

Water in the World

Hawkesbury Nepean River

The Hawkesbury Nepean River has been a vital part of our landscape for many thousands of years. It played a key role in the lives of Indigenous Darug People living in the area, the early European Settlers, and is important to many thousands of people today. This Geographical Inquiry will focus on the environmental and human processes that influence the availability and distribution of water, with a particular focus on the Hawkesbury River at Sackville North.

Inquiry Questions:

- How do natural and human processes influence the distribution and availability of water as a resource in the Hawkesbury Nepean River?
- What approaches can be used to sustainably manage water resources and reduce water scarcity in the Hawkesbury Nepean Catchment?



Health and Safety Issues

As you are working out in the field you need to be aware that:

- Ground material is often covered in moss and can be very slippery.
- Vines and dense undergrowth can trip.
- Fallen trees can be rotten and weak.
- Some animals can deliver painful or venomous bites.
- On slopes, rocks can be easily dislodged.

Outcomes

- GE4-1:** Locates and describes the diverse features and characteristics of a range of places and environments
- GE4-2:** Describes processes and influences that form and transform places and environments
- GE4-3:** Explains how interactions and connections between people, places and environments result in change
- GE4-5:** Discusses management of places and environments for their sustainability
- GE4-7:** Acquires and processes geographical information by selecting and using geographical tools for inquiry
- GE4-8:** Communicates geographical information using a variety of strategies

Student Name: _____

Inquiry Aim:

The aim of this Geographical Inquiry is to investigate the natural and human processes influencing the water quality and availability in the Hawkesbury River Catchment at Sackville North.

Pre-Visit Lesson One: Background Information

SIX Maps has been developed by the NSW Department of Land and Property. It provides access to cadastral (land and property boundaries) and topographic (hills and valleys) information, satellite data and aerial photography. Use [SIX Maps](#) to complete the following tasks.

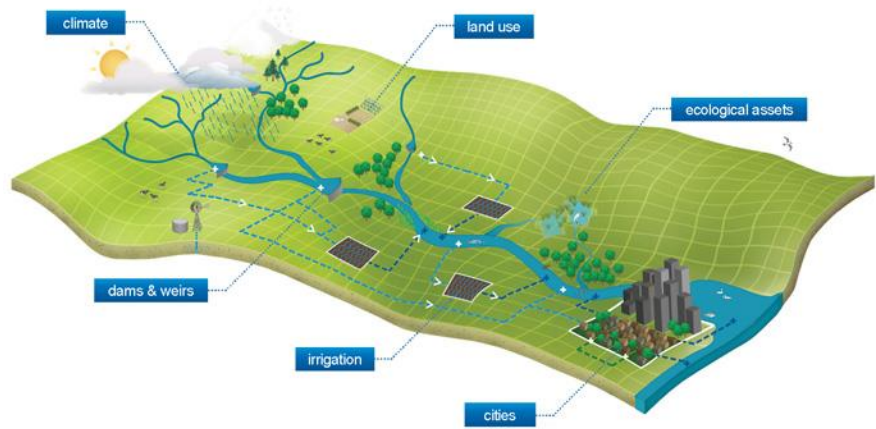
1. On SIX Maps, type in Sackville North.
2. Click on Basemaps (top right of page) and drag the tab down until you can see the Street and Suburb names.
3. Zoom out and fly around until you find your local Suburb.
4. Click on Basemaps and move the tab back up until you can see the satellite image.
5. Zoom out to a scale around 1:600 000 (you can see this in the bottom left of screen). Follow the Hawkesbury Nepean River upstream from the ocean to Warragamba Dam.
6. By holding a piece of string to your computer screen or using SIX Maps Distance tool (the one with the ruler icon) estimate the length of the Hawkesbury Nepean River:

_____ km

7. Look at the satellite image of the Hawkesbury Nepean River. Identify 3 different broad land use patterns around the river and discuss how this would effect the Hawkesbury Nepean River.
- 8.

Land Use	Effect

What is a river catchment?
(provide 3 local Sydney examples)



What is water scarcity? Do you think it is connected to water quality? Why?

Why is water important to the Sydney Region?

Is the Hawkesbury River important to Sydney? How?

Pre-Visit Lesson Two: Geographical Questions

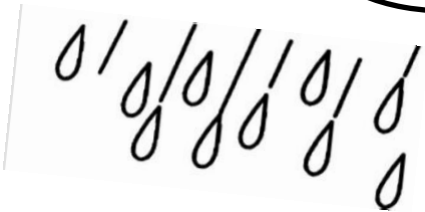
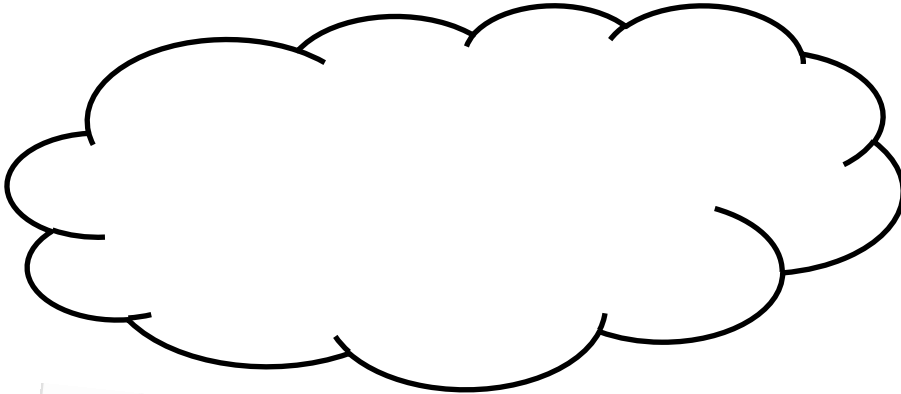


Brainstorm: What are some geographical questions you might ask for this Inquiry?

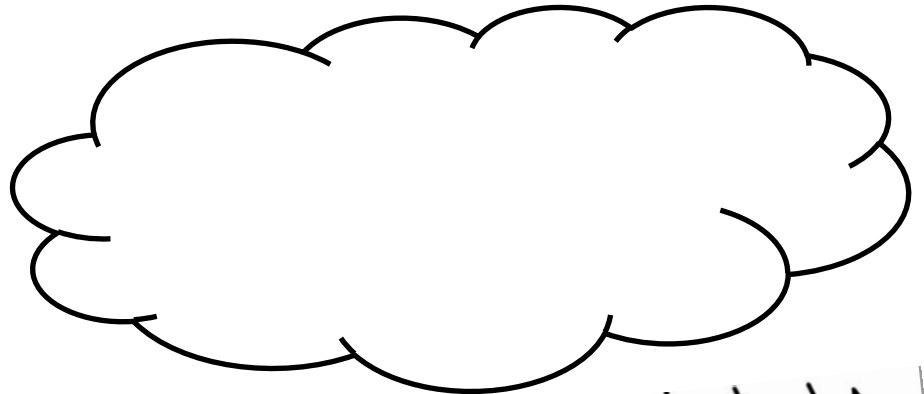
Geographical questions are questions which help you identify the information you need to answer the inquiry questions. Your inquiry questions are written on Page 1.

Example: What are some human impacts on the Hawkesbury Nepean River system?

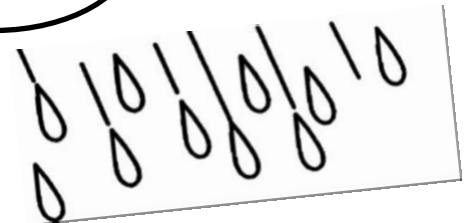
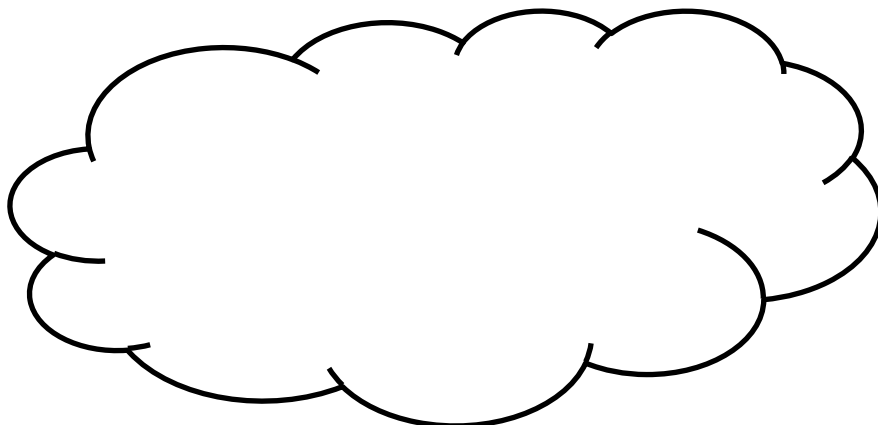
Geographical Question 1:



Geographical Question 2:



Geographical Question 3:



Can you think of any additional questions that might add depth to your inquiry.

Pre-Visit Lesson Three: Planning Your Inquiry

Answer the following questions for each of the geographical questions you came up with last lesson:

1. What information is needed to answer this geographical question and where can you find that information (resources)?
2. What are the geographical tools you need to access the information? (Tools include maps, fieldwork such as collecting data using scientific instrumentation, statistics and graphs, spatial tech such as GPS, Google Earth etc, Visual Tools such as drawing and photography).
3. Develop a system for recording the information you get. (Hint tables, media, writing)

Question	Information needed	Resources	Tools	Recording Method

Fieldwork Activity One:

Water Quality – Pond Water Bug Study

Biological Indicators of water pollution

- Circle the sensitivity rating if the animal is found
- Count the number of animals for abundance

Macroinvertebrate common name & sensitivity	Sensitivity rating	Abundance
Very sensitive		
Stonefly nymph	10	
Mayfly nymph	9	
Sensitive		
Caddisfly Larva	8	
Riffle Beetle or larva	7	
Water Mite	6	
Tolerant		
Beetles larva	5	
Dragonfly Nymph	4	
Water stider	4	
Whirligig Beetle	4	
Damselfly nymph	3	
Midge or Fly Larva	3	
Freshwater shrimp	3	
Water Scorpion/NeedleBug	3	
Very Tolerant		
Diving Beetle	2	
Worms	2	
Water treader (v.small)	2	
Water boatman	2	
Back swimmer	2	
Bloodworm	1	
Leech	1	
Freshwater Snails	1	
Total		

WATER QUALITY RATING TOTAL
50 + Excellent
35-49 Good
25 -34 Fair
<25 Poor

Sensitivity Ratings refer to:

Water quality is linked to the concept of scarcity because:

Fieldwork Activity Two: Water Quality ~ Hawkesbury River.

Darug Aboriginal name for the river _____

Site Location _____

Date of Water Tests _____

Physical Parameters

Parameter	Result		Unit	Healthy Range
River width			m	na
Tide	Ebb (flowing to low)	Flood (Flowing to high)		na
Water Temperature			°C	18-22 °C
Turbidity			NTU	<10 NTUs

Chemical Parameters

Parameter	Result	Unit	Healthy Range
Salinity		ppm	<250ppm
pH (acidity)		pH	6-8
Oxygen		mg/L	8-10mg/L

What natural and human factors could influence results for the following?

Measurement	Natural factors	Human factors
River Width		
Water Temperature		
Turbidity		
Salinity		
pH		
Oxygen		

Fieldwork Activity Three:

Water Quality – Impact of Vegetation & Topography

In your 10 metre quadrat:

Parameter	Units	Equipment	Result
Average Plant Height (Measure 5 random trees in the quadrat then work out the average height)	Metres	iPad App	
Tree abundance	Number of trees (more than 5m)		
Groundcover	% cover	Eyes	
Canopy Cover	% cover	Mirrors and Canopy Cover Charts	
Aspect	Degrees	Compass	
Slope	Degrees	Clinometer	

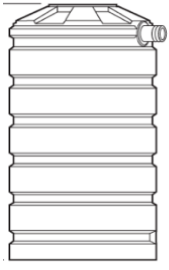
Use the map below and a GPS (or iPad App) to record your elevation at the following points along your walk.


A	Kitchen	m
B		m
C		m
D		m
E		m
F	River Edge	m





How do vegetation and topography combine to affect water quality?


Fieldwork Activity Four: Water Quality – Relying on Tank Water

Green Water Tank – School House		Results
	Position relative to sunlight:	
	Made from:	
	Approx. Water Level: (measure from base up)	
	Water temp:	
	Water pH:	

Silver Tank – School House		Results
	Position relative to sunlight:	
	Made from:	
	Approx. Water Level: (measure from base up)	
	Water temp:	
	Water pH:	

Old Grey Tank – School House		Results
	Position relative to sunlight:	
	Made from:	
	Approx. Water Level: (measure from base up)	
	Water temp:	
	Water pH:	

Green Tanks – Teacher Accommodation		Results
	Position relative to sunlight:	
	Made from:	
	Approx. Water Level: (measure from base up)	
	Water temp:	
	Water pH:	

Small Tank – BBQ		Results
	Position relative to sunlight:	
	Made from:	
	Approx. Water Level: (measure from base up)	
	Water temp:	
	Water pH:	

Water Taste Test Challenge

We will be blind taste testing three types of water – Tank water, Town Water (Richmond or Windsor) and Bottled water.

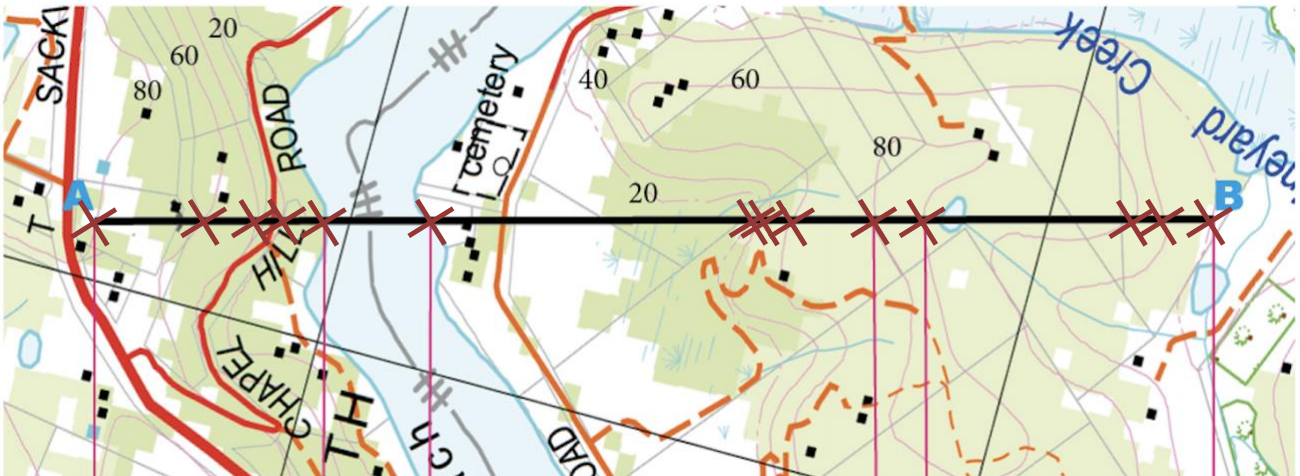
Preference Tally			
	Taste Test 1	Taste Test 2	Taste Test 3
Your Class			
Another Class			
Another Class			
TOTALS			

Why is drinking town or tank water better for the environment?

Post visit Activity One:

Topography of the Hawkesbury River

1. Complete the cross-section by drawing lines from the contour interval to the corresponding graph line. ✕ marks the contour lines.
2. Use the **Word Bank** below to label the geomorphic features of the landscape into the cross-section



Which side of the river (the steep side or the flatter side) contribute most to water turbidity? Why?

Brewongle Ridge
Lagoon
Floodplain
Gully
Cemetery
River Road

Post-Visit Lesson Two: Fieldwork Summary

How does topography influence water quality?

Describe a human process that has changed the availability of water in the Hawkesbury River.

What role does vegetation play in the health of a river system?

Post-Visit Lesson Three:

Processing the Data

Below is a list of Geographical Tools used to collate, review and evaluate data and information. Choose at least 5 of these tools to analyse and present your data in a Word Document.

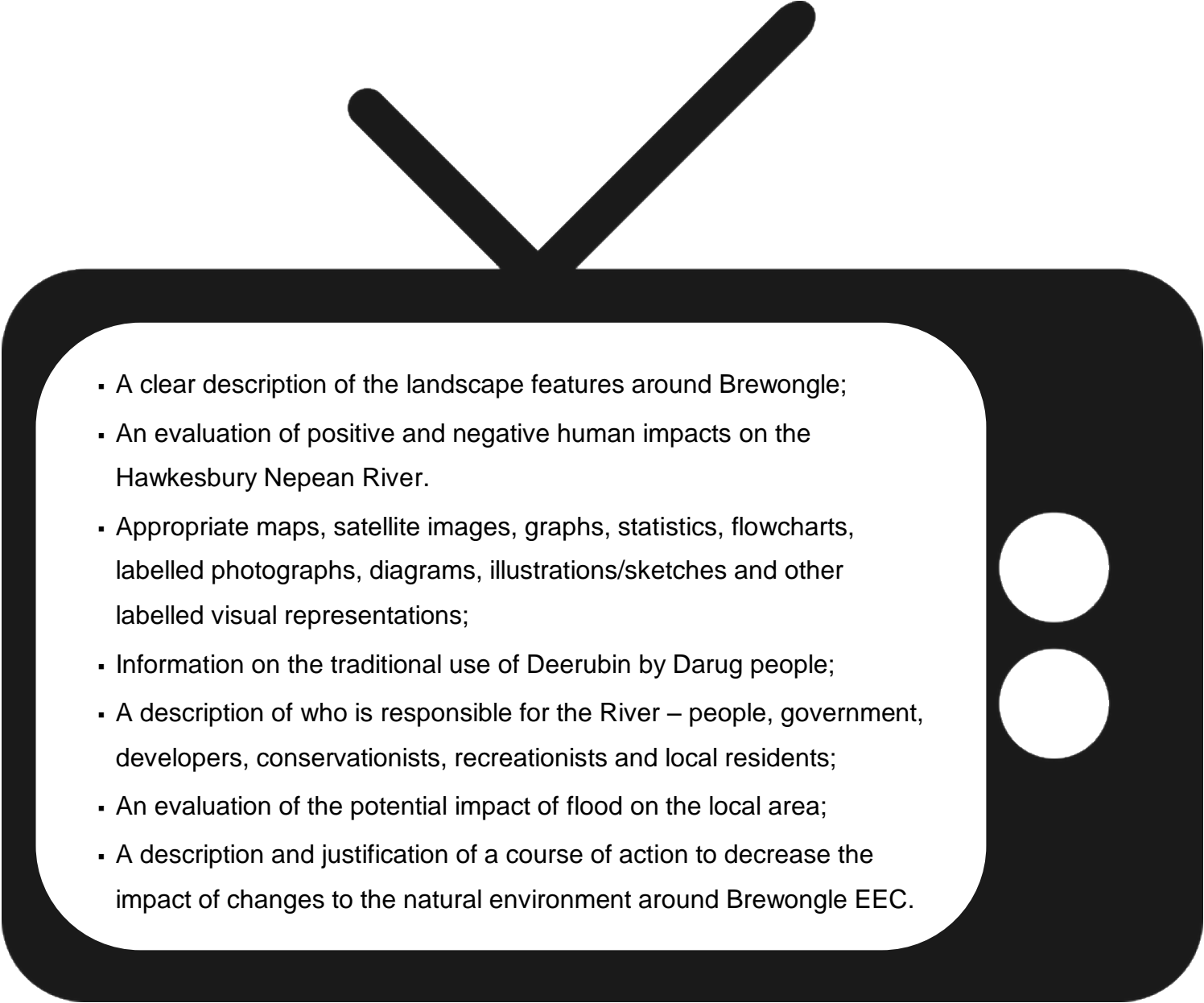
The information you create here will be used in your documentary assessment task.

<ul style="list-style-type: none"> Using ICT software, use a topographic map or satellite image as a base map, locate the Hawkesbury River at Brewongle and identify surrounding natural and human features.
<ul style="list-style-type: none"> Collate data from your in-depth study into a table to summarise your findings.
<ul style="list-style-type: none"> Create flowcharts to demonstrate your understanding of the ways water quality influences people and places.
<ul style="list-style-type: none"> Assemble and annotate photographs to provide a visual representation of the site. Analyse and label interconnections.
<ul style="list-style-type: none"> Develop consequences charts to explain human impacts (positive and negative) on the Hawkesbury Nepean River. Show the impacts on Google Tour Builder. Use photos taken on the day to match parts of the tracks we walked.
<ul style="list-style-type: none"> Use a T-chart to represent data on advantages and disadvantages of population increases in the Hawkesbury Nepean River Catchment.
<ul style="list-style-type: none"> Create a mind map summarising how different groups of people (stakeholders) value the Hawkesbury Nepean River. Include Traditional Owners, National Parks Rangers, local residents, local farmers, recreational users and any others you can think of.
<ul style="list-style-type: none"> Construct a flow chart or concept map to explain the role of government and other major stakeholders in sustainably managing the Hawkesbury Nepean River Catchment.
<ul style="list-style-type: none"> Research floods of the Hawkesbury Nepean River and create a poster to educate local residents about flood mitigation.

Assessment Task:

Communicating Geographical Information

Work in small groups to develop a 5-6 minute video documentary on the environmental and human processes that form and transform water availability for the Hawkesbury Nepean River, using Sackville North as a field study. Your documentary should include:

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- A clear description of the landscape features around Brewongle;
 - An evaluation of positive and negative human impacts on the Hawkesbury Nepean River.
 - Appropriate maps, satellite images, graphs, statistics, flowcharts, labelled photographs, diagrams, illustrations/sketches and other labelled visual representations;
 - Information on the traditional use of Deerubin by Darug people;
 - A description of who is responsible for the River – people, government, developers, conservationists, recreationists and local residents;
 - An evaluation of the potential impact of flood on the local area;
 - A description and justification of a course of action to decrease the impact of changes to the natural environment around Brewongle EEC.