
10.	New Hampshire	Mr. W. A. Healy, Executive Director, Water Supply and Pollution Control Commission State of New Hampshire, 61 South Spring Street, Concord, New Hampshire 03301	Existing Laws (For Marine Toilets and Disposal of Sewage from Boats)
11.	New York	Mr. Howard B. Gates, III, Chief Camp and Recreation Section, Bureau of Residential and Recreation Sanitation, Division of Sanitary Engineering, NYS Department of Health, 845 Central Avenue, Albany, New York 12206	Existing Laws (Watercraft Pollution) Proposing Rules and Regulations for Sanitary Facilities
12.	North Carolina	Mr. John Andrews, Branch Head Sanitary Engineering Section Division of Health Services N. C. Department of Human Resources, Raleigh, N. C.	None
13.	Ohio	Mr. V. Eugene Paul, Sanitarian-in-Charge, Recreation Sanitation Unit, Division of Sanitation, Ohio Department of Health, 450 East Town Street, Columbus, Ohio	Existing Bill to be Passed
14.	Oregon	Mr. Kenneth H. Spies, Deputy Director, Oregon Department of Environmental Quality, 1234 SW Morrison, Portland, Oregon 97205	None
15.	Pennsylvania	Mr. Arthur F. Lehmann Bureau of Water Quality Management, Department of Environmental Resources, Fulton Bldg., Box 2063 Harrisburg, Pennsylvania 17120	None

Response to Regulations Questionnaire

16.	Rhode Island	Mr. W. J. Shea, Assistant Division of Health, R.I. Department of Health, Davis Street Providence, R. I. 02080	None
17.	South Carolina	Mr. Robert E. Malpass, P.E., Director, Division of General Engineering Services, Bureau of Environmental Engineering, S. C. State Board of Health, Columbia, S. C. 29201	Existing Policy
18.	Texas	Mr. Henry L. Dabney, P.E., Director, Division of Wastewater Technology & Surveilleillance, Texas State Department of Health, 1100 West 49th Street, Austin, Texas 78756	Existing (For Disposal of Wastes from Watercraft)
		and	
		Mr. T. L. Morris, P.E., Texas Water Quality Board, 314 W. 11th Street, Austin, Texas 78711	Existing Bill
19.	Washington	Mr. Jack Lilja, Department of Social & Health Services, Health Services Division, P.O. Box 1788, Olympia, Washington 98504	Proposing Rules and Regulations for Marinas
20.	Massachusetts	Mr. Mario M. Boschetti Division of Environmental Health Department of Public Health Room 320, 600 Washington Street Boston, Massachusetts 02111	Existing Policy
21.	Maine	Mr. W. C. Toppan Division of Health Engineering Department of Health and Welfare Augusta, Maine 04330	None

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Response to Marina Regulations Questionnaire

Canada-Ontario	Mr. R. A. Fahlman, Director, Federal Activities Branch, Environmental Protection Service, Place Vincent Massey, Ottawa, Ontario Canada KIA OH3	Existing (For Discharge of Sewage from Pleasure Boats and for Marinas)
Canada-Ontario	Mr. N. Ross Radford, Executive Director, Field Services Division, Ontario, Ministry of Industry and Tourism, 900 Bay Street, Hearst Block, Queens Park, Toronto, Ontario Canada	Existing (For Tourist Establishments)

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A SUMMARY OF RESULTS FROM THE REGULATIONS QUESTIONNAIRE
BY STATES

Michigan

1. "Water Craft Pollution Control Act of 1970"

   Sec. 4 — Limits marine toilets to holding tanks that can be discharged on shore or an incinerating tank which can be emptied ashore without causing pollution.

   Sec. 5a — All marinas have to have pump-out facilities approved by Department of Health.

   Sec. 5c — Marina or dock which holds less than 15 watercraft does not have to have pump-out facilities.

   Sec. 11 — Violation results in $500 fine.

   Sec. 9 — State reserves right to establish for disposal and discharge of sewage from watercraft.

   Sec. 8 — Right of State to inspect waterside facilities or see if they are complying with Health Regulations.

2. Department of Health Regulations

   a) R. 325.2587

   Rl. 7(1) — Breakdown of number of toilets, urinals lavatories and showers required at a marina.

   (3) — Additional toilet fixtures required if marina operator has a restaurant or boat launching ramp.

NOTE: The minimum requirements for sanitary facilities closely parallels those in the Virginia Regulation, however, there are no minimums for marinas with less than 10 slips and toilet requirements are for transient slips.

Regulations Questionnaire Results

b) R. 325.2589 Receiving Units for Sewage

Rl. 9 Approved methods in order of preference

1. Discharge to public sewer
2. Stored in on-shore watertight holding tank
3. Discharge into marina owners own treatment system but approval of system required
4. Discharge from one watercraft to another-prohibited unless approved.

The regulation in Michigan provide for only four accepted sewage treatment facilities. The Virginia regulations are on an "as approved" standard for treatment facilities.

Washington

WAC-248-148-020 Definitions

2. Marina - Moorage space for 15 or more watercraft.

WAC-248-148-050 Rest Room Facilities

1. Flush toilets required unless health officer allows other (sealed vault or chemical)

WAC-248-148-060 Sewage Disposal

1. Public system discharge desirable but health officer may approve another type.

2. Sewage pump-out facilities only required for marinas with over 25 moorings.

New York

Subpart 75-3 State Health Regulation - A detailed description of pump-out requirements and watercraft toilet requirements.

Ontario

a) Regulation 646 - Ontario Water Resources Act (O. Reg. 261/70)

Distinguishes between a "marina" and a "commercial marina" and allows for less stringent standard for sanitary facilities at a "marina" which is primarily for fee docking of pleasure boats without toilets. The "marina" owner only has to provide for litter containers the "commerical marina" owner must provide pump-out facilities. The Regulation does not cover on-shore sanitary facilities.

Regulations Questionnaire Results (Ontario Cont'd.)

b) Regulation 390/72 The Ontario Tourism Act

States guidelines for toilet conveniences, plumbing and sewage disposal for tourist and camping establishments (Sections 22 through 30). Lists minimum toilet, lavatory and shower requirements based on the number of people using these establishments (Tables I and II).

Ohio

Sec. 3733.21 to 31

General Act empowering the State Board of Health to regulate sanitary facilities at marinas. The Director is given wide discretionary power to revoke previously licensed facilities if they don't meet "regulations" adopted by the Public Health Council.

California

Art. 1.5-4431 General statute prohibiting depositing sewage in marina areas.

Texas

Sec. 21.097 "Disposal of Boat Sewage"

This was the basis for the Texas State Board of Health Regulation covering disposal of wastes from watercraft. The entire focus of the regulation is on the on-board toilet not on dockside sanitary facilities.

South Carolina

Has a policy letter from the State Health Officer which is more detailed than some regulations. The letter outlines minimum requirements for holding tanks, incineration toilets and grinder pumps. There is an additional requirement that all heads on watercraft be sealed until such time that marinas are able to treat the waste.

New Hampshire

Chapt. 149-A "Marine toilets and disposal of sewage from boats" - This simply says that no discharge from marine toilets into the State waters.

Regulations Questionnaire Results

Hawaii

1. Rules and Regulations Governing Small Boat Harbors Department of Transportation (Part IV Sanitation)

Sec. 4.08 a) No untreated sewage may be discharged into waters of a small boat harbor.

b) Toilet can't be used unless it treats adequately - Approval by Director of Health.

2. Chapter 38 Public Health Regulations outlines sewage treatment and disposal requirements.

Massachusetts

Have existing policy under Department of Public Health (Table 18).