

SCIENTISTS ON THE GO



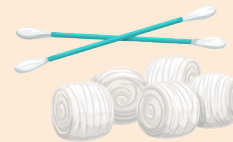
Down the Drain and Then What?

What do you think is in wastewater besides water? LOTT Clean Water Alliance treats the wastewater for Lacey, Olympia, Tumwater, and parts of Thurston County. The water is full of unwanted things!

► Draw a line from each item to show how to properly dispose of it.



Flushable Wipes



Cotton Balls and Swabs



Food Scraps



Poop and Pee



Medications



Toilet Paper



Floss



Flush down
the toilet



Put in the trash



Take to a police station



Toss in the compost

Check your answers!

The only things you should flush are poop, pee, and tp!

Follow the Treatment Process

When the water reaches LOTT's Budd Inlet Treatment Plant, it takes about 24 hours to be cleaned.

► Read the steps and label the pictures with the correct step.



1. _____



2. _____

Disinfect Water: Water passes through a green ultraviolet light. Bacteria are no longer harmful!

Influent Pipe: Wastewater flows through a 5' tall pipe into the treatment plant.

Remove Trash: In Headworks, all trash bigger than a pencil eraser is removed with a moving screen.

Remove Bacteria: Wastewater flows into Secondary Clarifiers, where bacteria float to the top or sink to the bottom of the tank and are then removed.

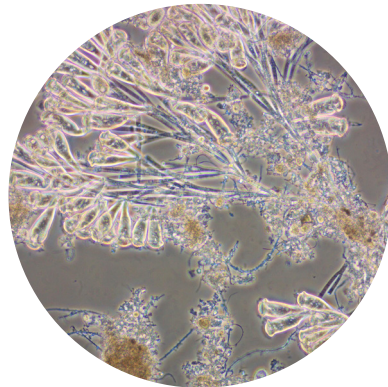
Remove Solids: In the Primary Clarifiers, water settles for three hours. The fats, oils, and grease float to the top. Poop sinks to the bottom. (*Hint: Water is still brown.*)

Final Effluent: Treated wastewater flows into Puget Sound.

Bacteria at Work: Bacteria work hard to break down the remaining poop and some chemicals. (*Hint: Image has microbes*)



3. _____



4. _____



5. _____



6. _____



7. _____

Check your answers!

1. Influent Pipe 2. Remove Trash 3. Remove Solids 4. Bacteria at Work 5. Remove Bacteria 6. Disinfect Water 7. Final Effluent

Travel Back in Time Through Toilets

Travel through history to see different kinds of toilets. Toilets have not always looked like they do now. Roughly 4,000 years ago, Minoans on the Mediterranean Islands of Crete and the Indus Valley Civilization of present-day Pakistan and India had sophisticated sanitation systems and the earliest documented flushing toilets. It was then many more years before a similar toilet was used again.

- ▶ Circle the toilets you would consider using or have used.
- ▶ Put an X through the toilet you would not want to use!



Roman Public Toilets
1,000 BC - 410

Romans had public toilet areas where waste went into small streams running continuously beneath the toilet. They cleaned themselves with a communal sponge on a stick. It was a social event to use the bathroom.



Chamber Pot
500 BC to mid-1800's

A chamber pot is a portable toilet typically kept in the bedroom and used at night. They were emptied into open channels that ran through the streets. This caused many health and environmental problems.



Garderoibe
1100

The medieval latrine was a hole over a moat with water or an underground tank called a cesspit. The cesspits were cleaned at night by people called gong farmers.



Outhouse
1500 - Present

An outhouse is a small structure with a "toilet" separate from a main building. They do not flush and the waste goes into a hole or a holding tank.



Mechanical Flushing Toilet
1596 - Present

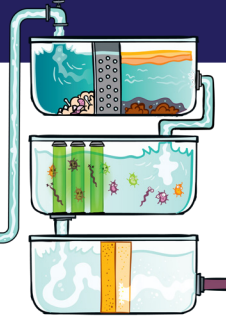
Sir John Harrington invented the flushing toilet in 1596 but the idea failed to catch on. In 1775 Alexander Cumming patented a flushing toilet.



Limited Access to Toilets
Even though flushing toilets have been around for hundreds of years, 1 in 3 people worldwide do not have access to sanitation services such as toilets or latrines.

Engineer a Wastewater Filter

Wastewater treatment plants are complex systems designed to remove trash, poop, oil, bacteria, and some chemicals. Your challenge is to create a mini treatment plant to make the cleanest water possible.



Prepare "Wastewater"

1. Gather materials.
2. Put the wastewater ingredients into a cup or jar.
Add water and mix with a spoon. Set it aside to use after you design and build your filter.

Circle the wastewater ingredient that you think will be the hardest to remove with your filter.

Design and Test Trial 1 Filter

1. Draw your filter design in the box below.
2. Build the filter according to your drawing.
3. Test your filter! Stir the "wastewater" then pour half of the water through the filter.
4. Put the filtered water aside to compare with Trial 2 results.

Build and Test Trial 2 Filter

1. Make changes to your filter.
2. Pour the rest of the wastewater through your second filter.
3. Collect the filtered water and set it next to the Trial 1 water.

Evaluate

Compare your results. For each trial write none, some, or most to describe the amount of the ingredient still in the wastewater.

Supplies

"Wastewater" Supplies	Real Wastewater
Spoonful of soil/coffee	Poop
Handful of torn paper	Garbage
Few drops of dish soap	Soap and chemicals
Splash of cooking oil	Fats, oils, and grease
Pinch of salt	Germ and bacteria
Cup or jar	

Filter Supplies	
Strainer/funnel	Cotton balls
Large bowl	Spoon
Paper towel or	Two cups
Coffee filter	Rubber band

Draw and label your filter design

Wastewater Ingredient	Trial 1	Trial 2	Other Observations
Poop (coffee/soil)			
Garbage (torn paper)			
Chemicals (soap)			
Fats, oils, and grease (oil)			
Germ/bacteria (salt)			



Nice work! You are on your way to becoming a wastewater engineer. Engineers work hard to design the most efficient and effective tools for treating wastewater.



Wastewater Word Search

► Circle wastewater-related words. Words appear straight across, up, down, and diagonally.

N W H R T E L I O T T R B T Q
E O A E O C J B J E P E L A M
P F I S T T W T L D O E D R E
H M F T T I A O E X O N Y D D
U S O L A E I R A X P I T I I
G L A O U V W I E G K G I G C
Q E J R A E R A N P G N L R I
U L Q R T E N E T Y O E A A N
Q N T A T E E T S E O B U D E
S L A C I M E H C N R S Q E V
U Y A P E E A V R B O Y R O K
K B R H P S J R I J D C E M V
T O I L E T P A P E R E T U F
P I F L O O N W Q P V D A P V
I N F L U E N T D J W L W K Q

Wastewater
Poop
Pee
Operator
Engineer
Bacteria

Ultraviolet
LOTT
Tardigrade
Influent
Effluent
Toilet

Conservation
Trash
Medicine
Water Quality
Toilet Paper
Chemicals



Should You Flush It Experiment

Sometimes it is confusing to know what to flush and why. With this experiment, you can see what happens to paper products when they go into the sewer pipes.

► Should You Flush it Experiment

1. Gather your supplies.
2. Fill your container or bowl with water.
3. Add toilet paper to the water. Close the lid if using a container.
4. Shake or mix with a spoon for 1 minute.
5. Describe what happens in the result table below.
6. Repeat for paper towel, wipes, and something of your choice.

Supplies

Water
Container with lid or mixing bowl and spoon
Toilet paper
Paper towel
Wipe

Results Table

Product Type	Describe what it looks like after 1 minute	Should you flush it? (Yes or No)
Toilet paper		
Paper towel		
Wipe		

Reflection

Why is it bad to flush paper that doesn't break into small pieces?

Even wipes that say "flushable" should not be flushed. Where should you put them?



Picture shows a pipe clogged with wipes being cleaned out.



Thanks for helping protect the environment by only flushing the 3 P's: poop, pee, and (toilet) paper. Flush whatever comes out of you and toilet paper. Flushing trash can clog pipes and cause dirty water to overflow. Now that's gross!

Which Career Interests You?

Wastewater treatment plants require all sorts of skills to help clean water, run computer systems, test water, and engage with the community.

► Read about four careers and choose the one you find the most interesting.

Water Quality Analyst

Responsibilities

- Test chemical, physical, and microbiological quality of treated water
- Keep track of wastewater test results using computer programs



Job Highlights

Protect marine life and the environment

Education and Experience

Bachelor of Science and graduate level chemistry, microbiology, biology, and environmental science

Environmental Educator

Responsibilities

- Give presentations about water conservation and what not to flush
- Greet guests visiting the educational center

Job Highlights

Interacting with students as they learn about the environment

Education and Experience

Bachelor degree with an environmental focus and experience working with the public



The most interesting wastewater career to me is

because _____

Wastewater Operator

Responsibilities

- Operate and monitor treatment plant systems and processes
- Respond to emergencies like equipment failures and high water flows

Job Highlights

Investigate and solve problems at the treatment plant

Education and Experience

- High school with some college level courses in math and sciences
- Certification as a Wastewater Treatment Plant Operator



Wastewater Engineer

Responsibilities

- Design wastewater treatment processes
- Collaborate with construction managers during projects

Jobs Highlights

Create and update the systems needed by Operators to treat wastewater

Education and Experience

Bachelor of Engineering with focus in civil, environmental, or chemical engineering



