RESEARCH REPORT

Technical Impediments to Use of the Existing On-Site Sewage System of a Host House to Service a Garden Suite on the Same Property

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TECHNICAL IMPEDIMENTS TO USE OF THE EXISTING ON-SITE SEWAGE SYSTEM OF HOST HOUSE TO SERVICE GARDEN SUITE ON SAME PROPERTY

NOTE: **DISPONIBLE AUSSI EN FRANÇAIS SOUS LE TITRE:**

PROBLÈMES TECHNIQUES LIÉS À L'UTILISATION DU SYSTÈME EXISTANT D'ÉVACUATION DES EAUX USÉES DESSERVANT À LA FOIS UNE HABITATION PRINCIPALE ET UN PAVILLON-JARDIN ÉRIGÉ SUR LE MÊME TERRAIN

TECHNICAL IMPEDIMENTS TO USE OF THE EXISTING ON-SITE SEWAGE SYSTEM OF A HOST HOUSE TO SERVICE A GARDEN SUITE ON THE SAME PROPERTY

REPORT TO CANADA HOUSING AND MORTGAGE CORPORATION

March, 1993

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DISCLAIMER

This study was conducted for Canada Mortgage and Housing Corporation under Part IX of the National Housing Act. The analysis, interpretations and recommendations are those of the consultant and do not necessarily reflect the views of Canada Mortgage and Housing Corporation or those divisions of the Corporation that assisted in the study and its publication.

TABLE OF CONTENTS

APPENDICES

LIST OF TABLES

LIST OF FIGURES

EXECUTIVE SUMMARY

Introduction

A Garden Suite is a small self-contained house that is placed on the same lot as the home of a close family member (the Host House). Garden Suites are designated to be relocatable in order that they can be removed and reused where needed. Canada Mortgage and Housing Corporation (CMHC) has collaborated with industry, governments and non-government groups to foster the inclusion of Garden Suites among the housing options for seniors.

If a Garden Suite is located on a property serviced by an on-site sewage disposal (septic tank) system it is considered cost-effective, and therefore desirable, to connect the Garden Suite of the existing on-site system. The alternatives are to provide a separate system for the garden suite, or to disallow its installation.

Objective

The objective of this project to identify and address concerns of regulatory officials in Atlantic Canada about technical impediments to use of the existing on-site system of a Host House to service a Garden Suite on the same property.

It was expected that identification and description of potential technical problems would assist decision making for agencies and organizations interested in making this option available in their jurisdictions.

Methodology

The project included two components:

- the first comprised interviews with responsible officials in each of the four Atlantic provinces, to document technical concerns related to the connection of a garden suite to an existing on-site system;

- the second component involved a review and assessment of the results of the interviews, and of reference material and the technical literature.

Findings

- all provincial officials in Atlantic Canada share a principle concern about connection of a Garden Suite to an existing septic system: the potential for system malfunction if loaded beyond its capacity.

- the potential for malfunction depends on the current condition of the disposal field, the original system design, and the hydraulic and pollutant loading to which the system might be exposed. The condition of the field depends on factors such as age, soil type, intensity of use and frequency of maintenance. System design depends on the regulations in force when the system was built, and the extent to which these were enforced. System loadings depend on occupancy and water use in the Host House and Garden Suite. Site-specific conditions such as use of water conditioners, whirlpool baths or garburators or connection of storm drainage to the sanitary system, may result in increased loads.

- there is no simple routine or certain procedure to assess the condition or capacity of an existing on-site system. Procedures currently used include examination of records about system installation and history, and of knowledge about local soils, groundwater and system failures.

- lot size is important, related to both system performance and the feasibility of remediation;

- factors that determine the condition and capacity of an existing on-site system are highly site specific;

- technical approaches to addressing potential problems or concerns about system capacity or condition include: water conservation to reduce hydraulic loads; adequate maintenance, which normally consists of regular pump-outs and upgrading of an undersized or malfunctioning system.

- Given uncertainties about ability to determine or predict potential systems malfunction, institutional approaches may provide ways to anticipate and address these problems in order to facilitate adoption of Garden Suites. Possible institutional approaches include measures intended to assure regulatory agencies that:

  - the Garden Suite is used for the intended purpose, i.e., temporary housing accommodation for senior relatives;

  - water conservation measures are incorporating in the Garden Suite and, if necessary, implemented in the Host House,

  - system maintenance is carried out at the time of installation and, on a regular basis,

  - if a replacement system is required it will be installed and the property size will accommodate it.

Conclusions

- Agencies and organizations interested in making Garden Suites available in their jurisdictions should recognize that technical impediments related to connection to the on-site system of a Host House may require:

  (i) upgrading of the existing on-site system;

  (ii) development and implementation of institutional measures that will assure approval authorities that the system is used and maintained as expected and, that it will be replaced if necessary.

- Agencies and organizations concerned with regulations related to use of on-site systems, should pursue development and evaluation of improved protocols and methodologies that can provide more exact and reliable assessment of the current condition of an existing system, and of technology to reduce pollutant loads on on-site disposal systems.

1.0 INTRODUCTION

Canada Mortgage and Housing Corporation is exploring the concept of the Garden Suite as a new housing option for elderly Canadians.

Garden Suites are small, self-contained houses that are placed on the same lot as the home of a close family member. Most suites have one bedroom, a living room, a kitchen, and a bathroom, as well as storage and laundry facilities and all the usual amenities of a home. The suites are not intended as permanent additions to the lots and are designed so that they are easily movable. It is proposed that the water supply and sewerage system of a Garden Suite be connected to the exiting well and septic tank system of the Host House.

The objective of this project was to identify and address concerns of regulatory officials in Atlantic Canada about technical impediments to use of the existing on-site sewage disposal system of a Host House to service a Garden Suite on the same property.

It was understood that this project was concerned solely with perceived technical problems, that perceived institutional problems would not be considered or addressed, and that the project should address concerns of regulatory officials in New Brunswick, Newfoundland and Labrador, Nova Scotia, and Prince Edward Island.

The Terms of Reference of the project are included in Appendix 1.

2.0 METHODOLOGY

2.1 WHAT WAS DONE?

The regulatory agencies who have a role in decision making with respect to on-site sewage disposal systems were identified in the four Atlantic provinces. Contact was made with them to discuss the project and to arrange for a meeting with them and other provincial and/or municipal staff who are associated with the decision making process. A copy of the contract was provided to the Lead Provincial Public Health representative and the decision to invite other members of staff or other provincial departments to the meeting were left with him. The project and the identified deliverables were reviewed with the provincial contacts and a meeting was arranged to discuss in detail the questions to which we were seeking information. While interviews were being carried out, a library search was conducted for relevant information, technical documents, and other related data on the hydraulics and the technical aspects of on-site sewage disposal systems.

2.2 WHO WAS INTERVIEWED?

The first contact with provincial agencies was made through the Nova Scotia Department of Health. Included in that meeting were the Director of Public Health Engineering and a Public Health Inspector, one a registered Professional Engineer in the province of Nova Scotia, the other a certified Public Health Inspector. In New Brunswick the main contact was a consultant with the Department of Community and Environmental Health. Discussions were also held with the Director of Health and Community Services, both these individuals are registered, certified Public Health Inspectors. In Prince Edward Island the main contact was with the Prince Edward Island Department of the Environment through the Director of Water Resources Division. Also in attendance at that meeting were other representatives of that department as well as a member of the Department of Community and Cultural Affairs who is responsible for coordinating On-Site Sewage Disposal activities for their property development section. In Newfoundland, the contact was with the acting Director, Environmental Health Services Division of the Newfoundland and Labrador Department of Health, and a certified Public Health Inspector.

2.3 THE QUESTIONS ASKED

The approach taken during the interviews was to follow the contract and to focus on the deliverables that are identified that will allow achieving the objectives of this study. The deliverables outline eight questions that were posed during the meeting and discussions with the provincial Public Health Regulators or Regulatory Officials. These questions are as follows:

1. Which agency in each province determines the policy related to technical acceptability of connecting Garden Suites to host house on-site systems?

2. What policies and regulations determine the design and use of on-site systems?
3. What are the technical concerns of the responsible agency in each province?
4. How are the hydraulic loads determined for the on-site systems?
5. How are the pollutant loads determined for these systems?
6. How will the capacity of the host house system be assessed in the approval process for Garden Suites?
7. What other technical obstacles are foreseen for the use of these systems by Garden Suites?
8. What conditions and/or limitations may be required to satisfy the concerns of responsible agencies?

2.4 TECHNICAL REVIEW

Section 4 of this report reviews the literature and information assembled during the provincial interviews, and summarizes available information about factors affecting design of on-site systems, potential effects of garden suites, possible mitigation approaches, and site assessment procedures.

3.0 PROVINCIAL INTERVIEWS

Minutes of all four provincial interviews were prepared and are attached to this report as Appendix 2. The same format is used in each set of minutes to provide an easy comparison among the four provinces. In each case, a brief introduction is offered in the minutes and then the summary of discussion as focused on the deliverables and the eight questions that are posed above are dealt with. This section summarizes the results of these interviews.

3.1 IDENTIFICATION OF AGENCIES

In Nova Scotia the prime and sole agency responsible for the approval of on-site sewage disposal systems is the Nova Scotia Department of Health. The responsibility of inspection review and recommendations rests with the Environmental Health Division of that department, who deal with all aspects of on-site sewage disposal. The Administration of the Legislation relating to on-site sewage disposal in Nova Scotia is through seven regional health units. These units are made up of Municipal Councilors and citizens in the areas of their jurisdiction. These Municipal Health Boards have the authority for approving on-site disposal systems as recommended by Environmental Health Division Staff. The Boards also have the power and authority to allow an appeal and to approve an installation following an appeal. The Environmental Health Division makes recommendations for a particular application to be approved and normally these are accepted by the Municipal Health Boards. Recommendations that are not approved by this division may be appealed by the board.

In the province of New Brunswick, the Department of Health and Community Services is the sole Provincial Regulatory Agency responsible for the approval of on-site sewage disposal systems. This responsibility is administered through the Community and Public Health and Medical Services Division of that department. Prior to 1967, the Health Act was administered through the province by a number of health boards similar to the arrangement in Nova Scotia. However, since 1967 all matters related to on-site sewage disposal in the province have been administered through provincial Health and Community Services. This department has been regionalized by the establishment of seven offices throughout the province. The Department of Health and Community Services has the authority for approval of on-site sewage disposal systems with the ultimate authority resting with District Medical Health Officers or the Deputy Minister. This department also works closely with the New Brunswick Department of the Environment, which regulates well construction and water rights. Application is required for on-site sewage disposal system installation. Following inspection, and approval by a Public Health Inspector, installation is carried out by a registered contractor. Normally a building permit is not issued to a proponent without an application for an on-site sewage disposal system.

In Prince Edward Island there are two provincial departments that play a role in the approval process for on-site sewage disposal systems. The

provincial authority for this process comes through the Environmental Protection Act under the Department of the Environment. However, the Sewage Disposal Regulations pursuant to this act are in turn administered through the Department of Community and Cultural Affairs who carry out this responsibility in consultation with the Department of the Environment. These two provincial departments have sole responsibility for administering the Environmental Protection Act with respect to on-site sewage disposal. Building Development Officers with the Department of Community and Cultural Affairs are required to inspect and approve applications for on-site sewage disposal. In the approval process between these two departments, building approval is required, as well as approval of construction of an on-site sewage disposal system. The building approval is only granted after approval has been given for on-site sewage disposal. However, on-site sewage disposal permits may be issued without a building approval. Twenty Municipal Agencies throughout the province have policies with respect to buildings and building permits.

The provisions for approval of on-site sewage systems in Newfoundland and Labrador are divided between the Provincial Department of Health and the Department of the Environment and Lands. For systems designed to handle less than 1,000 gallons/day, the Department of Health is responsible for providing the basic concept and inspection of such facilities. Where systems are expected to generate more than 1,000 gallons/day the responsibility of approval goes to the Department of the Environment and Lands. The province has established that applications for Garden Suites will be directed through the Newfoundland and Labrador Department of Housing who will then refer the question of on-site sewage disposal to the Environmental Health Services Division of the Department of Health. The Public Health Inspectors in the Environmental Health Services Division are organized in five regions throughout the province. Each regional office has a Director who reports to the Provincial Director of Environmental Services Division in St. John's. Decisions for approval of the system rest with the Regional Director in each of these regions.

3.2 IDENTIFICATION OF POLICIES AND REGULATIONS

The policies and regulations in Nova Scotia that regulate design and use of on-site sewage systems are those as outlined in the Regulations under the Public Health Act. In addition to these regulations are a number of technical guidelines that have been prepared for special purposes including those for multiple units and for senior citizens' complexes.

Policies and regulations in New Brunswick regulating the design and use of on-site sewer systems are made pursuant to the Public Health Act and are referred to as regulations 88-200. Included in these regulations are two schedules (A&B) which identify minimum lot size and the estimated sewage flow for types of buildings. There is also a policy within the province with respect to permissible variance which District Medical Health Officers make from time-to-time that are deemed acceptable with respect to dimensions.

All of the conventional on-site sewage disposal systems in Prince Edward Island are designed using the Environmental Protection Act and the Sewage

Disposal Regulations. Although there are no soil investigations done during the approval process for these sites, the size of the tank and field specifications are based on the worst case scenario of on-site percolation results and soil conditions.

The authority for approval for on-site sewage disposal systems in Newfoundland comes from the Department of Health Act. Regulations pursuant to the Health Act deal with the installation of on-site sewage disposal systems, as well as the manufacturing and prefabrication of septic tanks and other disposal system components. The Environmental Health Services Division has prepared a set of guidelines on the policies and procedures to be followed for the assessment of unserviced land, for the installation of private sewage disposal systems. This division is also developing policies and procedures to more effectively and uniformly deal with Garden Suites and provision of Water and Sewer Services for these facilities.

3.3 IDENTIFICATION OF TECHNICAL CONCERNS

In Nova Scotia technical concerns identified with respect to the additional servicing of Garden Suites relate to the condition of the existing system providing the services for the host house. Evaluation of the existing system is very difficult. Information required to do this includes design details, information on installation, type of connection, provisions for clean-out, depth of the field and the compatibility with current guidelines.

In New Brunswick, discussion of the technical concerns related to servicing Garden Suite with an on-site host house system focused on the loading and the conditions of the host house system. Technical considerations of interest to the Public Health Inspectors would be soil type, depth to the water table, depth to bedrock, slope, drainage conditions, and zoning of the area. A history of the site including the technical aspects of construction, tank size, area of drainage field were also identified.

In Prince Edward Island, the technical concerns identified again focused on the condition of the present system and number of residents in the host house. Other factors that inspectors would consider include the age of the system, design aspects, the size of the lot and available space to expand the current system. The history of groundwater contamination in the area is also a factor that would be considered.

In Newfoundland, identification of technical concerns with servicing a Garden Suite focused on the condition of the existing system that services the host house and whether or not it is operating at or near capacity. Of particular interest to the Public Health Inspectors would be the history of the site, the number of people in the host house, and the original design capacity of the host system. The inspectors in Newfoundland would also check on whether the system was inspected prior to covering and whether records are available on the details of the system, at the time of construction.

3.4 HYDRAULIC LOADS

In Nova Scotia, discussion related to the hydraulic loading of the system of a host house, included what might be considered for retrofitting of the host house by the provision of conservation features such as low flush toilets in both the host house and the Garden Suite. Also of concern are the use of water conditioners, and the disposal of the backwash brines, and how the roof stormwater is handled on the property.

In New Brunswick, hydraulic loads per residence are determined through schedule B of the regulations. This flow for a one bedroom dwelling is 750 Liters/day. The experience of the Public Health Inspector based on monitored flows in New Brunswick have shown that flows of sewage at senior citizens' units are less than flows estimated for one bedroom dwellings which lead to the design flow of 450 L/day for such units. Also under Section 238 of the regulations, a District Medical Health Officer may permit a reasonable variance from their requirements of lots in which mobile homes are planned for temporary location. A written application is required to the District Medical Health Officer before this variance on compassionate grounds will be considered. Also under Section 238 of the regulations some flexibility in dimensions and type of system are allowed for family members wanting to locate a temporary mobile home.

In Prince Edward Island, Table A of their Regulations specify a minimum tank size of 450 gallons and 280 ft. of drainage pipe which is based on a two bedroom dwelling. Tile field sizes vary under the P.E.I. regulations with the more important factor in the system being the amount of field tile installed in the absorption field. The original design requirements of the system are based on the number of bedrooms in the host house. P.E.I. officials therefore see that the hydraulic loadings are likely to vary much more within the host house rather that in a single person Garden Suite dwelling.

In Newfoundland, the hydraulic loading used or system design of a host home is based entirely on the number of bedrooms for that house. For Garden Suites a figure of 50-100 gallons/day/person is considered a reasonable estimate of water use. Loading from other sources such as down spouts and sump pumps are not considered because these are not recommended practices for disposing of these sources of water.

3.5 POLLUTANT LOADS

In Nova Scotia, the pollutant loads used for system design have been based on the same technical aspects as those for determining hydraulic loads. No consideration is currently given to changes in concentrations based on water treatment, backwash brines, or the compensating affect of water conservation in the host home and/or the Garden Suite.

In New Brunswick, there are currently no special considerations with respect to pollutant loads other than the estimated sewage flow identified in schedule B of the Regulations. Loading from such features as water treatment

backwash, whirlpools, garb orators and other modern technical conveniences are not included at this time.

In Prince Edward Island, again the pollutant loads used for system design for the host system and the Garden Suite covered technical aspects that are very similar to determine the hydraulic loading. There are no considerations given to higher concentrations from special water uses or for conservation practices. The current practice in Prince Edward Island is that all septic tank systems require pumping and the recommended period is every 5 years.

In Newfoundland the method for determining pollutant loads for on-site sewage systems is the same as that used for hydraulic loads. The experience in Newfoundland is that for normal operations the loadings from things such as detergents and dishwashers have been considered in the overall design of the system. They do not consider the backwash from water treatment systems a problem because of the low usage of water treatment in the province. They do not consider loadings from other sources such as oils, greases, fats, and solvents in the system because these are not recommended for disposal in on-site systems.

3.6 PROPOSED ASSESSMENT PROCEDURES

In Nova Scotia, the most important design parameter considered by the Environmental Health Division Engineers for assessing a house system is the number of bedrooms. The number of bedrooms is the best indication of the total number of people and therefore, the potential load that would be generated for this on-site system. Other aspects that will be considered in the assessment include the use of water meters, the use of special fixtures such as whirlpools, available records on the system, the age of the system, results of field tests, history of problems, and local soils and drainage conditions.

The type of building and the number of bedrooms in the host house were also considered to be the most important parameters to be considered by Public Health Inspectors in New Brunswick. Other factors that would be considered include the length of the drainage tile, size of the field, percolation rates, water table conditions, soil and bedrock as well as history of problems at the site.

The current practices and procedures for reviewing and approving systems in P.E.I. is to check the records of installation and to review the history of problems on the site related to both water supply and sewage disposal. Other factors considered in this province are the size of the property being considered, as well as the on-site inspection of the drainage field to observe drainage patterns, leakage, change in vegetation and how the drainage field is being maintained.

In Newfoundland, the number of bedrooms and the number of occupants in the host house will be the most important parameters in carrying out an assessment for a Garden Suite. New guidelines are being developed for dealing with the review of water and sewage systems of existing homes to

satisfy concerns of financial/mortgage lending institutions who want more assurance that adequate water supply and sewage disposal systems in place.

3.7 OTHER TECHNICAL OBSTACLES

All of the Public Health Inspectors interviewed pointed out that there is no good test or proven method to assess the operating efficiency of an on-site sewage disposal system. In other words there is no way to determine whether the system is currently operating well below its capacity or near its design capacity. At present the best inspection method and the state of the art, allows only for the identification of problems based on observation of the site for signs of stressed vegetation and ponding in the tile drainage area. Another problem raised by the inspectors is that often times there are no records available for the sites, especially the older properties on which to determine whether the system meets the minimum requirements. In P.E.I., some of the other factors that are considered include community acceptance, nearby land use, impact on property values and lot size. Although all of the provinces publish guidelines for both properly designed and engineered systems, as well as pamphlets on the do's and don'ts for the care and operation of such systems, there is no sure way of determining whether a system has been properly serviced and operated.

3.8 CONDITIONS AND/OR LIMITATIONS

In Nova Scotia, it is concluded by Health Officials that the best approach is to evaluate each case and judge it on its own merit. Their present feeling is that Garden Suites could be recommended on presently serviced lots, but not necessarily on unserviced lots where on-site sewage disposal concerns have to be addressed.

New Brunswick Health Inspectors would also evaluate each case on its own merit. The conditions of approval would depend on the characteristics of the site, the system's history of performance, and the type of system. It appears that the approval for Garden Suites in New Brunswick may fit under the specific reference to mobile homes for other members of the family as covered in Section 238 of the Regulations. Efforts are being taken in New Brunswick to ensure that there is a uniform and consistent interpretation of the regulations and the application of policies and administration of the guidelines across the province.

The P.E.I. Officials agreed that there is no sure way of estimating the current usage and the current capacity of the system against the design installed capacity. They also follow the practice of evaluating each case on its own merit. However, one condition or limitation for any approval, in P.E.I., is that the facility and the arrangement be one of a temporary nature and that the facility be owned either by CMHC or the P.E.I. Housing Corporation.

The main condition and limitation in the province of Newfoundland and Labrador is that the Garden Suite be there on a temporary basis. It is also

understood by the Department of Health and the Housing Authorities that once the Garden Suite is no longer used for its intended purpose it will be removed from the property and the connections to the site properly abandoned. Another condition that the province may impose for the servicing of a Garden Suite is that the system be pumped on a regular basis i.e., once a year. In addition to pumping they may also require a monitoring system to assess the performance of the systems. There is general agreement between the Housing Authority and the Department of Health Officials that should a site be investigated and found to be inadequate to accommodate the additional load of a Garden Suite, the Housing Agency will not pay to have the on-site system upgraded to accommodate an additional Garden Suite.

4.0 TECHNICAL REVIEW

4.1 INTRODUCTION

The on-site sewage (wastewater) disposal system addressed in this report consists of two major components: a septic tank and a disposal field (Figure 1). This engineered system works basically as described below.

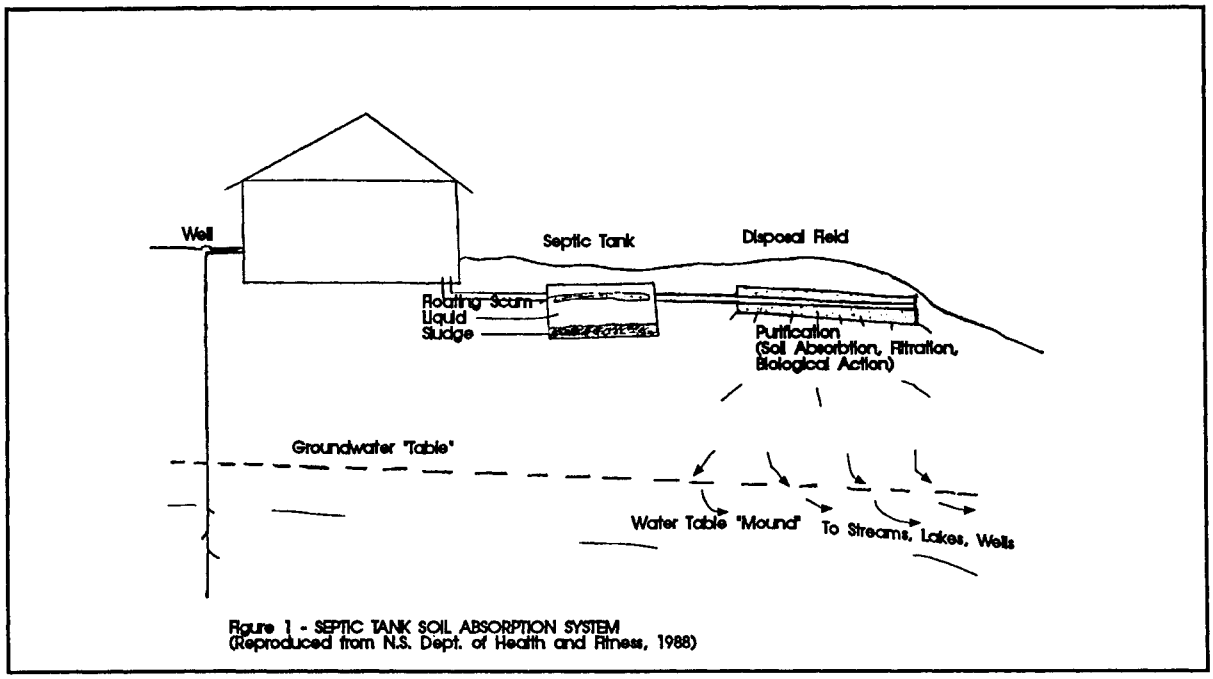

Figure 1 - SEPTIC TANK SOIL ABSORPTION SYSTEM
(Reproduced from N.S. Dept. of Health and Fitness, 1988)

Wastewater discharged from a house flows first into the septic tank. Here the solids and greases are allowed to separate from the water by settling to the bottom, or floating to the top of the tank. The size of tank is chosen such that the wastewater will be retained for a sufficient time to allow the separation to occur. The more clarified liquid in the mid-section of the tank is then directed into the disposal field, where it is distributed over a large surface area, through a buried system of drain pipes and gravel-filled trenches or area beds (Warshall,1979).

As the wastewater seeps into the ground through the bottom of the trench it enters into the natural soil environment. At the soil/trench interface, biological organisms multiply as they feed on the nutrients in the wastewater. These multiply to form a biomat which serves to physically filter the wastewater as well as to reduce its nutrient content (Wilhelm et al, 1991). Ideally, as the wastewater infiltrates through the unsaturated soil zone, the remaining contaminants (including disease-causing bacteria and viruses) are filtered, adsorbed, or oxidized; so that by the time it reaches the groundwater table, it will have experienced an acceptable level of filtration and dilution.

The purpose of this report is to examine the technical impediments to the installation of garden suites, on a lot with an existing on-site disposal system belonging to the host house. The waste stream from the garden suite will add hydraulic and pollutant loads to the host system. This section examines these effects.

4.2 HYDRAULIC LOAD

The hydraulic load is the volume of wastewater discharged from the dwelling in a certain time. It is used to establish the dimensions of the septic tank and disposal field. These values can be described in a number of ways, such as: flow per house, flow per bedroom in the house, flow in terms of the number of fixtures in the house, and flow per capita. Units are usually measured as gallons or liters per day. Flow per capita is most useful for this report.

Table 1 gives a list of hydraulic loads measured in various studies, and shows the percentage contribution of various sources within a dwelling. There is fairly close agreement on an average per capita flow rate for the 5 surveys listed, ie. about 43 U.S. gallons per capita per day (gpcd), (which equals about 35 imperial gallons per capita per day (igpcd)). This figure of 35 igpcd is used in Nova Scotia for disposal field design (N.S. Dept. of Health and Fitness, 1988).

TABLE 1

WATER USAGE CAMPARISON

(Reproduced from Senn et al, 1979)

	USGS[3] 1962	NANEY HAMANN[5] 1967	LAAK[6] 1971	LIGMAN[7] 1972	WALLMAN[9] 1972	ONTARIO RESEARCH[3] 1973	BENNETT[2] 1973	THIS STUDY 1974
TOILET	41	45	43	41	27-45	38	33	22
LAUNDRY	4	5	16	19	18	12	26	25
BATH	37	30	19	26	18-36	34	20	23
KITCHEN	6	6	8	10	13	10	12	11
CLEANING	3	4	5	1	-	3	3	-
DRINKING	5	3	3	3	-	3	3	-
MISC	4	7	6	0	6	0	3	13 Other 6 Water Softener
FLOW (gpcd)	-	-	41	45	30-50	-	44	43

Reprinted by permission from the University of Wisconsin.

Warshall (1979) provides guidelines for the homeowner trying to estimate the hydraulic load for system design. He suggests using 75-100 gpcd (62-82 igpcd) for an average household with any items such as dishwashers and washing machines. For a household where people have extravagant water habits, a figure of as much as 150 gpcd (125 igpcd) should be used. The National Environmental Health Association (Senn et al, 1979) suggests that it is reasonable to base code requirements for system design on loads of 50-75 gpcd.

Per capita water usage has been shown to vary significantly with a number of variables including; ethnic group, income and age. Kaplan (1991) argues that each area should be assessed using locally available information from water/sewer districts. Since usage can be so variable from area to area, he states that if average values are used for designing systems, this will result in half of them being overdesigned, and half underdesigned.

The only information encountered about water use by seniors is contained in a report by Mooers and Waller (in prep.): prior to implementation of water conservation measure consumption averaged approximately 50 igpcd.

4.3 SEPTIC TANK DESIGN

The objective of the septic tank is to separate and store the settleable and floatable components in wastewater, and provide an available culture of microorganisms to anaerobically digest much of this material (Laak and Crates, 1977).

The treatment efficiency of a septic tank is assumed to be primarily a function of the detention time in the tank. This is the ratio of the tank volume over the hydraulic load. The larger the size of the tank (relative to the load), the more effective is the level of treatment, especially if the tank provides a long pathway between the inlet and the outlet, and features which enhance separation of solids.

4.3.1 Hydraulic Loads for Septic Tank Design

The critical design parameter for the septic tank is the anticipated hydraulic load. All of the Atlantic Provinces base their septic tank capacity requirements on the number of bedrooms in a single-family dwelling. Loadings are expressed as the required volume of septic tank per bedroom; subject to a minimum tank size. In addition, Newfoundland policy (in preparation) specifies minimum dimensions for each tank size.

A summary of provincial requirements is shown in Table 2, along with an indication of the additional capacity required per bedroom (in columns labeled "inc"). Volume per bedroom ranges from 500 to 600 igal for 3 bedrooms, and from 100-180 igal, for each additional bedroom.

Tank volumes are related to numbers of bedrooms through the hydraulic load per bedroom, and the required tank size per unit of hydraulic load. The

TABLE 2

SEPTIC TANK CAPACITY REQUIRED BY PROVINCIAL REGULATIONS

(Capacities in Imperial Gallons)

Inc. is incremental capacity required per additional bedroom

	N.S.	Inc.	N.B.	NFLD.	Inc.	P.E.I.	Inc.
Minimum Capacity	*600		500	500		450	
# Bedrooms							150
3	600	120	500	500	135	600	150
4	720	180		635	145	750	150
5	900			780	100	900	100
6				880	100	**1000	100
7				980		**1100	

*for Cat. I lots only
Cat. II and III require 1000 igal

** 2 compartments
if tank >900 igal

N.S. Technical Guidelines (1988) indicate that hydraulic loads are based on about 35 igpcd and 2 persons per bedroom, which corresponds to about 200 igal for a 3 bedroom home and a 600 igal capacity requirement. The average detention time for such a tank is therefore 3 days.

The Nova Scotia guidelines indicate that a 2 day retention time is required for satisfactory performance. Newfoundland and New Brunswick Guidelines suggest less septic tank retention time than does the Nova Scotia Guidelines, ie. only 1 to 1.5 days. (PEI does not refer to this parameter.) This difference is reflected in the minimum tank size requirements.

Although tank capacities are specified in terms of average daily loads, tank performance is strongly affected by peak flows. During the course of study by Bennett et al (1974), surges in hydraulic flow as high as 60 gallons in 7 minutes were recorded. Solids can be swept into the disposal field by, a) large surges discharged into the septic tank if, for instance, 2 bathtubs are discharged simultaneously causing turbulence and high outlet velocities within the septic tank (Jones, 1974). These affects can be minimized by larger tank volumes, and by tank configurations.

A variety of features will enhance the performance of a septic tank. Tanks with 2 compartments and those providing a longer dimension between the inlet and outlet (rectangular), are more efficient and effective than single-compartment square tanks. Baffles around inlets and outlets serve to slow flow within the tank, thus improving the rate of separation of solids and scum from the effluent. A filter on the outlet to prevent solids from leaving the tank will help protect the disposal field from clogging with suspended solids (Bounds, 1991).

4.4 DISPOSAL FIELD DESIGN

The purpose of the disposal field is to distribute the clarified effluent from the septic tank over a large surface area. The effluent will then trickle into the ground and through the soil layer at a rate that will maintain unsaturated soil conditions, ie. at a rate lower than the soil's permeability. The design objective is to avoid saturating the soil layer since an unsaturated, aerobic environment is critical for adequate treatment of the effluent before it enters the groundwater.

As a system ages, a biomat develops along the base of the trench (or area bed) and may eventually extend up the sides of the trench, decreasing the system's permeability (Kaplan, 1991). Thus it is the biomat, rather than the soil, that is usually the limiting factor with respect to permeability. A well developed (anaerobic) biomat may have a permeability of less than 0.17 igpd per square foot. As the biomat develops, the flow of effluent into the field may eventually exceed the rate of infiltration, and the effluent will surface on top of the field. The system has failed at this point.

A variety of configurations are available for the disposal fields. Typically effluent from the septic tank is conveyed through drain pipe (perforated pipe) buried within a single gravel-filled trench, a network of trenches, or

within one large bed of gravel called an area bed. The conventional disposal field is either a multiple-trench or area bed design. These are generally used when the lot has an adequate soil cover and permeability.

Other more sophisticated designs (eg. contour and mound) may have to be used when the lot has less natural soil cover and lower permeability. Designs may include such features as: a) distribution boxes to divide the flow evenly between parallel trenches, b) drop-boxes which delivers the flow in stages, c) alternate fields and valves to switch flow yearly between fields, d) pumping systems to feed flow uphill from the septic tank to the drainfield, and e) siphon dosing systems to feed effluent from septic tank to drainfield in large doses, with no flow in between doses (Warshall, 1979).

4.4.1 Hydraulic Loading Rates for Disposal Field Design

The flow of effluent from a disposal field is expressed as the hydraulic loading rate. This is the critical design parameter used to size a wastewater infiltration system. It is expressed as the permissible hydraulic load per unit area of field; or as the minimum area required to accommodate 1 igpd of septic tank effluent.

The factors which determine the maximum hydraulic loading rate are: 1) the hydraulic capacity of the site, 2) the soil infiltration rate for the wastewater, and 3) the wastewater purification requirements (Jenssen and Siegrist, 1991).

The hydraulic capacity of the site is the amount of liquid per unit time which can continuously infiltrate without producing a rise in the groundwater table (Jenssen and Siegrist, 1991). It is determined in regulations and guidelines by parameters such as; the depth to groundwater table, topography, lot size, and density of disposal systems. The soil infiltration rates are determined by test pits and soil profiles, grain size and texture analysis, and the percolation (perc) test. Wastewater purification requirements lead to regulations governing minimum distances to water supplies (dug and drilled wells) and watercourses.

Percolation tests have been used since the 1920's to try to determine the permeability of soils to wastewater (Kaplan,1991). Graphs have been constructed by various authors to convert directly between the percolation rate of water as measured in the field (in minutes per inch; mpi) and the allowable hydraulic loading rate for wastewater. However, there may be problems with this technique: 1) the result will be effected by previous soil moisture conditions as well as the location and diameter of the percolation test hole, 2) clean water is used in the percolation test not wastewater, and 3) over time a disposal field develops a biomat which may reduce the permeability of the field significantly and is not determined by this test.

Some consultants calculate the permissible hydraulic loading by dividing the percolation test results by a factor of 5 to account for biomat development; Kaplan (1991) says that this factor should actually be in the order of 45 to

1100. For these reasons, a number of factors may need to be evaluated in determining the permissible hydraulic loading rate.

The hydraulic loading rate (or surface area) required for a particular site in Nova Scotia, is determined using the following factors: the hydraulic load, effective soil depth, ground slope, and soil permeability (from test pits and percolation tests). Disposal fields are designed to provide a large enough infiltration area to accommodate the maximum loading rates specified in the regulations. For example, the Nova Scotia Guidelines (1988) specify a maximum loading rate of, 0.67 igpd per square foot of trench surface area for contour fields with sandy-gravel soil. As the soil grain size decreases the maximum permissible loading rate decreases to reflect the soil's lower permeability.

There is a general consensus in the literature that the sidewalls on the disposal field act as the main infiltration surface (Warshall, 1979; Jenssen and Siegrist, 1991; Kaplan, 1991). Field designs resulting in more sidewall area will be the most efficient and this is the reason why trenches are more efficient than area beds. This is reflected in the Nova Scotia Guidelines (1988) by maximum permissible loading rates to the multiple trench field of 1.1 igpd per square foot, while for the area bed field, it is only 0.3 igpd per square foot.

All the regulations and/or guidelines for the Atlantic Provinces, have specific requirements regarding the dimensions of the trenches used in the disposal system. The limitations placed on these by the each province are shown in Table 3. This provides a summary of the main points of these guidelines and regulations, along with the specific regulation/guideline in which they can be found.

Newfoundland Standards (in preparation) pertain to the multiple trench disposal field, and requires that all other types of systems (eg. contour and mound) be designed by a professional engineer. A table is provided in these Standards, from which the length of the design trench is determined on the basis of percolation rate, and the number of bedrooms in the house.

New Brunswick Regulations state the requirements for the standard disposal field geometry using Schedule A. This requires the estimated hydraulic load to the septic tank (determined by a combination of number of bedrooms and flow rate) and the soil percolation rate. If any of the parameters of the system fall outside of the range in this Schedule; Regulation 249 states that it shall be designed and constructed to the satisfaction of the district medical health officer. Regulations 253 and 254 describe requirements for mound type disposal systems and leaching chamber, respectively.

P.E.I. Regulation 10 indicates the minimum length of trench required as a function of the number of bedrooms, unless the soil and topographic conditions are unsuitable; then minimum will be adjusted accordingly. For other than multiple trench type of disposal field, they use the Nova Scotia Technical Guidelines, 1988.

TABLE 3A

PROVINCIAL REGULATIONS AND GUIDELINES FOR

ON-SITE SEWAGE DISPOSAL

PROVINCE	NOVA SCOTIA	NEW BRUNSWICK	NEWFOUNDLAND	PRINCE EDWARD ISLAND
SOIL SUITABILITY EVALUATION	REG# 2.3	N.B. REG 88-200 Section #237.1 to 239.2	STD # 4A	EPA: REG # 12
a) Type of test required.	Perc tests, test pits, or other.	Perc test, soil evaluations, or other	Test pits, perc tests	Test pits, perc tests
b) Min. perc rate	Not Applicable	>30 minutes/inch	>60 minutes/inch	NF
MINIMUM LOT SIZE REQUIREMENTS	REG. # 8.1 Cat.I 20,000sq. ft. Cat.II 50,000sq. ft. Cat.III 100,000sq. ft.	N.B. REG 88-200 REG # 238.1 43,000 sq. ft.	POL # 7.c 20,000 to 44,000 sq. ft.	PA: REG # 37 15,000 sq. ft.
SEPTIC TANK DESIGN SPECIFICATIONS	REG: SCHEDULE A	N.B. REG 88-250 REG: Schedule A/B	STD # 1	EPA: REG # 10
a) Min. capacity.	600 igal	500 igal	500 igal	450 igal
b) Assumed design hydraulic load.	35 igpcd	100 igpd per bedroom	90 igpcd	NF
c) Basis for design	no. of bedrooms	no. of bedrooms	no. of bedrooms	no. of bedrooms
d) Recommended tank retention time.	48 hours	24-36 hours	24 hours	NF
e) Min. permitted clearances:	REG. # 9	REG. # 240	STD. # 1	EPA: REG # 10
To dug well	100 ft.	100 ft.	50 ft.	50 ft.
To drilled well	50 ft.	50 ft.	25 ft.	50ft.
To watercourse	100 ft.	100-300 ft.	100 ft.	50 ft.

GDL - Guidelines **REG** - Regulations **POL** - Policy **STD** - Standards **NF** - Not Found

TABLE 3B

PROVINCIAL REGULATIONS AND GUIDELINES FOR

ON-SITE SEWAGE DISPOSAL

PROVINCE	NOVA SCOTIA	NEW BRUNSWICK	NEWFOUNDLAND	PRINCE EDWARD ISLAND
DISPOSAL FIELD DESIGN SPECIFICATIONS	GDL p. # 3 - 01		STD 4a to 4e	EPA: REG # 7
a) Max. hydraulic loading rate	1.5 sq. ft/gal-day (CS) (0.67) gal/sq ft - day)	NF	Determined from perc. test.	NF
b) Min. gravel below/above pipe.	REG # 14k to 14p 8"/3"	GDL p. # 6 8"/2"	6"/2"	6" - 8"/covered
c) Min. topfill over gravel.	12 - 18"	12"	12"	12"
d) Standard trench dimensions:		GDL p. # 11		
Min. width		450mm (1.6 ft)	18/24 in	18/24 in
Min. separation	4 ft	2 m (6.5 ft)	6 ft	5 ft
Max. depth		900 mm (3 ft)	24/36 in	24/36 in
Min.-Max. grade	2-4 in per 100 ft.	Max - 50 mm in 15 m	2-4 in per 100 ft	2-4 in per 50 ft
Max. length	100 ft	15m (49 ft)	100 ft	total < 500 ft
e) Contour Trench	GDL p. 3-07			
Width	2-6'			
Length*	Min. 50'			
f) Min. distances:	REG # 9; GDL p.2-08	GDL p. # 11	STD 4a to 4e	
to dug well	100 ft	30 m (100 ft)	100 ft	
to drilled well	50 ft	23 m (75 ft)	50 ft	
to watercourse	50 ft/100 ft	15 m/30 m	100 ft	
to bedrock/gw table	3 ft to trench	1.2 m (4 ft to surface)	1 m (3.25 ft) to trench	

GDL - Guidelines **REG** - Regulations **POL** - Policy **STD** - Standards **NF**-Not Found **CS**-Contour System

* - Length based on Darcy's Law (Min. Area + 300 Square ft)

The Nova Scotia Technical Guidelines, 1988 provide the most exhaustive/comprehensive description for determining required trench lengths. A number of tables are available for standard, contour and mound types of designs. The hydraulic loading rate defines the minimum permitted trench length, however a combination of other parameters are used in the determination tables and nomograms i.e. hydraulic load, the soil depth, ground slope, soil type and permeability.

4.5 EFFECTS OF WATER CONSERVATION

The hydraulic load from a dwelling can be reduced by: a) water conservation practices by the occupants, b) recycling of greywater for toilet flushing (advocated by Warshall, 1979), and c) installation of flow reduction techniques. The results of a number of studies that have investigated the contribution of various fixtures within the house are shown in Table 1. These indicate that 22% to 45% of wastewater is generated through the toilet, and that there is a large potential for decreasing water use through the installation of modern low flow toilets.

Table 4 shows that the resulting reductions in flow, from the addition of a number of low flow fixtures was about 17% (NEHA, 1979). Mooers and Waller (in preparation) in their investigation of hydraulic flow problems in a 15 unit, senior citizen complex in Nova Scotia; found that more substantial reduction in flow is possible. A 50% decrease in the total hydraulic load was achieved by installation of a pressure reducing valve on the building inlet, and retrofitting the units with low flow shower heads, sink aerators, and low flow toilets (1.6 igal). Average demand after implementation of these measures was approximately 25 igpcd.

The results of a number of household conservation programs have been reported by REIC Ltd. (1991). One such program in San Jose, California found that senior citizens (over the age of 65), used 15% less water than young to middle-aged adults, who were the heaviest users.

Reduction in average flows may not result in comparable reductions in peak flows, e.g., a clothes washer with a suds saver feature may discharge at the same rate as a conventional machine at the end of its cycle.

TABLE 4

POSSIBLE WATER REDUCTIONS

ALL VOLUMES IN GPCD

(Reporduced from Senn et al. 1979)

LOCATION	Average GPCD	With 3 Gal Flush	With Sudsaver @27.68 Gal.	With 15 Gal. Per Bath or Shower	With All Three Methods Used	% Reduc. Accomo With three	With Addition of Recyc. Bath/Laun. or Toilet	Total Reduction Using All Four Methods
A	56.73	53.84	54.13	49.68	44.18	22%	37.97	33%
B	25.43	23.61	25.43	23.18	21.36	16%	14.49	43%
C	38.85	38.32	35.80	36.22	32.64	16%	27.54	29%
D	41.05	41.05	39.83	37.69	36.47	11%	28.10	32%
E	41.46	38.36	36.70	39.60	31.75	23%	26.62	36%
F	33.74	31.67	33.74	31.91	29.83	12%	25.66	24%
G	29.78	27.76	29.78	28.16	27.75	7%	23.28	22%
H	49.68	47.38	47.45	49.20	44.67	10%	37.80	24%
I	41.81	38.93	41.81	39.77	36.88	12%	31.84	24%
J	45.11	40.67	43.09	41.35	34.90	23%	25.60	43%
K	56.93	54.81	53.40	53.45	47.81	16%	39.02	31%
AVERAGE (Weighted)	**42.59**	**40.31**	**40.73**	**39.65**	**35.49**	**17%**	**28.62**	**33%**

4.5.1 Septic Tank Effects

Reduction of hydraulic load to the septic tank will result in a better level of treatment due to a longer retention time and more quiescent conditions. Hampton et al, 1984, report a more efficient level of treatment within a septic tank when water conservation devices are in place, but their study did not include an additional pollutant load as well.

4.5.2 Disposal Field Effects

Reduced hydraulic loading rates improve the life performance of the disposal field. Kaplan (1991) gives examples of systems which are still functioning well after 30 years or more. He attributes this directly to the reduced hydraulic loading rates which resulted from designing the field to be much larger than the minimum code requirements (i.e. sidewall area was much greater than codes required).

Jenssen and Siegrist (1991) also emphasize the importance of hydraulic loading rates and suggest that if low loading rates are applied to disposal trenches in doses, the system could have a life expectancy of more than 20 years. The objective of applying the load in doses, is to allow the soil to return to unsaturated, aerobic conditions between doses. Aerobic conditions promote oxidation of effluent, reduce the BOD, and keep the biomat from getting excessively thick, thus clogging the field. Alternating between 2 fields on a yearly basis, serves essentially the same purpose as dosing (aeration and breakdown of the biomat), and may lead to a field which will last indefinitely.

There is general agreement in the literature (Wilhelm et al, 1991; Kaplan, 1991; Warshall, 1979; among others), that for the normal range of soils, the main limiting factor controlling the rate of infiltration in a disposal field is the permeability of the biomat, rather than the permeability of the soil. However, in many regulations the permeability of the soil is a major parameter to be determined for the design of disposal fields. It is determined through percolation tests and soil analysis.

4.6 POLLUTANT LOADINGS

4.6.1 Domestic Sewage

Wastewater from a domestic source is 99.9% water; i.e. with a pollutant load of only about 0.1% (Warshall, 1979). Sewage is highly dilute because so much water is used to flush the pollutants down the drain.

About 85% of the pollutants are organic (feces, urine, detergents, soaps and food wastes) and 15% is inorganic (water softeners, borax, chlorine and photochemicals). Table 5 provides a useful breakdown of the per capita daily load of contaminants in domestic sewage and the household sources of

the contaminants (Witt et al, 1974). The average flow per capita for the study was 43 gpcd (35 igpcd). (The result is also listed in Table 1, under "This study".) Table 5 could serve as a useful guide to pollutant loads and sources in the house.

Household cleaning products contribute low concentrations (10 to 100 micrograms per liter) of organic chemicals to domestic sewage (Wilhelm et al, 1991).

TABLE 5

MEAN WASTEWATER CONTRIBUTIONS FROM

INDIVIDUAL HOUSEHOLD EVENTS, MG/CAP/DAY

(Reproduced from Witt et al, 1975)

EVENT / PARAMETER	FECAL TOILET FLUSH	NONFECAL TOILET FLUSH	GARBAGE DISPOSAL	KITCHEN SINK USAGE	AUTOMATIC DISH-WASHER	CLOTHES WASH	CLOTHES RINSE	BATH/ SHOWER	E (MEANS) LESS DISPOSAL
FLOW[1]	7.1	19.5	10.6	5.7	12.1	30	26.5	18.5	119.4
BOD_5 UNFILTERED	4337	6379	10923	8344	12625	10763	4011	3086	49545
BOD_5 FILTERED	2339	3979	2568	4576	7835	6965	2842	1872	30408
TOC UNFILTERED	3533	4246	7317	5000	7276	7698	2605	1749	32107
TOC FILTERED	1574	3165	3911	4111	4686	5381	1907	1128	21952
TOTAL SOLIDS	10671	17799	25755	13761	18157	37489	10941	4590	113408
VOLATILE SOLIDS	7757	11972	24018	9731	10544	14657	4794	3596	63051
SUSPENDED SOLIDS	6473	6276	15823	4111	5267	7927	3043	2261	35358
VOLATILE SUSPENDED SOLIDS	5087	5122	13486	3841	4457	4699	1817	1571	26594
TOTAL NITROGEN	1497	2644	632	424	487	579	146	306	6083
AMMONIA NITROGEN	593	521	9.6	32.3	54	19.4	11.4	40	1271
NITRATE NITROGEN	6.3	21.1	.2	1.8	4.1	17	10.3	7.4	68
TOTAL PHOSPHORUS	268	280	128	419	819	1602	548	36	3972
ORTHO PHOSPHORUS	115	188	88	177	382	411	112	21	1406
NUMBER OF SAMPLES	35	34	6	10	14	25	26	21	
GREASE[2]	928	2423	2100	2329	2476	1844	1406	3219	14625

1 Flow values were determined in the wastewater quality study and are in liters/capita/day.
2 Number of samples used for grease analysis varies from 2-8 depending on event.
All values do not include carriage water contributions.

4.6.2 Septic Tank Effects

Septic tanks remove from 10% to 30% of the total nitrogen in the wastewater; and 7% to 46% of the Biochemical Oxygen Demand (BOD), (Wilhelm et al, 1991). Most of the nitrogen in effluent from the tank (about 75%) is in the reduced form, ie ammonium.

Table 6 displays a summary of typical septic tank effluent quality. Another more complete analysis is shown in Table 7.

A low velocity of discharge at the outlet of the septic tank is desirable since accumulated solids are less likely to be swept out into the disposal field during surges in hydraulic load (Jones, 1974). Design features which reduce the outlet velocity are: a) a tank with a large surface area, b) increasing the size of the outlet flow area and reducing the size of the discharge pipe, and c) having more than 1 compartment in the tank. Jones (1974) notes, however, that reducing the discharge rate from the septic tank, may be conducive to poor distribution of the effluent and subsequent clogging, in the disposal field. To remedy this effect, he recommends a dosing system. Bounds (1991) recommends a filter on the outlet to prevent suspended solids carryover.

An important function of a septic tank is to dilute and homogenize the pollutant load such that the effluent to the disposal field provides a fairly consistent environment for the biomat (Wilhelm et al, 1991). A tank with baffles and/or more than 1 compartment, will reduce the possibility of short-circuiting and homogenize the effluent more effectively (Jones, 1974).

A tank with a larger surface area will show a slower accumulation of sludge thickness, than one of smaller surface area. Too rapid an accumulation may result in rapid digestion, gas production and resuspension of the sludge (Jones, 1974).

TABLE 6

SUMMARY OF EFFLUENT DATA FROM VARIOUS

SEPTIC TANK STUDIES (Source: EPA[6])
(Reproduced from Kaplan, 1991)

	Source				
Parameter	**7 Sites**	**10 Tanks**	**19 Sites**	**4 Sites**	**1 Tank**
BOD_5					
Mean, mg.1	138	138[a]	140	240[b]	120
Range, mg 1	7-480	64-256	-	70.385	30-280
No. of Samples	150	44	51	21	50
COD					
Mean, mg 1	327	-	-	-	200
Range, mg 1	25-780	-	-	-	71-360
No. of Samples	152	-	-	-	50
Suspended Solids					
Mean, mg. 1	49	155[a]	101	95[b]	39
Range, mg 1	10-695	43-485	-	48-340	8-270
No. of Samples	148	55	51	18	47
Total Nitrogen					
Mean, mg 1	45	-	36	-	-
Range, mg 1	9-125	-	-	-	-
No. of Samples	99	-	51	-	-

a Calculated from the average values from 10 tanks, with 6 series of tests.

b Calculated on the bases of a log-normal distribution of data.

TABLE 7

(Reproduced from Converse et al. 1991)

7A) SEPTIC TANK EFFLUENT CHARACTERISTICS FOR 29 RESIDENTIAL SITES AND ONE APARTMENT/OFFICE COMPLEX BASED ON ONE GRAB SAMPLE TAKEN FROM THE PUMP CHAMBER AT THE TIME OF THE AT-GRADE EVALUATION

Parameter	Units	Sample Size	Average	Stnd Dev.	Range
Total Solids	mg/L	30	1271	589	457-2632
Vol. Solids	mg/L	30	402	118	186-726
Susp. Sol.	mg/L	30	99	102	44-572
V. Susp. Sol.	mg/L	30	60	72	19-402
BOD_5	mg/L	25	150	54	47-239
COD	mg/L	27	291	163	89-743
Org. Nit.	mg N/L	30	11	8	5-48
Ammonium	mg N/L	30	48	18	19-84
Phorphorus	mg P/L	25	5	1	3-7
Chloride	mg/L	29	275	333	14-1200
EC	umho/cm	29	2225	1251	810-5000
pH	-	27	8.4	0.4	7.8-9.1
Total Coli	MPN/100 ml	29	1.0E8	2.1E8	3.6E6-1.0E9
Fecal Coli	MPN/100ml	29	2.7E6	7.7E6	2.3E3-4.1E7

7B) AEROBIC TANK EFFLUENT CHARACTERISTICS FOR 1 RESIDENTIAL SITE BASED ON 21 GRAB SAMPLES TAKEN FROM THE PUMP CHAMBER OVER 1 1/2 YEARS.

Parameter	Units	Sample Size	Average*	Stnd Dev	Range*
Total Solids	mg/L	21	811	96	648-970
Vol. Solids	mg/L	21	384	59	252-503
Susp. sol.	mg/L	21	18	15	1-60
V. Susp.Sol.	mg/L	21	4	3	0-11
BOD_5	mg/L	17	3	2	1-6
COD	mg/L	20	28	13	6-66
Org. Nit.	mg N/L	21	1	1	0-2
Ammonium	mg N/L	21	0	0	0-2
Nitrate	mg N/L	21	53	12	25-77
Phosphorus	mg P/L	5	4	0	3-4
Chloride	mg/L	21	58	12	35-85
EC	umho/cm	21	1078	82	950-1250
pH	-	18	7.9	0.3	7.2-8.3
Total Coli	MPN/100ml	16	8.9E4	2.4E5	4.3E2-1.0E6
Fecal Coli	MPN/100ml	16	2.5E3	4.0E3	5.0E0-1.5E4
D.O.	mg/l	18	6.9	0.3	7.2-8.3
Temperature	^{o}C				
Pump Tank		20	15	5	7-24
Aerator		17	23	4	17-30

*If the value was recorded as <l mg/L by the laboratory it was listed as zero.

4.6.3 Septic Tank Maintenance

Accumulation rates for sludge and scum (on a per capita basis) have been reported by various authors, and a useful summary graph of the derived regressions (Bounds, 1992), is shown in Fig. 2. The Bounds curve reveals, for instance, that after 8 years, a 3 person family would have filled the septic tank with only 300 gal (250 igal) of sludge and scum.

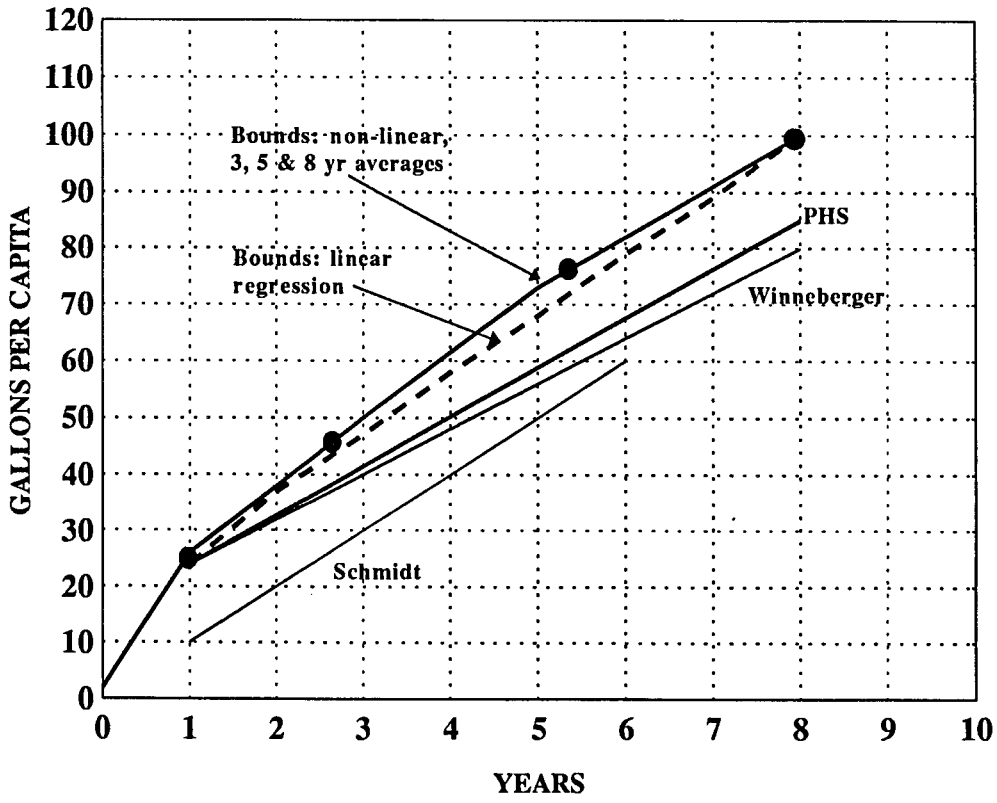

Figure 2 - RATE OF SLUDGE AND SCUM ACCUMULATION (Reproduced from Bounds, 1992)

Most regulators set pumping schedules at around 5 years (Wilcox, 1992). The N.S. Technical Guidelines (1988) recommend a 2 to 5 year pumping frequency; the N.B. Guidelines (1989) state that tanks shall be pumped every 3 years; P.E.I. Regulations require pumping when the sludge is 4 inches from the bottom of the outlet "T". Requirement for Newfoundland could not be found.

Wilcox (1992) reports that the 5 year recommended pumping interval is based on hearsay and local practice; formulas developed by the U.S. Public Health Service and other researchers produce a pumping schedule in the order of 12 years. Bounds (1992) reports accumulation rates and densities of sludge and scum measured in 450, 1000 gallon (833 igal) tanks as part of the Glide Audit in Oregon.

This Glide study found that over a period of years, compaction and/or biological digestion become important processes for reducing the sludge accumulation rates. Bounds (1992) confirms the interval of 12 (to possibly as much as 18) years is a more appropriate pumping schedule for these 1000 gal tanks.

Accumulated sludge and scum must be removed by pumping, before solids are no longer retained in the tank. Septic tanks are designed to maintain detention times of over 24 hours even with large solids accumulation, however, a case study reported measured retention times as low as 12 hours (Wilhelm, 1991). Jones (1974) cautions that the solids removal efficiency of a tank may be significantly reduced before the ultimate sludge retention volume is reached.

4.6.4 Disposal Field

Effluent delivered from the septic tank to the disposal field contains very little dissolved oxygen, and contaminants are in the reduced form (e.g. nitrogen as ammonium). The biomat, which may be 2-5 cm thick in a mature field, strains out finer grained sediments, suspended solids, organic matter and pathogens (Wilhelm et al, 1991).

In the unsaturated soil zone, microorganisms are capable of oxidizing the reduced components in the wastewater, (ie. converting ammonium to nitrate, organic carbon to carbon dioxide, dissolved phosphorus to phosphate) and reducing the chemical and biological oxygen demand (COD and BOD). If insufficient oxygen is available, the reduced compounds may be retained in the soil by filtration and adsorption (Wilhelm et at, 1991).

Both phosphate and nitrates have a detrimental effect if discharged to surface waters. Phosphate is present in septic tank effluent in concentrations of 10-20 mg/l. Although phosphate is readily adsorbed by the soil in an aerobic environment, it may be more mobile in an anaerobic setting (Wilhelm et al, 1991). Nitrate, however, moves readily through the unsaturated zone and into the groundwater.

Nitrate contamination of groundwater is a problem even in a properly functioning disposal system. The problem is most severe in sandy loams and less severe in clayey soils (NEHA, 1979). Peat filters and sand filters have been used successfully in laboratory models or pilot-scale studies, to remove nitrates (e.g. Whitmyer et al, 1991).

The effectiveness of the disposal field to remove pollutants from the wastewater depends on the amount of pollutants and the availability of oxygen in the soil. If a site has good drainage, an adequate soil cover and depth to the groundwater table (as it should if a system exits on the site), then the latter factor is largely controlled by the hydraulic loading rate.

Overloading of a disposal system may result in saturated, anaerobic conditions which: a) compact the soil (by decreasing available pore space for air), b) promote excessive growth of the biomat (resulting in clogging), c) fail to oxidize the organic carbon (resulting in clogging of soil), d) fail to remove wastewater pollutants such as the BOD, COD, phosphorus and pathogens, and e) don't allow the loss to the atmosphere, of volatile organic chemicals from household cleaners (Wilhelm et al, 1991).

A 6 year study of biomat development by Siegrist and Boyle in 1987 (reported in Wilhelm et al, 1991), found a correlation between biomat formation and the suspended solids concentration and oxygen demand in the wastewater. This may or may not be a problem, depending on the rate of the biomat formation and the availability of oxygen which would tend to limit the excessive growth which can clog and cause failure of the field.

4.7 IMPACTS OF GARDEN SUITES

4.7.1 Impacts on Hydraulic Loads

With no water conservation the increase of hydraulic load due to a single occupancy of a garden suite would probably average 35 igpd. For a 3 bedroom home with an estimated 200 igpd discharge, this represents an increase of about 18%. With the water saving devices installed in the host house, as described in Table 4 (NEHA, 1979), a 17% reduction in water usage was accomplished. This would offset most of the garden suite's contribution to the hydraulic load. Mooers and Waller (in prep.) indicate that much more significant reductions could be achieved if necessary (eg. dual occupancy of garden suite).

A garden suite might be more amenable to modification with water conservation devices than the host house. Using all the available modern low flush toilets and other devices, the average contribution of the garden suite could be reduced by 50%; to only about 9% of a 200 igpd flow. Obviously, for a larger house this percentage contribution would become even lower and less water conservation devices would be necessary to compensate for the garden suite.

If water conservation methods do not compensate for the additional hydraulic load the additional load may have some impact on the disposal system's performance.

4.7.2 Impacts on Pollutant Loads

Although the additional hydraulic load from installation of a garden suite can be offset by water conservation measures, the pollutant load must increase. If water conservation measures are undertaken, this will increase the concentration of the pollutants.

Hampton et al (1974) report that increased pollutant concentration may lead to more efficient removal within the septic tank.

4.7.3 Impacts on System Performance

Addition of sewage from a Garden Suite could decrease the efficiency of a septic tank by decreasing the detention time as the result of a) increased hydraulic load (Section 4.7.1), and b) reduced tank capacity because of increased solids load (Figure 2 indicates that over 5 years one person would add 58 gallons of solids to a tank, which would reduce detention time from 36 to 29 hours for a 600 gallon tank with an original load of 200 igpd). The former effect could be offset by water conservation, the latter by more frequent pump-out.

The pollutant load discharged to the disposal field may be increased by addition of a garden suite because of the increased load discharged by the new occupant(s) and possibly reduced tank efficiency.

The additional hydraulic load from a garden suite, if not offset by water conservation measures, has the potential to exceed the capacity of the biomat and/or the soil system. The additional pollutant load, which can be offset but not necessarily eliminated by more frequent pumping, has the potential to increase the hydraulic resistance of the biomat. These effects may be important in systems where current hydraulic loads from the host house are close to or at the capacity of the biomat and/or the soil.

Nitrates are not effectively removed by even a properly functioning disposal field. Therefore an increase in nitrate concentration in the wastewater entering a disposal field, would cause an increase in nitrate discharged to groundwater.

Another impact to be considered is the reduction in the area of the lot due to the area occupied by the garden suite, thus reducing the area available for construction of a replacement field for a failed system, or to maneuver equipment for system repairs.

4.8 EVALUATION AND MITIGATION OF IMPACTS OF GARDEN SUITES

4.8.1 Evaluation of Impacts of Garden Suites

The impact of a garden suite on a septic disposal system should be viewed in relative terms: i.e. the larger the host house system, the less the impact will be. If the host house is large, has low occupancy, and the system has been built to modern standards, there could be no appreciable impact. The system will be oversized for the host house.

The potential for hydraulic overloading, may be the most harmful impact of installing a garden suite. If the host house system is relatively small, with a number of occupants, the system may already be working to capacity. Addition of the garden suite could then have a significant impact, especially if the hydraulic load were increased. The deleterious effects of this have been discussed above.

Although the literature reports many surveys of the performance of on-site systems, and such surveys by provincial agencies are common, no references were found that dealt with formulation of a protocol for assessment of existing systems.

Factors that are of particular concern to provincial officials are presented in Appendix 2 and reviewed in Section 3. They include:

1) Age of the system, which relates both to its condition and to likelihood of conformity with existing standards.

2) Size of the lot, as related to current standards, space for the garden suite, and space for system renovation or replacement.

3) Availability and adequacy of records related to system malfunctions and to original design and inspection.

4) Size and occupancy of the host house compared with the garden suite.

5) History of problems, or knowledge of problem soil or groundwater conditions, in the locality.

6) Existing fixtures and plumbing system, including possible connections of stormwater to the sanitary system, connection of backwash from water conditioners, or use of high water use fixtures.

7) Possible use of dye test (recognizing that a negative test is not an infallible indication of a properly functioning system).

These factors are considered as part of site specific assessments of individual lots. Other factors of concern to one or more provincial authorities are:

a) An assurance that the garden suite is temporary;
b) Assurance that the septic tank will be regularly pumped;

c) Periodic monitoring of system performance; and
d) Assurance that a malfunctioning system will be upgraded if required.

Possible techniques to evaluate the host system include:

1) An inspection of the site, to identify the location and condition of the field for such factors as ponding of leachate or possible tree root intrusion into a field, would be a basic requirement for evaluation of the system. This could be followed by inspection/testing of the septic tank and disposal field

2) Septic tanks can be accessed through the man-hole cover; scum and sludge levels can be determined to estimate accumulation rate, if previous pumping date is known. Pumping of the tank permits inspection of the condition, configuration and capacity of the tank. Tank dimensions can then be compared with the relevant regulations/guidelines to see if the current tank conforms to specifications. Tank should be inspected for obvious signs of cracking, settlement or decay (Hantzsche et al, 1991), plugging of sanitary "tees" etc.

3) Hantzsche et al (1991), propose a simple method of testing the hydraulic loading capacity of the disposal field. Following pumping of the septic tank, the tank is surcharged with water (150 gallons in 30-45 minutes) and the level of the water in the septic tank is monitored. Results can be compared with those shown in Table 8 to determine how well the system is functioning. This test is accompanied by inspection of the leachfield for ponding, and the above inspection and testing process should take on the order of 1-2 hours (Hantzsche et al, 1991). There is no experience with this procedure in Atlantic Canada.

TABLE 8

HYDRAULIC LOAD TEST RATING GUIDELINES

(Reproduced from Hantzsche et al. 1991)

Rating	Septic Tank Response to Hydraulic Loading
Excellent	No noticeable rise in water level during filling.
Good	Maximum water level rise of about 1 inch, with rapid decline to initial level within 5 minutes after end of filling.
Satisfactory	Maximum water level rise of about 2-inches , with decline to initial level within about 15-minutes after end of filling.
Marginal	Maximum water level rise of about 3-inches, with decline to initial level within about 30-minutes after end of filling.
Poor	Water level rise of about 3-inches, with decline not reaching initial level within 30 minutes after end of filling.
Failed	Water level rise of more than 3 inches, with no noticeable decline with in 30 minutes after end of filling.

4.8.2 Mitigation of Effects

Possible measures to mitigate the potential impacts of a garden suite are listed below. The extent to which ny or all of these measures are required will presumably depend on the relative impacts of the garden suite when compared with the current load on the host system.

1) Upgrade the septic tank and/or disposal system to accommodate the combined load from the host house and the garden suite.

2) Implement water conservation measures in the garden suite and possibly in the host house.

3) Arrange for more frequent and consistent pumping of the septic tank, to maintain the same level of treatment because of the reduction in retention time due to storage space occupied by additional solids.

4) Bounds, 1991, suggests installation of simple devices such as effluent filters and screened pump vaults; they reduce 50% of the suspended solids discharge, and block all significant solids from entering the field. There is no experience with these devices in Atlantic Canada.

5) A number of methods have been used for reducing the effects of clogging of an existing disposal field but none have shown consistent results: a) improved pretreatment of the effluent from the septic tank by methods listed above, b) installation of intermittent dosing systems, c) the use of trenches instead of area beds, d) application of wastewater in large intermittent doses, with dose intervals over one day, e) alternation of disposal fields on a yearly basis to allow the system to "rest" (Otis, 1984).

4.8.3 Relevant Provincial Regulations

The addition of a garden suite to a lot may be regarded by regulatory bodies as an addition of a bedroom. If so, Table 2 implies that at least 100 igal of additional septic tank capacity might be required upon installation of the garden suite. Similarly, disposal fields may require modification to comply with the maximum hydraulic loading rate permissible for the new load. (This assumes the original tank and field were installed according to current requirements.)

New Brunswick's regulation 238 refers to a situation similar to the garden suite concept: the installation of a mobile home on an established lot for the use of a close relative, for compassionate reasons. The mobile home can only be plumbed into the host system if the lot is larger than 4000 sq. meters (43,000 sq. ft). Therefore lots smaller than this might be unlikely candidates in New Brunswick.

Newfoundland and Labrador are actively promoting the installation of Garden Suites through the housing authority. Over the next 4-5 years they plan to install about 20 Garden Suites and assess their performance.

P.E.I. Regulation 8 permits a number of variances, except for those regarding minimum distances to potable water supplies.

5.0 DISCUSSION

This study has proven useful in understanding the government Regulatory Agencies involved with and the Technical Impediments for use of existing On-Site Sewage Systems of Host Houses to service Garden Suites on the same property in the Atlantic provinces. From the discussions held with the Provincial Officials and review of the reference material provided by them it appears that there are many similarities in the approval process for On-Site Sewage Disposal Systems in the region. Although different agencies are involved, from province to province, the administrative aspect of this approval system is well in place, operates well and provides for provincial and municipal coordination.

In all cases the officials interviewed share concerns about potential technical problems associated with connecting a garden suite to an on-site system of a host house. The level of concern varies from province to province, and in Nova Scotia, where the approach is most cautious there is a suggestion to locate them only on service lots. On the other hand, in the province of Newfoundland and Labrador, an arrangement between the Regulatory Agency and the Housing Corporation has led to the development of a policy and a plan to actively promote the use of garden suites.

One of the operating concerns related to On-Site Sewage Systems expressed by officials throughout the provinces is that there is no simple routine or certain procedure to assess the condition or capacity of an on-site system. It is also understood that to carry out a detailed assessment of a site, the information would not be transferable and the results will rely heavily on the knowledge and experience of the individual who conducts the examination.

There are a number of measures that have been discussed in the literature and in practice that can be adopted to eliminate or reduce concerns associated with connection of garden suites to existing on-site systems. Some of these measures include system upgrading, additional installed capacity, water conservation practices, and a regular system maintenance program, such as tank pumping.

Several questions were asked during the course of the interviews about the nature of the garden suite design. Related factors that are of concern to provincial officials are assurance about the temporary nature of a garden suite, the original capacity of the installed system, its maintenance monitoring and system upgrading. This project has identified several subjects related to use of garden suites where the state of existing knowledge suggests that applied research will be of value. In particular, these subjects relate to protocols and procedures for assessment of the condition and capacity of existing systems, the applicability of a proposed test of the hydraulic capacity of a disposal field, and the performance and value of septic effluent filters.

The results of this study have also shown that the regulatory agencies should be involved at an early stage in the design planning and

implementation of programs to introduce garden suites. Such proposals should be developed in consultation with the provincial agencies identified in this report. One of the constraints of on-site sewage disposal systems is that every site is different because of the actual drainage characteristics and the loadings and maintenance of the installed system. Accordingly proposals to introduce use of garden suites should recognize that the capability of the system of a host house to accommodate a garden suite can only be determined on a site specific basis.

In addition, proposals to introduce use of garden suites should recognize that measures may be required to anticipate and mitigate potential on-site problems. Such proposals for these facilities should recognize the necessity to address long-term concerns about the duration of system use, system maintenance & monitoring and possible upgrading. A number of applied research needs have been identified in this report and consideration should be given to addressing these as the demand for these facilities increases.

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APPENDIX AI

TERMS OF REFERENCE

TECHNICAL IMPEDIMENTS TO USE OF THE EXISTING ON-SITE SEWAGE DISPOSAL SYSTEM OF A HOST HOUSE TO SERVICE A GARDEN SUITE ON THE SAME PROPERTY

PROPOSAL

to

CANADA MORTGAGE AND HOUSING CORPORATION

from

CENTRE FOR WATER RESOURCES STUDIES
TECHNICAL UNIVERSITY OF NOVA SCOTIA

1. INTRODUCTION

Canada Mortgage and Housing Corporation is exploring the concept of the Garden Suite as a new housing option for elderly Canadians.

Garden Suites are small, self-contained houses that are placed on the same lot as the home of close family members. Most suites have one bedroom, a living room, a kitchen, and a bathroom, as well as storage and laundry facilities and all the usual amenities of a home. The suites are not intended as permanent additions to the lots and are designed so that they are easily movable.

It is proposed that the water supply and sewage system of a Garden Suite be connected to the exiting well and septic tank system of the Host House. The intent of this proposal is to anticipate and address technical concerns of regulatory agencies in Atlantic Canada who would be asked to approve the use of the existing on-site sewage disposal system of a Host House to service a Garden Suite on the same property.

2. OBJECTIVES

To identify and address technical concerns of regulatory officials in Atlantic Canada about technical impediments to use of the existing on-site sewage disposal system of a Host House to service a Garden Suite on the same property.

3. UNDERSTANDING

(1) That this project is concerned solely with perceived technical problems, and that perceived institutional problems will not be considered or addressed.

(2) That the project should address concerns of regulatory officials in New Brunswick, Newfoundland, Nova Scotia, and Prince Edward Island.

(3) That the scope of the project will be defined by the Work Program, Schedule, and Budget set forth below.

(4) That a draft report will be presented by January 8, 1993, and a final report by February 5, 1993, based on a starting date of October 19, 1992, and a two-week review of the fraft report by CMHC.

(5) That the total cost of the project will not exceed $23,600.

4. DELIVERABLES

(1) An Executive Summary that summarizes the project results, conclusions and recommendations for the ordinary reader.

(2) A complete presentation that includes: Introduction; Objectives; Methodology; Results; Analysis/Discussion; Conclusions and Recommendations; Appendices as appropriate.

(3) Conslusions and recommendations that will relate to:

- Identification of the agency or agencies in each province in Atlantic Canada that determines policy related to technical acceptability of connection of Garden Sutes to Host House on-site systems.
- Identification of policies and regulations in each province that regulate design and use of on-site systems, including specifications of design loadings.
- Identification of technical concerns of the responsible agencies in each province.
- Freshwater/hydraulic loads - used for system design
    - actual for Host House
    - expected for Garden Suite
    - potential effects of water conservation
    - in Garden Suites
    - in Host House
- Pollutant loads - used for system design
    - actual in Host House
    - added by Garden Suite
    - effect of higher concentrations resulting from conservation
- Proposed calculations and procedures to estimate and assess the capacity and condition of Host House systems, taking into account occupant load, soil conditions, and other relevant factors.
- Other technical obstacles perceived by provincial authorities.
- Conditions and/or limitations that may be required to satisfy concerns of responsible agencies.

5. WORK PROGRAM

(1) Interview with the Director of Public Health Engineering and Chief Public Health Inspector, Nova Scotia Department of Health (NSDOH), to:
- identify agency or agencies in Nova Scotia responsible for decisions about technical feasability of connection of Garden Suites to Host House systems

- identify policies and regulations that relate to hydraulic and pollutant loadings to household on-site systems.
- identify technical concerns of the NSDOH
- provide a basis for development of a protocol for interview with provincial agencies in NB, Nfld, and PEI.

(2) Interviews with provincial agencies in the other three provinces.

(3) If interviews in (1) and (2) indicate that other agencies such as Boards of Health or Municipalities are responsible for technical policy descisions, develop appropriate questionnaires and apply them by telephone or mail (assuming that available time or financial resources will not permit personal interviews with each agency).

(4) In parallel with (1) to (3) assemble information related to the technical concerns now recognized by CWRS and CMHC, based on information in CWRS files, and search of CWRS reference sources.

(5) Analyze information from (1) to (3), and produce a report.

6. SHCEDULE

The following schedule begins with the starting date specified in the project contract. Completion of the project will require 13 weeks, plus time for CMHC to review the draft final report. If the scheduled time overlaps the Christmas holiday season, add one to two weeks to allow for unavailability of persons to be interview/consulted, and staff holidays.

Week 1: Mobilization; meet with NSDOH; begin information search/assembly

Week 2 to 5:
Contact and interview officials in NB, Nfld, and PEI. Initiate mail interviews if required. Information analysis.

Week 6 to 8:
Complete mail interview; identify additional concerns.

Week 9 and 10:
Complete information analysis related to additional concerns. Begin report.

Week 11: Complete and submit draft report for CMHC review.

Time for CMHC review.
Additional two weeks: Finalize and submit report.

APPENDIX A2

INTERVIEW WITH NEW BRUNSWICK AGENCIES

MINUTES OF THE MEETING WITH NEW BRUNSWICK DEPARTMENT OF HEALTH AND COMMUNITY SERVICES OFFICIALS REGARDING THE PROJECT DEALING WITH THE TECHNICAL IMPEDIMENTS TO THE USE OF EXISTING ON SITE SEWAGE DISPOSAL SYSTEM OF HOST HOUSE TO SERVICE A GARDEN SUITE ON THE SAME PROPERTY

HELD IN THE OFFICE OF HEALTH AND COMMUNITY SERVICES
COMMUNITY AND ENVIRONMENTAL HEALTH DIVISION

FREDERICTON, NEW BRUNSWICK

NOVEMBER 25, 1992

PRESENT: Ivan L. Brophy, Consultant
Mark C. Allen, Director
Terry Hennigar, CWRS

Community and Environmental Health Division

1. Introduction

The generalities of the project with Canada Mortgage and Housing Corporation (CMHC) regarding the technical impediments to use of the existing on site sewage disposal system of an host house to service a garden suite on the same property were reviewed with Public Health officials. The background to the development of this study was reviewed as well as the objectives and timing of the work to be carried out. The outline of the study includes a review of the on site sewage disposal policies and regulations in the four Atlantic Provinces. This meeting with the New Brunswick officials is the second in the series to determine the mandate, administration, and technical considerations of the approval process for on site sewage disposal.

A copy of the proposal was mailed to the New Brunswick Health Officials for their review, and preparation for this meeting. The discussion that followed which was carried out primarily with only Mr. Ivan Brophy, who has for the past twenty years been involved in public health inspection for the province in the Saint John Region and who has recently been transferred to the provincial office in Fredericton as a Consultant in the Community and Environmental Health Division. The discussion centered on item 4 entitled the Deliverables Related to Their Requirements of CWRS to complete the study for CMHC. In particular the discussion focused on item 3 of the Deliverables dealing with the eight categories related to what is required

in the conclusions and recommendations relevant to the policies and concerns for servicing garden suites from a host home system.

The following is the summary of discussions regarding New Brunswick activities:

1. Identification of Agency or Agencies in the Province

In the province of New Brunswick, the Department of Health and Community Services is the sole provincial regulatory agency responsible for the approval of on site sewage disposal systems. In particular the Public Health and Medical Services Division administers the Health Act and Regulations which cover the aspects of on site sewage disposal in the province. Regulations pursuant to the Health Act deal with the design and approval of on site systems. In addition policies and guidelines related to on site sewage have also been prepared by this Division for application in the province of New Brunswick.

Prior to 1967, the Health Act was administered throughout the province by a number of health boards similar to the arrangement in Nova Scotia. Since 1967, all matters related to on site sewage disposal in the province have been administered through Public Health and Medical Services. The organization of the department has been regionalized by the establishment of seven regional offices throughout the province managed by a District Medical Health Officer (DMHO) or regional manager. Included in each office is Public Health nursing staff, a medical officer, nutritionist, and inspectors that deal with water supplies, sewage disposal, and inspections of restaurants, food processing plants, and schools.

The New Brunswick Department of Health and Community Services has the authority for approval of on site sewage disposal systems throughout the province with the ultimate authority resting with district medical officers or the deputy minister. Public health inspectors working out of the regional offices carry out the inspections and on their recommendations the DMHO will or may approve the system. The department works in conjunction with and coordinates the approval process with other provincial departments in both incorporated areas and unincorporated areas of the province. Coordination is normally with the local planning jurisdictions which may be municipal or provincial planning agencies which operate under and administers the Community Planning Act in the province. The Department of Health also works closely with the New Brunswick Department of the Environment who has a role with respect to well construction and water rights. Under the Health Act there is a section dealing specifically with potable water supplies for various purposes in the province and the District Medical Health Officer has authority for approving, recommending treatment or closing of a well or a spring used as a water supply.

For any on site sewage disposal system in the province, an application is required by the proponent for such a system and this application is

submitted to the local public health inspector with payment be for processing. Following inspection of the site and discussion related to design approval is given by a health inspector to install such facilities. The actual construction and installation of on site sewage disposal systems are carried out by installers who are also licensed by the New Brunswick Department of Health and Community Services. During this inspection and approval process, the inspector and the installer often visit the site and agree on the type of system that is considered to be the best for the conditions. Following installation of the tanks and drainage field the inspector carries out an inspection of the installation prior to closure or covering of the field. In some areas of the province a building permit is not issued to a proponent without an application for an on site disposal system.

2. Identification of Policies and Regulations

The Act, regulations, policies and guidelines in New Brunswick that regulate the design and use of on site systems are those that are outlined in the Public Health Act. This Act and the regulations persuant to it are referred to as Regulations 88-200 under the Health Act of OC 88-800 filed September 1988. Included in these regulations under the Health Act, is a list of the seven districts in the province through which the act and regulations are administered. These regulations deal with abattoirs and meat, maintenance and operations of abattoirs, milk production, as well as, the transportation and pasteurization of milk, the medical inspection of school children, notifiable diseases, food service establishments, sanitary facilities, fluoridation, transportation of dead bodies, potable water supplies, and on site sewage disposal systems. This is the range of activities that staff in each of the regional offices deals with on a day-to-day basis.

Specifically related to on site sewage disposal systems, Regulations 88-200 include two schedules: schedule A and schedule B, which identify minimum size of building lots and the estimated sewage flow for various types of buildings respectively. The minimum lot size in New Brunswick for on-site sewage disposal is one acre with a minimum width of 180 feet. Lots that were approved prior to 1976, and do not fit these size requirements may be approved under the grandfather clause. Using the new policy and regulations, before any on site sewage disposal system is installed the suitability of the soil shall be determined by the performance of (1) percolation test, (2) soil evaluation test, and (3) other tests which a district medical health officer may approve or request. All of the above is done under the direction of a Public Health inspector.

There is also a practising policy with respect to permissible variance which the district medical officer may from time to time deem acceptable and approve a reasonable variance with respect to dimensions. This reasonable variance is considered approval and may be granted if such variance would not cause a nuisance or conflict with the intent to this regulation. In addition, under the reasonable variance policy larger

lots and longer widths may also be required on the judgement of the district medical officer if there is evidence that the site may cause pollution to ground water or other water sources or cause health hazards or nuisances.

3. Identification of Technical Concerns

During the discussion of technical concerns with respect to including garden suites to a house property the discussion focused on the loading and the conditions of the host house system. The technical considerations of interest to the public health inspectors would be the soil type, water table, depth to the bedrock, slope, drainage conditions, and zoning of the area. The history of the site including the technical aspect of construction, size of tank, length of tile pipe would also be considered in evaluating such a site for an additional connection.

4. Fresh Water/Hydraulic Loads

In determining hydraulic loads for systems in New Brunswick, references are made to schedule B of Regulation 88-200. In this schedule B types of buildings are listed with the estimated sewage flow. The lowest flow is for a one bedroom dwelling unit with 750 liters per day and the highest load is for a laundry facility with a flow of 1575 liters per day per machine. In 1976, hydraulic loadings for senior citizen housing were estimated at one hundred gallons per unit per day.

Mr. Brophy's experience in the field with monitored flows of sewage at senior citizens units has shown flows are not necessarily less than flows estimated for one bedroom dwellings. Schedule B of The Regulations do not include loads for senior citizen units. Flows measured from senior citizens units are more in the range of 450 liters per day per unit and not the estimated flow of 750 liters per day per dwelling unit. A policy the Province developed in 1976 uses loads of 450 liters per day for a senior citizen unit.

Under Section 238 of the regulations a district medical health officer may permit a reasonable variance from the requirements of lots on which mobile homes are planned for temporary location. For approval of this variance on compassionate grounds written application is required to the district medical health officer. There is also flexibility on the approval of on-site systems for the use of holding tanks on small lots. There is currently a new protocol being prepared by the department regarding holding tanks. Included in this protocol will be requirements that the tanks meet with CSA approval, that they be equipped with an alarm port and a clean out. A copy of this protocol will be forward to us when it is available.

Although there is no consideration of water conservation under these regulations, it is intrinsically included under Section 238. This section does allow a fair amount of flexibility in dimensions and type of

system for approval for uses other than family dwellings. A comparison may be drawn between a temporary mobile home, which is used as a second residence for the use of a parent or grandparent or another member of the family, and a Garden Suite.

5. Pollutant Loads

Currently there are no special requirements or considerations applied in New Brunswick with respect to pollutant loads other than the estimated sewage flow from the type of buildings identified in schedule B. The use of water treatment back wash, whirl pools, garborators, and other modern technical conveniences that may affect the loadings of an on site sewage disposal system are not included or considered in any of these policies, regulations, or guidelines as applied in New Brunswick. The department has published a pamphlet for home owners who rely on site sewage disposal systems in the province. This pamphlet covers the "does and don'ts" of selecting sites, design, construction, operations, and maintenance of on site sewage disposal systems. A copy of this pamphlet will be mailed to us since none were readily available at the time of my visit.

6. Proposed Calculations and Procedures

Under this section dealing with proposed calculations and procedures for estimating and assessing the capacity and condition of host homes systems, the most important parameter considered by public health inspectors in the province of New Brunswick is the type of building and the number of bedroom included in the house. Schedule B lists all the types of buildings and the estimated sewage flows, and public health inspectors follow this closely. Also the length of pipe and size of the field are determined on the basis of these estimated sewage flows and the percolation rates as measured under direction of the public health inspector. On sites that are considered difficult with respect to high water table, shallow overburden, bedrock, and clay soil, more frequent test holes are used for observations to augment the percolation test results.

7. Other Technical Obstacles

One of the major problems raised by Mr. Brophy regarding other obstacles relates to the fact that often there are no records available for sites, especially the older properties or systems that have been installed prior to 1967. For sites where records exist the inspector would check for the design, type of construction, field conditions, age of the system, drainage characteristics of the site, and frequency of pumping of the tank over its period of use.

8. Conditions and Limitations

Under this heading of conditions and limitations may be required to satisfy concerns of the health department, the best approach suggested is to evaluated each case on its own merit. This would include the evaluation of soils, drainage, type of system, design, how it was constructed, its history of performance, the age of the system and the estimated loadings that is going through the system.

The greatest apparent opportunity in New Brunswick for garden suites may be under the specific reference to mobile homes for other members of the family as covered in section 238. If the concerns of other regulatory agencies are being addressed, ie. environment zoning or other planning aspects, and in Mr. Brophy's opinion, if the site and system satisfy the public health inspector and the public health department then it is approved.

To help insure that the Act and Regulations are being interpreted and applied uniformly across the province the Public Health Inspector Advisory Committee arranges for the 7 district regional offices to meet quarterly to review policies, problems with administering the Act, new protocols that have been developed, and interpretation of the Act and regulations.

To assist in this uniformity of application of the regulations an orientation manual is being prepared for public health inspectors in the province of New Brunswick. Also since 1988, it has been a requirement that installers of on site sewage disposal systems be licensed by the Department of Health. The Department also provides training for installers and plans are underway to develop a training manual for installers of these systems in the province. Licensed installers are required to relicense annually and to pay an annual fee of $125. The practice has been that the installers work with and coordinate activities with public health inspectors. Also for the proponent to apply for an on site system, the Department requires an up front fee of $100. Both the installers fees and the proponents fees are paid without any major objections.

9. Other

The Department and the District Health offices circulate copies of their brochure of the "do's and don'ts" of selecting, designing, and operating an on site sewage disposal system. They see a continuing need for education of home owners on the care and maintenance of on site sewage disposal systems. Common problems related to lack of care and damage to systems include equipment damage during landscaping of properties over a field that encourages ponding of water, planting of trees and shrubs on top of a field which tends to clog or interfere with the drainage of the tiles, and the driving and or parking of vehicles on top of the field which compresses and damages the tile system.

REFERENCES

1. Regulation 88-200 under the Health Act, 1988.
2. Regulation 91-115 under the Health Act, 1991.
3. Septic Tank Disposal Systems, 1989, Health and Community Services.
4. Holding Tank Policy, 1992, Health and Community Services.

APPENDIX A3

INTERVIEW WITH NEWFOUNDLAND & LABRADOR AGENCIES

MINUTES OF THE MEETING WITH THE NEWFOUNDLAND AND LABRADOR DEPARTMENT OF HEALTH OFFICIALS REGARDING THE PROJECT DEALING WITH THE TECHNICAL IMPEDIMENTS TO THE USE OF EXISTING ON SITE SEWAGE DISPOSAL SYSTEM OF A HOST HOUSE TO SERVE A GARDEN SUITE ON THE SAME PROPERTY

AT THE DEPARTMENT OF HEALTH OFFICE

ST. JOHN'S, NEWFOUNDLAND

DECEMBER 4, 1992

Present: Dave Rogers, Acting Provincial Director, Environmental Health Services Division

Terry Hennigar, CWRS

1. Introduction

The generalities of the project with the Canada Mortgage Housing Corporation (CMHC) regarding the technical impediments to use of the existing on site sewage disposal system of a host house to serve a garden suite on the same property were reviewed with Mr. Rogers. The background to the development of this study was reviewed as well as the objectives and timing of the work to be carried out. The scope of the study includes a review of the on site sewage disposal policies and regulations in the four Atlantic provinces. This meeting is the last of a series of meetings with the various officials throughout Atlantic Canada. The purpose of these meetings has been to determine the mandate, administrative setups and technical considerations of the approval process for on site sewage disposal.

A copy of the proposal was given to Mr. Rogers in November for his review and preparation for this meeting. The discussion that followed during this meeting was focused on item 4 entitled "The Deliverables Related to the Requirements of the Centre for Water Resource Studies" to complete this study for CMHC. In particular the discussion focused on item 3 of the Deliverables dealing with the eight categories of what is required in the conclusions and recommendations related to the policy and concerns with servicing garden suites from a host home system.

Mr. Rogers indicated that provincial officials are developing a new policy with respect to garden suites. Although they have had no applications yet for the provision of garden suites, they hope to have the new policies and procedures in place by the time the applications begin. He indicated that there is a need for a consistent approach to the assessment of a site for provision of garden suites in all the management regions of the province. Part of this approach will include an assessment of the existing house system using data available on file as well as a site visit.

1. Identification of Agency or Agencies in Each Province

The divisions of approval for sewage systems in Newfoundland are divided between the Department of Health and the Department of Environment and Lands. For systems designed to handle less than 1,000 gallons per day, the Department of Health is responsible for approval providing the design concept and inspection of such facilities. Where systems are expected to generate more than 1,000 gallons per day, the responsibility of approval goes to the Department of Environment and Land. For the establishment of garden suites in Newfoundland applications will be directed through the Newfoundland and Labrador Department of Housing who will refer the question of on site sewage disposal to the Environment Health Services Division of the Department of Health. This division is responsible for administering the regulations under the Department of Health Act for site investigation, design, and approval of on site sewage disposal systems. Most sites are inspected but because of shortages of staff not all systems areinspected before they are covered. For properties that are being mortgaged, most financial institutions now require an inspection of the system prior to covering. Mr. Rogers estimated that inspections are carried out on approximately 80% of the systems in the province prior to their covering.

The public health inspectors in the Environment Health Services Division throughout the province are organized in five regions; namely St. John's, Eastern, Central, Western, and Northern. Each office has a regional director, who reports directly to Dave Rogers. The exception in this organization is the Labrador or Northern region, who report directly to Dave Rogers in his capacity of Regional Director, not only of the province, but also that region. Each region also has a number of district offices that have been set up for more effective enforcement and administration of the regulations under the Health Act. Decisions for approval of a system rest with the Regional Director, who relies on the provincial policies and procedures for arriving at his decision. Applications for new residences and building construction go to the municipal building authorities. These agencies in return refer the application for a new building that will require on site sewage disposal services to the Regional Environment Health office for their recommendation. To assist the health inspectors to arrive at their decisions, to recommend or not, a set of guidelines on policy and procedures has been developed for the assessment of unserviced land for the installation of private sewage disposal systems. A copy of these guidelines were made available by Mr. Rogers and is included in the list of references at the end of this set of minutes. As part of these guidelines and policies, site assessment includes the requirement for a test pit on the site based on the findings and the observations in this test pit a percolation test of the soil on the site may or may not be required. Also under these guidelines lot sizes vary from region to region, from a minimum 20 thousand square feet to one acre. Although the traditional tank and drainage tile field is used, the province is also considering alternative methods of on site disposal such as the contour trench system. This review and approval process of health officials is

coordinated with the municipal building agency, who is ultimately responsible for issuing the occupancy permit.

2. Identification of Policies and Regulations

The authority for approval for on-site sewage disposal systems in Newfoundland comes under the Department of Health Act, a copy of this is being obtained from the Queens Printer. There are two sets of regulations pursuant to the Public Health Act that relate to sewage disposal. Regulations cited as the Department of Health sewage disposal system regulations 1985 were passed pursuant to the Health Act. These regulations deal with the installation of on site sewage disposal systems as well as the manufacturing and prefabrication of sceptic tanks and other disposal system components.

The Environmental Health Service Division has prepared a set of guidelines on the policy and procedures to be followed for the assessment of unserviced land for the installation of private sewage disposal systems. These guidelines include developments of cottages, recreational, residential, small commercial, and temporary construction where sewage flows are less than 1,000 gallons per day. These guidelines include subdivision development, lot assessment, assessment of existing services, water service hook-ups, alternative methods of sewage disposal, specifications, and inspections. Included in these guidelines are standards of accepted practice for the location, design, construction of private sewage disposal systems.

The Environmental Health Services Division is also developing policies and procedures to more effectively and uniformly deal with garden suites and the provision of water and sewer services for these facilities.

3. Identification of Technical Concerns

During the discussion on the technical concerns of the responsible agency, discussion focused on the condition of the existing system that services a host house and whether or not it is operating at or near capacity. The specific items of interest to Mr. Rogers included the history of the site, the number of people in the host house, and the original design capacity of the host system. Also of interest is whether or not the system was inspected prior to covering. Basically it will be a judgement call by the public health inspectors regarding the level of use or capacity and that will be based on the occupancy of the host home at the time of application. The arrangement provincially for the garden suite applications is for these to be processed through the housing department and referred to the Department of Health.

4. Fresh Water/Hydraulic Loads

The discussions related to the hydraulic loading used for system design of the host home revealed that loadings are based entirely on the number of bedrooms for that house. For garden suites a figure of 50 to 100 gallons per day per person is considered a good estimate of water use. Mr. Rogers' estimates based on his experience, uses are the same load for all individuals, regardless of age or economic category. At the moment there is no consideration for allowances made for water conservation practises, such as low flush toilets and low flow shower heads. The hydraulic loads of systems from other uses such as water treatment backwash waters has not been considered because of the low percentage of the use of these systems in the province. Mr. Rogers estimates such use to be less than 5% of the homes with water treatment facilities. The loading from such things as sump pumps, is also not considered because it is not a recommended practice to discharge sump water into on-site sewage disposal systems.

5. Pollutant Loads

The discussion on pollutant loads for on site sewage systems design for a host home and those that would be considered for garden suites follow the same general theme as determining hydraulic loads. The experience in Newfoundland is that for the normal operations of residences the loadings from things such as detergents have been considered in the overall design in the system and they are intrinsically included in the allowances for hydraulic loading. The pollutant loadings from other sources, such as disposal of oils, greases, fats, solvents, to the disposal systems are also not considered because the system is not recommended as a approved method for disposal of these materials.

6. Proposed Calculations and Procedures

During the review of the calculations and procedures dealing with the capacity and conditions of a host house system, Mr. Rogers indicated that the most important parameter considered by the Environmental Health Services Division inspectors is the number of bedrooms and the number of occupants in the host house. For a garden suite because of the temporary nature of this facility it felt that the most important aspect in determining the loading and capacity would be the number of the occupants in the host house at the time of application. No consideration has been given to specific water usage fixtures such as whirl pools, garborators, automatic dishwashers, automatic clothes washers, etc in arriving at a decision.

During the discussion of the procedures at this stage, Mr. Rogers did indicate that there are new guidelines being developed on the policies and procedures for dealing with the approval for water and sewage systems. Existing properties with no records or history of problems, that are being financed by mortgage institutions are of particular interest. These companies are requiring more of an inspection to satisfy

themselves that the property does have an adequate water supply and sewage disposal system.

7. Other Technical Obstacles

One of the main problems raised throughout the meeting by Mr. Rogers related to determining whether the system is adequate or suitable to handle an additional load. Historical records are not always available, nor are the details of the design or construction methods known. Records on systems installed during the past five years are normally readily available and are relatively complete. Also the availability of historical records vary from region to region depending on the storage facilities at the regional offices.

Other aspects of these facilities including those related to zoning are not considered by his public health inspectors but may be referred to the municipal agency in the area where the application is being made.

8. Conditions and/or Limitations

All of the conditions that are inherent in the setting up of a garden suite are based on the facility or the suite being there on a temporary basis. Because of that it is understood by the Department of Health and the Housing Authorities that once the garden suite is no longer used for its intended purpose, it will be removed from the property and the connections to the on site sewage disposal system properly abandoned.

Another condition that might be considered for allowing a garden suite to be connected to the host house on site sewage disposal system is that the tank be pumped on a regular basis, ie on a frequency of once every year.

Another condition that is being considered by Health Officials with respect to garden suite connections to the host home on site sewage disposal system is to require a monitoring system to assess the performance of the on site sewage disposal system over time.

It has been agreed by the Housing Authority and Department of Health Officials that should a site be investigated and found to be inadequate to accommodate the additional load of a garden suite, the housing agency will not pay to have the on site system upgraded to accommodate the additional property.

9. Other

The question of operational maintenance and proper care of on site systems was discussed as factors that will influence the successful performance of an on site sewage disposal system. The Department of Health has produced a booklet entitled "Installing a Septic Tank System" which includes the basic parts of a system including the septic tank,

inlets and outlets, man hole, disposal trenches, as well as the care and maintenance of a septic tank system.

All applications for on site sewage disposal systems in the province of Newfoundland and Labrador are investigated by staff who are certified public health inspectors. In the province there are 42 such inspectors who have a certificate in public health inspection.

The applications for the establishment of a garden suite on a property that is serviced by a municipal water and sewage system will not be handled by the Department of Health. Such applications will be handled by the municipal authority for a decision on water and sewer services.

References:

1. Installing a Septic Tank System, Department of Newfoundland and Labrador Health.

2. Regulations Regarding the Department of Health Sewage Disposal System, 1985.

3. Public Health (Sanitation) Regulations, 1991.

4. Policy and Procedures Prepared by Environmental Health Services Division Regarding Private Water Supply.

5. Policy and Procedures Prepared by Environmental Health Services Division Regarding Garden Suites.

6. Policy and Procedures Environmental Health Services Division Regarding Assessment of Unserviced Land for the Installation of Private Sewage Disposal Systems.

APPENDIX A4

INTERVIEW WITH NOVA SCOTIA AGENCIES

MINUTES

of the Meeting with
Nova Scotia Department of Health Officials

regarding the project
dealing with the

TECHNICAL IMPEDIMENTS TO THE USE OF THE EXISTING
ON-SITE SEWAGE DISPOSAL SYSTEM OF A
HOST HOUSE TO SERVICE A GARDEN SUITE ON THE SAME PROPERTY

at the
Centre for Water Resources Studies

21 October, 1992

PRESENT: Peter Casey, Terry Hennigar, Michael Horwich, and Don Waller

INTRODUCTION

The generalities of the project with Canada Mortgage and Housing Corporation (CMHC) regarding the technical impediments to use of the existing on-site sewage disposal system of a host house to service a garden suite on the same property were reviewed with Public Health officials. The background to development of this study was reviewed as well as the objectives and timing of the work to be carried out. The scope of the study includes a review of the on-site sewage disposal policies and regulations in the four Atlantic provinces and this meeting is the first with Nova Scotia officials to determine the mandate, administration, and technical considerations of the approval process for on-site sewage disposal.

A copy of the proposal was given to the Health officials for their review. The discussion that followed was focused on Item 4, entitled, The Deliverables, related to the requirements of CWRS to complete the study for CMHC. In paticular, the discussion focused on Item 3 of The Deliverables, dealing with the eight categories related to what is required in the conclusions and recommendations relating to the policy and concerns with servicing garden suites from a host home system.

1. Identification of Agency or Agencies in each Province

The fiest item deals with the identification of the agency or agencies in each province in Atlantic Canada that determines policy related to technical acceptability of connection of garden suites to host house on-site systems.

In Nova Scotia the Department of Health is the sole provincial regulatory agency responsible for the approval of on-site sewage disposal systems. In particular, the Environmental Health Division administers The Health

Act which covers the aspects of on-site sewage disposal in the province. Regulations pursuant to The Health Act deal with the design and approval of on-site systems and, in addition, policies and guidelines related to on-site sewage have also been prepared by this Division.

The administration of the Act and Regulations in Nova Scotia are done through seven Health Units in the province, which are made up of municipal councillors and citizens in the area. This Municipal Health Board has the authority for approving on-site disposal systems. The Environmental Health Division makes recommendqations to the Board following inspection of the site where applications have been made for construction of such a system. These inspections and recommendations are prepared by Public Health Inspectors who are employed by the Environmental Health Division. There are seven Health Units throughout the province and each municipality has a Board of Health. Nova Scotia is unique in the Atlantic region in that the Boards of Health actually have the authority, on appeal, to approve these installations. The approvals are presented to the Board by the Inspectors at regular meetings, and each Board has a Planning Authority for these applications. Section 39 of The Health Act allows for an appeal process for those applications that have not been recommended by the Public Health Inspector. The Board makes the decision on whether or not there will be an appeal, and the major considerations with respect to appeals, is the judgment of the public interest of the project vs. the health risk involved in the approval. Approximately 50% of the applications that are processed by the Department are declined or not approved and these are decisions that are made by the Public Health Inspectors following their investigations.

The ealtHe questions of allowing on-site sewage disposal for garden suites is a questions related to The Health Act of Nova Scotia. For garden suites on a site that is served by central sewage, the question of approval then is more one of planning because of the authority of the municipality and Municipal Affairs under The Planning Act.

In summary, the Environmental Health Division recommends that a particular application be approved and these are accepted by the Board of Health. The Environmental Health Division recommendations that are not for approval of a facility may be appealed and that decision for appeal is made by the Board of Health.

2. Identification of Policies and Regulations:

The Policies and Regulations in Nova Scotia that regulate design and use of on-site systems are those as outlined in the Regulations under The Public Health Act. In addition to this Act, there are a number of technical guidelines that have been prepared. These include guidelines for subdivision regulations regarding on-site sewage disposal, guidelines for multiple units for on-site sewage disposal, guidelines for water use re senior citizens complexes. In addition to these, municipal policies and guidelines may also be in affect that are not covered under The Public Health Act. An example of this would be the use of holding tanks

that may be approved through a municipal by-law or policy. These may be approved for special consideration under Section 39 of The Health Act, or for seasonal use. In general, the use of holding tanks are not acceptable or approved by the Department of Health.

3. Identification of Technical Concerns:

Identification of technical concerns of the responsible agency focuses on the condition of the existing system that services the host house. Other aspects that would be considered for technical evaluation would be the design details of the system and whether or not the records exist for the system when it was built. Other aspects include the type of connection, the provision for clean out, the depth of the field, the compatibility with current guidelines, and pipe size, as well as, the long-time assurance of intended use of the system.

4. Freshwater/Hydraulic Loads:

Discussion related to the hydraulic loading used for system design of the host house relates to what might be considered for retrofitting on the host house and the provision of low flush and water conservation units in the garden suite, as well as in the host house. Another aspect to consider in loading is the use of water conditioners, water quality softeners, and the backwash volumes generated which is basically a salt brine and whether this is going into the on-site sewage system. It is suspected that this backwash water, or salt brine, has the potential to interfere with the septic tank operations, as well as, proposes a potential impact to nearby drinking water supplies. Another aspect of hydraulic loading is the piping of storm drainage from the property and whether or not it is piped away from the system or whether it is actually piped into the on-site sewage disposal system.

5. Pollutant Loads:

The pollutant loads used for a system design, both for the host house and the garden suite, covered technical aspects that are very similar to those discussed in Item 4 above. Of particular interest in the pollutant loading is the effective higher concentrations of loadings, especially if there are water conditioning, backwater brines to deal with, and from the positive side, the reduced loading from the application and practice of water conservation in the host home and the garden suite.

6. Proposed Calculation and Procedures:

Under this section, dealing with proposed calculations and procedures for estimating and assessing the capacity and condition of host house systems, the most important parameter considered by Environmental Health Division Engineers is the number of bedrooms included in the host house.

The number of bedrooms in a house is an indication of the total number of people, and therefore, the potential load that could be generated for the on-site sewage disposal system. Particular aspects that could be considered in calculating the capacity of a house system would be the use of water metres and also consideration of water conservation to reduce the load. Specific water use fixtures, such as whirlpools, should also be considered. Other factors to consider include:

. available records supporting oringinal permit
. age of system
. results of field tests (i.e. percolation, dye)
. history of problems at site and in the area
. local soils drainage conditions

7. **Other Technical Obstacles**:

The major point raised by Mr. Casey, regarding other obstacles, related to the fact that there is no good test or proven method to assess the on-site sewage system as to its state of repair or level of efficiency. The most effective test to determine whether there is a problem, other than observing seepage, is the dye test. This test will verify that there is a problem related to the house plumbing, and the seepage areas near the on-site sewage disposal system, normally in the tile drainage area.

8. **Conditions and/or Limitations**:

Under this heading of conditions and limitations tha may be required to satisfy concerns of responsible agencies, the best approach suggested by Nova Scotia Health is to evaluate each case on its own merit. This would include the evaluation of soils, age of the system, the type of system that has been designed, as well as, the estimated loadings that are currently being supplied to the system.

The unknown factor of what new loadings will ultimately be delivered to the system is a concern. For example, will the system that is apparently operating very well with a given load, how will it respond or handle, or will it even fail, with an increased load? Critical factors in this relate to both the tank size of the system, as well as the area of the tile filled. There is no sure way of estimating the current use and the current capacity against the design or install capacity of a system.

It is the present feeling of Health officials that the garden suites could be recommended onpresently serviced lots and not on unserviced lots where on-site sewage disposal concerns have to be addressed. To provide this service for garden suites from serviced lots, does raise questions regarding to The Planning Act, and the National Plumbing Code.

Another consideration of Public Health with respect to approving a garden suite for on-site tie in to host house, would be the size of the property. For example, should a malfunction occur with the additional

loading from the garden suite, is there room on the lot for restoration and repair of the system? In this case, both lot size and soil types will be critical factors in the successful application of the system.

9. **Other**:

The whole question of operational maintenance of systems and their care was raised as factors to consider in the approval process. For example, in maintenance of the system, have the tanks been pumped on a regular basis, and is the slope of the tile drainage field properly maintained to prevent ponding and surface water accumulation?

Care of the System:

Have compounds advertised to promote/enhance performance of the system been used? Also, have materials been flushed to the system that would interfere with its performance? Examples of materials that do not enhance the operation and cause problems with maintenance are fats, greases, oily products, and other "slow to decompose" materials that are flushed down drains. The Department has produced a brochure on the maintenance and proper care of on-site disposal systems and that would be required reading, and become part of the management operation of any system approved for garden suites

OTHER PROVINCIAL CONTACTS

Mark Allen, New Brunswick Department of Health
Rory Francis, Prince Edward Island
Dave Rogers, Newfoundland Department of Health

APPENDIX A5

INTERVIEW WITH PRINCE EDWARD ISLAND AGENCIES

MINUTES OF MEETING WITH

PRINCE EDWARD ISLAND OFFICIALS REGARDING THE PROJECT DEALING WITH THE TECHNICAL IMPEDIMENTS TO THE USE OF THE EXISTING ON-SITE SEWAGE DISPOSAL SYSTEM OF A HOST HOUSE TO SERVICE A GARDEN SUITE ON THE SAME PROPERTY

MEETING HELD AT THE PRINCE EDWARD ISLAND DEPARTMENT OF THE ENVIRONMENT

CHARLOTTETOWN, PRINCE EDWARD ISLAND

DECEMBER 3, 1992

Present: Jerry MacDonald, Dept. of Community and Cultural Affairs
Delbert Reeves, PEI Department of the Environment
James Young, PEI Department of the Environment
George Summers, PEI Department of the Environment
Clare Murphy, PEI Department of the Environment
Terry Hennigar, Centre For Water Resources Studies

1. Introduction

Clare Murphy, Director, Water Resources Division, introduced those attending the meeting and indicated that the responsibilities of disposal systems are handled through the two departments of the Environment and Community and Cultural Affairs. Clare reviewed the activities with respect to these two departments and introduced the topics regarding the interest in garden suites. Terry Hennigar gave an overview of the generalities of the project with Canada Mortgage Housing Corporation (CMHC) regarding the technical constraints and impediments for using existing on-site sewage disposal systems that have been designed and built for a host house to also serve a garden suite on the same property. Some background was given on the work carried out to date at the CWRS and the interest of CMHC in obtaining this information for implementing their new program dealing with garden suites. The objectives and the timing of the work to be done under this study was also discussed. The scope was reviewed with respect to on-site sewage disposal policies and regulations in the four Atlantic provinces. It was indicated that this is the third meeting to determine the mandate, administration, and technical considerations of the approval process for on-site sewage disposal in the Atlantic provinces.

A copy of the proposal entitle "The Technical Impediments To Use the Existing ON-SITE Sewage Disposal System of a Host House to Service a Garden Suite on the Same Property", that was presented to Canada Mortgage Housing Corporation by the Centre For Water Resources Studies was sent to Clare Murphy for his information prior to the meeting. He in turn had distributed copies of this to each member attending this meeting. The discussion that followed was focused on item 4, entitled "The Deliverables Related to the Requirements for the Centre For Water Resources Studies to

Complete the Project for CMHC". In particular the discussions focused on item 3 of the Deliverables dealing with the eight categories related to what is required for in-house recommendations relating to the policy and concerns with servicing garden suites from a host home system. The discussion on these items are as follows:

1. Identification of Agency or Agencies in the province of PEI

This item deals with the identification of the agencies in PEI that determine policies related to technical acceptability of collecting sewage of garden suites by host home on-site systems. In PEI there are two provincial departments that play a role in this approval process. The provincial authority for this process comes through the Environmental Protection Act, under the Department of the Environment. The sewage disposal regulations persuant to this Act are in turn administered through the Department of Community and Cultural Affairs (CCA), in consultation with the Department of the Environment. These two provincial agencies have the sole responsibility for administering the Environmental Protection Act with respect to on-site sewage disposal. The Department of the Environment on various aspects advises the Department of Community and Cultural Affairs to assist in streamlining the approval process.

Building development officers with CCA are required to inspect and approve applications for on-site sewage disposal. The Department of the Environment became involved with problem sites or systems that are recommended as alternative designs from the basic tank and drainage field system. Examples of alternative designs include: contour trench systems and the use of other materials other than granular or aggregate for the drainage field. For sewage systems in subdivisions approval is required for the subdivision by the Department of the Environment. This is for both serviced and unserviced lots. The basic design specifications for on-site sewage disposal is included in the Environmental Protection Act, Regulations for Sewage Disposal, 1988 reference CAP E-9.

Current practice is that the Department of Community and Cultural Affairs wants proof of the system as it is installed prior to approval for use by garden suites. To date approximately 6-10 such systems have been approved on the island and the only requirement has been to upgrade the system by adding more drainage field and tile. In the approval process between these two departments, the building approval is required as well as approval of construction of an on-site sewage disposal system. The building approval is only granted after approval has been given for on-site sewage disposal; however, on-site sewage disposal permits may be issued without the building approval. In PEI twenty municipal agencies also have policies with respect to building and building permits. The current practice for garden suites is that an application is also required through the regulatory agencies and the province treats these applications as a variance to the current regulations.

The provincial Department of Health is not involved in the approval process for on-site sewage disposal but they do get involved in problem systems and faulty systems if there is a public health issue, such as contaminated water supply or sewage flowing into an open water course.

To date the approvals for garden suites in PEI have been done with the understanding that the garden suites are actually owned by CMHC or the PEI Department of Housing. The arrangements between the tenant in the garden suite with CMHC and/or the Housing Corporation is not understood.

2. Identification of Policies and Regulations

All of the conventional on-site sewage disposal systems are designed using the information and the regulations under the Environmental Protection Act sewage disposal RSPEI in 1988 CAP E-9. In these regulations the minimum specific tank capacity and the minimum total length of drainage pipe for a single family houses and duplexes are set out in Table A. The governing factor and main criteria in establishing volumes of tanks and drainage field size relates to the number of bedrooms. The regulatory agencies use the Nova Scotia regulations and guidelines for alternative systems or nonconventional system design on PEI. There are no soil investigations done for these sites and all tile requirements and tank sizes are based on the expected living occupants in the dwelling, which is a function of the number of bedrooms. However, each site is visited and the conditions are reviewed for drainage, slope, lot size, closeness to water courses and near by water supplies. The tank size and drainage pipe requirements are outlined in Table A. They are based on the worst case scenario of on-site percolation results and soil conditions. Appendix D in the regulations cover the technical aspects of the field tank and field layout spacing and hookup patterns.

3. Identification of Technical Concerns

During the discussion of identifying technical concerns of the agencies administering the regulations of on-site sewage disposal, the discussion focused on the condition of the present system that services the host house. Some of the factors that inspectors are particularly interested in include the age of the system, the design aspects, the size of the existing system. In addition they are interested in whether there is room to expand the system on the present lot and whether there are any constraints related to water supply and drainage for increasing the capacity of the on-site system. The history of ground water contamination in the area is also a factor that needs to be considered. Other aspects related to on-site waste disposal including soil type, lot size is also a concern and would be considered. For example, older lots were approved on the island for on-site sewage disposal with minimum size of 12,000 square feet. The minimum lot size today is 15,000 square feet. Other factors that would be considered for the approval process connecting garden suites include building set back, type of water supply, drainage patterns, and land use in the area.

Also included as a technical concern with respect to approval of garden suites and on-site sewage systems would be aspects under the Planning Act which is administered by the Department of Community and Cultural Affairs. This Act deals with subdivisions as well as mobile home courts, summer cottage developments, as well as special planning and conservation zones.

4. Fresh Water/Hydraulic Loads

Discussion on this topic related to the hydraulic loading used for system design of the host house as it is relates to what might be considered for retrofitting from the host house and the provision of additional capacity for he garden suite. All the tank and tile field sizes vary under the PEI egulations. The more important factor in the system is the amount of tile nstalled in the absorption field. Water usage figures on PEI show that sages approximate 175 gallons per day per home based on figures metered in the Parkdale system near Charlottetown.

Based on calculations in Table A in the regulation, the minimum tank size of 450 gallons and 280 feet of drainage pipe are based on two bedrooms. For other types of development these specifications are determined from Table B. In this table developments are listed under the nature of the establishment, whether they be apartments, hospital, mobile home parks, boarding schools, etc.. The original design requirements of the system are based on the number of bedrooms in the host house. The immediate use of that house may be considered if all the bedrooms are not currently being used. In such a case approval for a garden suite may pretty well be a given because the unit is designed for a single person. However, the usage of the host home can change significantly simply by a change of ownership with a new family and younger members moving in. The present policy applied in PEI with respect to mobile homes is that because they are portable they may use the host home system. This is a judgement commonly made by the inspector after sight investigation including lot size and other factors considered above.

The present record keeping system for on-site sewage disposal systems all started in 1979. An application for a garden suite on a property with the system installed since that date may be looked upon more favorable because of the historic information being available for proper assessment; however, the records for installation may be available, but there are not likely any records of problems in operation during that period.

In assessing the hydraulic loading of the facility's on-site factors such as water treatment, sump pump dischargers, downspout water handling, use of dishwashers etc., are factors that may significantly add to the hydraulic loading of the system and not currently considered. Also conservation practices, the use of low volume flushes, low volume shower heads are currently not considered.

As a point of interest, there are no building codes used on PEI except for the city of Charlottetown and the town of Summerside.

5. Pollutant Loads

The pollutant loads used for system design for the host system and the garden suite cover technical aspects that are very similar to those in section 4 above. There are no considerations given at the moment to the impact of kitchen items such as garborators, or the backwash loadings of water treatment systems or the loadings from appliances such as jacuzzis. The current practice on PEI is that septic tank systems require pumping based on loads and types of materials that are currently input to them. Reports from contractors involved in the pumping business report that pumping frequency ranges from one year to ten years. There are no records kept of pumping or of materials disposed of in the systems. There are no regulations or inspections for tank pumping but the Department recommends tanks be pumped every five years.

6. Proposed Calculation and Procedures

Under this section dealing with calculations and procedures for estimating and assessing the capacity and the condition of host systems, the most important parameter considered by the Department officials is the number of bedrooms in the host home. This number is the potential number of residents and the nature of the load the system will be required to handle. Although holding tanks are not approved for normal use they are permitted for special applications such as cottages and mobile homes or in areas for temporary use where they are about to be serviced with central systems.

Current practices and procedures for reviewing and approving the system is to check the records of installation, review the history of problems on the site with both water supply and/or sewage disposal. Other factors to be considered are size of the property being considered. The loadings on the host system are determined by outside interviews. There are no tests available to determine the capacity of the system or whether the system is operating at well below or near the installed capacity of the system. Inspectors upon visits to the sites would do a walk over the tile field to observe particular drainage patterns, leakage, change in vegetation and look at flooding. They would also discuss maintenance practices and problems as well as water quality of the source water and whether treatment is being provided. There is currently no consideration of the impact of backwash brines from water treatment systems and their affect on the operations of the disposal field. In addition, iron and manganese are considered common quality problems. Slugs of iron and manganese slime produced by bacteria and oxygen is also thought to have an impact on the hydraulics of the disposed field.

7. Other Technical Obstacles

Given that the site conditions are adequate the main criteria of the system would be tank, storage capacity, and tile drainage area. Other factors that would be considered include community acceptance, nearby land use, impact on property values, and lot size for example, lots below the current minimum of 20,000 square feet may be restricted to no further expansion. Other factors related to approval would relate to the nature of the water supply and the location of the well on the lot.

The PEI Regulations and Appeals Commission have regulations regarding water supply and sewage disposal systems in serviced subdivisions. This commission has also produced a document dealing with general rules and regulations with respect to water and sewage systems on the island. This group should be contacted and the aspect of garden suites and their use of on-site systems should be discussed with ether Donald Sutherland or Shawn Hogan of 892-3501. This commission would also be involved in the approval process for garden suites wanting to develop on lots with central services.

8. Conditions and Limitations

With respect to conditions and limitations for using on-site disposal systems the regulatory agencies tend to agree with Nova Scotia and New Brunswick that the best approach is to evaluate each case on its own merits. They agree there is no sure way of estimating the current usage and the current capacity against the designed installed capacity of a system.

One of the conditions or limitations for any approval is that the facility and the arrangement be one of a temporary nature. It is also understood that such a facility because it is owned by either CMHC or the PEI Housing Corporation when the intended use of that facility terminates then the responsible governing agency would be sure that the usage has not changed and that the garden suite and the servicing has been discontinued. If this is a condition or a limitation it is one that would have to be enforced by the owner ie. CMHC or the Housing Corporation and not the regulatory agencies because of lack of staff for enforcement by the regulatory agencies will create loss of control of these units for their intended use

9. Other

The question of operational maintenance and care of the system was discussed as factors in consideration for approval. The Department does have a brochure that discusses the dos and don'ts of good management of a system. Also the disposal of materials such as greases, fats, oils, other hydrocarbon products, oils, paints that have a detrimental affect on the system are listed as items for not flushing.

REFERENCES

1. Environment Protection Act, "Sewage Disposal RSPEI 1988 CAP E-9 Regulations"

2. Planning Act, "RSPEI 1988 CAP P-8 Regulations"

3. Planning Act, "RSPEI 1988 CAP P-8"

4. Planning Act, "Coastal Area Regulations Amendment No. EC247-92"

5. Prince Edward Island Municipal Directory 1992 Department of Community and Cultural Affairs