

## Purified recycled water—Case study

### » Lesson overview

In the previous lesson, students investigated the advantages and disadvantages of four alternative water sources. In this lesson, students investigate one of these alternatives using a case study of the Western Corridor Recycled Water Project.

The Western Corridor Recycled Water Project is a major infrastructure project that will have significant benefits for South East Queensland (SEQ). The project aims to reduce pressure on existing water supplies by piping purified recycled water to power stations and industry. It will be introduced to Wivenhoe Dam to supplement water supplies when SEQ's combined dam levels drop to 40%. The project will contribute substantially to sustainable water management in SEQ.

Although this project is specific to SEQ, this area is a significant tourist venue, so many people both within Australia and internationally will feel the positive effects of this state-of-the-art technology.

The information in this lesson is provided courtesy of the Queensland Water Commission.

**Recycled water is an alternative water source that has the potential to grow with increased water demand.**

### » Lesson objectives

In this lesson, students:

- explore the seven barriers of the purified recycled water treatment process
- identify the controls that are used at each barrier
- explore the current technologies that are used in the treatment process to make the drinking water safe.

### » Opportunities for assessment

You can monitor students' developing understanding of water and wastewater systems, and their understanding of water as a finite resource, by reading students' responses in their journals. Frequent monitoring of these journals will allow identification of student alternative conceptions and will provide evidence of student learning.

### » Equipment

#### For the class

- one enlarged copy of the 'Western Corridor Recycled Water Project' fact sheet (Resource 8)
- one enlarged copy of the 'Barrier system—Retrieval chart' (Resource 9)
- one enlarged copy of the 'Map of South East Queensland Western Corridor Recycled Water Project Pipeline' (Resource 10), preferably in colour to identify the pipeline route

#### For each group

- one A3 copy of the 'Map of South East Queensland Western Corridor Recycled Water Project pipeline' (Resource 10)
- one copy of the 'Purified recycled water process cycle' (Resource 7)
- sticky dots of three different colours, or sets of three different coloured Lego blocks, to represent the wastewater (sewage) treatment plants, the advanced water treatment plants and water treatment plants

#### For each student

- one copy of the 'Western Corridor Recycled Water Project—Fact sheet' (Resource 8)
- one copy of the 'Barrier system—Retrieval chart' (Resource 9)

## » Lesson steps

1. Lead a whole-class discussion about what has been learned to date. Students can use their journal entries and the TWLH chart started in Lesson 2 as prompts. Explain that in this lesson, students investigate the use of purified recycled water to supplement water sources.
2. With students, investigate and describe some international purified recycled water schemes.

Go to [www.qwc.qld.gov.au/Where+else](http://www.qwc.qld.gov.au/Where+else), 'Where else is purified recycled water used?'

**Purified recycled water is used to replenish drinking water supplies in many parts of the world including the USA, UK, Singapore and Belgium. In some cases this process has been in operation for more than 40 years.**

3. Explain that Queensland has constructed a major project to introduce purified recycled water for use by the state's power stations and industry, and to supplement dam water supplies. What we are going to do today is discover how purified recycled water technology works.
4. Discuss the importance of understanding the terminology related to this technology. Ask students to begin a glossary in their journal; the first term could be 'purified recycled water'.

Read the following 'textbook' definition, then ask students to suggest a definition of this term in their own words. Purified recycled water is wastewater that is passed through multiple barriers to ensure that it is safe to drink. This highly purified water is then added to another water supply (in this case, Wivenhoe Dam). This blended water is then subjected to the usual water treatment process (at Mt Crosby Water Treatment Plant), which currently applies to dam water.'

Continue to develop this glossary throughout the lesson. Terminology can be found in *Background Information for Teachers* available at [www.nrw.qld.gov.au/waterwise/education/units/teacher\\_background.html](http://www.nrw.qld.gov.au/waterwise/education/units/teacher_background.html). Ask students to write their definitions in their own words because it will help them to remember the definitions.

5. Give students an overview of the Western Corridor Recycled Water project. Water must pass through seven barriers before it enters our homes and businesses.
6. Students will use the 'Expert group jigsaw' strategy to research the purified recycled water process. Divide students into teams of seven. Explain that these teams are their 'home' teams. Where this cannot be done evenly, allocate more than one research item to a capable student in the team. Give each student in each team a number between one and seven.

Explain that they are to research the specific barrier that their allocated number relates to. For instance, Student 1 will work with the other Student 1s to research the information relating to Barrier 1, 'Source control'.

7. Distribute the 'Western Corridor Recycled Water Project—Fact sheet' (Resource 8). This fact sheet explains the project at a simpler level. To explain how drinking water is supplied in South East Queensland and how the purified recycled water process works, show the five minute video that can be found at [www.qwc.qld.gov.au/Purified+recycled+water](http://www.qwc.qld.gov.au/Purified+recycled+water).

Also distribute the retrieval chart (Resource 9) for students to complete, or ask students to draw up the retrieval chart in their journal. Explain that their role at this stage is only to complete their specific area in the retrieval chart. They then become the 'expert' in their barrier for their original 'home' team.

8. When original groups are called back together, each student is an expert on a specific barrier level. They share this information with the rest of their group members. This information is collated on their own retrieval chart. In this way, each student will have a full suite of information on each barrier level on their retrieval chart.

Additional information on the seven-barrier system can be found at [www.qwc.qld.gov.au/How+is+it+made](http://www.qwc.qld.gov.au/How+is+it+made).

9. When students have collated all the researched information, distribute to each group the (A3 size) map of SEQ relating to the Western Corridor pipeline. Students use a marker pen to trace the pipeline on the map. A class colour copy of the map will assist students to pick out the pipeline route.

They identify the relevant areas of Wivenhoe Dam; Brisbane River; the three advanced water treatment plants at Luggage Point, Gibson Island and Bundamba; the six wastewater treatment plants at Bundamba, Goodna, Wacol, Oxley, Gibson Island and Luggage Point; and the power stations at Swanbank and Tarong. To indicate the pipeline, use straws cut to length and taped on the map.

10. Students use the sticky dots or Lego blocks to locate the advanced water treatment plants, the wastewater (sewage) treatment plants and the water treatment plants on the group map. The graphics for each barrier level from the 'Purified recycled water process cycle' (Resource 7) can also be added to the map at relevant locations. Students can record additional information in dot point form, on appropriate locations on the map.

11. Finally, as a whole class discuss what has been researched. Compare and contrast information from each group.

In their journal, students write a paragraph in their own words answering the following:

- What is purified recycled water?
- What are the advantages of purified recycled water?
- Reflecting on what you have learned, are the treatment processes at each barrier sufficient to ensure clean drinkable water by Barrier 7?

12. Ask students to draw and explain their own flow chart of the seven-barrier system in their journals.

## »» Curriculum links

### SOSE

- Discuss with students why the infrastructure (water treatment plants and dam) are located where they are in the Western Corridor Recycled Water Project and ask students how they would find out why the infrastructure is located in those areas.