



# Stage 6 Earth and Environmental Science

## Depth Study

Sample Depth Study assessment

### Depth Study Inquiry Question:

How does scientific knowledge in an industrial setting (Sydney Water) enable effective treatment of wastewater (sewage) to produce high quality recycled water and biosolids for re-use and to protect the environment?

### Context:

Students will create a scientific field report or presentation related to application of separation techniques and the need for scientific monitoring during process to protect the environment. Students will do a fieldwork investigation on wastewater treatment processes at Penrith Water Recycling Plant or St Marys Advanced Water Recycling Plant, with secondary research and content from Modules 4.

Students will:

- participate in fieldwork investigating the processes at a water recycling plant
- gather knowledge and skills to help understand implications of science for society and the environment.

The suggested Depth Study time allocated is 4 to 8 hours including:

1. Excursion/ fieldwork at Penrith Water Recycling Plant or St Marys Advanced Water Recycling Plant, where you will:
  - see how we apply separation techniques to produce recycled water and biosolids
  - understand how wastewater is treated to produce recycled water
  - recognise the importance of monitoring pollutants that can impact the environment
2. 4 hours in class time for secondary research, data analysis and create report/presentation using our online resources and teacher/student investigations.

Task number: 3	Weighting: 35%	Timing: Term 3, Week 9
<b>Outcomes assessed</b> A student: <ul style="list-style-type: none"> <li>• describes human impact on the Earth in relation to hydrological processes, geological processes and biological changes EES11-11</li> <li>• designs and evaluates investigations to obtain primary and secondary data and information EES11/12-2</li> <li>• analyses and evaluates primary and secondary data and information EES11/12-5</li> <li>• communicates scientific understanding using suitable language and terminology for a specific audience or purpose EES11/12-7</li> <li>• conducts investigation to collect valid and reliable primary and secondary data and information EES11/12-3 (optional)</li> </ul>		
<b>Nature of the task</b> A report/presentation requires students to: <ul style="list-style-type: none"> <li>• describe the context of the site (<a href="#">Penrith Water Recycling Plant</a> and/or <a href="#">St Marys Advanced Water Recycling Plant</a>)</li> <li>• explain the relevance of the site to the investigation's question</li> <li>• process and analyse first-hand lab activities, fieldwork and secondary data</li> <li>• communicate the results and conclusion of the fieldwork, lab and research investigations</li> </ul>		

## Outcomes:

### Syllabus Knowledge and Understanding outcomes

**EES11-11** describes human impact on the Earth in relation to hydrological processes, geological processes and biological changes

Students:

- investigate the treatment and potential reuse of different types of water, including but not limited to sewage
- describe ways in which human activity can influence the availability and quality of water both directly or indirectly

### Working Scientifically outcomes

#### Planning

**EES11/12-2** Designs and evaluates investigations to obtain primary and secondary data and information

Students:

- assess risks, consider ethical issues and select appropriate materials and technologies when designing and planning an investigation

#### Analysis and problem solving

**EES11/12-5** Analyses and evaluates primary and secondary data and information

Students:

- assess relevance and reliability of the gathered information
- collate useful and relevant information into water recycling process that relates to treatment and potential reuse of sewage and human impacts
- evaluate the influence of recycled water and biosolids for re-use and to protect the environment

#### Communicating

**EES11/12-7** Communicates scientific understanding using suitable language and terminology for a specific audience or purpose

Students:

- propose ideas in a coherent and logical way and correctly use scientific terminology and principles
- present information on the science and chemistry of acid/base reactions and buffers
- summarise from a range of sources and appropriately acknowledge sources

#### Conducting Investigations (Optional)

**EES11/12-3** Conducts investigation to collect valid and reliable primary and secondary data and information

Students:

- employ and evaluate safe work practices and manage risks
- use appropriate technologies to ensure and evaluate accuracy
- select and extract information from a wide range of reliable secondary sources and acknowledge them using an accepted referencing style

## Marking Guidelines:

Students:	Range of Marks
<ul style="list-style-type: none"> <li>• assess risks, consider ethical issues and select appropriate materials and technologies</li> <li>• demonstrate comprehensive knowledge and understanding of treatment and potential reuse of sewage that are applied in industries</li> <li>• evaluate ways in which human activity can influence the availability and quality of water both directly or indirectly</li> <li>• evaluate a wastewater treatment process that relates to separation techniques and their products (recycled water and biosolids) to protect the environment</li> <li>• assess the relevance and reliability of the gathered information</li> <li>• use scientific terminology and principles effectively</li> <li>• acknowledge sources appropriately and thoroughly</li> </ul>	30–35
<ul style="list-style-type: none"> <li>• assess risks, consider relevant issues, materials and technologies</li> <li>• demonstrate accurate knowledge and understanding of treatment and potential reuse of sewage that are applied in industries</li> <li>• discuss ways in which human activity can influence the availability and quality of water both directly or indirectly</li> <li>• presents a wastewater treatment process that collates useful and relevant information referring to separation techniques and products (recycled water and biosolids) to protect the environment</li> <li>• describe the relevance and reliability of the gathered information</li> <li>• use scientific terminology and principles</li> <li>• acknowledge sources appropriately</li> </ul>	23–29
<ul style="list-style-type: none"> <li>• assess risks, consider issues, materials and technologies</li> <li>• demonstrate sound knowledge and understanding of treatment and potential reuse of sewage that are applied in industries</li> <li>• describe ways in which human activity can influence the availability and quality of water</li> <li>• presents a wastewater treatment process that outlines the applications or products (recycled water and biosolids) of separation techniques</li> <li>• describe relevance or reliability of the gathered information</li> <li>• use some scientific terminology</li> <li>• acknowledge sources</li> </ul>	17–22
<ul style="list-style-type: none"> <li>• assess risks, consider issues, materials or technologies</li> <li>• demonstrate basic knowledge and understanding of treatment and potential reuse of sewage that are applied in industries</li> <li>• identify ways in which human activity can influence the availability and quality of water</li> <li>• presents a wastewater treatment process that identifies the applications or products of separation techniques</li> <li>• outlines the relevance or reliability of the gathered information</li> <li>• use limited scientific terminology</li> <li>• acknowledge some sources</li> </ul>	11–16
<ul style="list-style-type: none"> <li>• assess risks</li> <li>• gather some relevant information about of treatment and potential reuse of sewage that are applied in industries</li> <li>• present an incomplete wastewater treatment process relates to separation techniques</li> <li>• use some scientific terms</li> <li>• attempt to acknowledge some sources</li> </ul>	1–10

### Teacher Comments

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