The Planning and Management of On-Site Communal Septic Treatment Systems to Support Clustered Rural Residential Development

by

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DEDICATION

This thesis is dedicated to my parents,
who have shown me the importance of hard work,
dedication and believing in myself.

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ABSTRACT

Rural land in North America has traditionally been a viewed as an endless resource. Because of this attitude, relatively low land values, low levels of taxation, and lack of development standards and guidelines, rural communities have expanded at rates often exceeding growth in neighbouring urban areas. As a result, many rural developments over consume both the natural landscape and the municipal infrastructure that services them.

In an attempt to combat the negative effects of excessive rural development, this thesis explores an alternative form of rural residential development and, more importantly, the on-site sewage disposal systems that service them. The alternative form of development to be examined is the cluster approach. While clustering is not a new or an exotic innovation, if carried out properly, it can enable the creation of a new form of rural residential development that contains the same density as a conventional type development, but consumes less land and requires only a fraction of the on-site infrastructure. In Nova Scotia, the clustering of rural residential developments can be achieved through Comprehensive Development Districts and Bare Land Condominiums and, as such, both concepts will be examined throughout the progression of this thesis.

In Nova Scotia, the *Environment Act, R..S.N.S. 1995*, has recently been amended to allow for the use of cluster on-site sewage disposal systems to facilitate clustered rural residential development. In addition, the implementation of such cluster sewage systems can be achieved through Wastewater Management Districts and Bare Land Condominiums. These two approaches to wastewater management will thus be evaluated to determine which method should be used for new cluster developments and which should be implemented to accommodate failing on-site sewage disposal systems.

Finally, this thesis will recommend that the proper management of on-site cluster sewage disposal systems requires the implementation of a province wide inspection program that would see the privatization of sewage system inspectors as well as the requirement of annual inspections for both individual and cluster on-site sewage collection and disposal systems. Through these management systems, rural residential cluster developments in Nova Scotia will become a viable alternative to current sprawling developments plaguing the rural landscape.

Part I Introduction to Rural Living, Sprawl and the Concept of Clustered Rural Residential Development

1.0 Introduction

As the borders of cities, towns and villages are rapidly expanding, development is being pushed out into their fringes and even beyond into the rural countryside. Commonly known as sprawl, this type of development has often been serviced by public water and sewer, costing municipalities great amounts of tax dollars to install and maintain. With a growing pressure on governments to reduce their budgets, many municipalities have put a boundary in place in an attempt to limit the amount of urban growth. To enforce this boundary, municipal governments are refusing to service developments that fall outside the line. While this has slowed much of the growth, development is nevertheless occurring outside municipal service boundaries. Unlike developments within a serviced area, those outside are most often serviced through private septic treatment and water collection systems.

Traditionally developments, ranging from small scale residential to large scale industrial, which contained their own private means of septic and water servicing, were looked upon as having a potentially negative impact on their surrounding environments. Many septic systems failed due to improper design, siting, installation and maintenance, causing septic effluent to leak into surrounding water supplies. As a result, privately owned and maintained systems had the potential for serious harm. Although negative opinions still exist about the use and promotion of on-site septic disposal systems, in reality, a properly designed, installed and maintained septic system is a positive method of treatment and disposal of human wastes.

Several advances and modifications have been made to private septic disposal systems and when compared to public facilities, may prove to be more cost effective, easier to maintain and environmentally friendly. These systems can help create alternative development patterns where the building footprint of new residential, commercial,

community or industrial developments is actually reduced. By using cluster methods of on-site septic systems, developments can also be clustered together, maintaining an overall rural density while decreasing the total amount of land physically consumed. In particular, the clustering of rural residential developments can be achieved through the proper planning, operation and management of cluster on-site septic disposal systems.

A goal of this thesis is to examine current methods of rural residential development throughout Canada and the United States, including consumption habits and lifestyles. From this, a study on cluster development will be undertaken to suggest methods and techniques regarding how new forms of rural residential development can be clustered together to maximize the advantages of such a land development and consumption pattern. As will be illustrated, a major obstacle to achieving clustered developments is the use of on-site septic disposal systems. As such, the second part of this thesis will take an in-depth look at the components of on-site septic disposal systems commonly used in the province of Nova Scotia and throughout different areas of North America, to determine how these methods can be clustered together to create a system that will accommodate the concepts of clustered development.

From the above research and analysis, the last section will make some observations and propose recommendations for the individual homeowner, the developer, the municipality and the province suggesting how cluster development can be achieved through the proper planning and management of communal on-site septic systems.

1.1 Trends in Rural Development

The gathering of people into rural communities has occurred for centuries, due to the access of safe living conditions, improved communications, and better modes of transportation. During the late 19th and early 20th centuries, the industrial revolution in North America saw a dramatic increase in the immigration of people from rural to urban areas. Large industrial cities developed that consumed the adjacent rural countryside. While this development trend continued well into the 1940s, the period following the Second World War would display a completely different growth pattern altogether.

Shortly after World War II, the Canadian and American economies grew exponentially as did public infrastructure work programs. Because of changing social values and ideals, residential growth began moving outward from city centres into new suburbs, slowly replacing the rural countryside. By this time, returning war veterans and their families began searching for the prime living conditions which included a single detached house, placed on a relatively large individual lot, and surrounded by a white picket fence which opened to permit the new car in the driveway. Although this description may sound ideal, it in truth has led to the destruction of many cities and small communities. The dramatic rise in suburban living has led to increased levels of taxation, inflated property values, wasted resources, excessive land consumption, and a decrease in community cohesiveness. Eventually, to escape these ills of the ever-growing city, people began to move back into rural areas where they sought the benefits of a rural lifestyle. With an increased accessibility to the automobile, added to lower land values and tax rates, moving to rural unserviced areas became very popular and the growth rates of these areas soon began to surpass those of urban areas.

In order to safely accommodate new rural residential development, large individual lots became the standard for housing these moving populations. These large lots were required by provincial and municipal planning policy, as well as for the safe functioning of the individual on-site septic systems needed to accommodate household wastewater.

Large residential lots have been created in a manner that results in the over consumption of land, resources and energy, as well as a disregard for the rural built and natural environments. This type of development is commonly known as rural sprawl, and it must be alleviated before the rural landscape is consumed to the point of depletion. One method of altering current development practices is through clustering.

1.2 Responsibility to Decrease Land Consumption Patterns Through Clustering

The current method of rural subdivision design, reflects both the practice of over-consuming land as well as the construction of excessive amounts of infrastructure, such as roads, and public utilities like water and sewer, if the area is to be serviced by the local municipality. If the area is not connected to public services, then the subdivision will contain individual on-site septic systems to collect, treat and safely dispose of household wastes. To move away from this development form, the idea of cluster development has been proposed as an alternative method of accommodating the housing needs for those individuals moving to the rural countryside.

The idea of cluster development is an old concept that reflects the historical development pattern of many small communities. Instead of building large, separate, unconnected residential lots, clustering in a rural area provides smaller, more concentrated pockets of development that share common spaces and collective ownership of roadways, recreational areas and any private infrastructure. This comparison can be seen through Figures 1.2A, 1.2B and 1.2C. Instead of developing the entire piece of land, the cluster approach contains the same densities as a conventional development while preserving a large portion of the project site in its natural state or as open and common spaces.

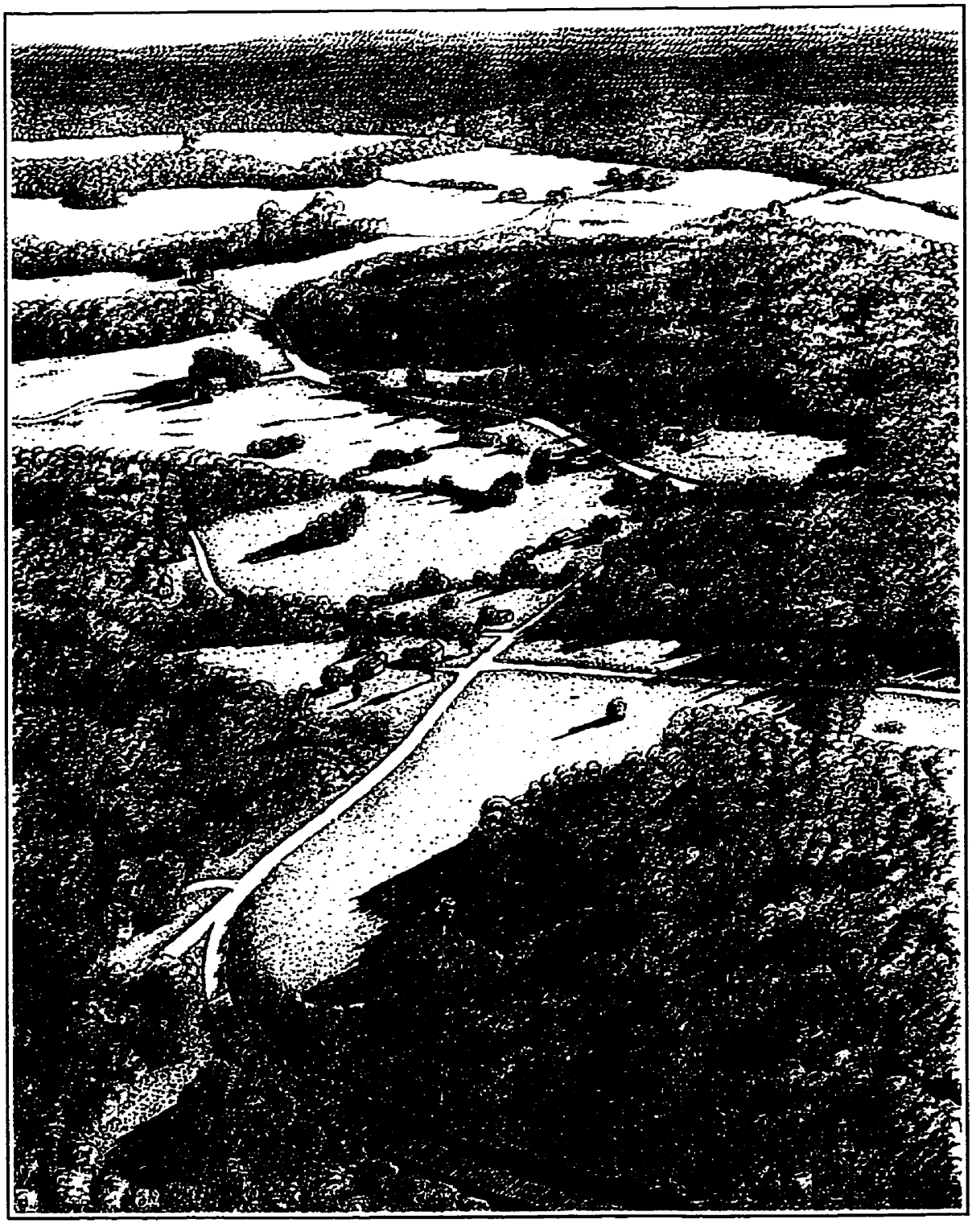


Figure 1.2A Rural Area Before Development

Source: Arendt, 1993.

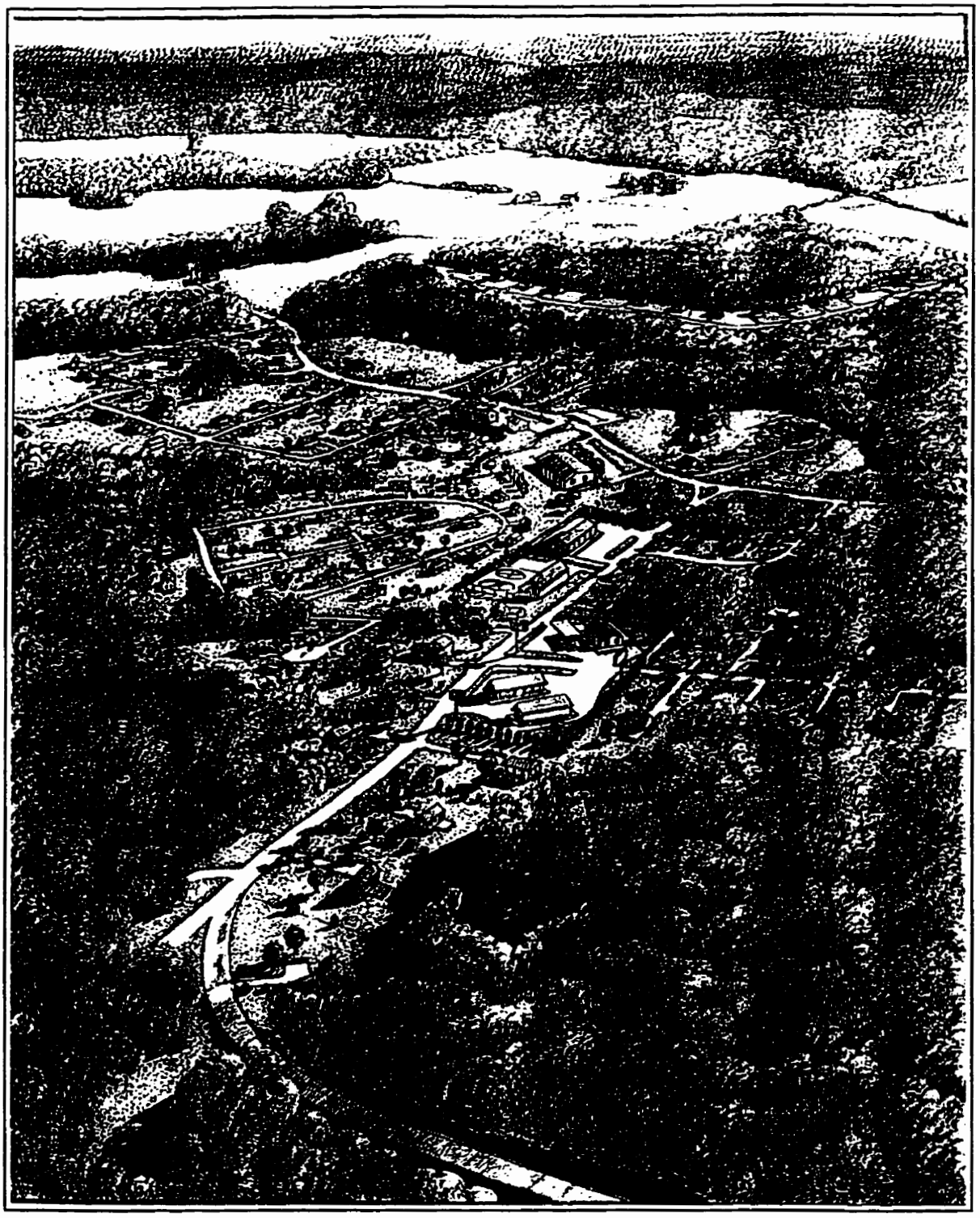


Figure 1.2B Rural Area After Conventional Type Development
Source: Arendt, 1993.

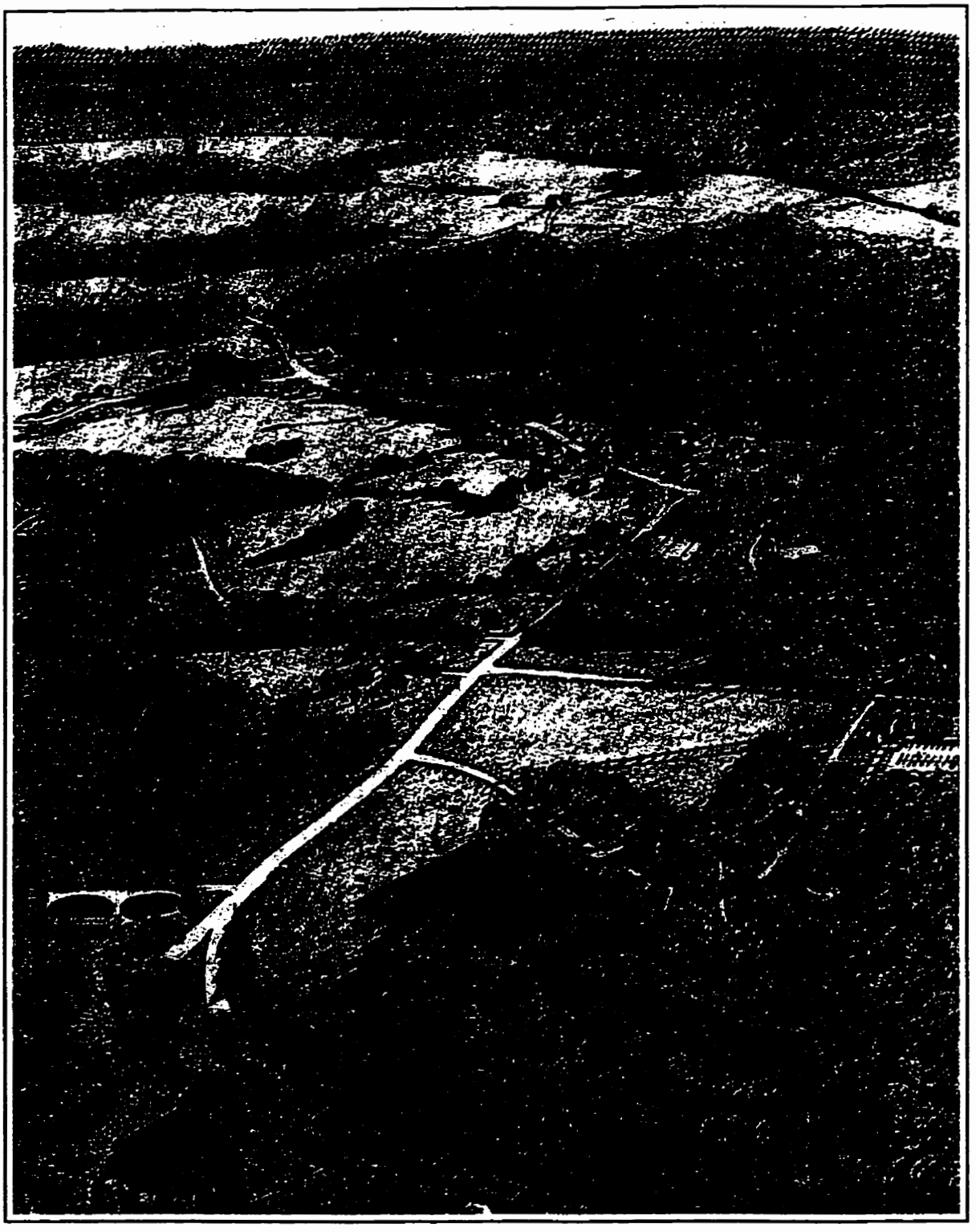


Figure 1.2C Same Rural Area After Cluster Type Development

Source: Arendt, 1993.

While clustering in a rural area may appear to be simple it presents many hurdles that must be overcome before it can be accepted and implemented into standard decision making processes. Some of these difficulties include the need to persuade planning officials and political decision makers of the benefits of cluster development, and changing planning policy and legislation to permit the use of clusters. Finally the most difficult obstacle to overcome is the collective servicing of the cluster developments in rural areas. The cluster concept and how it is implemented into current planning scenarios is explored in Chapter 3.

1.3 Clustering Through Communal On-Site Sewage Disposal Facilities

As an alternative to the conventional methods of rural servicing, the cluster concept depends heavily on the collective servicing of the individual dwellings and buildings in each cluster. Consequently, rather than developing individual septic systems, a rural residential cluster, as illustrated in Figure 1.3, is to be serviced by a cluster septic system that can safely collect and dispose of the wastewater produced by its users.

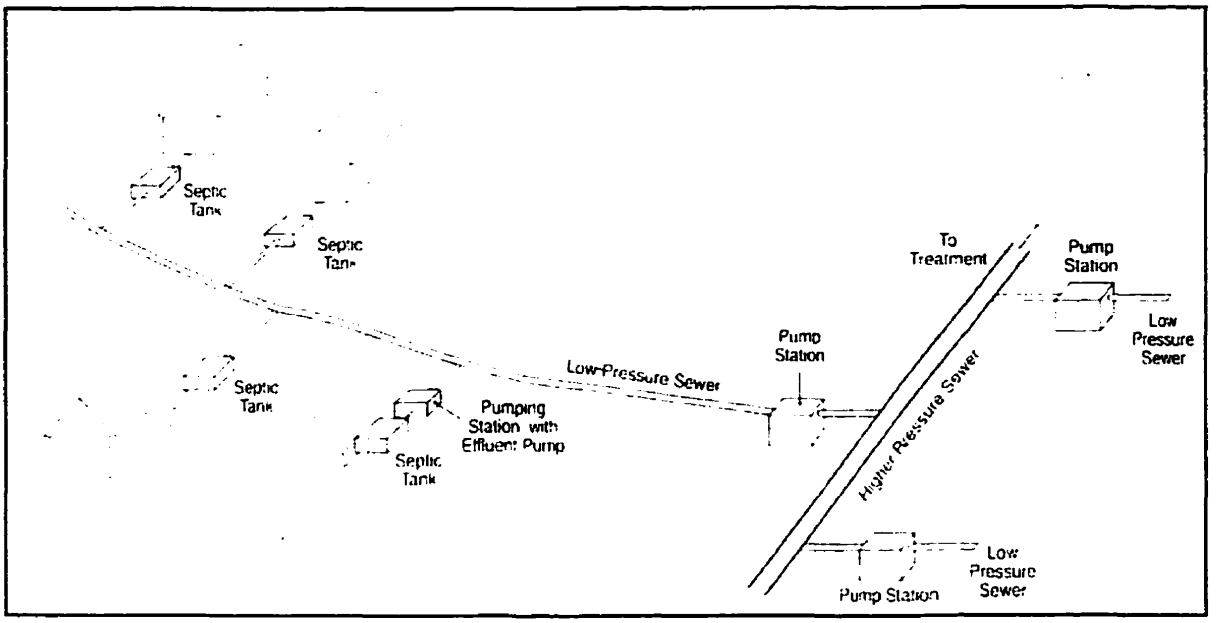


Figure 1.3 Example of a Possible Rural Cluster Septic System
Source: United States Environmental Protection Agency, 1992.

Instead of using traditional on-site sewage disposal systems, clusters can use alternative techniques that may improve the quality and lifespan of the septic system. The components of a cluster system may include multi-chamber septic tanks, aerobic treatment units, sand filters and contour leaching fields, as well as collection systems such as pressure, vacuum or, small diameter effluent sewers. While these alternative communal septic treatment systems may be somewhat more expensive to plan, construct, operate and maintain than traditional septic systems, they are significantly more economical than constructing conventional public services such as large collection sewers and mechanical sewage treatment plants.

The use of on-site cluster septic systems is paramount to the success of rural residential cluster developments, yet problems commonly arise when servicing options are suggested for such a development form. Therefore, the issues of planning, owning and managing a cluster on-site septic system are examined in Part II of this thesis.

1.4 Ownership, Planning and Management of On-Site Sewage Disposal Systems

Traditionally, users of on-site septic systems have been responsible for their ownership and maintenance, but when their systems failed, governments were often forced to step in and either clean, repair or replace them. In some cases, governments have had to form a type of public utility in order to correct faulty systems and put into place a management program that is implemented by the municipality and funded through user fees. In Nova Scotia, this type of program is known as Wastewater Management Districts and has been implemented successfully in three different scenarios.

This method of municipal ownership and maintenance of communal on-site septic systems is currently under considerable pressure due to the lack of financial support and the necessary resources to properly take on such a venture. In light of this, other options must be devised that will place the responsibilities of system ownership and maintenance on the users. A program must be created that will satisfy the needs of both the provincial and municipal governments as well as the residents of the clustered rural community. Two options for user ownership include the creation of Homeowner Associations or that of Bare Land Condominiums. Both options are devised to fulfill the same goals of systems ownership and maintenance, but their legal makeups differ greatly. The primary difference between the two concepts centres on the legal requirements of belonging to an association or a legal corporation. In this case the Bare Land Condominium, or the legal corporation, creates more options for enforcement and legal responsibilities on its members, the system users. These options are crucial for the successful creation and maintenance of a cluster development in a rural unserviced area and will be fully explored in Chapters 5 and 6.

1.5 Implications for the Planning Field

The implications of clustering rural residential developments for the planning field are extraordinary. It requires a fundamental rethinking and reevaluation of current planning practices found throughout Canada and the United States. Currently, municipalities are using Official Plans, Municipal Planning Strategies and Zoning By-laws as tools to implement a planning process that does not permit any type of design creativity or efforts for conservation. Instead of using methods to promote standard "cookie-cutter" residential developments, these documents must be revised to allow for a broader and more diverse approach to land use planning. This would include making provisions for cluster developments in rural areas that would create more timely and effective results.

In addition to reevaluating current planning documents, an important task for planners working in the field of physical land use planning is to understand the workings of communal on-site sewage disposal systems in order to facilitate the cluster development concept. By understanding the different options available regarding methods of wastewater collection and disposal, planners can ultimately enhance their ability to increase the different development possibilities for a particular site. Therefore, understanding the basic mechanics of alternative communal on-site sewage disposal systems will prepare planners to fully understand and promote the concepts of cluster development, and in turn ease the effects of rural sprawl.

2.0 Rural Living and Development

Residential development patterns were historically concentrated in rural areas largely because urban communities had yet to be strongly formed. The cottage industry and agriculture were part of life, and the rural inhabitant was self-sufficient. Over time, industry changed and communities emerged as the concentration of residential inhabitants moved from the rural countryside to the more densely populated urban areas. More recently, the living conditions of the built-up urban environment have deteriorated and because of the automobile, many people have moved back to the rural countryside to escape city living. This movement of people has put pressure on rural areas to develop valuable land and, because the density of rural residential development patterns is extremely low compared with its urban counterparts, many have begun questioning rural development practices.

The purpose of this chapter is to examine the characteristics of rural living, such as the density of developments, lot sizes, and rural living as a choice. This thesis will not focus on the idea of rural character and the attempt to preserve it through various development techniques. Rural living as a choice has many advantages and disadvantages with respect to both the physical environment and to the individual in terms of economic costs and savings. This will be examined simply to depict a specific rural lifestyle and to criticize a pattern of rural development that excessively consumes resources and is not based on the same internalization of actual costs as is urban living. Current publications on rural living will be studied and examples of actual rural experiences will be provided while investigating the current situation in Canada in terms of Development Guidelines, Zoning Regulations and On-Site Sewage Disposal Regulations. This chapter will set the stage for creating an alternative rural development form such as clustering.

2.1 What is "Rural"?

The term "rural" sparks a variety of images in different people's minds. Traditionally, notions of the agricultural industry, sparse population, physical isolation, and low amounts of public servicing would have been the main characteristics separating a rural area from an urban one. In Canada, any community with a population of one thousand or less has always been considered rural in terms of a municipal designation (Dasgupta, 1988, 3). The size of the population, combined with physical isolation, ultimately results in "relatively homogeneous cultures, an economy based on rural resources, and a strong sense of local identity" (Flora, Flora, Spears, Swanson, Lapping & Weinberg, 1992, 6). While traditionally this may have been true, new emigration into rural communities, coupled with access to improved communications and transportation, has resulted in a great change over the last half of this century, reflecting more varied land use, cultures and economies.

Currently, the land uses found in rural areas can be divided into three categories, namely "open space," "rural production," and "rural settlement." Open space areas would contain features such as natural untouched wilderness, grass lands and sparsely populated areas that have little or no economic activity. Rural production areas are defined by a diversity of economies and population, and while these areas may primarily rely on industries dependent on natural resources, they now also include manufacturing regions which house industrial and business parks. Finally, rural settlement areas would include unincorporated areas, urban-rural fringes, villages, towns and small cities. Unfortunately, many of the residents living in these areas do not work within the community and often commute to and from their workplaces daily (Lapping et al., 1989, 2).

A rural community, therefore, may contain most of what is thought to be urban. There is settlement, a diverse economy and varieties of cultures. Rural inhabitants may enjoy some features of the natural environment, but as more people move into rural communities, the environment often must give way for residential, commercial and

industrial expansion. In fact, during the mid-1980s, the United States saw over 4 million people move from urban to rural areas as well as traditional urban-based manufacturing plants have also appeared to have an increasing presence in these areas. (Lapping et al., 1989, 3).

A refined definition of rural would acknowledge that rural living environments have acquired some of the characteristics of urban areas. As such, the main characteristics of a rural area have become physical distance and separation, coupled with a lack of public infrastructure and servicing. People living in rural environments do so in areas where residential lots are typically in excess of one acre which, when compared to the size of urban lots, appear excessive. This leads to physical separation from their neighbours as well as from local amenities. Therefore, the automobile becomes a way of life as these residents must travel to work, schools, stores, hospitals and to other services that are necessary to carry out a normal day (Lapping et al., 1989, 4). It is wrong to assume that the people who inhabit rural areas form a type of isolated local culture, because, as a result of improvements in communication and transportation, they are no longer cut off from the rest of society. For the purpose of this study, then, rural is defined as including areas having characteristics of physical separation from the built urban environments, consisting of developments that are typically not serviced by public water or sewer, and that contain large individual residential lots housing single family units.

This quest for larger living areas, causing a sense of privacy and physical separation from the surrounding environment has contributed to what is commonly known as "rural sprawl." This phenomenon has been a cause of concern for various sectors of society, as land is becoming a scarce and expensive commodity.

2.2 Rural Sprawl

Rural sprawl is the overconsumption of land resulting from the attempt to house residential and industrial land uses. Often "non-continuous, unserviced, unplanned, inconvenient and costly, rural sprawl destroys farms and woodlands, it can block future developments, and it is haphazard and unattractive in appearance" (Ashton, 1997, 6). By consuming excessive tracts of land, both urban and rural residents are paying more for such things as unnecessary road construction and repair, as well as the extension of water and sewer services to areas that were at one time well outside of any districts accommodated by such infrastructure. In addition, this needless waste of land is quickly reducing the total amount of rich agricultural and forested lands available (Thompson, 1993, 20). As a result, the consumption of rural land for low density residential use creates a situation where developments are pushed farther away from the core of the community and, as such, an increased demand for the automobile is created. This, in turn, increases air pollution as the financial viability of public transit or other methods of mass transit are greatly reduced (Thompson, 1993, 20).

Adding to this destructive trend is the fact that decision makers are too often persuaded to believe that by allowing low density developments, they are maintaining and potentially improving the living conditions of rural areas. As a result, low density development is taking place where more physical space (rural land) is required to house and service expected and existing populations. When the physical distance is increased between these developments, the need for parking lots also increases as walking and bicycling are no longer convenient while public transportation becomes too expensive to develop and maintain (Thompson, 1993, 20)

Reinforcing the attitudes of many decision makers is the practice of using conventional methods of zoning as development controls and standards. Not only does zoning designate different permitted land uses such as residential, commercial and industrial, it also sets out standards such as required lot sizes, front, rear and side yard widths, that must be adhered to when developing in a particular zone. Randel Arendt, an advocate for

the protection of rural landscapes and character, argues that "conventional zoning has been accurately described as "planned sprawl," because every square foot of each development parcel is converted to front yards, back yards, side yards, streets, sidewalks, or driveways" (Arendt,1998, 1). Due to this development pattern, planners and developers are left with few options for creative design. In addition, every square inch of a property is accounted for and, often, the only lands preserved in their natural state are sensitive areas like flood plains and wetlands.

The blueprint for development which is set out by conventional zoning by-laws results in the transformation of natural rural landscapes into a collection of "wall-to-wall" subdivisions that reflect nothing of what was once there. Not only is the natural environment needlessly exploited, but the rural character that once existed in these areas is lost to a form of development that has no character or sense of identity (Arendt, 1998, 3). By continuing to use conventional zoning by-laws to design rural residential developments, rural sprawl is not likely to improve. Instead, it is likely to worsen as individual lot sizes in rural areas remain excessively large and ideas for alternative forms of development are discouraged.

Provincial standards for lot sizes in unserviced areas constitute an additional element that have an important impact on rural development leading to sprawl. These standards, unlike zoning by-laws, are put in place to ensure public safety and the proper functioning of on-site sewage disposal systems. By setting standards for minimum lot size requirements, the provincial government ensures that residential dwellings are built in areas that contain the proper type and amount of soil to effectively treat sewage through the use of individual on-site septic systems. Currently in the province of Nova Scotia, the Department of the Environment determines lot sizes in rural unserviced areas by the makeup of the soils and their ability to accommodate effluent discharged for treatment into the surrounding soils. As illustrated in Table 2.2, the minimum lot size currently permitted by the Department of the Environment is 2700 m^2 (just over 29,000 square feet) which is a lot typically measuring 37 metres by 73 metres, while the maximum lot

size required is 9000 m² (just under 97,000 square feet), or 76 metres by 119 metres. Although these minimum lot sizes are required for the proper functioning of an on-site sewage disposal system, they tend to form the basis of large lot development in rural unserviced areas of Nova Scotia. This situation is not limited to Nova Scotia, but extends to most rural unserviced areas throughout North America, which further aggravates the problem of rural sprawl.

Table 2.2 Minimum Lot Size Requirements for Unserviced Lots in Nova Scotia

Source: Schedule "A" of the *Environment Act, R.S.N.S. 1995 as amended 1997*

Schedule "A"
Minimum Lot Size Requirements for Single Unit Detached Dwellings in Utilizing On-site Sewage Disposal Systems[a]

Category	Depth of permeable soil (mm)	Lot area (m^2)	Lot Width (m)
1	greater than 900	2700	37
1	600 to 900	3150	37
1	greater than 600 on a waterfront lot	3716	45
2	300 to 600	4500	53
3	150 to 300	6800	60
4	less than 150	9000	76

The present situation is not irreversible, however. In Nova Scotia, the provincial Department of Environment recently obtained approval of its new regulations regarding on-site sewage disposal systems (Nova Scotia Department of the Environment, 1997). These regulations contain some interesting provisions for cluster septic systems, which service more than one building lot and it is through these new revisions that planners can begin combatting the problem of rural sprawl.

2.3 A Need For Change

Currently, the urbanization of the rural countryside in Canada is consuming land at a rate in excess of the population growth. Too often, it is agricultural land that is excessively consumed. (Canadian Mortgage and Housing Corporation, 23). As economies expand, growth appears in areas such as housing starts, the employment level and individual disposable incomes. In addition, the increase in these activities also raises prices for services and products including land values and taxation rates. Consequently, businesses and residents alike move out into rural areas, where the price for land and taxation rates are lower than in urban areas. This leads to a number of development forms, such as "strip development along rural roads, cottage lot subdivisions along the shores and watercourses, large scale residential subdivisions on former farmlands, and "satellite" industrial complexes relocating to the rural areas"(Graesser, 1997, 4). Developments such as these not only physically alter the rural landscape, but they also have negative impacts on the natural environment and its resource lands.

In Canada, no province has seen the negative effects of rural sprawl more than New Brunswick. In that province, the rural population has been growing at a faster rate than the urban one. This has not been the result of a growing agricultural or fisheries industry, but instead has come about because of provincial policy and development practices (Forbes & Forrest, 1997, 34).

Examining the situation in Fredericton, as example of what can happen if rural sprawl is not stopped, Forbes & Forrest, in their 1997 Plan Canada article "Frustrated in Fredericton" depict the rural sprawl problem as:

- 92% of the total population growth in the Fredericton area between 1976 and 1996 has taken place in unincorporated and primarily unserviced areas;
- the vast majority of housing starts occur outside of the City;
- substantial tax avoidance is realized by property owners who choose to live outside municipal boundaries;
- while a substantial number of people choose to live in rural areas, 93% of the labour force in the surrounding areas commute to work in the City of Fredericton, utilizing city roads and other facilities without contributing financially to their upkeep;
- developers in unincorporated areas are not required to provide public open spaces, recreational facilities, or commercial uses, thereby placing further burdens on the infrastructure of the municipality;
- large, unserviced subdivisions are located immediately adjacent to the City, resulting in pressure for the extension of municipal water and sewer services, public transit, and other city services to non-taxpayers (Forbes & Forrest, 1997, 34).

Rural sprawl, therefore, has a great affect on both the surrounding urban and rural areas. In addition, the large numbers of people that move out from the city are often seeking to be closer to trees, meadows, and other natural areas that are depicted as being part of the rural landscape. These images are usually destroyed, since developers are rarely required to supply open space amenities and, as such, completed rural low density subdivisions resemble nothing more than large lot urban residential subdivisions. Also, once these areas become established, and the urban boundaries begin to encroach on the rural areas, existing rural subdivisions often pressure their local municipality to tie into the expanding public water and sewer services. As municipalities are faced with tough financial constraints, they cannot supply these areas with municipal services, so large sprawling

developments continue to ravage the rural countryside. (National Association of Home Builders, 1980, 28).

The practice of exploiting and wasting rural land to accommodate residential sprawl must be stopped. There are several options available to discourage rural development, including increased development charges, zoning restrictions and the enforcement of development boundaries. However, if the local market continues to support the idea of rural residential development, there must be alternatives that will contain the physical consumption of land developed in rural residential projects. This new form of development must allow for social and economic diversity, environmental control as well as energy efficiency. The best suited type of development to meet these requirements is the concept of clustering (Zsolt, 1994, 3). By creating innovative development plans that encourage clustering dwellings closer together, residential projects can be created that reduce the impact of residential land use on the environment, conserve construction and maintenance costs, and, at the same time, provide forms of housing that are adaptable to a variety of family and individual needs (Zsolt, 1994, 5).

3.0 Cluster Development

This Chapter focuses on the idea of "Cluster Development" and how, if used properly, it can produce a significantly different type of rural residential development. This alternative pattern will consume less land and cost less to construct while helping to create a better sense of community among residents when compared to conventional developments. One of the main barriers to achieving a successful cluster type development is the planning and management of an on-site septic disposal system. These problems will be thoroughly examined in the chapters to follow, and this study will be concluded by suggesting methods to solve the current challenge of providing and maintaining on-site septic systems in cluster rural residential developments.

The above objectives will be achieved through the study of relevant planning literature and by comparing the theoretical approach of cluster development to the conventional methods of rural residential planning currently practised. This will include an examination of current planning legislation in Nova Scotia as well as in other parts of Canada.

3.1 What is Meant by Cluster Development

Cluster development may simply be defined as grouping new homes and other structures supporting residential activity together on one part of a development site, so that rest of the land may be left in its natural state. This new living environment would provide an attractive and comfortable alternative to conventional rural residential subdivisions that waste the land and its natural surroundings (Arendt, 1998, 2).

In a rural residential cluster, dwellings may take several different forms, such as single detached dwelling houses, semi-detached and row housing, and are grouped close together. Often they are centered around a public court yard, an open space public area, at the end of a cul-de-sac, or around a a short loop street. By attempting to make the most effective use of the natural environment, clustering preserves natural areas, reduces overall

construction and maintenance costs, and allows for the same residential density as a conventional rural subdivision. Clustering development attempts to solve problems such as, "high development costs, high energy costs, lack of natural green space, monotony of endless rows of rectangular lots, and no sense of community or neighbourhood" (National Association of Home Builders, 1980, 30).

Properly planned and constructed rural residential cluster projects will also allow a developer to be creative with natural elements such as topography, natural stands of trees, and rock formations to create community focal points, viewscapes, wind breaks and orientations that will receive the most amount of sunlight (Whyte, 1964, 14). In addition, development sites that contain areas with a seasonally high water table, steep slopes, shallow bedrock or any other type of restrictive characteristic can be avoided as the residential cluster can be constructed in other more pleasing settings. This also has the potential for avoiding the development of standardized lots which inevitably lead to a checkerboard style of lot formation (Arendt, 1993, 209).

The cluster concept can alter the style and pattern of rural residential development, but the success of such a development scheme will depend on the support it receives from planners, engineers, architects, municipal and provincial decision makers, developers and, most importantly, the public. There are several advantages and disadvantages to the cluster theory, and in the final analysis, public perception will ultimately determine the overall success of rural residential clustering (Whyte, 1964, 8).

3.2 History and Theory of Cluster Development

W.H. Whyte, an author who studied the concept of cluster development, illustrates that the idea of clustering development together is not new. In fact, the first basic principle of community design was to form a tight-knit cluster of dwellings. As a result, villages of the earliest cultures were defined by clusters of individual dwellings that acted together to form a type of defensive communal structure, enclosing an area of open community

space. Each individual dwelling that opened onto the public space increased the level of community cohesiveness while allowing for better levels of communication and security (Untermann & Small, 1977, 3). This principle was mimicked in the creation of the mediaeval village as well as the early New England town (Whyte, 1964, 11).

Around the turn of the century, clustering occurred as a way of life. By 1910, the nostalgic American image of the homestead portrayed towns and cities that had characteristics of clustered development (Whyte, 1964, 11). As the cities and towns grew in population, many houses began to be constructed farther away from the centre of the community and more isolated from communal spaces. In addition, the city was becoming a planned form of settlement. Ignoring topography and the natural characteristics of an area, the informal pattern of growth became more formal as streets were laid out in the popular rectilinear grid pattern. As a result, the cluster form was replaced by the "city block," and the unplanned development of the cluster was abandoned for the "discipline of the block" (Untermann & Small, 1977, 4). This trend continued throughout the 1920s and 1930s as a neat, rigid gridiron layout was used. It became the preferred urban design form, mostly because it was easier for surveyors, engineers and lawyers to deal with (Speed, 1969, 7).

Another trend emerging during this period saw the growth of suburban development as America's wealthy society yearned for the home in the country or the suburbs (Whyte, 1964, 11). As the wealthy moved away from the city, boroughs were established which looked as if they were "run through a chopping machine and came out houses, fire hydrants, curbs, gutters and sidewalks all rectilinear and the same size" (Speed, 1969, 7). This pattern slowed during the 1930s and 1940s, but by the 1950s, the popularity of the suburbs re-emerged. Developments were, for the most part, cloned from past projects, but lots were getting bigger, houses were becoming larger, and the only open spaces left to be shared by the residents were the streets.

The 1950s also experienced a growing urban population that spilled out into the rural countryside causing a great surge in suburban development. Therefore, the move to the suburbs and rural areas to enjoy "regular contact with out-door light and air, farm scenes, animals, fields, trees, birds, warmth and free skies" was lost as the countryside was being consumed in an unstoppable momentum (Speed, 1969, 2). As a result, rural and suburban growth pushed farther away from the urban centres, causing developers to spend more to develop and service the land. This, in turn, resulted in higher housing prices and lower returns for the developers. In addition, municipal governments were also forced to increase taxes in rural and suburban areas so that operating budgets could be raised to supply the necessary maintenance and repair to the infrastructure needed to support such developments (Whyte, 1964, 12).

The trend to move into rural areas is still present, although less dominant. Because Canada and the United States have reached high levels of national wealth, residential growth continues to expand in unserviced rural areas. Due to "increased wages, shorter working hours, decentralized industry, universal automobile ownership and better roads," moving to outlying rural areas appears to be attainable for large numbers of middle and upper class families (Speed, 1969, 2). As such, the conventional large lot form of rural residential development continues to be the main cause of rural sprawl.

Although the existing situation looks bleak, there is a change in the development industry that is beginning to gain momentum. It is the return of the cluster principle in rural residential design. As developers realize that there is the potential to put the same number of residential units on a piece of land as when developing in a conventional manner, slowing the effects rural residential sprawl can be achieved. These new rural clusters can be created to provide better living environments than conventional rural subdivisions, while providing alternatives solutions for construction and maintenance of items such as roads, public spaces and water collection and sewage disposal facilities (Whyte, 1964, 8).

Although the cluster concept can be found in many alternative planning policies and practices such as density zoning, planned unit development, environmental planning and conservation subdivisions, it must nevertheless be analysed for its advantages and disadvantages in today's development industry (Whyte, 1964, 13).

3.3 Advantages to Clustered Forms of Rural Residential Developments

When examining the concept of cluster development in rural areas, it is important that the advantages to such a change in planning techniques be fully understood. At a glance, the construction of a cluster type subdivision has great potential for both developers and buyers. Residential projects enhanced by attractive park-like settings, protected viewscapes and an increased sense of community spirit and security are easier to sell and tend to appreciate faster compared to the standard "cookie-cutter" developments. While this appears to be the most prevalent advantage over conventional developments, cluster developments also offer broader advantages to the environment and society as a whole.

According to Andrew Paton, a Planner with the Nova Scotia Department of Municipal Affairs and Housing, the overall advantages of creating new cluster type development in a rural environment include:

- addressing environmental constraints - only a portion of the site is developable because of things such as steep slopes, shallow depth to bedrock, flooding, wetlands, etc;
- protecting the environment - in order to preserve or maintain a part of a site (which may have environmental significance), development is carried out on only a portion of the site, leaving the rest of the site undisturbed;
- minimizing infrastructure capital costs - roads, sewers, water lines and other infrastructure are costly, in reducing the need for this by locating development on only a portion of the site, development costs are reduced;

- reducing infrastructure operation costs - with less extensive piped services and roads, the requirements for upkeep and ongoing activities such as snow plowing, periodic road resurfacing and garbage collection will be reduced;

- utilizing valuable site characteristics - since development is clustered it can be located so as to take advantage of a valuable site attributes such as viewscapes, treed areas, or open natural spaces;

- preserving the natural landscape - protecting certain aspects or attributes of the landscape that are of value, for example preserving the rural landscape character of an area (Paton, 1995, 12).

As well, the National Association of Home Builders (1980) discusses other advantages created by cluster developments:

- clustering allows a better mixture of unit types and densities, single family detached and attached units;

- provision of open space means less environmental disturbance, more existing natural resources especially when trees are left in place;

- the creation of open space affords the opportunity to channel and retain storm water through the use of grass swales and ponded areas. This approach to using natural drainage systems as a method of storm water management can eliminate and/or reduce the need for curbs and cutters, inlets, head walls and pipes (National Association of Home Builders, 1980, 31).

An additional benefit of clustering is the creation of flexibility and diversity in the makeup of the residents. As development scales and densities are becoming more understood as influential factors for development, planners are realizing that there is a need to balance individual privacy while enhancing public safety. This can be accomplished through the cluster concept by ensuring a sense of public safety, while leaving large open spaces to allow for individual privacy. In addition, through the use of different housing types available in a cluster, such as single detached dwellings, semi-detached and row housing,

the social makeup of this pocket rural neighbourhood can be diverse enough to attract residents from different social and economic backgrounds. This will enhance the living environment while bringing different walks of life together to form a solid communal environment (Untermann & Small, 1977, 1). When planning a development, whether in a rural or an urban setting, planners must realize that they are not simply physically creating a housing project, but should also be creating a sense of community. This task can be made easier through the use of clustering.

Of the benefits mentioned, the two most prominent advantages to clustering rural residential developments are the benefits to the environment and the economy.

3.3.1 Benefits to the Environment

The natural environment has become one of the most valuable and sought after commodities in today's development industry. But the traditional patterns of development and land use are leading today's cities and communities into a future that will be unable to accommodate the needs of its inhabitants, and alternatives to current development practices must be developed. As a response to the urgency of a shrinking natural resource base the concepts of sustainable development and sustainability have emerged. These new ideas challenge individuals, communities and entire nations to rethink their traditional approaches to planning and development practices and to consider the long-term implications of their decisions. One of these alternatives is the revival of cluster development. This concept recognizes that the environment and its resources should become paramount in the decision-making process, which is, in essence, the most important principle to sustainable development.

By making the natural environment the key feature of a clustered development all the special characteristics of a subject property, from unbuildable areas such as wetlands, floodplains and steep slopes, to developable land that requires additional effort needed for conservation, can be properly addressed and protected. Such features might include

mature or healthy and diverse woodlands, wildlife habitats critical for breeding or feeding, hedgerows and prime farmland, scenic views into and out of the site, and historic buildings in their rural context. The characteristics of a cluster development also add to the possibility of creating a living environment that is one step closer to achieving environmental sustainability, and yet is still affordable for all stakeholders.

3.3.2 Economic Advantages

While environmental protection and enhancement are important advantages of cluster development, the factor that determines how successful a development is still remains the price that the consumer is willing to pay. Often, a problem with developments promoted as the better way to save the environment is that they are too expensive to develop. This problem can be resolved through the implementation of residential designs that revolve around the cluster principle. In addition, clustering tends to produce much better developments when compared to conventional developments, due to a competitive pricing scheme, better use of the natural environment and a generally superior planned and designed housing unit (Whyte, 1964, 13).

Simply stated, building less costs less, not only during the planning and construction phase, but also during the operational stage of the development. Once residents have taken ownership of their cluster community, they often share costs with the municipality for the maintenance of roads (repair, resurfacing and snow removal) as well as the management of infrastructure facilities, such as water collection and sewer disposal systems. If less roads, water lines, sewers or sewage disposal facilities are constructed, the maintenance and repair of these items will be noticeably more economical (National Association of Home Builders, 1976, 116).

Both the community and developers benefit from rural residential cluster developments. The developer enjoys reduced costs, due to minimizing overall infrastructure and the community benefits from good aesthetics, the protection of the natural environment and

the preservation of the rural environment while attaining an affordable residential environment. These benefits are demonstrated in Figure 3.3.2.

As with any proposal for an alternative method of residential design and construction, there are also some practical disadvantages that could potentially discredit the cluster concept before it is even seriously attempted.

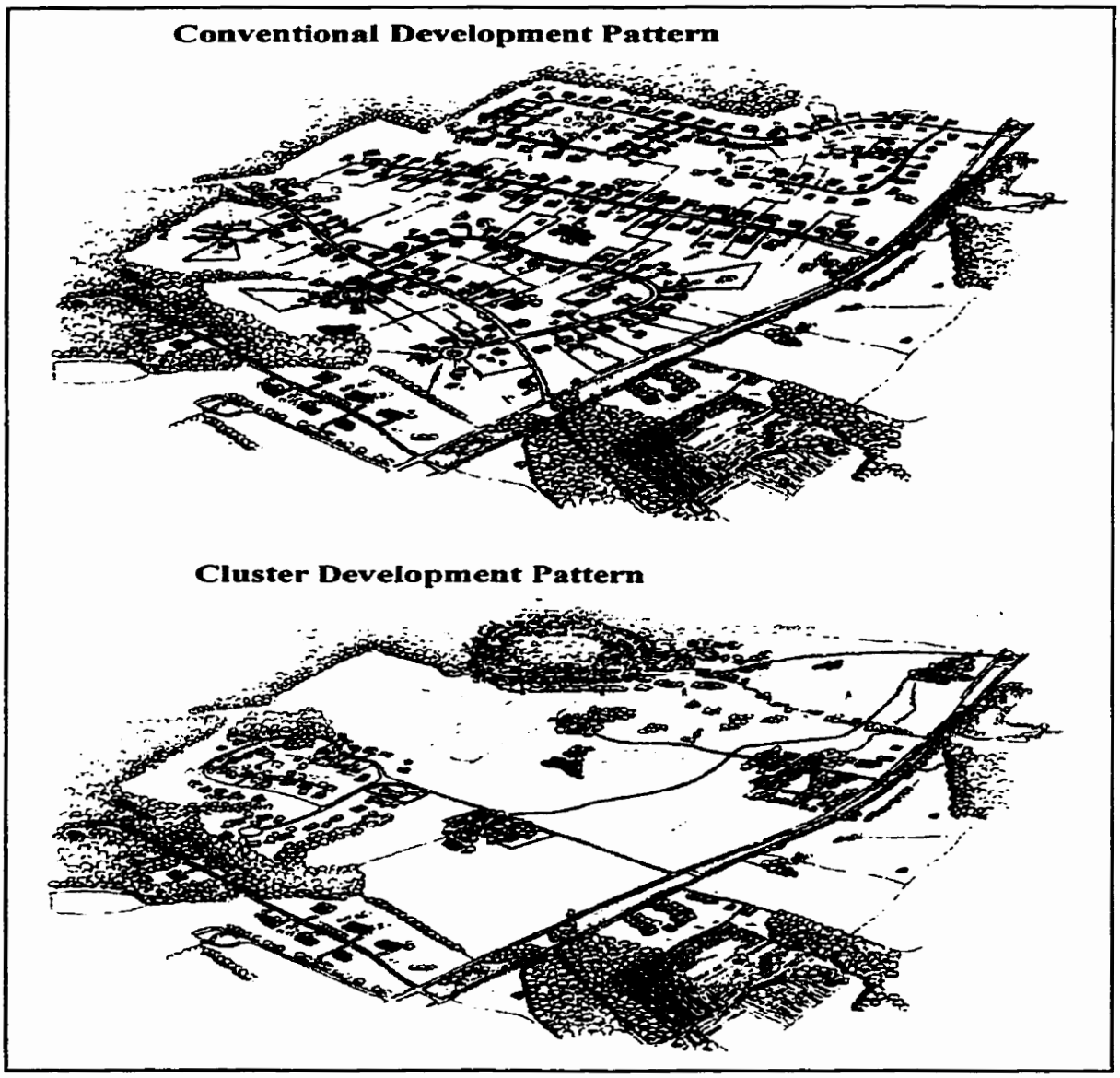


Figure 3.3.2 Comparison Between Conventional and Cluster Development to Illustrate the Reduction in On-Site Infrastructure

Source: Arendt, 1993.

3.4 Obstacles to Cluster Developments

The primary disadvantage of the cluster concept is the likely perception held by local residents of a community in which it is proposed. Although the idea of clustering development together is a rather old and proven theory, North American culture does not currently support it. The public is accustomed to the large conventional developments currently produced and is simply uninformed as to the benefits of clustering. If such a rural development were proposed, residents of rural communities may perceive it as a scheme devised by greedy developers to create a residential project that merely squeezes houses together and abuses the possible advantages of alternative housing forms. Because rural areas are still seen as an endless supply of developable land, residents faced with the idea of clustering may question why this form of development is needed and how it will affect the character and values of the community. The resistance to change in rural areas will have an impact on the decisions needed to enforce alternative development forms, such as changes to local outdated zoning regulations and land use controls which ultimately discourage the idea of clustering (National Association of Home Builders, 1980, 42). If residents of a community fear that the change towards more sustainable developments is undesirable, they will influence their local decision makers to uphold current development patterns and avoid the cluster principle altogether (Canadian Mortgage and Housing Corporation, 4).

Even if the cluster concept is accepted by the existing community, a problem arises with the planning, design and actual construction of this new form of rural development. As most land and housing developers are used to conventional housing projects, they will be unfamiliar with the cluster concepts. This form of alternative development usually requires more experience and business judgment than other commonly practised methods. As such, many developers will be unwilling to experiment with new cluster developments simply because they lack the required knowledge to successfully create and market cluster developments in rural areas (National Association of Home Builders, 1976, 118).

If a cluster development is given planning approval and construction is carried out, the questions of ownership, maintenance and protection of communal and public spaces must also be dealt with. For example, people that move from urban areas into rural areas often do not know how to appreciate or manage open spaces such as streams, valleys or wooded areas. In fact, many urban immigrants going to rural areas may find some of these natural characteristics to be menaces and may not be willing to allow their children to play or venture near them for fear of them getting hurt. As a result, public areas and open spaces can become a major drawback in a cluster proposal (Whyte, 1964, 15). There are, however, methods of addressing this problem:

- to deed open public space to the local government - this is the simplest course of action, but may prove to be the least effective as governments may not want to assume proper responsibility for these areas;

- to set up a special government district, the boundaries of which coincide with that of the development, and deed the land to the district. Such districts are empowered to levy assessments on the residents for maintenance and development of the open space and are legally responsible for these public spaces;

- to create a non-profit corporation consisting of mandatory membership of the homeowners that would be set up at the beginning of the development. It would assume legal responsibility of the area and assess and collect the necessary funds to cover costs due to management and repair of open spaces;

- to enforce legal covenants which are attached to the ownership of each lot within a cluster development. These covenants would outline what is expected by each landowner and how public spaces and common interests are to be owned and maintained (Whyte, 1964, 14).

These ideas can be incorporated into the ownership scheme of a cluster development. The best method of dealing with these issues, however, is to implement an ownership scheme during the planning and design phase of the project. This would result in the setting up of legal corporations such as condominium corporations or homeowner associations to deal with these issues.

Whichever methods of ownership and management are selected, it is essential that all open space and recreational areas in the clustered neighbourhood are protected from any future development. Therefore, during development negotiations, the planning authority should determine what the maximum allowable density of the project would be if it was constructed following conventional development patterns. Once density level is determined, then the entire project site should be rezoned so that the cluster development will contain the same population density as a conventional development. In addition to limiting the density of the development, the planning authority should identify areas that are most suitable for development and protect open spaces and natural areas from future development. This protection can be accomplished either through restrictive covenants or rezonings that could designate any undeveloped land as environmentally protected, nondevelopable, parkland or recreational areas.

It may take a substantial amount of time to plan and construct a project using the concepts of clustering. This may range from the time it will take to develop a market interest for such a housing project, to the time it will take to convince decision makers to change planning legislation and policy to permit such a development, to the time it will take to actually plan, design, construct and sell the actual development. In many cases, obtaining planning approvals may take years, often discouraging prospective developers who may abandon the project in pursuit of other more probable developments (Whyte, 1964, 22). Until planning authorities and decision makers change their current policies and practices to permit the immediate development of rural residential clusters, the length of the process to change policy will inhibit the development of clusters in rural areas.

The last and most difficult problem to overcome is the issue of developing a water and sewer servicing scheme that will facilitate the needs of a cluster development. The main concern when dealing with the issue of wastewater management is that the safe collection and disposal of residential sewage and wastewater must not only be developed through physical infrastructure during the development of the rural cluster, but it must also be effectively managed as the community matures. Unlike the other obstacles to be dealt

with, the effective management of household wastewater must be carried out throughout the entire life of the community (Whyte, 1964, 24). While there are alternative methods of servicing options available to be used in the development of a cluster project, most often, planners and local decision makers are not aware of them. These problems can, however, be overcome and an important focus of this research is to examine the components of on-site sewage disposal systems that could be clustered together, as well as the ownership and management options that can be implemented to successfully achieve the long and safe life of clustered rural residential developments. These issues will be thoroughly analyzed in Part II of this report.

The obstacles to creating cluster developments in rural unserviced areas can be overcome, and, through a consistent push by the planning profession, may be implemented into today's housing market. Although implementation may take some time, the benefits of pursuing such a development form will be well worth the effort.

3.4.1 Implementation of Cluster Development

The cluster concept can be implemented into current planning practices, but the existing policies and legislation that control planning functions must first be examined and revised to allow for such developments. If the existing utilities and infrastructure were available, most builders could expect to process their zoning applications or subdivision plans for a conventional development in a relatively short period of time. Unless the local governing body had already adopted flexible controls, however, the cluster plan could meet substantial resistance and time delays. Consequently, it is crucial that planning policies be changed to allow for the quick and efficient implementation of cluster developments in rural unserviced areas(National Association of Home Builders, 1980, 118).

Zoning by-laws and official plans, as well as municipal planning strategies must take into consideration the need for timely alternative methods of rural development, for example the cluster concept, to combat the negative effects of sprawl. An example of how this has

been addressed is demonstrated in the creation of the Comprehensive Development District (CDD) in Nova Scotia. The CDD approach, as of now, is possible under the *Planning Act, R.S.N.S 1983*, and is currently the only mechanism that allows for cluster type development. This provision requires that an agreement be made between the land developer and the municipality which encompasses the development issues laid out in the Municipal Planning Strategy. These issues may include types of land uses, maximum permitted density, housing types, phasing, open space design and protection, architectural design and landscaping, transportation issues and impacts on the surrounding community. The agreement between the land developer and the municipality would override existing land use by-law provisions so that innovative approaches like clustering could be utilized. Other provinces such as Ontario and Quebec permit developments to take place through the use of Site Plan Agreements, which address the same concerns as a CDD, but the development under a site plan must occur according to the regulations of the applicable zoning by-law. As such, no negotiations can take place between the developer and the municipality unless the Zoning By-law and Official Plan are amended to reflect any proposed changes not permitted under the law.

In addition, cluster developments can be implemented through the creation of municipal development policies that promote rural clustering. These programs may include reducing tax levels or development charges or implementing cost-sharing programs that would lead municipal governments to split the costs of developing infrastructure such as communal on-site sewage disposal systems, roads and public recreation areas. The main benefit of such cost-sharing is the overall saving that can be realized by the municipality, encouraging the private development and ownership of rural residential cluster-type developments.

Two main options exist regarding issues of ownership for the proper implementation of this form of development. In the first option, individual ownership of a house lot within the clustered community would require mandatory membership in a Homeowner's Association (HOA), established to manage and operate any communal elements, including

infrastructure and public spaces. Another possibility would see the creation of a Condominium Corporation which would require that each resident buy a share of the Corporation and be legally bound to follow the by-laws passed and enforced by this legal entity. In Nova Scotia and British Columbia, the concept of a Bare Land Condominium (BLC) has been created through *Condominium Acts*, which accommodate such developments. Currently, the Nova Scotia *Condominium Act, R.S.N.S. 1989,* provided in Appendix "A," is under revision and the provisions required to set up a Bare Land Condominium Corporation are being implemented. In its simplest form, a Bare Land Condominium Corporation is a legal entity that is created where one share in the corporation would entitle the owner clear title to one dwelling unit owned by the corporation. In the case of a cluster development, the dwelling unit type would either consist of a single detached dwelling house, a unit in a semi-detached dwelling house or a dwelling unit in a row house. In addition members of the corporation are collective owners of such communal interests as private roadways, private water collection and sewage disposal facilities, as well as any public spaces like natural open areas or recreational facilities. Because of the legal setup of this form of ownership, the Condominium Corporation is responsible for the management of all common elements and must ensure that financial provisions are put into place for future maintenance and repairs. Also, the corporation has a board of directors, whose members consist of shareholders in the BLC. This board has the legal authority to pass and enforce by-laws, as well as collect fees from the members, to ensure that all current and future financial obligations will be met. Because of the legal technicalities involved in setting up ownership for a cluster development, the preferred ownership option for implementing this concept is through the use of a Bare Land Condominium Corporation rather than through a Homeowner's Association.

If all of these issues are resolved in a timely manner, the concept of developing a rural residential cluster housing project can be successful.

3.5 Conclusions

Cluster Development is not a new concept, but when properly implemented it can produce a significantly different type of rural residential neighbourhood, as compared with current conventional developments. Simply defined as the grouping of a variety of housing types on only one part of a development site, clustering consumes less land, costs less to construct, helps create a better sense of community amoung its residents as well as protects the natural environment. If carried out properly, clustering can avoid many of the negative effects of rural sprawl and led to a development pattern that does not excessively consume the rural landscape.

Although the general public is not yet accustomed to rural residential clustering, the Province of Nova Scotia could permit such development to take place under a Comprehensive Development District. In addition, the ownership structures for clusters can be accommodated through Bare Land Condominiums and Homeowner Associations. Therefore, the final obstacle to overcome in an attempt to create rural residential cluster developments is the provision of communal systems of sewage disposal. As such, a detailed examination of how these systems are planned and designed, how they function, and how they are managed is carried out in Part II of this thesis.

Part II The Technicalities of Communal On-Site Wastewater Treatment Systems & Their Application Towards Cluster Development

4.0 On-Site Wastewater and Septic Disposal Systems

Throughout North America, many residential dwellings, both in urban and rural areas, have been developed using private septic disposal systems to accommodate their everyday sewage needs. The simplicity of these systems allows them to provide a useful method of disposing everyday household septic wastes. When clustered together these systems, whether a simple tank and leaching field or a complex facility of tanks, filters and specialized draining fields, may accommodate cluster residential development, consisting of either several individual units, or a series of single detached dwelling houses.

The problem with the concept and practice of on-site sewage treatment facilities is the potential for a system breakdown. Instead of filtering the sewage properly, the system can malfunction, releasing sewage into its immediate surroundings. The focus of this chapter is to examine the need for on-site septic systems, their basic designs and functions, alternatives to systems commonly used today, examples of communal on-site septic systems, and the costs involved in using such systems. This will be achieved by examining current literature on the subject and by studying on-site septic disposal guidelines from both the provinces of Nova Scotia and Ontario as well as from other areas throughout the United States.

Not only will it be established that communal on-site sewage disposal systems are required to service rural residential clusters, this section will also point out significant advantages and disadvantages of using communal sewage disposal systems. This will lead into the next chapter which focuses on maintaining on-site septic systems, whether individually or collectively owned.

The purpose of the following three chapters is not to provide intricate details regarding the workings of alternative septic disposal systems, but instead to give a brief summary of the systems that are presently available, how they function and most importantly how they are designed, installed, operated and maintained. This will give planners the tools needed to begin asking questions about the types of development occurring in today's housing market. It will also give them ability to lead developers and the general public towards more sustainable living practices. Planners are not experts in the area of wastewater treatment, but they should have enough knowledge to know what questions to ask and where to go when it comes to the design and function of alternative approaches to wastewater treatment and disposal.

4.1 The Need for Systems in Rural and Unserviced Areas

Historically, central sewage systems were looked upon as being the servicing solution to rural and urban-fringe developments throughout North America. This was partly due to the large amount of government money that was available to communities for the creation and improvement of specific infrastructure projects. In fact, in the period between 1950 and 1970, over 10 million American homes abandoned their private on-site sewage disposal systems and connected their house sewer lines to municipal sewers. (Alth & Alth, 1984, 160). Over time, these projects became excessively expensive as the municipal costs to provide central sewage collection and disposal systems increased at an overwhelming rate. For example, in Nova Scotia, the cost of installing and maintaining a central sewage treatment system increased by six times between 1969 and 1982, rising from approximately $1500 per connection to $9000 per connection. By 1992, estimates had risen to between $15 000 and $30 000 per connection. In addition, the operating costs of central sewage treatment systems have also dramatically increased due to rising electrical costs (Mooers & Waller, 1996, 22). Often, when rural areas are serviced by a large municipal central collection and treatment system, the costs of installing and operating the facilities completely dominate all other municipal servicing costs (H.J. Porter & Associates Limited, 1980, 1.11). The United States Environmental Protection

Agency has recommended that if less than 50 households were connected to a central sewer along one mile, the community would be better off examining the use and benefits of on-site systems. In short, large conventional sewage treatment systems are simply not economically feasible for most rural areas (Hoover et al, 1996, 2).

Many environmentalists believe that on-site sewage systems are not only more economically feasible, but the can also be more friendly to the environment. By disposing of human wastes directly into a public treatment plant, vast amounts of energy are required for both collection and treatment. Often these facilities will use "petroleum, methane, lime carbon, alum and lime...to treat the waste." In addition, many large treatment plants condition the collected sewage with chemicals such as chlorine and then discharge them, to be broken down, into local water bodies (Alth & Alth, 1984, 160). By utilizing a natural treatment system such as a septic system the amount of wastes entering public sewage facilities is reduced and, ultimately, the amount of chemicals used and pollutants entering our streams, rivers, lakes and oceans is also diminished.

4.2 The Common Use of Systems

In both Canada and the United States, the use of septic system is very popular (Alth, 1984, 162). Statistics, gathered through a study conducted by the United States Environmental Protection Agency's Office of Technology Assessment, show that the amount of water that was cycled through some form of septic system in 1996 was well over one trillion gallons per year in the United States (National Small Flows Clearinghouse, 1997, 1). This translates into approximately 24.7 million homes in the United States, 15 percent of which are in urban areas, operating a theoretically practical and efficient on-site sewage disposal system . This number is growing at a rate of about 500,000 per year and it is expected that over one-quarter of the homes in the United States will be operating a septic system by the year 2000 (National Small Flows Clearinghouse, 1997, 1). In fact, the state of California has recently passed legislation that encourages the use of septic systems instead of extending municipal sewer services to

unserviced areas (Alth & Alth, 1984, 162).

Looking at the common use of these systems in Canada it is estimated that roughly half of rural homes use septic systems while the amount is steadily increasing (National Small Flows Clearinghouse, 1997, 2). This may be a result of municipalities refusing to extend their service boundaries to rural area or because rural development is taking place at a rate that far exceeds the rate at which municipal services are being extended into the rural areas. Either way, the use of septic systems in both Canada and the United States is extremely common and is increasing steadily. Because of this it is important that planners, whether public or private, understand how these systems work and how they can benefit a development in both the rural or the urban area.

4.3 The Standard Method of On-Site Sewage Disposal

The most common method of individual on-site sewage disposal is through the use of a septic system. With such a system, as illustrated in Figure 4.3, the two main components are the septic tank, a large solid tank that slows down and contains the flow of sewage coming from the building, and the soil absorption system, also known as the disposal field. In the tank solid wastes settle and are broken down by anaerobic bacteria. After the effluent has had time to separate it then travels to the soil absorption field where it is filtered through different soil types to be further cleaned and filtered. Once in the soil, aerobic bacteria further break down this effluent so that once it reaches the water table it should be clean enough to drink again (Alth & Alth, 1984, 162).

These systems have no moving parts and require almost no energy to operate as the liquid being moved from the house to the septic tank and finally to the disposal field is carried by gravity. They do, however, require regular inspection and maintenance as the solid waste material which settles in the tank can over accumulate and flow out into the absorption field. This, in turn, will clog the absorption field and cause the system to fail. These systems, if properly maintained, can last for extended periods of time as the tank

should never need to be replaced and the soil absorption field only treated or replaced after approximately twenty years or more (Alth & Alth, 1984, 162).

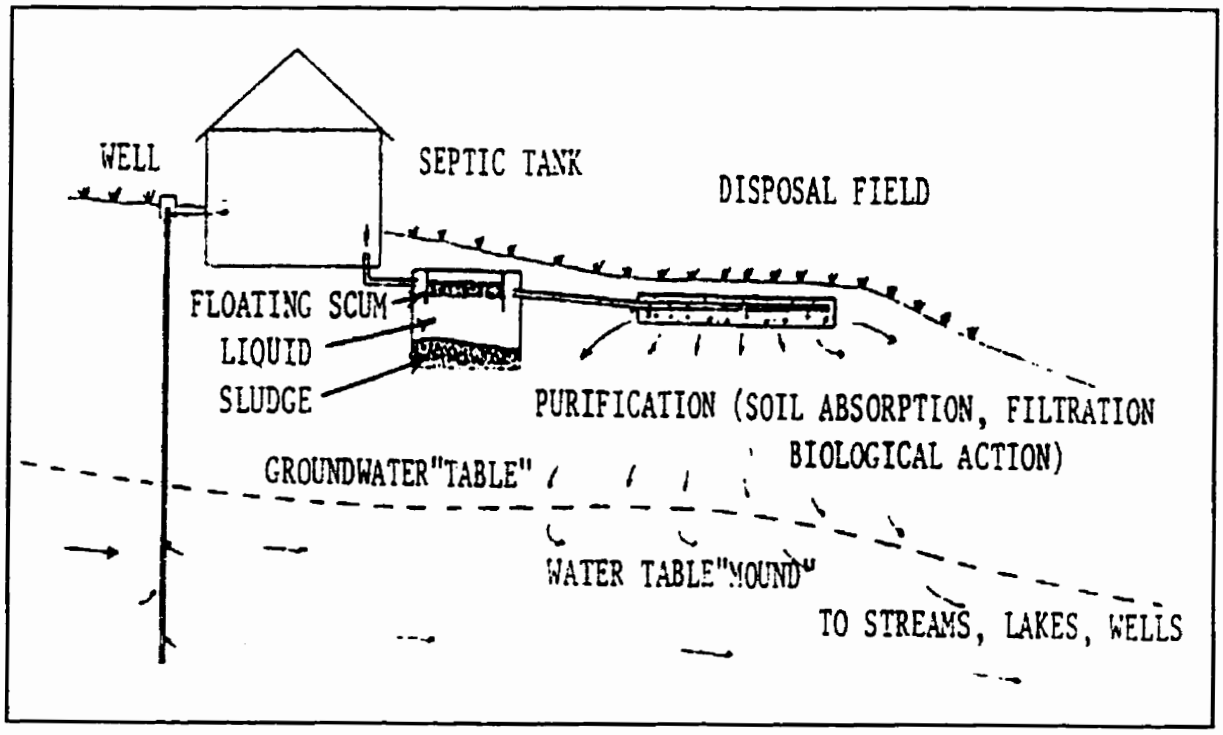


Figure 4.3 Traditional On-Site Septic System

Source: Nova Scotia Department of Health & Fitness, 1988.

4.3.1 Basic Principles in the System's Design

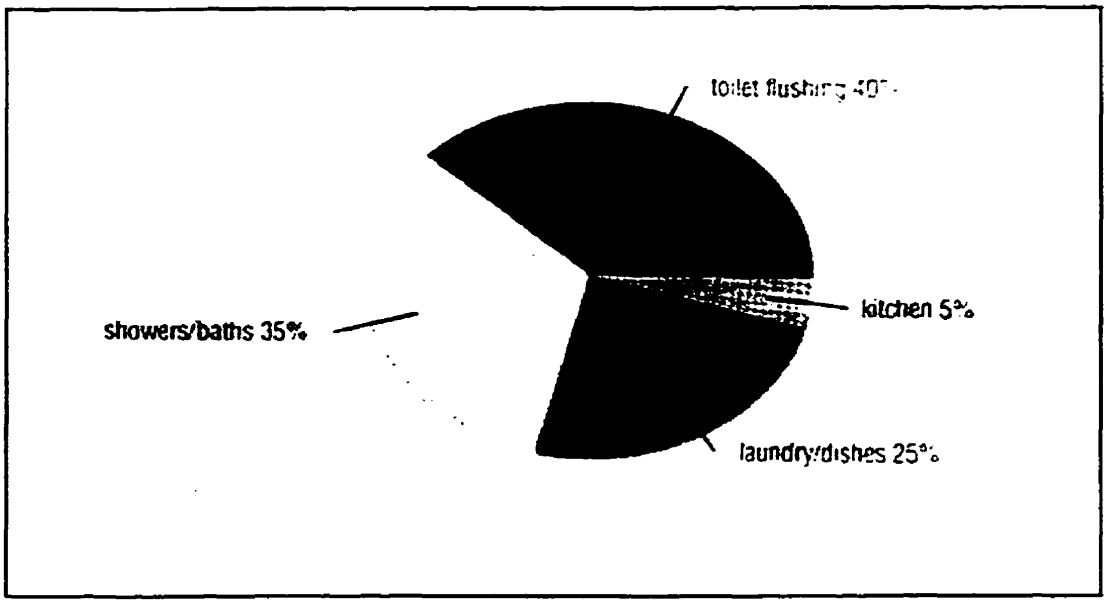
4.3.1.1 Capacity of the System

When examining the uses of septic systems and their function, the most important element is the designed hydraulic and organic capacity of the system. Each household creates a specific amount and type of waste, and this usually corresponds to the household size and its consumption habits. If a system is designed to facilitate a specific size family or community it should have the capacity to accommodate the amount and type of wastes that is entering the system. For example, in the state of Ohio, a 1000 gallon tank is required for a house which contains 3 bedrooms or less, a 2000 gallon tank is needed for a house containing 4 to 5 bedrooms, and a house with 6 bedrooms or more needs a tank that is 2500 gallons in size (Mancl, 1997b, 1). When the system is undersized, meaning it is not large enough to handle the organic and hydraulic loading that is expected to enter into the system, it is doomed to fail from the beginning. Many systems that do not have the minimum capacity required to safely and effectively treat and discharge household sewage usually fail within a few months of installation. The most common reasons for such failures include having either an inadequately sized septic tank or soil absorption field, or having a system installed in an area that will not allow the proper filtration of the effluent through the soil absorption field. This is often due to a high ground water level or having soil such as clay or solid bedrock in the disposal field that will not permit water to pass through it (Mancl, 1998b, 2).

Regarding consumption patterns, an individual Canadian will consume an average of 350 litres of water per day, which represents the second highest consumption rate in the world (Canadian Mortgage and Housing Corporation, 20). Water consumed, as illustrated in Table 4.3.1.1, is used for drinking, cooking, cleaning, and flushing the toilet, and approximately 50 percent of it is polluted. Of the materials being disposed of in the wastewater, about 99.9 percent of it is water, while the remaining 0.1 percent is in the form of a solid. These solids are predominantly organic, and take the form of "feces, detergents, soaps, ... , food bits produced by garbage grinders, and food bits simply

discarded without care (Alth & Alth, 1984, 162)." Therefore, a sewage disposal system must have the ability to handle large amounts of water in the form of effluent.

Table 4.3.1.1 Water Consumption Chart for a Typical Canadian Single Family Household
Source: CMHC.



By understanding that a septic system must accommodate large amounts of effluent, it becomes clear why the system must be designed in such a way that the liquids and solids entering the system will be safely contained and disposed of. To accomplish this, the septic tank must be large enough to contain the sewage leaving the house and at the same time must also slow the rate the effluent is leaving the tank into the disposal field. This containment is crucial in eliminating the possibility of any health concerns caused by septic contamination of the surrounding environment. An estimate for the size and design of the septic tank is usually based on the ability of the system to accommodate the sewage that will be expected to enter the system over a three-to-five day period, known as "residence time." The sewage coming from the house must be given enough time to stay in the tank so that the solids can separate and settle in the bottom of it. In fact, the longer the effluent is allowed to remain in the septic tank, the cleaner it will be when it

reaches the disposal field (Alth & Alth, 1984, 171). Ideally, a system should operate well below its capacity, but this would likely mean oversizing the system, resulting in higher start-up costs.

4.3.1.2 The Role of the Soil

The role and usefulness of the soil in the disposal field is an important element of most on-site sewage disposal systems. The effluent that leaves the septic tank and flows into the subsurface absorption field is still septic, which means that it "contains substances that promote the decomposition of vegetable and animal matter as well as pathogens, bacteria, and viruses harmful to humans and animals" (Alth & Alth, 1984, 164).

The most effective method of disposing of the effluent is to allow it to seep through 4 feet of soil. Although simplistic in nature, in many cases, because of an inadequate permeability and depth of soil in a receiving environment the effluent cannot effectively percolate through the soil to be properly treated. This can often be problematic. Therefore, in most American states and Canadian provinces, the appropriate depth of the soil is determined by health authorities or approved soil scientists (Alth & Alth, 1984, 164).

Comprised of pieces of stone and humus (decayed organic matter such as leaves, wood, etc.), well aerated soil acts as a filter which must be protected if it is to function properly and consistently (Mancl, 1998b 2). Not only does it screen and separate larger pieces of wastes, it also functions as a far more complex filter for viruses and different aerobic bacteria (Alth & Alth, 1984, 166). If the soil is too compact or tight, the effluent will not percolate through the soil and, therefore, will not properly be treated.

Alth and Alth, 1984, have suggested that the microorganisms living in the soil of a disposal field cleanse effluent through six different processes. These include:

- soil bacteria, fungi and other microbial organisms produce antibiotics such as penicillin that destroy pathogens;
- temperature, acidity, and moisture within the soil is so different from that found in human and animal bodies that the pathogens soon die;
- protozoa in the soil prey upon bacteria and the viruses along with the bacteria;
- soil organisms compete with pathogens for food, thus starving them out;
- the soil acts as a filter and prevents the larger bacteria from travelling very far;
- the soil - especially the clay - absorbs the viruses and locks them in place, preventing them from moving on (Alth & Alth, 1984, 166).

Once the effluent is in the disposal field, most of the water will slowly seep down into the local aquifer, while a small amount of liquid will either evaporate or be absorbed by the roots of plants and trees in a process known as transpiration. Either way, a properly designed and successfully operating disposal field should contain enough soil so that all the liquid that enters the system will be filtered, cleansed and eventually safely leave the system. The condition of the soil in a septic system will determine the lifespan and effectiveness of the system, and when the soil becomes clogged with fine waste material, it looses its ability to function properly. In a properly balanced system, the disposal field may last indefinitely, but in other cases, the soil may need to be treated or replaced if it is to continue to function safely. Often the soil in the disposal field is already clogged before it is noticed that it needs to be treated or cleaned. In this case the entire soil absorption field will have to be replaced in order for the system to function properly again (Alth & Alth, 1984, 168).

4.3.2 The Design and Function of the Septic Tank

In the common septic system design, the septic tank is the initial destination of wastewater flowing from a building. It is very important that the septic tank be water tight so that no ground water will seep into the tank or effluent leak out of the tank (Machmeier, 1997b, 5). This tank receives the household wastewater usually through some type of gravity sewer, but other methods such as vacuum sewers, sewage pumps or small diameter sewers may also employed. The effluent then slows down in the septic tank, and creates a pond-like environment. This environment benefits anaerobic bacteria and other micro organisms that live and breed in stagnant liquid. By slowing down the effluent, the septic tank permits solid waste material to decompose into sludge as it sinks to the bottom, while lighter materials float to the top of the tank and create a layer of foam and scum (Alth & Alth, 1984, 163).

Even though some solid decomposition is achieved in the anaerobic bacteria digestion process, approximately 50 percent of the solids may still remain in the tank. Therefore, it is critical that the tank be large enough to hold the sludge and foam that will accumulate in the tank over a period of time (Mancl, 1997a, 1). By removing and storing most solids from the effluent, the septic tank is ultimately protecting the soil by refraining solid material from flowing out into the field and potentially clogging up the entire system (Mancl, 1997b, 1).

At a basic level, the septic tank acts as a holding container that separates the solids from the liquid in wastewater. By examining some of the bacterial functions in the tank, however, it can be seen that this type of sewage disposal system can become rather complex and its design and placement on a particular piece of property can greatly effect its performance. As the solids sink to the bottom of the tank, they are decomposed into sludge by anaerobic bacteria that release methane and other gases as by-products. Once the gas is released, it slowly rises in the form of bubbles to the top of the tank, taking with it finer solid materials that help create the top layer of foam and scum. By creating

this top layer of material, a layer of insulation is added to the tank which helps keep out any light that may get into the tank and adds a level of heat retention to the tank (Alth & Alth, 1984, 163). This is important to the proper functioning of the septic tank, because the bacteria living in the tank need a certain level of heat to stay alive. Therefore, as long as there is enough food in the form of organic material, and the temperature does not drop below the freezing point, the anaerobic bacteria living in a septic tank can survive and continue to break down and decompose human organic waste material (Alth & Alth, 1984, 163).

Regarding the maintenance of septic tanks, it should be noted that not all solids will be decomposed and broken down by the anaerobic bacteria. These bacteria cannot digest materials such as bones, stones, plastic or large pieces of wood and, as such, these materials will remain on the bottom of the tank until they are removed. To remove these materials, the septic tank must be opened up and the contents pumped out. In general, a septic tank should be pumped out every two to five years for a family of four using a 1000 gallon septic tank. This is an estimate, however, and not necessarily consistent for each household. By pumping out a septic tank, the operational life of the system will be lengthened and the economic benefits are worth noting (Arendt, 1993, 209). This issue of on-site septic system maintenance will be discussed in further detail in Chapter 5 which is entitled Maintenance of On-Site Sewage Disposal Systems.

4.3.2.1 Septic Tanks - Single Compartment Design

There are several varieties of septic tanks being used today to accommodate the sewage needs of households throughout the world. The most simple design and most commonly used is the single compartment septic tank. As illustrated in Figure 4.3.2.1, the single compartment septic tank is built from a strong corrosion-free material that ultimately creates a water tight, air tight and light-free type of container that should last forever (Mancl, 1997b, 1). Among the most important features of the single compartment septic tank are the baffles or inlet and outlet T's. These devices are responsible for the pattern

by which effluent flows into and out of the tank. The inlet baffle forces water that is coming into the tank to be directed downward into the tank, thereby forcing it to be slowed down while preventing it from simply flowing out of the tank. The outlet T or baffle is positioned in a manner so that the scum layer is trapped from flowing out into the soil absorption field. If these two devices were not present in a septic tank, wastewater would flow directly into the tank and the solids would float across the surface of the wastewater in the tank, and then directly out into the disposal field causing blockage of the soil, eventually resulting in complete failure of the system (Mancl, 1997b, 2).

In addition to baffles, a septic tank should have inspection ports so that the contents of the tank can be inspected and the tank can be pumped out from time to time. Although not all tanks are designed with these ports, when they are installed in a septic tank they should be placed over the inlet and outlet devices so that any obstructions in the tank can be removed and the amount of sludge in the tank can be inspected (Machmeier, 1997b, 4).

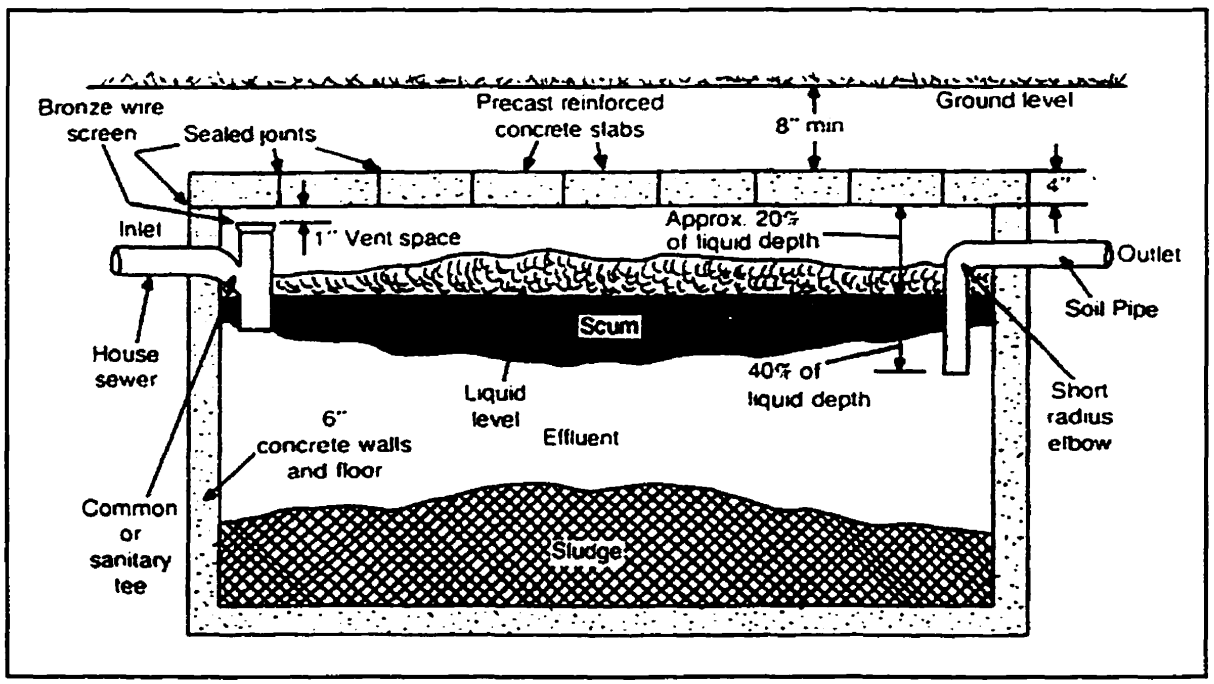


Figure 4.3.2.1 **Cross Section of a Typical Septic Tank (without Cleanout or Inspection Ports)**

Source: Alth & Alth, 1984

4.3.3 The Design and Function of the Soil Absorption Field

The largest physical portion of an on-site septic system is the soil absorption field, otherwise known as the disposal field. This is commonly a subsurface discharge system that relies on its ability to intake large amounts of wastewater and effectively filter it through the soils that are located within the field. The design of a disposal field can consist of trenches, gravel beds, seepage pits, mounds, sand filters, fills and artificial drainage systems (Cantor & Knox, 1985, 23). These different designs all serve the same purpose, to filter and cleanse effluent so that it may safely be discharged into the surrounding water table. Of these designs, the soil absorption field, as displayed in Figure 4.3.3, is the one most commonly used for individual household purposes and consists of a series of perforated pipes buried underground. These pipes receive and evenly distribute the effluent to the soil so that it can be filtered and discharged.

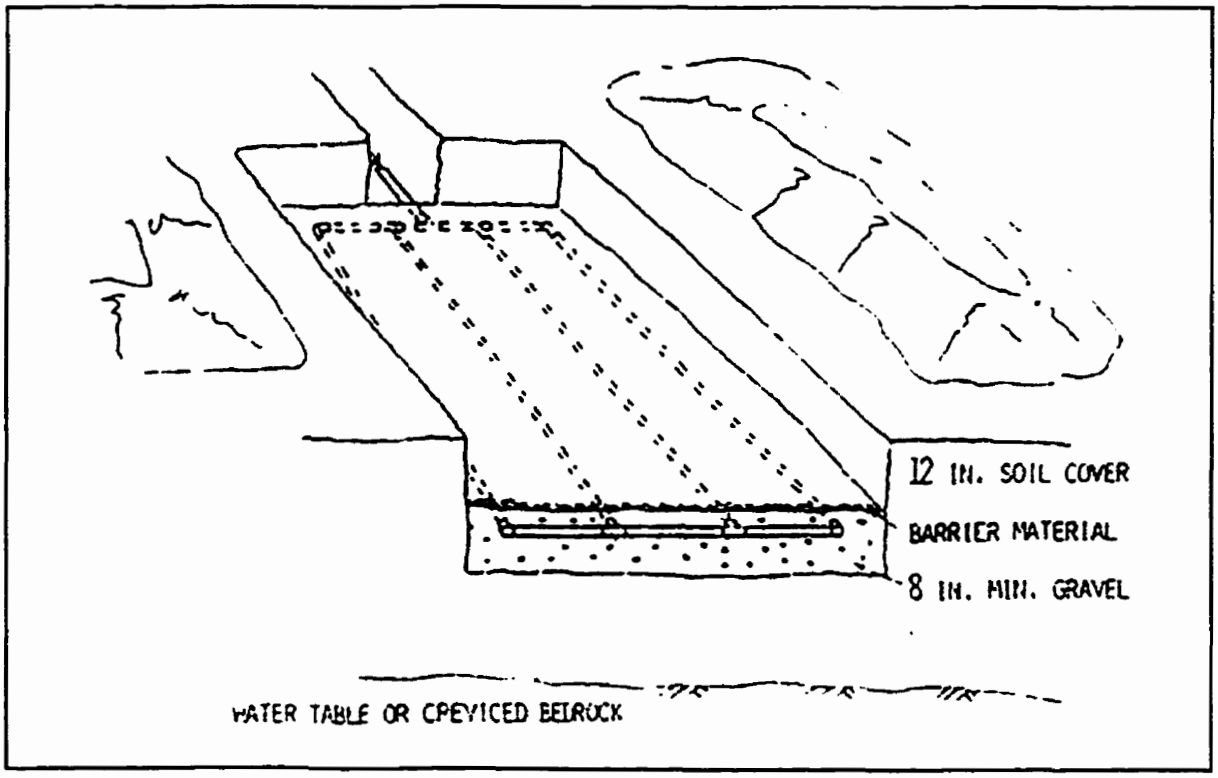


Figure 4.3.3 **Basic Layout of a Soil Absorption Field**
Source: Nova Scotia Department of Health & Fitness, 1988.

In these type of systems, the main objective is to disperse the effluent evenly over a large area, so that the soil can effectively treat the wastewater. While it is best if the existing soils on a particular piece of land can be used to house and support the disposal system, often other imported granular fill is needed to build up the area where the system is to be constructed (Zsolt, 1994, 58).

Because this type of system is closed, whatever amount of water enters the septic tank must be released into the disposal field. The wastewater flowing through the system is normally carried by gravity to the septic tank and then to the soil absorption field. However, other methods such as pressure dosing, which uses a pump to move the effluent along, tend to do a better job of evenly distributing the effluent through the entire disposal field, thereby more optimally using the field to dispose of the effluent (Mooers & Waller, 1996, 65).

When planning to construct a disposal field, several items should be kept in mind, including:

- a disposal field should be located in an area that is not subject to flooding and where it will receive the most amount of sun on the lot to be developed on;

- a disposal field should be designed and constructed so that all components have a slight, but constant slope. Too much or too little slope will cause the effluent to either pool in one area, or travel too quickly through the system and result in premature failure of either one section or the entire system;

- a disposal field should not be subjected to any heavy weight that may break or move the perforated pipes or compact the soil in the field and therefore should be constructed away from any high traffic areas or driveways;

- the field itself should not be constructed when the area is wet or it is raining, as this could lead to soil compaction and smearing of the soil in the field;

- the disposal field should not be subjected to excessive water due to rain water drainage or spring run off, as this will increase the amount of water the system must absorb and could lead to premature system failure (Mancl, 1997b, 3).

A disposal field is relatively low maintenance, but it should not be ignored, because a malfunctioning field can lead to ground water contamination. In addition, the cost of installing a basic soil absorption field, in Nova Scotia, can range any where from $2500 to $10 000, depending on the size of the system needed and the soils in which it is to be constructed. By properly using and maintaining the system, the owner is protecting an investment and could save a great deal of money in the future on repairs or total replacement (Mooers & Waller, 1996, 70).

4.4 Alternative Components of On-Site Sewage Systems Which Can Enhance the Development of Cluster Systems

4.4.1 Types of Alternative Systems

The treatment and collection of wastewater can be separated into three categories; innovative, alternative, and conventional. All three of these categories contain technologies that are directed towards the effective treatment and disposal of wastewater, but their popularities and the frequency with which they are used differs greatly. Innovative methods of treating wastewater are those techniques that are cutting-edge, but still mainly experimental. Alternative approaches include examples that may be cutting edge, but are proven and tend to be in use today (United States General Accounting Office, 1994, 10). Several alternative methods of wastewater treatment include those systems that use the land's ability to absorb and treat effluent. In addition, these natural systems "employ few mechanical parts, use little energy, and have lower construction and operation and maintenance costs than conventional treatment systems" (United States General Accounting Office, 1994, 13). The last classification of wastewater treatment is termed conventional and this would include systems that are used as a type of default due to their common and proven use. This type of system includes central treatment facilities

and large gravity sewers in serviced areas, while single compartment septic tanks and gravel absorption fields that serve one home at a time make up those conventional systems used in unserviced areas (United States General Accounting Office, 1994, 10).

4.4.1.1 The Two-Compartment Septic Tank

Similar to the single compartment design, the two-compartment septic tank is constructed to do the same job, but does it better. By separating the tank into two compartments, the effluent should be freer of solids when it is discharged into the disposal field. By adding a divider to the tank, two compartments are created; the intake compartment occupies about 60 percent of the total volume of the tank and the outlet compartment makes up the remaining 40 percent. Once the effluent enters the first chamber it slows down, begins to separate and the bacteria begin to decompose the solids. From the first chamber, the clear effluent flows into the second chamber, where it is slowed down again. This enables the remaining solids to be separated from the effluent while it is again broken down by the microorganisms. Therefore the liquid that is released into the drainfield should be more free of solids and easier to treat (Alth & Alth, 1984, 181).

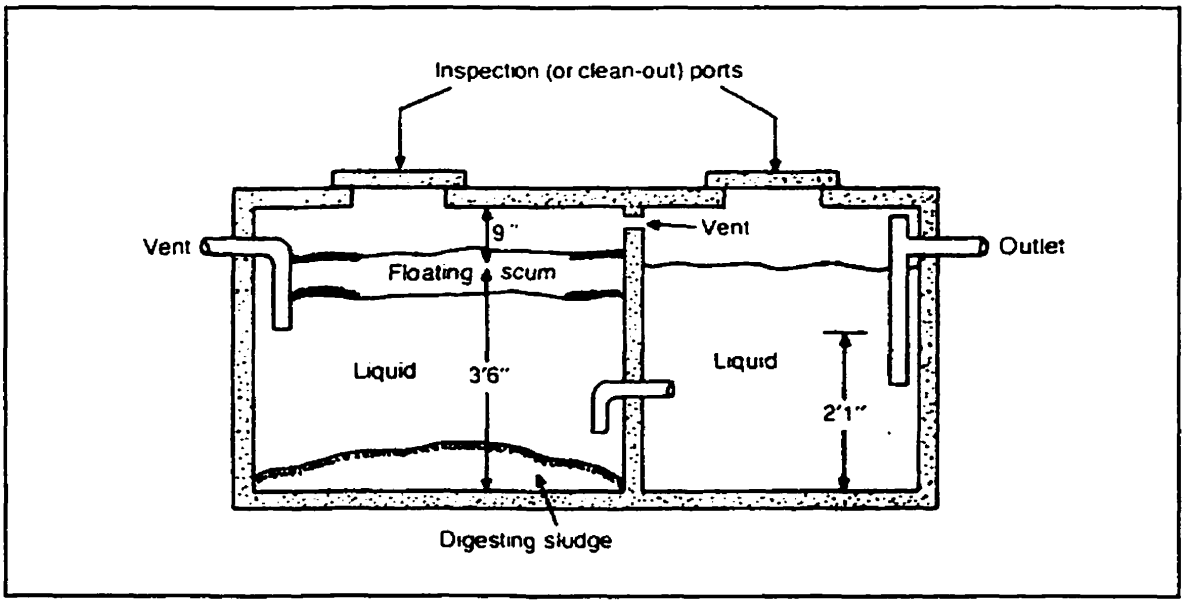


Figure 4.4.1.1 Two-Compartment Septic Tank Design
Source: Alth & Alth, 1984.

Although there are several different versions of this design, the two-compartment tank, as illustrated in Figure 4.4.1.1, must have two separate clean out ports so that it can be inspected and cleaned out on a regular basis. Because this tank is more efficient in settling solids when compared to a single compartment tank, it must be inspected and cleaned more frequently. This type of tank is slightly more expensive than the single compartment design, but if properly maintained, it may save on long-term costs to the environment and the soil absorption field (Alth & Alth, 1984, 181).

4.4.1.2 The Meander Design

Based on the principles of slowing, settling and retaining more solids found in the effluent, the meandering septic tank design was "devised to force the effluent to meander like a slow moving river. The slower the stream moves, the more sand and silt it drops. The more turns the river makes, the more it drops going around the turns" (Alth & Alth, 1984, 184). By dividing the tank lengthwise into three compartments, as shown in Figure 4.4.1.2, the effluent must travel three times the length of the tank before it is finally discharged into the receiving environment. This again protects the surrounding environment and the soil absorption field since the effluent should be that much cleaner when it leaves the septic tank.

Because this tank has three chambers it should also have three clean out or inspection ports. Each compartment should be regularly inspected and pumped, since this type of tank has the ability to retain many more solids than both the single or the two compartment tank designs. Again, it is more costly to construct, but it too has great cost-saving potential and environmental benefits.

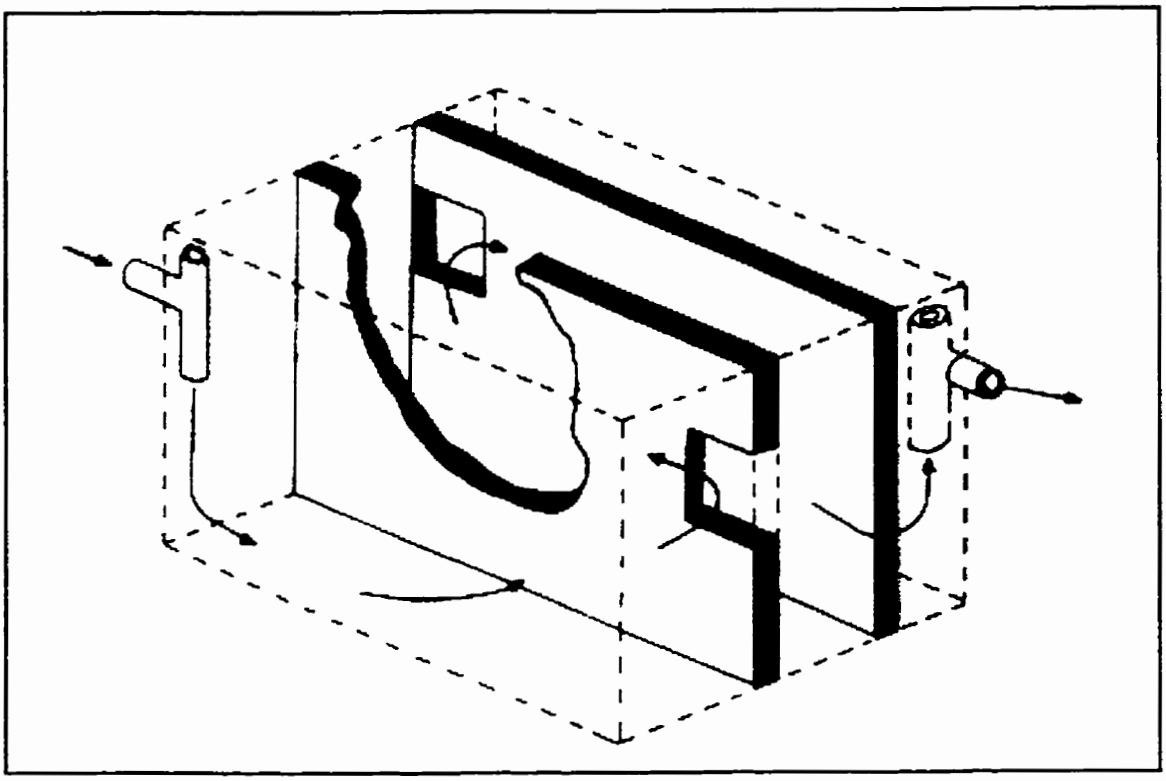


Figure 4.4.1.2 Meandering Septic Tank
Source: Alth & Alth, 1984.

4.4.1.3 Aerobic Treatment Units

Unlike the previously mentioned septic tanks which had no moving parts, an aerobic treatment unit requires electricity to periodically run a pump that oxygenates and a motor that stirs the effluent. A common design sees this unit broken into three separate components, but other designs also exist which use a single chamber construction to achieve the same results. A three compartment unit has two main functions; to settle the solid waste material, and to accelerate the aerobic digestion of the effluent. The first compartment acts as a septic tank, settling the effluent so it can be passed into the second chamber where it is aerated and stirred in order to maximize its decomposition by aerobic bacteria. This allows more organic material to be digested and in turn creates a cleaner effluent. After this activity, the effluent flows into a third compartment where it once

again is settled and more separation of solid material takes place. Finally, the liquid leaves the system and is discharged into the soil absorption field or into another filtering system (The Water Quality Program Committee, 1996, 1).

This type of treatment is more effective than those methods previously examined, but it also requires the most maintenance and it costs the most to install and operate. Because it requires electricity to operate, it will involve an increase to a monthly electric bill and if the power supply is ever cut off, the aeration unit will not function. In addition, because an aerobic treatment unit has moving parts, it should have an alarm to alert users regarding any malfunctions, and it must be inspected frequently and cleaned on a regular basis. Therefore, the unit should have inspection ports and manholes for each compartment so that it can be inspected and cleaned or repaired.

4.4.2 Types of Soil Absorption Fields and Filter Systems

Just like disposal tanks, the main function of any soil absorption field or filter system is to cleanse household, industrial or commercial wastewater so that it can be safely discharged back in to the ground water supply. The simpler the system, the less maintenance it will require and the less it will cost both in the long and short term. These types of systems are the preferred to create communal septic systems as they will better suit users that have the "flush and forget" attitude.

4.4.2.1 Contour Disposal Field

As a response to failing rural Maritime on-site septic disposal systems, the contour disposal field was developed in the mid-1980s to correct the problem of uneven effluent distribution in existing standard area disposal beds (Arendt, 1993, 213). Although this form of disposal field is ideal for developments that are situated on lands which contain "more than one foot of clayey silt or greater permeability soil with a slope between five and thirty percent" and is commonly used in the Atlantic provinces, its benefits have yet

to be fully realized in most other Canadian provinces (Nova Scotia Department of Health and Fitness, 1988, 3-04) . As such, for the purpose of this thesis, a contour disposal field will be regarded as an alternative design for a soil absorption field.

Based on the principle that natural and effluent ground water both flow laterally along the slope of the ground, a "contour trench disposal field is a relatively narrow and shallow disposal bed constructed in a trench which is dug along a contour of the ground surface" (Nova Scotia Department of Health and Fitness, 1988, 3-04). The bed, as shown in Figure 4.4.2.1, is constructed of a layer of sand, followed by screened and washed gravel or crushed rock and a single perforated effluent distribution pipe (Nova Scotia Department of Health and Fitness, 1988, 3-04). As Mooers and Waller (1996) explain:

> This concept known as "Contour Disposal Fields" is designed to maximize flow area in the direction of the maximum hydraulic gradient,which is perpendicular to the field. The principles of design of subsurface soil disposal systems in Nova Scotia are based on the assumption that in the majority of cases, due to high ground water table, bedrock or impermeable material near the surface, the treated effluent must move away laterally, rather than vertically downwards. At sites with limiting conditions near the surface the disposal field is raised to the ground surface and a layer of imported fill covers the trench to protect it from frost and to provide treatment for hydraulic loads that exceed the infiltration capacity of the disposal field (p.40).

Although this system was created as a reaction to failing traditional systems, its technology can be communally used to accommodate newer rural residential cluster developments (Nova Scotia Department of Health and Fitness, 1988, 3-04). While the length of each trench will vary, the estimated length for each household ranges from 50 feet to 220 feet depending on the size of the household and the condition of the receiving soils. To ensure even distribution of the effluent throughout the entire length of the system contour disposal fields, a bed measuring 150 feet or less can be operated on trickle flow, but beds longer than 150 feet must be fed using as pressure distribution system (Nova Scotia Department of Health and Fitness, 1988, 3-08).

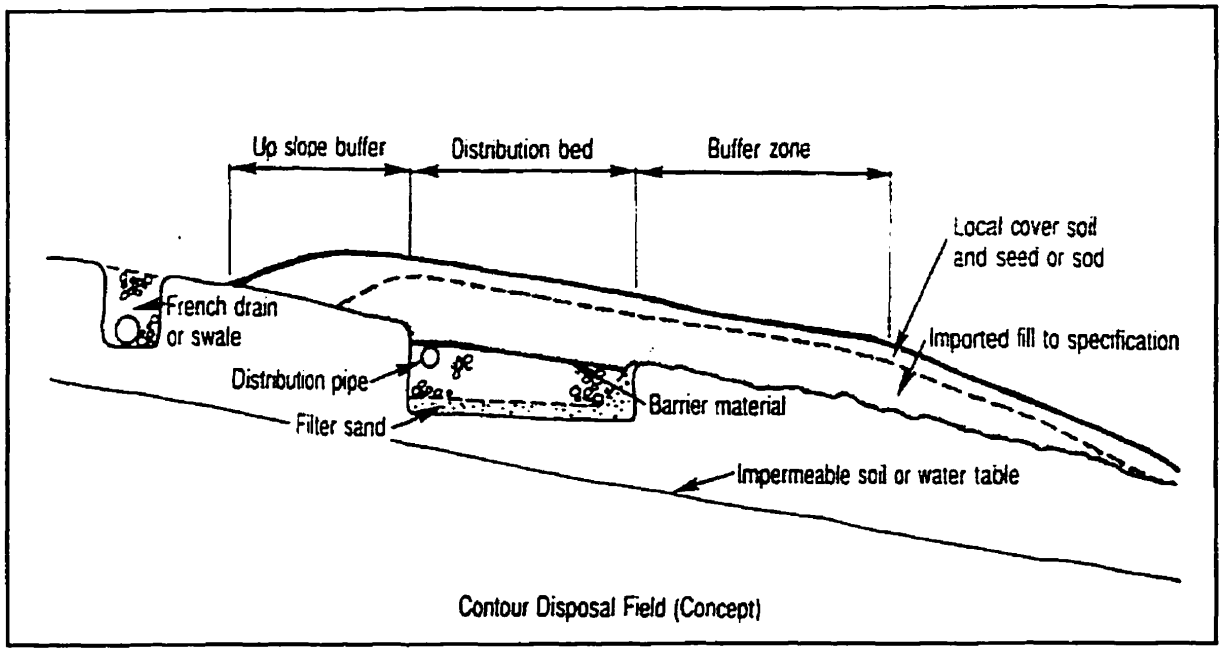


Figure 4.4.2.1 **Cross Section of a Contour Disposal Field**
Source: Arendt, 1993.

4.4.2.2 Mound Absorption System

The mound system or fill system, as depicted in Figure 4.4.2.2, is the most commonly used above ground soil filter for treating wastewater in North America, and has been approved for use in Nova Scotia (Nova Scotia Department of Health and Fitness, 1988). Due to the shallow depth of soil in many rural areas, it becomes impossible to construct a subsurface soil absorption field. Therefore, soil and other materials must be brought onto the site to artificially construct a mound which becomes the soil absorption field (Cantor & Knox, 1985, 43). The mound is then sloped and covered with grass to control erosion, freezing and, to permit water to be absorbed by the immediate environment. In order to get the effluent from the septic tank into the mound disposal field, there is a pumping chamber immediately following the tank. This chamber is usually a separate water tight container which fills up with effluent, and when it reaches a specified capacity it pumps the effluent through a pressure dosed pipe system evenly throughout the mound.

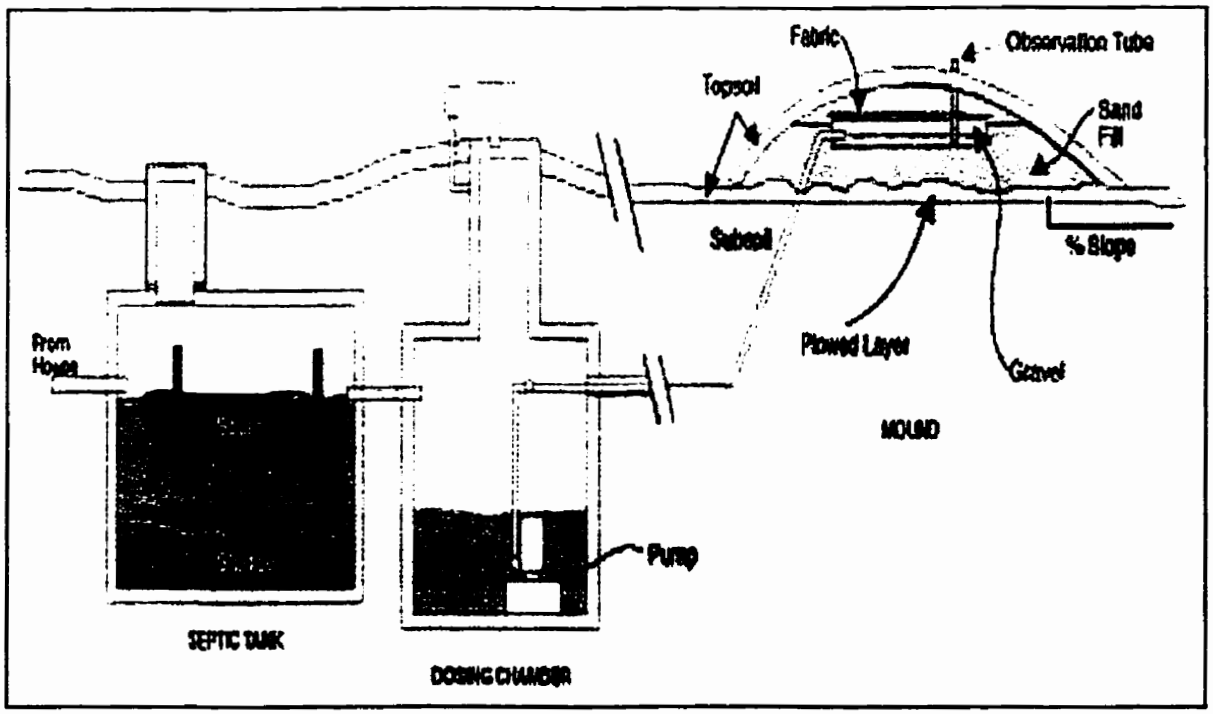


Figure 4.4.2.2 **Cross Section of a Mound Absorption System**
Source: United States Environmental Protection Agency, 1992.

Compared to a conventional system, a mound system has a longer lifespan and works more evenly and effectively (Mancl, 1998a, 2). In most cases, this type of disposal system costs approximately twice as much as a conventional system to construct, but may be less expensive in the long run (Mancl, 1998a, 4). Although the advantages of the mound disposal system include the possibility of constructing a septic disposal field where a conventional system cannot be developed and a longer overall life, there are disadvantages as well. Not only do these mounds cost more for maintenance and equipment replacement (ie, pumps and electrical switches), but often the physical appearance is more difficult to place in a landscape architectural scheme (Mooers & Waller, 1996, 74).

4.4.2.3 Sand Filters

Another alternative method of treating effluent, which can be used to create a cluster sewage system, is to pass it through a type of sand filter. This mechanism can be either below or above the ground and usually works in conjunction with a septic tank and/or an aerobic treatment unit, and a subsurface disposal system. The main function of a sand filter, as illustrated in Figure 4.4.2.3, is to add another type of filter to enhance the existing capabilities of the septic tank and disposal field alone. Sand filters are typically used when the distance between the soil and the level of ground water is too short, or the permeability of the soil is inadequate to permit the sole use of a soil absorption field. They ultimately reduce the total amount of organic solids in the effluent before it is discharged into the disposal field (Mooers & Waller, 1996, 78). By using a layered system of fine sand particles, a bed of gravel and an under drain piping system, effluent flowing from the septic tank passes through the sand and gravel where microorganisms further feed off of the organic material in the effluent. The filtered liquid is then picked up in the under drain system and is either returned to be filtered through the sand again, or is released into the disposal field (The Water Quality Program Committee, 1996, 2). By practising this method of wastewater disposal, the effluent is cleaner and more easily passed through the final soil absorption process adding to the life of the disposal bed.

The estimated costs of this type of filter system range greatly, but regardless of the actual cost to design, construct, install and maintain, it will be substantially larger compared to a conventional septic tank and soil absorption field.

The disadvantages of a sand filter are related primarily to its functioning and maintenance. Because the contents of a sand filter cannot be disturbed, the area where it is installed cannot be used for any other activity, and access to this land should be restricted. In addition, the sand in the system must be raked on a regular basis to prevent clogging and the build up of organic materials. The intervals are determined by the amount of use it receives, and therefore, the owners of the system must be conscious of their

responsibilities to actively monitor and maintain the sand in the system. Finally, some sand filter systems may use an electrical pump to move effluent. Not only does this require electricity, but it may include replacing and repairing parts (Mooers & Waller, 1996, 78).

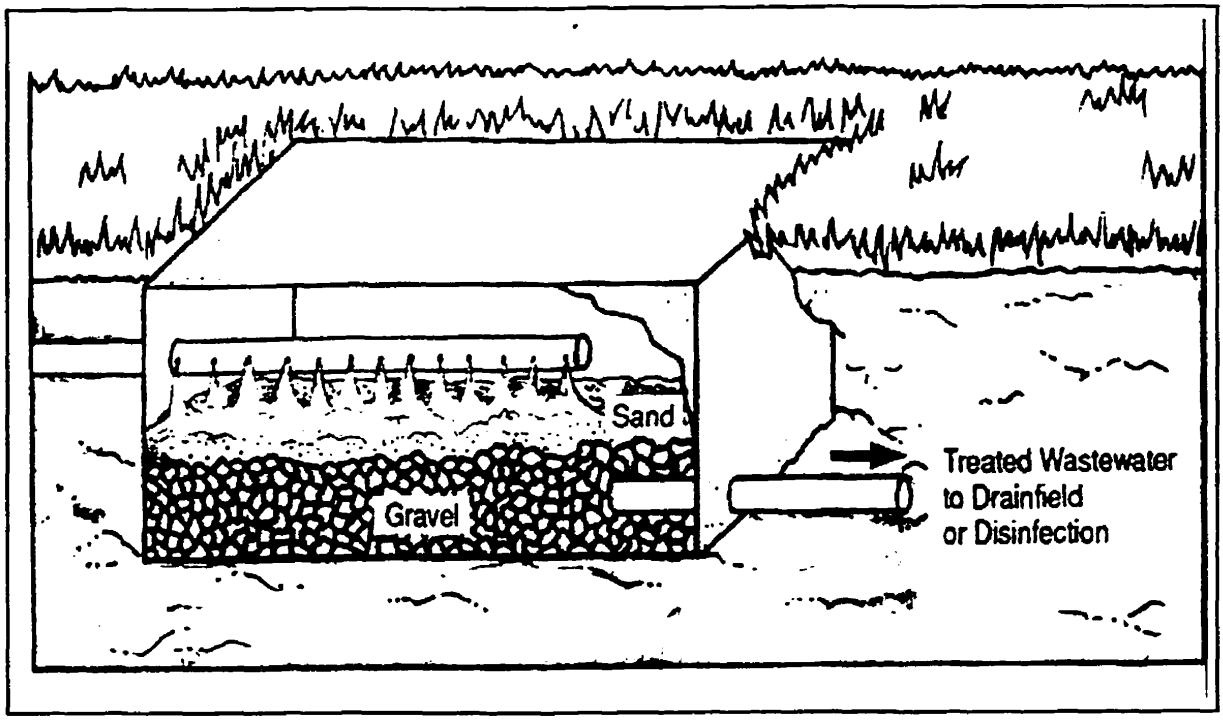


Figure 4.4.2.3 Cross Section of a Typical Sand Filter
Source: United States Environmental Protection Agency, 1992.

4.4.2.4 Back-up and Alternate Soil Absorption Fields

The most common reason sighted for the failure of a soil absorption system is hydraulic overloading. One method of combating this problem is to construct not one, but two disposal fields which can be alternated. By alternating disposal fields, no matter what type or design, the soil and filtering material can be given a chance to rest and recover through biological activity. This may be an expensive approach to wastewater disposal, but it is a proactive method of solving any future problems of system failure. Not only can the fields be alternated to give them time to regenerate themselves, but if one field fails, the effluent can immediately be diverted into the other, possibly eliminating future

environmental contamination. The needed time for the fields to be alternated varies, depending on the size of the household and the consumption patterns of the user. In some American states, however, legislation has been enacted requiring the use of back-up soil absorption fields and how often they should be alternated (Mancl, 1998b, 3).

While this approach to wastewater disposal may not employ cutting edge technology, its use in creating a cluster system warrants attention. Its usefulness is centered on solving the main problem that plagues all types of septic systems, that is, maintenance. By constructing two separate disposal fields there is a better chance that the downtime of a system can be eliminated therefore the system becomes failsafe. If a system has only one disposal field that must be repaired or replaced, there is a break in the treatment of wastewater. But if another disposal field exists, it can pick up where the other leaves off.

4.4.3 Clustered On-site Septic Disposal Systems

All sub-surface septic disposal systems referred to, whether septic tanks, filters or disposal fields, can be clustered together to service a group of dwellings or buildings. These forms of communal on-site septic systems are preferred to surface discharge systems because they are more passive, environmentally friendly and require lower levels of operation and maintenance (Machmeier, 1997b, 4). In addition, Arendt (1993) explains that by creating an effective and cost efficient communal sewage disposal system the needs of a rural residential cluster community can be accommodated.

This idea of a clustered septic disposal system has great potential for serving a series of buildings or dwellings and can be constructed to accommodate the total volume of wastewater that it will be expected to receive. For example, a single-family three-bedroom dwelling may require an individual system that can accommodate 1000 gallons of wastewater a day. If a system is devised that can accommodate 15, 000 gallons of wastewater a day, then 15 such units could be served by this system, as illustrated in Figure 4.4.3. The size and suitability of a sub-surface on-site sewage disposal system

will ultimately depend on the conditions of the site on which it is to be located, and so the standards and design guidelines for each system will be different. In addition, instead of servicing all dwellings within a cluster through the same septic system, situations will arise where several communal septic systems will be able to service several small pockets of cluster developments.

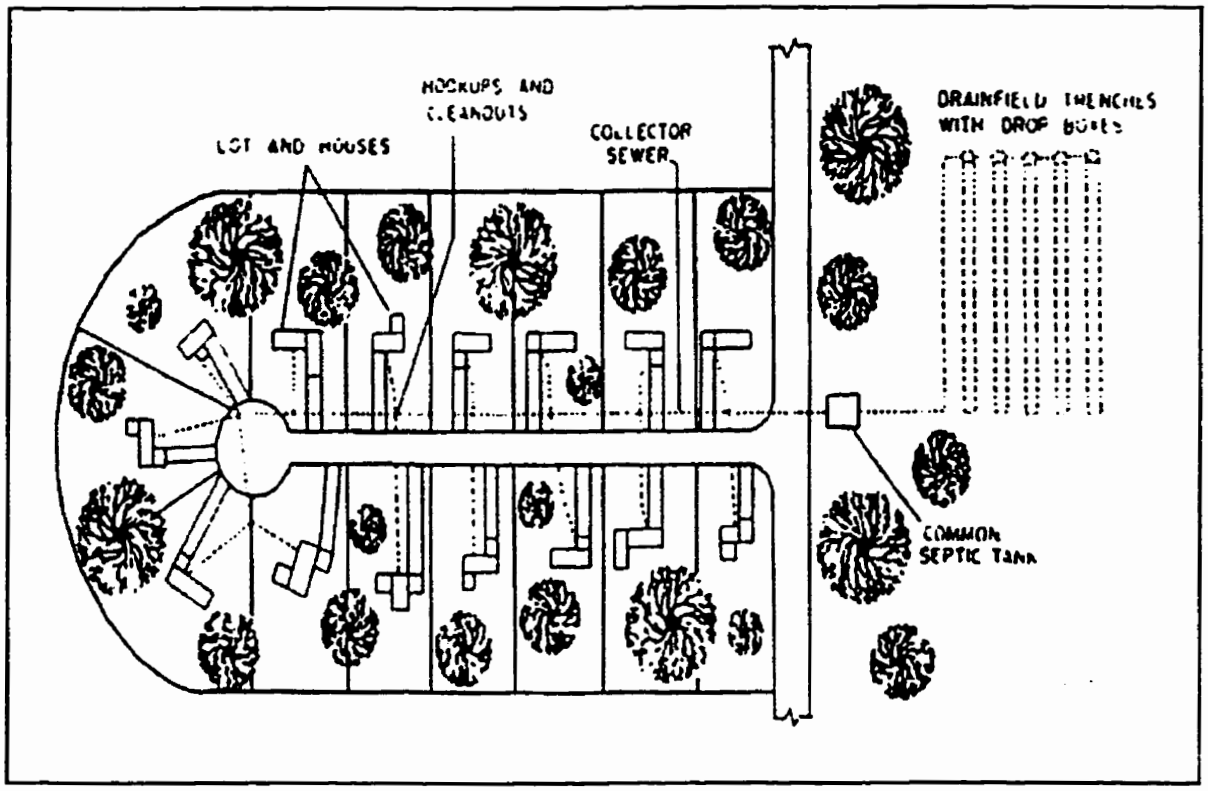


Figure 4.4.3 **An Example of a Cluster Septic System Servicing a Rural Cluster Neighbourhood**

Source: Arendt, 1993.

As in most states and provinces, the guidelines for sewage disposal are set out by the Department or Ministry of the Environment. In Nova Scotia, it is the Department of Environment which sets out guidelines and must approve all on-site disposal systems. In addition, it also regulates the size, type and functioning of the systems to be used when dealing with on-site facilities. In referring to the capacity of systems, *The Sewage Treatment Plant Effluent Discharge Policy* found in the Nova Scotia Standards and Guidelines Manual For the Collection, Treatment and Disposal of Sanitary Sewage

recommends that any sewage disposal system operating with a capacity at or below 50 000 gallons per day be a type of in-ground system. Table 4.4.3 demonstrates the type of treatment preferred by the Province of Nova Scotia's Department of the Environment.

Table 4.4.3 Types of Desired Sewage Treatment in the Province of Nova Scotia

Source: Nova Scotia Sewage Treatment Plant Effluent Discharge Policy

(2) **Type of Treatment**

The Departments recommend the following types of treatment based on the size of the facility.

Size gallons/day	Type of Treatment
0-2000	on-site in ground systems
2000-50,000	By order of preference 1. in ground systems 2. seasonal discharge (i.e. lagoon) 3. STP* with land disposal (e.g. spray on forest) (*secondary 30/30 with no chlorination) 4. small STP based on Table 1. Criteria other than that specified in Table 1 may be accepted when based on a receiving water study
>50,000	Treatment based on study

In addition, the Regulations Respecting On-site Sewage Sewage Disposal Systems as part of the *Environment Act, R.S.N.S. 1995,* were amended in May of 1997 to allow for the use of cluster on-site sewage disposal systems. According to their definition, a cluster system is "intended to service more than one building, structure or dwelling," while an

on-site sewage disposal system includes:

(i) a septic tank and a disposal field,
(ii) a holding tank
(iii) a privy, or
(iv) a system, other than one described in subclauses (i), (ii) or (iii), that meets the specifications established or adopted by the Department [of the Environment] and is not connected to a municipal system or an approved central sewage collection and treatment system, but does not include a wastewater treatment facility *(Schedule "A" of the Nova Scotia Environment Act R.S.N.S. 1995, as amended 1997, 1).*

Thus in Nova Scotia, cluster systems can now be developed that will ultimately benefit the concept of clustered rural residential development. Although these new guidelines have been created to help stimulate cluster development, the Department of the Environment must still be satisfied that these disposal systems will meet the needs of its users and, therefore, has final approval authority. Section 33 (6) sets out the criteria that must be met in order for final approval:

(6) Subject to subsection (7) [minimum lot size specifications] and Section 29 [Variations], an inspector may issue an approval to install a cluster system to serve more than one building, structure or dwelling where the volume of sewage to which the system will be subjected is more than 1000 l per day, provided:

(a) a sewage maintenance program that is considered acceptable by an inspector has been prepared;

(b) the minimum lot specifications and requirements prescribed by the inspector are met; and

(c) the system meets minimum clearance distances prescribed in Section 12 *(Schedule "A" of the Nova Scotia Environment Act R.S.N.S. 1995, as amended 1997, 14).*

If the conditions set out by the provincial inspector are met, it is then possible to design, install and operate a cluster on-site sewage disposal system that will effectively accommodate clustered rural residential developments. In addition to design and installation, however, there also exists the issues of ownership and management of such systems which will be discussed in greater detail in chapters 5 and 6.

4.4.4 Alternative Methods of Sewage Collection and Group Collection Systems to Facilitate Cluster Septic Systems

If clustered on-site wastewater disposal systems are to serve more than one building or structure, some form of collection system must be developed to transport the sewage from each dwelling to the septic tanks, filters and/or disposal site. As a collection system can cost almost two thirds of the cost of an entire sewage disposal system, alternative methods have been developed to overcome the disadvantages of the conventional collection systems. Where there is shallow soil depth, high water tables, bedrock or hilly terrain, conventional high volume sewers generate much of the system's costs. Therefore, smaller less expensive collection systems have been developed that can ultimately do the same job. Some of these alternative collection systems include pressure sewers, vacuum sewers and small diameter effluent sewers (H.J. Porter & Associates Limited, 1980, 26). These systems transport effluent, in some cases before it has been treated in a septic tank, while others have been designed to carry effluent coming out of the septic tank. In either case, such systems have been developed to lower costs for the municipality, the developer and the homeowner.

4.4.4.1 Pressure Sewers

The most common alternative method of wastewater collection and transportation system is through the use of pressure sewers. These systems consist of either a grinder pump, which grinds the solids in the wastewater much like a garbage disposal does, or a septic tank and an effluent pump (commonly known as a S.T.E.P. system).

In the grinder pump system, as displayed in Figure 4.4.4.1, the wastewater leaves the dwelling and enters a holding tank where the contents are ground up into a type of liquid material that can be safely pumped into a small pipeline. This system does not allow for any primary treatment before the wastewater is ground up and send to a treatment system. Originally developed for single family dwellings that discharge their effluent into a conventional sanitary sewer system, the use of a grinder pump system can also be used for the purposes of cluster on-site septic treatment. An example of this is can be found on Toronto Island where a cluster system was developed and installed in the early 1980s and still continues to function reliably (Zsolt, 1994, 38).

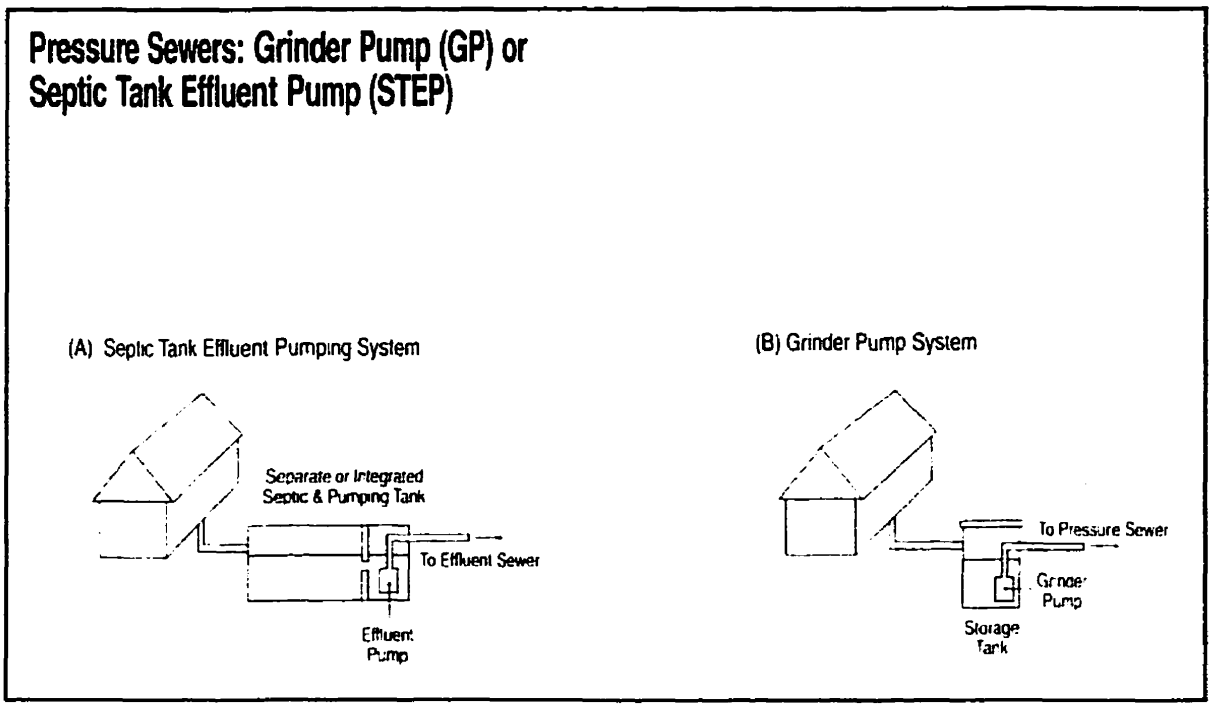


Figure 4.4.4.1 **Examples of Pressure Sewer and S.T.E.P. System**
Source: Unites States Environmental Protection Agency, 1992.

Under the S.T.E.P. system, household wastewater is first carried into an individual septic tank for primary sewage treatment. From here, the effluent is pumped into a pipeline and carried to its receiving environment for secondary treatment before it is released back into the local ground water. Because the solids are settled out in the septic tank, this system

can use a smaller diameter piping system to carry the effluent from the tank to the disposal field (United States General Accounting Office, 1994, 29).

Although there are higher operation and maintenance costs to each individual user connected to this type system, the many advantages include:

- a reduction of construction costs compared with conventional collection systems;
- because they use a pumping system, they eliminate the need for a constant slope on the collection pipe, and therefore can be used in several different environments;
- each household has its own small pump to move the effluent into the system, therefore eliminating the need for large pumping stations (Nova Scotia Departments of Municipal Affairs, Health and Environment, 1983, 10).

4.4.4.2 Vacuum Sewers

The main function of vacuum sewers is to carry sewage from buildings, dwellings or structures by using a system of negative pressure to pull wastewater to its destination. The main components of this type of system are "vacuum mains, collection tanks and vacuum pumps and individual home valve connecting systems" (H.J. Porter & Associates Limited, 1980, 2.7). As illustrated in Figure 4.4.4.2, the vacuum sewers generally have all the advantages and disadvantages of a pressure sewer, but instead of pushing the wastewater along, vacuum sewers pull it (United States General Accounting Office, 1994, 33).

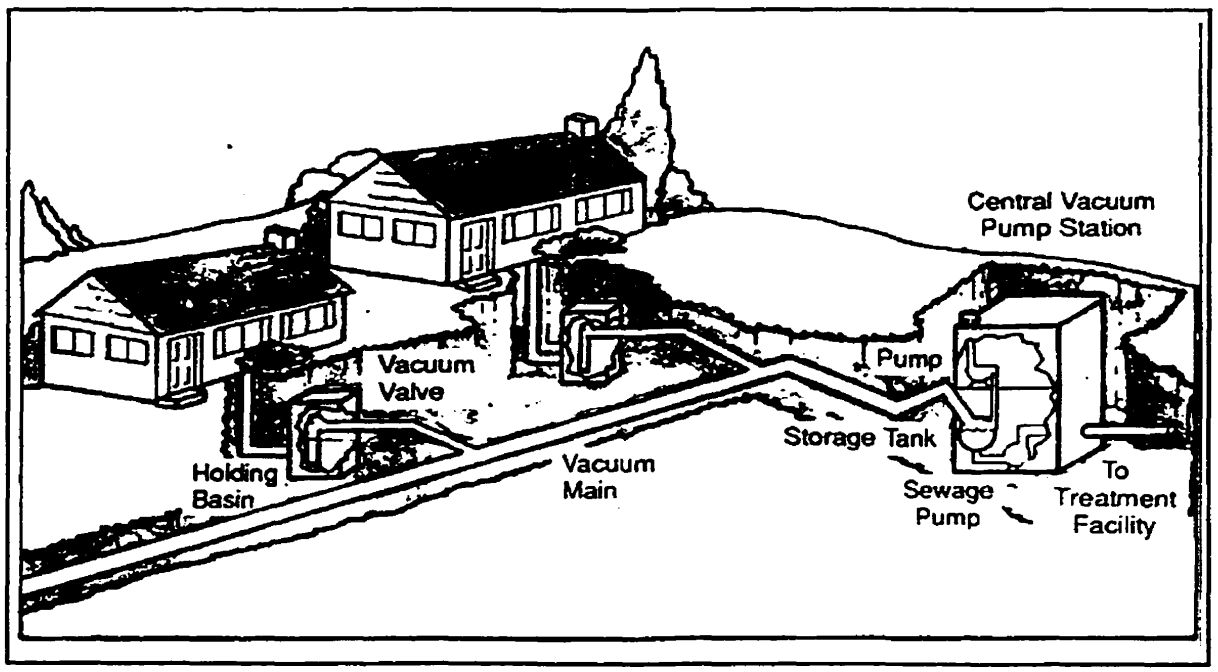


Figure 4.4.4.2 Example of a Vacuum Sewer Collection System
Source: United States General Accounting Office, 1994.

4.4.4.3 Small Diameter Effluent Sewers

A third alternative collection system is the use of small diameter effluent sewers. These work in a similar way to the S.T.E.P. system, but instead of using a pump to move the effluent into the collection system, gravity is used. Since each building or dwelling has its own septic tank, the effluent that is collected in this system will have very limited amounts of solids present. Therefore, a small, 4 inch pipe can be used to carry the effluent to the disposal field (H.J. Porter & Associates Limited, 1980, 2.7). As shown in Figure 4.4.4.3, this system is still affected by some of the gravitational disadvantages associated with conventional sewers, but can be installed using a smaller slope and therefore less construction and excavation is required.

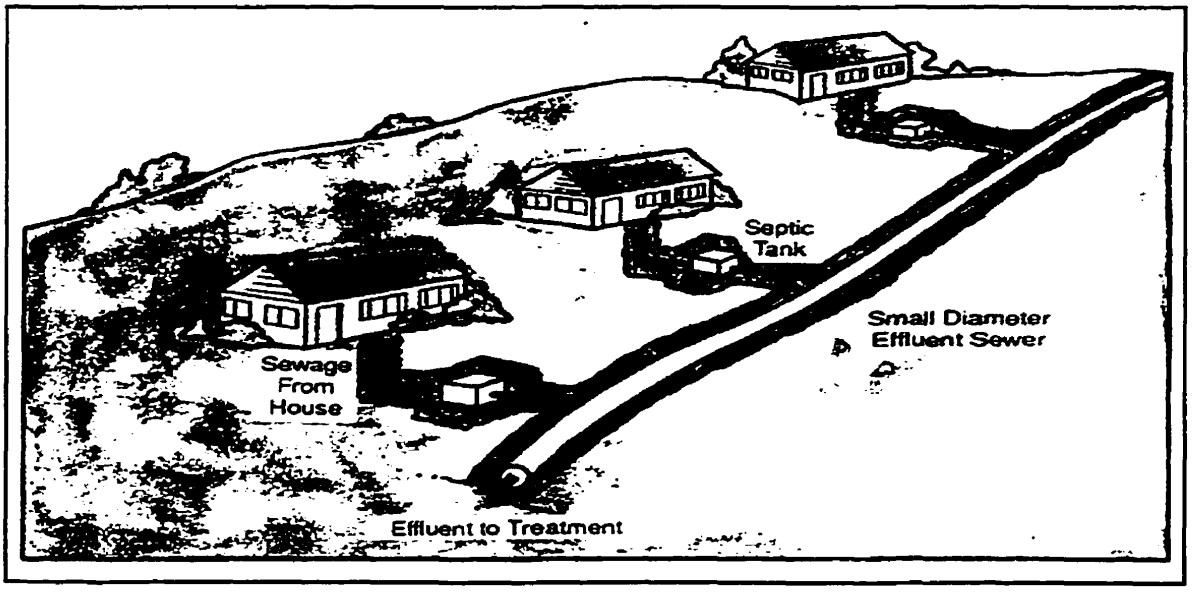


Figure 4.4.4.3 **Example of a Small Diameter Effluent Sewer That Could be Used to Service a Rural Cluster Development**
Source: United States General Accounting Office, 1994.

This type of system was successfully developed and installed in a low-density community in Ohio named Maysville, which contained about 770 households and therefore could also be used to service a small cluster of rural dwellings. This collection system has a cost savings of about 35 percent when compared to constructing a conventional gravity sewer system (United States General Accounting Office, 1994, 26).

4.5 Overall Costs Associated With Clustered Methods of On-Site Sewage Disposal Systems

Costs of clustered sewage treatment systems vary greatly depending on the proposed function, the condition of the site it is to be installed on, the distance between the treatment facility and the dwellings and, the size and capacity of the system. According to Arendt (1993), the costs of clustered septic disposal systems can be as much as 50 percent less than conventional systems. In Nova Scotia, three situations already exist where cluster systems are currently being used or can be accommodated for in the future. These systems were installed through the implementation of Wastewater Management Districts in Port Maitland, Guysborough and Woods Harbor to remedy the negative impacts of their failing systems. Port Maitland, in particular, estimated that to correct the situation through the use of a conventional collection and and treatment system would cost each household being served between $6000 and $10 000. Instead, the community decided to construct cluster systems, upgrade failing on-site septic systems and keep those on-site septic systems that function which resulted in a household cost of approximately $2400. While this reflected a large cost savings, there is nevertheless an annual fee to be paid by the system's users, and the government also injected substantial financial support (Mooers & Waller, 1996, 23-4). In the end, however, this project did make more sense economically than constructing a large sewage collection and treatment system.

Overall it is difficult to determine what the cost savings are by using a clustered on-site sewage disposal system. There are many variables in the equation and the result will be different for every development. Although determining the exact benefits of cluster septic systems is not easy, the Nova Scotia Departments of Municipal Affairs, Health and Environment conducted a study in 1983 which contained the following estimates for sewage disposal:

Wastewater Disposal System		1982 cost per connection
1.	Septic tank/ Disposal field individual on-site	$2500
2.	Septic tank/disposal field cluster system	$6000
3.	Conventional Central System	$9000

(Nova Scotia departments of Municipal Affairs, Health and Environment, 1983, 17).

Thus the economics of communal on-site septic disposal systems appear to make sense when compared to conventional central collection and treatment systems, but may still be more expensive when compared with individual on-site treatment systems. The issue that faces a community then, is whether or not it is to the public's advantage to construct cluster systems rather than individual on-site septic systems. The answer, although not based entirely on costs, should be yes. Although cluster systems may cost more in financial terms, they make up the difference in savings for the environment and community cohesiveness.

4.6 Overall Advantages and Disadvantages to Cluster Methods of On-Site Sewage Disposal

4.6.1 Advantages

Most on-site sewage disposal systems, whether individual or clustered, use natural treatment systems to provide a safe method of returning wastewater to the local aquifer and often cost between 30 and 40 percent less than conventional methods. Functioning with fewer mechanical parts and using less energy, cluster methods of sewage disposal create new options for development in areas that will result in less land consumption and a new rural development form (United States General Accounting Office, 1994, 2).

The most important benefit of communal sewage disposal systems when compared to the use of individual on-site septic systems is their capacity to increase the likelihood of clustered rural residential developments. The technology involved in using large natural systems to serve the wastewater treatment needs of a collection of buildings or dwellings opens the door for a different type of rural development. Instead of following old development habits of large lots serviced by individual on-site septic systems, new clustered forms of residential developments can take place where each dwelling is connected to a form of communal on-site sewage disposal system for the benefit of all. This new form of development ultimately has the ability to conserve and protect the environment, bring small rural neighbourhoods closer together and cost less overall in economic terms. Through the use of a variety of communal on-site sewage disposal systems, such as those previously illustrated, rural cluster development can be achieved. Because each cluster project will have different sewage disposal needs, however, no one type of communal system will be the best option for all developments.

4.6.2 Disadvantages

The main disadvantages of cluster systems when compared to individual systems are the lack of public knowledge concerning their function, and benefits, the increased level of maintenance, and the increase in overall costs. While it may appear that the use of a natural filtration and disposal system would clearly be the way to develop in the future, theory unfortunately does not always lead to reality.

Because the development industry is geared toward ventures that have proven to be successful in the past, alternative or innovative practices, such as clustering, may not get the chance to prove how well they function and how they can improve current conditions. This is primarily due to market demand. If a community has been handling its sewage in a specific way over a long period of time, it typically will be reluctant to change. Consumers dictate, through their consumption habits, what will sell and what will not. To get the public to switch to alternative methods of on-site sewage disposal

systems, therefore, will require that the public be taught to believe that the old way of doing things is the wrong way. This requires great amounts of education and time. Because developers build what they believe is going to sell, they develop projects within specific time frames so that they can get a prompt and timely return on their investment. In most cases they cannot afford or refuse to spend time exploring alternative options because if they take too long, their development time envelope may close and they will be forced to take losses on their investments. Therefore, until more people are educated about the benefits and the overall savings associated with alternative methods of on-site sewage disposal systems, it will be some time before this concept and the idea of clustered rural residential developments is accepted and practised.

The second disadvantage of on-site sewage disposal systems is the need for proper use, regular inspections and maintenance. If the septic tank is damaged or allowed to overflow with solid waste materials, there is the possibility that solids will be discharged into the disposal field reducing the soil's ability to effectively treat the effluent. In addition, the perforated pipes in the disposal field can be crushed or moved causing the disposal field to become ineffective. These are major drawbacks that the user must be aware of and that must be overcome when dealing with on-site systems. Due to the high failure rate of existing septic systems, questions can be posed regarding the true benefits of cluster systems. If systems using natural on-site methods of sewage disposal are properly designed, installed, used and maintained, then they do hold the key to a new form of development, but if they are not properly maintained, they will become a threat to the surrounding community and environment.

5.0 Maintenance of On-Site Sewage Disposal Systems

One of the major barriers to the proper functioning and operation of cluster on-site sewage disposal systems is the practice, or lack thereof, of regular monitoring and maintenance of existing individual septic systems. Currently a serious problem, most residents using these systems view them as "flush and forget" forms of disposing their household sewage wastes. Because communal systems will be required to accommodate larger sewage flows than individual septic systems, they must be properly maintained so that they do not malfunction. Therefore, the management of a communal on-site communal sewage disposal system must play a major role if the concept of clustered rural residential development is to be successful. The main focus of this chapter is to illustrate how it should become the joint responsibility of the developer, the homeowner, the municipality, and the province to ensure that septic disposal systems can be properly maintained. In addition, how these different stakeholders can perform simple tasks to enhance the safety and performance of their communal septic system, while ensuring a longer lifespan with less costs to all parties, will also be discussed. Ultimately, changes in current management practices must developed and therefore the idea of implementing a mandatory provincial inspection program through the privatization of septic system inspectors will be explored.

5.1 Homeowner's Responsibility

When dealing with the issue of on-site septic system maintenance, in rural unserviced areas, the responsibility of properly maintaining and operating these systems falls on the user (Nova Scotia Department of Health & Fitness, 1988, 6-01). In comparing a private septic system to the use of a new, expensive automobile, how many people would drive the car until it ran out of gas and then just forget about it and walk away? Or what kind of individual would never change the oil and drive the car until it simply seized up and stopped running? Not likely not very many people would invest a large amount of money on an object such as a car and then let it quickly deteriorate to the point where it

was no longer functional. Yet this is precisely why so many private septic systems fail. Too often, once it is in the ground, it is forgotten about. This, in addition to several other problems, is the main reason why the onus of private septic system maintenance should fall completely on the user.

Eating and water consumption habits vary between households, and so the amount and type of wastewater produced will also be different. No matter what the range of wastewater produced, the main concerns are the volume produced and the amount of organic material contained in the wastewater (Machmeier, 1997b, 3). Because a septic system is designed to accommodate a specific capacity of wastewater, the less water that enters the system, the better. By conserving water consumption, therefore, a household can help maintain and prolong the life of its septic system. To conserve water, a household can perform simple activities such as using appliances that reduce water consumption (i.e., low flow toilets and energy saving appliances such as dishwashers and washing machines), limiting the length of showers, keeping a container of cold water in the refrigerator instead of leaving the tap run until the water is cold enough to drink and only flushing a toilet to dispose of solids, to name a few.

In addition to the amount of wastewater that is discharged into an on-site sewage disposal system, the makeup of the solids also greatly affect the performance of the system. By subjecting the system to materials that it cannot digest, its lifespan will be shortened. Because the septic tank cannot digest materials such as raw vegetables, fruits and meats, garbage disposals should not be used in conjunction with on-site septic disposal systems (Machmeier, 1997a, 1). Not only should ground garbage be prohibited from entering a septic system, but also the user of such a system should ensure that non-decomposable items such as cooking grease, coffee grounds, disposable diapers, cat box litter, sanitary napkins, tampons, cigarette butts, plastics or heavy paper products are never flushed down the toilet or washed down the sink. By allowing these types of materials to enter the system, the user risks unnecessarily filling up the septic tank with undigestible materials (Brown & Peart, 1996, 4).

The issue of regular septic system inspection and cleaning is the most important stage in homeowner maintenance. Often overlooked by the homeowner, this must be the sole responsibility of those who use the system. It is estimated that a properly designed system should be inspected and cleaned every two to four years, but this varies greatly depending on the capacity of the system, the consumption habits or size of the household and the geographic location of the system (Mancl, 1997a, 2). A safe time line for septic tank inspection is once a year. The tank should be pumped out when the height of the sludge at the outlet end of the tank is half of the total height of the liquid in the tank. It is thus important that those using such systems are aware of where their septic tank and disposal field are located and how access can be gained to them so that they may be inspected and cleaned. Although there are costs associated with such a preventive maintenance exercise, which differ between provinces, they are small in comparison with the amount it would take to completely replace a failing system. By practising such a maintenance program, an on-site septic disposal system, whether individual or cluster, should properly function for twenty years or more (Vandervort, 1997, 3).

5.2 Developer's Responsibility for the Proper Function & Maintenance of On-Site Sewage Disposal Systems

The type and function of an on-site sewage disposal system are often determined during the planning and development stage of a project. The developer and planners must ensure that a system of sewage disposal is constructed that has the ability to function effectively for an extended period of time. Although developers are not directly responsible for the maintenance of any cluster septic system, they can ensure that any installed system will be easy to maintain.

In the United States, it has been estimated that as many as 75 percent of all failing septic disposal systems have resulted from hydraulic overloading (North Carolina Cooperative Extension Service, 1998, 1). In many instances, this could have been avoided if the developer had not undersized the system. Although a developer may see immediate financial advantages in terms of lower costs associated with undersizing a septic system,

in the end, both the environment and the user pay a higher price. Developers should therefore be aware of the capacity requirements or size of the development being proposed, and anticipate installing a sewage disposal system that maybe slightly oversized, having extra capacity to guard against hydraulic overloading and premature system failure (Alth & Alth, 1984, 172). While this is theoretically a sound argument, in reality, the consumption habits of households cannot always be correctly forecasted and even if a septic system has been oversized, it possibly may not be able to accommodate the amount of wastewater produced.

Aside from ensuring adequate system capacity, a developer can also assist in the reduction of wastewater produced. By constructing residential dwellings and other buildings that use water conserving appliances and fixtures, a developer can help reduce the consumption habits of the individuals that will eventually be living there. The fixture that produces the most wastewater per day is the toilet, as it accounts for approximately 40 percent of the sewage produced, averaging between 5 and 6 gallons of wastewater per flush. By using a reliable and effective low flow toilet, or toilets such as the two-flush and flush-stop design, wastewater can be reduced by over one third, as demonstrated in Figure 5.2. In addition, the newly constructed home can also utilize advantages such as black and grey water separation and recycling devices, low flow/energy saving shower heads as well as water consumption reduced washing machines. These items will add some initial cost to the home, but much less than the price of a new septic system (Machmeier, 1997a, 3).

In North Carolina, for example, a recent study concluded that alternative cluster septic systems failed twice as often as individual conventional systems due to the lack of maintenance. A responsible developer must, therefore, also be willing to take the time to help the user set up a maintenance program to ensure that any system, whether individual or communal, will be properly cared for in the future. This would include information as to where the system is located, how it works, and how it should be maintained (Hoover et al., 1996, 2). If users realize that their systems must be properly maintained and cleaned

after a specific duration of time, they may possibly understand the importance of proper maintenance and use.

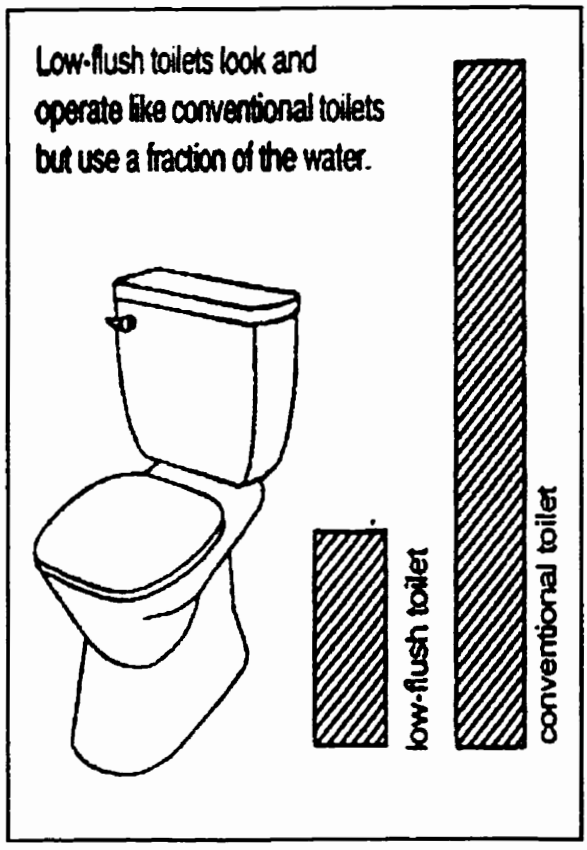


Figure 5.2 Low Flow Toilet
Source: CMHC.

5.3 Municipality's Responsibility

Because final approval regarding most developments in urban and rural areas falls upon municipal or county governments, it is important that they follow through to ensure that any proposed on-site cluster septic system is correctly managed and maintained. Although this task does present many difficulties in terms of enforcement, several American States, as well as the Province of Quebec, have current legislation in place that allows municipalities to pass municipal ordinances requiring owners of on-site septic systems to have their systems inspected over a certain time period. These by-laws, if enforced, ensure that the proper maintenance of septic systems will be carried out (Arendt, 1993, 209). In Nova Scotia, there is currently no such provision enabling a municipal or county government to pass this type of by-law, but specific proposed revisions to the *Municipal Government Act* may possibly change this. Under the Municipal Government Act: A Working Paper in Legislative Form (1997), Part 14, section 331 entitled Private Sewage Disposal System By-law, a municipality, if this revision is successful :

> may, by by-law, require owners of private on-site sewage disposal systems to have the systems pumped, emptied, cleaned, checked and maintained in accordance with the standards set out in the by-law. (179)

This statement would greatly expand the powers of a Nova Scotia municipal government, allowing it to require that on-site septic systems be properly inspected, cleaned and maintained. Whether this clause will remain in the piece of legislation that is to be approved by the Legislative Assembly can only be speculated on, but at the very least, the Nova Scotia government is considering this type of action to manage rural septic systems. Unfortunately, this by-law would be optional for municipalities, there would still not exist any provincial requirement that would force a municipality to ensure the proper management of septic systems within their boundaries.

Perhaps the most important issue facing a municipality is its ability to educate the public. This does not only include those individuals who construct or use septic disposal systems, but also politicians and the general public. The problem with this concept is that many public officials are not up-to-date on current information and techniques concerning on-site cluster sewage treatment systems. In fact all too often, planners are forced to recite what is found in their outdated municipal zoning by-laws instead of being a true source of planning knowledge and guidance. Therefore, not much progress has been made in the movement towards communal methods of septic disposal, let alone methods of planning that would lead to cluster development. It is essential that municipal governments educate their staff on the newest methods of sewage disposal and the need to properly maintain these systems. In turn, these people must be available to educate the general public on the benefits of using such systems and the importance of maintaining and caring for them as well. Education is the key to successfully changing the patterns and habits of the past, and, if successful, campaigns of this sort can have very positive results.

5.4 Responsibility for Maintenance at the Provincial Level

As overseers of the entire development process, Canadian provinces have the ability to create and enforce laws that govern municipal actions. They can also give municipalities and county governments the powers to monitor and control local activities. Because of this, the province should be the leader when it comes to developing policies concerning on-site cluster sewage disposal system design, function and maintenance. In addition, the many Departments found in Provincial Governments should have the ability to make and enforce needed changes when it comes to dealing with proposals that utilize communal septic systems to accommodate rural cluster development. The entire issue of legislating maintenance for on-site septic systems, therefore, must originate from the provincial government. Section 5.3 has shown how the Province of Nova Scotia is proposing to pass legislation giving municipalities the option to pass by-laws requiring the proper maintenance of septic systems. Expanding on this idea, the province should ensure that a

specific standard or level of operation and maintenance is being achieved across the whole province.

The province should also aid municipalities and public organizations in their roles as educators and partners with the private sector. Often, the province has more knowledgeable members on staff and may employ different professionals that a municipality or non-for profit group cannot afford. They may be able to influence different experts to spend time educating public employees on the benefits of septic system maintenance . By lending out staff members to conduct training and information sessions, provinces can help save money in the long run as well as bringing the different levels of government closer together to function cooperatively instead of separately.

5.4.1 Mandatory Provincial Inspection Program

Enhancing the province's attempt to increase the level of management of cluster sewage disposal systems, the Department of the Environment should consider implementing a provincial program that would require the annual inspection of both individual and cluster septic systems. The annual inspections of septic systems could be carried out in a similar manner as current automotive inspections required by the Nova Scotia Department of Transportation and Communication where it is the responsibility of the owner to have his or her car inspected every year. Similarly, the province should notify homeowners that it is time to have their septic system inspected, and in turn, the homeowner would contact a provincially certified inspector to carry out the inspection. These certified inspectors can be employed by municipal or provincial governments, but if qualified private inspectors are available, then they too could carry out the inspections. Once the system passes inspection, the homeowner should then be required to make the Department of the Environment aware that the system has been inspected and is functioning properly. This notification can be a simple letter of certification issued by the inspector that is mailed into the province where it would be kept on file. All the records kept by the Department of the Environment should then be developed into a database so that the province can

keep tract of the inspections that are carried out throughout the province. This inspection program should ultimately be funded through inspection fees paid for by the homeowner and therefore, the data base can also keep track of all provincial inspectors and how much they charge to perform their services. Because the cost of each inspection may vary depending on the geographic location of the residence, the location of the septic system, and how much effort it takes to access the system, the information in the provincial database should be made available to members of the public so that they can find the inspectors in their area that are reliable and competitively priced.

If a septic system is not inspected or does not pass the inspection, the province should then have the option of carrying out the inspection themselves, and if needed, having the septic system cleaned, repaired or replaced at the cost of the homeowner. In addition, where a system does not pass inspection, the homeowner should be given the option of either contacting an independent company to clean the septic system, or have the inspector perform the required cleaning and maintenance. By giving this option to the homeowner, the province is creating a situation where the inspectors must be able to justify their decisions. For example, if an inspector decides that the septic system needs to be cleaned, the homeowner should be able contact an independent provincially certified company to obtain a second opinion. This would insert a safety mechanism into the inspection program that would ensure that inspectors are not requiring unnecessary work on septic systems be performed simply to increase their own business.

In order to develop an annual inspection program that is implemented in a fair yet timely manner, the Department of the Environment should first only require inspections for all septic systems that have been installed within the last five years, or after 1993. To ensure that the use of cluster septic systems is not selectively discouraged, both individual and cluster systems should be inspected under this program. As the program progresses, inspections should be required for all systems, even those that have been installed earlier than 1993. By inspecting recently installed septic systems first, the province can gauge how successful the inspection program is and if it does not appear to

be functioning as expected, then it can be modified or abandoned. This may appear to be a harsh approach to managing on-site sewage disposal systems, but it must occur in order to guarantee that all septic systems are properly used and maintained.

5.4.2 The Privatization of On-Site Sewage Disposal System Inspectors

Through the implementation of a mandatory inspection program, there will be an increase in the need for provincially certified septic system inspectors. Currently in Nova Scotia, Part IV (Certificates of Qualification) of *Schedule "A"* of the *Environment Act, R.S.N.S. 1995 as amended 1997*, standards are set that require qualified persons, installers and septic tank cleaners to meet before they are approved to do work in the province. This, in turn, sets the standards by which all activities relating to on-site septic disposal systems in the province of Nova Scotia are evaluated. If any unqualified persons attempt to install, repair, replace or clean a septic system within the province of Nova Scotia they can be charged under the *Environment Act R.S.N.S. 1995*. By acting in such a forceful manner, the Province of Nova Scotia is attempting to ensure that if septic systems continue to be employed in the province, they must be properly installed, inspected and cleaned by qualified personnel.

In addition to certifying qualified persons, septic system installers and cleaners, the province of Nova Scotia should evaluate the possibility of also certifying private septic system inspectors. Privately employed inspectors should be responsible for attaining the same level of certification as provincial and municipal inspectors, and would be responsible for evaluating each septic system by the same set of provincial standards. These individuals would be more readily accessible to the public as they would be operating a profitable business. To permit the certification of private inspectors, the Department of the Environment would again have to amend Schedule "A" of the *Environment Act*, but these amendments will allow private inspectors to perform the duties that would otherwise be required of provincial and municipal inspectors. Therefore the certification of private inspectors should decrease the perspective workload

of the Department. There would still be a need for government inspectors, but they would play the role of overseer in the management of on-site sewage disposal systems.

In order to implement the privatization of provincially certified inspectors, the Department of the Environment should contact private companies and individuals that they feel would best meet the requirements. Some of these companies may include septic system installers and cleaners as well as excavating companies, civil and environmental engineers and individuals who specialize in community sanitation services. By gathering existing professionals from across Nova Scotia, the province can determine those companies that have the best suited knowledge and background to become certified private inspectors. Once established, these inspection companies should be responsible for attaining their certification through a provincially run education program which would include attending different information sessions and on-site practical examinations. In addition, there should not be a limit placed on the number of certified inspectors, because the more inspectors there are through Nova Scotia, the more they will compete for business. As a result, costs should remain relatively consistent throughout the province.

A mandatory provincial program involving annual inspections of on-site sewage disposal systems and the use of private septic system inspectors does not have any precedent in Canada, but the province of Quebec does has a program that is somewhat similar. In Quebec, the municipality has the option of passing a by-law that would require annual inspections of septic systems. Although not required in all municipalities, these inspections are carried out by individuals employed by the province. Therefore, the concept of the privatization of inspectors does not yet exist in Canada and this is an opportunity for Nova Scotia to set the precedent in effective sewage disposal system management which in turn may promote the proper development and management of communal septic systems.

6.0 Ownership and Responsibility of Communal On-Site Septic Disposal Systems

In the past, it was common to have a municipality assume the ownership and responsibility to repairing cluster septic systems. As municipal operating budgets are declining, local governments are becoming less willing to accept these responsibilities and therefore other alternatives must be created. This chapter will not only examine this problem, but will also take an in-depth look at who is and who should be responsible for ownership of these systems, both from the beginning of the development to the successful sustenance of the community. Examples of methods used in examining the ownership dilemma will include Waste Water Management Districts, Homeowner Associations, and the possibilities of Bare Land Condominiums. By the end of this chapter, the groundwork will have been laid for an overall analysis and observations of the many possibilities for rural cluster development as a result of proper planning and management of cluster sewage treatment facilities.

6.1 The Province of Nova Scotia

The main function of the province as head of the regulatory system, is to develop the necessary policies and legislation to ensure the safe existence of all on-site sewage disposal systems. There are several different Ministries or Departments involved, each playing a vital role, with some Departments working alone and others working through special partnerships.

Some of the legislation and policies developed by the province of Nova Scotia that help achieve these goals include the *Planning Act*, the *Environment Act*, the *Condominium Act*, the *Municipal Government Act* and the *Towns Act*, to name but a few. In Ontario, for example, legislation such as the *Planning Act*, the *Environmental Protection Act* and policies such as the Ministry of the Environment and Energy's Guidelines for the Responsibility of Communal Water and Sewage Works and Communal Sewage Systems

also strive to achieve the same goals. Other Canadian provinces and American states have similar laws and regulations which, however, fall under different jurisdictions and names. By developing these guidelines the province, although not directly taking over ownership of on-site communal septic disposal systems, sets out the standards and definitions of what kind of ownership should take place in order for the successful operation of these alternative servicing options.

From the different legislation and policies come different forms of systems ownership. In North Carolina, legislation dictates that ownership of communal septic treatment facilities is not necessarily important, as long as they are maintained by a "management entity." The owners of these systems must have entered into a legal contract with a management entity to ensure that proper inspection and maintenance is carried out. In addition, the management entity, whether it is a privately or publicly run organization, must be approved by and take direction from the overseeing local health unit. The issue of ownership, therefore, is not a priority in that state as long as the legalities of a proper management plan are worked out (Hoover et al., 1996, 2).

In Canada, there are other alternatives to ownership for different problems. For example, Nova Scotia allows for the formation of Wastewater Management Districts, where alternative methods of communal sewage collection and disposal are operated by a municipality, or Bare Land Condominiums, which permits a condominium corporation to own and operate such systems. This somewhat contrasts the approach taken by the province of Ontario, where all communal systems, once installed, must be turned over to the municipal or county governments which assume the responsibility of ownership, maintenance and repair or replacement.

6.2 The Municipality's Role in the Ownership Debate

As the level of government that operates closest to its rate payers, municipalities are often more aware of the makeup and attitudes of the individual homeowners within a community. This level of government relies heavily on public awareness, education and participation when making decisions that affect the community. In addition, municipal governments have been viewed as the level that expresses the most concern for the well-being of its constituents.

The combination of these factors leads critics of wastewater management systems to believe that any type of communal on-site wastewater treatment and disposal system should be owned and maintained by some form of organization operated as a part of a municipal government. Examples of this type of organization may include a wastewater management authority or even a public works committee set up solely for the purpose of managing and controlling communal on-site septic treatment systems.

In Nova Scotia the province has devised a system where on-site cluster septic disposal systems can be owned and operated by the municipal level of government and funded through a fee structure where the user of the system pays a particular share of the construction and operating expenses. The following sub-section will take a closer look at one such arrangement in Nova Scotia known as Wastewater Management Districts.

6.2.1 Wastewater Management Districts

Enabled through the *Municipal Government Act*, the province of Nova Scotia is the only province in Canada with a program set up for Wastewater Management Districts (WWMD). Other provinces have examined solutions to the dilemma of on-site sewage treatment and have developed their own methods and approaches. In the province of Ontario, for example, the Ministry of Environment and Energy has set up *Guidelines for the Responsibility of Communal Water and Sewage Works and Communal Sewage*

Systems (Sept. '92) where the importance of Communal Waste Treatment Systems (CWTS) is recognized. In addition, the Ministry of Municipal Affairs has promoted the idea of CWTS as a servicing option for rural cluster development (Paton, 1995, 12). A major difference between communal systems in Ontario and those in Nova Scotia is how they are owned and managed. Providing a more cost-effective alternative to all stakeholders, the WWMD is an approach that depends on the approval and participation of the municipality and the homeowners who use the wastewater treatment system. Instead of assuming all costs, however, the municipality can charge a user fee to aid in the recovery of capital, operation and maintenance costs (Nova Scotia Departments of Municipal Affairs, Health and Environment, 1983, 4).

Established through the enactment of a municipal by-law, WWMDs are public utilities that own and operate the sewage treatment facilities of a specific area. Within this district, the utility has the ability to examine sewage treatment alternatives to best suit the needs of its prospective users (Nova Scotia Department of Housing and Municipal Affairs, 1994, 5). Once established, the managing utility would be responsible for:

- the ownership, purchase, lease and rental of both real and personal property;
- the planning, design, construction, inspection, operation, and maintenance of all types of wastewater disposal systems located within a WWMD;
- entering in contracts and undertaking debt obligations;
- fixing and collecting charges for use of sewage systems;
- planning service extensions;
- repairing or replacing malfunctioning systems (Mooers & Waller, 1996, 23).

A researcher studying the implementation of cluster developments, Marcello Battilana (1997, 69), explains that, before creating such a management district, the municipality must first define the area that will be subjected to the WWMD, hold a rate-payers plebiscite to agree to the use of such a wastewater management system, and finally, prepare the by-law for approval. Because all property owners within a WWMD must participate in funding the program, the aspect of public participation and approval is paramount in the success of the system.

To date, there have been several Wastewater Management Districts studied and proposed, but only three have been successfully implemented and maintained in Nova Scotia. These include Port Maitland, which was created in 1982, with Guysborough and Woods Harbour following in 1989 (Mooers & Waller, 1996, 23). These WWMD's were all set up as a response to malfunctioning individual on-site septic systems and utilized individual and cluster on-site sewage treatment systems, as well as conventional sewer collection and treatment systems. For the most part, the users have been satisfied. In Guysborough, however, where a combination of individual, cluster and conventional sewer systems were used, many users served by individual or cluster systems felt that they should not be responsible for repaying the capital costs of connecting other users within the same WWMD to a central collection and treatment system (Paton, 1995, 11).

As Andrew Paton, a planner for the Nova Scotia Department of Municipal Affairs and Housing, suggests (1995, 13), Wastewater Management Districts can be used to correct failing on-site sewage disposal systems, but are subject to limitations, as they are:

- an appropriate solution to disposal problems in some but not all small rural or semi-rural communities;
- viewed by much of the public as a second class solution;
- most appropriate when there are large tracts of land with suitable soils, close to the community with the disposal problem;

- useful as short to medium term solutions for communities beyond the fringe of larger growing communities, where the conventional central piped collection component of the cluster collection system can ultimately connect;

- often viewed as a more appropriate solution to conventional piped systems in areas where growth is expected, since on-site systems would tend to limit growth.

In conclusion, the establishment of WWMDs in Nova Scotia seem to provide a municipality with the ability to use various methods of sewage collection and treatment, so that it may provide a flexible and cost-effect means of correcting problems associated with failing on-site sewage systems. Although there are three areas in Nova Scotia that have implemented such ownership and management programs, most of the proposed WWMDs have never been accepted by the potential users. Public acceptance, education and participation have been considered key factors in the success of this management program, but have also been the reasons for failed implementation. As a response to this concern, the provincial Department Housing and Municipal Affairs has proposed that the *Municipal Government Act* be amended to remove the requirement of a plebiscite, presently needed in order to create a WWMD (Department of Housing and Municipal Affairs, 1997, 175). Instead, it has suggested that the requirements for establishing a WWMD should simply be for a municipal council to pass a by-law that would include:

- the boundaries of the wastewater management district;

- the system of wastewater management to be used in the district;

- the extent to which the municipality is responsible for the repair, upgrading or replacement of private and municipal sewer systems (Department of Housing and Municipal Affairs, 1997, 182)

While this would appear to be a solution to the current rejection of a WWMD by its proposed users, forcing a management system for failing sewage treatment systems on the rate payers may create a sense of resentment towards the program. Because sewage

disposal systems are not likely completely understood by the general public, it should not be expected that the public will immediately understand the usefulness of a WWMD (Paton, 1995, 10). But by properly educating the general public on the advantages, disadvantages and alternatives to a management system such as the WWMD, the general public may eventually become receptive and work with the municipality instead of against it. Currently, there exists a relatively high level of ignorance towards the use and need for WWMDs and thus has caused this wastewater management program to be rejected in most municipalities. In light of that fact, WWMDs should only be used as a reactive approach to correcting the problems associated with existing failing on-site sewage disposal systems.

6.3 The Developer

In any development project, the prime objective of the contractor or builder is making a profit. When dealing with the ownership of individual or communal on-site sewage disposal systems, a developer must create what can be sold at the best rate of return. If a specialized treatment facility has to be created and a management program implemented, a developer will pursue the project only if it is marketable and profitable. This may mean constructing a residential project and, once all the units or lots are sold, simply walking away with whatever profit the development has generated. Whichever way a developer wishes to proceed, (s)he would not own the sewage disposal system, but instead would be responsible to set up the required ownership scenarios for the resident.

The first option is the one most commonly practised in many areas and is the least desirable. It involves planning and constructing a residential and when completed, lots with or without services are sold off to builders and homeowners. In this scenario the developer retains no percentage of ownership in the development and once the project is completed and sold off, and is no longer involved with how the new development functions. The developer would come back to perform warranty work, but will have no ownership role in the everyday management of the finished product. As for how the

septic systems are managed, be it an individual system or a cluster system, the developer has no responsibility to ensure that it is adequately maintained, only that it is installed properly and approved by the municipality. In this situation, the users are most often not properly informed on how the system operates, how it should be used and managed or sometimes even where it is located. This usually leads to the most problems, which can be largely avoided if the developer can take the time to educate the users.

The other option, therefore, would see the developer set up a type of ownership and management system before the development is sold off. This will take both time and cooperation on the homeowner's and the developer's part, but will ensure that the proper steps are taken to limit the many problems associated with malfunctioning on-site septic systems. This method of management can be used for both individual and cluster systems and is the most preferred and realistic method of ensuring the developer sets up a management system for the homeowners. In taking the time to ensure the proper use of these systems, the developer can set up information sessions with the users and the septic system designer and installer. The developer may even go as far as helping the residents set up an association, which would have the responsibility of owning and maintaining all septic systems owned in the area where the management program is to be implemented. Often, the concept of cluster development through the use of communal septic systems requires that a type of management program is set up, no matter who owns and operates the system. The developer has little choice but to aid in this process if the project is to succeed. Homeowner's Associations or Bare Land Condominiums are examples, where the user would own or operate the system, or creating municipal management and ownership programs such as those explained in the Wastewater Management Districts scenarios. By taking time to ensure that the on-site sewage collection, treatment and disposal system will be properly used and managed, the developer is choosing the option that will benefit all stakeholders.

6.4 The Homeowner

Municipal governments often see rural development as a method of increasing tax revenue, and the idea of maintaining on-site services is never an issue until it becomes apparent how many of these systems actually malfunction. When this happens, the owners and users of such systems turn to their local public authorities, expecting that the government will solve their wastewater disposal problems. While in some instances, the government could afford to lend financial aid covering all or some costs of system replacement, more often the government cannot afford to repair or replace a failing system or to extend public sewer lines. In addition, many local governments are beginning to realize the magnitude of this problem and are simply refusing to service areas that do not benefit the community in terms of tax revenues spent. Therefore, the onus of ownership and maintenance of on-site septic disposal systems, no matter if it pertains to individual or cluster systems, should be on the users. It is clearly time that they are held legally and financially responsible for how they use or abuse their systems.

In examining the concept of cluster sewage disposal systems for rural residential developments, two primary options are available, Home Owner's Associations and Bare Land Condominium Corporations. These two concepts have the same basic objective, but differ largely in their status as legal entities and legal obligations of their members. Each ownership option must be implemented before the sewage disposal system is permitted to operate, and it is the municipality that ensures they are put in place before any residents are allowed to buy or move into the new residential development.

6.4.1 Homeowner's Associations

A Homeowner's Association (HOA) is formed by a collection of individuals who own property in the immediate vicinity of each other. These individuals share common interests such as the use and ownership of roads, public right-of-ways, and on-site cluster wastewater management systems. All of these interests require some form of

maintenance and, therefore, the members of a HOA act collectively to ensure that these items are taken care of. The HOA can thus monitor and, through the use of a fee structure, employ a septic system management company to inspect, clean or repair the system when it is required. In addition, fees collected can also be used to create a fund that would ensure meeting the future financial requirements of system repair or replacement (Hoover et al., 1996, 3). With each property owner being a part of the HOA, a collective ownership approach can be taken to ensure proper use and management of a cluster sewage disposal system.

Unfortunately, an association of this type is only effective if every member has the desire and legal obligation to support the efforts of the HOA. Realistically, however, this is not always the case. As Arendt (1993, 212) explains, membership in the HOA must be mandatory for all homeowners involved. Also, the HOA should have the authority to collect user fees, set up financial accounts for maintenance and system replacement and have the ability to borrow money if the need arises. This method of ownership through a HOA is an excellent concept if all individuals involved cooperate and are determined to make their neighbourhood work. A large flaw in this ownership system involves the question of legal authority. Homeowner Associations can take on several different levels of authority and responsibility, but because they are simply organizations made up of homeowners sharing common interests, each member ultimately has the option of participating in the program or not. This is due to the legalities of establishing a HOA and the lack of legal authority that it can have over its members. As such, this ownership approach has the potential for developing an environment where the user is ultimately responsible for his or her consumption habits, but it lacks the legal authority required to enforce its rules. Therefore, a much more effective and legally enforceable method of a HOA is required, which can be achieved through the establishment of a condominium corporation. This option is available in each province in Canada, and in Nova Scotia, is termed a Bare Land Condominium Corporation.

6.4.2 Bare Land Condominiums

In each Canadian province, the creation of a condominium corporation is a common legal procedure for setting up a development where a project has individual owners. Each member takes ownership of personal individual interests within the development, and in addition, shares ownership in a variety of common interests. This concept, which is commonly applied to high-rise residential developments, can also be applied to cluster type developments which facilitate a variety of housing forms from single detached units to multi-unit dwellings. This type of development can be achieved through the normal procedure of creating a condominium, but in British Columbia, Nova Scotia and several American States, amendments or proposed amendments to their *Condominium Acts* have led to the creation of what is known as the Bare Land Condominium (Department of Business and Consumer Affairs, 1996, 25).

Currently a part of the British Columbia *Condominium Act*, the concept of the Bare Land Condominium (BLC) has been proposed in future revisions of Nova Scotia's *Condominium Act, R.S.N.S. 1989.* Although not yet passed by the Legislative Assembly, this legislation would legally ensure the following:

- that a single entity, fundamentally identical to the users of the facility, is responsible for the operation, maintenance, repair and replacement of the facility;
- that all users share the financial and operational responsibilities the above obligations entail, that record notice of the responsibilities is given to all prospective purchasers, and that no user can avoid these responsibilities;
- that the entity has the authority to institute a user-charge system capable of generating adequate revenues;
- that the entity maintains a "ready fund"to finance emergency repairs and a "capital fund" adequate to replace the system and key components at the end of their useful lives;

- that the entity could not alter these arrangements without prior written approval of... [the Nova Scotia Department of the Environment];

- that the entity owns or has a legal easement to the land on which the Private Sewage Treatment Facility is situated (Arendt, 1993, 222).

By ensuring that these functions are the legal responsibility of the members of the BLC, the ideas of owning and managing communal on-site sewage treatment facilities becomes easier to implement and provide for. The main thrust of the *Act* is to ensure that all financial obligations, both current and projected will be fulfilled. Currently this is provided for in Section 31 of the Nova Scotia *Condominium Act R.S.N.S. 1989*, entitled Financial Provision as provided in Appendix "B." This section ensures that any financial obligations due to the workings, management, inspection, repair or replacement of any common element such as a communal sewage disposal treatment system of the Corporation, will be met.

The major disadvantage in employing a BLC Corporation to facilitate the ownership of a cluster septic disposal system is found in the setup of the legal entity. The concept requires the cooperation of all major stakeholders including the provincial and municipal level of governments, the developer, and the potential members of the Condominium Corporation. If there is a breakdown at any level, the entire process may stall and could cause a development to be abandoned. In addition, because of the complexities involved in planning, developing, and implementing such a corporation, it is only recommended for new developments. The possible conflicts that can occur in attempting to convert single individually owned properties into a condominium corporation setup are unlimited.

Overall, using a Bare Land Condominium as the legal approach to ensure the proper ownership and and management of communal on-site sewage disposal systems in clustered rural residential development is the preferred method. This method of sewage system management can also be used in urban and suburban areas, as it places the legal and financial responsibility of proper inspection, maintenance, repair and replacement of

its common elements on all owners. Because a communal on-site sewage disposal system qualifies as a common element in a condominium setup, it ultimately becomes the responsibility of its owners. While setting up a condominium corporation may involve a great deal of effort by all stakeholders, it is the most appropriate solution to communal on-site sewage disposal management problems for future developments. The use of Wastewater Management Districts or a version of this concept, on the other hand, still remains the best solution for existing failing systems.

Part III Putting The Pieces Together: Observations, Recommendations & Conclusions

7.0 Analysis and Observations

7.1 Clustered Design Due to Communal On-Site Sewage Disposal Facilities

The current trend in rural residential development is to subdivide land into large lots that usually accommodate one single-detached dwelling. This trend has evolved as a result of standards set out in provincial planning policies, municipal and county official plans or strategies, as well as zoning and land-use by-laws. In addition, the on-site sewage disposal standards required by provincial departments of Health and/or Environment have resulted in the creation of large rural residential lots. This has aggravated the problem of over-consuming land for housing developments. Rural land and landscapes, therefore, are becoming scarce commodities and as a result, many municipalities are being forced to rethink how these rural areas will be shaped in the future.

As a response to excessive rural growth, advocates for environmentally sound developments have reintroduced the idea of clustering. The clustering of small residential lots onto one section of a parcel of land creates a situation where the overall land consumed is greatly reduced, when compared to conventional unserviced rural housing developments. Also, the undeveloped land is left in its natural state and protected form further development. In addition, by utilizing different forms of housing the residential project can take on variety of different characters, creating a small rural neighbourhood that fosters a sense of community and security. Clustering may not entirely eliminate the effects of rural sprawl, but through this alternative development form, on-site infrastructure and the destruction of the natural landscape is greatly reduced.

While in theory this appears to be an excellent approach to combating many of the negative effects of over-developing rural land, the issue of owning and managing on-site communal septic systems has always been an obstacle for implementing cluster

developments. For the cluster concept to work, a communal on-site sewage collection, treatment and disposal system must be used to facilitate the sewage needs of the residents in question. Because many public agencies are becoming increasingly skeptical about allowing new forms of servicing, let alone alternative methods of on-site sewage disposal, the use of cluster septic disposal systems is still in the initial stages of development.

As public agencies revise their on-site sewage disposal regulations to accommodate cluster septic systems, one of the main concerns being addressed is proper system ownership, use, and maintenance. The province of Nova Scotia has recently revised its *Environment Act R.S.N.S 1995,* to allow for the use of cluster sewage disposal systems, but the owner of each system must provide the province with a maintenance plan before it will approve the installation of the system. Therefore, the question of system ownership and responsibility must still be addressed. As a result, Wastewater Management Districts and Bare Land Condominiums have been proposed as ownership structures which will ensure the management programs needed to support cluster septic systems.

In addition, to alleviate some of the concerns of proper management of individual and communal on-site sewage disposal systems, the Nova Scotia Department of the Environment should consider amending Schedule "A" of the *Environment Act, R.S.N.S. 1995*, to create a provincial septic system inspection program as well as the privatization of sewage disposal system inspectors. This program would require that septic systems undergo annual inspections to ensure they are functioning properly. Also these inspections will dictate when an on-site sewage disposal system should be cleaned, repaired or replaced, therefore reducing the risk of system failure. Although qualified provincial inspectors currently exist who could perform these tasks, by issuing provincial certification to private inspectors, the added workload of government inspectors will be minimized.

By implementing these methods of cluster system ownership and management, the idea of clustering rural residential developments is much closer to becoming a reality. Unfortunately, while it may take years before this form of rural development is embraced and practised, there is an immediate need to move towards rural clustering in order to facilitate the needs of future generations.

7.2 Need for Change

Whether the population boom in the rural and sub-urban fringe areas will cease and growth will be deflected inward towards the core of built urban centres is, at best, unknown. All that is clear is the need to change the current trend of expanding into rural unserviced areas in many North American cities. Many people moving to the countryside are employed in the urban centres and, therefore, add to the already excessive automotive commuting society. These people move into areas that are unserviced by public water and sewer, and thus, are required to supply their own private means of water collection and sewage disposal. In turn, the requirement for large residential lots becomes a necessity as large areas are needed to supply individual on-site septic systems and water collection systems. A situation is created where land is excessively consumed in an attempt to accommodate a small number of inhabitants. This current consumption level of the natural environment must therefore be reduced, and a rethinking in the current development practices must be undertaken in order to develop solutions to this problem.

Two approaches may be taken to solve the current sprawl dilemma. The first alternative would be to create harsh planning policies to limit or stop growth altogether in rural areas and, as such, put forth an attempt at directing growth back towards the existing urban centres. While on a superficial level this may appear to be a positive solution, it would take a great deal of time and public persuasion to implement. Such policies could also create a backlash by rural municipalities who would feel neglected and discriminated against by larger municipalities wanting to keep new development within their own boundaries. In addition, these rural municipalities may feel that they would lose a great

deal of income in the form of tax revenue and development charges. While this may be a harsh reality, it must nevertheless be faced by rural municipalities in order to help save both the urban and rural environments which now exist.

A second alternative would be to embrace the idea of rural clustering. By practising this method of rural development, the same overall densities are utilized on a specific piece of rural land, but the individual living areas would physically take up a smaller percentage of the land. This method of development still ignores some problems resulting from rural sprawl, but it creates a less harmful effect on the natural and built environments when compared to current conventional develop practices. This cluster concept cannot work alone to combat the negative effects of sprawl, but it can act to alleviate some of the more immediate problems until development can be contained and redirected into built urban areas.

One of the main problems with using cluster development in rural unserviced areas is the need to provide a method of wastewater disposal that is both safe and efficient. Traditionally, individual on-site septic systems have not been closely monitored or properly managed. As a result, several on-site septic systems have failed, causing environmental contamination and creating the need for complete system replacement. In light of these realities, provincial and municipal governments are naturally skeptical about permitting the use of communal disposal systems as a means of promoting cluster development in unserviced rural settings. Because most municipal governing bodies rarely have the time, money or expertise to properly own and manage this type of communal sewage disposal system, they are reluctant to accept the idea. In addition, other municipalities are only willing to accept the ownership of communal systems as a means of correcting the problems of existing failing systems, rather that as an alternative method to servicing new rural residential projects.

Some provinces are gradually realizing the importance of exploring new methods of communal sewage collection and disposal. Bare Land Condominiums legislated in British Columbia and proposed for Nova Scotia, for example, illustrate the willingness of some provinces to combat the negative effects of excessive rural development by putting the responsibilities of ownership, management and replacement in the hands of the users. This allows the rural clustering concept to proceed through the use of communal sewage collection and disposal systems where the government simply acts as an overseer or monitoring agency. All financial responsibilities lie with the users and therefore no government financing is required to ensure that the systems are properly maintained. Because of such proactive action, rural municipalities in the provinces of British Columbia and Nova Scotia can begin to take steps towards easing the effects of rural sprawl.

The alternatives presented illustrate only two approaches to combating sprawl. The first method is long-term, while the second should be used as a short-term approach to facilitate a long-term solution. Neither method will be successful if carried out alone, but together, they have the potential for success. This achievement will require the involvement of several professions, but no profession will be more important than that of planning.

7.3 The Role of the Planning Profession

Planning is not a profession that can be limited to one role, and planners must serve many functions in the development process. They have been looked upon as advocates, facilitators, experts, and public servants and therefore, the roles that planners play are diverse and important to the success of any development. When considering the use of cluster development and communal on-site septic systems to facilitate these projects, it is crucial that the planning profession lead by example. It is not uncommon for planners to assume a leadership role in the planning stage of any type of development, as they have traditionally gathered the expertise of other professions and attempted to merge them and

create the best type of development proposal available. The planning profession, therefore, from both the public and private perspectives, plays a key role in successfully implementing the concepts of clustered rural residential developments through the planning and management of communal on-site septic disposal systems.

As an advocate, a planner must be able to determine the benefits of developing rural residential cluster through the use of on-site communal sewage disposal systems. By doing so, the planner will have realized the benefits that can be gained from this type of development. Once the benefits are understood the planner can work to sway public and political opinion towards the direction of cluster development. In doing so, the advocate planner will also be selling the idea of proper planning and management techniques of communal on-site sewage disposal systems. By using knowledge as a tool, a planner can initiate types of developments that may eventually become accepted as the norm in rural areas, thus creating a new set of development standards and goals. Once the idea of cluster development is popularized, the planner, acting as an advocate for positive change, should monitor the success of clustering and compare its effect on the environment and community to that of traditional large lot developments in rural areas. The advocate planner must be proactive in initiating changes in rural development patterns before the effects of rural sprawl are too widespread to overcome. The tools exist for the advocate planner to persuade the general public, and now is the time for this knowledge to be put to use.

The idea of using communal on-site sewage disposal facilities to service clustered rural residential developments may not initially sit well with rural municipal administrators or developers who wish to continue shaping the land as they are used to. As such, it is also the responsibility of the planner to act as a facilitator. The introduction of a new method of cluster development in rural areas will require the planning profession to sift through the information given to them by other involved professions and best resolve the conflicts that will arise between all stakeholders. One of the largest obstacles to overcome will be the ownership and management of communal on-site sewage disposal systems. The idea

of wastewater management programs is fundamental to the entire process, and therefore must be handled with the most attention. Establishing such a program will involve the combined efforts of public and private planners, government support staffs, health officials, and developers to ensure that the user has the best possible management structure in place before use of the disposal system begins. This will require negotiation between all stakeholders and, therefore, the planner must be flexible enough and have the ability to lead and facilitate such an exercise. Ultimately, the planner acting as a facilitator must be able to work with all interested parties to ensure that major concerns are met, without compromising the cluster concept or the safe and efficient functioning of the required communal sewage disposal system.

In order to act as both an advocate of cluster design and a facilitator of the planning process, planners must be knowledgeable in many different fields. While they are not required to become leading figures in professions such as architecture, engineering, environmental design, business management, or law, planners must have specialized knowledge in order to interpret information and to know where to find more information. As such, planners initiating cluster developments must know the basics of cluster design, communal wastewater systems and management programs when examining subdivision plans for unserviced areas. By having the required knowledge, planners can piece together a proposal, or critique a design for cluster development in a rural unserviced area, and have the confidence and assurance that what they are suggesting is the best solution for each situation. In addition, a planner educated in all areas of development is most effective when it comes to dealing with and educating the public.

Acting in the capacity of a public servant, a planner must be able to distinguish what is best for a community from what is merely going to make the politicians or developers happy. These individuals have a responsibility to direct development in a manner that is beneficial to society's well being, economy, and environment. This may often mean not only persuading developers to change past development habits, but also creating planning policies and land use legislation that reflect a desire for clustered development. This

involves getting acquainted with the historic, current and potential development practices as well as exploring examples from other provinces and countries. The more a planner knows about rural sprawl and the benefits of cluster development, the easier it will be to create and support planning policy that enforces positive ideals. By changing planning documents to allow for the use of cluster developments (i.e. zoning and land use by-laws, official plans, municipal planning strategies, public growth policies), developers will be allowed quick access in proposing a new form of cluster development. Consequently, this would eliminate the time delay resulting from rezonings and other amendments. If it were made easier for developers to act on the concepts of cluster development, the move to the practical creation of such projects would be realistic. The changes in policy must come from and be enforced from the top down. As such, the province must initiate and dictate policy and legislative changes to the municipal level to create a uniform standard across the province. This would not only require the implementation of provincial policies encouraging the use of rural clustering, but a change in provincial legislation must follow to enforce such ideals.

Planning is an extremely diverse profession. It is clear, however, that in order to implement the concepts of cluster development, the planning profession must act together to create advocates, facilitators, experts, and servants of the general public. By using all available resources, planners can ultimately create planning policies and legislation that will guide society to the realization that rural residential cluster developments are beneficial for a community. Not only is it paramount that these policies reflect a proactive approach to development, but also to aid a constantly changing society. Clustering will make a significant difference in the form of current rural development, but will not be the ultimate solution. Therefore, planning documents must reflect the fact that nothing is permanent and that individuals, communities and societies are constantly evolving. Preparing for the future requires that planners have the ability to realize not only that change is good, but that it will always be needed. For now, the cluster concept is the best form of rural design to slow down the effects of a growing society, but it too, in time, will need to give way to other forms of development.

8.0 Recommendations and Concluding Remarks

In combatting the negative effects of rural sprawl, planning authorities, as well as the decision makers they consult, must implement measures to effectively assess current growth patterns. If warranted, they must successfully implement needed changes to allow for the concept of cluster development in a rural setting, including specific changes made to the planning and development of both urban and rural areas. The implementation of all proposed recommendations would result in the proper approach to containing urban growth. Consequently, this would minimize growth in rural areas, as well as protect them through cluster development and the sewage collection and disposal facilities that service them. If only certain recommendations are implemented in any one community, the total potential benefits will not be realized, but many positive effects will nevertheless occur that ultimately will enhance a community's natural and built environments, creating more community collectivity and cohesiveness.

8.1 Recommendations

8.1.1 Recommendation 1.

Provincial & Municipal Examination of Current Rural Development Trends

Governments, at all levels, should examine current development practices exercised in their rural areas, and if the results show a trend towards over-consumption of land for development practices, then they should be prepared to rethink their development policies. Instead of promoting rural development, governments and public agencies should be looking at ways of directing growth back inward towards built urban centres. This can be accomplished through development deterrents such as increasing development charges in rural areas, raising taxes for new rural developments and implementing restrictive planning policies and zoning by-laws. In addition, urban planning authorities

should promote positive policies to encourage development to be directed inward, such as urban renewal programs and infill developments that would maximize urban densities.

8.1.2 Recommendation 2.

The Role of the Municipality to Change Current Planning Practices

Municipalities, especially those governing rural areas, should reassess their role in the development process and become advocates for residential projects that promote cluster development. This would include a rethinking and reforming of Municipal Plans and Planning Strategies, Zoning By-laws, and Development Policies and Charges, so that the idea of cluster development and its benefits can be promoted. Not only should the idea of rural residential cluster type development be promoted and practised in rural areas, but it should also be considered as a method of curbing excessive urban development. If rural areas are not governed by municipal or county governments, the province should assume the responsibility of ensuring that this recommendation is adopted. To achieve the goals of this recommendation, the entire decision-making process should be reevaluated to ensure that decisions makers, as well as those planners who are guiding them, are properly educated on the alternative forms of rural development available for a specific site. This includes an understanding of how these residential projects will be serviced.

8.1.3 Recommendation 3.

The Need for Education

The main crux to the success of clustering in rural areas, and the proper use and management of the on-site sewage disposal systems that services these residential projects is education. By educating all community stakeholders, a level of acceptability towards rural residential clustering will be developed. To change conventional methods of rural development and servicing, every level in the decision making process will have to

accept change and therefore the first step towards change is to educate all stakeholders. This should include educating people in rural areas about the need to properly manage individual and communal on-site sewage disposal systems as well as the need to change to a more environmentally conscious form of development such as rural clustering.

Recommendation 3A.

Joint Municipal and Provincial Education Programs Promoting the Development of Rural Clustering

To enhance and better achieve the goals proposed through Recommendations 1 and 2, municipalities, together with their provincial governments, should cooperate in educating the public and developers regarding the benefits of clustered development for the tax base in the community, as well as for the environment. Instead of creating a situation where municipal decision makers appear to be forcing rural clustering, an educated public will be more aware and receptive to the benefits of clustering when it is recommended as development alternatives. Education programs can include public seminars held for land developers, planners, and the general public that will increase the overall level of knowledge towards the benefits of clustering. In addition, public agencies can work together with developers to ensure that all development proposals are fairly evaluated and, where possible, municipal and provincial planning authorities should also suggest ways that proposed development concepts can be adapted to encompasses the concepts of clustering. By working with developers instead of against them, public planning departments will gain a deeper trust and respect from developers, therefore the success of clustering in rural areas will be easier to achieve. This process of education will save both levels of government in the long run, as the public will eventually be knowledgeable enough to demand that local residential projects become more sustainable and more conscious of residents and the environment, and developers will become more perceptive to the ideas of clustering.

Recommendation 3B.

Joint Municipal and Provincial Education Programs Promoting the Proper Management of On-Site Septic Systems

In addition to educating the public on the benefits of clustered rural residential developments, municipal and provincial governments should inform their residents regarding the benefits of having their on-site sewage disposal system inspected and pumped out every few years. This could be accomplished by creating a database of newly installed septic systems within the province, as well as maintaining an inventory of existing systems. The database would include both individually owned and communal on-site sewage disposal systems. The main form of such proactive awareness would be the notification of septic system users through mail outs, telephone notices, or radio and television messages. The purpose of such notices would be inform users as to when they should get their on-site sewage disposal system inspected and possibly pumped out, how they can contact inspectors in their area, and an estimate of the price they can expect to pay. In addition, to enhance the level of awareness users of on-site sewage disposal systems have towards the benefits of proper use and management of such facilities, municipal authorities should take the time to educate new home owners in rural areas how to use their septic system to ensure a long an trouble free existence. This would include ideas such as eliminating the "flush and forget" mentality by reducing water consumption and removing certain harmful wastewater materials that often find their way into on-site sewage disposal systems.

By educating the public on the benefits and proper use of septic systems, the perception of cluster systems being second class methods of sewage disposal, when compared to conventional methods, may be overcome. If this program is successful, the acceptance and development of communal septic systems may increase and in turn increase the probability of developing rural residential clusters.

8.1.4 Recommendation 4.

The Need for Programs That Will Promote the Proper Management of Communal On-Site Sewage Disposal Systems

Currently, the Province of Nova Scotia has adopted planning and management policies as a result of problems that have existed in the past. These reactive solutions include the creation of the Wastewater Management District and the proposed amendment to the *Condominium Act, R.S.N.S. 1989*, which would legislate the use of Bare Land Condominiums. Both approaches have their merits and should be used to accommodate existing and proposed cluster developments in rural unserviced areas.

Recommendation 4A.

Wastewater Management Districts as a Response to Existing Failing On-Site Septic Systems

Although the main thrust of owning and managing cluster septic systems in Nova Scotia is currently through the Municipal Waste Water Management District, this idea should be reexamined and reevaluated regarding its true benefits to residents of proposed cluster developments. Instead of promoting an idea where municipal governments directly assume ownership, financial responsibility and management duties of cluster on-site septic systems, the users of these systems should become directly responsible for such tasks. The practice of enforcing WWMDs is an excellent method for responding to failing on-site sewage disposal facilities, but may not be popular with municipalities in the future as their operation budgets are continuously declining. In addition, the proposal to amend the Nova Scotia *Municipal Government Act*, eliminating the requirement for the public approval in the implementation of a WWMD, would give the municipal government more power to carry out the required repairs and replacement of failing septic systems. This may cause conflict with the users since they will be required to pay more to have the proper sewage collection and disposal systems in put place, but it will benefit both the built and natural environments in the long run. Therefore, the WWMD concept

should be used as a reactive means of correcting existing on-site sewage disposal systems that have failed and not as a means of servicing proposed rural clustered developments.

Recommendation 4B.

Bare Land Condominiums as an Approach to New Rural Residential Cluster Developments

The most effective way to accommodate clustering for new or proposed developments in unserviced rural areas would be to promote the use of Bare Land Condominiums. This would see a clustered rural residential development serviced through a properly managed on-site communal sewage treatment facility. Because of the structure of a Condominium Corporation, those individuals who are owners in the Corporation would be responsible for common elements such as privately owned infrastructure and management services. Section 31(1) of Nova Scotia's *Condominium Act R.S.N.S. 1989* - (Financial Provisions), subsections (a) and (b) set out the structure and requirements of a Condominium Corporation, so that it may establish a fund for all common expenses, including a reserve for major repair and replacement of all common elements and assets. In forming a BLC, the residents of clustered rural residential developments would be required to own and operate any on-site sewage disposal systems. In turn, they would be financially responsible for costs due to maintenance, repairs or replacement of their sewage treatment systems. This form of septic system ownership then relieves the local government of all costs associated with owning and maintaining a communal septic system. As new cluster developments are proposed, the ideas encompassed in the BLC are implemented from the start. Therefore, residents will be more receptive to the requirements and responsibilities involved in living in such a neighbourhood, and in turn, will accept the financial burdens of managing and maintaining the infrastructure that services them.

8.1.5 Recommendation 5.

Minor Revisions to the Nova Scotia *Environment Act, R.S.N.S. 1995* to be used as a Model for Other Provinces

In order to achieve the level of maintenance preferred by the Department of the Environment, Section 33(6) of the Province of Nova Scotia's Schedule "A" of the *Environment Act, R.S.N.S. 1995* should be amended to include the requirement an approved financial plan, as well as an approved management plan for on-site cluster sewage disposal systems. By amending this section of the *Act*, the Department of the Environment will not only have a management plan for the proper care and function of cluster septic systems, but will also have in place the needed financial plan to ensure that any costs due to maintenance, repairs or replacement of the sewage disposal system will be covered by the owners of the system. Currently, the requirement of a management plan may imply financial provisions to be put in place by the systems managing authority, but because the phrase "financial plan" is not specified, there is the possibility that the financial security aspect could be neglected.

Schedule "A"of the *Environment Act* dealing with communal septic systems, once amended, should be used as a model for other provinces to follow when considering how to create legislation that deals with on-site communal septic systems.

8.1.6 Recommendation 6.

Provincial Privatization & Certification of Septic System Inspectors, Cleaners and Installers

Provincial governments should ensure that all certified inspectors, septic tank cleaners and installers receive the same level of education and certification. Consequently, all on-site septic systems, whether serving individual or cluster needs, will be subject to the same level of scrutiny from any Provincial Inspector. Spot checks by provincial officials

should be periodically carried out to reinforce this recommendation. In addition, to using provincial employees as septic system inspectors, the province should adopt new legislation that would permit private inspectors to carry out the same functions. In Schedule "A', Part IV of the Nova Scotia *Environment Act, R.S.N.S. 1995*, guidelines have been established for qualified persons, septic tank installers and cleaners. These individuals, must receive certification from the province in order to be qualified to perform specific duties as described under the *Act*. In addition to these certified functions, the province should also explore the possibility of certifying individuals to inspect on-site sewage disposal systems. These private inspectors would be bound by the same expectations and responsibilities of provincial inspectors, and therefore would be qualified to perform the same duties. This would improve access to qualified and certified inspectors, and as a result would make sewage disposal system inspections easier and more timely to carry out.

8.1.7 Recommendation 7.

The Implementation of a Provincial Monitoring Program for On-Site Sewage Disposal Systems in Nova Scotia

The Nova Scotia Department of the Environment should begin to explore the feasibility of implementing a monitoring program for the proper inspection and cleaning of all on-site sewage disposal systems within the province. This program would monitor both individual and cluster systems, and could be undertaken in a similar manner as the Department of Transportation and Communication, which requires that motor vehicles registered in the province are annually inspected for safety and road worthiness. The Department of the Environment could set up a monitoring and inspection program where all private septic systems throughout the province would be subject to an annual inspection by a certified inspector, as defined in an amended *Environment Act*. A database on those tanks which are inspected would be created and closely monitored to ensure that all on-site septic systems are inspected and properly maintained. If a system

has not been inspected, the province could then inspect the system itself or contact the owners to have their system inspected by a certain date. This process can be coupled with Recommendation 3B to ensure that all homeowners are annually notified and aware of their responsibilities concerning the proper care of their on-site septic disposal system. In addition, if the province decides to approve the certification of private inspectors, such as those in Recommendation 6, inspections can be more readily carried out as there will be more qualified individuals to perform these required duties.

8.2 Implementation Strategy for Recommendations

To implement the above recommendations, the most effective strategic approach would be developed through an education process. This would include setting up public debates, information seminars, and brainstorming sessions that would include participants from the academic, government, and private sectors as well as community members. The outcome of these gatherings will determine the most important planning issue for a province or community. In addition, the overall knowledge of a community may be increased, as information regarding the use and management of communal septic systems and clustered development will be provided. Through education, all stakeholders will come to realize that the management of individual and communal on-site septic systems is essential to rural development, and especially to the creation of rural residential clusters. This will lead to a general acceptance of these concepts and increase the likelihood of their use.

Although the ideas of wastewater management and clustering of rural residential development will require the involvement of all stakeholders, they must be initiated from the provincial level so that all municipalities will have the opportunity to participate in the information gathering process. While this process should begin with the province, it must be embraced and continued at the municipal level so that communities can work together to create the change desired. Therefore, once community leaders have been educated on the use and benefits of communal septic systems and cluster development,

they must be willing to set up programs that will help a community decide what is best for them. Further study must be undertaken on the topics of wastewater management and cluster development to determine what is the most desirable solutions for communities in Nova Scotia.

8.3 Concluding Remarks

As the twentieth century is drawing to a close, North American society is slowly becoming aware that the physical assets that make communities unique, such as the natural environment, are becoming an increasing limited resource that must be protected and used prudently. The way in which communities physically evolve in the future must be safeguarded against the practice of over consuming land and its natural characteristics.

In this thesis, ideas were explored that can change the current practice of low-density rural development in an attempt to create an alternative development form which is more pleasing to the rural resident, while also being more environmentally sensitive. This concept is called clustering and, if carried out properly, can produce a rural residential development that has the same density as a conventional development while consuming only a fraction of the land. Clustering is neither a new concept, nor an exotic innovation. It is simply a common sense approach to residential planning. In the province of Nova Scotia, clustering can be implemented through the development of Comprehensive Developing Districts and Bare Land Condominium Corporations. The basic premise behind clustering is to examine a parcel of land and,instead of cutting it up into a checkerboard of residential lots, small dense pockets of housing units are constructed on those sections which are best suited to support this new rural neighbourhood. By acting in such a manner, land is used more wisely, and the preservation of existing natural land forms, vegetation, and open space is achieved.

An obstacle to creating rural residential cluster developments is the problem of effectively planning and managing the communal on-site sewage disposal systems required to service

this type of rural neighbourhood. There are several methods of sewage disposal that can used to facilitate such development, but whichever system is chosen, it must be maintained so that it effectively treats the sewage that is produced by the residents. In Nova Scotia, new amendments to the *Environment Act, R.S.N.S. 1995*, have permitted the use of on-site cluster disposal systems to facilitate such new rural developments. In addition, the creation of the systems should be implemented through Wastewater Management Districts, as a method of repairing existing failing on-site sewage disposal systems, or through Bare Land Condominiums as a method of promoting new rural cluster developments.

Although permitted, cluster sewage disposal systems must be regularly monitored and, therefore, it is recommended that the province of Nova Scotia implement an annual inspection program to aid in the proper management of both individual and cluster sewage disposal systems. For this inspection program to be successful, it will require a change in how rural residents view their sewage disposal systems as well as how they maintain them. In an attempt to create a timely and efficient inspection system, it is also recommended that the province certify private sewage system inspectors in order to carry out these annual inspections.

The concept of implementing cluster rural development through the use of communal on-site sewage disposal systems may not be the most desired development approach for all rural communities. Clustering requires a large amount of change to existing development processes and, therefore, many communities may not have the expertise or the demand to create such changes. Even if the ideas represented throughout this thesis are not fully implemented by rural communities, they still represent a step in the right direction for future rural development forms. Ideally these ideas will evoke other discussions concerning methods of rural residential development that will ultimately lead to the creation of a more environmentally sensitive and responsible society.

Appendix "A"

Part V of the Nova Scotia Condominium Act R.S.N.S 1989

signature at the foot of the balance sheet by two of the directors duly authorized to sign, and the auditor's report shall be attached to or accompany the financial statement.

(8) The corporation shall, ten days or more before the annual meeting of owners, send by prepaid mail or deliver to each owner at that owner's latest address as shown on the records of the corporation and shall file with the Registrar a copy of the financial statement and a copy of the auditor's report.

(9) The board shall lay before each annual meeting of owners

(a) a financial statement made in accordance with generally accepted accounting principles;

(b) the report of the auditor to the owners; and

(c) such further information respecting the financial position of the corporation as the by-laws of the corporation require. R.S., c. 85, s. 26

PART V

CONDOMINIUMS

Units and common interests

27 (1) Units and common interests are real property for all purposes.

(2) Subject to this Act, the declaration and the by-laws, each owner is entitled to exclusive ownership and use of that person's unit.

(3) No condition shall be permitted to exist and no activity shall be carried on in any unit or the common elements that are likely to damage the property.

(4) The corporation or any person authorized by the corporation may enter any unit at any reasonable time to

perform the objects and duties of the corporation. R.S., c. 85, s. 27

Common elements

28 (1) The owners are tenants in common of the common elements.

(2) An undivided interest in the common elements is appurtenant to each unit.

(3) The proportions of the common interests are those expressed in the declaration.

(4) Subject to this Act, the declaration and the by-laws, each owner may make reasonable use of the common elements.

(5) The ownership of a unit shall not be separated from the ownership of the common interest and any instrument dealing with a unit shall operate to deal with the common interest appurtenant thereto without express reference thereto.

(6) Except as provided by this Act, the common elements shall not be partitioned or divided.

(7) No encumbrance is enforceable against the common elements after the declaration and description are accepted for registration.

(8) Where but for subsection (7) an encumbrance would be enforceable against the common elements, the encumbrance is enforceable against all the units and common interests.

(9) Any unit and common interest may be discharged from such an encumbrance by payment to the claimant of a portion of the sum claimed determined by the proportions specified in the declaration for sharing the common expenses.

(10) Upon payment of a portion of the encumbrance sufficient to discharge a unit and common interest,

the claimant shall give to the owner a discharge of that unit and common interest in accordance with the regulations.

(11) For the purpose of municipal assessment and taxation, each unit and common interest constitute a parcel, and the common elements do not constitute a parcel.

(12) For the purpose of determining liability resulting from breach of the duties of an occupier of land, the corporation is the occupier of the common elements and the owners are not occupiers of the common elements. R.S., c. 85, s. 28

Easements

29 (1) The following easements are appurtenant to each unit:

(a) first: where a building or any part of a building

(i) moves after acceptance of the declaration and description for registration, or

(ii) after having been damaged and repaired, is not restored to the position occupied at the time of acceptance of the declaration and description for registration, an easement for exclusive use and occupation in accordance with this Act, the declaration and the by-laws, over the space of the other units and common elements that would be space included in the unit if the boundaries of the unit were determined by the position of the buildings from time to time after acceptance of the description for registration and not at the time of acceptance for registration;

(b) second: an easement for the provision of any service through any installation in the common elements or any other unit; and

(c) third: an easement for support and shelter by the common elements and any other unit capable of providing support and shelter.

(2) The following easements are appurtenant to the common elements:

(a) first: an easement for the provision of any service through any installation in any unit; and

(b) second: an easement for support and shelter by any unit capable of providing support and shelter.

(3) All ancillary rights and obligations reasonably necessary to make easements effective apply in respect of easements implied or created by this Act. R.S., c. 85, s. 29.

Duties of owners

30 (1) Each owner is bound by and shall comply with this Act, the declaration and the by-laws.

(2) Each owner has a right to the compliance by the other owners with this Act, the declaration and the by-laws.

(3) The corporation, and any person having an encumbrance against any unit and common interest, has a right to the compliance by the owners with this Act, the declaration and the by-laws. R.S., c. 85, s. 30

Financial provisions

31 (1) The corporation

(a) shall establish a fund for the payment of the common expenses to which fund the owners shall contribute in proportions specified in the declaration;

(b) shall establish a reserve and a special account for major repair and replacement of common elements and assets of the corporation

including where applicable, without limiting the generality of the foregoing, roofs, exteriors of buildings, roads, sidewalks, sewers, heating, electrical and plumbing systems, elevators, laundry, recreational and parking facilities and shall, by by-law, establish the minimum amount of the reserve fund and the proportions in which the owners shall contribute to the reserve fund;

(c) shall assess and collect the owner's contributions towards the common expenses and the reserve fund as regulated by the declaration and the by-laws;

(d) shall pay the common expenses;

(e) has the right to recover from any owner by an action for debt

(i) the unpaid amount of any assessment,

(ii) any sum of money expended by it for repairs to, or work done by it or at its direction in complying with any notice or order by a competent public or local authority in respect of that portion of the building comprising the unit of that owner, and

(iii) any sum of money expended by it for repairs done by it pursuant to subsection (6) of Section 35 for the owner;

(f) on the application of an owner or a purchaser of a unit and common interest, shall certify

(i) the amount of any assessment and accounts owing by the owner to the corporation, and for which the corporation has a lien or right of lien against the unit and common interest of the owner,

(ii) the manner in which the assessment and accounts are payable,

(iii) the extent to which the assessment and accounts have been paid by the owner, and

(iv) as to such other matters as the Governor in Council may prescribe,

and in favour of any person dealing with that owner, the certificate is conclusive proof of the matters certified therein.

(2) Any fund set up for any of the purposes mentioned in clause (b) of subsection (1) is and is deemed to be a reserve fund notwithstanding that it may not be so designated.

(3) No part of a reserve fund shall be used except for the purposes for which the fund was established.

(4) The reserve fund constitutes an asset of the corporation and shall not be distributed to any owner except upon termination of the government of the property pursuant to this Act.

(5) The obligation of an owner to contribute towards the common expenses and the reserve fund shall not be avoided by waiver of the right to use the common elements or by abandonment.

(6) Where an owner defaults in the owner's obligation to pay to the corporation any amount the corporation has the right to recover pursuant to clause (e) of subsection (1), the corporation has a lien for the unpaid amount against the unit and common interest of that owner.

(7) The lien referred to in subsection (6) shall be payable in priority to all other liens, charges or mortgages in respect of the unit and the common interest, other than a lien for taxes or a lien for money due to the Nova Scotia Power Corporation for the supply of electric power and energy.

(8) Every mortgagee, judgment creditor or other person having any lien, charge or encumbrance upon or against a unit and the common interest subject to the lien

mentioned in subsection (6) may, at any time after the lien arises, pay to the corporation the amount of the lien, together with all interest and expenses and add the amount so paid to that person's mortgage, judgment or other security, and shall have in respect thereto the same rights, remedies and privileges against the unit and the common interest as the mortgagee, judgment creditor or other person has by virtue of or under the security held by the mortgagee, judgment creditor or other person and the mortgagee, judgment creditor or other person may also sue for and recover in an action for debt the amount so paid, together with interest thereon, against the person primarily liable to pay such amount.

(9) The lien may be enforced in the same manner as a mortgage and the Rules of the Supreme Court respecting foreclosure shall apply *mutatis mutandis*.

(10) Upon payment of the unpaid amount, the corporation shall give the owner a discharge in the prescribed form. R.S., c. 85, s. 31.

Changes in common elements or assets

32 (1) The corporation, by a vote of members who own eighty per cent, or such greater percentage as is specified in the declaration, of the common elements, may make any substantial addition, alteration or improvement to or renovation of the common elements or may make any substantial change in the assets of the corporation, and the corporation, by a vote of a majority of the members, may make any other addition, alteration or improvement to or renovation of the common elements or may make any other change in the assets of the corporation.

(2) The cost of any addition, alteration or improvement to or renovation of the common elements and the cost of any substantial change in the assets of the corporation are common expenses.

(3) The declaration may provide that if any substantial addition, alteration or improvement to or renovation of the common elements is made, or if any substantial change in the assets of the corporation is made, the corpora-

tion must, on demand of any owner who dissented, purchase that owner's unit and common interest.

(4) Where the corporation and the owner who dissented do not agree as to the purchase price, the owner who dissented may elect to have the fair market value of that owner's unit and common interest determined by arbitration pursuant to the *Arbitration Act* by serving a notice to that effect on the corporation, and the purchase price of that owner's unit and common interest is the fair market value determined by the arbitration. R.S., c. 85, s. 32

Arbitration

33 (1) Where the corporation and an owner do not agree on any matter to which this Act applies, other than a matter referred to in subsection (4) of Section 32, and all the parties agree to arbitration, the dispute shall be resolved by arbitration pursuant to the *Arbitration Act*.

(2) Where two or more owners do not agree on any matter to which this Act applies, and all the parties agree to arbitration, the dispute shall be resolved by arbitration pursuant to the *Arbitration Act*. R.S., c. 85, s. 33.

Insurance

34 (1) The corporation shall insure its liability to repair the units and common elements after damage resulting from fire, and such other risks as may be specified by the declaration or the by-laws, to the extent required by the declaration or the by-laws and, for that purpose, the corporation has an insurable interest to the replacement value of the units and common elements.

(2) Notwithstanding subsection (1) and the *Insurance Act*, or any other law relating to insurance, an owner may insure the owner's unit in respect of any damage in a sum equal to the amount owing at the date of any loss referred to in the policy on a mortgage of the owner's unit.

(3) Any payment by an insurer under a policy of insurance entered into pursuant to subsection (2), shall be made to the mortgagees if the mortgagees, or any of them, so require, in order of their priorities and the insurer is then

entitled to an assignment of the mortgage or a partial interest in the mortgage to secure the amount so paid.

(4) A policy of insurance issued to a corporation under the authority of subsection (1) is not liable to be brought into contribution with any other policy of insurance except another policy issued on the same building under the authority of subsection (1).

(5) A policy of insurance issued to an owner under the authority of subsection (2) is not liable to be brought into contribution with any other policy of insurance except another policy issued on the same unit under the authority of subsection (2).

(6) Subsections (1) and (2) do not restrict the capacity of any person to insure otherwise than as provided in those subsections. R.S., c. 85, s. 34.

Maintenance and repairs

35 (1) For the purposes of this Act, the obligation to repair after damage and to maintain are mutually exclusive, and the obligation to repair after damage does not include the repair of improvements made to units after acceptance for registration of the declaration and description.

(2) Subject to Section 36, the corporation shall repair the units and common elements after damage.

(3) The corporation shall maintain the common elements.

(4) Each owner shall maintain that owner's unit.

(5) Notwithstanding subsections (2), (3) and (4), the declaration may provide that

(a) subject to Section 36, each owner shall repair that owner's unit after damage;

(b) the owners shall maintain the common elements or any part of the common elements; or

(c) the corporation shall maintain the units or any part of the units.

(6) The corporation shall make any repairs that an owner is obligated to make and that the owner does not make within a reasonable time.

(7) An owner shall be deemed to have consented to have repairs done to the owner's unit by the corporation pursuant to this Section. R.S., c. 85, s. 35.

Damage

36 (1) Where damage to the buildings occurs, the board shall determine within thirty days of the occurrence whether there has been substantial damage to the extent that the cost of repair would be twenty-five per cent, or such greater percentage as is specified in the declaration, of the value of the buildings immediately prior to the occurrence.

(2) Where there has been a determination that there has been substantial damage as provided in subsection (1) and owners who own eighty per cent of the common elements, or such greater percentages as is specified in the declaration, vote for repair within sixty days of the determination, the corporation shall repair.

(3) Where on a vote the owners do not vote for repair, the corporation shall, within ten days of the vote, submit for registration a notice of termination in the prescribed form and the Registrar shall accept the notice for registration.

(4) Where there has been no vote within sixty days of the determination that there has been substantial damage pursuant to subsection (1), the corporation shall, within ten days after the expiry of the sixty-day period, submit for registration a notice of termination in the prescribed form and the Registrar shall accept the notice for registration.

(5) Upon the acceptance for registration of a notice of termination pursuant to subsection (3) or (4), the provisions of Section 42 apply. R.S., c. 85, s. 36.

Voting

37 (1) The owners have voting rights in the corporation in the proportions specified in the declaration.

(2) Where a mortgage or charge of a unit and common interest contains a provision that authorizes the mortgagee or chargee to exercise the right of the owner to vote or to consent, the mortgagee or chargee may exercise the right and, where two or more such mortgages or charges contain such a provision, the right may be exercised by the mortgagee or chargee who has priority.

(3) Any powers of voting conferred by, or any consent required to be given or document required to be executed pursuant to this Act, the declaration or the by-laws by an owner may be exercised, given or executed

(a) in the case of an owner who is an infant or incompetent person, by that owner's guardian; or

(b) in any other case by the person who for the time being is authorized by law to control the owner's property.

(4) Where the Court, upon application of the corporation or of any owner, is satisfied that there is no person capable or willing or reasonably available to exercise the power of voting, giving consent or executing a document, in respect of a unit, the Court

(a) in cases where unanimous vote or unanimous consent is required by this Act, the declaration or the by-laws, shall; and

(b) in any other case, may, in its discretion,

authorize some other fit and proper person to exercise the power of voting, to give the consent or to execute the document, in respect of the unit. R.S., c. 85, s. 37.

Enforcement

38 (1) Where a duty imposed by this Act, the declaration or the by-laws is not performed, the corporation, any owner, or any person having an encumbrance against a unit and common interest may apply to the Court for an order directing the performance of the duty.

(2) The Court may by order direct performance of the duty, and may include in the order any provisions that the Court considers appropriate in the circumstances including

(a) the appointment of an administrator for such time, and on such terms and conditions, as it deems necessary; and

(b) the payment of costs.

(3) An administrator appointed pursuant to subsection (2)

(a) to the exclusion of the corporation, has such powers and duties of the corporation as the Court shall order;

(b) has the right to delegate any of the powers so vested in the administrator; and

(c) shall be paid for the administrator's services by the corporation, which payments are common expenses.

(4) Nothing in this Section restricts the remedies otherwise available for failure to perform any duty imposed by this Act. R.S., c. 85, s. 38.

Expropriation of property

39 (1) The expropriation of all or part of the property shall not terminate the government of the property by this Act.

(2) The expropriation of all of the property shall not make the expropriating authority a member of the corporation. R.S., c. 85, s. 39.

Appendix "B"

Part of Schedule "A" of the Nova Scotia *Environment Act, R.S.N.S. 1995*

(3) An administrator may grant a variation in writing where, in the opinion of the administrator, information provided under subsection (2) shows that failure to meet the requirements of these regulations will not create an adverse effect.

(4) Despite subsection (3), an administrator shall refuse to grant a variation where

(a) the lot is created by an instrument of subdivision as defined under the *Planning Act;*

(b) granting the variation would violate the intent of the Act or the regulations;

(c) the difficulty experienced results from wilful or intentional disregard of the Act or these regulations;

(d) the minimum lot requirements and specifications can be met; or

(e) an application for a variation has already been denied by the Minister or a former Board of Health under the *Health Act*,

and the administrator shall provide, in writing, the reasons for refusing to grant the variation.

(5) Where a variation is granted by an administrator, the lot shall be deemed to meet the applicable requirements of these regulations.

Part III - Other Matters

Innovative systems

30 (1) A person applying for an approval to construct or install an experimental or prototype system shall complete and submit an application prescribed by the Department.

(2) Subject to a review by the Department, an administrator may issue an approval to install an experimental or prototype system.

(3) An approval issued under subsection (2) may be issued subject to terms and conditions including the following:

(a) design specifications;

(b) installation requirements;

(c) compliance monitoring;

(d) possible system replacement; and

(e) financial or other security.

Non-water carried toilet systems

31 (1) No person shall construct, install, use or operate a non-water carried toilet system or cause the same to be done if an adverse effect may result.

(2) No person shall handle or dispose of sewage, waste, residue, ash or other organic material from a non-water carried toilet system in a manner that may create an adverse effect.

Holding tanks

32 (1) No person shall construct or install a holding tank for the storage of sewage or cause the same to be done without first having obtained an approval in writing from an inspector.

(2) An applicant under subsection (1) shall retain a Level 1 or Level 2 qualified person to prepare an application and submit an assessment report to an inspector for approval to construct or install a holding tank.

(3) Upon written application , the Department may prepare the application and the report required under subsection (2).

(4) An inspector may request more information from an applicant.

(5) No person shall construct or install a holding tank or cause the same to be done unless the person who does the work holds a valid certificate of qualification issued under these regulations.

(6) An inspector may issue an approval to construct or install a holding tank in order to repair or replace an existing malfunctioning system that cannot be corrected by the installation of a new system or by upgrading the existing system.

(7) No approval to construct or install a holding tank may be issued by an inspector for a lot with no existing system unless

(a) the lot was created prior to August 6, 1984;

(b) the lot is unsuitable for the installation of a system; and

(c) the municipality where the lot is located has established a wastewater management district or has prepared a sewage management program that is considered acceptable by the inspector.

(8) When a municipal system or an approved central sewage collection and treatment system becomes available, an approval holder shall immediately discontinue use of the holding tank and connect the dwelling, building or structure to the municipal system or the approved central sewage collection and treatment system in the manner specified in an approval issued by an inspector.

(9) No person who has received an approval under subsection (6) or (7) shall fail to follow the requirements for size, design, construction, connection, installation, maintenance and repair of the holding tank as prescribed by an inspector.

Cluster systems

33 (1) No person shall construct or install a cluster system or cause the same to be done without first having obtained an approval from an inspector.

(2) Subject to subsections (3) and (4), no person shall design a cluster system.

(3) An applicant under subsection (1) shall retain a Level 1 qualified person to design the cluster system.

(4) Upon written application, the Department may design the cluster system.

(5) Subject to subsection (7) and Section 29, an inspector may issue an approval to install a cluster system where the volume of sewage to which the system will be subjected is less than 1000 ℓ per day, provided

(a) the minimum lot specifications and requirements prescribed by the inspector are met; and

(b) the system meets minimum clearance distances prescribed in Section 12.

(6) Subject to subsection (7) and Section 29, an inspector may issue an approval to install a cluster system to service more than one building, structure or dwelling where the volume of sewage to which the system will be subjected is more than 1000 ℓ per day, provided

(a) a sewage management program that is considered acceptable by an inspector has been prepared;

(b) the minimum lot specifications and requirements prescribed by the inspector are met; and

(c) the system meets minimum clearance distances prescribed in Section 12.

(7) An inspector who is of the opinion that the minimum lot specifications and requirements in clauses (5)(a) or (6)(b) may create an adverse effect may require greater lot specifications and requirements and shall provide the reasons in writing.

Department services/fees

34 (1) The Minister may establish guidelines or criteria describing where the Minister may provide services in substitution for a qualified person.

(2) The Minister may establish a fee for any application, approval, renewal, certificate of qualification, registration, report, or other documentation or services required under these regulations.

Part IV-Certificates of Qualification

Qualified person

35 (1) A person who performs or intends to perform the services of a qualified person shall comply with the following requirements:

(a) a Level 1 qualified person shall

(i) be a professional engineer who is registered to practice in the Province and holds valid professional liability insurance, and

(ii) perform tasks as prescribed in these regulations;

(b) a Level 2 qualified person shall

(i) have successfully completed a course of instruction established or adopted by the Department and hold a valid certificate of qualification issued by an administrator or a person authorized by the administrator, and

(ii) perform tasks as prescribed in these regulations.

(2) The Department may establish or adopt policies, guidelines or criteria to be met by a qualified person.

(3) The Department shall keep a list of Level 2 qualified persons and make the list available to the public.

(4) No person shall hold themselves out to be or perform the services of a qualified person unless that person complies with the Act, these regulations and any policies, guidelines or criteria established or adopted by the Department.

Installers

36 (1) Subject to subsection (2), no person shall construct or install a system, or cause the same to be done or hold themselves out as a constructor or an installer of a system unless that person holds a valid certificate of qualification issued under these regulations.

(2) Subsection (1) does not apply to

(a) a person who constructs or installs a pit privy; or

(b) a helper who is assisting a person who holds a valid certificate of qualification.

(3) An administrator may issue or authorize the issuance of a certificate of qualification to a person who

(a) satisfactorily completes a course of instruction established or approved by the Department;

(b) makes application on a form prescribed by the Department; and

(c) pays a fee established by the Minister.

(4) The administrator may impose terms and conditions in a certificate of qualification issued under these regulations.

(5) The Department shall keep a list of persons who hold valid certificates of qualification and make the list available to the public.

(6) Failure to comply with any terms or condition imposed in a certificate of qualification is an offence under these regulations.

(7) Subject to subsection (9), a certificate of qualification issued to an installer shall be in effect for 5 calendar years from the date of issuance and shall expire on December 31 of the fifth year.

(8) A certificate of qualification issued to an installer may be renewed by an administrator if the installer makes an application for renewal on a form prescribed by the Department and pays a fee established by the Minister.

(9) A certificate of qualification issued to an installer may be cancelled or suspended by an administrator if the holder does not comply with

(a) the Act;

(b) these regulations;

(c) any guidelines, standards or policies established or adopted by the Department;

(d) the terms or conditions of a certificate of installation or qualification issued under these regulations; or

(e) the terms or conditions of an approval issued under these regulations.

(10) The administrator shall supply reasons in writing for a cancellation or suspension under subsection (9).

(11) A certificate of qualification which has been cancelled or suspended pursuant to subsection (9) may be reinstated by the administrator if the holder of the certificate of qualification undertakes to comply with any terms and conditions that may be prescribed by the administrator.

(12) No installer shall fail to comply with the requirements of

(a) the Act;

(b) these regulations;

(c) any guidelines, standards and policies established or adopted by the Department;

(d) the terms and conditions of any certificate of installation issued under these regulations; or

(e) the terms and conditions of an approval issued under these regulations.

Septic tank cleaners

37 (1) No person shall engage in the business of cleaning a septic tank or hold themselves out as a septic tank cleaner without first having registered with the Department.

(2) The Department shall keep a list of names registered under subsection (1) and make the list available to the public.

(3) No septic tank cleaner shall dispose of sewage except at a disposal facility approved by the Department.

Part V - Appeals

Appeals

38 (1) Subject to subsection (2), any person who has been refused an approval or a certificate of qualification or whose approval or certificate of qualification has been suspended or revoked by an inspector or an administrator may, within 30 days of the refusal, suspension or revocation, appeal to the Minister.

(2) The Minister shall refuse to hear an appeal under subsection (1) where

(a) an inspector has refused to issue an approval to construct or install a system on grounds that it may cause an adverse effect; or

(b) the matter has already been appealed to the Minister or a former Board of Health under the *Health Act* and the appeal has been denied.

(3) Subject to subsection (2), the Minister may

(a) dismiss the appeal;

(b) allow the appeal;

(c) refer the appeal to alternate dispute resolution; or

(d) refer the appeal to a board or committee established by the Minister.

(4) The decision of the Minister under subsection (3) may, within 30 days of the decision, be appealed to the Supreme Court of Nova Scotia.

(5) The decision of an inspector under clause (2)(a) may, within 30 days of the decision, be appealed to the Supreme Court of Nova Scotia.

Effective Date

39 These regulations shall come into force on, from and after June 10, 1997.

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IMAGE EVALUATION
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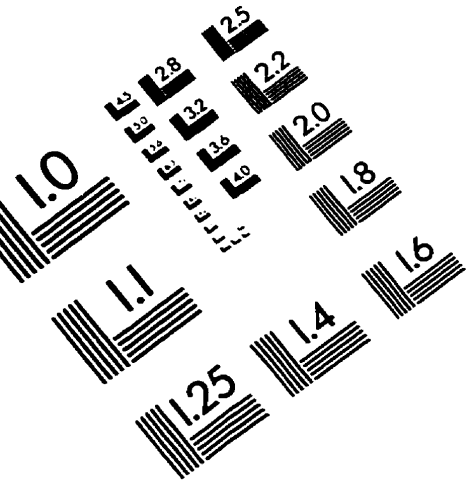

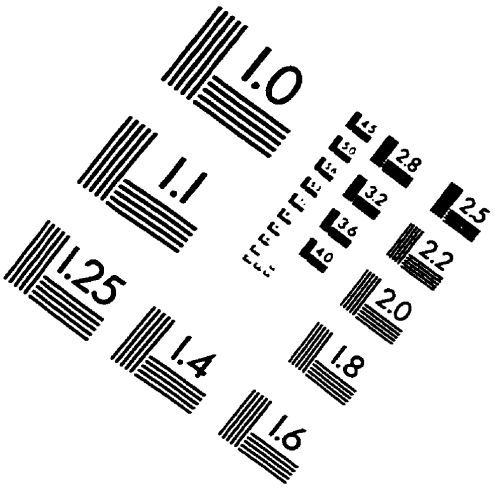

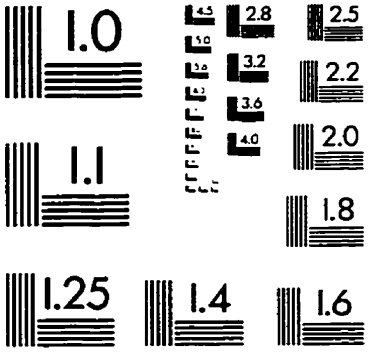

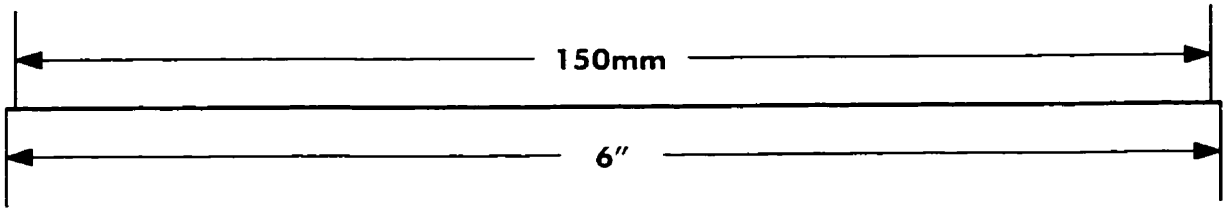

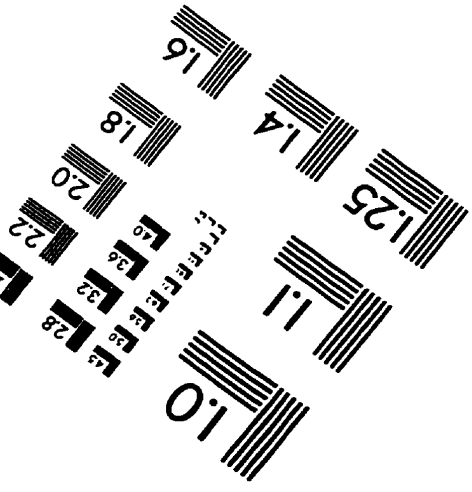

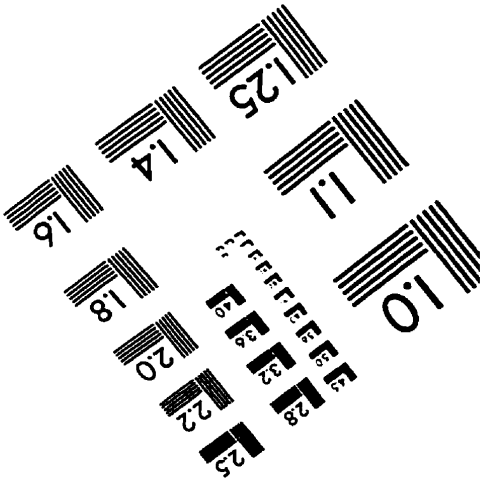

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