PUB SINGAPORE'S NATIONAL WATER AGENCY

PUB'S 3-STEP PROCESS TO PROTECT YOU FROM FLOODS

As our climate changes, rainfall will become more intense and frequent. This could overwhelm our drainage system and cause flash floods. With Singapore's land constraints, it is not feasible to expand drains to cater for extreme events. As such, Singapore has adopted a **'Source-Pathway-Receptor' approach** to enhance flood protection.

Starting at the 'source', developments need to control the amount of stormwater runoff entering the 'pathways' which refer to the drainage system. Buildings and infrastructure which could be 'receptors' of flood risk need to meet flood protection standards.

1. Source

'Source' measures, such as **rain gardens** can:

- reduce impervious surfaces and the amount of surface runoff generated.
- store stormwater temporarily and control flows into public drains.

These prevent drainage systems from being overwhelmed.

What is a rain garden?
A small man-made garden that catches and stores stormwater before slowly releasing it into nearby drains.

2. Pathway

PUB continually improves and upgrades 'pathways' like drains and canals to cater for new developments. These upgrades help convey stormwater efficiently or to detain it temporarily before discharging it back to drains.

Litter collection devices are also installed at major water ways to ensure that they remain free-flowing.

Don't throw litter into drains!
This can cause the litter to obstruct water flow and reduce the drain's ability to convey stormwater effectively.

3. Receptor

'Receptor' measures help to prevent floodwaters from entering buildings during flash floods.

Common examples of measures include meeting minimum platform levels of development sites and additional crest protection for underground spaces (e.g. MRT stations).

This is why you typically climb a flight of stairs before descending into an underground MRT station!

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AWESOME ALKAFF LAKE

Alkaff Lake, which is located in Bidadari Park, enhances flood protection for the Bidadari estate and surrounding areas. In dry weather, it is a beautiful lake that also functions as a community space for all to enjoy. But when there's heavy rainfall, it acts as a stormwater retention pond to temporarily hold stormwater runoff.

BIDADARI ESTATE

During a heavy storm, run-off from half of the Bidadari estate will flow by gravity into Alkaff Lake, which is the lowest point in the area.

A safety warning system broadcasts warnings to inform the public to move away when water levels rise. There are also red safety markers, beacon lights and signages to educate visitors on areas they should avoid.

ALKAFF LAKE

The 1.8-hectare lake is designed to hold up to 40,000 m^3 of water, or 16 Olympic-sized swimming pools. While the water level in Alkaff Lake is typically maintained between 1-1.5m, this can rise up to 4m during heavy storms!

Aerators in the lake improve water circulation and levels of dissolved oxygen in the water.

Terraced wetlands filter pollutants to ensure good water quality.

MACPHERSON AND BEYOND

Alkaff Lake has outlet points that slowly release stormwater to its next destination – the Happy Avenue outlet drain, nestled between private homes in MacPherson. This is then discharged to Pelton Canal, the Kallang River and subsequently to Marina Reservoir.

Gross pollutant traps collect litter and silt to improve water quality.

All images shown here are for illustrative purposes only and should not be taken as an accurate depiction of Alkaff Lake.

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TINY YET MIGHTY SYED ALWI PUMPING STATION

The heritage buildings in the Jalan Besar area are an important part of our history, but protecting them from floods presented a challenge.

Then came the Syed Alwi Pumping Station (SAPS), one of the solutions under PUB's **Source-Pathway-Receptor approach** to flood protection. Small yet efficient, SAPS manages floods without massive construction projects or taking up much space as the majority of the facility is underground. It reduces flood risks in the low-lying areas of Jalan Besar and parts of Little India.

How does it work?

1. Floodgates of the Syed Alwi drains shut to prevent backflow from Rochor Canal into the Jalan Besar area.
2. Stormwater flows into SAPS from Jalan Besar.
3. Four raker screens remove large debris from the stormwater.
4. Stormwater is diverted into an underground tank that can hold 9,300 m^3 of water, or 4 Olympic-sized swimming pools. When water in the tank reaches a certain level, it is discharged by automatic pumps.
5. Water is pumped into the nearby canal.

THE JALAN BESAR AREA

This area is low-lying, which makes it prone to flooding. Also, 40% of it is a conservation area. This means we cannot raise buildings and roads. Stormwater that falls over the Jalan Besar area is directed to flow into SAPS.

ROCHOR CANAL

To ensure the Jalan Besar area does not flood, stormwater from SAPS is pumped into a section of Rochor Canal further downstream and away from the neighbourhood.