

Stage 6 Chemistry Depth Study program outline

We offer three excursions that focus on the different types of water in our managed water cycle: drinking water, wastewater and water recycling.

Excursion options

Excursion options	Site	Excursion times	Duration	Student numbers
Drinking water See how we monitor, manage and process water to supply clean drinking water and protect public health.	Orchard Hills Water Filtration Plant	9.30 am – 1.30 pm 10.00 am – 2.00 pm	4 hours	10* – 120
Water recycling See how we produce high quality recycled water, produce biosolids and contribute to sustainable and liveable cities.	St Marys Water Recycling Education Centre	9.30 am – 1.30 pm 10.00 am – 2.00 pm	4 hours	10* – 120
Wastewater See how we monitor and manage wastewater and protect the environment.	Penrith Water Recycling Plant	9.30 am – 1.30 pm 10.00 am – 2.00 pm	4 hours	10* – 120

* Groups with less than 20 students will be combined with other schools doing the same program.

Who will provide worksheets?

We'll provide printed, syllabus linked worksheets for students and a teacher answer sheet. Students will need to bring a pen to complete the worksheet.

Where can we have a meal break?

Time for an on-site lunch break is included in the program. There are no food outlets near the site or canteen facilities and students will need to bring a packed lunch and drink (water refill is available).

What can school students and teachers wear?

Everyone, including teachers and group leaders, **must** wear sturdy, fully enclosed, flat soled shoes such as joggers, closed school shoes or boots. There should be no skin showing on feet. No open shoes such as sandals, thongs or ballet flats.

School students are permitted to wear school or sports day uniforms.

What happens if it's raining or too hot?

If it's very hot, raining or has been raining for a long period of time before your tour, it may not be safe to go outside or complete the whole tour. Your Education Officer will negotiate alterations to the program to make sure you still get the most out of your visit.

What content will be covered?

Our site-specific excursions cover the many links between water management and the current NSW Chemistry syllabus.

Each site has activities that touch on many different points in the syllabus and provide ideas and options for potential depth studies. Students will experience how we apply chemistry at an industrial scale through practical investigations.

Content	Drinking water	Wastewater	Water Recycling
Learning across the curriculum <ul style="list-style-type: none"> • Sustainability 	✓	✓	✓
Working scientifically outcomes <ul style="list-style-type: none"> • Questioning and Predicting CH11/12-1 • Problem solving CH11/12-6 • Analysing data and Information CH11/12-5 • Communicating CH11/12-7 	✓	✓	✓
Module 1 – Properties of Matter Inquiry question: How do the properties of substances help us to classify and separate them? <ul style="list-style-type: none"> • explore homogeneous mixtures and heterogeneous mixtures through practical investigations: <ul style="list-style-type: none"> - using separation techniques based on physical properties 		✓	✓
Module 5 – Equilibrium and Acid reactions Inquiry Question: What factors affect equilibrium and how? <ul style="list-style-type: none"> • investigate the effects of temperature, concentration, volume and/or pressure on a system at equilibrium and explain how Le Chatelier's principle can be used to predict such effects 	✓		
Module 6 – Acid/Base Reactions Inquiry Question: How are solutions of acids and bases analysed? <ul style="list-style-type: none"> • conduct a practical investigation to prepare a buffer and demonstrate its properties • describe the importance of buffers in natural systems 	✓		
Module 7 – Organic Chemistry Inquiry question: What are the properties and uses of polymers? <ul style="list-style-type: none"> • model and compare the structure, properties and uses of condensation polymers – e.g. polyacrylamide Inquiry question: How can hydrocarbons be classified based on their structure and reactivity? <ul style="list-style-type: none"> • describe the procedures required to safely handle and dispose of organic substances • examine the environmental, economic and sociocultural implications of obtaining and using hydrocarbons from the Earth 		✓	✓
Module 8 – Applying chemical ideas Inquiry question: How are the ions present in the environment identified and measured? <ul style="list-style-type: none"> • analyse the need for monitoring the environment 	✓	✓	✓

Excursion itineraries

Stage 6 Chemistry - Drinking water Depth Study at Orchard Hills Water Filtration Plant

Arrival	
Introduction	<ul style="list-style-type: none"> • Receive an orientation and safety induction. • Discuss the objectives of the excursion program. • Discuss the importance of the application of chemistry in industry to treat and manage drinking water to protect public health.
Walking tour of the filtration plant.	<ul style="list-style-type: none"> • Identify the name and purpose of the different chemicals used throughout the process. • Observe how we monitor and manage the pH of raw water to optimise its buffering capacity and promote flocculation.
Observe a flocculation demonstration experiment.	<ul style="list-style-type: none"> • Explore how changing variables (pH of raw water and concentration of coagulant) affects the efficiency of coagulation and flocculation in drinking water treatment. • Analyse data and to determine the optimal conditions (pH and coagulant volume) for flocculation in a mock raw water sample. • Use safe work practices and understand why risk assessments are conducted and followed in all workplaces. • Develop understanding of how increasing the pH of the water increases its natural buffering capacity.
Break	
Hands-on water quality experiment.	<ul style="list-style-type: none"> • Perform tests on different sources of water with lab experiments and technology used by Sydney Water every day to ensure safe and high-quality drinking water. • Gain understanding of water quality tests (pH, electrical conductivity, turbidity, hardness) used to protect environment and public health. • Compare the quality of water sources and assess reliability and validity of the experiment and suggest improvements.
Water management discussion using urban water model.	<ul style="list-style-type: none"> • Learn how Sydney water manages water supply. • Learn the role of governments, non-government organisations, individuals and communities in sustainable water management. • Understand the importance of working scientifically skills, like communication, in the context of how people perceive scientific data. • Discuss what water quality means and be a part of a blind taste test.
Conclusion	<ul style="list-style-type: none"> • Discuss how the data collected throughout the day may be incorporated into a depth study. • Discuss their role in managing drinking water. • Discuss how to access online information from Sydney Water website and outline potential depth study ideas.
Departure	

Stage 6 Chemistry - Water Recycling Depth Study at St Marys Advanced Water Recycling Plant

Arrival	
Introduction	<ul style="list-style-type: none"> • Receive an orientation and safety induction. • Discuss the objectives of the excursion program.] • Discuss the importance of the application of chemistry industry to treat and manage wastewater to create high quality recycled water and biosolids to protect the environment and build sustainable cities.
Water management discussion using urban water model.	<ul style="list-style-type: none"> • Discuss the properties of matter and the processes in wastewater treatment prior to recycling processes. • Learn the role of governments, non-government organisations, individuals and communities in sustainable water management. • Examine the disposal, removal and recycling of organic substances in wastewater treatment. • identify environmental, economic and sociocultural implications of obtaining, using and disposing of organic substances in the water industry.
Observe a flocculation and biosolids demonstration	<ul style="list-style-type: none"> • Perform first-hand investigations to determine the optimal conditions (polymer volume and mixing speed) for flocculation of a mock wastewater sample • Observe how the structure of polyacrylamide relates to its properties and uses and how it improves the efficiency of wastewater treatment • Identify how polymer (cationic polyacrylamide) is used on-site both as a flocculant and as a biosolids dewatering aid to protect the environment.
Break	
Walking tour of the plant	<ul style="list-style-type: none"> • Identify the name and purpose of the different chemicals used throughout the process. • Observe how we monitor and manage the pH of raw water to optimise its buffering capacity and promote flocculation.
Hands-on water quality experiment.	<ul style="list-style-type: none"> • Use an interactive catchment model to explore Sydney's urban environment, the urban water cycle and managing impacts on the environment • Perform tests on different sources of water with lab experiments and technology used by Sydney Water every day to ensure it produces safe and high-quality recycled water • Gain understanding of water quality tests (pH, electrical conductivity, turbidity, hardness) to protect environment and public health. • Compare the quality of water sources and assess reliability and validity of the experiment and suggest improvements.
Conclusion	<ul style="list-style-type: none"> • Discuss how the data collected throughout the day may be incorporated into a depth study. • Discuss their role in the urban water cycle. • Discuss how to access online information from Sydney Water website and outline potential depth study ideas.
Departure	

Stage 6 Chemistry - Wastewater Depth Study at Penrith Water Recycling Plant

Arrival	
Introduction	<ul style="list-style-type: none"> • Receive an orientation and safety induction. • Discuss the objectives of the excursion program.] • Discuss the importance of the application of chemistry every day in the industrial context to best treat and manage wastewater and solids processing to protect the environment
Walking tour of the plant	<ul style="list-style-type: none"> • Observe wastewater treatment processes, how we separate matter based on its properties. • See how we use polymers to optimise water treatment processes and ultimately protect the environment.
Water management discussion	<ul style="list-style-type: none"> • Use an augmented reality sandbox to investigate the natural water cycle. • Use an interactive catchment model to explore Sydney's urban environment, the urban water cycle and managing impacts on the environment. • Examine the disposal, removal and recycling of organic substances in wastewater treatment. • Identify environmental, economic and sociocultural implications of obtaining, utilising and disposing of organic substances in the water industry.
Break	
Observe a flocculation and biosolids demonstration	<ul style="list-style-type: none"> • Discuss the use of polymers in wastewater and biosolids management. • Perform a first-hand investigation for optimal polymers conditions (volume and mixing speed). • Explain how the properties of polymers improve the efficiency of wastewater treatment.
Hands-on water quality experiment.	<ul style="list-style-type: none"> • Complete a practical investigation with a mock wastewater sample - using a combination of filtration materials students separate the mixture with the aim of getting the sample as "clean" as possible and manage waste collection. • Students are encouraged to identify the separation techniques they use and record a flow chart of their results and conduct calculation of results obtained. • Perform basic water quality tests (phosphates, nitrates, turbidity) and discuss why monitoring these ions are important in protecting the environment.
Conclusion	<ul style="list-style-type: none"> • Discuss how the data collected throughout the day may be incorporated into a depth study. • Discuss their role in the urban water cycle. • Discuss how to access online information from Sydney Water website and outline potential depth study ideas.
Departure	