Low-cost fieldwork in a pandemic

Fleur Farah, Head Teacher HSIE, Oran Park High School

Context

Oran Park High School is located in a master planned community in south-west Sydney. The school opened at the start of 2020 with Year 7 and Year 8. When at capacity, Oran Park High School will have 2000 students enrolled. Being a passionate geographer, I was determined to get students out in the field in Stage 4 by creating inclusive, low-cost fieldwork in the local area. As part of the planned infrastructure for the Oran Park, the Kolombo Creek catchment was developed using water sensitive design principles. This created the ideal fieldwork site for students in Year 8 Geography, studying Water in the World.

During 2020, the COVID-19 pandemic has presented a variety of challenges. This has had a significant impact on how schools conduct excursions and complete fieldwork. To ensure that my proposed fieldwork was compliant and COVID-safe, I adhered to the *NSW school advice for school students for Term 3 families* document that stated:

> **Day field trips to outdoor locations with no physical distancing requirements can take place (e.g. DoE Environmental Education Centres and sport and recreation facilities, trips to the local river to collect water samples).**

With this knowledge I was able to conduct fieldwork safely in the local area whilst still adhering to COVID health guidelines.

Syllabus links

Topic: Water in the World – Stage 4

Syllabus content: The water cycle – students investigate how the operation of the water cycle connects people and places.

Geographical concepts: Place, scale, environment, change, interconnection.

Geographical tools:

- Fieldwork – investigating hydrologic processes in local landscapes using fieldwork equipment
- Graphs and statistics – basic data tables
- Maps – topographic maps, special-purpose maps
- Spatial technologies – Google Earth, Spatial Map Viewer (spatial datasets) satellite images
- Visual representations- diagrams, photographs, multimedia (presentation video).

Key inquiry question: What approaches can be used to sustainably manage water resources and reduce water scarcity?

Geographical inquiry skills:

- Acquiring geographical information
  - Collect, select, record and organise relevant data and geographical information, using ethical protocols, from a variety of appropriate primary data and secondary information sources.
- Processing geographical information
  - Apply geographical concepts to synthesise information from various sources and draw conclusions based on the analysis of data and information, taking into account alternative perspectives.
- Communicating geographical information
  - Present findings, arguments and explanations in a range of appropriate communication forms selected for their effectiveness and to suit audience and purpose, using relevant geographical terminology and digital technologies as appropriate.

Outcomes:

- GE4-1 – locates and describes the diverse features and characteristics of a range of 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
- GE4-8 – communicates geographical information using a variety of strategies

Expected learning:

Students

- identify water cycle processes in a catchment area
- investigate how people and places impact on a catchment area and the water cycle
- describe how water flows within a catchment area
- determine effective management strategies to manage a catchment area in a sustainable way.

Assessment: Students complete an in-class written response with stimulus material on the management of stormwater at Kolombo Creek, Oran Park. This response is based on fieldwork data and observations taken on the fieldtrip.

Pre-fieldwork activity

Before starting the fieldwork at Kolombo Creek, students needed to know the processes operating in the water cycle. Knowledge of the processes of precipitation, infiltration and surface runoff are crucial for students to understand how catchment areas work and why topography determines where water will flow and flood. Using the *SES Flooding in the Hawkesbury-Nepean Valley* lesson activities, students created their own catchment areas to predict where water would flow and flood. See *Create a catchment*: Figures 1 and 2

Create a catchment

Figure 1: Instructions for creating your own catchment.

Scrunch your paper first.

Use a **brown** marker or watercolour paint to colour along tops of the ridges.

Use **black** to draw in one or two roads from the plains and across the mountains along the ridges.

Use **blue** to draw water courses in the crease (valleys).

Predict where you think the water will flow to and pool if it '**rains**'. Colour those areas blue.

Spray the catchment with water to represent rain. **Observe** the flow and pooling of the water.

Before adding water, predict what areas may flood.

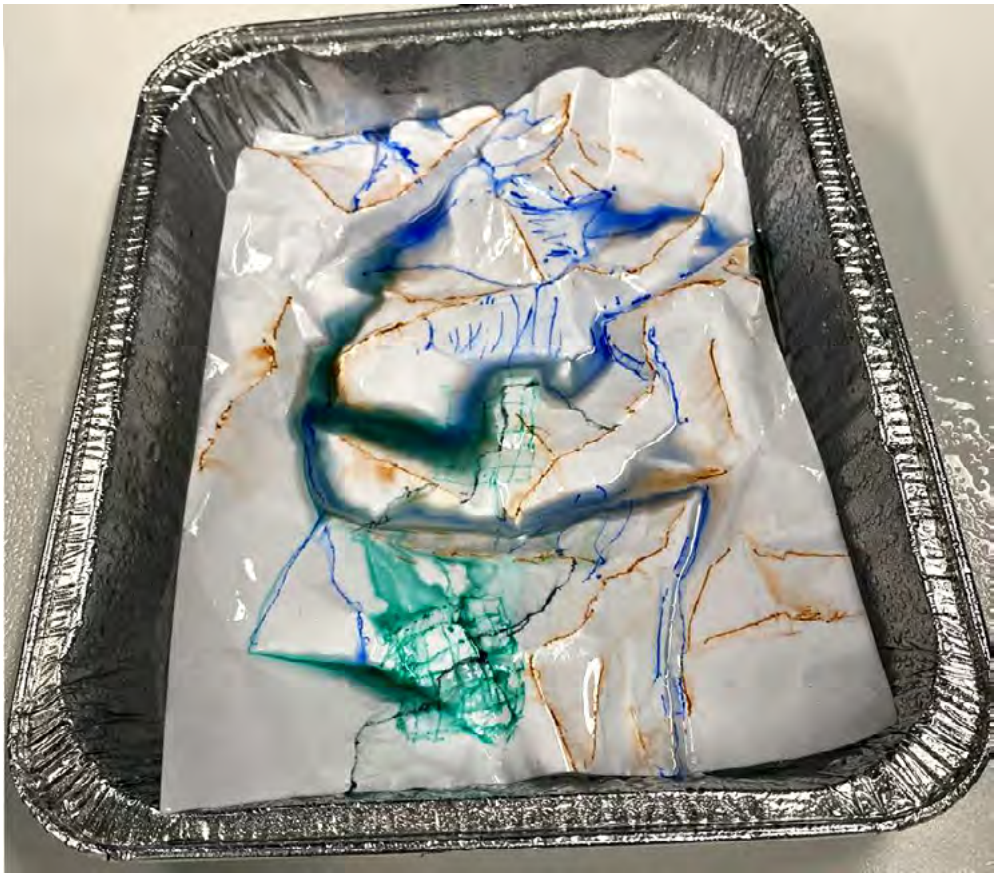
What happens as more water is added to the catchment?

Add more water to one setion of the catchment, what happens?

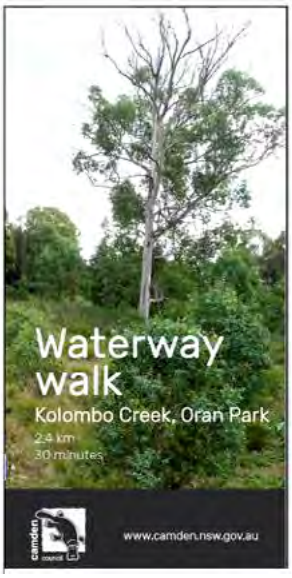
Why is it important to predict and model where water will run in a catchment area?

These ideas then led to discussions on where surface runoff goes and how does surface runoff (stormwater) move through a catchment area with the potential to flood low lying areas. Source for Figures 1 & 2: SES Flooding in the Hawkesbury - Nepean Valley website launch event, Richmond, 2019.

Figure 2: Catchment area using a foil tray, coloured markers, A4 paper and a small water spray bottle.



Fieldwork preparation



Prior to creating the fieldwork activities, I conducted research to find out about stormwater and its impact on catchment areas. I 'googled' stormwater, pollution, and the impacts of stormwater in urban areas. I contacted the local council to see if there were up-to-date stormwater management plans for Oran Park as it is a new master-planned community. I was fortunate that a brochure for the catchment was being developed by the council, resulting in me being able to use information from the brochure to supplement my fieldwork, as noted in Figure 3.

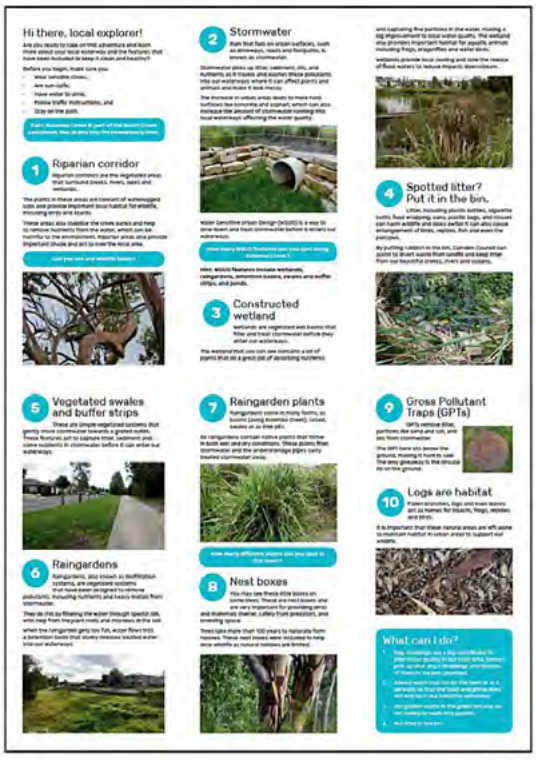


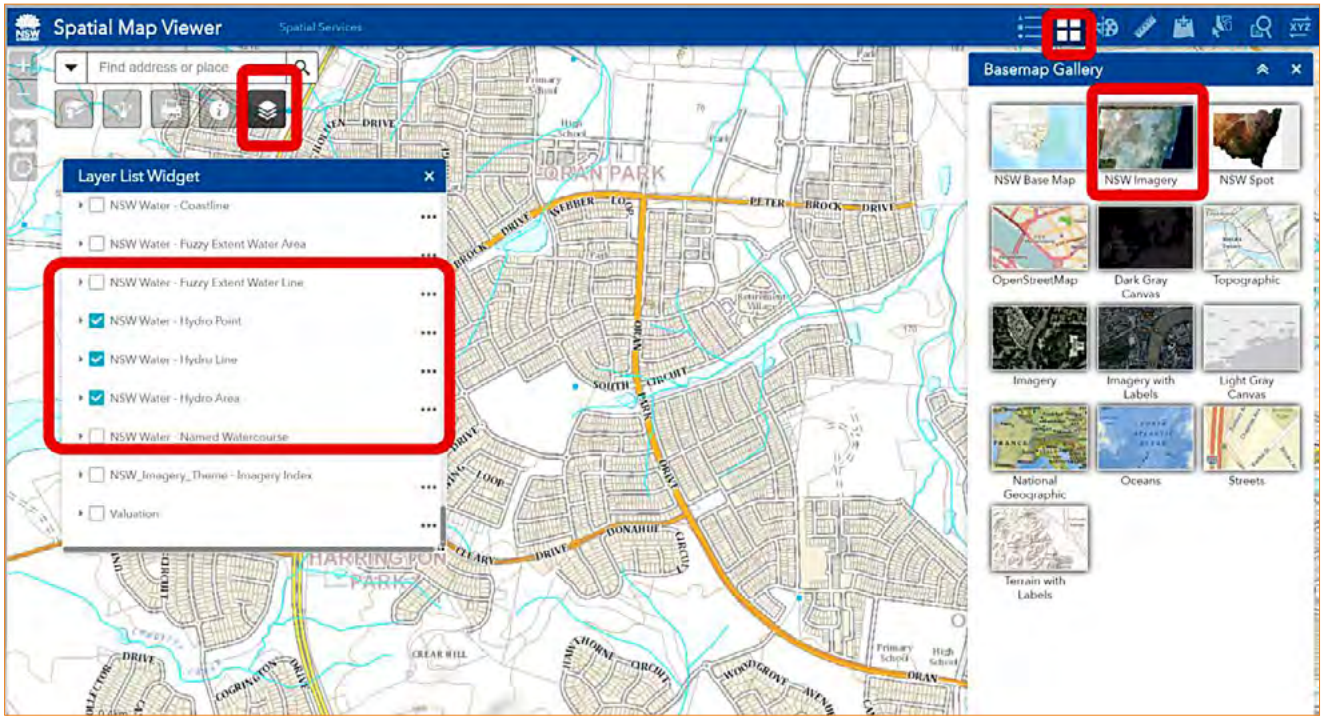
Figure 3: Waterway walk Kolombo Creek Oran Park community brochure.

I visited the catchment area to take photographs and assess the risk associated with conducting fieldwork during a pandemic. I used my observations to create my risk assessment and used my photographs to produce the fieldwork student booklet and presentation for pre and post excursion activities.

Mapwork

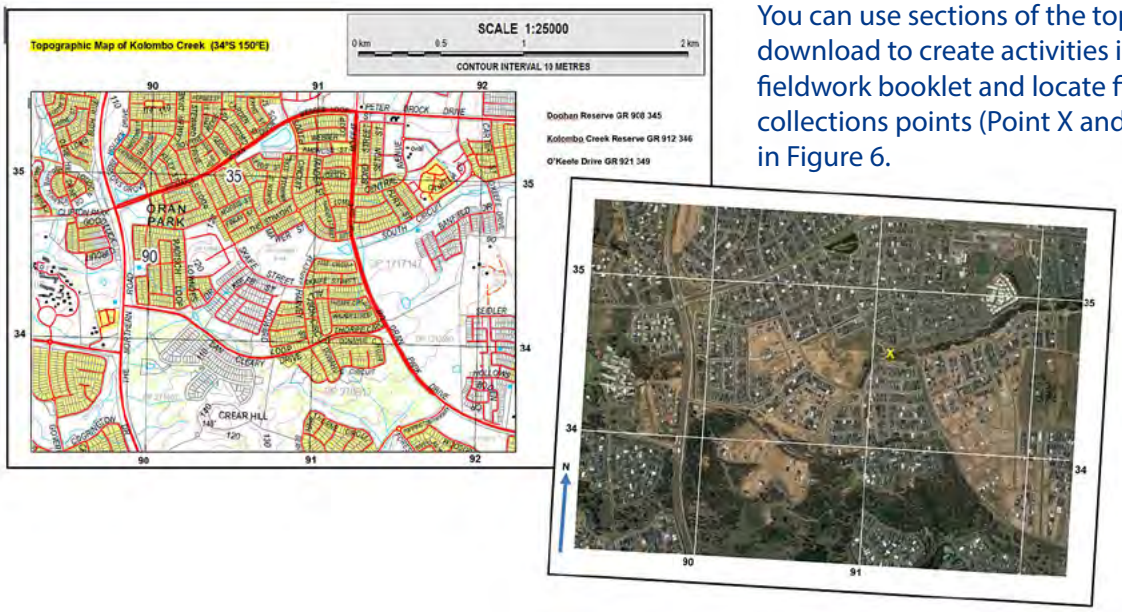
Students needed to be able to familiarise themselves with topographic maps of the area to understand the importance of contour lines in determining topography and predicting where water will flow in the catchment. I used Spatial Map Viewer to visualise where the water moved through the catchment ensuring I selected the 'Hydo' widgets and changed to the NSW Imagery satellite image, as noted in Figure 4. These are great maps to show watercourses in an area.

Figure 4: Spatial Map Viewer with Layer List Widgets and Basemap Gallery.



Selecting the GeoPDF Download Layer List Widget, I downloaded the topographic map of the region to create a screenshot of the catchment area. With this download, I created a customised topographic map of the area, including a screenshot of google maps of the same area for the reverse side. I added additional grid squares, adding eastings and northings, so students could easily locate features on the map, using area and grid references. A class set of A4 laminated maps of the local area is an invaluable resource that can be used in a variety of Geography lessons.

Figure 5: Create customised maps of your local area



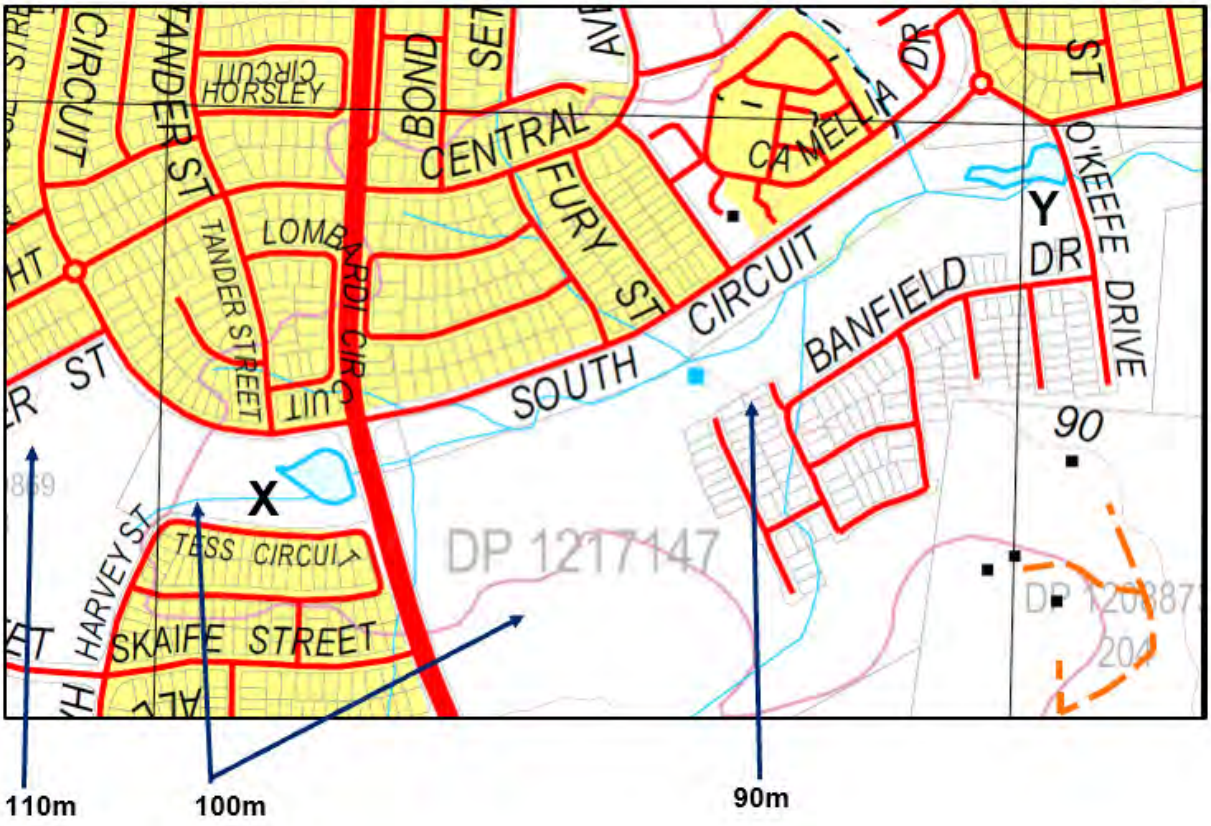
You can use sections of the topographic map download to create activities in the student fieldwork booklet and locate fieldwork data collections points (Point X and Point Y) as seen in Figure 6.

Figure 6: Map used in the fieldwork booklet

Kolombo Creek Fieldwork

Student name:	Class:

1. Label: Kolombo Creek, Kolombo Reserve, Doohan Reserve, Oran Park Drive



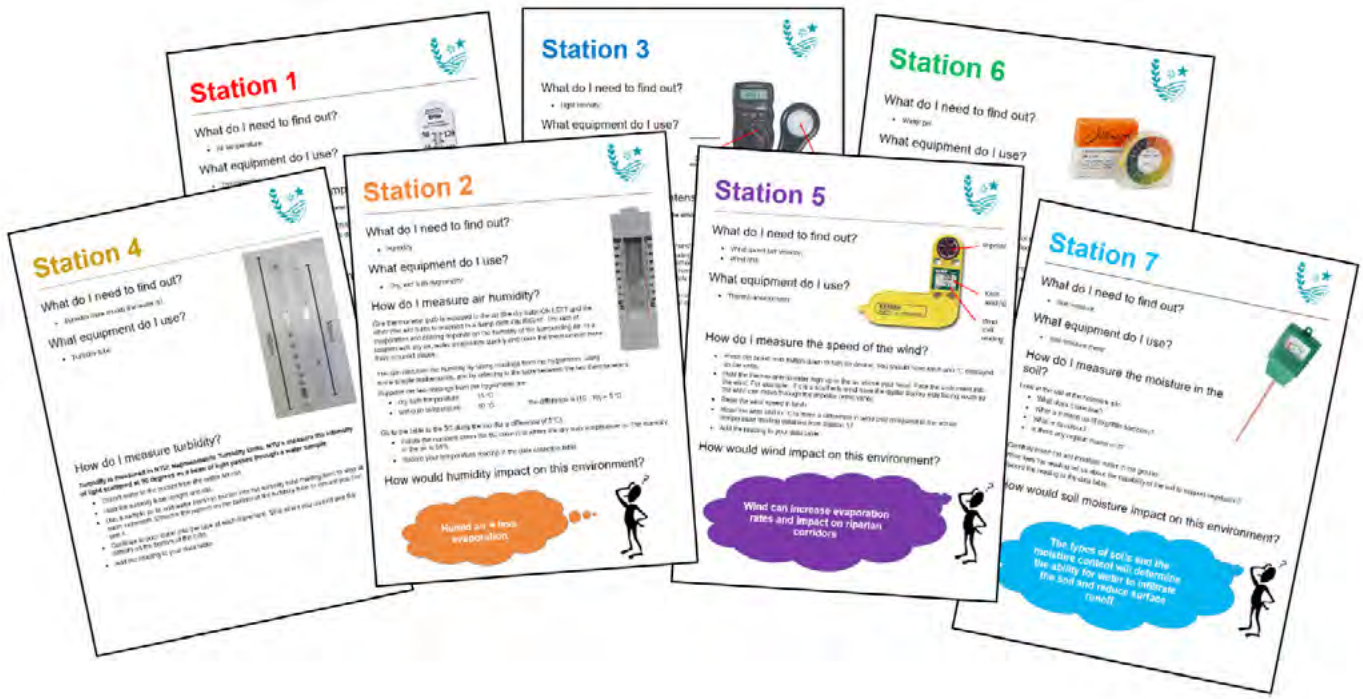
**More streets have been added to this map. These include Lillywhite Cct, Loveday St, Richmond Rd, Rowan St and Peckham Grove.

2. Explain how storm water moves through this catchment area.

Fieldwork instruments

I created simple fieldwork guides to assist students in collecting fieldwork data whilst promoting independent learning. Students moved through a rotation to collect fieldwork data at each fieldwork station (Figure 7). To ensure safety, I used large snap-lock bags to carry the fieldwork guide and equipment. Included in each bag were anti-bacterial wipes to clean equipment after each use. Working in a HSIE faculty, it was crucial to have create quick reference guides for each fieldwork activity, to take pressure off 'out of field' teachers.

Figure 7: Fieldwork guides



The fieldwork activities asked for students to take measurements at two locations. Students were required to collect fieldwork data at Point X and Point Y. This was to determine if water quality improved after moving through the wetland area. Students entered fieldwork measurements in their student booklet (Figure 8) and could make a judgement, based on criteria (fieldwork data), to evaluate the effectiveness of the water management strategies at Kolombo Creek.

Background Information

From the Editor: The Kolombo Creek strategies are an example of Water Sensitive Urban Design. The benefits can be seen in this diagram.

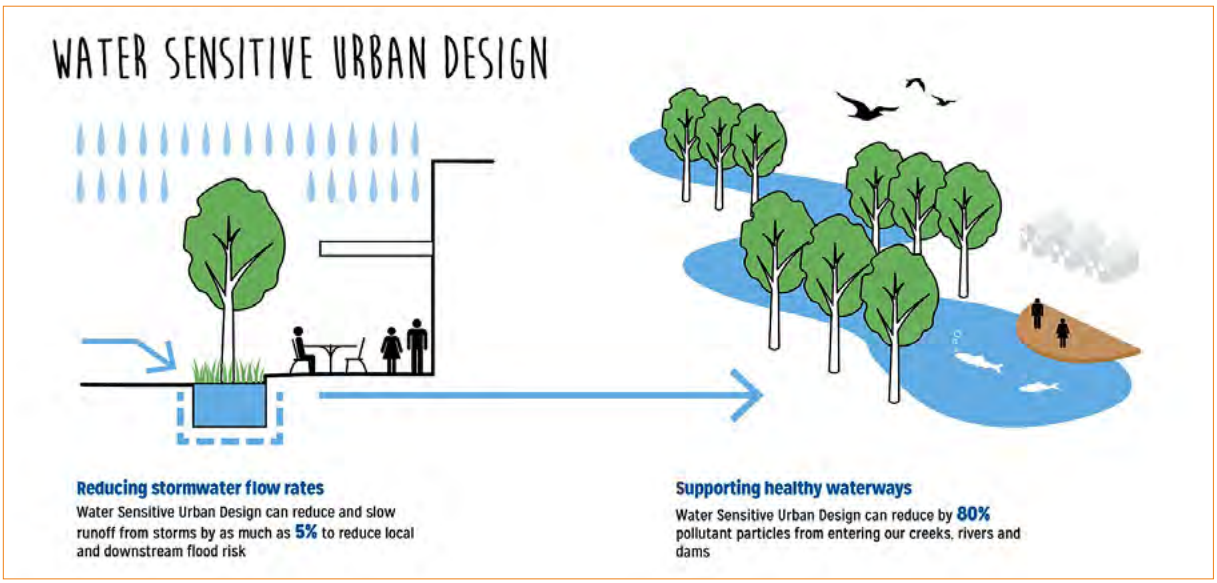


Figure 8: Fieldwork data table

Fieldwork data collection – Point X

6. Use the fieldwork equipment to complete the table at Point X. Point X is located on the map on page 1 of the booklet.

Location 1: Kolombo Creek Reserve – Point X

Data collection	Equipment	Explanation	Measurement
Air temperature	Thermometer	Measurement in °C	
Humidity	Hygrometer	Measured as a percentage %	
Light	Light meter	Measured in LUX	
Turbidity	Turbidity tube	Measured in NTU	
Wind speed and direction	Anemometer	Measured in km/h and (N,S,E,W)	
Water pH	Universal indicator paper	Measured pH (6.8 – 7.4 is healthy water)	
Soil moisture	Soil moisture meter	Measured from level 1-10	

Figure 9: Fieldwork activity, describing management strategies at Kolombo Creek

Storm water management in Kolombo Reserve

There are several management strategies that have been out into place in the Kolombo Creek catchment.

8. Describe the storm water management strategies that are in operation at Kolombo Creek and how they work

Zone	How it works
	Inlet zone
	Macrophyte zone
	Open water zone

Students conducting fieldwork

Figure 10: Students using the fieldwork guide and compass to determine direction.

Figure 11: Using a turbidity tube to measure turbidity of the stormwater.

Figure 12: Using universal indicator paper to determine stormwater pH level.

Assessment

Students were required to write an extended response, using stimulus material to answer the following question:

> "If left unmanaged stormwater can pollute waterways, cause erosion, sedimentation and increase flooding".
> **Explain** how stormwater is managed at Kolombo Creek and **evaluate** the effectiveness of the management strategies implemented in the catchment.

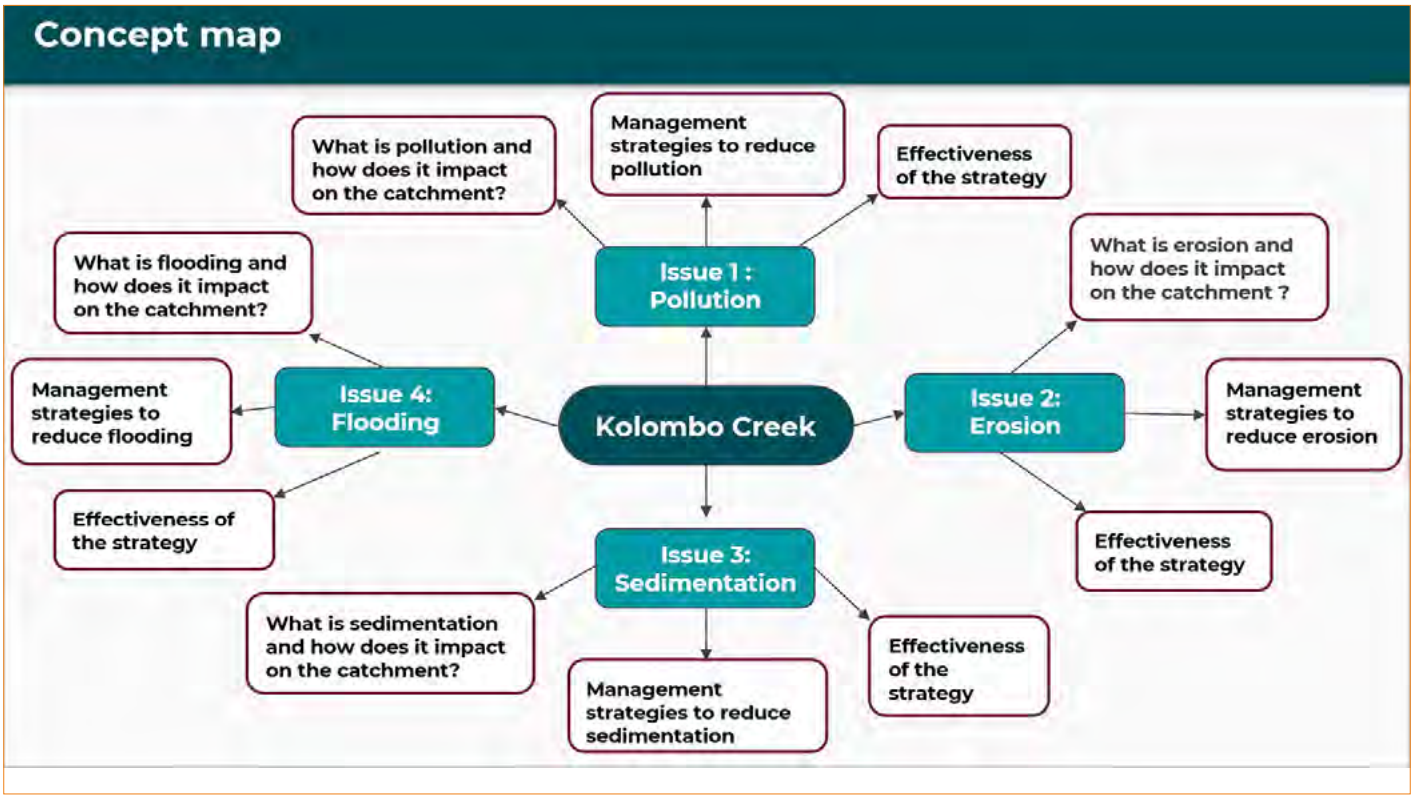
Marking guidelines

CRITERIA	GRADE
• Clearly describes a variety of stormwater issues • Demonstrates a comprehensive understanding of how water is managed • Clearly determines the value of the strategies • Integrates relevant stimulus materials provided, where appropriate • Presents a sustained, logical and cohesive response using appropriate geographical information, ideas, terms and concepts	**A**
• Describes a variety of stormwater issues • Demonstrates a well-developed understanding of how storm water is managed • Determines the value of the strategies • Refers to relevant stimulus material provided • Presents a logical response using appropriate geographical information, ideas, terms and concepts	**B**
• Describes some stormwater issues • Demonstrates a sound understanding of how stormwater is managed • Provides characteristics and features of the management strategies • Refers to the stimulus material provided • Presents a structured response using appropriate geographical information	**C**
• Outlines some stormwater issues • Demonstrates some understanding of how stormwater is managed and/ or management strategies • May refer to stimulus material provided • Uses some geographical information	**D**
• Identifies some stormwater issues • Demonstrates a basic understanding of how stormwater is managed and/or management strategies	**E**

Strategies to support student learning for this task

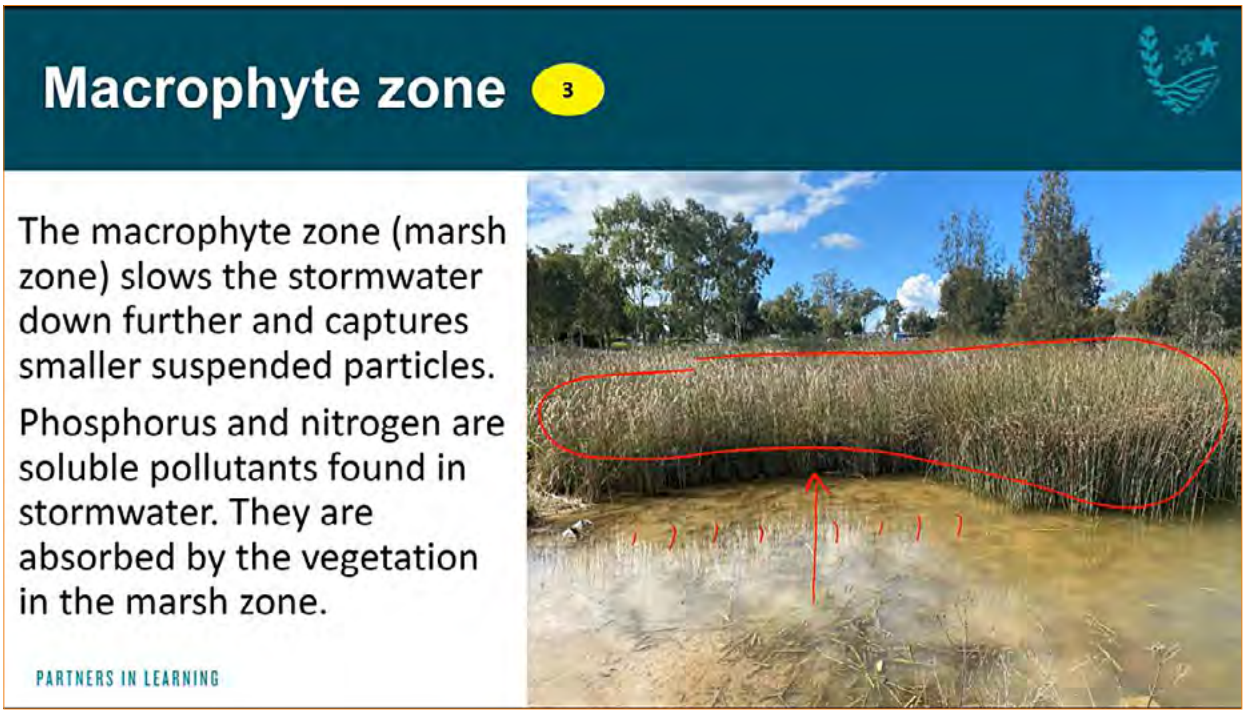
Graphic organiser

Figure 13: Concept map for students to visualise their ideas in graphic form



Audio and video recording

I created a video presentation with annotations using maps, images and my photographs from the fieldwork site to explain key points. This was useful for any students who did not attend the fieldwork and for students to watch if they missed any key information in the field. The video was a vital tool for students who needed more time to process information as they could view the video in their own time, to prepare their response.



Writing scaffold

PARAGRAPHS	PARAGRAPH CONTENT
Paragraph 1 Introduction	• What is stormwater • Why is stormwater an issue • Why does stormwater impact on urban areas • Introduce Kolombo Creek Catchment (KCC) (location, features, topography) • Outline the four **issues** that are associated with stormwater at KCC and the need for **effective** strategies to **manage** the catchment.
Paragraph 2 Pollution	• What is **pollution** • Types of pollution in stormwater • The impact of pollution on catchment areas • How is pollution **managed** at the KCC • How **effective** is the management strategies in reducing pollution in the KCC
Paragraph 3 Erosion	• What is **erosion** • How does erosion occur in a catchment area • What is the impact of erosion in catchment areas • How is erosion **managed** at KCC • How **effective** is the management strategies in reducing erosion in the KCC
Paragraph 4 Sedimentation	• What is **sedimentation** • How does sedimentation occur in stormwater • What is the impact of sedimentation in catchment areas • How is sedimentation **managed** at KCC • How **effective** is the management strategies in reducing sedimentation in the KCC
Paragraph 5 Flooding	• What is **flooding** • Why does flooding occur in an urban catchment area like KCC • What are the impacts of flooding in an urban creek environment • How is flooding **managed** at the KCC • How **effective** are the management strategies in reducing floods in the KCC
Paragraph 6 Conclusion	• Conclude, bringing together all the **issues** that urban stormwater brings to a catchment area and how they are **managed**. Draw conclusions on the **effectiveness** of the management strategies that are implemented in the KCC.

Stimulus material

Stimulus was provided in the writing booklet as a visual cue to assist with recalling geographical information and to support writing development. The material proved to be an essential component providing support for poorer performing students. All students, regardless of ability experienced some success as they could demonstrate some understanding of the stimulus material in relation to the catchment area and stormwater. In addition, the stimulus material provided high performing students with the ability to apply their geographical knowledge of the stimulus and incorporate the images into their response.

Figure 15: Stimulus material provided to support student writing

Figure A: South Creek catchment

Figure B: Gross pollutant trap, Kolombo Reserve, Oran Park

Figure C: Proposed Doohan Reserve, Oran Park

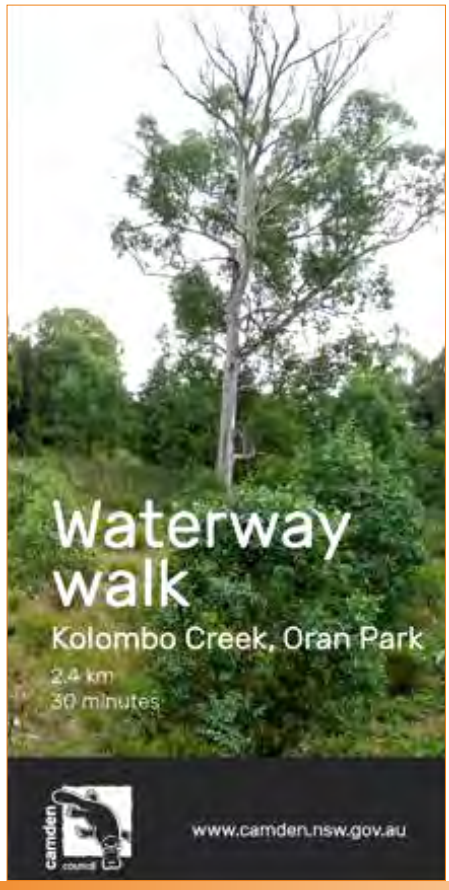


Figure E: Waterways walk brochure educating Oran Park residents about managing local waterways

Figure D: Pollution in the macrophyte zone, Kolombo Reserve, Oran Park

References

COVID-19 Health advice for NSW Department schools – https://education.nsw.gov.au/covid-19/advice-for-families#School3

Google maps – https://www.google.com/maps

SES Flooding in the Hawkesbury-Nepean Valley lesson activities – https://www.ses.nsw.gov.au/for-schools/secondary/water-in-the-world/

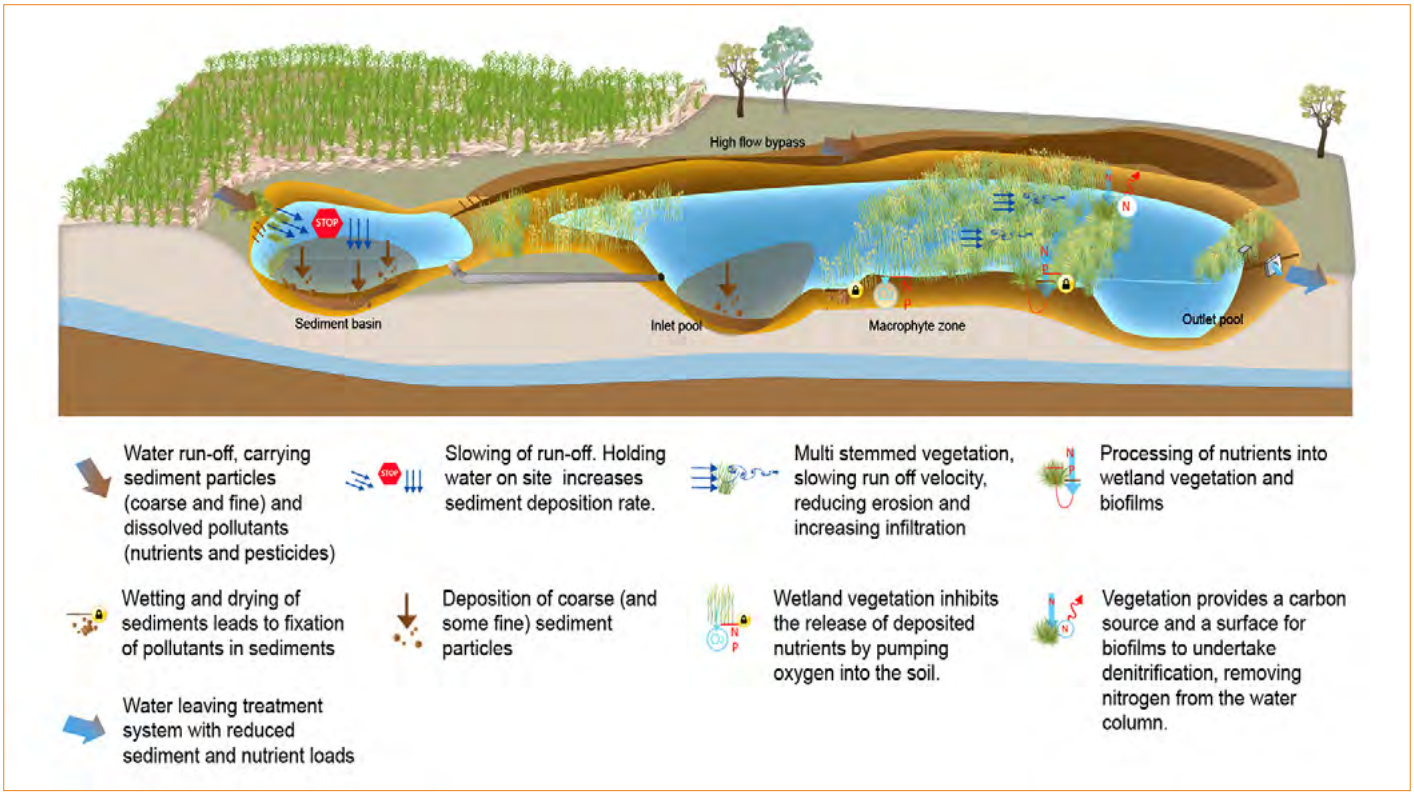
Waterway walk – Kolombo Creek Guide – https://www.camden.nsw.gov.au/environment/waterways/

Spatial Map Viewer – https://portal.spatial.nsw.gov.au/portal/apps/webappviewer/index.html?id=44e72c6c7ccf498cb1c822b740c647d3

Oran Park High School website – https://oranpark-h.schools.nsw.gov.au/gallery/year-8-geography-fieldwork-excursion-.html

Background information

From the Editor: Features of a constructed wetland

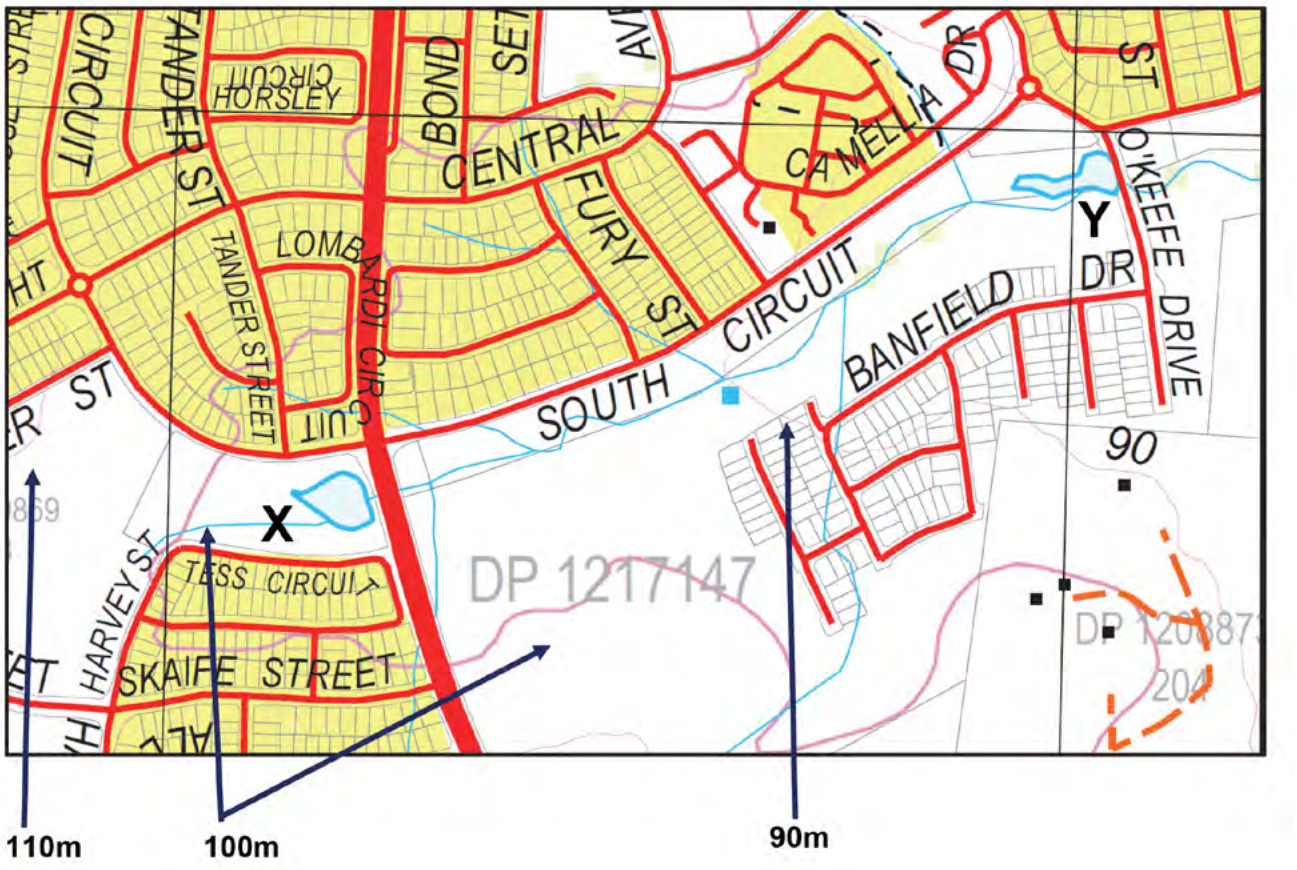


Source: https://wetlandinfo.des.qld.gov.au/wetlands/management/treatment-systems/for-agriculture/treatment-sys-nav-page/constructed-wetlands/links-and-references.html

Kolombo Creek Fieldwork Workbook

Student name: **Class:**

1. Label: Kolombo Creek, Kolombo Reserve, Doohan Reserve, Oran Park Drive



** More streets have been added to this map. These include Lillywhite Cct, Loveday St, Richmond Rd, Rowan St and Peckham Grove.

2. Explain how storm water moves through this catchment area.

Kolombo Creek Fieldwork

Stormwater

Rain that falls on urban surfaces, such as driveways, roads and footpaths, is known as stormwater. Stormwater can also be called urban runoff. Stormwater picks up litter, sediment, oils, and nutrients as it travels and washes these pollutants into our waterways. The pollutants can affect plants and animals and make the environment look unsightly. The increase in urban areas leads to more hard surfaces like concrete and asphalt which can also increase the amount of stormwater running into local waterways, affecting the water quality. Therefore, it is critical that stormwater is managed effectively in catchment areas, slowing down the movement of water in catchment areas by constructing wetlands, using Water Sensitive Urban Design (WSUD).

Concrete stormwater canal

Constructed wetland using WSUD

In the past, stormwater was managed by building large concrete canals. These structures were unsightly and had many disadvantages. Innovative urban design has resulted in storm water being managed differently, encompassing water sensitive urban design principles.

3. List some advantages and disadvantages of storm water canals and constructed wetlands.

Storm water canals

Advantages	Disadvantages

Constructed wetlands

Advantages	Disadvantages

Kolombo Creek Fieldwork

The Kolombo Creek Catchment

The Kolombo Creek catchment (photographed) has undergone significant urban change since 2010. Kolombo Creek enters into the South Creek catchment east of Oran Park, near Catherine Field. The Kolombo Creek area is one of the lowest elevations in Oran Park. The higher land at Doohan Reserve (110 metres) drains into Kolombo Creek in the western section of Kolombo Reserve.

View of the Kolombo Creek catchment from Kolombo Reserve, 2020

Source: F Farah, Oran Park High School

4. Describe the catchment you can see at Point X on the map on page 1 of the booklet.

   What can be seen to the north, south, east and west? What is the shape of the land? Describe the built (human) features in the area. How is the area used by people? Describe the natural features of this area.

Kolombo Creek Fieldwork

Mapping

5. Using the compass to determine where north is in the landscape. Draw a map of the catchment area in Kolombo Reserve. Make sure you have BOLTS on your map, Oran Park Drive, South Circuit and Tess Circuit.

Map of .....

Key

Kolombo Creek Fieldwork

Fieldwork data collection – Point X

6. Use the fieldwork equipment to complete the table at Point X. Point X is located on the map on page 1 of the booklet.

Location 1: Kolombo Creek Reserve – Point X

DATA COLLECTION	EQUIPMENT	EXPLANATION	MEASUREMENT
Air temperature	Thermometer	Measurement in °C	
Humidity	Hygrometer	Measured as a percentage %	
Light	Light meter	Measured in LUX	
Turbidity	Turbidity tube	Measured in NTU	
Wind speed and direction	Anemometer	Measured in km/h and (N,S,E,W)	
Water pH	Universal indicator paper	Measured pH (6.8 – 7.4 is healthy water)	
Soil moisture	Soil moisture meter	Measured from level 1–10	

Kolombo Creek Fieldwork

Gross pollution trap

Gross Pollutant Traps (GPTs) are filters that catch stormwater pollution before it has a chance to enter waterways. GPTs catch most of the litter and silt and are emptied on a regular basis and sent to landfill.

Gross pollutant trap on Tess Circuit, Oran Park, 2020

7. What does a GPT NOT catch? How can this impact on the catchment or Kolombo Creek and South Creek?

Kolombo Creek Fieldwork

Storm water management in Kolombo Reserve

There are several management strategies that have been out into place in the Kolombo Creek catchment.

8. Describe the storm water management strategies that are in operation at Kolombo Creek and how they work.

ZONE	HOW IT WORKS
	Inlet zone
	Macrophyte zone
	Open water zone

Kolombo Creek Fieldwork

Riparian corridors

A riparian corridor is the vegetated areas that surround Kolombo Creek. The plants in this area are tolerant of waterlogged soils and provide important local habitat for wildlife, including birds and lizards. Riparian corridors stabilise the creek bank and help to remove nutrients from the water. They provide important shade and act to cool the local area.

Riparian corridor adjacent to Kolombo Creek, Oran Park, 2020

Source: F Farah, Oran Park High School

9. Explain the importance of the riparian corridor at Kolombo Creek.

Kolombo Creek Fieldwork

Raingardens

Raingardens are vegetated areas in catchment areas that capture urban runoff (stormwater) before it can reach Kolombo Creek. Raingardens have special soils that remove nutrients and heavy metals from the storm water. Heavy metals wash from car tires, car exhausts and road surfaces and can impact on water quality. When raingardens get too full, water flows into a detention basin that slowly releases treated water into Kolombo Creek.

Raingarden adjacent South Circuit and Grice Street, Oran Park, 2020

Source: F Farah, Oran Park High School

10. Explain the importance of the raingardens at Kolombo Creek.

Kolombo Creek Fieldwork

Fieldwork data collection – Point Y

11. Use the fieldwork equipment to complete the table at Point Y. Point Y is located on the map on page 1 of the booklet.

Location 2: O'Keefe Drive Bridge – Point Y

DATA COLLECTION	EQUIPMENT	EXPLANATION	MEASUREMENT
Air temperature	Thermometer	Measurement in ºC	
Humidity	Hygrometer	Measured as a percentage %	
Light	Light meter	Measured in LUX	
Turbidity	Turbidity tube	Measured in NTU	
Wind speed and direction	Anemometer	Measured in km/h and (N,S,E,W)	
Water pH	Universal indicator paper	Measured pH (6.8 – 7.4 is healthy water)	
Soil moisture	Soil moisture meter	Measured from level 1–10	

12. Compare and contrast the measurements from Point X and Point Y. How would changes in these measurements impact on the environment and the water cycle at Point X and Point Y?

HSIE Faculty
Year 8 Geography Assessment Task 1, Term 3 2020

STUDENT NAME ..... CLASS .....

DETAILS

Topic: Water in the World

Due date:

- **8A –** Wednesday 16 September, Period 2
- **8E –** Thursday 17 September, Period 2
- **8G –** Friday 18 September, Period 2
- **8D –** Friday 18 September, Period 3

Date of issue:

- **8A –** Wednesday 2 September, Period 2
- **8E –** Thursday 3 September, Period 2
- **8G –** Friday 4 September, Period 2
- **8D –** Friday 4 September, Period 3

TASK DESCRIPTION

This term in Geography, you have been studying the topic, Water in the World.

In this unit, you have been learning about catchment areas and how we can manage all aspects of water effectively.

In-class task – For your assessment task you are required to write an extended response, using stimulus material to answer the following question:

"If left unmanaged stormwater can pollute waterways, cause erosion, sedimentation and increase flooding".

Explain how stormwater is managed at Kolombo Creek and **evaluate** the effectiveness of the management strategies implemented in the catchment.

You have been provided with the opportunity to engage in fieldwork and visit Kolombo Creek, Oran Park. Use your fieldwork student booklet and the Kolombo Creek video presentation (in Microsoft Teams) to help you prepare for your task.

NESA TERMINOLOGY

Explain – relate cause and effect; make the relationships between things evident; provide why/and/ or how.

Evaluate – make a judgement based on criteria; determine the value of.

HSIE Faculty – Year 8 Geography Assessment Task 1

MARKING CRITERIA

You will be assessed on how well you:

- demonstrate knowledge and understanding of the management of stormwater at Kolombo Creek, Oran Park
- refer to stimulus where appropriate
- process geographical information such as maps, photographs and fieldwork notes
- present a logical and cohesive response using appropriate geographical terminology

OUTCOMES TO BE ASSESSED

GE4-1 – locates and describes the diverse features and characteristics of a range of 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

GE4-8 – communicates geographical information using a variety of strategies

SUBMISSION INSTRUCTIONS

You are encouraged to prepare a response in advance using the scaffold provided, your fieldwork student booklet and the Kolombo Creek presentation. You will complete your task during your designated Geography lesson. **Notes will not be permitted in the assessment task.**

What do I do if I am absent?

If you are absent the day of an assessment task or examination, you MUST:

- report to the teacher or head teacher of the faculty on the first day of return to school
- supply a suitable explanation e.g. letter, doctors certificate

The Head Teacher will decide and advise you whether:

- you will sit for a substitute task, OR
- can submit the task late, OR
- be given an estimate, OR
- the task will be recorded as a Non-Attempt

HSIE Faculty – Year 8 Geography Assessment Task 1

MARKING GUIDELINES

CRITERIA	GRADE
– Clearly demonstrates a variety of stormwater issues – Demonstrates a comprehensive understanding of how water is managed – Clearly determines the value of the strategies – Integrates relevant stimulus materials provided, where appropriate – Presents a sustained, logical and cohesive response using appropriate geographical information, ideas, terms and concepts	A
– Describes a variety of stormwater issues – Demonstrates a well-developed understanding of how storm water is managed – Determines the value of the strategies – Refers to relevant stimulus material provided – Presents a logical response using appropriate geographical information, ideas, terms and concepts	B
– Describes some stormwater issues – Demonstrates a sound understanding of how stormwater is managed – Provides characteristics and features of the management strategies – Refers to the stimulus material provided – Presents a structured response using appropriate geographical information	C
– Outlines some stormwater issues – Demonstrates some understanding of how stormwater is managed and/ or management strategies – May refer to stimulus material provided – Uses some geographical information	D
– Identifies some stormwater issues – Demonstrates a basic understanding of how stormwater is managed and/or management strategies	E

HSIE Faculty – Year 8 Geography Assessment Task 1

SCAFFOLDS

A scaffold to help you set out your ideas

ISSUES	**Management** strategies (water sensitive urban design)	**Effectiveness** of the strategies
pollution		
erosion		
sedimentation		
flooding		

A writing scaffold to help you structure your extended response

PARAGRAPHS	**Paragraph content**
Paragraph 1 **Introduction**	– What is stormwater – Why is stormwater an issue – Why does stormwater impact on urban areas – Introduce Kolombo Creek Catchment (KCC) (location, features, topography) – Outline the four **issues** that are associated with stormwater at KCC and the need for **effective** strategies to **manage** the catchment
Paragraph 2 **Pollution**	– What is **pollution** – Types of pollution in stormwater – The impact of pollution on catchment areas – How is pollution **managed** at the KCC – How **effective** is the management strategies in reducing pollution in the KCC
Paragraph 3 **Erosion**	– What is **erosion** – How does erosion occur in a catchment area – What is the impact of erosion in catchment areas – How is erosion **managed** at KCC – How **effective** is the management strategies in reducing erosion in the KCC

HSIE Faculty – Year 8 Geography Assessment Task 1

Paragraph 4 **Sedimentation**	– What is **sedimentation** – How does sedimentation occur in stormwater – What is the impact of sedimentation in catchment areas – How is sedimentation **managed** at KCC – How **effective** is the management strategies in reducing sedimentation in the KCC
Paragraph 5 **Flooding**	– What is **flooding** – Why does flooding occur in an urban catchment area like KCC – What are the impacts of flooding in an urban creek environment – How is flooding **managed** at the KCC – How **effective** are the management strategies in reducing floods in the KCC
Paragraph 6 **Conclusion**	– Conclude, bringing together all the **issues** that urban stormwater brings to a catchment area and how they are **managed**. Draw conclusions on the **effectiveness** of the management strategies that are implemented in the KCC.

FEEDBACK

Areas where you have performed well.
Areas where you need to improve.
Strategies to help you improve.

Oran Park High School Year 8 Geography Task 1

STUDENT NAME ..... CLASS .....

In class writing task – 50 mins

Stimulus material

Figure 1: South Creek catchment.

Figure 2: Gross pollutant trap, Kolombo Reserve, Oran Park.

Figure 4: Pollution in the macrophyte zone, Kolombo Reserve, Oran Park

Figure 3: Proposed Doohan Reserve, Oran Park

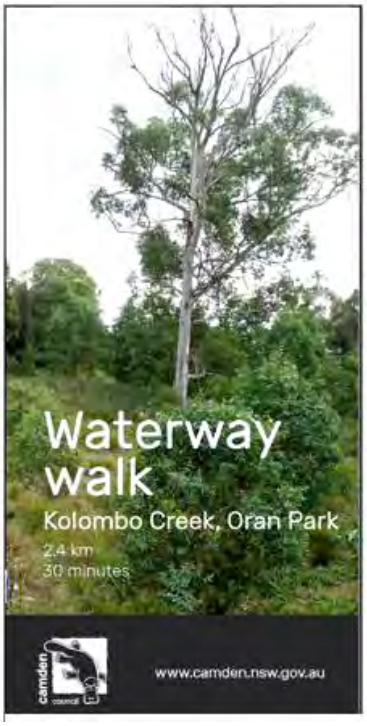


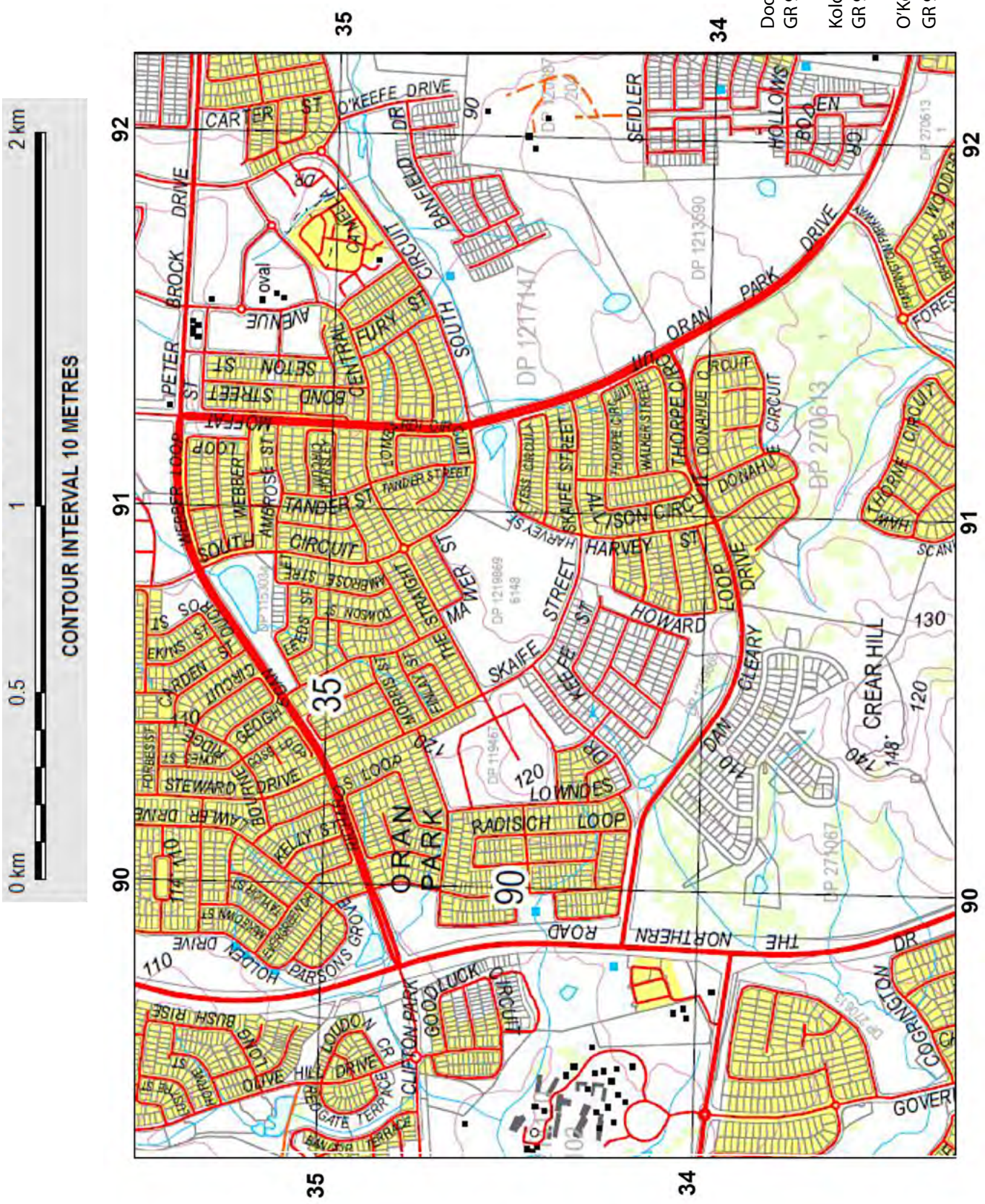
Figure 5: Waterway walk brochure. Educating Oran Park residents about managing local waterways

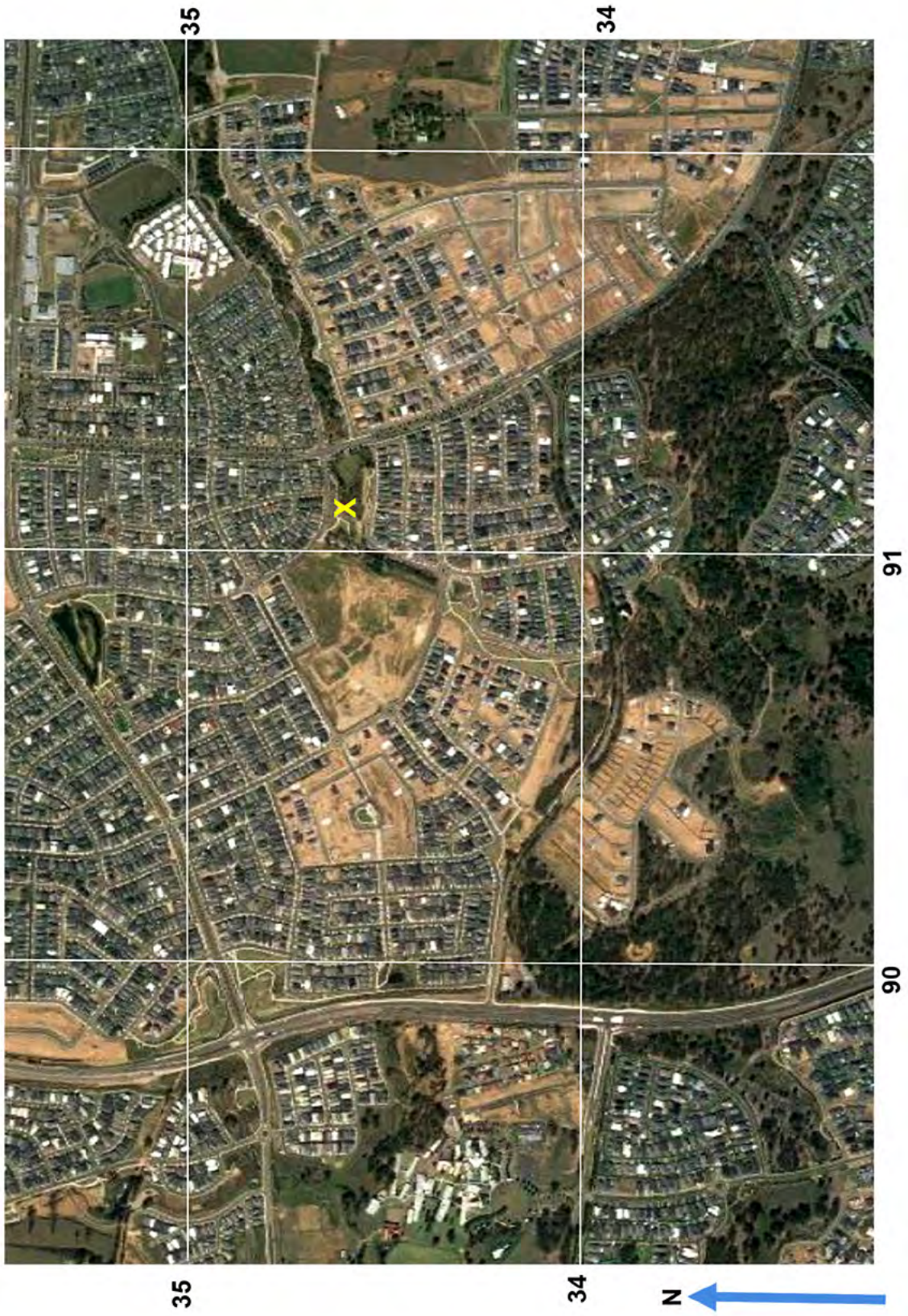
Question

"If left unmanaged stormwater can pollute waterways, cause erosion, sedimentation and increase flooding".

Explain how stormwater is managed at Kolombo Creek and evaluate the effectiveness of the management strategies implemented in the catchment

Topographic Map of Kolombo Creek (34°S 150°E)

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Fieldwork equipment

Station 1

What do I need to find out?

- Air temperature.

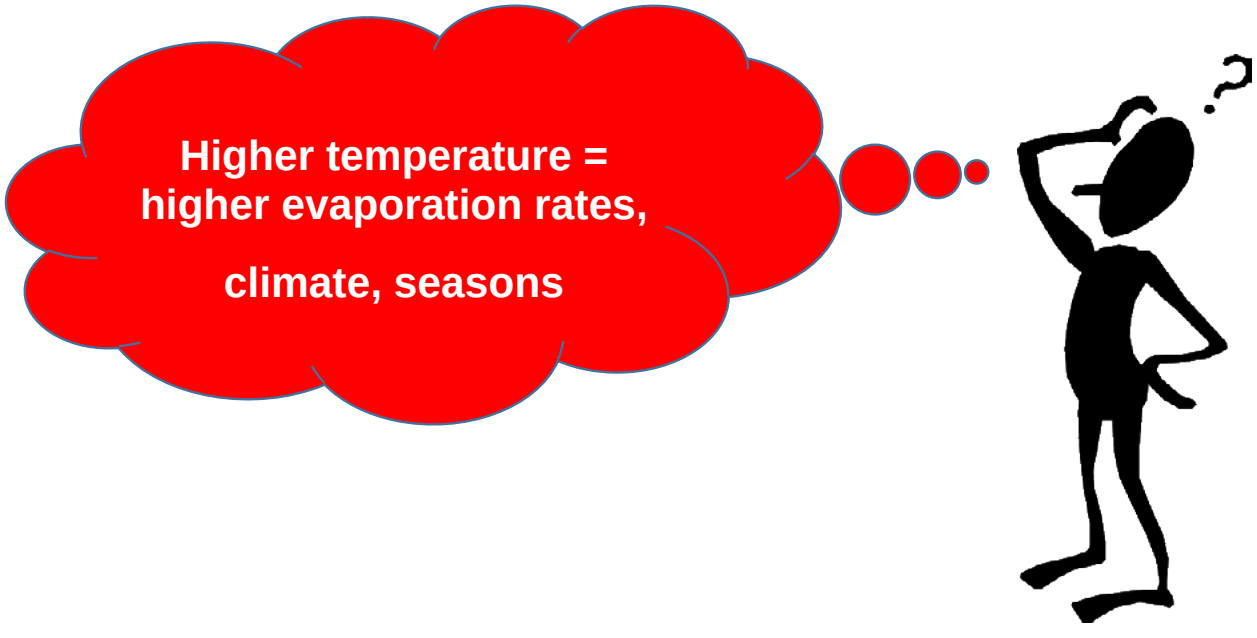
What equipment do I use?

- Thermometer.

How do I measure air temperature?

- One team member holds the thermometer upright in a stationary position for 3 minutes.
- Temperature is measured in degrees celsius ºC
- Record your temperature reading in the data collection table.

How would temperature impact on this environment?



Fieldwork equipment

Station 2

What do I need to find out?

- Humidity

What equipment do I use?

- Dry, wet bulb hygrometer

How do I measure air humidity?

One thermometer bulb is exposed to the air (the dry bulb) ON LEFT and the other (the wet bulb) is wrapped in a damp cloth ON RIGHT. The rate of evaporation and cooling depends on the humidity of the surrounding air. In a location with dry air, water evaporates quickly and cools the thermometer more than in humid places.

You can calculate the humidity by taking readings from the hygrometer, using some simple mathematics, and by referring to the table between the two thermometers.

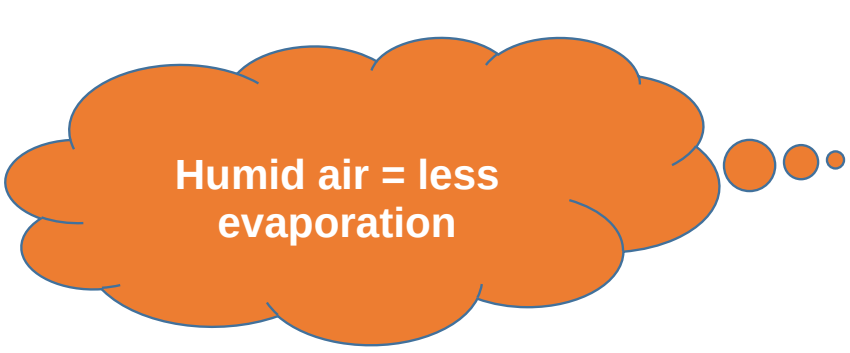
Suppose the two readings from the hygrometer are:

- dry bulb temperature: 15 °C
- wet-bulb temperature: 10 °C the difference is (15 - 10) = 5 °C

Go to the table to the 5C along the top (for a difference of 5°C).

- Follow the numbers down the 5C column to where the dry bulb temperature is. The humidity in the air is 54%.
- Record your temperature reading in the data collection table.

How would humidity impact on this environment?



Fieldwork equipment

Station 3

What do I need to find out?

- Light intensity

What equipment do I use?

- Light meter

How do I measure light intensity?

LUX: Lux is the metric unit for measuring the amount of light that falls on an object.

- Take the cover off the light sensor
- +-
- Hold the light sensor in the palm of your hand with the light sensor facing upwards.
- Turn the dial to 200. If you get an 'OL' reading, switch the dial to 2000. If you get a reading at this level, write it down in the data collection table. If you are still getting an 'OL' reading, it means that the light is too bright and you have to switch the dial up to 20,000 (x10). If you get a reading now, write it down and multiply the number by 10. Add your reading to your data table
- If you are still getting a 'OL' reading, switch to the highest dial. Record that reading and multiply it by 100. Add your reading to your data table.
- Replace the cover on the light sensor.
- Switch the dial back to OFF

What does this all mean?

Range display multipliers

Range	Units	Multiplier
200	Lux	Direct reading
2 000	Lux	Direct reading
20 000	Lux	Reading x 10
50 000	Lux	Reading x 100

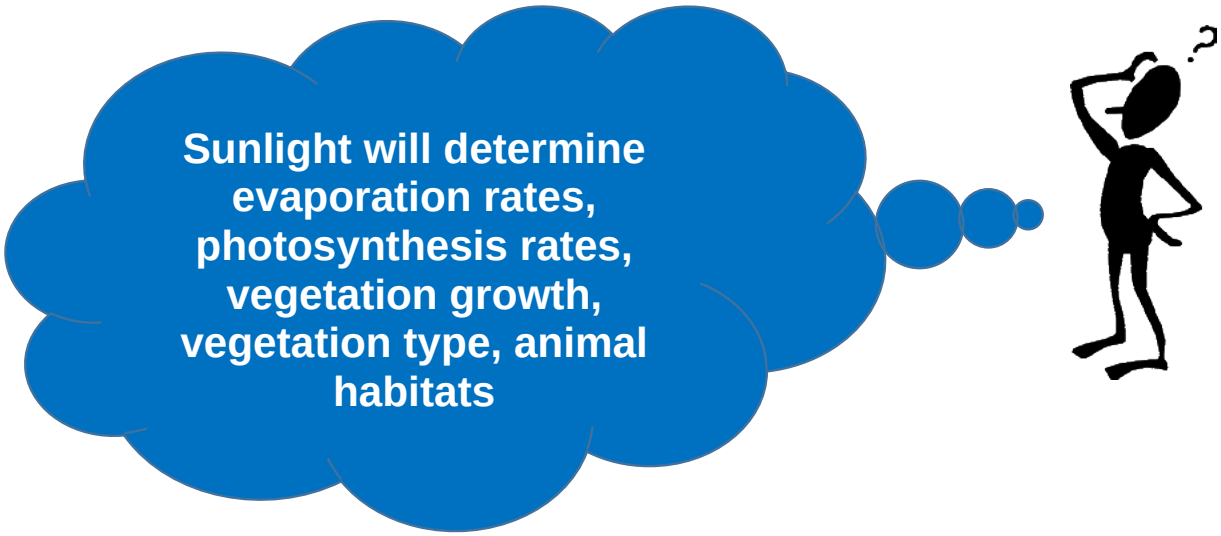
Fieldwork equipment

For example: Here is a copy of my data collection at 4pm in the afternoon outside, but not in direct sunlight. My readings are as follows:

Dial range	Units	Multiplier	My readings
200	Lux	Direct reading	'OL'
2 000	Lux	Direct reading	1088 lux
20 000	Lux	Reading x 10	108 lux
50 000	Lux	Reading x 100	10 lux

- I turned on the light meter dial to 200 and did not get a reading (OL)
- I then switched the dial to 2000 and recorded 1088 Lux (a direct reading)
- I then wanted to check if I would get a reading at 20 000 and got 108 lux. Multiplied by 10 = 1080 lux
- I then checked the reading with the dial turned to 50 000 and got a lux reading of 10. Multiplied by 100 = 1000 lux
- My second reading is the most accurate. Making your way up the dial, go with the first reading that the 'OL' is not displayed.

How would light impact on this environment?



Fieldwork equipment

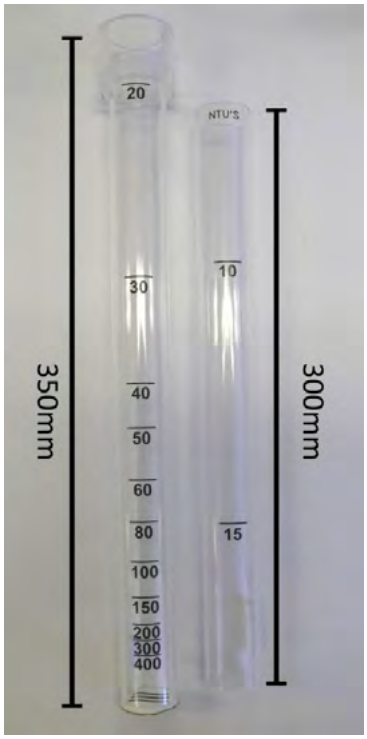
Station 4

What do I need to find out?

- Turbidity (how muddy the water is)

What equipment do I use?

- Turbidity tube



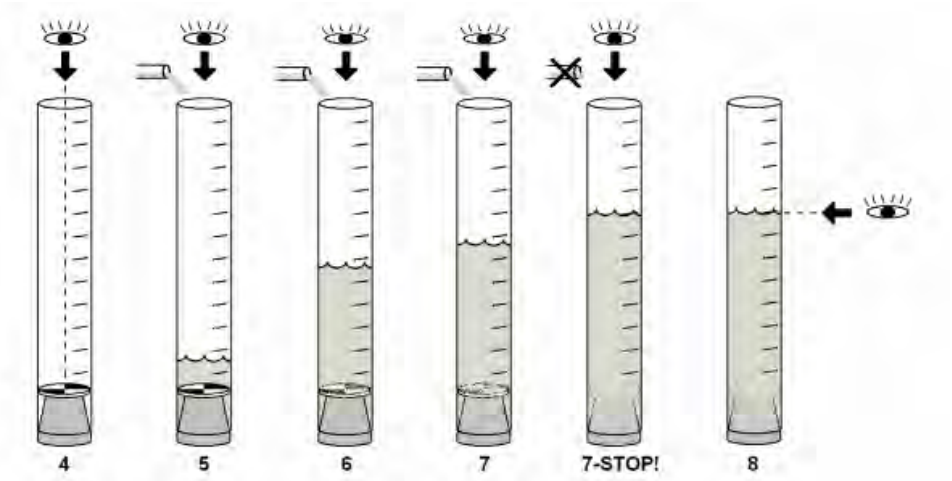
How do I measure turbidity?

Turbidity is measured in NTU: Nephelometric Turbidity Units. NTU's measure the intensity of light scattered at 90 degrees as a bean of light passes through a water sample.

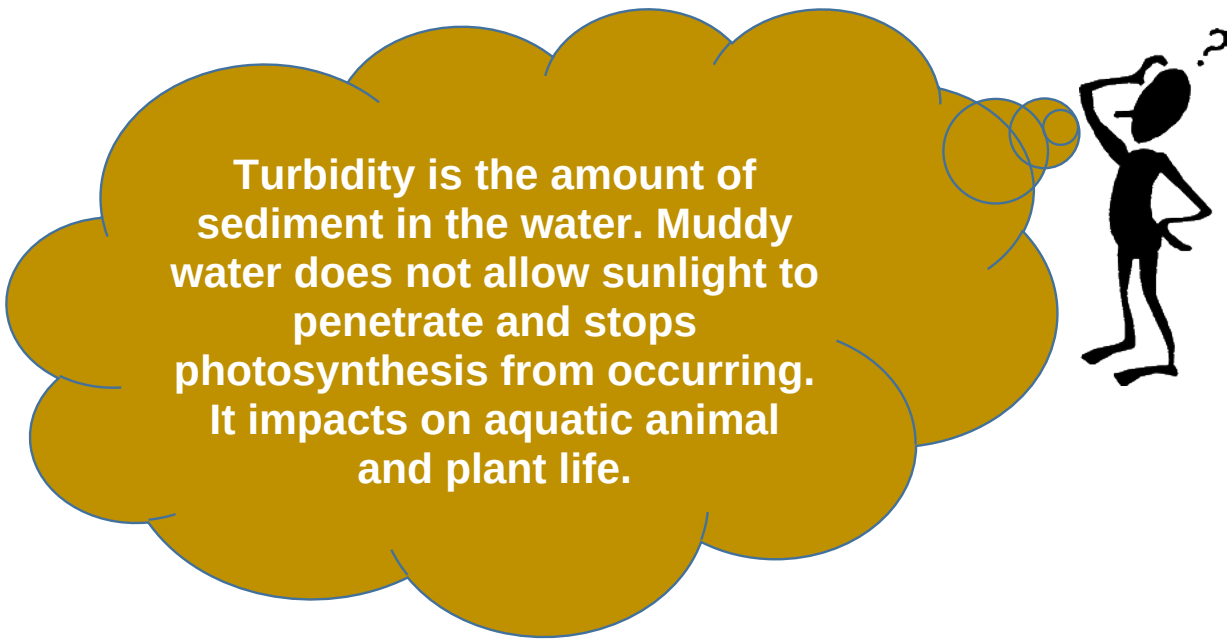
- Collect water in the bucket from the water source.
- Hold the turbidity tube upright and still.
- Use a sample jar to add water from the bucket into the turbidity tube making sure to stop at each increment. Observe the pattern on the bottom of the turbidity tube to ensure you can see it.
- Continue to poor water into the tube at each increment. Stop when you cannot see the pattern on the bottom of the tube.
- Add the reading to your data table.

Fieldwork equipment

What does this all mean?



How would turbidity impact on this environment?



Fieldwork equipment

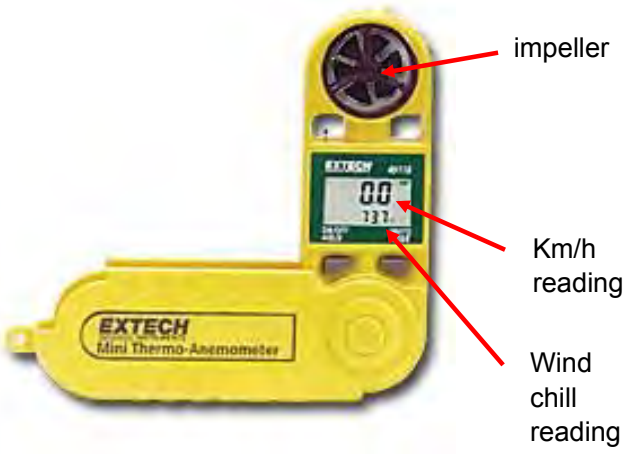
Station 5

What do I need to find out?

- Wind speed (air velocity)
- Wind chill

What equipment do I use?

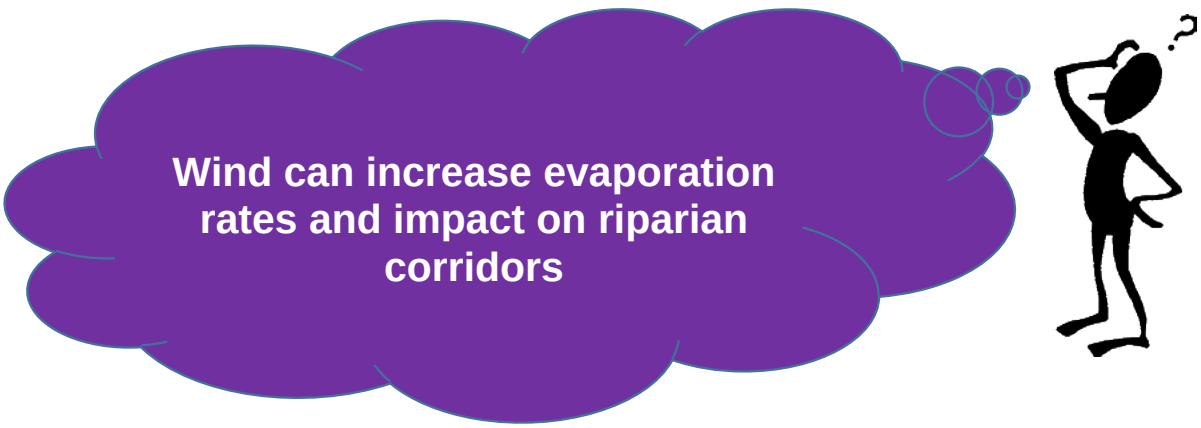
- Thermo-anemometer



How do I measure the speed of the wind?

- Press the on/off hold button down to turn on device. You should have km/h and °C displayed as the units.
- Hold the thermo-anemometer high up in the air above your head. Face the instrument into the wind. For example: if it is a southerly wind have the digital display side facing south so the wind can move through the impeller (wind vane)
- Read the wind speed in km/h
- Read the wind chill in °C is there a difference in wind chill compared to the actual temperature reading obtained from Station 1?
- Add the reading to your data table.

How would wind impact on this environment?



Fieldwork equipment

Station 6

What do I need to find out?

- Water pH

What equipment do I use?

- Universal indicator paper

How do I measure pH?

The pH of water measures the acidity or alkalinity of the water. Waterways are healthy if they fall within a middle range of pH (7). If water becomes too acidic (low) or too alkaline (high), aquatic plants and animals may have difficulty surviving.

- Collect water from the water source in a sample jar
- Dip a small piece of universal indicator into the water sample. Remove immediately.
- Immediately hold the wet universal indicator strip against the colour chart to determine the pH level.
- Record the result in your data table.

What does this all mean?

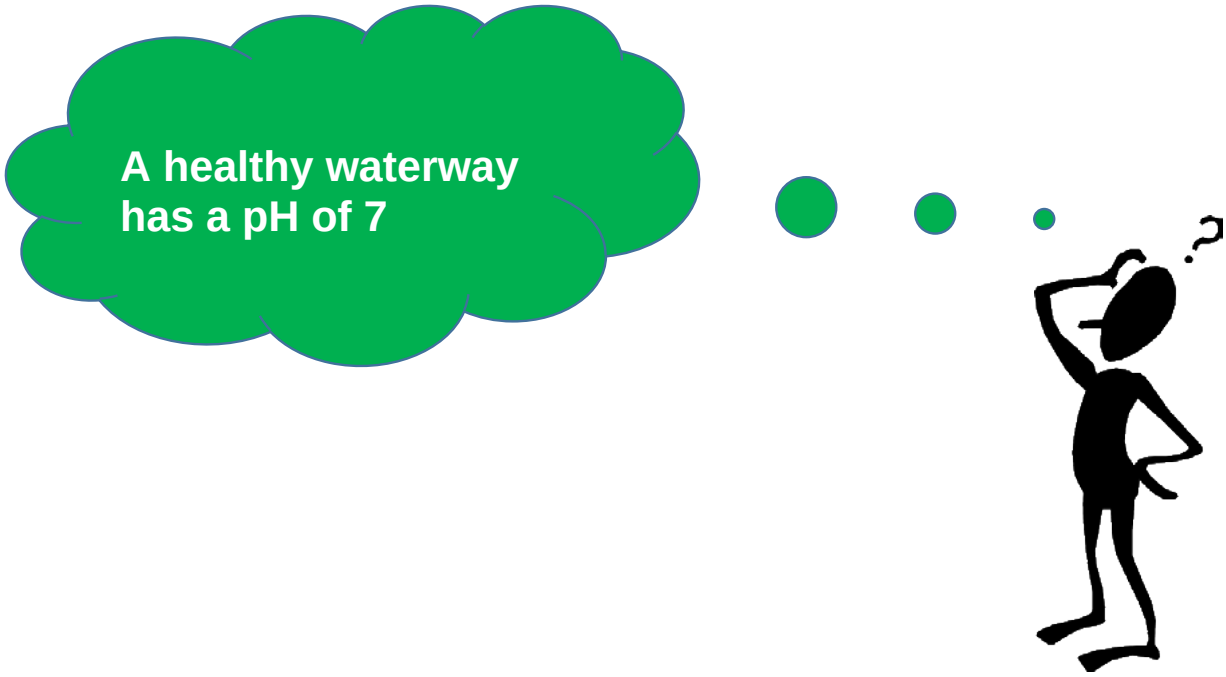
pH range	Description	Colour
< 3	Strong acid	Red
3 - 6	Weak acid	Orange or yellow
7	Neutral	Green
8 - 11	Weak alkali	Blue
> 11	Strong alkali	Violet or indigo

Fieldwork equipment

How would pH impact on this environment?

ACID 1-6 indicates hydrochloric acid, herbicides and builder's runoff. Aquatic invertebrates (with shells) are very sensitive to a pH lower than 7. This can stop their shells forming.

ALKALI 8-14 indicates fertilisers and cleaning products such as detergents. Detergents and fertilisers can result in **eutrophication**, creating dense plant growth that decrease oxygen levels and reduces photosynthesis, impacting on other plants and animals.



Fieldwork equipment

Station 7

What do I need to find out?

- Soil moisture

What equipment do I use?

- Soil moisture meter

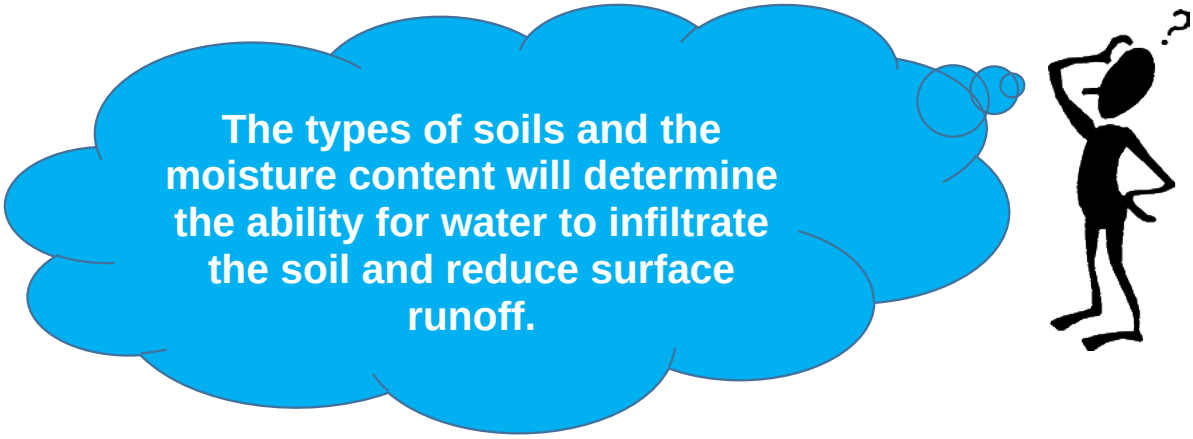
How do I measure the moisture in the soil?

Look at the soil at the fieldwork site

- What does it look like?
- What is it made up of (big/little particles)?
- What is its colour?
- Is there any organic matter in it?

Carefully insert the soil moisture meter in the ground.
What foes the reading tell us about the capability of the soil to support vegetation?
Record the reading in the data table.

How would soil moisture impact on this environment?



Fieldwork equipment

Station 8

What do I need to find out?

- Find north
- Orientate to the north to draw a map

What equipment do I use?

- Compass

How do I find north?

- North is wherever the red end of the needle is pointing.
- To accurately face north, hold your compass out in front of you, making sure the compass is level (horizontal). If the compass is not level, it can restrict the free rotation of the needle and give you a false reading.
- With the compass level and pointing away from you, look down the directional arrow of the compass and rotate your body slowly on the spot. Watch the needle – as you rotate, it spins in the opposite direction!
- When the red end of the needle and the directional arrow line up, you're facing north.

How do I do orientate myself to the map?

Orientating, or aligning, the map is really easy with just 3 steps:

- Lay your map out on a relatively flat, smooth surface.
- Turn your compass dial so due North is aligned with the directional arrows.
- Place your compass on your map with the bottom of the compass (near the string) parallel to the north-south grid lines on the map. Turn the map and compass slowly together on the ground until the compass needle and directional arrows are going in the same direction as the grid lines on the map.
- You now have the map orientated to north. Try and see if you can see any of the features on the map in front of you in the distance.