PRIMARY

Micro-Lesson #1:

Where Does My Tap Water Come From?

Featuring:

"DRiP" THE WATER DROP!

Hamilton

Where Does My Tap Water Come From?

MICRO-LESSON #1

Introduction / Objective

Water is the most important natural resource on Earth yet a great deal of people can't answer this question: **Where does your tap water come from?**

Through this micro-lesson, students will explore sources of water in the environment and discover exactly where most people in Hamilton get their tap water.

Activity / Demo	Key Question	Objective
Warm Up Excercise - Water Sources	Where is water found?	Develop an awareness that drinking water comes from a source in the environment
Video #1 - Where Does My Tap Water Come From?	Where in our environment does Hamilton's tap water come from?	Understand that tap water comes from Lake Ontario and it's journey from source to tap
Activity #1 - Trip of a Drip	Where in our environment does Hamilton's tap water come from?	Understand that tap water comes from Lake Ontario and it's journey from source to tap
Colouring Page #6 - Lake Ontario	Where is Hamilton located on Lake Ontario?	Understand the scale of Lake Ontario
Word Search #3 - Water Places	Where is water found?	Develop an awareness that water can be found in many places in the environment

Warm-up

We use water every single day. We just turn on the tap anytime we need clean water to use. Ask your students if they have ever thought about where that water actually comes from. It must come from somewhere! Indicate that tap water comes from somewhere in our environment.

Have students list (verbal or written) all of the places that we can find water outside in our environment. Ask them to identify which source on their list they think their tap water comes from. Guide or prompt students as necessary (E.g. Do you ever see water when you look out the car window? Where do fish live? etc.)

Each student can create their own list to be compiled into one comprehensive list. Fill in and share any gaps left off of the list. E.g. students may not think of clouds, glaciers, underground sources such as aquifers/wells, etc.

Where Does My Tap Water Come From?

MICRO-LESSON #1

Instruction

Have your students watch the video "Where Does My Tap Water Come From?" to discover the source of their tap water! The video can be found here: https://youtu.be/vYDZ-1yX9co

Engage

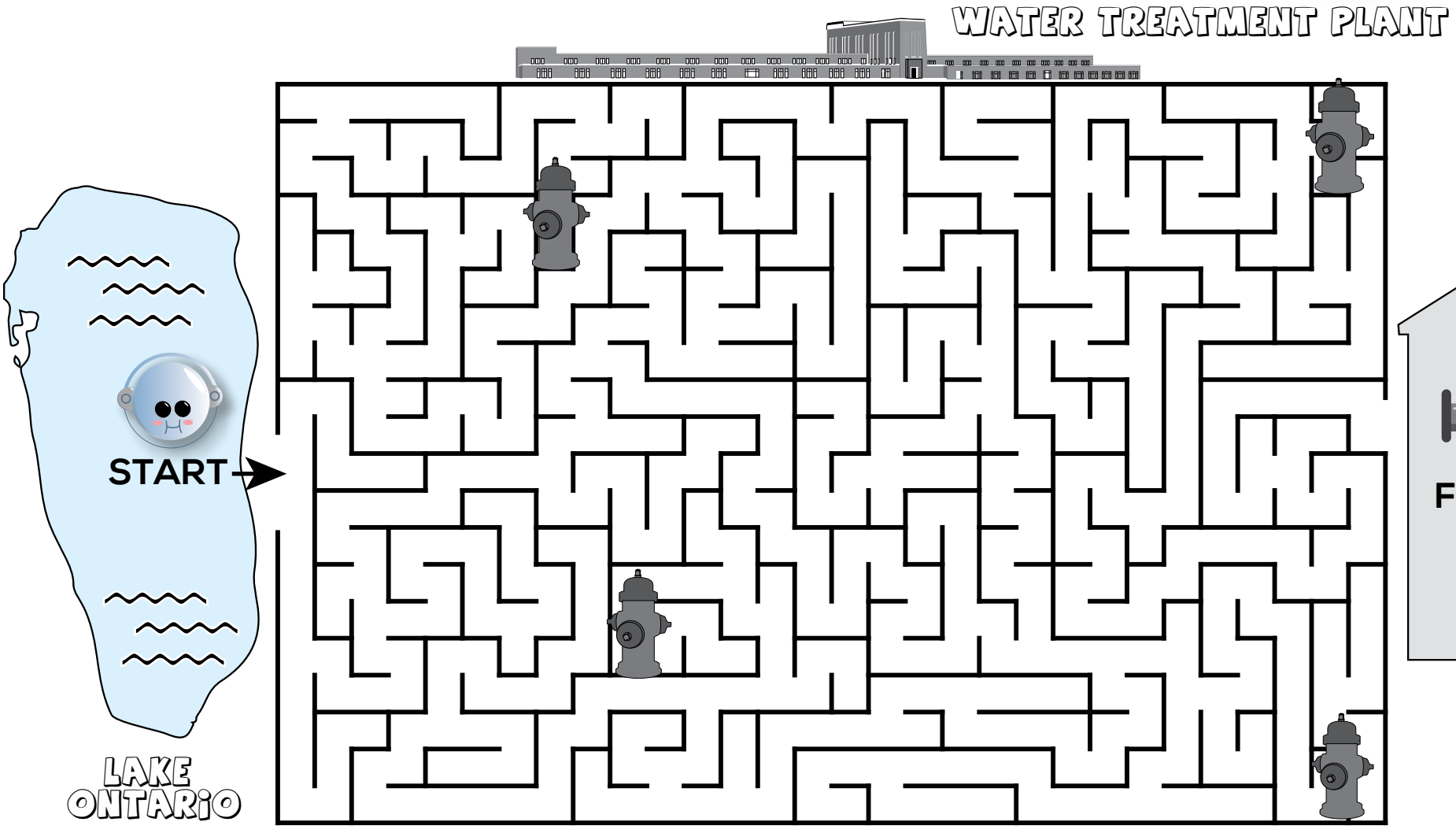
To identify student understanding, following the video ask your students if they were suprised about where their tap water comes from. What is one thing that happens to the water before it gets to their tap?

Have students complete one or several of the following resource activities below to reinforce the key concepts from the lesson:

Activity 1: Trip of a Drip
Colouring Page #6: Lake Ontario
Word Search #3: Water Places

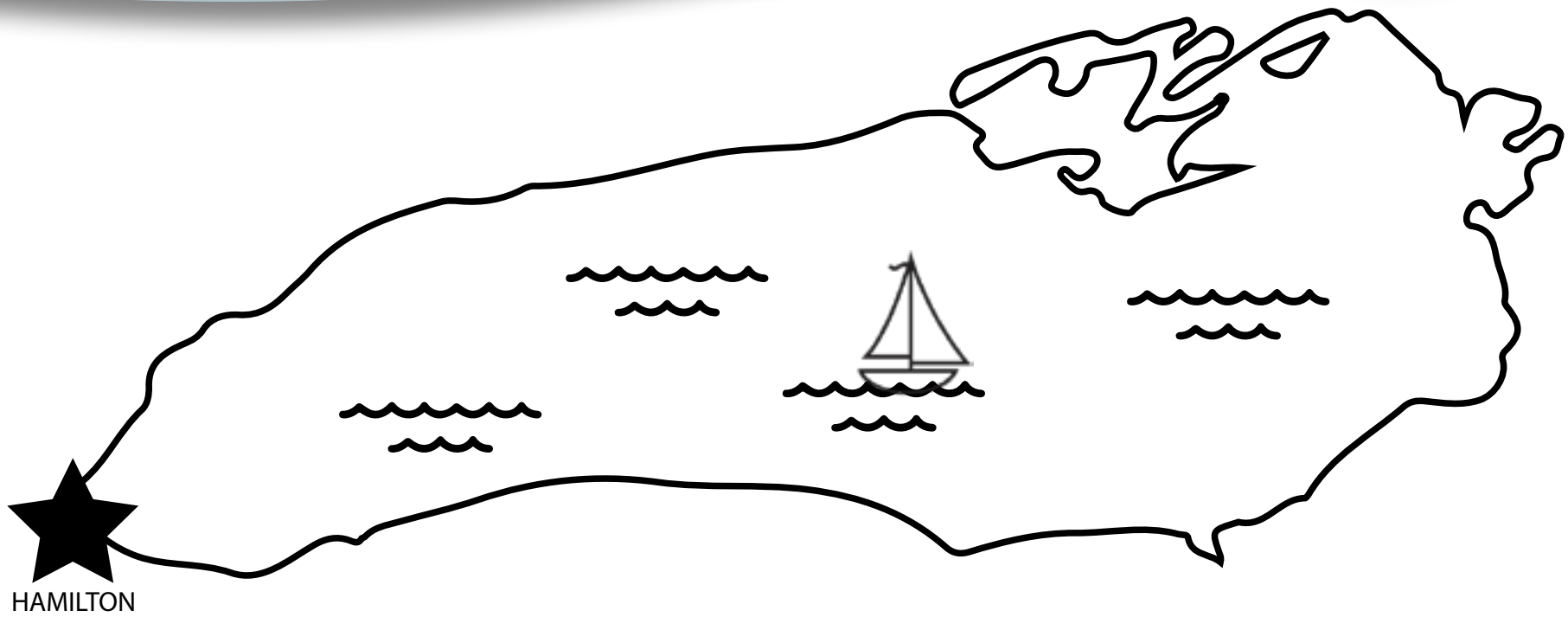
Trip of a Drip

Can you help Drip the Water Drop travel from Lake Ontario to your tap? The water drop has to go by the Water Treatment Plant to get cleaned first before it can get to your tap!



Where Does Your Tap Water Come From?

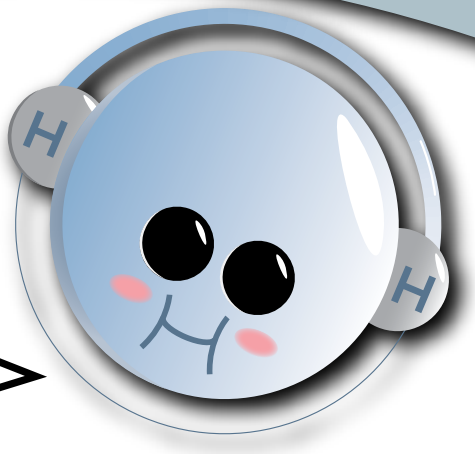
Have you ever thought about where the water from your tap comes from? It goes on a long journey through pipes, pumps and even a water treatment plant to be cleaned before it gets to your tap!



Water Word Search #3

Water Places

YOU CAN FIND WATER EVERYWHERE YOU LOOK. CAN YOU FIND SOME OF THESE PLACES IN THE PUZZLE?



LAKE
WELL
STREAM
POOL

HARBOUR
PUDDLE
RIVER
OCEAN

POND
BAY
SWAMP
RESERVOIR

WATERFALL
RAIN
TAP
PIPES

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

Micro-Lesson #2:
Water Conservation

Featuring:

"DRiP" THE WATER DROP!

Hamilton

Water Conservation

Introduction

Through this micro-lesson, students will investigate how much fresh water we have on available to us on Earth and track their own water use in their homes. This Micro-Lesson contains:

Activity / Demo	Key Question	Objective
Wordsearch #2 - Water Uses	How do we rely on water?	Develop an awareness that we rely on water everyday
Demonstration - Water on Earth	How much water is on Earth?	Understand that water is a precious, limited resource
Activity #1 - I Love Water!	Why is water important to us?	Understand that life would be different without running water
Colouring Page #1 -Water Saver!	How can I save water?	Explore ways that water can be conserved at home
Activity #4 - Water Tracker	How much water do I use?	Quantify the amount of water used in a normal day

Warm-up

We rely on water for so many things everyday and many of us don't think twice about how much we use or about how much is available. Have your students think about their daily routine and create a list of all of the things that they can think of that they use water for. Prompt or guide students as necessary (E.g. What do you do after you go to the bathroom? Do you have a bath/shower? Do you use water to cook?). Students may also complete **Wordsearch #2 - Water Use** as a warm up to the demonstration.

Demonstration

Have your student(s) with assistance perform the following visual demonstration of the amount of fresh water we have on Earth.

Materials Needed:

- 1L Container
- 2 - Clear cups
- 1 - Teaspoon
- 1 - Tablespoon
- Optional: Tape and marker
- Optional: Blue food colouring
- Optional: Earth print out

Water Conservation

Demonstration

Introduce this activity by stating that the surface of the Earth is mostly covered in water, roughly 70%! The rest, or 30%, is land. Optional: show a picture of Earth representing the amount of land and water. Where on Earth can we find Earth's water? Oceans, lakes, rivers, etc. We have a lot of water in our world, but how much of this water is available for us to get to drink and use? In this activity, we will find out about how much (or how little) we can drink and use.

Some or all of the following steps can be prepared by the instructor in advance or the student(s) can assist with carrying them out. Prepare the first steps of the demonstration:

- Measure 1 litre of water and pour into a clear container
- Optional: Add a few drops of blue food colouring
- Optional: Place the print out of the earth in front of the container

Use your imagination and picture that we have taken all of the water on Earth and put it into this container. This container now represents all, or 100%, of the water on Earth. This water is made up of two different kinds of water, freshwater and saltwater. Can we drink saltwater or freshwater? Humans can drink freshwater but not saltwater!

For the next step, explain that you will be splitting the water in the container between the amount of freshwater and saltwater found on Earth. Ask the student(s) how much of the water on earth is saltwater. How much is freshwater? After a guess is provided, prepare the second step of the demonstration:

- Measure and remove **2 tablespoons** of water from the large container and place in a clear empty cup (**cup #1**)

Water Conservation

Demonstration

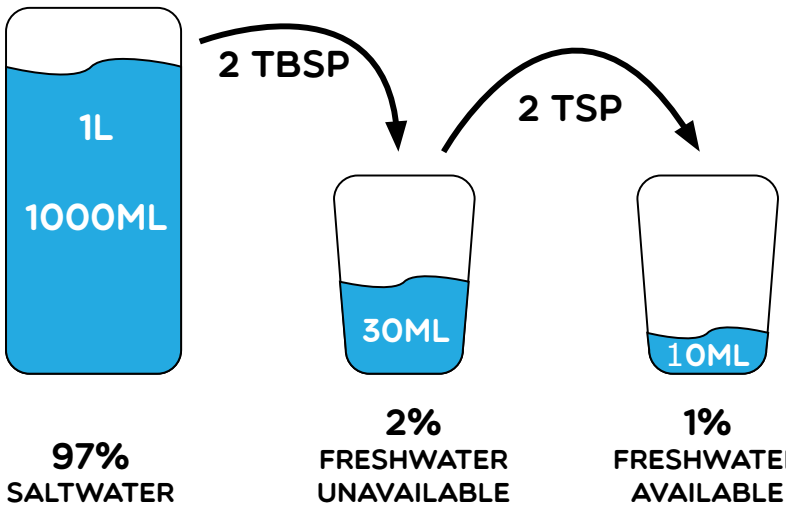
Explain that **Cup #1** represents freshwater (3% of the water on Earth) and the large container now represents saltwater (97% of the water on Earth). Stress that humans can't drink saltwater.

Lastly, explain that we can't access all of the freshwater on earth. Some of it is frozen, buried deep underground, floating around as water vapor, etc. State that we will now split the freshwater into the amount that we can and can't access. Preprare the last step of the demonstration:

- Remove **2 teaspoons (10ml)** of water from **Cup #1** and place in a second clear cup (**Cup #2**).

Explain that **Cup #2** represents the amount of fresh water (1%) that is available for us to use and drink which is spread all over the Earth. **Cup #1** represents all of the fresh water that we can't access (2%).

Wrap up the demonstration by placing the large container and two small cups side by side. Explain that although we have so much water on Earth, we have a very small amount that we can actually use. To aid with understanding, consider labelling the container and cups throughout the demonstration.



Water Conservation

Engage

The average person in Hamilton uses more than 200L of water every single day. Ask your students if they know how much water they use at home. Since we have such a limited amount of freshwater on Earth we need to be careful how much we use. Provide your students with **Colouring Page #1 - Water Saver** for ways to cut down on their water use. Optionally, students can also complete Activity #2 - I Love Water to share what they love most about water. To finish the lesson, students can complete **Activity #4 - Water Tracker** to determine how much water their household uses in a day. To expand on this activity, students can complete the worksheet for multiple days to see if they can reduce their water use!

Water Wordsearch #2

Water Use

WE USE WATER FOR SO MANY DIFFERENT THINGS! CAN YOU FIND ALL THE WAYS WE USE WATER IN THE PUZZLE BELOW?

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

BRUSH TEETH
DRINK
FISHING
TOILET
HOSE
SHOWER
BOATS
WATERING
FOUNTAIN
CAR WASH
CLEANING
SWIMMING
PLAYING
BATH
DIVING

Water Activity #2

I Love Water!

DRAW A PICTURE IN THE WATER DROP OF WHY YOU LOVE WATER

I love water because:

_____

_____

_____

_____

_____

_____

_____

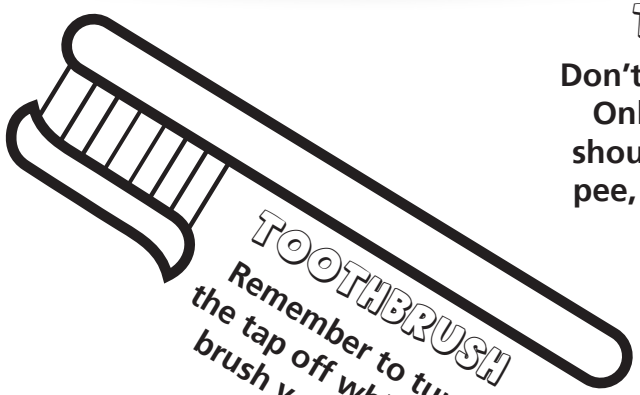
_____

DID YOU KNOW?

It costs less than $2 to fill a glass of water 2000 times with Hamilton tap water?

Be a Water Saver!

Did you know that out of all of the water on our planet, only 1% is available for us to use? You can help protect our water sources by following these water-saving tips!

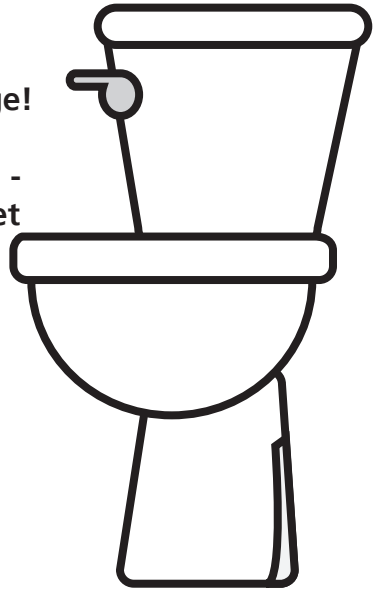


TOOTHBRUSH

Remember to turn the tap off while you brush your teeth!

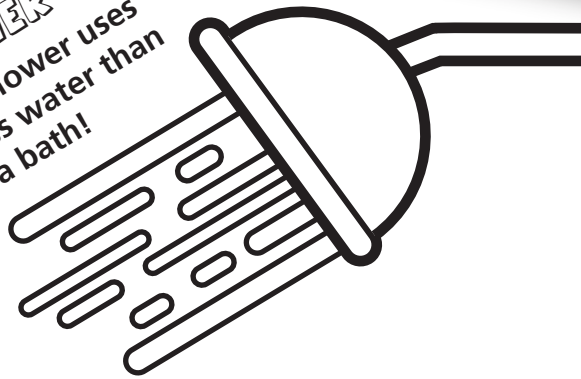
TOILET

Don't flush garbage! Only the the 3Ps should be flushed - pee, poo and toilet paper!



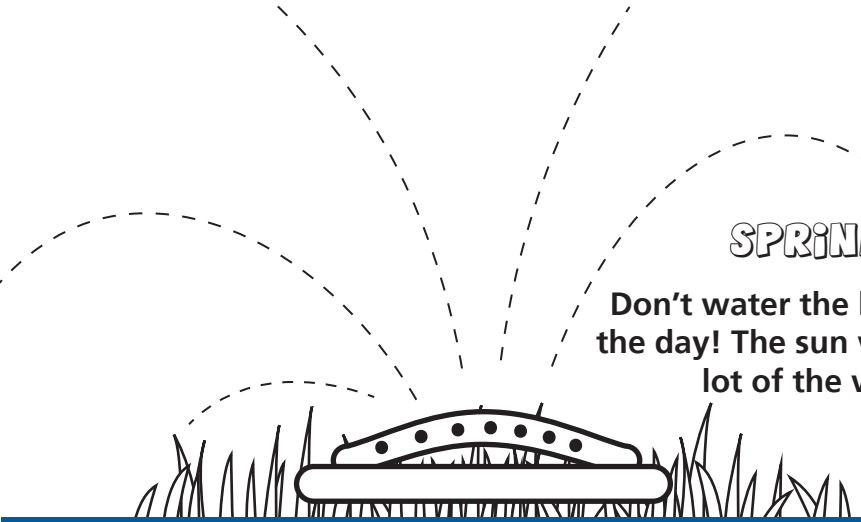
SHOWER

A short shower uses much less water than a bath!



WASHING MACHINE

Only wash your clothes when there's a full load!



SPRINKLER

Don't water the lawn during the day! The sun will dry up a lot of the water.

My Water Tracker

PLACE A CHECKMARK IN A WATER DROP EACH TIME YOUR FAMILY USES WATER!

Add up all of your water drops at the end of the day to see how much water you use.

Drink

Number of Checkmarks X 0.5 Litres = Litres

Wash Clothes

Remember to only wash full loads!

Number of Checkmarks X 53 Litres = Litres

Flush Toilet

Number of Checkmarks X 6 Litres = Litres

Wash Hands

Number of Checkmarks X 2 Litres = Litres

Brush Teeth

Remember to turn off the tap while brushing!

Number of Checkmarks X 0.5 Litres = Litres

Shower

10 minutes or less shower is best. 2 baths = 1 shower!

Number of Checkmarks X 75 Litres = Litres

Wash Dishes

A dishwasher can use less water than the sink!

Number of Checkmarks X 15 Litres = Litres

Add up all the numbers in the blue rectangles to see how much water your family used today! = Litres

PRIMARY

Micro-Lesson #3:
Pollution Prevention

Featuring:

"DRiP" THE WATER DROP!

Hamilton

Pollution Prevention

Introduction

Through this micro-lesson, students will investigate the proper behaviours to prevent pollution and learn that negative behaviours can have a negative impact on our environment. This Micro-Lesson contains:

Activity / Demo	Key Question	Objective
Colouring Page #2 - Where Does Wastewater Go?	Where does the water that goes down our drains go?	Develop an awareness that wastewater ultimately ends up in the enivironment
Colouring Page #3 - Plants and Wildlife	What plants and animals can we protect in Hamilton?	Understand plants and animals require clean water to live
Demonstration - Own Your Throne	Why can't certain items be flushed?	Understand how certain items impact pipes and sewers
Activity #2 - Own Your Throne	What can be flushed?	Identify which items belong in the toilet and which belong in the garbage

Warm-up

All of us need water to live. More specifically we need clean water to live. Ask your students to think about where their water goes after they flush the toilet, have a bath, brush our teeth etc. The answer will likely be "down the drain" but where does the drain lead to? Is that water in the drain really dirty?

The water that goes down our drains and toilets is called "wastewater" and is extremely toxic to humans, plants and wildlife. Wastewater goes through sewers to the wastewater treatment plant to be cleaned before going back into the environment (Hamilton Harbour). It's important it gets cleaned so that there is no harm to the environment including our water, plants and wildlife. Students can complete **Coloring Page #2 - Where Does Wastewater Go?** and **Coloring Page #3 - Plants and Wildlife** to see how we are connected to our environment.

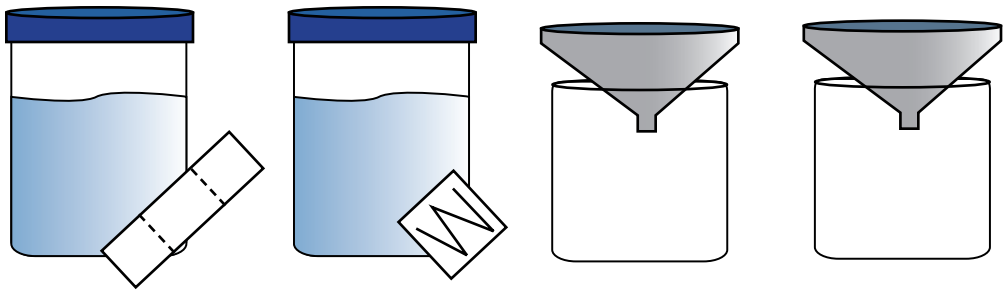
Pollution Prevention

Demonstration

One of the easiest things that we can do at home to prevent pollution and protect our sewers is to only flush the 3Ps (pee, poo and toilet paper) down the toilet and put garbage in the garbage bin. When garbage like baby wipes, cotton swabs, floss or any other garbage gets flushed down the toilet, these items can create blockages in the pipes in your home or in the sewer systems. These blockages can lead to dirty wastewater overflowing into your homes or into the environment resulting in costly repairs! Explain to your students that they are going to do an activity to see why only the 3Ps should be flushed down the toilet.

Materials Needed:

- 2 -Clear containers with lids
- 2 - Clear, open top containers
- 1 - Funnel
- 3 - Squares of toilet paper
- 1 - Wipe (or papertowel)
- Optional: Extra funnel



Set up the demonstration by filling 2 clear containers with lids halfway with water and placing funnels in the other two containers. Please keep in mind that if using glass containers extra precautions will need to be taken if the students will be handling them. Place the toilet paper beside one container with lid and the wipe beside the other. Explain that the containers represent toilets that they are going to pretend to flush, the funnels are the pipes in your home and the empty containers are the sewer! Ask the students to touch and feel the toilet paper and then the wipe (please read safety warnings depending on the type of wipe you are using). Ask the students to describe how each item feels and looks before placing them in the water. Are they soft/tough, weak/strong, etc. Then, ask the students what they think will happen to them once they are put in water. Will they stay the same, fall apart, etc.

Pollution Prevention

Demonstration

Explain to the students that they will place the toilet paper in one container with water (the "toilet") and the wipe in the other. Once the items are in the containers with the lids on tightly, each of them can be shaken up/down and left/right to mimic a toilet flushing for 15-20 seconds. Observe what each item looks like after "flushing the toilet".

Explain that after we flush a toilet the dirty water goes through pipes in our home (the funnel) and into the sewer system (the empty container) to be taken away. Instruct the students to open the first container with toilet paper and carefully dump it into the funnel. Ask the students to describe what they see happening. Is everything flowing freely? Did anything get stuck?

If performed successfully, the toilet paper should break down enough after being shaken to flow freely through the funnel and into the empty container. Explain to the students that the same thing happens in your toilet. Since the toilet paper breaks down easily, it can flow freely through the sewer system.

Ask the students to repeat this process for the container with the wipe. Did anything happen differently. Why or why not?

If performed successfully, the wipe should get caught in the funnel and not allow the water to move freely into the container. NOTE: You may need to add more water into the funnel if the wipe enters the funnel last. Explain to the students that the same thing happens in your toilet. Wipes and other garbage don't break down easily and can clog pipes in your home and the sewer system. Without anywhere to go, the dirty water can back up into your home or into the environment!

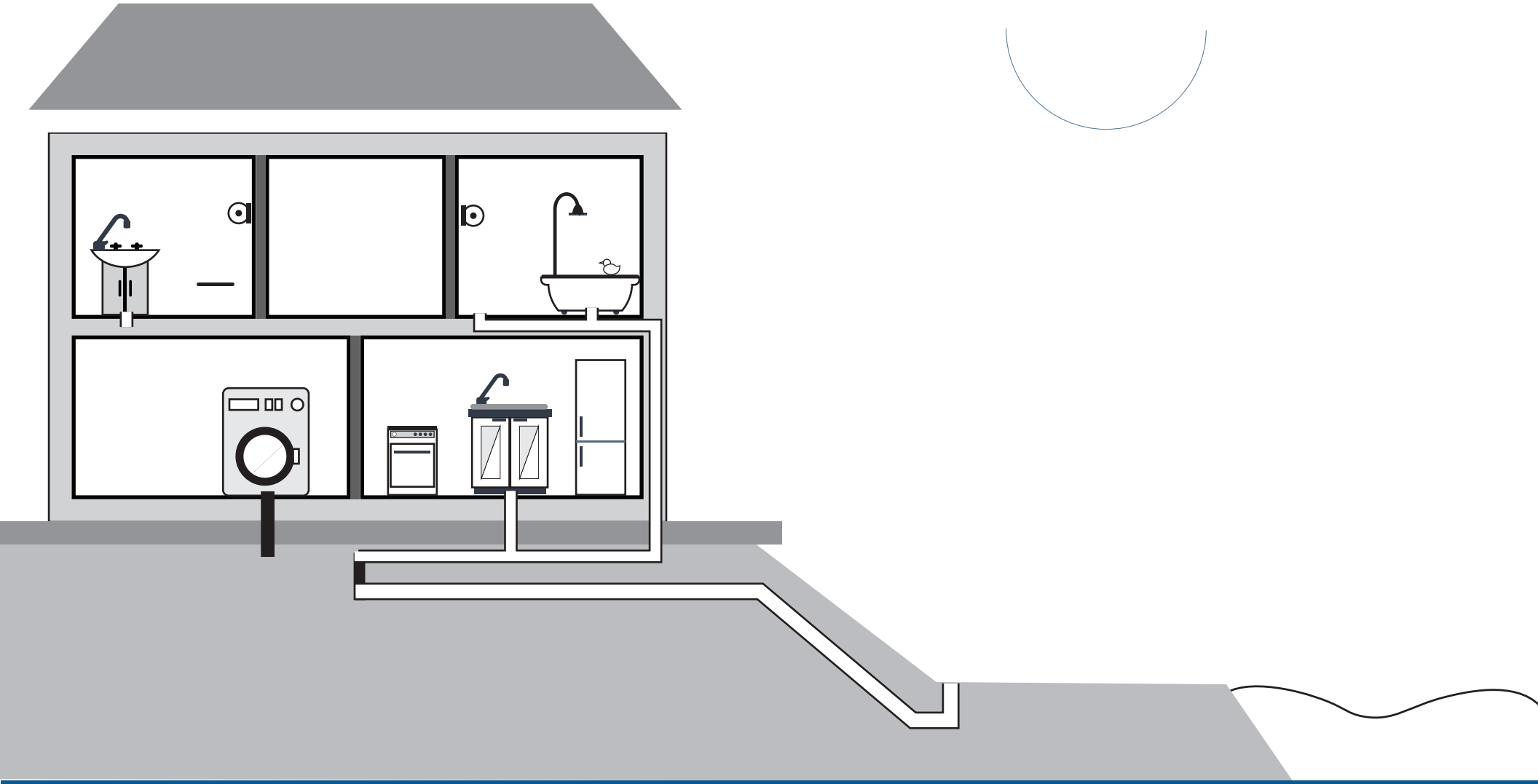
Stress that the dirty water that goes down our toilet and drains is very toxic and can harm humans, wildlife, plants and the environment. The students can do their part by only flushing the 3Ps - Pee, poo and toiletpaper!

Engage

To reinforce this message, students can complete **Activity #2 - Own Your Throne!**

Where Does Wastewater Go?

Did you know that all of that dirty water that goes down your drains has to end up somewhere?
The sewer system takes the dirty water to be cleaned before going into Hamilton Harbour!



Intermediate

Micro-Lesson #4:
Wastewater Treatment

Featuring:

"DRiP" THE WATER DROP!

Hamilton

Wastewater Treatment

Introduction

Through this micro-lesson, students will discover where that "stuff" that gets flushed down the toilet goes including how it is treated at the wastewater treatment plant. Students will gain an understanding of how our behaviours can have a negative impact on our environment. This Micro-Lesson contains:

Activity / Demo	Key Question	Objective
Colouring Page #2 - Where Does Wastewater Go?	Where does the water that goes down our drains go?	Develop an awareness that wastewater ultimately ends up in the enivironment
Video #2 - Wastewater Treatment	How is wastewater treated?	Wastewater treatment is necessary to protect human health and the environment.
Activity #5 - What's in Wastewater	What is wastewater made up of?	Identify that wastewater is a toxic mixture made up of waste from homes and business.
Wastewater Treatment Video Questions	How is wastewater treated?	Wastewater treatment is necessary to protect human health and the environment.
Colouring Page #7 - Wastewater Treatment	What does Hamilton's Wastewater Treatment Plant look like?	Develop an awareness of the scale and complexity of the Wastewater Treatment Plant

Warm-up

Wastewater is the dirty water and other "stuff" that goes down your drain. In the past, our wastewater was either contained in latrine pits, allowed to flow freely in open gutters or dumped directly in the environment. This practice led to widespread pollution and disease. An outbreak of Cholera in Hamilton in the 1800's that saw thousands of residents getting sick with many of them passing away due to contaminated drinking water. This event and others like it around the world shows the importance of modern wastewater collection and treatment systems. Ask your students to think about where the dirty water or wastewater goes after they flush the toilet, have a bath, brush their teeth etc. The answer will likely be "down the drain" but where does that drain lead to? Is that water in the drain really dirty?

Wastewater is extremely toxic to humans, plants and wildlife. It's important it gets cleaned so that there is no harm to human health and the environment including our water, plants and wildlife. Wastewater goes through the sewer system to the Wastewater Treatment Plant to be cleaned before going back into the environment (Hamilton Harbour). Students can complete **Coloring Page #2 - Where Does Wastewater Go?** for a visual representation.

Wastewater Treatment

Warm-up

Wastewater is a toxic mixture comprised of everything that goes down drains and toilets of homes and businesses and, in some areas, rain water from catch basins. Have your students brainstorm all of the different things that they might find in the wastewater in Hamilton sewers. It might be gross but it's a great excercise to get students thinking about the importance of treating the wastewater! Distribute **Activity #5 - What's in Wastewater**. This activity requires students to search for common pollutants found in wastewater including where they come from and how they can have a negative impact.

Instruction

Wastewater treatment combines mechanical and biological processes that remove contaminents so that the water going back into the environment will not have a negative impact on plant and animal life including human health. It is a highly complex process utilizing vast amount of infrastructure, equipment and staff expertise.

Wastewater treatment is a service that many residents in the City of Hamilton don't think twice about even though it's a service that they use every single day of the year. Many are unaware of the impact that their sometimes negative behaviours can have like flushing garbage down the toilet or pouring paint down a drain. Once things get flushed or go down the drain, they are out of mind.

To provide insight on wastewater treatment, have students watch the Wastewater Treatment Process video located here:

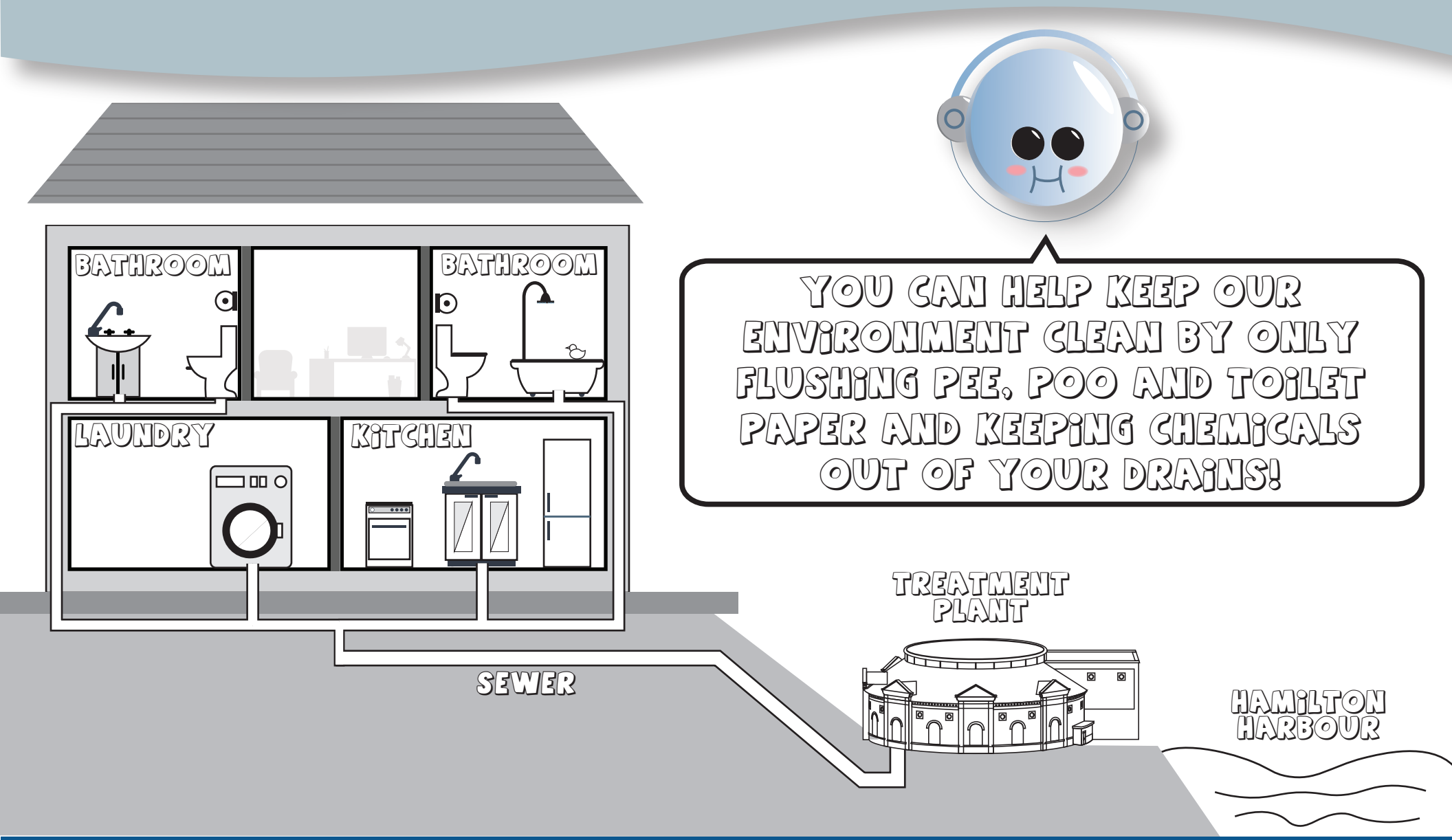
https://www.youtube.com/watch?v=fn3Sx8WlQnc

Students can complete the attached **Wastewater Treatment Video Questions** sheet as they watch the video.

After watching the video and answering the questions, students can also complete **Colouring Page #7 - Wastewater Treatment** as a supplementary activity.

Where Does Wastewater Go?

Did you know that all of that dirty water that goes down your drains has to end up somewhere? The sewer system takes the dirty water to be cleaned before going into Hamilton Harbour!



What's in Wastewater?

Wastewater from homes and businesses is an extremely toxic mixture! Below are some common pollutants found in wastewater. Search for each item online and complete the chart below.

Name:

Pollutant	How does it get into wastewater?	Why is bad for the environment?
Garbage like dental floss, cotton swabs, plastic, etc.	From people flushing garbage down the toilet.	Garbage can clog pumps and sewers leading to wastewater overflows in homes and the environment.
Detergents		
Heavy Metals		
Nitrates / Phosphates		
Pathogens		
Pesticides		
Sediments		
Oil and Grease		

Wastewater Treatment Process

Watch the Wastewater Treatment Process video on hamilton.ca/watereducation to find out where the "stuff" you flush down the toilet goes and how we all have an impact on the environement. Answer the questions below while you watch the video!

Name:

1) "Wastewater" is all of the dirty water that goes down your toilets and drains. Where does wastewater go to be treated (a.k.a. cleaned)?

_____

2) How does the wastewater get there?

a) Wastewater Collection System b) Trucks c) Tunnels

3) After initially being pumped, _____ moves the wastewater through the rest of the treatment plant.

a) A pump b) Gravity c) A worker

4) During pre-treatment, a chemical is added to remove phosphorus from the wastewater. This is important because too much phosphorus can cause _____ in Hamilton Harbour which has a negative impact on plants and wildlife.

a) Waves b) Drought c) Algae blooms d) Acidic water

5) Only the 3Ps should be flushed down the toilet. What are they?

_____

6) At the treatment plant, clarifiers remove solids from the liquid wastewater which are treated separately. Solids sink to the bottom of the clarifiers and fats, oil and grease float to the top. These things are referred to as:

a) Sludge & Scum b) Sludge & Slime c) Slime & Scum

Wastewater Treatment Plant

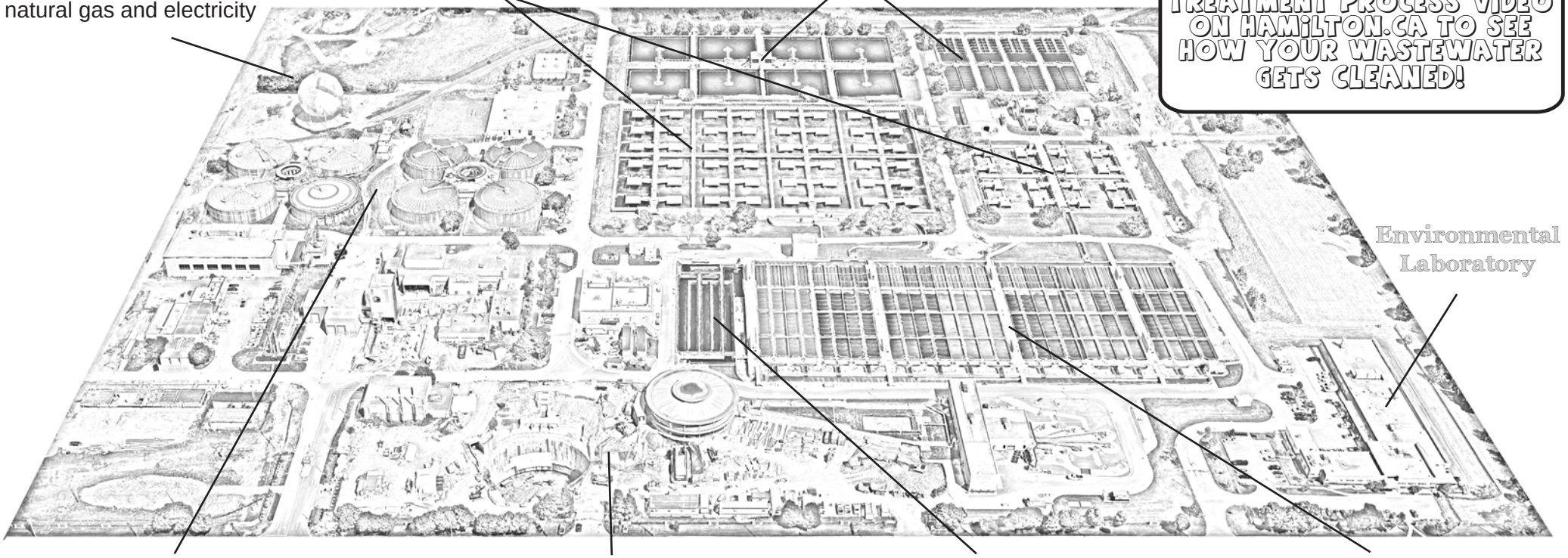
Do you know where all of the wastewater A.K.A. the "stuff" that gets flushed down your toilet goes? The Wastewater Treatment Plant of course! Here are just a few of the stops that your wastewater makes before going back into the environment. Give the plant some colour!

WATCH THE WASTEWATER TREATMENT PROCESS VIDEO ON HAMILTON.CA TO SEE HOW YOUR WASTEWATER GETS CLEANED!

Methane Sphere
Where methane is stored before it is turned into natural gas and electricity

Aeration
Where air is bubbled through the wastewater.

Secondary Clarifiers
Where solids and liquids are separated.



Environmental Laboratory

Digesters
Where organic waste is broken down.

New and Old Wet Wells
Where wastewater is collected!

Chlorine Contact Tank

Primary Clarifiers
Where solids and liquids are separated..

Tip: Visit the Woodward Ave Wastewater Treatment (700 Woodward Ave) on Google Maps!