

No 1 PUMP STATION: YEAR 2

Teacher Guide

HASS and Science Interrelated Program



This program comprises a Teacher Guide and Student Booklet

To book your excursion to No 1 Pump Station please complete an Education Enquiry Form available on our website: <https://www.nationaltrust.org.au/education-wa/>

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An excursion to No 1 Pump Station, Mundaring Weir can be used to help students develop historical understanding through key concepts including continuity and change, cause and effect, perspectives, empathy and significance. They discover aspects of the past and consider what has changed and what has remained the same.

Although written primarily for the history component of HASS, program also contains suggestions for other curriculum areas, in particular science, given in Year 2 students look at how Earth's resources, including water, are used in a variety of ways.

Up to 90 students can be accommodated at No 1 Pump Station at any one time. For Year 2 it is recommended that the school supervisory team consist of 1 adult to 5 students. Parent helpers are encouraged and are free of charge. All on site activities are coordinated by National Trust Education Officers. A full day's visit is recommended although shorter visits are possible. In general, weather and Water Corporation operations permitting, a visit includes a workshop exploring the Gold Rush and the subsequent need for the pipeline, a tour and exploration of No 1 Pump Station's interactive display and a walk across the dam wall.

This program provides suggestions of pre-visit and post-visit activities and should be adapted to suit individual needs. Use as little or as much of the program as you wish and incorporate your own activities and learning methodologies. This program is written to be delivered alongside the Student Booklet. The booklet is for use in the classroom only, and is not required when visiting No 1 Pump Station. Each student will require a copy of the booklet if the entire program is to be taught. While colour printing is optional it is encouraged. Please note website addresses and URL's where provided, were correct at time of publication. The National Trust accepts no responsibility for the accuracy or availability of this information.

INTRODUCTION

The Goldfields Water Supply Scheme has been delivering fresh water to Western Australia's Eastern Goldfields for more than 100 years. It consists of three elements: a steel pipeline, pumping stations and storage reservoirs. The scheme, built following rich discoveries of gold in Western Australia in the 1890s, still operates to this day. Electric pumps have replaced steam pumps, the dam wall has been raised and pipes are presently located above ground. Today the scheme supplies water to over 100,000 people as well as mines, farms and other enterprises.

Mundaring Weir, in the Darling Ranges, is the beginning of the water's 560 kilometre long journey. Work to dam the Helena River to create a storage reservoir began in 1898. No 1 Pump Station, the first in a line of eight steam-powered pumping stations, was built at the base of the weir. The scheme was officially opened on the 24th January 1903.



No 1 Pump Station is an ideal site to visit for a study of local history and to explore one of Australia's most significant engineering sites. Students are able to explore the area and are encouraged to recognise the site's importance and appreciate why the WA community deems it worthy of preservation. A visit to No 1 Pump Station, in use until the 1950s, includes a walk (weather conditions and operations permitting) across the dam wall to discover remains of the past. Today No 1 Pump Station tells fascinating stories from the past: of what life was like on the waterless goldfields; the impact of the pipeline; its importance in WA's history and more. The place is also associated with CY O'Connor, Western Australia's Chief Engineer.



TOPICS TO EXPLORE

The Year 2 HASS curriculum provides a study of local history within the broader topic *The Past in the Present*. The Year 2 Science curriculum examines *Science as a Human Endeavour* and the Earth's resources including water and its uses. No 1 Pump Station offers the following learning opportunities:

- Students explore, recognise and appreciate the history of their local area by examining remains of the past and considering why they should be preserved.
- The Goldfields Water Supply Scheme can be investigated in terms of changes in technology. Students investigate aspects that have remained the same over its period of operation and aspects that have changed.
- Students examine the reasons behind the creation of the Goldfields Water Supply Scheme and learn the history of the discovery of gold in Western Australia.
- Students consider the impact of the Goldfields Water Supply Scheme on the development of Western Australia.
- Students contemplate the scheme's longevity and its successes and failures. Students learn about the significance of CY O' Connor and Sir John Forrest in relation to the Goldfields Water Supply Scheme.
- The Goldfields water supply scheme can be used as springboard for an investigation of water as a resource and the water cycle.
- Students consider the many women and men who contributed to the Goldfields Water Supply Scheme



NO 1 PUMP STATION LENDS ITSELF TO THE DEVELOPMENT OF THE FOLLOWING:

What aspects of the past can you see today? What do they tell us?

Physical remains of the past give us insights about technology of the time. A visit to No 1 Pump Station includes a tour of the building which consists of two sections, the Boiler Room and the Engine Room. This leads to discussion about how the engines were fuelled in the past. As a further example of remains of the past that can 'talk', a walk across the wall reveals evidence of the original height of the wall.



What remains of the past are important to the local community? Why?

Plaques located at Mundaring Weir attest to the significance of the Goldfields Water Supply Scheme e.g. it is an International Historic Civil Engineering Landmark (one of only three in Australia). A bust of CY O'Connor overlooks the site, evidence of the high esteem in which the community holds him.

How have changes in technology shaped our daily life?

The Goldfields Water Supply Scheme has been operating for more than 100 years allowing students to make comparisons between technology used when their grandparents were children and today. Technological changes have affected where people who work/ed on the pipeline live/d and their jobs i.e. now the engines are electric there are fewer people employed at Mundaring Weir.

What points of view and different perspectives did people have about the Goldfields Water Supply Scheme?

Some people called the Goldfields Water Supply Scheme a scheme of madness. Why was it called this? Students explore the conditions experienced by miners on the waterless goldfields. Students consider the opposition and scrutiny that CY O'Connor and the Goldfields Water Supply Scheme faced and explore different perspectives and points of view of people in the past.

Earth's resources are used in a variety of ways?

The natural resource of water is used in our daily lives for a variety of purposes; cooking, cleaning, for consumption, in agriculture and industry, transport, leisure and entertainment.

How do people use science in their daily lives?

Students identify the science or technology that allows them ready access to water in their home and school and investigate the water supply system that supplies their school and home. Students investigate the three states of matter and the changing state of water.

CURRICULUM LINKS: Humanities and Social Sciences

Content Strand		Knowledge and Understanding					Humanities and Social Sciences Skills			
Key Concepts	Geography	Place		Space	Environment	Interconnection	Sustainability		Scale	Change
	History	Source	Evidence	Continuity and Change	Cause and Effect	Perspective	Empathy	Significance	Contestability	
General Capabilities		Literacy		Numeracy	ICT capability	Critical and creative thinking	Personal and social capability	Ethical understanding	Intercultural understanding	
Cross- Curriculum Priorities		Aboriginal and Torres Strait Islander histories and cultures			Asia and Australia's engagement with Asia			Sustainability		

CONTENT DESCRIPTION AND ACHIEVEMENT STANDARDS

Knowledge and Understanding	Humanities and Social Sciences Skills	Relevant Aspects Of The Achievement Standard
<p>Geography People are connected to many places</p> <ul style="list-style-type: none"> Local features and places are given names, which have meaning to people, and these places can be defined on a variety of scales, including personal (e.g. home), local (e.g. street, suburb or town), regional (e.g. state) and national (e.g. country) (ACHASSK048) The ways in which Aboriginal and Torres Strait Islander People maintain connections to their Country/Place. <p>History The past in the present</p> <ul style="list-style-type: none"> The history of a significant person, building, site or part of the natural environment in the local community and what it reveals about the past (ACHASSK044) The importance today of an historical site (e.g. community building, landmark, war memorial, rock painting, engraving) and why it has heritage significance and cultural value for present generations (e.g. a record of a significant historical event, aesthetic value, reflects the community's identity) (ACHASSK045) The impact of changing technology on people's lives (e.g. at home, work, travel, communication, leisure, toys) and how the technology of the past differs from what is used today (ACHASSK046) 	<p>Questioning and Researching</p> <ul style="list-style-type: none"> Reflect on current understanding of a topic Pose questions about the familiar and unfamiliar Locate information from a variety of provided sources Sort and record selected information and/or data <p>Analysing</p> <ul style="list-style-type: none"> Identify relevant information Process information and/or data collected Explore different points of view Represent collected information and/or data into different formats <p>Evaluating</p> <ul style="list-style-type: none"> Draw conclusions based on information and/or data displayed in pictures, texts and maps Participate in decision-making processes <p>Communicating and Reflecting</p> <ul style="list-style-type: none"> Present findings in a range of communication forms, using relevant terms Develop texts, including narratives, that describes an event or place Reflect on learning and respond to findings 	<p>At Standard, students pose questions, locate, sort and record collected information and/or data from provided sources. They identify and process relevant information and/or data by categorising, sequencing events and exploring points of view. Students use different formats to represent their information, and draw simple conclusions. They participate in decision-making processes by contributing to group discussions. Students share their findings in a range of ways, and develop simple texts, using some relevant terms. They reflect on what they have learnt using oral and/or written forms.</p> <p>Students locate major geographical divisions of the world, and describe places at a variety of scales. They describe the interconnections between people and places, and they identify the factors that influence people's connections with others in different places. Students identify people, sites and parts of the natural environment in their local community that reveal information about the past, and those that have significance today. They identify examples of how technology has changed and its impact on people's lives.</p>

Source: Schools Curriculum and Standards Authority, <http://k10outline.scsa.wa.edu.au>

CURRICULUM LINKS: Science

Content Strand		Knowledge and Understanding				Science		
Key Concepts	Science	Patterns Order and Organisation	Form and Function	Stability and Change	Scale and Measurement	Matter and Energy	Systems	
General Capabilities		Literacy	Numeracy	ICT capability	Critical and creative thinking	Personal and social capability	Ethical understanding	Intercultural understanding
Cross- Curriculum Priorities		Aboriginal and Torres Strait Islander histories and cultures		Asia and Australia's engagement with Asia		Sustainability		

CONTENT DESCRIPTION AND ACHIEVEMENT STANDARDS

Science Understanding	Science as a Human Endeavour	Science Inquiry Skills	Relevant Aspects of the Achievement Standard
<p>Biological Sciences Living things grow, change and have offspring similar to themselves (ACSSU030)</p> <p>Chemical Sciences Different materials can be combined for a particular purpose (ACSSU031)</p> <p>Earth and space sciences Earth's resources are used in a variety of ways (ACSSU032)</p> <p>Physical Sciences A push or a pull affects how an object moves or change shape (ACSSU033)</p>	<p>Nature and Development of Science Science involves observing, asking questions about, and describing changes in, objects and events (ACSHE034)</p> <p>Use and influence of science People use science in their daily lives, including when caring for their environment and living things (ACSHE035)</p>	<p>Questioning and Predicting Pose and respond to questions, and make predictions about familiar objects and events (AC SIS037)</p> <ul style="list-style-type: none"> Literacy Numeracy Critical and creative thinking Personal and social capability <p>Planning and Conducting Participate in guided investigations to explore and answer questions (AC SIS038)</p> <ul style="list-style-type: none"> Literacy Critical and creative thinking Personal and social capability <p>Use informal measurements to collect and record observations, using digital technologies as appropriate (AC SIS039)</p> <p>Processing and analysing data and information Use a range of methods to sort information, including drawings and provided tables and through discussion, compare observations with predictions (AC SIS040)</p> <ul style="list-style-type: none"> Literacy Numeracy Critical and creative thinking <p>Evaluating Compare observations with those of others (AC SIS041)</p> <ul style="list-style-type: none"> Literacy Critical and creative thinking <p>Communicating Represent and communicate observations and ideas in a variety of ways (AC SIS042)</p> <ul style="list-style-type: none"> Literacy 	<p>Science Understanding At Standard, students describe changes to materials and living things, and how a push or a pull affects an object's behaviour. They identify that certain materials and resources have different uses.</p> <p>Science as a Human Endeavour Students describe examples of where science is used in people's daily lives.</p> <p>Science Inquiry Skills Students pose and respond to questions about their experiences and predict outcomes of investigations. They use informal measurements to make and compare observations. Students record and represent observations and communicate ideas in a variety of ways.</p>

Source: Schools Curriculum and Standards Authority

STUDENT ACTIVITIES

Student knowledge and understanding will be enhanced and consolidated by a visit to No 1 Pump Station and Mundaring Weir. These are suggested pre and post visit activities, please use as much or as little as you wish. Page numbers indicated refer to the Student Booklet. The Student Booklet is a classroom resource and is not required on a visit to No 1 Pump Station. Each activity is aligned with Year 2 HASS and Science Australian Curriculum and Western Australian Curriculum concepts and key ideas. Please see key below.

History	H
Geography	G
Science	S

KWL Chart H

What do you know about the past? What do you wonder about the past? What have you learned about the past? Brainstorm as a class and record student responses. Discuss the various ways people can learn about the past (books, photos, internet, guest speakers, site visits etc.). Students complete individual KWL charts. Student Booklet p. 1

Brainstorm the meaning of 'Past in the Present' H G

- Investigate a range of buildings in the local area e.g. school buildings, local historic buildings, monuments and plaques.
- Is this an old building or a new building? How can you tell?
- Discuss their significance, who may find them to be important and why?
- If it is not significant now do you think it might be significant in the future? Why or why not?
- Complete p. 2

Picture Investigations H G

Part 1: Begin with some modern, unrelated images to help students with this activity prior to looking at historical images. Students need help to “read” photos together before they do an independent activity. Develop a series of questions to consider when looking at different images. Questions or prompts might include:

What do you notice first?

Describe what you see.

What people and objects are shown?

How are they arranged?

What is the physical setting?

Can you work out what time of day it is?

Why do you think they took this picture?

What is happening in the image?

Who do you think this was taken for (audience)?

If we took the same photograph ten years later what might be different?

What might be the same?

What do you wonder about?

Part 2: Present a range of historical images to students, choose local landmarks or other images. ‘What can we find out about the past by looking closely at this picture?’ As a class, brainstorm and list all the things that can be learned by looking at the picture (technology, building materials, families, farming, agriculture etc.) This activity examines the details of images and encourages students to question what the photographer or artist has captured and what they have omitted and to reflect on possible motivations for this. Obtain images from newspapers, magazines or photographs p. 3.

Water as a Resource H G S

Brainstorm uses of water in a student’s daily life. Where do we use water? How do we use water? Where else is water used in our community? List responses on the board, students illustrate two ways water is used at home, at school and in the wider community p. 4 Watch Water Corporation clip ‘Catchment to Tap Part 1: Our drinking water Sources’ (URL: <https://www.youtube.com/watch?v=38GdjlXRmCM&feature=youtu.be>)

Place through pictures H G

Examine the contemporary image of Mundaring Weir p.5. Brainstorm a series of enquiry questions to do with this image e.g.

What is this?

Who built this?

When was it built?

What was it built from?

What was it used for?

Where is this place?

What is its name?

How did it get its name?

Consider methods for discovering answers to these questions i.e. books, internet, local museum, visiting the site, State Library Western Australia, local library, historical society, the National Trust. In small groups undertake research. Create a class display, record student discoveries alongside the image. Leave space to add to the display as students learn additional information to share. p. 5



Water Explorer S H

Students explore their school and look at where they can find sources of water or access to water and consider how it is being used. Complete Water Explorer p. 6.

As a class discuss findings; is water being used responsibly or irresponsibly around the school? What could we change to encourage people are using water more responsibly? Watch the Water Corporation clip ‘How we use water’ (URL: https://www.youtube.com/watch?time_continue=135&v=Ik6XurtNVkY).

In small groups or pairs students create brochures, flyers or posters to remind people how important the resource of water is and how important it is to conserve it and use it wisely. Share their posters/brochures with another class or display around the school to help others think about their water use and wastage.

The Water Cycle S

Students investigate how water moves around the earth in the water cycle. Students learn about the processes of evaporation, condensation and precipitation.

View the clip ‘How does rain form and what is the water cycle?’

(URL: <https://www.youtube.com/watch?v=zBnKgwnn7i4>)

Students the complete The Water Cycle cloze and colour the picture of the water cycle p. 7

Watch the Water Corporation Clip ‘Groundwater Replenishment Part 1: The Water Cycle’

(URL: <https://www.youtube.com/watch?v=7RHvDTT3BRc&feature=youtube>)

Needs versus Wants H G S

This activity should be conducted outside so students have room to move around, it may be conducted across a few lessons. The aim is firstly to touch on people’s fascination with gold and, secondly, to consider the value of gold versus the value of water.

1. Provide a container with gold objects such as coins/spray painted rocks, fake jewellery and another container with silver objects, coins/ other rocks painted a copper/brass colour. Create a safe “gold rush” for your students i.e. a race to the various containers placed at a distance and students choose an object from one of the containers. Modify to suit your class. Ask why the students chose the item they did. Explain that when gold was discovered people were often gripped by ‘gold fever’ and a ‘gold rush’ was the result.
2. Fill up one container e.g. an empty plastic bottle with dirty water (just add a bit of dirt to tap water). Put a small amount of clear water in a similar container. Ask students to line up next to the container they would choose. Students explain their choices. The discussion might generate the issue of the quality of water versus quantity.
3. Place a small amount of dirty water next to the container with gold objects and a bottle filled with clear water next to the container with silver objects. Explain this represents the situation in Western Australia’s Eastern Goldfields at the time gold was first discovered. Where there is gold there is not enough clean water. And where there is water there is no gold. Students discuss which container of coins/rocks they would choose and explain the reasons for their choice. Explain that this was the choice that many faced after the discovery of gold in the desert in Western Australian - prospectors had to choose between the harsh conditions of the desert versus the chance to strike it lucky. Prospectors risked their lives to find gold – some perished from a lack of water. Which is more precious? Water or gold?

Gold and its Uses S

Brainstorm reasons why gold is so precious and valuable. Consider the ways in which gold is used today; as jewellery, as currency, ornamental objects, for use in electronics, dentistry, medicine, aerospace and aeronautical engineering, medals and trophies and other awards, crowns and religious objects, glassmaking and building. Student illustrate ways in which gold is used in our society p. 8

Gold fever or Gold Rush S H G

What is meant by the term gold fever and gold rush? Brainstorm similarities and differences. What are some possible effects of the discovery of gold in 1892 in Coolgardie and then Kalgoorlie in 1893? Revisit the needs and wants activity. What did most students want? But what did they establish was a need? Why were people rushing?

Getting to the Goldfields

After European settlement Western Australia had been a poorer and smaller colony than the other colonies in the eastern states. But with the opportunity to strike it lucky and become rich, people from the other side of Australia and around the world flocked to the Western Australia's Goldfields causing a population explosion. The population of Western Australia went from approximately 50,000 in 1891 to nearly 200,000 in 1901. Consider how the prospectors got to the goldfields. Share images of prospectors and how they travelled to the goldfields. Discuss the effectiveness of each form of transport. What kinds of things did the prospectors bring with them? What difficulties did they face on the journey? For more information on transport and to view images please visit The National trust website and select 'Gold and Water'. (URL: <https://www.nationaltrust.org.au/educationprograms/gold-and-water/>). Students complete the activity on Page 9 of the Student workbook considering the ways in which prospectors travelled to the goldfields and the difficulties they faced.

Life on the Goldfields

Life was incredibly tough on the goldfields. Discuss the daily activities of those on the goldfields and explore why it was so difficult. What challenges did prospectors (people searching and digging for gold) face? What about other people on the Goldfields as not all people were prospecting i.e. women and children? Also discuss that people came from all over the world so there was a lot of diversity at the Goldfields which sometimes led to conflict and confusion because of language barriers and cultural misunderstandings. With people flocking to the Goldfields the small towns springing up did not have adequate water or food supplies to meet the needs of the number of people. Many prospectors died from thirst or hunger and many people developed illnesses such as typhoid, scurvy and dysentery due to the lack of access to fresh water and fresh food. p.10 Explain that the Premier of Western Australia, John Forrest, supported building a water pipeline to deliver water to the goldfields as a solution to the problem of limited water sources.

Simply Significant H G

Discuss the definition of significant/significance. Brainstorm significant people in the local community, people who have made an important contribution in their local community, for example the town mayor, school principal, a police officer, national park ranger etc. Include current as well as past residents. Discuss why these people are significant or who they're significant to. Students think about three significant people in their lives and draw a picture and write a statement explaining why these people are significant to them. p. 11 Read *The Pipeline C Y O'Connor Built* by Joy Lefroy and Diana Frylinck. At the completion of the story students discuss how and why C Y O'Connor and John Forrest are significant people in the history of Western Australia. Note: this activity lends itself to a cross curricula English activity

Simply Significant People H G

Create a class list of people with a connection to No 1 Pump Station and the Goldfields Water Supply Scheme e.g. John Forrest, C Y O'Connor, George Leake, Arthur Bayley, William Ford, Paddy Hannan, Dan Shea and Tom Flanagan. In small groups, select one person from the list on p. 12, conduct simple research and complete as many details as possible on p. 13 of the Student Booklet. As a follow-up activity, students come to school dressed as the person they researched be ready to answer some simple questions about their person.

Changing state S

Students conduct an experiment where they witness changes that occur to water when the temperature is increased or decreased. Conduct simple science experiments in class to demonstrate the changes in state that occur when the temperature is altered i.e. Water freezes when temperature is dropped to 0 degrees and turns to ice, a solid. Water boils when the temperature is increased to 100 degrees and turns to water vapour, a gas. What happens when the water vapour is cooled? Or the ice is removed from the freezer and placed at room temperature?

Students record their findings on p.14

Past and Present H G

Revise earlier activity on p. 3 Student Booklet. Students look at the collection of images of No 1 Pump Station on p. 15 of their Student Booklet and in small groups decide which images are from the past and which are from the present. What are some clues to help us decide e.g. black and white vs colour images, clarity and quality of picture, the number of rooms or buildings, and the condition of the buildings. Each group places the photographs into chronological order and shares their sequence and reasoning with the class. Students can now look at the correct sequence of images and discuss how No 1 Pump Station has changed over time. Discuss why and how some of these changes may have occurred p.15. (Please Note: if the Student Booklets have been printed in greyscale it is recommended that students have access to a set of coloured photos for this activity.)

Answer key: d, a, f, b, c, e

Image D: 1902

Image A: 1902 after Image D,

Image F: 1903 first time dam overflowed,

Image B: 1996 last time the dam overflowed,

Image C&E: 2018 images of Pump Station today.

Timeline of GWSS H G

Students investigate the series of events that led to the establishment and creation of the Goldfields Water Supply Scheme. Students cut out the events and place them in chronological order. The timeline could be added to the class display along with text, photographs and images p.17-19

Mapping the pipeline H G

Look at the images on page 20. Identify the towns that have or used to have a pump station and examine the pipeline from Mundaring to Kalgoorlie. Study the satellite image and discuss what they notice about the landscape along the pipeline. The image is available online at

<https://www.goldenpipeline.com.au/explore/>

Discuss what the introduction of the pipeline and access to fresh water would have meant for these towns. In small groups investigate one of the towns along the Goldfields Water Supply Scheme (GWSS) route. What are these towns known for today? What do they produce in these areas? Has the GWSS enabled there to be more growth in terms of population, agriculture and industry in these towns? Complete p. 21

Tour of No 1 Pump Station H G

Students imagine they are taking their family on a tour of No 1 Pump Station and Mundaring Weir. Describe what their family will see on their tour and explain things that are significant. Talk about what their family is going to discover about No 1 Pump Station p. 22-23 *Please note: It is recommended that this activity is completed after an excursion to No 1 Pump Station.*

Then and Now H S

Compare technologies from the past with what we use today. Students identify the technologies that were once used at No 1 Pump Station and compare with that used today p. 24

Worth keeping? H

Revisit the KWL Chart. What have students have learnt about No 1 Pump Station and Mundaring Weir. Revise what significant means. Discuss whether or not students think that No 1 Pump Station is a significant place worth preserving. Why or why not? What can we learn from this place? Who is it important to? Do students think it will be significant in the future? Students summarise their opinions on p. 25

