

Stage 4 Geography

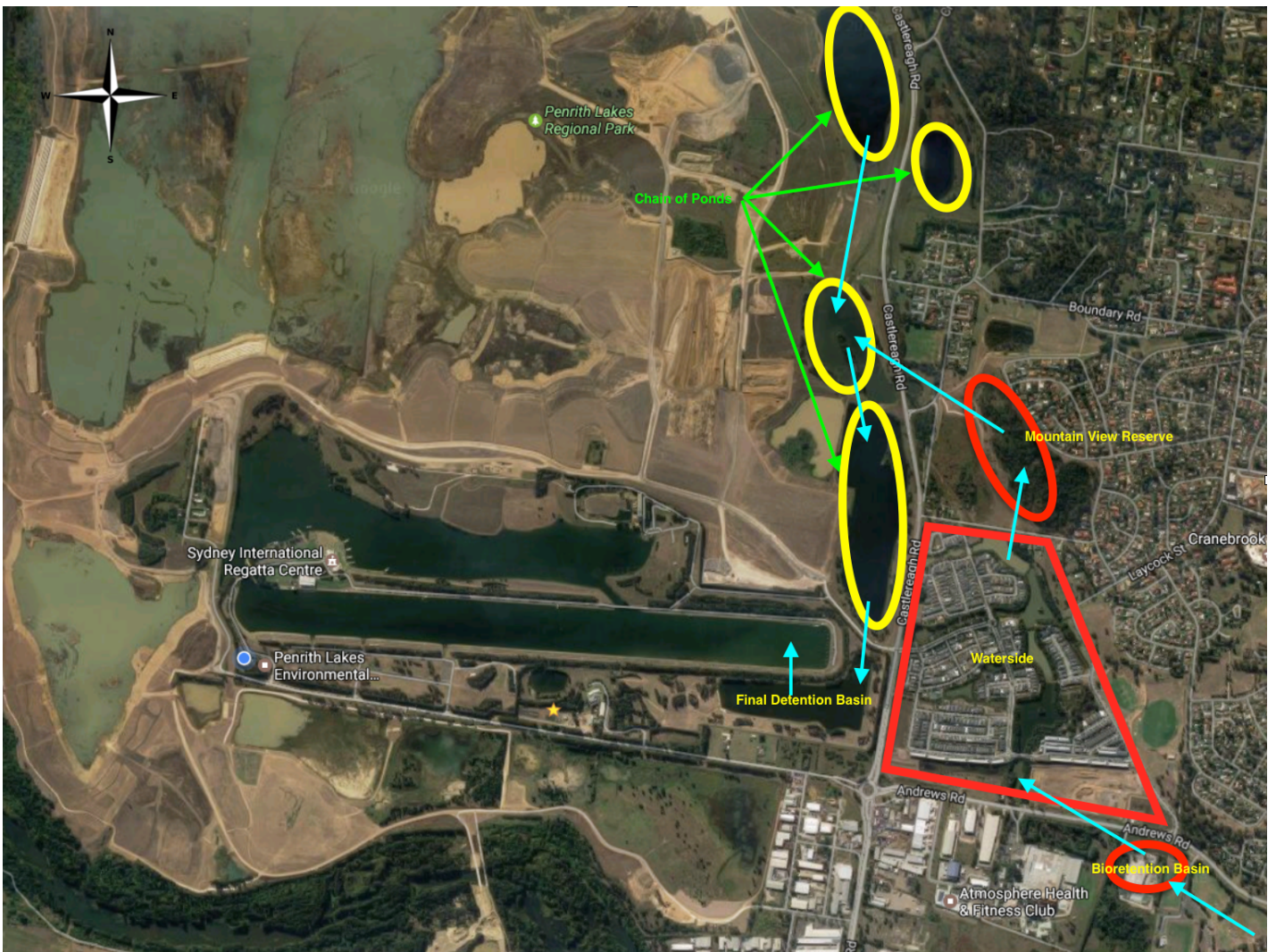
Water in the World - Half Day

Outcomes:

1. **GE4-1** Locates and describes the diverse features and characteristics of a range of places and environments.
2. **GE4-3** Explains how interactions and connections between people, places and environments result in change.
3. **GE4-5** Discusses management of places and environments for their sustainability.
4. **GE4-7** Acquires and processes geographical information by selecting and using geographical tools for inquiry.

Student Name: _____

Case Study: Water Management at Penrith Lakes



Water Management Walk

Before reaching the Final _____ Basin, stormwater has been treated at a number of sites and slowed down by the _____ of ponds. Within the Final Detention Basin there are some further water management practices in place to ensure the stormwater is clean enough for recreational use. For sustainable recreational water a well balanced native _____ needs to be in place.

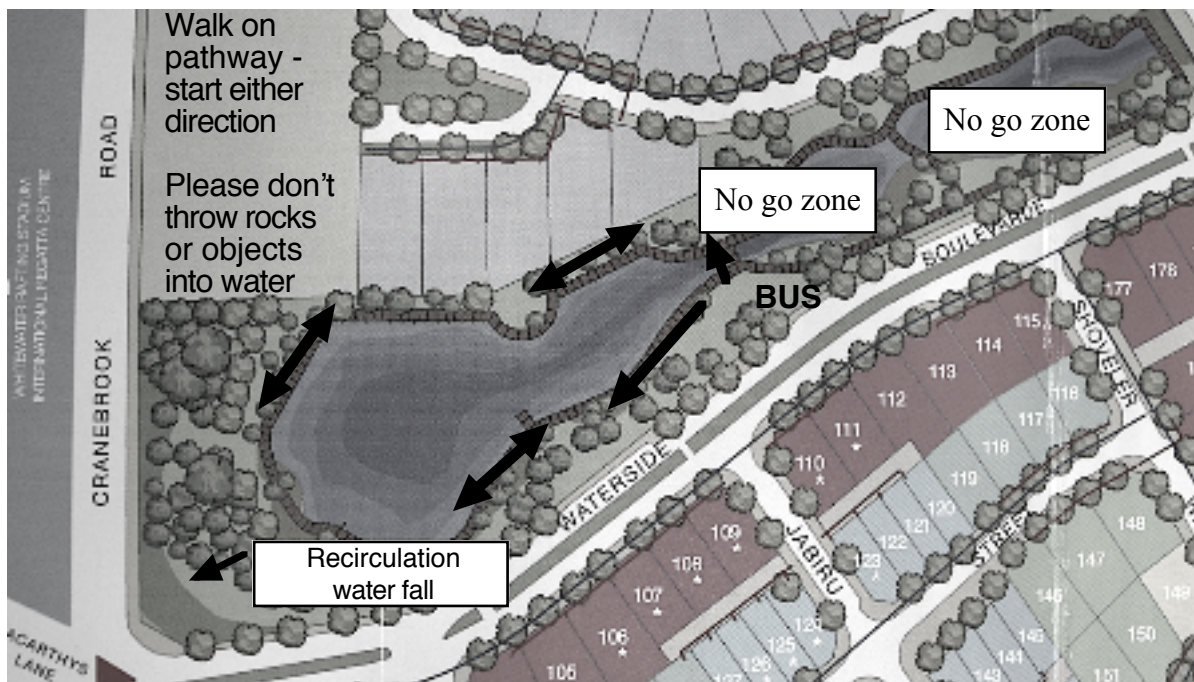
	Problem	Effects on water quality	Management
A	High nutrient run off	Encourages _____ algal blooms.	(2) _____ wetlands (use up nutrients) (3) Floating Treatment _____ .
B	Excessive sediment from land clearing and non sealed areas	Causes turbid (brown) water which raises water temperature and lower O2 by blocking sunlight.	(4) A silt _____ (filters sediment). (2) _____ wetlands (slows inflow). (1) Detention basin system and sluice gate.
C	_____ (high water surface temperatures and low bottom temperatures)	Stratified water (low O2 at bottom level) releases _____ from "floor" sediment. Warm top layer encourages algal blooms.	(5) An _____ and hoses create currents to mix water. (6) Remote temperature sensor (yellow floating instrument with solar panels) triggers the air pump.
D	Petrochemicals (e.g. oil) and litter	Harmful impacts on ecosystem life. Blocks sunlight (low O2).	(7) A trash _____ holds back oil and litter.
E	Polluted storm water/ storm events	First flush run-off brings pollutants. Large flows can exceed basin capacity.	(8) _____ gate can be closed for pollutants or opened during flooding/ storms.
F	European _____ (introduced fauna)	High _____ - stirs up sediments and rips out water plants which leads to lower O2 and higher nutrients.	Electro-fishing (in the past). (9) Stocking the lakes with _____ (biological control)
G	Hydrilla (native flora)	Hydrilla canopies lower O2 by blocking sunlight. Chokes out _____ plants.	(10) Weed _____ . (11) Selective _____ . (12) Covering with mats.

Word List

sluice; chain; harvesting; air pump; detention; stratification; nutrients; turbidity; boom; carp; blue-green; perched; bass; wetlands; native; screen; ecosystem; spraying



Waterside - A case study of "Water Sensitive Urban Design"



Picture 2: Waterside Location Map and Pathways

The "Waterside" development is being built by Stockland and is made up of two areas - Corporate (Employment) and Residential. Waterside Corporate covers 12.5ha of developable land providing valuable employment. The residential area of Waterside covers 54ha. There will be 686 lots available. The estimated population is 2,150 persons. The public open space will cover 11 ha and the lakes another 11 ha.

Waterside has been planned around a series of lakes that are designed to provide amenity to the estate as well as water quality improvements.

Central to Waterside is the practice of "Water Sensitive Urban Design" (WSUD). This involves the management and protection of stormwater.

Key principles of WSUD (fill in the blank spaces below):

1. Protect _____ systems
2. Protect _____ quality (e.g. chain of ponds to begin water filtration)
3. Integrate _____ treatment into the landscape
4. Reduce _____ and peak flows
5. Add value while _____ development costs (e.g. water drains to centre of road)
6. Reduce _____ water demand (e.g. rainwater tanks for gardening)

What role does each feature play in Water Management?

Raingardens:

Raingardens have rainwater directed into them from the _____. They reduce the amount and increase the quality of _____ that would otherwise wash large amounts of _____ into the stormwater drain. They also provide _____ for native fauna.

Rip Raps:

At this location the lake is divided into sections. The contours fall from west to east which creates _____. In between each section are _____ known as rip raps. The water movement over rip raps put _____ into the water.

Housing Layout:

This involves a more _____ form of development, which reduces surfaces that cannot _____ water and help protect the _____ quality. Having double storey homes on smaller blocks means there is more space available for _____ areas, e.g. buffer zones.

Road Layout:

Run-off from roads is directed onto _____ surfaces, e.g. gardens, for watering purposes and to _____ stormwater flow. Drainage from roads goes to one side (decreasing pipework) and roads tend to be _____ (decreasing impervious surfaces). A major advantage, apart from reducing flows, is the reduced _____.

Buffer Zones:

Buffer Zones are made up of native _____/_____ and herbs /grasses near ponds. Buffer Zones slow down the _____ and allow infiltration. Excess _____ are taken out of the water by the plants' root system. _____ is held back by buffer zone.

Macrophyte (large water plants) Zone:

This area is usually occupied by _____ (at waters edge) and _____ (underwater) aquatic plants. The plants take up or convert the nutrients (_____ and _____). Other pollutants taken up even include oil.

Rainwater Tanks:

Rainwater tanks use stormwater as a _____ around the home as well as reducing urban _____. Tankwater at Waterside is used for _____ purposes. A _____ device manages the supply of stored rainwater to appropriate uses in your house _____.

Recirculation Fountain / Waterfall:

Water flows from the upstream _____ are collected in a _____. Pumps then carry the water to this waterfall which has two major functions :

1. Circulate water to prevent _____
2. Add _____ to the water as indicated by the white bubbles.