Preventing Sewage Spills

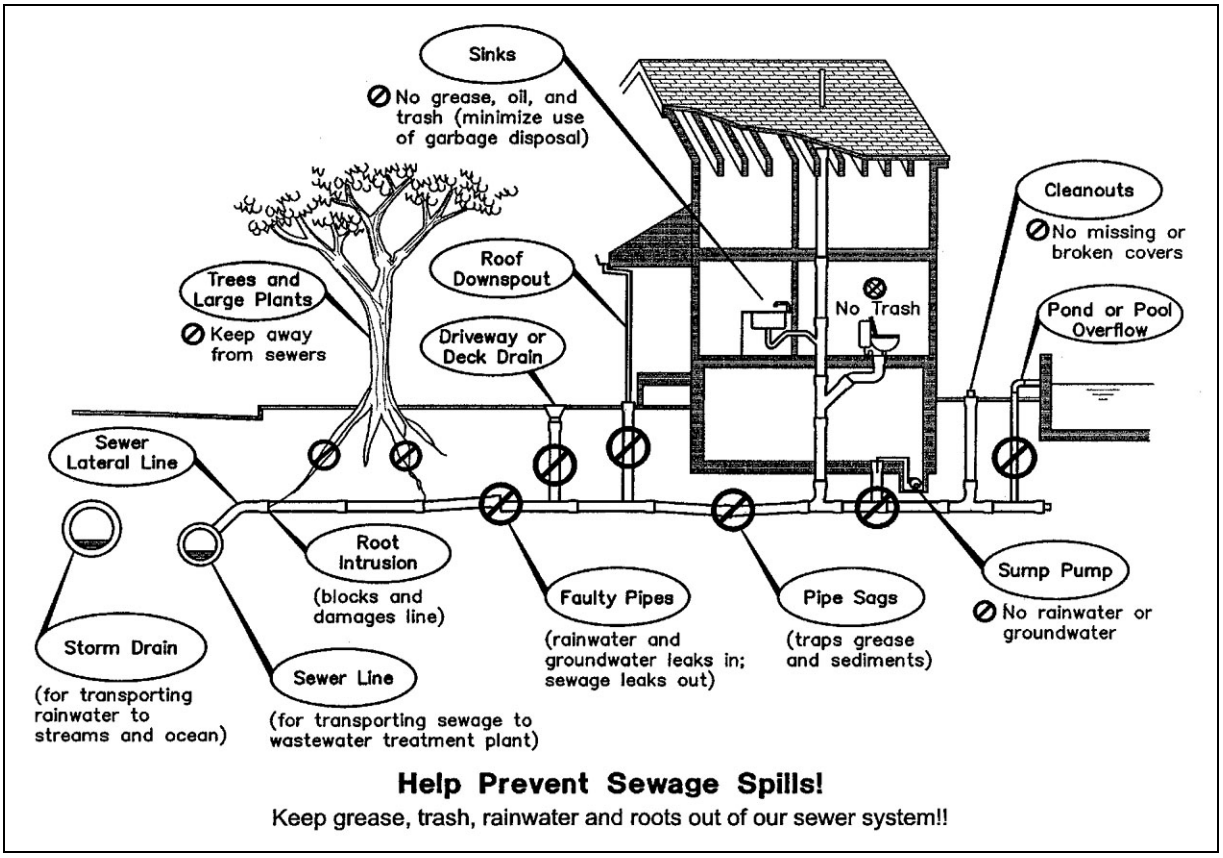
Overflows and spills from sewer lines onto our roadways and into our streams and oceans spoil our beautiful Hawaiian environment and can endanger public health. Sewage spills are costly to clean up (increasing your sewer bills) and can even hurt our tourist industry by causing beach closures. In a typical year, there are over 400 spills statewide involving more than two million gallons of raw sewage!

Learn about the sanitary sewer system and what you can do to help prevent SEWAGE SPILLS!

A Quick Overview

Preventing sewage spills is quite simple. Spills are simply caused by clogged pipes and/or too much flow. All everyone needs to do is keep unwanted things out of our sewer pipes such as grease, trash, rainwater and tree roots.

Illustrated below are some of the causes of sewage spills and how you can help prevent these spills:



More Information on Sewage Spills

Now that you have a feel for the basic ways to prevent sewage spills, take some time to learn about the fascinating details of sewage spills and your underground sewer system. By reading through the information presented below, you can learn:

- Important sewer system terms.
- The difference between "sanitary sewers" and storm drains.
- Why sewage spills are a BIG problem.
- Typical causes of sewage spills.
- How to keep grease and oils out of the sewer system.
- How to keep rubbish out of the sewer system.
- What infiltration and inflow are and why it is important to keep rainwater and other excess water out of the sewer system.
- What you should do if you see a sewage spill.
- Where more information on your sewer system can be obtained.

Ten Terms to Help You Better Understand Your Sewer System

1. **"SEWAGE" or "WASTEWATER."** This is the "used" water that contains human wastes from toilets and water from other sources such as sinks, showers, washing machines, etc. In addition to being odorous, sewage can contain large amounts of germs that cause disease. The term "wastewater" is often used in place of "sewage" to make things sound more pleasant when discussing this unpleasant subject.

2. **"SANITARY SEWER SYSTEM," also known as "WASTEWATER COLLECTION SYSTEM," or "SEWERS."** These are pipes through which sewage is carried from homes and businesses to a treatment plant. The sanitary sewer system includes the main sewer lines in the streets and the branch lines to individual sewer customers called "sewer laterals."

   Sewer systems are generally designed to flow by gravity through sloped pipes until it reaches either the treatment plant or a sewage pumping station (which pumps the sewage up to another higher sewer or a treatment plant).

Although sewage is very unsanitary, the term “sanitary sewer” is used because the sewer pipes are separate from the pipes used for storm water drainage. This helps protect public health and the environment. In some older cities, sewage and rainwater flow through the same pipes. This can cause major environmental and public health problems because untreated or partially treated-sewage is discharged into streams, rivers and other water bodies during heavy rain.

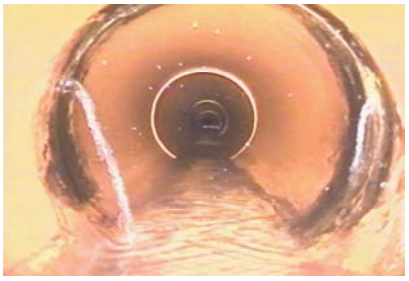
3. **“SEWER LATERAL.”** This is the sewer pipe that connects a building’s plumbing system to the main sewer line in the street. Maintenance of sewer lateral pipes located within private property is generally the responsibility of the property owner. Sewer laterals are also called “service laterals,” “house laterals,” or simply “laterals.”

4. **“SEWER CLEANOUT.”** This is a pipe rising from the sewer lateral to the ground surface with a removable cap or plug. It is used to access the sewer lateral to free blockages. A sewer cleanout is usually located just inside the property line. There may be additional sewer cleanouts at various other locations in your property.

Typical sewer cleanout with properly installed plug.

5. **“WASTEWATER TREATMENT PLANT” or “WASTEWATER RECLAMATION FACILITY”**. These are facilities where organic matter, bacteria, viruses and solids are removed from sewage through physical, biological and chemical processes. The treated wastewater (called effluent) may be disposed of by discharging it to water bodies (mainly the ocean in Hawaii), injecting it into the ground, or reusing it for irrigation or other beneficial non-potable (non-drinking) uses.

6. **“INFILTRATION.”** This refers to groundwater (water found below the ground surface) that enters sewer pipes through cracks, pipe joints, and other system leaks. Because sewers in coastal areas are typically buried deep, they are often located below the water table. Since most sewer lines do not flow full (under pressure), groundwater “infiltrating” into the sewer line is actually more of a problem than sewage leaking out of the line. Storm events can raise groundwater levels and increase infiltration of groundwater into sewer pipes. The highest infiltration flows are observed during or right after heavy rain. Too much infiltration will overload the sewers and cause spills!



Water infiltrating into a sewer line.

7. **“INFLOW.”** This is rainwater that enters the sewer system from sources such as yard and patio drains, roof gutter downspouts, uncapped cleanouts, pond or pool

overflow drains, footing drains, cross-connections with storm drains, and even holes in manhole covers. Inflow is greatest during heavy rainfall and like infiltration, can cause excessive flows and sewage spills.

8. **"PATHOGENS."** These are harmful germs in raw sewage that cause diseases such as cholera, dysentery, hepatitis and gastroenteritis.

9. **"MANHOLES."** Sewer manholes are underground structures used to provide access to underground sewer lines and are usually found in a street, parking area or sidewalk. Access is required to periodically inspect and clean the lines. Sewer manholes typically have heavy round covers with the words "Sanitary Sewer" on the cover.

10. **"SANITARY SEWER OVERFLOW."** Sewage spills are technically called "sanitary sewer overflows" since it involves the overflow of sewage from the sanitary sewer system. The word "sanitary" is used only because the overflow is from the sanitary sewer system, and not because the raw sewage is sanitary! (See definition of sanitary sewer above). For simplicity, we will use the term "sewage spill" or "sewage overflow."

Sewage overflows often occur from sewer manholes in the streets. Sewage can also backup into homes through your toilets, showers and floor drains. Sewage spills are caused by sewage filling the sewer pipes behind the clog to the point where it spills out of an opening in the system (generally the lowest manhole, shower drain or other plumbing fixture).

What is the difference between "sanitary sewers" and "storm drains"?

"Sanitary sewers" collect and convey sewage to a treatment plant where the sewage can be treated. It is important to understand that sanitary sewers are a completely different set of pipes from "storm drains."

In Hawaii and most other areas, an independent system of pipes called "storm drains" is used to only transport storm water (i.e., rainwater) to streams, bays and the ocean with little or no treatment. The separate "sanitary sewer system" (see definition above) is "sanitary" because it keeps sewage out of the storm drains and sends the sewage to a treatment plant before it is released into the environment.

Some key points to remember are:

- Sanitary sewers have limited capacities and are not designed to dispose of storm water (i.e., rainwater) from your property.

- Storm drainage flows are generally not treated and therefore should not contain any pollutants that could affect our streams and ocean.

- Rubbish should not be thrown down sewers or storm drains. Because sewage is treated, sewers can handle sewage as well as certain types and limited amounts of "toxic" materials such as household cleaners.

Why are sewage spills a public health, environmental and economic problem?

Sewage spills are simply an overflow of untreated or partially-treated sewage from the sewer system (i.e., the raw sewage overflows from a sewer line before it reaches the wastewater treatment plant). The sewage can overflow from the manholes in the streets, from open cleanout lines, or from toilets and drains in your home.

In really bad situations, someone else's sewage could spill out of your toilet or shower and flood your home! Yuck!! This may not happen to you but what you do in your home could cause it to happen to someone else living farther down the sewer line!

Sewage spills are a big problem because:

- Sewage spills cause public health problems. Spills can expose people to disease-causing germs (pathogens) such as *E. coli* and *Cryptosporidium* that are present in sewage.

- Sewage spills can pollute our streams, the ocean and other bodies of water. In addition to being a public health problem, sewage can add unwanted nutrients to our water environment and cause excessive growth of algae that disrupts the ecosystem.

- Sewage spills can pollute the groundwater, which in many inland areas, is our source of drinking water.

- Sewage spills hurt our economy. Sewage spills are costly to clean up and this affects our sewer bills (which almost everyone feels are already too high!). More importantly, sewage spills can cause beach closures that can have a big impact on Hawaii's tourism-based economy.

What are the main causes of sewage spills?

Sewage spills are caused by the clogging of pipes and/or too much flow. Clogging is caused by blockages from fats, oils and grease as well as rubbish, roots and other foreign or unwanted objects in the sewer system. Too much flow is caused by infiltration and inflow (i.e., groundwater and rainwater getting into the sewer system). The following sections discuss each cause in detail.

Keeping fats, oils and grease out of the sewer system

Fats, oils, and grease, and other byproducts of cooking come from meat, lard, shortening, butter, margarine, food scraps, sauces, and dairy products. They present a significant clogging problem for sewer systems. Fats, oils and grease stick to the inner walls of sewer pipes and reduce the diameter of the pipes over time. This eventually causes clogged sewer pipes and sewage spills.

Grease on the walls of a sewer pipe

A typical grease ball

Clogging is further caused by chunks of grease breaking away from the pipe walls and becoming stuck further down the line. Grease balls that form when grease combines with sand, grit, and other sewage debris can even become large and hard enough to clog sewage pumps!

Fats, oils and grease also flow down to the wastewater treatment plants where it disrupts operations and increases maintenance costs.

Regulations require restaurants and other commercial food handling facilities to install large grease separation devices to protect sewers from grease problems. Folks at home need to do their part!

How should we properly dispose of grease and oils?

Everyone can do their share to prevent clogged sewers by following these simple Do's and Don'ts:

Both liquid oils and solid fats should be placed in absorbent filled containers prior to trashing.

DO's:

- Collect oil and grease in a container filled with absorbent material (shredded newspaper, napkins, paper towels, rags, etc.) and properly dispose of it in the garbage.

- Scrape grease and food scraps off cooking/serving utensils and plates for proper disposal. Better yet, wipe them with used napkins and paper towels before washing.

- Encourage friends and neighbors to practice similar habits of proper oil and grease disposal. Parents, set a good example for your kids! Kids, educate your parents!

DON'Ts:

- Do not pour grease or oil down the drain or toilet.

- Do not dump greasy or oily food waste into the drain. (Minimize the use of your garbage disposal and better yet, compost your vegetable scraps!)

Some other points to remember:

- Be sure to put your oil and grease in a suitable container or bag with absorbent material. The reason for using the absorbent material is so that your grease and oils do not leak out of garbage trucks and cause a big mess. Also, remember that solid grease can turn to liquid in our hot climate so use absorbent material for solid or semi-solid fats too!

- If you have a large amount of cooking oil, consider using a disposable automotive oil change box filled with absorbent material. For even larger quantities (several gallons or more), take your used cooking oil to a recycler (check your yellow pages).

- On Oahu, your trash is sent to HPOWER and therefore, instead of causing a costly sewer and environmental problem, throwing your fats, oils and grease in the trash is now helping to generate power and save everyone money!

Keeping rubbish out of the sewer system

Your toilet and sewer system are only designed to dispose of human wastes and toilet paper (which quickly breaks down). Unfortunately, people use the toilet as a wastebasket out of convenience. It is a huge "out of sight, out of mind" problem because people often don't see the mess sewer overflows cause and the problems that sewer workers need to deal with!

Almost any type of rubbish may restrict sewage flow, clog sewers, and cause sewage overflows. Keep the following from going down your toilet and sinks:

- Paper (paper towels, facial tissue (Kleenex), paper napkins, wrappers, etc.). Only toilet tissue is okay!

- Plastics (bags, wrappers, bottles, cotton-tip shafts),

- Rubber (gloves, condoms, underclothes elastic, etc.),

- Cloth and fibers (cotton balls, tampons, cigarette filters, stockings, rags, etc.).

- Food scraps (greasy items are the worst but minimize throwing down non-greasy items too. Try to even keep out smaller food items such as tea-leaves, coffee grounds or eggshells. Garbage grinders help but its even better not to use it where possible -- compost what you can and throw the rest in the trash. Place food scraps in tightly sealed bags or other containers so it does not become an odor or rodent problem.)

- Toys, cans, sticks, pebbles and sand, and pretty much all other solids except for human wastes and toilet tissue.

Why is it a problem? Rubbish and other objects often combine with hair, grease and other debris to cause clogging of the sewer system. Even something as small as a cotton tip swab with other attached debris can cause a blockage in sewer pipes. Rags and stringy material can clog sewage pumps. Malfunctioning sewage pumps, like clogged pipes, prevent sewage from flowing through the system and are a cause of spills. Any rubbish-type items that you dump in toilets and sinks at home, work, schools, shopping centers, movie theaters, or parks can contribute to sewage spills.

Do your share to keep rubbish from clogging our sewers by following these simple Do's and Don'ts:

DO's:

- Place and use a wastebasket in the bathroom to dispose of rubbish (including disposable diapers and personal hygiene products).

- Use sink and shower drain strainers.

- Scrape food scraps into sealed containers or bags and throw them out in the garbage.

- Educate each other on minimizing disposal of rubbish to our sewers.

DON'Ts:

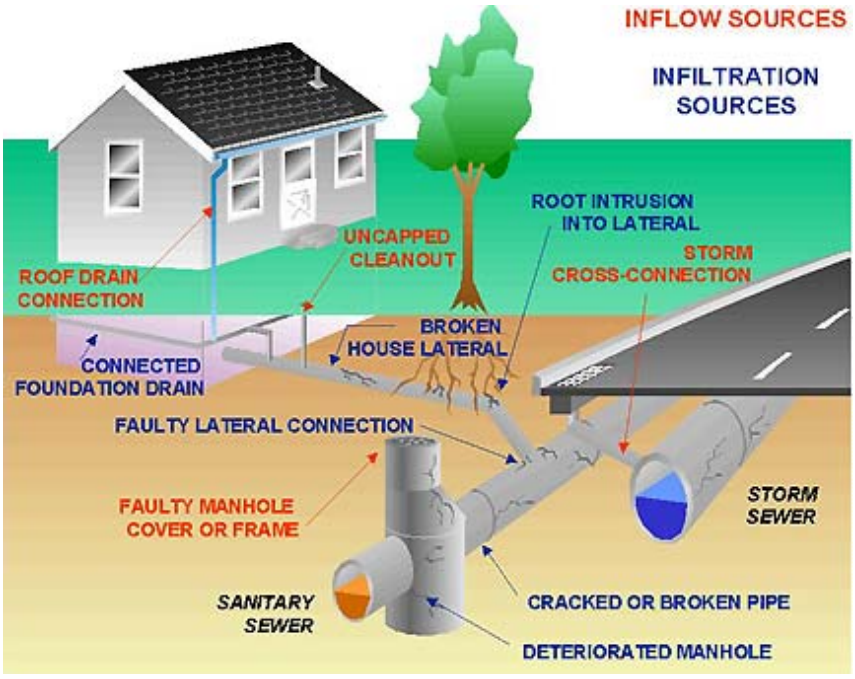
- Don't use the sewer as a convenient means to dispose of food scraps.

- Don't use the toilet as a wastebasket!!

Keeping rainwater and other excess water out of the sewer system

What is infiltration and inflow?

Infiltration and inflow are the technical terms referring to rainwater and/or groundwater that enters the sewer system through such sources as cracked pipes, leaky manholes, or improperly connected storm drains and roof gutter downspouts. Most infiltration comes from groundwater and most inflow comes from rainwater. See the definitions presented earlier for infiltration and inflow. The following figure shows typical sources of infiltration and inflow.



Courtesy of King County website

Why are infiltration and inflow big problems?

In addition to causing sewage spills, the additional flow from infiltration and inflow results in the need for larger sewers and treatment plants. This raises the sewer fees that residents and businesses must pay the government or private sewer agency to build, operate and maintain the sewers and wastewater treatment plants.

Sewer systems (sewer pipes and pumping stations) are designed to handle sewage flows from houses and businesses plus some additional flow from infiltration and inflow. Sewage flow rates used to design sewers have been developed over the years based on information obtained from water usage within the household and workplace. The exact volume of groundwater and rainwater (infiltration and inflow) entering the system, however, varies with location and is virtually impossible to predict. Infiltration and inflow entering the

system can be much higher than the system's capacity when there is too much leakage due to infiltration from deteriorated sewer pipes or significant sources of rainwater inflow.

The infiltration and inflow that enters the sewer system is transported to wastewater treatment plants along with the sewage. The groundwater and/or rainwater mixed with the sewage can double and even triple the design capacity of the treatment plant. Like the sewer system, the treatment plants are generally designed and constructed to accommodate the expected sewage flows plus some infiltration and inflow, but not large volumes of groundwater and rainwater.

When large volumes of infiltration and inflow increase the wastewater flow, the sewer system is overwhelmed to the point where a sewage spill can occur. The extra flow from infiltration and inflow simply causes the sewer system capacity to be exceeded. Sewage spills pose a public health risk due to increased probability of human contact with harmful pathogens as the sewage runs down the street to the storm drains, the streams, and eventually our recreational waters. Devastating backups of sewage into homes can also occur. In addition to causing sewage spills, the high flows can also affect the ability of the treatment plant to adequately treat the wastewater.

How does this affect the sewer fees that everyone pays? In many cases, your sewer agency will deal with heavy infiltration and inflow by increasing the size of the sewer pipes, pumping stations, and treatment plants.

Constructing large sewer lines to handle high infiltration and inflow is very expensive and has its own problems associated with it. For example, large sewer pipes tend to result in sluggish flow during normal low dry weather flows. This causes the organic matter to putrefy and generate gases that are both odorous and corrosive to the sewer pipes. The corrosive gases shorten the life of the sewer lines and manholes, which increases your sewer bill even more!

At the sewage treatment plant, high infiltration and inflow can result in a significant amount of money being spent to construct facilities that are rarely used. The sewer users pay for the higher maintenance costs as well as the added construction costs. Once again, this increases your sewer bill!

Who is responsible for the infiltration and inflow problem?

Although infiltration of groundwater is a concern, the large jump in flow caused by inflow of rainwater has the greatest impact on a sewer system. Through extensive studies on sewers in the U.S., it has been found that the greatest contribution of inflow comes from private property. Common inflow sources include direct connections from rain gutter downspouts, outdoor drains, and pool/pond overflow pipes connected to the sewer lines. Uncapped cleanouts and broken house sewer laterals also cause excessive rainwater to enter the sewer system.

Although these inflow connections at your home may alleviate the inconvenience of yard

flooding and puddles, they have significant impacts to the sewer system, the sewer rates, and public health. It has been estimated that as much as 40% of the total infiltration and inflow is contributed by the "private" side of the sewer. The individual sewer user therefore can play a **HUGE** role in minimizing sewer fees, promoting proper functioning of the sewer system (reducing spills), and protecting the environment. Your sewer agency is probably spending a lot of money replacing old defective sewer lines in the streets to reduce infiltration but individual sewer users must do their part in reducing rainwater inflow!

What can you do to prevent and reduce infiltration and inflow?

The following are important actions that sewer users can take to help reduce infiltration and inflow:

- Inspect the rain gutters on your house to see if the downspout connects to a sewer line. Such connections are illegal (violation of the plumbing code)! If the gutter downspouts are connected to the sewer line, have them disconnected—the large amount of water from the roof can cause a sewage spill. The rainwater needs to be directed onto your lawn and/or to the storm drain system.

Example of downspout potentially connected to the sewer.

- Look for and check your sewer cleanout. The cleanout is usually a small pipe, about 4-inches in diameter, outside your house that is used to access the sewer lateral for cleaning. You will normally find it near the house (where the sewer lateral comes out) and/or near the property line (where the sewer lateral connects to the main sewer line). Make sure the cap to the cleanout pipe is not missing and has not been damaged (such as by a lawn mower). Replace missing caps so that rainwater cannot get into the sewer line. Kids love to throw rocks, toys and other nasty things down an uncapped cleanout! By keeping the cleanout capped, you can also prevent unpleasant sewer odors and gases from escaping.

- Check to see that outdoor patio, deck or yard drains are not connected to the sewer. Also, be sure that pool or pond overflow drains are not connected to the sewer. These connections are not allowed by the plumbing code. You may want to call your plumber to assist you in checking your connection. You can also try calling your sewer agency for assistance since they often have personnel that can trace lines and have a strong interest in keeping rainwater out of the sewers. If you are <u>voluntarily</u> taking steps to find and correct the problem, it is unlikely that you will be fined for the illegal connection(s).

- If you live in a low area with a high water table, and/or experience a lot of settlement on your property, you may want to have your sewer line checked for cracks,

separated joints, or “sags” that could cause entry of rainwater or clogging problems. Many plumbers now have miniature video cameras that can be sent down your line to check if the line has any significant damage or other problems.

- Avoid planting trees and shrubs over or near the sewer laterals. This also applies to sewer mains that may be in yard easements. Roots can enter and damage sewers. This allows groundwater and rainwater to enter the sewer and also causes costly ongoing problems with sewer clogging, backups and spills.

- If you have a basement sump pump to pump out groundwater or rainwater leakage, be sure that it does not connect to your sewer pipes or to a sink or floor drain in your basement. This would be another source of unwanted excess flows that can overload the sewer system.

- If your area is experiencing flooding, **NEVER** try to drain the areas by removing the sewer manhole covers in the street or covers from your cleanouts. The huge amount of flow that would enter the sewer system will definitely cause a problem downstream. Notify your sewer agency if you observe or know of someone doing this.

What should you do if you see a sewage spill?

Make sure that people are kept away from the area of the overflow, typically a manhole cover. This is especially important for children and pets who may play near the overflow area (e.g. street, public park, or local stream).

If liquid is coming out of a manhole cover with “Sanitary Sewer” on it, it is probably sewage! Note that sewage is not brown or yellowish in color and actually looks like dirty gray dishwater. Especially during heavy rain, take note of and report any sewer manhole covers that you see lifting up and spilling sewage.

Report the sewer overflow immediately to the statewide Hazard Evaluation and Emergency Response Hotline (Ph. 586-4249 during working hours; Ph. 247-2191 after hours) or your sewer agency if you have their number. Quick action is required to reduce the risk of public exposure to raw sewage by stopping the overflow, monitoring its impact, and ensuring proper cleanup.

Where can I obtain more information?

For any questions on your plumbing system, call your local city or county building department. They are the experts on plumbing codes and what should or should not be connected to the sewer line.

Most plumbers would be able to assist you in locating and disconnecting illicit sources of rainwater discharge to the sewer line within private property.

For problems with the sewer lines in the road and other public property, contact your sewer agency or private wastewater service provider.

For any other questions, feel free to email HWEA at info@hwea.org. As a public service, we will do our best to respond to your questions or direct you to someone who can. HWEA can also provide or find speakers to do presentations on most topics related to wastewater treatment and water pollution control.

Keep Hawaii Spill Free!