

# Make mock water samples

You can use these sample to investigate different sources of water and water quality. You can safely filter, treat, or test water samples at school or home.

Water is an excellent solvent. This means it dissolves things. Wherever it travels, water carries particles, chemicals, minerals, and nutrients with it. Depending on the environment and where the water has been, it changes water quality – its chemical, physical, and biological characteristics.

Mock water samples simulate scenarios which can change water quality. This lets us control the environment and water quality to replicate tests and compare results.

## Why make mock water samples?

There are several reasons why you should make mock samples:

- 1. Collecting water can be a risk** – urban waterways can be unsafe places, as many are also stormwater drains. Water can rise quickly and unexpectedly, and you could be swept away even if it's not raining in the area.
- 2. Water samples can be a risk** – wastewater and stormwater may contain unknown pollutants like sharp items, chemicals, and disease-causing microbes.
- 3. Replicating tests and training** – making a sample that replicates known water quality variables is a good control or standard for testing a hypothesis. By having a standard sample, you can compare different methods of treating water or test instruments that monitor water. You can also repeat tests fairly. You may also use mock samples as practice before using real samples. This is a helpful way to train people in safe equipment use and to understand scientific protocols like in our nationally accredited testing facilities.
- 4. Changing the water quality variables of the samples** – without expensive equipment it can be difficult in a school science lab to get significant results from water samples. Increasing the concentration of items makes activities like filtration and water testing a little more visual.
- 5. Real scientists use mock samples too** – we make mock samples at treatment plants and laboratories. We use these samples to test the capabilities of treatment processes. We use mock samples to help us simulate water quality issues we may face. This means we can plan for emergencies such as severe weather events.



Collecting water can be a risk even if it looks clear and calm.

## What types of mock water samples can we make?

The samples provided will replicate sources of water you may see or use in your daily lives. These are sources of water from our urban water cycle. The urban water cycle is the water that is collected, used, and managed in an urban environment.

### Want to learn more?



See our [Urban water management](#) for more information.

**Need some lesson ideas?** Our [High school](#) webpage is filled with resources, including lesson plans to use these mock samples. You can also complement it with a DIY waterway excursion, see our [Self-guide excursion](#) webpages for more information.

## How to make mock water samples?

Remember, some of these samples don't reflect true water quality so they remain safe, can be used in class for experiments and just a little more visual. Use the materials list as a rough guideline. You can get creative, as most items are common household products. You can use substitutes or skip items as required.

As you're making your water samples think about:

1. Why am I making a sample?
2. Am I meeting safety standards with a replicable procedure?
3. What are the items in my sample replicating?
4. Where would these items or pollutants come from in the real urban water cycle?
5. Can our water use, influence the quantity and quality of these types of water?

For a summary list of sample recipes and scenarios see the table in the [Appendix on Page 7](#)

## What you'll need

**Safety first!** Adult supervision required. Follow all safety instructions as directed on product packaging.

- Large containers with lid (>700 mL)
  - Measuring cup or beaker (~500 mL)
  - Measuring spoons set
  - Dropper pipette or plastic syringe (1-3mL)
  - Household items in recipes provided
  - Additional items for water quality tests
- \*See appendix for full details.

## What to do

1. Place all the items listed in the sample recipe (or your own recipe) into the container.
2. Shake or stir vigorously for 15-30 seconds to mix all contents thoroughly.
3. Use sample for separation activity or with water quality testing experiment.

## What should I add to my mock samples?

### Raw water

Raw water is natural water from the environment, like water from our river catchment behind the dam. This is the main source of Sydney's drinking water supply.

**Did you know?** Our raw water is managed by [WaterNSW](#) surrounded by Special Areas to protect water in our catchments.



Raw water from Warragamba

To your 500mL of tap water add:		What does this represent or replicate?
Item for physical characteristics	<ul style="list-style-type: none"> <li>1 tsp fine soil</li> </ul>	Naturally occurring sediments that cause turbidity (cloudiness).
	<ul style="list-style-type: none"> <li>1 Tbsp leaves or twigs</li> </ul>	Natural items in water.
Additional items for chemical characteristics	<ul style="list-style-type: none"> <li>Replace tap water with a 50:50 solution of tap and demineralised water.</li> </ul>	Raw surface water around Sydney is soft (low in minerals and salts). Minerals and salts are added to tap water to meet drinking water guidelines.
	Make a 50:50 dilution of nitrate and phosphate solutions, then add: <ul style="list-style-type: none"> <li>0.5 mL dilute Nitrogen solution</li> <li>1 drop dilute Phosphorous solution</li> </ul>	Naturally occurring dissolved nutrients are found in low concentration, these come from organic sources such as decaying plant or animal material.
Extension ideas	<ul style="list-style-type: none"> <li>Other variables – What else might be found in a natural waterway?</li> <li>Scenario testing – What would you add to replicated water effected by bushfires, drought or flood?</li> </ul>	

### Drinking water

Drinking water is water that is used for human use and consumption. No mock sample needed here you can just head straight to a tap!

### Wastewater

Wastewater is the used water that goes down toilets, sinks and drains and into the sewerage system. We have developed a safe mock sample to help your investigations.

To your 500mL of tap water add:		What does this represent or replicate?
Item for physical characteristics	<ul style="list-style-type: none"> <li>2 Tbsp of crumbled choc biscuit or cake</li> </ul>	Colour and texture of human waste.
	<ul style="list-style-type: none"> <li>1 tsp sand</li> </ul>	Sand in the system like when you shower after the beach or illegal stormwater connections.
	<ul style="list-style-type: none"> <li>2-3 sheet toilet paper</li> <li>1 tissue and 1 wipe</li> <li>1 cotton tip</li> <li>1 strand of dental floss</li> </ul>	These are all items we find in wastewater from the bathroom.
	<ul style="list-style-type: none"> <li>2-3 Tbsp cooking oil</li> <li>1-2 tsp food scraps like corn, rice or cereal</li> <li>5 drops soap</li> </ul>	These are all items we find in wastewater from the kitchen.
Additional items for chemical characteristics	<ul style="list-style-type: none"> <li>0.5 mL Nitrogen solution</li> <li>1 drop Phosphorous solution</li> </ul>	Dissolved nutrients are found in human waste, decaying food scraps and in chemicals from fertilisers, soaps, and detergents.
	<ul style="list-style-type: none"> <li>1/16 tsp CaCO<sub>3</sub></li> <li>1/4 tsp Epsom salt</li> </ul>	This represents additional salts and minerals come from household products.
Extension ideas	<ul style="list-style-type: none"> <li>Other variables – What else might be found in a wastewater? How can you best simulate wastewater without making it unsafe?</li> <li>Scenario testing – What would you add to replicated wastewater that cause problems for our system like wastewater blockages and overflows? How do storms affect wastewater?</li> </ul>	

## Recycled water

Recycled water is wastewater that has been treated for reuse. Recycled water can be treated to different levels for different purposes. It can be used for irrigation, watering gardens, flushing toilets and many other outdoor uses in homes and businesses.

To your 500mL of tap water add:		What does this represent or replicate?
Item for physical characteristics	<ul style="list-style-type: none"> <li>Nothing</li> </ul>	Most recycled water looks identical to tap water.
Additional items for chemical characteristics	<ul style="list-style-type: none"> <li>1 drop Nitrogen solution</li> <li>1/16 CaCO<sub>3</sub></li> </ul>	Some recycled water may contain extra nutrients and minerals.
Extension ideas	<ul style="list-style-type: none"> <li>Other variables – What else might be in recycled water? How is it different to raw and tap water?</li> <li>Scenario testing – How does wastewater quality impact recycled water quality? What would you do to make recycled water into drinking quality? Could this be achieved?</li> </ul>	

## Advanced recycled water

Some recycled water goes advanced treatment like reverse osmosis membrane technology to remove dissolved nutrients, minerals and salts. This water can be re-used in specialised industrial processes and keeping our rivers healthy.

To your 500mL of tap water add:		What does this represent or replicate?
Item for chemical characteristics	<ul style="list-style-type: none"> <li>Replace tap water with 500mL demineralised water</li> </ul>	Advanced recycled water looks identical to tap water. Using reverse osmosis removes dissolved nutrients, salt, and minerals.
Extension ideas	Scenario testing – How do you make purified water drinkable?	

## Stormwater

Stormwater is the rainwater that runs off hard surfaces like roofs and roads and is carried away by stormwater drains flowing into local waterways like your local creek, river and eventually to the sea.

To your 500mL of tap water add:		What does this represent or replicate?
Item for physical characteristics	<ul style="list-style-type: none"> <li>1 tsp small plastic pieces</li> </ul>	Litter that gets washed down drains.
	<ul style="list-style-type: none"> <li>1 tsp lawn clippings, twigs, or mulch</li> <li>1 tsp sand or gravel</li> <li>1 tsp fine soil</li> </ul>	Items from urban environment that runs off into stormwater.
Additional items for chemical characteristics	<ul style="list-style-type: none"> <li>1-2 drops soap</li> <li>½ tsp drops cooking oil</li> </ul>	A safe representation of chemicals like soaps from car washing and motor oil on the road.
	<ul style="list-style-type: none"> <li>2-3 drop Nitrogen solution</li> <li>2-3 drops Phosphorous solution</li> </ul>	Nutrients from plants and animals like dog-poo, fertilisers and other organic items.
Extension ideas	<ul style="list-style-type: none"> <li>1/16 CaCO<sub>3</sub></li> </ul>	Salts and minerals run off hard surfaces.
	<ul style="list-style-type: none"> <li>Other variables – What else can you add to replicate stormwater?</li> <li>Scenario testing – How can stormwater quality fluctuate with weather? How can our individual behaviours impact stormwater?</li> </ul>	

## Seawater

Seawater is water from seas or oceans. It's another source of raw water from the environment that can supplement some of Sydney's drinking water through desalination. This uses reverse osmosis technology to remove salts.

To your 500mL of tap water add:		What does this represent or replicate?
Item for physical characteristics	• 1/2 tsp fine sand	Sediments and solids in seawater.
	• 3 - 4 tsp salt (NaCl)	Salt in sea water.
Additional items for chemical characteristics	• 2-3 drops Nitrogen solution	Naturally occurring nutrients and nutrients from runoff.
	• 1½ tsp Epsom salt	Other dissolved salts and minerals also found in the sea.
	• ⅛ tsp calcium carbonate	
Extension ideas	• ¼ tsp bicarb soda	Reduce pH as sea water is slightly alkaline.
	<ul style="list-style-type: none"> <li>• Other variables – What else can you add to replicate seawater?</li> <li>• Scenario testing – What are other saltwater environments? What is the water quality from estuaries, marshes, brine pools? Could these be another source of drinking water?</li> </ul>	

## What can I do with these mock water samples?

These samples can be used for a variety of experiments or discussions.

- How can you treat and clean these samples?
- How can you test if they're different?
- How accurately do your samples represent real world data?

### Need some ideas?



Our [High school](#) and [Primary school](#) webpages are filled with resources. Things that might interest you:

- Why not try our *Make a simple water filter* video and lesson plan? Or watch our *Water in your home* video and see how we can all influence water quantity and quality.
- Stage 6 Chemistry and Earth & Environmental science lesson plans and sample assessments.
- Stage 4 Science and Geography water experiments which can be adapted to a range of age groups.



## Where can I find secondary data to compare with my mock water sample?

Use these resource links to help find out about water quality results and water quality management.

<b>Drinking water</b>	<ul style="list-style-type: none"> <li>• <a href="#">Water analysis</a> – learn about your drinking water quality by heading the education tab. This includes raw water results from our catchments managed by <a href="#">WaterNSW</a>.</li> </ul>
<b>Wastewater</b>	<ul style="list-style-type: none"> <li>• <a href="#">What's in wastewater</a> – use this factsheet to see what gets to our wastewater plants on our <a href="#">High school</a> page.</li> <li>• <a href="#">Wastewater audit</a> – discover what's in your wastewater at home.</li> <li>• <a href="#">Wastewater network</a> and <a href="#">Environmental protection</a> – learn about how our wastewater network works and what we do to protect the environment. The <i>EPA pollution monitoring data reports</i> show water quality results for treated.</li> </ul>
<b>Recycled water</b>	<ul style="list-style-type: none"> <li>• <a href="#">Water recycling</a> – find out about how we recycle water and how it is used.</li> </ul>
<b>Advanced recycled water</b>	<ul style="list-style-type: none"> <li>• <a href="#">St Marys Advanced Water Recycling Plant</a> – learn how we use reverse osmosis to produce highly treated recycled water, which is discharged into the Hawkesbury-Nepean River.</li> <li>• <a href="#">Wollongong Water Recycling Plant</a> – learn how we use advanced treatment for recycled water in a specialised industrial process.</li> <li>• <i>EPA pollution monitoring data reports</i> – find out the water quality results for advanced treated wastewater and our environmental protection requirements clicking through our <a href="#">Wastewater network</a> webpage.</li> </ul>
<b>Stormwater</b>	<ul style="list-style-type: none"> <li>• <a href="#">Stormwater</a> – learn about stormwater management and try a stormwater audit.</li> <li>• <a href="#">Current projects</a> – Learn about local waterways and projects managed by Sydney Water, and how we can protect these areas.</li> </ul>
<b>Seawater</b>	<ul style="list-style-type: none"> <li>• <a href="#">Sydney Desalination Plant</a> – learn how they take seawater to provide a supply of drinking water.</li> </ul>
<b>Other resources</b>	<ul style="list-style-type: none"> <li>• <a href="#">Water Quality Australia</a> – find out about national water quality management.</li> <li>• <a href="#">Beachwatch</a> – learn about the Beachwatch monitoring program and what they do.</li> <li>• <a href="#">Streamwatch</a> – find out about this citizen water monitoring program.</li> </ul>

## How does Sydney Water manage water quality?

Our Operating Licence allows us to do what we do - supply you with water, wastewater, recycled water and stormwater services. It also sets requirements for us to provide you with water quality and environmental indicators.

- We test over 70 parameters in drinking water to ensure its clean and safe meeting [Australian Drinking Water Guidelines](#).
- Wastewater treatment is also monitored and must meet our [Environment Protection Licence](#) regulated by the [Environmental Protection Agency](#).
- Recycled water must also meet [Australian Guidelines for Water Recycling](#).
- [Sydney Water Monitoring Services](#) is Australia's largest dedicated water, wastewater and environmental sampling and testing facility. This is accredited by [National Association of Testing Authorities, Australia \(NATA\)](#).



Water quality analyst in the lab



## Appendix 1 – Summary of sample recipes and scenarios

Tests	Raw water	Wastewater	Stormwater	Recycled water	Advanced recycled water	Seawater
Item for physical characteristics	<ul style="list-style-type: none"> <li>• 500 mL tap water</li> <li>• 1 tsp fine soil</li> <li>• 1 Tbsp leaves or twigs</li> </ul>	<ul style="list-style-type: none"> <li>• 500 mL tap water</li> <li>• 2 Tbsp of crumbled choc biscuit or cake</li> <li>• 1 tsp sand</li> <li>• 1 tissue or wipe</li> <li>• 2 sheets toilet paper</li> <li>• 1 cotton tip</li> <li>• 1 strand of dental floss</li> <li>• 1-2 tsp food scraps like corn, rice or cereal</li> <li>• 5 drops soap</li> <li>• 2-3 Tbsp cooking oil</li> </ul>	<ul style="list-style-type: none"> <li>• 500 mL tap water</li> <li>• 1 tsp small plastic pieces</li> <li>• 1 tsp lawn clippings, twigs, or mulch</li> <li>• 1 tsp sand or gravel</li> <li>• 1 tsp fine soil</li> <li>• 1-2 drops soap</li> <li>• ½ tsp cooking oil</li> </ul>	<ul style="list-style-type: none"> <li>• 500 mL tap water</li> </ul>	<ul style="list-style-type: none"> <li>• 500 mL demineralised water only</li> </ul>	<ul style="list-style-type: none"> <li>• 500 mL tap water</li> <li>• 3 tsp salt (NaCl)</li> </ul>
Additional items for chemical characteristics	<p>Use 50:50 solution of tap;demineralised water. Make 50:50 dilution of Nitrogen solution and Phosphorous solutions* then add:</p> <ul style="list-style-type: none"> <li>• 0.5 mL dilute N</li> <li>• 1 drop dilute P</li> </ul>	<ul style="list-style-type: none"> <li>• 0.5 mL Nitrogen solution*</li> <li>• 1 drop Phosphorous solution*</li> <li>• 1/16 tsp CaCO<sub>3</sub></li> <li>• ¼ tsp Epsom salt</li> </ul>	<ul style="list-style-type: none"> <li>• 2-3 drop Nitrogen solution*</li> <li>• 1/16 tsp salt</li> <li>• 1/16 tsp CaCO<sub>3</sub></li> </ul>	<ul style="list-style-type: none"> <li>• 1 drop N solution*</li> <li>• 1/16 tsp CaCO<sub>3</sub></li> </ul>		<ul style="list-style-type: none"> <li>• 2-3 drops Nitrogen solution*</li> <li>• 1½ tsp Epsom salt</li> <li>• ⅛ tsp calcium carbonate</li> <li>• ¼ tsp bicarb soda</li> </ul>
Extension ideas – problem pollutants and scenarios	<p>Bushfire scenario</p> <ul style="list-style-type: none"> <li>• 1 tsp crushed charcoal or charcoal powder</li> </ul> <p>Extreme low levels of water</p> <ul style="list-style-type: none"> <li>• ¼ tsp of brown or terracotta craft clay</li> </ul>	<p>Fatbergs in our pipes</p> <ul style="list-style-type: none"> <li>• 1-2 extra wipes</li> <li>• 2-3 Tbsp of melted butter, vegetable shortening or coconut oil</li> </ul>	<p>Litterbugs</p> <ul style="list-style-type: none"> <li>• Pieces of single use plastic</li> </ul> <p>Oil spill on the road</p> <ul style="list-style-type: none"> <li>• 1-2 Tbsp cooking oil</li> </ul> <p>Wastewater overflow</p> <ul style="list-style-type: none"> <li>• 2-3 drops Nitrogen solution</li> <li>• 1-2 wet wipes</li> </ul> <p>Storm</p> <ul style="list-style-type: none"> <li>• Double the pollutants</li> </ul>		<p>Reusing advanced recycle water in homes. Remineralisation:</p> <ul style="list-style-type: none"> <li>• &lt;1/16 CaCO<sub>3</sub></li> </ul>	<p>Litterbugs</p> <ul style="list-style-type: none"> <li>• Pieces of single use plastic</li> </ul> <p>Storm</p> <ul style="list-style-type: none"> <li>• Add extra pollutants from stormwater</li> </ul> <p>Brackish water reduce salt:</p> <ul style="list-style-type: none"> <li>• 0.5 – 3 tsp of salt</li> </ul>



## Appendix 2 – Summary of water quality parameters and optional items

We use a range of techniques to accurately measure parameters with [NATA accredited methods](#) in laboratories. We choose the right techniques to validly test for these parameters. Sometimes we need very high level of precision and certainty, whilst other times there's a larger allowable range. It also differs when we are doing a daily check in the field, our final product or bringing it back to our main lab with sophisticated equipment.

Keeping this in mind, we've chosen items to exaggerate some chemical characteristics that you can test back in the classroom.

Parameter	Optional items	What simple tests can I do at school?
Nutrients	Add nitrogen (N) solution (Total N 1.5%) or Phosphorus (P) solution (Phosphate 0.3%) both can be found in aquarium stores. Alternatively, liquid fertiliser may be used but may need adjusting from the recipes included.	<ul style="list-style-type: none"><li>• Nitrate and phosphate strips found in water testing kits</li><li>• Ion meters</li></ul>
Hardness (CaCO <sub>3</sub> )	Add calcium carbonate (CaCO <sub>3</sub> ) which can be found at supplement and pet stores. It's also in chalk and some antacids. This compound is found in nature like shells and limestone but is also a component in cement. We may also add this to soft water (water low in minerals) to help regulate pH and prevent corrosion in pipes.	<ul style="list-style-type: none"><li>• Hardness strips found in water testing kits</li><li>• Soap test</li></ul>
pH	Most of these sources of water are neutral. You can add bicarb soda (NaHCO <sub>3</sub> ) to increase pH or white vinegar to decrease it.	<ul style="list-style-type: none"><li>• Universal indicators</li><li>• pH strips</li><li>• pH meters</li></ul>
Salinity	Add salt (NaCl) or Epsom salt. Epsom salt (MgSO <sub>4</sub> ) can also be used to test for magnesium and doesn't affect clarity as much as table salt.	<ul style="list-style-type: none"><li>• Salinity meter (electrical conductivity)</li><li>• Filter the sample then<ul style="list-style-type: none"><li>- recover salts (and dissolved solids) using evaporation</li><li>- use a refractometer as an indicator, solutions with greater salinity generally refract more light</li></ul></li></ul>
Cloudiness (turbidity)	Add sediment and soils to your sample. Dissolved salts also increase turbidity.	<ul style="list-style-type: none"><li>• Visual assessment with turbidity standards</li><li>• Turbidity tube</li><li>• Turbidity meter</li></ul>