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Phase II - Feasibility of Large Scale Use of On-Site Sewage Disposal Systems in Florida Soils

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PHASE II - STUDY TO DETERMINE THE FEASIBILITY OF LARGE-SCALE USE OF ON-SITE SEWAGE DISPOSAL SYSTEMS IN FLORIDA SOILS

A report of the Construction Research Project
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EXECUTIVE SUMMARY

PURPOSE: This study was made to determine the feasibility of the wide-spread use of individual, on-site, sewage disposal systems in Florida soils, for the purpose of advising the legislature of the findings.

PAST AND CURRENT RESEARCH

FINDINGS: There are more than 1,000,000 septic tanks serving about 4 million Floridians. The potential for pollution of the ground water in many ways is serious. Studies of the use of septic tanks are prolific and date beyond the year 1900. There is more laboratory research conducted on similated field conditions than actual field tests and there are more "scientific" papers written by those who assimilate and analyze the findings of other researchers works than the actual field researchers. There are innumerable studies of the movement of living organisms and contaminants, with some disparity in their conclusions.

CONCLUSIONS: There are areas in Florida where the standard septic tank (soils absorptive system) cannot be used because of soil or ground water conditions. Conversely, there are areas where the standard septic tank system is the most efficient and economical method of sewage disposal. Most field studies show that the standard S.T.(SAS) does not have any significant effect upon the ground water quality. The most detrimental effects upon the ground water is derived from surface storm water run-off. Studies conclude that it is better to discharge sewage effluent under ground, where filtration, dilution, and bacterial action can be expected, instead of discharging it into lakes and streams.

RECOMMENDATIONS: There is an urgent need for thorough, on-going research by competent researchers to determine the effect of widespread use of the septic tank. There should be a central clearing house where all research data would be readily available. The scope of the research program should be statewide and coordinated by one agency, not necessarily a governmental agency. The aim of this program should be to determine safety margins for the use, installation, control and management of on-site sewage treatment facilities. The findings of future research should be utilized and not simply filed away.

REASONS FOR THE TEMPORARY STATUS OF SEPTIC TANK SYSTEMS:

FINDINGS: Public interest due to finance and health is the most often quoted reasons for their temporary status. There are many cases of political purposes. Each county has control over and vary in their interpretation of state codes and "Home Rule" counties can act separately from the intent of the state code.

CONCLUSIONS: Capital outlay for sanitary sewers and central treatment plants has reached staggering levels and authorities use every means available to produce revenue. The Florida Health and Rehabilitative

Services (HRS) is responsible for the protection of public health. The lack of control over the use and misuse of the septic tank poses a threat to which the HRS must respond.

It must be concluded that politics plays a part in the restrictions that are placed on septic tanks when a legislator submits a bill that arbitrarily places restrictions on septic tanks without benefit of any data to justify the restrictions.

RECOMMENDATIONS: Studies have been made that shows that public owned, or investor-owned sewage system can be managed where fees are set which would provide funding to properly protect the financial and health hazzard of any sewage system. Therefore the need for cepitol should not become a reason for requiring owner to abandon septic tank systems.

LIFE EXPECTANCY OF THE SEPTIC TANK

FINDINGS: The S.T.(SAS) properly installed will operate indefinitely with proper maintenance.

CONCLUSIONS: Two studies have shown that the septic tank in past years has been found to serve an average of 20-25 years. With proper maintenence and the use of knowledge that has been gained recently, there is evidence that the septic tank could last for 50 years.

RECOMMENDATIONS: The County Health Units (CHU) should keep records of the installation and repair permits issued.

FIELD STUDIES OF FIVE S.T. SYSTEMS

FINDINGS: Five septic tank systems, located on four sites were chosen for study and for evaluation of their relative use and cost effectiveness as compared to municipal sewage treatment systems. These systems were monitored for nearly 2 years. Other field operations included the observation of installations and inspections.

CONCLUSIONS: The standard septic tank (S.T.,SAS) installed in proper soil, where ground water is not a problem, has been shown to be the most efficient and the most economical method of sewage disposal systems. Alternative systems can be used effectively and efficiently as the central sewer system. Some innovative systems can become a source of revenue. There are some weakness in the methods of installation and inspections of on-site sewage disposal systems.

RECOMMENDATIONS: The rules for regulation of individuial sewage disposal systems, Florida Administrative Code, Chapter 10D-6, should not require a properly operating system to be abandoned when a municipal sewer system becomes available. When any project is considered to be temporary, there is no incentive to install anything more than minimum requirements.

TO IMPROVE THE QUALITY OF SEPTIC TANK INSTALLATIONS AND INSPECTIONS THE FOLLOWING IS RECOMMENDED:

1. All persons licensed to perform work on sewage disposal systems should be required to pass a proficency test covering the Code requirements of Chapter 10D-6 FAC and the principles and practives of good workmanship.

2. The test should be uniform and a statewide requirement.

3. All inspections should be made after the entire system is completed and prior to backfilling.

4. All systems should be warranted by the installer for 2 years minimum.

5. All septic tanks should be pumped out every 3 years.

6. An adequate fee should be charged for inspections.

CHAPTER I

INTRODUCTION

The original proposal: A Pilot Study to Determine the Feasibility of Large-scale Use of On-site Sewage Disposal Systems in Florida Soils, stated that its major objective was to identify and evaluate the need for such systems, and to serve as a basis for advising the legislature of their relative value. In Phase II, the research objective was modified to include a study of the relative cost, and the relative effectiveness of the regional sewage disposal systems, as compared to on-site sewage disposal systems in Florida soils.

The proposal methodology for completing the proposals were to:

1. Assimilate information on previous and current studies of on-site disposal systems.
2. Identify conflicting rules of government which would require a waiver request for innovative or permanent on-site installations.
3. Assimilate information from the various counties of permits issued, repairs, failures, and the life expectancy of the types of systems in use.
4. Assimilate similar information from septic tank installers as in item 3 above, and the relative cost estimation for separating Gray water from black water.
5. Monitor various on-site systems, with the assistance of installers and county health sanitarians, of typical and innovative nature to determine possible predictable results of long time usage.

6. Summarize findings and make recommendations concerning future use of on-site sewage disposal systems.

Discussion of work accomplished:

Assimilation of Information.

The purpose of this phase of study is to accumulate data on past and present studies of a nature that may affect the feasibility of the use of on-site sewage disposal systems in Florida soils.

A large amount of the material that will be included in this report will be quotes from magazines, newspapers, editorials, lay persons, and professional persons who are knowledgeable in the care and use of the septic tank systems, water pollution and treatment of water.

The material that has been gathered during this study will be discussed in each of the respective parts of this report. Only those articles which pertain to the use of septic tanks in Florida soils, and those which relate other areas to Florida will be listed in the bibliography.

This portion of the report will also attempt to reflect the trend in thinking of the Florida legislature, state and national environmentalist, and other regulatory agencies who are charged with or interested in the ecology.

CHAPTER 2

BACKGROUND

There are three basic ways by which ground water may become polluted:

1. The natural filtering system of vegetation, soil, gravel, or rocks is bypassed by the polluting substance.
2. The natural filtering system is overwhelmed by the concentration of polluting substances beyond its capacity to handle them - or by substances that are unfilterable.
3. The hydraulic or chemical balance in the subsurface is altered in that polluting substances move to with-in or between aquifers to change the water quality.[1]

Sewage treatment plants are not the sole potential polluters. Any hole in the ground is a potential pollution agency. The surface filtering system in most of Florida is so fragile that nearly all subsurface excavation places the ground water in jeopardy. All types of extraction wells, injection wells, sink holes, quarries, stratagraphic tests, and borrow pits are just a few of the many types of holes that violates our surface filter system.

It is estimated that Florida draws 92% of its fresh water from underground supplies.[2] Yet we go about our daily business without giving a thought to the fact that ten million persons work, play and discharge our wastes all within just a few feet above the enormous fresh water supply.

Most of our water comes from the Floridian aquifer. It is estimated to be 82,000 square miles of fractured limestone that reaches past Georgia and South Carolina. Actually there are several "layers" of the limestone, separated by imperious clay strata. These limestone layers "tilt" and outcrop in various regions for which they are named.

There is the "Hawthorne" aquifer; the "Ocala" aquifer; the "Avon Park" aquifer, etc. (see Figure 1).

The head of pressure that is built up in the aquifers by re-charge in the mountainous upper regions, has been reduced steadily over the past years. Fifty years ago there were free flowing artesian wells in the areas of Palatka, Hastings, and others. Today many of these wells must utilize power pumps to obtain the same quantity of water that used to flow freely.

The Hawthorne aquifer lies about one hundred feet below the surface in Alachua county. In many of the fresh water wells that are pumped from this aquifer we find excessive particles of fine sediment and trash, as wood fibers which tend to clog well screens and air volume control valves. Where this occurs, the well casing must be extended to the Ocala aquifer. This operation often allows the "dirty" water to travel down the annulus around the casing, and in turn begins to pollute the Ocala aquifer.

There are very few water control districts which require the well casings to be grouted. (Sealed with concrete cement slurry around the well casing.)

Other aquifers, especially the Biscayne aquifer, which is composed of oolitic limestone, is covered by a thin layer of sand filter. The Biscayne, and other sand and gravel aquifers all depend upon surface water recharge. Wells installed into these aquifers are not artesian.

The chance of polluting these aquifers by the use of pesticides, leaking gasoline tanks, cesspools, and flooding with surface run-off containing animal decay, fecal matter and other pollutants is one

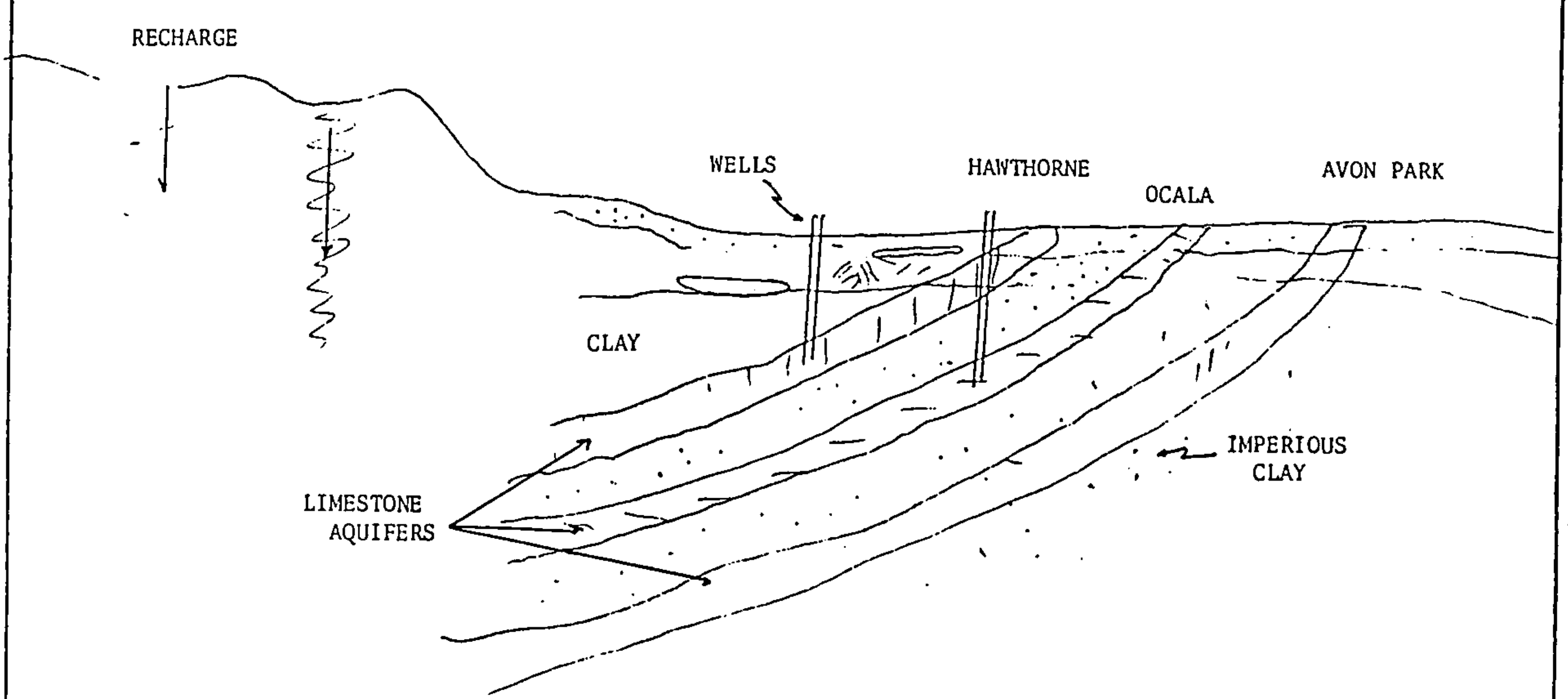

RECHARGE
WELLS
HAWTHORNE
OCALA
AVON PARK
CLAY
LIMESTONE
AQUIFERS
IMPERIOUS
CLAY

Figure No. 1

example of pollution by overwhelming the surface filter system.

An example of possible pollution by hydraulic and chemical balance is the trend toward the use of injection wells for the disposal of effluent from central sewage treatment plants.

These deep well injection wells has, in some cases, had disastrous results. Blow-outs in casings, and excessive pressures has caused salt water intrusion into some water supply wells in Dade County. Some authorities see these injection wells as time bombs. Others have praise for them as a means of storing water, that is partially treated, which may be retrieved and re-used during drought years.

The effluent that is discharged from the regional sewage plant in Gainesville, Florida is discharged into deep injection wells in the Kanapaha sink. The estimated flow is 8 million gallons per day. Growth of population is rapidly approaching maximum capacity, to the point that an additional increase of 4 million g.p.d. is now being planned. There are four major hospitals in the Gainesville area whose waste is discharged into these wells. There is a growing concern among some opponents of this method of waste disposal.

The concern is two fold. Even where the effluent is theoretically treated to 98% B.O.D. Removal, there are occasions in all sewage treatment plants where power failures occur which effects the plants capability to treat the effluent property. And there is the possibility of wasting trace elements of toxic substances into these deep well injection systems. No one can predict accurately where this waste will go after it is pumped under ground. There is no physical method by which eight millions of gallons of waste water can be stored in this sewage treatment plant if a failure should occur and last for several days.

The Environmental Protection Agency recently stated that 650,000 injection wells are being used to dispose of chemical, sewage, and various wastes that are generated by gas and oil drilling operations. E.P.A. charges each state with the responsibility of enforcing regulations aimed at the protection of groundwater from pollution by injection wells.[3]

Storm water plays a large part in the planning of pollution control and for a balance between flooding and drought conditions which threaten Florida each year.

There is a delicate balance between the forces of storm water run-off, and salt water intrusion. The pressure of the salt water intrusion is constant, while the fresh water that is needed to hold back the salt water intrusion varies with the amount of rainfall, the withdrawal by pumps for consumption and agricultural irrigation. This fresh water ebb and flow may vary hourly.

Proponents of the septic tank for sewage disposal has contended for years that the effluent from septic tanks are critical to this balance between fresh water and salt water intrusion, especially in the coastal areas.

Studies have shown that salt water had indeed encroached upon many cities on the east and west coasts. However, other studies will show that recycled sewage water, if used to recharge the Biscayne aquifer, would require all of the waste water from 8.5 million people to maintain a sufficient stand of water to supply the domestic and agricultural needs, and to prevent salt water intrusion. This would amount to 1320 cubic feet per second, for a part of the coastline from Everglades

National Park, to Snapper Creek.[4]

Yet the recharge water from the septic tanks that serves an estimated 4.5 million people is a significant volume not to be ignored, especially in drought years.

It is evident that storm water provides the major portion of aquifer recharge water. It also provides a major portion of pollution to the open bodies of water. The conclusions of a four year study of "Ground Water Quality in selected areas serviced by septic tanks, Dade Co. Florida, stated: "contamination from agricultural activities in Homestead, and from storm-water infiltrate at the West Miami, and Hialeah, and North Dade are more readily identified and pervasive than that from septic tanks."[5]

There are many studies of various sewage disposal systems which reach opposing conclusions. There are also opposing views by the persons in charge of our water protection agencies. In 1980, Mr. Pete Varn, Florida Environmental Regulation Secretary told a senate committee that Florida is guilty of "Cosmetic" water pollution control and has failed to protect its ground water resources. He stated that Florida has done a good job of protecting its lakes, rivers, and streams, but ignored hazardous wastes that are dumped in land fills and into sewers without proper treatment.[6]

In 1983, Ms. Vickie Tschinkel, Head of the Florida Department of Environmental Regulations stated that, "Industry and poorly managed sewer systems have long taken the blame for the bulk of Florida's pollution headaches when, instead the greater problem comes from thousands of small polluters such as service stations, farmers, septic tanks, and package plants for some of the problem, and she called on local politicians to consider forcing new residents to pay an impact fee for central sewer systems and water systems."[7]

In response to a request to the Environmental Protection Agency, in 1971, for funding a research proposal for the study of septic tanks, Mr. Rosencranz stated that the clean water act, P.L. 92-500 was a "mandate" to E.P.A. to develop "alternatives" to the use of septic tanks. He stated that no provisions could be made for such on-site disposal systems.

In contrast to the above, on June 15, 1972, Mr. E.T. Jensen, Deputy Assistant Administrator for Water programs, E.P.A., stated that "Regional sewage systems have been generally promoted by most regulatory agencies for many years. However, there is increasing awareness that there is a limit to the economics in regionalization and that super-sized regional systems may have built in dis-economies. There is also concern that many municipal sewage systems have been radically overdesigned and extended for the construction of capacity which would not be used for many years. It is the position of the E.P.A. that while one should plan for sewage needs for 20 or 30 years, in most cases it is not economical to build capacity for more than 8 to 10 years into the future." He further stated, "There is also a new awareness that pollution control measures useful for large communities may not be either technically or economically sound for suburban areas or small rural communities. Under the latter circumstances we are convinced that septic tank systems, and their newer cousins represent a preferable solution, and thereby are eligible for federal assistance, provided all requirements of state and federal law are met."[8]

In 1975, the E.P.A. came out strong in the support of septic tank use as well as many other on-site sewage disposal systems. E.P.A. has authorized studies and has funded educational seminars for the disimination of information on small waste flow.

E.P.A. has published several pamphlets and policy statements and has distributed two application kits for grants for "Training Grant" E.P.A. form 5700-7D (Revised 11-77) and for "Fellowship" E.P.A. form 5700-7C (Revised 11-77).

The following letter from the Florida Local Environmental Regulation Association, to the Deputy Administrator for water programs operations, E.P.A., Washington D.C., will illustrate the attitude of many organization who oppose the use of on-site sewage disposal systems in Florida.

September 1, 1978

Mr. John T. Rhett
Deputy Assistant Administrator (or
   Water Program Operation (WH456)
Environmental Protection Agency
Washington, D. C. 20460

Re: Funding of Sewage Collection Systems Projects, PRM #78-9

Dear Mr. Rhett:

The Florida Local Environmental Regulation Association (FLERA) is a statewide organization of local pollution control programs responsible for the administration and enforcement of environmental laws and rules. Among our objectives is the aim to promote standardization of actions relating to pollution control to insure the greatest long-range benefits for the majority of the citizens.

We are becoming increasingly alarmed at the apparent erosion of the goals, policies and objectives of PL92-500. Specifically, recent policy statements show a relaxation of the policies stated in Sections 101(1) and (5), PL92-500. To this end we offer the following comments on the policy statements in your PRM #78-9 regarding septic tanks and other alternatives to central collection and disposal.

1. Policy Statement: New collector sewers should be funded only when systems in use (e.g., septic tanks or raw discharges from homes) for disposal of waters from the existing population are creating a public health problem, contaminating ground water, or violating the point source discharge requirements of the Act.

   Response: If this policy is placed in effect, large urban subdivisions which now use septic tanks for sewage disposal will be excluded from participating in areawide collection systems. The burden of paying for the transmission and treatment facilities will borne by fewer at greater individual expense. There are literally thousands of urban subdivisions which have been developed on septic tanks due to lack of central facilities but should now be placed on central systems. This policy is incongruous with the policy, stated in PL92-500, to develop areawide wastewater treatment facilities to properly control sources of pollution. It is our position that septic tanks are incompatible with urban development and, therefore, should not be permitted except as a very temporary measure or on very large parcels of land (minimum of one acre).

2. Policy Statement: The facility plan must also document the nature, number and location of existing disposal systems (e.g. septic tanks) which are malfunctioning.

   Response: As stated before, the use of septic tanks in highly urbanized areas is not compatible with proper control of pollution. It is not necessary that a septic tank malfunction for it to pollute ground and/or surface waters. The literature is replete with cases of ground water pollution from septic tank effluent.

3. Policy Statement(s): The alternatives to be evaluated include the following:

   --measures to improve operation and maintenance of existing septic tanks

   --new septic tanks

   --various means of upgrading septic tanks

Response: As stated above, septic tanks are not compatible with urban development. All the suggested alternatives simply give septic tank communities an opportunity to postpone, or avoid, participation in areawide systems; thereby increasing the cost to participating customers and to regulatory agencies.

We are aware of the various restrictive criteria which are included in the policy memorandum but these tend to be overlooked, or ignored, when it comes time to participate in an areawide system. The dominant issue is economics and even a cost effective central collection and treatment systems will require money which would not otherwise be needed if individuals were simply allowed to continue the use of functioning septic tanks. The dominant problem is pollution of ground waters and this is what septic tanks cause.

The solution is to maximize central collection and treatment. The fairest way to do that is to spread the cost over the largest possible population.

It is strongly urged that the Federal Environmental Protection Agency give maximum support to those who are endeavoring to install regional systems and to discourage those who are attempting to obviate the intent of PL92-500 through the continued use of septic tanks.

Very truly yours,

FRANK J. GARGIULO, P.E.
State Chairman

cc: Jay Lenders, Florida Department of Environmenal Regulation
John Bateman, Secretary (FLERA)

The following letter is a reply to the Florida Local Environmental Regulation Association's comments.

October 25, 1978

Mr. Frank J. Gargiule, P.E.
State Chairman, Florida Local
Environmental Regulation Assocation
2008 E. Michigan
Orlando, Florida 32806

Dear Mr. Gargiulo:

Thank you for your letter of September 1, 1978, concerning EPA's policy on septic tanks and other alternatives to central collection, treatment and disposal systems as stated in our Program Requirements Memorandum #78-9. Mr. Rhett has asked me to reply. We regret the delay in responding to your comments.

In your letter you expressed alarm at the apparent erosion of the goals, policies and objectives of P.L. 92-500, and stated that septic tanks are not compatible with proper control of pollution nor with urban development. You commented that the alternatives suggested in PRM 78-9 simply give communities utilizing septic tanks the opportunity to postpone or avoid, participation in areawide systems, thereby increasing the costs to participating customers and to regulatory agencies. In conclusion your letter strongly urged that the Federal Environmental Protection Agency give maximum support to the installation of regioinal systems, as the solution to the dominate problem of pollution of ground waters by septic tanks.

Our experience is that regional systems can have serious disadvantages under certain circumstances. New interceptor and collector sewers replacing septic systems in lower density populated areas and non-urban areas can result in unplanned urban sprawl, loss of prime farm land and extreme economic impacts on local households. We have learned that locally established sewer usage charges including debt retirement are exceeding in many instances $200 and in some cases as much as $500 per user annually. Political upheaval, refusal to connect into or to pay after connecting into central sewers, violence at public meetings, requests for injunctions and other unfortnate reactions have occurred in several locations where high user charges have been established. It has become apparent that where regional systems are not cost-effective nor environmentally sound, the cost-effective alternative must be utilized to meet the goals of the Act.

In some locations where septic systems are properly designed, constructed, maintained and operated they can function virtually indefinitely without contaminating the groundwater or causing a health hazard. Other alternatives such as the use of low cost small diameter gravity or pressure sewers to convery septic tank effluent to treatment, sand filtration with disinfection, alternating leach beds, dual waterless toilet-greywater systems, and mound systems can in given situations be the best, most economical solution to a specific water pollution or health problem

We have also found that expected economics of scale of regional systems have not always materialized. In fact the reverse has occurred where extensive pumping facilities or contraction, in place has been specified. In addition the disposal of massive quantities of sludge from large regional plants has become one of our major concerns.

You refer to subsections of PL 92-500 which set zero discharge as a national goal and areawide waste treatment management planning processes as natinal policy. These objectives do not restrict the use of any generic type of wastewater treatment works, including centrally-managed on-site systems. EPA's policy is that all feasible alternatives be considered in each situation and that the best solution considering all factors be selected. In fact, under the new Cleanwater Act of 1977, PL 95-217, innovative and alternative systems can be selected even if they are 15 percent more costly than conventional systems.

I appreciate your interest and concerns about our program. However, the monetary and environmenal considerations and the law itself do not permit the acceptance of your suggestion that regional systems be installed everywhere.

Sincerely yours,

Michael B. Cook
Acting Director, Facility Requirements Division (WH-647)

Following is an abstract (C), by author James F. Krisal, U.S. E.P.A. stating the intent of P.L. 92-500 to direct the E.P.A. to conduct a comprehensive research and development program on new and improved methods of pollution prevention by on-site sewage disposal systems. It authorizes the expenditure of funds to accomplish this goal.

ABSTRACT

TITLE OF PAPER: "US EPA Response to P.L. 92-500 Relating to Rural Wastewater Problems: Office of Research and Development (SEC. 104 & 105)"

AUTHORS: James F. Kreissl

ADDRESS: U. S. Environmental Protection Agency
26 W. St. Clair Street
Cincinnati, Ohio 45268

DATE OF PRESENTATION: November 16, 1976 TIME: 2:45 PM

Section 104(q)(1) of P.L. 92-500 directs the U.S. EPA to conduct a comprehensive R&D program on new and improved methods of preventing, reducing, storing, collecting, treating, or otherwise eliminating pollution from sewage in rural areas where conventional sewage collection is impractical, uneconomical, or otherwise infeasible, or where septic tank-soil absorption systems are precluded by soil conditions or other factors. Section 105(e)(2) authorizes the expenditure of funds to demonstrate methods of accomplishing these ends. Several projects have been implemented in response to the charge in Section 104 in the areas of on-site systems to both upgrade understanding of conventional systems and implement improved methods of on-site treatment; improved methods of collection for wastewaters in rural communities which reduce the cost of collection dramatically when compared to conventional sewers; and the treatment and disposal of residuals which must be periodically removed from onsite treatment systems.

The following abstract (D) is a response of the U.S. Housing and Urban Devolopment agency lending support of the research and development programs for the use of septic tank systems, and the retro-fitting of houses, to produce "sewerless devices", in order to remove the threat of water shortages which will result from the use of large municipal sewage treatment plants.

ABSTRACT

TITLE OF PAPER: U.S. HUD Response to the Homebuilding Crisis: Current Extent of Agency Involvement

AUTHORS: Orville Lee

ADDRESS: Dept. of Housing and Urban Development
451 Seventh Street, S.W.
Washington, DC 20410

DATE OF PRESENTATION: Nov. 16, 1976 TIME: 3:15 PM

In order to predict the needs for housing and the type of housing to look forward to, first take a look at the big picture and see what the national growth pattern is and where the trends for growth are. We note that service and manufacturing activities typically are locating in smaller towns and cities in counties adjacent to the Standard Metropolitan Statistical Areas and that since 1970 metropolitan areas have grown less rapidly than the country as a whole. We might deduce that this trend will constitute an end to the massive migration from rural hinterland to major urban centers that has continued virtually unabated since the early 1800's.

These facts on national growth give us a strong clue to the continued necessity for single family onsite sewage disposal systems. Unless significant improvements are made in the present technology, we can further deduce that stream pollution will increase and that further groundwater depletion will not be abated.

ABSTRACT

With the facts of the recent past before us, we can now almost predict that the next crisis to overcome us will be one of water shortages and the extremely high costs of sewage treatment.

It would appear that individual sewage disposal systems for all new construction would have an immense impact by negating the necessity for large municipal sewage treatment plants. Further research toward the development of individual water recycling systems would decrease the necessity for the development of new water sources.

Because of the nature of such a crisis and the impact to be derived from further research, it seems the federal government is obliged to participate in arriving at solutions.

HUD's research programs are reviewed to show the order of existing national priorities in housing research. The research in septic tank and drainfield retrofitting at the University of Washington is discussed and the new research program in "sewerless devices" is presented with the hope and supposition that the new administration will have a desire to fund such research to a logical conclusion.

The final abstract (E), by Keith Dearth, explains section 201 amendment ot the water pollution control act. He points out that the congressionally authorized funds may, under certain circumstances, be spent on small waste water treatment systems.

ABSTRACT

TITLE OF PAPER: Office of Water Program Operations (Section 201)

AUTHORS: Keith H. Dearth

ADDRESS: Environmental Protection Agency
401 M. St., S. W.
Washington, D. C., 20460

DATE OF PRESENTATION: November 16, 1976 TIME: 3:00 PM

Section 201 of the 1972 amendments to the Water Pollution Control Act provides grants for planning and construction of municipal wastewater treatment facilities. Congress authorized $18 billion in grant funds for fiscal years 1973-75, and the Agency is planning for a $5-billion/year program in the future. This level of funding makes the grants program the largest public works program in the nation. The funds may, under certain conditions, be spent for small wastewater treatment systems, servicing equipment and residual waste disposal facilities. Many of the facility plans reviewed by Headquarters to date should have analyzed better the cost-effectiveness of utilizing such small facilities rather than comprehensive collection, conveyance and traditional secondary treatment systems. Use of small facilities may in some cases reduce capital and O&M costs. Such a reduction is essential. Recent analyses of a large sample of completed facility plans for small communities resulted in the conclusion that many households may not be able to afford the facilities recommended, and less expensive means of meeting treatment needs should be considered more carefully.

The following enclosure is E.P.A.'s comments on a report that was published by the National Utility Contractors Association (NUCA), wherein NUCA was critical of E.P.A.'s position on the use of small on-site sewage disposal systems. The author, Keith Dearth, Facility Requirement Division, Washington D.C., makes the reply for E.P.A.

EPA COMMENTS ON NUCA REPORT ABOUT WASTEWATER SYSTEMS FOR SMALL COMMUNITIES

The National Utility Contractors Association Report of June 15, 1979, "Evaluation of Wastewater Treatment Alternatives for Small Communities," concludes that the Environmental Protection Agency's (EPA's) policy encouraging careful consideration of alternatives to conventional gravity sewer systems is "misguided". This conclusion is based mainly on the finding that alternative systems such as septic tanks with soil absorption fields and vacuum and pressure sewers followed by treatment are more costly than conventional systems in all but the smallest communities.

EPA found in reviewing the report that it generally describes adequately the capabilities, advantages and disadvantages of a number of alternative systems. The report, however, does not accurately present the actual high costs of conventional sewer systems, the requirements of the Clean Water Act or many situations in which alternative systems would be far less costly and potentially just as effective as conventional systems. These inaccuracies are discussed in more detail below:

1. <u>Costs of conventional sewers are much higher than those used in the report</u>

The following table compares EPA's published cost experience with the costs used in the report. EPA's costs are based on intensive field review of hundreds of projects and are several times higher than the costs of conventional systems used by NUCA. Use of these higher costs in the analysis would result in the conclusion that alternative systems are less costly than conventional sewers in many more communities than the report concluded would be the case.

NUCA ECONOMIC ASSUMPTIONS AND EPA EXPERIENCE

	NUCA Assumption	EPA Cost Experience	% Difference
Cost/Foot for collector sewers in a town of 2,000 or less	$16	$43	270%
O&M (operation & maint.) costs/mile/yr	$400	$2800	700%
O&M costs/capita/year	$2.	$14.50	725%

2. Density is far more important than population size in determining cost-effectiveness

The analysis in the report implies that costs of wastewater systems vary principally with community size and concludes that in communities over 1500, conventional systems are almost always more cost-effective than on-site systems. Our experience is that the cost-effectiveness of conventional and alternative systems depends more on density and other factors than community size. Alternative systems can be cost-effective even in portions of major cities where density is low.

Extremely high costs result from using conventional collection systems in areas of low population density, such as along a lake shore, a ridge, or steep river valley. Recent evaluation of alternative systems in many communities has resulted in the conclusion that alternative systems will save millions of dollars over conventional systems. Examples of such communities are Crystal Lake, Michigan; Green Lake, Minnesota; Otter Tail Lake, Minnesota; Salem Township, Wisconsin; and Steuben Lakes, Indiana. Use of alternative systems in part of the Chautauqua County, New York, project (population about 6000 persons) alone is expected to save $20 million.

3. A high percentage of the inhabited area of the nation is suitable for alternative systems

The NUCA report concludes that a large part of the land area of the United States is unsuitable for soil absorption systems. Much of this land area, of course, is uninhabited mountains, deserts and wetlands. Mounds and other specially designed soil absorption systems can be utilized in many habited areas where conventional absorption systems cannot. For example, mound systems are being used successfully where the ground water table is high in Minnesota , Wisconsin and other states. Another successful means of coping with poor soil conditions and high ground water is to pump septic tank effluent through low pressure sewers to areas with better soil and ground water conditions.

4. EPA policies conform with the clear intent of Congress to promote alternative systems

Our construction grant policies carefully reflect the requirements of the Clean Water Act and do not run counter to the Agency's Congressional mandate as suggested at the press conference on the NUCA report. Congress has mandated that:

a. 4% of rural state allocations be set aside for alternatives to conventional sewers and central plants in communities of 3500 and highly dispersed areas of larger communities;

b. 2% of all state allocations be set aside to increase grants from 75% to 85% for projects involving innovative or alternative technology;

c. grants shall not be made to any municipality unless the grant applicant has satisfactorily demonstrated that alternative wastewater treatment processes have been fully studied and evaluated.

5. <u>On-site systems can provide perfectly adequate long term protection to ground water</u>

On-site systems, when properly installed, maintained and operated, can provide very good protection to groundwater. Moreover, this protection can be provided at reasonable operation and maintenance costs during design periods comparable to conventional systems. Experience with numerous projects verify these conclusions, including the well documented experience with septic tanks in Fairfax County, Virginia. On-site systems have created pollution problems when not properly installed or maintained, but this unfortunately is also very true of conventional systems.

POLLUTION VIA SEPTIC TANKS VS. SANITARY SEWERS

The sudden awakening of the general public, sanitarians and industry to the realization that for years we have been negligent and complacent in our attitudes and efforts to prevent the pollution of our water sources by discharging waste into the most convenient receptical, has been shocking, expensive, and frustrating.

Shocking, when we examine our own activities and compare the way we as individuals once considered water to be as "free as the air." Shocking, when we were satisfied with our philosophy that said, "the solution to pollution is dilution." At that time many cities and individuals collected our waste to one central point and without treatment discharged it into a convenient lake, creek, canal, cesspool, or ocean. And since sewage is defined as a mixture of solid waste, suspended in a liquid carrier, it only seems natural to discharge it into a larger body of water. Especially when the ratio of liquid to solids is about 5000 to 1 or about 99.9% water. That .1 percent of solid waste will pollute the liquid carrier, as well as the receiving water course.

With the passing of the clean water Act PL92-500, the EPA began to enforce the clean-up goal of 90% B.O.D. removal from all waste water prior to discharging it into any stream. After spending billions of dollars and ten years we are still in a stage of frustration because the cost is still rising and so is the pollution of many public water sources. (ENR 12/16/82, p. 82).

The clean water act did not begin with the water pollution control act of 1972. In 1956, a seed grant program of $50 million was begun to assist the states and municipalities to build sewage treatment systems.

Then in 1965, the federal water quality act allowed the states to set their own water quality criteria. Some states assigned a particular "use" for some streams and as long as the plant effluent did not drop below the quality of the "use" assignment they were not in violation of any law.

Since the 1972 Act was passed and amended in 1977 and again in 1981, the law requires that all municipal treatment plants must provide secondary treatment. But the overriding fault with the law is that the "discharged" water quality plays the big role and the quality of the receiving stream is secondary. Now, ten years later, the EPA agrees that the standards have produced treatment for the sake of treatment, regardless of cost. (ENR 10/7/82, p.54). The seed money grant program to date has cost about $32 billion. The 1980 EPA Needs Survey for the year 2000 recorded $120 billion in sewage treatment needs that would be eilgible for federal funding under the clean water act as amended in 1977. (ENR 10/7/82, p.46). Estimates that have been calculated by others such as the American Water Works Association (AWWA), reach to $600 billion to achieve a clean-up of all ailing municipal water treatment facilities, and for building new plants.

Engineers claim that for all the money that has been spent, their profits have been lower because of red tape of the EPA. Robert C. Marire, a vice-president at Camp, Ousser and McKee, Inc, Boston said: "Prior to EPA, we made 6% on gross revenues, now it's averaging 3% to 4%." (ENR 10/7/82, p.46).

On the other side, the House sub-committee on oversight and investigations found last year (1982) that one-quarter to one third of the sewage treatment plants built with federal assistance before and after 1972 "experienced significant performance problems". The heart of the matter was poor design the committee claims. (ENR 1/20/83, p.92).

"That things have occasionally gotten out of hand in the sewage construction business has been well documented over the years by concerned professionals and the penny watchers in the governmental accounting office," is putting it mild. There are many reports and studies that gives evidence of cost overrun and construction of facilities for greater and more sophisticated treatment plants due to political gains, vested interests and poor design methods. In an editorial cited as cases that use "high brow" solutions. The Alaskan town of Barrow, populated by 5,200 Eskimos, is spending close to $350 million so they can have flush toilets. Mayor Eugene Brower defends spending $67,300 per person on a one-of-a-kind system to bring his constituents these services: "we are not spending money frivolously," he says. (ENR 1/12/84, p. 132).

Petersburg, a southern Alaska city has hired attorneys to sue 26 firms and individuals that participated in the design and construction of its federally funded sewage project because the 600,000 gallons per day secondary treatment plant doesn't work.

After spending years of doctoring its plant, Petersburg gave up in 1980 and is discharging raw sewage directly into a sound off the Gulf of Alaska. The city is asking a total of $14 million damages (ENR 1/12/84, p.132).

These two cases are not isolated, they are representive of chaos in the water clean up effort.

States and federal agencies alike suffer from the lack of experience with the technology and methods involved in ground water problems and waste control. In the state of Michigan there are over 900 known contaminated sites and there are only 20 persons in the state agencies who know what they are doing, said W. M. Iverson, Chief of Hydrology in Michigan's Department of Natural Resources. David W. Miller, hydrologist, summed up the problem as: "It's to big a job that's being attacked with too little money and not enough experience." (ENR 10/1/81 p.63)

It has been estimated that there are 3,500 technical people working in the ground water field nationally. There are about 20 United States firms that specialize in ground water hydrology, and another 50 national engineering companies with relatively new ground water divisions. "There are a lot of people in this business who are converted surface water people who don't know a lot about what they're doing," said Robert W. Cleary, a consultant and engineering professor at Princeton.

The foregoing discussion has dwelt upon costs and other problems that are related to sewage treatment plants and the discharge of water into surface or subsurface sites.

Another source of potential pollution and cost are the sanitary sewer systems. The Ingersol-Rand Construction Company cites studies by experts to show that the Nation's sewer and water mains are so old and are in such a state of disrepair that it will require ten years and $225 billion to bring them up to standard. Experts have estimated that we lose fifteen gallons of water for every 100 gallons that are consumed. (ENR 1/5/84 p.15)

Where leaks occur in water pipes under pressure, there is an equal threat of polluted water infiltrating the fresh water pipes where pressure is low.

The following discussion of the infiltration of ground water into sanitary sewers will quote expert witnesses who are testifying at hearings before the Committee on Public Works House of Representatives 92nd Congress 1971.[9]

The problem of ground water that infiltrates existing sewer lines is two to three times as much during high ground water tables and high rain fall periods as it is during drought periods. Even during the low rain fall periods, there is enough infiltration of extraneous ground water to cause concern. This infiltration results in overloading the existing sewers and sewage treatment plants to the point where raw sewage is bypassed at key locations (lift stations and holding tanks) as well as the treatment plant. Bypassing is necessary to prevent sewage from backing up into streets and homes. This excessive infiltration takes over the capacity of a sewage treatment plant which was originally designed to allow for growth.

Studies of case histories of infiltration into sewers showed volumes of 15.5 million gallons per day infiltration where the original system was only designed for 1.0 million gallons per day.

In a study of 1,600 sewage treatment plants in the United States, the Federal Water Quality Agency found that 50 percent of these plants bypassed raw sewage and infiltration water during wet periods. 20 percent of these plants had intensified bypassing in order to keep the size of the plant within reasonable design parameters.[10]

Two hundred and twelve public jurisdictions in the United States and Canada were contacted, and 26 communities were visited. Practices of consulting engineers and state and provential water pollution control agencies were also surveyed. The survey indicated that infiltration and inflow are wide spread problems. The American Public Works Association, who conducted the survey, recommended that for new construction, allowances of not more than 200 gallons per day per inch of diameters, per mile of pipe should be set.[11]

As an example of maximum allowable infiltration for a 10" diameter pipe for five miles, the total flow would be: 200 gal/1 day/10"/5 mi or 200 g.p.d. x 1 day x 10" x 5 mi = 10,000 g.p.d.

Sewage treatment plants must be designed to meet the demands of peak flow periods. High water usage is most often during early morning or late afternoon. However, there are other occasions which must be expected and plans made to cope with heavy flows such as half time at football stadiums, and during commercial "breaks" when high interest movies are aired on television. It is not uncommon for sewage plant operators to conduct a "lottery" among themselves as they predict the magnitude of flow at this station break. It was reported that "The Exorcist" movie was rated at 50 million gallons flush in Chicago as people flush the toilets during commercial breaks.

A manual of septic-tank practice, Public Health Service publication no. 526, lays down guide lines for "the safe disposal of all human and domestic waste to protect the health of the individual family and the community and to prevent the occurrence of nuisances. The manual lists six criteria for accomplishing this goal:

1. They will not contaminate any drinking water supply.
2. They will not give rise to a public health hazzard by being accesible to insects, rodents, or other possible carriers which may come into contact with food or drinking water.

3. They will not give rise to a public health hazard by being accessible to children.
4. They will not violate laws or regulations governing water pollution or sewage disposal.
5. They will not contaminate the waters of any bathing beach, shellfish breading ground, or stream used for public or domestic water supply purposes, or for recreational purposes.
6. They will not give rise to a nuisance due to odor or unsightly appearance.

The manual continues: "These criteria can best be met by the discharge of domestic sewage to an adequate public or community sewage system."[12]

All of the above criteria is rigidly enforced for the on-sight sewage disposal system, yet every municipal sewage disposal system violates all of the above criteria. They are all open, and give off odors; they all discharge waste into streams, land surfaces, and/or injection wells; they are allowed to stock sludge in holding basins which are little more than gigantic cess-pools; and they all have power failures or biological failures which at times result in the bypass of raw sewage into the receiving water courses.

The septic tank has been used, and has been considered to be a temporary means of sewage disposal which must be abondoned when sanitary sewers become available.

This pilot study lacks the proper funding needed to attempt the "proof" of the pollution potential. It will report the findings of research that has been conducted by others. The format will be to summarize the great number of studies which has been collected. They will be abstracted for brevity.

SELECTED STUDIES:

1. On Site Waste Water Disposal for Homes in Unsewered Areas. University of Wisconsin extension, Division of Economics and Environmental Development, 1973.

   Effluent coming from the septic tank is not of a high quality nor is it consistent, but this is not necessary if suitable soil is used for final subsurface disposal. The septic tank does remove up to 60 percent B.O.D. and 70 percent of suspended solids. A properly operating soil absorption field can treat and nearly completely purify the septic tank effluent. The soil very effectively removes B.O.D., phosphorus, bacteria and viruses. Only nitrogen freely moves through the system, but only if it is oxidized to nitrate-nitrogen (NO_3-N) in well aerated soil.

2. Septic Tanks and the Environment, J. W. Patterson, et al. Illinois Institute for Environmental Control, Chicago, Illinois, 1971.

   The qualities of materials released from septic tanks appear to have a broad impact on the environment. The occurence of sewage-borne diseases such as typhoid fever, dysentary and diarrhea have been traced to septic tank systems (Leech, 1951). Contamination of wells, ponds, streams and surface soil by septic tanks are common occurance resulting in both public nuisance and health hazzards. (No authority is cited for the above.)

   Warwick and Muegge (1930) reported that pollutants only travel in the direction of ground water flow. However, Fredler (1936) mentions that the cone of ground water depression resulting from high rate of pumping can alter the normal pollution travel pattern. Caldwell (1938) found the extent of chemical pollution of ground water to vary with the time of year, due to changes in the course and movement of the ground water.

   Bacteria and most other microorganisms which are present in excreta, pass easily through the septic tanks, and into the soil around the absorption field. These microorganisms are not capable of self movement or migration, but are carried along by the movement of the liquid flowing through the soil.

3. Environmental Impact Statement, Final: Prepared by EPA Region IV Atlanta, Ga. 3/19/73: Exerpts:

> Approximately 275,000 septic tank systems servicing an estimated 962,000 people, are in use within this study area. Septic tanks for individual homes are capable of reducing suspended solids by 40 to 70 percent and B.O.D. by 25 to 50 percent. (Goldstein, 1972)
>
> If suitable soil conditions exist, most remaining solids will be filtered out. In addition, soil microorganisms will decompose most of the remaining organic materials. Amranry (1968) found in Israel that during the passage of sewage waste waters through 10 to 23 feet of sand the B.O.D. was reduced by 90 percent, C.O.D. by 58 to 80 percent, dissolved volatile solids by 34 to 64 percent, organic nitrogen by about 74 to 94 percent, and total nitrogen content by 74 to 84 percent. Bacteria and viral densities are also reduced as waste waters percolate through the soil. (McMichael, 1966; Butler et. al. 1954; Orewry and Eliassen, 1958; Robech et. al., 1967) A properly designed and constructed individual home septic tank-soil absorption system can provide the equivalent of primary, and in some cases, secondary treatment (Goldstein, 1972).

This impact statement concludes that "based upon the results of the previously cited authorities (and others), septic tanks for individual homes will work satisfactorily within the study area."

Following this seemingly glowing satisfaction with the positive peformance record of septic tanks, the study then recommends that septic tanks should be considered as a temporary method of waste water disposal for the following reasons:

a. Home owners tend to punch holes in seawallls to allow water to drain into canals (Ross, et. al. 1972);

b. Difficulty in regulating septic tank maintenance;

c. By far the major source of pollution of ground water in other parts of the United States is septic tanks. (Ballentine,et.al., 1972)

d. There have been outbreaks of hepatitus, (State of Illinois, 1971) and other communities, which have been traced to septic tank effluent.[13]

VIRUSES

More than 100 kinds of viruses are known to be excreted by man and approximately 70 of them have been found in sewage. (Viraraghavan)

Those that appear to be transmitted through wastewaters are the enteroviruses poliomyeletis, coxsackie and infectious hepatitis. There are only limited number of field studies on the movement of viruses through granular media. The details of some of these studies along with their summary and conclusions will be discussed.

Field tests were conducted by Merril et.al., at the Santa Fe Water Reclamation Project near San Diego, California for evaluating the treatment used to upgrade municipal sewage for recreation purposes. The treatment included an activated sludge plant followed by an oxidation pond with a retenion time of 20 to 30 days. The effluent of the oxidation pond was discharged into percolation basins and allowed to travel 458 meters through sand and gravel, overlying a clay stratum, to a collection ditch. The ditch water was chlorinated before the water was used for recreational lakes. There were high concentrations of polio viruses in the sewage and mass immunizationa against polio were being made at the time. Viruses could be found in the effluent of the activated sludge unit, but none were found in the effluent of the oxidation pond. In order to test the efficiency of the percolation beds, a high concentration of poliomyeletis virus was added directly to one of the percolation ponds. The average velocity of water flow through the aquifer was estimated to be 30m/day. Samples were collected from observation wells located 61m and 122m below the flow from the bed and from the ditch for a two month period. No viruses were found.

R. Eliassen, et.al., in "Studies on the Movement of Viruses in Ground Water," Water Quality Control Research Laboratory, Stanford University, 1967, developed traces and analytical techniques for bacterial viruses and studies this movement through fine samples of soils under saturated flow conditions. The removal of virus from percolating water was found to be due to adsorption on the soil particles. Soils having a higher clay content adsorbed the virus more rapidly than those with less clay.

Studies made by McMichael and McKee, "Wastewater Reclamation at Whitler Narrows," 1966, indicated that:

a. Though viruses (polio type III and type I) were identified and enumerated in the settled sewage samples (82 PFU/800 ml) [PLAQUE FORMING UNITS], and in the activated sludge effluent (202 PFU/800ml), no entero viruses were detected in 800 ml of the sample of waters that had percolated through 0.6 m of soil.

b. The results of virological array on samples from the test basin (0.6m and 4.2m) showed no viruses in one litre, during August 1964 and February-March 1965; and

c. After adding virus (100 PFU) salin type III poliovirus vaccine to 191.1m^3 of effluent, none of the samples from 0-6, 1.2, 1.8 and 2.4m pans after an interval of a few hours to a few days (3 days) showed any entero-viruses in the dilutions tested.

In Alabama, in 1937, Caldwell and Parr investigated the migration of bacteria in sandy soils as measured by coliform organisms from a bored-hole latrine that penetrated below the water table. Initially coliform organisms traveled 15 feet in three days. After three months of continued use of the latrine 90 percent recovery was made at 15 feet, 40 percent at 25 feet and only an occasional positive sample at 35 feet. Chemical pollution traveled farther than the bacteria. The travel of pollution was only in the direction of the stream flow. The width of flow of bacterial pollution was three feet at a distance of 15 feet, whereas the chemical pollution was 5 feet at 25 feet.

When only 10 gallons of water were drawn daily, after two months of use in the latrine, coliforms were occasionally detected at only 10 feet from the latrine. When large volumes (750) gallons were drawn, coliform organisms were consistently detected at 10 feet. Dr. W.L. Mallman, Professor Emeritus, Department of Microbiology, commenting on the findings of Caldwell states that "the significant findings of this study was the demonstration of a barrier to the spread of microbial contamination. This barrier formed by the deposition of particulate material at the periphery of the latrine functioned as a filtering mechanism."
Dr. Mallman continues to explain, "when the suspended solids in the effluent pass into the soil, they are trapped. These solids with the accompanying microorganisms form filter barriers that slow down the acceptance of the liquid into the soil. These filter barriers develop faster in heavy soils than in an open sandy soil. A filter barrier tends to hold back bacteria and viruses. Ordinarily the distance of 50 feet between the well and drainage field is sufficient to prevent the passage of pathogenic microorganisms and such indicator organisms as coliforms and fecal streptococci. High water tables are conducive to travel of bacteria and viruses in the soil."

Dr. Flora Mae Wellings, Epidemiology Research Center, Department of Health and Rehabilitative Services, Tampa, Florida, in a paper written in 1982 "Viruses in Groundwater," Permagon Press Ltd., sums up her concern by citing future expectations. "It has been established that virus contamination of groundwater resulted from land disposal of sewage effluents and that this contamination played an important role in the transmission of disease. As land disposal of poorly treated effluents become more widespread, increased ground water contamination will ensue." Concerning the widespread use of septic tanks she stated; "there is a dichotomy that cannot be ignored; those soils which score the highest on percolation tests required for septic tank drainfields are the same soils which allow rapid passeage of the virus-laden waters. If virus adsorption onto soil particles is to occur, particularly in sandy soils, percolation must be slow enought to permit the virus adsorption. The same dichotomy will be operable at sewage effluent land disposal sites." In conclusion she states that "The presence of a clay layer is important in ground water protection, yet it has been shown that as the percolating water reaches the clay layer the water may move laterally in the direction of least resistance until a vertical route is once again available. If lateral movement is precluded, then application rates will be limited by the soil depth to the clay layer; otherwise, flooding and run-off will occur. Extreme caution must be exercised in evaluating the percolation rates at a sewage effluent land disposal site, but a thorough geohydrological understanding of the site is equally important."

The following statement made by Richard C. Harris, National Septic Solids Research Inc., Miami, Florida, will close the discussion of viruses.

> "Relatively little is known about viruses. Viruses are significantly different from bacteria. Virologists do not even concur that viruses are living organisms; some regard them as self perpetuating (autocatalysis) chemicals.

There is little reference to viruses in relation to the treatment of sewage by collection systems and treatment plants because up to the present time the quantitative rendering of viruses to an inactive state (note: there is insufficient understanding of these agents to use the term 'dead' or 'killed') by such means has been nil, or next to nil - and this latter only through incidental occurrence. Viruses, especially those that are pathogenic to man, are generally extremely difficult to inactivate, or destroy, especially on the large scale required by sewage treatment. It has only recently been established that chlorine can effect permanent inactivation of viruses - but chlorine in such concentration and requiring such a prolonged period of contact - that such treatment is of no practical value. A late development in the destruction of viruses in sewage holds great promise - this is the treatment of sewage by irradiation (exposure to radioactive materials). There are several pilot treatment plants in the world now using this method, but considerable time and research is yet required before its general use can be accepted. For instance, while it appears that the destruction of all types and quantities of viruses is possible by this method, with the present limitatins of our technology the level of radiation so required still constitutes a distinct danger to humans in the area. So, unfortunately, the answer to "What is the degree, or effect, of the treatment of viruses in modern sewage treatment plants?", remains, "Very little or none".

"What, then, is the effect of septic tanks' anaerobic treatment of viruses? Perhaps the very first information on this subject is contained in reports of an extensive study of the effects of septic tank effluent upon ground water quality in Dade County, Florida, now being compiled by the U. S. Department of the Interior, Geological Survey. One report notes the findings of the University of Miami's Francis Parsons, that the sludge of (in) a subject septic tank had the binding capacity to bind all the viruses applied to it, with evidence that the viruses could be, or would be, so bound indefinitely. Presumably many, most, possibly all, viruses so bound could be, or would be, eventually destroyed by the disintegration of their protein capsid (integument or sheath) through hydrolysis. Obviously, further research on this subject is of great importance for there is now evidence that properly operating septic tanks control viruses at least as well as modern sewage treatment plants."

CHAPTER 3

CONFLICTING RULES OF GOVERNMENT AFFECTING THE USE OF SEPTIC TANKS IN FLORIDA

The water management situation in Florida is a complicated maze of loosely connected, or non-connected governmental agencies. These agencies are often acting at cross purposes.[14] There are Federal, State, District, County, City, even communities, who may act autonomously without regards to efforts or aims of each other.

In general, even though the State rules of the Department of Health and Rehabilitative Servies (HRS), Chapter 10D-6 of the Florida Administrative Code, establishes the standards for on-site sewage disposal systems, local authorities may require "more stringent" restrictions where they deem necessary. Chapter 10D-6 has been in a state of constant ammendment to attempt to write the code that is uniform for the entire state.

After years of work, travel, public meetings and working with septic tank installers, manufacturers, homebuilders, realtors and environmentalists, by Mr. Eanix Poole, Administrator, Environmental Helth program (HRS), a new Chapter 10D-6 was completed and became effective on January 1, 1983. Then the 1983 Water Quality Assurance Act (HB 47-B) requires the re-writing of the entire Chapter 10D-6. Mr. Poole and his staff have been busy since the bill became effective 1 July 1983 with more public hearings and meetings explaining the new rules that are now in effect, but the new 10D-6 won't be ready for certification until the spring of 1984.

In a guest column of the January 1984 publication of the Florida Septic Tank Association (FSTA) newsletter, Mr. Poole stated; "By June 30, (1984) we anticipate having completed an evaluation of the 67 county septic tank programs. This is because of our concerns, as well as those expressed by you (FSTA) and developers, that counties are not uniform in their interpretations and enforcement of Chapter 10D-6, FAC. In some cases, this lack of uniformity is because of local ordinances which are blended with requirements of Chapter 10D-6. However, we are aware that there is room for improvement in the implementation of the minimum statewide standards."

The Minimum Property Standards (MPS) published by the U. S. Housing and Urban Development Department (HUD), establishes the criteria that must be used for buildings that comes under their jurisdication. Specifically affected are the homes that are sponsored by the Veteran's Administration (VA), Federal Housing Authority (FHA) and Farmers Home Administration (F_mHA). There are several conflicts between the HUD-MPS standards and Chapter 10D-6 FAC in the required set-back distances between water wells and septic tank systems. These differences often cause delays in occupancy of homes and added expense to the homebuilder or buyer because of variance requests or physically moving the well or septic tanks. At the present time the policy of the VA - FHA field offices on the enforcement of HUD - MPS is: Each on-site sewage disposal systems will be evaluated based upon individual design criteria and existing drainage conditions. Mounded systems will be tolerated, but all systems must flow by gravity. Due to this restrictive criteria many sites are not favorable property for building homes. And where changes are made in the elevations of the building floor level to meet this criteria, the total building cost is beyond the capability of the potential buyer. (See Innovative Cases No. 1 and 4).

A growing concern now exists in the method of sludge disposal. Septage, the solid waste product of any disposal system must be disposed of in a safe manner.

As stated before, the solids that are transported in waste water amounts to about one five thousanth of the total in-flow. Yet the cost of separating, treating and disposal amounts to more than one half of the cost of a sewage treatment plant. All disposal systems must face this problem, including septic tank systems. Septic tanks are cleaned of sludge once every 2 - 4 years and is disposed of in various ways. The most widely used method today is the land spread method. Even though Chapter 17-7 FAC covers the rules for sludge disposal, there are many different interpretations on means of treating and/or stabilizing this waste product before it is allowed to be returned to the ground.

There are many other agencies who are involved with the control of septic tank systems. The Florida Department of Environmental Regulations (DER) has state-wide jurisdiction over waste water treatment and other regulatory issues. They are charged with setting standards and rules for the regulation of septic tanks where the volume of domestic sewage from any establishment exceeds five thousand gallons per day, or for any volume of industrial waste, and when kitchen waste water flow exceeds two thousand gallons per day.

When House Bill 47-B was passed by the legislature in 1983, one portion of the bill was intended to restrict the total amount of septic tank effluent that can be discharged to the soil. The law states that, depending on whether public water or private wells are used, discharge is restricted to an average of 2500 or 1500 gallons of sewage per day per acre of land. This bill is in effect, yet the new Chapter 10D-6 Florida Administrative Code will not be certified for several months at the earliest possible time. HRS has adopted an interim policy of allocating to each lot a pro rata share of the applicable maximum gallonage. Some builders have complained that their local county health unit has incorrectly counted the flows of existing contiguous homes and establishments in determining the remaining gallonage allocation for contiguous undeveloped lots.

The Department of HRS has issued an information Bulletin to all county health unit directors (7-28-83) attempting to interpret the law and to assure uniform enforcement. (SEE APPENDIX A)

CHAPTER 4

LIFE EXPECTANCY OF SEPTIC TANK SYSTEMS IN FLORIDA SOILS

The Florida Department of Health and Rehabilitative Services (HRS) does not require the local county health units (CHU^s) to retain records of septic tank permits longer than ten years. This proposal was made predicated upon the use of local CHU^s records. Specifically, Alachua County. The personnel in this local office were cooperative and helpful. However, there was inadequate records of septic tank installments beyond the required ten years. No funds were allocated in the budget to travel to distant counties for such a search.

Other problems relative to this phase of study was in response to questionnaires that were mailed to the CHU^s. All respondents recognized the needs for studies such as this, but requested to be excused from the study due to an already overload of work and lack of funds or personnel that would be required to participate in the study.

One of the most comprehensive studies of septic tank survival was made in 1972 by John W. Clayton, R.S. in Fairfax County, Virginia.

This study, an analysis of 6,000 septic tank systems installed over the period 1952 to 1972 determined that septic tanks were surviving an average of 20 to 30 years.

The conclusion of this study was summarized by the researchers belief that if the septic tank systems are installed properly, using the knowledge that has been gained from years of study, and with the proper maintenance, i.e., cleaning the septic tanks every 3 to 5 years, systems may continue to function 30 to 50 years or even indefinetely.[15]

The septic tank itself will seldom fail. Most tanks are constructed of concrete, masonry materials or fiberglass re-inforced plastic material. The major elements contained in the septic tank are not usually hostile or detrimental to the tanks. A liquid of high sulfur content will be detrimental to the some concrete and masonry tanks.

The conditions inside the septic tank which cause system failure are almost always the results of poor installation or abuse of the system. The major items that tend to cause failures are: (a) failure to clean tanks, resulting in build-up of sludge and grease which is carried into the drainfields. (b) clogged inlet pipes, due to excessive grease and garbage disposals, together with improper inlet (c) excessive discharge from clothes washers. These and other conditions which cause failure of the entire septic tank system will be discussed in section 5 of studies of innovative methods of on-site sewage disposal systems.

CHAPTER 5

ASSIMILATION OF INFORMATION FROM SEPTIC TANK INSTALLERS ON RELATIVE COSTS OF SEPARATION OF GRAY WATER FROM BLACK WATER.

The gray water system refers to the practice of separating the waters from fixtures that discharge waste from toilets, urinals and kitchen drains (called black water) from all other domestic waste including bath, lavatory, laundry and sink (except kitchen).

The black water is flushed into the street sewer and transported to the municipal sewage treatment plant.

The gray water is shunted into a typical on-site septic tank and drainfield system. The tank and drainfield shall be designed according to section 10D-6.48.[23] But the minimum depth of liquid shall be 30 inches.

This system is expected to reduce the flow in existing street sewers and in turn allow new buildings to be connected to the existing sewers.

A major concern of this system is in the reduction of the liquid in the sewers, and the increase of total solid volumes. Since the existing drain pipes are designed based upon the total "fixture unit" load and the degree of slope on the drain pipes. It seems possible that clogging could occur.

Also, as stated earlier, the cost of treating and disposing of the solid wastes constitutes more than one-half of the cost of a sewage treatment plant.

At the time this proposal was made, a group of concerned citizens of Orlando, Florida, comprised of homebuilders, sanitarians and engineers called themselves the "Graywater Treatment Committee" issued a statement to the public concerning the dire condition of sewage treatment facilities in many Florida cities.

The Graywater Treatment Committee Report created enough interest whereby the Homebuilders Association of Mid-Florida established a larger committee to investigate and make recommendations for the recirculation of waste water in domestic applications. Mr. Herbert A. Ross was designated Chairman. Meetings were held in Orlando, Florida.

After attending several meetings for study and input, it was decided that this pilot study would be more productive in the study of other innovative disposal devices already under study. A copy of the final report of the recommendations of the Graywater Committee is included in this study. (SEE APPENDIX B & C)

MONITOR VARIOUS SYSTEMS OF TYPICAL AND INNOVATIVE NATURE.

The aim and purpose of this portion of the study has been to determine the relative effectiveness of the on - site sewage disposal system that has become known as the septic tank; soils absorptive system (S.T.S.A.S.), as compared to the standard municipal sewage treatment system. At the same time inovative systems were designed, installed and monitored for their individual effectiveness in the various means of treatment and disposal of sewage wastes.

While the standard septic tank system (S.T.,S.A.S.) is in itself a controversial subject, it has become the one most widely used methods of sewage disposal systems in the world.

Even opponents of the use of this system recognize and accept the fact that the standard septic tank, when designed properly, installed accordingly, and maintained periodically, will serve adequately for an indefinite time where soils and ground water is ideal. The opponents of septic systems will generally agree that, given these ideal conditions the septic tank system is one of the most economical and cost efficient system available. Septic tank opponents cite poor installation, poor maintenance and abuse of the system by the home owner as reasons why the septic tank should not be considered to be a permanent type of sewage disposal system. Further, where soil and ground water is less than ideal, the fear of pollution possibility is increased.

It is these, "less than ideal conditions" to which the innovative systems and their effectiveness had been studied in an effort to predict their effect on the environment and to determine their overall usefullness.

The effectiveness "of the innovations selected for study has been based upon three criteria: (1) Will it work? (2) Is it practical? and (3) Is it cost effective?

No attempt had been made to determine the degree of pollution potential, if any, that may result form the use of any of these systems. But by the same token, no innovative system has been proposed which would violate specific code regulations such as placing untreated sewage in contact with persons, food, animals or contamination of drinking water.

Two of the selected study sites have been tested with dyes to attempt to determine the flow of ground water from the septic tanks. However, no water analyses were made to determine bacterial movement through the soils. It has been shown in other parts of this report that this is one of the most controversial subjects yet left to be resolved. It will require more controlled studies by persons who have expertise in ground water hydrogoly, microbiology, soils engineering, virology, toxicology, agriculture, food science, agrology and others to completely resolve the question of ground water pollution and protection.

Since there is no person who possesses even a portion of the qualities listed above, it is considered a waste of time and money to try to prove or disprove such a complex problem at only one site, and analyzed by one person.

The estimated time required to complete this phase of study was in error. It has taken about four times the original estimate. Comments will be made as each of the case studies are discussed.

CASE NO. 1

The use of Evapo-transpiration method for discharging septic tank liquid effluent. See plan and elevation drawings.

The purpose of this study is to determine: (1) the practical aspects and (2) the cost effectiveness of utilizing evaporation and transpiration as an alternate method of discharging the liquid effluent from septic tanks where soil conditions prohibits the use of the standard soils absorptive system of drain fields.

This has been accomplished by the conversion of an existing septic tank system, into an evapo-transpiration system.

The original system used a 1000 gallon septic tank and distribution box with a total of 375 square feet of drainfield lines. It serves 3 full bathrooms in a single family residence with 6 bedrooms.

The original system is 16 years old and has a history of good performance. It was pumped out in 1976 and 1980. It is located in northwest Gainesville on a large lot that is heavily wooded.

This system was modified as follows: The drainfield pipes were cut away from the distribution box and abandoned. A 4 inch plastic (PVC) pipe connected the distribution box and by gravity flow the effluent drains into a 55 gallon PVC tank which contain an activated charcoal filter. From the filter the effluent drains into a second PVC 55 gallon tank (dosing chamber).

A float activated switch operated a sump pump which forces the liquid into a network of 3/4 inch (P.E.) polyethlene pipe in the ceiling and walls of a greenhouse.

The greenhouse is 20' x 20' frame structure which is covered on the roof and sides with transluscent corrugated plastic and fiberglass panals. The side panels are operable for ventilation.

The Evapotranspiration bed is a 12 inch beep layer of cypress wood chips. The bottom and sides of the bed is lined with 10 mil visqueen plastic.

The 3/4 inch P.E. sprays the effluent over hanging baskets of plants and flows through the baskets to the wood chop floor to irrigate vegetation that is planted in the wood chips.

IS THIS SYSTEM A PRACTICAL MEANS OF DISCHARGING SEPTIC TANK EFFLUENT?

This system has been operative for 24 months. The maximum level of water that has accumulated in the bottom of the evapotranspiration bed is three inches.

This level only occurs during peak high usage of bath fixtures. The water level drawdown is rapid when the inflow is reduced. No effort has been made to determine the percent of liquid that was evaporated by the wood chips, or the amount taken up by the plants.

The principal plants that have been used are "Elephant ears" planted in the wood chips, and ivy plants in hanging baskets.

The plants grow and multiply abundantly.

There is no noticeable objectionable odors.

At this time only three-fourths of the available floor space is utilized for plant growth. The remainder of the floor area is used for storage of pots, etc. This indicates that a smaller green house could be used, reducing the first cost of a system.

PROBLEMS THAT HAVE DEVELOPED OR ARE ANTICIPATED.

The first sump pump that was installed failed after ten months use. It was determined to be a defective motor and was not caused by any elements of the septic tank system.

A gelatin like slime tends to accumulate in the polyethelene pipes, along with minute particles of black sludge. This causes the small feed pipes to clog up and stop the flow of liquid to the hanging baskets. In turn, the plants fade rapidly.

The use of 3/4 inch flexible polyethelene pipes that is suspended from the ceiling tends to sag between supports. This speeds up the clogging of small pipes.

The 3/4 inch feed pipes must be opened at the ends of each run and flushed out periodically.

Electrical power failure is possible. A warning system must be installed to alert the owner of an emergency.

Freezing weather must be expected and plans made for the protection of plants and any exposed pipes or valves.

During February 1983, a hard freeze killed every plant above the ground in the greenhouse. Prior to the freeze, transluscent plastic pannels had been installed on all walls . The experiment was made to determine the extent of damage that would be done. Everything was killed above the wood chips except one small orange tree, and some border grass.

The elephant ears, lillies, rubber trees, heavy vines, ivy, ferns and many other potted plants were killed. However, the system continued to work, and water reached to 6 inches depth in the wood chips. Then 12 days after the freeze, the first to show new shoots of growth were the elephant ears, lillies and ferns, Within 10 days, the shoots were more than 12 inches high, The hanging potted plants did not recover, indicating that plants in the water received some benefit from the ground and water.

This system is workable. However, it will not be acceptable by H.U.D. An analysis of this system was made by V.A. Construction Analysts Tom Johnson, chief, and Ken Baum. They suggested that if an emergency drainfield of about ten square feet of area was installed to receive the overflow during the time of any repairs, that HUD would approve the use of a system such as this.

The activated charcoal filter must be replaced and cleaned periodically to flush out organic particals. This system utilizes one and one-half cubic feet of charcoal at a cost of $66.00 per cubic foot. An extra amount must be on hand to replace the filter while the used filter material is dried and cleaned. A lose factor of ten percent is expected with each cleaning.

IS THE EVAPOTRANSPIRATION SYSTEM COST EFFECTIVE?

A. E.T. System:

Building First Cost		$ 2,000.00
Wood Chips		260.00
Filter Media	4x$66/cf	264.00
Pipes Valves		210.00
Plants		180.00
Pump and Wiring		510.00
Misc	20%	684.80
		$ 4,108.80
Cost of Septic Tank		350.00
Total First Cost		$ 4,458.80
Annual Cost: Estimated 20 Year Life		
Charcoal	264x10%	26.40
Electricity	$10/mo.	120.00
Labor	1 day/mo. @ 4/hr	384.00
Annual operating cost		$ 530.40
First Cost/20 years =$4458.80/20		222.94
Total Annual Cost		$ 753.34

B. Septic Tank (SAS)

First Cost:		
Tank		$ 350.00
Field	160 LF @ 4.20	670.00
Total First Cost		$ 1,020.00
First Cost/20 years		51.00 YR
Annual Cost:		
Pump Out	once/3 years	25.00
Total Annual Cost		$ 76.00

C. Sanitary Sewer System

Front Foot Cost 100 feet	$ 860.00
Cap. Ser. Ch.	920.00
Tap in Labor	400.00
Total First Cost	$ 2,380.00
Total First Cost/20 years	
2380/20	119.00
Annual cost @ 18/mo	216.00
Total Annual Cost	$ 335.00

D. Comparitive Costs per Year

E.T. System	$ 752.94
S.T. (SAS)	76.00
S.S. System	335.00

It is obvious from the above calculations that the annual cost of the evapotranspiration system is more than twice the cost of the sanitary sewer system, and is nearly ten times the cost of the standard septic tank system. From the stand point of pure costs the conclusion as to the cost effectiveness of the E.T. system, it is a failure and should only be used where soil conditions will not permit any other innovative systems, and where sanitary sewers are not available.

However, the E.T. system has other values if it could be developed into a commercial venture. A commercial nursery with a 400 SF green house, with adequate water should be an asset rather than a liability. This study concludes that this is a viable alternative in the physical sense but not cost effective because of the large capital outlay and the constant maintenance of the growing plants and cleaning the system.

CASE 1

EVAPO-TRANSPIRATION SYSTEM

No Scale

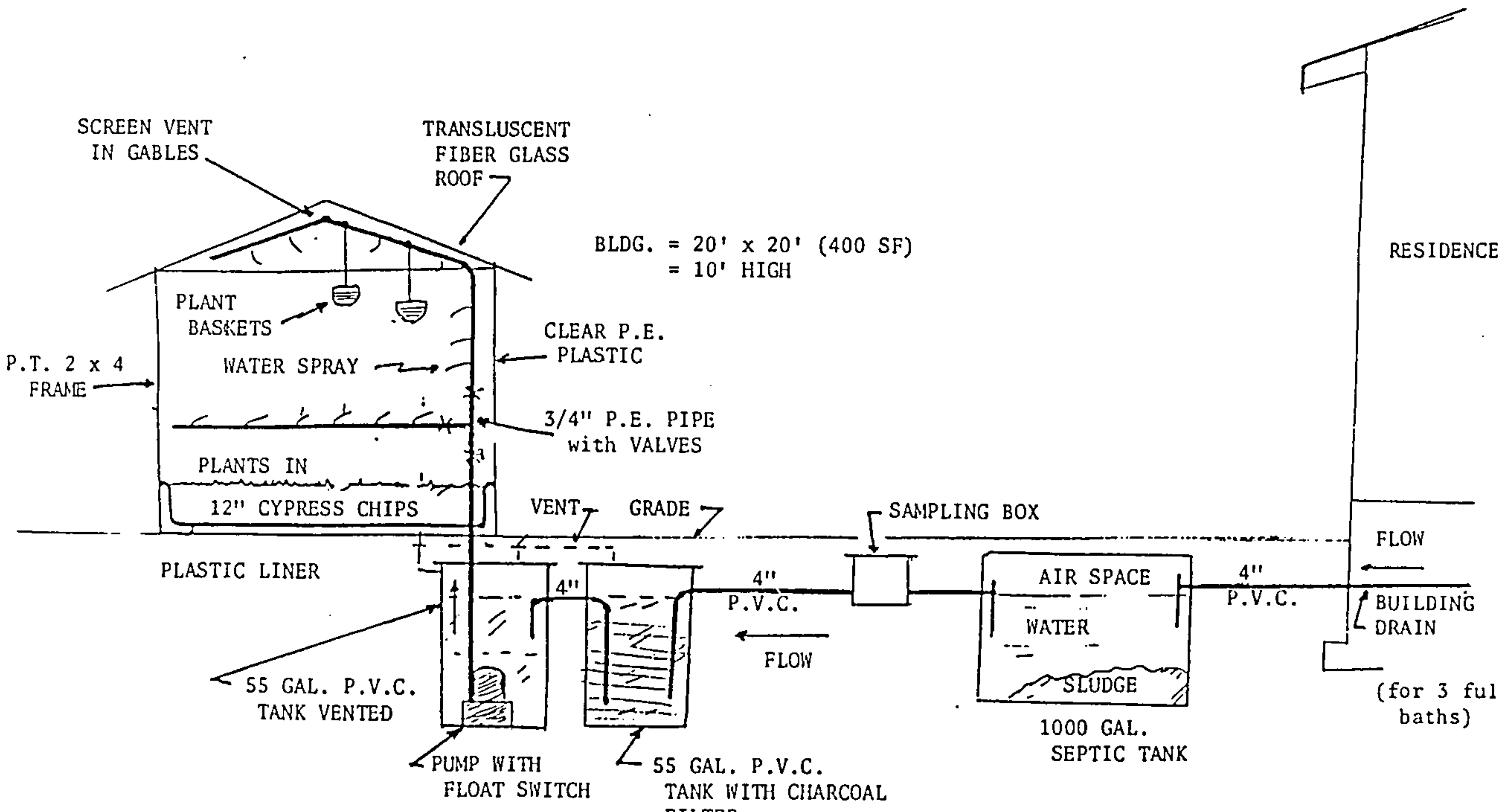


Figure No. 2

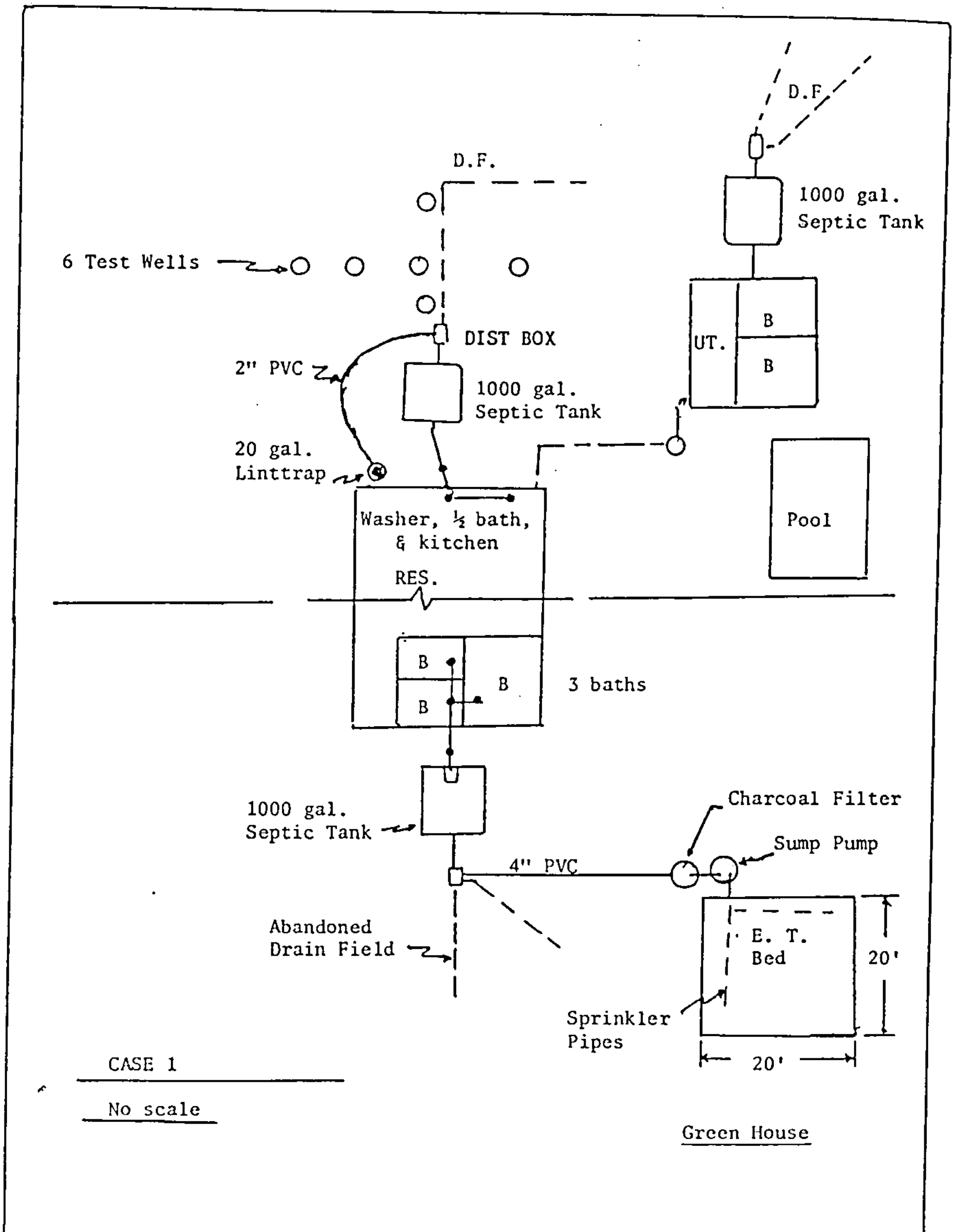

D.F.
D.F.
1000 gal.
Septic Tank
6 Test Wells
UT.
B
B
DIST BOX
2" PVC
1000 gal.
Septic Tank
20 gal.
Linttrap
Pool
Washer, ½ bath,
& kitchen
RES.
B
B
B
3 baths
1000 gal.
Septic Tank
Charcoal Filter
Sump Pump
4" PVC
Abandoned
Drain Field
E. T.
Bed
20'
Sprinkler
Pipes
20'
CASE 1
No scale
Green House

Figure No. 3

CASE NO. 2

The purpose of this study was to (a) determine why this S.T.(SAS) has a history of clogging at the tank inlet, (b) find method of discharging clothes washer effluent without going through the septic tank, (c) to monitor the ground water level around the drain field, (d) to determine the possibility of effluent flow into the polable water well that serves the building site.

This septic tank (SAS) serves one kitchen sink with a garbage disposal and dishwasher, one water closet and lavatory, and clothes washer. It is eighteen years old and has been pumped out in 1978 and 1981.

All appliances attached to this septic tank has a history of extremely high usage. The tank capacity is 1000 gallons. The drainfield was increased from the original 225 S.F. of bottom area to 425 S.F. The type of soil is sandy.

The ground water table elevation ranges from six feet to eight feet seasonally.

OBSERVATIONS AND EXPERIMENTS

The building drain to the septic tank was 3 inch diameter, cast-iron pipe from the building to a clean-out fitting at five feet where a concrete cement joint connects the cast iron pipe to 4 inch diameter terracotta clay pipe of four feet and into a bell and spigot, 90° elbow inlet fitting. The inlet joint was made with concrete cement.

The inlet pipe clogged up twice during this study. Care was taken to remove the inlet pipe so the cause of stoppage could be determined.

The inlet fitting was found to be plugged with a hard soap-like substance which required sharp instruments (chisels) to cut out the plug. The inlet pipe was restored to its original condition.

Ten months later the system experienced another stoppage, and the same type if plugging substance was discovered. Further, the terracotta pipe had a tough slime which lined the inside of the pipe for 3 feet. The slime lining appeared to have become so heavy that the top portion came loose at the high end and collapsed, there by preventing any solids from entering the septic tank. In both cases the soap-like plug had built up until the inlet opening was less than 2 inches in diameter.

The repairs made at the second failure consisted of: removing the terracotta pipe and inlet fitting and replaced by a 4 inch pvc inlet pipe discharging straight into the septic tank. There has been no evidence of the tendency to clog for more than 16 months.

Some of the incoming grease from the kitchen waste floats on top of water inside of the sweep and congeals around the sides of the sweep until the build-up of grease, mixed with dish washer detergents, food wastes from the disposal and dish washer formed an almost rock hard substance. It is probable that the slime lining in the pipe was the result of water and waste that would stand above the restriction when the flow into the pipe was more rapid than the opening could pass.

This method of inlet has now been approved by ch. 10 D-6 of the Florida code.

GRAY WATER DISPOSAL

Included in this case 2 study was a means of disposal of clothes washer waste water with out discharging it into the house septic tank. The sketch below shows the use of an interceptor tank with inlet and outlet pipes. The gray water is retained in the tank long enough to allow the dirt and lint from the washer to settle out and drop to the bottom of the tank. The discharge pipe is 2 inch diameter polyethelene pipe which by-passes the septic tank and is fed into the distribution box and into the drainfield.

This system has worked successfully for more than two years. The residue must be removed annually. A tight fitting lid is required to prevent root growth into the tank. A vent is required as shown.

GROUND WATER LEVEL AND FLOW

This septic tank system has a history of very high usage. During periods where this system was used by groups of people numbering more than 200 for 6 hours duration, no evidence of drainfield saturation has been noticed. To study the effects of high usage on the ground water level, six test wells were driven to 14 feet deep. Three of these wells were placed within 3 feet of the drainfield and spaced 25 feet apart. Three more wells were installed at distances of 20 to 50 feet away from the drainfield. (See plan view of case 1 and 2)

Measurements of distance from ground surface to ground water was as follows:

1. During normal usage there was no measurable difference between water level of any of the test wells.
2. During high use periods the water level in the test wells near the drainfield always indicated that the water level was at the bottom of the drainfield rock. The level of water in the test field which was 20 feet away was no higher than water in the test well located 50 feet from the drainfiled. The drainfield

on this system is the standard type that utilizes 12 inch lengths of 4 inch diameter clay tile. The clay tile is embedded in 12 inches of lightweight rock. The total bottom area is 425 SF.

FLOW OF WATER UNDER GROUND

The potable water well which serves Case 1 and 2 is located between 2 septic tank systems. These systems are within 82 feet of the well. The well is a 4 inch diameter submersible pump with steel casing. The casing is 187 feet deep and into the limerock aquifer. Water rises 120 feet into the casing and the well pump is set 130 feet below the ground surface. (sixty three feet stand above the pump.)

The well was constructed by the use of a percussion drill bit and cable. The well log shows sand for 22 feet deep then a stiff clay strata 25 feet deep and lime rock and marl down to the limerock aquifer. The well was not grouted.

Following one of the high use periods of the facilities at site 1 and 2, the following test was made to determine whether any water from the septic tanks was flowing into the potable water well.

Two quarts of concentrated food coloring was poured into test well number 1, which is the well nearest to the potable water. The dye was poured into the drainfield at 8:00 a.m.

The pumps ran constantly until 6:00 pm. The rating in the pump at 67 feet of head is 8.8 GPM delivery.

During the testing period samples were drawn from other test wells by means of a bail bucket at 30 minute intervals. No visible signs of coloring were detected in any other test wells, even though test well number one is located on the side of the drainfield bed at the distribution box.

After eight hours of taking samples by the bail bucket method, each well was evacuated by the use of a hand operated suction pump. Samples of the ground water was pumped into glass jars and compared to a control sample jar of clean water that was taken prior to making this test. No traces of coloring was detected after numerous pumping and sampling.

The potable water from the deep well was directed through a wound cord filter element with a glass body. No indication of coloring was detected by visual examination.

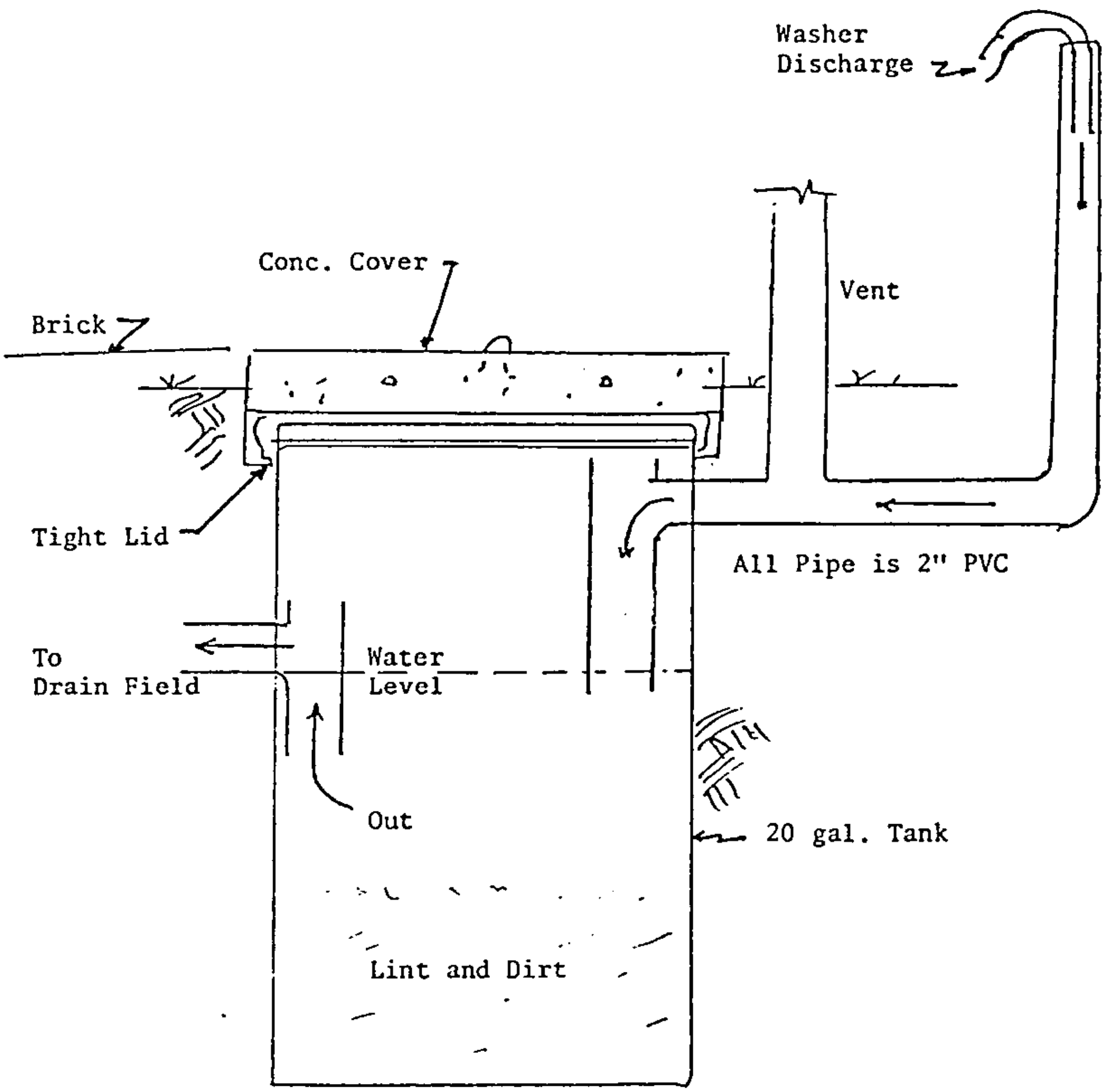
The results of this test indicates that the soil is capable of filtering out the particles of coloring where the nearest sampling well is 25 feet from the point of application.

During this study soil tests were made to determine the following characteristics:

Soil Classification...SW (Sand-Well Graded)
Permeability Rate..22.38 inch/hr
Percolation Rate....0.78 min/inch

The percolation rate is so rapid it is possible that the dye reached the ground water and became too diluted to be detected by the visual method.

CASE 2



Lint Trap with bypass to Drain Field

No scale

Figure No. 4

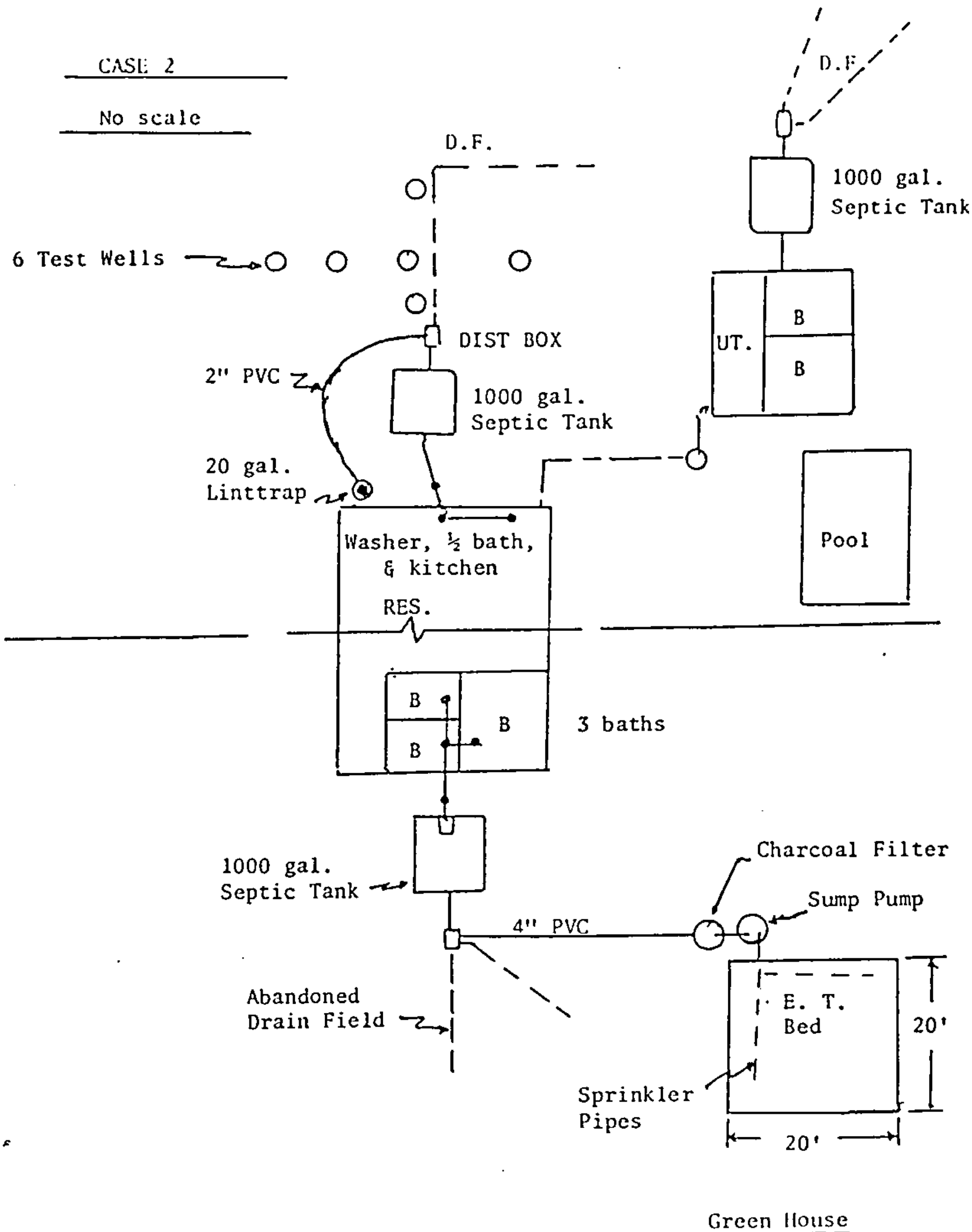

CASE 2
No scale
D.F.
D.F.
1000 gal.
Septic Tank
6 Test Wells
DIST BOX
2" PVC
1000 gal.
Septic Tank
B
B
UT.
20 gal.
Linttrap
Washer, ½ bath,
& kitchen
Pool
RES.
B
B
B
3 baths
1000 gal.
Septic Tank
Charcoal Filter
Sump Pump
4" PVC
Abandoned
Drain Field
E. T.
Bed
20'
Sprinkler
Pipes
20'
Green House

Figure No. 5

CASE NO. 3

The purpose of this study is to compare an emergency relief system for a standard S.T. (S.A.S.) pump, and to evaluate a mounded type drainfield to a gravity flow mounded drainfield (case number 4).

This system (case number 3) is located in northwest Gainesville, Florida. A three bedroom, two bath building situated in a highly wooded one acre lot. It was built in 1976.

The soil type is candler silty sand. The lot is poorly drained because of underbrush on all sides including somw palmetto brush. The ground water table is normally 3 to 5 feet below the ground surface.

This building uses two 900 gallon septic tanks. Tank 3B serves 1 kitchen sink, 1 dishwasher, disposal and laundry tub-clothes washing machine.

During eight years of occupancy this system has not malfunctioned. It has never been cleaned out.

Tank 3A serves two full baths, one bath utilizes a standard tub-shower, and bath no. 2 utilizes a sunken tub-shower bath. The use of the sunken tub caused the building drain to be set 12 inches lower into the ground. This in turn caused back flow into the building during rainy seasons.

Drainage ditches around the building site was provided and fill dirt was brought in to swale the surface water away from the building. Roof gutters and drain spouts were installed to lead rain water away. However, the wooded property adjacent and down stream of the site prevented the water from flowing off the owners property.

Since this problem was a re-occuring, but not constant, the owners elected to install an emergency system in lieu of the standard sump pump, dosing chamber and large mounded drainfield system.

This system was modified as follows: the distribution box was made deep enough to install a submersible sump pump. The original drain fields were left intact. The sump pump float switch was set to cut on whenever the drainfields began to flood. The sump pump evacuates the flood water through a 1½ inch check valve and polyethelene pipe to a seepage bed. The seepage bed was constructed as follows (see sketch). Twelve inches of top soil was removed from an area 12 feet by 20 feet and stock piled. Four inches of light weight aggragate (holite) was spread over that area. Two 4 inch diameter perforated pipes 20 feet long were connected to a standard distribution box. The pipes were covered by eight more inches of aggregate. The drainfield was covered by one layer of polyester membrane. The entire area was covered with 12 inches of granular fill. The top soil was placed over this bed and sloped toward the edges at a 30 degree pitch. The effluent pipe was connected to the distribution box.

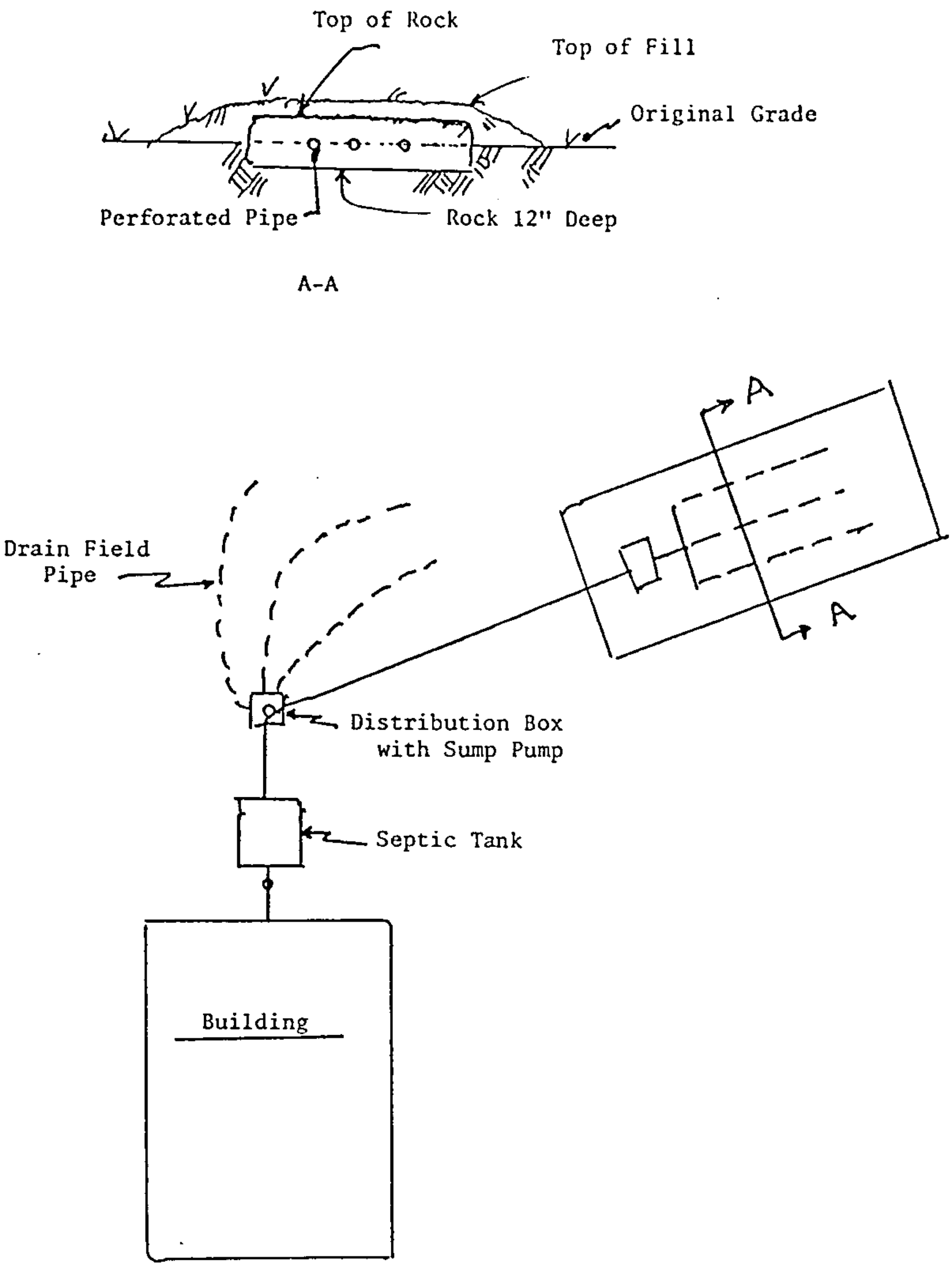
This system was completed in 1980. No malfunctions occured since that date.

The cost of installation of this system is shown below. It will be shown that this method of correction is less expensive than some other systems utilizing dosing chambers, pumps, and mounded drainfields.

COSTS FOR CASE 3:

1 sump pump assy - 1/3 HP	$ 109.00
27 CY Aggragate	324.00
30 CY Fill Dirt	90.00
1 Distribution Box	60.00
40' Perf Pipe 4"	16.00
1 Check Valve	14.00
40'-1½" PE Pipe	12.00
Wire and signal light	60.00
Labor	350.00
Total Cost	$ 1,035.00

There has been no maintenance costs since installation. No estimate has been made for the cost of electricity. The actual costs has been included in the total utility bills of the owners. They indicate that any additional costs are negligible.



CASE NO. 3 No scale

Figure No. 6

CASE NO. 4

The purpose of this case study is to illustrate one method of installing an on-site sewage disposal system that meets the requirements of the minimum property standards (MPS) of HUD. On site sewage disposal systems will be considered on the merrits of each system by the construction analyst division of the Veterans Administration Loan Guarantee Field office in Florida. Basically, mound systems are discouraged, although acceptable where other methods are not feasible.

Case 4 is located in Hastings, Florida. Soil is sandy loam. The ground water is too high, and has a history of flooding. Streets are unpaved with drainage ditches on one side where water stands almost continually. A standard S.T. (S.A.S.) is not acceptable for V.A. loan guarantee and was disapproved when plans and specifications showed the builders intention to use a dosing tank and elevated drainfield with a sump pump. The system was required to be a gravity flow.

The original plans for this building were revised from a concrete slab on grade, to a wood frame floor wirh 3 feet of crawl space. The additional cost incurred for this change was $1,995.00.

In addition to these charges the clothes washer was required to have a seperate 270 gallon tank with separate drainfield of 120 sq. ft.

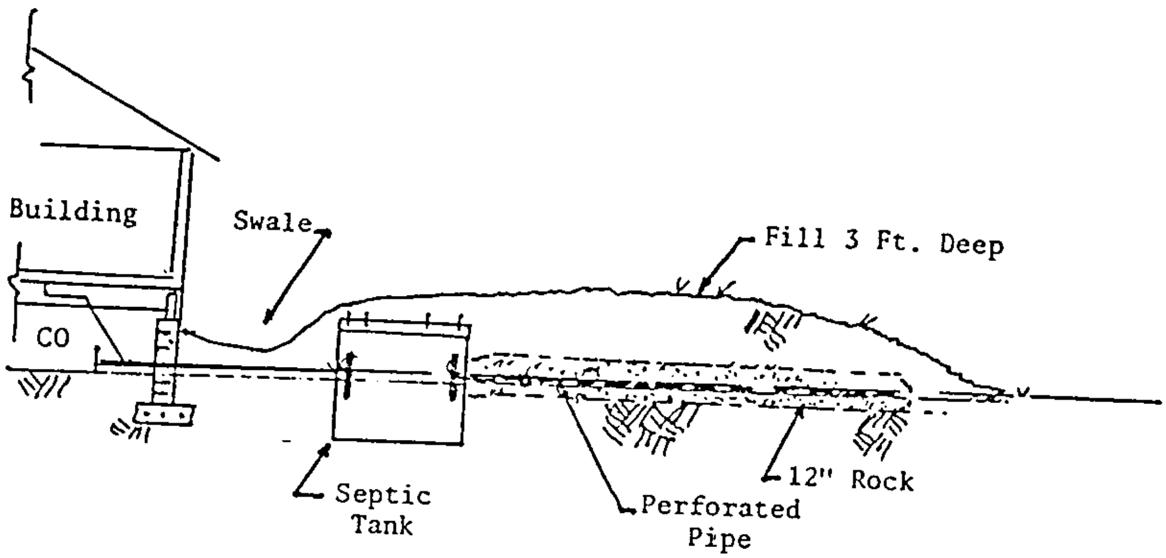
The original costs for this sewage system, located in an ideal soil and draining condition should have been:

1-900 Gal./ S.T. w/265 Sq. Ft. of Drainfield...$710.00 (Bid Price)

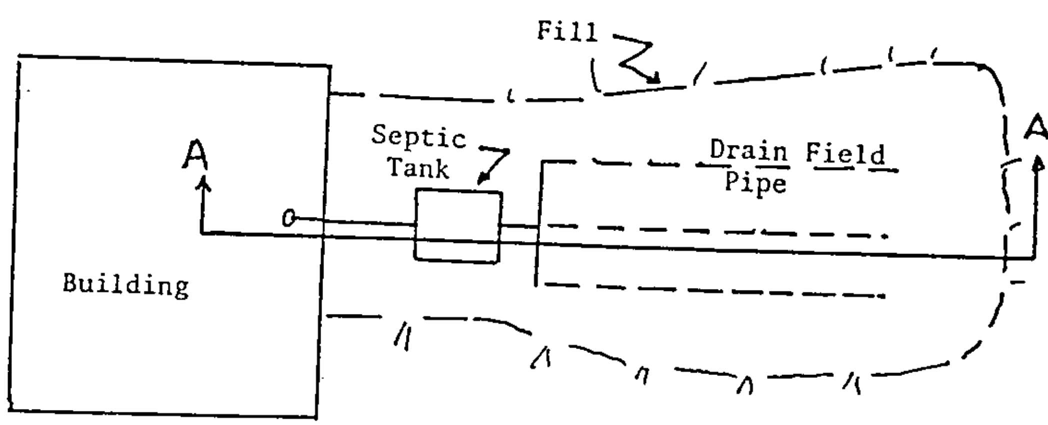
Because of the high water condition the additional cost was:

Sand Fill and Grading......................	$ 1,100.00
Washing Machine Tank and D.F...............	575.00
Added Costs for Conditions.................	$ 1,675.00
Additional Cost for Gravity Flow System	$ 1,995.00
Total Cost for Sewage System	$ 4,380.00

This system was installed in August 1981. It has operated satisfactorily without maintenance of the system itself. However, this building is located in an area that is highly populated and during subsequent visits to the site there is evidence of children and animals playing on the mound. Holes were dug in the mound. Ant hills were numerous and some areas were bare of grass. Some weeds are growing up to crowd the grass out. It is anticipated that repairs will be required constantly, or the drainfield should be fenced in for protection.



ELEVATION A-A



Plan

CASE NO. 4

No scale

Figure No. 7

CASE NO. 5

MOBILE HOME WITH S.T. (SAS)

This system is located in south-east Gainesville near Newmans Lake. It is 30 years old and has been used constantly. The mobile home is a one-bedroom unit with attached cabana with one additonal bedroom. The premise has been occupied by rental tenants, ranging from one person to five, at varying intervals. There has been no known repairs made to drain fields. It has a long history of clogging at the effluent in-let pipe. The building drain is a 3 inch bell and spigot cast iron, with caulked and leaded joints. A clean out plug is located between the building drain and the septic tank. There is eight feet of 4" clay pipe between the C.O. and the S.T. All joints in the clay pipe are concrete grout. The original owner (and landlord) described the tank as a 750 gallon septic tank which was made of 8 x 8 x 16 inch concrete blocks with cement parginy inside and a poured concrete bottom. It has a three-piece concrete lid.

The past owner reported that complaints from tennants has been remedied most often by the use of a plumbers snake to dislodge items that became stuck in the building drain. There has been occasions where a roto-rooter was necessary to open the building drain.

This site was selected for this study and also for Professor Holland's research on ground water studies. However, Professor Holland abandoned this site when it became impossible to sink test wells into the ground water. The character of the soil is fine sand fourteen feet deep where a strata of hard sand and clay which could not be penetrated by the well jetting equipment that was available. Four wells were placed at the site but stopped at the hard layer. There was no ground water in excess of 6 inches in any of the wells.

Continuing the investigation of the S.T. if was discovered that:
(1) The clay in-let pipe had been removed from the in-let tee.
(2) The in-let port was plugged with cement grout.
(3) A hole was knocked into the side of the S.T. where the in-let pipe was grouted into the hole.
(4) All cement grouted joints were cracked.
(5) A profusion of root growth exsisted at each joint.

During this period of work on this system the tenants were on a 30 day vacation and no water was being flushed into the septic tank.

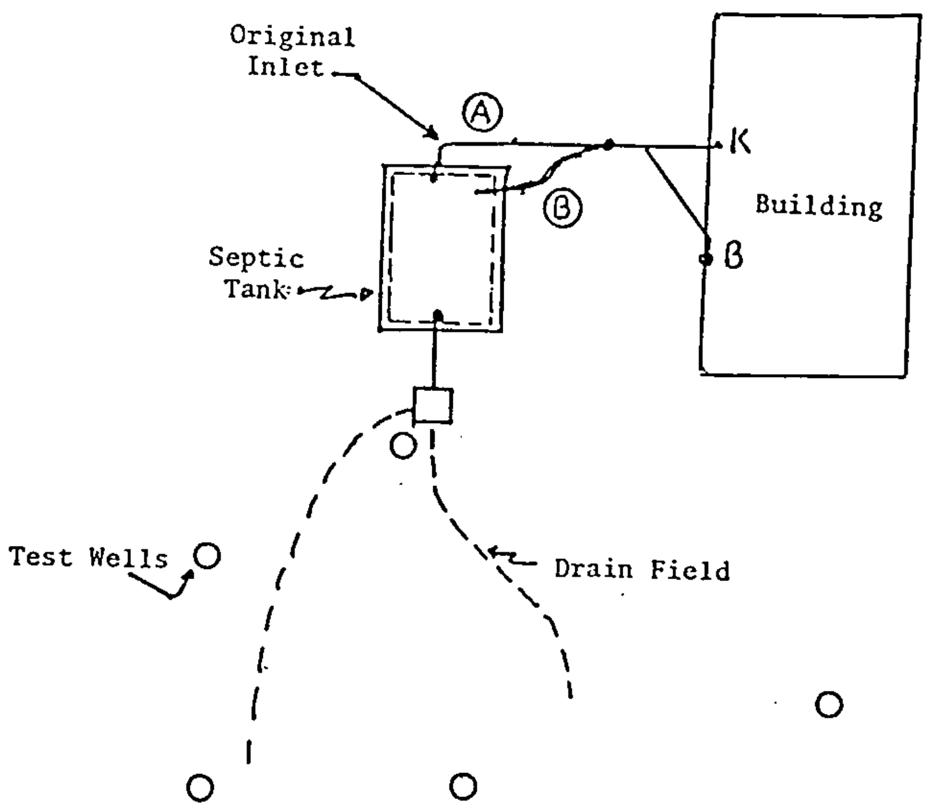
When the soil cover was removed from the top of the S.T. it became obvious that the tank lids had not been grouted to the top of the tank. (1) There was root growth under the lids on all sides and extending down the inside of the tank. (2) The water level in the tank was 10 inches below the invert of the outlet pipe.

It was evident that the septic tank was not water tight and the roots were taking up the water in the tank.

This disposal system was scheduled for futher studies because of the nature of the area. It is near a lake; it is in a high density area where small lots are served by septic tanks and water wells.

A four inch deep well was being drilled on the site when the drill rig failed and remained stuck on the site for the remainder of the alloted time of this study.

This building is scheduled for demolition and no repairs were made except to replace the in-let pipe joints.



Plan View

No scale

CASE NO. 5

Figure No. 8

DISCUSSION

The essence of the purpose of this study is to narrow the volume of written reports of studies, opinions, beliefs, and observations of the pro and con use of septic tank systems into a statement predicting the effects of their widespread use in Florida soils.

This study confirms that the majority of persons who are familiar with the various methods of sewage treatment and waste disposal recognize that the standard septic tank is economical and efficient under favorable condition. It is equally obvious that it will continue to be used for sewage treatment outside of the economical proximity of the central sanitary sewage treatment plants.

Further, the costs of studying, planning, building and maintaining the treatment plants, and extending sewers, building retention ponds and lift stations, is rapidly approaching the point where even the Federal Government cannot afford the degree of water treatment that everyone envisions as ideal and necessary.

Estimated costs for future clean up and control of waste water are so varied that there is a disparity of 600% between some authorities. To complicate cost estimates that are made by Cities and State planners, there are constant changes in the percent of support that may be expected from the Federal Government.

Example: In February 1984, the Environmental Protection Agency issued revised final regulations for the construction grants program that imposes stricter conditions for obtaining federal funds for building new sewage treatment plants. Beginning October, 1984, the federal share of project costs will drop from 75% to 55%. And beginning January 1, 1985, EPA will not award any grants for separate planning and designing of new treatment plants.

EPA also changed the final rules to require that a municipal grantee certify to the regional EPA Administrator that the sewage plant meets its design specifications. In the regulations issued in May 1982, EPA only required that it be showed that the plant was "capable of meeting" the design specifications. (ENR 3/1/84 p. 14). Also, a grant applicant must prove to the EPA that it has the legal, institutional, managerial and financial capability to build and operate a sewage plant.

To cite another example; EPA is expected to announce at the end of this month (3/84) that all eastern cities must abandon a sludge dump site 12 miles off the New Jersey coast, and barge their sludge to a site 106 miles off the coast. Since 1981 New York City has dumped 260 tons of dry sludge per day at the 12 mile site. New York City now dumps about 3.2 million tons annually at a cost of 4 million dollars. This cost is expected to rise to 20 million dollars annually. Also, retrofitting of cities barges for the extra distance would cost another 40 million dollars. (ENR 3/8/84, p. 18)

The Reagan Administration has requested 2.4 billion dollars for the construction grants program for this year, the same as the past 3 years. But an amendment to the Cleanwater Act proposed by Rep. J.J. Howard (D-N.J.) would raise the annual funding to 5 billion dollars for the program (ENR 3/1/84 p. 14).

CONFLICTING RULES OF THE LEGISLATURE

The Florida state rules for the regulation of individual sewage disposal system has been in a constant state of rewriting for many years. The current rules (Chapter 10D-6 FAC) was adopted effective January 1, 1983 after extensive public hearings. The 1983 septic tank legislation House Bill 47-B was passed, making it necessary to rewrite the rules again. At this time, a new Chapter 10D-6 is about to become effective in June of 1984.

Already House Bill 357 has been proposed by Rep. Samuel Bell of Ormond Beach. This bill changes the septic tank set-back distance from streams and lakes. The set-back distance in the recent past was 25 feet; then 50 feet, and in the newly written Chapter 10D-6 has become 75 feet. House Bill 357 would extend the distance to 150 feet.

RESEARCH IMPLEMENTATIONS THROUGH THE USE OF PRIVATE INDUSTRY AND GOVERNMENTAL GROUPS

This study was conceived under assumptions that the research effort would meet with enthusiasum and participation by the septic tank industry and the County Health Units (CHU's). While all persons concerned were interested and enthusiastic about the research, there was almost no participation. This was because the original tasks and monitary contributions that were asked for was too time consuming and somewhat expensive.

The response from the CHU's were courteous and careful to explain their lack of personnel or funds to hire someone to reseach files for permit data.

The Florida Septic Tank Assocation was generous in the contribution of matchings funds, and in the donation of some materials.

Because of the limited assistance from industry and governmental bodies, the thrust of this investigation was modified to spend more time and available funds on the innovative systems listed as Cases 1 thorugh 5, and in library research.

FIELD WORK AND OBSERVATION OF INNOVATIVE SYSTEMS

The five systems that were studied during this study have been shown to be practical and cost effective when compared to the standard municipal sewage treatment systems.

The primary concern of health authorities relative to any sewage disposal systems is the prevention of contamination of ground and surface water by the spread of fecal matter that carries bacteria and viruses, and the prevention of contamination of bodies of water by the discharge of nutrients which speeds up the eutrophication process which in turn causes the bodies of water to become choked with algae.

The primary nutrients that are found in sewage effluent are nitrates, ammonia, and phosphates.

FINDINGS

This study has cited research tests that demonstrate the fact that all contaminants are filtered out of the liquid effluent as it passes through a filter media. Some filter media is more effective than others. It has been shown that soil is a practical filter material. The upper 2 feet of most soil contains bacteria which feeds on the contaminants thus creating a tertiary treatment of the liquid effluent.

CONCLUSIONS

All sewage discharge must be recycled by some method to insure the continued adequate amount of potable water. The question becomes; Can we afford the risk of widespread use of septic tanks in Florida soils? It is the conclusion of this study that sewage liquid wastes can be discharged under ground in scattered locations more safely than through the collection and consentration of wastes by sewage treatment plants for discharge into rivers, oceans, or injection wells. Furthermore, it has been shown that most septic tanks have functioned satisfactorily for many years without pumping out the sludge. This indicates that the septic tank is capable of digesting the solids to reduce them to a fraction of their original volume. Since the treatment and discharge of the solids at a sewage treatment plant constitutes the major part of their operating cost, it is the conclusion of this study that it would be better to "store" sewage in septic tanks located at every building other than collecting it at central locations which are becoming inundated with ever increasing volumes. The use of a septic tank as a "holding tank" should be a multi-chambered type which would rapidly divert the solids from the liquid. This would reduce the time that polluting solids would be in contact with the liquids. The liquids should be brought into community treatment facilities and treated for local irrigation purposes and "green" areas.

RECOMMENDATIONS

Further research should be conducted to determine the extent to which the use of septic tanks can be integrated into existing sanitary sewer systems. Research should be aimed at techniques of treatment and disposal and in managerial methods of innovative individual systems as well as integrated systems. The findings of responsible researchers should be implemented into the program. Too often new information is filed and forgot.

IMPLEMENTATION

The bottom line on implementing any changes in our floundering sewage treatment jungle is money. The need for research is critical. The fragile line of balance between our fresh water resources and elements of pollution is drawn. Hesitation to act now could be disasterous.

The money that is required will seem staggering to the imagination but it must be spent. This study has demonstrated that regardless of how much an individual has at stake in our environment that individual can not, and will not sacrafice his time and business without just compensation.

We will need competent individuals and teams with expertise in every part of our society, from technicians to management, and they must be paid well.

EPA final regulations for construction grants program allows states to reserve between 4 and 7.5 percent of their grant allotment to fund innovative and alternative (1 and A) programs. Governor Graham should work to obtain this type of money to begin a comprehensive research plan.

APPLICATION OF THIS STUDY TO THE FUTURE

The news media was responsible for causing statewide interest in the study of Case 1, Evapo-transpiration of liquid wastes and the operation of the greenhouse. This system is still in operation and various groups have indicated an interest in further experimenting. These groups are primarily from the University of Florida.

There are many questions to be answered relative to the complete use and maintenance of septic tank systems. This study can be used as a basis for many facets of individual sewage disposal systems.

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APPENDIX A

RULES OF THE

DEPARTMENT OF HEALTH AND REHABILITATION SERVICES

CHAPTER 10D-6

STANDARDS FOR ONSITE SEWAGE DISPOSAL SYSTEMS

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STANDARDS FOR ONSITE SEWAGE DISPOSAL SYSTEMS

STATE OF FLORIDA

DEPARTMENT OF HEALTH AND REHABILITATIVE SERVICES

CHAPTER 10D-6, FLORIDA ADMINISTRATIVE CODE

STANDARDS FOR ONSITE SEWAGE DISPOSAL SYSTEMS

PART I

10D-6.41 General

(1) It is the policy of the State of Florida to require that all onsite sewage disposal systems, except approved onsite graywater systems, developed under the provisions of law and administrative rules connect to a publicly owned or investor-owned sewerage system within 365 days after notification that such a system is available. Where a publicly owned or investor-owned sewerage system is not available, the Department of Health and Rehabilitative Services may issue permits for the construction or installation of onsite sewage disposal systems under conditions as described in the following sections.

~~(1)~~ (2) The purpose of This rule is to provide establishes minimum standards, provisions, and requirements for the design, construction, installation, utilization, operation and maintenance of onsite sewage disposal systems used for disposal of human excreta and domestic sewage.

~~(2)~~ (3) Any onsite sewage disposal system (also referred to as system), as defined in this Chapter, hereafter designed, constructed, installed, utilized, operated and maintained in the State of Florida shall conform to the requirements of this Chapter. ~~Any previously installed system which was inspected and approved, by the permitting authority, shall remain valid for use under the terms of the regulation and permit under which it was approved.~~ An existing system installed under previous rules and regulations which becomes non-conforming with the standards and requirements of this chapter and which has been out of service for a period of one year or more or has not been placed in use for a period of one year or more shall be deemed abandoned and unapproved for use.

Under emergency or epidemic conditions and when operated under its supervision, the Department of Health and Rehabilitative Ser-

[illegible] approve temporary systems of excreta disposal which may differ with standards set forth in this Chapter.

~~(3)~~ (4) No person shall construct or install an onsite sewage disposal system without receiving prior written approval from the Department. Individual county health units may require that they be given notification of intent to repair, or may require the repairer to obtain written approval prior to making a system repair.

~~(4)~~ (5) No municipality or political subdivision of the State shall issue a building or plumbing permit for any building requiring the use of an onsite sewage disposal system unless the owner or builder has received a construction permit for such system from the Department.

(6) No permit shall be issued for an onsite sewage disposal system in areas zoned for industrial or manufacturing use, or its equivalent, where possible use is to dispose of toxic or hazardous chemicals.

~~(5)~~ (7) Buildings used or intended for human occupancy, employment or service to the public and locations where persons congregate shall provide toilet(s) connected to an approved sewage waste disposal system. Also, property or locations where persons congregate, are employed, or where property is used by the public for temporary and short periods of duration, such as construction sites, fairs, carnivals, revivals, field locations for agricultural workers, encampments or other use shall be provided with an approved sewage waste disposal system.

~~(6)~~ (8) If additions or alterations to a building or its ownership are made which will increase sewage flow or change sewage characteristics, any onsite sewage disposal system serving such buildings shall be upgraded to comply with the provisions and requirements of these rules. Provided, where only minor changes are made, such as the addition of one bedroom to a single family residence, the system, at the discretion of the local department authority, may not be required to be altered.

~~(7)~~ (9) When the volume of domestic sewage from an ~~establishment exceeds five thousand (5000) gallons per day, or~~ for any volume of industrial waste, and when kitchen wastewater flows exceed two thousand (2000) gallons per day, treatment and disposal of the total sewage flow from a building or establishment shall be in compliance with the State of Florida Department of Environmental Regulation (DER) standards and rules. Provided, consideration may be given to low density establishments where it would be difficult or impossible to consolidate flows through sewering because of layout and distribution of facilities. ~~The table of estimated sewage flows set forth in Table I~~ Section 10D-6.48(1) shall be the ~~guide~~ when used for determining the total daily domestic sewage flow from ~~all sources~~ a non-residential establishment located on one or more parcels of land.

~~(8)~~ (10) The local Department authority may require, for review and approval, the submission of detailed system construction plans, prepared by an engineer registered in the State of Florida~~, for any system to receive flows not exceeding five thousand (5000) gallons of sewage per day~~.

Name of Person Originating Proposed Rule: John Heber

Name of Supervisor or Person who Approved the Proposed Rule:

Eanix Poole

Date Proposed Rule Approved:

Specific Authority: 381.031(1)(g)3, FS

Law Implemented: 381.031, 381.061, 381.071, 381.261, 381.272, 381.291, 381.311, 386, FS

History: New

10D-6.42 Definitions

(1) Absorption surface - the total surface area of soil at the bottom and sidewalls of the soil absorption system drainfield.

(2) Aerobic sewage treatment facility - a sewage treatment plant which incorporates a means of introducing air into the sewage so as to provide aerobic biochemical stabilization during a detention period.

(3) Alternative system - any approved onsite sewage disposal system used in lieu of, including modifications to, a

standard subsurface system.

(4) Approved - onsite sewage disposal system constructed and installed in compliance with technical standards and requirements of this Chapter. "Approved" installation does not imply that a disposal system will perform satisfactorily for any specific period of time.

(5) Aquifer - a geological formation, group of formations, or part of a formation (stratum) that is capable of yielding potentially usable quantities of water from wells or springs.

(6) Available - a municipal or investor-owned sewerage system shall be deemed available for connection if all of the following requirements are met:

(a) the system is not under a Department of Environmental Regulation moratorium;

(b) for estimated sewage flows of six hundred (600) or less gallons per day, a sewerage system shall be considered available if a sewer line exists in a public easement or right-of-way which abuts the property, and if gravity flow can be maintained from the building drain to the sewer line.

(c) for estimated sewage flows exceeding six hundred (600) gallons per day, a sewerage system shall be considered available if a sewer line exists in a public easement or right-of-way which abuts the property or is within one hundred (100) feet of the property.

(7) Bedroom - A room designed primarily for sleeping. For residences, rooms having two (2) or more of the following features shall, for the purpose of these rules, be classified as bedrooms.

(a) Excluding bathroom, patio, balcony, and bedroom entrances, any room having a single point of ingress and egress from other parts of the building.

(b) Rooms having one or more closets.

(c) Rooms having an attached bathroom.

~~(7)~~ (8) Conditions associated with a periodic saturation of soil - physical soil characteristics, such as soil color or the presence of soil mottling, which can be utilized to determine the maximum expected elevation of a fluctuating wat table.

~~(8)~~ (9) Department - the Department of Health a Rehabilitative Services including authorized agents of the ind vidual county health units.

~~(9)~~ (10) Domestic sewage wastes - human and domest wastes, liquids or matter from plumbing fixtures normally carri off by drains and sewers, including bath and toilet wastes, lau dry wastes, kitchen wastes and other similar wastes from hous hold appurtenances. Sewage wastes are further categorized as:

(a) Blackwater - waste carried off by toilet urinals, kitchen drains, and sewers.

(b) Graywater - all domestic waste not covered in (above and including bath, lavatory, laundry and sink (except ki chen sink) waste.

~~(10)~~ (11) Drainfield - a system of open-jointed perforated piping, alternative distribution units, or oth treatment facilities designed to distribute effluent for filtr tion, oxidation and absorption by the soil within the zone aeration.

~~(11)~~ (12) Effective capacity - the liquid volume of sewage retention tank contained below the liquid level line.

~~(12)~~ (13) Effective soil depth - the depth satisfactory (slight or moderate limited) soil material ly above a non-pervious soil layer such as heavy clays, hardpan muck or bedrock. Satisfactory soils do not impede the moveme of air and water or the growth of plant roots.

~~(13)~~ (14) Establishment - a housing, commercial, institutional development including, but not limited to, a pla of business, assembly, or residence, whether multiple or sing family. An establishment will include all buildings, structure mobile homes, and the land appertaining thereto.

~~(14)~~ (15) Experimental - an onsite sewage dispos system not specifically described in this Chapter which has be submitted for review and has been approved by the Departme Health Program Office.

[illegible] [illegible] Flooding - a covering of soil surface by water from any source, such as streams overflowing their banks, runoff from adjacent or surrounding slopes, elevation of the ground water table exceeding that of the soil surface, inflow from high tides, or combinations of these. <u>Water standing on the ground surface for twelve (12) hours or less following heavy rainfall events is not considered flooding.</u> Terms also associated with flooding and used elsewhere in this Chapter are:

(a) frequent - flooding which occurs more than once every two (2) years on the average;

~~(b)~~ ~~long duration - soils are flooded for at least seven (7) consecutive days;~~

~~(c)~~ <u>(b)</u> ten (10) year flood elevation - the elevation, in feet above sea level, which approximates the level of flooding expected on a frequency of not less than the ten (10) year recurring interval, or on a frequency of not greater than a ten percent (10%) probability of occurrence in any given year, as determined from analysis of best available information.

(17) Industrial sewage waste - wastewater not otherwise defined as domestic sewage waste. Wastewater flows exceeding two thousand (2000) gallons per day from commercial food service kitchens and wastewater from commercial laundry facilities are specifically included in this definition.

(18) Limitation ratings - U.S. Department of Agriculture (USDA) Soils Classification ratings which describe the relative suitability of soils to properly assimilate sewage effluent. The three rating categories are:

(a) Slight limited - soils with favorable properties for the use of an onsite soil absorption system.

(b) Moderate limited - soils that have properties moderately favorable for use. Limitations in this category may be overcome by site alteration involving removal of impervious or too rapidly percolating soil layers, addition of fill, or lowering of high water tables through approved drainage methods, or any combination of the above.

(c) Severe limited - soils which have one or more properties unsuitable for the use of an onsite soil absorption system.

(19) <u>Mean high water - a tidal datum of the arithmetic mean of the high water height observed over a specific 19 year metonic cycle.</u>

(20) <u>Mean high water line - The intersection of the land with the water surface at the elevation of mean high water. The mean high water line may be determined by an evaluation of indicators such as vegetation, soil characteristics, and other typical shoreline features.</u>

~~(19)~~ <u>(21)</u> Mound system - is a sewage effluent soil absorption system in which sewage distribution drain pipe is installed in an elevation of fill material.

~~(20)~~ <u>(22)</u> "O" Horizon - the layer of organic matter on the surface of a mineral soil. This soil layer consists of decaying plant residues.

~~(21)~~ <u>(23)</u> Obstructed land - those areas on a lot or property used for such purposes as pools, concrete slabs, buildings, driveways, parking and similar areas which would prohibit, hinder, or affect the installation, operation and/or maintenance of an onsite sewage disposal system.

~~(22)~~ <u>(24)</u> Onsite sewage disposal system (also referred to as system) - any domestic sewage treatment and disposal facility, including standard subsurface, alternative or experimental systems installed or proposed to be installed on land of the owner or on other land to which the owner or owners have the legal right to install a system.

~~(16)~~ <u>(25)</u> ~~Mean high water line - is the largest normal boundary, perimeter or outline, formed by a lake, river, stream or other body of water. The mean high water line is determined by an evaluation of indicators such as vegetation, soil characteristics, and other typical shoreline features.~~ <u>Ordinary high water mark (non-tidal) - means the intersection of the land with the water surface of a lake, river, stream, canal or other non-tidal body of water at the elevation of the ordinary high water mark. This mark may be determined by examining the bed and</u>

banks and ascertaining where the presence and action of the water, as so common and usual and so long continued in all ordinary years, as to mark upon the soil of the bed a character distinct from that of the banks, in respect to vegetation as well as to the nature of the soil itself.

~~23~~ (26) Private water supply well - a source of water which is used only by individual family living units including private homes, duplexes and multiple family type buildings of four (4) family units or less.

~~24~~ (27) Repair - modifications or additions to a failing system which are necessary to allow the system to function or must be made to eliminate a public health or pollution hazard. Pumping of septage from a system or making minor structural corrections to a tank or building sewer does not constitute a repair.

~~25~~ (28) Septage - a mixture of sludge, fatty materials, and wastewater removed during the pumping of an onsite sewage disposal system.

~~26~~ (29) Septic tank - a watertight receptacle constructed to promote separation of solid and liquid components of wastewater, to provide limited digestion of organic matter, to store solids, and to allow clarified liquid to discharge for further treatment and disposal in a soil absorption system.

~~27~~ (30) Standard subsurface system - an onsite sewage disposal system consisting of a septic tank, distribution box and gravity-fed drain trench or absorption bed installed below the natural ground surface.

~~28~~ (31) Subdivision - any tract or plot of land divided into two (2) or more lots or parcels less than one acre in size for sale, lease or rent for residential, industrial or commercial use, regardless of whether the lots or parcels are described by reference to recorded plats, metes and bounds description, or by any other ~~legally sufficient~~ legal method.

~~29~~ (32) Surface water - water upon the surface of the earth whether contained in bounds created naturally or artificially or diffused. Swamp and/or wetlands areas are specifically included in this definition.

~~30~~ (33) Temporary - a single period or [illegible] accumulation of periods not exceeding 90 total days in any 36[illegible] day period.

~~31~~ (34) Water table elevation - refers to the highest elevation of seasonal saturation of soil, which exists for a period of at least fourteen (14) consecutive days during the wettest season.

~~32~~ (35) Wettest season - that period of time each year in which the ground water table elevation can normally be expected to be at its highest elevation.

Name of Person Originating Proposed Rule: John Heber

Name of Supervisor or Person who Approved the Proposed Rule: Eanix Poole

Date Proposed Rule was Approved:

Specific Authority: 381.031(1)(g)3, FS

Law Implemented: 381.031, 381.061, 381.071, 381.261, 381.272, 381.291, 381.311, 386, FS

10D-6.43 Permits

(1) System Construction Permit - no septic tank or other onsite sewage disposal system shall be installed until a "Onsite Sewage Disposal System Construction Permit" (HRS-H For[illegible] 4016 or equivalent county form) has been obtained from the Department. Permits issued for new construction shall become void after one calendar year from the date of issue if the system has not been installed. However, if building construction has commenced, the system construction permit shall be valid concurrent with the building permit. Individual county health units may require that a construction permit also be obtained for system repairs.

(2) Final Inspection - Before covering with earth and before placing a system into service, a person installing or constructing a septic tank, drainfield, or other onsite sewage disposal system shall have the system inspected for compliance with the requirements of this Chapter. The Department shall make every reasonable effort to make the final inspection within tw[illegible]

(2) working days after notification to the Department that the system has been installed. If the system is approved, the Department shall issue a "Final Installation Approval" notice (HRS-H Form 4016 or equivalent county form). A building or structure shall not be occupied until a Final installation approval notification has been given.

Name of Person Originating Proposed Rule: John Heber

Name of Supervisor or Person Who Approved the Proposed Rule: Eanie Poole

Date Proposed Rule was Approved:

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Law Implemented: 381.031, 381.061, 381.071, 381.261, 381.272, 381.291, 381.311, 386, FS

History: New

10D-6.44 Application for System Construction Permit

(1) No person shall cause or allow construction of a system without first applying for and obtaining a construction permit. HRS-H Form 4015, or an equivalent county form, shall be used for recording permit application information.

(2) An application shall be completed in full, signed by the owner or the owner's legally authorized representative, and shall be accompanied by all required exhibits and fees.

(3) The suitability of a lot, property, subdivision or building for the use of an onsite sewage disposal system shall be determined from an evaluation of lot size, anticipated hydraulic load on the system, soil and water table conditions, soil drainage and site topography. Necessary site investigations and tests shall be performed at the expense of the owner by either an engineer with soils training who is registered in the State of Florida pursuant to Chapter 471, Florida Statutes, by Department personnel, or by other qualified persons. Results of site investigations shall be entered on, or attached to, the construction permit application form for consideration by the local Department authority. The application shall also include the following data:

(a) A plan or plat of the lot or total site ownership drawn to scale, showing boundaries with dimensions, locations of residences or buildings, recorded easements, the onsite sewage disposal system location, the general slope of the property and any existing or proposed wells, drainage features, filled areas, obstructed areas, and surface waters such as lakes, ponds, streams or canals. The location of wells, onsite sewage disposal systems, surface waters and other pertinent facilities or features on contiguous or adjacent property, if the features are within seventy-five (75) feet of the applicant lot, must also be shown but need not be drawn to scale..

(b) At least one (1) soil profile delineating soil characteristics within the proposed system soil absorption area to a minimum depth of six (6) feet in accordance with USDA Soil Classification Methodology. The Department may require more than one soil profile on isolated lots where a subdivision analysis has not been performed or where marginal soils, sloping terrain or location problems are anticipated.

(c) Percolation rates which may be estimated from soil characteristics including soil texture, soil structure, soil drainage and other properties relating to water movement in soils. Percolation tests, if conducted, shall be evaluated as only one of several criteria in determining soil suitability for the absorption of wastewater effluent.

(d) Water table elevations which exist at the time of the site evaluation and estimated water table elevation during the wettest season of the year.

(e) For any subdivision platted and recorded or unrecorded on or after January 1, 1972, the applicant-owner, developer or subdivider shall submit additional data which is necessary to properly perform a subdivision analysis. The following minimum data is required:

1. A general site location reference map identifying the area.

2. A plan of the subdivision clearly drawn to scale, showing lot and block arrangement, lot dimensions and lot numbering.

3. A topographic map with contour intervals to indicate surface configurations including slopes; streams or water courses; bodies of water; low, wet or marshy land and the lots on which fill is to be added.

4. Any proposed drainage plans approved by the local drainage authority.

5. All dedicated rights-of-way or recorded easements proposed for use in the installation of individual onsite sewage disposal and/or water supply systems.

6. Sewer utility easements and rights-of-way shall be included on the subdivision plan to provide for the eventual construction and utilization of a central sewerage collection and/or treatment system.

6. 7. Soil profiles, to a minimum depth of six (6) feet using the USDA Soil Classification methodology. Profiles shall be performed on a sufficient number of lots throughout the proposed subdivision to provide adequate information on the overall suitability of the subdivision for the use of onsite soil absorption systems.

(f) Subdivisions platted and recorded or unrecorded prior to January 1, 1972, will be considered on the basis of an evaluation of soil characteristics, water table elevations, history of flooding and records of service of existing installations in the same general area.

(4) The applicant shall be the permit holder and shall be held responsible for all information supplied to the Department. The attested application and site evaluation serve as the basis by which the Department determines the issuance of a construction permit. In the event of a change in any material fact given in the application which served as basis for issuing a construction permit, the permit holder will immediately file an amended application detailing such changed conditions. If the new conditions are determined to be in compliance with the standards in this Chapter, the construction permit shall be amended. If the new conditions are determined to be in non-compliance with the standards of this Chapter, the permit shall be revoked subject to the provisions of Section 10D-6.44(5).

(5) Processing of an application for permit and the denial or revocation of a construction permit shall be in compliance with requirements of Chapter 120, Florida Statutes. When a construction permit has been denied by the Department, or the Department has given notice of intent to revoke an existing constuction permit, the applicant is entitled to:

(a) Request an administrative hearing, pursuant to Section 120.57, Florida Statutes, to challenge the denial or revocation action; or

(b) Request a variance from certain requirements in this Chapter.

Name of Person Originating Proposed Rule: John Heber

Name of Supervisor or Person who Approved the Proposed Rule: Eanix Poole

Date Proposed Rule was Approved:

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Law Implemented: 381.031, 381.061, 381.071, 381.261, 381.272 381.291, 381.311, 386, FS

History: New

10D-6.45 Variances

(1) The Staff Director, Health Program Office, shall appoint five persons, each with an alternate who may serve in the absence of the appointee, an advisory review variance board, with each board member having an alternate, to review applications for variance and to recommend proper action in each case. The review group The board shall consist of appropriate persons as follows be comprised of a representative from each of the following entities: one from the Department Health Program Office, one from a county health unit, one from the home building industry, one from the septic tank industry and one from the Department of Environmental Regulation. Review group members shall be appointed for a period of three years with such appointments being staggered so that no more than two members terms expire on any one year.

(2) Applications for variance shall be submitt

utilizing HRS-H Form 4057 and must be received by the Department Health Program Office at least ten (10) days prior to a scheduled ~~quarterly~~ monthly public variance meeting which shall be held in a convenient Florida location. Each application shall be accompanied by supportive materials and documents such as a copy of the property deed, site evaluation data, plans and specifications for the proposed system, a statement regarding the existence of a hardship, information regarding adjacent property and any other information necessary for rendering a proper decision. A separate application must be filed for each site considered for a variance. The burden of presenting supportive facts shall be the responsibility of the applicant.

(3) Upon consideration of the merits of each application and the recommendations of the review group, the Staff Director, Health Program Office, has discretionary authority to grant a variance from certain provisions of this Chapter. Such variance may be granted to relieve or prevent excessive hardship only in cases involving minor deviation from established standards when it is clearly shown that ~~the public health will not be impaired or that pollution of surface or ground water will not result~~ hardship was not caused intentionally by the action of the applicant, where no reasonable alternative exists for the treatment of sewage and where discharge from the onsite sewage disposal system will not adversely affect the health of the applicant or other members of the public or significantly degrade ground or surface waters. Where soil conditions, water table elevation, and setback provisions are determined by the department to be satisfactory, special consideration shall be given to those lots platted prior to 1972. The decision to grant or deny a variance may be appealed through an administrative hearing.

Name of Person Originating Proposed Rule: John Heber

Name of Supervisor or Person who Approved the Proposed Rule:

Eanix Poole

Date Proposed Rule was Approved:

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Law Implemented: 381.031, 381.061, 381.071, 381.261, 381.272, 381.291, 381.311, 386, FS

History: New

10D-6.46 Location and Installation - All systems shall be located and installed so that with proper maintenance the systems function in a sanitary manner, do not create sanitary nuisances or health hazards and do not endanger the safety of any domestic water supply. Sewage waste and effluent from individual onsite sewage disposal systems shall not be discharged onto the ground surface or into ditches, drainage structures, surface waters, or aquifers. To prevent such discharge or health hazards:

(1) Systems ~~shall not be located laterally within seventy-five (75) feet of any private water supply well or within one hundred (100) feet of any public water supply well as defined in Chapters 10D-4 and 17-22, FAC. With respect to groundwater movement, locations shall be downstream from water supply wells when practical~~ With respect to groundwater movement, system locations shall be downstream from water supply wells when practical. Onsite systems shall be placed no closer than the minimum distances indicated for the following:

(a) Seventy-five (75) feet from a private potable well

(b) One-hundred (100) feet from a commercial private potable well

(c) Two-hundred (200) feet from a public potable well.

(d) Seventy-five (75) feet from a non-potable well. However, where the direction of groundwater movement is away from the non-potable well site and the well is constructed according to standards for water wells found in Chapter 17-21, FAC, the local department authority may approve a non-potable well which shall be no closer than fifty (50) feet to an onsite sewage disposal system.

(2) Systems shall not be located under buildings or within five (5) feet ~~thereof~~ of building foundations, or within five (5) feet of property lines except where property lines abut utility easements which do not contain underground utilities, or where recorded easements are specifically provided for the

installation of systems for service to more than one lot or property owner. Drain trenches, absorption beds or other drainfield systems shall not be located within ten (10) feet of potable water lines unless such lines are encased in at least six (6) inches of concrete or lines are placed within a sleeve of similar material pipe to a distance of at least ten (10) feet from the nearest portion of the drainfield. Chapter 10D-9, FAC, shall be used to determine water distribution pipe material and installation requirements.

(3) Except for the provisions of section 10D-6.46(7)(f), Ssystems shall not be located laterally within fifty (50) seventy-five (75) feet of the mean high water line of tidal water bodies or within seventy-five (75) feet of the ordinary high water mark of lakes, streams, canals or other non-tidal surface waters. This requirement also applies to the design high water level of drainage structures and storm water retention areas serving more than two (2) lots. This requirement does not apply to shallow swales which are not designed to contain water twenty-four (24) hours after a rainfall event. Systems shall be located a minimum of fifteen (15) feet from the design high water level of normally dry individual lot storm water retention areas.

(4) Suitable, unobstructed land shall be available for the installation and proper functioning of drainfields. At least fifty percent (50%) of the unobstructed area must meet minimum setback requirements of subsections (1) and (3) above to allow for drainfield repair and/or system expansion. The minimum unobstructed area shall:

(a) be at least three (3) times as large as the drainfield absorption area required by Section 10D-6.48(5) and

(b) be contiguous to the drainfield

(c) shall be in addition to the setbacks required in Subsection (2) above.

(5) Standard subsurface systems shall not be installed in fill material unless such fill has been allowed to settle for a period of at least six (6) months, or has been compacted to a density comparable to the surrounding natural soil.

(6) To prevent soil smear and excessive soi[l] compaction, drainfields shall not be installed while a fin[e] textured soil is wet above the soil's plastic limit. Soils othe[r] than sand, loamy sand and sandy loam are considered fine texture[d] soils.

(6) (7) Onsite sewage disposal systems may [b]e installed under the following conditions:

(a) Subdivisions and lots of 50 or fewer lots, wher[e] each lot having has a minimum area of at least one-half acre an[d] either a minimum dimension of 100 feet or a mean of at least 10[0] feet of the side bordering the street and the distance formed [b]y a line parallel to the side bordering the street drawn betwe[en] the two most distant points of the remainder of the lot, may [b]e developed with a private potable well and individual onsit[e] sewage disposal system, provided the projected daily domesti[c] sewage flow does not exceed an average of 1500 gallons per acr[e] per day and provided satisfactory ground drinking water can [b]e obtained and all distance and setback, soil condition, wate[r] table elevation and other related requirements of Chapter 10D- are met.

1. Sequential development of contiguous subdivisions as described in this subsection, under single ownership is pro hibited.

2. Development under the provisions of th[is] subsection shall not apply to areas where a municipal [or] investor-owned public sewage system is available contiguous [to] the proposed subdivision or within one-fourth mile thereof wi[th] public right-of-way accessibility.

(b) Residential sSubdivisions and lots with a publ[ic] water system may utilize individual onsite sewage dispos[al] facilities systems provided there are no more than four (4) lo[ts] per acre, provided the projected daily domestic sewage flow do[es] not exceed an average of 2500 gallons an acre per day, a[nd] provided that all distance and setback, soil condition, wat[er] table elevation and other related requirements which a[re] generally applicable to the use of individual onsite sewa[ge] disposal systems are met.

(c) Notwithstanding the provisions of subsections 10D-6.46(7)(a) and (b), where a developer or other appropriate entity has previously made or makes provisions, including financial assurances (at minimum a performance bond) or other commitments, acceptable to the Department, that a central water system will be installed by a regulated public utility based on a density formula, then private potable wells may be used on a temporary basis with onsite sewage disposal systems until the agreed upon densities are reached. In subdivisions regulated by this subsection, the average daily domestic sewage flow shall not exceed 2,500 gallons per acre per day. This section shall not affect the validity of existing prior agreements. Any new agreement for the future installation of a central water system must be approved by the Department Health Program Office.

(d) Subsections 10D-6.46(7)(a) and (b) shall not apply to areas where a municipally owned or investor-owned public sewerage system is available contiguous to the proposed subdivision or within one-fourth mile thereof with public right-of-way accessibility.

(e) (e) Whenever onsite sewage waste disposal systems are used under the provisions of Section 10D-6.46(7)(a) or (b) the following shall apply:

1. The minimum area of each lot under 10D-6.46(7)(a) shall consist of at least one half acre (21,780 square feet) exclusive of all paved areas and prepared road beds within public rights-of-way or easements and exclusive of streams, lakes, drainage ditches, marshes or other such bodies of surface water.

2. The determination of lot densities under 10D-6.46(67)(b) shall be made on the basis of the net acreage of the subdivision which shall exclude from the gross acreage all paved areas and prepared road beds within public or private rights-of-way or easements and shall also exclude streams, lakes, drainage ditches, marshes or other such bodies of surface water.

3. Daily sewage flow limitations specified in sections 10D-6.46(7)(a) and (b) and section 10D-6.46(7)(f) shall be calculated on an individual lot by lot basis. The acreage or fraction of an acre of each lot or parcel of land shall be determined and this value shall be multiplied by 2500 gallons per acre per day or 1500 gallons per acre per day depending on whether a public water supply or private potable well is utilized. Contiguous unpaved and non-compacted road rights-of-way, and easements with no subsurface obstructions that would affect the operation of drainfield systems, may be included in effective lot size calculations. Where an unobstructed easement is contiguous to two or more lots, each lot shall receive its pro rata share of the area contained in the easement. Streams, lakes, drainage ditches, marshes and other such bodies of surface water shall not be included in lot size calculations. Section 10D-6.48(1) shall be used for determining average projected daily domestic sewage flows. However, for residential subdivisions, average daily sewage flow shall be based on one hundred fifty (150) gallons of sewage per day for the first bedroom of a dwelling unit and an additional flow of one hundred and fifteen (115) gallons per day for each additional bedroom.

(d) (f) All undeveloped residential lots platted prior to 1972, unless public sewage disposal facilities are available, may be developed with a minimum distance of seventy-five (75) feet between any private well and an individual sewage disposal system, or with a public water supply and an individual sewage disposal system, provided that all soil conditions, water table elevations and other non-distance related requirements of this Chapter are met, and provided that such development is done only after written notification of such intended development is given to the health department of the county in which such lots are situated. All provisions of these rules relating to soil condition, water table elevation, distance, and other setback requirements shall be equally applied to all lots regardless of the date of platting. However, lots platted prior to 1972 shall be subject to a 50 foot minimum surface water setback and shall not be subject to lot size requirements. The projected daily flow for domestic onsite sewage disposal systems for lots platted before 1972 shall not exceed an average of:

1. 2,500 gallons per acre per day for lots served by public water systems.

2. 1,500 gallons per acre per day for lots served by private potable wells.

Name of Person Originating Proposed Rule: John Heber

Name of Supervisor or Person who Approved the Proposed Rule: Eanix Poole

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History: New

10D-6.47 Site Evaluation Criteria - Standard onsite sewage disposal systems may be utilized where lot sizes are in compliance with requirements of Section 10D-6.46(6) and all of the following criteria are met:

(1) An existing approved sanitary sewer of a sewerage system is not available. However, individual onsite graywater systems may be utilized provided blackwater is disposed into a sanitary sewer system.

(2) The effective soil depth throughout the drainfield installation site extends forty-two (42) inches or more below the bottom surface of the drainfield gravel. Subsections (a), (b) and (c) list soil texture classes with their respective limitation ratings.

(a) Sand, loamy sand, sandy loam, loam and silt loam are considered to be slight limited soils.

(b) Silt, sandy clay loam, clay loam, silty clay loam, sandy clay and silty clay soils are considered to be moderate limited and are subject to evaluation with other influencing factors and local conditions.

(c) Clay, bedrock (includes limerock), organic soil and very course sand (when associated with a high ground water table) are severe limited soils. If severe limited soil can be replaced with slight limited soil, see Footnotes 3 and 4 of Table III for minimum requirements.

(3) The water table elevation at the wettest season of the year is at least twenty-four (24) inches below the bottom surface of the drainfield gravel. One or more of the following means of determining water table elevations shall be used:

(a) Evaluation of conditions associated with a periodic saturation of soil.

(b) Actual measurement of the water table during the wettest season.

(c) U.S. Department of Agriculture Soil Conservation Service soils maps and soil interpretation records.

(4) Setbacks in Section 10D-6.46(1), (2), (3) and (4) are met.

(5) The site of the installation and the additional required unobstructed land referred to in Section 10D-6.46(4) shall not be covered with asphalt or concrete, or be subject to vehicular traffic or other activity as defined in 10D-6.42(21) which would adversely affect the soil.

(6) The site of the installation and the additional required unobstructed land referred to in Section 10D-6.46(4) is not subject to saturation from sources such as artificial drainage of ground surfaces, driveways, roads or roof drains.

(7) ~~The original lot elevation (i.e., the elevation of a lot prior to placement of fill material) at the site of the proposed system installation and the additional unobstructed land referred to in Section 10D-6.46(4), is not~~ No portion of a system shall be installed within seventy-five (75) feet of an area subject to frequent and ~~long~~ duration flooding. In areas not subject to frequent and ~~long~~ duration flooding, the bottom surface of the drainfield ~~gravel~~ trench or absorption bed shall not be subject to flooding based on ten (10) year flood elevations. However, pertaining to the installation of systems in a ten (10) year flood zone, for lots where original site conditions (i.e., natural lot elevations and soil conditions prior to placement of fill material) meet all of the requirements of section 10D-6.47, a standard subsurface system may

installed. U. S. Department of Agriculture Soil Conservation Service soils maps, State of Florida Water Management Districts, and Federal Emergency Management Agency Flood Insurance maps are resources that can be used to identify flood prone areas.

Name of Person Originating Proposed Rule: John Heber

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History: New

10D-6.48 System Size Determinations

(1) Minimum design flows for systems servicing any structure, building or group of buildings shall be based on the estimated daily sewage flow as determined from Table I. However, at the discretion of the local Department authority, authenticated water use data may, for non-residential facilities, be used in lieu of the flows set forth in Table I.

TABLE I

ESTIMATED DOMESTIC SEWAGE FLOWS

TYPE OF ESTABLISHMENT	GALLONS PER DAY (GPD)
COMMERCIAL:	
Airports	
(a) per passenger	5
(b) add per employee	20
Barber & beauty shops (per chair)	100
Bowling alleys (toilet wastes only per lane)	100
Country club	
(a) per resident member	100
(b) per member present	25
(c) per employee	20
Dentist offices	
(a) per wet chair	200
(b) per non-wet chair	50
Doctors offices (per doctor)	250
Factories, exclusive of industrial wastes (gallons per person per shift)	
(a) No showers provided	20
(b) Showers provided	35
Food service operations	
(a) Ordinary restaurant (per seat)	50
(b) 24 hour restaurant (per seat)	75
(c) Single service articles only (per seat)	25
(d) Bar and cocktail lounge (per seat)	30
(e) Drive-in restaurant (per car space)	50
(f) Carry out only	
(1) per 100 square feet of floor space	50
(2) add per employee	20
(g) Institutions (per meal)	5
Hotels & motels	
(a) Regular (per room)	100
(b) Resort hotels, camps, cottages (per person)	75
(c) Add for establishments with self service laundry facilities (per machine)	400
Office building (per worker)	20
Service stations (per bay)	500
Shopping centers without food or laundry (per square foot of floor space)	0.1
Stadiums, race tracks, ball parks (per seat)	5
Stores (without food service)	
(a) Private toilets, for employees only (per employee)	20
(b) Public toilets (per square foot of floor space)	0.1
Theatres	
(a) Indoor, auditoriums (per seat)	5
(b) Outdoor, drive-ins (per space)	10

Trailer/Mobile Home Park (per trailer space)	200
Travel trailer/recreational vehicle park	
(a) Travel trailer (overnight), w/o water and sewer hookup (per trailer space)	50
(b) Add for <u>Travel trailer (overnight), with water and sewer hookups</u> (per trailer space)	100
Swimming and bathing facilities, public (per person)	10
INSTITUTIONAL:	
Churches (per seat)	3
Hospitals (per bed)	200
Nursing, rest homes (per person)	100
Parks, public picnic	
(a) with toilets only (per person)	5
(b) with bathhouse, showers & toilets (per person)	10
Public institutions other than schools and hospitals (per person)	100
Schools (per student)	
(a) Day-type	15
(b) Add for showers	5
(c) Add for cafeteria	5
(d) Add for day school workers	15
(e) Boarding-type	75
Work/construction camps, semi-permanent (per worker)	50
RESIDENTIAL:	
Residences	
(a) Single family (per bedroom)	150
(b) Apartment (per bedroom)	150
(c) Mobile home not in a trailer park (per bedroom)	150
(d) Other (per occupant)	75

Footnotes to Table I:

1. For food service operations, kitchen wastewater flows shall normally be calculated as sixty-six (66) percent of the total establishment wastewater flow.

2. Systems serving high volume establishments, such as fast food restaurants and service stations located near interstate type highways, require special sizing consideration due to above average sewage volume expected from restroom facilities.

3. For residences, the volume of wastewater shall be calculated as fifty (50) percent blackwater and fifty (50) percent graywater.

(2) Minimum effective septic tank capacity shall be determined from Table II:

TABLE II

SEPTIC TANK CAPACITY

AVERAGE SEWAGE FLOW (Gallons/Day)	MINIMUM EFFECTIVE CAPACITY (Gallons)
0-400	750
401-500	900
501-600	1050
601-700	1200
701-800	1350
801-900	1500
901-1000	1650
1001-1250	1900
1251-1500	2200
1501-2000	2700
2001-2500	3200
2501-3000	3700
3001-3500	4300
3501-4000	4800
4001-4500	5300
4501-5000	5800

(3) Where a separate graywater system is used, the minimum effective capacity of the retention tank shall be 250 gallons with such system receiving not more than seventy five (75) gallons of flow per day. For graywater systems receiving flows greater than seventy five (75) gallons per day, minimum effective tank capacity shall be based on the average daily sewage flow plus two hundred (200) gallons for sludge storage. Design requirements for graywater retention tanks are described in Section 10D-6.54(3). Where separate graywater and blackwater systems are utilized, the size of the blackwater system can be reduced proportionally to the amount of wastewater received by the gray water system. However, the minimum capacity for septic tanks disposing of blackwater shall be 750 gallons.

(4) A separate laundry waste system is recommended for residences and may be required by the local authority where moderate limited soil conditions or other significant site restrictions exist. For residential laundry waste systems, the minimum drainfield absorption area shall be seventy-five (75) square feet for a one (1) or two (2) bedroom residence with an additional twenty-five (25) square feet for each additional bedroom. The permitting authority may require additional drainfield area depending on site specific conditions. Where a separate residential laundry waste system, as described in Section 10D-6.48(6) and 10D-6.54(5) is used, a size reduction of twenty five (2025) percent size reduction in shall be allowed for the main septic tank system shall be allowed.

(5) The minimum absorption area for standard soil absorption facilities, mound, and graywater systems shall be based on Table III. This table assumes the use of drain trenches. If absorption beds are used in lieu of drain trenches, the size of the absorption area shall be increased by 25 percent for sand, loamy sand and sandy loam soils and by 50 percent for other approved soil classes.

TABLE III

U.S. DEPARTMENT OF AGRICULTURE SOIL TEXTURAL CLASSIFICATION	PERCOLATION RATE	MAXIMUM RATE OF SEWAGE APPLICATION TO TRENCH BOTTOM (GALLONS PER SQUARE FOOT PER DAY)
Sand, Loamy Sand	Less than 2 min/inch	2.0
Sandy Loam	2-4 min/inch	1.5
Loam, Silt Loam	5-10 min/inch	1.0

Silt, Sandy Clay Loam	Greater than 10 min/inch but not exceeding 15 min/inch	0.50
Clay Loam, Silty Clay Loam, Sandy Clay, Silty Clay	Greater than 15 min/inch but not exceeding 30 min/inch	0.25
Clay, Organic Soils, Bedrock	Greater than 30 min/inch	Unsatisfactory for standard subsurface system
Very Course Sand, Gravel or Fractured Rock	Less than 1 min/inch and a water table less than 4 feet below the drainfield	Unsatisfactory for standard subsurface system

Footnotes to Table III:

1. U.S. Department of Agriculture major soil textural classification groupings and methods of field identification are explained in 10D-6.58(1)-(8). Laboratory sieve analysis of soil samples may be necessary to confirm field evaluation of specific soil textural classifications. The U.S. Department of Agriculture Soil Conservation Service "Soil Textural Triangle" shall be used to classify soil groupings based on the proportion of sand, silt and clay size particles.

2. The permeability or percolation rate of a soil within a specific textural classification may be affected by such factors as soil structure and mineralogy. Where a percolation rate is determined utilizing the percolation test procedure outlined in Section 10D-6.57, the calculated percolation test rate shall be used with Table III in sizing the drainfield area.

3. When all other site conditions are favorable, thin horizons or strata of impervious severe limited soil may be replaced ... or soil of the same texture as the satisfactory permeable layer lying below the replaced layer. T[illegible] resulting soil profile must be satisfactory to a minimum depth fifty-four (54) inches beneath the bottom surface of the propos[illegible] drainfield surface. The width of the replacement area shall [illegible] at least three (3) times the drain trench width and f[illegible] absorption beds shall include an area at least ten (10) fe[illegible] wider than the proposed bed width. Drainfields shall be center[illegible] in the replaced area.

4. Where very coarse sand, gravel, or fractured ro[illegible] directly underlies the drainfield area, and where the water tab[illegible] at the wettest season of the year is less than four (4) fe[illegible] below the bottom infiltrative surface of the proposed drainfiel[illegible] the site may be approved provided a minimum depth of twenty-fo[illegible] (24) inches of the rapidly percolating soil beneath the bott[illegible] infiltrative surface of the drainfield and a minimum twelve (1[illegible] inches of rapidly percolating soil contiguous to the drainfie[illegible] sidewall infiltrative surfaces, is replaced with slight limit[illegible] sandy loam or loam. Where such replacement method is utilize[illegible] the drainfield size shall be determined using a maximum sewa[illegible] application rate of 1.0 gallons per day per square foot of drai[illegible] field.

~~(6) For separate residential laundry waste system[illegible] the minimum drainfield absorption area shall be one hundred (1[illegible] square feet for a two (2) bedroom residence with an addition[illegible] twenty-five (25) square feet for each additional bedroom. T[illegible] permitting authority may require additional drainfield ar[illegible] depending on site specific conditions.~~

Name of Person Originating Proposed Rule: John Heber

Name of Supervisor or Person who Approved the Proposed Rule: Eanix Poole

Date Proposed Rule was Approved:

Specific Authority: 381.031(1)(g)3, 381.272, FS

Law Implemented: 381.031, 381.061, 381.071, 381.261, 381.27[illegible] 381.291, 381.311, 386, FS

History: New

10D-6.49 Alternative Systems - When approved by the loc[illegible]

Department authority, alternative systems may be utilized in circumstances where standard subsurface systems are not suitable or where alternative systems are more feasible. Unless otherwise noted, all rules pertaining to siting, construction, and maintenance of standard subsurface systems shall apply to alternative systems. In addition, the local permitting authority may require the submission of plans prepared by an engineer registered in the State of Florida and qualified in the field of wastewater system design prior to considering the use of any alternative system. The local permitting authority may also require the design engineer to certify that the installed system complies with the approved design and installation requirements.

(1) Organic waste composting toilets - may be approved for use provided that graywater and any other liquid and solid waste is properly collected and disposed of in accordance with standards established in this Chapter.

(2) Sanitary pit privy - shall not be permitted except at remote locations where electrical service is unavailable and in no case shall such installations be permitted for permanent residences. Plans and specifications for sanitary pit privy system construction are available through the local Department authority.

(3) Mound soil absorption systems - may be used to overcome certain moderate limited site conditions such as a seasonal high water table, shallow permeable soil overlying slowly permeable soil and shallow permeable soil located over creviced or porous bedrock. Special installation instructions or design techniques to suit a particular site may be specified on the construction permit in addition to the following general requirements.

(a) Site preparation must render the site in compliance with requirements of subsections 10D-6.47 (1)-(7).

(b) The maximum height (base to crest) of a mound system shall be forty-eight (48) inches.

(c) Soil used for the mound fill shall be, as near as possible, of the same or superior textural class as the natural satisfactory soil which lies above any layer that limits effective soil depth.

(d) All or a portion of the "0" horizon of original topsoil and vegetation must be removed from the fill site and the exposed underlying soil plowed or roughened to prevent formation of an impervious barrier between the fill and natural soil.

(e) ~~The~~ <u>Mound</u> drainfield size shall be determined ~~according to Section 10D-6.48(5).~~ <u>based on the quality of fill material utilized in the mound system and shall be in compliance with the following:</u>

<u>Fill Material</u>	<u>Maximum Rate of Sewage Application to Mound Drainfield (gallons per square foot per day</u>
<u>Sand, loamy sand,</u>	<u>1.2</u>
<u>sandy loam</u>	<u>0.6</u>

<u>(f)</u> There shall be a minimum five (5) foot separation between the shoulder of the fill and the nearest trench or absorption bed sidewall. To taper the maximum elevation of the mound down to the toe of the slope, additional fill shall be placed at a minimum 4:1 grade, provided, that where the mound is to be sodded concurrent with its construction, the additional fill may be placed at a minimum 2:1 grade.

<u>(g)</u> ~~(f)~~ There shall be a nine (9) to twelve (12) inch soil cap spread evenly over the drainfield gravel.

<u>(h)</u> ~~(g)~~ The site shall be landscaped according to permit specifications and be protected from automotive traffic or other activity that could damage the system. Swales or other surface drainage structures should be utilized to prevent surface water shed from mounds draining onto neighboring property.

(4) Other alternative systems - systems such as low pressure pipe systems, small diameter gravity sewers, low pressure sewer systems, alternating absorption fields, large diameter drainpipe systems, and experimental systems meeting the general requirements of this Chapter, may be approved by the Department Health Program Office where evidence exists that use of such systems will not create sanitary nuisance conditions,

health hazards or pollute receiving waters. Use of an alternative or experimental system may require the establishment of procedures for routine maintenance, operational surveillance, and environmental monitoring to assure the system continues to function properly. Use of a system to serve more than one residence or commercial building under separate ownership and when located on separate lots shall require the establishment of a local sewer district, maintenance franchise, or other legally binding arrangement for the operation and maintenance of such system.

Name of Person Originating Proposed Rule: John Heber

Name of Supervisor or Person who Approved the Proposed Rule: Eanix Poole

Date Proposed Rule was Approved:

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History: New

10D-6.50 Maintenance - Any person owning or controlling property upon which an onsite sewage disposal system is installed shall be responsible for maintenance of the system. The following criteria is provided for guidance in proper system maintenance.

(1) Systems shall be maintained at all times to prevent seepage of sewage or effluent to the surface of the ground.

(2) Septic tanks and other sewage retention tanks require occasional cleaning. Septic tanks should be checked at least once every three years (once a year if garbage grinders are discharging to the tank) to determine if sludge needs to be removed. Tanks should be cleaned whenever the bottom of the scum layer is within eight (8) inches of the bottom of the outlet device or when the sludge level is within eighteen (18) inches of the bottom of the outlet device.

(3) Grease interceptors should be cleaned at appropriate intervals to insure that at least fifty (50) percent of the grease retention capacity of the tank is retained.

(4) Organic chemical solvents shall not be advertised sold, or used in the state for the purpose of degreasing or declogging onsite sewage disposal systems.

Name of Person Originating Proposed Rule: John Heber

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History: New

10D-6.51 Systems for Temporary Use

(1) The Department may approve, on a temporary basis portable toilets, privies or holding tanks for fairs, carnivals revivals, field locations, encampments and other locations wher people congregate for short periods of time, provided th construction, maintenance, and utilization of such system conform to the general provisions of this chapter. Portabl toilets or other toilet facilities shall be provided at construc tion sites for the duration of construction any time workers ar present. The Department may waive or reduce any of the setbac requirements of Section 10D-6.46(1)-(3), where it is determine no health hazard will result.

(2) Portable toilets shall be self-contained, hav self closing doors, have screened vents and shall be designed an maintained so that insects are excluded from the waste containe: Additional requirements are:

(a) The number of facilities required shall compl with the provisions of Chapters 10D-9 and 10D-10, FAC.

(b) Waste receptacles shall be watertight and made o non-absorbent, acid resistant, non-corrosive and easily cleanab material.

(c) The floors and interior walls shall have a non absorbent finish and be easily cleanable.

(d) The inside of the structure housing the storag compartment shall be cleaned and disinfected on each servic

...sit.

(e) Portable toilets shall be serviced weekly or at a more frequent interval to prevent the creation of insanitary conditions.

(3) Holding tanks shall be watertight and have no overflow vent at an elevation lower than the overflow level of the lowest fixture served. Additional requirements are as follows:

(a) Unless otherwise allowed by the local department authority, the projected daily sewage flow into a holding tank shall not exceed one hundred fifty (150) gallons.

(b) The minimum liquid storage capacity shall be equal to the total anticipated sewage flow for a period of seven (7) days.

(c) Holding tanks shall be designed and located to facilitate removal of contents by pumping.

(d) An applicant for a holding tank installation permit shall provide, to the local department authority, a copy of a contract with a permitted septage disposal company which states the scheduled tank pumping frequency.

(4) Persons servicing portable or temporary toilet systems shall obtain an annual permit from the Department. A servicing permit may be suspended, revoked or denied by the Department in accordance with the Administrative Procedure Act (Chapter 120, FS) for failure to comply with requirements of this Chapter. Application for a portable or temporary toilet system service permit shall be made to the Department on Form HRS-H 4012 or equivalent county form.

(5) The following equipment, maintenance and service requirements shall be complied with:

(a) Tank trucks used for servicing portable toilets. Privies and holding tanks shall be provided with a dual compartment tank and shall be approved by the Department. One tank shall be used for receiving and removing wastes and shall be equipped with a suction hose having a cut-off valve not more than thirty-six (36) inches from the intake end. The second tank shall be used for clean water storage and ...

size to allow proper cleaning of each serviced unit. Water from the second tank shall be provided under pressure.

(b) Standby service equipment shall be available for use during breakdowns or emergencies. If equipment from another approved service is to be used for stand-by purposes, a written agreement between the services must be provided to the local Department authority.

(c) The waste storage compartment of a tank truck shall be maintained as necessary to prevent the creation of sanitary nuisance conditions.

(d) Persons servicing portable or temporary toilets shall place a sticker in a conspicuous place on the serviced facility which indicates the name of the company and the date and time the unit was serviced.

Name of Person Originating Proposed Rule: John Heber

Name of Supervisor or Person who Approved the Proposed Rule:

Eanix Poole

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10D-6.52 Disposal of Septage

(1) No septic tank, grease trap, privy, portable toilet, holding tank or other onsite waste disposal facility shall be cleaned or have its contents removed by a person engaged in a septage disposal service until the service person has obtained an annual written permit (Form HRS-H 4013, or equivalent county form) from the local Department authority.

(2) Application for a septage disposal service permit shall be made to the Department on Form HRS-H 4012 or equivalent county form. The following must be provided for evaluation prior to issuance of a service permit:

(a) Evidence that the applicant possesses adequate equipment such as a tank truck, pumps, appurtenances and tools for the work intended. Equipment shall be inspected and approved by the Department.

(b) The permanent location and address of the business where operations will originate and where equipment is to be stored when it is not in use.

(c) The proposed disposal method and the site to be used for disposing of onsite sewage disposal system septage.

(3) When a permit is issued, the number of said permit along with the name of the company, its address, phone number and the gallon capacity of the truck shall be prominently displayed on the service truck with three (3) inch or larger letters. A septage disposal service permit may be suspended, revoked or denied by the Department, in accordance with the Administrative Procedure Act (Chapter 120, FS) for failure to comply with requirements of this Chapter.

(4) After septage is removed from an onsite waste disposal system, the original lid of the tank shall be put back in place, or be replaced with a new top if the original lid is broken or structurally defective. The tank lid shall be completely sealed and the ground backfilled and compacted so that the site is left in a nuisance free condition.

(5) Septage shall be transported to the disposal site in such a manner so as to preclude leakage, spillage or the creation of a sanitary nuisance.

(6) The sludge and contents from onsite waste disposal systems shall be disposed of at a site approved by the local Department authority and by an approved disposal method ~~such as soil injection, incineration, sanitary landfill, landspreading or discharge into a public sewerage system~~ <u>as provided in Chapter 17-7, FAC</u>.

Name of Person Originating Proposed Rule: John Heber

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History: New

10D-6.53 Abandonment of Systems

(1) Whenever the use of an onsite sewage disposal system is discontinued following connection to a sanitary sewer or <u>following</u> condemnation or demolition of a building or property, the system shall be abandoned and any further use of the system for any purpose shall be prohibited. However, the Department of Enviromental Regulation may approve the use of the retention tank where the tank is to become an integral part of a sanitary sewer system.

(2) The following actions shall be taken, in the order listed, to abandon an onsite sewage disposal system:

(a) The tank shall be pumped out.

(b) The bottom of the tank shall be opened or ruptured so as to prevent the tank from retaining water, and

(c) The tank shall be filled with clean sand or other suitable material.

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History: New

10D-6.54 General Standards for Treatment Receptacles

(1) Septic Tank Design - The following requirements shall apply to all septic tanks manufactured for use in Florida unless specifically exempted by other provisions of these rules.

(a) Septic tanks shall be watertight and may have single or multiple compartments, or tanks may be placed in series, to achieve required liquid capacity. The first chamber of a multi-compartment tank or the first tank of two or more tanks placed in series shall have a minimum effective liquid capacity of at least two-thirds (2/3) of the total required liquid capacity. Additional chambers shall have a minimum effectank liquid capacity equal to or greater than one-half (1/2) of the liquid capacity of the first chamber.

(b) Each compartment shall have access provided by a sectional lid or manholes with manholes having a minimum area of 225 square inches. Access points Manholes or sectional lids shall be located so as to allow unobstructed access to the inlet and outlet device. For single compartment tanks, the access manhole, the sectional lid, or a minimum six (6) inch diameter riser over the inlet manhole or sectional lid shall extend to the ground surface to allow for inspection and/or servicing of the tank interior. For multi-compartment tanks or tanks in series, the manhole, the sectional lid, or the riser over the first compartment inlet manhole and the last compartment outlet device manhole shall extend to the ground surface. Openings shall be provided manhole or sectional lid shall extend to the ground surface over the first compartment inlet and the last compartment outlet. with aAn appropriate mechanism to make them shall be provided to make access points vandal and tamper proof.

(c) The liquid depth of compartments shall be at least forty-two (42) inches. Liquid depths greater than seventy-two (72) inches shall not be considered in determining the effective liquid capacity.

(d) A minimum free board or airspace of fifteen (15) percent of the volume of the holding capacity of the tank shall be provided.

(e) The inlet invert shall enter the tank one to three inches above the liquid level of the tank. A vented inlet tee, vented sweep or a baffle may be provided at the discretion of the manufacturer to divert the incoming sewage. The inlet device, if utilized, shall have a minimum diameter of four (4) inches and shall not extend below the liquid surface more than 33 percent of the liquid depth.

(f) A vented outlet tee, a vented sweep or a baffle shall be provided with a gas baffle or other approved device to prevent solids from entering the soil absorption field. A minimum four (4) inch diameter vented outlet device tee, sweep or baffle shall extend below the liquid level of the tank a distance not less than thirty (30) percent nor greater than forty (40) percent of the liquid depth, and extend at least five (5) inches above the liquid level in order to provide scum storage. The submerged intake orifice of the outlet fixture shall be provided with an approved solids deflection device to reduce the volume of solids discharged to the soil absorption field.

(g) The inlet and outlet devices shall be located at opposite ends of the tank so as to be separated by the maximum distance possible and shall be attached in a watertight manner.

(h) Sewage flow between the first and second chamber of a multi-chamber tank shall interconnect utilizing either a minimum six (6) inch diameter hole or equivalent size slot in the wall or with a minimum six (6) inch diameter vented and inverted U-fitting or a tee. Tanks in series shall interconnect utilizing a vented, inverted U-fitting or a tee. The intake of the outlet device or hole invert shall extend below the liquid surface approximately 33 percent of the tank liquid depth.

(i) Tanks shall be provided with a suitable legend cast or stamped into the wall at the inlet end, and within six (6) inches of the top of the wall. The legend shall identify the manufacturer, the year the tank was manufactured and indicate the effective liquid capacity of the tank in gallons.

(2) Individual home aerobic treatment plants - may be substituted for conventional septic tanks described in this section provided that:

(a) The unit to be installed is of a class or category approved by the Department Health Program Office and is identified by a manufacturer's catalogue or other suitable listing such as the National Sanitation Foundation (NSF).

(b) The unit will function as a septic tank in the event of power outage or pump failure.

(c) An appropriate electrical failure warning system is installed in a conspicuous location.

(d) Servicing equipment and replacement parts are readily available to provide for continuous operation of the system.

(e) Effluent from an individual home aerobic sewage treatment plant is disposed of on the owner's property in conformance with other requirements of this Chapter.

(3) Graywater retention tanks - when a separate system is installed to dispose of graywater, the retention tank for such system shall meet the following minimum design standards.

(a) The minimum effective capacity shall be as specified in Section 10D-6.48(3). Liquid depth shall be at least thirty (30) inches.

(b) Retention tanks shall be baffled and vented as specified in the septic tank construction standards found elsewhere in this section provided that an inlet tee, ell, or baffle shall be provided for graywater tanks.

(4) Grease interceptors - are not required for a residence. However, one or more grease interceptors are required where food is commercially prepared <u>an appreciable amount of grease is generated in a commercial food operation</u>. The design of grease interceptors shall be based on standards found in Chapter 10D-9, FAC, or applicable local plumbing codes. In addition, the following general requirements apply when determining the proper use and installation of a grease interceptor used as a component of an onsite sewage disposal system.

(a) Interceptors must be located so as to provide easy access for routine inspection, cleaning and maintenance. Manholes shall be provided over the inlet and outlet of each interceptor and be brought to finished grade.

(b) Sizing of grease interceptors shall be based on the equations below, provided that the minimum volume of any grease interceptor shall be seven hundred fifty (750) gallons.

1. Restaurants: (S) X (GS) X (HR/12) X (LF) = effective capacity of grease interceptor in gallons.

S = number of seats in the dining area

GS = gallons of wastewater per seat (use 25 gallons <u>for ordinary restaurant, use 10 gallons for single service article restaurants</u>)

HR = number of hours establishment is open

LF = loading factor (use: 1.25 interstate highways 1.00 other freeways, 1.00 recreational areas, 0.80 main highways and 0.50 other highways).

2. Other type establishments with commercia kitchens: (M) X (GM) X (LF) = effective capacity of greas interceptor in gallons.

M = meals prepared per day

GM = gallons of wastewater per meal (use 5 gallons)

LF = loading factor (use: 1.00 with dishwashing an 0.50 without dishwashing).

(5) Laundry waste interceptor - when a separate syste is installed to dispose of effluent or drainage from home washin machines only, the retention tank or interceptor for such syste shall meet the following minimum standards.

(a) The minimum effective capacity shall be two hun dred twenty-five (225) gallons.

(b) The interceptor shall be baffled and vented a specified in the septic tank construction standards found else where in this section, provided that a vented inlet tee, vente sweep, or a baffle shall be provided.

(c) The interceptor shall not receive waste flow fro kitchen fixtures or be used as a grease trap.

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History: New

10D-6.55 Construction Materials for Treatment Receptacles

(1) Concrete septic tanks - onsite wastewater treat ment receptacles shall be watertight and may be built of precas or poured in place concrete which has a design mix for unit co-

pressure strength of at least three thousand (3000) pounds per square inch after twenty-eight (28) days curing.

(a) Precast concrete septic tanks with a capacity of twelve hundred (1200) gallons or less shall have a minimum wall and bottom thickness of two (2) inches. Precast tanks with a capacity exceeding twelve hundred (1200) gallons shall have a minimum wall and bottom thickness of three (3) inches. Precast concrete septic tanks shall contain reinforcing to facilitate handling. Septic tanks of concrete poured in place shall have a minimum wall and bottom thickness of four (4) inches. The bottoms of concrete septic tanks shall be monolithic and an integral part of the walls.

(b) Septic tanks with capacities of twelve hundred (1200) gallons or less shall have tops or covers of concrete with a minimum thickness of three (3) inches when precast and four (4) inches when poured in place. When capacities exceed twelve hundred (1200) gallons, the tops shall be precast with a minimum thickness of four (4) inches.

(c) Tops shall be reinforced with three-eights (3/8) inch steel reinforcing rods on six (6) inch centers in each direction. Whenever vehicular traffic is anticipated to cross over the septic tank or other onsite waste receptacle, traffic lids shall be installed with manhole covers to finished grade. Traffic lids shall be designed to support a minimum load of ten (10) tons.

(d) When approved by the local department authority, septic tanks may be built of brick or concrete block. When constructed of these materials, tanks shall have a minimum wall thickness of eight (8) inches . The inside walls of the tanks must be plastered with cement mortar.

(2) Fiberglass reinforced plastic septic tanks - the following structural requirements are applicable to fiberglass septic tanks and tanks made of a comparable class of materials.

(a) Resins and sealants used in the tank manufacturing process shall be capable of effectively resisting the corrosive influences of the liquid components of sewage, sewage gases and soil bacteria. Materials used shall be formulated to withstand shock, vibration, normal household chemicals, earth and hydrostatic pressure when either full or empty.

(b) Not less than thirty (30) percent of the total weight of the tank shall be fiberglass reinforcement. Fiberglass tanks shall have a minimum wall thickness of one-fourth (1/4) inch, however, a thickness of no less than three-sixteenth (3/16) inch will be allowed in small isolated areas for tanks not exceeding a capacity of fifteen hundred (1500) gallons.

(c) Internal surfaces shall be coated with an appropriate gel coating to provide a smooth, pore-free, watertight surface.

(d) Tanks shall be constructed so that all parts of the tank meet the following mechanical requirements.

1. Ultimate tensile strength - minimum twelve thousand (12,000) PSI when tested in accordance with ASTM D 638-82, Standard Method of Test for Tensile Properties of Plastics.

2. Flexural strength - minimum nineteen thousand (19,000) PSI when tested in accordance with ASTM D 790-81, Standard Method of Test for Flexural Properties of Plastics.

3. Flexural modulus of elasticity (Tangent) - minimum eight hundred thousand (800,000) PSI when tested in accordance with ASTM D 790-81, Standard Method of Test for Flexural Properties of Plastics.

(e) A test report from an independent testing laboratory is required to substantiate that individual tank designs and material formulations meet the requirements of (d) 1, 2, and 3 above.

(f) Physical properties for tanks over 1500 gallons effective liquid capacity must be approved by the Department.

(g) Tank lids shall be securely fastened or sealed to prevent unwarranted access to the contents of the tanks.

(3) Septic tanks to be constructed of other materials shall have prior approval from the Department Health Program Office.

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History: New

10D-6.56 Construction Standards for Drainfield Systems

(1) Distribution box - where gravity flow is possible, a distribution box may be required for distributing sewage from the septic tank or other waste receptacle to the drainfield. The distribution box may be built as an integral part of the septic tank or may be a separate unit set on solid ground and anchored between the septic tank, or other sewage waste receptacle, and the drainfield.

(a) Distribution boxes shall be watertight, constructed of durable materials, have adequate structural strength, and be of sufficient size to accomodate the required number of drain pipe lines.

(b) Each drainfield line shall be connected individually to the box.

(c) The invert of inlets to the box shall be at least one (1) inch above the invert of the outlets. The invert of all outlets shall be level with respect to each other.

(2) Header pipe - in lieu of a distribution box, a header pipe may be used when approved by the Department and installed in compliance with the following requirements:

(a) The header pipe shall conform to material standards in Chapter 10D-9, FAC, and have a minimum inside diameter of four (4) inches for gravity flow applications.

(b) The header pipe shall be laid level with direct, watertight connections to each drainfield line and the septic tank outlet pipe. The header pipe is not required to be encased in filter material.

(3) Automatic dosing - where the required area of the drainfield is greater than one thousand (1000) square feet, or where a septic tank or sewage waste receptacle must be placed to low to permit gravity flow into a properly designed, constructe and located drainfield or absorption bed, an automatic dosin device shall be used. Plans and equipment specifications fo automatic dosing systems shall be approved by the Departmen prior to construction or installation.

(a) Dosing systems for less than two thousand (2000 square feet of drainfield shall consist of a dosing tank tha receives the flow from a septic tank or other sewage waste recep tacle. This dosing tank shall be at least twenty-four (24 inches in diameter (or equivalent rectangular size) and shall b provided with one or more pumps with level controls set in accor dance with the requirements set forth in (c) and (d) of this sec tion. Two (2) pumps shall be required for commercial use.

(b) Systems having more than two thousand (2000 square feet of drainfield shall have two (2) dosing pumps, wit each pump serving one half (1/2) of the total required absorptio area. The pumps shall dose alternately.

(c) The volume of the dosing chamber between the pum operating levels shall be adequate to assure that the entir drain pipe is dosed each cycle. The liquid volume of pipe typi cally used in drainfield systems is as follows:

PIPE SIZE	LIQUID VOLUME OF CONDUIT
2"	0.16 Gal/foot
4"	0.65 Gal/foot
6"	1.47 Gal/foot

(d) When a drainfield is installed in sand, loamy san or sandy loam soils, operating levels should be adjusted to dos the drainfield four (4) times in a twenty-four hour period. Fo fine textured soils the drainfield should be dosed no more tha two (2) times in a twenty-four hour period.

(e) A high water alarm shall be provided to warn :

pump stations.

(4) Drain trenches and absorption beds - drain trenches and absorption beds are the standard subsurface drainfield systems used for disposing of effluent from septic tanks or other sewage waste receptacles. When used, these systems shall be constructed as specified below.

(a) When utilizing the standard drain trench method, the width of the trench at the bottom shall be eighteen (18) to twenty-four (24) inches. There shall be a minimum separation distance of six (6) feet between centers of the trenches.

(b) Absorption beds when approved by the local department authority may be used in lieu of the standard drain trench method. An absorption bed consists of an area in which the entire earth content of the required absorption area is removed and replaced with filter material and distribution pipe. The distance between the centers of distribution lines in standard beds shall be a maximum of three (3) feet for drain tiles and four (4) feet for block or cradle units. The distance between the side wall of the bed and the center of the outside drain line shall be one and one-half (1.5) feet for drain pipe and two (2) feet for block or cradle units.

(c) When utilizing a standard subsurface drainfield system, Ddrain tile, perforated pipe, and cradle or block units shall be installed in filter material of washed and screened gravel, stone, slag, or similar material meeting State of Florida Department of Transportation (DOT) specifications under Section 901, "Standard Specifications for Road and Bridge Construction, 1982". Filter material may vary in size from one-quarter (1/4) inch to two (2) inches and shall be free of excessive fines which could clog the soil infiltrative surface. Approved standard sizes for various drainfield filter materials are:

MATERIAL	DOT SIZE NUMBER
Limestone, slag, and similar materials	3, 4, or 5
quartz rock and river gravel	3, 4, 5, 6, or 7

(d) Filter material shall encase the distribution pipe to a minimum depth of (6) inches under the pipe and have a total depth of at least twelve (12) inches extending throughout the width of the trench or absorption bed. Whenever cradle or block units are permitted for use, the total depth of the filter material shall be at least fourteen (14) inches extending throughout the width of the bed with at least six (6) inches under the unit and eight (8) inches above the bottom of the unit.

(e) The filter material in place shall be protected from infiltration of earth backfill by an effective barrier of building paper, polyester bonded filament or other acceptable material as determined by the Department.

(f) The maximum depth from the invert of the drain pipe or distribution pipe to the finished ground surface shall not exceed twenty-four (24) inches. The minimum earth cover over the top of the drain tile, distribution box or header pipe in standard subsurface drainfields shall be six (6) inches.

(g) The inside diameter of the drain pipe used in drainfields shall be determined based on the type and design of the proposed absorption system. However, for standard gravity gravel drainfield systems, inside pipe diameter shall not be less than four (4) inches. Pipes constructed of vitrified clay or plastic material shall conform to standards in Chapter 10D-9, FAC. When the above pipes are installed with open joints, the open joints shall be spaced no less than one-quarter (1/4) inch apart. Perforated pipe shall have a minimum perforated area of one and one-half (1.5) square inches per linear foot. Perforations shall be located in the bottom half of the pipe. However, for drainfield systems over five hundred (500) square feet in size, drainpipe perforation area and hole configuration shall be especially designed in order to assure that effluent is distributed as equally as possible throughout the drainfield area. All plastic pipe shall conform to the standards of ASTM F 405-77a.

(h) Depending on the type of drainfield system being utilized, drainlines may be placed level or with a downward slope not exceeding one-half (1/2) inch per ten (10) feet. However, for standard gravity gravel drainfield systems, drainlines shall be graded with a downward slope of one-quarter (1/4) inch to one-half (1/2) inch per ten feet.

(i) The maximum length of drain lines shall not exceed one hundred (100) feet and where two (2) or more drain lines are used, they shall be, as near as practical, the same length. The ends of two (2) or more drain lines in mound systems shall be connected to produce a continuous circuit. A continuous circuit arrangement is also recommended for standard drain trench and absorption bed systems.

(5) Large diameter drainpipe trench (LDDT) systems - LDDT systems can be substituted for standard gravel filled drain trenches where the systems are to be installed in sand, loamy sand or sandy loam soils. Where LDDT systems are utilized they shall be constructed of at least an eight (8) inch minimum diameter (I.D.) corrugated polyethylene tubing encased in spun bonded nylon filter wrap. Each linear foot of eight (8) inch diameter drainpipe is equivalent to one and one half (1.5) square feet of soil absorption area.

(a) Large diameter drainpipe shall be manufactured in accordance with the following specifications:

1. The eight (8) inch I.D. corrugated polyethylene tubing shall meet the requirements of ASTM F667, Standard Specification for 8", 10", 12", and 15" Corrugated Polyethylene Tubing with the following exceptions:

a. Perforations shall be cleanly cut and uniformly spaced along the length of the tubing as follows: two (2) rows of three-eights (3/8) inch diameter holes located 120º apart along the bottom half of the tubing (each 60º up from the bottom centerline). These perforations should be staggered so that there is only one (1) hole in each corrugation.

b. The tubing shall be marked with a visible top location stripe, 120º away from each row of perforations.

2. Filter wrap - All large diameter drainpipe shall be encased, at the point of manufacture, with a spun-bonded nylon filter wrap. This wrap shall have the following qualities:

Physical Properties	Nominal Values	Minimum Values
Weight, oz. per sq. yd. (ASTM D1910-64)	0.85	0.84
Thickness, mils (ASTM D1777)	5.4	4.4
Fiber Size, denier per filament (dpf)	4.7	4.1
Grab Strength, lbs. (ASTM 2263-58)		
Machine Direction	26	19
Transverse Direction	18	11
Burst Strength, psi (ASTM D231)	36	26
Air Permeability, cfm per sq. ft. (ASTM D737-69)	700	500
Specific Gravity	1.0	1.3
Water Flow Rate (ADS TM-100)	530 gpm per sq. ft. at 3" head	
Temperature resistance (ASTM D648)	425ºF	
Surface Reaction to Water	Hydrophilic	
Fiber Length	Continuous	
Color	Translucent White	

Particle Arrestance

(Polyethylene particles in water and alcohol solution, coulter counter analysis, single pass)

Particle Size (Microns)	% Retained
70	80
60	68
50	56
40	40
30	22
20	5

(b) LDDP system installations shall conform to all rules and regulations which apply to standard gravel filled trench systems with the following exceptions:

1. Large diameter drainpipe is to be installed wit-

the top of the pipe having at least eight (8) inches, but no more than sixteen (16) inches of soil cover.

2. The pipe shall be laid level and positioned in the trench so that each row of drain holes is located 60 degrees from the bottom centerline of the pipe.

3. The trench shall be backfilled to grade with native soil.

Name of Person Originating Proposed Rule: John Heber

Name of Supervisor or Person who Approved the Proposed Rule: Eanix Poole

Date Proposed Rule was Approved:

Specific Authority: 381.031(1)(g)3, FS

Law Implemented: 381.031, 381.061, 381.071, 381.261, 381.272, 381.291, 381.311, 386, FS

History: New

10D-6.57 Percolation Test Procedure

(1) When a percolation test is to be performed, one or more test holes shall be dug within the area proposed for a soil absorption system. Where soil conditions within the area are highly variable, a minimum of three (3) percolation test holes, uniformly spaced, shall be required.

(2) The diameter of each test hole shall be six (6) inches, dug or bored to the proposed depth of the absorption system. To expose a natural soil surface, the sides of the hole are scratched with a sharp pointed instrument and the loose material is removed from the bottom of the test hole. Two (2) inches of 1/2 to 3/4 inch gravel shall be placed in the hole to protect the bottom from scouring action when water is added.

(3) The hole must be carefully filled with at least twelve (12) inches of clear water. This depth of water shall be maintained for at least four (4) hours and preferably overnight if clay soils are present. Automatic siphons or float valves may be employed to automatically maintain the water level during the soaking period. In sandy soils with little or no clay, soaking is not necessary. If, after filling the hole twice with twelve (12) inches of water, the water seeps completely away in less than ten minutes, the test can proceed immediately.

(4) Except for sandy soils, percolation rate measurements shall be made at least fifteen (15) hours, but no more than thirty (30) hours, after the soaking period began. Any soil that sloughed into the hole during the soaking period shall be removed and the water level adjusted to six (6) inches above the gravel (or eight (8) inches above the bottom of the hole). At no time during the test shall the water level be allowed to rise more than six (6) inches above the gravel. Immediately after adjustment, the water level is measured from a fixed reference point to the nearest 1/16 inch at thirty (30) minute intervals. The test shall be continued until two (2) successive water level drops do not vary by more than 1/16 inch. At least three (3) measurements must be made. After each measurement, the water level shall be readjusted to the six (6) inch level. The last water drop is used to calculate the percolation rate. In sandy soils or soils in which the first six (6) inches of water added, after the soaking period, seeps away in less than thirty (30) minutes, water level measurements are made at ten (10) minute intervals for a one (1) hour period. The last water level drop shall be used to calculate the percolation rate.

(5) The percolation rate is calculated for each test hole by dividing the time interval used between measurements by the magnitude of the last water level drop. This calculation results in a percolation rate in terms of minutes/inch. To determine the percolation rates for the area, the rates obtained from each hole shall be averaged. If tests in the area vary by more than twenty (20) minutes/inch, variations in soil types are indicated. Under these circumstances, percolation rates shall not be averaged. Percolation rate calculation example: If the last measured drop in water level after thirty (30) minutes is two (2) inches, the percolation rate = 30 minutes/2 inches = 15 minutes per inch.

Name of Person Originating Proposed Rule: John Heber

Name of Supervisor or Person who Approved the Proposed Rule: Eanix Poole

Date Proposed Rule Approved:

Specific Authority: 381.031(1)(g)3, FS

Law Implemented: 381.031, 381.061, 381.071, 381.261, 381.272, 381.291, 381.311, 386, FS

History: New

10D-6.58 U.S. Department of Agriculture Soil Textural Classification System - Major USDA soil texture classifications are described below along with methods of field evaluation:

(1) Sand - This soil has a granular appearance in which the individual grain sizes can be detected. It is free flowing when in a dry condition. When air dry this soil will not form a cast and will fall apart when pressure is released. When moist, the soil forms a cast which will crumble when lightly touched. This soil cannot be ribboned.

(2) Sandy Loam - Is essentially a granular soil with sufficient silt and clay to make it somewhat coherent. Sand characteristics predominate. When dry, this soil forms a cast which readily falls apart when lightly touched. When moist, the soil forms a cast which will bear careful handling without breaking. This soil cannot be ribboned.

(3) Loam - This soil has a uniform mixture of sand, silt and clay and the grading of the sand fraction is quite uniform from coarse to fine. It is mellow and has a somewhat gritty feel, yet it is fairly smooth and slightly plastic. When air dry it forms a cast which will bear careful handling without breaking and, when moist, it forms a cast which can be handled freely without breaking. This soil cannot be ribboned.

(4) Silt Loam - Contains a moderate amount of the finer grades of sand and only a small amount of clay, over half of the particles are silt. When dry, it may appear quite cloddy, which readily can be broken and pulverized to a powder. When air dry, this soil forms a cast which can be freely handled. When pulverized, it has a soft flourlike feel. When moist, a cast can be formed which can be freely handled. When wet, the soil runs together and puddles. This soil will not ribbon, but it has a broken appearance, feels smooth and may be slightly plastic.

(5) Silt - Is composed of over 80 percent silt siz[e] particles with very little sand and clay. When dry, it may [b]e cloddy, it readily pulverizes to a powder, and it has a sof[t] feel. When dry, it forms a cast which can be handled withou[t] breaking and, when moist, it forms a cast which can be freel[y] handled. When wet, it readily puddles. This soil has a smoot[h] feel and has a tendency to ribbon with a broken appearance.

(6) Clay Loam - Is a fine textured soil which break[s] into hard lumps when dry. It contains more clay than silt loa[m] and resembles clay in a dry condition. Identification is made o[n] the basis of the physical behavior of moist soil. When air dry it forms a cast which can be handled freely without breaking[.] When moist, it forms a cast which can be handled freely withou[t] breaking and it can be worked into a dense mass. This soil form[s] a thin ribbon which readily breaks, barely sustaining its ow[n] weight.

(7) Clay - This fine textured soil breaks into ver[y] hard lumps when dry and it is difficult to pulverize into a sof[t] flourlike powder when dry. Liquification is based on cohesiv[e] properties of the moist soil. When both dry and moist, it form[s] a cast which can be freely handled without breaking. This soi[l] forms a long thin flexible ribbon which can be worked into dense, compact mass which has considerable plasticity.

(8) Organic - Identification of this soil is based o[n] the high organic content. These soils occur in lowlands, i[n] swamps or swales. Muck consists of thoroughly decomposed organi[c] material with a considerable amount of mineral soil finel[y] divided with some fibrous remains. When considerable fibrou[s] material is present, organic soil may be classified as peat. I[n] peaty soils, plant remains, or sometimes the wood structure, ca[n] be easily recognized. Organic soil color ranges from brown t[o] black. These soils shrink upon drying.

Name of Person Originating Proposed Rule: John Heber

Name of Supervisor or Person who Approved the Proposed Rule: Eanix Poole

Date Proposed Rule was Approved:

Specific Authority: 381.031(1)(g)3, FS

Law Implemented: 381.031, 381.061, 381.071, 381.261, 381.272, 381.291, 381.311, 386, FS

History: New

10D-6.59 Fees

(1) The following fees are required to accompany applications for site evaluations, construction or repair permits, and other services provided by the Department.

(a)	Site evaluation (includes an evaluation of criteria specified in section 10D-6.44(3))	$30
(b)	Permitting (includes plan review, issuance of construction permits and installation inspection)	$30
	1. Research Fee (until 6/30/88)	$ 3
	2. Accelerated Soil Survey Program (until 1/1/91)	$ 7
(c)	Tank Manufacturer's Inspection (per annum)	$45
(d)	Cleaning Service permit (per annum)	$25
(e)	Temporary Privy Service permit (per annum)	$25
(f)	Repair Permit (each)	$35
(g)	Percolation Test (each)	$100
(h)	Re-inspection (each)	$10
(i)	Variance Application (per lot)	$100

(2) Fees collected pursuant to 10D-6.59(1)(a) through 10D-6.59(1)(h) shall be deposited in a trust fund administered by the Department to be used to meet the cost of carrying out the onsite sewage disposal program as well as onsite sewage disposal research.

(3) Fees collected pursuant to 10D-6.59(1)(b)2. for the accelerated soil survey shall remain in effect until January 1, 1991 and shall be transferred to the Department of Professional Regulation.

(4) Fees collected pursuant to 10D-6.59(1)(i) shall be used to offset administrative costs associated with the variance review process described in 10D-6.45. Seventy-five (75) percent of the variance application fee shall be deposited into an account credited to the Department Health Program Office. Twenty-five (25) percent of the fee shall be credited to the trust fund account of the applicable county public health unit through which the variance request is submitted.

Specific Authority: 381.273, 154.06

Law Implemented: 381.273, 154.06

History: New

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APPENDIX B

REPORT

GRAY WATER TREATMENT COMMITTEE

REPORT

GRAY WATER TREATMENT COMMITTEE

Home Builders Association of Mid-Florida
626 North Lake Formosa Drive
Orlando, Florida 32803

November 1980

Homebuilding is one of the most vital industries in America. Immediately impacted by a variety of economic conditions, it is perhaps one of the most volatile industries, and especially important to the success of burgeoning Central Florida. In the sense that the community needs homebuilders to provide their essential services, it is also recognized by the homebuilders that there is an important relationship to be nurtured in support of local government's responsibility to provide public utilities and the immediate problem of sanitary sewerage connections.

Recognizing that construction of new homes is partially paralyzed at present and seriously jeopardized in the future in our area, the President of the Homebuilders Association of Mid-Florida established a committee to investigate and make recommendations for the recirculation of waste water in domestic applications. Entitled the "Gray Water Treatment Committee", Mr. Herbert A. Ross, was designated Chairman. Committee membership was structured as a cross sectional representation of private enterprise and government:

Ken McCoig, P.E., Manager	Orange County Sewer and Water
Charles True, P.E., President	FAM Associates
Alan B. Ispass, P.E. Process Engineer	Orange County Sewer and Water
Robbie Roberson, Director, Division of Environmental Health	Orange County Health Department
Tom Shutts, Vice-President	Laurel Builders
John Bateman, P.E., Director	Orange County Pollution Control
Tom Sawicki, P.E., Assistant Director	Orange County Pollution Control
Martin Kreidt, Director	Orange County Div. of Planning & Development
John Deamud, P.E, Associate Vice-President	Reynolds, Smith and Hill
Bill Veroski, P.E., Director	Orange County Div. of Public Utilities
Phillip Hollis, Mktg. Director	Dawkins and Associates
Rick Hoepner, P.E. Vice President	Tompkins Development
Allen Eberly Engineering Administrator	City of Orlando
Richard Allison, Executive Director	Homebuilders Association

It was agreed by the committee that it should confine its efforts to dealing with the source of the sewerage problem rather than the treatment of effluent. It is felt that the long-term solution to effluent disposal is one that can be most appropriately addressed by government.

BACKGROUND

As has been the instance in a number of communities throughout the nation, Central Florida is in the midst of a sewer moratorium imposed by environmental regulatory agencies. While this restriction for new connections to waste water treatment plants has not been formally implemented, the Florida Department of Environmental Regulation, supported by the United States Environmental Protection Agency, has suspended the processing of applications for new connections to the City of Orlando's McLeod Road treatment plant and until just recently, Orange County's Sand Lake Road treatment plant. The principal thrust of the regulatory authorities has been for these two agencies to cease and desist from discharging treated effluent into the receiving stream, Shingle Creek. Deep concern has been expressed for water quality in both Shingle Creek and downstream lakes.

In an effort to break the impasse, Orange County has successfully negotiated a trilateral agreement with the Florida Department of Environmental Regulation and the United States Environmental protection Agency that schedules the permitting of additional connections to the Sand Lake Road treatment plant. Of this capacity, approximately 2.0 million gallons per day is being contractually obligated to the proposed Western Electric Company manufacturing facility. This latitude for new capacity was not however, extracted without a price. Orange County has agreed to a progressive implementation schedule to completely eliminate all discharge into Shingle Creek within an eight year period. The agreement terms outline the requirement for the County to spray irrigate treated effluent over yet to be purchased acreage.

The City of Orlando, however, has assumed a questioning posture with the regulatory agencies. The City, citing recent reports from the Orange County Pollution Control Department, takes the position that water quality standards in Lake Toho are not being violated by the point-source polluters in Orange County. The City concludes that almost all contaminants found in the lake are products of agricultural and natural non-point source polluters. To reinforce this position, the City has authorized over $200,000 to its consulting engineers to perform a detailed study of the stream's water quality characteristics. This report will be incorporated into an appeal to the Florida Department of Environmental Regulation. This action alone, if successful, however, will not greatly assist in providing near-term connections to the McLeod Road facility; the treatment plant is nearly at its design capacity of 12.0 million gallons per day. Under the assumption that the regulatory agencies will favorably respond to the City's appeal, the City needs to engage in activity that will produce relatively immediate capacity beyond what is presently permitted: plant expansion, diversion of flows, or balancing of flows with Orange County, are most frequently mentioned. Should the City's appeal fail, it is assumed that an agreement similar to the County's aforementioned instrument will need to be negotiated.

This report does not suggest, even though it has been emphasized, that all of our sewage problems are isolated to the Sand Lake and McLeod Road treatment plants. Both the city and County are placing heavy reliance upon the Iron Bridge Road treatment plant presently under construction in Seminole County. However, total treatment capacity is somewhat limited in that it hardly will meet current construction activit For example, Orange County has requirements considerably above presently reserved capacity while the City is nearly to reserved capacity. Prior to the second expansion phase being considered for construction, the City must develop a plan that provides for no discharge of treated effluent

The intent of describing this background is to familiarize the reader with the nature and extent of the problem as it impacts our community. Given the recent projections of the East Central Florida Regional Planning Council, we can reasonably expect $8 billion of major constructi projects and 70,000 increased population from 1980 to 1985. To say our growth is projected to be unprecedented is an understatement. Our growth demands are upon us and the need to act in a timely and prudent manner is our responsibility.

RECOMMENDATIONS

1) Gray Water Recirculation

In an effort to reduce hydraulic loading upon receiving treatment plants, the committee immediately addressed its principal charge of evaluating the recirculation of gray water. By committee definition, gray water is defined as those waste waters generated by domestic showers, bathroom lavatories, bath tubs, washing machines, service sinks, floor drains, wet bars, and the like. Fixtures that have flow associated with the generation of pathogens were specifically deleted: toilets, bidets, kitchen sinks, and dishwashers. It was approximated by the committee that as much as two-thirds of waste water flow could be defined as gray water. The basic concept is to receive gray water from its sources in appropriately sized storage facilities and then either use this resourc for flushing water in toilets or to discharge onto the lawn for irrigatio purposes. Both propositions are, however, not without difficulty.

The committee felt that the typical homeowner would voice objection to untreated gray water in their commodes. It was felt that it would be necessary to provide the system with a septic tank or grease trap. Concern was expressed about the need for the homeowner to cleanse the grease trap on a routine basis. It was estimated that the average cost for such a system for new construction to be approximately $200. Retrofitting of this system to existing construction was discussed and felt to be cost-prohibitive for on-grade floor slabs. There is a possibility that retrofitting can be readily adapted to structures with above-grade flooring systems.

The alternative of discharging gray water into a lawn irrigation system also has merit. Physically, the gray water would be received in a holding tank and then be disposed of by either directly spraying, or by directing through a septic tank. The problem with this system is that th present regulations of the Florida Department of Health prohibit such disposal. A modification of this stance requires study by a responsible agency and/or efforts by our legislative delegation.

2) Septic Systems

As the committee's efforts progressed, it quickly became apparent that effective employment of gray water in itself would not have an immediate, beneficial impact upon the problem. Concurrently, it was felt that septic systems could do much to alleviate the frustrations of many builders. The committee position relative to septic systems follows:

ITEM A

The existing law states that a facility must connect to a central sewage system if said system is available or when it becomes available. This wording would make all septic tanks temporary in nature and would place a burden on the homebuyer at a later date when a central sewage system was made available in their area.

The law should be modified to allow a permanent septic tank installation in areas having suitable soil and water table conditions and not require mandatory future connections to a central system.

ITEM B

In order to receive the support of the above modification, the Department of Health would also like to modify the existing septic tank law from a requirement of 3-feet differential between finished floor of living unit to normal wet season water table to read "3-feet difference between drain field and normal wet season water table".

ITEM C

The existing septic tank law will allow four living units per net acre (¼ acre minimum per lot) for septic tank use with a central water system. This should be modified to permit as many structures as soils and water table conditions will allow.

ITEM D

A paragraph should be added to the existing septic tank law which would encourage the permanent use of septic tanks in a franchise area where a central sewage system has not yet been constructed, provided soil, water table and setbacks from lakes or streams meet all requirements. This will reduce flows to the existing sewage treatment plants and provide additional capacity for areas where septic tanks may not be utilized.

As previously suggested, coordination with our legislative delegation is deemed to be an appropriate measure in support of this position.

ITEM E

In an effort to continue residential growth, a proposal has been made to remove existing houses that are presently on sewer and located in good soil conditions to retrofit to septic tanks, thusly allowing a freed sewer connection for a new house where septic tanks cannot be permitted.

Incentives are central to the success of this proposal. It has been suggested that encouragement can be twofold: (1) the retrofitting homeowner has the opportunity to escape monthly user charges, and (2) that units of Local government issue bonds to capitalize a number of retrofits, with the homeowner borrowing and repaying to this revolving account at a favored interest rate. Of course, this proposal will require considerable future study and strong support from local government to be successful.

3) Septic Tank - Sewer Discharge

For areas with seasonal high water tables, combination septic/collection systems were reviewed. The committee studied the question of installing a septic tank between the house and the street sewer; the costs of which is estimated to be $500. The obvious benefit would be pre-treatment of sewage prior to transmission to the receiving treatment plant. The committee's initial reaction to this proposal was quite high; however, there was some concern about the impact of this sewage upon the biological treatment process at the treatment plant. To pursue this question, it would be necessary to fund a study to determine its practicality. Funds exist at the state level for such activities, but must be targeted by the legislature. Again, a study by our legislative delegation would be helpful in this area.

4) Sewer Infiltration

Because of leaks in joints, broken pipes, and poor connections, there is considerable infiltration of groundwater into the sewerage collection systems. It has been estimated by the committee that as much as twenty-five percent (25%) of the flow into the various treatment plants is groundwater. Considerable discussion ensued as to the best methodology to be recommended to solve the problem. It was generally agreed that no present technology is available to improve existing service laterals; our only conclusion for these laterals is to have strong inspection practices for new construction.

The committee did, however, feel that government could engage in an aggressive and comprehensive program to install plastic slip-liners, or grouting as necessary, in those public collection systems that have experienced infiltration. Furthermore, that new street collectors be constructed that have infiltration rates restricted to the maximum extent possible, polyvinyl chloride (PVC) pipe and the new plastic collars on vitrified clay pipe (VCP) being most frequently mentioned. Orange County presently has, and the City proposes to have, construction specifications to permit polyvinyl chloride pipe.

5) Water Saving Devices

As many builders are aware, there are many new water saving devices coming rapidly to the market. Restrictive shower heads, efficient dishwashers, and the like, all have significant contributions to make in reducing flows. Builders are encouraged to specify these devices in new construction. We do feel that a public awareness program will be necessary to promote retrofitting in existing structures.

6) Incentives

The probability of citizen acceptance of gray water recirculatory systems and water saving devices is a function of economics. Until such time as the consumer can have a realistic expectation to amortize the capitalization of these improvements, there is little, if any, hope of implementation. Further study needs to be made in the area of reduced sewage bills to the consumer. Whether the benefit is a flat charge reduction or individual sewage meters (an expensive proposition), something needs to be done. Also, the possibility of giving tax credits similar to the ones now available through the energy conservation programs should be investigated.

7) Regional Sewerage Utility

While somewhat beyond the previously stated purview of our committee, it was an underlying sentiment of the members that the fundamental problem of effluent disposal is of such magnitude that it assumes regional proportions. The ability of any one governmental agency to resolve such large and expensive solutions appears doubtful. Both the City of Orlando and Orange County are encouraged to study the possibility of establishing a regional sewer authority, similar in structure to the Orlando Utilities Commission, to address our strategic sewerage requirements.

This report concludes the mission of our Gray Water Treatment Committee. It is the hope of our members that the efforts initiated here will be embraced and progressed to implementation.

Respectfully submitted,

Herbert A. Ross, Chairman
Gray Water Treatment Committee

APPENDIX C

DISCUSSION ON GRAY WATER

UNIVERSITY OF FLORIDA • GAINESVILLE 32611 • SCHOOL OF BUILDING CONSTRUCTION

PHONE 904 392-0202
904 392-5965
SUNCOM 622-0202

May 4, 1982

Mr. Kinney S. Harley
Florida Home Builders Association
P.O. Box 1259
Tallahassee, Florida 32302

Dear Kinney,

I had to cut off the Summary in order to get it in the mail today. Enclosed are some notes that I made and did not get into the original.

THE COST: A study similar to the type that we have been discussing was made in Dade County in 1971-1974. It was conducted under the supervision of the U.S. Dept. of the Interior geological survey. I don't recall where I learned the cost, but it was nearly One Million Dollars, as I remember. They took 324 water samples from 65 wells, and made 19,000 different analyses during that time period. In their report, septic tanks came up smelling sweet.

Below is a partial list of other items.

PURPOSE OF SPLITTING BLACK AND GRAY WATER:

1. Reduce volume loading on sewage treatment plants.
2. Reduce the amount of fresh water that is wasted to ocean or other means of discharge.
3. Return fresh water into the upper ground surface for filtration.
4. To reduce the load on overtaxed street sewers.
5. To allow more buildings to connect to street sewers as some buildings disconnect or reduce the load by retaining gray water on site.

HOW TO PUT INTO EFFECT:

1. New S/D
2. Remodeling
3. Mobile Home Parks
4. Large buildings, such as University, public buildings.
5. Multi-story with suspended ceilings, such as motels.
6. Food Service Fast Foods. They usually have baths separated from kitchen waste.

INCENTIVES:

1. Lift station cost is cut by using split system.
2. Front foot cost reductions.
3. Reduced monthly cost where monthly sewer charge is based on metered fresh water used.
4. Tax break.
5. Public recognition of participants.

ALTERNATE METHODS OF WASTE WATER TREATMENT:

1. Central (local) tank and lines for group or cluster--pump to community treatment of water for irrigation in local area.
2. Install french drains in road beds similar to current use of french drain for water table control; drain to retention pond or settlement basin--for treatment and land spread.

I don't think that I will make the May 11th meeting in Orlando for several reasons.

Sincerely yours,

Tom

Tom Martin

TM:ap
Encl.

SUMMARY

A summary of a discussion of the feasibility of initiating a research program to study the effects upon the ground water quality, where "gray water" is discharged into the ground by means of septic tank systems.

Time and Place: 11:00 A.M., April 30, 1982, Gainesville, Florida

Persons present: Randall Brown, U.F.
Kinney Harley, FHBA
John Heber, HRS
Tom Martin, U.F.
Steven Metz, Attorney
Eanix Poole, HRS.

BACKGROUND:

On March 8, 1982, Governor Graham signed the "Gray Water" Bill into law. This bill authorizes the use of a "split system" of plumbing, wherein the sewage waste from a building may discharge "black water" into a sewer system, for collection and treatment, and may discharge "gray water" into an on-site disposal system. The bill authorizes studies which would determine, and control, ground water pollution as a result of gray water discharge.

This "Gray Water" bill resulted from the action of a committee of interested and concerned persons from various parts of Florida. The committee was chaired by Mr. Herb Ross of Orlando. After numerous meetings and input from the members, legislative action followed. This, in turn, caused the committee's recommendations to be included into the recently proposed rules for Health and Rehabilitative Services (HRS), Chapter 10D-6, "Regulations for Individual Sewage Disposal Systems." Specifically, the new rules define "black water" as wastes from toilets and kitchen drains.

They define "gray water" as all other wastes not classified as black water. The newly proposed rules have established the minimum capacity for any gray water septic tank to be 400 gallons where not more than 300 gpd flow is expected. Appendix 'A' further defines the size of the tank where flow exceeds 300 gpd.

WHAT IS THE PURPOSE OF A GRAY WATER SYSTEM?

The major purpose of the gray water system is to reduce the volume of waste water that must be transported through sewer pipes to the central sewage treatment plant. It has been estimated that approximately 50% of the total waste water from a residence is gray water, and further reduction of flow into sewers is possible where water-saving toilet devices are used.

WHAT DO WE HOPE TO GAIN BY USING THE GRAY WATER SYSTEM?

Theoretically, it would be a 50% reduction in the cost of water treatment and discharge of the transporting liquids. While it is not possible to get a savings of 50% because of the need for continued installation of sewers, manholes, lift stations and equipment to handle the remaining "black water," it does mean that more customers can be served by an existing sewer, thereby allowing building to continue where sewer moratoriums now exist.

There would be a 50% reduction in the volume of waste water that would be otherwise discharged into rivers, oceans or dry well injection systems. All of these methods of discharge are major sources of pollution today. The liquids from the gray water systems would put the waste water back into the ground for filtration back into our aquifers.

WHAT ARE THE POTENTIAL PROBLEMS INHERENT IN THE GRAY WATER SYSTEM?

The first question asked is: What about the pollution of our ground water? Any water that has been used is polluted, and therefore presents a possible pollution problem. As with the use of the typical septic tank system, there are some who swear by them, and others who swear at them. And after years of study there are many unsolved questions. However, this system would be used for liquids without fecal matter or kitchen wastes being discharged into the holding tank.

Then here is the major need for the early establishment of a research study to identify the pollution potential of this system.

There are other questions that arise. Some of these were discussed and suggestions offered, such as:

1. Sewers are designed for flow capacity consistent with the rate of flow based upon the number of fixtures (fixture unit flow rate) and the slope of the pipe. How will the reduction of the water carrier affect the transporting of solids to the sewer plant?
2. How much will it cost to plumb a building for a dual system?
3. How can you retro-fit a building for gray water discharge?
4. What incentive can we use to get builders or owners to partially abandon a sewer system and go to the split system?
5. Cities and counties have "The Home Rule" law which gives them the choice of rejecting this system entirely.

These are some problems that should be studied, and resolved, if need be.

METHODS SUGGESTED FOR A RESEARCH STUDY.

There were many questions asked and problems discussed which were relevant to the typical septic tank system. And, as stated above, these gray water systems will present less hazards, if any.

Therefore, the feeling of the group was to suggest a research plan that would monitor the ground water in its movement through all major types of Florida soil to determine the type of contaminants that would be discharged into the ground water, and to determine the rate of flow and distance that such contaminants might travel from the drain fields.

It was suggested that vertical columns of representative soil samples could be lab-tested in a similar manner.

It was the feeling of the group that the column studies should be used as a supportive method of study.

While the study should be aimed at the pollution possibility, other studies should be conducted to determine the practical aspect and the cost effectiveness of the gray water system.

FUNDING SUCH A STUDY WAS DISCUSSED.

The anticipated time frame for such a study was between three and five years. It was assumed that one year would be required to set up for this study. To account for seasonal changes two or more years would be required for testing.

If this study should be supported by the Construction Industry Licensing Board and the Department of Continuing Education, some funds could be utilized by controlling the study at a principal university, with the installation and monitoring done by the various community colleges with construction programs.

It is anticipated that the cost will be between $75,000.00 - $100,000.00 per year. The major cost for this project will be drilling wells and making laboratory tests. Each lab test will cost about $100.00.

Attached will be a sketch to show the typical layout of the septic tank and drain field with recommended test wells, showing their depth and proximity to the drain fields. See plan view of Case No. 2. (The purchase of one or more "Do-It-Yourself" well drilling rigs would probably pay dividends.)

APPENDIX D

WHY SMALL SYSTEMS?

Why Small Systems?

Lower Water & Sewer Rates	Save Energy, Water, Materials	Save Prime Farmland, Prevent Urban Sprawl
Rates skyrocket when a few people have to pay for a large system.	Most small systems use less.	Large central sewage systems in rural areas can bring unwanted development.

Federal Government Pays 85%

EPA Construction Grants Program

If you're a *small community* or a *sparsely populated area of a large community* and have a water pollution problem caused by buildings in use December 27, 1977:

● The Government pays 85% of eligible costs for alternative systems if your State, local government, and EPA approve them for your project. Your community, often with State help, pays the other 15%. Farmers Home Administration, Economic Development Administration, Housing & Urban Development, and Community Services Administration programs also help in some areas.

● The Government pays to repair or replace the system if it fails within 2 years of final inspection because it proves unsuited to the project or its design concept is faulty.

● Systems can be *publicly or privately owned.* They can be for residences or small commercial establishments.

— *Publicly owned* systems are owned by the local government.

— *Privately owned* systems are owned by the property owner or a community organization. They can be funded if:

- An authorized local government unit applies for the grant; guarantees a system for inspection, proper operation, maintenance, and user charges; and says public ownership isn't practical;
- They're more cost effective than a conventional central system;
- The residence is a principal dwelling; vacation or second homes are not eligible.
- Commercial users pay back their share of system cost.

You Must Consider Alternatives
EPA can't approve a central system plan submitted after Sept. 30, 1978, unless the community shows it considered alternative systems.

More Information From:

- **EPA National Small Wastewater Flows Clearinghouse**
  West Virginia University; Morgantown, WV 26506; 800-624-8301.

- **Center for Environmental Research Information**
  26 W. St. Clair; Cincinnati, OH 45268; 513-684-7391.

- **Your EPA Regional Office**

1. Boston
(Conn., Maine, Mass., N.H., R.I., Vt.); JFK Federal Bldg.; Boston, MA 02203; 617-223-7210.

2. New York
(N.J., N.Y., P.R., V.I.); 26 Federal Plaza; New York, NY 10007; 212-264-2525.

3. Philadelphia
(Del., Md., Pa., Va., W.Va., D.C.); 6th & Walnut Sts.; Philadelphia, PA 19108; 215-597-9814.

4. Atlanta
(Ala., Ga., Fla., Miss., N.C., S.C., Tenn., Ky); 345 Courtland St., N E.; Atlanta, GA 30308; 404-881-4727.

5. Chicago
(Ill., Ind., Ohio, Mich., Minn., Wis.); 230 S. Dearborn St.; Chicago, IL 60604; 312-353-2000.

6. Dallas
(Ark., La., Okla., Tex., N.Mex.); 1201 Elm St.; Dallas, TX 75270; 214-767-2600.

7. Kansas City
(Iowa, Kans., Mo., Nebr.); 324 E. 11th St.; Kansas City, MO 64108; 816-374-5493.

8. Denver
(Colo., Utah, Wyo., Mont., N.D., S.D.); 1860 Lincoln St.; Denver, CO 80203; 303-837-3895.

9. San Francisco
(Ariz., Calif., Guam, Hawaii, Nev., Amer. Samoa, Trust Territories of the Pacific); 215 Fremont St.; San Francisco, CA 94105; 415-556-2320.

10. Seattle
(Alaska, Idaho, Oreg., Wash.); 1200—6th Ave.; Seattle, WA 98101; 206-442-1220.

Engineers and consultants: For detailed technical information get EPA's onsite systems manual free from Center for Environmental Research Information; 26 W. St. Clair; Cincinnati, OH 45268; 513-684-7391; and Innovative and Alternative Technology Assessment Manual from Municipal Construction Division (WH-547), OWPO, EPA, 401 M St. SW., DC 20460; 202-426-8976.

This publication isn't meant to be a comprehensive guide to alternative systems. It tries to acquaint the layperson with some representative systems used in the United States. EPA does not endorse, approve, or disapprove any system described here. Not all systems shown are approved by all jurisdictions. To get EPA funds, a project must meet Federal, State, and local standards.

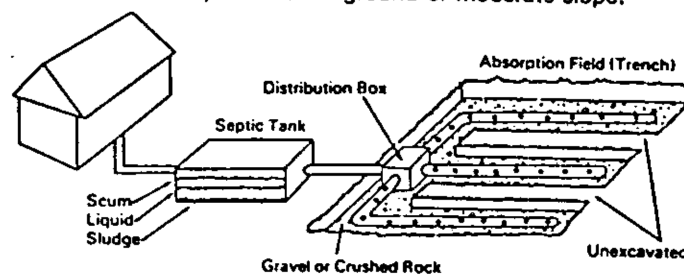
Small Wastewater Systems

Alternative Systems for Small Communities and Rural Areas

EPA
United States Environmental Protection Agency
FRD-10

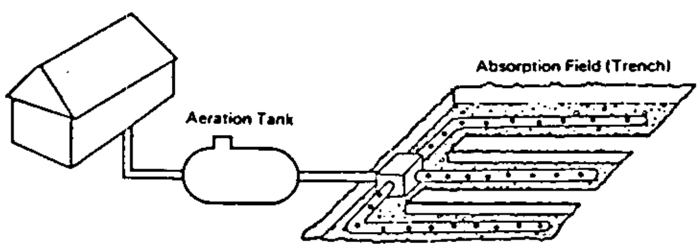
1 Septic Tank & Soil Absorption Field (Trench)

Sewage bacteria break up some solids in tank. Heavy solids sink to bottom as sludge. Grease & light particles float to top as scum. Liquid flows from tank through closed pipe and distribution box to perforated pipes in trenches; flows through surrounding crushed rocks or gravel and soil to ground water (underground water). Bacteria & oxygen in soil help purify liquid. Tank sludge & scum are pumped out periodically. Most common onsite system. Level ground or moderate slope.



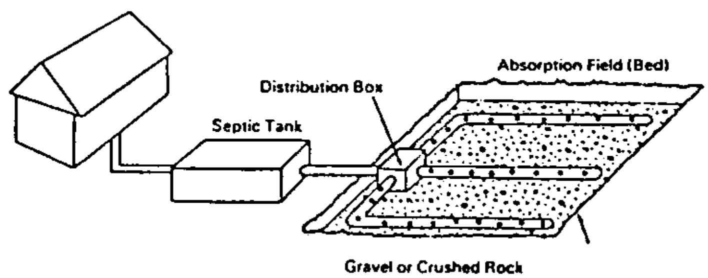
2 Aerobic System & Soil Absorption Field

Air and wastewater are mixed in tank. Oxygen-using (aerobic) bacteria grow, digest sewage, liquefy most solids. Liquid discharges to absorption field where treatment continues. Can use same treatment & disposal methods as septic tank. Maintenance essential. Uses energy.



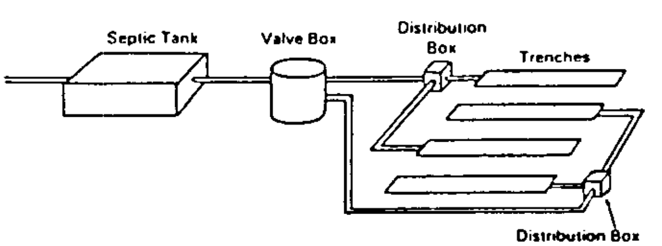
3 Septic Tank & Soil Absorption Field (Bed)

Similar to Sketch 1 but smaller field. Total field excavated. Used where space limited. Nearly level ground.



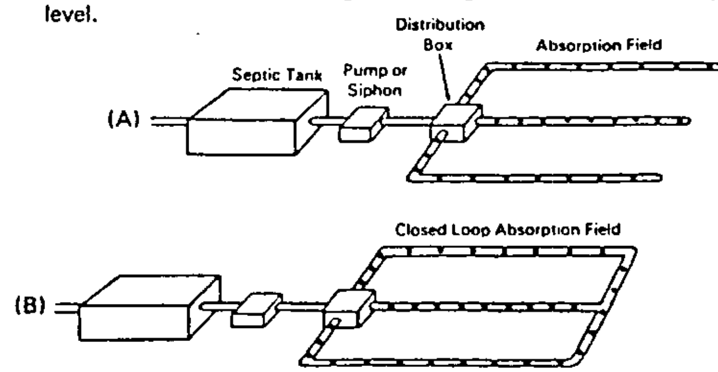
4 Septic Tank with Alternating Absorption Fields

One field rests while other is in use. Allows field to renew itself. Extends life of field. Provides standby if one field fails. Valve directs sewage liquid to proper field. Fields usually switched every 6-12 months.



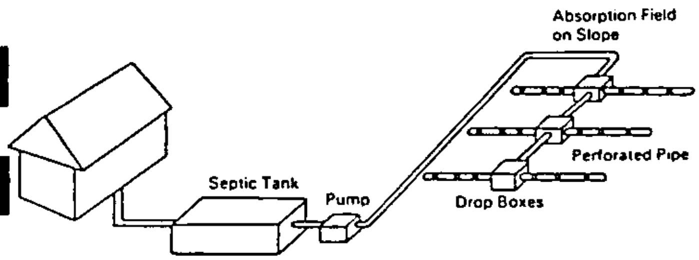
5 Septic System Refinements: (A) Dosing (B) Closed Loop

(A) Pump or siphon forces liquid to perforated pipes in controlled doses so all pipes discharge liquid almost at same time (dosing). Spreads liquid more evenly & gives field chance to dry out between dosings. (B) Variation of Sketch 1 absorption field. Can be used for dosing & where ground is level or nearly level.



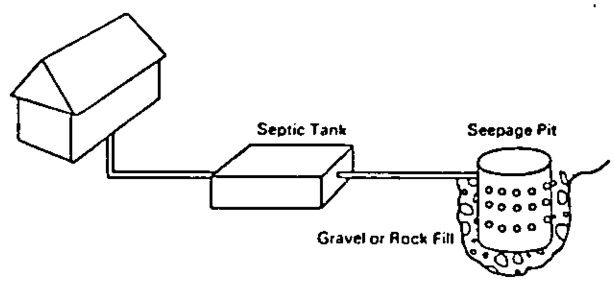
6 Septic Tank with Sloping Field—Serial Distribution

Pump forces liquid to perforated pipes in contoured absorption field. Drop boxes regulate liquid flow so highest trench fills up first, second fills up next, & lowest fills up last. Plastic fittings can be used instead of drop boxes to regulate flow. Used on slopes.



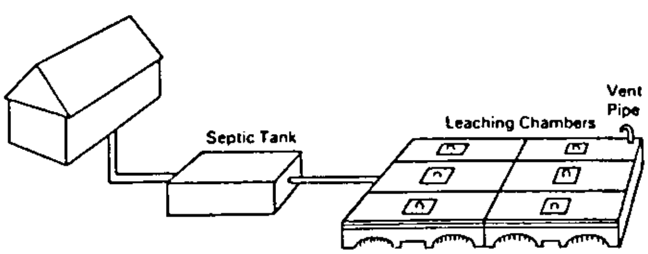
7 Septic Tank with Seepage Pit

Liquid flows to pit that has open-jointed brick or stone walls surrounded by rocks. Precast tanks with sidewall holes can also be used. Liquid seeps through walls & rocks to surrounding soil. Pit sides are cleaned periodically to prevent clogging.



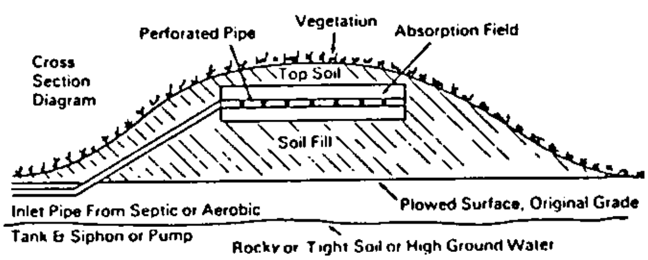
8 Septic Tank & Leaching Chambers

Open-bottom concrete chambers create underground cavern over absorption field. Liquid is piped into cavern & spread over field by troughs, splashplates, or dams. Liquid filters through soil. Chambers replace perforated pipe, trenches, & rocks of conventional absorption field. Access holes at top allow maintenance & soil inspection.



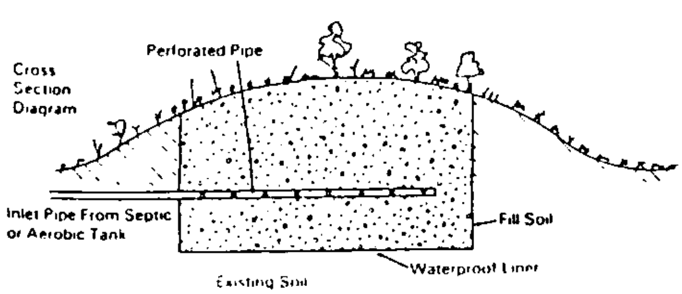
9 Mound System (Used with Septic or Aerobic Tank)

Liquid is pumped from storage tank (as in Sketch 21) to perforated plastic pipe in sand mound that covers plowed ground. Liquid flows through rocks or gravel, sand, & natural soil. Mound vegetation helps evaporate liquid. Rocky or tight soil or high water table.



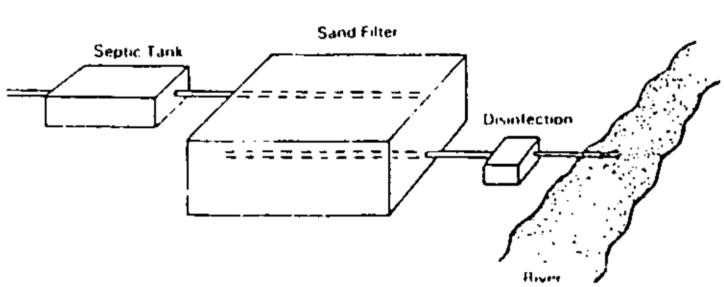
10 Evapotranspiration Bed (Used with Septic or Aerobic Tank)

Similar to Sketch 9 but sand bed is lined with plastic or other waterproof material. Bed could be mound or level. Liquid evaporates because liner prevents it from filtering through natural soil. Plants speed evaporation by drawing moisture from soil & breathing it into the air. Used where conventional absorption field not possible.



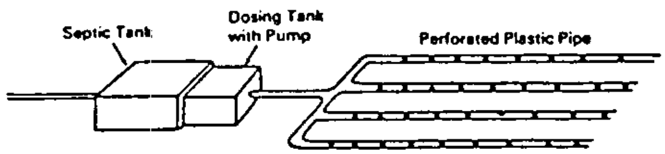
11 Septic Tank, Sand Filter, Disinfection & Discharge

Filter is ground-level or buried sand pit. Liquid enters perforated pipe at top & filters through sand & gravel to bottom pipe. Bottom pipe conducts liquid to disinfection tank. Liquid discharges to stream or ditch. Variations are intermittent sand filter & recirculating sand filter. Used where soil absorption field not possible.



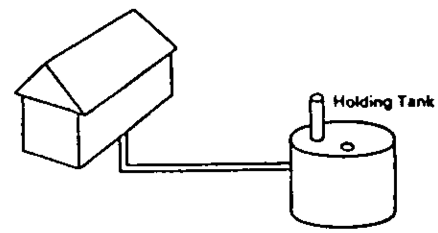
12 Low-Pressure Subsurface Pipe Distribution

Network of small-diameter perforated plastic pipes are buried 6"- 18" in 4"- 6"-wide trenches. Pump forces liquid through pipes in controlled doses so liquid discharges evenly. Site & soil determine pipe layout & pipe-hole size & number. Absorption field is same size as conventional field. Rocky or tight soil or high water table.



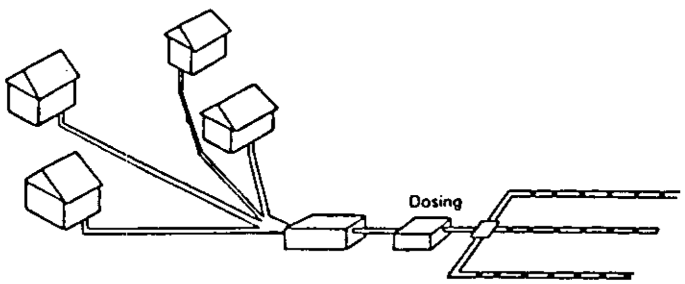
13 Holding Tank

Sewage flows to large, underground, watertight storage tank. Tank is pumped periodically & sewage hauled away. Isolated or remote areas where absorption field not possible. Sewage hauling cost high.



14 Cluster System (Two or More Users on One Alternative System)

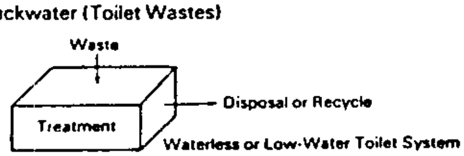
Several houses are served by common treatment & disposal system. Houses could also have onsite septic or aerobic tanks with liquid conducted to common absorption field. Clusters of houses can also use other alternative systems, such as mounds (Sketch 9), pressure & vacuum sewers (Sketches 18, 20, 21), & sewage treatment lagoons.



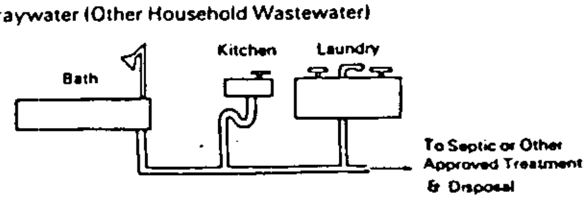
16 Dual Systems: Blackwater & Graywater

Many systems. In this one: (A) toilet wastes (blackwater) are handled by waterless or low-water toilet system (Sketch 15). (B) Other household wastewater from kitchen, bath, laundry (graywater) needs separate treatment & disposal.

(A) Blackwater (Toilet Wastes)



(B) Graywater (Other Household Wastewater)



15 Waterless or Low-Water Toilet Systems*

Composting: No water.
Large & small systems. Converts toilet wastes & most food wastes to compost. Electric vent fan & heating element optional on large systems; essential on small systems. Proper care vital.

Incinerating: No water.
Electricity, gas, or oil burns solids & evaporates liquid. Small amount of ash is removed weekly. Roof vent. Proper care essential.

Recycling Oil Flush: No water.
Similar to water-flush toilet but uses oil for flush. Oil & wastes go to large storage tank where wastes settle at bottom & oil rises to top. Filtered oil recycles for flush. Storage tank is pumped & oil replaced periodically. Uses electricity. Proper care essential.

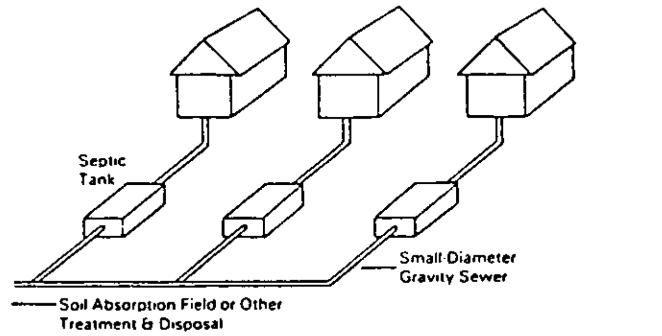
Recycling Chemical: Low water.
Water-chemical flush mixture is pumped into toilet bowl. Mixture & wastes go to storage tank. Filtered liquid recirculates for flush. Permanent or portable types. Permanent needs water hookup. Storage tank is pumped & chemicals added periodically. Uses electricity. Proper care essential.

Recycling Water: Low water.
Various systems. Some reduce wastes to water, gas, & vapor. Treated wastewater recycles to flush toilet. System vents to outside. Multiflush commercial units available. Most systems use electricity. Professional maintenance essential.

**Treat toilet wastes (blackwater). Other household wastewater (graywater) needs separate treatment & disposal system.*

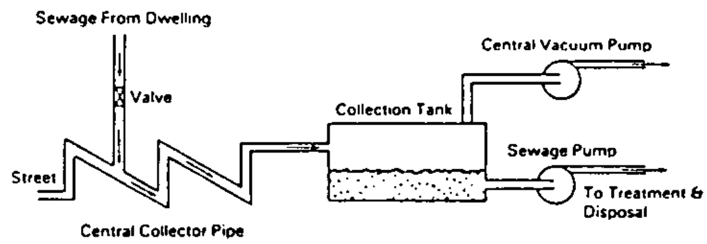
17 Small-Diameter Gravity Sewers (Collection System)

4"- 6" pipe is sloped so liquid from septic or aerobic tank flows through pipe to treatment & disposal. Treatment & disposal system can be conventional or alternative. Small pipe costs less than conventional 8" pipe.



18 Vacuum Sewers (Collection System)

Vacuum pump creates vacuum in collector pipes. Valve opens when sewage from dwelling presses against it. Sewage & plug of air behind it enter pipe. Air forces sewage to collection tank. Sewage pump forces sewage from tank to treatment system. Needs standby electric power & failure alarm system. Can be used with large cluster systems (Sketch 14).



19 Land Application

Sewage liquid is applied to land to nourish vegetation & purify liquid. Methods:

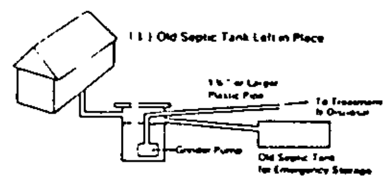
1. **Irrigation**—Liquid is applied to crops or to forests (silviculture) by sprinkling, flooding, or ridge & furrow. Liquid is sometimes disinfected before application.
2. **Overland flow**—Liquid flows through vegetation on graded slope. Runoff is collected at bottom & reused or discharged to river or stream. Suitable for tight soils.
3. **Rapid infiltration**—Partly treated sewage is applied in controlled doses to sandy soil. Solids break down. Liquid purifies as it seeps to ground water (underground water) or is collected & may be reused.

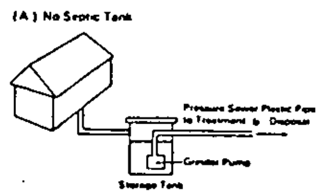
Aquaculture:

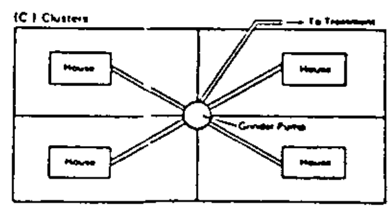
Plants & animals that grow in wastewater help purify water by digesting pollutants. Harvest is used as food, fertilizer, etc.

20 Pressure Sewers, GP (Grinder Pump)

Unit grinds sewage & pumps it through small-diameter plastic pipe to central or alternative treatment & disposal. Doesn't use septic tank but existing tank (B) may remain for emergency storage. Used for one or several homes (C).







21 Pressure Sewers, STEP (Septic Tank Effluent Pump)

(A) One dwelling. Pump forces liquid from septic tank through plastic pipe to further treatment & disposal. Sludge is pumped from septic tank periodically.

(B) Cluster system. Liquid from several septic tanks flows to one pumping tank. Pump forces liquid through plastic pipe to treatment & disposal.