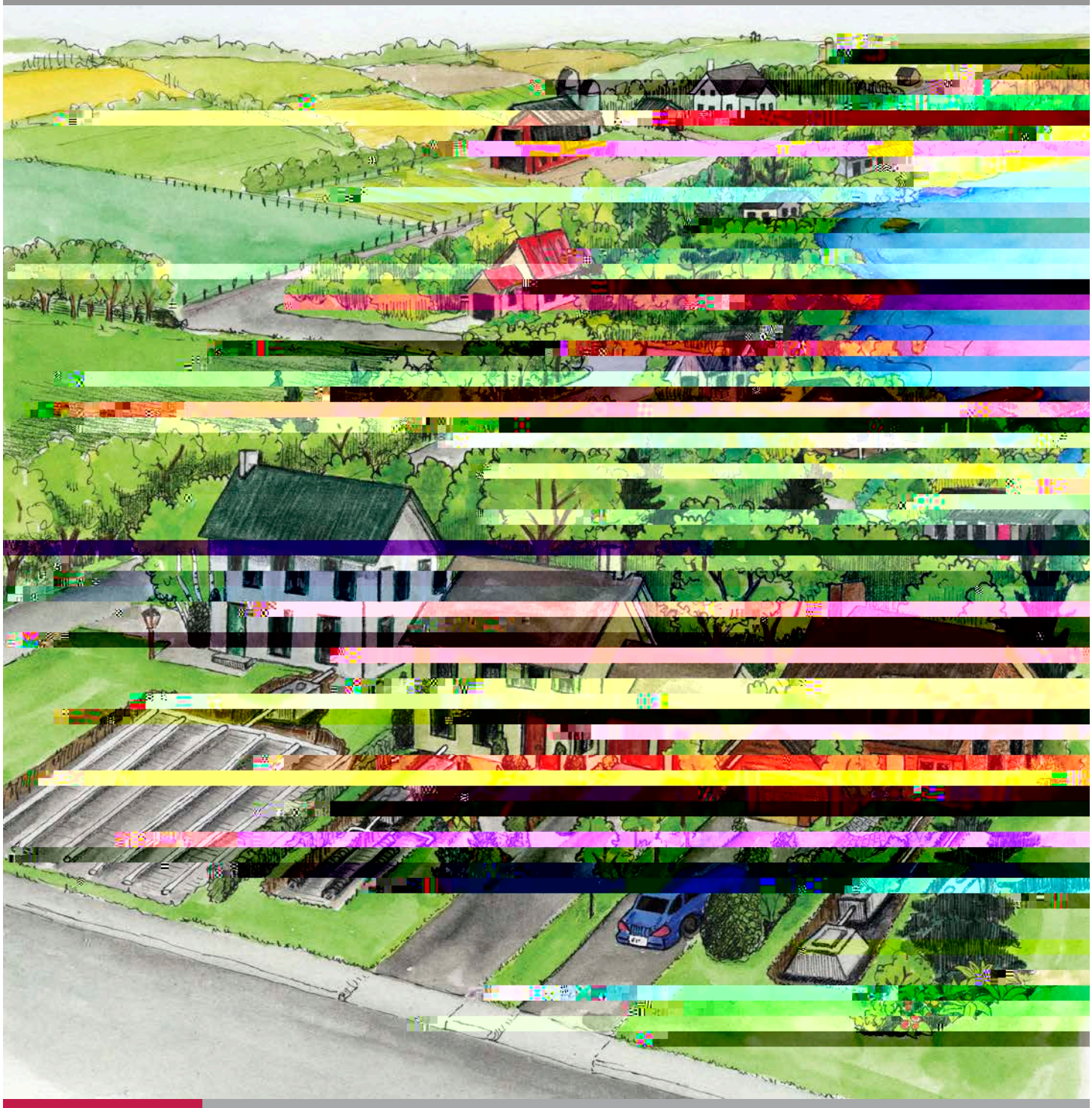
SepticSmart!

Understanding Your Home's Wastewater System



Rideau

Ontario

If you live in a rural area, a small community or you have a cottage, chances are you have a septic system. Septic systems are onsite wastewater treatment units that fulfill the role of municipal sewers in rural areas. Anything that goes down the drain — every shower drip and every toilet flush — flows to the septic system. Septic systems, generally speaking, are comprised of a tank, a network of pipes and billions of organisms that process your waste.

This booklet will help you become familiar with how your system works and how to keep it working properly. It is important to know that you are responsible for your septic system and that it is in your best interest to take good care of it — from a health, financial and environmental perspective.

There are many contaminants in wastewater that, if they enter drinking water, groundwater or surface water supplies, can negatively a□ect your health and the

A properly functioning septic system will remove most contaminants to acceptable levels. However, treated wastewater that percolates through the soil may still contain some contaminants that can enter the groundwater table (Figure 1).

To reduce the risk to nearby ground or surface water supplies, the location of your septic system is critical.

There are legislated minimum separation distances required between your septic system and your home and well, neighbouring homes and wells, and nearby bodies of water. Respecting these distances and planning your lot accordingly will lead to a healthier, longer-lasting system (see Section 8, Figure 12 on page 26). To learn more about the basics of rural wells, check out *G ound ate – An Impo tant Ru al Resou ce, P i ate Ru al Wate Supplies*.

Did you know?
Septic systems are vital in the treatment of various contaminants, especially *Esche ichia coli (E. coli).*

Esche ichia coli (E. coli) is a species of bacteria that is naturally found in the intestines of humans and warm-blooded animals. However, some types can cause illness in humans, including diarrhea, abdominal pain, fever, and sometimes vomiting. A proper functioning septic system protects groundwater and surface water from fecal contamination.

Presence of *E.coli* in water is an indication of contamination.

E. coli bacteria

Septic systems provide onsite wastewater treatment. They are your home or cottage's sewage treatment facility. Hidden from view, this "facility" is hard at work collecting all your wastewater through your plumbing, treating it and returning it back to the soil.

While there are di□erent types of septic systems, most include the following steps in the treatment process:

1 **Collection of wastewater** — Anything that goes down the drain into your plumbing flows to one location for pre-treatment.

2

4 Who does what?

In Ontario, the *Onta io Building Code* (OBC) governs nearly all rural septic systems. Part 8 of the OBC regulates sewage systems with a daily flow not exceeding 10,000 litres per day. This covers most homes, but also small businesses such as restaurants, dental clinics, churches and schools.

The OBC prescribes approved design and construction requirements for septic systems and determines who may do what — including the licensing of designers, installers and inspectors. When installing, repairing, upgrading or replacing a system, you are required to work with designers and installers who practice under the OBC and are qualified and registered by the Ministry of Municipal A□airs and Housing (MMAH). Professional Engineers, with relevant expertise may also support your project and do not require certification under the OBC.

All installations, repairs and upgrades to your septic system must also be inspected and approved by your local regulatory authority. The regulatory authority may be your local or regional municipality, health unit or conservation authority. They will inspect systems, issue permits, maintain records and enforce the laws regarding septic systems under the OBC.

- install new and replacement systems
- design systems that they will install
- repair systems
- conduct site evaluations

5 Types of systems

There are five classes of systems identified by the *Onta io Building Code* to deal with waste, but most aren't applicable for everyday family living. Classes 1, 2, 3 and 5 have very specific and limited uses. Most rural homes, cottages, and businesses use a Class 4 septic system that disperses the e□uent into soil.

Class 1 — Privies
- "porta-potty" (portable privies), outhouses (earth pit privies), vault privies, chemical toilets, composting toilets, incinerator toilets
- human waste only, no discharge of greywater collected from household fixtures such as dishwashers, washing machines, sinks and showers
- used in remote or temporary locations

Class 2 — Greywater systems
- only used for the treatment and disposal of greywater collected from household fixtures such as dishwashers, washing machines, sinks and showers

Class 3 — Cesspool
- used for the treatment of human waste from a Class I system
- usually discouraged because the human waste will quickly clog the soil particles and slow down its operation
- have a short life and are not recommended unless all other possibilities for treatment have been rejected

Class 4 — Distribution systems with Level I and Level IV e□uent treatment
- used for rural homes, cottages and small businesses
- size and placement will vary from site to site as the specific design is based on flow volumes from the house, space available in the yard, topography, soil material and depth to bedrock and/or other issues related to the property such as proximity to surface water and groundwater
- requires routine maintenance and periodic pumping

Class 5 — Holding tank
- holds all household waste and provides no treatment of waste
- requires frequent pumping by a licensed sewage hauler

6 Class 4 systems

Level I and Level IV e□uent treatment units and final distribution options

The

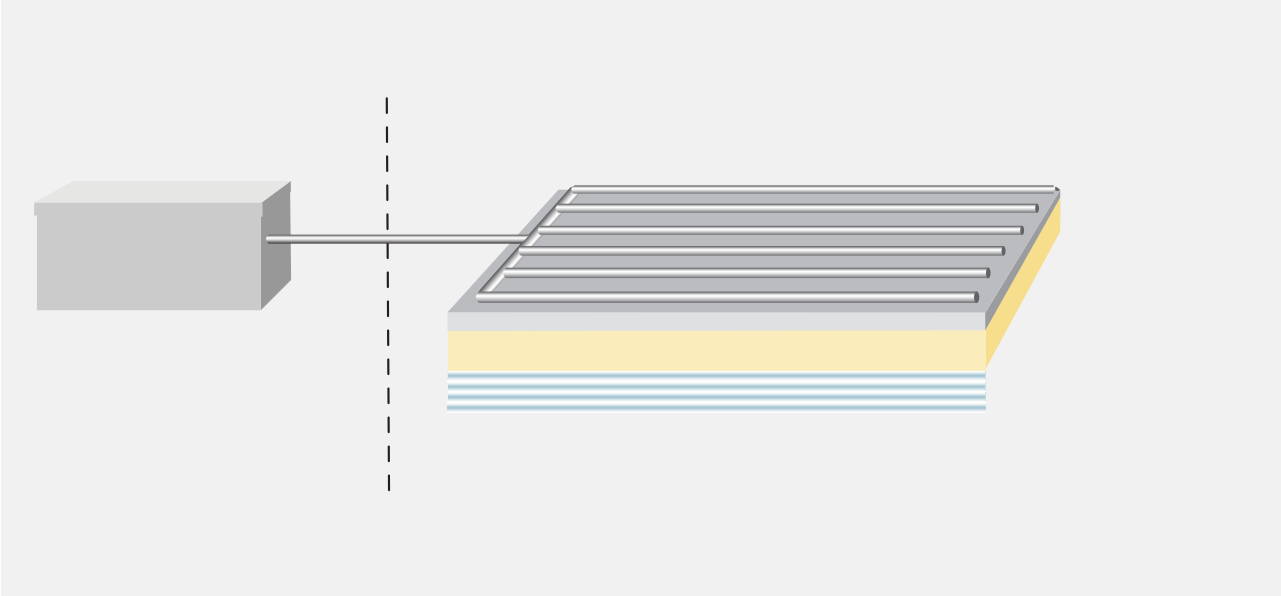
All household wastewater exits your home through an underground pipe that leads to the buried septic tank. The waste flows to the first compartment of the septic tank where the heavy solids settle and the lighter materials (fats, oils and grease) float to the top as scum.

In the second compartment, finer particles settle to the bottom. Anaerobic microbes break down the organic materials found in the tank. An e□uent filter (screen) prevents the scum layer and suspended solids from escaping the tank.

From the tank, the e□uent moves through a final distribution system that allows the liquid to seep into the ground where bacteria and other organisms process the e□uent further. The e□uent is fed through the system either by gravity or a pump depending on site conditions.

Be Septic Smart!
A conventional anaerobic system uses the natural filtering benefits of soil. They are economical and easy to maintain.

In an anaerobic system, 30 to 50 percent of the wastewater treatment is done in the septic tank and 50 to 70 percent is done in the soil (ref. US Environmental Protection Agency, Chapter 4.6.1). Soils below the stone in the trench bottom act as a biological, chemical, and physical filter to remove most remaining organic and biological contaminants.



Final Distribution for Anaerobic Systems (Level I E□uent)

Two final distribution options can be used with an anaerobic system: absorption trench or filter bed. When designing an absorption trench or filter bed, site constraints such as a high groundwater table, bedrock or fine-grained (clay) soil will dictate the size of the bed and the elevation of the bed relative to the existing grade (Figures 5a to 5d).

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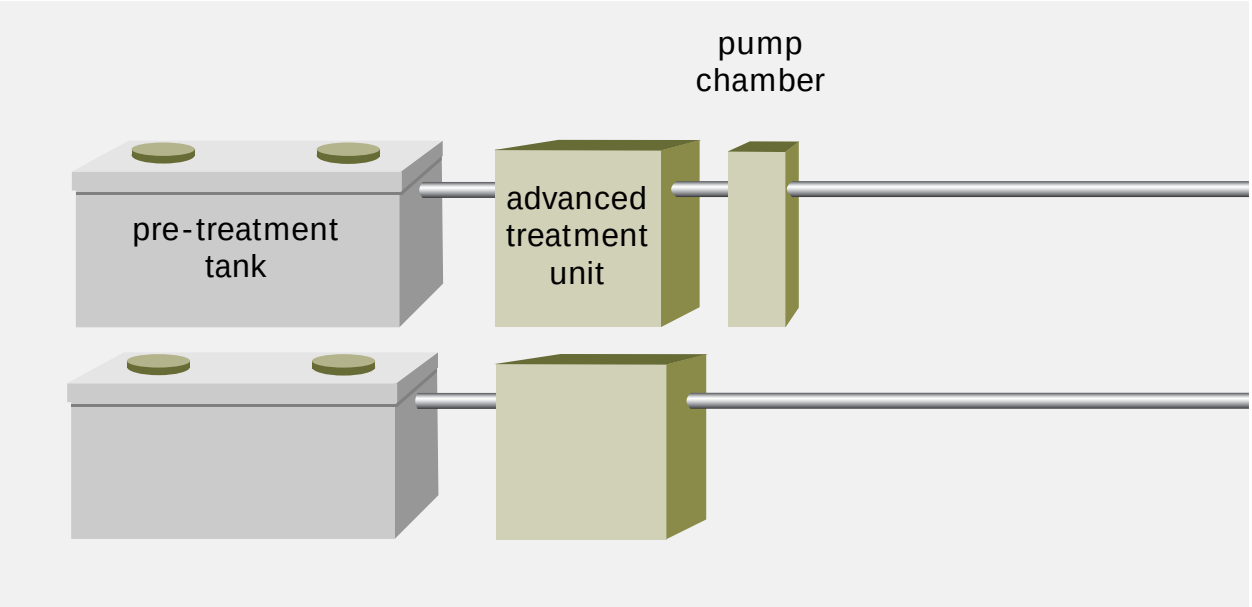
6b

Aerobic Systems — Level IV E□uent

Unlike conventional systems, aerobic systems use oxygen to break down organic matter. In fact, approximately 90 percent of the wastewater treatment is done prior to it being returned to the soil (ref. US EPA, Chapter 4.6.1). This aerobic treatment provides an enhanced level of e□uent treatment which in turn allows for alternative soil distribution options. There are many properties that are not suitable for the installation of conventional anaerobic systems Level I e□uent due to poor site conditions.



Homeowners may turn to Level IV treatment units when:

- dealing with properties with inadequate conditions for Level I e□uent treatment
- coping with small lots that can't accommodate the size of a conventional absorption trench or filter bed
- replacing a failed septic system
- rejuvenating failing absorption trench or filter bed
- building on hard-to-access properties where finding and/or transporting traditional materials for conventional systems is costly or di□cult
- wanting to provide additional protection to groundwater or surface water by additional nitrate or phosphorus reduction

Advantages:

- provide the opportunity to service sites not suited for conventional Level I e□uent systems
- have the potential to remove significantly more bacteria and organic material than a conventional Level I e□uent system
- may extend the life of an existing absorption trench or filter bed
- take up less room in yard
- require mandatory maintenance (ensures the unit is functioning properly)
- may reduce nutrient output (depending on type)

Disadvantages:

- may be more expensive to purchase and install depending on the site characteristics
- are more expensive to operate than a septic system (e.g., yearly electrical costs, media replacement)
-

Aerobic Treatment Units:

- can be part of a new system, a replacement system or added to an existing conventional system to prolong the life of the distribution bed
- require air compressors and in most cases pumps
- can use an absoption trench or filter bed for final distribution and treatment but would require a larger footprint
- can use a shallow buried trench, a Type A dispersal bed or Type B dispersal bed for final distribution and treatment which require smaller footprints (Figure 7)
- can be used for residential, communal and commercial applications
- require an annual maintenance agreement

6b (ii) Filtration Units

Filtration units use gravity to trickle e□uent over a filtering medium like foam or peat moss to provide additional treatment to the e□uent. Similar to the other systems, the wastewater flows from the home to a pre-treatment tank to settle solids and separate scum. Wastewater is then piped or pumped into the top of the filtration unit that is filled with materials such as synthetic foam cubes, peat moss or coconut fibers. As the wastewater trickles or percolates down through the filtration unit, a bacterial slime grows and thrives. Trapped air fills the voids and encourages aerobic conditions where bacteria break down the waste. The e□uent then flows to a shallow buried trench or a Type A or Type B dispersal bed (Figure 8) for final distribution and treatment in the soil.

E uent is dist ibuted onto a s nthetic media – foam cubes, peat moss o coconut be – fo ae obic t eatment.

Filtration units can use several di□erent options for final distribution: absorption trench, filter bed, shallow buried trench (SBT), Type A dispersal bed and Type B dispersal bed (Figures 9 and 10).

Filtration Units:

- can be part of a new system, a replacement system or added to an existing conventional system to prolong the life of an absorption trench or filter bed
- require pumps for in-ground installation
- can use a shallow buried trench, a Type A or B dispersal bed for final distribution and treatment which require smaller footprints (Figure 8)
- can use an absorption trench or filter bed for final distribution and treatment but require larger footprints
- can be used for residential, communal and commercial applications
- require a maintenance agreement
- require replacement of filter material (peat, sand or synthetic material) approximately every 8–15 years

- **Shallow Buried Trench**

- **Type A Dispersal Bed**
  A Type A dispersal bed consists of a stone layer overlying a sand layer, using a sand with specified properties. This sand is known as Type A dispersal bed sand. The sand layer may vary in depth and size depending on the treatment unit used. Some Level IV treatment systems have open bottoms that sit right on top of the stone layer while others have PVC pipes placed in the stone layer for e□uent distribution (Figure 10). E□uent from the Level IV treatment unit will flow by gravity to the dispersal bed. Some systems have a pump as an integral part of the system and other times a pump is added to overcome an elevation di□erence

Be Septic Smart!
If you have a high water table, bedrock or clay soil you will need to use a raised bed. If you are concerned with the landscaping impacts, a Type A

- **Type B Dispersal Bed**
  Type B dispersal beds are a newer type of treatment bed that was accepted into the *Onta io Building Code* in 2017. The distribution pipe network is placed in a stone bed and is pressurized to ensure even distribution. As with a shallow buried trench, the pump chamber must be sized and controlled so that e□uent is evenly dosed over a 24-hour period (Figure 11). Type B dispersal beds can only accept Level IV e□uent. A Type B dispersal bed is rectangular with the long dimension parallel to site contours to spread the e□uent across the slope.

7 Design considerations

Which system is best for you?

So which system is best for you? That depends on a number of factors including existing site conditions, your plans for your property and your budget. Each system has advantages and disadvantages, as we've already discovered.

Your property's site conditions may limit your choices. Lot size, soil conditions, property access may require the use of one system over another to meet design and construction requirements outlined in the *Ontai o Building Code*. For new home construction, you may have special plans for the property including pools, decks, wells, sheds, gardens and trees. How will it all fit and look on your property? You also may want to consider your budget for not only the construction of the system but also the long-term or possible annual costs of maintaining your system.

Consult with an OBC-approved designer or contractor to ensure the final product will suit your short- and long-term objectives. Your team of septic experts will help you consider options following a site evaluation, determine the total daily demand of waste and balance your property use and budget. They can recommend the type of treatment unit and final distribution system for your situation.

Case Study: Sizing your septic system

Scenario: an existing home needs a new septic system. The system is in the backyard as the drilled well is located in the front yard. The homeowner is considering an inground pool, so they want a system that requires the smallest footprint. The owner has asked the designer to determine the footprint for di□erent Class 4 systems based on the following:

- a four bedroom home with a daily flow of 2,000 litres per day
- native soil is a fine-grained soil (i.e., clay)

Design Results:

System	Footprint
Level I e□uent with absorption trench	500 square metres
Level I e□uent with filter bed	500 square metres
Level IV e□uent with Type A bed	250 square metres
Level IV e□uent with Type B bed	250 square metres
Level IV e□uent with Shallow Buried Trench	89 square metres
BMEC Authorized System	250 square metres

Be Septic Smart!
There are a lot of di□erent systems on the market. Protect yourself and your investment by ensuring your system meets the *Onta io Building Code* requirement, certification (Can/BNQ 3680-600). Visit bnq.qc.ca for certified Level IV systems and visit www.ontario.ca/page/building-materials-evaluation-commission-decisions for BMEC approved system. This ensures your system meets established performance standards for residential wastewater treatment technologies.

Did you know that septic systems are the responsibility of the homeowner? It is up to

Do:

- familiarize yourself with the location of your system
- keep the tank access lid secured to the riser at all times
- keep an as-built system diagram in a safe place for reference
- keep accurate records of septic system maintenance and service calls
- test your well water at least three times a year — spring, summer and fall — for indicator bacteria
- have your tank inspected for sludge and scum buildup on a regular basis (3-5 years) and clean out when a third of the depth of your tank is full of sludge and scum
- have your e□uent filter checked and cleaned every year; if you don't have an e□uent filter, consider adding one
- divert surface water away from your distribution system

Be Septic Smart!
A licensed sewage hauler or onsite sewage system professional should remove the septic tank cover and inspect the system every three to five years and pump out the solids and scum when required.

10 What happens when there's a problem?

Septic systems have a lifespan of approximately 15 to 40 years. To maximize the lifespan of your system, follow the "Do and Don't" list on page 28.

Symptoms of a Malfunctioning Septic System:

- household drains slow down
- toilets back up
- sewage smell in yard
- grass over septic system is unusually green and/or spongy
- bacteria or nitrate contamination shows up in well water
- surface ponding of e□uent

A malfunctioning septic system is easy to see … and smell. If you suspect you have a problem with your septic system, it is important to fix the problem quickly. A malfunctioning septic system is a risk to the local environment and your health. It can quickly contaminate groundwater and surface water used as drinking water sources.

If failure occurs shortly after construction, it may be the result of poor site assessment, poor design, poor construction practices or homeowner abuse.

E uent o ing out of septic tank lids means blockage in e uent lte o a satu ated dist ibution s stem. This scena io is ha a dous to ou health, as aste ate pathogens include pa asites, bacte ia and i uses.

If you think there's a problem, start by having the septic system inspected. The tank may just need a cleaning. However, if there is a problem with the distribution system, you will want to speak to an onsite sewage system professional for their advice. Onsite sewage system professionals include installers, professional engineers, certified engineering technologists and registered sewage system designers. A second opinion is always recommended.

If a homeowner has a malfunctioning septic system, the big question is, "Do I have to replace the whole system?" Repairs can range from cleaning a few lines to replacing the entire distribution system and removing contaminated and clogged soils.

If repairs are required to correct your septic system problem, contact your local regulatory agency to obtain the appropriate permit before proceeding. The local regulatory agency varies from municipality to municipality. Contact your municipality to learn who administers the septic program in your area. Local grant programs may also exist to help you with repair costs.

A failed distribution system can leak contamination into local ditches, streams and groundwater courses. Wastewater contains high levels of phosphorus. Excess phosphorus causes excessive algae and weed growth in surface water.

Information provided in this publication is not intended to convey legal advice. The reader should not rely on the information presented for the specific design of a system. Refer to recent codes and check with local authorities and individual manufacturers for the most up-to-date information.

Several factors will guide your decision regarding septic system design, including: the physical features of the site, practicality, level of performance, cost, maintenance, availability and personal preference. While care has been taken to ensure accuracy, the examples and explanations in this booklet are given for the purpose of illustration only. Readers must refer to the actual wording of the *Onta io Building Code* or other